The Chemical Formulary

A Collection of Valuable, Timely, Practical
Commercial Formulae and Recipes for
Making Thousands of Products in
Many Fields of Industry

VOLUME IV

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PREFACE

Chemistry as taught in our schools and colleges is confined to synthesis, analysis and engineering—and properly so. It is part of the proper foundation for the education of the chemist.

Many a chemist on entering an industry soon finds that the bulk of the products manufactured by his concern are not synthetic or definite chemical compounds but are mixtures, blends or highly complex compounds of which he knows little or nothing. The literature in this field, if any, may be meagre, scattered or antiquated.

Even chemists, with years of experience in one or more industries, spend considerable time and effort in acquainting themselves on entering a new field. Consulting chemists, similarly, have problems brought to them from industries foreign to them. A definite need has existed for an up-to-date compilation of formulae for chemical compounding and treatment. Since the fields to be covered are many and varied, an editorial board was formed, composed of chemists and engineers in many industries.

Many publications, laboratories, manufacturing companies and individuals have been drawn upon to obtain the latest and best information. It is felt that the formulae given in this volume will save chemists and allied workers much time and effort.

Manufacturers and sellers of chemicals will find in these formulae new uses for their products. Non-chemical executives, professional men and others, who may be interested, will gain from this volume a "speaking acquaintance" with products which they may be using, trying, or with which they are in contact.

It often happens that two individuals using the same ingredients in the same formula get different results. This may be the result of slight deviations or unfamiliarity with the intricacies of a new technique. Accordingly, repeated experiments may be necessary to get the best results. Although many of the formulae given are being used commercially many have been taken from patent specifications and the literature. Since these sources are often subject to various errors and omissions, due regard must be given to this factor. Wherever possible it is advisable to consult with other chemists or technical workers regarding commercial production. This will save time and money and avoid "headaches."

It is seldom that any formula will give exactly the results which one requires. Formulae are useful as starting points from which to work out one's own ideas. Formulae very often give us ideas which may help us in our specific problems. In a compilation of this kind errors of omission, commission and printing may occur. We shall be glad to receive any constructive criticism in this, our first attempt.

To the layman, it is suggested that he arrange for the services of a chemist or technical worker familiar with the specific field in which he is interested. Although this involves an expense it will insure quicker and better formulation without wastage of time and materials.

H. BENNETT

PREFACE TO VOLUME IV

New and additional formulae gathered during the past year have accumulated in quantity sufficient to produce an additional volume to volumes I, II & III of the Chemical Formulary. With some trepidation as to the acceptability of a fourth volume at this time, inquiry was made of educators, chemists, engineers, and manufacturers as to whether or not it should be published at this time. The unanimous answer was that information of this nature should be disseminated at the earliest moment to do the greatest amount of good.

It is gratifying to note that schools and colleges are making greater use of the Chemical Formulary as an auxiliary in stimulating practical interest in chemistry. With it students are making adhesives, insecticides, polishes, cosmetics, etc. It makes chemistry interesting, practical and useful to them.

Because some purchasers of this book are beginners in the art of chemical compounding, it was suggested that a simple introductory chapter be included. This has been done, giving complete directions for making simple preparations in everyday use.

It is a sincere pleasure to acknowledge the valuable assistance of the members of the board of editors and others who have given of their time and knowledge in contributing the special formulae which have made this volume possible.

H. BENNETT

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ABBREVIATIONS

amp.	ampere
amp./dm^2	amperes per square decimeter
amp./sq. ft.	amperes per square foot
anhydr.	anhydrous
avoir.	avoirdupois
Bé.	Baumé
b.p.	boiling point
C.	Centigrade
°C.	Degrees Centigrade
cc.	cubic centimeter
c.d.	current density
cm.	centimeter
cm^3	cubic centimeter
conc.	concentrated
c.p.	chemically pure
cu. ft.	cubic foot
cu. in.	cubic inch
cwt.	hundred weight
d.	density
dil.	dilute
dm.	decimeter
dm^2	square decimeter
dr.	dram
E.	Engler
F.	Fahrenheit
°F.	Degrees Fahrenheit
f.f.c.	free from chlorine
f.f.p.a.	free from prussic acid
fl. dr.	fluid dram
fl. oz.	fluid ounce
f.p.	freezing point
ft.	foot
ft.^{2}	square foot
g.	gram
gal.	gallon
gr.	grain
hl.	Hectoliter
hr.	hour
in.	inch
kg.	kilogram
l.	liter
lb.	pound
liq.	liquid
m.	meter
min.	minim, minute
ml.	milliliter—cubic centimeter
mm.	millimeter
m.p.	melting point
N.	Normal
N.F.	National Formulary
oz.	ounce
pH	Hydrogen-Ion Concentration

ABBREVIATIONS

p.p.m.	parts per million
pt.	pint
pwt.	pennyweight
q.s.	a quantity sufficient to make
qt.	quart
r.p.m.	revolutions per minute
S.A.E.	Society of Automotive Engineers
sec.	second
sp.	spirits
sp. gr.	specific gravity
sq. dm.	square decimeter
tech.	technical
tinc.	tincture
tr.	tincture
Tw.	Twaddell
U.S.P.	United States Pharmacopeia
v.	volt
visc.	viscosity
vol.	volume
wt.	weight

INTRODUCTION

At the suggestion of a number of teachers of chemistry and home economics the following introductory matter has been included.

The contents of this section are written in a simple way so that anyone, regardless of technical education or experience, can start making simple products without any complicated or expensive machinery. For commercial productions, however, suitable equipment is necessary.

Chemical specialties en masse are composed of pigments, gums, resins, solvents, oils, greases, fats, waxes, emulsifying agents, water, chemicals of great diversity, dyestuffs, and perfumes. To compound certain of these with some of the others requires certain definite and well-studied procedure, any departure from which will inevitably result in failure. The successful steps are given with the formulas. Follow them explicitly. If the directions require that A should be added to B, carry this out literally, and not in reverse fashion. In making an emulsion, the job is often quite as tricky as the making of mayonnaise. In making mayonnaise, you add the oil to the egg, *slowly*, with constant and even and regular stirring. If you do it correctly, you get mayonnaise. If you depart from any of these details: if you add the egg to the oil, or pour the oil in too quickly, or fail to stir regularly, the result is a complete disappointment. The same disappointment might be expected if the prescribed procedure of any other formula is violated.

The next point in importance is the scrupulous use of the proper ingredients. Substitutions are sure to result in inferior quality, if not in complete failure. Use what the formula calls for. If a cheaper product is desired, do not obtain it by substituting a cheaper material for the one prescribed: resort to a different formula. Not infrequently a formula will call for some ingredient which is difficult to obtain: in such cases, either reject the formula or substitute a similar material only after preliminary experiment demonstrates its usability. There is a limit to which this rule may reasonably be extended. In some instances the substitution of an equivalent ingredient may legitimately be made. For example: when the formula calls for *white wax* (beeswax), yellow wax can be used, if the color of the finished product is a matter of secondary importance. Yellow beeswax can often replace white beeswax, making due allowance for color: but paraffin will *not* replace beeswax, even though its light color recommends it above yellow beeswax.

And this leads to the third point: the use of good quality ingredients, and ingredients of the correct quality. Ordinary lanolin is not the same thing as *anhydrous* lanolin: the replacement of one for the other, weight for weight, will give discouragingly different results. Use exactly what the formula calls for: if you are unacquainted with the material and a doubt arises as to just what is meant, discard the formula and use one that you understand. Buy your materials from reliable sources. Many ingredients are obtainable in a number of different grades: if the formula does not designate the grade, it is understood that the best grade is to be used. Remember that a formula and the directions can tell you only a part of the story. Some skill is often required to attain success. Practice with a small batch in such cases until you are sure of your technique. Many instances can be cited. If the formula calls for steeping quince seed for 30 minutes in cold water, your duplication of this procedure may produce a mucilage of too thin a consistency. The originator of the formula may have used a fresher grade of seed, or his conception of what ''cold'' water means may be different from yours. You should have a feeling for the right degree of mucilaginousness, and if steeping the seed for 30 minutes fails to produce it, steep them longer until you get the right kind of mucilage. If you do not know what the right kind is, you will have to experiment until you find out. Hence the recommendation to make small experimental batches until successful results are arrived at. Another case is the use of dyestuffs for coloring lotions, and the like. Dyes vary in strength: they are all very powerful in tinting value: it is not always easy to state in quantitative terms how much to use. You must establish the quantity by carefully adding minute quantities until you have the desired tint.

Gum tragacanth is one of those products which can give much trouble. It varies widely in solubility and bodying power: the quantity prescribed in the formula may be entirely unsuitable for *your* grade of tragacanth. Hence a correction is necessary, which can only be made after experiments to determine *how much* to correct.

In short, if you are completely inexperienced, you can profit greatly by gaining some experience through recourse to experiment. Such products as mouth washes, hair tonics, astringent lotions, need little or no experience, because they are as a rule merely mixtures of simple liquid and solid ingredients, the latter dissolving without difficulty and the whole being a clear solution that is ready for use when mixed. On the other hand, face creams, tooth pastes, lubricating greases, wax polishes, etc., which require relatively elaborate procedure and which depend for their usability on a definite final viscosity, must be made with the exercise of some skill, and not infrequently some experience.

Figuring

Some prefer proportions expressed by weight, volume or in terms of percentages. In different industries and foreign countries various systems of weights and measures are used. For this reason no one set of units could be satisfactory for everyone. Thus divers formulae appear with different units in accordance with their sources of origin. In some cases, parts instead of percentages or weight or volume is designated. The following examples illustrate typical units:

Ink for Marking Glass

Glycerin	40	Ammonium Sulphate	10
Barium Sulphate	15	Oxalic Acid	8
Ammonium Bifluoride	15	Water	12

Here no units are mentioned. When such is the case it is standard practice to use parts by weight, using the same system throughout. Thus here we may use ounces or grams as desired. But if ounces are used for one item then ounces must be the unit for all the other items in the particular formula.

Flexible Glue

Glue, Powdered	30.9 %	Glycerin	5.15%
Sorbitol (85%)	15.45%	Water	48.5 %

Where no units of weight or volume but percentages are given then forget the percentages and use the same instructions as given under Example No. 1.

Example No. 3

Antiseptic Ointment

Petrolatum	16 parts	Benzoic Acid	1 part
Coconut Oil	12 parts	Chlorthymol	1 part
Salicylic Acid	1 part		

The same instructions as given under Example No. 1 apply to Example No. 3.

It is not wise in many cases to make up too large a quantity of material until one has first made a number of small batches to first master the necessary technique and also to see whether it is suitable for the particular outlet for which it is intended. Since, in many cases, a formula may be given in proportions as made up on a commercial factory scale, it is advisable to reduce the proportions accordingly. Thus, taking the following formula:

Example No. 4

Neutral Cleansing Cream

Mineral Oil	80 lb.	Water	90 lb.
Spermaceti	30 lb.	Glycerin	10 lb.
Glyceryl Monostearate	24 lb.	Perfume	to suit

Here, instead of pounds, grams may be used. Thus this formula would then read:

Mineral Oil	80 g.	Water	90 g.
Spermaceti	30 g.	Glycerin	10 g.
Glyceryl Monostearate	24 g.	Perfume	to suit

Reduction in bulk may also be obtained by taking the same fractional part or portion of each ingredient in a formula. Thus in the following formula:

Example No. 5

Vinegar Face Lotion

Acetic Acid (80%)	20	Alcohol	440
Glycerin	20	Water	500
Perfume	20		

We can divide each amount by ten and the finished bulk is only 1/10th of the original formula. Thus it becomes:

Acetic Acid (80%)	2	Alcohol	44
Glycerin	2	Water	50
Perfume	2		

Apparatus

For most preparations pots, pans, china and glassware, such as is used in every household, will be satisfactory. For making fine mixtures and emulsions a "malted-milk" mixer or egg-beater is necessary. For weighing, a small, low priced scale should be purchased from a laboratory supply house. For measuring of fluids, glass graduates or measuring glasses may be purchased from your local druggist. Where a thermometer is necessary a chemical thermometer should be obtained from a druggist or chemical supply house.

Methods

To better understand the products which you intend making, it is advisable that you read the complete section covering such products. Very often an important idea is thus gotten. You may learn different methods that may be used and also avoid errors which many beginners are prone to make.

Containers for Compounding

Where discoloration or contamination is to be avoided (as in light colored, or food and drug products) it is best to use enamelled or earthenware vessels. Aluminum, as well, is highly desirable in such cases but it should not be used with alkalies as the latter dissolve and corrode this metal.

Heating

To avoid overheating, it is advisable to use a double boiler when temperatures below 212° F. (temperature of boiling water) will suffice. If a double boiler is not at hand, any pot may be filled with water and the vessel containing the ingredients to be heated is placed therein. The pot may then be heated by any flame without fear of overheating. The water in the pot, however, should be replenished from time to time as necessary—it must not be allowed to "go dry." To get uniform higher temperatures, oil, grease or wax is used in the outer container in place of water. Here of course care must be taken to stop heating when thick fumes are given off as these are inflammable. When higher uniform temperatures are necessary, molten lead may be used as a heating medium. Of course, where materials melt uniformly and stirring is possible, direct heating over an open flame is possible.

Where instructions indicate working at a certain temperature, it is important that the proper temperature be attained—not by guesswork, but by the use of a thermometer. Deviations from indicated temperatures will usually result in spoiled preparations.

Temperature Measurements

In Great Britain and the United States, the Fahrenheit scale of temperature measurement is used. The temperature of boiling water is 212° Fahrenheit (212° F.); the temperature of melting ice is 32° Fahrenheit (32° F.).

In scientific work and in most foreign countries the Centigrade scale is used. On this scale of temperature measurement, the temperature of boiling water is 100 degrees Centigrade (100° C.) and the temperature of melting ice is 0 degrees Centigrade (0° C.).

The temperature of liquids is measured by a glass thermometer. The latter is inserted as deeply as possible in the liquid and is moved about until the temperature remains steady. It takes a little time for the glass of the thermometer to come to the temperatures of the liquid. The thermometer should not be placed against the bottom or side of the container, but near the center of the liquid in the vessel. Since the glass of the bulb of the thermometer is very thin, it can be broken easily by striking it against any hard surface. A cold thermometer should be warmed gradually (by holding over the surface of a hot liquid) before immersion. Similarly the hot thermometer when taken out should not be put into cold water suddenly. A sharp change in temperature will often crack the glass.

Mixing and Dissolving

Ordinary solution (e.g. sugar in water) is hastened by stirring and warming. Where the ingredients are not corrosive, a clean stick, bone or composition fork or spoon is used as a mixing device. These may also be used for mixing thick creams or pastes. In cases where most efficient stirring is necessary (as in making mayonnaise, milky polishes, etc.) an egg beater or a malted-milk mixer is necessary.

Filtering and Clarification

When dirt or undissolved particles are present in a liquid, they are removed by settling or filtering. In the former the solution is allowed to stand and if the particles are heavier than the liquid they will gradually sink to the bottom. The upper liquid may be poured or siphoned off carefully and in some cases is then of sufficient clarity to be used. If, however, the particles do not settle out then they must be filtered off. If the particles are coarse they may be filtered or strained through muslin or other cloth. If they are very small particles then filter paper is used. Filter papers may be obtained in various degrees of fineness. Coarse filter paper filters rapidly but will not, of course, take out extremely fine particles. For the latter, it is necessary to use a very fine grade of filter paper. In extreme cases even this paper may not be fine enough. Here it will be necessary to add to the liquid 1–3% of infusorial earth or magnesium carbonate. The latter clog up the pores of the filter paper and thus reduce their size and hold back undissolved material of extreme fineness. In all such filtering, it is advisable to take the first portions of the filtered liquid and pour them through the filter again as they may develop cloudiness in standing.

Decolorizing

The most commonly used decolorizer is decolorizing carbon. The latter is added to the liquid to the extent of 1–5% and heated with stirring for ½ hour to as high a temperature as is feasible. It is then allowed to stand for a while and filtered. In some cases bleaching must be resorted to. Examples of this are given in this book.

Pulverizing and Grinding

Large masses or lumps are first broken up by wrapping in a clean cloth and placing between two boards and pounding with a hammer. The smaller pieces are then pounded again to reduce their size. Finer grinding is done in a mortar with a pestle.

Spoilage and Loss

All containers should be closed when not in use to prevent evaporation or contamination by dust; also because, in some cases, air affects the material adversely. Many materials attack or corrode the metal containers in which they are received. This is particularly true of liquids. The latter, therefore, should be transferred to glass bottles which should be as full as possible. Corks shoud be covered with aluminum foil (or dipped in melted paraffin wax when alkalies are present).

Materials such as glue, gums, olive oil or other vegetable or animal products may ferment or become rancid. This produces discoloration or unpleasant odors. To avoid this, suitable antiseptics or preservatives must be used. Too great stress cannot be placed on cleanliness. All containers must be cleaned thoroughly before use to avoid various complications.

Weighing and Measuring

Since, in most cases, small quantities are to be weighed, it is necessary to get a light scale. Heavy scales should not be used for weighing small amounts as they are not accurate for this type of weighing.

For measuring volume (liquids) measuring glasses or cylinders (graduates) should be used. Since this glassware cracks when heated or cooled suddenly it should not be subjected to sudden changes of temperature.

Caution

Some chemicals are corrosive and poisonous. In many cases they are labeled as such. As a precautionary measure, it is advised not to smell bottles directly, but only to sniff a few inches from the cork or stopper. Always work in a well ventilated room when handling poisonous or unknown chemicals. If anything is spilled, it should be wiped off and washed away at once.

Where to Buy Chemicals and Apparatus

Many chemicals and most glassware can be purchased from your druggist. Notices of suppliers of all products will be found at the end of this book.

ADVICE

This book is the result of co-operation of many chemists and engineers who have given freely of their time and knowledge. It is their business to act as consultants and, for a fee, to give advice on technical matters. As publishers, we do not maintain a laboratory or consulting service to compete with them.

Please, therefore, do not ask us for advice or opinions, but confer with a chemist in your vicinity.

Extra Reading

Keep up with new developments of new materials and methods by reading technical magazines. Many technical publications are listed under references in the back section of this book.

Calculating Costs

Purchases of raw materials, in small quantities, are naturally higher in price than when bought in large quantities. Commercial prices, as given in the trade papers and catalogs of manufacturers, are for quantities such as barrels, drums or sacks. For example, a pound of epsom salts, bought at retail, may cost 10 or 15 cents. In barrel lots its price today is about 2 to 3 cents per pound.

Typical Costing Calculation
Formula for Beer- or Milk Pipe Cleaner

Soda Ash	25 lb. @	.02½ per lb.	=	$0.63
Sodium Perborate	75 lb. @	.16 per lb.	=	12.00
Total	100 lb.		Total	$12.63

If 100 lb. cost $12.63, 1 lb. will cost $12.63 divided by 100 or about $0.126 per lb. for raw materials, assuming no loss.

Always weigh the amount of finished product and use *this* weight in calculating costs. Most compounding results in some loss of material because of spillage, sticking to apparatus, evaporation, etc. Costs of making experimental lots are always high and should not be used for figuring costs. To meet competition, it is necessary to buy in larger units and costs should be based on the latter.

Elementary Preparations

The recipes that follow have been gotten up in a very simple way. Only one of each type is given so as to avoid confusion. These have been selected because of their importance and because they can be made readily.

The succeeding chapters go into greater detail and give many different types and modifications of these and other recipes for home and commercial use.

Cleansing Creams

Cleansing creams as the name implies serve as skin cleaners. Their basic ingredients are oils and waxes which are rubbed into the skin. When wiped off they carry off dirt and dead skin. The liquefying type of cleansing cream contains no water and melts or liquefies when rubbed on the skin. To suit different climates and likes and dislikes harder or softer products can be made.

Cleansing Cream (Liquefying)

Liquid Petrolatum (White Mineral Oil)	5½ oz.
Paraffin Wax	2½ oz.
Petrolatum (Vaseline)	2 oz.

Melt together with stirring in an aluminum or enamelled dish and allow to cool. Then stir in a dash of perfume oil. Allow to stand until a haziness appears and then pour into jars, which should be allowed to stand *undisturbed* over night.

Cold Creams

The most important facial cream is cold cream. This type of cream consists of a mineral oil and wax which are emulsified in water with a little borax or glycosterin. The function of a cold cream is to furnish a greasy film which takes up dirt and waste tissue which are removed when the skin is wiped thoroughly. Many modifications of this basic cream are encountered in stores. They vary in color, odor, and in claims but, essentially, they are no more useful than this simple cream. The latest type of cold cream is the non-greasy cold cream which is of particular interest because it is non-alkaline and therefore non-irritating to sensitive skins.

Cold Cream

Liquid Petrolatum (White Mineral Oil)	52 g.
White Beeswax	14 g.

Heat the above in an aluminum or enamelled double boiler (the water in the outer pot should be brought to a boil). In a separate aluminum or enamelled pot dissolve

Borax	1 g.
Water	33 c.c.

and bring this to a boil. Add this in a thin stream, to the melted wax, while stirring vigorously in one direction only, to the melted wax mixture. Use a fork for stirring. When the mixture turns to a smooth thin cream, immerse the bottom of the thermometer in it from time to time, stirring continuously. When the temperature drops to 140° F. add ½ c.c. of perfume oil and continue stirring until the temperature drops to 120° F. At this point pour into jars where the cream will "set" after a while. If a harder cream is desired, reduce the amount of liquid petrolatum. If a softer cream is wanted increase it.

Cold Cream (Non-Greasy)

White Paraffin Wax	1¼ oz.
Petrolatum (Vaseline)	1½ oz.
Glycosterin or Glyceryl Monostearate	2¼ oz.
Liquid Petrolatum (White Mineral Oil)	3 oz.

Heat the above in an aluminum or enamelled double boiler (the water in the outer pot should be boiling). Stir until clear. To this slowly add, while stirring vigorously with a fork,

Water (boiling)	10 oz.

Continue stirring until smooth and then add with stirring, a little perfume oil. Pour into jars at 110–130° F. and cover the jars as soon as possible.

Vanishing Creams

Vanishing creams are non-greasy creams, soapy in nature. Some are white and others have a very beautiful pearly appearance. This type of cream depends on its soapiness for its cleansing character and is useful as a powder base.

Vanishing Cream

Stearic Acid	18 oz.

Melt the above in an aluminum or enamelled double boiler (the water in the outer pot must be boiling). To the above add, in a thin stream, while stirring vigorously with a fork, the following boiling solution made in an aluminum or enamelled pot:

Potassium Carbonate	¼ oz.
Glycerin	6½ oz.
Water	5 lb.

Continue stirring until the temperature falls to 135° F., then stir in a little perfume oil and stir from time to time until cold. Allow to stand over night and stir again the next day. Pack into jars which should be closed tightly.

Hand Lotions

Hand lotions are usually clear or milky liquids or salves which are useful in protecting the skin from roughness and redness because of exposure to cold, hot water, soap and other materials. "Chapped" hands are a common occurrence. The use of a good hand lotion keeps the skin smooth, soft, and in a normally healthy condition. The lotion is best applied at night, rather freely, and cotton gloves may be worn to prevent soiling. During the day it should be put on sparingly and the excess wiped off.

Hand Lotion (Salve)

Boric Acid	1 oz.
Glycerin	6 oz.

Warm the above in an aluminum or enamelled dish and stir with a clean wooden stick until dissolved (clear). Then allow to cool and work into the following mixture with a potato masher, or rounded stick, adding only a little of the above liquid at a time to the mixture below and not adding a further portion until it is fully absorbed.

Lanolin	6 oz.
Petrolatum or "Vaseline"	8 oz.

If it is desired to impart a pleasant odor to this lotion a little perfume may be added and worked in.

Hand Lotion (Milky Liquid)

Lanolin	¼ teaspoonful
Glycosterin or Glyceryl Monostearate	1 oz.

Tincture of Benzoin	2 oz.
Witch Hazel	25 oz.

Melt the first two items together in an aluminum or enamelled double boiler. If no double boiler is at hand improvise one by standing the dish in a small pot containing boiling water. When the mixture becomes clear remove from the double boiler and add slowly, while stirring vigorously with a fork or stick, the tincture of benzoin and then the witch hazel. Continue stirring until cool and then put into one or two large bottles and shake vigorously. The finished lotion is a beautiful milky liquid comparable to the best hand lotions on the market sold at high prices.

Brushless Shaving Creams

Brushless or latherless shaving creams are soapy in nature and do not require lathering or water. The formula given below is of the latest type being free from alkali and non-irritating. It should be borne in mind, however, that certain beards are not softened by this type of cream and require the old-fashioned lathering shaving cream.

Brushless Shaving Cream

White Mineral Oil	10 oz.
Glycosterin or Glyceryl Monostearate	10 oz.
Water	50 oz.

Heat the first two ingredients together in a pyrex or enamelled dish to 150° F. and into this run slowly, while stirring with a fork, the water which has been heated to boiling. Allow to cool to 105° F. and while stirring add a few drops of perfume oil. Continue stirring until cold.

Mouth Washes

Mouth washes and oral antiseptics are of practically negligible value. Many, however, insist on their use because of their refreshing taste and deodorizing value.

Mouth Wash

Benzoic Acid	⅝ oz.
Tincture of Rhatany	3 oz.
Alcohol	20 oz.
Peppermint Oil	⅛ oz.

Just shake together in a dry bottle until it is dissolved and it is ready. A teaspoonful is used to a small wineglassful of water.

Tooth Powders

Tooth powders depend for their cleansing action on soap and mild abrasives such as precipitated chalk and magnesium carbonate. The antiseptic present is practically of no value. The flavoring ingredients mask the taste of the soap and give the user's mouth a pleasant after-taste.

Tooth Powder

Magnesium Carbonate	420 g.
Precipitated Chalk	565 g.
Sodium Perborate	55 g.
Sodium Bicarbonate	45 g.
Soap, Powdered White	50 g.
Sugar, Powdered	90 g.
Wintergreen Oil	8 cc.
Cinnamon Oil	2 cc.
Menthol	1 g.

Dissolve the last three ingredients together and then rub well into the sugar. Add the soap and perborate mixing in well. Add the chalk with good mixing and then the sodium bicarbonate and magnesium carbonate. Mix thoroughly and sift through a fine wire screen. Keep dry.

Foot Powders

Foot powders consist of a filler such as talc or starch with or without an antiseptic or deodorizer. In the following formula the perborates liberate oxygen when in contact with perspiration which tends to destroy unpleasant odors. The talc acts as a lubricant and prevents friction and chafing.

Foot Powder

Sodium Perborate	3 oz.
Zinc Peroxide	2 oz.
Talc	15 oz.

Shake together thoroughly in a dry container until uniformly mixed. This powder must be kept dry or it will spoil.

Liniments

Liniments usually consist of an oil and an irritant such as methyl salicylate or turpentine. The oil acts as a solvent and tempering agent for the irritant. The irritant produces a rush of blood and warmth which is often slightly helpful.

Liniment, Sore Muscle

Olive Oil	6 fl. oz.
Methyl Salicylate	3 fl. oz.

Shake together and keep in a well stoppered bottle. Apply externally but do not apply to chafed or cut skin.

Chest-Rubs

In spite of the fact that chest-rubs are practically useless countless sufferers use them. Their action is similar to that of liniments and they differ only in that they are in the form of a salve.

"Chest-Rub" Salve

Yellow Petrolatum or Yellow Vaseline	1 lb.
Paraffin Wax	1 oz.
Eucalyptus Oil	2 fl. oz.
Menthol	½ oz.
Cassia Oil	⅛ fl. oz.
Turpentine	½ fl. oz.

Melt the vaseline and paraffin wax together in a double boiler and then add the menthol. Remove from the heat, stir, and cool a little; then stir in the oils, turpentine, and acid. When it begins to thicken pour into tins and cover.

Insect Repellants

Preparations of this type may irritate sensitive skins. Moreover, they will not always work. Psychologically they often are helpful, even though they may not keep insects away, because they give one confidence of protection.

Mosquito Repelling Oil

Cedar Oil	2 fl. oz.
Citronella Oil	4 fl. oz.
Spirits of Camphor	8 fl. oz.

Just shake together in a dry bottle and it is ready for use. This preparation may be smeared on the skin as often as is necessary to repel mosquitoes and other insects.

Fly Sprays

Fly sprays usually consist of deodorized kerosene, perfuming material, and an active insecticide. In some cases they merely stun the flies who may later recover and beginning buzzing again.

Fly Spray

Deodorized Kerosene	89 fl. oz.
Methyl Salicylate	1 fl. oz.
Pyrethrum Powder	10 oz.

Mix thoroughly by stirring from time to time; allow to stand covered over night and then filter through muslin.

Caution: This spray is inflammable and should not be used near open flames.

Deodorant Spray

(For public buildings, sick-rooms, lavatories, etc.)

Pine Needle Oil	2 oz.
Formaldehyde	2 oz.
* Acetone	6 oz.
* Isopropyl Alcohol	20 oz.

One ounce of the above is mixed with a pint of water for spraying.

* Inflammable.

Cresol Disinfectant

* Caustic Soda	25½ g.
Water	140 cc.

* Do not get this on skin as it is corrosive.

Dissolve the above in a pyrex or enamelled dish and warm it. To this add slowly the following warmed mixture:

* Cresylic Acid	500 cc.
Rosin	170 g.

Stir until dissolved and add water to make 1000 cc.

*Do not get this on skin as it is corrosive.

Ant Poison

Sugar	1 lb.
Water	1 qt.
* Arsenate of Soda	125 g.

Boil and stir until uniform; strain through muslin; add a spoonful of honey.

* Poison.

Bedbug Exterminator

† Kerosene	90 fl. oz.
Clove Oil	5 fl. oz.
*Cresol	1 fl. oz.
Pine Oil	4 fl. oz.

Simply shake and bottle.

† Inflammable.
* Corrosive to skin.

Mothproofing Fluid (Non-Staining)

Sodium Aluminum Silicofluoride	½ oz.
Water	98 oz.
Glycerin	½ oz.
Sulfatate (Wetting-Agent)	

Stir until dissolved.

Fly Paper

Rosin	32 oz.
Rosin Oil	20 oz.
Castor Oil	8 oz.

Heat the above in an aluminum or enamelled pot on a gas stove with stirring until all the rosin has melted and dissolved. While hot pour on firm paper sheets of suitable size which has been brushed with soap water just before coating. Smooth out the coating with a long knife or piece of thin flat wood and allow to cool. If a heavier coating is desirable increase the amount of rosin used. Similarly a thinner coating is gotten by reducing the amount of rosin. The finished paper should be laid flat and not exposed to undue heat.

Household Baking Powder

Bicarbonate of Soda	28 oz.
Mono Calcium Phosphate	35 oz.
Corn Starch	27 oz.

Mix the above powders thoroughly in a dry can by shaking and rolling for a half hour. Pack into dry air-tight tins as moisture will cause lumping.

Malted Milk Powder

Malt Extract, Powdered	5 oz.
Skimmed Milk, Powdered	2 oz.
Sugar, Powdered	3 oz.

Mix thoroughly by shaking and rolling in a dry can. Pack in an air-tight container.

Cocoa Malt Powder

Corn Sugar	55 oz.
Malt, Powdered, Mild	19 oz.
Skim Milk, Powdered	12½ oz.
Cocoa	13 oz.
Vanillin	⅛ oz.
Salt, Powdered	⅜ oz.

Mix thoroughly and then run through a fine wire sieve.

Sweet Cocoa Powder

Cocoa	17½ oz.
Sugar, Powdered	32½ oz.
Vanillin	¾ g.

Mix thoroughly and sift.

Pure Lemon Extract

Lemon Oil U.S.P.	6½ fl. oz.
Alcohol	121½ fl. oz.

Shake together in a gallon jug till dissolved.

Artificial Vanilla Flavor

Vanillin	¾ oz.
Coumarin	¼ oz.
Alcohol	2 pt.

Stir the above in a glass or china pitcher until dissolved. Then stir in the following solution which has been made by stirring in another pitcher.

Sugar	12 oz.
Water	5¼ pt.
Glycerin	1 pt.

Color brown by adding sufficient "burnt" sugar coloring.

Canary Bird Food

Yolk of Eggs, Dried and Chopped	2 oz.
Poppy Heads (Coarse Powder)	1 oz.
Cuttlefish Bone (Coarse Powder)	1 oz.
Granulated Sugar	2 oz.
Soda Crackers, Powdered	8 oz.

Mix well together.

Writing Ink (Blue-Black)

Naphthol Blue Black	1 oz.
Gum Arabic, Powdered	½ oz.
Carbolic Acid	¼ oz
Water	1 gal.

Stir together in a glass or enamelled vessel until dissolved.

Laundry Marking Ink (Indelible)

A. Soda Ash	1 oz.
Gum Arabic, Powdered	1 oz.
Water	10 fl. oz.

Stir the above until dissolved.

B. Silver Nitrate	4 oz.
Gum Arabic, Powdered	4 oz.
Lampblack	2 oz.
Water	40 fl. oz.

Stir this in a glass or porcelain dish until dissolved. Do not expose this to strong light or it will spoil. Finally pour into a brown glass bottle. In using these solutions wet the cloth with solution A and allow to dry. Then write on it with solution B using a quill pen.

Marking Crayon (Green)

Ceresin	8 oz.
Carnauba Wax	7 oz.
Paraffin Wax	4 oz.
Beeswax	1 oz.
Talc	10 oz.
Chrome Green	3 oz.

Melt the first four ingredients in any container and then add the last two slowly while stirring. Remove from the heat and continue stirring until thickening begins. Then pour into molds. If other color crayons are desired, other pigments may be used. For example for black, use carbon or bone-black; for blue, Prussian blue; for red, orange chrome yellow.

Antique Coloring for Copper

Copper Nitrate	4 oz.
Acetic Acid	1 oz.
Water	2 oz.

Dissolve by stirring together in a glass or porcelain vessel. Pack in glass bottles.

To Use: Wet the copper to be colored and apply the above solution hot.

Blue-Black Finish on Steel

a. Place object in molten sodium nitrate (700–800° F.) for 2–3 minutes. Remove and allow to cool somewhat; wash in hot water; dry and oil with mineral or linseed oil.

b. Place in following solution for 15 minutes:

Copper Sulphate	½ oz.
Iron Chloride	1 lb.
Hydrochloric Acid	4 oz.
Nitric Acid	½ oz.
Water	1 gal.

Then allow to dry for several hours; place in above solution again for 15 min.; remove and dry for 10 hours. Place in boiling water for ½ hour; dry and scratch brush very lightly. Oil with mineral or linseed oil and wipe dry.

Rust Prevention Compound

Lanolin	1 oz.
* Naphtha	2 oz.

Mix until dissolved.

The metal to be protected is cleaned with a dry cloth and then coated with the above composition.

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* Inflammable—keep away from flames.

Metal Polish

Naphtha	62	oz.
Oleic Acid	⅛	oz.
Abrasive	7	oz.
Triethanolamine Oleate	⅛	oz.
Ammonia (26°)	1	oz.
Water	1	gal.

In one container mix together the naphtha and oleic acid to a clear solution. Dissolve the triethanolamine in water separately, stir in the abrasive, if it is of a clay type, and then add the naphtha solution. Stir the resulting mixture at a high speed until a uniform creamy emulsion results. Then add the ammonia and mix well, but do not agitate as vigorously as before.

Glass Etching Fluid

Hot Water	12	fl. oz.
* Ammonium Bifluoride	15	oz.
Oxalic Acid	8	oz.
Ammonium Sulfate	10	oz.
Glycerin	40	oz.
Barium Sulfate	15	oz.

Warm the washed glass slightly before writing on it with this fluid. Allow the fluid to act on the glass for about two minutes.

* Corrosive.

Leather Preservative

Neatsfoot Oil (Cold Pressed)	10	oz.
Castor Oil	10	oz.

Just shake together.

This is an excellent preservative for leather book bindings, luggage and other leather goods.

White Shoe Dressing

Lithopone	19	oz.
Titanium Dioxide	1	oz.
Shellac (Bleached)	3	oz.
Ammonium Hydroxide	¼	fl. oz.
Water	25	fl. oz.
Alcohol	25	fl. oz.
Glycerin	1	oz.

Dissolve the last four ingredients by mixing in a porcelain vessel. When dissolved stir in the first two pigments. Keep in stoppered bottles and shake before using.

Waterproofing for Shoes

Wool Grease	8	oz.
Dark Petrolatum	4	oz.
Paraffin Wax	4	oz.

Melt together in any container. Apply this grease warm but never hotter than the hand can bear.

Polishes

Polishes are usually used to restore the original lustre and finish of a smooth surface. As a secondary purpose they are expected to clean the surface and also to prevent corrosion or deterioration. There is no one polish which will give good results on all surfaces.

Most polishes depend on oil or wax for their lustering or polishing properties. Oil polishes are applied easily but the surfaces on which they are used attract dust and show finger marks. Wax polishes are more difficult to apply but are more lasting.

Oil or wax polishes are of two types: waterless and with water. The former are clear or translucent and the latter are milky in appearance.

For use on metals abrasives of various kinds such as tripoli, silica dust or infusorial earth are incorporated to grind away oxide films or corrosion products present.

Shoe Polish (Black)

Carnauba Wax	5½	oz.
Crude Montan Wax	5½	oz.

Melt together in a double boiler (the water in outer container should be at a boil) then stir in the following melted and dissolved mixture:

Stearic Acid	2	oz.
Nigrosine Base	1	oz.

Then stir in

Ceresin	15	oz.

Remove all flames and run in slowly, while stirring

Turpentine	90	fl. oz.

Allow mixture to cool to 105° F. and pour into air-tight tins which should be allowed to stand undisturbed over night.

Auto Polish (Clear Oil Type)

Paraffin (Mineral) Oil	5	pt.
Raw Linseed Oil	2	pt.
China Wood Oil	½	pt.
* Benzol	¼	pt.
Kerosene	¼	pt.
Amyl Acetate	1	tbsp.

Shake together in a glass jug and keep stoppered.

* Inflammable—Keep away from flames.

Auto and Floor Wax (Paste Type)

Yellow Beeswax	1	oz.
Ceresin	2½	oz.
Carnauba Wax	4½	oz.
Montan Wax	1¼	oz.
* Naphtha or Mineral Spirits	1	pt.
* Turpentine	2	oz.
Pine Oil	½	oz.

Melt the waxes together in a double boiler. Turn off the heat and run in the last three ingredients in a thin stream and stir with a fork. Pour into cans; cover and allow to stand undisturbed overnight.

* Inflammable.

Furniture Polish (Oil and Wax Type)

Thin Paraffin (Mineral) Oil	1 pt.
Carnauba Wax, Powdered	¼ oz.
Ceresin Wax	⅛ oz.

Heat together until all of the wax is melted. Allow to cool and pour into bottles before mixture turns cloudy.

Polishing Wax (Liquid)

Beeswax, Yellow	1 oz.
Ceresin Wax	4 oz.

Melt together and then cool to 130° F.; turn off all flames and stir in slowly.

* Turpentine	17 fl. oz.
Pine Oil	½ fl. oz.

Pour into cans or bottles which are closed tightly to prevent evaporation.

* Inflammable.

Floor Oil

Mineral Oil	46 fl. oz.
Beeswax	½ oz.
Carnauba Wax	1 oz.

Heat together in double boiler until dissolved (clear). Turn off flame and stir in

* Turpentine	3 fl. oz.

* Inflammable.

Lubricants

Lubricants in the form of oils or greases are used to prevent friction and wearing of parts which rub together. Lubricants must be chosen to fit specific uses. They consist of oils and fats often compounded with soaps and other unctuous materials. For heavy duty heavy oils or greases are used and light oils for light duty.

Gun Lubricant

White Petrolatum	15 oz.
Bone Oil (Acid Free)	5 oz.

Warm gently and mix together.

Graphite Grease

Ceresin	7 oz.
Tallow	7 oz.

Warm together and gradually work in, with a stick

Graphite	3 oz.

Stir until uniform and pack in tins when thickening begins.

Penetrating Oil

(For freeing rusted bolts, screws, etc.)

Kerosene	2 oz.
Thin Mineral Oil	7 oz.
Secondary Butyl Alcohol	1 oz.

Shake together and keep in a stoppered bottle.

Molding Material

White Glue	13 lb.
Rosin	13 lb.
Raw Linseed Oil	⅓ qt.
Glycerin	1 qt.
Whiting	19 lb.

This mixture is prepared by cooking the white glue until it is dissolved. Then cook separately the rosin and raw linseed oil until they are dissolved. Add the rosin, oil, and glycerin to the cooked glue, stirring in the whiting until the mass makes up to the consistency of putty. Keep the mixture hot.

Place this putty mass in the die, pressing it firmly into the same and allowing it to cool slightly before removing. The finished product is ready to use within a few hours after removal. Suitable colors can be added to secure brown, red, black or other color.

In applying ornaments made of this composition to a wood surface, they are first steamed to make them flexible; in this condition they can be glued to the wood surface easily and securely. They can be bent to any shape, and no nails are required for applying them.

Grafting Wax

Wool Grease	11 oz.
Rosin	22 oz.
Paraffin Wax	6 oz.
Beeswax	4 oz.
Japan Wax	1 oz.
Rosin Oil	9 oz.
Pine Oil	1 oz.

Melt together until clear and pour into tins. This composition can be made thinner by increasing the amount of rosin oil and thicker by decreasing it.

Candles

Paraffin Wax	30 oz.
Stearic Acid	17½ oz.
Beeswax	2½ oz.

Melt together and stir until clear. If colored candles are desired a pinch of any oil soluble dye is dissolved at this stage. Pour into vertical molds in which wicks are hung.

Adhesives

Adhesives are sticky substances used to unite two surfaces. Adhesives are specifically called glues, pastes, cements, mucilages, lutes, etc. For different uses different types are required.

Wall Patching Plaster

Plaster of Paris	32 oz.
Dextrin	4 oz.
Pumice Powder	4 oz.

Mix thoroughly by shaking and rolling in a dry container. Keep away from moisture.

Cement Floor Hardener

Magnesium Fluosilicate	1 lb.
Water	15 pt.

Mix until dissolved.

In using this, the cement should first be washed with clean water and then drenched with the above solution.

Paperhanger's Paste

Use a cheap grade of rye or wheat flour, mix thoroughly with cold water to about the consistency of dough or a little thinner, being careful to remove all lumps. Stir in a tablespoonful of powdered alum to a quart of flour, then pour in boiling water, stirring rapidly until the flour is thoroughly cooked. Let this cool before using and thin with cold water.

a. White or Fish Glue	4 oz.
Cold Water	8 oz.
b. Venice Turpentine	2 fl. oz.
c. Rye Flour	1 lb.
Cold Water	16 fl. oz.
d. Boiling Water	64 fl. oz.

Soak the 4 oz. of glue in the cold water for 4 hours. Dissolve on a water-bath (glue-pot) and while hot stir in the Venice turpentine. Make up *c* into a batter free from lumps and pour into *d*. Stir briskly, and finally add the glue solution. This makes a very strong paste, and it will adhere to a painted surface, owing to the Venice turpentine in its composition.

Aquarium Cement

Litharge	10 oz.
Plaster of Paris	10 oz.
Powdered Rosin	1 oz.
Dry White Sand	10 oz.
Boiled Linseed Oil	Sufficient

Mix all together in the dry state, and make into a stiff putty with the oil when wanted for use.

Do not fill the aquarium for three days after cementing. This cement hardens under water, and will stick to wood, stone, metal, or glass, and, as it resists the action of sea-water, it is useful for marine aquaria. The linseed oil may have an addition of drier to the putty made up four or five hours before use, but after standing fifteen hours, however, it loses its strength when in the mass.

Wood Dough Plastic

* Collodion	86 g.
Ester Gum, Powdered	9 g.
Wood Flour	80 g.

Allow first two ingredients to stand until dissolved, stirring from time to time. Then while stirring add the wood flour a little at a time until uniform. This product can be made softer by adding more collodion.

* Inflammable.

Putty

Whiting	80 oz.
Raw Linseed Oil	16 oz.

Rub together until smooth. Keep in closed container.

Wood Floor Bleach

Sodium Metasilicate	90 oz.
Sodium Perborate	10 oz.

Mix thoroughly and keep dry in a closed can. Use 1 pound to a gallon of boiling water. Mop or brush on the floor, allow to stand ½ hour, then rub off and rinse well with water.

* Paint Remover

Benzol	5 pt.
Ethyl Acetate	3 pt.
Butyl Acetate	2 pt.
Paraffin Wax	½ lb.

Stir together until dissolved.

* Inflammable.

Soaps and Cleaners

Soaps are made from a fat or fatty acid and an alkali. They lather and produce a foam which entraps dirt and grease which is washed away with water. There are numerous kinds of soaps depending on the uses to which they are to be put.

Cleaners consist of solvent such as naphtha with or without a soap. Abrasive cleaners are soap pastes containing powdered pumice, stone, silica, etc.

Liquid Soap (Concentrated)

Water	11 oz.
* Caustic Potash (Solid)	1 oz.
Glycerin	4 oz.
Red Oil (Oleic Acid)	4 oz.

Dissolve the caustic in water, add the glycerin and bring to a boil in an enamelled pot. Remove from heat, add the red oil slowly while stirring. If a more neutral soap is wanted, use a little more red oil.

* Do not get on skin as it is corrosive.

Saddle Soap

Beeswax	5 oz.
* Caustic Potash	0.8 oz.
Water	8 oz.

Boil for 5 minutes while stirring. In another vessel heat

Castile Soap	1.6 oz.
Water	8 oz.

* Corrosive.

Mix the two with good stirring; remove from heat and add

Turpentine	12	oz.

while stirring.

Mechanics Hand Soap Paste

Water	1.8	qt.
White Soap Chips	1.5	lb.
Glycerin	2.4	oz.
Borax	6	oz.
Dry Sodium Carbonate	3	oz.
Coarse Pumice Powder	2.2	lb.
Safrol	enough to scent	

Dissolve the soap in ⅔ of the water by heat. Dissolve the last three in the rest of the water. Pour the two solutions together and stir well. When it begins to thicken, sift in the pumice, stirring constantly till thick, then pour into cans. Vary amount of water, for heavier or softer paste (water cannot be added to the finished soap).

Dry Cleaning Fluid

Glycol Oleate	2	fl. oz.
Carbon Tetrachloride	60	fl. oz.
Varnoline (Naphtha)	20	fl. oz.
Benzine	18	fl. oz.

An excellent cleaner that will not injure the finest fabrics.

Wall Paper Cleaner

Whiting	10	lb.
Magnesia Calcined	2	lb.
Fullers Earth	2	lb.
Pumice Powder	12	oz.
Lemenone or Citronella Oil	4	oz.

Mix well together.

Household Cleaner

Soap Powder	2	oz.
Soda Ash	3	oz.
Trisodium Phosphate	40	oz.
Finely Ground Silica	55	oz.

Mix well and put up in the usual containers.

Window Cleanser

Castile Soap	2	oz.
Water	5	oz.
Chalk	4	oz.
French Chalk	3	oz.
Tripoli Powder	2	oz.
Petroleum Spirits	5	oz.

Mix well and pack in tight containers.

Straw Hat Cleaner

Sponge the hat with a solution of

Sodium Hyposulphite	10	oz.
Glycerin	5	oz.
Alcohol	10	oz.
Water	75	oz.

Lay aside in a damp place for 24 hours and then apply

Citric Acid	2	oz.
Alcohol	10	oz.
Water	90	oz.

Press with a moderately hot iron after stiffening with gum water if necessary.

Grease, Oil, Paint & Lacquer Spot Remover

Alcohol	1	oz.
Ethyl Acetate	2	oz.
Butyl Acetate	2	oz.
Toluol	2	oz.
Carbon Tetrachloride	3	oz.

Place garment with spot over a piece of clean paper or cloth and wet with the above fluid; rub with clean cloth toward center of spot. Use a clean section of cloth for rubbing and clean paper or cloth for each application of the fluid. The above product is inflammable and should be kept away from flames. Use of cleaners of this type should be out-of-doors or in well-ventilated rooms as the fumes are toxic.

Paint Brush Cleaner

Mix (1)

Kerosene	2	pt.
Oleic Acid	1	pt.

Mix (2)

Strong Liquid Ammonia, 28%	¼	pt.
Denatured Alcohol	¼	pt.

Slowly stir 2 into 1 until a smooth mixture results. To clean brushes, pour into a can and stand the brushes in it overnight. In the morning, wash out with warm water.

Rust & Ink Remover

Immerse portion of fabric with rust or ink spot alternately in Solution A and B, rinsing with water after each immersion.

Solution A

Ammonium Sulphide Solution	1	oz.
Water	19	oz.

Solution B

* Oxalic Acid	1	oz.
Water	19	oz.

* Poisonous.

Javelle Water (Laundry Bleach)

Bleaching Powder	2	oz.
Soda Ash	2	oz.
Water	5	gal.

Mix well until reaction is completed. Allow to settle overnight and siphon off the clear liquid.

Laundry Blue (Liquid)

Prussian Blue	1	oz.
Distilled Water	32	oz.
* Oxalic Acid	¼	oz.

* Poison.

Dissolve by mixing in a crock or wooden tub.

"Glassine" Paper

Paper is coated with or dipped in the following solution and then hung up to dry.

Gum Copal	10 oz.
Alcohol	30 fl. oz.
Castor Oil	1 fl. oz.

Dissolve by letting stand overnight in a covered jar and stirring the next day.

Waterproofing Paper and Fibreboard

The following composition and method of application will render uncalendered paper, fibreboard, and similar porous material waterproof and proof against the passage or penetration of water.

Paraffin (Melting Point about 130° F.)	22.5 oz.
Trihydroxyethylamine Stearate	3.0 oz.
Water	74.5 oz.

The paraffin wax is melted and the stearate added to same. The water is then heated to nearly boiling and then vigorously agitated with a suitable mechanical stirring device while the above mixture of melted wax and emulsifier is slowly added. This mixture is cooled while it is stirred.

The paper or fibreboard is coated on the side which is to be in contact with water. This is then quickly heated to the melting point of the wax, which then coalesces into a continuous film that does not soak into the paper which is preferentially wetted by the water. This method works most effectively on paper pulp moulded containers and possesses the advantages of being much cheaper than dipping in melted paraffin as only about a tenth as much paraffin is needed. In addition, the outside of the container is not greasy, and can be printed upon after treatment which is not the case when treated with melted wax.

Waterproofing Liquid

Paraffin Wax	⅖ oz.
Gum Dammar	1⅕ oz.
Pure Rubber	⅛ oz.
Benzol	13 oz.
Carbon Tetrachloride to make	1 gal.

Dissolve rubber in benzol; add other ingredients and allow to dissolve. (Inflammable.)

The above is suitable for wearing apparel and wood. It is applied by brushing on two or more coats, allowing each to dry before applying another coating. Apply outdoors as vapors are inflammable and toxic.

Waterproofing Heavy Canvas

Raw Linseed Oil	1 gal.
Beeswax, Crude	13 oz.
White Lead	1 lb.
Rosin	12 oz.

Heat the above, while stirring, until all lumps are gone and apply warm to upper side of canvas; wetting the canvas with a sponge on the underside before applying.

Cement Waterproofing

Chinawood Oil Fatty Acids	10 oz.
Paraffin Wax	10 oz.
Kerosene	2½ gal.

Stir until dissolved. This is painted or sprayed on cement walls, which must be dry.

Oil and Greaseproofing Paper and Fibreboard

This solution applied by brush, spray, or dipping will leave a thin film which is impervious to oils and greases. Applied to paper or fibre containers, it will enable them to retain oils and greases. All the following ingredients are by weight:

Starch	6.6 oz.
Caustic Soda	0.1 oz.
Glycerin	2.0 oz.
Sugar	0.6 oz.
Water	90.5 oz.
Sodium Salicylate	0.2 oz.

The caustic soda is dissolved in the water and then the starch is made into a thick paste by adding a portion of this solution. This paste is then added to the water. This mixture is placed in a water jacket and heated to about 85° C. until all the starch granules have broken and the temperature maintained for about half an hour longer. The other substances are then added and thoroughly mixed and the composition is completed and ready for application. A smaller water content may be used if applied hot and a thicker coating will result. Two coats will result in a very considerable resistance to oil penetration.

Fireproof Paper

Ammonium Sulphate	8 oz.
Boric Acid	3 oz.
Borax	1¾ oz.
Water	100 fl. oz.

Mix together in a gallon jug, by shaking, until dissolved.

The paper to be treated is dipped into this solution in a pan, until uniformly saturated. It is then taken out and hung up to dry. Wrinkles can be prevented by drying between cloths in a press.

Fireproofing Canvas

Ammonium Phosphate	1	lb.
Ammonium Chloride	2	lb.
Water	½	gal.

Impregnate with above; squeeze out excess and dry. Washing or exposure to rain will remove fireproofing salts.

Fireproofing Light Fabrics

Borax	10	oz.
Boric Acid	8	oz.
Water	1	gal.

Impregnate; squeeze and dry. Fabrics so impregnated must be treated again after washing or exposure to rain as the fireproofing salts wash out easily.

Dry Fire Extinguisher

Ammonium Sulphate	15	oz.
Sodium Bicarbonate	9	oz.
Ammonium Phosphate	1	oz.
Red Ochre	2	oz.
Silex	23	oz.

Use powdered materials only; mix well and pass through a fine sieve. Pack in tight containers to prevent "lumping."

Fire Extinguishing Liquid

Carbon Tetrachloride	95	oz.
Solvent Naphtha	5	oz.

The inclusion of the naphtha minimizes production of toxic fumes when extinguishing fires.

Fire Kindler

Rosin or Pitch	10	oz.
Sawdust	10 or more	oz.

Melt, mix, and cast in forms.

Solidified Gasoline

* Gasoline	½	gal.
White Soap (Fine Shaved)	12	oz.
Water	1	pt.
Household Ammonia	5	oz.

Heat the water, add soap, mix and when cool add the ammonia. Then slowly work in the gasoline to form semi-solid mass.

* Inflammable

Boiler Compound

Soda Ash	87	oz.
Trisodium Phosphate	10	oz.
Starch	1	oz.
Tannic Acid	2	oz.

Use powdered materials, mixing well and then pass through a fine sieve.

Anti-Freezes

The materials listed below are the basic ingredients used in all good anti-freeze liquids. Of these, alcohol is the only one that evaporates. Radiators containing alcohol should be tested from time to time to be sure of protection. A hydrometer for testing alcohol solution strength can be bought from sellers of denatured alcohol.

Anti-Freeze Liquids

Pints of anti-freeze per gal. of water for protection at:

	+10° F.	0° F.	—10° F.	—20° F.
Denatured Alcohol 180° proof	3.4	4.9	6.5	8.3
Denatured Alcohol 188° proof	3.3	4.7	6.0	7.7
Glycerin 95%	3.3	5.3	7.1	9.0
Radiator Glycerin 60%	10.0	18.7	39.0	106.5
Ethylene Glycol 95%	2.7	4.0	5.1	6.5

Specific gravity for protection at:

	+10° F.	0° F.	—10° F.	—20° F.	—30° F.
Denatured Alcohol	0.968	0.959	0.950	0.942	0.921
Glycerin	1.090	1.112	1.131	1.147	1.158
Ethylene Glycol	1.038	1.048	1.056	1.064	1.069

Soldering Flux (Non-corrosive)

Rosin, Powdered	1	oz.
Denatured Alcohol	4	oz.

Soak overnight and mix well.

Photographic Solutions

Developing Solution

Stock Solution A

Dissolve the following, separately, in glass or enamel dishes.

Pyro	4	oz.
Sodium Bisulphite, Pure	280	gr.
Potassium Bromide	32	gr.
Distilled Water	64	oz.

Stock Solution B

Sodium Sulphite, Pure	7	oz.
Sodium Carbonate, Pure	5	oz.
Distilled Water	64	oz.

To use take the following proportions:

Stock Solution A	2	oz.
Stock Solution B	2	oz.
Distilled Water	16	oz.

At a temperature of 65° F. this developer requires about 8 minutes.

Acid Hardening Fixing Bath

A.	Sodium Hyposulphite	32	oz.
	Distilled Water	8	oz.

Stir until dissolved and then add the following chemicals in the order given below, stirring each until dissolved:

B.	Distilled Water (Warm)	2½	oz.
	Sodium Sulphite, Pure	½	oz.
	Acetic Acid (28%), Pure	1½	oz.
	Potassium Alum Powder	½	oz.

Add Solution B to A and store in dark bottles away from light.

Adhesives for Cellophane

Formula No. 1

a.	Gelatin	100 g.
	Water	500 g.
b.	Citric Acid	100 g.
	Water	500 g.
c.	Alcohol	120 g.

Make *a* by swelling for several hours and dissolving on the waterbath.

Mix with solution *b*, and mix thoroughly with *c*.

No. 2

Colophony	33 g.
Camphor	2 g.
Acetone	35 g.
Alcohol	30 g.

No. 3

Mastic	20 g.
Rubber, Pale	1 g.
Chloroform or Trichlorethylene	50 g.

No. 4

Cellulose Acetate	5 g.
Ethyl Acetate	20 g.
Diethyl Phthatate	2 g.

No. 5

Shellac	15 g.
Mastic	5 g.
Thick Turpentine	1 g.
Alcohol	60 g.

No. 6

Gelatin or Glue	30 g.
Potassium Bichromate	2 g.
Water	68 g.

This hardens in the light and must be kept in the dark!

No. 7

Rosin	25 g.
Sandarac Resin	5 g.
Mastic	3 g.
Camphor	2 g.
Alcohol	40 g.
Acetone	30 g.

Moistureproof "Cellophane" Adhesive

U. S. Patent 2,037,053

Nitrocellulose	15.7 oz.
Gum Dammar	15.0 oz.
"Cellosolve"	30.4 oz.
Ethyl Lactate	16.8 oz.
Alcohol	22.1 oz.

Affixing Labels to Moistureproof "Cellophane"

U. S. Patent 2,036,387

Treat surface with:

Formula No. 1

Caustic Potash	1 oz.
Methyl Alcohol	70 oz.
Water	28 oz.
Gelatin	1 oz.

No. 2

Vinyl Acetate	3 oz.
Tartaric Acid	2 oz.
Alcohol	95 oz.

Non-Curling Adhesive for Gummed Paper

Tapioca Dextrin	40 lb.
Corn Dextrin	30 lb.
Water	30 lb.
Sorbitol (83%)	6 oz.
Diethylene Glycol	1 oz.

Cook together with stirring until uniform.

Adhesive for Greasy or Waxed Paper

U. S. Patent 1,983,650

Gum Arabic	40 oz.
Caustic Potash	34 oz.
Water	75 oz.

Glazed Paper Adhesive

Glue, Animal	2 lb.
Water	2 lb.
Glycol Bori-Borate	1 lb.

Laminated Glassine Paper Cement or Binder

U. S. Patent 2,098,221

Paraffin Wax (m.p. 155° F.)	40–63%
Rosin	20–45%
Rubber	3–12%
Petrolatum	7–13%

The rubber is softened in a mill and the petrolatum is worked in and heat applied while mixing. Then add this while mixing to the melted wax and rosin.

Flexible Glues for Magazine Backing

	Winter	Summer	Mid Season
Glue	30.9 %	35.7%	33.3 %
Sorbitol (83%)	15.45%	10.7%	12.54%
Glycerin	5.15%	3.6%	4.16%
Water	48.5 %	50.0%	50.0 %

Flexible Bookbinding Glue

Canadian Patent 357,259

A bookbinding adhesive that spreads rapidly and which produces a smooth, firm, flexible coating is made of:

Glycol Bori-Borate (Aquaresin)	8 oz.
Bone Glue	6 oz.
Glycerin	4 oz.
Spermaceti	⅛ oz.
Water	12 oz.

This adhesive has many other uses, aside from its particular adaptability for bindings.

Book Binder's Adhesive

a. Calcium Chloride (25% Solution)	25 lb.
Potato Starch	5 lb.
b. Water	20 lb.

Heat *a* to 65° C. until the mass has become clear and free of lumps. Dilute with warm *b*.

Alkaline Cold-Paste for Cardboard

(So-called Quick-Binder)

Dextrin, Yellow	100 kg.
Borax Solution (10%, Cold)	70 kg.

Dissolve hot, chill, and add:

Caustic Soda (40° Bé.)	5 kg.

Let stand for 2 days. If a dark liquid separates, mix thoroughly again.

Waterproof Paper Board Adhesive

Canadian Patent 358,953

Petroleum wax 75 g. and ester gum 15 g. are heated to 200° F., and 10 g. of coumarone resin is added; the temperature is gradually raised to 285° F. until all the solids have disappeared, and the solution cooled to 240° F. to separate the resin as a colloidal suspension, spread in sheet form upon a sheet of paper or as the bond between plies of cardboard.

Aluminum to Cigarette Paper Adhesive

Mastic	10 g.
Sandarac Resin	10 g.
Alcohol, Denatured	230 g.
Turpentine	3 g.
Isinglass } equal Glue } parts Water until pasty	250 g.

Mix the resin solution and the glue paste thoroughly.

Label Paste for Aluminum Surfaces

Dextrin solutions, to which 10–15% of thick turpentine (on the weight of the dry dextrin) have been added.

It is advisable to treat the surface with abrasive paper, and thereafter with onion juice, before applying the paste.

Adhesive for Paper on Aluminum

Formula No. 1

a. Rosin	20 g.
Soda Ash	5 g.
Water	200 g.
b. Dextrin, Yellow	200 g.
Water	200 g.
Borax	20 g.

No. 2

Collodion	7 g.
Ethyl Ether of Ethylene Glycol	14 g.
Butanol	5 g.
Methyl Acetate	34 g.
Alcohol	40 g.

Adhesive for Labels to be put on Bakelite

Formula No. 1

Shellac	2 lb.
Camphor (Synthetic)	1 lb.
Alcohol	30 lb.

No. 2

Celluloid Waste	50 lb.
Thick Turpentine	6 lb.
Acetone	200 lb.
Ethyl Acetate	45 lb.

Adhesives for Tortoise Shell

Formula No. 1

Mastic	500 g.
Rosin Oil	60 g.
Latch Turpentine	100 g.
Linseed Oil	340 g.

Melt together. Apply hot.

No. 2

Mastic	70 g.
Shellac	215 g.
Larch Turpentine	100 g.
Alcohol	700 g.

No. 3

a. Isinglass, Concentrated Solution	28 g.
Glue	55 g.
Water	820 g.
b. Mastic	15 g.
Alcohol	82 g.
Rosin Oil	10 g.

Mix the solutions *a* and *b* together with thorough stirring. Apply while hot.

Adhesive for Wall Paper (Powder)

For use with cold water:

Potato Starch, Dry	40 g.
Calcium Chloride Solution (10 Calcium Chloride, 4–5 Water)	50 g.

Grind together, dry, and grind the powder.

Paper Hangers' Wall Size

Gelatin	7.0 oz.
Agar Agar	1.6 oz.
Sugar	24.0 oz.
Water	67.4 oz.

Allow to swell overnight and mix until uniform.

This mixture will form a soft gel and should be reduced with from one half to one part of warm water before using.

Painters' Size

Starch Solution	95 oz.
Sodium Naphthenate	5 oz.
Diglycol Laurate	1 oz.

This solution penetrates rapidly and does not spoil.

Wall Paper Stripping Solutions

British Patent 445,191

Paper is stripped from walls, bottles, etc., by treating with an aqueous emulsion of a terpene compound. Pine oil, terpineol, camphor, pinene or limonene is mixed with an equal amount of an emulsifying agent, e.g., Turkey-red oil, naphthalenesulfonate, sulfonated alcohol, esters or vegetable oils, or soap, and 2 vols. of water added, the resulting stock emulsion being diluted before use.

Waterproof Sandpaper Binder

U. S. Patent 2,030,743

Cellulose Acetate Solution (In Acetone)	40 oz.
Rosin	3 oz.
Camphor	1 oz.
Castor Oil	2 oz.

Sticking Labels to Tin

To make labels adhere to a tin box, rub two or three drops of tincture of myrrh on the surface of the container; let dry, and then apply label in the usual way.

Paste for Attaching Labels to Lithographed Cans

Flour	½ lb.
Water	2 pt.
Glycerin	1 oz.
Nitric Acid	2 dr.
Methyl Salicylate	½ dr.

Make a smooth paste of the flour and water by the aid of heat, using an enamelled kettle and wooden paddle; add the glycerin, then the methyl salicylate, and then take off the fire. Add the acid while cooling.

This white paste does not become dry and will attach readily to nearly anything. It is always ready to use.

Cellulose to Paper, Wood or Glass Adhesive

French Patent 802,016

Nitrocellulose	23 g.
Cyclohexyl Phthalate	27 g.
Benzine	300 g.
Ethyl Acetate	430 g.
Alcohol	120 g.
Water	100 cc.

Adhesive to Paste Completing Vignettes on Lithographed and Lacquered Labels

Formula No. 1

Acetyl Cellulose	20 g.
Acetone (or Substitute)	80 g.

No. 2

Colophony	40 g.
Shellac	20 g.
Alcohol, Denatured	32 g.
Softener	8 g.

"Universal" Adhesive

a. Crude Rubber	5 g.
Benzene	75 g.
b. Shellac, Powdered	75 g.

Dissolve *a* with precautions against fire, on a water bath. Add *b*, stirring and heating until clearly dissolved.

Office Adhesive

Dextrin, Yellow	15 g.
Water	20 g.
Sugar	2 g.
Vinegar (3–5%)	5 g.
Preservative	0.1%
Perfume (Citronella, Spike, Sassafras Oil, etc.)	

Liquid Library Adhesive

U. S. Patent 2,045,988

Yellow Dextrin	2 oz.
Calcium Chloride	1 oz.

Suspend in water (100) and heat quickly to 85° C. Cool. By decreasing amount of water thicker products are obtained. This product remains fluid on aging and is completely miscible with water.

Adhesive for Envelopes

Formula No. 1

a. Potato Flour	13 kg.
Water	80 kg.
Caustic Soda (37° Bé.)	3 kg.
b. Nitric Acid (24° Bé.)	3 kg.
c. Formaldehyde or Phenol	1 kg.

Heat *a* to a clear solution, neutralize with *b*, and preserve with *c*.

To get a more adhesive product, add 15–20% of a solution of

Gelatin, Technical	3 kg.
Starch Syrup	2 kg.
Water	10 kg.

No. 2

a. Dextrin, White	200 kg.
Water	240 kg.
b. Boric Acid	2 kg.
(or Borax)	5 kg.
Glycerin	5 kg.

Water	20 kg.
c. Thymol (10% Alcohol Solution)	0.5 kg.

Dissolve *a* at 90° C., add *b*, and, ultimately, *c*, as preservative.

Self-Sealing Envelope Adhesive

U. S. Patent 2,093,105

Rubber Latex (40–60% Solids)	50 oz.
Mica, Powder	50 oz.

Postage Stamp Adhesive

Formula No. 1

Gum Arabic	100 kg.
Sodium Chloride	2.5 kg.
Glycerin	2 kg.
Starch	2 kg.
Water	130 l.

No. 2

a. Dextrin	150 kg.
Sugar	20 kg.
Water	280 kg.
b. Lime Water	10 kg.
Vinegar	40 kg.

Mix the solution *a* with *b*.

Coating to Prevent the Sticking Together of Postage Stamps Under the Influence of Body Heat

Apply on the front surface:

Stearic Acid	5 g.
Aluminum Palmitate	28 g.
Benzine	240 cc.
Turpentine	240 cc.

Label Paste

Formula No. 1

Casein	1 lb.
Water Ground Mica	1 lb.
Boiling Water	1 gal.
Borax	0.25 lb.
Sodium Fluoride	0.25 lb.
Pine Oil	1 oz.

No. 2

Dextrin	85 %
Sorbitol (83%)	7.5%
Invert Sugar	6 %
Glycerin	1.5%

This gives a gum back that is remoistening and non-curling, as well as resistant to sticking during hot, humid, summer weather.

Adhesive for Photographic Film

a. Celluloid-Scrap	as desired
b. Methyl Acetate	80 g.
Ethyl Lactate	20 g.

Dissolve enough of *a* in solvent *b* to get a viscous, syrupy solution.

Film Cement

Formula No. 1

Acetone	4 oz.
Ether	½ oz.
Old Film	6 in.

No. 2

Amyl Acetate and Acetone in equal parts

No film need be dissolved. This cement works well with all kinds of film stock, acetate or nitrate. Still another formula is: One part glacial acetic acid with four parts of flexible collodion. This added to any of the above formulas works well with any type of film.

Photo Engravers' Glue

Of good photographic gelatin or high grade flexible glue, take 2 oz. and put it in a glass beaker, of about 8 oz. capacity, to which add 2 oz. of distilled water. Next dissolve ½ oz. sodium salicylate in 1 oz. of distilled water and add it to the glue and water. Let the whole stand for an hour or two and then melt the glue in a water bath with the water almost at the boiling point. Stir thoroughly until solution is complete and then allow the whole to cool for a time, after which add about ½ dr. of oil of wintergreen. Let the mass stand overnight until the air bells, that may come from stirring, work themselves out and the solution is clear, when it is ready for use.

This glue flows quite freely at about 70° F., but below this it stiffens. It will not flow at 60°, although commercial glues are liquid at even lower temperatures. It stands to reason that the higher the melting point the tougher the glue. If you use this special glue with potassium bichromate you should have a stencil on your plate that will be tough and stand all the etch you need to give it without fear of breaking down and that can be removed after the etching with an acid, or a soda bath, as easily as any other glue stencil. One point in making this glue should be carefully observed: do not use cheap glue base. Use high-grade flexible glue that looks clear and that will bend in the fingers without breaking, or use good photographic gelatin.

Shellac-Wax Cement for Laboratory Use

Rosin	35 g.
Shellac	20 g.
Beeswax	15 g.
Talc, Fibrous	0 to 30 g.

Melt the rosin in a 6 inch hemispherical iron pan, add the shellac and beeswax with stirring, and heat the mixture over a hot gas flame, so that the temperature reaches 360° C. in about six minutes. At once, allow to cool spontaneously to about 275°, add the talc, if desired, cool to about 90° C., and stir well as the mixture becomes viscous. Molds must be scrubbed thoroughly with household washing powder and water, rinsed and then coated with very thick, smooth dextrine-water paste. When the cement mixture, well stirred, is almost too viscous to flow, pour into molds. The talc gives a broad apparent melting range; that is, when as much as 30 grams talc is used, the cement when heated gradually softens to a highly viscous condition which is serviceable where a sort of plastering operation is desired by the user. If the time of heating of the mixture is too short, the cement is brittle; if too long, an excessive amount (over 20 g.) disappears in the process.

Improved de Khotinsky Cement

Shellac	90 g.
Vistanex, Medium	10 g.

Melt the above ingredients together with stirring, taking care not to burn the shellac. This makes a splendid general usage laboratory cement which adheres well and is more elastic than the ordinary de Khotinsky cement.

Linoleum Cement

Formula No. 1

Canadian Patent 358,652

Raw Rubber	100 oz.
Rosin	130–200 oz.

Dissolve in a suitable amount of kerosene or naphtha to get proper consistency.

No. 2

U. S. Patent 1,991,007

Cumarone (m.p. 100–115° C.)	25 oz.
Cumarone (m.p. 20–30° C.)	2.8 oz.
Portland Cement	57.2 oz.
Asbestine	4.6 oz.
Acetone	2.1 oz.
Methyl Ethyl Ketone	8.3 oz.

No. 3

Manila Copal	20 lb.
Rosin	40 lb.
Galipot Resin	5 lb.
Rosin Oil	5 lb.
Alcohol	30 lb.
Kaolin	30 lb.
Neuburg Chalk	70 lb.

Dissolve the resins in the alcohol, and work together with the mineral powder to get a heavy fluid paste applicable with a brush.

Wall Tile & Linoleum Adhesive

U. S. Patent 2,064,139

An adhesive composition, adapted for the installation of linoleum or a similar surface covering on plaster walls and ceilings, comprises approximately 27% to 35% of alcohol-soluble oxidized drying oil, approximately 6% to 8% of rosin, approximately 35% to 40% of a filler material including a major proportion of bentonite clay and minor proportions of asbestos fiber and a white pigment, and approximately 25% of alcohol.

Plastic Adhesive for Laminated Floor Coverings

U. S. Patent 2,078,727

Asphalt	15–40 lb.
Pitch	17–30 lb.
Gilsonite	4–10 lb.
Slate	45–55 lb.

Adhesive for Cork Parquet

Rosin, Powdered	50 kg.
Resin (Bakelite or Albertol) Alcohol-Soluble	30 kg.
Shellac	20 kg.

Dissolve in sufficient alcohol to form viscous paste.

Binder for Cork

Cork	150 lb.
Glue	16 lb.
Sorbitol (83%)	11 lb.
Glycerin	9 lb.
Water	10 lb.

Where a phenolic resin binder is used for the cork, a 50–50 mixture of sorbitol and diethylene glycol may be used as a plasticizer to give permanent flexibility.

ADHESIVES FOR LEATHER

The binding of leather to leather requires a different adhesive to that where it is a matter of leather to textile material, wood or metal. It should be noted that "leather glue," strictly speaking, is a glue prepared from waste leather, so that the expression glue or adhesive for leather is more appropriate in the present case. Leather glue is very little used for binding leather, because of its solubility in water, brittleness, and its liability to decompose through bacterial action. For certain minor and general purposes, animal (fish) glue treated with acetic acid or with calcium sucrate is used, particularly if service demands are not high. Animal glue may be improved by the addition of Venice turps or other resinous material. When animal glue is employed it is advisable to add a small amount of wetting agent to facilitate absorption. The addition of glycerin may give suppleness if required. Additions of small quantities of soaps and fillers—e.g., kaolin, talc, blanc fixe, and lithopone (not more than 15 per cent.)—are sometimes made.

Animal glue is soluble in water, and

it is necessary to add such hardening agents as formalin and bichromate, etc. One example is 100 parts of gluten-rich glue, suitably swollen in water, 25 parts of glycerin, 3 parts of potassium bichromate, and 10 parts of talc.

In this case the binding material is water-resistant. Casein adhesives are also recommended sometimes for the binding of leather. For the preparation of water-resistant binding a hardening agent is required, usually formaldehyde. Emulsifying and dispersing agents are occasionally added. Blood albumen, which coagulates at 68–70°, makes a good binder for leather articles. Here simple warming above the coagulating temperature results in insolubilizing the binding medium.

Rubber is a useful adhesive where waterproof and elastic bindings are required. The rubber is applied both in the form of latex, which is after-treated, and in solution in organic solvents. If the binding is to be oil-resistant the rubber must be vulcanized. It should be pointed out that regenerated rubber is useful for this purpose, being applied in solution.

A recommended adhesive is nitrocellulose, or celluloid. This is water- and oil-resistant. Any desired softness and/or elasticity may be attained by using plasticizers. These celluloid adhesives are usually fairly dilute, whilst there is another form, more concentrated, known as celluloid cement. In the former, 5 kg. nitrocellulose is dissolved in 30 kg. solvent after mixing with 1.8–2.0 kg. camphor and a plasticizer such as dibutyl phthalate.

Leather Adhesives

Solid

Petroleum Pitch	70 kg.
Lanolin	10 kg.
Rosin Oil	20 kg.

Liquid

Rosin Oil	25 kg.
Castor Oil	25 kg.
Latex	25 kg.
Lanolin	15 kg.
Organic Solvent	25 kg.

Adhesive for Leather Belts

1.	Carpenters Dry Glue	500 g.
	Water	1 l.
2.	Isinglass	500 g.
	Beer	1 l.
3.	Tannin or Tannic Acid	15 g.
	Alcohol	50 g.
	Water	150 g.

Soak 1 and 2, separately, for 24 hours. Put both together in a pot and heat up to boiling. Add the solution 3 slowly, take up to a boil again, and cool.

The adhesive should be heated for use, and should be applied upon a belt which has been well sharpened by a plane. The edge should be long; 1½ to 2 times of the breadth of the belt.

Plastic Adhesive for the Heel-Lining of Shoes

Formula No. 1. For Cold Application

a.	Rubber, Crepe	8 kg.
	Benzine	90 kg.
	Ester Gum	2 kg.
b.	Cork Powder	to suit

Make rubber solution *a*, known as "shoe cement" by shaking in the cold. Add enough *b* to make a viscous, plastic paste.

Can be applied cold.

No. 2. For Hot Application

a.	Rosin, or Ester Gum	30 kg.
	Petroleum or White Spirit	10 kg.
b.	Cork Powder	30 kg.

Warm up for application.

It is advisable to combine these rosin solutions with a nitrocellulose solution, which will guarantee an adhesive that will not allow the lining to move in the shoe.

No. 3

Crude Rubber, Cut	5 kg.
Benzene	30–40 kg.
Linseed Oil Varnish	10–12 kg.

Allow to stand in warm place for a few days and then mix until uniform.

Adhesive for Soles and Inner Lining of Shoes

Celluloid Waste, Transparent	28 kg.
Acetone, Technical	50 kg.
Tricresyl Phosphate	3 kg.

Inner Sole Adhesives

Two consistencies are met with, a heavy bodied one being used for heavy work and a lighter one for ladies' shoes.

	Heavy Adhesive	Light Adhesive
Caoutchouc	7 lb.	2 lb. 14 oz.
Rosin	1¼ lb.	9 oz.
Turpentine	12 lb.	6 lb.
Benzene	30 lb.	41 lb.

Solution of the caoutchouc is more easily achieved by dividing the quantity in the formula equally, one portion being dissolved in the benzene and the other in the turpentine together with the rosin, and finally the two solutions are mixed. This preparation should be marked "Inflammable" and be packed in securely closed containers.

Self-Vulcanizing Shoe Cement

Smoked Sheet Rubber	100 g.
Gasoline	900 g.
Zinc Oxide	5 g.
Sulphur, Precipitated	3 g.
p-Toluidine	1 g.
Zinc Butyl Xanthate	3 g.

White Cement

U. S. Patent 2,092,600

Benzol	75 oz.
Rosin	10 oz.
Calcium Oxide	15 oz.
Zinc Oxide	10 oz.
Whiting	85 oz.
Rubber, Ground	5 oz.

Allow the rubber and rosin to swell and "dissolve" in the benzol before mixing in other ingredients.

Shoe Sole Cements

Soft, Elastic

Formula No. 1

Film Waste, High Viscosity	18–20%
Solvent, Low-Boiling	72–60%
Plasticizers	10–20%

No. 2

Nitro Cotton, High Viscosity	15–20%
Solvent, Low-Boiling	75–60%
Plasticizers	10–20%

No. 3

Cellulose Acetate Waste	15–20%
Solvent (Acetone, etc.)	75–65%
Plasticizers	10–15%

Formula No. 1

Celluloid Waste, Medium to High Viscosity, Transparent	20–25%
Solvent, Low-Boiling	80–75%

No. 2

Film Waste, Medium to High Viscosity	20–25%
Solvent, Low-Boiling	75–70%
Ester Gum	5%

No. 3

Nitro Cotton, Medium to High Viscosity	16–20%
Solvent	80–75%
Tricresyl Phosphate	4– 5%

Rubber Cements for Leather

Formula No. 1

Best Crude Pale Crepe Rubber	40 lb.
Powdered Rosin	90 lb.
Benzol	to make 100 gal.

No. 2

Best Crude Bolivian Rubber	3.33 lb.
Powdered Rosin	10 lb.
"Skellysolve" (Naphtha)	to make 35 gal.

No. 3

Plantation Crepe Rubber	25 lb.
Powdered Rosin	100 lb.
V. M. & P. Naphtha	to make 100 gal.

Ester gum or cumar resins may be substituted in the above formulas, if desired, instead of powdered rosin.

Rubber Adhesive

Shellac	10 kg.
Rosin	4 kg.
Alcohol	8 kg.
Whiting	1 kg.

Self-Vulcanizing Rubber Cements

The cement is made of unplasticized rubber dissolved in benzene.

The cements are stored as two separate solutions A and B of the following composition:

	A	B
Smoked Sheet Rubber	100	100 g.
Sulphur (Precipitated)	6	... g.
Zinc Oxide	3	3 g.
Zinc Butylxanthate	...	6 g.
p-Toluidine	2	2 g.

Self-vulcanizing cement of the composition mentioned is already used in practice, both by the rubber and other industries.

In the rubber industry it is used in different shop operations for cementing vulcanized rubber goods.

Rubber Cement

Formula No. 1

a. Rosin	2 g.
Rubber	5 g.
b. Larch Turpentine	1 g.
c. Gum Turpentine	20 g.
d. Dichloroethylene	140 g.
Rubber, Cut	5 g.

Melt *a*, and add *b*; thin the melted mixture with *c*. Add the solution *d*. Mix thoroughly by shaking.

No. 2

Para-Rubber Solution	1 kg.
Linseed Oil	5 kg.
Ivory Black	6 kg.

Rubber-Metal Adhesive

a. Para Rubber, Minced	3 lb.
Benzol	8 lb.
b. Bitumen, Mexican	5 lb.

Make solution *a* by stirring in the cold or on the water bath (caution!). When dissolved, add *b* and stir until dissolved.

Fluid Cement for Metallic Surfaces

U. S. Patent 2,092,600

Rubber, Ground	5 oz.
Asphaltum	100 oz.
Benzene	75 oz.

Rosin, Powdered	10 oz.
Calcium Oxide	15 oz.
Zinc Oxide	10 oz.
Whiting	85 oz.

Rubber Casein Adhesive
U. S. Patent 2,073,927

An adhesive composition comprises an aqueous dispersion of rubber, glycerin, casein and added water in the following relative proportions:

Aqueous Dispersion of Rubber (60%)	40–75 oz.
Glycerin	15–40 oz.
Casein	3– 8 oz.

and added water of the order of 20% of the total ingredients.

Reducing Viscosity of Rubber Cements

The spreading properties and viscosity of a rubber cement can be reduced by the addition of non-solvents such as ethyl alcohol or methyl acetate. Other materials which may be added are organic bases, organic acids, and acetone.

The same cement may have quite different properties and viscosity if different solvents are used. The cements made with benzol are usually "smoother" and less viscous than those from gasoline.

Artificial Rubber Latex Cement

Smoked Sheet Rubber	100 lb.
Gasoline	200 lb.
Oleic Acid	8 lb.

Digest until "dissolved." Then work in

Ammonia (25%)	20 lb.
Casein	20 lb.

Mix thoroughly and add

Zinc Oxide	10 lb.
Kaptax	2 lb.
Thiuram	1 lb.

Emulsify with

Water	50 lb.

Waterproof Latex Cement

Latex (40%)	100 oz.
Water	45 oz.
Glue	10 oz.
Zinc Oxide	20 oz.
Sulphur	3 oz.
Titanium Dioxide	25 oz.
Potassium Bichromate	10 oz.

Self-Sealing Envelope Adhesive
U. S. Patent 2,093,105

Latex (60%)	50 g.
Mica, Powdered	50 g.

Cement, Pressure Sealing
(Used for masking tape & self-sealing envelopes)

Latex (60%)	100 oz.
Castor Oil	50 oz.
Rosin	5 oz.

Adhesive for Cellulose
Water-Resistant

Glue	20 g.
Water	20 g.
Acetic Acid (30%)	40 g.
Potassium Bichromate	1 g.

This chromate glue must be stored in total darkness.

Adhesive for Cellulose Acetate to Paper
British Patent 454,759

Burgundy Pitch	8 oz.
Wool-Fat	4 oz.

Melt together; cool; add

Petroleum Ether	4 oz.

To the above add the following which has been previously dissolved:

Rubber	8 oz.
Petroleum Ether	16 oz.

Adhesive for Bonding Gauze to "Cellophane"

Starch (Cassava)	4 lb.
Sodium Hypochlorite (5% available Chlorine)	6 oz.
Caustic Soda	0.3 oz.
Formaldehyde (40%)	4 oz.
Water to make up to	4 gal.

The starch is mixed with about three quarters of the volume of water, and the sodium hypochlorite solution added to same. This is heated in a water jacket with continued stirring until the starch granules burst, and then heating continued at the same temperature until the solution completely clarifies. The caustic soda is dissolved in about ten times its weight of water and added to the above starch paste in small amounts with continued stirring. The mass is heated for about ten minutes longer, removed from the source of heat, allowed to cool somewhat, and the formaldehyde added, which acts as a preservative. The remainder of the water is then added. The composition is then ready for application to the "Cellophane." The gauze is then attached to this coated surface by passing same over and around hot rolls to evaporate the moisture. This laminated product is used for raincoats, umbrellas, clothes sacks and the like. An amount of glycerol equivalent to 20% of the starch may be added to this mixture to prevent abnormal brittleness at low humidities.

Non-Slip Rug Composition

If the front office or reception room rugs curl at the corners, you can obviate this annoyance by applying a simple glycerin mixture to the back of the rug. Using 5 parts of glycerin to 3 of starch, mix the starch with water to form a smooth paste and add the glycerin gradually until it spreads easily before applying. Let the rug dry thoroughly. This treatment will not stiffen the rug or make it less flexible.

Upholstery Cements

Formula No. 1

Rosin	35 lb.
Talc	35 lb.
Calcium Oxide	4 lb.
Raw Linseed Oil	11 lb.
Soft Asphalt	1 lb.
V. M. & P. Naphtha	14 lb.

No. 2

Smoked Sheet Rubber	2.5 lb.
Quick Lime	0.1 lb.
Rosin (Powdered)	7.4 lb.
Gasoline (Low Test)	2 gal.

No. 3

Rubber	100 lb.
Hydrated Lime	7 lb.
Zinc Oxide	4 lb.
Rosin	300 lb.
Gasoline	12 gal.

Brush Bristle Cement

(For Paint and Varnish Brushes)

Rubber	55 oz.
Vulcone	4 oz.
Zinc Oxide	2 oz.
Sulphur	27 oz.
Perilla Oil	5 oz.
Diethanolamine	2 oz.
Rosin Oil	5 oz.

Disperse the above compound in amount of 3 lb. per gal. of gasoline. After drying, cure overnight on a steam plate at 40 lb. pressure.

Tin Can Sealing Compound

Resistant to Water, Oil, Alcohol, Turpentine

Polyvinyl Acetate	15 lb.
Benzene	45 lb.
Toluene	40 lb.

Litharge Cement Without Glycerin

Litharge	75 oz.
Glycol	25 oz.

This sets in 1–2 hours.

Glycerin-Litharge Cements

Strong permanent repairs can be made at short notice if the ingredients of glycerin-litharge cements are kept at hand. A general method for preparing the cement consists of mixing six parts of pure glycerin with one to three parts of water and sufficient litharge (lead oxide) to form a paste of the desired thickness. If preferred, the water may be omitted. Mix the cement just prior to use, since it sets rapidly, within an hour or so. A more specific formula for making a cubic foot of the cement requires the combining of 23 lb. of litharge and 5.25 lb. of 90 per cent pure glycerin. Addition of about 10 per cent of such materials as iron oxide, fuller's earth or silica, will delay the setting time somewhat, without affecting the final hardness or strength. These glycerin-litharge compounds are unique in their ability to withstand the action of most corrosive solutions and dilute acids. These cements, too, are highly resistant to moisture and heat and stand temperatures of 200° C. or more. A further usage of these cements is to fill depressions in metal tanks, in automobile and truck bodies, fenders and similar sheet metal objects, to even off the indented places. The cement takes a good finish and paint adheres well.

Metal Fillers (For crevices, faults)

Formula No. 1

Iron Filings	95 g.
Ammonium Chloride	3 g.
Sulphur	2 g.
Water	to make paste

One drop of concentrated sulphuric acid starts the reaction and it hardens in a few days.

No. 2

Gum Arabic	12 g.
Gypsum	12 g.
Iron Filings	12 g.
Silica Powder	64 g.

This hardens to a water and fire resistant coating.

Metal Cements (Low melting point alloys)

Lead	34 g.
Bismuth	66 g.

(Melting Point 94° C.)

Lead	20 g.
Zinc	30 g.
Bismuth	50 g.

(Melting Point 100° C.)

Lead	18 g.
Zinc	18 g.
Bismuth	64 g.

(Melting Point 93° C.)

Lead	10 g.
Zinc	40 g.
Bismuth	50 g.

(Melting Point 120° C.)

Lead	27 g.
Zinc	13 g.
Bismuth	50 g.
Cadmium	10 g.

(Melting Point 70° C.)

Lead	40 g.
Zinc	45 g.
Bismuth	15 g.

(Melting Point 160° C.)

Lead	14 g.
Zinc	86 g.

(Melting Point 200° C.)

These alloys are satisfactory in joining bronze, brass, copper, zinc, lead, Britannia metal, iron, tin, and conditions must be established for heating the parts to be joined before the molten alloy is poured in.

Copper	25–35 g.
Mercury	75–65 g.

Steel and Iron Cementing Composition
U. S. Patent 2,025,050

Sodium Cyanide	8 lb.
Salt	62–65 lb.
Potassium Chloride	18–19 lb.
Activated Carbon	8 lb.

The above is molten at cementing temperatures.

Iron Cement

Powdered Iron	72 lb.
Plaster of Paris	10 lb.
Gum Arabic	8 lb.
Whiting	8 lb.
Sal Ammoniac	2 lb.

Cement for Iron Vessels

Iron Filings	4 oz.
Clay, Powdered	2 oz.
Refractory Brick, Powdered	1 oz.
Salt Solution	until pasty

Iron Casting Crack Filler

Iron Filings	98 oz.
Sulphur	1 oz.
Ammonium Chloride	1 oz.

Iron Boiler Cement

Iron Filings	33 oz.
Ferrous Sulphate	17 oz.
Vinegar	50 oz.

Expansion Joint Filler
U. S. Patent 1,987,530

Cottonseed Oil	8 lb.
Linseed Oil	8 lb.
Sulphur	8 lb.
Rosin	4 lb.
Silica	4 lb.
Blown Asphalt	1 lb.

This is plastic between -18° and 93°.

Turners' Cement

Used by model makers for mounting sheet brass on lathes.

Rosin	1 lb.
Melt and add	
Pitch	¼ lb.

Bring to boil and stir in brick dust to thicken. Apply hot.

Gasket Paste
U. S. Patent 2,054,801

Castor Oil	40 oz.
Soft Soap	50 oz.
Glycerin	10 oz.

Non-Hardening Tile and Glass Cement
U. S. Patent 2,095,614

Tallow	340 lb.
Mineral Oil	50–100 lb.
Aluminum Oleate	50–100 lb.
Rosin Oil	50–100 lb.
Asbestos or Soapstone (Powdered)	400–1000 lb.

Plastic Wood Dough Type Filler
Formula No. 1

Casein	50 oz.
Lime Hydrate	8 oz.
Tri Sodium Phosphate	3 oz.
Sodium Fluoride	3 oz.
Naphtha	2 oz.
Hardwood Sawdust	34 oz.

Make this mixture up with *water* to a consistency suitable for tubes.

No. 2

*Base	30 gal.
Silica	100 lb.
China Clay	50 lb.
Wood Flour (Coarse)	10 lb.
Wood Flour (Fine)	25 lb.

No. 3

*Base	30 gal.
Wood Flour	45 lb.
China Clay	15 lb.

* Base is made by dissolving 175 lb. Manila gum in 30 gal. of methyl alcohol plus 3 gal. of benzol.

Crack Filler

Molding Plaster	100 lb.
Silica	12½ lb.
Yellow Dextrin	12½ lb.
Raw Sienna	1 lb.

Knife Handle Cement

a. Rosin	10 kg.
Lime Hydrate	1 kg.
b. Cumar, Hard	10 kg.
c. Whiting	2 kg.
Manganese Dioxide	5 kg.

Melt *a* to 180° C., add *b* and melt again to make homogeneous. Mix in *c*.

Pour this mass into the voids of the handles; push in the blade of the knives; let cool.

Wood Cement

Tar, Anhydrous	60 kg.
Asphaltum	15 kg.
Sulphur	25 kg.
Rosin	1–5 kg.

Melt up and mix thoroughly.

Barrel Cement
Formula No. 1
(Water and Oil-Resistant)

Cottage Cheese	6 kg.
Calcium Oxide, Powdered	5 kg.
Water	10 kg.

No. 2

(Oil- and Vinegar-Proof)

a.	Shellac	200 kg.
	Alcohol	600 kg.
b.	Sawdust	200 kg.

No. 3

Shellac	20 lb.
Alcohol	60 lb.
Castor Oil	4 lb.
Beach Wood Sawdust	16 lb.

Prepare the shellac-alcohol solution in a big enough can, in the cold. Mix it with the oil in a kettle with good agitation, and add in the sawdust through strainers. Stir until a homogenous paste results. Put into tightly closed cans.

Hints on Gluing

When gluing dowelled or mortise-and-tenon joints, it is better to apply the glue inside of the mortises and dowel holes than to apply it to the dowels and tenons where it may be scraped off in assembling the work. A toothbrush is often handy for applying the glue. For small mortises, the bristles of the brush may be cut short, or the brush may be whittled down in width, to get into tight places.

An ordinary comb is handy for applying glue on narrow grooves. In assembling panel work, be sure that there is plenty of space to permit the panels to shrink or swell a reasonable amount without striking the bottom of the grooves in which they fit. This precaution is unnecessary when plywood panels are used. The usual tedious job of applying glue to inlay grooves can be done easily by thinning it enough to be applied with an oil can, the spout of which has been cut off so that the opening is relatively large.

To Distinguish Between Glue and Casein

Moisten the substance with a drop of concentrated nitric acid, when, if casein is present, an intense yellow stain is produced. On adding sodium hydroxide solution, the stain turns brown, or if ammonia water is added, the stain turns orange.

Special Adhesive

Formula No. 1

a.	Sugar Solution (25%)	240 oz.
	Lime Hydrate	15 oz.
b.	Hide Glue or Bone Glue	600 oz.

Heat *a* to 75° C. Let soak *b* in this solution, and dissolve on the boiling water bath.

No. 2

a.	Glue	2 lb.
	Cold Water	7 lb.
b.	Boiling Water	33 lb.
c.	Starch	15 lb.
	Cold Water	10 lb.
d.	Formaldehyde	0.75 lb.

Soak *a* for several hours; heat gently to get a completely clear solution, and add *b* stirring continuously. Stir *c* in a separate container until it is quite smooth, and add to it the boiling glue solution. Boil for 10 minutes. Cool, add *d*.

Painter's Glue

a.	Water	80 kg.
	Potato Flour	20 kg.
b.	Sodium Hydroxide	1.5–2 kg.
c.	Nitric Acid	to neutralize

Make the starch milk *a*, and add a solution of *b* to it. Neutralize to neutral or faintly alkaline reaction as soon as the starch milk is formed. Wax Soap (from montan wax and alkali) of 30% concentration can be added to this.

Fish-Glue Substitute

a.	Glue in Plates	1 kg.
	Water	to swell
b.	Acetic Acid	500 g.
	Water	700 g.

Swell the glue in water, and pour the water off.

Add *b*, and heat this until a sample will not gel any more on cooling.

Waterproof Glue

U. S. Patent 1,994,050

Soya Bean Flour (Oil Free)	100	oz.
Disodium Hydrogen Phosphate	10	oz.
Sodium Fluoride	5	oz.
Calcium Hydroxide	7–10	oz.
Calcium Carbonate	50	oz.
Copper Sulphate	½	oz.
Salt	2	oz.
Water	530	oz.

The above is mixed with 5 to 10 parts of the reaction product of formaldehyde 35 ounces and 18% ammonia, 105 ounces.

The glue produced in this way is fluid for 6 to 10 hours and sets completely in 24 hours and is impervious to boiling water.

Caterpillar Catching Glue

Rosin	30 kg.
Linseed Oil Varnish	20 kg.
Yellow Beeswax	20 kg.

Paraffin Cement

Paraffin wax can be made into a strong cement for glass and other materials where the joint must be close-fitting by the solution of a little rubber in it. This is most readily effected by the addition of 4 g. to 100 g. of 40% latex rubber, added drop by drop, with stirring, to the wax, which is heated above the boiling point of water during the operation. Strain while hot through several layers of cheese cloth.

Gelatin-Capsules

Formula No. 1

Gelatin	10 kg.
Water	20 kg.
Glycerin	10 kg.

No. 2

Gelatin	16 kg.
Water	20 kg.
Glycerin	15 kg.

Iron rods with pear-shaped ends, slightly greased with olive oil, are dipped into this solution. Let cool and solidify, cut around the stick, pull off the pear-shaped capsule. Dry, fill, and close the open end by a drop of the above-described solutions.

Dip Seal for Corked Bottles

Formula No. 1

Celluloid	8 lb.
Acetone	20 lb.
Amyl Acetate	70 lb.
Castor Oil, or Tricresyl Phosphate	2 lb.

No. 2

a. Cologne Glue	50 kg.
Water	50 kg.
b. Glycerin, White Free of Lime	5 kg.
c. Confectioners' Sugar, Powdered	2–3 kg.
Zinc White or Other Pigment	12 kg.
Water	to make paste

Swell and finally dissolve *a*, add *b* and, if desired, *c*. Dip the bottle-tops (corked) into the glue, and harden by dipping thereafter into *d* formaldehyde, 10–20% solution.

Colored Caulking Cement

U. S. Patent 2,011,607

Para Cumarone Resin (m. p. 50–60° C.)	60 lb.
Asbestos Fiber	20 lb.
Iron Oxide	5 lb.
Xylol	15 lb.
Pigment	5 lb.

The above gives a permanently elastic cement applicable by a trowel without heating.

Porcelain Cement

Refractory Brick Powder	45 g.
Highly Refractory Clay	40 g.
Sodium Silicate (38/40° Bé.)	15 g.
Water	to form heavy paste

Use at once.

Remove dust and grease before use.

Porcelain or Glass to Metal Cement

U. S. Patent 2,032,142

Powdered Flint	62 oz.
Sodium Silicate	14 oz.
Water	14 oz.
Aluminum Fluoride	10 oz.

Ethyl Silicate Bonding Medium

Ethyl Silicate is used as preservative for hardening stone and arresting decay and disintegration. Paints formulated with it are unaffected by heat and are used for coating furnace castings.

To convert Ethyl Silicate to a suitable bonding medium, it should first be partially hydrolyzed, as follows:

Formula No. 1

Ethyl Silicate	300.0 cc.
Water	5.6 cc.
Denatured Alcohol	175.0 cc.

The resulting solution, after standing at least 24 hours, forms a satisfactory bonding medium when 51 cc. water are added. Before adding this second portion of water, the partially hydrolyzed silicate solution can be stored for a period of time. After the addition of the second portion of water, the solution is stable for at least a month without change in viscosity or deposition of silica.

Fast Setting Bonding Medium

No. 2

If it is desirable to speed up the hydrolysis, the reaction may be catalyzed by the addition of 1/10 Normal hydrochloric acid inside the 51 volumes of water. The speed of the reaction will depend upon the quantity of acid present. The proportions can be varied to meet particular needs of viscosity and speed of setting.

Stoneware Cement

When a cement for porcelain, metals or stoneware is desired, casein mixed with sodium silicate and lime makes an efficient mixture. To make this, dried casein is soaked in an equal weight of water for two hours. The casein swells, but does not dissolve. At the end of that time, the sodium silicate and lime are stirred in and the cement is ready for use.

Temporary Binder for Abrasive Wheels, Blocks, etc.

Sicapon	1 lb.
Water	4 lb.

The Sicapon is completely dissolved in the water. Five pounds of this solution thoroughly mixed with 95 lb. of the granulated abrasive is ordinarily sufficient. Two to three hours after molding, the object is firmly knit and may be easily handled, preparatory to firing, with only moderate care. The binder is almost completely volatilized in the firing.

ACID-RESISTING PUTTIES OR LUTES

In certain cases, particularly in the construction of nitric and hydrochloric acid plants, and generally where a rigid joint is not desirable, non-setting putties are employed. These putties, although acid and weather resistant, do not harden or crack.

Litharge putty is made by mixing together:

Linseed Oil	19%
Flock Asbestos	8%
Litharge	73%

This mixture sets moderately hard in about seven days, and is useful for socket and spigot joints in stoneware. At atmospheric temperature it will resist nitric acid up to a strength of 56 per cent.

Asbestos putty is composed of:

Asbestos Powder	50%
Asbestos Fiber	10%
China Clay	12%
Boiled Linseed Oil	28%

This mixture forms a permanently soft putty, useful for joints in stoneware or vitreosil, which is resistant to cold nitric acid. Joints made with this putty may be surfaced with a hard-setting cement such as the barytes cement mentioned above.

Black putty is used for joints in stoneware in contact with hydrochloric acid. A stiff putty may be made by mixing together:

China Clay	54 %
Dehydrated Tar	38 %
Anthracene Oil	2.7%
Asbestos Wool	5.3%

A thinner variety of this mixture is composed of:

Sharp Oil	10%
Anthracene Oil	20%
Dehydrated Tar	18%
China Clay	52%

This putty may be used for bedding bricks and tiles, in the construction of hydrochloric acid tanks and absorption towers.

Window Putty

Formula No. 1

Bitumen Waste Emulsion	20 kg.
Chalk Powder	80 kg.
Asbestos Fiber	10 kg.

No. 2
(For the Tropics)

Chalk, Dry, Fine	85 kg.
Linseed Oil Varnish	15 kg.

No. 3

Chalk, Dry, Powdered	85 kg.
Mineral Oil	4.5 kg.
Linseed Oil, Raw	10.5 kg.

Putty for Kettles

Borax, Powdered	1 lb.
Zinc White, Technical	5 lb.
Manganese Dioxide	10 lb.
Sodium Silicate	to make a paste

Temperature-Resistant Putty
(Not Soluble in Benzene, Oil, and Water—For Car Cylinders)

a.	Movie-Film Waste	10 kg.
	Camphor or Other Plasticizer	2 kg.
	Alcohol	20 kg.
	Ethyl Acetate	20 kg.
	Amyl or Butyl Acetate	25 kg.
	Benzene	24 kg.
b.	Aluminum Powder	as desired
	Pigment (Sienna, Umber, etc.)	

To the solution *a* add the fillers *b*.

Copal Resin Putty
(For Enamelling Work)

1.	Kauri- or Manila Copal, Light	10 g.
	Dammar Resin	10 g.
2.	Turpentine, Heavy	8 g.
	Alcohol	8 g.
3.	Zinc White	12 g.

Melt up 1 and mix well. Cool. Grind to powder. Make a paste by working in 2, and mix thoroughly with 3.

SEALING WAXES

Sealing waxes comprise one subdivision of a large group of compositions designed for sealing purposes, and since sealing compositions cover a wide variety of materials, properties and industries, only sealing waxes can be described in this article. This industry was originally developed in Europe, principally Germany, and has been transplanted in the United States where the only changes have been the introduction of less expensive materials.

They are used upon paper and bottle caps; the largest consumers being banks, express companies and miscellaneous organizations which are required to seal valuable documents and packages for storage or shipment. The use upon bottles has been displaced by the modern plastics, and upon paper their properties have been improved to meet the demands of recently developed wrappings like Glassine and Cellophane.

The term sealing wax is a misnomer in

that few contain any wax at all and wax acts only as a filler for which less expensive materials could be substituted. They comprise principally plasticized resins with inorganic fillers and pigments. The primary requisites are smoothness of texture, brilliancy of gloss, absence of obnoxious odors upon melting, wide range of softening points, rehardening without the appearance of a rubbery behavior, retention of color and fracturing without crumbling.

They are classified below according to form available for use and types of paper to which they are to be applied.

Type A. Sticks, to be heated over a direct flame.

Type B. Bulk, to be heated in pots, electric or gas.

Type A

Types of paper to which they must adhere:

1. Parchment, rag white, bond, 100% rag, ledger, Glassine.
2. Hard and rough surfaced paper, Kraft, Manila, sulfite.
3. Medium finished paper, Kraft, Manila.
4. Soft finished paper, wrapping, Manila.
5. For bottles and insulators.

Careful purchasers, like government procurement departments, require all the above-mentioned qualities and in addition those listed below.

1. After application to paper it should remain soft for a sufficient length of time for a brass die to be pressed into it and upon removal the design must be clearly marked.
2. It must separate from paper without pulling fibers with it.
3. Maximum flexibility, no stringiness upon heating, drops must fall about two seconds apart from heated portion.
4. Type B. Only 1.30% of sediment is allowed when melted in a glass container over electric or gas heat.

Seventeen formulas of compositions designed to meet the above exacting conditions are listed below. Their use requires indirect heating containers, mixing equipment, molds, and buffing machines for polishing the sticks. They are divided into two groups; those containing some wax and those containing none.

It is obvious that the seven formulas in which no wax is compounded are arranged in the order of decreasing cost of raw materials and the first five would correspond very closely to the five subheadings of Type A. A decreasing amount of shellac with its substitution by rosin, while other components are kept nearly the same, results in less adhesion, more brittleness and other divergences from the requirements listed above.

The balsams are present only for imparting pleasant odors and can be chosen to suit the taste; the quantity being so small that little softening action is introduced by the essential oils present. Venice turpentine is listed in all seven formulas and although expensive is a good plasticizer. It should only be purchased from reliable people because recently mixtures of fused rosin and castor oil have been introduced and sold as genuine.

Wax-Containing Formulas

(All parts by weight)

Formula No. 1

Shellac	33
Wax I. G. (O. P.)	5
Venice Turpentine	20
Talc	10
Pigment	25
Tricresyl Phosphate	5
Balsam	2

No. 2

Carnauba Wax	40
Paraffin Wax	20
Magnesia	15
Bronze Powder	25

No. 3

Carnauba Wax	30
Beeswax	20
Paraffin Wax	20
Whiting	4
Barium Carbonate	10
Pigment	16

No. 4

Rosin	30
Venice Turpentine	22
Paraffin Wax	6
Whiting	12
Barium Carbonate	12
Pigment	18

No. 5

Montan Wax	40
Japan Wax	10
Paraffin Wax	15
Whiting	9
Barium Carbonate	10
Pigment	16

No. 6

Paraffin Wax	70
Beeswax	10
Japan Wax	17
Aniline Dye	3

No. 7

Montan Wax	40
Japan Wax	10
Paraffin Wax	15
Whiting	9
Barium Carbonate	10
Pigment	16

No. 8

Rosin	34
Venice Turpentine	24
Paraffin Wax	6
Whiting	10
Barium Carbonate	10
Pigment	16

No. 9

Montan Wax	8
Japan Wax	20
Paraffin Wax	52
Pigment	20

No. 10

Rosin	30
Venice Turpentine	22
Paraffin Wax	6
Whiting	12
Barium Carbonate	12
Pigment	18

Non-Wax-Containing Formulas

(All parts by weight)

Formula No. 1

Shellac	53.00
Venice Turpentine	30.00
Vermilion	16.85
Magnesite	0.05
Balsam (Fir)	0.10

No. 2

Shellac	38
Venice Turpentine	22
Magnesia	10
Pigment	26
Turpentine	2
Balsam (Fir)	2

No. 3

Shellac	25
Rosin	10
Venice Turpentine	22
Talc	14
Pigment	25
Turpentine	2
Balsam	2

No. 4

Shellac	3
Rosin	25
Venice Turpentine	22
Whiting	13
Barium Carbonate	12
Pigment	22
Turpentine	3

No. 5

Shellac	5
Rosin	25
Venice Turpentine	21
Whiting	13
Barium Carbonate	11
Pigment	22
Turpentine	3

No. 6

Shellac	20
Rosin	12
Venice Turpentine	22
Talc	17
Pigment	25
Tricresyl Phosphate	4

No. 7

Shellac	8
Rosin	25
Venice Turpentine	20
Whiting	11
Barium Carbonate	11
Pigment	22
Turpentine	3

Pigments and Mixtures

White, Zinc Oxide, Barium Sulphate, Lithopone.
Yellow, Ochers, Chrome or Zinc Yellow.
Bright Yellow, 60 Lithopone, 40 Chrome Yellow.
Orange, Chrome Orange, or 80 Ocher—20 Angelic Red.
Red, Mercuric Sulphide, Red Lead, Ochers.
Light Red, 60 Zinc Oxide, 40 Chrome Cinnabar (Mercuric Sulphide).
Rose, 85 Zinc Oxide, 15 Chrome Cinnabar (Mercuric Sulphide).
Brown, 85 Angelic Red, 15 Carbon Black.
Light Brown, 20 Lithopone, 20 Ochers, 45 Angelic Red, 15 Carbon Black.
Blue, Ultramarine, Paris Blue.
Light Blue, 60 Lithopone, 40 Ultramarine.
Green, Chrome Green or Zinc Green.
Yellowish Green, 60 Lithopone, 20 Chrome Yellow, 20 Chrome Green.
Light Green, 65 Lithopone, 35 Chrome Green or Zinc Green.
Black, Carbon Black.
Gray, 95 Lithopone, 5 Carbon Black.
Bronze, Bronze Powder.
Gold, Brass Powder
Silver, Aluminum Powder.
Copper, Copper Filings.

Venice turpentine was adopted in this industry before the modern plasticizers and synthetic resins were developed and its substitution by less expensive ones can be done but only by experiments. Fillers like magnesite, whiting, magnesia, talc, and barium carbonate serve a two-fold purpose; they lessen the cost, and tone down the color of the pigment. In formula No. 6 tricresyl phosphate is introduced. This is a plasticizer and is one example of many others which could be adopted.

In the ten formulas where waxes are embodied Nos. 2, 3, 5, 6, 7 and 9 have waxes only. They are more expensive than those containing only resins and are softer as well as more brittle. Their use is restricted to bottle seals. During application they must be heated by steam and in the molten condition must be stirred constantly to prevent pigments and fillers from settling to the bottom. This is not the case when resins are involved because the viscosity is such that the inerts remain suspended.

The danger of heating directly and vigorously during manufacture and application cannot be overemphasized because the natural material, shellac, loses its hardness and flexibility and the possibility of decomposing the fillers and their subsequent interaction with the resins would result in bubbles and far from uniform qualities of product. In closing, this industry could be given a new lease of life by introduction of transparent sticks of sealing wax colored like the modern plastics so common upon umbrella handles, pipe stems, and other sundries.

Oil-Soluble Dyes for Sealing Waxes

Yellow:	
Auramin-Base	1 g.
Stearic Acid	2 g.
Orange:	
Chrysoidin RZ-Base	1 g.
Stearic Acid	2 g.
Red:	
Rhodamin B "extra" Base	1 g.
Stearic Acid	2 g.
Violet:	
Methylviolet-Base	1 g.
Stearic Acid	2 g.
Blue:	
Victoria Blue B-Base	1 g.
Stearic Acid	2 g.
Green:	
Victoria Green-Base	1 g.
Stearic Acid	2 g.
Black:	
Nigrosin-Base C	1 g.
Stearic Acid	2 g.

Procedure:

Dissolve dyes in the melted stearin.

PRESSURE SEALING ADHESIVES

	Formula No. 1	No. 2	No. 3	No. 4
Hercolyn	40 g.	40 g.	38 g.	45 g.
Hydrogenated Rosin	50 g.	—	—	—
Rosin	—	52 g.	—	—
Dammar Gum	—	—	50 g.	—
Neville Resin No. 14	—	—	—	47 g.
Ethyl Cellulose	—	8 g.	—	—
Tornesit	—	—	12 g.	—
Rubber	10 g.	—	—	—
Pliolite	—	—	—	8 g.

Any adhesive must be formulated for its specific application. Adhesives that are essentially non-tacky can be formulated according to the following general formula:

15% to 25% of a film-forming ingredient chosen from rubber, ethyl cellulose vinyl chloride-acetate, Tornesit, or Pliolite.

20% to 40% Hercolyn.

65% to 35% resin from the group listed above.

Heat Sealing Adhesive
U. S. Patent 2,054,112

Paraffin Wax	70–94 oz.
Crepe Rubber	30– 6 oz.

Mill together in a heated heavy duty mixer until uniform and of desired consistency. Apply hot to paper or cloth and allow to set.

Plastic Adhesive
U. S. Patent 2,078,727

A plastic adhesive composition that will not stick to cold laminating rolls, comprises asphalt 15 to 40%, pitch 17 to 30%, gilsonite 4 to 10%, and slate 45 to 55% by weight.

Acid-Proof Cements
German Patent 635,405

Formula No. 1

a. Benzoic Anhydride, Coarse	20 g.
Silicate Powder, Acid-Proof	980 g.
b. Sodium Silicate, High Silica Content	300 cc.

Mix *a* to homogeneous mass, and wet with *b*.

Hardens after about 8 minutes.

No. 2

a. Barium Oxide, Coarse	40 g.
Silicate Powder, Acid-Proof	960 g.
b. Sodium Silicate, Commercial	300 cc.

As above.

Hardens after about 30 minutes.

Plastic Fireproof Adhesive
U. S. Patent 1,989,833

Sodium Silicate Solution (d. 1.71)	36	gal.
Asbestos Fiber	160	lb.
Asbestine	128	lb.
Sulphonated Castor Oil	0.36	gal.

Waterproof Silicate Cement
U. S. Patent 2,032,142

Flint, Powdered	62 lb.
Sodium Silicate	14 lb.
Water	14 lb.
Aluminum Fluoride	10 lb.

Mix well and dry at 125° C.

Veneer Cold Glue Powder

Casein, Fine	65 kg.
Lime Hydrate, Powdered	12 kg.
TriSodium Phosphate	7 kg.
Sodium Fluoride	4 kg.
Calcium Sulphate	10 kg.
Petroleum	2 kg.

Casein-Silicate Furniture Adhesive

Casein	100 oz.
Water	350 oz.
Sodium Silicate	15 oz.
Slaked Lime	10 oz.

Alkalized Casein Powder
(Base for Casein Dispersions)

Casein from Acid Milk, Powder	60 g.
Marble Calcium Hydroxide	20 g.
TriSodium Phosphate	10 g.
Sodium Sulphite	8 g.
Petroleum	2 g.

Mix in a sealed mixer. For use, the resulting powder is dispersed in water.

Sealing Mass

Portland Cement	100 lb.
Brick Powder	25 lb.
Casein	30 lb.

Make up with *water* to give a paste shortly before use. Slow hardening.

WATERPROOF SPECIAL ADHESIVES

Resin Solution

Rosin	60 g.
Mastic	10 g.
Sandarac	20 g.
Ether	5 g.
Alcohol	75–100 g.

Chrome Glue Solution

Hide Glue	20 g.
Water	20 g.
Acetic Acid (30%)	40 g.
Potassium Bichromate	1 g.

Keep in dark. Mix before use.

Museum Adhesive

Polymerized polyvinyl resin is used for special adhesives. This is used for the transfer of Oriental wall paintings; for fixing crackled and scaling paint film on a tempera painted wall-paper; for fixing scaling particles of glaze on ancient pottery (where it is preferable to celluloid); for joining two surfaces, e.g., paintings to new canvas and wood backings; and for fixing labels to glass. It is not recommended for use out of doors, since it is permeable to moisture; and its use on oil paintings must be with great caution. The use of the following mixed solvents is recommended: 1. (for general use) toluene 70%, ethyl alcohol 10%, ethylene dichloride 10%, cellosolve or butyl acetate 5%, and cellosolve acetate or amyl acetate; 2. (for use where a slow-drying, penetrating solution is needed, containing up to 5% polyvinyl acetate) ethyl alcohol 70%, ethylene dichloride 20%, dibutyl phthalate 2%, and cellosolve acetate or amyl acetate 8%; 3. (for use where a very quick-drying lacquer is desired, containing up to 30% polyvinyl acetate) ethyl alcohol 80%, ethylene dichloride 20%. Alcohol or acetone alone may be used, but are unsatisfactory in warm humid weather.

Highway Joint Filler

Use a mixture of approximately 70% soft-grade, slow-curing road oil and 30% of commercial latex. To avoid foaming of the latex, mixing temperatures are maintained at 200° F.

Hard Stopping Cement

White Lead (Paste)	50 lb.
Fine Dry Whiting	45 lb.
Japan Gold Size	6 pt.
Boiled Linseed Oil	2 pt.
Turpentine or White Spirit	8 pt.

To be tinted as necessary.

Plastic Refrigerator Joint Seal
U. S. Patent 2,082,016

Aluminum Powder	60–35 oz.
Copal, Dammar or Kauri Gum	5–22 oz.
Castor Oil	35–43 oz.

Adhesives

Water-Soluble

Wheat Flour	50 lb.
Water	200 lb.
Alum	1 lb.
Rosin	4 lb.

Boil to a viscous paste.

Water-Insoluble

Rosin	30 lb.
Thick Turpentine	3 lb.
Camphor	2 lb.
Alcohol	30 lb.
Acetone	35 lb.

Adhesive for Oiled or Inked Surfaces
U. S. Patent 2,073,927

Rubber Latex (60%)	40–75 oz.
Glycerin	15–40 oz.
Water	20 oz.

Strong Adhesive

French Patent 796,588

a.	Water	100	cc.
	Manioc Flour	100	g.
	Sodium Bicarbonate	0.3	g.
	Hydrogen Peroxide (12 vol.)	3	g.
b.	Caustic Soda (36°)	25	g.
	Water	25	g.

Mix *a* and *b*, stirring well and warming.

Waterproof Adhesive Coating

Canadian Patent 356,169

Water	50 –200	oz.
Aluminum Chloride	10	oz.
Sodium Acetate	2.5– 5	oz.
Borax	2	oz.

Adhesive, Blood-Albumin

Black Blood Albumin, Soluble	6	lb.
Water (at 27° C.)	11	lb.
Ammonia (sp.g. 0.90)	0.25	lb.
Slaked Lime	0.13	lb.

Vegetable Albumin

The following treatment is used for soya and castor seeds:

The first treatment of the seeds for the subsequent extraction is similar in both cases. The cleaned soya kernels are reduced and extracted with warm benzine (60–75° C.). The meal is then heated to 70–75° C. In the case of castor the seeds are preheated before extraction with solvent. The ground meal is then extracted with milk of lime and caustic soda sufficient to raise the alkali figure to 0.2 per cent (calculated as caustic soda). The alkaline solution is placed in the diffuser and warmed to 40° C. and the meal added slowly. This addition takes about thirty to forty-five minutes, and air is blown through to agitate, and agitation is repeated every fifteen to twenty minutes. When the layer contains 2 per cent albuminoids it is pumped through a sieve into a container where hydrochloric acid is added until the *p*H falls to 4.4–4.6. After settling, the mother liquor is removed, and the precipitate is washed with warm water and allowed to settle to a paste which contains about 93 per cent water. This is filter-pressed and dried in a current of warm air. The final product contains 8–10 per cent water. The residual meal is used, in the case of soya, as feeding materials, and in the case of castor as fertilizer.

Preservation of Adhesives

For every 100 kg. of dry substance, use any of following:

Carbolic Acid	250	g.
Thymol	250	g.
Salicylic Acid	200	g.
Sodium Bisulphite	500–750	g.
Zinc Sulphate	150	g.
β-Naphthol	200	g.
Sodium Fluoride	250	g.

In 100 kg. finished adhesive:

Formalin, 35%	0.5–2	kg.
Moldex, Aseptex Nipasols, Nipagins } water-soluble	200	g.
Chlorthymol	200	g.

Animal & Vegetable Substance Preservative

(Poisonous)

U. S. Patent 2,066,453

Sodium Sulphate (Decahydrate)	30	oz.
Sodium Fluoride	2	oz.
Kaolin	68	oz.
Water	to suit	

ADHESIVE TAPES

Fabric:

Generally, a cotton-fabric, or sometimes rayon, is used. The fabric should be smooth, without knots, and free of heavy metal salts (copper, manganese).

Coatings:

Formula No. 1

Heavy Type

Rubber	30	kg.
Filler (Barium Sulphate)	40	kg.
Rosin Oil or Colza Oil	15	kg.
Rosin or Tar	15	kg.

The mixture is homogenized on rolls, then dissolved in a mixing machine.

No. 2

Light Type

Guayule Rubber	15	kg.
Flake Rubber	15	kg.
Barium Sulphate	40	kg.
Rosin Oil	14	kg.
Wood Tar	4	kg.
Rosin	8	kg.
Asphaltum	4	kg.

No. 3

Free of Fillers

Guayule Rubber	24	kg.
Crude Rubber	25	kg.
Factice, Tacky	20	kg.
Gutta-Percha Resin	6	kg.
Mineral Filler	10	kg.
Engine Oil	2.5	kg.
Rosin	6	kg.
Rosin Oil	6	kg.
Lampblack	0.5	kg.

No. 4

White Tapes for Wrapping

Guayule Rubber	25	kg.
Balata, Brazil	5	kg.
Colza Oil	5	kg.
Lithopone	24	kg.

Blanc Fixe	29 kg.
Rosin	4 kg.

No. 5

Tapes for Pharmaceutical Use

Caoutchouc	34.0 kg.
Dammar	7.0 kg.
Colophony	3.5 kg.
Lanolin, Neutral	24.5 kg.
Zinc Oxide, Free of Lead	30.0 kg.

Defoamer for Glue

U. S. Patent 2,108,912

Fifteen pounds of aluminum stearate are dissolved in 90 to 100 pounds of stearic acid and to this solution are added 90 pounds of paraffin wax and 100 pounds of Japan wax. This wax is then made up into the defoamer as follows: 45 pounds of wax are dissolved in 135 pounds of tallow, 30 pounds of castor oil, and 30 pounds of Turkey red oil. This solution is then emulsified with 30 to 50 pounds of water in which form it is ready for use.

Increasing Strength of Silicate Binders

British Patent 464.967

The strength of alkali silicate binders is improved by the addition of 1% of an alkali metal phosphate, calculated on the weight of the material to be bonded; or 10% of phosphate, based on the dry weight of the silicate, may be added thereto. The binder may be used for ***abrasives, refractory cements, mortars, asbestos paper, wood joints, plywood, corrugated paper, fiberboard*** and ***laminated board.***

The percentage of alcohol used in cordials varies with different manufacturers. This is a very vital point both in cost and tax. All cordials of foreign manufacture are mostly distilled or blended from the product called High Proof or the High Wine Grape Distillate, and not from grain or molasses alcohol as in this country. No cordial is mellow, sweet or full flavored without the use of High Proof Grape Distillate or High Wine.

The essences are produced from roots, herbs, fruits, oils, etc. by infusion, maceration, digestion and distillation.

The fruit cordials which are very largely consumed in this country are made of 70° proof 10° Baume with grape distillate alcohol, syrup, distilled water and cherry, peach, apricot, and blackberry flavors.

FRUIT JUICES AND FLAVORING

All newly distilled liquors and spirits have a harsh and pungent taste, which must be remedied before they can be used as beverages. This is done with fruit juices or flavors, which are mainly diluted alcoholic extracts of fruits or other substances, and are employed in certain proportions to counteract the raw taste of the new spirits.

These extracts may be prepared with very little difficulty, and generally better and cheaper than they can be purchased ready-made.

A very simple apparatus may be made, which will answer every purpose. Procure a barrel of 50 gallon capacity; about four inches from the bottom insert a tightly fitting false bottom, pierced with a considerable number of holes about a quarter or a third of an inch in diameter; fit a faucet in firmly below the false bottom and the macerating tub is ready for use. The ingredients to be macerated should be well bruised, and placed in the barrel and the fluid used poured on them and the whole allowed to macerate together for not less than three days, and as much longer as is possible. If these general directions are properly carried out, the following extracts will be all that can be desired. Smaller quantities may be made by using smaller proportions of each ingredient.

Prune Juice

Macerate

Prunes	50	lb.
Raisins	12½	lb.
Proof Spirits	15	gal.
Distilled Water	3¾	gal.

Peach Juice

Macerate

Dried Peaches	25	lb.
Dried Apples	12½	lb.
Proof Spirits	20	gal.

Cherry Juice

Macerate

Dried Cherries	25	lb.
Cudbear	1	lb.
Proof Spirits	20	gal.

Blackberry Juice

Macerate

Dried Blackberries	25	lb.
Port Wine	5	gal.
Proof Spirits	20	gal.
Logwood	10	lb.

Apricot Juice

Macerate

Dried Apricots	25	lb.
Dried Prunes	5	lb.
Proof Spirits	20	gal.

The above extracts are all used in every rectifying establishment, although the fact is surrounded with a great deal of secrecy on the part of the rectifiers.

There is nothing injurious in any of these extracts, and this recommends their use above all others. They are harmless, and efficient aids both to the liquors and to the pocket.

Bourbon Oil

Fusel Oil	64	oz.
Potassium Acetate	4	oz.
Copper Sulphate	½	oz.
Ammonium Oxalate	½	oz.
(dissolve each in water)	4	oz.
Add Manganese Dioxide	1	oz.

NOTE: Place them all in a glass percolator and let rest for 12 hours. Then percolate and put into a glass still, and distill half a gallon of the Bourbon Oil.

Rye Oil

Fusel Oil	64 oz.
Oenanthic Ether	8 oz.
Chloroform	8 oz.
Sulphuric Acid	8 oz.
Add—Potassium Chlorate	2 oz.
Dissolved in water	8 oz.

NOTE: Place in a glass still and distill 64 oz.

TRUE FRUIT LIQUEUR CORDIALS

70 Proof—10° Bé.

Liqueur Cherry Cordial 70 P.—10° Bé.

Wine Distillate (175 proof)	40 gal.
Distilled Water	10 gal.
True Fruit Cherry Extract	9 qt.
Syrup 36° Bé.	37 gal.
Water, Distilled	11 gal.

Liqueur Apricot Cordial 70 P.—10° Bé.

Grape Distillate Alcohol	40 gal.
Distilled Water	10 gal.
True Fruit Apricot Extract	9 qt.
Distilled Water	14 gal.
Syrup 36° Bé.	38 gal.

Liqueur Blackberry Cordial

70 P.—10° Bé.

Distilled Water	9 gal.
True Fruit Blackberry Extract	9 qt.
Syrup 36° Bé.	41 gal.
Distilled Water	12 gal.
Wine Distillate (175 proof)	37 gal.

Liqueur Peach Cordial 70 P.—10° Bé.

Distilled Water	7 gal.
True Fruit Peach Extract	9 qt.
Syrup 36° Bé.	42 gal.
Distilled Water	12 gal.
Wine Distillate	37 gal.
Aldehyde C 14	1 oz.

French Brandy

a. Ethyl Acetate	5 g.
Oenanthic Ether	0.5 g.
Tincture of Rhatany	10 g.
Bay Oil	0.5 g.
Alcohol	650 cc.
b. Water, Distilled	350 cc.

"Beading" Compound: (Bead Oil)

(For producing foam in alcoholic liquors)

Sweet Almond Oil	48 oz.
Sulphuric Acid C. P.	12 oz.

Mix thoroughly, cool and carefully neutralize with sufficient ammonia. Now add twice the volume of proof spirit, mix well and distill.

A few drops of creosote may be added if it is desired to simulate the characteristic odor of Scotch in the preparation to which this beading compound is to be added.

Scotch Whiskey Base

Dissolve in ½ ounce alcohol 2 drops Creosote.

Acetic Acid	20 drops
Alcohol	4½ pt.
Water	3½ pt.

or:

Glycerin	1 oz.
Caramel	30 drops
Butyric Ether	10 drops
Oenanthic Ether	10 drops
Formic Ether	10 drops
Creosote	2 drops
Alcohol 80%	1 gal.

Sherry Base

Nitrous Ether, Spirit	15 oz.
Oenanthic Ether	1 oz.
Orange Tincture	1 oz.

Slivowitz Base

Cognac Oil	1½ oz.
Fusel Oil	2½ oz.
Benzaldehyde	12 oz.
Alcohol	2½ gal.

Whiskey and Gin Flavor Improver

U. S. Patent 2,061,560

Addition of 0.3–0.4% sorbitol gives improved "smoothness" and palatability.

Detection of Wood Alcohol in Ethyl Alcohol, Alcoholic Beverages, Tinctures, Etc.

If the sample contains more than 60% ethyl alcohol, use 10 cc. and dilute with 10 cc. of water; if 20–60% ethyl alcohol, use 10 cc.; if less than 20%, use 20 cc. sample. Introduce the sample into a 50 cc. flask provided with a small glass tube 75 cm. long, bent twice nearly at right angles, which serves as a condenser. If the sample is distinctly acid, neutralize with 0.1–0.5 gram of precipitated calcium carbonate. By means of a small flame distill carefully 1 cc. into a small test tube cooled by ice water. The last vertical column of the condenser should not become heated. Place 0.1 cc., 0.2 cc. and 0.3 cc. of the distillate separately into 3 test tubes; fill each to 5 cc. with water; add 0.4 cc. of 50% sulphuric acid and 5 cc. of 1% potassium permanganate. Allow the mixture to stand 2 minutes; decolorize by adding 1 cc. of 8% oxalic acid followed by 1 cc. of concentrated sulphuric acid. Then add 5 cc. of fuchsin-sulphurous acid solution and mix. If methyl alcohol is present, a violet or reddish-purple color is developed in 1–2 hours. If it is desired to distinguish a small amount of methyl alcohol spontaneously generated by fermentation, etc. from that intentionally added, add 2 cc. (instead of 1 cc.) of concentrated sulphuric acid after decolorization with oxalic acid. In the former case (0.05% methyl alcohol or less), no color reaction is obtained.

Liquor (Oak) Coloring

U. S. Patent 2,007,727

Oak bark chips are heated to 150–190° C., avoiding burning. Then extract with 50% alcohol and concentrate by evaporating sufficient alcohol to give a thick syrup.

Filter Aid for Wine

Kaolin	55 g.
Kieselguhr	30 g.
Precipitated Calcium Carbonate	18 g.
Tannin	2 g.
Potassium Meta Bisulphite	0.5 g.

Mix dry in a powder mixer. Use about 100 g. per 1 hl. of wine.

Cognac Essence

Amyl Alcohol	10 oz.
Oenanthic Ether	10 oz.
Alcohol	100 oz.

or:

Pelargonic Ether	1 oz.
Alcohol	20 oz.

or:

Cognac Oil	1 oz.
Ethyl Acetate	10 oz.
Raisin Extract	10 oz.
Alcohol	100 oz.

or:

Cognac Oil	15 oz.
Ethyl Nitrate	30 oz.
Thyme Oil	10 oz.
Ethyl Acetate	30 oz.
Vanillin	3 oz.
Alcohol	1760 oz.

Chartreuse Essence

Melissa Oil	6 oz.
Angelica Oil	30 oz.
Clove Oil	6 oz.
Peppermint Oil	40 oz.
Hyssop Oil	6 oz.
Nutmeg Oil	6 oz.
Cinnamon Oil	6 oz.
Alcohol	2000 oz.

or:

Lemon Oil	50 oz.
Sweet Orange Oil	40 oz.
Neroli Oil	10 oz.
Angelica Oil	15 oz.
Fir Oil	8 oz.
Cinnamon Oil	10 oz.
Wormwood Oil	5 oz.
Mace Oil	2 oz.
Coriander Oil	5 oz.
Ethyl Butyrate	5 oz.
Rose Oil	1 oz.
Violet Oil	1 oz.
Alcohol	3060 oz.

Fruit Essence

Lemon Oil	20 oz.
Orange Oil	30 oz.
Vanillin	2 oz.
Strawberry Essence	10 oz.
Neroli Oil	1 oz.
Benzaldehyde	10 oz.
Alcohol	1000 oz.

Ginger Essence

Ginger Oil	50 oz.
Clove Oil	5 oz.
Mace Oil	2 oz.
Alcohol	1540 oz.

Ginger Ale Essence

Ginger Essence	1 pt.
Lemon Essence	1 oz.
Ginger Oil	1 oz.
Vanilla Extract	1 oz.
Rose Essence	½ oz.
Tincture of Cinnamon	1 dr.
Pineapple Essence	½ dr.
Capsicum Essence	2 dr.

Curacao (Bitter Orange Peel) Essence

Sweet Orange Oil	4 dr.
Lemon Oil	2 dr.
Anise Oil	3 dr.
Alcohol	9 oz.
Water	9 oz.

Rum Essence

Butyric Ether	1 oz.
Nitrous Ether, Spirit	1 oz.
Alcohol	4 oz.

Imitation Orange Essence

Orange Oil	10 oz.
Ethyl Acetate	5 oz.
Ethyl Benzoate	1 oz.
Ethyl Butyrate	1 oz.
Ethyl Formate	1 oz.
Amyl Acetate	1 oz.
Methyl Salicylate	1 oz.
Aldehyde	2 oz.
Chloroform	2 oz.
Glycerin	10 oz.
Tartaric Acid Solution	1 oz.
Alcohol	6 pt.

Imitation Peach Essence

Formula No. 1

Ethyl Formate	5 oz.
Ethyl Butyrate	5 oz.
Ethyl Acetate	5 oz.
Ethyl Sebacate	1 oz.
Ethyl Valerianate	5 oz.

Benzaldehyde	5 oz.
Aldehyde	2 oz.
Glycerin	5 oz.
Amyl Alcohol	2 oz.
Alcohol	6 pt.

or:

No. 2

Ethyl Formate	5 oz.
Ethyl Butyrate	5 oz.
Ethyl Acetate	5 oz.
Aldehyde C_{14}	3 oz.
Ethyl Valerianate	5 oz.
Glycerin	5 oz.
Alcohol	6 pt.

Imitation Prune Essence

Ethyl Acetate	5 oz.
Aldehyde	5 oz.
Benzaldehyde	4 oz.
Glycerin	8 oz.
Alcohol	6 pt.

Imitation Raisin Essence

Ethyl Formate	2 oz.
Ethyl Oenanthate	10 oz.
Methyl Salicylate	1 oz.
Aldehyde	2 oz.
Chloroform	2 oz.
Glycerin	10 oz.
Solution	
Tartaric Acid	5 oz.
Succinic Acid	3 oz.
Alcohol	6 pt.

Imitation Raspberry Essence

Ethyl Benzoate	1 oz.
Ethyl Formate	1 oz.
Ethyl Nitrite	1 oz.
Amyl Acetate	5 oz.
Aldehyde	1 oz.
Glycerin	4 oz.
Tartaric Acid Solution	5 oz.
Vanilla Essence	1 oz.
Alcohol	6 pt.

Imitation Strawberry Essence

Formula No. 1

Ethyl Butyrate	5 oz.
Ethyl Formate	1 oz.
Ethyl Nitrite	1 oz.
Ethyl Salicylate	1 oz.
Ethyl Acetate	5 oz.
Amyl Acetate	3 oz.
Amyl Butyrate	2 oz.
Glycerin	2 oz.
Alcohol	6 pt.

or:

No. 2

Ethyl Butyrate	4 oz.
Ethyl Formate	1 oz.
Ethyl Nitrite	1 oz.
Aldehyde C_{16}	1 oz.
Ethyl Acetate	4 oz.
Amyl Acetate	3 oz.
Amyl Butyrate	2 oz.
Glycerin	2 oz.
Alcohol	6 pt.

Imitation Walnut Essence

Coumarin	2 oz.
Rose Oil	10 drops
Lovage Oil	5 drops
Alcohol	6 pt.

Spice Oil

Cinnamon Oil	20 oz.
Clove Oil	30 oz.
Bitter Almond Oil or Benzaldehyde	60 oz.
Lemon Oil	60 oz.

LIQUID FOOD AND BEVERAGE COLORS

GENERAL FORMULA

Primary or Secondary Color	4 oz.
Glycerin	6 oz.
Balance Water for one Gallon	

YELLOWS:

Egg Color

A very popular formula

Tartrazine	5 lb. 6 oz.
Orange I	1 lb. 4 oz.
Glycerin	1¼ gal.
Balance water for 50 gal.	

(that is approximately 2.1 oz. color per gallon)

or:

Tartrazine	½ lb.
Orange I	¾ oz.
Alcohol	4 oz.
Balance water for 2 gal.	

Lemon

Tartrazine	25 oz.
Glycerin	30 oz.
Balance water for 5 gal.	

BROWN:

Primary or Secondary Color	4 oz.
Glycerin	6 oz.
Balance water for 1 gal.	

GREENS:

Guinea Green	12 oz.
Tartrazine	12 oz.
Glycerin	18 oz.
Balance water for 6 gal.	

ORANGES:

Orange I	2½ lb.
Alcohol	1 qt.
Balance water for 5 gal.	
Boil and strain	

VIOLETS:

Amaranth	2 oz.
Sodium Indigo Disulphonate	2 oz.
Glycerin	6 oz.
Balance water for 1 gal.	

Lavender

Erythrosine	2 oz.

Sodium Indigo Disulphonate	2 oz.
Balance water for 1 gal.	
Grape	
Amaranth	3 oz.
Sodium Indigo Disulphonate	1 oz.
Glycerin	6 oz.
Balance water for 1 gal.	

REDS:

Amaranth	2½ lb.
Alcohol	½ gal.
Balance water for 10 gal.	
Raspberry	
As red color	
Strawberry	
Amaranth	17 oz.
Ponceau	3 oz.
Balance water for 5 gal.	
Cherry	
Ponceau	4 oz.
Alcohol	6 oz.
Balance water for 1 gal.	
Pink	
Erythrosine	4 oz.
Glycerin	6 oz.
Balance water for 1 gal.	
Brilliant Rose	
Amaranth	3½ oz.
Orange I	½ oz.
Glycerin	6 oz.
Balance water for 1 gal.	

BLUES:

Sodium Indigo Disulphonate	4 oz.
Glycerin	6 oz.
Balance water for 1 gal.	

Notice

Dissolve the colors in hot water and strain through cheese cloth. Where alcohol is required, add the alcohol after cooling. Alcohol and glycerin act as preservatives.

PASTE FOOD COLORS

GENERAL FORMULA

Color	1 lb.
4X Sugar	8 lb.
Glycerin	3½ pt.

Heat glycerin to about 145° F. Add the color. Stir until all is dissolved. Then add gradually under good stirring 8 pounds XXXX sugar (Confectioner's), which has been previously sifted. Continue stirring on low gas until a smooth paste is obtained. Fill while still hot.

YELLOW

Tartrazine	13½ oz.
Orange I	1½ oz.

Proceed as above.

On account of the partly insoluble tartrazine strain the paste.

LEMON	
Tartrazine	1 lb.
BROWN	
Brown (Secondary Color)	1 lb.
GREEN	
Guinea Green	1 lb.
ORANGE	
Orange I	1 lb.
VIOLET	
Sodium Indigo Disulphonate	3 oz.
Amaranth	12 oz.
RED	
Amaranth	1 lb.
PINK	
Erythrosine	1 lb.
BLUE	
Sodium Indigo Disulphonate	1 lb.
BLACK	
Black (Wood Charcoal)	3 oz.
Grape Sugar	1 oz.
Water	6 oz.

Almond Extract

Formula No. 1

Almond Oil	3 oz.
Alcohol	5 pt.
Water	3 pt.

No. 2

Almond Oil	1.5 oz.
Alcohol	52 oz.
Water (Distilled)	76 oz.

In each case dissolve the almond oil in the alcohol, then add the water.

Imitation Almond Extract

Benzaldehyde	1¼ oz.
Alcohol	45 oz.
Water	83 oz.

Ginger Ale Extract

Oleo Resin Ginger	60 fl. oz.
Lemon Oil	2½ fl. oz.
Essence of Rose	10 fl. oz.
Carbonate of Magnesia	40 oz.
Alcohol (95%)	5 gal.

Mix the ginger, lemon and magnesia with a little alcohol, stir to a smooth paste, add balance of alcohol, then add the essence of rose. Let stand for 24 hours; agitating frequently.

Extract of Ginger

Formula No. 1

Jamaica Ginger (Coarse Powder)	2 lb.
Alcohol	1 gal.

Percolate and filter.

No. 2

Oleo-Resin Ginger	1.5 oz.
Alcohol	1 gal.
Distilled Water	¼ gal.

No. 3

(Cheap Quality)

Jamaica Ginger (Coarse Powder)	4 lb.
Pumice Stone (Powdered)	4 oz.

Lime (Slaked)	4 oz.
Distilled Water	½ gal.
Alcohol	½ gal.

No. 4

Fluid Extract of Ginger (U.S.P.)	8 oz.
Pumice (Powdered & Washed)	2 oz.
Distilled Water	16 oz.

Stir the above together; allow to stand overnight and filter.

Household Lemon Extract

Formula No. 1

Lemon Oil (66% Citral)	3 dr.
Alcohol	½ gal.
Distilled Water	½ gal.

No. 2

Lemol Oil	10 cc.
Alcohol	90 cc.

Color with 2 drops of 0.5% alcoholic solution of Dimethyl-amidoazobenzol (Butter Color).

Fortified Soluble Lemon Flavor

Alcohol	3½ pt.
Lemon Oil	10 oz.
Citral	½ oz.
Bergamot Oil	1 oz.
Lime Oil	1 oz.

Agitate and stir thoroughly and then add:

Glycerin	8 oz.
Boiling Water	4 pt.

Constant agitation until cool. Syphon off.

Soluble Essence of Lemon

About one part of lemon oil is mixed with about three and a half volumes of alcohol and one and a half volumes of water and the whole shaken well in a separator. This shaking is carried out two or three times a day for two or three days and the mixture is then allowed to separate. The alcohol solution is drawn off; this contains the soluble flavoring constituents of the oil of lemon and can be used to flavor the acidulated syrup prepared as above at the rate of 1 oz. to the gallon. The oily layer in the extraction consists of the insoluble terpenes in the main.

A great improvement on the essence as prepared in this way can, however, be made by incorporating some of the spirit extract of fresh lemon peel with it. This can be made by macerating fresh lemon peel (free from the white pectinous pithy inner layer) in a mixture of equal volumes of strong alcohol and water, using about 1 lb. of peels to about half a gallon of the mixture, leaving for a fortnight, running off the spirit extract, pressing the peels and adding the pressings to this spirit extract. This peel tincture should be added to the essence made as above. If it is still desired to fortify the essence, this may be done by the addition of a little terpeneless or sesquiterpeneless oil of lemon.

No. 2

Lemon Oil	7 oz.
Alcohol	½ gal.
Water	½ gal.

"Cut" the oil with powdered pumice and some sugar in a mortar. Work with a pestle to a smooth paste; add by degrees the alcohol, mix and put in a gallon bottle, then add water gradually, shake well and filter and refilter through paper till bright.

Use to:

Simple Syrup	1 gal.
Soluble Essence of Lemon	3 oz.
Citric Acid Solution	2 oz.

Lemon Squash

Formula No. 1

Mix together in a jug 1 quart of lemon juice and 3 lb. sugar. Stand the jug in a pan of hot water until dissolved, but do not allow to boil. Bottle. It will keep for months. To use, add water or soda-water to a small quantity.

No. 2

Lemon Juice	1 gal.
Sugar Syrup (60° Tw.)	1 gal.
Essence of Lemon	¼ fl. oz.
Tincture of Lemon Peels	¼ fl. oz.

Bottlers' Soluble Lemon Extract

Lemon Oil	14 fl. oz.
Alcohol	½ gal.
Glycerin	6 fl. oz.
Hot Water	½ gal.

Mix the lemon oil and 3¾ pints of the alcohol together in a ½-gallon bottle and shake for 15 minutes. Add the glycerin and shake again. Into a two-gallon bottle (warm) put ½ gallon of hot water.

Add the mixture of lemon oil, alcohol and glycerin; shake or roll constantly for two hours, not allowing the ingredients to separate. Let stand for 24 hours. Introduce a rubber tube and syphon (draw off) the extract from beneath the undissolved oil.

Add the 4 ounces of alcohol left over from the ½ gallon. Filter through filter paper and bottle for future use. Use great care in separating the extract from the oil as, if you leave small globules of the oil, the extract will not be clear. If the least cloudy, filter through a small amount of powdered pumice stone.

The oil that is left is good for commercial purposes and it is best to dispose of it to candy manufacturers or bakers.

Use to:

Simple Syrup	1 gal.
Above	1 oz.

Soluble Lemon Extract with Citral

Lemon Oil	6 oz.
Citral	½ oz.
Glycerin	12 oz.
Alcohol	48 oz.
Lime Oil	1 oz.
Water	60 oz.

Add a little powdered pumice and filter and refilter until bright.

Use to:

Simple Syrup	1 gal.

Lemon Citral Extract	½–2 oz.
Citric Acid Solution	2 oz.

The use of foam is optional.

Orange Flavoring Extract

Orange (Sweet) Oil	10 cc.
Alcohol (95%)	90 cc.

Color with 2 drops of Congo Red Solution.*

* *Congo Red Solution*—Dissolve 0.5 g. Congo Red in 90 cc. water and add 10 cc. alcohol.

Peppermint Extract

Peppermint Oil	4 oz.
Alcohol	1 gal.

Color with peppermint leaves.

SPICE OIL EXTRACTS

	Oil	*Alcohol*	
Sweet Basil Oil	⅛ fl. oz.	103 fl. oz.	Water to make 1 gallon
Carrot Seed Oil	⅛ fl. oz.	103 fl. oz.	
Cumin Seed Oil	⅛ fl. oz.	103 fl. oz.	
Sweet Fennel Oil	3 fl. oz.	95 fl. oz.	
Estragon Oil	2½ fl. oz.	103 fl. oz.	
Sweet Marjoram Oil	1 fl. oz.	103 fl. oz.	
Origanum Oil	⅛ fl. oz.	103 fl. oz.	
Savory Oil	½ fl. oz.	103 fl. oz.	

Pure Vanilla Extract

Vanilla Beans (Cut very fine)	14 oz.
Cologne Spirits (190 Proof)	½ gal.
Distilled Water	½ gal.
Cane Sugar	9½ oz.

Imitation Vanilla Flavoring Extract

Formula No. 1

Vanillin	0.5 g.
Coumarin	0.5 g.
Alcohol	250 cc.
Water	250 cc.

Dissolve vanillin and coumarin in the alcohol, add the water and mix. Color with caramel.

No. 2

Vanillin	7 oz.
Coumarin	1 oz.
Cane Sugar	8 lb.
Alcohol	3 gal.
Distilled Water	6½ gal.

Color with caramel.

No. 3

Vanillin	4 oz.
Coumarin	1 oz.
Cane Sugar	6 lb.
Alcohol	½ gal.
Distilled Water	6½ gal.

Color with caramel.

Wintergreen Extract

Wintergreen Oil	4 oz.
Distilled Water	38 oz.
Alcohol	90 oz.

Imitation Wintergreen Extract

Formula No. 1

Methyl Salicylate	3.5 oz.
Alcohol	76 oz.
Distilled Water	52 oz.

No. 2

Sweet Birch Oil	3.5 oz.
Alcohol	76 oz.
Distilled Water	52 oz.

ARTIFICIAL FRUIT FLAVORS

Almond

Benzaldehyde	30.0 g.
Benzyl Alcohol	200.0 g.
Bitter Almond Oil	15.0 g.
Vanillin	0.1 g.

Apple

Amyl Valerianate	32 g.
Isobutyl Valerianate	50 g.
Ethyl Butyrate	29 g.
Concentrated Apple Juice	50 g.

Apricot

Ethyl Butyrate	55.0 g.
Butyl Butyrate	25.0 g.
Apricot Extract	20.0 g.
Vanillin	1.0 g.
Methyl Anthranilate	0.2 g.
Bitter Almond Oil	0.1 g.

Banana

Amyl Acetate	52.0 g.
Ethyl Acetate	10.0 g.
Amyl Butyrate	3.0 g.
Ethyl Butyrate	2.0 g.
Ethyl Sebacate	1.0 g.
Lemon Oil	0.3 g.
Vanillin	0.1 g.

Butter

Diacetyl	100.0	g.
Ethyl Butyrate	6.0	g.
Butyl Butyrate	5.0	g.
Ethyl Pelargonate	3.0	g.
Vanillin	0.1	g.

Cherry

Amyl Formate	5.0	g.
Ethyl Acetate	12.0	g.
Amyl Butyrate	2.0	g.
Benzaldehyde	1.0	g.
Ethyl Heptoate	1.0	g.
Terpeneless Lemon Oil	0.1	g.

Lime

Terpeneless Lemon Oil	15	g.
Citral	5	g.
Lime Oil	5	g.
Terpeneless Orange Oil	10	g.
Benzyl Alcohol	8	g.

Peach

Raspberry Essence	200	g.
Ethyl Acetate	17	g.
Ethyl Butyrate	30	g.
Ethyl Iso-Butyrate	20	g.
Methyl Heptine Carbonate	16	g.
Methyl Phenyl Carbonate	20	g.
Gamma-Undecalactone	5	g.
Ethyl Pelargonate	3	g.
Gamma-Nonyl Lactone	1	g.

Plum

Peach Essence	750	g.
Amyl Butyrate	16	g.
Ethyl Butyrate	27	g.
Ethyl Acetate	25	g.
Ethyl Heptine Carbonate	5	g.
Raspberry Essence	5	g.
Clove Oil	2	g.
Coumarin	2	g.

Raspberry

Amyl Acetate	25.0	g.
Amyl Butyrate	20.0	g.
Ethyl Nitrate	15.0	g.
Ethyl Acetate	10.0	g.
Ethyl Heptoate	15.0	g.
Isobutyl Formate	3.0	g.
Gamma-Nonyl Lactone	2.0	g.
Beta-Naphthol Butyl Ether	7.0	g.
Vanillin	0.5	g.

Strawberry

Ethyl Butyrate	16.0	g.
Ethyl Acetate	8.0	g.
Amyl Butyrate	24.0	g.
Amyl Acetate	6.0	g.
Raspberry Essence	50.0	g.
Beta-Naphthol Butyl Ether	2.0	g.
Ethyl Methyl Phenyl Glycidate	1.5	g.

The synthetic flavors compounded in this way are either used alone or, better, admixed with varying amounts of natural fruits in the form of extracts, concentrates, etc. In this way a first-rate product can be prepared. Distillation is not usually necessary, but in some instances a purer flavor is obtainable by distilling off a fraction of the finished compound.

Artificial Concord Grape Flavor

Benzyl Butyrate	10½	fl. oz.
Methyl Anthranilate	4½	fl. oz.
Methyl Salicylate	½	oz.
Amyl Valerianate	½	fl. oz.
Fluid Extract Veleri	3	fl. oz.
Alcohol (188 proof)	150	fl. oz.
Port Wine	75	fl. oz.
Grape Juice	50	fl. oz.
Glycerin	25	fl. oz.

Color to suit.

Biscuit Flavor

Clove Oil	1¼	dr.
Vanillin	4¾	dr.
Benzaldehyde	10	dr.
Rose Water	1½	oz.
Alcohol	6	oz.
Water	6	oz.

Dissolve vanillin in the alcohol.

Brandy Flavor

Acetic Ether	2	oz.
Vanilla Extract	1	oz.
Peru, Balsam	¼	oz.
Tolu, Balsam	¼	oz.
Syrup	2	oz.
Alcohol	7	oz.
Water to make	1	pt.

Butter Flavor

Formula No. 1

Coumarin	5¾	oz.
Ethyl Butyrate	5 pt. 12	oz.
Butyric Acid	2 pt. 2½	oz.

From the above: 4 ounces to 1 gallon corn oil.

No. 2

Amyl Butyrate	2	oz.
Ethyl Butyrate	1½	oz.
Butyric Acid	2	oz.
Rose Essence	2	drops
Bitter Almond Oil	1	oz.
Sweet Almond Oil	5	oz.
Nutmeg Oil	2	oz.
Walnut Oil	1	oz.
Cottonseed Oil	1	gal.

Butterscotch Flavor

Benzaldehyde	4	oz.
Sweet Orange Oil	20	oz.
Butyric Acid	2½	pt.
Amyl Acetate	2	pt.
Alcohol	3¼	pt.

Butterscotch Flavor Base

Ethyl Oenanthate	0.50	oz.
Ethyl Pelargonate	1.00	oz.
Butyl Butyrate	1.25	oz.

Amyl Acetate	1.25 oz.
Ethyl Butyrate	1.50 oz.
Butyric Acid (100%)	2.50 oz.

Butterscotch Flavor Prepared from Above Concentrate

Basic Ether (above)	13.5 oz.
Glycerin	18.5 oz.
Proof Spirit	8.0 lb.

Maple Flavor

Foenugreek Extract	1 pt.
Caramel Color	4 oz.
Tincture of Musk	1 drop
Alcohol	3 pt.
Water to make	1 gal.

Pound Cake Flavor

Orange Oil	½ oz.
Mace Oil	5 oz.
Lemon Oil	7½ oz.
Clove Oil	1/32 oz.
Cassia Oil	1/32 oz.
Coumarin	1/16 oz.
Vanillin	3¼ oz.

Add sufficient alcohol to make one gallon.

Use 4 oz. of this flavor to 100 lb. cake batter.

Flavoring and Seasoning Composition

British Patent 456,944

The following ingredients are heated and mixed together: meat extract 1.2, vegetable extract (prepared by concentrating the pressed juices of kitchen vegetables) 0.7, calf fat 1.3, beef fat 2.0, cooking salt 4.0, roasted finely-chopped onions 0.7, ground nutmeg 0.05, and ground pepper, 0.05 kg. The mixture is stirred mechanically to yield a thick mush and filled hot into cellulose skins.

Sweetened Juices and Syrups

Usually 1 volume of lemon juice and 3 of orange juice are mixed. A typical formula is 75 gallons of orange juice, 25 gallons of lemon juice and 700 lbs. of sugar. Stir to dissolve sugar. Preserve with one-tenth of 1 per cent sodium benzoate.

In preserving syrup, sweetened juices and concentrates it is desirable to place the juice at once under a high vacuum (29 inch) to remove occluded and dissolved air in order to arrest oxidation changes. This should be applied long enough to remove all of the air. The addition of sugar greatly retards undesirable changes in flavor.

Orange or Grapefruit Squash

Orange or Grapefruit Juice	1 gal.
Sugar Syrup (60° Tw.)	1 gal.
Citric Acid	1½ oz.
Essence of Orange	¼ fl. oz.
Tincture of Orange Peels	¼ fl. oz.

Removal of Sediment from Fruit Juices

Newly expressed fruit juices are invariably turbid because of the suspended substances present. A convenient way for removing the greater part of the sediment consists in passing the juice through a milk separator, which causes a large portion of the sediment to adhere closely to the walls of the bowl. By filtering through paper pulp a perfectly clear juice may usually be obtained. Infusorial earth is recommended by filter press manufacturers as an aid in the filtration of liquids which contain slime, and the experiments on fruit juices here considered indicate that this substance may be generally used in their filtration. The addition of 2 per cent or less of infusorial earth to a fruit juice will in many cases produce a perfectly clear filtrate, as the infusorial earth prevents the stopping up of the pores of the filter by the slimy suspended substances of the juice.

Sterilization of Fruit Juices

Containers of glass, porcelain, or tinned iron (tin cans) in which fruit juices may be sealed and sterilized are available. The juice may also be poured while very hot into sterilized wooden casks, which are then sealed.

Artificial Honey

Formula No. 1

a.	Sugar	5,000 kg.
	Water	1,650 kg.
	Hydrochloric Acid	5 kg.
b.	Sodium Carbonate	1.5 kg.
	Water	5 kg.
c.	Tartaric Acid	6 kg.
	Formic Acid (50%)	3.5 kg.
	Water	to dissolve
d.	Sugar Coloring	to suit
e.	Honey Odor	15 kg.

React *a* at 70° C. for 8 hours. Neutralize with *b*. Add solution *c*. Mix thoroughly, and add *d* and *e*. Speed up crystallization by adding some finished honey. Otherwise, the solidification (crystallization) takes a week.

No. 2

Mix:

Invert Sugar	750 oz.
Hydrous Cerelose	250 oz.

Tint the same with caramel using a 25 per cent solution of caramel and water for ease of distribution, then flavor this with one part of imitation honey flavor.

If the mass be slightly warmed before

flavoring and coloring, less difficulty will be had in the mixing. The imitation honey flavor will vary in accordance with the ideas of the manufacturer.

Chocolate Syrup

Ground chocolate eight ounces, glycerin eight ounces, sugar eight ounces, vanilla extract four drachms, sweet milk sufficient to make one gallon. Mix chocolate and sugar thoroughly and add the milk. Let mixture come to a boil and add the glycerin. When the sugar has cooled add the vanilla.

Hot Fudge for Sundaes

Corn Sugar	6	lb.
Sugar, Cane	6	lb.
Mixture—	¾	gal.
Half 18% Cream		
Half Evaporated Milk		

Cook to 240° F. medium ball. Remove from fire and stir in ½ lb. shaved chocolate. Dilute 1⅛ qts. of boiling water.

Maple Syrup Concentrate
U. S. Patent 2,054,873

A process of producing maple products of intense maple flavor comprises evaporating at normal pressure maple sap to a concentration of 10 to 35% solids, further concentrating in a vacuum pan at a temperature not substantially exceeding about 50° C. and thereafter heating the product in a closed vessel to a temperature of 120 to 150° C.

Tonic Beverage Syrup

Sassafras Oil	15	min.
Wintergreen Oil	15	min.
Alcohol	1	oz.
Fluid Extract of Gentian	1	oz.
Compound Syrup of Sarsaparilla	8	oz.
Caramel	1	oz.
Syrup enough to make	5	pt.

Kola Type Flavor

1.	Fluid Extract Kola Nut	100	cc.
	Fluid Extract Kola Leaves	100	cc.
	Water	40	cc.
	Alcohol	40	cc.
2.	Alcohol	100	cc.
	Lemon Oil	26	cc.

Directions: Take 36 parts of *1* to which add 8 parts of *2*. Mix. Let stand for 6 days. Filter through kieselguhr. No oil will separate out. The filtrate is the flavor to use below.

Directions for Making One Gallon Extract
Sugar, 5.5 lb.
Water, 4½ pints (approximately).
Caramel Color, about 2 oz. or to suit.
Citric Acid, ½ oz. to the gallon. (Dissolve in a little water.)
Phosphoric Acid, ¼ oz. (Use 85% Syrupy Phosphoric Acid.)
1 oz. of the above filtered oil.
*Mellol, 1 oz.
Lime Juice, ½ oz.

Add in the order as listed. Do not shake violently or foam will form.

* Mellol

Alcohol	1	oz.
Distilled Lime Oil	½	cc.
Cassia Oil	.06	cc.
Nutmeg Oil	.06	cc.
Neroli (Artif.) Oil	.01	cc.
Fluid Extract of Gambir	3	cc.

Non-Clouding Beer and Ale
U. S. Patent 2,088,712

Papain (of high digestive activity) 2 lb. 4 oz., sodium citrate 10 oz., powdered sugar (without starch) 7 lb. 5 oz. Two pounds of the above mixture are added to each 100 barrels of beer (each barrel holding 31 gallons).

Although this mixture may be added at any stage prior to final filtration and pasteurizing, the best time is after cooling the wort and the primary filtration. Pasteurizing must be accomplished at 55–57° C.

Grape Juice

The general method of the manufacture of unfermented grape juice is as follows: The grapes are crushed and run directly into double boilers provided with mixing apparatus, which keep the crushed grapes continually stirred, while they are heated to a temperature of 140° F. The juice is drained from the crushed grapes and the pomace is pressed in a press. The drained juice is mixed in kettles, heated to about 160° F. and skimmed; it is then run through a pasteurizer maintained at a temperature of about 180° F. From the pasteurizer the juice runs into sterile barrels or into five- to ten gallon carboys and is stored for about six months to allow the precipitation and settling of the precipitated matter. The clear juice is then siphoned off, filtered, bottled and pasteurized.

The bottled and pasteurized grape juice should be wholesome and palatable and free of sediment.

Modified Grape Juice

1. Use a mixture of ripe grapes to give flavor with grapes of high acid, to remedy the lack of acid in the ripe grapes.

2. Add 8 to 12 ounces of potassium metabisulphite per ton of grapes at the crusher to prevent fermentation during defecation.

3. Allow the juice to defecate 24 to 48 hours and rack from sediment.

4. Add to each 100 gallons of juice 4 to 6 ounces of casein dissolved in sodium carbonate or ammonium hydroxide.

5. Add a small amount of tartaric acid to increase the rate of separation of the cream of tartar.

6. Heat the juice to 165° F. and store in 50-gallon barrels until most of the cream of tartar has separated.

7. Rack from the sediment and filter if necessary.

8. Add a small amount of citric acid to prevent further separation of cream of tartar, and bottle.

9. Pasteurize in bottle at 160° F.

This process is practical only when there is a possibility to find suitable grapes and there is considerable difficulty experienced in obtaining a uniform product.

Lemon Soda

Syrup	1 gal.
Soluble Lemon Extract	1 oz.
Citric Acid Solution	1 oz.

Cloudy Orange Emulsion

Gum Arabic (Best Grade)	1 lb.
Water	1 pt.

Let stand overnight; mix and filter. Add

Orange Oil	6 dr.

Mix and pass through a colloid mill. Use 1–2 oz. of above per gallon of syrup.

Sarsaparilla Beer

Compound Decoction of Sarsaparilla	2 oz.
Sassafras Root	¼ oz.
Honey	¾ lb.
Cane Sugar	1 lb.
Yeast	4 oz.
Boiling Water	1 gal.

Dissolve the honey and sugar in the water, and when lukewarm add the yeast and sarsaparilla. Let stand two days, then strain and filter.

Fruit Salts

Bicarbonate of Soda	2 oz.
Tartaric Acid	2 oz.
Cream of Tartar	2 oz.
Citrate of Magnesia	2 oz.
Epsom Salts	2 oz.
Sifted Sugar	2 oz.

See that all are quite dry. Mix well and bottle for use. One tablespoonful to a tumbler of water.

Semi-Solid Buttermilk

Semi-solid buttermilk is made from fluid buttermilk essentially as follows:

The fluid is warmed to a temperature of about 100 degrees F. and allowed to sour spontaneously, keeping the temperature as constant as possible. Or a special culture of Bulgarian organisms (or Bulgarian plus mycoderm organisms) are used with a ripening temperature of 105 degrees F. to 110 degrees F. In either case as high a degree of acidity as it is possible to get is desirable. By natural souring this will usually be not much over one per cent but by using the special starters 1.5 to 2.0 per cent is possible.

After ripening the product is heated to 145 to 160 degrees F., thoroughly agitated and condensed in a vacuum pan until the semi-solid consistency is obtained. The finishing point can be determined by appearance just about as accurately as by any other means, since the proper appearance of the finished product is one of the most important criteria and the other methods use characteristics whose values would vary considerably, depending on the acidity developed in the fluid.

After condensing to the proper degree the product is filled directly from the pan into the final container. Barrels or butter tubs (second hand) are commonly used. Tubs should be lined with parchment and both tubs and barrels should be clean and probably treated with formaldehyde or chlorine before use to eliminate molds.

While this product can be made from naturally ripened buttermilk, the special cultures are essential with fluid skim milk. These cultures are also desirable with buttermilk because the higher acidity obtained gives a smoother texture, a higher yield and better keeping quality to the finished product.

Chocolate Milk

Best flavor is obtained with skim milk by addition of 1.1% of cocoa and 7% of sugar, but with milk containing 2–3% of fat 1.3% of cocoa is required. Ingredients are added to the milk at 55° and pasteurization must be carried out at 75° C. for 30 min. Of the various stabilizers, 0.4% of gelatin is most satisfactory.

Stabilized Milk Yeast Beverage
U. S. Patent 1,994,496

Milk containing 0.6% of gelatin as a stabilizer is pasteurized, then cooled to 50°, mixed with 1.5 oz. of yeast per quart, run through a homogenizer, and rapidly cooled to room temperature or lower.

Synthetic Coconut Milk
Canadian Patent 366,395

Coconut Oil	100 g.
Alcohol	100 g.

Boil together; add	
Water, Boiling	150 cc.

Allow to stand and separate alcohol-water layer to which add

Water	90.46 g.
Potassium Nitrate	1 g.
Sugar	7 g.
Sodium Benzoate	0.14 g.

Caffein-Free Coffee

U. S. Patent 2,023,333

A rotating extraction autoclave is charged with 1,000 kg. of raw coffee, steam or water is introduced until the total moisture content of the coffee amounts at most to 16 per cent, the autoclave is sealed and the double jacket is heated with steam of 5 atmospheres pressure, whereupon the extractor is set into motion. In the course of an hour the interior of the autoclave is heated up to 125° C. This temperature is maintained for about 30 to 40 minutes, and then the whole is allowed to cool down to about 100° C. Seven hundred kilograms of preliminarily heated dichlorethane are then pumped in under pressure and extraction effected for 40 minutes at raised temperature.

After that the extracting agent is led under pressure to a shaking apparatus and a fresh quantity of extracting agent introduced into the extractor. The procedure is then repeated. In the meantime the extracting agent is freed from caffein. The extraction is continued until the coffee has a caffein content of less than 0.08 per cent.

After the last extraction the residual portions of the extraction agent are removed from the raw coffee, preferably by introducing liquids or vapors other than water or steam under pressure and at temperatures which are higher than the boiling point of the extracting agent. Thereupon the air is withdrawn from the rotating extraction autoclaves with the result that the solvent residues draw off, and this phase of the process is repeated until no traces of foreign substances are detectable in either the distillate coming over or in the extracted material.

The coffee is then dried under diminished pressure.

Cocoa Beverage Concentrate

French Patent 818,971

Sugar Syrup	79.000 kg.
Cocoa	19.425 kg.
Lecithin	0.500 kg.
Calcium Phosphate	1.000 kg.
Vanillin	0.070 kg.
Coumarin	0.005 kg.

Bath Salts

Formula No. 1

Sodium Chloride	500 g.
Borax, Powdered	500 g.
Saponin	5 g.
Fluorescein	1 g.
Pinus Montana Oil	10 g.

No. 2

Sodium Metaphosphate	600 g.
Sodium Chloride	400 g.
Pinus Montana Oil, Terpeneless	15 g.
Fluorescein	1 g.

No. 3

Sodium Metaphosphate	400 g.
Sodium Chloride	500 g.
Sodium Carbonate	100 g.
Pinus Montana Oil	10 g.
Fluorescein	1 g.

Not suitable for hard water.

No. 4

Per 1 kg. salts use 10–20 g. of the following oil:

Pinus Montana Oil	200 g.
Lavender Oil	30 g.
Lemon Oil	20 g.
Coumarin	10 g.

Effervescent Pine Needle Bathing Tablets

Formula No. 1

Ammonium Carbonate	100 g.
Sodium Acid Carbonate	330 g.
Sodium Chloride	1500 g.
Tartaric Acid	400 g.
Starch	280 g.
Alcoholic Solution of Uranin or Fluorescein	to suit
Tincture of Benzoin	to suit
Pine Needle Perfume	56–78 g.

No. 2

Sodium Acid Carbonate	300 g.
Tartaric Acid	225 g.
Borax	400 g.
Sodium Sulphate, Anhydrous	200 g.
Lactose	50 g.
Talcum	25 g.
Pinus Montana Needle Oil	15 g.
Pine Needle Oil	15 g.
Fluorescein	6–12 g.

Foam Bath Salts

Formula No. 1

Soap Flakes	9 oz.
Sodium Cholate	3 oz.
Hot Water (Soft)	2 gal.

The mixture is beaten energetically until the required amount of foam is produced, and then allowed to stand for an hour.

No. 2

Sodium Bicarbonate	120 oz.
Starch	70 oz.
Saponin	20 oz.
Tartaric Acid	70 oz.
Powdered Soap Flakes (Dry)	225 oz.
Borax	90 oz.

Six ounces of powder mixed with four pints of water, and then poured quickly into two gallons of hot water in the bath.

No. 3

Sodium Bicarbonate	120 oz.
Tartaric Acid	70 oz.
Borax	20 oz.
Lauryl Sodium Sulphate	200 oz.
Perfume	as required

Three ounces of powder added to one inch of hot water in the bath.

Bath Preparations

(1) Borax 30 parts, salt 50, sodium bicarbonate 20. (2) Borax 50 parts, disodium phosphate 30, sodium bicarbonate 20. (3) Glauber's salt 20 parts, sodium thiosulphate 30, salt 50. (4) Calgon 50 parts, sodium bicarbonate 30, borax 10, salt 10. Perfume 1–2% introduced by means of 2% starch colloidal silicic acid or kaolin. *Effervescent Bath Salts.*—(1) Sodium carbonate 175 parts, sodium bicarbonate 100, tartaric acid 150, sodium perborate 50, Calgon 25. (2) Sodium bicarbonate 250 parts, citric acid 125, Stärek 25, salt 100. (3) Sodium carbonate 150, sodium bicarbonate 100, sodium acid sulphate 10, Calgon 240. *Bath Tablets.*—(1) Sodium bicarbonate 250 parts, tartaric acid 225, starch 25. (2) Sodium bicarbonate 250 parts, ammonia-soda 25, saponin 50, sodium acid sulphate 175. (3) Ammonia-soda 150 parts, sodium bicarbonate 100, saponin 25, starch 10, citric acid 115, tartaric acid 100. *Perfumes for Bath Salts.*—(1) Needle oil: (*a*) bornyl acetate 175, larch turpentine 12.5, lavender oil 25, musk ambrette 12.5, oil citronella 12.5, styrax resinoid 12.5, (*b*) Siberian needle oil 50, knee pine oil 40, oil bergamot 10, oil citronella 15, oil eucalyptus 5 and (2) oil lavender: oil eucalyptus 5 and (2) oil bergamot 250, oil rosemary 75, oil thyme 25, borneol 30, oakmoss 20, oil geranium

50 and heliotropin 40. All parts by weight.

Carbon Dioxide Bath Tablets

German Patent 645,641

Component 1

Glauber's Salt, Crystallized	50 kg.
Sodium Bicarbonate	50 kg.

Component 2

Glauber's Salt, Crystallized	100 kg.
Aluminum Sulphate	80 kg.
Tartaric Acid	20 kg.

Each of the two components is melted and either poured into tablet form or ground and pressed into powder form. Melted Glauber's Salt, being poorly soluble in water, regulates the rate of solution for the active components, and thus the speed of development of carbon dioxide.

Foot Bathing Salt

Mixture I

Soda Ash	65 g.
Sodium Bicarbonate	5 g.
Sodium Perborate	20 g.
Sodium Chloride	8 g.
Hard Soap, Powdered	2 g.

Mixture II

Tartaric Acid	Amount equivalent to the soda ash of I
or	
Sodium Bisulphate	
or	
Mono Sodium Phosphate	

Prepare 2 separate packages, to be mixed in the bath.

Bath Oil

Sulphonated Castor Oil (75%)	65 oz.
Wetanol (Wetting Agent)	33 oz.
Pine Oil, Tyrolean	2 oz.

Greaseless Cold Cream ✓

(Pearly)

Stearic Acid	180 g.
*Potassium Carbonate	18 g.
Glycerin	300 g.
Lanolin, Anhydrous	40 g.
Beeswax, White	10 g.
Water	1600 g.
Perfume for Soap	1–2%
Alcohol	if desired

*or:

Caustic Potash (35° Bé.)	12 g.
Caustic Soda (40° Bé.)	5 g.

Greasy Cold Creams

(Type Pons)

Formula No. 1

a. Beeswax, White	60 g.
Spermaceti	70 g.
Stearic Acid	10 g.
b. Peanut Oil	620 g.
c. Borax	5 g.
Benzoic Acid	5 g.
Water	220 g.
d. Perfume	10 g.

Melt *a*, and mix with *b*. Take to 55° C. on the waterbath, and add the hot solution *c* in small portions with good agitation. When properly emulsified and slightly cooled, add *c*. Stir until cold.

No. 2

a. Beeswax, White	80 g.
Spermaceti	50 g.
Stearic Acid	20 g.
Lanolin, Anhydrous	20 g.
b. Borax	5 g.
Benzoic Acid	5 g.
c. Perfume	9 g.
d. "Apple Ether"	1 g.
e. Peanut Oil	540 g.
f. Water	270 g.

Melt *a*, mix in *e*, and saponify with *b* and *f*. Add *d* to cover the odor of the lanolin; perfume with *c*.

Cold Cream

Formula No. 1

Cetyl Alcohol	100 g.
White Beeswax	150 g.
Vegetable Oil	200 g.
Mineral Oil	250 g.
Cholesterin	5 g.
Borax	10 g.
Water	260 cc.
Perfume	25 g.

No. 2

a. Ceresin, White	27 g.
Spermaceti	25 g.
Stearic Acid	21 g.
Undecylic Acid	1 g.
Mineral Oil, White	87 g.
b. Borax	5 g.
Water, Distilled	36 g.

Melt *a* and add with agitation to the hot solution *b*. Stir until cold.

Vanishing

Stearic Acid	160 g.
Cetyl Alcohol	20 g.
Caustic Potash Solution (N/1)	108 g.
Distilled Water	760 cc.
Perfume	5 g.

Vegetable Vanishing Cream

Hydrogenated Cottonseed Oil	10%
Sesame Oil	50%
Water	30%
Beeswax	8%
Lanolin	2%

To this formula 1–3% sorbitol (83%) with or without 0.2% borax may be added to give a firm, fine-grained stable cream. The oil constituents are melted together at 170° F., and the water soluble parts are then mixed with the oil at the same temperature and mixing continued while cooling.

Cleansing Cream

Formula No. 1

Sorbitol Mono-Oleate	5%
Sorbitol Di-Stearate	10%
Beeswax	7%
Mineral Oil	32%
Lanolin	3%
Water	43%

This combination gives a moderately firm cream with a fine-grained texture.

No. 2

*Cosmetic Base	22%
Mineral Oil	25%
Lanolin	3%
Beeswax (bleached)	7%
Water	43%

* The cosmetic base may be made up of 10% sorbitol mono-oleate and 90% petrolatum or 10% sorbitol di-stearate and 90% petrolatum.

No. 3

Beeswax	6.00 g.
Spermaceti	2.00 g.
Petrolatum	5.00 g.
Raisin Seed Oil	50.60 g.
Mineral Oil	10.00 g.
Rancidex (Preservative)	0.10 g.
Water	25.00 cc.
Borax	0.60 g.
Triethanolamine	0.20 g.
Perfume	0.50 g.

Melt fats and oils at 160° F. Water and borax in separate kettle at same temperature. Emulsify by adding water to oils at 160° F. with constant stirring. Add perfume oils at 115° F.

Avocado Oil Cleansing Cream

Part 1.

Hydrogenated Oil (Cosmetic Grade)	11.0 g.
Beeswax U.S.P. White	5.0 g.
Stearic Acid Triple Pressed	0.5 g.
Sesame Seed Oil	60.0 g.
Avocado Oil	7.0 g.
Antioxident & Preservative	0.1 g.

Part 2.

Distilled Water	15.3 g.
Borax U.S.P.	0.5 g.

Part 3.

Perfume	0.6 g.

Procedure: Melt Part 1 at 80° C.
Heat Part 2 to 75° C.

When Part 1 has cooled to 75° C. add Part 2 with constant stirring. Add Part 3 at 60° C. Pour between 55°–50° C.

This cream is of the quick liquefying type. It does not melt or run in the jar even under extremely hot weather conditions. The quick liquefying property is mechanical not thermal.

Pore or Blackhead Cream

For the removal of blackheads and cleansing of the pores, a "pore cream" or "blackhead cream" is used. Applied over areas of large pores after the face has been moistened with warm water, it is left on for a few minutes and then washed off with warm water. The face is then rinsed with ice cold water and an astringent lotion applied with cotton.

Formula No. 1

Salicylic Acid	2.5 g.
Starch	25.0 g.
Zinc Oxide	35.0 g.
Castor Oil	7.5 g.
Soft White Paraffin Wax	30.0 g.

The precautions necessary in compounding this preparation lie in a thorough grinding of the three powders, then slightly warmed paraffin added to the oil and powders after they are triturated, in a warmed mortar.

No. 2

Zinc Sulphate	0.15 g.
Alum	0.2 g.
Acacia (Powdered)	4.0 g.
White Beeswax	15.5 g.
Glycerin	13.0 g.
Sodium Benzoate	0.1 g.
Cocoa Butter	3.0 g.
Perfume	0.5 g.
Distilled Water	63.53 cc.

Toilette-"Vaseline"

Rosin, Pale	10 g.
Lanolin, Anhydrous	20 g.
Petrolatum (36–38° C.)	70 g.

Protective Hand Cream

Formula No. 1

Gum Arabic	20 g.
Chip White Soap	80 g.

Add water until the desired consistency is obtained.

Apply to hands before using Dry Pigments, Colored Lacquers, Enamels, Paints, etc. Water will clean off pigment and dirt very easily.

No. 2

Hard Paraffin Wax	50 g.
Petrolatum, Yellow	400 g.
Peanut Oil	200 g.
Beeswax, Yellow	100 g.
Lanolin, Anhydrous	60 g.
Rosin, Pale	40 g.
Water	140 g.
Borax	10 g.

No. 3

Lanolin	2 oz.
Glycosterin	19 oz.
Dextrin	4 oz.
Glycol Bori-Borate	3 oz.
Water	72 oz.

Dissolve last four ingredients by warming to 60° C. with stirring. Melt first two materials together and add first solution, stirring slowly but well. A little perfume may now be added and stirred in.

This gives an excellent cream to smear on hands to protect them while working with greases, lacquers, etc.

No. 4
U. S. Patent 2,021,131

Sodium Silicate	9	oz.
is stirred into a hot solution of		
Sodium Stearate	2⅞	oz.
Water	1	pt.
and then add		
Glycerin	11½	oz.

Milkers' Hand Lubricant
Formula No. 1

Paraffin, Hard	320 g.
Ceresin	280 g.
Mineral Oil, White	400 g.

No. 2

Mineral Oil, White	600 g.
Ceresin, White	200 g.
Lanolin, Anhydrous	200 g.

No. 3

White Mineral Oil, High Viscosity	60 g.
White Ozokerite (60/62° C.)	20 g.
Woolfat, Neutral	20 g.

Melt the ingredients on a waterbath, mix thoroughly, pour into containers near the filter point of the "fat."

Tissue Cream
Formula No. 1

Beeswax	9.20 g.
Lanolin	3.70 g.
Raisin Seed Oil	62.60 g.
"Rancidex"	0.10 g.
Benzyl Ester of Parahydroxy Benzoic Acid or Moldex	0.05 g.
Water (Distilled)	23.00 g.
Borax	0.9 g.
Perfume	0.45 g.

Melt oils, waxes and preservative at 160° F. In another kettle bring water and borax to same temperature. Add water to oils at this temperature with constant stirring. When the emulsion is formed add perfume at 115° F. Pour while hot.

No. 2
(Fairly Hard)

White Soft Paraffin Wax	4 oz.
Yellow Soft Paraffin Wax	4 oz.
Hard Paraffin Wax	1 oz.
Beeswax (White)	1 oz.
Lanolin	2 oz.
Perfume to suit.	

Antiseptic Tissue Cream

Stearic Acid	1.50 lb.
Lanolin, Anhydrous	1.00 lb.
White Beeswax	.80 lb.
White Mineral Oil	1.65 lb.
Triethanolamine	.20 lb.
Glycerin	1.00 lb.
Water	4.75 lb.
Cocoa Butter Oxyanhydride	.54 lb.
Perfume	.01 lb.

(1) Melt stearic acid, lanolin and beeswax together in mineral oil, heating to 70° C.

(2) Heat the solution of triethanolamine in water also to 70° C.

(3) Make a suspension of cocoa butter oxyanhydride in glycerin.

To solution (2) add solution (1) gradually, with agitation, and when cooled to around 50° C., add the suspension (3).

Continue agitation until the product is of a uniform consistency. Fill into jars while still lukewarm, and cool in ice box for setting.

Avocado Tissue Cream

Avocado Oil	20 g.
Lanolin Absorption Base	10 g.
Stearic Acid	5 g.
Cetyl Alcohol	5 g.
Beeswax	5 g.
Almond Oil	25 g.
Preservative	0.2 g.
Perfume	0.8 g.
Borax	1 g.
Distilled Water	28 g.

The water and borax are brought to a temperature of 165° F. and are then added to the molten fats, oils and waxes. Careful heating and constant stirring are essential, the perfume being added when the temperature has dropped to about 120° F.

Vegetable Oil Tissue Cream

Part 1.	
Hydrogenated Oil	25.6 g.
Beeswax U.S.P.	9.7 g.
Lanolin Anhydrous U.S.P.	8.5 g.
Spermaceti U.S.P.	2.5 g.
Sesame Seed Oil U.S.P.	36.5 g.
Preservative and Antioxidant	0.1 g.
Part 2.	
Water (Distilled)	15.8 g.
Borax U.S.P.	0.5 g.
Part 3.	
Oleic Acid (White)	0.3 g.
Perfume	0.5 g.

Melt Part 1 at 70° C. Bring Part 2 to same temperature and add to Part 1 with slow agitation. Add Part 3 at above 60° C. Pour hot and top.

Orange Skin Food (Soft)

Lanolin	8 oz.
White Soft Paraffin Wax	12 oz.
Yellow Soft Paraffin Wax	12 oz.
Liquid Paraffin Oil	8 oz.
Hard Paraffin Wax	2 oz.

Perfume with rose, neroli, or lemon—about ½ oz.

Turtle Oil Cream

Turtle Oil (Pale Deodorized)	10 g.
Diglycol Stearate	10 g.
Liquid Paraffin	30 g.
Lanolin Absorption Base	9 g.
Perfume	1 g.
Distilled Water	40 g.

The procedure consists of melting the fats and wax and stirring in the hot water at a temperature of 170° F. The perfume is added with slow stirring when the batch has cooled to about 120° F., after which the stirring device may be switched off, and the batch allowed to cool.

Deodorizer for Woolfat (Lanolin)

Use

Fruit Ether	½–1 %
or	
Aldehyde C_{14} or C_{16}	0.2–0.5%

ABSORPTION BASES

	Formula No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
Cetyl Alcohol	10 g.	15 g.	12 g.	4 g.	—	—	—
Lanolin, Anhydrous	5 g.	10 g.	5 g.	24 g.	—	7 g.	—
Petrolatum, White	75 g.	45 g.	—	——	95 g.	84 g.	58 g.
Mineral Oil, White	15 g.	30 g.	63 g.	17.5 g.	—	—	12 g.
Paraffin Wax	—	—	20 g.	14.5 g.	—	4 g.	22 g.
Cholesterol	—	—	—	——	5 g.	5 g.	8 g.

No. 8

a.	Woolfat, Anhydrous, Neutral	40 g.
	Petrolatum, White	10 g.
	Peanut, Olive, or Sesame Oil	20 g.
b.	Glycerin (sp.g. = 1.23)	5 g.
	Water	25 g.

Melt *a* on waterbath. Add *b*. Stir till cold.

No. 9

German Patent 647,451

By alcoholic saponification of lanolin, two products are obtained, one soluble and the other insoluble in alcohol. On addition of a large amount of water to the former, an extraordinarily voluminous substance is precipitated, which, after washing and evaporation of the water, is brown and resinous. On being replaced in water, it becomes whitish and swells within 24 to 36 seconds, attaining an even more voluminous form than before. It can absorb up to 900 per cent of water. The hydrated form is added to pomades and creams, and the anhydrous form to vaseline, etc. Ex.: 200 g. of liquefied lanolin are dissolved in 850 cc. of alcohol containing 50 gr. of caustic potash. 150 cc. of petroleum ether are added, and the mixture is stirred for 48 hr. at ordinary temperature. The part precipitated contains cholesterol, isocholesterol, etc. The mixture is filtered and the filtrate is poured in a thin stream into a large quantity of water. The precipitate contains chiefly the insoluble potassium soaps of the higher fatty acids, such as cerotic and carnaubic acids. The precipitate is washed with water until neutral.

Massage Skin Food (Liquefying)

Lanolin	4 oz.
Cocoa Butter	4 oz.
Almond Oil	4 oz.
Coconut Oil	8 oz.
Yellow Soft Paraffin Wax	12 oz.
Hard Paraffin Wax	4 oz.

Perfume as desired.

Frost Bite Prevention Creams

Formula No. 1

Lanolin	10 g.
Cocoa Butter	15 g.
Olive Oil	25 g.
White Beeswax	22 g.
Water	25 g.
Borax	1.5 g.
Benzoic Acid	.5 g.
Perfume	1 g.

Mix the fat, oil and wax at about 49° C., add the solution of borax and water which should be about 10 degrees warmer. The whole mixture should be stirred until the temperature has dropped to 45° C. The last ingredients are the perfume and the benzoic acid which should be dissolved in a little alcohol to make a more "elegant" preparation.

No. 2

Almond Oil	425 g.
Lanolin	185 g.
Beeswax	62 g.
Borax	4.5 g.
Spermaceti	62 g.
Distilled Water	300 g.

No. 3

Paraffin Wax	145 g.
Anhydrous Lanolin	240 g.

Paraffin Oil	175 g.
Cetyl Alcohol	40 g.

Melt these and add distilled water, 600 cc., which should be heated to a temperature of 70° C. The mixture will be of the consistency of cold cream.

No. 4

Dissolve 100 g. purified ox gall in 850 cc. hot water. Stir vigorously. When cold add the perfume. Then put in 50 g. glycerin containing one g. benzoic acid.

Nourishing Cream

Formula No. 1

Lanolin absorption base 400, glycerin 50, arnica (1:10) 50, witch hazel extract 150, distilled water 347, perfume 3. Heat the absorption base until soft (35° C.) and incorporate water previously heated to the same temperature a little at a time. Finally add the other ingredients. All parts by weight.

No. 2

Cetyl Alcohol	50 g.
Lanolin	50 g.
Cocoa Butter	50 g.
Cholesterin	10 g.
White Beeswax	50 g.
Arachis Oil	100 g.
Mineral Oil	150 g.
Petrolatum, White	240 g.
Water	280 cc.
Perfume	20 g.

Finishing Cream

Glyceryl monostearate 200, glycerin 75, witch hazel extract 150, water 572, perfume 3. Melt the glyceryl monostearate with the glycerin and add water heated to boiling. Stir until homogeneous and when cooled to 35° C. add the witch hazel extract and finally the perfume. All parts by weight.

Bleaching Cream

a.	Petrolatum (White)	9 lb.
	Paraffin Wax	6.5 lb.
	Mineral Oil	14 lb.
	Acimul	12 lb.
b.	Carbitol	3 lb.
	* Lemon Juice	5.5 lb.
	Water	50 lb.

A is melted, *b* is mixed, heated to 70–75° C. and poured slowly into *a*, with stirring. Perfume is added at 55° C. Pour at 50° C.

* Lemon juice can be replaced by citric and lactic acid, etc., in proportionate amounts.

Peroxide Cream

a.	Paraffin Wax	4 lb.
	Mineral Oil	10 lb.
	Lanolin	6 lb.
	Acimul	15 lb.
b.	Hydrogen Peroxide (100 volume)	5 lb.
c.	Water	60 lb.

Heat *a* to 70° C. and stir till completely clear. Heat *c* to 70° C. and add *a* to *c* slowly, stirring in one direction only. At 55° C. add *b* and perfume. Stir and pour at 50° C.

If 5 parts of the water are replaced by 5 parts "Carbitol" the cream can be poured at 45° C.

All Purpose Cream

1.	Parachol (Absorption Base)	25 oz.
2.	Lanolin, Anhydrous	10 oz.
3.	Mineral Oil	20 oz.
4.	Paraffin Wax	2 oz.
5.	Ozokerite, White	6 oz.
6.	Glycol Bori-Borate	2 oz.
7.	Water	50 oz.

Melt together 1, 2, 3, 4, and 5 on a water-bath and keep at 50° C. Add solution of 6 in 7 heated to 50° C. a little at a time, using a low speed mixer with large paddles. Do not add additional amounts of water until first addition has been absorbed. Stir until temperature falls to 42° C. and then mix in a little perfume. Then pass through an ointment or colloid mill.

All Purpose Cream

Sorbitol Di-Stearate	10%
Mineral Oil	20%
Lanolin	3%
Glycerin	5%
Beeswax	4%
Ceresin Wax	10%
Water	48%

Make-Up Remover

Ceraflux	2½ lb.
Mineral Oil	8 lb.
Petrolatum, White	10 lb.

Used to remove make-up. No perfume.

Deodorant Creams

Formula No. 1

1.	Stearic Acid	20 g.
2.	Potassium Hydroxide	0.8 g.
3.	Sodium Hydroxide	0.2 g.
4.	Glycerin	5 g.
5.	Methenamine	5 g.
6.	Water	67 g.
7.	Titanium Dioxide	2 g.
8.	Perfume	to suit

No. 2

1.	Glyceryl Monostearate	15 g.
2.	Spermaceti	3 g
3.	Glycerin	5 g
4.	Titanium Dioxide	2 g.
5.	Methenamine	5 g.
6.	Mineral Oil	3 g.

7. Water	67 g.
8. Perfume	to suit

No. 3

1. Acimul	15 g.
2. Aluminum Chloride	10 g.
3. Spermaceti	5 g.
4. Glycerin	3 g.
5. Water	67 g.
6. Perfume	to suit

Dissolve 2 in about 20 or 25 parts of 5, and warm to about 50° C. Place 1, 3, 4 and remainder of 5 in one kettle, and bring to about 90° C. Remove from fire, place on mixer, make emulsion by stirring rapidly at first, and more slowly until product temperature drops to about 50° C., at which temperature increase agitation speed and add aluminum chloride solution a little at a time until all is added. Continue stirring, add perfume at about 45° C. It may be necessary to homogenize or mill this cream if it is grainy or lumpy. If a white cream is wanted, titanium dioxide can be added. From 2 to 5% is sufficient.

No. 4

a. Mineral Oil	25 lb.
Acimul	25 lb.
b. Water	25 lb.
c. Oxyquinoline Sulphate (0.1% Solution)	25 lb.

a is heated till clear. *b* is heated to 75° C. and added to *a* stirring thoroughly. At 60° C. add *c* and stir. It is necessary to add *c* in small portions taking care to make no more additions until the previous portions have been emulsified. Add perfume. Stir. Pour at 55° C.

Perspiration Inhibiting Creams

U. S. Patent 2,087,162

Formula No. 1

22.5 g. of aluminum chloride, hydrated ($AlCl_3.6H_2O$), 12.0 g. of candelilla wax and 16.0 g. of stearic acid are boiled under a reflux condenser with an alcoholic menstruum consisting of 108 cc. of anhydrous ethyl alcohol, denatured according to U. S. Government formula, and 108 cc. of isopropyl alcohol (98% by volume). When solution of the solid ingredients has been effected, 0.7 cc. of perfume base is added and the mixture is run off into small containers. When cold it forms a solid mass of smooth salve-like consistency, small portions of which can be removed in discrete quantities from the container, by means of the fingers, and applied to the human skin, as under the arms, to control or deodorize perspiration.

No. 2

Like Formula No. 1, except that 16.0 g. of glycol stearate is used instead of the same amount of stearic acid.

Sports Cream

Glycosterin	12 oz.
Mineral Oil	10 oz.
Cetyl Alcohol	3 oz.
Water	100 oz.

Heat to 60° C. and mix vigorously till emulsified.

Stearate Cream

Stearic Acid, Triple Pressed	10.0 g.
Spermaceti	1.5 g.
Ammonia	1.0 g.
Borax	0.5 g.
Methyl Cellulose	0.8– 1.0 g.
Mineral Oil	3.0 g.
Glycerin	4.0 g.
Perfume, as desired	0.5 g.
Water, Distilled	78.5 g.

Melt stearin, spermaceti and mineral oil to 85° C.

Dissolve borax and glycerin in a part of the water, at 85° C. The remaining water is used to make the methyl cellulose mucilage.

Add the ammonia to the water, and pour the oil to that right after. Boil for 15 minutes. Replace lost water, stir until 60° C., when the mucilage (50° C.) is added with thorough agitation. Perfume at 40° C.

Oxycholesterol and Triethanolamine Stearate Cream

Soft Paraffin Containing 1% Oxycholesterol	746 g.
Stearic Acid	20 g.
Triethanolamine	9 g.
Rose Water	225 g.
Perfume	to suit

This cream can be made by dissolving the stearic acid and oxycholesterol in the molten soft paraffin, bringing the temperature to about 70–75° C., adding the mixture of rose water all at once at the same temperature, stirring vigorously (the heat being maintained) until the mixture is quote homogeneous, transferring to a cold mortar, and whisking until cold.

Hormone Cream

a. Petrolatum	15 g.
Lanolin, Anhydrous	15 g.
Absorption Base	10 g.
Olive Oil	5 g.
Spermaceti	5 g.
b. Hormone Oil	20 g.
c. Water or Rose Water	40 g.
d. Perfume	

Melt *a* on the waterbath. Cool to below 35° C., and add *b*—then emulsify with *c*. Perfume last.

Alum Cream

Petrolatum, White	9 lb.
Paraffin Wax (52° C.)	6.5 lb.
Mineral Oil	14 lb.
Acimul	12 lb.
Carbitol	3 lb.
Alum Solution, Saturated	5.5 lb.
Rose Water	50 lb.

Melt the oil and waxes at 70° C. Add them to water, alum solution and Carbitol of the same temperature with good stirring. Stir until cold enough to be just about pourable (50° C.). Perfume at 55° C.

Myristyl Alcohol in Lotion Creams

German Patent 633,056

Formula No. 1

a.	Myristyl Alcohol	30 g.
	Petroleum Jelly	9 g.
b.	Glycerin	7 g.
	Water	30 g.

Melt *a* on the waterbath. Heat *b* to 60° C., and add it to *a* with agitation. Stir till cooled.

No. 2

a.	Myristyl Alcohol	80 g.
	Stearin	20 g.
b.	Triethanolamine Oleate	10 g.
	Glycerin	200 g.
	Water	400 g.
c.	Perfume	to suit

As in No. 1. Perfume when cooled.

No. 3

Olive Oil-Alkali Soap, Neutral	100 g.
Myristyl Alcohol	20 g.
Water	to suit

No. 4

a.	Palm Oil	100 g.
	Olive Oil	100 g.
	Coconut Oil	40 g.
b.	Caustic Potash (50° Bé.)	100 g.
	Water	140 g.
c.	Myristyl Alcohol	50 g.

Saponify *a* and *b* by heating to 80–90° C. for 1½ hours. Add *c*, and stir until cold.

Glycerite of Starch

Wheat Starch	70 g.
Water, Distilled	100 cc.

Mix the above and add

Glycerin	900 g.

Heat with stirring in an oil-bath until desired consistency is reached.

Lipsticks

Formula No. 1

Cetyl Alcohol	240 g.
White Petrolatum	370 g.
Ceresin	240 g.
Colored Lakes	120 g.
Perfume	30 g.

No. 2

(The Color Develops on Application)

a.	Stearic Acid	9 kg.
	Eosin	1 kg.
b.	Stearic Acid	30 kg.
	Beeswax, White	40 kg.
	Paraffin Wax (50/52° C.)	20 kg.
	Ceresin Wax, White	20 kg.
	Mineral Oil	60 kg.
	Lanolin, Anhydrous	5 kg.
c.	Lanolin, Anhydrous	15 kg.
	Ceresin Wax, White	50 kg.
	Spermaceti	5 kg.
	Mineral Oil	60 kg.

To the wax-composition *b* or *c*, 2 parts of the eosin stearate are added, mix well, and a bit of alcohol is used to disperse the dye better. The alcohol evaporates quickly.

No. 3

German Patent 633,661

Stearic Acid	19 g.
Mineral Oil, White	38 g.
Ceresin	38 g.
Undecylic Acid	5 g.
Color	

Melt together, and pour into forms.

Liquid Lip Make-Up

a.	Triethanolamine Oleate	15 lb.
	Glycerin	10 lb.
	Water	10 lb.
b.	Beeswax	10 lb.
	Mineral Oil, White	40 lb.
	Scarlet, Oil-Soluble	2.5 lb.
c.	Perfume (Eau de Cologne Oil, Rose, Fougère)	

Emulsify by adding *b* to *a* at 50–60° C. Stir till cold, and add perfume.

Rouge Cream, Non-Greasy

Stearic Acid	24.7 kg.
Diglycol Stearate	12.35 kg.
Potassium Hydroxide	1.0 kg.
Glycerin	3.8 kg.
Diethylene Glycol	6.75 kg.
Distilled Water	30.93 kg.
Tartrazine or Erythrosin	0.38 kg.
Zinc Oxide	12.35 kg.
Lake Color Combination	6.20 kg.
Perfume	1.54 kg.

Water, glycerin, and diethylene glycol are mixed. The dyes are dissolved in this. Melt stearic acid and diglycol stearate together. Mix the waxes and the (warmed) water solution with good stirring. Mix in the pigments and the perfume. Stir cold.

Rouge

Hydrogenated Castor Oil	56 g.
Beeswax	16 g.
Mineral Oil	8 g.
Lanolin, Anhydrous	4 g.

Petrolatum, White	4 g.
Lake Color	10 g.
Eosin	2 g.

Rouge Inalterable

Alkanna Extract	4 g.
Polychol	5 g.
Alcohol	91 g.

Oil-Rouge

Eosin Stearate	1.5 g.
Paraffin Oil	10 g.
Fatty Oil	88.5 g.

Liquid Rouge

Formula No. 1

Erythrosin, Pure	1–5 g.
Polychol	100 g.
Glycerin	200 g.
Alcohol	100 g.
Water, Distilled	600 g.

No. 2

Phloxin	2–3 g.
Polychol	200 g.
Rose Water	800 g.

Liquid Make-Up, Pink

Eosin or Phloxin	0.1 g.
Alcohol	80 g.
Polychol	5 g.

Theatrical Rouge

Eosin, Yellowish	1 g.
Alcohol	5 g.
Polychol or Glycerin	10 g.
Rose Water	84 g.

Antipyrin Make-Up

Antipyrin	8.7 g.
Magnesium Stearate	0.4 g.
Talcum	0.8 g.
Magnesium Carbonate	0.8 g.
Glycerin	12.5 g.
Alcohol	8.8 g.
Witch Hazel	25 g.
Rose Water	43 g.

Dissolve the antipyrin in the mixed liquids. The powders are mixed with an addition of perfume, and all is mixed together.

Antipyrin in make-ups is not free of objections because it may cause dermatitis in sensitive individuals.

Hand Lotion

Formula No. 1

Raisin Seed Oil	17.50 g.
Stearic Acid (Triple Pressed)	5.50 g.
Rancidex	0.10 g.
Water	70.00 cc.
Triethanolamine	1.00 g.
Alcohol	5.50 g.
Perfume	0.40 g.

Melt oil, stearic acid and preservatives at 155° F. Bring water and triethanolamine to same temperature. Add oils to water at 155° F. with slow stirring. Stir until cold. Add alcohol and perfume last.

No. 2

Carob Gum	10 g.
Glycerin	120 cc.
Water	240 cc.
Perfume	5 cc.
Alcohol (90%)	20 cc.
Benzoic Acid	0.5 g.

Pearly Hand Lotion

Vanishing Cream	22.5 oz.
Gum Tragacanth	2 oz.
Water	175.5 oz.
Moldex or Other Good Preservative	0.2 oz.

The last three items are dispersed by warming and mixing. When completely dissolved, cool and mix into the vanishing cream.

Cooling Hand Lotion

Menthol	0.5 g.
Glycerin	10.0 g.
Alcohol	60.0 g.
Perfume and Color, as desired	
Water, to make	100.0 cc.

Creamy Hand Lotion

Stearic Acid	3 g.
Potassium Hydroxide	0.1 g.
Triethanolamine	0.2 g.
Glycerin	8 g.
Alcohol	5 g.
Gum Tragacanth	1.5 g.
Beeswax (White)	0.5 g.
Water, to make	100 cc.
Preservative	

Macerate the gum in half the water (containing preservative), and set over night. Next day—in the other half of water, dissolve the potassium hydroxide, glycerin and triethanolamine, bringing to 70° C. Separately on a waterbath melt the stearic acid and beeswax, bringing to 70° C. Add the wax-acid mixture to the water alkali mixture, with rapid stirring. While this is going on, warm up the tragacanth mucilage to about 60° C., and add to the emulsion being stirred, and continue rapid agitation until emulsion is homogeneous, then continue stirring moderately fast until cool. Dissolve any perfume used in the alcohol, adding this to your cold emulsion. Set aside in closed container without touching for a day or two to aid in developing pearliness. Strain through muslin. Bottle with aid of gravity filler. If you have a colloid mill available, it is advisable to pass the finished emulsion through this machine, immediately after adding perfume. Be sure to use care in stirring, or your mass will be too frothy. Full mixing containers with proper stirring apparatus will help avoid frothing. Karaya gum or other gums can be used in place of tragacanth. Karaya is reputed to have a softening effect on the hands that is not possessed by tragacanth. Adjust the amount of gum to give you the desired viscosity and feel. The alcohol too can be adjusted to either a higher or lower figure. Add sufficient preservative to preserve the whole mass, dissolving this in your water used to macerate the gum.

Glycerin-Benzoin Hand Lotion

Benzoin	30 g.
Glycerin	640 g.
Alcohol	10 g.
Color and Perfume, as desired	
Water	80 cc.

Soak the benzoin in the mixture of liquids for seven days, and then decant the clear liquid. Just a few drops of the lotion should be applied at a time in order to avoid stickiness.

Hand Whitening Lotion

Formula No. 1

Hydrogen Peroxide (30 vol.)	35 cc.
Tincture of Benzoin	10 cc.
Rose Water	950 cc.

No. 2

Tincture of Benzoin	20 g.
Perfume	10 g.
Rose Water	1760 cc.
Hydrogen Peroxide (10 vol.)	200 cc.

Lotion for Laborers' Hands

Glycerin	20 g.
Ammonia Water	5 g.
Bay Rum	20 g.
Rose Water	55 g.

This is to be applied to the hands after washing and dried by friction.

Astringent Hand Lotion

Tincture of Benzoin	3 g.
Spirits of Camphor	14 g.
Bay Rum	35 g.
Witch Hazel, to make	100 cc.

Removal of Skin Discolorations

For the removal of skin discolorations for which the cause cannot be found, or which do not yield to treatment of the cause, local bleaching may be tried, by the application every evening of the following:

Mercury Bichloride	0.6 g.
Alcohol	40.0 cc.
Distilled Water	120.0 cc.

For external use. Poison.

Too energetic methods may result in the increase of the color, instead of its removal. The prescription is to be allowed to dry on the skin, and to be washed off in the morning.

After a number of applications, a slight inflammation may indicate that the process has been carried far enough, and the application of the lotion should cease until peeling of the skin has been completed.

Freckle “Preventive”

Quinine Bisulphate	20 g.
Water	477 g.
Amino Stearin	100 g.
Petrolatum, White	200 g.
Mineral Oil	100 g.
Woolfat	100 g.
Perfume Oil	3 g.

Melt the oils and waxes with agitation, and add, at about 70° C., the quinine bisulphate solution of equal temperature. Stir until cold.

Skin Lotions or Oils

Formula No. 1

Peanut Oil	100 g.
Lanolin	20 g.
Moldex (Preservative)	1 g.
Triethanolamine Oleate	2–4 g.
Water	200 g

No. 2

Parachol (Absorption Base)	125 g.
Peanut Oil	400 g.
Glycerin	200 g.
Water	800 g.

No. 3

Peanut Oil or Olive Oil	100 g.
Pine Needle Oil	2 g.
Lavender Oil	0.5 g.
Chlorophyll, Oil Soluble	0.2 g.

No. 4

a. Walnut Shells, Coarsely Powdered	100 g.
Ammonia	3 g.
Ether	50 g.
Alcohol	50 g.
b. Fatty Oil	600 g.
c. Fatty Oil	400 g.
d. Perfume, etc.	

Make extract *a*, allow to stand for 6 hours; treat with *b* at below 70° C.; repeat treatment of press residue of *b* with *c*. Mix all extracts, steam-treat to remove solvents. Add *d*.

No. 5

Melissa Oil	2.5 g.
Rosemary Oil	2.5 g.
Peppermint Oil	5.0 g.
Turpentine Oil	5.0 g.
Menthol	5.0 g.
Methyl Salicylate	10.0 g.

Camphor	10.0 g.
Chamomile Oil, Infusion, to make	150.0 g.

No. 6

Peanut Oil	220.0 g.
Olive Oil	240.0 g.
Ammonia	100.0 g.
Arnica, Tincture of	70.0 g.
Camphor	20.0 g.
Rosemary Oil	15.0 g.

To each 100 g. of this, add:

Witch Hazel Extract	5.0 g.
Tormentilla Extract	10–20.0 g.
Walnut Extract	20.0 g.
Eosin	0.5 g.
Bole, Red	0.5 g.

Skin Cleansing Lotion

Stearic Acid	30 kg.
Cetyl Alcohol	4 kg.
Mineral Oil	2 kg.
Glycerin	10 kg.
Triethanolamine	1.5 kg.
Borax	0.5 kg.
Iodine-Sulphur Emulsion	0.5 kg.
Water, Distilled	41.5 kg.
Witch Hazel	10 kg.

Face Lotions
(For Dry Skin)
Formula No. 1

Camphor	25 g.
Alcohol (96%)	850 g.
Glycerin	25 g.
Perfume	30 g.
Water, Distilled	1570 g.

No. 2

Boric Acid	10 g.
Glycerin	29 g.
Menthol	1 g.
Alcohol	60 g.
Witch Hazel, Distilled	300 g.
Water, Distilled	600 g.

No. 3

Lanolin or Cholesterol	0.5 g.
Lecithin	0.05 g.
Alcohol	6 g.
Glycerin (sp.g. 1.23–1.24)	5 g.
Glyceryl Monostearate	3 g.
Almond Oil	10 g.
Water, Distilled	about 85 g.

(For Oily Skin)
No. 4

Alcohol	450 g.
Camphorated Spirits	100 g.
Perfume	10 g.
Witch Hazel, Distilled	440 g.

No. 5

Sulphur, Precipitated	2 g.
Glycerin (sp.g. 1.23–1.24)	5 g.
Camphorated Spirits, 10%	3 g.
Lavender Water	10 g.
Borax	1 g.
Water, Distilled	81 g.

Cooling Face Lotion

Spirits of Camphor	10 g.
Alcohol	45 g.
Perfume	1 g.
Witch Hazel	44 cc.

Camphor Face Lotion

Alcohol	580 g.
Camphor	10 g.
Glycerin, Refined	10 g.
Perfume	10 g.
Witch Hazel, Distilled	390 g.

Cleansing Pad Lotion
Formula No. 1

a.	Glyceryl Monostearate	1.3 g.
	Triethanolamine	0.3 g.
	Glycerin	1.6 g.
	Water	83.8 g.
b.	Oleic Acid	0.6 g.
	Mineral Oil	2.0 g.
	Cetyl Alcohol	0.2 g.
c.	Ethyl Alcohol	10.0 g.
	Perfume	0.2 g.

The procedure listed is: Boil *a* and stir to 60° C. Heat *b* to 60° C., then add to *a* under constant stirring. Stir until cool and then add *c*. The lotion is poured on the pads which have previously been placed in the jars. Only about 1 cc. of lotion per pad is needed, it is claimed.

Supplementing this type of formulation is another published one in which the addition of a wetting agent and a preservative is recommended. The wetting agent, it is pointed out, facilitates wetting the pads, while the preservative overcomes possible mold growth in the flannel cloth ordinarily used.

No. 2

a.	Glycol Stearate	1.5 g.
	Triethanolamine	0.3 g.
	Glycerin	3.0 g.
	Wetting Agent	0.2 g.
	Water	86.8 g.
	Preservative	0.2 g.
b.	Oleic Acid	0.7 g.
	Mineral Oil	2.0 g.
	Spermaceti	0.5 g.
c.	Ethyl Alcohol	5.0 g.
	Perfume	to suit

a is brought to a boil and then cooled to 65° C.; *b* is heated to 65° C. in another container and then added to *a* with rapid stirring. When the emulsion is cool, perfume and alcohol are added.

Toilet Vinegar

Glacial Acetic Acid	33 g.
Citric Acid	9 g.
Distilled Water	600 g.
Alcohol	348 g.
Perfume	10 g.

Astringent Lotion

Lactic acid 120 min.; alcohol (90%) 1 fl. oz. 96 min.; alum 60 gr.; glycerin 200 min.; potassium oxyquinoline sulphate 80 gr.; perfume; water to make 8 fl. oz. Mix the lactic acid with most of the water and the glycerin. Add the potassium oxyquinoline sulfate, then the alum previously dissolved in the remainder of the water. Dissolve the perfume in the alcohol and add the solution to the other ingredients. Add color if desired. Allow the lotion to stand for two days. Clarify.

Mild Astringent Lotion

Zinc Phenolsulphonate	8.0 oz.
Camphor	0.4 oz.
Menthol	0.4 oz.
Perfume	0.8 oz.
Alcohol	1.0 gal.
Witch Hazel, to make	10.0 gal.
Color, as desired.	

Astringent Bath Lotion

Alum	0.5 g.
Boric Acid	2.0 g.
Camphor	0.3 g.
Alcohol	24.0 g.
Water, to make	100.0 cc.
Perfume and Color, as desired.	

DEODORANT LOTIONS

Deodorant Perspiration Lotion

Aluminum Chloride Crystals	22.4 g.
Color and Perfume, as desired	
Distilled Water, to make	100.0 cc.

Borated Perspiration Deodorant

Boric Acid	4 g.
Salicylic Acid	1 g.
Glycerin	2 g.
Color and Perfume, as desired	
Water, to make	100 cc.

Astringent Perspiration Deodorant

Exsiccated Alum	10 g.
Boric Acid	10 g.
Color and Perfume, as desired	
Water, to make	300 cc.

Deodorizing Detergent Solution

Peppermint Oil	0.2 g.
Pine Needle Oil	0.2 g.
Thymol	0.2 g.
Alcohol	6.0 g.
Tincture of Green Soap	3.0 g.
Water, to make	100.0 cc.

Prevention of Perspiration
Hungarian Patent 114,592

a.	Iodine	200 g.
	Glycerin	250 g.
	Alcohol	1000 g.
b.	Sodium Thiosulphate	400 g.
	Water	600 g.
c.	Alum	50 g.
	Water	150 g.
	Formaldehyde, 40% Solution	750 g.
	Menthol	3 g.
	Lavender Oil	10 g.
	Thyme Oil	10 g.
	Ethyl Acetate	25 g.

Add solution *b* to *a*; finally add in solution *c*. Impregnate cloth with this.

Deodorizing Powders
Formula No. 1

Oxyquinoline Sulphate	1– 2 g.
Colloidal Silicic Acid	5 g.
Zinc Oxide	10 g.
Talc	20 g.
Colloidal Clay	40 g.
Magnesium Stearate	5 g.
Formaldehyde-Starch	10 g.

No. 2

Zinc Peroxide	35 g.
Boric Acid	20 g.
Talc	35 g.
Colloidal Clay	9.5 g.
Perfume	0.5 g.

No. 3

Chloramine	0.5– 1 g.
Magnesium Stearate	5–10 g.
Talc	40 g.
Magnesium Carbonate	5 g.
Colloidal Clay	30–40 g.
Zinc Oxide	9 g.

Deodorants
Formula No. 1

Talc	25 oz.
Aluminum Sulphate (Powder)	12 oz.
Aluminum Stearate	12 oz.

No. 2

Alum	15 g.
Glycerin	5 g.
Water	80 g.

No. 3

Zinc Oxide	16 g.
Boric Acid	6 g.
Paraffin Wax	3 g.
Petrolatum	25 g.

Skin Tonics
Formula No. 1

Sage Tincture	5
Witch Hazel Extract	25
Borax	5
Glycerin	80
Alcohol	347.5
Perfume	7.5
Distilled Water	530

All parts by weight.

Dissolve the borax in the glycerin, and dissolve the essential oils, witch hazel, and sage tincture in alcohol. Mix and add the water. Shake well and then occasionally during eight days. Add talc and filter.

No. 2

Triethanolamine	5
Glycerin	40
Alcohol	330
Eau de Cologne Extract	5
Witch Hazel Extract	25
Arnica Tincture (1:10)	25
Distilled Water	570

All parts by weight.

Powdered Skin Tonic

Boric Acid	50
Precipitated Chalk	100
Witch Hazel Extract	5
Sage Tincture	3
Perfume	2
Zinc Oxide	30
Talc	810

All parts by weight.

Facial Astringent

Purified Alum	5 oz.
Talc	76 oz.
Boric Acid	4 oz.
Alcohol (70%)	115 oz.
Water	200 oz.

Color, trace of Tartrazine.
Perfume, to suit.

Skin Milk

1.	Mineral Oil	300.00 g.
	Stearic Acid	40.00 g.
2.	Triethanolamine	30.00 g.
	Distilled Water	700.00 g.
3.	Otto of Rose, Bulgarian	0.20 g.
	Rhodinol	1.00 g.
	Phenylethyl Alcohol	0.50 g.
	Citronellol	0.30 g.
	Alcohol (90%)	10.00 g.

1. Warm the stearic acid and oil on a waterbath to about 70° C.

2. Pour the triethanolamine into the water, agitate, and warm on a waterbath to 70° C. Then pour (1) into this triethanolamine solution, with constant stirring. A pure white milk is thus obtained. To avoid clotting, the triethanolamine solution must be sufficiently warm.

3. Add drop by drop the perfume dissolved in alcohol to the warm milk and continue to agitate vigorously.

Toilet Milk

Cetyl Alcohol	68 g.
Medicinal Soap	18 g.
Glycerin	23 g.
Mineral Oil	91 g.
Water	780 cc.
Perfume	20 g.

Cucumber Face Milk

a.	Wool Fat, Anhydrous	30 g.
b.	Rose Water	200 g.
	Potash Soap	10 g.
	Glycerin	20 g.
c.	Perfume	10 g.
	Benzoin, Tincture	30 g.
d.	Cucumber Juice, Fresh, Percolated	700 g.

Melt *a* on the waterbath and add to it the luke-warm *b* in small portions. *c* is added to the emulsion and all are mixed through thoroughly. Take off the waterbath and stir in slowly the luke-warm *d*. Stir until cold.

Vitamin F Milky Skin Lotion

The following formula gives a soothing, emollient beauty milk of typically modern character, based on triethanolamine stearate formed *in situ* and stabilized by means of diglycol stearate.

1.	Lanolin	20 g.
	Almond Oil	80 g.
	Stearic Acid	40 g.
	Diglycol Stearate	10 g.
	Vitamin F (50,000 units per g.)	5 g.
	Vegetable Lecithin	1 g.
2.	Triethanolamine	20 g.
	Glycerin	30 g.
	Water	800 cc.
3.	Perfume	to suit

"Muscle" Oils

Formula No. 1

Olive Oil, Benzoinated	60 g.
Mineral Oil	35 g.
Lavender or Pine Needle Oil	2 g.
Cholesterol	0.5 g.

No. 2

Lanolin, Anhydrous	6–10 g.
Olive Oil	94–90 g.

No. 3

Olive Oil		20 g.
Nut Oil		10 g.
Mixture of		5 g.
Laurel Oil	5 g.	
Pine Needle Oil	3 g.	
Lavender Oil	3 g.	
Rosemary Oil	4 g.	

The above should be preserved with 0.1% Rancidex or other anti-oxidant.

No. 4

Castor Oil, U.S.P.	10 oz.
Olive or Corn Oil	90 oz.
Camphor Oil	1 oz.
Gum Benzoin	½ oz.
Rancidex	1/10 oz.

Water-Dispersable Antiseptic Oil

Diglycol Laurate	20 lb.
Coal Tar Distillate	3 lb.
Mineral Oil	77 lb.

The components easily dissolve in each other with simple mixing. This product will satisfactorily disperse in 1,000 parts of water. Glyceryl Monoricinoleate may be used in place of the Diglycol Laurate.

Sun Burn Preventing Powder

Formula No. 1

Talc	60 g.
Colloidal Clay	20 g.
Magnesium Carbonate	1 g.
Sodium Bicarbonate	5 g.
Methyl Umbelliferone	5 g.
Titanium Dioxide	5 g.
Pigments (Brown)	7.5 g.
Zinc Oxide	1 g.

No. 2

Anthracene, Pure	5–10 g.
Zinc Oxide	5 g.
Titanium Dioxide	5 g.
Talc	50 g.
Colloidal Kaolin	25 g.
Magnesium Carbonate	5 g.

No. 3

Bismuth Oxychloride	10 g.
Talc	25 g.
Zinc Stearate	5 g.
Rice Starch	15 g.
Colloidal Kaolin	55 g.

Sun Burn Powders

Formula No. 1

Bismuth Subnitrate	10 g.
Rice Starch	40 g.
Magnesium Stearate	5 g.
Talc, Superfatted	35 g.
Colloidal Kaolin, Dry, Saturated with "Phenol-Camphor"	10 g.

No. 2

Rice Starch	40 g.
Colloidal Kaolin, Dry, Saturated with "Phenol-Camphor" and Sesame Oil, 1:1	40 g.
Lycopodium	10 g.
Talc	10 g.

Sun Burn Preparation (Concentrate for Lotions)

Formula No. 1

Trichlorbutanol	100 g.
Glycerin	1250 g.
Zinc Oxide	250 g.

No. 2

*Anesthesin	3 kg.
Benzyl Alcohol, Purest	5 kg.
Ether	10 kg.
Chloroform	2 kg.
Zinc Oxide	10 kg.
Olive Oil	80 kg.
Phenol-Camphor	5 kg.

Sun Burn Lotion

Benzocain	2.5 g.
Alcohol	15.0 g.
Carbitol	15.0 g.
Picric Acid	0.6 g.
Water, to make	150 g.

Sun Tan Lotions

Formula No. 1

Tragacanth, Gum	8.0–10.0 g.
Quinine Bisulphate	50.0 g.
Citric Acid	50.0 g.
Glycerin	90.0 g.
Alcohol	200.0 g.
Water, Distilled	990.0 g.
Perfume, Water-Soluble	10.0 g.
Methyl Parahydroxybenzoate	0.2 g.

No. 2

Agar-Agar	2.0 g.
Glycerin	40.0 g.
Rose Water	60.0 g.
Quinine Bisulphate	5.0 g.
Methyl Parahydroxybenzoate	0.2 g.

No. 3

Glycerin	500 g.
Water	500 g.
Esculine	50 g.
Tragacanth	20 g.
"Gelose" (Agar-Agar)	15 g.
Methyl Parahydroxybenzoate	2 g.

No. 4

Agar-Agar	4.0 g.
Glycerin	40.0 g.
Rose Water	60.0 g.
Esculine	5.0 g.
Tormentilla Root, Fluid Extract	40.0 g.
Preservative	0.5–1%

No. 5

Tannin	15 g.
Alcohol	55 g.
Water	155 g.

No. 6

U. S. Patent 2,102,712

A ½ to 1 per cent solution of benzyl anthranilic acid in peanut or other oil, with suitable color and perfume added.

No. 2

A 1 per cent solution of dimethyl anthranilic acid in 20 per cent almond oil and 80 per cent mineral oil with color and perfume to suit.

No. 3

A 2 per cent solution of anthranilic acid stearate in mineral oil. (This product is made by melting 14 pounds of anthranilic acid with 30 pounds of stearic acid and heating to 80° C. until the mass is homogeneous.)

Depilatory

Strontium Sulphide	32 g.
Calcium Sulphide	18 g.
Starch	30 g.
Talc	19 g.

* Isobutyl Paraaminobenzoate.

Resin-Wax Depilatory

U. S. Patent 2,062,411

Rosin	5 lb.
Beeswax	1 lb. 4 oz.
Musk Ambrette	7¾ gr.
Labdanum Resin	7¾ gr.
Oil Soluble Red Dye	¼ gr.

Heat in double boiler until melted; mix until uniform. Pour into molds. Sticks of about 3/16 of an inch in diameter for removing hair from the eyebrows, 5/8 inch sticks for use on the upper lip, face and chin, and still larger sticks for melting down and applying on larger areas of the body for full leg or full arm treatment are used. Before application place a stick in hot water. When thoroughly softened apply to skin. The plastic mixture is to be allowed to remain in place for from 3 to 15 minutes. After this period the depilatory may be lifted away and will bring with it the hair which has been imbedded.

Plucking Depilatory

British Patent 478,176

Glucose	210 g.
Flour	20 g.
Beeswax	8 g.

Boil together for 15 minutes with good stirring.

Liquid Depilatory

Formula No. 1

Sodium Sulphide, Pure	8–10 g.
Sugar	8 g.
Water, Distilled, or Witch Hazel	84 g.
Diglycol Stearate	2 g.

No. 2

Sodium Acid Sulphide, Pure	8 g.
Sugar	5 g.
Triethanolamine Laurylsulphonate	1 g.
Water, Distilled	86 g.

No. 3

Sodium Sulphide, Pure	8 g.
"Soluble" Starch	4 g.
Sugar	4 g.
Glycerin	5 g.
Borax	1 g.
Turkey Red Oil, or Sodium Laurylsulphonate	1 g.
Water, Distilled, Free of Carbon Dioxide	77 g.

It is advisable to put a thin layer of mineral oil on top of this liquid depilatory, to better its stability. Shake before use.

Protecting Compound for the Skin to Be Used Together With Depilatories

German Patent 650,384

Formula No. 1

Wood Flour, Finest	10 lb.
Caustic Soda (1.091)	36 lb.

The mixture is cooked in an autoclave at 200° C. under continuous stirring. When a solution has been formed after several hours, the whole is filtered through carbon, dialyzed until all alkali is removed, and concentrated to a syrup.

This latter is emulsified by sulfonated oil, or other stabilizers (woolfat alcohols, stearates, resinates, etc.).

No. 2

a.	Casein	15 g.
	Water	30 g.
b.	Caustic Soda (sp.g. 1.357)	2.2 g.
	Water	28.5 g.
c.	Methyl Parahydroxybenzoate, in 4% Solution	3.0 g.
d.	Caustic Soda (sp.g. 1.210)	2.1 g.
	Water	6.0 g.
e.	Rosin, Powdered	6.2 g.
f.	Mineral Oil	5.0 g.
	Almond Oil, Sweet	2.0 g.

a is made by soaking for 6 hours, dispersed by adding *b; c* is added. Separately, *d* is heated to a boil, and *e* is added in portions with stirring, and the solution is boiled ½ hour. After mixing all, stir *f* into the cooled dispersion.

Dialyze the resulting material.

No. 3

a.	Tragacanth Gum	3.0 g.
	Glycerin	8.0 g.
	Water	45.9 g.
	Sodium Benzoate	0.1 g.
b.	Isocholesterol	14.0 g.
	White Beeswax	4.0 g.
	Mineral Oil (0.881)	25.0 g.

Disperse *a* in the usual manner. Cool to a medium warmth, add the mixture *b* in small portions. Homogenize.

No. 4

a.	Water	58.0 g.
	Salt	1.5 g.
	Corn Starch	7.5 g.
b.	Caustic Soda (sp.g. 1.21)	2.8 g.
c.	Hydrochloric Acid (sp.g. 1.2)	3.0 g.
d.	Formaldehyde (40%)	0.2 g.
e.	Stearic Acid	2.5 g.
f.	Ammonia (sp.g. 0.960)	1.2 g.
	Glycerin (sp.g. 1.230)	1.3 g.
	Mineral Oil (sp.g. 0.881)	1.2 g.
	Water	20.8 g.

Soak the starch in the salt solution *a*, make soluble with *b*; neutralize again with *c* when solubilized. Preserve with *d.* Separately, melt *e* and add to the hot mixture *f*. To the emulsion formed this way and cooled, the starch colloid is added. Homogenize.

Formulas 1–4 represent examples of colloidal materials which will penetrate the skin and stay near its surface for protection against the causticity of the depilatories.

No. 5

Sodium Sulphide, Pure	8 g.
Alcohol	1 g.
Methylcellulose (5:100)	91 g.

Perfume for Depilatories

Formula No. 1

Bergamot Oil	20 g.
Lemon Oil	20 g.
Vetivert Oil	10 g.
Terpineol	10 g.
Lauryl Alcohol	5 g.
Xylene Musk	5 g.
Geranium Oil, African	15 g.
Diphenyl Methane	15 g.

No. 2

Bergamot Oil	20 g.
Terpineol	10 g.
Diphenyl Methane	5 g.
Benzyl Alcohol	15 g.
Menthol, Synthetic	50 g.

Lotion for Use After Depilatory Application

Acetic Acid	2 oz.
Zinc Acetate	16 oz.
Lavender Oil	2 oz.
Water	100 oz.

Mix until dissolved; filter through magnesium carbonate or talc to clarify.

HAIR DYE SOLUTIONS

Formula No. 1

a.	Bismuth Subnitrate	50 g.
	Cream of Tartar	100 g.
	Water, Distilled	500 g.
b.	Water, Distilled	400 g.
c.	Sodium Hydroxide	until just alkaline
d.	Precipitated Sulphur	25 g.
	Glycerin (28° Bé.)	65 g.
e.	Rose Water, to make	1000 g.

Boil *a* for 30 minutes, pour off the liquid, add *b* to the residue, and repeat the boiling. Pour the second extract into the first, add *c* to make weakly alkaline. The thoroughly mixed *d* is now added to the liquids, and washed from the mortar by parts of *e*. Fill up to 1000 cc.

Apply on degreased hair.

No. 2

Bismuth Citrate	48 g.
Nitric Acid, Pure	72 g.
Tartaric Acid	36 g.
Sodium Bicarbonate	34 g.
Ammonia to make slightly	alkaline
Sodium Thiosulphate	24 g.
Glycerin	120 g.
Water, Distilled	4600 g.

Method: Similar to that given in No. 1.

No. 3

Amino-diphenylamino-monosulfonic Acid	40 g.
Sodium Carbonate	20 g.

Press tablets. For use, dissolve a tablet of about 6 g. in 100 cc. of water, and add a second tablet of a material developing oxygen, e.g. sodium perborate or sodium persulphate.

No. 4

Monomethyl paraamido phenolsulphate ("Adilol")	10 g.
Amidophenol Hydrochloride	5 g.
Amidodiphenylamine	6 g.
Sodium Sulphite	5 g.

Dissolve in 500 parts of alcohol, and add hydrogen peroxide, or a tablet of a material developing oxygen.

No. 5

Para-Toluylene Diamine	25 g.
Sodium Sulphite, Crystallized	50 g.

Dissolve 7½ g. in 100 g. water, and add the oxidizing tablets or hydrogen peroxide, as given above.

Two-in-One Hair Dye

Solution I:

Bismuth Subnitrate	50 g.
Rose Water	50 g.
Distilled Water	200 g.
Alcohol	700 g.

Solution II:

Sodium Thiosulphate	60 g.
Water	200 g.

Mix plenty of I with a little II in the palm of the hand, and put on the hair.

Does not dye greasy hair and skin. The hair must be absolutely free of grease, but it is advisable to oil the face next to the hair to prevent dying of the skin.

Hair Darkening Pomade

Silver Nitrate	1 g.
Ammonium Carbonate	1.5 g.
Rose Water	20 drops
Pomade (Fat Base)	30 g.

Hair Dye Fluid, Thick

British Patent 463,481

Glyceryl Monostearate	15 g.
p-Phenylenediamine	85 g.
Water, Warm	to suit

Nail and Hair Bleach

Hydrogen Peroxide (3%)	8½ oz.
Ammonia (0.96)	1½ oz.

Hair Oil

Vermouth Oil, American	1 g.
Thyme Oil	1 g.
Chamomile Oil, German	1 g.
Peppermint Oil	1 g.
Eau de Cologne Oil	10 g.
Ylang Ylang Oil	10 g.
Cananga Oil	20 g.
Peru Balsam	50 g.
Peanut Oil	10 kg.
Methyl Parahydroxybenzoate	20 g.

Digest for 8 days. Filter.

Hair Milk

Formula No. 1

Triethanolamine Stearate	7
Spermaceti	3
Liquid Paraffin	25
Distilled Water	65
Perfume	to suit

Dissolve the trihydroxyethylamine stearate and spermaceti in the liquid paraffin over a water-bath. While still warm run in the water previously warmed. Stir vigorously until quite homogeneous and cool, working in the perfume as the cream cools. The figures in the formula refer to parts by weight.

No. 2

Glyceryl Monostearate	6
Liquid Paraffin	30
Distilled Water	64
Perfume	to suit

HAIR FIXATIVES

Formula No. 1

a.	Water, Distilled	700 g.
	Glycerin	30 g.
	Borax, Powdered	25 g.
b.	Tincture of Benzoin	235 g.
c.	Perfume	10 g.

Make solution *a*, and add *b* with good stirring and in a thin jet. Add *c*. Allow to stand 3–5 days. Filter.

No. 2

a.	Borax, Powdered	20 g.
	Water, Distilled	700 g.
b.	Shellac, Bleached	100 g.
c.	Alcohol (90%)	170 g.
	Perfume	10 g.

Dissolve *a* hot, add *b* in small quantities, stirring. When a homogeneous mass results, add *c* at not more than 50° C. Stir until cold, keeping evaporation low. Store, filter as in No. 1.

No. 3

Tincture of Benzoin	970 g.
Perfume	10 g.
Venetian Turpentine	20 g.

No. 4

Rosin, Light Grade	90 g.
Alcohol (90%)	900 g.
Perfume	10 g.

No. 5

German Patent Application I, 52,969

Lotion:

Polyvinyl Alcohol, High Viscosity	25 kg.
Water	1000 kg.
Sodium Benzoate	4 kg.

Paste:

Polyvinyl Alcohol, High Viscosity	20 kg.
Water	100 kg.
Resorcinol	1 kg.
Soap, 10% Alcoholic Solution	12 kg.

HAIR WAVE SET

Formula No. 1

Gum Karaya	2 g.
Alcohol	5 g.
Glycerin	3 g.
Water & Preservative	93 g.

No. 2

(Concentrate)

Gum Karaya, Finely Powdered	4 oz.
Isopropyl Alcohol	10 oz.
Aquaresin GB (Glyceryl Bori-Borate)	8 oz.
Borax	⅛ oz.

This is for beauty parlor use. 4–6 oz. are poured into a gal. of water and mixed for use.

Decolorizing Water "Soluble" Gums

U. S. Patent 2,093,405

Water	1 l.
Antimony Potassium Tartrate	5 g.
Gum Karaya	100 g.

Boil and mix until uniform. Add a little filter-medium (Filter-Cel or magnesium carbonate) and filter.

Hair Wave Lotion

Tincture of Benzoin	6.0 g.
Glycerin	1.5 g.
Alcohol	120.0 g.
Distilled Water	42.5 g.

PERMANENT WAVE SOLUTIONS

Formula No. 1

Ammonia	4.0 g.
Potassium Carbonate	.5 g.
Ammonium Chloride	.4 g.
Water	95.1 g.

No. 2

Glycerin, C.P.	100 g.
Sodium Sulphite	100 g.
Water	1000 cc.
Ammonia (10%) Solution	100 g.

Dissolve the glycerin and the sulphite in the water, and add to this the ammonia.

No. 3

Morpholine	6.0 oz.
Potassium Sulphite	1.5 oz.
Ammonium Carbonate	2.5 oz.
Sulphonated Castor Oil	1.0 oz.
Water	89.0 oz.

No. 4

Monoethanolamine	6.0 oz.
Potassium Sulphite	1.5 oz.
Potassium Carbonate	1.5 oz.
Borax	0.5 oz.
Ammonium Carbonate	2.5 oz.
Sulphonated Castor Oil	1.0 oz.
Distilled Water	87.0 oz.

No. 5

Ammonium Carbonate	2.0 oz.
Potassium Carbonate	1.4 oz.

Potassium Sulphite	2.5 oz.
Ammonium Hydroxide (0.900)	3.25 oz.
Sulphonated Castor Oil	1.0 oz.
Distilled Water	90.0 oz.

No. 6
French Patent 810,389

a.	Ammonium Carbonate	5 g.
	Monosodium Sulphide	185 g.
	Lecithin	15 g.
	Alcohol	780 g.
	Bergamot Oil	15 g.
b.	Water, Distilled	780 g.

Composition *a* is the concentrate, and should for use be diluted with *b*.

No. 7

Ammonia (25%)	100 g.
Ammonium Sulphite Solution (22° Bé.)	100 g.
Turkey Red Oil (100%)	10 g.
Rose Water	790 g.

Milky Permanent Waving Solutions

The addition of 2–5% of Milcol to either the ammonia or non-ammonia type of permanent wave solution will produce a milky product which will remain permanently milky and not separate. The intensity of the milk can be varied by varying the amount of Milcol used.

Pre-Permanent Waving Treatment
British Patent 443,359

As a preparatory to waving the hair, the application of a 6 per cent solution of a composition is made, then it is washed off. The resulting wave is made more permanent and the luster of the hair is said to improve. A typical mixture is as follows:

Cetyl Sodium Sulphate	15 oz.
Cane Sugar	35 oz.
Anhydrous Sodium Sulphite	50 oz.

Permanent Hair Waving Without Heat
U. S. Patent 2,061,709

A softening agent is prepared by placing in water solution 1/100 to 4 per cent of sodium stannite to which there is added about ½ to 2 per cent of sodium hyposulphate, less than 1 per cent of sodium polysulfide and about 1/100 per cent of trypsin. The hair to be waved is carefully combed and divided into tresses and the softening composition is generously applied, treating one or several tresses at a time. The treated tresses are then conformed with the aid of curling devices, if desired. The operation is repeated until all of the hair has been treated and conformed. A period of time of about ten to twenty minutes is then permitted to elapse. At the end of this period a water solution containing 10 to 50 per cent of aluminum sulfate and about 5 to 15 per cent of zinc sulfate is applied to the hair and the formed curls thoroughly soaked therewith so that penetration of the fixing composition is obtained. In case the hair has been very tightly wound it may be necessary to relax the same slightly in order to obtain such penetration. A period of about 10 to 20 minutes is then permitted to elapse, during which time the hair returns to its normal condition of elasticity and hardness, but retains the conformation placed thereon. A thorough application of hypertonic neutral salt solution is then made. The neutral salt solution may contain about 10 to 30 per cent of sodium chloride, 5 to 25 per cent of magnesium sulphate or Rochelle salt. This is generously applied until the concentration of excess fixing or softening composition is substantially reduced. If preferred, the application of the hypertonic solution may be omitted, in which case the hair may be set up in the desired wave immediately following the fixing period. In the latter case some relaxation of the wave will result. If the hypertonic solution is employed the wave is set while the hair is still moist therewith and is then dried. After drying, the crystallized salt is combed or brushed out and the process is complete.

Heat Producer for Hair Waving
Canadian Patent 367,908

Aluminum Powder	20– 40 g.
Sodium Thiosulphate	50– 500 g.
Maleic Acid	50– 150 g.
Copper Oxide	40– 100 g.
Fullers' Earth	500–1000 g.

Permanent Hair Waving Powder
U. S. Patent 2,095,374

Potassium Sulphite	70 g.
Ammonium Carbonate	30 g.

Preventing Lumping in Hair Wave Concentrates
Use Absolute Alcohol in Gum Concentrates

Gum concentrates (such as karaya) made with anhydrous or absolute alcohol are more easily dispersed than those prepared with alcohol of lower strength.

When alcohol of low proof is used, water present in the alcohol is taken up by the gum if the concentrate is stored for any length of time. Gum swollen by water is particularly difficult to shake into suspension. This is a serious drawback when preparing more dilute aqueous solutions from the concentrates as is usually done in beauty parlors.

Kinky Hair Straightener

U. S. Patent 2,087,953

Stannous Chloride	0.3– 8 g.
Sodium Zincate	0.3– 8 g.
Sodium Hyposulphite	2 – 15 g.
Sodium Polysulphide	0.5– 18 g.
Magnesium Hydroxide to make	100 g.

MODIFIED COCONUT OIL SHAMPOOS

Coconut oil is often combined with other oils in the preparation of high lathering shampoo soaps, e.g., a liquid shampoo may be made from 9 parts of coconut oil and 7 parts of refined soybean oil. The coconut oil is slowly melted, avoiding overheating, the soybean oil added and the whole warmed to about 75° C. Stir in slowly 7.5 parts caustic potash (50° Bé.) which has been diluted with 10 parts of distilled water. After stirring until reaction appears to be complete, cover the kettle and let stand for two hours. Test to see if saponification is complete and for excess alkalinity. A practical method of testing is to dissolve about 2 grams of soap in 6 grams of distilled water, with warming. Turbidity shows the presence of unsaponified fat, so that possibly 200 grams of caustic potash should be added.

To test for free alkali, add 2 drops of a 1 per cent phenolphthalein to the sample solution. If a decided red color results, stir in 0.3 to 1 part of castor oil fatty acids. If the soap is already too thick, diluted soap may also be added, after which it is necessary to boil at least a half hour. Eventually 75 parts of distilled water are stirred in. The soap dissolves overnight.

The following alternative procedure may be used as possibly being simpler. The fats are warmed together as above and 7.7 parts of 50° Bé. caustic potash solution diluted with 10 parts of distilled water, added. The vessel is left covered for two hours and 75 parts of hot water added. After complete solution the excess of alkali is neutralized with castor oil fatty acids. First 300 grams of the fatty acids are stirred into the soap, the mixture is brought to boiling and after a quarter hour, a few drops of soap are tested with phenolphthalein. If the test shows only a pale pink or lack of a pink color, 0.3 kg. of potash carbonate dissolved in 3 kg. of distilled water is added. However, if the soap sample should still show a decided red color, 300 kg. more of castor oil fatty acids are added, boiled, and again tested. When the soap is no longer too alkaline, the potash solution is added. If still too alkaline, more fatty acids are added and correction continued as above. The potash is only added after the soap shows the desired reaction.

The soap is next cooled and perfumed. For the perfume, 0.5–1.5 kg. of pineneedle oil is stirred with a mixture of 0.2–0.6 kg. of castor oil fatty acids, 0.1–0.3 kg. of triethanolamine and 0.3–0.5 kg. of alcohol. This mixture is thoroughly stirred into the soap. If desired, the pineneedle oil may be mixed with other perfume materials such as bornyl acetate and lavender oil but these tend to cover partially the odor of pine.

The perfumed soap is allowed to stand in a cool room preferably for 14 days or longer to allow impurities and insoluble soap to settle. It should stand for a minimum of 8 days. It is then filtered, preferably in a cool room. Addition of 5 per cent of glycerin and 5 per cent of isopropyl alcohol renders the liquid soap somewhat more resistant to the effects of later chilling. The finished soap may be colored with fluorescein.

In place of soybean oil, olive foots, olive oil, peanut oil, or sunflower oil may be used without any other changes in the fat charge. Coconut oil may be replaced by its fatty acids, when slightly more caustic potash would be required.

Liquid Shampoo

Formula No. 1

Olein	220 lb.
Coconut Oil Fatty Acids	160 lb.
Triethanolamine	200 lb.
Alcohol	110 lb.
Water	110 lb.

No. 2

Sapamin Citrate	15 lb.
Alcohol (10%)	75 lb.
Saponin	1 lb.
Glycerin	1 lb.

Shampoo, Non-Lathering

Sulphonated Castor Oil	60 cc.
Sulphonated Olive Oil	30 cc.
Ethylene Glycol	3 cc.
Mineral Oil	7 cc.
Sulfatate or Other Wetting Agent	1 g.

Oil Shampoo

Sulphonated Castor Oil (75%)	65 g.
Sulphonated Olive Oil (75%)	28 g.
Best Mineral Oil	5 g.
Ethylene Glycol	2 g.

Perfume to suit.

Soapless Foaming Shampoo

Virifoam A	5 g.
Water	95 cc.

Color and perfume to suit.

Lime Hair Cream

Castor Oil, U.S.P.	600 g.
Bleached Almond Oil	275 g.
Spermaceti	100 g.
Terpeneless Lime Oil	3 g.
Bergamot Oil	2 g.
Hydroxy-citronellal	1 g.

Melt and strain the bases, cool, and add the perfume. Pour into tins or glass jars. Allow to solidify slowly.

Hair Creams

Formula No. 1

Powdered Soap	50 oz.
Water	36 oz.
Glycerin	18 oz.

Dissolve the soap in hot water, add the glycerin. While stirring well add

Peanut Oil	40 oz.

Mix until homogeneous and add

Perfume	12 oz.

and continue stirring until nearly cool. To get maximum stability run through a colloid mill.

No. 2

Cholesterin	2 oz.
White Petrolatum	10 oz.
Lanolin	10 oz.
White Mineral Oil	50 oz.
Water	100 oz.

The lanolin may be replaced by deodorized arachis oil and beeswax (1:5). It is necessary to use a homogenizer in the preparation of such a cream.

Hair Pomade

Tallow	390 g.
Ceresin, White	150 g.
Beeswax, White	50 g.
Rosin, Pale	200 g.
Mineral Oil, White	200 g.
Perfume	10 g.

Moustache Pomade

Glycosterin	4 g.
Gum Arabic	8 g.
Water	31 g.
Castile Soap	12 g.
Beeswax	30 g.
Diethylene Glycol	12 g.

Perfume to suit.

Warm until wax has melted and mix vigorously until uniform.

Petroleum Hair Oil

Formula No. 1

a.	Water, Distilled	800 cc.
	Sulphonated Higher Fatty Alcohol Sodium Salt	5 g.
b.	Alcohol (90%)	200 cc.
c.	Kerosene, Deodorized	25 g.
	Bergamot Oil	75 g.

Make solution *a*, filter; add *b* and *c*, which will remain floating on top.

Shake before use.

No. 2

Kerosene, White, Deodorized	10 kg.
Citronella Oil	10 kg.
Castor Oil	5 kg.
Alcohol (90%)	50 kg.
Water	75 kg.

No. 3

Petroleum, Rectified	20 kg.
Vaseline Oil, Yellow	20 kg.
Castor Oil	15 kg.
Lavender Oil	5 kg.
Quinine Hydrochloride	1 kg.
Formaldehyde	2 kg.
Lemon Oil	5 kg.
Bergamot Oil	5 kg.
Alcohol	400 kg.
Distilled Water	600 kg.

Perfumed Hair Oil

Castor Oil	12	oz.
Alcohol	52	oz.
Lemon Oil	0.5	oz.
Lavender Oil	1	dr.
Bergamot Oil	2	dr.
Cinnamon Oil	10	drops
Clove Oil	10	drops
Citronella Oil	10	drops
Tincture of Turmeric	1	dr.

Henna Brilliantine

Powdered Henna	2.5 g.
Olive Oil	20 g.
Mineral Oil, Yellow,	80 or to 100 g.

Most brilliantines are merely colored oils, henna, oil soluble brown toned with red.

Cholesterol-Sulphur Hair Lotion

Alcohol	89 kg.
Cholesterol	0.5 kg.
Sulphurized Oil	1.5 kg.
Glycerol	2 kg.
Water	7 kg.

Tar-Sulphur Hair Lotion

Alcohol	50 kg.
"Anthrasol" (Tar Distillate)	1.5 kg.
Sulphurized Oil	1 kg.
Salicylic Acid	0.2 kg.
Distilled Water	42 kg.

Sulphur Hair Tonic

Alcohol	60 kg.
Sulphurized Oil	1 kg.
Boric Acid	2 kg.
Portugal Essence	2 kg.
Water, Distilled	35 kg.

Hair Lotion for Dandruff and Greasy Hair

French Brandy	90 kg.
Sulphurized Oil	1 kg.
Triethanolamine	5 kg.
Peru Balsam	4 kg.

EYEBROW PENCILS

Eyebrow pencils consist of a fatty base to form the body of the pencil along with from 10 to 50 per cent of pigment. A fat or oil soluble dye may be used to round off the color or, in fact, may be used as the sole color in the pencil. The pigment mixture is passed through a fine sieve and then mixed with part of the fat base in a mortar or a roller mill and rubbed to an absolutely homogeneous paste. The rest of the base, warmed, is added and the small amount of dye is mixed into the fat mixture. When used as a supplement to pigment, 0.5 to 1 per cent of soluble dye is used; as the only coloring material, 10 to 15 per cent of dye is generally necessary. When dye alone is used it need not be ground with the fatty material but is simply dissolved in the heated fats. The base itself is made by melting the solid ingredients carefully, preferably on the water-bath, and then adding the liquid components. After mixture with the coloring material, the mass is passed through a sieve, warmed again and poured into molds. Add perfume shortly before pouring. The stick mass can be made along the lines of the following formulas. Yellow mineral oil 210, white ceresin 320, beeswax 30, benzoinated tallow 440. Beeswax 42, white ceresin 10.5, soft paraffin 13.5, anhydrous lanolin 13.5, peanut oil 20.5. Ceresin 30, Japan wax 20, beeswax 30, mineral oil 20. Pigments and dyes are used to suit individual tastes. Use all parts by weight.

Eyebrow Pencils

Mineral Oil	100 kg.
Ozokerite (60/62° C.), White	55 kg.
Beeswax	15 kg.
Tallow, Benzoated	240 kg.
Coumarin	1 kg.

The color for this is, for 1,000 parts of the base:

Medium Brown:	
Umber	225 kg.
Mahogany	150 kg.
Dark Brown:	
Umber	150 kg.
Mahogany	150 kg.
Kassel Brown	50 kg.
Blue-Black:	
Zinc Oxide	150 kg.
Dark Ultramarine Blue	145 kg.
Lamp Black	5 kg.

Nail Cream

a.	Beeswax, White	15.0 g.
	Ozokerite, White	2.5 g.
	Montan Wax, Bleached	2.5 g.
	Mineral Oil	60.0 g.
	Cetyl Alcohol	2.0 g.
b.	Water	23.5 g.
	Borax	1.5 g.
c.	Aluminum Stearate	20.0 g.
d.	Fish Silver Paste (10% Dispersed in Amyl Acetate)	5.0 g.

Melt *a*, add *b* of about 70° C. Stir thoroughly, add *c*. Stir until the emulsion is almost cold, add *d*.

Brittle Nails, Prevention of

Formula No. 1

Nails should be swabbed daily with diglycol laurate on a tuft of absorbent cotton. The same treatment should be used before applying any nail enamel or lacquer. In all cases wipe off any excess of the diglycol laurate.

No. 2

Linoleic Acid	5 g.
Diglycol Laurate	5 g.
Perfume	to suit

No. 3

Linoleic Acid	10 g.
Diglycol Laurate	10 g.
Cholesterol	½ g.
Lanolin	10 g.
Perfume	to suit

Nail Polish Remover

Ethylene Glycol	6 cc.
Acetone	40 cc.
Ethyl Acetate	20 cc.
Amyl Acetate	20 cc.
Alcohol	10 cc.
Diglycol Laurate	4 cc.

The inclusion of diglycol laurate prevents brittleness of nails.

Cuticle Creams

Formula No. 1

White Petroleum Oil	87.75 g.
Paraffin Wax (M.P. 125° F.)	9.00 g.
Menthol	3.00 g.
Thymol	.025 g.
Color (Oil Soluble Red)	to suit

No. 2

Anhydrous Lanolin	12.0 g.
Distilled Water	12.0 g.
Lecithin	0.5 g.
Petrolatum (Cream or Lily White)	55.5 g.
Light Mineral Oil	20.0 g.
Perfume	to suit

Since the two types of cuticle cream above are essentially hydrocarbon oils which are difficult to rinse off thoroughly their use should be directed after, not before, the application of liquid polish. Thus any impairment of lustre and adhesion of the subsequently applied polish will be avoided.

Cuticle Remover

Formula No. 1

Tri Sodium Phosphate	7–10 oz.
Glycerin	10–30 oz.
Perfume	to suit
Water	to suit

No. 2

U. S. Patent 2,041,158

Formamide	40–60 oz.
Water	60–40 oz.

Honey Odor, Concentrate

Methyl Phenyl Acetate	500 g.
Ethyl Phenyl Acetate	250 g.
Ethyl Cinnamate	175 g.
Guaiac Wood Oil, Concrete	100 g.
Phenyl Acetaldehyde (100%), Freshly Distilled	50 g.
Phenyl Acetic Acid (Chemically Pure)	50 g.
Coumarin	50 g.
Anisaldehyde ex Anethol (Aubépine)	25 g.
Para-Cresyl Acetate	40 g.
Bromelia	75 g.
Benzyl Isobutyrate	30 g.
Geranyl Acetate	30 g.
Laurinaldehyde (10% Solution)	10 g.
Cognac Oil (Genuine, Green)	5 g.
Vanillin	25 g.
Benzaldehyde	30 g.
Heliotrope, Concrete	90 g.
Cetyl Acetate	50 g.
Para-Cresyl Phenyl Acetate	25 g.

Soap Perfumes

Formula No. 1

Diphenyl Oxide	50 g.
Cedarwood Oil	20 g.
Benzyl Acetate	15 g.
Geraniol Terpenes	15 g.

No. 2

Diphenyl Oxide	40 g.
Geraniol Terpenes	10 g.
Cedarwood Oil	20 g.
Methyl Anthranilate	5 g.
Petitgrain Oil	10 g.
Lemongrass Oil	5 g.

No. 3

Amyl Salicylate	40 g.
Aubepine	10 g.
Benzyl Acetate	10 g.
Terpineol	20 g.
Cedarwood Oil	20 g.

No. 4

Amyl Salicylate	10 g.
p-Cresyl Acetate	5 g.
Phenyl Ethyl Acetate	5 g.
Benzyl Acetate	20 g.
Terpineol	20 g.
Cedarwood Oil	20 g.
Citronella Oil	20 g.

No. 5

Methyl Acetophenone	10 g.
Cedarleaf Oil	15 g.
Geraniol Terpenes	20 g.
Benzyl Acetate	20 g.
Cedarwood Oil	30 g.
Phellandrene	5 g.

No. 6

Nutmeg Oil	2 g.
Methyl Benzoate	2 g.
Birch Tar (Rectified)	3 g.
Cedarwood Oil	50 g.
Terpineol	43 g.

No. 7

Spike Lavender Oil	40 g.
Terpinyl Acetate	10 g.
Linalyl Acetate Fractions (or Shui Oil)	20 g.
Benzylidene Acetone	5 g.
Terpineol	10 g.
Peppermint Oil	3 g.
White Thyme Oil	5 g.
Phenyl Acetic Acid	3 g.
Styrax	4 g.

No. 8

Benzyl Acetate	60 g.
Amyl Cinnamic Aldehyde	3 g.
p-Methyl Quinoline	1 g.
Geraniol Terpenes	20 g.
Cedarwood Oil	16 g.

No. 9

Phellandrene	20 g.
Pine Oil	20 g.
Juniper Berry Oil	20 g.
Cedarwood Oil	30 g.
Naphthalene	5 g.
Camphor	5 g.

No. 10

Eucalyptus Oil	60 g.
Cassia Oil	10 g.
Spike Lavender Oil	10 g.
Cedarwood Oil	20 g.

No. 11

Geraniol Terpenes	50 g.
Phenyl Ethyl Alcohol	19 g.
Benzyl Acetate	10 g.
Terpineol	10 g.
Cedarwood Oil	10 g.
Phenylacetaldehyde	1 g.

No. 12

Nutmeg Oil	10 g.
Methyl Salicylate	8 g.
Methyl Benzoate	5 g.

Geraniol Terpenes	32 g.
Cedarwood Oil	20 g.
Terpineol	25 g.

Solid Perfumes

Formula No. 1

Paraffin Wax	500 g.

Melt on water-bath and add

Perfume Oil	50 g.
Menthol	½ g.

Mix well and pour into containers at 160° F.

No. 2

Stearic Acid	5 g.

Melt and mix vigorously with

Sodium Carbonate	½ g.
Rosin Soap (Best)	1½ g.
Toilet Water (75% Alcohol)	93 g.

Heat in an autoclave for ½ hour and pour into molds.

No. 3

Potassium Diacetone Fructose Sulphate	2 g.

Add with vigorous mixing to following until a gel is formed.

Perfume Oil	10 g.
Alcohol	80 g.

Pack cold.

No. 4

Stearic Acid	9 g.
Alcohol	50 g.

Warm together until dissolved.

To above add:

Caustic Potash	1 g.
Water	40 g.

Heat and mix on a water-bath until clear. Cool to 50° C. and stir in perfume. Pour into molds.

Solid Eau de Cologne

Formula No. 1

This is generally considered as a more or less transparent alcohol soap. One method is to dissolve 8.5 g. of stearic acid in 50 g. of 90 per cent alcohol. To this 1.3 g. of sodium hydrate dissolved in 40 g. of water are added. The mixture is warmed until it becomes clear. Now add essence of eau de Cologne carefully to avoid loss by evaporation and any congealing action. Pour into molds and allow to set.

No. 2

Another formula is: Mix 150 g. white gelatin (*i.e.*, gelatin containing zinc oxide or titanium oxide) with 750 g. hot water and let stand for 24 hours. Then add 50 g. 28° Bé. glycerin in which about 1.5 to 2.5 per cent essence of eau de Cologne and about 0.5 to 1 per cent recrystallized menthol have been dissolved. A preservative will be required for this.

No. 3

Dissolve 20 to 25 g. essence of eau de Cologne and 0.5 g. of menthol in 1,000 g. of best-grade paraffin wax melted on a water-bath. Stir well and cast in molds. Sometimes almond oil is used with the eau de Cologne.

A satisfactory base can be prepared by dissolving about 10 per cent of good soap chips in alcohol.

No. 4

Sodium Stearate, Colloidal	325 g.
Aluminum Hydroxide, Colloidal	20 g.
Glycerin	600 g.
Cologne Water Oil	50 g.
Menthol	5 g.

Cedar Odor for Soap and Polish

Cedar Oil	300 cc.
Clove Oil	120 cc.
Cassia Oil	80 cc.
Bergamot Oil	400 cc.
Benzaldehyde	30 cc.
Phenyl Ethyl Alcohol	50 cc.
Musk Xylene	20 g.

The popularity of cedar oil, which is said to be the seventh odor in order of preference, is attested by the fact that it is used to mask the odors of chlorine disinfectants, furniture polish, insecticides, and naphthalene and paradichlorobenzene blocks and cakes. It is also used considerably in compounding perfumes for deodorizing theaters.

Ambergris—Function and Application of, in Perfumes

Black ambergris has the most pronounced indole odor, the infusion is dark in color with a coarse but strong smell. Some varieties of ambergris which are light in color have little odor, and the resulting tinctures are of little value, being weak. Qualities should be selected in which the indole odor is not excessively strong and the sea-smell present, but not pronounced. Ambergris is tested by taking small quantities from different pieces, reducing to a fine state of division and making a tincture of 1 gram in 40 cc. of 96% alcohol. After two or three days a test slip is immersed in the tincture, allowed to dry—the odor should not be fœcal; after 12 hours the odor should be fully developed and should subsist for several days. The strength of tincture is 25 g. of ambergris to 1 l. of alcohol; 1,000 g. of powdered ambergris are placed in a wide-mouthed vessel of 10–12 l. capacity and 8 l. of 96% alcohol are added, allowed to digest for eight days, with occasional stirring.

The supernatant liquid is decanted and reserved, and replaced by 8 l. of fresh alcohol, which is decanted after 8 days. In all five such extractions are made, and the combined 40 l. of alcoholic extract are filtered and placed in a warm spot to mature for six months. The marc is covered with 10 l. of alcohol and allowed to stand until it is necessary to extract a further quantity of ambergris, when this alcohol is used for the first extraction. The exhausted residue is placed to dry in the air, ground and preserved in metal containers for use in sachet powders and musk powders. For good results in perfumes it is necessary to use 30 to 80 cc. of this tincture to 1 l. of perfume.

Compact Powders
Formula No. 1

Talcum	42.64 kg.
Zinc Oxide	14.96 kg.
Magnesium Carbonate	2.94 kg.
Starch	26.46 kg.
*Stearin-Starch	13.00 kg.

* Stearin-Starch (Binder)

a. Stearic Acid	100 g.
Mineral Oil	20 g.
b. Ammonia (0.97)	50 g.
c. Corn Starch	250 g.

Melt *a*, add *b* with good agitation, and to this emulsion add *c*. Stir till cold. Strain. Grind when hardened.

No. 2

Talcum	30.58 kg.
Zinc Oxide	21.12 kg.
Magnesium Carbonate	3.43 kg.
Starch	30.87 kg.
*Stearin-Starch	14.00 kg.

* "Stearin-Starch" Binder for Compact Powders

a. Stearic Acid	25 g.
Cetyl Alcohol	5 g.
Mineral Oil	5 g.
b. Corn Starch	50 g.
Calcium Carbonate	15 g.

Dissolve *a* in ligroin (or solvent naphtha) and mix with *b* to a heavy mass. Dry, grind, sift.

10–12% of this is added to the other powder bodies to bind them in the compact powder block.

No. 3

Talcum, Finest	40 kg.
Colloidal Clay	25 kg.
Corn Starch	30 kg.
Zinc Oxide	5 kg.

No. 4

Talcum	35 kg.
Colloidal Clay	25 kg.
Barium Sulphate	10 kg.
Starch	25 kg.
Zinc Oxide	5 kg.

The powders are pressed to blocks by a correct pressure, which is essential for the success.

No. 5

Talcum, Finest	333 g.
Colloidal Clay	333 g.
Zinc Oxide	167 g.
Magnesium Carbonate	167 g.
*Binder	80 g.

* Consisting of:

Tragacanth	80 g.
Alcohol	100 g.
Water, Distilled	900 g.

Adhesive for Compact Powders

Dextrin	15 g.
Gum Arabic	10 g.
Water	75 g.
Aquaresin	10 g.

Liquid Face Powders
Formula No. 1

Zinc Oxide	200 g.
Titanium Dioxide	50 g.
Talcum	50 g.
Eau de Cologne	100 g.
Rose Water	580 g.
Glycerin	20 g.

No. 2

Bismuth Subnitrate	20 g.
Calcium Carbonate, Precipitated	75 g.
Zinc Oxide	55 g.
Talcum	150 g.
Orange Flower Water	670 g.
Eau de Cologne Oil	10 g.
Glycerin (28° Bé.)	20 g.

No. 3

Zinc Oxide	20 g.
Calcium Carbonate, Precipitated	150 g.
Talcum	30 g.
Glycerin (28° Bé.)	10 g.
Perfume	10 g.
Rose Water	180 g.
Water, Distilled	600 g.

No. 4

Titanium Dioxide	120 g.
Tincture Benzoin, Siam (1:5)	50 g.
Glycerin	60 g.
Glycopon S or Alcohol	70 g.
Perfume	3 g.
Gelatin	2 g.
Water, Distilled	695 g.

These powders may contain pigments or dyes to give the desired shades.

No. 5
(Flesh Color)

Magnesium Carbonate, Light	15 g.
Zinc Oxide, Light	1.5 g.
Salicylic Acid	0.1 g.
Alcohol (90%)	7 g.
Ponceau 4R (1:100 Solution)	0.1 g.
Eosin, Yellowish (1:100 Solution)	0.03 g.

Rose Water	about 86.3 g.
Special Perfume	about 1 g.

No. 6

German Patent 633,661

Zinc Stearate	3.8 g.
Undecylic Acid	0.2 g.
Titanium Dioxide	8 g.
Talc	10.5 g.
Glycerin	6 g.
Water, Distilled	80 g.

Mix thoroughly.

Shake before use.

	Formula No. 7 Standard Type	No. 8 With Chalk	No. 9 Quick Drying	No. 10 Extra Smooth
Starch, Rice or Corn	—	—	5 oz.	5 oz.
Colloidal Kaolin	10 oz.	10 oz.	10 oz.	15 oz.
Precipitated Chalk	—	5 oz.	5 oz.	—
Zinc Oxide	16 oz.	10 oz.	—	—
Titanium Dioxide	—	—	5 oz.	5 oz.
Glycerin	8 oz.	5 oz.	10 oz.	7 oz.
Alcohol	10 oz.	7 oz.	9 oz.	10 oz.
Perfume Compound	1 oz.	1 oz.	1 oz.	1 oz.
Tincture Benzoin	—	—	5 oz.	—
Quince Seed Mucilage	—	—	—	3 oz.
Distilled Water	105 oz.	112 oz.	100 oz.	104 oz.

Powder Creams

Formula No. 1

Zinc Oxide	3 kg.
Titanium Dioxide	3 kg.
Parachol (Oxycholesterol-Absorption Base)	10 kg.
Stearic Acid	3 kg.
Potassium Hydroxide	0.1 kg.
Glycerin	4 kg.
Spermaceti	5 kg.
Water	71.9 kg.
Perfume Color	to suit

No. 2

Zinc Oxide	5 kg.
Stearic Acid	22.8 kg.
Potassium Hydroxide	0.8 kg.
Glycerin	10 kg.
Water	61.3 kg.
Perfume Color	to suit

No. 3

Zinc Oxide	3 kg.
Absorption Base	6 kg.
Stearic Acid	2 kg.
Potassium Hydroxide	0.2 kg.
Glycerin	3 kg.
Spermaceti	3 kg.
Water	82.2 kg.
Perfume Color	to suit

No. 4

a. Zinc Stearate	7.6 g.
Undecylic Acid	0.4 g.
Glycerin	15 g.
b. Water, Distilled	10 g.

Mix *a* well, and add *b* slowly, mixing thoroughly.

No. 5

"Velouty de Dixor" Type

Starch	20 g.
Glycerin	40 g.
Stearic Acid	7 g.
Caustic Potash	1 g.
Zinc Oxide	6 g.
Water	26 g.

Astringent Powders

Formula No. 1

Aluminum Cetyl Acetate	0.5 lb.
Zinc Stearate	5 lb.
Zinc Oxide	10 lb.
Titanium Dioxide	5 lb.
Magnesium Carbonate	10 lb.
Talc	50 lb.
Colloidal Kaolin	19.5 lb.

No. 2

Talc	40 lb.
Colloidal Kaolin	25 lb.
Zinc Oxide	20 lb.
Magnesium Carbonate	5 lb.
Zinc Undecanate	5 lb.
Tannic Acid, Purest	5 lb.

No. 3

Talc	20 lb.
Colloidal Kaolin	25 lb.
Titanium Dioxide	5 lb.
Zinc Oxide	20 lb.
Magnesium Carbonate	10 lb.
Zinc Undecanate	10 lb.
Aluminum Stearate	5 lb.

No. 4

Alum, Powdered	0.5 lb.
Aluminum Stearate	4 lb.
Zinc Stearate	10 lb.
Magnesium Carbonate	10 lb.
Zinc Oxide, Purest	25 lb.
Titanium Dioxide or Borate	4.5 lb.
Colloidal Kaolin	20 lb.
Talc	21 lb.

Witch Hazel Powder

a. Talc	30 lb.
Colloidal Kaolin	35 lb.
Magnesium Carbonate	5 lb.

Witch Hazel Water, 1:1, or Extract	10 lb.
b. Zinc Stearate	5 lb.
Titanium Dioxide	5 lb.
Rice Starch	10 lb.
Lavender Perfume	as desired

Mix *a* thoroughly and dry cautiously in vacuo. Mix with *b*.

Military Foot Powder

Trioxymethylene	10 g.
Boric Acid, Powdered	10 g.
Talc	72.5 g.
*Fat Composition	7.5 g.

* Consists of:

Yellow Vaseline	50 g.
Lanolin, Anhydrous	20 g.
Beeswax, White	5 g.
Water, Distilled	25 g.

Body Powder for Children

Formula No. 1

Talc	70 kg.
Colloidal Kaolin	25 kg.
Lycopodium	3 kg.
Magnesium Carbonate	2 kg.

No. 2

Talc	80 kg.
Colloidal Kaolin	15 kg.
Zinc Stearate	5 kg.

No. 3

Bentonite, Sterilized	10 kg.
Boric Acid, Powdered	5 kg.
Rice Starch	10 kg.
Lycopodium	15 kg.
Magnesium Carbonate	5 kg.
Titanium Dioxide	5 kg.
Zinc Oxide	5 kg.
Talc	45 kg.

No. 4

Talc	50 kg.
Rice Starch	15 kg.
Magnesium Carbonate	15 kg.
Lycopodium	5 kg.
Titanium Dioxide	1 kg.
Zinc Oxide	4 kg.
Magnesium Stearate	5 kg.
Boric Acid	2 kg.

Superfatted Baby Powders

Formula No. 1

Talc	74 kg.
Colloidal Kaolin	20 kg.
Magnesium Stearate	5 kg.
Glyceryl Monostearate	1 kg.

No. 2

Titanium Dioxide, Purest	5 kg.
Magnesium Stearate	5 kg.
Colloidal Kaolin	15 kg.
Talc	72 kg.
Glyceryl Monostearate	3 kg.

Starch Powders

Formula No. 1

Rice Starch	60 g.
Corn Starch	20 g.
Talc	10 g.
Zinc Oxide	5 g.
Magnesium Stearate	5 g.

No. 2

Rice Starch	55 g.
Magnesium Carbonate	20 g.
Colloidal Kaolin	10 g.
Talc	10 g.
Zinc Stearate	5 g.

No. 3

(Very Dry, French Style)

Rice Starch	52 g.
Corn Starch	24 g.
Magnesium Carbonate	24 g.

Toilet Powder

French Patent 803,330

Talc	83.3 g.
Zinc Stearate	9.6 g.
Boric Acid	5.6 g.
Zinc Oxide	1.5 g.

Talcum Powders

Formula No. 1

Talc	80 g.
Boric Acid, Powdered	10 g.
Magnesium Carbonate	7 g.
Zinc Undecanate	3 g.

No. 2

Talc	85 g.
Rice Starch	8 g.
Boric Acid, Powdered	5 g.
Titanium Dioxide	1 g.
Magnesium Carbonate	1 g.

No. 3

Talc, Finest	90 g.
Magnesium Carbonate	5 g.
Zinc Stearate	5 g.

No. 4

Talc	95 g.
Magnesium Stearate	2.5 g.
Magnesium Carbonate	2.5 g.

No. 5

Talc, Venetian	80 g.
Zinc Oxide	1 g.
Boric Acid, Powdered	4 g.
Magnesium Carbonate	5 g.
Colloidal Clay	10 g.

Electric Razor Pre-Shaving Lotion

(Sets up hair prior to shaving)

Alcohol	50 g.
Water	50 g.
Aluminum Chloride	½ g.
Color Yellow Perfume	to suit

Apply to face and allow to dry before shaving.

Shaving Cream

Formula No. 1

Stearic Acid	80 g.
Tallow, Edible	18 g.
Coconut Oil Cochin	20 g.

Caustic Potash (36° Bé.)	70 g.
Water	100 g.
Triethanolamine Oleate	3 g.

Let stand in earthenware jars for 2 weeks, mixing from time to time.

No. 2

a. Diglycol Stearate	14 lb.
Stearic Acid	6 lb.
Mineral Oil	1 lb.
b. Diethylene Glycol	5 lb.
Water	74 lb.

Melt *a* to 70° C., and heat *b* to 75° C. separately. Add *b* to *a* slowly with good agitation. Stir until the cream sets.

This gives an excellent product, highly thought of on the Continent.

No. 3

Stearic Acid	6 lb.
Glyceryl Monostearate	6 lb.
Sulphonated Olive Oil	4 lb.
Diglycol Laurate	2 lb.
Glycerol	2 lb.
Potassium Hydroxide	0.3 lb.
Borax	0.5 lb.
Water	79.2 lb.

Greasy Shaving Cream

Stearic Acid, Triple Pressed	75 lb.
Sesame Oil, Preserved	70 lb.
Spermaceti	10 lb.
Ammonia (0.880)	10 lb.
Glycerin	30 lb.
Water, Distilled	315 lb.

Shaving Cream, Transparent

Gelatin	2 g.
Wheat Starch	1 g.
Glycerin	20 g.
Triethanolamine Oleate, Light	8 g.
Distilled Water	69 g.

Brushless Shaving Cream

Stearic Acid	16.5 g.
Lanolin	1.0 g.
Raisin Seed Oil	8.5 g.
Triethanolamine	1.0 g.
Water	72.5 cc.
Perfume	0.5 g.

Non-Foaming Pearly Shaving Cream

a. Coconut Oil	20 kg.
Hog Fat	15 kg.
b. Potassium Hydroxide (about 90%)	37 kg.
Borax	2.5 kg.
Water, Distilled	145 kg.
c. Glycerin	100 kg.
Water, Distilled	45 kg.
d. Stearic Acid	146 kg.
e. Diglycol Stearate	40 kg.
Stearic Acid	80 kg.
Water, Distilled	400–500 kg.

Saponify *a* with *b*. When finished, add *c*, and after 1 hour on the waterbath add *d*, keeping the mixture free from lumps and air bubbles. Let cool without stirring, and allow to stand for 3 days, when pearl formation should have occurred. To this, the emulsion *e*, prepared at 70–80° C., is added, and the whole is homogenized in a roller mill.

Non-Gummy Shaving Cream

U. S. Patent 2,047,320

Hydrogenated Cotton Seed Oil Fatty Acids	32.5 oz.
Coconut Oil	4.8 oz.
Caustic Potash (42.2° Bé.)	17.6 oz.
Caustic Soda (42.2° Bé.)	2.9 oz.
Water	39.5 oz.

Shaving Cream That Will Prevent Razor Blades From Rusting

British Patent 450,221

The addition of 1 g. per lb. of chromium hydroxide or sodium dichromate to a shaving cream will passivate the razor blade used in shaving.

Solid Shaving Preparation

German Patent 636,097

Formula No. 1

Magnesium Peroxide	1,000 g.
Lactose	200 g.
Gum Arabic	50 g.
Hydrogen Peroxide-Carbamide	5 g.
Water	to correct consistency

No. 2

Magnesium Peroxide	1,500 g.
Hydrogen Peroxide-Carbamide	60 g.
Gum Arabic	300 g.
Magnesium Carbonate	3,500 g.
Lactose	200 g.
Talc	200 g.
Water	to suit

Mix all together thoroughly, wet with water, and press into forms (sticks).

Apply the stick, leading it over the skin. After ½ a minute, shaving can start.

Casein Paste to Enhance the Molding Properties of Shaving Soap

Casein	10 kg.
Water, Cold	27.4 kg.
Water, Hot	10 kg.
Borax	1.35 kg.
Boric Acid	1.25 kg.
Stearic Acid	15 kg.
Lanolin	15 kg.

2–4% of this paste should be added to the soap before pressing.

Shaving Soap

Formula No. 1

a. Stearic Acid, Triple Pressed	80 kg.
Coconut Oil, Cochin	20 kg.
b. Potash Hydroxide (38° Bé.)	36 kg.
Sodium Hydroxide (38° Bé.)	19 kg.
Water, Distilled	2 kg.
Glycerin (28° Bé.)	6– 8 kg.

Melt *a* to 75° C. in steam-jacketed kettle with stirring. Mix the lyes with glycerin and water, *b*, and add this slowly to the kettle, causing a strong development of heat. When the soap rises too much, cool by spraying with cold water. When all *b* has been added, start heating again, and keep stirring for some time. Stop both for one hour, let stand covered. Keep at about 80° C.

Stir up again, let stand for another hour. Test for correct neutrality * and absence of unsaponified fat, and adjust, if necessary, with some stearic acid.

Pour into forms, cut, etc.

* Not more than 0.03% as KOH.
Not more than 0.5–1% free stearic acid.

No. 2

Stearic Acid	40 kg.
Coconut Oil, Cochin	10 kg.
Potassium Hydroxide (38° Bé.)	23 kg.
Sodium Hydroxide (38° Bé.)	6 kg.
Diglycol Stearate	4 kg.
Glycerin	1 kg.

Saponify in the regular fashion at 70-80° C., and add the diglycol stearate to the finished soap.

This product is highly favored on the Continent.

Transparent Shaving Soap

Only the highest grade of materials is suitable for use in transparent shaving soap. This applies equally to the fats and lye, as well as to glycerin and other incidental ingredients.

	Formula No. 1	No. 2	No. 3
Beef Tallow	—	20 oz.	40 oz.
Cochin Coconut Oil	30 oz.	20 oz.	30 oz.
Triple Pressed Stearic Acid	60 oz.	50 oz.	20 oz.
Castor Oil	10 oz.	10 oz.	10 oz.
Caustic Potash (40° Bé.)	35 oz.	30 oz.	20 oz.
Caustic Soda (36° Bé.)	15 oz.	20 oz.	30 oz.
Denatured Alcohol	40 oz.	50 oz.	60 oz.
Glycerin	20 oz.	15 oz.	10 oz.
Sugar	15 oz	20 oz.	20 oz.
Water	20 oz.	20 oz.	20 oz.
Perfume	1.5 oz.	1.5 oz.	1.5 oz.
Color to suit			

The oils and fats, except for a portion of the castor oil, are put into a covered kettle and warmed to about 60° C. (140° F.) on a water bath. The alkali is heated to the same temperature and then added slowly with constant stirring to the fat charge. A little alcohol is added to accelerate saponification. The kettle is kept covered for half an hour when the batch is tested to determine whether saponification is complete. If it is, the remainder of the castor oil is run in. It is covered again and kept on the water bath. After an hour tests are again made for completeness of saponification. If too much alkali is found present it must be taken up by the addition of more oil.

The soap is next removed from the water bath and a clear, filtered solution of sugar warmed to about 70° C. (158° F.) is added with thorough mixing. Alcohol and glycerin are also stirred into the soap until the soap has gone into solution. Filtered dye material and perfume are added. The soap solution is filtered if possible and put into tin barrels. On the second day the soap bars are taken out by warming the barrels. The bars are cut to the required size and kept for two weeks to dry. They are then stamped and packed.

Care must be taken in the selection of color and perfume in order to keep the soap transparent. Water-soluble colors are preferable.

Shaving Soap Bases

Formula No. 1

Palm Oil (or Fatty Acid)	20 kg
Coconut Oil	15 kg.
Olive Oil (or Sulphur Olive Oil)	15 kg.
Stearic Acid	50 kg.

No. 2

Palm Oil Stearin	75 kg.
Coconut Oil	15 kg.
Olive Oil	10 kg.

For the saponification use a 2:1 or a 3:1 mixture of potassium and sodium hydroxide. Slight addition of glycerin is possible, but not necessary.

Transparent Liquid Shaving Soap

Oleic Acid		13.50 kg.
Coconut Oil		15.75 kg.
Caustic Potash (50%)	about	6.33 kg.
Water, Distilled		79.00 kg

Liquid Clear Shaving Soap

Olive or Apricot Kernel Oil		350 g.
Coconut Oil Fatty Acid		50 g.
Alcohol		90 g.
Glycerin		60 g.
Caustic Potash (48° Bé.)	about	190 g.
Water, Distilled		210 g.

Saponify in the regular manner, and neutralize with a good 100% Turkey Red Oil (72–74% fat content). Store cold and filter after a few weeks. When using olive oil, use a zerolized oil (liquid fraction pressed out at 0° C.), which will not deposit any stearin on cooling.

Cooling After-Shaving Lotions
Formula No. 1

Menthol	2 g.
Glycerin	100 g.
Alcohol	500 g.
Water	400 cc.

No. 2

Boric Acid	4 g.
Menthol	1 g
Glycerin	30 g.
Alcohol	125 g.
Water or Witch Hazel, to make	1,000 cc.

No. 3

Menthol	½ g.
Alcohol	15 g.
Glycerin	25 g.
Mucilage of Irish Moss	12 g.
Boric Acid	5 g.
Perfume and Color, as desired	
Camphor Water, to make	100 cc.

No. 4

Glyceryl Monostearate	18.0 g.
Peanut Oil	4.2 g.
Lanolin	2.5 g.
Diethylene Glycol	5.0 g.
Menthol	0.1 g.
Alcohol	5.0 cc.
Water	65.0 cc.

No. 5
Astringent

Boric Acid	5 oz.
Menthol	2 dr.
Glycerin	10 oz.
Alcohol	10 qt.
Water, to make	10 gal.
Perfume and Color, as desired.	

No. 5

Sage Tincture	5
Witch Hazel Extract	75
Borax	5
Glycerin	80
Alcohol	345
Eau de Cologne Essence	5
Distilled Water	485

All parts by weight.

After-Shaving Powder

Talcum, Finest	50 g.
Zinc Oxide	25 g.
Colloidal Kaolin	20 g.
Boric Acid	5 g.

Embalming Fluids
Formula No. 1

Borax	4 oz.
Phenol	5 oz.
Salicylic Acid	5 oz.
Formalin (40%)	71 oz.
Glycerin	31 oz.
Water to make	1 gal.

No. 2
Special Jaundice Fluid

Same fluid as above, except omit the formalin and add 10 oz. more of phenol.

No. 3
French "Oil Embalming Fluid"

a.	Borax	3 oz.
	Sodium Salicylate	1 oz.
	Sodium Chloride	1 oz.
	Glycerin	5 oz.
	Water	6 oz.
b.	Sodium Nitrate	1½ oz.
	Sodium Citrate	1 oz.
	Sodium Chlorate	½ oz.
	Sodium Chloride	1 oz.
	Water	6 oz.
c.	Menthol	7 oz.
	Thymol	11 oz.
	Clove Oil	2 oz.
	Peppermint Oil	2 oz.
	Nutmeg Oil	2 oz.
	Eucalyptus Oil	3 oz.
	Methanol	22 pt.
	Formalin	6 pt.

Dissolve the oils in 7 pints methanol (except the clove and eucalyptus). These are dissolved in the balance of the methanol. The formalin is added to this. When *a* and *b* are both dissolved, mix together and add the methanol solution of menthol and eucalyptus. Let stand 6 hours, filter and bottle.

No. 4
Alkaline Embalming Fluid

10% Sodium Carbonate Solution	1 pt.
20% Sodium Nitrate Solution	1 pt.
20% Sodium Citrate Solution	1 pt.
17% Sodium Chloride Solution	1 pt.

25% Granulated Sugar Solution	1 pt.
25% Parachlormetacresol Solution in Methanol	1 pt.
Formalin (40%)	3 pt.
Glycerin	1 pt.

Make solutions separately, then add and mix.

Embalmers' Cavity Fluid

Formula No. 1

Formaldehyde	58 lb.
Methanol, Anhydrous	20 lb.
Ethyl Ether	12.5 lb.
Phenol	9 lb.
Red Dye, Alcohol Soluble	to color
Wintergreen Oil	0.5 lb.

The phenol is added to the mixture of ether and methanol. This solution is then poured into the formaldehyde. A small amount of the red dye is dissolved in some of the methanol, which solution is added to the above mixture to color it a bright cherry.

No. 2

Methanol	50 oz.
Formalin (40%)	50 oz.

Embalming (Arterial) Fluids

Formula No. 1

Formalin	220 oz.
Glycerin	100 oz.
Borax	90 oz.
Sodium Chloride	10 oz.
Sodium Nitrate	10 oz.
Sodium Citrate	50 oz.
Methanol	40 oz.
Benzaldehyde	6 oz.
Water	75 oz.
Erythrosine (Dye)	to suit

No. 2

Water	10 oz.
Phenol (U.S.P.)	5 oz.
Borax	4 oz.
Sodium Salicylate	6 oz.
Glycerin	31 oz.
Formalin	71 oz.
Water to make	128 oz.

No. 3

Formalin	42.60 oz.
Methanol	14.00 oz.
Glycerin	5.80 oz.
Borax	2.25 oz.
Sodium Nitrate	5.00 oz.

No. 4

Formalin	61.70 oz.
Methanol	13.00 oz.
Glycerin	13.00 oz.
Borax	1.75 oz.
Sodium Nitrate	3.00 oz.
Phenol	5.00 oz.
Parachlormetacresol	3.00 oz.

No. 5

Formaldehyde	52 lb.
Methanol	15 lb.
Glycerol	12 lb.
Potassium Nitrate	3 lb.
Boric Acid	1.5 lb.
Sodium Citrate	1 lb.
Clove Oil	0.5 lb.
Red Dye	sufficient to color
Water	15 lb.

The boric acid is dissolved in the methanol, and the glycerol then added. The oil of cloves is then added to this mixture.

The potassium nitrate and sodium citrate are dissolved in the water. The solutions are then mixed with the formaldehyde and tinted to a cherry color.

Tissue Filler

(For dead human bodies)

A saturated solution of "soluble cotton" (nitro-cellulose) in methanol.

Inject with a hypodermic needle.

Embalmers' Covering Creams

Flesh:

White Petrolatum	100 g.
Titanium Dioxide	30 g.
Cosmetic Pink Ochre	1 g.
Cosmetic Yellow Ochre	8 g.
Lead Chromate	0.5 g.

Ivory:

White Petrolatum	2,000 g.
Titanium Dioxide	400 g.
Cosmetic Ochre	20 g.

Embalmers' Liquefying Cream

White Petrolatum	13 g.
Mineral Oil, White	100 g.
Selexene	50 g.
Lilac Perfume Oil	1 g.
Brilliant Scarlet	to suit

Embalmers' Vanishing Cream

Stearic Acid	20 g.
Diglycol Stearate	11 g.
Water	50 g.
Diphenyl Oxide	to suit

Embalmers' Cosmetic Sprays

Basic Solution

Methanol	3,600 cc.
Glycerin	400 cc.

1. "Rosytint"

To basic solution above add:

Croceine Scarlet	1.6 g.
Eosin	0.4 g.
Lilac Perfume	to suit

2. "Vivatone"

To basic solution above add:

Erythrosine	0.8 g.
Eosin	0.2 g.
Violet Perfume	to suit

3. "Brunette"

To basic solution above add:

Oil Red Dye	1.6 g.
Benzaldehyde	to suit

4. "Sun-tan"

To basic solution above add:

Erie Catechu	6.4 g.
Oil Red Dye	1.6 g.
Perfume	to suit

Deodorant Spray (For Embalmers)

Boric Acid	12 oz.
Sodium Nitrate	12 oz.
Potassium Chlorate	12 oz.
Chloral Hydrate	8 oz.
Alcohol	1 pt.
Water to make	5 gal.

Corpse Drying and Disinfecting Powder

U. S. Patent 2,047,323

Paraformaldehyde	7.6 oz.
Ammonia Alum	3.4 oz.
Magnesium Sulphate	4.2 oz.
Calcined Gypsum	22.0 oz.
Pumice, Powdered	31.4 oz.
Slaked Lime	3.4 oz.
Marble Dust	27.5 oz.
Soap Bark, Powdered	0.42 oz.
Calcium Stearate	0.08 oz.

Insect Bite Anodyne

Menthol	8 gr.
Alcohol	6 dr.
Ammonia	2 dr.

Tropical Mosquito Salve

Quinine Dihydrochloride	5 g.
Lanolin	70 g.
Cod Liver Oil	25 g.
Lavender Oil	to perfume

Midge Bite Preventive

Glycerin	1 dr.
Tincture of Wormwood	3 dr.
Eau de Cologne to make	2 oz.

Bee and Wasp Sting Treatment

The sting must be removed, *not* by pulling it with tweezers or fingers, which will cause additional poison to be ejected into the wound, but by "lifting" it with a scraping upward movement of a knife blade. It may then be dabbed with dilute ammonia or with one of the following:

Sting Lotion

Formula No. 1

Sodium Bicarbonate	9–10 g.
Water	90 g.
Perfume	to suit

No. 2

Thymol	20 g.
Camphor, Spirits of	800 g.
Ammonia (10%)	200 cc.

Mosquito Bite Ointment

Boric Acid Ointment (U.S.P.)	95 g.
Phenol	5 g.

Triturate the phenol into the ointment cold.

White Wash for Mosquito Bites

Zinc Oxide	2 lb.
Glycerin	24 oz.
Alcohol	16 oz.
Cresylic Acid	4 oz.
Lime Water	1 gal.

Mosquito Chaser

Eucalyptol	1½ oz.
Acetic Ether	6 dr.
Cologne Water	6 dr.
Tincture Pyrethrum	7½ oz.

Apply mixture to skin or spray about room.

White Bole Salve

White Bole	300 g.
Boric Acid, Powdered	2 g.
Salicylic Acid, Powdered	0.5 g.
Methyl Salicylate	5 g.
Peppermint Oil	1 g.
Glycerin (80%)	to make a paste

Metol Poisoning Salve

Formula No. 1

Ichthyol	1 dr.
Boric Acid	1 dr.
Zinc Oxide	½ dr.
Petrolatum	1 dr.

No. 2

Ichthyol	1 oz.
Resorcin	1 oz.
Zinc Oxide	½ oz.
White Paraffin Ointment	5 oz.

Apply after washing hands thoroughly. Use at night and protect with gloves or some other wrapping.

Skin Disinfection

Tincture of mercuric chloride possesses, in high degree, the properties of an ideal skin disinfectant. It is bactericidal, penetrating, removes fat, colors the skin and fades rapidly, causes little or no irritation, and its cost is low.

The formula is:

Mercuric Chloride	1.00 g.
Chrysoidin Y	2.00 g.
Hydrochloric Acid	7.50 g.
Acetone	100.00 cc.
Alcohol	525.00 cc.
Distilled Water, to make	1000.00 cc.

After clinical trial, surgeons report no infections after its use.

Sulphur Ointment

Highly active sulphur salves of value for skin eczemas, especially athlete's foot, may be made by mixing 150 oz. of precipitated sulphur, 50 oz. of paraffin oil, and 50 oz. of peanut oil. Then work in

20 oz. of white beeswax and 20 oz. of spermaceti, and finally 100 oz. of anhydrous lanolin and 100 oz. more of peanut oil. The mixture is then melted on a water bath and 60 oz. of water is added with agitation. Remove heat and continue agitation until cool.

Athlete's Foot Preparations

Formula No. 1

Salicylic Acid	8 g.
Ammoniated Mercury	4 g.
Bismuth Subnitrate	12 g.
Eucalyptus Oil	12 g.
Hydrous Wool Fat	64 g.

No. 2

Salicylic Acid	5 g.
Benzoic Acid	5 g.
Chlorthymol	2 g.
Propyl Para-amino Benzoate	5 g.
or	
Benzocaine	10 g.
Vanishing Cream Base,	a sufficient quantity.

No. 3

Powdered Sodium Thiosulphate	20 g.
Powdered Boric Acid	50 g.
Purified Talc (Sterilized)	30 g.

No. 4

For skin diseases caused by fungus, etc.

Sodium Thiosulphate, Finely Powdered	18 g.
Sodium Bicarbonate, Finely Powdered	1 g.
Paraffin Wax	11 g.
White Petrolatum	70 g.

Grind together in a mortar.

Zinc oxide may be incorporated into the ointment; if done, decrease amount of paraffin. The ointment may be perfumed. It must be kept slightly alkaline to preserve tne sodium thiosulphate.

Chiropodist's Paste

Gelatin	5 lb.
Zinc Oxide	5 lb.
Boric Acid	1 lb.
Glycerin	8 lb.
Water	6 lb.

Foot Powder

Salicylic acid (very finely powdered) one drachm, boric acid (finely powdered) one ounce, French chalk (carefully prepared) to make four ounces.

Foot Fungus Treatment

Copper Nitrate	2.6 g.
Benzoic Acid	6.0 g.
Acetone	45 cc.
Alcohol, Denatured	170 cc.
Water to make	250 cc.

Apply twice daily.

Foot Ease Lotion

Salicylic Acid	50 g.
Ethyl Alcohol	1,000 cc.
Ferric Chloride Solution, Dilute	1 drop
Methyl Salicylate	1 cc.

Using this solution, massage the feet thoroughly.

Foot Cream

Oleic Acid, White	250 g.
Mineral Oil	250 g.
Ammonia	25 g.
Salicylic Acid	120 g.
Alcohol	65 g.

Frost Foot Bath Powder

Alum	10 g.
Borax	14 g.
Tannic Acid	12 g.
Zinc Sulphate	20 g.
Starch	30 g.
Rosemary Oil	15 drops
Neroli Oil, Artificial	5 drops

Toe Nail Softener

Caustic Potash	2.5 g.
Glycerol	15 g.
Alcohol	15 g.
Water	67.5 g.

Chilblains Remedy

Formula No. 1

Chilblains are relieved by local application of oil of eucalyptus.

No. 2

Paint with a mixture of tincture of iodine one oz., flexible collodion three or four oz., once or twice a day.

Poison Gas Treatment
(Mustard Gas)

First Treatment

The first essential in treatment is the removal of clothing and the cleaning of the skin. Such cleaning should be directed towards removing all surface dirt and contamination as well as any possible mustard gas or mustard gas vapor dissolved in the patient's sweat. Hence the immediate use of a bath with a bland superfatted soap after exposure, has been possible is highly advisable. The skin should then be dusted with a bland dusting powder such as—

Boric Acid	1 oz.
French Chalk	2 oz.
Starch	3 oz.

Ointment Dressing

In the stage where the skin is reddened the patient may be too sore to get into a bath; indeed, he may be wounded or shocked or mutilated as well. The washing of the skin, perhaps under an anesthetic, can be carried out and then a red area may be well dressed with an ointment of the following composition:

Boric Acid (Powdered)	44 gr.
Eucalyptus Oil	15 min.
Soft Paraffin Wax	to 1 oz.

This should be spread on the smooth side of strips of white lint 10 in. by 4, stored folded down across the middle to keep the business side of the dressing clean. These are opened out and laid on the skin with a slight overlap and kept in position with the lightest bandaging, changed, if possible, night and morning.

Deep ulcers and septic complications will need fomentations with four thicknesses of white lint with a strip of oil silk and a wad of cotton wool to keep the heat in. These fomentations may be repeated three times a day and an ointment dressing applied in between the fomentations.

Irrigation of Wounds

Then large surface wounds will need irrigating with large quantities of warm normal saline solutions; some surgeons would use a weak solution of potassium permanganate.

In severe cases there will be shock, for which injections of morphia will be required and also hot water, adrenalin injections, hot coffee, and perhaps electrically heated blankets and beds that can be easily elevated at the foot.

Oxygen Provision

The provision of oxygen for inhalation by patients whose respiration habit is endangered or who may have their airway narrowed by some inhalation of the gas must not be forgotten.

There are refinements that one could consider. The bad cases could be nursed in a bath of warm running water kept at a fixed temperature by a thermo-electrically regulated device. Here and there blood transfusions may be called for in the case of a patient both wounded and shocked by gas burns.

Pneumonic complications may set in, too, and the good working of the kidneys may be endangered. For these special and rarer complications the resources of the ordinary chemist's shop are ample.

Eye Washes for War Gas Inflammation

Formula No. 1

For Bromocyanobenzene

Wash with warm soda or isotonic salt solution.

No. 2

For Yperite (Mustard Gas)

Wash with 5% dichloramine-T, 2¼% soda solution, a mixture of 6% cobalt hydroxide and 12½% sugar.

Eye Drops

Atropine Sulphate	0.08 g.
Boric Acid	0.16 g.
Distilled Water to make	8.00 cc.

Use: Instilled into each eye three times daily for three days preceding refraction.

Nose Drops

Salt	18 oz.
Water	98 oz.
Ephedrine Sulphate	1 oz.

Germicidal Nose Jelly

Mix 10 g. soluble starch with 20 cc. water. To this add slowly, under stirring, 70 cc. glycerin heated to about 140° C.

Keep the mixture at about 140° C. until translucent jelly is formed on cooling.

To the jelly add .25% lactic acid; mix well and cool to around 60° C. At this point add 5% cocoa butter oxyanhydride. Mix thoroughly, holding the temperature until a uniform product is obtained.

Flavor with eucalyptol, menthol, camphor, etc., according to flavor desired, and cool.

Gargle and Nasal Irrigant

Sodium Chloride	1 g.
Sodium Bicarbonate	1 g.
Distilled Water to make	100 cc.

Ear Irrigant

Boric Acid	2.400 g.
Mercuric Chloride	0.012 g.
Alcohol	40.000 cc.
Distilled Water to make	60.000 cc.

Dose: Instill four drops in external auditory ear twice daily (after irrigation).

Earache Remedy

Menthol twenty grains, camphor twenty grains, phenol fifteen grains, glycerin one ounce. Warm ten drops in a spoon and pour in ear.

Earache Oils

Formula No. 1

Chloroform	1 oz.
Turpentine Oil	1 oz.
Olive Oil	8 oz.

No. 2

Glycerin	1 oz.
Almond Oil	1 oz.

No. 3

Chloral Hydrate	2 oz.
Camphor	2 oz.
Phenol	1 oz.
Castor Oil	2 oz.

In preparing this last formula, rub the chloral hydrate, camphor and phenol in a mortar until liquefied, then add the oil. The preparations can be perfumed with any suitable oil.

Catarrh Inhalant

Pine Needle Oil	12.5 oz.
Tr. of Benzoin, to make	100.0 oz.

One teaspoonful of this mixture should be placed in an inhalor, or placed in a previously heated cup, scalding water poured over it, and the vapors inhaled through the mouth. In laryngitis this type of steamy inhalant is highly recommended, as well as in nasopharyngitis and bronchitis. Tincture of benzoin is much more pleasant than the compound tincture which contains aloe, storax and tolu.

Drunkenness Hiccough Remedy

Two drops of creosote made from beech tar given with a little water might be called a specific for this trouble.

Whooping Cough Remedies

Formula No. 1

Taken Through Mouth

Potassium Citrate	10 gr.
Tincture of Ipecac	5 min.
Spirits of Nitrous Ether	10 min.
Syrup of Tolu	15 min.
Anise Water to make	1 fl. dr.

No. 2

Chest Rub

Camphor	15 g.
Menthol	5 g.
Methyl Salicylate	5 g.
Eucalyptus Oil	5 g.
Lanolin, Anhydrous	20 g
Paraffin Wax, Soft	100 g.

Melt and stir until uniform; pour into jars or tins at lowest possible temperature.

No. 3

Vapor Inhalation Fluid

Pine Oil	10 cc.
Eucalyptol	5 cc.
Cresol to make	100 cc.

One part of above is mixed with two parts of water and heated. The resultant steam is inhaled.

No. 4

Final Stage Medicine

Benzyl Benzoate	5 min.
Cod Liver Oil	30 min.
Gum Acacia	12 gr.
Gum Tragacanth	8 gr.
Benzaldehyde	1/10 min.
Elixir of Saccharin	1/4 min.
Chloroform Water	1 fl. dr.
Cinnamon Water to make	2 fl. dr.

Dose, 1/2 to 2 drachms.

No. 5

Spasm Liquid

Tincture of Belladonna	5 min.
Syrup of Tolu	15 min.
Chloroform Water to make	1 fl. dr.

Cough Mixture

Sodium Citrate	5 oz.
Ammonium Chloride	5 oz.
Sugar Syrup	90 oz.
Licorice Extract, U.S.P.	6 oz.

Asthma Inhalant

Sodium Nitrate	25 g.
Powdered Anise	25 g.
Stramonium	50 g.

A teaspoonful of this mixture should be heated, and the volatile products inhaled. Cubeb is, at times, added to the mixture.

Cold Inhaling Liquid

Formula No. 1

Menthol	20 gr.
Eucalyptus Oil	50 gr.

No. 2

Eucalyptus Oil	50 gr.
Turpentine	20 gr.
Pinus Pumilionis, Oil	20 gr.
Menthol	10 gr.

Insomnia Cure

Bromine	0.1– 0.25 g.
Water	99.9–99.75 cc.

Take two tablespoonfuls daily.

Milk of Magnesia

Magnesium Oxide, U.S.P.	30 lb.
Water	60 gal.

To make milk by the oxide process calls for the use of a steam jacketed or coil heated tank with accessory fittings, a portable mixer, a homogenizer and a storage tank. Inasmuch as magnesium oxide changes to some extent into carbonate when exposed to air, it is the usual practice to make the batch according to the standard size of the container in which the oxide is shipped. Thus, if the oxide is shipped in 30 pound drums it is the usual practice to make the batch big enough to require an entire container. Hence, a thirty pound drum would take sixty gallons of water. If larger batches are wanted, they should be multiples of these amounts. The procedure is to put half the water, preferably distilled, into the mixing tank and heat it to a temperature ranging from 100–180° F. This depends upon the oxide, the better qualities require lower temperatures for hydration. When the water is up to temperature the agitator is started and the oxide added. Mix for about a half hour and allow the batch to stand overnight. The following morning add the remainder of the water with about five per cent of the total added to compensate for evaporation losses, and mix for about half an hour. Then run the batch through a homogenizer into the storage tank. A few additional comments are necessary. The portable mixer shaft should be fitted with a wide propeller blade, say 10 inches, and at its extreme end it should be fitted with a beater having an upward thrust to keep the powder from settling into the bottom of the tank before it is completely hydrated. The tanks should all be glass-lined or made of tested stainless steel as milk of magnesia is very corrosive. The equipment units can be arranged one above the other, if more than one floor is available, or on one floor if pumps are on hand. The first set-up is desirable because milk of magnesia, being highly abrasive, wears pumps out quickly unless they are specially constructed for it.

Laxative Jelly
U. S. Patent 2,072,589

A jelly-like laxative composition is produced by dissolving sugar 96 and corn syrup 16 in water 22, adding mineral oil 200 to the sugar solution while heating it to about 128° F., then, first with low-speed agitation and then with high-speed agitation, adding a suitable proportion of calomel and phenolphthalein together with glycerol 14, gelatin 5.5 and water 24, and continuing the heating and agitation until the last added materials are uniformly distributed, then allowing the mixture to cool and set.

Castor Oil Emulsion Laxative
U. S. Patent ———

The resulting preparation is said to make possible the elimination of added antiseptics in many cases, while it gives greater freedom from bacterial growth and eliminates the objectionable "soapy" flavor common to certain other commercial castor oil preparations.

The aluminum hydroxide gel to be used in this preparation is made as follows:

Sixteen pounds of granular aluminum chloride c.p. is dissolved in 30 gallons of distilled water and filtered clear into a vessel of approximately 100 gallons capacity. Thirty-two pounds of ammonia 16° (10 per cent) is diluted with 15 gallons of distilled water. With the solutions of aluminum chloride and ammonia at an approximate temperature of 35° C. the ammonia solution is poured into the aluminum chloride solution in a thin stream at a slow rate, constant stirring of the aluminum chloride being kept up during the pouring operation.

Aluminum hydroxide is thrown out as a gelatinous precipitate which breaks up under agitation. After the whole of the ammonia solution has been added to the aluminum chloride, a slight excess of ammonia is added to the combined mixture, which is then allowed to settle. The supernatant liquid is then siphoned off and the resultant precipitate washed at least five times with distilled water, the precipitate being allowed to settle after each washing, the resultant supernatant wash liquid being siphoned off after each settling until the precipitated aluminum hydroxide is free of ammonium chloride.

The aluminum hydroxide gel thus precipitated has the appearance of a smooth translucent cream, and possesses great surface area and high adsorptive power.

Using this aluminum hydroxide gel, the following is a typical formula of a castor oil emulsion prepared in accordance with this invention: Aluminum hydroxide gel (3 per cent solids), 400 g.; castor oil, 700 g.; water, 50 g.; flavor and sweetening, to suit.

The quantities of water, gel and castor oil are placed together, flavoring matter and sweetening having been previously added to the castor oil.

The whole is then beaten together mechanically, forming a thick, creamy mass which is more or less stable according to the amount of mixing.

To prepare the completed product for internal administration, this cream is usually passed through a homogenizer or similar suitable emulsifying apparatus. The final product is a finely dispersed, stable and white emulsion containing approximately 60 per cent castor oil combined with approximately 1 per cent of aluminum hydroxide on a dry basis.

Disguised Castor Oil
Formula No. 1

Finely Powdered Roasted Coffee	10 g.
Powdered Sugar	20 g.
Castor Oil	20 g.

No. 2

Saccharin	15 gr.
Sodium Bicarbonate	15 gr.
Chloroform	5 dr.
Pimenta Oil	2½ dr.
Cassia Oil	2½ dr.
Clove Oil	2½ dr.
Castor Oil	5 pt.

Dissolve the saccharin in the chloroform; add the sodium bicarbonate; then add the oils, which have been previously mixed, and shake vigorously.

To Hide Cod Liver Oil Odor and Taste

Use the following flavor to suit:

Cinnamon Oil	3 lb.
Bitter Almond Oil (Free from Prussic Acid)	1 lb.
Wintergreen Oil	1 lb.

Syrups for Masking Unpleasant Tastes

Sugarless Syrup

Orange

Orange Oil	3 cc.
Citric Acid	10 g.
Saccharin, Soluble	1 g.
Glycerin	500 cc.
Distilled Water to make	1,000 cc.

Color-certified dye naphtha yellow (4.8 cc. of a 1/200 solution).

Add the oil of orange to 500 cc. of glycerin and allow to stand 24 hours with occasional shaking. Dissolve the soluble saccharin and citric acid in the water and add to the solution of glycerin and volatile oil, with constant stirring. Filter through cotton if necessary.

Sugarless Syrup

Anise

Anise Oil	1.50 cc.
Fennel Oil	1.50 cc.
Saccharin, Soluble	1.00 g.
Glycerin	500.00 cc.
Solution Amaranth	4.80 cc.
Distilled Water to make	1,000.00 cc.

Add the oil of anise and fennel to 500 cc. of glycerin and allow to stand for 24 hours, with occasional shaking. Dissolve the soluble saccharin in the water and add the solution of amaranth. Pour the saccharin solution with the dye into the glycerin solution, with constant stirring. Filter through cotton if necessary.

The choice of two differently flavored sugarless syrups makes a very good disguise for ammonium carbonate, potassium acetate, potassium citrate and potassium iodide. These sugarless syrups apparently make a better disguise for the drugs mentioned than do those containing sugar.

Syrup of Pineapple

Pineapple Juice	450 cc.
Sugar	850 g.

Glycerin Suppositories

Formula No. 1

Glycerin	92 g.
Sodium Stearate	8 g.
Distilled Water	5 cc.

To make about 30 rectal suppositories.

Heat the glycerin to 95° C. in a double boiler. Add the sodium stearate, stirring very gently occasionally until a clear solution is effected. Then add the distilled water, mix thoroughly and pour the mass into suitable molds. Remove the suppositories when they are completely cold and preserve them in tightly stoppered glass bottles in a cool place.

No. 2

Glycerin	91.00 g.
Sodium Hydroxide (50%)	2.52 g.
Stearic Acid	9.00 g.
Monohydrated Sodium Carbonate	0.09 g.
Water	0.5 cc.

To make about 30 suppositories.

Place the glycerin in a suitable vessel and heat on a water-bath, keeping the vessel well immersed in the boiling water, until the temperature is about 85° C. Add the sodium hydroxide 50 per cent or its equivalent of an approximately 50 per cent solution to the hot glycerin with thorough mixing. Melt the stearic acid in a small vessel and pour at once into the hot alkaline glycerin mixture, stirring thoroughly. Maintain the temperature at from 85° C. to 90° C. for twenty to thirty minutes. Dissolve the monohydrated sodium carbonate in 0.5 cc. of distilled water, contained in a test-tube and add to the hot mixture just finished. Mix thoroughly, pour the melted mass into suitable molds. Remove the suppositories when they are completely cold and preserve in tightly stoppered glass vessels in a cool place.

Foaming Antiseptic Suppository

British Patent 459,327

55 g. tartaric acid and 25 g. sodium bicarbonate are mixed and finely ground and the mixture incorporated with a melted mixture of 60 g. cocoa-butter and 3 cc. olive oil; the pasty mass so obtained is molded into square-section rods or other formed bodies, or into sheets from which formed bodies are stamped. When solidified the bodies are coated with the cocoa-butter-olive-oil mixture or petroleum jelly to exclude moisture. The carrier is then made by dissolving 125 g. gelatin in 200 cc. warm aqueous solution of mercuric cyanate of strength 1 : 10,000, to which 5 g. egg albumen may have been added. The following ingredients are then added: Aluminum aceto-tartrate, 20 g.; hexyl resorcinol, 100 cc. of 1 : 1,000 solution; kalada juice, 100 cc.; glycerin, 350 cc. The carrier may be rendered opaque by whipping air into it or adding an opacifying substance. The suppository is molded in a two-part mold, the lower half of which is first almost filled with jelly carrier, upon which, after setting, a rod or the like of gas-forming material is laid. The mold is then closed and filled with jelly carrier in a vertical position.

Water "Soluble" Suppository Bases

Formula No. 1

U. S. Patent 2,055,063

Propylene Glycol Stearate	**82 g.**
Triethanol Amine	**2–3 g.**

Stearic Acid	15 g.

Melt together and dissolve medicaments in it.

No. 2

Glycol Glyceryl Stearate	40 oz.
Diglycol Laurate	10 oz.

This composition is neutral, non-irritating and will not dry out or sweat. It can be made harder or softer by varying the diglycol laurate content.

Infant Diarrhoea Formula

Dextrin and maltose, 175 g.; acid-free pectin, 6 g.; agar-agar, finely ground, 8 g. It has previously been shown that scraped raw apple is beneficial in this condition, hence the use of pectin. Agar-agar is chosen as a desirable source of cellulose. The substances are mixed dry. Water or milk is boiled with the mixed powders for three to five minutes, and while still hot the product is poured into eight custard cups to form a day's feeding on a three-hour schedule.

Hygienic Douches for Women

Formula No. 1

Formaldehyde-Soap Solution 1–2% strength.

No. 2

Wood-Vinegar, crude or purified—about 5% strength.

No. 3

Cresol-Soap Solution ½ to 1% strength.

No. 4

Tannic Acid, ½ to 1½%, recommended in solution 1:2 in glycerin, in which it dissolves very easily.

No. 5

Chloramin (*p*-Toluene-Sulfon-chloramide-Sodium), 1/5%.

No. 6

German Patent 276,662

p-Chlor-*m*-Cresol, or *p*-Chlor-Xylenol, ½–1%.

No. 7

Thymol, 1/10%.

Organic Compositions of Vegetable Origin.

No. 8

Chamomile Flowers	5–20 g.
Water, Boiling	1 l.

No. 9

Sage Leaves	5–20 g.
Water, Boiling	1 l.

No. 10

Lactic Acid	0.9 Moles
Glucose	0.1 Moles
Chamomile Extract	5 g.
Sage Extract	5 g.
Water, to make	100 g.

Use 1–2 teaspoonfuls per liter of water.

No. 11

Angelica Root	200 g.
Rosemary Leaves	200 g.
Basilicum	200 g.
Chicory Root	150 g.
Parsley Root	250 g.

Use 5–10 g. per l. decoction.

Inorganic Compositions

No. 12

Potassium Alum, 2–3% solution.

No. 13

Potassium Permanganate, in 1/10–1/5% solution.

No. 14

Aluminum Acetate Solution, ½–2% strength.

No. 15

Hydrogen Peroxide, 3% by weight solution.

No. 16

Boric Acid, ½–2%.

Others: Sodium Perborate, Persulphate.

There are possible all kinds of combinations of these materials.

The temperature of these douches must be body temperature (37.0° C.) for correct application.

Gland Extracts

Canadian Patent 364,253

Fresh glands, cut into thin strips, are allowed to stand in distilled water, containing ½% phenol at about 40° F. Extraction takes place by osmosis. The extract is then filtered and packaged.

Hormone of Corpus Lutcum

Canadian Patent 364,352

Pig Ovaries	100 kg.
Sodium Fluoride, Powdered	10 kg.

Mix together and place in flat trays. Air dry at 30–40° C.; pulverize; boil with five times by weight of acetone; filter and distill off acetone from filtrate.

Liver Extract

Liquid extract of liver is prepared by extracting trimmed ox or sheep liver by the process described for dry extract of liver (given later). The extract, obtained by precipitation and granulation with dehydrated alcohol, is collected on a filter and dissolved in distilled water.

Glycerin, alcohol (95 per cent), and distilled water are added in such proportions that 1,000 millilitres of the resulting liquid contain a quantity of the extract equivalent to 8,000 g. of the original liver, not less than the equivalent of 10 per cent v/v of alcohol (95 per cent) and not less than 20 per cent v/v of glycerin.

Dry Extract of Liver.—This is a selected fraction of an alcoholic extract of ox or sheep liver and contains the specific principles which increase the number of red corpuscles in the blood of persons suffering from pernicious anemia.

Mince 5,000 g. of trimmed ox or sheep liver; add 6,600 millilitres of alcohol (80 per cent) and 5.5 millilitres of a mixture of equal volumes of sulphuric acid and distilled water; set aside for twelve to eighteen hours, stirring frequently; filter and reserve the filtrate.

Collect the residual liver tissue and add to it 12,500 millilitres of alcohol (50 per cent); set aside for a further twelve to eighteen hours, stirring frequently; filter. Mix the two filtrates and evaporate the mixture under reduced pressure to 500 millilitres; add 500 millilitres of dehydrated alcohol; allow the resulting precipitate to settle; decant the clear solution and filter the remainder, or separate the liquid from the solid matter by means of a centrifuge, washing the filter or the centrifuge vessel and contents with alcohol (50 per cent). By evaporation under reduced pressure remove the alcohol from the mixed liquids, and reduce the residue to a syrupy consistence, then pour the product with constant stirring into ten times its volume of dehydrated alcohol. Manipulate below the surface of the liquid the extract which is precipitated, so as to expose as great a surface as possible to the dehydrating action of the alcohol; then pour off the alcohol and replace it with a further sufficient quantity of dehydrated alcohol; let the extract remain exposed to the dehydrating action of the alcohol until it becomes brittle. Remove the alcohol by filtration; dry the extract *in vacuo*; reduce it to a powder as rapidly as possible, then dry again *in vacuo*. Weigh the dry powder, mix with it not less than one-tenth of its weight of finely powdered dry sodium chloride, transfer the product as quickly as possible to tubes, placing in each the amount equivalent to 225 g. of the original liver. Close the tubes hermetically.

Vitamin A Concentrate
U. S. Patent 2,076,901

100 kg. of fish liver are mixed with 50 kg. of 50% aqueous ethyl alcohol and 20 kg. of potassium or sodium hydroxide. The mixture is heated to 60° C. during one hour while stirring and passing through a stream of nitrogen. The saponification mixture is then dissolved in 150 kg. of ice cold 40% aqueous ethyl alcohol and the liquid obtained is extracted by means of 300 kg. of a lipoid solvent immiscible with water, for instance, ether, petroleum ether or ligroin. The extract obtained is freed from the solvent by evaporation.

Stabilization of Vitamin A Preparations
U. S. Patent 2,051,257

Materials such as halibut liver oil, carotene or irradiated ergosterol, are stabilized by adding phospholipins such as soybean lecithin, cephalin, cuorin or sphingomyelin, etc., suitably in a proportion of about 1%.

Osserman Dental Pain Killers

Liquid Desensitizer

Thymol	70 g.
Acetone	10 g.
Ethyl Aminobenzoate	25 g.

Paste Desensitizer

n-Propyl-*m*-Cresol Aminobenzoate	10 g.
Ethyl Aminobenzoate	30 g.
Thymol	10 g.

Dental Desensitizer (Pain Killer)

Formula No. 1

Thymol	4 dr.
Benzocaine	28 gr.
Acetone	52 min.

Stir until dissolved and keep in stoppered brown bottle.

No. 2

Camphor	2 oz.
Clove Oil	2 oz.
Cajeput Oil	2 oz.
Peppermint Oil	1 oz.
Menthol	1 oz.
Hops Oil	2 oz.
Alcohol	15 oz.
Ether	10 oz.

Toothache Remedy

Formula No. 1

Cinnamon Oil	1.67 g.
Phenol	3.33 g.
Methyl Salicylate	5.0 cc.

Apply locally to gums.

No. 2

Phenol	2.0 g.
Chlorbutanol	2.0 cc.
Cinnamon Oil	1.0 cc.
Clove Oil	2.0 cc.
Methyl Salicylate	3.0 cc.

Corn Salve

a.	Pine Rosin, Refined	8 g.
	Glyceryl Monoricinoleate	2 g.
	Larch Turpentine	10 g.
	Beeswax, Yellow	16 g.
b.	Salicylic Acid	8 g.
c.	Peru Balsam	8 g.

Melt *a*; dissolve *b* in the melted base, and add *c*. Stir until homogeneous, cool, and pour.

Corn Remover

Formula No. 1

Salicylic Acid	15 g.
Lactic Acid (85%)	15 g.
Collodion	70 g.

No. 2

Salicylic Acid	20 g.
Larch Turpentine	20 g.
Hemp Extract	2 g.
Lactic Acid (85%)	4 g.
Ether 1 part Alcohol 4 parts	60 g.

Corn Plaster Base

a.	Rosin Oil	30 g.
	Copaïba Balsam	40 g.
	Larch Turpentine	20 g.
	Rosin, Pale	40 g.
	Beeswax, Yellow	12 g.
b.	Ethyl Ether	100 g.
c.	Sheet Rubber	100 g.
	Ethyl Ether	500 g.

Melt up *a* and stir until homogeneous. Strain through a fine-mesh cloth into a wide-mouth metal-bottle, and add *b*.

Separately, digest the rubber solution *c* in a wide-mouth glass-bottle, and keep tightly closed. Shake daily, and use as soon as a homogeneous, and pourable solution has formed (this takes about 3 weeks). Add *c* to the wax-resin solution *a* and *b*, and add enough ether to make 800 g.

Use this for the

Salicylic Acid Corn Plaster

Salicylic Acid, Powdered	34 g.
Violet Root, Finely Powdered	70 g.
Sandarac, Powdered	20 g.
Rosin Oil	22 g.
Petroleum Ether	185 g.
Plaster Base, as above	800 g.

Mix powders, wet with the rosin oil and the petroleum ether, and work in the plaster base.

Removing Tattoo Marks, Warts, Moles, Etc.

Bichloracetic acid is used. Since it is highly corrosive it must be used with great caution.

1.—Apply petrolatum, using a camel's hair brush, around the corn, callus or wart, to prevent the bichloracetic acid from coming into contact with normal skin.

2.—With an applicator stick apply a little of the acid to the lesion. After this has been absorbed, apply a little more.

An applicator stick is used to apply the acid. The stick is sharpened to a point, and the amount retained on it can be regulated by letting the excess amount run down the side of the bottle. Further, the wood absorbs some of the excess acid, and, in addition, the amount of acid applied in treatment can be further regulated by varying the angle at which the stick is held.

The acid has a tendency to spread over the skin area around the lesion, however, and, despite all one's caution, one may at times get too much acid on the skin and cause a chemical burn. The use of petrolatum, while not indispensable, constitutes an additional safeguard.

Bichloracetic acid will generally cause more scar tissue formation in persons with a delicate skin; and young persons will usually form more scar tissue than will older patients.

The practitioner will be able, after treating a number of lesions, to judge the amount of bichloracetic acid needed to treat any particular case. To gauge the interval between treatments is simple—one is always safe in allowing from five to seven days to elapse between treatments. Warts, corns, and calluses require heavy applications. Other lesions, of slight density, such as moles, xanthelasma, and angiomas are best treated by very light applications of the acid. If necessary, a second application may be used on such lesions, but it is safer, before using a second application, to wait until the crust following the first has dropped off, and until there is at least a thin layer of normal epidermis over the lesion. Light applications are usually to be preferred in cases where the cosmetic result is an important consideration, since they ensure greater freedom from the danger of scarring. The immediate, liberal use of water is recommended should any acid be dropped on normal skin.

Wart Treatment

Of the non-specific methods of treating warts probably paints of various kinds are most commonly employed. A well-known one is 10 per cent salicylic acid in flexible collodion. Owing to the horny surface of a wart it is essential to use a keratolytic substance, and caustic potash, phenol, and glacial acetic acid belong to this category. A useful combination is the following:

Phenol	10 g.
Glacial Acetic Acid	10 g.
Salicylic Acid	10 g.
Tincture of Iodine	20 g.
Alcohol	100 g.

Success may often be obtained by constant daily application of such remedies.

Local Hemostatic

Pectin	0.3	g.
Calcium Chloride	0.01	g.
Sodium Chloride	0.14	g.
Water	20	cc.

Blood, Test For

Dissolve 1 g. of benzidine in 10 cc. of glacial acetic acid and to 1 cc. of this solution add 10 cc. of 3 per cent hydrogen peroxide solution. No color, or at most a very faint color, should appear within a few minutes. Then add a small amount of blood to the solution. A blue color should be produced.

Toisson's Solution

(For use in making red blood cell count)

Sodium Chloride	1	g.
Sodium Sulphate	8	g.
Glycerin	30	g.
Distilled Water	160	g.

plus Methyl Violet, 5B to give a strong purple color.

Blood Substitute

A blood substitute, for cases where a donor is not on hand to provide whole blood by transfusion when an obstetrical patient has lost blood in quantities sufficient to make fluid replacement imperative, is suggested in a recent issue of the *British Medical Journal.*

1 grain ephedrine hydrochloride, 40 grains glucose, 525 grains of gum acacia, and enough water to make 1 pint.

Styptic Pencils

Formula No. 1

Ammonium Chloride	6	lb.
Copper Sulphate	24	lb.
Iron Sulphate	40	lb.
Alum	30	lb.

No. 2

Ammonium Chloride	6	lb.
Copper Sulphate	6	lb.
Iron Sulphate	6	lb.
Zinc Sulphate	6	lb.
Alum	76	lb.

Preventing Mold in Gelatin Solutions

Molds are best prevented in a gelatin solution by saturating it with chlorbutanol—0.8 g. in 100 cc. Chlorbutanol dissolves slowly, but it will dissolve in this proportion. Benzoic acid—1 g. in 1000 cc. will hinder the growth of molds, but will not entirely prevent them. Five percent of alcohol in the solution will also hinder mold growth for a considerable time.

To prevent gelatinizing, dissolve the gelatin in acetic acid (30 to 36 per cent) or add about 2 per cent of nitric acid. If a very strong gelatin solution is wanted, more acid will be needed. The stronger acid will also prevent the growth of molds.

Preventing Insulin Deterioration

The production of insulin is simplified by a storing method which has been patented. Experiments seem to prove that the addition of 25 cc. of hydrochloric acid to 1 kg. of fresh pancreas practically eliminates any insulin losses during cold storage.

Preventing Peroxide Formation in Ether

Place a piece of clean copper wire in each ether container. Or add hydroquinone in proportion of 1–5000 of ether.

Storing Hydrogen Peroxide in Aluminum

U. S. Patent 2,008,726

To prevent pitting of aluminum storage vessels for hydrogen peroxide the inner surface of the vessel is treated with 50% nitric acid for 9–16 hours at 35–15° C. and 0.1–0.5 g. of sodium or potassium nitrate is added per liter of peroxide.

Oxygen Evolving Composition

British Patent 462,321

Sodium Peroxide	3	g.
Caustic Soda	2	g.
Water	1	g.
Sodium Permanganate	7	g.
Calcium Oxide	45	g.

Elastic Plaster Bandage

U. S. Patent 2,053,728

One hundred grams of freshly precipitated cellulose sulphacetate are dissolved in 700 grams of alcohol and 200 grams of acetone, 50 grams of monoacetine being added and 2,000 grams of gypsum then stirred into the mass.

The viscous paste is diluted with another 500 grams of alcohol, and then spread out thinly, with a spatula, on a muslin strip. After drying, which can be accelerated by ventilation and a current of warm air, the bandage forms a uniformly smooth layer.

On being wetted with water, the bandage softens in a few seconds, whereupon it is freed from surplus water by squeezing and used for the purpose of making plaster of Paris dressings. It sets in a few minutes and attains its final degree of hardness in from five to ten minutes longer.

Mentholated Adhesive Tape

Beeswax, Yellow	100	g.
Rosin	750	g.

Melt together; mix until uniform; cool until it thickens slightly and then mix in

Menthol 50 g.

Apply to cloth or rubberized tape.

Removal of Adhesive Tape from Skin

Oil of wintergreen is a simple, painless and highly efficient means of removing adhesive tape from the skin. The oil should be used only at the point of separation of the adhesive from the skin.

SMALL SCALE TABLET MAKING

The chief troubles experienced in the preparation of compressed tablets are “capping,” “sticking,” and “picking.” Capping is the term applied when the upper surface of the tablet splits off on leaving the die or on falling into the tray; it may not occur until later in the storage container. The chief cause is usually excess of powder in the granulation, and may sometimes necessitate re-granulation. Care should be taken against using a worn or socketed die, as the tablet is formed in an enlarged portion of the bore, and on ejection capping results. Too much pressure may also cause the trouble, and this should be tested in the absence of other obvious causes.

“Picking”

Picking is the adherence of granules to the face of the punch, and occurs either from a granulation which is not quite dry or from a scratched face of the punch. The top punch is more usually affected, and the face should be smoothed with a portion of well-used, fine emery cloth and a trace of oil.

“Sticking”

Sticking is the effect produced when the bottom punch binds in the die and may be caused by a slightly damp granulation or excess of powder. It sometimes occurs with substances such as calcium lactate, and may be only overcome by using up to 4 per cent of talc as a lubricant and additionally by placing one or two drops of liquid paraffin in the die, working the machine for a minute and removing excess or grease before compression.

Compression

The degree of compression will vary with different types of tablets. Tablets such as potassium chlorate, soda-mint and formamint which are required to be dissolved in the mouth are usually compressed as hard as possible. In other cases the tablet should be capable of resisting a fall of several feet on to a hard surface, and on storage little or no powder should accumulate in the container. An exception should be made with mercury and chalk; as this is required to powder easily it should be treated carefully to avoid over-compressions resulting in hard, gritty particles on breaking. Precautions must be taken with granulations of deliquescent or hygroscopic ingredients such as thyroid, and there should be no delay between drying and compression. In fact, if the weather is damp it is better to delay until drier conditions prevail.

In regard to shape and size of the tablet, the thickness should be at least one-third of the diameter, otherwise there will be an insufficient depth of granules in the die to allow for fine adjustment of pressure. Tablets of soluble substances such as sodium chloride, potassium permanganate, etc., should dissolve readily in tepid water, and those containing aspirin, phenacetin, etc., should disintegrate within a few seconds when placed in water. With a slowly soluble substance like calcium lactate a tablet prepared with mucilage of acacia as excipient would be only slightly affected by water, and it is therefore necessary to add starch as a disintegrator.

Formulæ of Common Tablets

ASPIRIN

Aspirin, in heavy crystals	5 gr.	5000 gr.
Starch, in Powder	½ gr.	500 gr.
Die 12/32″	For one tablet	For 1000 tablets

Mix the powders, dry for one hour, and pass through a No. 20 sieve, and press into 5½ grain tablets. (Aspirin can easily be obtained in granular form suitable for compression without further granulation.)

PHENACETIN AND CAFFEINE

Phenacetin, in powder	4 gr.	4000 gr.
Caffeine	1 gr.	1000 gr.
Sucrose, in powder	½ gr.	500 gr.
Starch, in powder	¼ gr.	250 gr.
Acacia, in powder	⅜ gr.	375 gr.
Talc, in powder	⅛ gr.	125 gr.
Die 13/32″	For one tablet	For 1000 tablets

Mix the ingredients, except the talc, and pass through a No. 40 sieve. Damp with dilute mucilage of acacia, pass through a 20 sieve, and dry. Pass through a No. 20 sieve and incorporate the talc.

Note: Acacia is necessary with such substances as phenacetin, sulphonal, amidopyrin, etc., which are liable to capping or picking.

SACCHARIN

Saccharin, in powder	½ gr.	500 gr.
Sodium Bicarbonate, in powder	½ gr.	430 gr.
Acacia, in powder		50 gr.
Talc, in powder		20 gr.
Sodium bicarbonate, Die 7/32"	For one tablet	For 1000 tablets

Mix the powders, except the talc, and pass through a No. 40 sieve. Damp with water, pass through a No. 20 sieve, and dry. Pass through a 20 sieve and incorporate the talc.

SODA-MINT

Sodium Bicarbonate, in powder	4 gr.	480 gr.
Ammoinum Carbonate, in powder	1/12 gr.	10 gr.
Peppermint Oil	1/12 min.	10 min.
Sucrose, in powder	11/30 gr.	44 gr.
Acacia, in powder	11/30 gr.	44 gr.
Talc, in powder	1/10 gr.	12 gr.
Die 11/32"	For one tablet	For 120 tablets

Mix the sodium bicarbonate, sugar, and acacia, and add the oil of peppermint. Damp with syrup of glucose and water, equal parts, and pass through a No. 20 sieve. When dry pass through a No. 20 sieve, add the ammonium carbonate and talc, and press into 5 grain tablets.

CALCIUM LACTATE

Calcium Lactate, in powder	5 gr.	5000 gr.
Starch, in powder	1¼ gr.	1250 gr.
Talc, in powder	¼ gr.	250 gr.
Die 12/32"	For one tablet	For 1000 tablets

Mix the calcium lactate and starch and pass through a No. 40 sieve. Damp with syrup of glucose and water, equal parts, pass through a No. 20 sieve and dry. Pass through a No. 20 sieve, incorporate the talc, and press.

ALOES, NUX VOMICA AND BELLADONNA

Extract of Aloes	1½ gr.	1500 gr.
Dry Extract of Belladonna	⅓ gr.	333 gr.
Dry Extract of Nux Vomica	½ gr.	500 gr.
Licorice root, in powder	1 gr.	100 gr.
Starch, in powder	57/100 gr.	570 gr.
Talc, in powder	1/10 gr.	100 gr.
Die 11/32"	For one tablet	For 1000 tablets

Mix the licorice root and starch, sift through a No. 40 sieve, and damp with syrup of glucose and water, equal parts. Pass through a No. 20 sieve, and dry in a steam oven. Pass through a No. 20 sieve, shake the granules in a dry container with the talc, and press into tablets.

Enteric Pill and Tablet Coating

Formula	No. 1	No. 2	No. 3
Cetyl Alcohol	10	10	10 g.
Shellac	—	10	— g.
Mastic, Gum	—	—	10 g.
Acetone	100 cc.	100 cc.	100 cc.

No. 4

Stearic Acid	5 g.
Shellac	10 g.
Balsam, Tolu	10 g.
Ether	50 g.
Alcohol	50 g.

No. 5

U. S. Patent 2,071,511

Abietic Acid	10 lb.
Methyl Abietate	3 oz.
Oleic Acid	1 pt.
Benzoic Acid	12 oz.

Warm gently until dissolved.

No. 6

Enteric Coating for Pills and Tablets

A coating for pills or tablets, insoluble in the stomach but disintegrating in the intestines, may be obtained by applying a thick layer of plasticized shellac. Small successive quantities of a solution containing shellac 20 g., anhydrous lanolin 5 g., and alcohol 75 g., are applied in a coating pan.

After the first uniform coating, the tablets are dusted with gum acacia, but powdered talc is applied after each of two additional coats.

When the weight of the tablets has been increased by 37 per cent, two or three coats of a 20 per cent solution of shellac in alcohol are added, and the tablets dried.

Enteric Coating for Drug Tablets

U. S. Patent 2,011,586-7

The mixture is made by melting together 55.5 g. of stearic acid, 24.25 g. of carnauba wax and 1.75 g. of petrolatum, then incorporating 13.9 g. of powdered agar and 4.6 g. of powdered elm bark. Upon cooling, the mixture is ground to a powder.

Pharmaceutical Pill Coating

Pills are coated with

Cocoa Powder	15 g.
Gum Arabic	1 g.
Sugar Syrup, Simple	2 g.

They are then varnished with

Formula No. 1

Tolu, Balsam	20 g.
Ether	10 g.
Alcohol, Absolute	30 g.

No. 2

Benzoin, Gum	15 g.
Ether	22 g.
Alcohol, Absolute	68 g.

Pill Mass

Carob gum 20 g.; glycerin 60 cc.; water 20 cc.; glucose 100 g. Pills containing 100 mg. of quinine sulphate can easily be made, the mass being plastic and easily handled and the pills relatively small.

Magnesia Tooth Paste

Formula No. 1

Magnesium Oxide	50 g.
Calcium Phosphate	50 g.
Soap	5 g.
Calcium Carbonate	5 g.
Glycerin	25 g.
Water	25 g.

No. 2

German Patent 648,583

Magnesium Carbonate	5 g.
Calcium Carbonate	45 g.
Starch Syrup	18 g.
Water	38 g.
Perfume	to suit

Non-Foaming Tooth Paste

Water	39 g.
Calcium Carbonate	44 g.
Glycerin	11 g.
Potassium Chlorate	3 g.
Carragheen Moss	2 g.
Saccharin	0.5 g.
Tragacanth	0.5 g.
Alcohol	2 g.
Water	37 g.
Calcium Carbonate	42 g.
Magnesium Carbonate	6 g.

Tooth Paste with Colloidal Kaolin

Calcium Carbonate	30 g.
Colloidal Kaolin	15 g.
Soap, Powdered	3 g.
Tragacanth	0.5 g.
Glycerin	30 g.
Water	60 g.

Pepsin Tooth Paste

Make up a mucilage of

Pectin	5 g.
Tragacanth	1 g.
Glycerin	15 g.
Alcohol	15 g.
Water	60 g.

and use it for the paste as follows:

Mucilage, as above	36 g.
Diethylamino-ethyloleyl-amide	4 g.
Glycerin	4 g.
Pepsin	22 g.
Calcium Carbonate	20 g.
Titanium Dioxide	17 g.

Bleaching Tooth Paste

Magnesium Peroxide	50 g.
Calcium Carbonate	500 g.
Glycerin	300 g.
Soap	12 g.

The peroxide is ground with a small amount of mineral oil, to give the paste the right consistency.

Tooth Paste

German Patent 63,403

Calcium Carbonate, Precipitated	600 g.
Cactus Mucilage	500 g.
Magnesium Carbonate	400 g.
Medicinal Soap, Powdered	180 g.
Glycerin	100 g.
Lactose	100 g.
Peppermint Oil	100 g.
Clove Oil	5 g.

Pancreatin Tooth Paste

Calcium Carbonate	100 g.
Magnesium Carbonate	20 g.
Pancreatin	6 g.
Glycerin-Mucilage*	200 g.

*Glycerin Mucilage

Tragacanth	0.75 g.
Alcohol	5 g.
Glycerin	95 g.

Tooth Paste Removing Dental Deposits

Calcium Carbonate	65 g.
Karlsbad Salt	10 g.
Glycerin	100 g.
Water	16 g.
Agar-Agar or Tragacanth	0.5 g.

Flavors for Tooth Paste

Formula No. 1

Peppermint Oil	200 g.
Star-Anise Oil	180 g.
Menthol	20 g.
Clove Oil	5 g.
Anise Oil	10 g.

No. 2

Peppermint Oil	200 g.
Menthol	20 g.
Fennel Oil	10 g.
Vanillin	1 g.

No. 3

Peppermint Oil	100 g.
Cinnamon Oil	100 g.
Anise Oil	100 g.
Clove Oil	100 g.
Wintergreen Oil	150 g.

No. 4

Peppermint Oil	300 g.
Anethol	30 g.

Cinnamon Oil	50 g.
Lavender Oil	20 g.

No. 5

Eucalyptus Oil	300 g.
Menthol	25 g.
Peppermint Oil	200 g.

Tooth Powders
Formula No. 1

Kaolin	225 g.
Iris Root Powder	75 g.
Magnesium Oxide	25 g.

No. 2

Kaolin	225 g.
Soap Powder, White	15 g.
Whiting	15 g.

"Oxygen" Tooth Powder

Magnesium Carbonate	60 g.
Sodium Perborate	60 g.
Calcium Carbonate	80 g.

Dentifrice
French Patent 803,161

Ammonium Sesquicarbonate	80 g.
Sodium Carbonate	10 g.
Sodium Bicarbonate	10 g.

Tooth Wash

Castile soap (shavings) two ounces, glycerin six ounces, oil peppermint forty minims, oil of gaultheria sixty minims, oil of cloves twenty minims, extract of vanilla six drachms, solution of carmine (N. F.) two drachms, alcohol fourteen ounces, water a quantity sufficient to make thirty-two ounces. Dissolve the soap in half a pint of boiling water. Having dissolved the oils and glycerin in the alcohol, add the vanilla and carmine. Mix and filter through paper in which a little powdered willow charcoal is sprinkled. Add sufficient water to make two pints.

Dental "Disclosing" Solution

"Disclosing Solutions" are of tremendous value to the dentist, who uses these preparations to obtain visible stains upon teeth covered with mucinous and bacterial plaques. These films and plaques take the stain, and the rest may be washed off with water. It then is a comparatively easy matter for the dentist to proceed without injuring healthy enamel.

Potassium Iodide	15 g.
Iodine Crystals	50 g.
Zinc Iodide	15 g.
Distilled Water	240 cc.
Glycerin	240 g.

Removing Stains From Teeth
U. S. Patent 2,031,169

Paint teeth with
Iodine (3.3% Solution)
and later brush with
Sodium Thiosulphate (5% Solution)

Tooth Tincture

Melissa Leaves Extract	960 g.
China (Bark) Tincture	20 g.
Myrrh Tincture	20 g.
Peppermint Oil	4 g.

Cleanser for Artificial Teeth
Formula No. 1

Mineral Oil	15 lb.
Turpentine	10 lb.
Benzine	5 lb.

(Particularly for the rubber joints.)

No. 2

Starch	2 kg.
Hard Soap	2 kg.
Water	80 kg.
Glycerin	1 kg.
Sodium Silicate Solution	15 kg.
Pumice Powder (#0000)	50 kg.

No. 3

Soap, Powdered	2 kg.
Chloramine-T	50 g.
Sulfatate or Other Wetting Agent	50 g.

This formula has a marked antiseptic as well as a cleansing action.

Solid Block Disinfectants
Formula No. 1

Tallow	22 lb.
Caustic Soda (40° Tw.)	15 lb.
Creosote Oil	4 lb.
Soda Ash	8 lb.

No. 2

Tallow	8 lb.
Rosin	8 lb.
Creosote Oil	75 lb.
Caustic Soda (66° Tw.)	9 lb.

No. 3

Tallow	7½ lb.
Rosin	1½ lb.
Creosote Oil	9 lb.
Naphthalene	1 lb.
Solid Caustic Soda	1 lb.
Water	2½ lb.

Melt the fat and while hot add the caustic soda. Or, melt the fat, reduce the temperature, add the creosote oil and stir in the caustic soda. Cheaper fats can substitute the tallow.

Miscible Pine Oil Disinfectant

Pine Oil	80 lb.
Double Sulphonated Castor Oil	20 lb.

Pine Oil Disinfectant

Pine Oil	60 oz.
Naphthenic Soap	25 oz.
Sulphonated Castor Oil	15 oz.

Pine Oil Disinfectant and Deodorant

Pine Oil	63 lb.
Soap	29 lb.
Water	8 lb.

Urinal Drip Fluid

Nitrobenzene	6 pt.
Eucalyptus Oil	3 pt.
Yellow Neutral Mineral Oil	50 gal.

Compound Cresol Solution

Cresol	500 cc.
Oil (Any Vegetable Oil)	300 g.
Potassium Hydroxide	80 g.
Alcohol	10 cc.
Water, sufficient to make	1000 cc.

Procedure.—Put the potassium hydroxide into 80 cc. of water. When solution is about three-fourths complete, add the alcohol and stir until solution is effected. Add this solution to the oil which has been previously warmed to about 60° upon a water-bath, and stir gently. When saponification is complete, as shown by testing with water, in the usual way, or by appearance, add the cresol in small portions, with stirring. Finally, remove from the water-bath, cool and adjust the volume to 1000 cc. with distilled water.

Water-Soluble Cresol Disinfectant

Formula No. 1

A very satisfactory water-soluble disinfectant is a mixture of equal parts of cresol and Turkey red oil.

No. 2

Cresylic Acid	100 g.
Linseed Oil	100 g.
Caustic Potash Solution (33⅓%)	75 g.
Alcohol	6 g.

No. 3

Tar Oil Acids	40 g.
Rosin	10 g.
Caustic Potash Solution (33⅓%)	70 g.
Alcohol	70 g.

The specified mode of procedure is to boil the various ingredients together in an apparatus with a reflux condenser, until saponification is complete.

On a commercial scale, similar preparations may be made by the saponification of either castor or linseed oils with caustic potash. As an example: take 50 lb. of castor oil and heat it gently in an iron kettle. To this is added, in a thin stream, 10 lb. of caustic potash dissolved in 10 lb. of distilled water, crutching being continued meanwhile and the heat gradually increased until soap is formed. Steam is then turned off and the kettle left covered for about an hour, at the end of which time the soap should be balanced, leaving a very slight excess of alkali.

Pale cresylic acid, in the proportion of 40 lb., is now added in the same manner as the alkali, with continuous stirring and the application of gentle heat. When all the acid oil is incorporated, the contents of the pan should be perfectly clear and a small quantity transferred to a test tube should give a clear solution in water.

If it is preferred to employ linseed oil, the quantity of caustic potash used will naturally have to be modified; in this particular case, increased from 10 to 10½ lb.

Essential Oil Germicides

Essential oils which have antiseptic properties, can be made suitable for use by the general public in the same way as pine oil, by emulsifying with soap or by the use of sulphonated oils. Eucalyptus oil disinfectant is prepared according to the following formulas:

Formula No. 1

Eucalyptus Oil	100 lb.
W. W. Rosin	100 lb.
Caustic Soda Solution (25%)	50 lb.
Denatured Alcohol	20 lb.
Water	150 lb.

No. 2

Eucalyptus Oil	250 lb.
Commercial Oleic Acid	105 lb.
Water	300 lb.
Caustic Soda Solution (25%)	60 lb.
Denatured Alcohol	60 lb.

These products are nonpoisonous and noncorrosive. They are prepared by dissolving the rosin or oleic acid in the caustic solution, diluting with half the water content, cooling, stirring in the eucalyptus oil, and adding the alcohol.

An example of thyme oil disinfectant is as follows:

Thymol	3 lb.
Thyme Oil	1½ lb.
Origanum Oil	1 lb.
Terpineol	5 lb.
Sulphonated Castor Oil	40 lb.
Water	50 lb.

This gives a perfect emulsion in water, which is truly antiseptic and nonpoisonous.

Disinfectant for Telephone Mouthpiece

Formaldehyde	5 drops
Mountain Pine Oil	5 drops

Rosemary Oil	6 drops
Lavender Oil	6 drops
Acetone	5 cc.
Alcohol, Denatured, to make	50 cc.

Telephone Disinfectant Cleanser

Thymol	1 g.
Pine Needle Oil	15 drops
Peppermint Oil	15 drops
Alcohol, Denatured	5 cc.
Soap, Tincture of Green	10 cc.
Water, to make	50 cc.

Telephone Booth Air-Deodorizer

a. Naphthalene	730 g.
b. Camphor, Synthetic	70 g.
c. Hexachloroethane	20 g.
Paradichlorobenzene	100 g.
d. Bornyl Acetate	50 g.
Eucalyptol	30 g.

Melt *a* on the waterbath, add *b*, later *c*. When all is dissolved, cool to 80° C., add *d* and pour, or use to dip cardboards into the melted mass.

Disinfectant for Toilets

Phenol	1 oz.
Pine Oil	5 oz.
Sulphonated Olive Oil (30%)	16 oz.
Water	78 oz.

Anti-Rusting Surgical Instrument Antiseptic

French Patent 800,982

Phenol or Cresol	3 g.
Borax	8 g.
Paraformaldehyde	15 g.
Water	1 l.

Toilet Deodorant

Formula No. 1

Formalin (38%)	2.5 gal.
Water	50 gal.

Thyme oil makes a good odor if desired.

No. 2

Concentrated

Formalin (38%)	25 gal.
Zinc Chloride Solution (50%)	25 gal.

No. 3

Anthracene Oil	80 kg.
Cresol, Crude	20 kg.

No. 4

a. Naphthalene	730 g.
b. Camphor	70 g.
Hexachloroethane	20 g.
Paradichlorobenzene	100 g.
c. Bornyl Acetate	50 g.
Eucalyptol	30 g.
Orange Peel Oil	20 g.

Melt *a* on the waterbath. Add the mixture *b*, and heat gently (over asbestos-plates) till all is dissolved again.

Allow to cool to 80° C., and add *c* with agitation.

Pour into molds, or impregnate cardboard pieces of the conventional square shape.

Pack air-tight.

Deodorant Sprays

Formula No. 1

Boric Acid	12 oz.
Sodium Nitrate	12 oz.
Potassium Chlorate	12 oz.
Chloral Hydrate	8 oz.
Methanol	32 oz.
Water, to make	5 gal.

No. 2

Water	40 oz.
Aluminum Chloride	8 oz.
Fluorescene (Dye)	to suit

Theatre Sprays

English Patent 425,309

For Large Halls

Camphorated Oil	90 g.
Menthol	10 g.

Example: For a theatre of 1,500 seats, only 20 g. of this mixture, being slowly evaporated by a heating device, are active without undesirable odor.

For Small Halls

Camphorated Oil	5 g.
Menthol	5 g.
Alcohol	90 g.

Tobacco Pipe Cleaner and Deodorant

Formaldehyde	200 cc.
Soft Soap, U.S.P.	400 g.
Alcohol	300 cc.
Water, to make	1000 cc.

The above may be perfumed with oil of lavender and menthol.

Breath Lozenges

Formula No. 1

Peppermint Oil	1 g.
Powdered Sugar	100 g.
Mucilage of Acacia	10 g.

Make mass and divide into lozenges weighing one gram each.

No. 2

Peppermint Oil	1 cc.
Powdered Sugar	100 g.

Mucilage of Tragacanth, q.s. to make 100 lozenges.

Incense Cones

Dry materials in the following should be powdered and worked up with a gum tragacanth solution and then molded and dried.

Black

Linden Coal	1000 g.
Benzoin	650 g.
Tolu Balsam	100 g.
Olibanum	150 g.
Peru Balsam	80 g.
Clove Oil	4 g.
Rose Oil	1 g.
Solution Iris	5 g.
Vanillin	3 g.

Red

Red Sandal Wood, Powdered	1000 g.
Sandal Wood, East India	20 g.
Siam Benzoin	150 g.
Sumatra Benzoin	50 g.
Tolu Balsam	200 g.
Labdanum	50 g.
Tea Flower Tincture	30 g.
Clove Oil	25 g.
Vanillin	5 g.
Cassia Oil	20 g.
Saltpeter	100 g.
Musk, Tincture	25 g.

White

Linden Wood Powder	1000 g.
Styrax, Liquid	75 g.
Benzoin	150 g.
Olibanum	150 g.
Labdanum	75 g.
Mastic	45 g.
Clove Oil	20 g.
Cassia Oil	15 g.
Lavender Oil	5 g.
Musk, Tincture	15 g.
Ketone-Musk Solution	4 g.
Vanillin	6 g.

Incense Pastilles

Charcoal, Powdered	600 g.
Sandalwood, Powdered	150 g.
Storax	75 g.
Benzoin, Powdered	75 g.
Cinnamon-Cassia Powder	25 g.
Peru Balsam	15 g.
Cloves, Powdered	25 g.
Potassium Nitrate	35 g.
Tragacanth Water	to fix

Make a dough and press into shape.

Moth Balls

Naphthalene	200 kg.
Camphor	20 kg.
Phenol	30 kg.
Ceresin	50 kg.

Melt; agitate until well mixed. Pour into suitable molds as soon as cooled to about 50–60° C.

Cream Rubbing Alcohol
British Patent 446,594

Opaque, even-rubbing masses with a smooth texture are prepared by incorporating in an alcoholic menstruum a small proportion of a gel-forming agent and a small proportion of a solid true wax with or without the addition of soft paraffin, refined wool fat, or a glyceride fat. A typical mixture comprises: 1.81 (parts by weight) high-grade stearic acid and 2.42 first-grade white beeswax, which are dissolved in 85.58 boiling absolute alcohol. The acid is neutralized by 3.73 parts of a 10 per cent aqueous sodium hydroxide solution and the hot solution thinned with 6.46 water. When allowed to cool, the product soon sets to a fine-grained, non-elastic, non-syneretic mass of even texture which readily liquefies when rubbed on the skin. The final composition is sodium stearate 2, beeswax 2.4, water 10, alcohol 85.6. Such compositions are thixotropic—*i.e.*, capable of setting up again after liquefaction by pressure. Also they regain the original smooth structure without any great increase in syneresis, a property which is an advantage when the products are used as bases for medicating agents such as zinc stearate, zinc oxide, and sulphur, which can be successfully incorporated by grinding with the semi-solid mass and allowing to set again.

The Sealing of Gelatin Capsules

In dispensing small numbers of soft gelatin capsules it is customary to seal the capsules with the aid of a hot spatula or glass rod. This method is not entirely satisfactory, as it is difficult to obtain a neat seal, and one which is reliable in keeping the contents in the capsule. Moreover, it frequently happens that the hot iron or glass discolors the gelatin. To overcome these drawbacks, the following method has been adopted: Steam is generated from a pointed bent glass tubing inserted through a stoppered test-tube. The capsule is held in the steam within the area of dryness. A rapid seal is effected, which is neat, strong and free from any trace of charring. Instead of a glass apparatus, a flat oil-can such as is supplied with cycles and sewing machines, may be used.

Artificial Gastric Juice

Pepsin	0.10 oz.
Hydrochloric Acid	0.25 oz.

Artificial Intestinal Juice

Pancreatin	1 oz.
Sodium Bicarbonate	1 oz.
Ox Bile, Fresh	2 oz.

Medicinal Mineral Oil Emulsion

1. Gelatin	6–8 g.
2. Tartaric Acid (Sufficient to give a pH of 3.2)	

3. Simple Syrup	100	cc.
4. Vanillin	0.04	g.
5. Alcohol	60	cc.
6. Water, to make	500	cc.
7. Heavy White Refined Mineral Oil	500	cc.

Place 1 and 2 in about 340 cc. cold water; allow to swell for a few minutes and then heat until dissolved. Heat to 95–98° C. for 15 minutes. Cool to 60° C., add 3, then 4, which has been dissolved in 5. Add balance of water. Add 7 slowly while mixing vigorously with an electric mixer. Homogenize at 3000–3500 pressure, recirculating twice. A stable emulsion thinner than the usual medicinal mineral oil emulsions results.

Adhesive Tape "Looseners"

Formula No. 1

Carbon Tetrachloride	60	oz.
Naphtha	40	oz.
Perfume	½	oz.
*Diglycol Laurate	10	oz.

No. 2

Dichlormethane	98	oz.
Chloroform	2	oz.

The vapors given off by the above are toxic and should be drawn away by a fan.

* The use of diglycol laurate softens the hair and lessens pain by acting as a lubricant.

Treatment of Bed Sores

Bed sores may be treated by stretching elastic adhesive tape completely over the sore, from healthy skin to healthy skin, and leaving it in place until it loosens (24 to 48 hours); then remove the old tape and dry the surrounding skin, but *not* the ulcer; re-applying the tape until complete healing has taken place. Patients will complain of itching.

Or, this method may be used: Spray on a 5 per cent solution of tannic acid, or paint with brilliant green (1 per cent watery solution) until a crust is formed. The area must be kept clean and dry. If infection occurs under the crust, as indicated by softening of an area, remove the crust with hot saline compresses or petrolatum and treat the infection by wet compresses of Dakin's solution or boric acid. Then repeat the treatment. This method cannot be used if a virulent infection, deep necrosis of tissue, or bone involvement is present.

If the sore is extremely bad, arrange a continuous bath, which should be kept clean by a continuous overflow and refilling, and a constant temperature, controlled by a thermostat. Perfect drainage and relief from pressure are thus obtained.

Dust with following:

Zinc Stearate	5.00	g.
Tincture of Benzoin	5.00	g.
Scarlet Red Ointment (5%)	0.25	g.
Hydrous Wool Fat	30.00	g.
Liniment of Camphor	180.00	g.
Mutton Tallow	500.00	g.

Melt the fats, add the camphor liniment; and when almost cooled, beat in tincture of benzoin and zinc stearate until a creamy mixture is secured.

Treatment of the bed-sore itself is done by spraying every hour with 5% aqueous tannic acid and continuing until a heavy coagulation is formed. Occasionally the crust must be removed to prevent infection.

EMULSIONS

"Soluble" Oils

Formula No. 1

Sulphonated Castor Oil	15 g.
"Carbitol"	5 g.
Diglycol Laurate	80 g.
Mineral Oil	410 g.

No. 2

Rosin Soap	25 oz.
Red Oil	10 oz.
Pine Oil	4 oz.
Alcohol, Anhydrous	6 oz.

One part of above dissolves in four parts of "spindle" mineral oil.

Orthodichlorbenzol-Soluble Oil

"Carbitol"	5 oz.
Diglycol Laurate	95 oz.
Orthodichlorbenzol	400 oz.

The above emulsifies readily in water.

Hard Water-Soluble Oil

Pine Oil	75 oz.
"Carbitol"	25 oz.
"Sulfatate" (or other water-soluble naphthalene sulphonic acid esters or salts)	20 oz.
Water	20 oz.
Diglycol Laurate	360 oz.
Mineral Oil	1600 oz.

The "sulfatate" is dissolved in water and mixed well into the other ingredients. This oil disperses in *hard waters* without scum formation.

Soluble Oil Stable to Sea Water

Pine Oil	12 oz.
Red Oil	9 oz.
"Carbitol"	8 oz.
Diglycol Laurate	65 oz.
"Sulfatate" (or other water-soluble sulfonated hydrocarbon)	6 oz.

Water-In-Oil Emulsion

a. Diglycol Oleate	15 g.
Mineral Oil	60 g.
b. Water	25 g.

Pour *a* into *b* with vigorous stirring.

Stable Water in Oil Emulsifier

German Patent 646,503

a. Pectin, Dry	4–5	parts
Agar-Agar	1	part
Gelatin	½	part
b. Water, Boiling	100	parts

Dissolve *a* in *b*, cool. The smooth jelly that forms is liquefied once again by stirring and run through a homogenizer.

The viscous liquid thus formed can be used to emulsify oils in varying amounts.

Mineral Oil Emulsion

Aminostearin	10 g.
Mineral Oil	75 g.
Water	

This emulsion is stable to hard water and weak acids.

Technical Mineral Oil Emulsion

Water	170 cc.
Gum Arabic, Powdered	10 g.
Moldex or other *good* preservative	0.3 g.
When dissolved add to	
Mineral Oil	30 g.

while mixing vigorously; then run through colloid mill or homogenizer.

Non-Foaming Oil Emulsion

U. S. Patent 2,052,164

Stearic Acid	1 g.
Oil-Soluble Mahogany Sulphonate	99 g.
Mineral Oil	500 g.
Water	5000 cc.

Warm and mix first three ingredients until clear; then add water slowly with vigorous mixing.

Sesame Oil Emulsion

Citrus-Pectin	5 g.
Sesame Oil	20 g.
Citric Acid	0.5 g.
Distilled Water	74.5 g.

Homogenize.

Emulsions with Special Kaolins

Formula No. 1

Kaolin, Colloidal*	2.2 g.
Water	30.0 g.
Alcohol	1.1 g.
Fatty Oils	66.7 g.
Preservative	

No. 2

Kaolin, Colloidal*	1.3 g.
Water, Distilled	17.0 g.

Alcohol	1.7 g.
Fatty Oils	80.0 g.
Preservative	

Preparation: Stir the kaolin into the water. When homogeneous, add the oil in small portions. Addition of soaps (potassium, triethanolamine soaps) helps the emulsions.

7–8% of the colloidal kaolin gives a gel in water.

Cutting Oil, Concentrated

Pine Oil	2.5 oz.
Red Oil	12.0 oz.
Caustic Potash (50%)	4 oz.
Alcohol, Anhydrous	5 oz.
Potassium Oleo-Abietate	16 oz.

Possesses excellent self-emulsifying properties.

Japan Wax Emulsion

a. Japan Wax	36 g.
Trihydroxyethylamine Stearate	4 g.
b. Water, Boiling	360 cc.

Warm *a* to 65° C. and add *b* to it slowly with vigorous stirring.

Montan Wax Emulsion

Montan Wax	20 oz.
Oleic Acid	5 oz.

Heat to 100° C. and add the following heated to 95–100° C. slowly with good mixing:

Triethanolamine	8 oz.
Borax	2 oz.
Water	185 oz.

Esparto Wax Emulsion

a. Esparto Wax	15 g.
Triethanolamine	3 g.
Red Oil	1⅞ g.
b. Borax	1¼ g.
Water	10 g.
c. Water	32½ g.

Heat *a* to 95–100° C. and mix well; run into *b* heated to 95–100° C., beating vigorously; when smooth gel is formed add *c* heated to 95–100° C. and beat vigorously until cool.

Candelilla Wax Emulsion

a. Candelilla Wax	30 g.
Triethanolamine	7 g.
Red Oil	5 g.
b. Borax	2½ g.
Water	20 g.
c. Water	150 g.

Method as in esparto wax emulsion.

Candelilla Wax Emulsions

Formula No. 1

a. Candelilla Wax	20 g.
Oleic Acid	3 g.

Heat to 95–100° C. and then run in the following heated to 95–100° C., mixing with a high-speed stirrer:

b. Triethanolamine	4 g.
Borax	2 g.
Water	185 cc.

No. 2

a. Candelilla Wax	20 g.
Oleic Acid	3 g.

Use above method adding:

b. Triethanolamine	3 g.
Borax	1½ g.
Water	185 cc.

Paraffin Wax Emulsion

a. Paraffin Wax	12 oz.
b. Stearic Acid	5 oz.
c. Trigamine	3 oz.
d. Water	80 oz.

Melt *a* and *b* at 65–70° C. and add *c* and *d* at same temperature, slowly, while mixing with a high-speed agitator.

Opal Wax Emulsion

a. Opal Wax	15 g.
Aminostearin	5 g.
b. Water	75 g.
Sulfatate	5 g.

Heat *a* to 100–105° C. and add to it slowly while mixing with high-speed mixer *b* heated to 95° C. A smooth emulsion results that may be used for a furniture polish.

Bituminous Emulsion

Formula No. 1

U. S. Patent 2,087,400

Add 15 parts by weight of oleic acid to 250 parts by weight of asphalt flux oil, heating the mix to about 100° C., adding the same to 750 parts of water to which have been added 34 parts of aqueous ammonia whereby an emulsion of the asphalt flux oil which has a viscosity substantially greater than that of water is produced, thereafter adding 1500 parts by weight of coal tar which has a specific gravity of about 1.18 or more heated to a temperature of about 70° C. to which has been added 45 parts of oleic acid, vigorously agitating said tar with the emulsion of asphalt flux oil, and subjecting the resulting mixed emulsion to intensive mechanical disintegration, as for example by passage through a colloid mill.

No. 2

U. S. Patent 2,023,540

Hydrous Magnesium Silicate	8–10 lb.
Water	20 gal.

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* Particle size: 0.5 µ.

Mix well and heat to a boil; then mix in an emulsifying machine with

Asphalt (Melted)	36 gal.
Acetic Acid (0.1 N.)	250–420 cc.
Water (Boiling)	10 gal.

Bitumen Emulsion

Italian Patent 276,770

1,000 g. bitumen (preferably asphalt) are heated to 90° C. 60 g. Swedish resin at 80–90° C. are then added and finally a solution of 20 g. caustic potash in 120 g. water cooled to 60–70° C. is added. Vigorous stirring is needed throughout. 1,000 g. hot water are poured in and when soap formation is ended a further 800 g. water are added.

Asphalt or Bitumen Emulsion

British Patent 441,782

Rosin	100 lb.
Slaked Lime	3¾ lb.

Heat at 140° C. and mix until uniform. Add while mixing

Fuel Oil	103 lb.

Take 4 lbs. of above mixture and add to 100 lbs. melted bitumen or asphalt and then disperse mixture in 0.05 N potassium rosinate solution to give a 57% bitumen content.

Asphalt-Rubber Emulsion

Swedish Patent 86,859

Shale asphalt, consisting of residues obtained after distg. crude shale oil, is heated to about 300° and distd. in steam at 325° to drive off traces of oil, and mixed with montan wax and a fatty acid at 120–30° in the proportions asphalt 50, wax 1–2 and fatty acid 0.5–2.5. The molten mixt. is led in fine stream with stirring into an aqueous caustic soda or soap solution at 90° C. in proportions water 15–20, a caustic soda 0.3–0.6 and fatty acid 0.4–0.5. The emulsion is then boiled for 2–10 min., and may be mixed at a temperature not above 55° C. with a rubber emulsion, such as Revertex.

Pitch Emulsion

British Patent 462,111

Coal Tar Pitch	180 lb.
Stearin Pitch	20 lb.

Melt together and add to following at 100° C.

*Casein Solution	45 lb.
Water	35 lb.
Caustic Potash	1 lb.

then add

Water, Boiling	120 lb.

* Casein Solution—

Casein	56 lb.
Caustic Potash (50%)	10 lb.
Water	494 lb.
Cresylic Acid	11 lb.

Lacquer Emulsions

Patented

The following table is given to illustrate typical formulations of nitrocellulose emulsions for various uses. In the case of pigmented lacquer emulsions only carbon black and a gray are given because they illustrate opposite extremes in ease of emulsification. The gray is formulated with zinc oxide. It is necessary to use a colloid mill or homogenizer in making these emulsions.

Clear Lacquer Emulsions for Furniture

Formula No. 1

Lacquer Phase

5–6 Sec. Nitrocellulose (dry weight)	17.0 oz.
Ester Gum	13.6 oz.
Dibutyl Phthalate	3.4 oz.
Butanol Carried by Nitrocellulose	7.4 oz.
Butanol	9.1 oz.
Hi-Flash Solvent Naphtha	16.5 oz.
Secondary Hexyl Acetate	16.5 oz.
Octyl Acetate	16.5 oz.

Water Phase

Water	78.5 oz.
Acetone	20.0 oz.
Purified Duponol W. A. or Duponol M. E. (dry)	0.5 oz.
Sulphonated Castor Oil	1.0 oz.

Ratio of lacquer phase to water phase recommended: From 2.5 to 1, to 3.5 to 1 parts by weight.

No. 2

Lacquer Phase

R. S. ½ Sec. (dry weight)	18.5 oz.
Lewisohl No. 2	18.5 oz.
Dibutyl Phthalate	3.7 oz.
No. 15 Castor Oil	5.8 oz.
Butanol Carried by Nitrocellulose	8.0 oz.
Butanol	2.7 oz.
Hi-Flash Solvent Naphtha	10.7 oz.
Secondary Hexyl Acetate	32.1 oz.

Water Phase

Water	83.5 oz.
Acetone	15.0 oz.
Duponol M. E. (dry)	0.5 oz.
Sulphonated Castor Oil	1.0 oz.

Ratio of lacquer phase to water phase recommended: From 2.5 to 1, to 3.5 to 1 parts by weight.

Black Pigmented Lacquer Emulsion

Lacquer Phase

R. S. ½ Sec. (dry weight)	20.0 oz.
Dammar Gum (Dewaxed) (dry weight)	6.0 oz.
Dibutyl Phthalate	3.0 oz.
Tricresyl Phosphate	2.6 oz.
Blown Castor Oil	5.4 oz.
Carbon Black	2.0 oz.

Butanol Carried by Nitrocellulose	8.6 oz.
Butanol	5.0 oz.
Denatured Ethyl Alcohol (in Dammar Solution)	4.0 oz.
Hi-Flash Solvent Naphtha	13.8 oz.
Toluol (in Dammar Solution)	2.0 oz.
Secondary Hexyl Acetate	13.8 oz.
Octyl Acetate	13.8 oz.

Water Phase

Water	98.50 oz.
Duponol M. E. (dry)	0.25 oz.
Sulphonated Castor Oil	1.25 oz.

Ratio of lacquer phase to water phase recommended: From 2.5 to 1, to 3 to 1 parts by weight.

Gray Pigmented Lacquer Emulsion

Lacquer Phase

R. S. ½ Sec. (dry weight)	18.0 oz.
Dammar Gum (Dewaxed) (dry weight)	5.4 oz.
Tricresyl Phosphate	3.0 oz.
Blown Castor Oil	6.0 oz.
Gray Pigment*	12.0 oz.
Butanol Carried by Nitrocellulose	7.8 oz.
Butanol	1.9 oz.
Denatured Ethyl Alcohol (in Dammar Solution)	4.0 oz.
Hi-Flash Solvent Naphtha	14.0 oz.
Toluol (in Dammar Solution)	2.0 oz.
Secondary Hexyl Acetate	13.0 oz.
Octyl Acetate	12.9 oz.

Water Phase

Water	98.20 oz.
Duponol M. E. (dry)	0.25 oz.
Sulphonated Castor Oil	1.25 oz.
Methyl Cellulose	0.30 oz.

Ratio of lacquer phase to water phase recommended: From 2 to 1, to 2.5 to 1 parts by weight.

* Composition of gray pigment:

Zinc oxide	96.0 oz.
Chrome yellow	1.6 oz.
Carbon black	0.7 oz.
Prussian blue	0.7 oz.
Iron oxide	1.0 oz.

Clear Lacquer Emulsion Greaseproof to Vegetable Oils

Lacquer Phase

5–6 Sec. Nitrocellulose (Dry Weight)	25.0 oz.
Tri-ethyl Citrate	15.0 oz.
Butanol carried by Nitrocellulose	10.7 oz.
Secondary Hexyl Acetate*	36.0 oz.
Xylol*	13.3 oz.

Water Phase

Water	98.5 oz.
Duponol M. E. (Dry)	0.5 oz.
Sulphonated Castor Oil	1.0 oz.

Ratio of lacquer phase to water phase recommended: From 2.5 to 1, to 3.5 to 1 parts by weight.

Clear Lacquer Emulsion Greaseproof to Mineral Oils—(for use where toxicity of coating is not objectionable)

Lacquer Phase

5–6 Sec. Nitrocellulose (Dry Weight)	25.0 oz.
Tricresyl Phosphate	15.0 oz.
Butanol carried by Nitrocellulose	10.7 oz.
Secondary Hexyl Acetate*	36.0 oz.
Xylol*	13.3 oz.

* An alternate solvent combination for use where drying at elevated temperatures can be used is butyl acetate and toluol in equal amounts.

Water Phase

Water	98.5 oz.
Duponol M. E. (Dry)	0.5 oz.
Sulphonated Castor Oil	1.0 oz.

Ratio of lacquer phase to water phase recommended: From 2.5 to 1, to 3.5 to 1 parts by weight.

Clear Lacquer Emulsion Greaseproof to Mineral Oils—(for use where color and odor are not objectionable)

Lacquer Phase

5–6 Sec. Nitrocellulose (Dry Weight)	20.0 oz.
Blown Castor Oil	30.0 oz.
Butanol carried by Nitrocellulose	8.6 oz.
Toluol	20.7 oz.
Butyl Acetate	20.7 oz.

Water Phase

Water	98.5 oz.
Duponol M. E. (Dry)	0.5 oz.
Sulphonated Castor Oil	1.0 oz.

Ratio of lacquer phase to water phase recommended: From 2 to 1, to 3 to 1 parts by weight.

Chlorinated Rubber Emulsion

Stable emulsions can easily be obtained without the use of emulsifying agents, if, for example, 70 g. of chlorinated rubber, 30 g. xylol and 40 g. of water—kept apart from each, *i.e.*, the chlorinated rubber is not dissolved but fed simultaneously and progressively into a stirring device in operation.

Chlorinated Rubber Emulsion
Canadian Patent 360,946

Casein	2 oz.
Ammonia (28%)	0.1 oz.
Turkey Red Oil	6 oz.

Heat to 35° C. with stirring and add slowly a solution of

Chlorinated Rubber	20 oz.
Trichlorethylene	80 oz.

Stir until uniform. This disperses well in water.

Lecithin Emulsions

British Patent 437,859

Soya Lecithin	8 oz.
Pine Oil	15 oz.
Turpentine	12 oz.
Paraffin Oil	10 oz.
Water	55 oz.

Teglac (Synthetic Resin) Emulsion

Teglac 65	12.5 g.
Toluol	12.5 g.

Dissolve by stirring.

Into above run slowly with good mixing

Triethanolamine	1 cc.
Water	10 cc.

Gives a thick emulsion which dries to fair gloss in thin films.

Gold Sol

The stock solution contains gold bromide crystals, 5.0 g.; purified potassium bromate, 1.365 g.; and freshly distilled water, 38.7 g. This solution is stable for one year. For preparation of the gold sol, 1 cc. of the stock solution is first diluted with 14 cc. of distilled water and then further diluted with water to make one liter. For the reduction, 10 cc. of a 1% potassium oxalate solution is added, and the solution placed in daylight for about 20 minutes.

Demulsifier for Oils

U. S. Patent 2,051,226

Furfuraldehyde-Potassium Bisulphite Solution	11.1 cc.
Ricinoleic Acid	50.4 cc.
Ammonia (0.897)	8.9 cc.
Castor Oil	29.6 cc.

Emulsifiers

Formula No. 1

Cottonseed Oil	75 g.
Diethylene Glycol	22 g.
Potassium Carbonate	1 g.

Heat with good stirring, for 1 hour, at 125–130° C.

This is soluble in mineral oil and disperses in warm water.

No. 2

Castor Oil	46.6 g.
Soya Bean Oil	112.5 g.
Diethylene Glycol	44.0 g.
Potassium Carbonate	2.0 g.

Method as above.

No. 3

Coconut Oil	137 g.
Diethylene Glycol	44 g.
Potassium Carbonate	2 g.

Method as above.

No. 4

Palm Kernel Oil	150 g.
Diethylene Glycol	44 g.
Potassium Carbonate	5 g.

Method as above.

No. 5

U. S. Patent 2,090,909

Castor Oil, Blown	85 g.
Castor Oil Fatty Acids	15 g.
Sodium Hydroxide (10%)	6.7 g.

No. 6

Diglycol Laurate	80 g.
"Carbitol"	20 g.

A good white water in oil cream emulsion is obtained from

Above Emulsifier	15 g.
Mineral Oil	40 g.
Water	45 g.

No. 7

German Patent 646,503

Pectin	4–5 g.
Agar	1 g.
Gelatin	½ g.
Water (Boiling)	100 cc.

Soya Bean Emulsifier

Soya Bean Flour	1 lb.
Water	150 lb.
Caustic Potash	0.1 lb.

Heat together and stir until uniform.

Wetting Out and Emulsifying Agents

U. S. Patent 1,999,628–32

	Formula No. 1	No. 2
Turkey Red Oil	20 oz.	30 oz.
Sodium Tetrahydronaphthalene Sulfonate	5 oz.	10 oz.
Trisodium Phosphate	10 oz.	50 oz.
Cetyl Alcohol	10 oz.	—
Soda Ash	12 oz.	—
Methyl Hexalin	—	10 oz.

Melt together and stir until uniform.

No. 3

Tripotassium Phosphate	3 oz.
Ammonium Lauryl Sulphate	1 oz.

Dispersing Agent

Formula No. 1

U. S. Patent 2,058,013

Tallow	175
Dimethyl Amine (25%)	324

Heat at 200° C. in an autoclave for 16 hours. This yields a mixture of dimethyl amides.

No. 2

German Patent 622,640

Lauryl Alcohol, Melted	186 kg.
Chlorsulphonic Acid	116 kg.

Stir while heating gently.

After removing the hydrogen chloride by passing through the reaction mixture a current of inert gas, add

Triethanolamine	150 kg.

Defoaming

Octyl alcohol is used as a defoaming agent as follows (all suggested concentrations are by volume unless otherwise indicated):

(a) Oil, where foaming is due to presence of water, use 0.0005%.
(b) Varnish inks, use 0.001–0.01%.
(c) Beet sugar, use 0.0005–0.005% of solution.
(d) Paper, use 0.0005–0.005% of pulp.
(e) Analytical procedure; such as analyses of fruit juices, powdered milk, petroleum-water mixtures, etc., use a few drops in 500 cc.
(f) Photographic film developing solutions. Spray 1 to 10 oz. for 200 gal. of foam.
(g) Textile printing, use 0.25–1.5% of paste.
(h) Chemical Processes (manufacture dyes, alum, etc.) use .1–1.0%.
(i) Wire drawing soap lubricants, use 0.01–0.1%.
(j) Asphalt emulsions, use 0.001–0.01%.
(k) Eliminating air bubbles and ''pin holes'' in gelatin glue spreading, use 0.1–1.0%.

Wetting Agent

Octyl alcohol is used in the following proportions by volume:

(a) Pigments in water or oil base paints, use 0.02–1.0% of weight of pigment.
(b) Pigments in water base cosmetic lotions, use 0.001–0.01%.
(c) Pottery casting clays to increase ''slip'' and remove air bubbles, use, 0.0001–0.001% of ''slip''.
(d) Leather dressings, spray 0.002–0.02% onto pigment before water is added.
(e) Pigments in lacquers, use 0.1–1.0% of weight of pigment.
(f) Mercerizing baths.
(g) Penetrating oils, use approximately 1.0%.

Defoaming Skim Milk

The addition of 0.1–0.5% diglycol laurate or glyceryl glycol laurate to skim milk decreases foaming greatly.

Breaking Oil Emulsions

5% of a solution of the following is agitated with the emulsion and then allowed to settle:

Naphthenic Acid	¼ lb.
Salt	¼ lb.
Water	99½ lb.

Flotation Agent

U. S. Patent 2,094,646

Crude Paraffin Base Petroleum	4 lb.
Kerosene	4 lb.
Creosote, Coal Tar	1 lb.

Soilless Growing Nutrient Salts

	Formula No. 1	No. 2
Calcium Chloride, Anhydrous	——	3.2 g.
Potassium Monophosphate	5.9 g.	3.9 g.
Calcium Nitrate	20.1 g.	——
Magnesium Sulphate	10.7 g.	10.3 g.
Ammonium Sulphate	1.8 g.	——
Sodium Nitrate	——	6.4 g.
Water	5 gal.	5 gal.
*Trace Solution	10 cc.	10 cc.
†Iron Solution	40 cc.	40 cc.

	No. 3	No. 4	No. 5	No. 6
Superphosphate	5.8 g.	——	——	——
Sodium Nitrate	6.4 g.	——	——	——
Magnesium Sulphate	10.3 g.	7.3 g.	4.9 g.	2.4 g.
Potassium Chloride	3.9 g.	——	——	——
Potassium Sulphate	——	5.6 g.	——	——
Double Superphosphate	——	8.6 g.	5.7 g.	2.8 g.
Potassium Nitrite	——	12.0 g.	16.0 g.	16.0 g.
Ammonium Sulphate	——	4.0 g.	4.9 g.	10.4 g.
Water	5 gal.	5 gal.	5 gal.	5 gal.
*Trace Solution	5 cc.	——	——	——
†Iron Solution	20 cc.	——	——	——

No. 7

Calcium Nitrate, Dry	19.5 g.
Potassium Nitrate	2.1 g.
Potassium Monophosphate	5.5 g.
Magnesium Sulphate, Dry	1.5 g.
Sal Ammoniac	1.5 g.
Magnesium Nitrate	6.1 g.
Water	5 gal.
*Trace Solution	5 cc.
†Iron Solution	40 cc.

* Trace solution consists of:

Manganese Sulphate	0.8 g.
Zinc Sulphate	0.8 g.
Boric Acid	0.8 g.
Water	1 pt.

† Iron solution consists of:

Ferrous Sulphate	0.8 g.
Water	1 pt.

This should only be added to above solution directly before use as it forms a precipitate.

Fertilizer for Flowers and Herbs

Ammonium Nitrate	20 oz.
Ammonium Chloride	2½ oz.
Ammonium Phosphate	10 oz.
Potassium Nitrate	12½ oz.
Calcium Sulphate	3 oz.
Iron Sulphate	2 oz.

This mixture is employed by dissolving a teaspoonful in a gallon of water, and sprinkling the latter on the plants.

Humus Rich Fertilizer

U. S. Patent 2,027,766

Peat dried to 10% moisture or leather scrap is autoclaved with ammonia at 180–300° F. for 8 hours.

Fertilizer

Formula No. 1

U. S. Patent 2,081,401

A process for producing a fertilizer which comprises treating a superphosphate material with a solution of about 34.5 parts of ammonium chloride in about 80.5 parts of 50% aqua ammonia, said solution being added to the superphosphate material in the proportions of about 115 parts of the solution to about 890 parts of superphosphate, all parts by weight.

No. 2

Swiss Patent 185,428

A fertilizer is made by heaping a mixture of sludge or silt and peat dust in piles and leaving till the temperature of the centers of the piles is above 50° C. The piles are then turned over to bring the outer layers to the center and to allow the center to cool on the outside.

Insecticidal Fertilizer

U. S. Patent 2,095,366

Unspent Humus	40 lb.
Bone Meal	35 lb.
Blood, Dried	20 lb.
Copper Sulphate	5 lb.

Dry Poultry Manure Fertilizer

British Patent 471,067

Poultry Manure	1 lb.
Quick-lime	1 lb.

Mix together and grind with

Bone Meal	⅕ lb.

Citrus Fertilizer

U. S. Patent 2,002,400

Wet Citrus Pomace	2000 lb.
Calcium Cyanamid	300 lb.
Calcium Sulphate	80 lb.

Mix and store until temperature rises to 90–100° C., then mix in

Sodium Nitrate	215 lb.
Potassium Sulphate	50 lb.
Ammonium Sulphate	100 lb.
Triple Superphosphate	250 lb.

Fish Meal Fertilizer

Fish Waste	1 ton

is treated with

Formaldehyde	5–10 lb.

and digested at 50° C. Press to remove oil, etc. Then dry to produce a powder.

Shark Meal Fertilizer

A very high grade feed or fertilizer can be produced from the carcass of the shark, and this method of utilizing same is recommended instead of for edible purposes, unless the fresh meat can be sold locally, in which case both methods can be used.

Shark meal is high in vitamin contents, and other feed values, and is mixed with less rich feeds for fattening fowls and animals. It is too strong to be used alone as a fertilizer, and is, therefore, also mixed with other fertilizers. In order to produce shark meal economically, it is necessary to obtain sufficient quantities of sharks in *one location*, to warrant the cost of a plant. A power plant with grinding and drying machinery is required. It is not practical to transport the carcasses forty or fifty miles, and they cannot be preserved.

There are other shark by-products which can be developed, such as liver oil for medical purposes, backbones, etc. It has been found advisable, however, to begin operations by saving only the hides, fins, teeth and oil, and develop the other by-products gradually, as soon as the other operations are well established.

Caterpillar Banding Compositions

Formula No. 1

Soft:

Petroleum Sludge	50 kg.
Lime Hydrate	6 kg.
Tar (Rosin or Wood)	2 kg.
Rosin Oil	6 kg.

No. 2

Medium:

Petroleum Sludge	40 kg.
Lime Hydrate	10 kg.
Rosin Oil	10 kg.
Tar	3 kg.

No. 3

Solid:

Petroleum Sludge	40 kg.
Lime Hydrate	15 kg.
Rosin Oil	12 kg.
Tar	3 kg.

No. 4

Blue or Green Petroleum Oil	50 kg.
Lime Hydrate	6 kg.
Rosin Oil	9 kg.
Wood Tar	2 kg.

No. 5

Gas Oil	35 kg.
Tar Oil, Free of Phenol	15 kg.
Lime Hydrate	8 kg.
Rosin Oil	10–12 kg.

No. 6

a.	Oleic Acid	20 kg.
	Mineral Oil Fraction	30 kg.
	Slaked Lime	3 kg.
	Water	15 kg.
b.	Blue Oil	60 kg.
	Crude Creosote	10 kg.

Boil *a* until it gels (stringy!) and add *b*. Stir until cold. To cheapen, add

Heavy Spar	10 kg.

To Protect Trees Against Deer

Formula No. 1

Clay, Dry, Free from Sand, Powdered	500 g.
Train Oil	35 g.
Cattle Blood	to thicken

No. 2

Spent Lime	20 kg.
Linseed Oil	2.5 kg.
Naphtha	3 kg.

No. 3

Sodium Carbonate	1 kg.
Cattle Blood	4 kg.
Coal Tar	4 kg.

No. 4

Cattle Blood	10 kg.
Spent Lime	1 kg.

No. 5

Coal Tar	60 kg.
Naphtha	20 kg.
Animal Oil, Thickened*	15 kg.
Ammonium Sulphate	5 kg.

* With lubricating grease made from lime soap and mineral oil.

No. 6

Ceresin	20 kg.
Spindle Oil	65 kg.
Carbolineum	15 kg.

No. 7

Coal Tar	1 kg.
Cattle Blood	1 kg.
Sodium Carbonate	1.3 kg.

Citrus Tree Frost Protection

U. S. Patent 2,057,316

Spray trees, beginning a few minutes before sunrise, and continue until the orchard has been warmed up, that is, approximately until nine or ten in the morning, with a solution containing such chemical ingredients as ammonium sulfate, calcium nitrate and ammonium phosphate. A typical formula is the following:

Ammonium Sulphate	50 lb.
Calcium Nitrate	100 lb.
Ammonium Phosphate	50 lb.
Water	approximately 50,000 gal.

This treatment is based upon the theory that the damage to frosted trees results not from the frost itself, but rather from the later effects of the burning rays of the sun following the frost.

Tree Wound Dressing

Use a coating of lanolin to get rapid callous formation.

Painting Tree Wounds

Experts agree that there is no need of painting over wounds which are not more than two or two and a half inches in diameter. Paint made of common white lead and linseed oil is entirely satisfactory for painting larger wounds.

Plant Protecting Composition

German Patent 642,493

Insectifuges for protecting plants and trees comprise tar oil, castor oil, naphthalene and pyrethrin, with or without phenol or cresol. Suitable proportions are tar oil 50–75, castor oil 50–25, naphthalene 17–18, pyrethrin 3–15, and phenol or cresol 1–4 parts by weight. The compositions may be applied as such or as aqueous emulsions, or they may be mixed with solid diluents or fertilizers and applied as powders.

Prevention of Downy Mildew on Tobacco

Tobacco seedlings are exposed to benzol vapor for 3–9 days to prevent downy mildew attack.

Control of Tobacco Insects

A poison bait consisting of 0.5 lb. Paris green or sodium fluosilicate, 25 lb. of coarse bran or cottonseed meal, and 3 gal. of water scattered over a field at the rate of 15 lb. per acre will effectively control cutworms. For budworms on tobacco 1 lb. of cryolite or lead arsenate to 75 lb. of corn meal is suggested. Flea beetles and hornworms are best controlled by dusting at the rate of 3–5 lb. per acre with a mixture of 1 lb. of cryolite to 3 lb. of fine road dust or flour.

Spray for Sigatoka Disease in Banana Plants

To combat the plant disease known as Sigatoka, which by attacking the leaves prevents the development of the plant, banana plantations in Guatemala and Honduras are effectively employing a Bordeaux mixture spray.

The mixture is made in the field by adding 5 pounds of copper sulphate and 5 pounds of lime to each 50 gallons of water. This mixture is distributed through pipe lines laid among the banana plants and applied with hand sprays to the leaves. In the first application 300 gallons are applied to each acre, while subsequent sprayings, to follow at intervals of 15 days, require but 275 gallons per acre. It is anticipated that from 12 to 18 applications each season will be sufficient to protect the plants.

To remove any remaining Bordeaux mixture from bananas before shipment to market a washing machine is used. Stems passing through this machine are rinsed with a mixture containing hydrochloric acid to remove the Bordeaux mixture, and later with fresh water to remove the hydrochloric acid.

Removal of Spray Residues from Tomatoes

Dip in 1% hydrochloric acid solution for 1½ minutes, then immerse in limewater (¼ lb. hydrated lime to 10 gal. water) for 1 minute and then wash with clean water.

Removing Spray Poisons from Cherries

Crates of cherries are dipped in tanks of 1% hydrochloric acid for 30–60 seconds, with gentle mixing. Rinse carefully in clean water and dry.

(Orchard) Tree Wax

Rosin	25 kg.
Japan Wax	10 kg.
Beeswax	25 kg.
Tallow	15 kg.
Turpentine, Venice	25 kg.

Rose Bug Spray

A 3% solution of paraldehyde in water is effective as a spray against rose bugs and similar pests.

Destruction of Wasps and Yellow Jackets

The most effective and least damaging remedy is to pour about 4 oz. of carbon disulfide in the nest. This is best done through a funnel. All insects in the nest are killed at once, and those out of the nest fly into the toxic vapors on their return.

West Indian Fruit Fly Spray

Tartar Emetic	4–8 lb.
Molasses	5 gal.
Water	100 gal.

Palargonium Rust Spray

Formula No. 1

(Outdoors)

Colloidal Sulphur	2 lb.
Water	100 gal.

No. 2

(For Greenhouses)

Lime-Sulphur Spray

Orange Worm Sprays

Formula No. 1

Dusting Spray

Barium Silicofluoride	50 lb.
Talc, Fibrous	45 lb.
Mineral Oil, Refined	5 lb.

Spray at rate of 1 lb. per tree.

No. 2

Sodium Silicofluoride	3 lb.
Water	100 gal.

Use blood-albumen as spreader.

Japanese Beetle Spray

For repelling Japanese beetles, the following spray is used:

Slaked Lime	20 lb.
Aluminum Sulphate	3–6 lb.
Water	100 gal.

For asparagus ½ lb. sodium lauryl sulphate is added to the above.

Tobacco Flea Beetle Spray

It is recommended that the plant beds be sprayed with arsenate of lead (paste) at the rate of 1 pound to 10 gallons of water, or with arsenate of lead (powdered) or arsenate of lime at the rate of 1 pound to 20 gallons of water; or the plants may be dusted with powdered arsenate of lead or arsenate of lime mixed with fine sifted wood ashes at the rate of 1 pound of the poison to 4 pounds of the ashes.

Parasite Spray

U. S. Patent 2,037,656

A parasiticidal preparation, comprises the complex products of the reaction between zinc-lime, and lime-sulphur. For example, zinc-lime may be prepared by mixing 4 lb. of zinc sulphate (white vitriol) with 4 lb. of hydrated lime (calcium hydroxide) in 50 gal. of water. Then 1¼ gal. of lime-sulphur solution testing 33° Bé. may be added. If desired, arsenate of lead at the usual strength may be added for the control of certain insect pests. The above described mixture in fluid form when sprayed upon plants causes no injury and is toxic to parasitic organisms.

Plant and Tree Spray

U. S. Patent 2,046,961

A composition of matter suitable for use as a plant and tree spray comprises by weight a petroleum fraction having a sulphonation value above 50, 1.2–0.3 per cent, trichlorobenzene 0.4–0.1 per cent, an emulsifying agent 0.04–0.01 per cent, water 98.36–99.59 per cent.

Pyrethrum Spray, Non-Inflammable

Pyrethrum Extract (Kerosene)	1 gal.
Carbon Tetrachloride	4 gal.

The above is useful for airplane spraying against mosquitoes.

Ant Spray

Naphthalene	1 oz.
Kerosene	4 oz.
Cyclohexanol	2 oz.
Creosote	1 oz.

Dissolve by mixing and add slowly with vigorous stirring

Liquid Soap	32 oz.
Water	120 oz.

Termite-Proofing Oil

Formula No. 1

Paradichlorbenzol	16 lb.
Creosote Oil	25 lb.
Wood Tar Oil	15 lb.
Heavy Mineral Oil	44 lb.

The paradichlorbenzol crystals are melted and poured into the heavy mineral oil. This mineral oil is a low viscosity oil partially refined lubricating oil of about 10 seconds viscosity S.A.E.

The creosote oil is a coal tar distillation product containing about 35% of free mixed cresols.

The wood tar oil is a viscous product obtained from the dry distillation of pine and other resinous woods.

The last two products are added to the mineral oil mixture.

This product may be applied to the infested areas of the wood with a paint brush, mop, or spray gun. It may also be poured into the ground in a hole drilled close to the nest or colony.

No. 2

Sodium Fluoride	50 lb.
Sodium Arsenate	42 lb.
Picric Acid	8 lb.
Water	3 gal. per lb. of above

The above products are mixed and added to the water and stirred occasionally until dissolved.

This solution may be applied with a spray gun, or brush or mop; however, the preferred form is to drill a small hole in the infested wood or wood to be protected, and with a suitable fitting apply the solution at a pressure of several hundred pounds. The hole should be drilled to the heart of the structural wood. As the solution is a deep yellow due to the picric acid, this dye-like action makes it known to the operator how far the solution has penetrated.

CAUTION: As this solution is very poisonous, the user should wear rubber gloves. Avoid taking any internally.

Termite Killer
Formula No. 1

Soda Ash	10 g.
Sodium Sulphate, Anhydrous	20 g.
Salt	20 g.
Borax, Powdered	25 g.
Tartar Emetic, Powdered	25–50 g.
Sodium Fluosilicate, Powdered	50 g.
Kieselguhr	50 g.
Sodium Fluoride, Powdered	100 g.

No. 2
U. S. Patent 2,059,125

Orthodichlorbenzol	23.98 lb.
Naphtha	35.20 lb.
Betanaphthol	4.32 lb.
Rosin	4.32 lb.
Alcohol	6.90 lb.

Colloidal Sulphur
U. S. Patent 2,046,880

A process of producing a colloidal sulphur, comprises adding a thiosulphate solution to a bulk supply of sulphuric acid so as to form sulphur in the colloidal condition, while maintaining the reaction temperature mainly between 40 and 50° C.

Colloidal Sulphur
U. S. Patent 2,064,728

Glycerin	60
Water	40
Ammonium Caseinate	10
Sulphur	40

Heat together with good mixing and keep at 120–130° C. until uniform.

Nicotine Spray "Spreader"
Formula No. 1

Water	5.00
Potassium Hydroxide (92% Flakes)	7.40
Pine Tar Oil (Sp. Gr. 1.035)	44.30
Ethylene Glycol Monoethyl Ether	10.00
Oleic Acid	33.30

The ingredients are to be added in the order given from top to bottom. The potassium hydroxide is dissolved in the water before the pine tar oil is added. This combination requires no heat.

During the past year, a second formula has been used that permits an increase of pine tar oil and a decrease in solvents in the formula. Formula 2 has about the same effect as Formula 1. It is a cheaper spreader, mixes more readily with water, but is more complex. Each formula thus has advantages.

No. 2

Water	5.00
Potassium Hydroxide (92% Flakes)	7.40
Pine Tar Oil (Sp. Gr. 1.035)	48.80
Iso Amyl Alcohol	3.00
Phenol (85%)	1.00
Ethylene Glycol Monoethyl Ether	1.50
Oleic Acid	33.30

The same mixing directions given in Formula 1 apply to Formula 2.

Increasing Efficiency of Nicotine Sulphate Sprays

Using 1 oz. gum karaya per 500 fl. oz. of nicotine sulphate spray increases efficiency 3–5 times.

Insecticidal Spray Spreader
U. S. Patent 2,018,681

A spreader composition consists of soyabean flour 5, dried skimmed milk 15, and powdered slaked lime. 1 lb. of this spreader is used per 100 gal. of spray.

Insecticidal Oil Spray
U. S. Patent 2,096,947

Petroleum Oil (40–100 Sec. Saybolt)	100 lb.
Cetyl Alcohol	0.2–10 lb.

Agricultural Spray Spreader

Use ¼–½ lb. waste sulphite liquor concentrate (goulac, lignone, etc.) per 50 gal.

Plant Spray
Austrian Patent 151,664

Copper Sulphate	10.0 g.
Ammonium Carbonate	39.5 g.
Dextrin	20.0 g.
Soda, Sal	20.0 g.

Sulphur, Colloidal	10.0 g.
Saponin	0.5 g.
Water	1.0 l.

Soyabean Spreader for Sprays

One lb. soyabean flour per 100 gal. of following codling moth spray greatly increases efficiency and permits easier removal from fruit.

Lead Arsenate	3–6 lb.
Lime, Slaked	2 lb.
Water	100 gal.

Eradicating Poison Ivy

A 20 per cent solution of sodium thiocyanate seems to be the most practical. This may be had by mixing five pounds of the sodium thiocyanate in three gallons of water and this amount of spray should be enough to take care of one application on an area of 150 square feet.

This spray should be applied with a pressure spray pump, completely saturating all the leaves and stems of the ivy plants above ground. The ideal time to apply this treatment is along the latter part of June.

Dry Arsenical Fungicide

Calcium Hydroxide	55 g.
Water	3 l.

To the above add while mixing

Talc	850 g.

and

Arsenic Trioxide	110 g.

Mix and dry in a revolving drum at 120–150° C.

Grub and Root Aphid Killer

Break soil and drop in 1–2 lb. naphthalene per 100 sq. ft.

Soil Fungicide for Damping-Off

Formula No. 1

Trioxymethylene	3 lb.
Fullers' Earth or Dry Soil	47 lb.

Apply 2 oz. per sq. ft. of seed bed.

No. 2

Formaldehyde	3 lb.
Fullers' Earth or Dry Soil	17 lb.

Weed-Killers

An alkaline arsenical weed-killer is made of: Arsenious acid, 16 oz.; sodium hydroxide, 16 oz.; water, 120 oz. Boil until clear, then dilute to one gallon. This concentrated preparation is diluted with nine parts of water before using. Each gallon of a diluted solution is sufficient for 4 square yards.

A simpler method is the following: Dissolve 2½ lb. of granular caustic potash in 1 gal. of water in an open cask, and, by the aid of heat generated during solution, dissolve in the caustic liquid 2½ lb. of arsenic, added gradually in small quantities, and add color. Dilute this concentrated solution to 25 gal. with water when required for use.

An acid weed-killer is made as follows: Arsenious oxide, 15; spirits of salts, 50; water, 50. Boil together. When cool, dilute to 200 parts with water and add color. For use, the finished liquid is diluted with 10 times its volume of water.

If small quantities are required, a colored solution of sodium arsenate, 1 lb., in water 5 gal., will provide an effective solution which can be rapidly prepared.

Sodium chlorate sprinkled either dry or in solution, on garden paths at the rate of ½ to 1 lb. for every square yard, is a useful non-poisonous weed-killer.

Weed Killer and Dust Layer

Sodium Arsenite	8 lb.
Fuel Oil	1 gal.
Red Oil	1 oz.
Aqua Ammonia (26°)	2 oz.
Water	1 gal.

Herbicide (Weed Killer)

U. S. Patent 2,007,433

Kerosene	89 lb.
Furfuraldehyde	10 lb.
Heavy Petroleum Oil	1 lb.

Dandelion Killer

Furfuraldehyde	10 lb.
Butyl Alcohol	20 lb.
Kerosene	70 lb.

Chickweed Eliminator

Sodium Arsenite	1 lb.
Soap Chips	1 lb.
Water-Soluble Green Color	1 oz.
Water	98 lb.

Hoary Cress Eradicant

Two ounces of carbon bisulphide poured into holes 6 inches deep and staggered 18 inches apart over the infested area kill Hoary Cress *(Lepidium Draba)*.

Bermuda Grass Eradicant

Carbon bisulphide, sprinkled on the infested area and covered immediately with a wet canvas, building paper, or other cover to prevent rapid loss by evaporation, is an effective eradicant of Bermuda grass.

Curing Brown Patch in Lawns

The soil around the infested spots should be forked to permit penetration of a solution of corrosive sublimate (3 oz. in 50 gal. of water). This should soak in to a depth of three or four inches. If this fails another possibility is to remove the soil to a depth of five or six inches, replace with fresh soil and reseed.

Or use a mixture of two parts calomel and one part corrosive sublimate. This should be applied at the rate of two or three oz. per 1,000 sq. ft. as a spray or mixed with soil.

If attacks are numerous, they may be held off by regular preventive treatments of fungicides to be made at ten day intervals during periods of hot, humid weather. Where turf is attacked only occasionally it is hardly worth while to attempt to control the disease. Ordinarily the disease will soon spend itself, after which the damaged spots can be repaired.

Grub-Proofing Lawns

The University of Maryland advises the use of 5 to 15 pounds of lead arsenate to 1,000 square feet of lawn. The amount to use depends on the intensity of the infestation. With an infestation of less than 100 grubs to the square yard use 5 pounds, if the infestation is heavier use 10 to 15 pounds. The lead arsenate should be mixed with about 25 times its volume of moist sand and broadcast evenly. This treatment can be made at any time except when the ground is frozen. It is best, however, to apply it before July 1.

When new lawns are made, they may be grub-proofed by incorporating 35 pounds of arsenate of lead, to 1,000 square feet of lawn in the upper three inches of soil.

Cutworm Destruction
Poison Bran Mash

Water	1	qt.
Paris Green	15	g.
Amyl Acetate	½	oz.
Molasses	2	oz.

Mix bran and Paris green dry.

Mix the molasses with the water and mix thoroughly with the bran and Paris green.

Finally mix with the amyl acetate.

Scatter thinly over the turf late in the evening. Is just as effective if placed in small piles under pieces of boards to keep it away from chickens and birds.

How to Kill Toadstools

Soak the ground thoroughly with sulphate of copper or Bordeaux mixture. This will kill the fungus.

Another method is to loosen the soil and apply an iron sulphate solution, one pound in 1½ gallons of water. Bordeaux mixture is preferred as it does little or no damage to the grass.

Controlling Hairy Cinch Bug in Turf

Two applications of tobacco dust (1% nicotine), cubé dust (1% rotenone) or a nicotine sulphate spray (1:400) will control heavy infestations of this insect. The dusts are applied 25 lb. per 1,000 sq. ft., the sprays 240 gal. per 1,000 sq. ft.

Insecticide

*Nicotine	1 kg.
Methanol	10 kg.
Water	10 kg.

* This is very poisonous and should not be gotten into cuts or left on the hands.

Insecticide Powders
Formula No. 1

Pyrethrum Flowers, Finely Powdered	90 kg.
Hexachlorethane	10 kg.

No. 2

Pyrethrum Flowers, Finely Powdered	80 kg.
Derris Root, Finely Powdered	10 kg.
Naphthalene	5 kg.
Magnesium Carbonate, Precipitated	5 kg.

No. 3

Pyrethrum Extract, Dry	10 oz.
Fullers' Earth or Flour	90 oz.

Active Pyrethrin Insecticide
U. S. Patent 2,066,737

Extraction of pyrethrum flowers with kerosene (2½ gal. per lb. of flowers) for 20–30 minutes gives more active extracts than by lengthier extractions.

Insecticide Sprays
Formula No. 1

Pyrethrum Extract, 15%	100 kg.
Turkey Red Oil, Neutral	500 kg.

Apply in 0.5–1% aqueous dilution.

No. 2

Pyrethrum Extract, 15% in Acetone	100 kg.
Derris Extract in Acetone, Containing 8% of Rotenone	100 kg.
Turkey Red Oil, Neutral	800 kg.

Apply as No. 1.

No. 3

Pyrethrum Extract (15% Pyrethrins)	100 kg.
Kerosene	14,900 kg.
p-Cresol-Methyl Ether	50 kg.

No. 4

a. Pyrethrum Extract (15% Total Pyrethrins)	100 kg.
Kerosene	14,900 kg.
b. Benzyl Alcohol	50 kg.
Amyl Acetate	30 kg.
Wintergreen Oil	20 kg.

Make up the solution *a* and add the composition *b*, which also can be replaced by one of the following mixtures:

Benzyl Acetate	80	kg.
Eugenol	10	kg.
Bromstyrol	10	kg.
or		
Cloves Oil or Eugenol	20	kg.
Butanol	50	kg.
Sassafras Oil	30	kg.
or		
Pine Oil	100	kg.
Camphorated Oil	50	kg.
or		
Eucalyptus Oil	25	kg.
Benzyl Acetate	75	kg.

No. 5

Pyrethrum Extract (15% Pyrethrins)	100	kg.
Kerosene	14,800	kg.
Chlorobenzol	100	kg.
Camphorated Oil	100	kg.

Derris Root Extract
U. S. Patent 2,058,832

Extract powdered derris root with a petroleum distillate (boiling point below 330°C.) containing 20–30% ethylene dichloride.

Derris Emulsion

Extract:

Derris Root Powder	15	g.
with		
Terpinolene	100	g.

Let stand for 5 days, shaking twice a day, at 30° C. Filter. Store in colored bottles.

Emulsion:

a.	Extract (Above)	60	g.
b.	Pine Oil	20	g.
	Oleyl Alcohol, Sulphonated	20	g.

Water, to make 0.5% emulsion.

Rotenone-Derris Insecticides

15 g. of powdered derris root containing 5 per cent rotenone is macerated at a temperature not exceeding 30° C. with 100 g. of terpinolene for five days, with occasional shaking. The liquid is then filtered into a colored glass container to protect it from the action of light. A mixture is then made of terpinolene extract of derris 60 parts, French pine oil (terpineol) 20 parts, and sulphonated oleyl alcohol 20 parts. The terpineol and oleyl alcohol are mixed first, and then the derris extract incorporated. A 0.5 per cent emulsion of this is said to be very effective for spraying potatoes infected with blight. In winter this emulsion may assume a figged appearance, but all that is necessary is to warm it slightly and then mix with tepid water. The setting-point can be lowered somewhat by replacing some of the pine oil and oleyl alcohol by ammonium sulphoricinoleate.

Activated Rotenone Insecticides
U. S. Patent 2,024,392

The efficiency of rotenone-containing insecticides is increased by admixture of veratrin or material containing it. Suitable dusts are

Derris Root	25	lb.
Sabadilla Seed	7½	lb.
Talc	90	lb.
or		
Rotenone	½	lb.
Veratrin	⅛	lb.
Kaolin	99½	lb.

High Nicotine Tobacco Extract

Powdered or granulated tobacco is extracted with dilute sulphuric acid and concentrated by boiling off most of the water. It is then mixed with four times its volume of 98% alcohol and filtered and evaporated Almost twice as much nicotine is extracted by this method.

Tobacco Extract Insecticide

a.	(1)	Copper Sulphate	1	kg.
		Water	5	l.
		Dissolve; add		
		Water	46	l.
	(2)	Calcium Oxide	0.75	kg.
		Water	1	l.
		Mix well and add		
		Water	46	l.

Pour (1) into (2) slowly while mixing.

b. Dissolve

Soda Ash	20	g.
Water	1	l.
*Tobacco Extract	5	l.

Mix *a* and *b*.

*Tobacco Extract

Tobacco Leaves and Stems	20	kg.

Macerate for 24–48 hrs. in 100 l. cold water.

Wood-Worm Insecticide

Naphthalene	10	g.
Benzine	90	g.

Clean furniture by knocking and brushing off the wood meal. Introduce the solution into the worm holes with a small oil-can with a long, thin nozzle.

Stable Polysulphide Vermicide
British Patent 453,266

Fuse together

Sodium Sulphide, Hydrated	65	lb.
Sodium Sulphocyanide	8½	lb.
Sulphur	26½	lb.
and then mix in		
Soap Powder	200	lb.

Remedy for Ants

Ants may be gotten rid of by placing a rough surfaced, flat dish filled with a mixture of syrup, sugar and yeast in their runway. The sweetness entices them, but the yeast kills them.

Killing Termites and Ants in Citrus Trees

Phenol	1 lb.
Fish Oil Soap	1 lb.
Water	3 gal.

Emulsify by stirring vigorously and pour around base of tree.

Ant Exterminators

Formula No. 1

Naphthalene, Powdered	950 g.
Derris Root Powder	50 g.

No. 2

Heavy Benzine	900 g.
Naphthalene	100 g.

No. 3

Derris Powder	200 g.
Folia Rutae, Powdered	250 g.
Borax	550 g.

No. 4

Derris Powder	300 g.
Hexachlorethane	100 g.
Guillaya Bark Powder	600 g.

No. 5

Camphor, Synthetic	50 g.
Paradichlorbenzene	150 g.
Derris Root Powder	250 g.
Spanish Pepper Powder	200 g.
Guillaya Bark Powder	350 g.

Killing Ants in Lawns

Use tartar emetic (antimony potassium tartrate) 1 ounce and of powdered sugar 8 ounces. Mix these thoroughly and then put a small amount on each ant hill. The grass is not disturbed and the ants disappear.

Worm and Beetle Poisons

Spread fresh, dry mowrah meal (ground meal from the seed of the madhuca tree) at the rate of 15 lb. per 1,000 sq. ft. and water freely. This treatment is preferred as the toxic agent is relatively harmless to man.

Cut Worms.—Poison bran mash is used, prepared by mixing bran with one tablespoonful of Paris green, and making into a paste with a solution of one quart of water and 2 tablespoonsful of cheap molasses. When mixed add a spoonful of amyl acetate. Apply to infested areas.

Web Worms.—Apply dry arsenate of lead at the rate of 6–7 lb. per 1,000 sq. ft. and wet down with a coarse stream of water.

Apply pyretheum extract diluted 1 oz. to 5 gal. with water at the rate of 112 gal. per 1,000 sq. ft.

Trapping Japanese Beetles

In a large wide-mouth preserve jar place a wide-mouth funnel and a fine wire gauze screen with an opening in it.

In the jar place a mixture of

Eugenol	1 g.
Geraniol	10 g.

Destroying Worms in Lawns

Mowrah seed is used for killing worms in lawns either by sprinkling it on the grass at the rate of about 8 ozs. per square yard and watering in well, or by macerating 4 ozs. of the seed in a quart of water for twelve to twenty-four hours and then applying the mixture to a square yard of the lawn. The seed in either case should be in the form of a fairly fine powder or meal.

Another preparation used for killing worms in a lawn consists of: Mercuric chloride, 1 lb.; hydrochloric acid, 22 ozs.; water to make 1 gallon. One teacupful of this mixture is added to 10 gallons of water and then used for sprinkling the lawn.

Worm-killers are most effective if applied on a warm, muggy day when the worms are near the surface.

Garden Formula for Grasshopper Control

The following formula may be used where only a small amount of bait is desired.

Bran	10 lb.
Paris Green or Crude White Arsenic	½ lb.
Molasses	1½ pt.
Water	1 gal.

Grasshopper Poisons

Formula No. 1

Bran	100 lb.
Sodium Arsenite	2 qt.
Water	10–12 gal.

No. 2

Bran	50 lb.
Sawdust	50 lb.
Sodium Arsenite	2 qt.
Water	10–12 gal.

No. 3

Bran	50 lb.
Cottonseed Hulls	50 lb.
Sodium Arsenite	2 qt.
Water	10–12 gal.

White arsenic may be used to replace the sodium arsenite, using 5 lb. per 100 lb. of bait.

No. 4

The control of grasshopper pests in many sections of the country has been facilitated by the use of a poison bran in which amyl acetate serves as the bait. A number of the agricultural experiment stations in the mid-west have employed this type of poison with success.

To 100 pounds of bran add:

Salt	5 lb.
Sodium Arsenite	1 qt.
Blackstrap Molasses	2 gal.
Water	6–8 gal.

All materials are thoroughly mixed, and 3 oz. of technical amyl acetate is added.

This mixture, or a similar one, can be broadcast over a field where the grasshoppers are feeding, or can be thinly poured into long trenches. The grasshoppers are attracted by the odor.

No. 5

Bran	60–65 oz.
Molasses	15 oz.
Epsom Salts	20–25 oz.
Water	sufficient to moisten

The above is as effective as 5% arsenic bait and is harmless to humans, animals and birds.

No. 6

This bait can be sprayed from an airplane.

Bran	100 lb.
Arsenic Trioxide	5 lb.
Lubricating Oil, Cheap	2 gal.

Fly Poisons for the Farm

Both Paris green and sodium cyanide are effective larvicides but are too poisonous or harmful to the soil to be recommended for general use. A solution made up of 0.5 lb. of powdered hellebore in 10 gal. of water is sufficient to treat 10 cu. ft. of manure very effectively. Borax used at the rate of 1 lb. per 16 cu. ft. of manure destroys about 90% of the fly larvae. Borax-treated manure may increase crop growth on some soils but may be injurious in other soils. A mixture of calcium cyanide and superphosphate possesses considerable larvicidal value; 0.5 lb. of each mixed and applied as a powder to 1 bu. of manure will kill most of the larvae. Chloride of lime is an effective larvicide for use in garbage or other materials not to be used for animal or plant food. One of the best fly baits and attractants consists of 0.5 pt. of milk, 0.5 pt. of water and 3 teaspoonfuls of formaldehyde solution. Another effective poison is made by substituting 1 oz. of brown sugar in place of the milk in this formula. Arsenic baits are most effective when flies do not have access to water. For fly sprays, a refined kerosene of about 41.4° sp. gr. (A. P. I.) and 190–260° boiling range gives best results when finely atomized. Only fresh pyrethrum powder (1% total pyrethrins) is satisfactory for fly sprays. The pyrethrum should be mixed with kerosene at the rate of 1 lb. of powder to 1 gal. of kerosene. Amyl acetate, oil of sassafras and oil of wintergreen are satisfactory perfuming substances for the oil-pyrethrum mixture. From 2 to 3 oz. per 1,000 cu. ft. of space is required. Sulphur when burned at the rate of 2 lb. per 1,000 cu. ft. of space is also an effective fumigant for adult flies.

Fly Catcher Composition

a.	Crepe Rubber	8 lb.
	Benzol, Benzine. Add some Dichlorethylene.	
b.	Rosin	50 lb.
	Mineral Oil (Sp. Gr. 0.923) (Viscosity 3½° E., 50° C.)	40 lb.
	Lanolin	7 lb.
	Beeswax	2 lb.
	Castor Oil	2 lb.

Make rubber solution *a* and add it to the adhesive *b*.

To Keep Flies from Screens

Mix a teaspoonful of phenol with a quart of kerosene and rub solution on the screen door.

Mosquito Deterrent

Oil of Citronella	½ oz.
Spirits of Camphor	¼ oz.
Oil of Cedar Wood	¼ oz.
White Petrolatum	2 oz.

Heat the petrolatum and mix with other ingredients and cool quickly by placing container in cold water or refrigerator.

Mosquito Larvicide

Dust surface of water with

Formula No. 1

Chloropicrin	1 l.
Dust	1 kg.
Mineral Oil	1 l.

No. 2

Coke Oven Residue (Containing Anthracene)	10 kg.
Dust	90 kg.

No. 3

Hexachlorethane	2 oz.
Talc	1 oz.

Mix and strew over water.

No. 4

Kerosene	95 lb.
*Cashew Nut Shell Oil	5 lb.

* Skin-irritant.

Mole Control

Black pepper inserted liberally in mole runs regularly for several weeks will keep moles from renewing and extending their burrows.

Rat Poisons

Formula No. 1

Strychnine Sulphate	80 gr.
Lactose	160 gr.
Prussian Blue	5 gr.
Fine Oatmeal or Biscuit Meal, to make	1 lb.

Place the strychnine in a mortar with a little of the lactose and thoroughly grind the two together, add the Prussian blue and gradually the remainder of the lactose so as to make a perfect mixture. Lastly mix in the fine oatmeal or biscuit.

No. 2

Strychnine (Alkaloid)	1 oz.
Lactose	3 oz.
Prussian Blue	5 gr.
Fine Oatmeal	6 oz.
Lard or Drippings	10 qt.

Mix the strychnine, Prussian blue and sugar. Add the oatmeal and rub in the lard (using a spatula) to form a soft paste. The preparation may be spread between bread to form sandwiches. This bait is also useful for the extermination of mice.

No. 3

Strychnine (Alkaloid)	1 oz.
Bicarbonate of Soda	1 oz.
Saccharin	1 dr.
Flour	1½ oz.
Wheat	10 qt.

Mix together the strychnine, soda, saccharin and flour, then add a little cold water to make a smooth creamy paste. Pour over the grain and mix thoroughly, afterwards spreading out the wheat to dry.

No. 4

Strychnine (Alkaloid)	1 oz.
Cyanide of Potassium	2 oz.
Honey	1 pt.
Wheat or Barley	30 lb.
Eggs	1 doz.

Beat up the eggs and mix in the honey. Add the strychnine and cyanide and stir until well mixed. Place the grain in a large receptacle and pour over the poison mixture. Well mix, stirring two or three times during twenty-four hours; afterwards spread out the wheat to dry.

No. 5

White Arsenic (Powder)	1 oz.
Oat or Maize Meal	19 oz.

Mix the ingredients and add sufficient aniseed oil to give a faint smell.

No. 6

White Arsenic	1 oz.
Prussian Blue	5 gr.
Fine Oatmeal, to make	1 lb.

Mix the arsenic and Prussian blue well together, incorporating a small quantity of oatmeal. Very gradually add the remaining oatmeal until a uniform color results. To this bait may be added grated cheese.

No. 7

White Arsenic	1 lb.
Cheese	1 lb.
Glycerin	1½ oz.
Water	3 pt.
Cornmeal	2½ lb.
Aniseed Oil	⅛ oz.
Aniline Black or Prussian Blue	sufficient to color

Melt the cheese in one-third of the water, to which is added the glycerin. Add the cornmeal and remainder of the water. Continue heating until the meal is cooked, stir in the arsenic, aniline and aniseed oil.

No. 8

White Arsenic	1 oz.
Wheat Flour	6 oz.
Tallow or Drippings	2–4 oz.
Prussian Blue	5 gr.

Fine Oatmeal to make up to 1 lb.

Aniseed Oil sufficient to give a faint smell to the bait.

Melt the tallow or drippings separately and pour quickly on to the dry ingredients which have been well mixed previously, stirring well until a stiff paste is produced, then add the oil of aniseed.

No. 9

Oxide of Iron	6½ oz.
White Arsenic	6 oz.
White Lead	8 oz.
Water	30 oz.

Treacle or Sugar, and make up with 20 per cent Aniseed Oil to make 100 oz.

No. 10

Ground Rice	6 oz.
Sugar	8 oz.
Lard, Tallow or Beef Drippings	6 oz.
Water	40 oz.
Phosphorus Dissolved in Carbon Bisulphide (1:1)	2 oz.

Mix the rice and sugar with 8 oz. of the water to make a thin cream. Boil the remainder of the water in an enamel-lined or aluminum vessel, quickly add the cream and again boil gently until a thick paste results, constantly stirring to prevent burning or the formation of lumps. Remove from the heat, add the lard, stirring the mixture while it cools. When cold pour in the solution of phosphorus a little at a time and stir until everything is dissolved.

Roach Powders

Formula No. 1

Borax, Powdered	65 g.
Sugar, Powdered	310 g.
Barium Carbonate	625 g.

No. 2

Borax, Powdered	500 g.
Flour	500 g.

No. 3

Ferrous Sulphate, Powdered	50 g.
Sodium Pyrophosphate	50 g.
Borax, Powdered	50 g.
Salicylic Acid, Powdered	50 g.
Flour	800 g.

Roach Spray

Powders

Formula No. 1

Rotenone or Derris	600 g.
Spanish Pepper, Powdered	175 g.
Euphorbium, Powdered	75 g.
Guillaya Bark, Powdered	75 g.
Hexachlorethane	50 g.
Paradichlorbenzene	25 g.

No. 2

Rotenone or Derris	650 g.
Hexachlorethane	50 g.
Euphorbium, Powdered	75 g.
Guillaya Bark, Powdered	75 g.
Spanish Pepper, Powdered	150 g.

No. 3

Boric Acid, Powdered	100 g.
Paradichlorbenzene	100 g.
Rotenone or Derris	400 g.
Tobacco Dust	400 g.

Liquids

No. 4

Hexachlorethane	75 g.
Camphor Oil, Light	125 g.
Kerosene, Refined	300 g.
Carbon Tetrachloride	500 g.

No. 5

Camphor	4 g.
Carbolic Acid, Crystallized	4 g.
Thyme Oil	12 g.
Alcohol	460 g.
Carbon Tetrachloride	520 g.

Strong Smelling Disinfectant

Melt together—

Rosin	8 lb.
Siberian Pine Oil	10 lb.
Venice Turpentine	6 lb.
Beta-Naphthol	2 lb.
Naphthalene	3 lb.

Now add 15 lb. of a solution of caustic potash (10 per cent) and stir vigorously for 20 minutes.

On cooling, more water may be added until a clear solution of the required viscosity and concentration is obtained. This product will give a white emulsion on dilution with excess water.

Drying and Disinfecting Powder

U. S. Patent 2,047,323

A drying and disinfecting powder is composed of:

Trioxymethylene	7.6 oz.
Ammonium Alum	3.4 oz.
Magnesium Sulphate	4.2 oz.
Calcined Gypsum	22.0 oz.
Pumice	31.4 oz.
Hydrated Lime	3.4 oz.
Graded Marble	27.5 oz.
Soap Bark	42.0 oz.
Calcium Stearate	.08 oz.

Cresol Disinfectants

A cresol disinfectant can be made at low cost by using rosin soap as the basis for the emulsifying agent. A small proportion of coconut oil and castor oil soaps aid emulsification. The rosin and oils are melted together in a suitable pan and the heat removed as soon as the mixture is completely melted. Creosote oil is then run in with constant stirring. An amount of caustic soda is added with stirring, which will cause 80 per cent saponification of the fat and rosin mixture. The water is run in, again with vigorous stirring. The mixture is allowed to stand overnight and the usual antiseptic and physical tests applied the next day. The rosin does not need to be completely saponified because rosin is soluble in creosote oil, so that there need be no fear of sedimentation. This method is simpler and cheaper than that in which complete saponification is attempted. The following are suitable formulas:

	Parts by weight		
Formulas	No. 1	No. 2	No. 3
Rosin, Light	...	100	...
Rosin, Dark	85	...	95
Coconut Oil	15	...	...
Castor Oil	...	...	5
Caustic Soda (38° Bé.)	30	35	40
Water	200	220	100
Creosote Oil	150	100	150
Carbolic Acid	...	1.5	2

Soda ash can be used for saponification in place of caustic soda. Soda ash is 90 per cent as efficient as a saponifying agent for rosin, as caustic soda.

Flour Mill Fumigant

U. S. Patent 2,024,027

Solid Carbon Dioxide	90 oz.
Ethylene Oxide or Chlorpicrin	10 oz.

Mothproofing

Formula No. 1

U. S. Patent 1,613,402

A mothproofing solution is prepared by adding 1 part of hexachloronaphthalene to a solution of 1 part of monochloronaphthalene in 9 parts of kerosene.

No. 2

U. S. Patent 1,885,292

10 g. of a salt of alkaloids derived from seed of *Lupinus* with saponins of quillaia, 1 g. of alum, and 1 g. of titanium sodium fluoride; No. 2, 10 g. of the above described alkaloidal salt, 2 g. of alum, and 1 g. of boric acid.

No. 3

U. S. Patent 1,901,960

A mothproofing composition comprises an aqueous solution containing about 0.5 percent sodium fluoride, 0.2 percent of a mixture of the bile salts sodium taurocholate and sodium glycocholate, and charged with a gas such as carbon dioxide at pressure of 75 to 100 pounds per square inch.

No. 4

Paradichlorbenzene	30 oz.
Toluene	10 oz.
Carbon Tetrachloride	60 oz.

No. 5

Paradichlorbenzene	10 oz.
Methylated Spirit	40 oz.
Carbon Tetrachloride	50 oz.

No. 6

A mixture of 1 part of paradichloronitrobenzene and 4 parts paradichlorobenzene in suitable solvents.

No. 7

Camphor	3 oz.
Naphthalene	3 oz.
Capsicum	8 oz.
Clove Oil	1 oz.
Turpentine	8 oz.
Alcohol	77 oz.

These ingredients are macerated together and then strained.

Moth Sprays

Formula No. 1

Benzine	500 g.
Carbon Tetrachloride	500 g.
Paradichlorobenzene, or Naphthalene	12.5 g.

No. 2

Benzine	500 g.
Ethylene Dichloride	600 g.
Hexachloroethane	13 g.
Camphor	5 g.

No. 3

Acetone	1000 g.
Carbon Tetrachloride	1000 g.
Ethylene Dichloride	500 g.
Terpinyl Acetate	50 g.
Benzyl Propionate	50 g.
Hexachloroethane	25 g.

No. 4

Acetone Oil	500 g.
Ethyl Acetate	200 g.
Ethylene Dichloride	500 g.
Methylacetophenone	20 g.
Linalyl Acetate	20 g.

No. 5

Carbolic Acid (Phenol)	3 kg.
Hexachloroethane	3 kg.
Naphthalene	3 kg.
Camphor	7 kg.
Alcohol	120 kg.

No. 6

Dissolve 1 oz. of quinidine alkaloid in 2 oz. of oleic acid. Dissolve this mixture in one gallon of cleaners naphtha and spray about the moth infected parts. May be used for clothes, but is especially recommended for spraying walls of closets.

No. 7

Camphor, Artificial	10 g.
Hexachlorethane	10 g.
Mustard Oil, Artificial	10 g.
Paradichlorbenzene	20 g.
Carbon Tetrachloride	1 kg.

No. 8

Camphor, Artificial	10 g.
Hexachlorethane	10 g.
Naphthalene	10 g.
Paradichlorbenzene	20 g.
Mustard Oil, Artificial	20 g.
Carbon Tetrachloride	1 kg.

Moth Herb Powder

Patchouli Leaves	10 lb.
Rosemary Leaves	20 lb.
Thyme Leaves	20 lb.
Sage Leaves	20 lb.

Paradichlorbenzene, hexachlorethane, methyl salicylate, or derris root powder should be added to this, to give a true insecticide action.

Moth Cards

Formula No. 1

Naphthalene	90 g.
Camphor	6.5 g.
Eucalyptus Oil	3.5 g.

No. 2

Naphthalene	75 g.
Camphor	20 g.
Hexachloroethane	5 g.

No. 3

Camphor	80 g.
Paradichlorbenzine	15 g.
Lemon Oil	5 g.

Procedure: **Melt up very cautiously, and pour into molds—or dip square cards into the melted mass.**

Laboratory Animal Feeds

Formula No. 1

Whole Yellow Maize	33.0 oz.
Whole Wheat Flour	33.0 oz.
Whole Milk, Powdered	21.0 oz.
Alfalfa Leaf Meal	2.0 oz.
Linseed Oil Meal	7.0 oz.
Dried Liver (Pig)	2.0 oz.
Cod Liver Oil	1.0 oz.
Sodium Chloride	0.5 oz.
Calcium Carbonate	0.5 oz.

Supplement with fresh green food—lettuce, etc., and fresh chopped steak, or cheese.

No. 2

Sherman Stock Diet

Whole Wheat Flour	66.0 oz.
Whole Milk, Powdered	33.0 oz.
Sodium Chloride	1.0 oz.

This diet is fed to the pregnant females at the time they are put in individual cages. This diet is fed throughout the nursing period, and to the young until they are started on vitamin-free diets.

Cod Liver Oil Emulsion for Animal Feeding

a.	Cod Liver Oil	420 lb.
	Gum Arabic	15 lb.
	Gum Tragacanth	7.5 lb.
b.	Gelatin	1 lb.
	Water	299 lb.
c.	Calcium Hypophosphite	12 lb.
	Sugar	90 lb.
	Water	60 lb.
	Water	86 lb.

Make up *a* by grinding, and *b* by heating. Add *b* to *a* at once, and stir until cooled.

To the cooled emulsion add the cooled solution *c* slowly, with good agitation.

Animal Feed Powder (Calcium Phosphate)

Dicalcium Phosphate	75 lb.
Salt	7 lb.
Trigonella Seed	7 lb.
Fennel	4 lb.
Juniper Berries	3 lb.
Licorice Root	3 lb.
Calamus	2 lb.

Modified Animal Fodder

British Patent 443,090

To ordinary fodder the following is added:

Sugar	40 lb.
Bran	5 lb.
Calcium Phosphate	24 lb.
Salt	20 lb.
Calcium Chloride	0.14 lb.
Cod Liver Oil	10.7 lb.
Aniseed Oil	0.16 lb.

Dog Food

Yellow Corn Meal	35 oz.
Wheat Bran	10 oz.
Wheat Middlings	20 oz.
Meat Scraps	10 oz.
Fish Meal	10 oz.
Skim Milk Powder	10 oz.
Alfalfa Meal	2 oz.
Bone Meal	2 oz.
Salt	1 oz.

The above formula was originated and is recommended by the Agricultural Experiment Station of Alabama Polytechnic Institute.

Powder "to Increase the Egg Production of Poultry"

Oyster Shells	250 g.
Iron Oxide	6 g.
Calcium Carbonate	38 g.
Calcium Phosphate	38 g.
Sodium Chloride	8 g.
Black Pepper	4 g.
Paprika	4 g.

White Diarrhea Treatment (Chicken)

Catechu	2 g.
Water	7 pints

Give the above as the drinking water; also give sour skim milk or sour buttermilk.

Poultry Constipation Treatments

Constipation is far more common among nearly adult pullets than some realize, and this is one of the reasons why pullets that start to redden up sometimes stay for so long before starting the business of egg production. It is not seen, consequently its presence is not realized.

Don't start dosing the birds; it is so easy to give a dose of Glauber salts, but the effect of salts is to upset the normal metabolism of the body, and this is the one thing to avoid in birds that are just about to lay.

A better plan is to give a few feeds of wet mash in which about 25 per cent of bran is used for this purpose only. Bran used wet acts as a laxative; when used dry it has the opposite effect.

Or a little finely chopped mutton fat can be used. This is a fine lubricant for the bowels, apart from its very high feeding value.

Another good laxative is linseed meal. Often adult birds will not eat linseed—though, curiously enough, once they have acquired the taste they eat it freely enough—but the meal can be introduced into the mash, though it should not exceed 5 per cent (by weight) of the whole, and then, of course, only for this specific purpose.

Linseed, however, is an excellent stimulant for those older birds which are finding it difficult to grow their new feathers. In addition to being very rich in minerals, linseed carries natural oils which assist in the development of feathers.

Animal Cod Liver Oil Emulsion

a.	Caragheen Moss	15 kg.
	Water	30 kg.
	Cod Liver Oil	50 kg.
	Preservative	0.1 kg.
b.	Starch Syrup	8.8 kg.
	Water	9 kg.
	Spice Decoction	0.1 kg.

Poultry Lice Powder

Formula No. 1

Sodium Fluoride	20 g.
Sulphur	25 g.
Tar Oil	5 g.
Tobacco, Powdered	50 g.

No. 2

Mix one pint of carbolic acid, one ounce of carbon bisulphide, one ounce of oil of tar, and four ounces of coal oil; mix with all the fresh saw dust it will saturate. Sprinkle a small quantity in the bottom of nests and cover with fresh straw.

Goat Lice Control

Two dippings at eleven-day intervals using the following formula in 100 gallons of water is effective.

Wettable Sulphur	10 lb.
Tri-Sodium Phosphate	10–25 oz.

(depending on the hardness of the water)

Simple Cattle Spray

Powdered Fresh Pyrethrum	½ lb.
Mineral Spirits	1 gal.

Shake occasionally for 48 hours and filter. Use clear liquid as spray.

Animal Mange Remedy

Lauryl Sulphocyanate	2 g.
Cotton Seed Oil	98 g.

The above solution may be emulsified just as cotton seed oil is emulsified.

Flea Spray for Dogs and Cats

Kerosene	90 g.
Oleic Acid	8 g.
Triethanolamine	3 g.
Water	100 g.

This is made into a primary emulsion and may be diluted with one or two gallons of water for washing infested animals.

Dog Eczema Ointment

Petrolatum	100 g.
Paradichlorbenzol	10 g.
Camphor	10 g.
Kerosene	10 g.
Sulphur	20 g.

Warm together and mix until uniform. Continue mixing until thickening begins. Pack in tight cans.

DOG REMEDIES

Dosage and Purity

Care must be taken since dogs vary enormously in size, and this is the main factor upon which correct dosage is based. In this section all doses are calculated on the basis of a fox terrier, and in general for smaller animals and toy dogs from one-half to one-quarter respectively of such doses may be given. Doses may be corrected according to any particular requirement from the following table of average bodyweights:

	Lb. Weight
Toy terriers and griffons	3–5
Toy spanicls and pugs, etc.	10–12
Fox and Scotch terriers	18–25
Bulldogs and field spaniels	40–45
Retrievers, collies, greyhounds	55–65
Great Danes, etc.	120

Aperients

In modern canine practice magnesium sulphate (Epsom salt) is not usually employed as a purgative since it may produce nausea. Small doses, however (10–20 gr.), are common constituents of laxative preparations. Sulphur is also a useful laxative (5–25 gr.), whilst up to 100 gr. has been used as a purgative. A combination of these with a little sodium bicarbonate forms a very mild aperient, an example of which is:

Sulphur	7 gr.
Sodium Bicarbonate	7 gr.
Magnesium Sulphate	15 gr.

One to be given once or twice a day in food.

Castor oil *cannot* be advised for routine treatment. Its nauseous taste may produce general malaise and vomiting, and since its purgative action is followed by constipation, prescription in cases of habitual constipation is entirely irrational.

Condition Powders

These preparations are intended to remove irritable conditions of the skin by cooling the blood and to ensure a glossy coat and general good health.

Milk of Sulphur	10 gr.
Lactose	10 gr.

Make twelve powders, and give one twice a day in food.

The sulphur in the above may usefully be replaced by heavy magnesium carbonate in cases of indigestion and flatulence. Actually condition powders are normally of such bulk that even if the whole powder consisted of the undiluted therapeutic agent employed little benefit would be derived.

Alteratives

The distinction between these preparations and condition powders is ill-defined, but in many cases these contain minute quantities of antimony or arsenic. Even in exceedingly small doses, arsenic is a tonic, improves digestion, and increases the appetite. It is believed, in addition, favorably to influence the nutrition of the skin with the production of a glossy coat. The dose of arsenious oxide employed is from 1/60–1/20 of a gr., depending upon the age and size of the dog. Since dogs are very susceptible to it, caution must be observed in its use, as even in medicinal doses its administration over prolonged periods may produce redness and swelling of the conjunctiva and catarrh. Its use is exemplified in the following preparation:

Arsenic	1/80–1/30 gr.
Magnesium Sulphate	20 gr.
Lactose	10 gr.

Make twelve. Give one daily in food.

Dyspepsia

In cases of dyspepsia, the stomach should first be rested by withholding food for a day, and a "grey powder" with magnesium carbonate or compound rhubarb powder may be given. In cases due to debility, alkaline and bitter stomachics should be given half an hour before food, but where excessive secretion of acid is present, which is characterized by the attacks occurring from 2–3 hours *after* food, antacids—*e.g.*, magnesia, sodium bicarbonate, and bismuth—as distinct from mild alkalies, should be given. Liquid paraffin may be given if desired, but *not* castor oil. An example of a gastric sedative powder is:

Bismuth Carbonate	30 gr.
Sodium Bicarbonate	30 gr
Heavy Magnesium Carbonate	30 gr.

Give one and repeat every 4 hours if required.

Diarrhoea

Opium is a most valuable remedy in the treatment of this most distressing and weakening complaint, but it should be remembered that diarrhoea may be a premonitory symptom in enteritis, in which case suitable measures should be taken. Where such symptoms arise from food poisoning due to bacterial toxins, kaolin given in 1 oz. doses is a valuable and harmless remedy, and might well be put up in little packets for such a purpose. It has no directly antiseptic action, but depends on its adsorptive properties for the removing of such toxins. Tinct. chloroform and morphine Co. B.P.C., is most effective for checking uncomplicated diarrhoea in puppies, for example:

Formula No. 1

Bismuth Carbonate	40 gr.
Camphorated Tinct. Opium	1 dr.
Chloroform Water to Make	2 oz.

Give ½–1 teaspoonful every 3 hours until checked.

No. 2

Compound Tinct. Chloroform and Morphine	10–15 min.
Liquid Paraffin	1–2 dr.

Diet in the above cases should be light: arrowroot and milk, and egg white with water or a little milk, being particularly useful. Rhubarb is particularly useful as an aperient for those cases dependent upon irritant matter in the bowels, as its laxative effect is followed by astringency. It may be given with sodium bicarbonate in peppermint water (3–15 gr.), or as the compound powder (pulvis rhei co.) 10–60 gr.

Worms

This complaint is unfortunately all too common amongst puppies and certain breeds of dog. The most effective preparation for the destruction of the tapeworm is male fern, in the form of capsules containing 1–4 mil. of the liquid extract. It is best to give a saline purge about 24 hours before, this being followed by a second about 6 hours after. Oily purgatives, such as castor oil, must *not* be given, since filicic acid may be absorbed with toxic results.

For the treatment of round worms, 1–3 gr. of santonin may be given; caution should be exercised as toxic results may occur after excessive doses. It may be combined with oil of chenopodium, but should never be given to animals under 8 weeks old. It is best given with a saline aperient, this being followed by an additional dose of aperient about 6 hours after.

Oil of chenopodium (1–2 min. for puppies, or from 2–20 min. for dogs) is one of the most active anthelmintics against ankylostoma duodenale. Preliminary purgation is unnecessary, but it should be given in an oily purgative, or castor oil should follow within 2 hours. Carbon tetrachloride is often given for this purpose, after fasting, although no purgatives are necessary. Recommended doses are in the neighborhood of 2½ min. per lb. bodyweight (the exact dose has not yet been determined satisfactorily). It must be given in capsule form, these being made with care, since if breakage should occur in the mouth, anæthesia may occur. For this reason instructions to "place the capsule well at the back of the tongue" should be incorporated.

Areca nut (betel nut) is largely used as a vermifuge for both tape and round worms, the dose being computed at 2 gr. per lb. bodyweight. It is best given in milk, but should not be given to young puppies or in cases of incipient distemper.

Disorders of the Skin

Disorders of the skin may arise from wrong feeding or from constipation or worms. In such cases treatment should follow as described above. In cases of disease of the skin, additional treatment is necessary. Irritable and eczematous conditions of this are unfortunately common to many dogs. In such cases there is one golden rule: Always soothe acute conditions of the skin.

It cannot be too strongly emphasized that ointments should *not* be applied to an oozing skin surface, or to an acutely inflamed skin, since they interfere with its normal radiation of heat. In such cases an evaporating lotion, or a little borated talcum and zinc oxide powder should be applied. An 18 per cent solution of tannic acid in glycerin, diluted with equal, or double, its volume of water, is an excellent preparation for moist eczema. It slightly diminishes the sensibility of the nerve endings, whilst at the same time it is astringent and cooling. Another useful lotion is:

Colloidal Calamine	20	g.
Glycerin	5	g.
Water to make	100	cc.
p-Chlor-*m*-cresol	0.1	gm.

If desired, the latter may be omitted and an equal volume of 20 per cent aqueous solution of ichthyol added before use. This has remarkable powers of controlling inflammation, is mildly antipruric and antiparasitic.

Lotions containing lead should be used with caution, as toxic symptoms may occur as a result of the dog licking the affected parts.

Sulphur frequently enters into the preparation of ointments. For these the precipitated form is more suitable on account of its greater activity. A useful lotion is:

Precipitated Sulphur	10	g.
Zinc Oxide	10	g.
Peach Kernel Oil	80	g.

Preparations containing sulphur should not be applied too frequently, as they may produce severe irritation of the skin. A soothing ointment is:

Zinc Oxide	10–20	g.
Hydrous Lanolin	40	g.
Soft Paraffin	40	g.

Treatment of the Eyes

In acute conditions the eyes may be bathed gently with a freshly prepared solution of boric acid (4 gr. in an ounce of distilled water). In catarrhal conditions of the conjunctiva, after the acute stage has finished, a solution of 2 gr. of zinc sulphate in 1 oz. of distilled water may be applied with an eyedropper twice daily. An excellent lotion is:

Witch-Hazel Extract	3	dr.
Boric Acid	40	gr.
Borax	40	gr.
Camphor Water	2	oz.
Water, Distilled	2	oz.

The eye to be bathed with this night and morning.

Dog Condition Powders

The doses suggested in the following notes are based upon the weight of a fox terrier, and should be computed to suit the breed concerned.

Canine condition powders are preparations designed to cleanse and cool the blood, remove irritable conditions of the skin, to ensure a glossy coat and keep the animal in general good health.

The usual preparations are quite innocuous, the staple ingredient being usually lactose (milk sugar) which is practically tasteless. Combined with sulphur it forms the more general preparations in common use. An example is—

Milk of Sulphur	10	gr.
Lactose	10	gr.

Make twelve powders with this and give one twice a day in food.

In cases of indigestion and flatulence, the sulphur in the above may be replaced with heavy magnesium carbonate.

Calomel is sometimes prescribed with lactose, but since dogs are peculiarly susceptible to its action it must be used with care, particularly in the cases of the smaller breeds for which "Grey Powder" is more suitable. Magnesium sulphate (Epsom salt), 10–20 grains, may replace the sulphur with useful results.

Arsenic and antimony preparations are also used as "alteratives"; the distinction between these and "condition powders" is not sharply defined. Even in minute doses arsenic is a tonic, improves digestion and increases the appetite.

Arsenic is discussed under the previous section on "alteratives".

Condition powders actually are generally of such small bulk that even if the whole of the powder consisted of the undiluted therapeutic agent employed (with the exception of poisons, of course), little effect would be really obtained.

There appears to be an opening for powders based upon modern pharmacology. The diet of a dog is often deficient in vitamins, and the tonic effect of minute quantities of these offers an effective preparation.

Vitamins B and C assist in the purification of the blood (these being obtained as "yeast" and ascorbic acid respectively) whilst A and D (the latter obtainable as calciferol) assist in the production of a glossy coat and prevention of ophthalmia.

Condition powders may be prepared by simple trituration, either by hand or machine, and if the raw constituents are purchased in a pulverized condition practically no plant is required. Hygroscopic substances must not, of course, be used.

Dog Shampoos

Formula No. 1

Soft Soap	500 g.
Water	1,000 g.
Lysol	50 g.

No. 2

Soft Soap	750 g.
Phenol	45 g.
Eucalyptus Oil	25 g.
Water	3,500 g.

No. 3

Green Soft Soap	50 g.
Saponin	20 g.
Denatured Alcohol	150 g.
Water	to 1,000 g.

No. 4

Coconut Oil Soap	30 g.
Water	115 g.
Perfume Antiseptic	to suit

The use of ammonia in such preparations is objectionable on account of the greater sensitivity of a dog's eyes and nose. Triethanolamine may, however, be incorporated to increase its detergent action.

Soapless shampoos appear to offer a market, particularly in those districts where the water is hard, since they do not form insoluble lime salts. An example of this type would be sulphonated castor and olive oils in water, in the proportion of about 3:2:5, the best results being obtained by experiment. No alkali must be added to the resulting shampoo, which should be clear, sparkling, and either neutral or slightly acid in reaction. Since such shampoos cleanse without lathering, a little saponin may be included.

Phenol, cresols, or Australian ti-tree oil *(Melaleuca alternifolia)* may be added up to about 2 per cent; these produce non-irritant shampoos having a pleasant antiseptic odor. Alternatively these may be omitted and a little lavender or pine oil added.

For the successful manufacture of liquid shampoos the following points should be adhered to. Turbidity must be avoided and only distilled water must be used, together with soap which is completely saponified. Unless full facilities are available for its manufacture, the soft soaps are better purchased from a reputable manufacturer.

In any case, in their preparation, the soap should be dissolved in hot water, cooled, and the antiseptic or perfume added. The solution should then be allowed to stand for from 15 to 30 days, in order to age, and preferably decanted into a tank equipped with refrigerating coils and chilled. If necessary it is then filtered through asbestos. It is claimed that the period of ageing can be shortened by first running the shampoo through a homogenizer of a colloid mill.

Foot Rot Wash, Sheep

Copper Sulphate	3 lb.
Water	7 lb.

Dog Soap

a.	Coconut or Palm Kernel Oil	50 kg.
	Caustic Soda (38° Bé.)	22 kg.
	Caustic Potash (38° Bé.)	4 kg.
b.	Naphthalin	1.5 kg.
	Alcohol	1.5 kg.
c.	Cresylic Acid	4 kg.

Make the soap base *a* by cold saponification.

Add the solution *b* with good stirring, and ultimately *c*. [Beware of splashing, very caustic!]

The soap has to be poured into molds quickly because it thickens soon. Cut when cooled.

Antiseptic Dry Cleaning Powder for Dogs

Insect Powder	1 kg.
Trisodium Phosphate	4 kg.
Borax	5 kg.
Sodium Carbonate	10 kg.
Carbolic Acid	2 kg.
White Clay	28 kg.
Starch	50 kg.

Preparations to Keep Dogs Away from Trees, Etc.

Formula No. 1

Animal Oil	1 lb.
Technical Mineral Oil	1 lb.

No. 2

Sulphur	2	make a paste
Gum Arabic	5	
Water	10	

No. 3

Tragacanth	3	mucilage
Water	100	
Formaldehyde	2	

No. 4

Asafoetida	5 lb.
Alcohol	95 lb.

Extract for a week. Pour off the tincture. Use to paint the walls in question.

No. 5

Oleum Rutae Hortens	10 g.
Arachis Oil	30 g.
Turpentine Oil	60 g.

No. 6

Aloe, Powdered	5 g.
Guillaya Bark	45 g.
White Pepper	100 g.
Asafoetida	50 g.

No. 7

Soft Soap	1 lb.
Alcohol	1 lb.
Pine Oil	1 lb.

No. 8

Ethereal Animal Oil	1 lb.
Mustard Oil	1 lb.
Nitrobenzene	1 lb.
Alcohol	197 lb.

No. 9

Dippel's Animal Oil	2 kg.
Mustard Oil	3 kg.
Nitrobenzene	2 kg.
Alcohol	157 kg.
Collodion, Liquid	30– 50 kg.

No. 10

Mix
Sulphur
Clay
Pigment
and stir into
Dextrin or Glue Solution

Paint the wall with this mixture, about 16 inches high from the bottom.

No. 11

Powdered red pepper is sprinkled liberally near shrubs or posts where dogs commit nuisances.

No. 12

Powdered Capsicum	1 oz.
Powdered Mustard, Strong	1 oz.

No. 13

Paraffin Wax	1 oz.
Naphthalene	1 oz.

Melt together and stir until uniform. When mixture begins to cloud add

Mustard Oil	⅛ oz.

Root Growth Activators

With respect to the practical use of solutions of growth substances for inducing root-formation in woody cuttings, leave the cut (basal) ends of cuttings for twenty-four hours or several days in aqueous solutions containing relatively low concentrations in preference to using higher concentrations for periods shorter than twenty-four hours. Desirable concentrations of the three principal substances (indoleacetic, indolebutyric, and α-naphthylacetic acids) are from 1 to 4 parts of the substance in 100,000 parts of water. A small quantity of alcohol may be used for preliminary solution of the substance; the naphthylacetic acids are all but insoluble in pure water. After treatment with the water solution for two to four days the cuttings should be placed in a potting compost. The novice should be warned not to expect to see any extensive root-formation at the end of a few days in the solution; the immediate purpose of the treatment is to enable the cuttings to absorb the growth-substance, which will then initiate root-formation while the cutting is in the compost. The formation of roots, however, usually takes place in appreciably less time than when compost alone is used.

Soil Conditioners

U. S. Patent 2,059,599–600

Formula No. 1

Coal ground to pass a screen of approximately 40 to 70 mesh and roasted at a temperature approximately between 300 degrees and 400 degrees F.

No. 2

Coal ground to pass a screen of approximately 40 to 70 mesh, and rock salt ground to pass a screen of approximately 120 mesh, the mixture roasted at a temperature approximately between 300 degrees and 400 degrees F.

Old Hedge Rejuvenator

The following is a formula for an old hedge that seems to be ailing:

Nitrate of Soda	1 lb.
Sulphate of Ammonia	3 lb.
Super Phosphate	11 lb.
Dried Blood	3 lb.
Sulphate of Potash	3 lb.

This is to be applied in the ratio of one pound of the mixture to every fifty square feet of ground.

Protecting Citrus Fruits from Decay

U. S. Patent 2,054,392

Fruits are treated with

Water	100 lb.
Sodium Phenylphenol	0.02–0.5 lb.
Caustic Soda	0.01–0.15 lb.

Preserving Cut Flowers

At a cost of less than half a cent for each pint of water in which they are placed, cut flowers may be kept fresher and more vigorous for longer periods of time before they wither and die. Experiments conducted at the scientific laboratories of the Hawaiian Sugar Planters Association in Honolulu, indicate that two eye droppers full of sulphurous acid (not sulphuric acid) added to each pint of water encourages buds to continue growing and leaves and stems to remain greener, and permits the flower itself to retain its freshness in some cases for days after it would normally cease to be attractive.

Drying Tobacco Quickly

By dipping green leaves into a hot solution of salt for 15 sec. 60–70% of the water is lost by the leaves and very little time is necessary to finish the drying of the tobacco. The color is preserved by this operation.

Artificial Sun Drying of Tobacco

The tobacco is slowly heated to 30–35° C. at a relative humidity of 86–95% for 2–2½ days, i.e., to a yellowish coloration. The drying is continued at a humidity of 75–80%, for 7 days, and temperature is increased by 2–3° C. The final drying (as soon as the brownish color is reached) is accomplished at a humidity of 20–25% and at 50° C. for 1.5 days.

Plant Growth Promoting Pots

U. S. Patent 2,094,513

Pots are made of the following composition by molding and pressing:

Humus	4 lb.
Manure	6 lb.
Potassium Chloride	1 lb.
Sodium Nitrate	1 lb.
Calcium Phosphate	2 lb.

Increasing Resin Yields of Trees

German Patent 638,451

Any of the following irritants applied to the incision in the tree increases the yield of resin:

Formula No. 1

Sulphuric Acid	1 oz.
Water	1 oz.

No. 2

Acetic Acid	6 oz.
Water	94 oz.

No. 3

Ammonium Hydroxide (20%)

Pasture Seed Mixtures

For strong loams and clay soils:

Kentucky Blue Grass	10 lb.
Red Top	3 lb.
Orchard Grass	10 lb.
Alsike Clover	3 lb.
Red Clover or Alfalfa	5 lb.

For wet bottom lands:

Red Top	3 lb.
Meadow Fescue	12 lb.
Alsike Clover	5 lb.

For light loam or sandy soils:

Tall Oat Grass	8 lb.
Orchard Grass	10 lb.
Red Top	3 lb.
Red Clover	6 lb.
Lespedeza	12 lb.

For poor land and gullied hillsides:

Sheep Fescue	6 lb.
Red Top	3 lb.
Orchard Grass	10 lb.
Japan Grass	10 lb.
Alsike	3 lb.

Bermuda Grass—about a bushel of chopped roots.

Preventing Damage to Peas While Planting

To avoid breaking dry peas in some of the new seed planting machines, it has been found that 1½ ounces of powdered graphite added to each bushel of seed so lubricates their flow through the machine that damage is prevented.

Seed Potato Dip

2 pints formaldehyde in 30 gallons of water.

Heat solution to 125° F.

Dip uncut seed in crates or potato sacks 3 minutes.

Cover 1 hour.

The seed dries adequately in crates or full potato sacks.

Plant as soon after cutting as possible.

Methods

Wash tub:

For small lots of potatoes up to 25 bushels, the treatment may be made easily in an ordinary wash tub heated on a cook stove. The solution should be made up and placed over the fire until the temperature is raised to 125° F. The sacked potatoes may then be dipped in half-bushel lots. A little regulation of the fire and the position of the tub will afford means of regulating the temperature.

Tank:

For larger lots a small stock tank may be used, the solution being heated by making a trench under it and building a wood fire. One end of the trench will require a chimney or stove pipe. A false bottom of woven wire or boards is adequate to protect the potatoes from becoming too warm on the bottom of the tank. From 200 to 300 bushels can be treated by this method per day.

Steam:

In treating still larger quantities, the work can be done effectively in a stock tank of about 300 gallons capacity. The solution may be heated with a steam coil from any steam boiler. From 500 to 1,000 bushels per day can be treated with an outfit of this description. It is especially adapted to community cooperation, either at a creamery or on some farm where a steam engine is available. Seed treatment centers make it possible for several farmers to work together in treating their seed.

Seed Potato Disinfectant

Mercury Oxide, Yellow	1 lb.
Water	15 gal.

Whole or cut seed tubers are protected against rhizotonia infection by treatment with this mixture.

Identifying Seeds

Seeds are dipped in any oil-soluble dye (e.g. Agrosan G) dissolved in gasoline. They are then air dried.

Fish Bait Oil

Benzoin	1 oz.
Olive Oil	12 oz.

Powder the benzoin and macerate with the oil for a day after a preliminary heating on the water-bath, then strain and add:

Rhodium Oil	½ dr.
Patchouli Oil	6 min.
Green Oil	1½ oz.

Other fish bait oils are oils of cumin, lavender, and anise.

Fox Trap Bait Lure

Tincture of Musk	10 g.
Cottonseed Oil	90 g.
Castor Oil	2 g.

Wood Tick Control

Keep the ticks from gorging on the blood of dogs. Pick the ticks off with a pair of forceps or tweezers. Dust the dog every five days with derris powder. Handle the ticks with care. Wear boots laced over the trouser legs when walking in thick-infested regions. Feel the back of your neck and head, their favorite feeding places. Examine children carefully in these spots twice a day. They will reveal the presence of a tick in time to prevent a fatal bite.

Examination of the whole body is necessary after exposure to ticks. If one is found, pull it off at once. Disinfect the bite and the surrounding tissues by inserting a round toothpick dipped in iodine into the exact spot where the tick was attached and drilling it in slightly. To detick clothing, place it in a vessel that can be tightly covered and set on top of it a pan containing half a teacupful of carbon tetrachloride or carbon disulfide. A few hours of such fumigation kills all ticks.

"Wine" Gum Candy

This type of confection can be made from ninety pounds of corn syrup, eighty pounds of sugar and twenty pounds of gelatin. The gelatin is swelled up with water by soaking until it is soft to the touch and all excess water is drained off. The sugar is dissolved in water and brought to a boil when the corn syrup is added and the boiling continued rapidly until 245° F. is reached.

It is then removed from the fire and after the batch becomes still it is poured into another pan which contains the soaked and drained gelatin. The whole mixture is then stirred and allowed to stand for about fifteen minutes. Scum rises to the top and is skimmed off clean after which the clear batch is ready to be deposited in starch. The filled boards are stacked and allowed to stand until the jellies have set. They are then transferred to a drying room and allowed to remain for four to six days, depending upon drying conditions. After drying has been completed the gums are removed from the drying room, allowed to cool, knocked out and brushed free from starch. The resulting dull pieces are then given a steam bath (dry steam) which produces a characteristic shine. The finished gums are of such a nature that they may stick if placed in the usual type of container, so a fifty-fifty mixture of petrolatum and slab oil is sprayed on and the gums are transferred to the grease bag or cylinder and tumbled.

Chewing Gum

Chicle	130 kg.
Paraffin Wax	37.3 kg.
Tolu Balsam	6.2 kg.
Peruvian Balsam	3.1 kg.
Sugar, Powdered	370 kg.
Glucose	150 kg.
Water	170 kg.
Flavor and Perfume	to suit

Soak the chicle in water, and mix hot with the melted paraffin and the balsams.

The sugars are boiled down with the water to a syrup, and kneaded with the rubber mixture to a plastic mass.

Chewing Gum with Rubber Latex Base

Rubber latex is used as an important ingredient in chewing gum base; for example, in the following preparation 100 lb. rubber latex are agitated with 50 pt. water, and 7 lb. cocoa powder, 85 lb. pulverized coumarone resin and 105 lb. powdered hydrogenated vegetable oil are added by parts. Mixture is gradually heated to 110° C. and agitated for two hours before removal.

Popcorn Coating

Brown Sugar	2½ lb.
Butter	½ lb.
Glucose	¼ lb.
Salt	¼ oz.
Soda	¼ oz.
Water	½ pt.

Mix the sugar, glucose, water and salt together and bring to a boil. Add the butter and boil to 290° F. Add the soda and stir vigorously. This will be sufficient to coat several quarts of corn after it has been popped.

Commercial Candied Peel

Select lemons of uniform size, either green or yellow, then cut into halves lengthwise, squeeze out the juice and remove the pulp. Make a strong pickling brine, using 1 lb. of salt to every 4 pints of water—the brine should be strong enough to float a potato. If seawater is handy it may be used instead. Take the peels and allow to soak in the brine for at least a month, changing the brine once during that time if necessary. Then remove, drain thoroughly, and soak in fresh water for two or three days.

After removing the peel from the brine it will be found that the inside white pulp will be quite soft, and can be easily removed by scooping it out with a teaspoon.

After the peel has soaked in fresh water, drain it and put it into fresh cold water, then place it on the fire and bring gradually to the boil. Allow to boil for five minutes, then drain and place on trays in a place where there is plenty of air circulating until the peels are slightly dry.

Make a syrup by boiling sugar (2 lb. sugar and 1 pint water) to 220° F. Remove the peels from water and pour syrup over them in an enamelled dish, after syrup has become quite cold.

Next day drain syrup off the peels, and boil again to 224° F., adding a pound or two more of sugar. After cooling down a bit pour over peels and allow to stand overnight. Repeat the operation on the two succeeding days, the first day running the boiling temperature to 227° F. and the second day to 230° F., each time adding some more sugar. On the last occasion, instead of pouring syrup over peels, put peels into the boiling syrup at 230° F., then stir until the syrup turns sugary, then remove the peel and pack in boxes with sheets of waxed paper.

Crystallized Fruits

Any preserved fruit (Konfyt) such as watermelon, figs, pears, pineapple, etc., may be crystallized by the following method, after having been drained from the syrup and then slightly dried in the sun.

Make a syrup from one pound of sugar and one cup water, stir until the sugar is dissolved, and just when it begins to boil stir in a quarter of a teaspoon cream of tartar, then leave off stirring, and allow to boil quickly for about three to four minutes. Test the syrup by dropping a little into cold water; if it forms a small soft ball between the thumb and finger, it has reached the desired degree. Drop the fruit to be crystallized, a few at a time, into this syrup, then lift out gently and drain free from all syrup. Place the fruit on wire (cake) trays and put in the sun to dry. When dry, make a syrup as before, and just as it reaches the "soft ball" stage add the fruit, put on wire trays, sift coarse granulated sugar over, and leave again in the sun to dry. When dry, put in boxes in layers, between sheets of waxed paper, and keep in a cool, dry place.

Apple Chutney

Put through a meat chopper 1½ lb. peeled and cored apples, 1 lb. onions, and ½ lb. stoned raisins. Add 2 quarts of vinegar, and cook gently for two hours, then add ¼ lb. ground ginger, 1 lb. brown sugar, 2 teaspoons cayenne pepper, ½ lb. mustard seeds, and a little salt. Cook another five minutes, stirring well, then leave to cool and bottle.

Seville or Bitter Orange Marmalade

Slice the fruit very finely, either by hand or through a machine. Put the pips in a separate basin and cover with ½ pint water. Weigh fruit and allow 3 pints water to 1 lb. fruit. Leave overnight, and next day boil till tender, adding water strained from the pips. Boil till the white pith is quite transparent and tender enough to pierce with a match or head of a pin. Stand overnight. Weigh the pulp, take an equal quantity of sugar, and boil together till it jellies (about ¾ hour), skimming and stirring from time to time.

Preserved Orange and Lemon Pulp, Skin and Juice

Immerse ½-pipe of lemon skins in cold water for 48 hours, changing the latter two or three times, to ensure complete removal of the salt. Cook the skins in a wooden cask fitted with a steam-coil of copper. Run off the hot water and add fresh water until quite cold, then drain the skins in a basket.

Place the skins in cold syrup (8 cwt. of sugar to 48 gals. of water). Bring to the boil, skim, and transfer to casks or tanks. Allow to stand 24 hours and then dry off the syrup. Run the syrup into the pans and bring to boiling point; after skimming run it over skins while hot and allow to stand for 24 hours.

Then draw off the syrup into the boiling pans, add 1 cwt. of sugar and boil to 220° F. Return the hot syrup to the peel and allow to stand for 48 hours. Again draw off the syrup into the boiling pans; add 1 cwt. sugar and boil to 225° F. Return to the peel and allow to stand for 48 hours. Repeat these operations for a third time, raising the temperature of the syrup up to 230° F.

Changing Setting Rates of Pectin

British Patent 454,504

The rate of setting of dried pectin is increased if it is soaked as follows:

Per 20 g. of pectin use

Methanol	100 cc.
N-Hydrochloric Acid	10 cc.

Soak for 24 hours at 25° C.

If the methanol is replaced by the following, setting times are as per the right hand column.

Ethyl Alcohol (80%)	8 minutes
Isopropyl Alcohol (90%)	13 minutes
Butyl Alcohol (80–85%)	20 minutes
Ethyl Methyl Ketone	25 minutes
Acetone	32 minutes

Baking Powder

Sodium Acid Pyrophosphate	42 g.
Sodium Bicarbonate	30 g.
Rice or Corn Starch	28 g.

Baking powder should develop 4.7–5.7 g. of carbon dioxide per kg. flour, and be acidic enough to remain slightly acid after the reaction with the bicarbonate is over.

Household Baking Powder

Cream of Tartar	2 lb.
Sodium Bicarbonate	1 lb.
Starch, Corn	1 lb.

Each ingredient should be well dried before mixing. Pack in air-tight containers.

Pyrophosphate Baking Powder

Formula No. 1

Sodium Bicarbonate	28.0 oz.
Monocalcium Phosphate, Granular	21.5 oz.
Sodium Acid Pyrophosphate	21.5 oz.
Re-Dried Corn Starch	29.0 oz.

No. 2

U. S. Patent 1,834,747

Sodium Bicarbonate	30.0 oz.
Monocalcium Phosphate	3.3 oz.
Sodium Acid Pyrophosphate	40.5 oz.
Re-Dried Corn Starch	26.2 oz.

Diabetic Baking Powder

Formula No. 1

Monocalcium Phosphate	33.5 oz.
Sodium Bicarbonate	40.0 oz.
Powdered Casein	26.5 oz.

This yields a high percentage of total Carbon dioxide.

No. 2

Monocalcium Phosphate	32.5 oz.
Sodium Bicarbonate	26.0 oz.
Powdered Casein	41.5 oz.

Shortening, Bakers'

Canadian Patent 359,918

Sugar	1 lb. 7 oz.
Salt	½ oz.
Shortening	7 oz.
Glyceryl Monostearate	⅛ oz.
Milk	1 lb.
Vanilla Extract	¼ oz.
Egg Whites	10 oz.

A high degree of cake shrinkage is prevented with this shortening.

Yeast Nutrient, Alkaline

U. S. Patent 2,033,009

A yeast concomitant fortified against acidic deterioration, adapted to be used in the making of leavened bread comprises in admixture, the following ingredients in approximately the following proportions: 0.64 ounce ammonium chloride, 1.76 ounces of calcium sulphate, .0176 ounce potassium bromate, 1.4 ounces flour, a compound selected from the following group: calcium carbonate, magnesium carbonate, having the proportion range, by weight of from .1 percent to 2 percent of the aggregate weight of the aforementioned ingredients, excepting the flour.

Retarding Staling of Bread

Formula No. 1

U. S. Patent 2,009,440

0.5–1.0% of arabinose is added to the dough. The loaf remains fresh for 24–48 hours longer than normal.

No. 2

U. S. Patent 2,033,180

0.025–0.1% of a 1:1 mixture of urea and ammonium sulphate is added to dough to give a pH of 5.

Fresh Marshmallow

Granulated Sugar	12 lb.
Water	3 qt.
Powdered Tartaric Acid	¼ oz.
Egg Whites	½ pt.
Gelatin	4 oz.
Vanilla Extract	¼ oz.

Put 2 quarts of water and 12 lb. sugar in kettle and boil to 240° F. When temperature reaches 235° F. add the tartaric and continue to boil to 240° F. This inverts the sugar, and keeps marshmallows soft and prevents granulation. Dissolve the gelatin in 1 quart hot water. When the syrup has boiled to the proper degree, whip the egg whites to a stiff meringue. Then pour in the boiled syrup and start whipping again. Slowly pour in the gelatine and whip until light. Add the vanilla flavor, then remove from kettle and use at once.

Frozen Custard (Ice Cream)

Eggs	10 doz.
Sugar (Acid Free)	25 lb.
Cornstarch	2–2½ lb.

After mixing this well on the upright mixer add:

Whole Milk	64 lb.
Cream	16 lb.

Mix all well in steam kettle and heat to 172 degrees F., or until the mixture thickens well. Age at least 24 hours in icebox before freezing.

A Simpler Method of Handling

Place in the steam kettle 25 pounds whole milk. Meanwhile mix together thoroughly in the beating machine the full amount of eggs, and 12½ pounds sugar mixed together dry with the 2 or 2½ pounds of starch. By mixing the sugar and the starch together dry, it will go into distribution more readily and eliminate the danger of lumps.

Beat the eggs and the sugar-starch mix together until thoroughly distributed. Meanwhile turn on the heat and when the milk is hot add approximately 1 gallon of this hot milk to the sugar and starch-egg preparation before taking it off the machine, while the remaining milk continues to heat. Then draw off in a receptacle suitable to handle and when the milk comes to the boiling point stream in the sugar, starch-egg, and milk preparation, while stirring the remaining milk. Bring to the temperature required to thicken (above 174° F.).

As soon as it has cooked thick, similar to a cream, add immediately, to prevent additional cooking, the remaining quantity of sugar. Stir as quickly as possible to check the heat. Meanwhile steam will have been turned on. Then add the remaining milk to cool down, adding the milk gradually while stirring. Follow with the addition of the cream; then proceed with the ageing and freezing as usual.

High Freezing Ice Cream
U. S. Patent 2,060,679
(Can be frozen in household refrigerator without continuous mixing.)

Egg Yolk	9.75	oz.
Confectioners' Sugar (1% Cornstarch)	100.00	oz.
Citric Acid	0.25	oz.
Agar	1.16	oz.
Pectin	0.16	oz.
Flavor to suit		

The amounts given in the illustrative formula serve to produce four ounces of the dry mixture, and, when employed in making ice cream, are added to about sixteen ounces of light cream or twenty-eight ounces of evaporated milk. The milk or cream is first whipped until almost stiff and the dry powder is then gradually mixed with the whipped cream and the resulting product then further whipped until stiff. This mixture is then placed in the trays of a mechanical refrigerator or frozen in any other desired manner to produce ice cream. The proportions given above produce about one and one-half quarts of ice cream when light cream is employed, or about two quarts of ice cream when using evaporated milk. If the dry powdered mixture is to be used in producing a sherbet or an ice, the powder is added during mixing to the liquid ingredients used in forming the particular product desired. For example, in producing a sherbet, the dry powdered mixture containing the desired flavoring agent is added to the stiffly beaten whites of eggs, and when thoroughly incorporated, the material is frozen.

The length of time required for freezing ice cream, for example, will vary considerably with the temperature of freezing and the proportions of the ingredients (especially sugar) present in the dry mixture employed. Ordinarily, when using the formula given above, the product will freeze in about forty-five minutes when held at a temperature of from 8° to 10° F. If the freezing temperature is higher, say 16° to 18° F., the freezing time is longer and may be as much as two hours.

Ice Cream
(British Formula)
Formula No. 1

Milk	6	pt.
Cream	1	pt.
Skim Milk Powder	7	oz.
Castor Sugar	22	oz.
Sodium Alginate	½	oz.

Heat the cream and milk cautiously in a steam pan or saucepan to 156° F. to pasteurize it. Add the sugar, skim milk powder, and alginate and stir for 20 minutes, maintaining the temperature at 156° F. the whole time. This will ensure that the alginate and skim milk powder are completely dissolved. Stir thoroughly or preferably homogenize. Cool rapidly to 40° F., add the flavoring and coloring agents. Age and freeze.

No. 2

Unsalted Butter	18	oz.
Skim Milk Powder	21	oz.
Sugar	23	oz.
Water	6	pt.
Sodium Alginate	1	oz.

Mixes of this type are best prepared in a steam heated pan and it is essential to homogenize the mix. The method of preparation is otherwise similar to the above.

Ice Cream Mix
U. S. Patent 2,065,398
Formula No. 1

Cream (40% Fat)	265.26	lb.
Milk (3½% Fat)	539.90	lb.
Skim Milk, Powdered	50.84	lb.
Sugar	140.00	lb.
Gelatin	3.00	lb.
Glyceryl Monostearate	1.00	lb.

No. 2

Cream (40% Fat)	265.37	lb.
Milk (3½% Fat)	538.63	lb.
Skim Milk, Powdered	51.00	lb.
Sugar	140.00	lb.
Gelatin	3.00	lb.
Glycol Stearate	2.00	lb.

The inclusion of the above stearates give better control of "over-run." They produce ice creams of a smoother texture in a shorter time.

(Lemon) Ice Cream Powder

Corn Starch	25	kg.
Rice Starch	25	kg.
Vanilla Sugar	3	kg.
Lemon Oil Sugar	5	kg.
Dry Ice Powder	5	kg.

Use 100 g. of the powder and 40–50 g. of sugar for 1 l. milk.

Diebetic (Sugar Free) Ice Cream

40% Cream	84.75 lb.
Water	7.00 lb.
Eggs	8.00 lb.
Saccharin	3.20 g.
Vanilla Extract	8.00 oz.

To make approximately 11.5 gallons.

The formula may be cut down to any desired amount. It is best to whip it first and then freeze and be certain that it does not freeze too stiff and so gum up in the freezer.

Ice Cream Thickener

Gum Tragacol	2 oz.
Flour	4 oz.
Gelatin	2 oz.

Use 8 oz. to 10 gals. of ice cream to keep it smooth and fine-grained.

Ice Cream Stabilizer
U. S. Patent 2,103,411

Skim Milk Powder	8.00 lb.
Sugar	16.00 lb.
Cream (40% Fat)	30.00 lb.
Water	45.78 lb.
Locust Bean Gum	0.15 lb.
Calcium Sulphate (Pure)	0.07 lb.

Stable Chocolate Milk
U. S. Patent 2,103,411

Formula No. 1

Powdered Cocoa (Low Fat)	1.80 lb.
Sugar	6.40 lb.
Locust Bean Gum	.13 lb.
Fluid Milk	91.52 lb.
Calcium Sulphate (Pure)	.15 lb.

The foregoing product is completed by heating the mixture for thirty minutes at about 180° F.; then cooling and bottling it. The product is unusually stable, retaining the cocoa particles uniformly dispersed. No settling out of any character takes place until actual souring of the milk begins.

No. 2

Powdered Cocoa (Low Fat)	1.80 lb.
Sugar	6.40 lb.
Tapioca Flour	.50 lb.
Fluid Milk	91.22 lb.
Calcium Sulphate	.08 lb.

These ingredients are heated for about thirty minutes to about 200° F., and the mixture is then cooled and bottled.

Where the beverage is to be made of a "high-fat" cocoa, the following mixture may be used, the same being heated to approximately 180° and then cooled.

No. 3

Powdered Cocoa (High Fat)	1.80 lb.
Sugar	6.40 lb.
Locust Bean Gum	.10 lb.
Fluid Milk	91.64 lb.
Calcium Sulphate	.06 lb.

Food Colors, Liquid

The following solutions are made from certified food colors and will keep in glass bottles tightly corked for several weeks. For longer periods of storage it is advisable to add about 7 grams of benzoate of soda to each gallon of solution.

Emerald Green

Tartrazine	44 g.
Brilliant Blue F.C.F.	27 g.
Light Green S.F.Y.	26 g.
Filtered Water	1 gal

Gum Drop Orange

Ponceau 3R	97 g.
Tartrazine	185 g.
Filtered Water	1 gal.

Raspberry Red

Ponceau 3R	200 g.
Erythrosine	25 g.
Filtered Water	1 gal.

English Caramel Red

Carmine	240 g.
Amaranth	16 g.
Erythrosine	24 g.
Ammonia	4 oz.
Filtered Water	1 gal.

Yellow

Tartrazine	210 g.
Orange I	14 g.
Filtered Water	1 gal.

Banana Orange

Amaranth	7 g.
Erythrosine	58 g.
Tartrazine	221 g.
Filtered Water	1 gal.

Tangerine Red

Amaranth	100 g.
Ponceau 3R	150 g.
Tartrazine	30 g.
Filtered Water	1 gal.

Caramel Brown

Amaranth	6 g.
Erythrosine	14 g.
Ponceau 3R	75 g.
Orange I	16 g.
Tartrazine	209 g.
Brilliant Blue F.C.F.	40 g.
Filtered Water	1 gal.

Reddish Brown

Amaranth	68 g.
Erythrosine	14 g.
Tartrazine	87 g.
Brilliant Blue F.C.F.	4 g.
Filtered Water	1 gal.

Food Colors, Paste

Paste Colors for use in food products may be made from certified food colors by mixing 4X sugar and glycerin. It is advisable to heat the glycerin to about 120° F. to get a better mixture.

Crimson Paste

Amaranth	65 g.
Ponceau 3R	100 g.
Brilliant Blue F.C.F.	3 g.
Glycerin	376 g.

Add 4X sugar to make desired paste.

Orange Paste

Ponceau 3R	300 g.
Tartrazine	600 g.
Glycerin	1000 g.

Add 4X sugar to make desired paste.

Rose Paste Color

Amaranth	12 g.
Erythrosine	28 g.
Glycerin	360 g.

Add 4X sugar (about 3 oz.) to make desired paste.

Yellow Paste

Tartrazine	98 g.
Glycerin	180 g.
4X Sugar	260 g.

Violet Paste

Amaranth	16 g.
Erythrosine	4 g.
Light Green S.F.Y.	20 g.
4X Sugar	60 g.

Add sufficient glycerin to make desired paste.

Food Colors, Powdered

Use only certified pure food primary colors.

Yellow (Bakers')

Tartrazine	9 oz.
Amaranth or Orange I	1 oz.

Egg-Yellow (Bakers')

Tartrazine	14½ oz.
Orange I	1½ oz.

Lemon-Yellow (Confectioners')

Tartrazine only

Golden-Yellow (Confectioners')

Tartrazine	15 oz.
Orange I	5 oz.

Brilliant Yellow (Macaroni)

Tartrazine only

Red-Orange

Orange I	9 oz.
Amaranth	1 oz.

Deep Orange

Ponceau	15 oz.
Tartrazine	2 oz.

Brilliant Orange

Orange I only

Violet

Amaranth	44 oz.
Sodium Indigo Disulphonate	21 oz.

Royal Purple

Amaranth	4 oz.
Sodium Indigo Disulphonate	1 oz.

Grape

Amaranth	4 oz.
Sodium Indigo Disuphonate	½ oz.

Green

Tartrazine	6 oz.
Sodium Indigo Disulphonate	4 oz.

Mint Green

Light Green S. F.	48 oz.
Tartrazine	52 oz.

Olive Green

Sodium Indigo Disulphonate	4 oz.
Orange I	1½ oz.
Tartrazine	10½ oz.

Deep Red

Ponceau	15 oz.
Amaranth	5 oz.

Striping-Red

Erythrosine	2 oz.
Amaranth	6 oz.
Ponceau	12 oz.

Carmine

Erythrosine	9 oz.
Ponceau	1 oz.

Cherry

Ponceau only

Sherry

Amaranth	3 oz.
Orange I	1 oz.

Raspberry

Amaranth only

Strawberry Red

Amaranth	8½ oz.
Orange I	1½ oz.

Brilliant Red

Amaranth	14 oz.
Orange I	2 oz.

Rose (Pink)

Amaranth	12 oz.
Sugar	4 oz.

Pink

Amaranth	15½ oz.
Sodium Indigo Disulphonate	½ oz.

Brown

Orange I	13 oz.
Sodium Indigo Disulphonate	8 oz.
Amaranth	3 oz.
Tartrazine	2 oz.

Red-Brown

Orange I	13¾ oz.
Amaranth	2¼ oz.

Chocolate Brown

Sodium Indigo Disulphonate	28 oz.
Amaranth	20 oz.
Tartrazine	40 oz.
Orange I	12 oz.

Burnt Peanut Brown

Orange I	45 oz.
Ponceau	25 oz.
Light Green S. F.	30 oz.

Royal Blue

Sodium Indigo Disulphonate	12 oz.
Sugar	4 oz.

Ice Cream Cone Color

Tartrazine	7 oz.
Chocolate	1 oz.

Blood-Orange

Egg Color	6¾ oz.
Strawberry Red	1¼ oz.

Ice Cream Color

Egg Color	4 oz.
Strawberry Red	½ oz.

Cheese Color

Ice Cream Color	½ oz.
Water	½ oz.

The above colors may be diluted with either salt or sugar.

Egg Coloring for Bakers

Tartrazine, Certified	1.5 oz.
Orange I	0.5 oz.
Water	1–2 gal.

Easter Egg Dyes

Blue

Marine Blue, B. N.	60 gr.
Citric Acid	600 gr.
Dextrin	2 oz.

Brown

Vesuvin, S.	1 oz.
Citric Acid	1¼ oz.
Dextrin	1 oz.

Green

Brilliant Green, G.	225 gr.
Citric Acid	300 gr.
Dextrin	2¼ oz.

Orange

Orange, I. I.	150 gr.
Citric Acid	300 gr.
Dextrin	2½ oz.

Red

Diamond Fuchsine, I	60 gr.
Citric Acid	300 gr.
Dextrin	2½ oz.

Violet

Methyl Violet, 6 B.	60 gr.
Citric Acid	300 gr.
Dextrin	2½ oz.

Yellow

Naphthol Yellow, S.	255 gr.
Citric Acid	600 gr.
Dextrin	2¼ oz.

Each of the above formulas suffices to make 20 powders, each of which will color at least 5 eggs. The directions should read as follows:

Dissolve the dye in a porcelain or earthen vessel in 1 pint of boiling water. In the meantime boil 5 eggs for 5 minutes, and transfer to the dye bath, and allow to remain in until sufficiently colored. Then remove, and polish them with a small quantity of oil or fat.

Coloring Easter Eggs

Boil the eggs in water containing outer skins of red or yellow onions. A deep red color results and is to be preferred to the aniline dyes which are used.

Butter Coloring

Curcuma Root	11 kg.
Annatto (Orleans)	77 kg.
Rapeseed Oil	177 kg.

Heat all in a copper or an enamelled kettle for several hours with agitation by means of a wooden paddle. Press out when cooled. Filter through a heated funnel. Adjust color with more rape oil.

Cheese Coloring

Annatto	10 kg.
Caustic Potash, Pure	1.4 kg.
Borax	0.5 kg.
Water, to make	25 kg.

Boil with part of the water. Fill up to total weight when all is dissolved. Filter. Adjust color-intensity with distilled water.

Butter Flavor

a.	Butyric Acid, from Fermentation	2.5 kg.
	Glycerin	25 kg.
	Sodium Acid Carbonate	1.25 kg.
b.	Coumarin	30 g.
	Alcohol, Pure	to dissolve
	Butter Ether	35 g.
c.	Safflower	50 g.
	Hot Water	500 g.
	Glycerin	2 kg.

Make *a* by neutralization.
Dissolve *b*.
Dissolve *c*.
Mix all solutions. Use 1 pt./1,000 of margarine.

Rice Flakes
U. S. Patent 2,064,701

The process of manufacturing rice flakes comprises heating rice grains at a temperature between about 165 degrees and 265 degrees F. for a period of at least thirty minutes in an atmosphere saturated with steam and compressing the product, when having a humidity of at most 20%, into flakes while it is at this temperature.

Soybean Breakfast Food

Heat the soybeans in hardened vegetable oil ("Crisco" type) five minutes. Remove hulls. Grind to pass a 14-mesh screen and be retained on a 28-mesh screen. To each pound of soybeans add one ounce of saturated salt solution and two ounces of saturated sugar solution, mix, and bake in a one-quarter to one-half inch layer at 160° C. to a satisfactory brown color (approximately one hour).

Improving Odor and Taste of Soya Beans
U. S. Patent 2,026,676

Natural odors and flavors are removed from soya beans by soaking in water at 38° for 15 minutes to give a water content of 20%, and heating them for a short time at 163°. The temperature is then lowered and drying continued.

Improving Coffee Flavor
U. S. Patent 2,027,801

The flavor of coffee is improved by keeping green coffee, containing 15% of water, in a closed container for 7–15 hr. at 32–77°, to allow enzymic activity to proceed, and by subsequent drying and roasting.

Stable Soup Powder
U. S. Patent 2,079,649

The vegetable materials to be incorporated in the formula are chopped, and dehydrated by the application of the least degree of heat necessary to drive off their natural moisture in order to keep them uncooked, to retain their characteristic raw flavors and colors, as well as vitamin content. The ingredients are then mixed in the following proportions:

Five to 10 lb. of vegetables, 15 to 25 lb. of vegetable proteins, preferably derived from Dunlap, Mandarin or Manchus soya beans, 4 to 8 lb. mono-sodium glutamate, 10 to 15 lb. sodium chloride, 1/40 to 1/70 lb. sodium nitrite—and as desired—20 to 30 lb. commercial milk powder, 3 to 7 lb. sugar (preferably granulated sucrose), 20 to 25 lb. white wheat-flour (or corn starch equal to the normal starch content of the stated amount of flour), 1 to 2 lb. suitable condiments (such as black and/or white pepper and/or marjoram and/or thyme, etc.).

Tilsiter Cheese

This cheese was first made in East Prussia. It is made from raw or pasteurized milk with 1.0, 1.8, and 3.0 per cent fat.

The milk is set at 33° C. to firm in 30 minutes. One per cent of culture is added to pasteurized milk; raw milk requiring only ¼ per cent of culture.

The 1.0 per cent milk curd is cooked to 37° C., and held for 1½ hours. The 1.8 per cent milk curd is cooked to 39° C. and held for 1¾ hours. The 3.0 per cent milk curd is cooked to 41° C. and held for 2 hours.

The curd is salted at the rate of 5 pounds per 1,000 liters of milk, then the cheeses are salt rubbed at 12, 24, and 36-hour intervals. The cheeses are cured at 15° C. for 8 to 10 weeks in a saturated atmosphere. The cheeses are washed twice weekly in clear water.

These cheeses are made about the size of daisy cheeses and without bandages. They contain about 40% of moisture. The flavor is similar to Trappist type cheese. The texture is open with many small holes.

Rapid Curing of Strong Flavor Cheese
(F. M. Method)

Keep the cheddar cheese at 40° F. for 2 weeks to develop rind and allow the curd to break down. Then place at 55° F. with a humidity of 70–85 for 2 weeks to cure rapidly and avoid excessive shrinkage losses. Then cure at 40–45° F. for 3 to 4 weeks, and if the cheese lacks flavor place at 62–66° F. for 2 weeks. Then store at 34–37° F.

St. Louis Cream Cheese

This cheese is prepared from cottage cheese, 10 per cent cream and evaporated milk. The cottage cheese is made in the usual manner. If it develops acidity or hard curd it is washed with milk of magnesia. Five gallons of cottage cheese are mixed with four and a half gallons of 10 per cent cream and one gallon of evaporated milk. The cream and the evaporated milk are heated to 145° F. before stirring into the cottage cheese. This mixture well stirred is processed at 1,000 pounds pressure. A smooth product results. The mixture is run through the machine following water and pressure is not applied until the mixture appears.

Hot Pack Cream Cheese

In this method 15 per cent cream with 0.2 per cent of gum added is pasteurized and homogenized at 2,500 pounds pressure. It is then cooled to 70° F. and 12 pounds of starter are added per 1,000 pounds of cream and 1 to 2 cc. of rennet.

The batch is allowed to stand until the acidity reaches 0.8 per cent. At this time it is cooled to 55 to 60° F. and bagged and drained. The drained curd with the addition of three-fourths per cent of salt based on the weight of the curd and 0.15 per cent of gelatin is heated to 165° F. and homogenized at 2,500 pounds pressure. The curd is standardized with skim milk so that a yield of 42 per cent is obtained on the basis of the original weight of cream used. This makes a cheese that will keep very well.

Coloring Gouda Cheese

Wash the cheese, which should not be less than 10 days old, with warm water containing 1% of ordinary blue lime, dry thoroughly and dip in paraffin wax (m.p. 130–135° F.) heated to 300° F. and containing amber petrolatum 5–10%, petrolatum ceresin 1.0–2.5% and oil-soluble carmine-red paint 2–3%.

Wax Coating for Cheese

U. S. Patent 2,102,516

White Scale Wax (m.p. 50–55° C.)	50–85%
Petroleum Wax (m.p. 55–60° C.)	50–15%

In thin layers this wax is flexible at cold storage temperatures.

Stabilizing Sour Cream

There are several procedures in the method of manufacture that lead one to believe that they are the cause of thin body. These are the use of too many stabilizers, holding the cream too long at 180° F. and setting at too high a temperature.

A procedure that has given good results is as follows: To the 18% fat cream add 3½ ounces of a good grade of gelatin for each ten gallons of cream, then heat to 180° F. and hold for 15 minutes, homogenize, using one valve and 3000 pounds pressure, then cool to 70° F. and to each ten gallons of cream add one quart of good starter and ripen to 0.6 to 0.7% acidity using a ripening temperature of 70° F. When the cream is ripened, cool in ice water and do so with the minimum of agitation.

A procedure that usually produces a still heavier body is the same as above except that when the cream reaches an acidity of about 0.4%, bottle, and then permit the ripening to 0.7% to continue in the bottle and then cool. This modification is time consuming and rather expensive but it will yield a heavy bodied product. Agitation of the cream after it has set up is most injurious to the body of the cream.

Using a temperature of 70° F. rather than 80° F. will yield a better flavored product, for in sour cream, as in the preparation of butter cultures, one is most interested in producing those desired characteristic flavors. Low temperature ripening influences the body, and the cream should be held during ripening at a temperature not exceeding 72° F. Should the temperature go higher, weak body cream with flat flavor usually results.

Jewish Type Sour Cream

Select a sweet cream containing between 20 and 25 per cent fat. Pasteurize the cream at a temperature of 150 to 165° F. and hold for 30 minutes. Homogenize the cream at a pressure of 2000 to 2500 pounds per square inch at the temperature at which the cream is pasteurized. Following homogenization, the cream should be cooled to 70° F. After cooling, 5 per cent of a good starter should be added. The cream should be permitted to ripen until the desired flavor is reached. The cream may then be bottled and if possible, cooled within the bottle, which may be accomplished by placing the bottles in a tank of ice water. Allow the bottled cream to stand 12 hours before delivering to the consumer. Make sure that a good starter is always available as it is essential in the preparation of a product of uniform flavor and aroma.

Devonshire Cream

Select, preferably, milk from cows producing 4% or more of milk fat. Place the milk in a vat without coils and cool to 40 to 50° F. without agitation. With a dipper strain the cream from the surface and place in a large container. The cream when ready for skimming should be crusted slightly brown from the heat, and oil globules should appear on the surface. Mix the cream slightly before placing in wide mouthed glasses for distribution.

Devonshire cream is extensively used in England. It is made in the home as well as commercially. In England it is usually made from the milk of Devon cattle. This milk averages 4% of fat. Devonshire cream has numerous uses; its main use is with fresh berries.

Artificial Cream
Formula No. 1

Butter, Unsalted	2	lb.
Milk	2	pt.
Sugar	½	oz.
Sodium Alginate	⅛	oz.

Warm the milk and butter together to 100° F., add the sugar and alginate and stir thoroughly until dissolved. Homogenize without the addition of further heat and without allowing the mix to cool. If the cream is to be kept for any length of time the mix should be pasteurized at 140° F. for half an hour before homogenizing and then passed through a sterilized homogenizer.

No. 2

Butter, Unsalted	2	lb.
Skim Milk Powder	4	oz.
Water	2	pt.
Sugar	½	oz.
Sodium Alginate	⅛	oz.

Make the skim milk powder into a paste with a portion of the water, then add the remainder of the water and the butter and warm to 100° F. Proceed as above.

Preserving Cream
U. S. Patent 2,053,740

About 0.01–0.09% hydrogen peroxide is added to the cream and it is heated to 61–63° C. for 15–30 minutes.

Removing Garlic or Onion Flavor from Milk

10 per cent white oil is added to 90 per cent milk, and agitated rapidly. After the oil has been broken up into minute particles and dispersed throughout the milk, the mixture is permitted to stand undisturbed until the oil rises to the top, carrying with it the minute particles of fat which contain the offensive odor and taste. It is then siphoned off. Only a comparatively small amount of butterfat is lost by this method.

Occasionally the milk of a particularly errant herd of cows requires two treatments, with exceptionally violent onion lovers requiring three.

The oil may be reclaimed by a series of washings or steamings, and then be sterilized and used over again.

Shortenings
Formula No. 1

Cottonseed Oil	60–50	lb.
Edible Tallow	40–50	lb.

No. 2

Cottonseed Oil	75–78	lb.
Edible Tallow	10–15	lb.
Oleo Stearine	10–12	lb.

No. 3

Cottonseed Oil	70	lb.
Edible Tallow	15	lb.
Oleo Stearine	10	lb.
Lard	5	lb.

Bulk of such products now made are either all vegetable fats or all animal fats. Some shortenings made of a combination of beef and hog fat and sold under a brand name have found very good acceptance.

Soybean Butter

Crack the beans in a corn mill with a coarse setting to remove hulls and germs. Heat in "Crisco" or other hydrogenated oil fat at 100° C. for five minutes. Drain. Roast at 160° C. for 20 minutes. Grind fine, adding soybean oil to give proper consistency, and salt to taste.

Egg Yolk Substitute for Margarine

Egg yolk is replaced and better emulsification is gotten by using 1 to 1½% of molasses.

Cottolene (Imitation Lard)

Deodorized Hog Grease	20	lb.
Oleo Stearine	8	lb.
Tallow	12	lb.
Cottonseed Oil	60	lb.

Warm until melted; mix; pour into containers at lowest possible temperature. This will make 100 lb. of excellent lard compound.

Margarine
British Patent 474,717

Margarine is made by dispersing 200 parts of sour skim milk in 1,000 parts of a molten mixture of cottonseed and coconut oils with the aid of 5 to 15 parts of an emulsifying agent (glyceryl monostearate).

Coating for Salamis
Formula No. 1

Paraffin Wax	35	g.
Rosin	62.8	g.
Whiting	2.2	g.

Applied at about 90° C.

No. 2

Linseed Oil	60 g.
Rosin	10 g.
Shellac	10 g.
Glycerin	10 g.
Beeswax	7 g.
Chalk	3 g.

Coating for Sausages

Paraffin Wax	35 g.
Rosin	62.8 g.
Whiting	2.2 g.

Glaze for Smoked Meats

A gelatin dip which is sometimes used on smoked meats to avoid mold and shrinkage is made of the following ingredients:

Commercial Gelatin	25 lb.
Glucose	35 lb.
Water	40 lb.

Place gelatin and glucose in a double boiler and mix, having temperature of water in bottom of boiler about luke warm. Then add 40 per cent water to gelatin and glucose, mix well and raise temperature gradually to not less than 130° F. and not over 150°. Cook for 1½ to 2 hours.

Wipe each piece of smoked meat carefully to remove surplus grease, salt, etc., then dip into glaze momentarily. If necessary, pieces may be dipped a second time. Then let them hang over dipping vessel so that any drip may be recovered. This glaze is transparent, resilient and amply tough to resist damage in reasonable handling. Meats may be wrapped and shipped in usual manner.

There are also glazes for covering meat loaves and sausage and for baked hams and picnics.

Sterilization of Meat Wrappings

Heating hessian wrappings at 65° for 1 hour gives practically complete control of low-temperature mold spores. Exposure for longer periods to somewhat lower temperatures (≮50°) is also effective.

Tongue Pickling Solution

Salt Solution (70°)	100 gal.
Sugar	30 lb.
Sodium Nitrate	10 lb.

Meat Pickling Brine, Acid

Sodium Nitrite	0.9 lb.
Sodium Nitrate	0.6 lb.
Salt	97.65 lb.
Citric Acid, Anhydrous	0.85 lb.

Arresting Formation of Nitrite in Pickling Brine

Biological changes increase nitrite content and alkalinity of pickling brines on ageing. This can be controlled by the addition of 1½% magnesium carbonate with or without 1% magnesium chloride.

Ham Brine for Injection

Salt	240 g.
Sugar	30 g.
Potassium Nitrate	30 g.
Water	750 g.

Use the above amount for each kilogram of meat. Cover with salt mixture in customary way and smoke at 38–43°.

Meat Curing Salt

French Patent 818,943

Sodium Formate	1000 g.
Sodium Citrate	30 g.
Sodium Nitrite	2 g.

Meat Preserving Salt

Austrian Patent 145,689

Salt	91 g.
Potassium Nitrate	3 g.
Sugar	3 g.
Sodium Dihydrogen Phosphate	1– 2 g.

Removing of Boar or Sex Odor from Hog Meat

This odor is largely removed by using 1–500 sodium nitrate in 10% salt solution when pickling.

Mushroom Extract

60 kg. fresh mushrooms or 6 kg. dried mushrooms, 1 kg. of truffles and 1.5 kg. of pure hydrochloric acid are allowed to soak. 50 kg. of distilled water is added at a moderate temperature, and extraction is carried out for 10 hours with stirring (if the mushrooms were not minced, more time is needed). Boil for 2 hours with stirring, until a smooth, gelatinous syrup has formed; neutralize with pure soda ash, filter hot through flannel, and evaporate to ½ its volume. This extract represents a jelly which can be stored in well filled and closed vessels. Yield 40–50 kg.

Extracts of Kitchen Herbs

Mince 50 kg. of cauliflower, 50 kg. of fresh celery, 30 kg. of asparagus, 30 kg. of ripe tomatoes, 3 kg. of fresh onions, some laurel leaves, carrots, a little garlic, nutmeg and parsley. Heat the mass with 30 kg. of pure hydrochloric acid for several hours, until it darkens in color to brown.

Shut off the steam, digest under stirring for several hours, boil up once again, neutralize with soda ash. Filter, evaporate to a thick extract in vacuo. Yield 40–60 kg. with a salt content of 24–27%.

Vegetable Extract

50 kg. fresh ripe tomatoes, 50 kg. of overripe tomatoes, 1.8 kg. of a slightly roasted celery, 0.5 kg. of roasted onions, 80 g. of garlic, 20 g. of sage, 20 g. of laurel leaves, 5 kg. asparagus are treated with 15 kg. purest beer yeast for 6 days, at 30–40° C. After this time, add 14 kg. of pure hydrochloric acid, boil for 1 hour, neutralize with soda ash, cool, filter, boil down in vacuo. 40–50 kg. yield.

Worcestershire Sauce

Vinegar	1 qt.
Powdered Pimento	2 dr.
Powdered Cloves	1 dr.
Powdered Black Pepper	1 dr.
Powdered Mustard	2 oz.
Powdered Jamaica Ginger	1 dr.
Common Salt	2 oz.
Shallots	2 oz.
Tamarinds	4 oz.
Sherry Wine	1 pt.
Curry Powder	1 oz.
Capsicum	1 dr.

Mix all together, simmer for 1 hour, and strain. Let the whole stand for a week, strain it, and fill in bottles. Worcestershire sauce is never quite clear; straining to remove the coarser particles is all that is necessary.

Tomato Ketchup

Take 8 lb. tomatoes and stew until tender, together with one or two shallots or onions cut up, then put through a sieve. Return to the saucepan, and add a tablespoon salt, 1 tablespoon ground cloves, 1 tablespoon ground ginger, ½ tablespoon allspice, and 1 pint vinegar. Boil until reduced to one-third.

Mayonnaise

Formula No. 1

Egg Yolks	14 lb.
Vinegar	10 lb.
Cotton Seed Oil (Prime Summer Yellow)	70 lb.
Salt	1½ lb.
Sugar	3½ lb.
Mustard	¾ lb.
Pepper	¼ lb.

Mix thoroughly in mixing bowls and run through a colloid mill with a clearance of .005″.

No. 2

Egg Yolk	15 lb.
Water	8 lb.
Salt	1 lb.
Mustard	½ lb.
Pepper	½ lb.
Vinegar	10 lb.
Sugar	5 lb.
Cottonseed Oil (Prime Summer Yellow)	60 lb.

Method as above.

Celery Salt

U. S. Patent 2,046,862

Celery Oil	0.1–1 g.
Mono-Sodium Glutamate	2.6 g.
Salt to make	100 g.

Seasoning and Condiment

U. S. Patent 2,021,403

Finely-granulated citric acid 22 oz. is heated with 66 oz. of table salt to 100° C. with continual stirring, until all the salt has been "wetted" by the acid. The mass is cooled slowly, the stirring being continued. Into the mixture are stirred powdered paprika 3.5 oz., white pepper 2.5 oz., and granulated sugar 6 oz. The product is non-hygroscopic.

Preservation of Eggs

Water Glass Method:

9 quarts soft water boiled and cooled; add 1 quart water glass; stir thoroughly. Sufficient for 15 dozen eggs. Use 6 gallon crock. Scald crock before using. Allow at least two inches of solution over eggs. Place crock in a cool, dry place, well covered to prevent evaporation.

Lime Water Method:

2 or 3 pounds of unslaked lime and 5 gallons water boiled and cooled. Pour water over lime and allow to stand until mixture settles and liquid is clear. Place clean, fresh eggs in a crock or jar and pour clear lime water over eggs. Allow two inches of liquid over top of eggs.

Dried Egg White

U. S. Patent 2,059,399

Adjust pH of egg-white to 5–6 with lactic acid. Set aside for 4–36 hours at room temperature. Pour off clear solution and adjust to pH of 8.6 with ammonia. Dry.

Thinning Egg Whites

U. S. Patent 2,054,213

If enterokinase from intestines of pigs is used, 1 lb. of the dried intestinal lining is sufficient to cause the thinning of 2,000 lb. of egg whites in 24 hours or less. The preferred temperature range is between 30 and 40° C. Occasional or very slow agitation helps.

If benzoyl glycerin is used, 1 lb. of

the activator will liberate trypsin to thin 5,000 lb. of egg whites. These ratios may vary with the eggs.

Greek Type Olives

Use black ripe olives of Mission or Manzanillo varieties. The Sevillano and Ascolano varieties are not suitable because deficient in oil. Obtain a supply of three-quarter or half ground rock salt of good quality; this is a medium coarse crushed salt; ice cream salt will do.

For containers use lug boxes, either 50 pound or 25 pound size, lined with ordinary burlap. Mix 5 pounds of the salt with each 20 pounds of olives in the box.

Once a week stir well; this can be done by pouring the olives into another box. Brine forms and is allowed to seep away from the box.

After about 6 weeks the olives should be ready to use. They will be somewhat shriveled and will have lost most of their bitterness.

To keep them, add a few handfuls of the coarse, crushed salt, and stir the olives occasionally. They should be eaten before they have completely dried or molded.

Preparing Green Olives

Use olives that have reached full size but which are still green to straw yellow in color.

Prepare a lye solution of 2½ ounces of lye, using any good household or farm granulated lye. This is equivalent to about ¾ of a pound to 5 gallons of water. Be sure that the lye has dissolved.

Cover the olives with this lye solution in a wooden tub or stoneware jar and allow it to stand, with occasional stirring, until the lye has penetrated about ½ or ⅔ of the way to the pit. Cut samples of the olives frequently with a knife to observe the rate of penetration of the lye. Penetration to the depths given requires ordinarily 6 to 8 hours.

Discard the lye. Cover the olives immediately with cold water. Pour this water off and replace it with fresh cold water. Change this water 4 or 5 times a day for two days.

Place the olives in a barrel or small keg and fill the container completely with brine containing 1 pound of salt to each gallon of water. Also add about 1 pint of imported Spanish olives and brine to each 5 gallon keg or larger container.

Seal the container completely except for a one-fourth inch opening to allow escape of gas. Keep the barrel filled at all times. If the barrel is stored in a warm room the olives should be ready for consumption at the end of about six months. When the barrel is opened, add to each 5 gallons of olives about 1 quart of vinegar. Transfer the olives and brine to glass top jars and seal. Do not use zinc top jars. No further treatment is necessary.

Green Tomato Pickle

Tomato Puree	25	gal.
Pale Malt Vinegar (16 Grain)	8	gal.
Table Salt	7	lb.
Gum Tragacanth	1	lb.
White Sugar	25	lb.
White Pepper	8	oz.
Ground Ginger	8	oz.
Ground Nutmeg	4	oz.
Cayenne	1	oz.
Raw Onions	4	lb.
Garlic	¼	lb.

Place the gum in 1 gal. of the vinegar to soak for 24 hours. Add 1 gal. more of vinegar to the gum, stir well. Peel the onions and chop fine. Place balance of vinegar in a steam pan; add sugar, salt, pepper, ginger, nutmeg, cayenne, onions, and garlic, also the gum. Stir well, add the tomato purée, bring to the boil, stirring all the time and gently simmer for 20 minutes. Shut off the steam and rub through a fine sieve. Fill and cap.

This should be sterilized in a water bath, temperature being brought up to 195° F. for 1 hour, remaining at this temperature for 15 minutes. Run off the water until cold.

Barbecue Relish

This is made by mixing two barrels of sweet pickle relish for which the formulas are as follows:

Formula No. 1

White Onion Skins	35	lb.
Red Bull Nose Peppers	40	lb.
Cauliflower Stocks	50	lb.
Pickles, Broken	175	lb.
100-Grain White Vinegar	10	gal.
Sugar, Granulated	125	lb.
Ground Ginger	4	oz.
Ground Nutmeg	4	oz.
Yellow Mustard Seed	1½	lb.

No. 2

White Onion Skins	35	lb.
Red Bull Nose Peppers	25	lb.
Cauliflower Stocks	20	lb.
Pickles, Broken	275	lb.
100-Grain White Vinegar	10	gal.

Sugar, Granulated	125	lb.
Ground Ginger	4	oz.
Ground Nutmeg	4	oz.
Yellow Mustard Seed	1½	lb.

No. 3

White Onion Skins	10	gal.
Red Bull Nose Peppers	5	gal.
Green Tomatoes	20	gal.
Pickles, Broken	90	gal.
100-grain White Vinegar	12	gal.
Sugar, Granulated	200	lb.
Celery Seed	½	lb.
Ground Nutmeg	2	oz.
Yellow Mustard Seed	2	lb.

With one-half barrel of ground sweet pepper pickles. The peppers are fermented in a salt brine or salt and vinegar after which the salt is removed by soaking in water and the peppers then covered either with a 40-grain white distilled vinegar or with a spiced sweet liquor such as is used to cover pickles. They should remain in the liquor for about a week. They are then either chopped very fine or else run through the medium or fine blade of a meat grinder and mixed thoroughly with the pickle relish. This is the relish that is used with "hot dogs," etc. Others mix the relish which has been drained or pressed to remove excess liquor with salad dressing at the rate of 2 parts of drained relish to 1 part of dressing.

Bleaching Walnuts

Walnuts cannot be satisfactorily bleached unless they have been thoroughly dried either in the sun or in a dehydrator at not over 110° F., before being placed in the bleaching solution.

Walnuts which have bits of hull or much fiber adhering tightly to the shell cannot be satisfactorily bleached and should be culled out before bleaching. Nuts which are split open should be removed or they may subsequently spoil if filled with bleach liquor.

Place 5 pounds of chloride of lime, from a freshly opened can, in a 10 gallon crock or barrel and add sufficient water to make a creamy paste after thorough stirring. Be sure that all lumps are thoroughly broken up, using the hands to insure a smooth creamy mixture. Fill the container half full of water and stir thoroughly.

In another and smaller container dissolve 2¾ pounds of pulverized sal soda in water.

Pour this solution into the chloride of lime solution, add water to make a total volume of 10 gallons and stir the mixture.

The solution must be allowed to settle at least 24, preferably 48, hours, before using in order that the clear bleaching solution may be carefully poured or siphoned off without disturbing the sludge. If the bleaching solution is not clear, the walnuts will be coated with a white film of lime.

Pour the walnuts into the clear solution which has been transferred to a bucket or barrel, and keep them in contact with the solution for not over 3 minutes by gentle stirring.

If the nuts do not acquire a satisfactory bleach by this treatment, the activity of the bleach solution can often be increased by adding 1 pint of strong vinegar to every 5 gallons of bleaching solution.

Drain the walnuts from the solution and place them without rinsing in an open crate or tray to dry for at least 24, preferably 48 hours, before they are packed in sacks, cartons or other containers. Never dry bleached walnuts in sunshine or many will split. Always dry in the shade, preferably indoors in a draft.

Bleaching Maraschino Type Cherries

U. S. Patent 2,019,030

Spots and blemishes on cherries not removable by sulphur dioxide are removed by treatment with aqueous sodium or calcium hypochlorite acidified with acetic acid. The concentration of available chlorine should be about 1% of the weight of the cherries.

Bleaching and Sterilizing Dried Figs

U. S. Patent 2,072,309

Dried figs are treated with a 2% solution of hydrogen peroxide; allowed to stand 12–14 hours and then immersed for 2–7 minutes in water just below boiling.

Artificial Honey Combs

a.	Beeswax, Yellow	45 kg.
	Paraffin Wax (52/54° C.)	40 kg.
	Ceresin	10 kg.
	Japan Wax	5 kg.
b.	Beeswax-Perfume	about 25 g.
	Honey-Perfume	a small amount

Melt *a* with steam, add *b* and mix thoroughly. Pour out into shallow dishes.

Rewarm on the water bath and roll to give it the honeycomb-shape.

Storing Potatoes for Potato Products

Potatoes stored at temperatures of 60° F. to 70° F. yield good chips, while those stored at lower temperatures are unsatisfactory. These results hold good for French fried and baked potatoes as well as potato chips. Good practice for consumers is to store potatoes at room temperature, avoiding extremes of hot and cold.

Quick Freezing of Foods
U. S. Patent 2,102,506

Foodstuffs are immersed in following cooled to at least -30°F.

Glycerin	20–40%
Alcohol	20–40%
Water	25–45%

Powdered Potatoes or Bananas
U. S. Patent 2,119,155

A method of reducing potatoes and other starch-containing vegetables to the form of a dry powder in which the starch is preserved in its initial form comprises cooking the vegetables at a temperature which must not substantially exceed 100° C., cutting the cooked vegetables into small pieces, partially drying the pieces, at a temperature which also must not substantially exceed 100° C. until they have lost at the most about 60% by weight of their initial water-content, reducing the partially dried pieces to the form of a moist powder and further drying the moist powder, at a temperature which must not greatly exceed 80° C., until it has a water-content of approximately 10–15% by weight.

Shark Fins

The fins of all the species (except the Nurse Shark), are commercially valuable for edible purposes. The fins of the Nurse Shark contain no edible gelatin, and therefore, have no value for edible purposes.

The Eastern sharks, (which are the Leopard or Tiger, Hammerhead, Blacktip, Sand and Sandbar, Duskies, Brown and Mackerel Shark), have the following fins: Tail fin (lower lobe), two pectoral fins and 1st and 2nd dorsal fins. Also, the anal and ventral fins from the larger size sharks are used.

The Sawfish Sharks have two dorsal fins, and the tail fin. They generally bring a higher price than the Eastern shark fins. The side fins of the Sawfish Shark, called the "flippers," have no value.

If the fins have been cut in a curve into the fin, very little skin or meat remains on the fin. However, every piece of skin or meat must be trimmed off the fin, otherwise this meat will attract flies, or may cause the fins to rot. After the fins are trimmed, they should be washed thoroughly in sea water, and may be left overnight in sea water, to facilitate cleaning.

Drying

The fins are then put on spreads in the sun for drying. The spreads are made of chicken wire, stretched 2 or 3 feet above the ground. Do *not* lay the fins one on top of the other. During the first few days the fins should be taken under shelter during the night, and also when it is raining. Later, after the fins are somewhat dried, dew or a little rain will not hurt them. It takes about 14 days, in good weather, with plenty of sunshine, for the fins to dry properly. When properly dried, they are very stiff and hard.

Packing and Shipping

The fins are packed in bags, cases or barrels. A sugar barrel or bag, will hold about 100 pounds of fins. Second-hand cases, or barrels, can be used. Do *not* use watertight barrels. Pack the Eastern fins separately from the Sawfish fins. Do *not* ship Nurse fins or Sawfish flippers. Ship the complete sets. If the tail or the pectoral fins are not included, the value of the sets is reduced.

CAUTION: Fins which are not properly trimmed, or which are not thoroughly dried, have only about one-half the value of first grade fins. Also, fins from sharks *under* five feet long are not desirable.

Preventing Sticking and Softening of Canned Fish
U. S. Patent 2,088,831

Clean the fish, contact the fish with a salt brine, and then soak the fish in a brine containing salt and from 1 to 5% of calcium chloride and 0.33% to 1% of vinegar, whereby the skins of the fish are rendered firm and adherence of skins of adjoining packed fish is substantially prevented.

Opening Oysters
U. S. Patent 2,041,727

Subject oysters to mechanical shock and dip into any of following solutions:

Formula No. 1

Acetic Acid	4 oz.
Water	1 gal.

No. 2

Potassium Chlorate	1 g.
Water	1 l.

No. 3

Hydrochloric Acid	2 cc.
Water	1 l.

Keeping Fish Fresh

A new process for keeping fish fresh has been developed. As soon as possible after landing, the cleaned fish are soaked in a highly diluted solution of 30 per cent hydrogen peroxide and immediately thereafter packed in ice in the shipping containers. Tests have shown that this process increases the resistance of the fish to bacteria, the fish remaining fresh for a period of from three to six days.

INKS

Writing Ink

Water, Distilled	94	oz.
Tannin	2	oz.
Gallic Acid, Crystallized	1.1	oz.
Ferrous Sulphate	2.15	oz.
Oxalic Acid	0.1	oz.
Phenol, Crystallized	0.1	oz.
Ink Black (Dye)	0.4	oz.
Glycerin	0.3	oz.

Non-Corrosive Ink

U. S. Patent 2,008,620

Gallnuts	28 g.
Dye, Blue	6 g.
Iron Chloride	30 g.
Glycerin	a trifle
Hydrochloric Acid	30 cc.
Arsenic Acid	1 g.
Phenol	1 g.
Water	100 l.

Gloss Ink

a.	Montan Wax, Crude	15	g.
	Colophony	2	g.
	Soft Paraffin 40/42° C.	3	g.
	Potash Carbonate	0.5	g.
	Marseilles Soap	4	g.
	Water	65	g.
b.	Shellac	20	g.
	Borax	7	g.
	Water	75	g.
c.	Nigrosine NTL	5.5	g.
	Water	25	g.

Make up separately *a*, *b*, and *c*, and mix these three components together.

Fountain-Pen Ink

Formula No. 1

a.	Water, Distilled	95	g.
	Ink Black A, Extra	0.5	g.
	Ink Blue, Extra	0.5	g.
b.	Caustic Soda, 98%	0.36	g.
	Water, Cold	3.64	g.
c.	Gum Arabic, if desired	0.5–1	g.

Make dye-solution *a*, and add the lye *b*. Keep stirring for 2 hours. Let settle, and filter.

The addition of *c* is recommended to make the ink more suitable for glued paper.

No. 2

Iron Chloride	288 g.
Sugar (Powdered)	250 g.
Tannic Acid	234 g.
Gallic Acid	77 g.
Water, to make	10 l.

Dissolve the sugar in the water by heating, add the iron chloride. Stir with a glass rod, and continue heating. When a smell of chlorine appears, add more of the water, add the acids (in solution). Add the balance of the water.

2.5% of alcohol may be added to make the ink dry more quickly.

Ink Base for Fountain Pens

a.	Tannic Acid	75 g.
	Gallic Acid	25 g.
	Water, Distilled	793 g.
b.	Sulphuric Acid	7 g.
c.	Iron Sulphate	100 g.

Mix *a*, add *b*, and after that *c*. Boil for ½ hour. Put aside for 2 days in a cool place, filter, and wash the filter to get 1000 g. of filtrate.

Keep cool and sealed.

Ink from Ink Base

a.	Ink Base (Above)	100–300 g.
b.	Gum Arabic, Free from Oxidase	20 g.
	Water, Distilled	50 g.
c.	Anilin Dye for Inks	12 g.
	Water, Distilled	sufficient
d.	Phenol	1 g.
e.	Water, Distilled, to make	1000 g.

Mix the strained gum dispersion *b* with the base *a*, the dye solution—made hot—*c*, and the phenol *d*. Thin with *e*.

Allow to rest for at least three weeks, tightly sealed and in a cool place. Siphon off the clear ink.

Stamp Pad Ink

Violet

Methyl Violet	1 g.
Water, Hot	10 g.
Gum Arabic	1 g.
Glycerin, C.P.	25 g.
Alcohol, Denatured	8 g.

Make a solution of the first three ingredients, add glycerin, cool, add alcohol. Impregnate the wooden pads with this ink after filtration.

Recording Inks

Dissolve any of the dyes shown below in a mixture of 1 oz. of glycerin and 3 oz. of water. This may be thinned down with alcohol, if desired. The addition of 0.1% of Moldex or other good preservative is necessary to prevent mold growth.

Dye	Color Index Number	Schultz Number
Benzo Fast Scarlet	326	279
Congo Red	370	307
Toluylene Orange *R*	446	362
Toluylene Orange *G*	478	392
Pyrazol Orange	653	...
Chloramine Yellow	814	617
Chloramine Green *B*	589	470
Diamine Green *B*	593	474
Diamine Sky Blue *FF*	518	424
Benzo Sky Blue	520	426
Diamine Violet *N*	394	327
Oxamine Blue *4R* (Erie Violet *2B*)	471	385
Bismarck Brown *R*	332	284
Benzamine Brown *3GO*	596	476
Columbia Black *FF* extra	539	436
Direct Deep Black *RW* (Erie Black *RXOO*)	582	463
Direct Deep Black *RW* (Erie Black *RW*)	582	463

Indelible Ink for Documents

Formula No. 1

French Patent 765,031

Suggests the addition to a printing ink of a compound which reacts with another compound forming colored derivatives. Example: Ammonium sulphocyanide, which would be colored red by iron chloride.

No. 2

a.	Tannin	27 g.
	Gallic Acid	15 g.
	Water	800 g.
b.	Iron Vitriol	60 g.
	Water	800 g.
c.	Hydrochloric Acid, Free of Arsenic	5 g.
d.	Gum Arabic	20 g.
	Water	150 g.
e.	Phenol, Crystallized	3 g.
	Water	120 g.

Mix *a* and *b*, and add gradually *c*, *d*, *e*. Mix thoroughly, settle in a brown bottle, and decant clear liquid.

No. 3

I	Copper Chloride Crystallized	8 g.
	Sodium Chloride	10 g.
	Ammonium Chloride	5 g.
	Distilled Water	60 g.
II	Anilin Hydrochloride	11 g.
	Gum Arabic	5 g.
	Glycerin	5 g.
	Distilled Water	249 g.

The ink is made from

Solution I	25 g.
Solution II	100 g.

Permanent Green Ink

Bichromate of Potash	10 oz.
Hydrochloric Acid	10 oz.
Alcohol	10 oz.
Gum Arabic	10 oz.
Soft Water	30 oz.
Carbonate of Soda	as required

Dissolve the bichromate of potash in the acid and allow to stand until solution is clear. Slowly pour in the alcohol with constant stirring. This will cause rapid heating and frothing, and great care must be taken at this stage. Carbonate of soda is next added a little at a time until all effervescence has ceased and a green precipitate just begins to form. The solution is left for a week covered up, being then filtered and the gum dissolved in it, and diluted with further water to the desired color. This ink is absolutely permanent, penetrates the paper evenly, and is difficult to efface.

Acid-Proof Black Ink

Water	1 gal.
Acid-Proof Soluble Blue Dye	2½ oz.
Oxalic Acid	1 oz.
Gum Arabic	1½ oz.
Alcohol	2 oz.

Dissolve the blue in ½ gal. water and add the oxalic acid and alcohol. Warm the remaining ½ gal. water and dissolve into it the gum arabic. Mix the two solutions and strain.

Marking Ink for Shipping Packages

Black

Formula No. 1

Ceresblack I, Liquid	2 kg.
Dissolve in Hot	
Brown Coal Tar	5 kg.
Gasoline	3 kg.

No. 2

Ceresblack I, Liquid	2 kg.
Mineral Oil (0.885 d.)	8 kg.

No. 3

Carbon Black	2 kg.
Dispersed in	
Mineral Oil (0.885 d.)	8 kg.

No. 4

Celluloid Scrap	0.3 kg.
Acetone	5.0 kg.
Rosin	0.2 kg.
Alcohol	3.0 kg.
Carbon Black	1.5 kg.

Blue

Formula No. 1

Rosin, Melted	1.0 kg.
Mineral Oil (0.885 d.)	6.5 kg.
Gasoline (Cold)	1.0 kg.
Ultramarine-Blue	1.5 kg.

No. 2

Sudan Blue	0.6	kg.
Oleic Acid	1.2	kg.
Mineral Oil (0.885 d.) Warm	8.2	kg.

Red

Formula No. 1

English-Red	2	kg.
Linseed Oil	8	kg.

No. 2

Sudan Red B	0.5	kg.
Oleic Acid	1.0	kg.
Mineral Oil (0.885 d.)	7.5	kg.
Gasoline	1.0	kg.

No. 3

Celluloid Scrap	0.4	kg.
Acetone	5.0	kg.
Rosin	0.2	kg.
Alcohol	2.0	kg.
Gasoline	2.2	kg.
Zapon Red	0.2	kg.

Yellow

Chrome Yellow	2	kg.
Linseed Oil	8	kg.

Marking Ink (Alkali and Acid Resistant)

Dissolve

Unbleached Shellac	20	oz.

in a solution consisting of

Borax	30	oz.
Water	350	oz.

Filter while the solution is still hot. Then add to this solution another made up from

Water-Soluble Nigrosine	10	oz.
Tannin	1	oz.
Picric Acid	1/10	oz.
Ammonium Hydroxide	15	oz.
Water	15	oz.

This ink is especially adapted for laboratory use and produces a beautiful black that flows freely from the pen.

Ink Powder

Formula No. 1

Gallic Acid Crystals	10.0	g.
Ferric Sulphate, Anhydrous	10.7	g.
Oxalic Acid Crystals	2.0	g.
Soluble Blue (Schultz #539)	3.5	g.

The weight of ferric sulphate called for, 10.7 g., contains 3 g. of iron. An equivalent amount of the hydrous salt can be used instead. The simplest plan is to determine the iron content of the ferric sulphate and from this calculate the weight of the salt that will give 3 g. of iron. Ink made by this formula does not corrode steel pens excessively, but it forms on them a thin, yellowish coating of ferrous oxalate.

A formula that makes a still better ink powder than the preceding is:

No. 2

Gallic Acid Crystals	10.0	g.
Ferrous Sulphate Crystals	15.0	g.
Tartaric Acid	1.0	g.
Soluble Blue (Schultz #539)	3.5	g.

As with the first formula, the ingredients are to be dissolved in enough water to make a total volume of 1 liter, and this will contain 3 g. of iron.

No. 3

Pulverize and mix intimately:

Logwood Extract	100	oz.
Indigo	½	oz.
Potassium Dichromate	1	oz.
Gum Arabic	1	oz.

These may be pressed into tablets or pellets.

Concentrated Ink Tablets

British Patent 461,408

Methylene Blue	25	oz.
Methyl Violet	5	oz.
Potassium Dichromate	2	oz.
Soda Ash	3	oz.
Sugar	7	oz.

Pulverize and press into cakes.

Invisible Inks

Ammonium chloride, "sal ammoniac", dissolved in 15 to 20 times its weight of water makes an ink that is invisible, but becomes dark brown or black when pressed with a hot iron, or held at a distance above a small flame. This is as good a sympathetic ink as any, is easy to prepare, and is not dangerously poisonous.

The salts of several metals have long been favorite materials for sympathetic ink. These salts are not all colorless when in the solid form, or in strong solution, but invisible marks made on paper with very dilute solutions can be developed by suitable means. Among these salts are lead acetate, ferric sulphate, mercuric chloride (corrosive sublimate, dangerous to handle and very poisonous), copper sulphate, cobalt chloride, and nickel chloride. In addition to being turned brown or black by the fumes of ammonium sulphide, writing with any of the salts can be developed by heat, and still other means can be employed with some of them. For instance, if the ink is made with ferric sulphate, a solution of gallic or tannic acid will turn the writing black, and potassium ferrocyanide will form prussian blue.

Of the salts just mentioned, cobalt chloride is in some respects the most interesting. When a solution of the salt in water evaporates to dryness, the chloride appears in crystals that are red, though not intensely so. If the solution used as sympathetic ink is so dilute as to be only of a moderately deep pink, the thin layer of the salt that is left on paper when the writing dries will not be perceptible. If the writing is kept for some time in rather dry air, or is warmed slightly, the cobalt chloride loses most of its "water of crystallization", and is then so intensely blue that the writing is visible. Exposure to moist air, as by breathing upon it, makes the writing vanish because the blue salt regains water of crystallization and turns red. These changes back and forth can be repeated many times, but if once the secret writing should be heated too strongly when warming it, the chloride will char the paper, and the writing will then be permanently black.

As a means of developing writing done with a variety of inks, iodine is interesting. It is preferably used as the vapor given off by the solid element at ordinary temperatures, though the tincture diluted with water can be employed. If a thin solution of boiled starch is used for the writing, iodine will turn it blue. The color disappears after a time, and more quickly by gentle warming. Writing with a solution of soap becomes yellow or brown because the soap absorbs iodine vapor more easily than paper does. This color soon vanishes because the iodine is so volatile. Copper sulphate and lead acetate are colored temporarily, while marks made with mercuric chloride show as white on a background of yellow paper. If the writing is done with distilled water, iodine vapor will color the letters a little more strongly than the background. The water disturbs the sizing at the surface of the paper, and thus allows the iodine vapor to be absorbed more readily there than elsewhere.

Another type is as follows:

Water	640 cc.
Acetone	350 cc.
Phenolphthalein	4 g.
Caustic Potash	1 g.

Writing with this ink is made visible by ammonia.

Transparent Writing Ink

German Patent 634,829

Formula No. 1

a.	Eosin	15 g.
	Water	100 cc.
b.	Polyvinyl Alcohol (High-Molecular)	4 g.
	Water	900 cc.

Mix solutions *a* and *b*.

No. 2

a.	Malachite Green	20 g.
	Water	200 cc.
b.	Polyvinyl Alcohol	2 g.
	Polyvinyl Acetate (Saponified to a Sap. No. 80–100)	2 g.
	Water	800 cc.

Mix *a* and *b*.

No. 3

a.	Methylene Blue	15 g.
	Water	200 cc.
b.	Polyvinyl Acetate (Saponified to a Saponification Value 80–100)	4 g.
	Water	800 cc.

Mix solutions *a* and *b*.

Drawing Ink

a.	Water, Distilled	50 lb.
	Borax	3 lb.
b.	Shellac, Bleached and Dewaxed	4 lb.
c.	Carbon Black	2.5 lb.

Into the boiling *a* add *b* in small portions, till there is a clear solution. Strain.

Disperse *c* in a part of this shellac solution, and thin the smooth concentrate with the balance of it. Add preservative (0.1–0.2%). The dispersion of the carbon black is finest when using a colloid mill.

Solid Stencil Inks

This ink is waterproof and will not rub off nor blur when the marking is exposed to wet or rain.

Black

Black Rosin	20 lb.
Shellac	16 lb.
Bone Black	14 lb.
Rosin Spirit	2 lb.
Japan Wax	2 lb.
Tallow	1¾ lb.
Hard Yellow Soap	¾ lb.

Melt the rosin, shellac, and rosin spirit, add the tallow and wax, stir well, add bone black and soap (sliced), stir until all dissolve and incorporate, then turn out into the molds to set hard.

Show Card Inks (Solution Bases)

a.	Water	2.55 kg.
	Gum Arabic	1.90 kg.
	Soda Ash	0.05 kg.
	Glycerin (28° Bé.)	0.50 kg.
b.	Water	3.00 kg.
	Shellac, Bleached	1.50 kg.
	Borax	0.30 kg.
	Glycerin	0.20 kg.

The solutions *a* or *b* are added to the following colors:

Black

Formula No. 1

Water	4.15 kg.
Carbon Black	0.80 kg.
Solution *a* or *b* (above)	5.00 kg.
Formaldehyde (40%)	0.04 kg.

No. 2

Water	3.96 kg.
Pigment Black	1.00 kg.
Solution *a* or *b* (above)	5.00 kg.
Formaldehyde (40%)	0.04 kg.

White

Water	3.76 kg.
Zinc Oxide	1.20 kg.
Solution *a* or *b* (above)	5.00 kg.
Formaldehyde (40%)	0.04 kg.

Red

Water	3.96 kg.
English Red	1.00 kg.
Solution *a* or *b* (above)	5.00 kg.
Formaldehyde (40%)	0.04 kg.

Blue

Water	3.86 kg.
Blue of Ultramarine	1.10 kg.
Solution *a* or *b* (above)	5.00 kg.
Formaldehyde (40%)	0.04 kg.

Green

Water	3.86 kg.
Green of Ultramarine	1.10 kg.
Solution *a* or *b* (above)	5.00 kg.
Formaldehyde (40%)	0.04 kg.

Oil Stamp Colors
(For Metal Stamps)

Black
Formula No. 1

Base of Nigrosine 51017	0.8 kg.
Dissolved in	
Oleic Acid, Hot	1.6 kg.
Castor Oil, Hot	3.0 kg.
Sesame Oil	4.6 kg.

No. 2

Sudan Black	0.8 kg.
Oleic Acid, Hot	1.6 kg.
White Spirit	7.6 kg.

Blue

Sudan Blue G	0.6 kg.
Oleic Acid	1.2 kg.
Sesame Oil	2.0 kg.
White Spirit	6.2 kg.

Violet

Sudan Violet BR	0.6 kg.
Oleic Acid	1.2 kg.
Sesame Oil	3.0 kg.
Castor Oil	5.2 kg.

Red

Rhodamine B Extra Base	0.2 kg.
Chrysoidine RL Extra Base	0.2 kg.
Oleic Acid	1.5 kg.
White Spirit	8.1 kg.

Stamping Inks

Black

Gum Arabic	0.30 kg.
Water	3.00 kg.
Water, Boiling	1.00 kg.
Nigrosine WLA	0.30 kg.
Glycerin (28° Bé.)	4.07 kg.
Formaldehyde (40%)	0.03 kg.
Carbon Black	1.30 kg.

Blue

Like black but replace Nigrosine with Ink-Blue and Carbon Black with Ultramarine Blue.

Red

Like black but replace Nigrosine by Eosin A and Carbon Black by English-Red.

Yellow

Like black, but replace Nigrosine by Genuine Yellow Y and Carbon Black by Chrome Yellow.

Stamp Ink for Eggs

Formula No. 1

Gum Arabic	0.1 kg.
Water	4.0 kg.
Glycerin (28° Bé.)	4.37 kg.
Formaldehyde (40%)	0.03 kg.
Ultramarine-Blue	1.50 kg.

No. 2
(Stable during Boiling)

Nigrosine, Water Soluble	0.4 kg.
Water	5.0 kg.
Tannin	1.0 kg.
"Carbitol"	1.8 kg.
Alcohol	1.8 kg.

Blue ink is made by substituting Victoria Blue for Nigrosine.

For red, use Rhodamine B Extra, instead of Nigrosine.

Meat Stamping Ink
(Blue)

Dextrin, White	1.00 kg.
Water	4.00 kg.
Glycerin (28° Bé.)	3.45 kg.
Salicylic Acid	0.05 kg.
Berlin-Blue (free of Oxalic Acid)	1.50 kg.

Ink to Mark Linen
(Black)

Pyroxylin	0.020 kg.
Wetted with	
Alcohol	0.025 kg.
Acetone	0.180 kg.
Then stir and add	
Butyl Acetate	0.125 kg.
Butanol	0.030 kg.
Alcohol	0.035 kg.
Benzol	0.080 kg.
Blown Castor Oil	0.005 kg.

This 0.500 kg. solution of pyroxylin is added to

Lacquer Black, Extra	0.050 kg.
dissolved in	
Acetin	0.450 kg.

Laundry Indelible Ink

Aniline Hydrochloride	6 g.
Dextrin	2 g.

Copper Sulphate	4 g.
Glycerin, Lime-Free (sp.g. 1.24)	1 g.
Water	to suit

Indelible Ink for the Marking of Laundry

Sudan Yellow	5–10 lb.
Acetin	40 lb.
Cellulose Lacquer (Low Viscosity)	50 lb.

Fabric Marking Paste

Copper Sulphate	20 oz.
Aniline Hydrochloride	30 oz.
Dextrin	10 oz.
Glycerin	5 oz.
Water	sufficient

First mix dry ingredients and then mix in glycerin and just enough water to make a smooth paste of proper consistency for use with a fine brush.

Textile Marking Crayon (Washable)

Barium Carbonate	25 g.
Diglycol Stearate	25 g.

Melt at lowest possible temperature and stir until uniform; pour into molds. Other colors are obtained by using colored pigments.

Ink for Writing on Photographs

Iodine	1 g.
Potassium Iodide	10 g.
Mucilage of Acacia	2 g.
Water	35 cc.

This ink produces white writing on dark prints.

White Ink
(For Photo Albums)

Shellac, Fresh Bleached	0.100 g.
Borax	0.060 g.
Water	0.690 g.
Zinc Oxide	0.040 g.
Lithopone	0.100 g.
Formaldehyde (40%)	0.010 g.

Ink for Writing on Celluloid

Tannic Acid	10 g.
Ferric Chloride	10 g.
Acetone	100 g.

Dissolve the tannic acid and the ferric salt separately, each in one-half of the acetone, and then mix the two solutions.

Cattle Marking Crayons

Blue

Soapstone Powder	28 kg.
Gypsum Powder	21 kg.
Chinese Blue	2 kg.
Soap Powder, White	10 kg.
Glue Solution, 2%	to make paste

Make paste, mold, and dry.

Sheep Marking Ink

Formula No. 1

Potassium Permanganate	4 oz.
Trisodium Phosphate	5 oz.
Dextrin	1 oz.
Water	as desired

No. 2

Spindle Oil	80–90 lb.
Oleic Acid	20–10 lb.
Oil Soluble Dye	1–2 lb.
Diglycol Laurate	1–2 lb.

This ink penetrates uniformly and is waterproof.

Stamp Ink for Backside of Leather

Black

Gum Arabic	0.80 kg.
Water	4.20 kg.
Glycerin (28° Bé.)	2.00 kg.
Alcohol	1.47 kg.
Formaldehyde (40%)	0.03 kg.
Carbon or Pigment Black	1.50 kg.

Yellow

Made like black, but color with 1.1 kg. lithopone plus 0.4 kg. Hansa Yellow G instead of blacks.

White

White is made like black, but color with 1.5 kg. lithopone instead of black.

Waterproof Stamp Inks for Backside of Leathers

Black

Celluloid Scrap	0.2 kg.
Acetone	6.8 kg.
Gasoline	1.0 kg.
Blown Castor Oil	0.5 kg.
Carbon or Pigment Black	1.5 kg.

Ink for Rubber

Film (Movie), Shredded	0.030 g.
Acetone	0.795 g.
Benzol	0.100 g.
Zapon Black	0.075 g.

Stamp Ink for Rubber and Rubber Shoes

Black

Celluloid Scrap	0.40 kg.
Acetone	7.35 kg.
Gasoline	1.00 kg.
Blown Castor Oil	0.50 kg.
Zapon Black 30189	0.75 kg.

Red

Celluloid Scrap	0.40 kg.
Acetone	7.60 kg.
Gasoline	1.00 kg.
Blown Castor Oil	0.50 kg.
Helio Red RMT	0.25 kg.
Lithopone	0.25 kg.

Ink for Stamping on Rubber Balloons

Soluble Nigrosin	3 g.
Water	15 g.

Glycerin	70 g.
Alcohol	enough
Lampblack	enough

Dissolve the nigrosin in the water; add 15 g. of alcohol, and then the glycerin. To this mixture add, with constant trituration, enough lampblack to make a thick cream. Dilute this to the desired fluidity with alcohol. Colored rubber cement is even better.

Marking of Uncured Rubber Mixes

For general use, where a stock is hot, a mixture of montan wax 3, beeswax 1, chrome yellow 3 is recommended. Where a stock receives no subsequent treatment and a mark which vanishes during vulcanization is desired, a mixture of montan wax 3, beeswax 1, zinc oxide 3, white lead (dry) 1 is recommended. For marking on wet stock a mixture of paraffin wax (m.p. 140° F.) 2, tallow 1, chrome yellow 2, is recommended. Glycerol is suitable for lubricating the wooden or metal molds in which the crayons are formed.

Glass Marking Ink

When an ink-marking on glass is desired, an effective ink for this purpose is easily made with the following formula:

Glycerin	40
Barium Sulphate	15
Ammonium Bifluoride	15
Ammonium Sulphate	10
Oxalic Acid	8
Water	12

All parts by weight. The viscosity may be adjusted with water. Use the mixture in a hood or a well ventilated room. To speed the action, up to 5% of sodium fluoride may be added.

Ink for Glass

Formula No. 1

(White)

Shellac, Bleached	0.080 g.
Alcohol, Denatured	0.820 g.
Lithopone, Dispersed	0.100 g.

No. 2

(Black)

Powdered India Ink	1 oz.
Solution of Sodium Silicate	2 oz.

Inks for Glass and Porcelain

Some of the inks recommended for writing on glass contain sodium silicate solution, or water glass, mixed with pigments that are not changed in color by the alkali in the silicate. Water glass should not be used if the marks are to be removed later because, when the solution dries completely, the silicate forms such a strong bond with the glass that it can not be removed completely without grinding. A typical formula for ink of this kind is to mix 11 oz. of drawing ink and 1 or 2 oz. of water glass.

Dissolve 4 oz. of rosin in 30 oz. of denatured alcohol. Separately dissolve 4 oz. of borax in 50 oz. of warm water. Mix the two solutions and let stand overnight in a loosely corked bottle. Next morning pour off the clear brown solution, and use it for dissolving dyes to make inks of the colors desired. The crystalline deposit on the bottom and walls of the bottle consists chiefly of borax, mixed with a little rosin. Because this ink has a slight tendency to spread on glass, it should be used with a fine-pointed pen.

A similar ink can be made by dissolving dyes in a solution of shellac and borax in water, without alcohol. The solvent is made by heating nearly to boiling a mixture of 4 oz. dry orange shellac, 1 oz. borax, and 150 oz. water. It may take 2 or 3 hours to dissolve the shellac. The solution must be filtered, preferably after it has cooled, to remove the insoluble waxy portion, the orpiment that settles to the bottom, and the miscellaneous impurities that shellac always seems to contain. The purplish color of the solution will not interfere noticeably with the hues of the dyes that are dissolved in it to make the ink. From 0.5 to 1 oz. of dye will usually suffice to make 100 oz. of ink. The following dyes are suggested in addition to those named in connection with waterproof drawing ink:

Dye	Color Index Number	Schultz Number
Naphthol Yellow	10	7
Tartrazine (Orange in This Ink)	640	23
Diamine Sky Blue *FF*	518	424
Naphthol Blue-Black *S* (Green-Blue)	246	217
Benzo Cyanine *R* (Verging on Violet)	405	336
Durol Black *B* (Blue-Black)	307	265
Nigrosine (Purplish or Bluish Black)	865	700

It should not be thought that this ink cannot be washed from glass. To get such a degree of fastness, water-glass ink or actual etching must be resorted to.

Permanent Marking of Glass and Porcelain Vessels

Formula No. 1

A good ceramic ink can be prepared from 1 g. potassium carbonate, 1 g. borax, 2 g. lead oxide and 2 g. cobalt nitrate. Mix with raw linseed oil with possibly a little turpentine, apply with a pen and heat.

No. 2

Cobalt Oxide, Black Commercial	18.8 g.
Bismuth Subnitrate	1.2 g.

Grind together thoroughly in

Turpentine	15 cc.
Dresden Thick Oil	15 drops

The ink is applied to the porcelain with a pen or brush; it becomes indelible after heating to a cherry red.

Ink for Ceramics

U. S. Patent 2,030,999

An ink for printing designs on glazed ware, to be applied before firing, consists of

Cobalt Oxide	3
Borax	1
Linseed Oil	sufficient to suit

Ink for Brass

Copper Acetate	1 oz.
Water	15 oz.

Dissolve and add enough strong ammonia water to dissolve blue precipitate.

Ink for Zinc or Galvanized Iron

Copper Sulphate	1 oz.
Potassium Chlorate	1 oz.
Water	36 oz.

Mix until dissolved. Use a very fine quill or gold pen.

Ink to Write on Iron or Steel

Formula No. 1

Ruby Shellac	10 g.
Alcohol	80 g.
Dye or Pigment	to suit

No. 2

a. Celluloid, Waste	4 kg.
Acetone	74 kg.
b. Amyl Acetate	14 kg.
c. Helio Red	3 kg.
Lithopone	5 kg.

Dissolve *a*, add *b*, mix in *c*. Grind until homogeneous.

No. 3

Selenous Acid, Crystallized	50 g.
Copper Sulphate (Iron-Free)	60 g.
Nitric Acid (sp. gr. 1.4)	200 g.
Water	690 g.

Dissolve with heating. Fill up with cold water to make 1 kg. Allow to stand, and filter.

No. 4

Selenous Acid, Crystallized	75 g.
Copper Sulphate (Iron-Free)	85 g.
Nitric Acid (sp. gr. 1.4)	100 g.
Water	740 g.

Dissolve by heat. Cool, fill up to 1 kg. with water. Settle, filter.

Marking Steel

When smooth, bright steel parts are to be marked for machine work, first wipe the surface with a 5 to 10% solution of copper sulfate. The resulting coat of copper is easily and conspicuously marked with a steel point.

Crayon for Marking Hot Metal

Chrome Green	75 g.
Quick Lime	2 g.
Zinc Oxide	4 g.
Stearic Acid	4 g.
Paraffin Wax	15 g.

Heat to 85° C. and mix thoroughly while hot. Force into forms and allow to cool.

Carbon Printing Colors

Binding Mixture:

Castor Oil	15.9 kg.
Linseed Oil Printing Varnish	22.1 kg.
Stearic Acid	26.6 kg.
Turpentine	35.4 kg.

Colors:

Lampblack.
Oil-Soluble Aniline-Dyes.

White Printing Ink

French Patent 788,406

Casein	100 g.
Water	1 l.
Ammonium Hydroxide	13 g.

Mix until smoothly dispersed and stir in

Titanium Dioxide	100 g.

Black Printing Ink

Russian Patent 48,943

Bitumen (10) and masut (55) are warmed to 180° C., treated with a mixture of fat-soluble indulin (3) and fat-soluble nigrosin (16.6), oleic acid (8.3) and masut, and poured through a sieve.

Printing Ink for Glassine Paper

Dye	8 oz.
Alcohol	800 cc.
Orange Shellac (4 lb. cut)	800 cc.

Preventing Offset in Printing

Formula No. 1

U. S. Patent 2,101,999

A composition of matter for preventing offset in printing consists of substantially fifteen parts of gum arabic, forty-five parts water, forty parts denatured alcohol and one part gum tragacanth, all parts by weight.

No. 2

French Patent 784,826

Offset is prevented by atomizing a suspension of finely divided

Gum Arabic	20 g.
Methanol	60 cc.
Carbon Tetrachloride	20 cc.

Offset Printing Ink

French Patent 817,406

Asphalt	6.0 kg.
Lampblack	6.0 kg.
Pitch	2.7 kg.
Petrolatum	28.8 kg.
Turpentine	56.5 kg.
Phenol	11.2 kg.

Printing Offset Compound

Canadian Patent 367,893

Gum Arabic	15 lb.
Water	45 lb.
Alcohol, Denatured	40 lb.
Gum Tragacanth	1 lb.

Offset Printing Ink Thinner

U. S. Patent 2,043,397

Castor Oil	15.9 oz.
Lithographic Varnish	22.1 oz.
Stearine	26.6 oz.
Turpentine	35.4 oz.

Reducer for Printing Ink

Formula No. 1

Petrolatum	16 oz.
Magnesium Carbonate	2½ oz.
Sodium Silicate	¼ fl. oz.
Diglycol Laurate	¼ fl. oz.

No. 2

W Rosin	2 lb.
Dammar	2 lb.
Japan Wax	4 lb.
Boiled Linseed Oil	5 qt.
Turpentine	½ pt.
Amyl Acetate	½ pt.

Melt at as low a heat as possible and stir continuously while cooling.

This will produce a soft, buttery paste which is added to printing ink to prevent "picking" and mottling.

No. 3

Extra Slow Drying

Raw Linseed Oil	6 fl. oz.
Boiled Linseed Oil	4 fl. oz.
Benzine	4 fl. oz.
Citronella Oil	2 fl. oz.

No. 4

Slow Drying

Raw Linseed Oil	12.5 fl. oz.
Benzine	20 fl. oz.
Kerosene	60 fl. oz.
Citronella Oil	7.5 fl. oz.

No. 5

Benzine	15 oz.
Kerosene	20 oz.
Citronella Oil	3 oz.

No. 6

Reducer for Black Printing Ink

Oil Black	5 oz.
Boiled Linseed Oil	30 oz.

Added to regular black ink, it prevents the ink from flaking or chipping when printed on gold paper.

Reducing Inks Used with Rubber Rollers

Use ten drops of kerosene or liquid cobalt drier per pound of ink.

Deodorizing Printing Ink

The addition of a small amount of coumarin to printing inks effectively covers up the usual "inky" odor.

Newspaper Picture Transfer Fluid

Formula No. 1

Liquid Soap	6 oz.
Potassium Carbonate	1 oz.
Trigamine	½ oz.
Water	3 pt.

Moisten face of newspaper with above and put face down on a sheet of unglazed paper. Rub back with back of a spoon to transfer.

No. 2

1. Diglycol Stearate	4 oz.
2. Soda Ash	½ oz.
3. Turpentine or Naphtha	10 oz.
4. Water	3 pt.

Dissolve 1 in water by warming and stirring, then mix in other ingredients, stirring rapidly until emulsified.

Transferring Colored Newspaper Pictures

1. Water	1 pt.
2. Soap	4 oz.
3. Turpentine	4 fl. oz.

Boil 1 and 2 until dissolved. Cool and add 3 with vigorous stirring.

Soak colored picture in a shallow dish containing above solution. Drain and blot slightly between newspapers. Place face down on sheet of white paper. Cover with sheet of stiff paper and rub firmly with a spoon or rounded object.

Lithographic Plate Resist

U. S. Patent 2,046,959

In printing lithographically with an ungrained metal plate having lithographic printing portions and nonprinting metallic portions, the nonprinting portions are coated with a mixture such as one of glucose 1 g., glycerol 1 g. and 50% sodium hyposulfite solution 2 g., etc.

Moistening Fluid for Mimeograph Rolls

Glycerin	1 pt.
Warm Water	7 pt.

"Make-Ready" for Relief Printing

British Patent 446,176

A make-ready for relief-printing forms is prepared by taking an impression from the form in a layer of a normally plastic material and then treating the layer with a hardening agent. A plastic consisting of a mixture of beeswax 20, petroleum jelly 2, colloidal graphite 15 and soft soap 5 oz. is applied to the platen or impression cylinder of the press in a layer sufficiently thick to take a clear impression from all parts of the form. A sheet of paper is preferably placed over the layer before the impression is taken, and a backing-sheet may be provided behind the layer. The impressed layer may be hardened by coating or spraying with a varnish or treating with a hardening liquid, e.g., formalin.

Mercury Printing Plate Treatment

British Patent 446,883

The nonprinting areas of mercurized printing plates are coated with a hard solid amalgam layer by simultaneous or consecutive treatment with aqueous solutions of a mercury salt and of a salt of another metal that forms an amalgam, e.g., 0.01% mercuric nitrate and 0.0005% silver nitrate solutions.

Printers' "Make-Ready" Composition

U. S. Patent 2,108,707

A process of producing "make-readies" for printing comprises first preparing a layer consisting of about 20 parts beeswax, 2 parts petroleum jelly, 15 parts powdered graphite and 5 parts soft soap, then applying said layer to the platen of a printing press, taking impressions of the form on said layer and finally hardening the layer.

Printers' Roller Composition

Formula No. 1

Glue	100 lb.
Water	12 gal.
Glycerin (45%)	176 lb.
Sorbitol (45%)	178 lb.
Old Roller Stock	138 lb.

No. 2

Glue	100 lb.
Water	3 gal.
Glycerin	300 lb.
Old Roller Stock	200 lb.

Printers' Rollers

British Patent 463,869

Rollers, plates and endless bands for applying and distributing ink in printing-machines and for removing excess ink from intaglio printing surfaces and comprising a core or support having a coating of gelatinous material are provided with a coating that is constituted by a thin preformed sheet of flexible material, e.g., of cloth or canvas with a coating of gelatinous material of 0.05–2 mm. thickness. A suitable composition consists of gelatin 70, whiting 50, beeswax 12, glycerol 70 parts and a quantity of water.

Recovery of Glycerin from Printers' Rollers

Cut up the rollers and distill with steam at 165–200° C. The residue may be ground with peat for use as a fertilizer.

Rejuvenating Typewriter Rollers

Only the surface of the roller hardens, ordinarily. Remove the roller from the machine and rub it evenly but briskly with fairly rough emery paper, until you have a new and soft surface.

Multigraph Inks

Formula No. 1

Black

Lithographer's Varnish	70 g.
Carbon Black	12 g.
Lamp Black	10 g.
Gas Soot	6 g.
Paris Blue	2 g.

No. 2

Black

Hot Water	78.50 g.
Methyl Violet N Blue	7.00 g.
Diamond Green BXX	0.70 g.
Chrysoidin RL	0.75 g.
Dextrin	3.00 g.
Sugar	5.80 g.
Acetic Acid (30%)	1.50 g.
Glycerin	2.50 g.
Carbolic Acid	0.20 g.

No. 3

Blue

Hot Water	80.00 g.
Crystal Violet	5.00 g.
Diamond Green BXX	5.00 g.
Dextrin	1.70 g.
Gum Arabic	2.50 g.
Hydrochloric Acid	6.00 g.
Carbolic Acid	0.15 g.

Ink for Hectographs

Formula No. 1

Black

Water, Hot	78.51 kg.
Methyl Violet N, Blue	6.90 kg.
Diamond Green BXX	0.69 kg.
Chrysoidine RL	0.75 kg.
Dextrin	3.00 kg.

Sugar	6.00 kg.
Acetic Acid (30%)	1.50 kg.
Glycerin (28° Bé.)	2.50 kg.
Phenol (Preservative)	0.15 kg.

No. 2
Blue

Water, Hot	79.65 kg.
Crystal Violet, Powdered	5.00 kg.
Diamond Green BXX	5.00 kg.
Dextrin	1.70 kg.
Gum Arabic	2.50 kg.
Hydrochloric Acid (20° Bé.)	6.00 kg.
Phenol	0.15 kg.

No. 3

Acetone	8 g.
Glycerin	20 g.
Acetic Acid (28%)	10 g.
Water	50 g.
Dextrin	2 g.
Dye	10 g.

The dextrin is first dissolved in the water, which must be heated, but need not be boiled. Care must be taken not to char the dextrin at the start, when it clings to the bottom of the vessel in a sticky mass. It is safest to heat the mixture by setting the container in a vessel of hot water. When a clear, or nearly clear, solution is obtained, cool it and add the other liquids. Acetone is combustible, and quite volatile, but the amount in the ink is not dangerous. If it should be poured into the hot solution, there would be a brisk boiling, and much of the acetone would be lost.

The following dyes give the greatest number of copies of satisfactory intensity. The best of all is methyl violet *B* (C.I. 680; Sch. 515). Crystal violet (C.I. 681; Sch. 516) is nearly as good. For red ink, rhodamine *B* (C.I. 749; Sch. 573) was selected, with fuchsine, or magenta (C.I. 677; Sch. 512), as second choice. Fuchsine is so slightly soluble that only 3.5 parts of it, instead of 10, can be dissolved in 90 parts of the solvent. For green and blue, emerald green (C.I. 662; Sch. 499) and victoria blue *B* (C.I. 729; Sch. 559) ranked first, with malachite green (C.I. 657; Sch. 495), and soluble blue (C.I. 707; Sch. 539), second.

Heliograph Printing Ink
French Patent 806,594

Beeswax	15 g.
Aluminum Stearate	10 g.
Castor Oil	14 g.
Nitrocellulose	15 g.
Butyl Acetate	70 g.
Toluene	30 g.
Lampblack	15 g.

Kymograph Ink

Shellac Solution	150 oz.
Titanium Dioxide	100 oz.
Castor Oil	1 oz.

Dispersing Oil for Pigment Inks
Formula No. 1

Castor Oil	3.0 kg.
White Spirit	7.0 kg.

No. 2

Castor Oil	4.0 kg.
Sesame Oil	6.0 kg.

Colors
Black

Carbon or Pigment Black	1.5 kg.
Dispersing Oil (above)	8.5 kg.

Blue

Fanal Blue B, Powder	1.5 kg.
Dispersing Oil	8.5 kg.

Violet

Fanal-Violet R	1.2 kg.
Dispersing Oil	8.8 kg.

Red

Lithol-Red OK	1.5 kg.
Dispersing Oil	8.5 kg.

Yellow

Hansa Yellow G	1.5 kg.
Dispersing Oil	9.0 kg.

Ink for Line-Drawing Machines

a.	Shellac, Pale	10 kg.
	Borax, Crystallized	2 kg.
	Water, Boiling	38 kg.
b.	Basic Dye*	1 kg.
	Water, Boiling	48.6 kg.
c.	Formaldehyde (40%)	0.4 kg.

Mix *a* and *b* hot. Cool, add *c*.

* *Blue:* Methylene Blue BB extra.
Red: Fuchsine A.

Watermark Mixture
Formula No. 1

A mixture of castor oil and wood alcohol used in place of ink will make a perfect watermark in any kind of hard finish sulphite or rag bond when applied to a perfectly clean press with good rollers. Any form or cut will appear as an ordinary watermark when allowed to dry thoroughly.

No. 2
U. S. Patent 2,021,141

An emulsion of a suitable printing ink consistency comprises Canadian balsam 8–20, turpentine 5–17, finely divided substantially colorless mineral matter such as diatomaceous silica 8–25 and castor oil 12–30%, emulsified with a slightly alkaline solution of borax and contains a substantially colorless indicator such as phenolphthalein reactive to both acids and alkalies, so that it is suitable for "safety paper" for checks, etc.

Carbon Duplicating Papers (Black)

Formula No. 1

Petroleum Jelly	21 lb.
Japan Wax	6 lb.
Drop Black (Ground in Turpentine)	4 lb.
Ceylon Graphite	4 lb.
Soft Soap	1 lb.
Oil Black Dye	2 oz.

Melt petroleum jelly, wax, and soap together, remove from the fire and stir in oil black when cooler, then grind to a fine paste with the others. The composition may be applied to the paper either hot or cold with a fairly stiff brush, then wipe off the superfluous paste and hang up papers with clips to dry.

No. 2

Lard Oil	1 gal.
Blacklead	3½ lb.
Lampblack	2½ lb.
Oil Black Dye	1 oz.

Dissolve oil black in the warmed lard oil, then mix with others to a non-lumpy state.

No. 3

Raw Linseed Oil	2 gal.
Tallow	8 lb.
Lampblack	4 lb.
Ceylon Graphite	2½ lb.
Oil Black Dye	2½ oz.

Warm the oil sufficiently to dissolve the tallow, stir in oil black and well mix with the others.

No. 4

Methylated Spirit	1 gal.
Castor Oil	1 gal.
Lampblack	2½ lb.
Frankfort Black	2½ lb.
Prussian Blue	1½ oz.

Mix as before, previously thoroughly working Prussian blue into the blacks.

No. 5

Carbon Black	20 g.
Milori Blue	6 g.
Violet Blue	5 g.
Paraffin Oil	32 g.
Montan Wax, Crude	15 g.
Montan Wax, Double Bleached	3 g.
Paraffin Wax (50/52° C.)	3 g.

No. 6
Violet

Methyl Violet-Base	5 g.
Oleic Acid	10 g.
Montan Wax, Crude	60 g.
Petrolatum	90 g.

Copying Paper

Austrian Patent 148,997

	Formula No. 1	No. 2
Carnauba Wax	9 g.	31 g.
Montan Wax	6 g.	24 g.
Violet Dye	7 g.	7 g.
Mineral Oil	63 g.	23 g.
Lampblack	15 g.	15 g.

Impregnation or Coatings for Carbon Papers, Typewriter Ribbons, Etc.

U. S. Patent 1,664,777

Cellulose Nitrate	5 oz.
Acetone	20 oz.
Methanol	20 oz.
Amyl Acetate	40 oz.
Amyl Alcohol	15 oz.
Oleyl Alcohol	25 oz.
Fatty Oil	3 oz.

Typewriter Ribbon Ink

Formula No. 1
Blue

Victoria Pure Blue Base B	100 g.
Oleic Acid	200 g.
Neat's Foot Oil	100 g.

No. 2
Red

Rhodamin Base B Extra	100 g.
Oleic Acid	200 g.
Neat's Foot Oil	200 g.

Apply on a fine, neat fabric of cotton, silk or half-silk, by a printing (not dipping) procedure.

No. 3
Black

Montan Wax, Crude	15 g.
Montan Wax, Doubly Bleached	3 g.
Paraffin Wax (50/52° C.)	2 g.
Mineral Oil	32 g.
Lampblack, or Soot	20 g.
Milori Blue	6 g.
Violet Blue	5 g.

Typewriter Ribbon, Reviving

Formula No. 1

U. S. Patent 2,051,942

Sulphonated Coconut Oil	200 g.
Lampblack	20 g.
Gum Arabic	0.1 g.

Warm together until liquid; stir until uniform; saturate used ribbon with this; squeeze out excess; press between warm absorbent pads or rollers.

No. 2

"Aqualube"	100 g.
Lampblack	8 g.
Milori Blue	3 g.

Mix together until smooth. This may be thinned with alcohol or Carbitol.

Color for "Blue Transfers"

Formula No. 1

Colophony	50 kg.
Rosin Oil	20 kg.
Montan Wax, Crude	10 kg.
Pigment	20 kg.

No. 2

Colophony	30 kg.
Rosin Oil	10 kg.

Montan Wax, Crude	10 kg.
Toluol or Xylol	35 kg.
Pigment	15 kg.

Transfer Ink
U. S. Patent 2,029,204

Shellac	5 lb.
Rosin	5 lb.
Titanium Dioxide	1 lb.
Triphenyl Phosphate	½ lb.
Heavy Lithographic Varnish	½ lb.

Warm together and mix until uniform.

Stencil Sheets
U. S. Patent 2,052,291

Formula No. 1

45 g. of gelatin are soaked and dissolved in 200 g. of water. 150 g. of Turkey red oil are well mixed with 80 g. of oleic alcohol, and 30 g. of chlorinated naphthalene. The mixture is heated to about 60° C. and is added while being constantly stirred to the solution containing the gelatin.

To this mixture of gelatin and softening agents 400 g. of alcohol, in which 1 g. of dye stuff is dissolved and which are heated to about 30–40° C., are added and thoroughly mixed therewith. The composition thus obtained, the solid ingredients of which are in extremely fine dispersion, is spread out upon the tissue paper sheets in the usual manner, and is then left to dry and solidify.

No. 2

45 g. of gelatin are dissolved in 200 g. of water and while the solution is heated to about 50–60° C., there is added first a dispersion containing 150 g. of Turkey red oil, 50 g. of oleic alcohol, 25 g. of chlorinated naphthalene and 50 g. of glycerol-mono-oleate; thereafter there is added 1 g. of dissolved dye stuff under constant agitation.

No. 3

U. S. Patent 2,004,484

Yoshino paper is impregnated at 37.7° C. with a liquid prepared by mixing boiling solutions of gelatin 13 g. and soap 42.6 g. in water 284 cc. each, and adding almond oil 56.8 cc.

Duplicator Stencil Moistening Fluid
U. S. Patent 1,996,125

Alcohol	25 cc.
Ethylene Glycol Mono Ethyl Ether	60 cc.
Water	15 cc.

Duplicating Machine Stencils

The wax-composition used should not be brittle and hard, but must be tough and elastic.

The paper used is a very fine, thin, fibrous, but tough tissue-paper.

Impregnation: Very thin.

Suggested Mixture:

Beeswax	20 kg.
Soft Ozokerite (60/62° C.)	15 kg.
Paraffin Wax (50/52° C.)	30 kg.

Melt together; mix; apply hot.

Tracing Cloth
U. S. Patent 1,988,914

Suitable material is impregnated with

Cellulose Acetate	20 oz.
Acetone	70 oz.
Water	10 oz.

This produces a dull frosted film on drying.

Ink for Tattooing Chickens

Pyrogallol	1 g.
Alcohol	10 cc.
Solution of Ferric Chloride	2 cc.
Acetone	20 cc.

Temperature Indicating Inks

Mix intimately one part by weight of cuprous iodide with two parts of mercuric iodide, grind to a fine powder, mix with a thin light colored non-acid oil or spirit varnish. Brush. Do not apply to aluminum.

heating ↓	R.T. → 130° F.	bright red	130		cooling ↑
	135	darkens	135		
	145	maroon	145	*cycle repeats*	
	155	light chocolate	155		
	160	dark chocolate			
	190	just before black	170↑	dark chocolate	
	212	black	212↓	This interval indeterminate	

Hectograph Composition

Glue	**100 g.**
Glycerin	**500 g.**
Barium Sulphate or Kaolin	**25 g.**
Water	**375 g.**

Part of the glycerin can be substituted by sugar solution or by calcium chloride solution.

Indelible Copying Leads

Methyl Violet	33 g.
Graphite (Fine)	64 g.

Gum Tragacanth	3 g.

Moisten and rub to a uniform paste. Force into forms under pressure and allow to dry thoroughly.

Shoe Repair Crayons
Formula No. 1
For Vici Kid

Broken Victrola Records	2½ lb.
Ozokerite	1¾ lb.
Yellow Beeswax	1¾ lb.
Lump Oil Black	1½ lb.

No. 2

Japan Wax	8 oz.
#2 Carnauba Wax	1 oz
Color	to suit

No. 3
For Patent Leather

Broken Victrola Records	7¼ lb.
Ozokerite	2¼ lb.
Lump Oil Black	3 lb.

No. 4
For Gun Metal

#2 Carnauba Wax	5 oz.
Ozokerite	18 oz.
Yellow Beeswax	18 oz.
Japan Wax	2 oz.
Hard Paraffin Wax	14 oz.
Oil Black	1 oz.

No. 5

Candelilla Wax	15 oz.
Stearic Acid	60 oz.
Ceresin Wax	7½ oz.
Ozokerite Wax	7½ oz.

Melt the above together and stir until uniform. To 1½ oz. of the above base (while melted) add ¼ oz. lampblack.

Shoe Edge Ink

Montan Wax	14 lb.
Caustic Potash	2 lb.
Nigrosine	3 lb.
Water	81 lb.

The dye is dissolved in the water and the caustic also added and dissolved, the whole being added, while stirring, to the molten wax.

Luminous Crayon

a. Gelatin, White, Best Grade	25 g.
Water	25 cc.
b. Glycerin	50 cc.
c. Luminous Pigment	about 3 g.
d. Whiting	to desired consistency

Soak *a* cold for ½ hour, add *b* and heat on the waterbath, with stirring, until clearly dissolved.

Add *c* and *d* with thorough stirring, to obtain an "ink" applicable by brush. Heat before use.

Fluorescent Crayon
U. S. Patent 2,013,417

Uranium Salts or Anthracene	6 g.
Chalk, Prepared	20 g.
Plaster of Paris	50 g.
Acetone	10 cc.
Water	40 cc.

Markings made with this crayon are visible in dark under influence of ultraviolet light.

Water Crayon

Paraffin Wax	40
Stearic Acid	10
Beeswax	1
Diglycol Laurate	10
Dye	to suit

Marks made with this crayon can be spread on wetting with water.

Artists' Crayons from Furfural

Bubble sulphur dioxide gas into technical furfural (at room temperature) until the sulphur dioxide forms 5% by weight of the final solution. Allow this solution, called Solution A, to age for 3 to 15 days before using it. Just before the crayons are to be made, mix 23 cc. of A with 27 cc. of technical furfural. Add 20 cc. of concentrated hydrochloric acid (sp. gr. 1.18) with vigorous stirring. Pour at once into molds made from pieces of glass tubing by placing a cork in one end of the tubes. Allow the material to remain in the mold for 20 hours, remove the cork, and push the crayons out of the mold. Allow them to dry at ordinary room temperatures for about a week before using. The crayons make an exceedingly black mark.

Hard Wax Crayons, #1 Grade

Base:

Stearic Acid (Double Pressed)	65 lb.
Paraffin Wax (138/140° F.)	35 lb.

Add to 100 lbs. of base:

Color	Pigment	Quantity
Black	Carbon Black	6 lb. 6 oz.
Magenta	Poster Cerise	25 lb.
Blue	C.P. Prussian Blue	7½ lb.

Ultramarine Blue	C.P. Ultramarine Blue	25 lb.
Orange	C.P. Chrome Orange	25 lb.
White	Lithopone	33–35 lb.
Yellow	Primrose Yellow	12½ lb.
	Chrome Yellow Light	12½ lb.
Brown	Burnt Umber	18¾ lb.
	Burnt Umber	6¼ lb.
Raw Umber	Raw Umber	25 lb.
Burnt Sienna	Burnt Sienna	17 lb. 10 oz.
Indian Red	Indian Red	18¾ lb.
	Pure Red Oxide	6¼ lb.
Venetian Red	Red Oxide	12½ lb.
Rose Pink	Process Red	4 lb.
	Lithopone	10 lb.
English Vermilion	American Vermilion	28 lb. 3 oz.
Flesh Tint	Vermilion	8 oz.
	Lithopone	4 lb.
Medium Yellow	Medium Chrome Yellow	25 lb.
Golden Ochre	Mexican Yellow or Strong Yellow Oxide	8 lb. 11 oz.
Green	Green A or C.P. Milori Dark Green	12½ lb.
Violet	Purple	12½ lb.
Light Green	Extra Light Green	12½ lb.
Cobalt Blue	Cobalt Blue	12½ lb.
Dark Green	C.P. Peerless Green Dark	17 lb. 10 oz.
Olive Green	Chrome Yellow Medium	8 lb.
	Black Lake	6 lb. 5 oz.
Red	Red #2097 (Lavenberg)	12½ lb.

Munsel Type Wax Crayons

Base:

Stearic Acid (Double Pressed)	65 lb.
Paraffin Wax (138/140° F.)	35 lb.

Add to 100 lb. base:

Color	Pigment	Quantity
Middle Blue	Peacock Blue	17 lb.
	C.P. Lincoln Toner	9½ oz.
Maximum Purple-Blue	C.P. Milori Blue	8 lb. 11 oz.
Middle Purple-Blue	Ultramarine Blue	1 lb.
Maximum Green	Green #8791 (Kohnstam)	8 lb. 11 oz.
Middle Red	Van Dyke Brown	2 lb. 11 oz.
	Para Red	1 lb. 10 oz.
	Lithopone	2 lb. 2 oz.
Middle Green	Green #8791 (Kohnstam)	5 lb. 6 oz.
	Black Lake	2 lb. 2½ oz.
Middle Yellow	Mexican Yellow	10 lb. 2 oz.
	Black Lake	1 lb. 11 oz.
Maximum Yellow-Red	Chrome Orange	25 lb. 3 oz.
	Permatone Orange (United)	1 lb. 4 oz.
Maximum Purple	Magenta	4 lb. 12 oz.
Maximum Red	Red #1897 (Lavenberg)	11 lb.
Maximum Red-Purple	Red Purple Lake #2128 (Lavenberg)	3 lb. 3½ oz.
Maximum Yellow	Primrose Yellow	12½ lb.
	Chrome Yellow Light	12½ lb.
Maximum Blue	Salisbury Blue (United)	11 lb.
Black	Carbon Black	6 lb. 6 oz.
Grey	Lamp Black	2 lb. 9 oz.
	Lithopone	25 lb. 13 oz.
Maximum Green-Yellow	Light Chrome Green	11 lb.
Middle Green-Yellow	Light Chrome Green	5 lb. 6 oz.
	Black Lake	2 lb. 3 oz.

Middle Yellow-Red	Persian Orange	2 lb. 11 oz.
	Black Lake	8½ oz.
	Lithopone	5 lb. 6½ oz.
Middle Blue-Green	Peacock Blue	1 lb. 8½ oz.
	Green #10–7500 (United)	13 oz.
	Black Lake	9 oz.
Maximum Blue-Green	Peacock Blue	3 lb. 2 oz.
	Green #10–7500 (United)	1 lb. 9 oz.
Middle Purple	Purple Lake	4 oz.
	Red Lake	2 oz.
	Lithopone	7½ lb.
Middle Red-Purple	Para Red	2 lb. 3 oz.
	Indian Red	1 lb. 2 oz.
	Black Lake	2 lb. 3 oz.
	Lithopone	5 lb. 6 oz.

Cast Chalk
#1 Grade Colored Chalk

Base:

Plaster of Paris	3 lb. 10 oz.
Terra Alba	6½ oz.
Water	72 oz.

Color	Pigment	Quantity
Yellow	Primrose Yellow	2 lb.
Green	Chrome Green	2 lb.
Ultra Blue	Ultramarine Blue	2 lb.
Purple	Purple Lake	1 lb. 10 oz.
Red	Para Red	1 lb. 4 oz.
Orange	C.P. Orange #40–6600 (United)	2 lb.
Black	Friction Black	6 oz.
Brown	Burnt Umber	2 lb.
Blue-Violet	Purple Lake	1 lb. 4 oz.
	Ultra Blue	13 oz.
Red-Violet	Purple Lake	1 lb. 4 oz.
	Para Red	6½ oz.
Red-Orange	C.P. Orange	1 lb. 10 oz.
	Para Red	6½ oz.
Lemon Yellow	Chrome Yellow Light	2 lb.

Impregnating Wax for Hard Pressed Crayon

Stearic Acid (Double Pressed)	10 lb.
Mutton Tallow	5 lb.
Japan Wax	10 lb.
Paraffin Wax, 138/140° F.	75 lb.

Soak crayons in above for 24 hours at 230/240° F.

Dustless Chalk

Whiting	300 lb.
Bentonite	3 lb.

Mix dry and add 10–13 gallons starch solution, mix until of right consistency and extrude. Cut and dry.

Starch Solution

Water at 212° F.	40 gal.
Add Starch in 1 gal. Cold Water	9 lb.
Acetic Acid (28%)	3 oz.

Note: Some of whiting may be replaced with China clay.

Billiard Chalk
German Patent 629,686

Pumice, Powdered	29 g.
Pumice, Granular	14 g.
Chalk	14 g.
Ultramarine Blue	7 g.
Green Pigment	4 g.
Water	29 cc.
Tragacanth	3 g.

The tragacanth is dispersed in the water by swelling and stirring. The other materials are mixed into it in a kneading mill and then pressed into forms.

Half-Pan School Water Colors

Base:

Carpenter's Bone Glue (Dry Basis)	3½ lb.
Glucose	36 lb.
Terra Alba	36 lb.
Beta Naphthol	½ lb.
Hot Water	24 lb.

Add Color:

Red	
National Rhodamine Spec.	2 lb.
Orange	
Wool Orange A Conc.	2 lb.
Yellow	
Auramine O	2 lb.
Purple	
Methyl Violet 2 B Conc. (National)	2 lb.
Blue	
Methylene Blue 2 B (National)	2 lb.
Brown	
Bismark Brown	3 lb.
Green	
Green #58 (Pylam)	3 lb.
Black	
Nigrosine 12525 Conc. Cryst. (National)	4 lb.
White	
Titanium White C	10 lb.
Gold	
Gold Lining Bronze	*
Silver	
Aluminum Lining Bronze	*

* Substitute in place of terra alba in base.

Procedure

1. Soak glue in equal weight of cold water for 6 hours then heat over steam or water bath until fluid.
2. Dissolve beta naphthol then dye in hot water.
3. Add 2 to 1 and stir in glucose.
4. Slowly add terra alba. Stir to prevent lumps.
5. Pour into pans while hot. Allow to set and then dry approximately 24 hours at 180/200° F.

Paint Tablets

	Toy Grade	School Grade
Dye	1 oz.	5 oz.
Pigment	5 oz.	10 oz.
Gum Tragacanth (Dry Basis) Paste	2 oz.	2 oz.
Terra Alba	87 oz.	80 oz.
Dry Soap Flakes (99%)	3 oz.	3 oz.

(Gum: Gum tragacanth is made up with water into a 10% paste. Add 1% beta naphthol as a preservative.) The soap is dissolved in sufficient water to make a stiff paste of the ingredients. Thorough mixing in a dough mixer follows. The mixture is then dried, pulverized, screened and molded on a press.

Color	Dye	Pigment
Yellow	National Auramine O or National Wool Yellow Ext. Conc.	Primrose Yellow
Orange	National Wool Orange A Conc.	C.P. Chrome Orange
Red	National Eosine O. J.	Para Dark Red Reduced
Green	National Victoria Green WB Cryst.	Green (United)
Blue	National Methylene Blue 2 B	Ultramarine Blue
Violet	National Methyl Violet 2 B Conc.	Purple Lake
Brown	National Bismark Brown # 53	Burnt Umber
Black	National Nigrosine #12525 Conc. Cryst.	Carbon Black

LEATHER, SKINS, FURS

Hide Depilatories

The simplest way to make a depilatory paint is to mix hydrated lime, slaked lime (carefully sieved) with enough sodium sulphide solution (26° Tw.) to make a smooth working paste. The skins should be laid out on a rough table and painted with a white wash brush so that an even coat of depilatory is given to the flesh. Care must be taken to prevent the wool being smudged with the depilatory and badly damaged. When painted, the skins need doubling up down the back and then stacking in piles, two to three feet high, and leaving for 12 to 24 hours. The piles should not be too high as otherwise heat will be generated and the skins damaged. The work of painting, folding and stacking requires a good deal of care and should be entrusted to intelligent men under the supervision of the foreman. It is advisable to arrange the work so that pulling or rubbing can take place the following morning. The wool must be kept clean and when a sufficient quantity has been collected it should be well washed, hydro-extracted for a few minutes and then dried off completely. Hydro-extracting may remove some of the valuable woolgrease and the running time must be regulated to prevent undue loss.

Instead of sodium sulphide, realgar or sulphide of arsenic may be used, and it is particularly suitable for gloving lambs, goatskins for glace, and certain grades of calf. It is claimed that the use of arsenic depilatories, also arsenic limes, results in a finer grain.

A good arsenic paint may be made as follows:

Quick Lime	100 lb.
Red Arsenic	20 lb.
Boiling Water	50 gal.

Tip the lime into a large size tub and pour over it just sufficient water for it to slake vigorously. When this has continued for half an hour add the arsenic and the remainder of the boiling water. Stir well for several hours and then allow to cool. Next day use the solution for painting; if too thick add some water, or if too thin, then add a few pounds of slaked lime. It is advisable to run the thin paste through a coarse sieve so as to remove any unslaked lumps of lime likely to burn holes in the skins. When handling arsenic compounds it is very necessary to exercise great care to prevent accidents. The men should be provided with rubber gauntlet gloves, and the preparation of the arsenic-lime depilatory carried out in the open air.

Depilatory action is always quicker and cheaper if it can be carried out by immersion in a strong sulphide solution, but this method is not practicable if the hair or wool is of any value. A depilatory lime may contain from one to two per cent sodium sulphide crystals and three to five per cent lime on the hydro-extracted weight of stock. The best plan is to slake the lime in a pit by just covering it with sufficient water to enable it to work vigorously over a period of twelve hours. At the end of that time the desired volume of water should be added and the liquor well plunged up or agitated by some mechanical means. Agitation by means of compressed air is a most efficient and economical means of agitation. To ensure the best results it is advisable to stir up the lime liquor either by hand plunging or other means, add the sulphide solution (26° Tw.) and then agitate the liquor again for the same length of time. This may seem like double and unnecessary work, but in practice it proves well worth while. The skins should be thrown into the liquor one by one and pushed under the surface with a long pole. Some tanners allow the goods to remain for six hours for drawing, others only two hours, but all manner of variations are capable of good results.

Unhairing of Hides and Skins

Formula No. 1

U. S. Patent 2,016,260

Skins are immersed in aqueous sodium sulphide the *p*H of which has been adjusted to 11.8—12.2 by addition of an acid salt, washed, and subsequently immersed in milk-of-lime.

No. 2

German Patent 632,882

Sodium Sulphide	1 kg.
Quick Lime	2½ kg.

Salt		½ kg.
Water		10 kg.
Mixture:		
Potassium Hydroxide (40° Bé.)	1 kg.	10–25 kg.
Alcohol	2 kg.	
Vegetable Oil	4 kg.	

Pickling and Depickling Skins

For pickling sheep, goat and deer skins use for 100 kilograms of skins: water 125 litres, salt 9 kilograms, sulphuric acid 1 kilogram. Dissolve the salt, put the skins into the paddle, and while turning add the acid at intervals over an hour. For vegetable tanning skins should be depickled. For 100 kilograms of skins use: water 125–150 litres, salt 10 kilograms, sodium acetate 5 kilograms. Dissolve the salt, add the sodium acetate and paddle the skins for one-half hour and test the solution with bromcresol green. If the skins are sufficiently depickled the solution will remain green. If the action is insufficient the color will be yellow.

Pickling Lamb and Sheep Skins

An inexpensive pickle for sheep and lamb skins can be made by dissolving 100 lbs. of salt in 100 gallons of water and adding 12 lbs. of sulphuric acid to the solution. Use 12 to 15 gallons of this solution for each 100 lbs. of skins treated. Drum the skins for 30 minutes and then horse up to drain.

When firm skins are desired use 20 gallons of water, 20 lbs. salt and 2 lbs. sulphuric acid for each 100 lbs of skins.

For skins which come off of country dry pelts dissolve 85 lbs. of salt in 100 gallons of water and add 3 lbs. of sulphuric acid. Apply the solution by brush to flesh side of cleanly fleshed skins. Then place in piles and allow to remain from 12 to 48 hours depending on thickness of skins. When the hair of the pelts can stand immersion without damage, the pelts can be drummed from 6 to 24 hours in the solution instead of brushed.

Bleaching Leather

For chrome tanning:

Put pack of pickled stock into drum and add 5 lb. salt in 5 gal. water at 70° F. per 100 lb. pickled weight of stock. Run drum for five minutes and then add 1 lb. of potassium permanganate and 3 lb. of salt in 3 gal. of water at 70° F. per 100 lb. pickled weight. Run drum twenty minutes and add 1½ lb. sodium bisulphite and 1 lb. salt in 1 gal. water at 70° F. per 100 lb. pickled weight. Run drum five minutes and add 1 lb. sulphuric acid and 1 lb. salt in 1 gal. water at 70° F. per 100 lb. pickled weight and run 15 minutes. Remove the stock and repickle to equilibrium with same liquor as was used in the original pickling.

For vegetable tanning, the following formula is suggested:

Put pack of bated stock into drum and add 1 lb. of potassium permanganate and two-thirds of a lb. of sulphuric acid in 10 gal. water per 100 lb. bated weight. Run drum for twenty minutes. Then 2¼ lb. of sodium bisulphite in 2 gal. of water is added, followed by two-thirds of a pound of sulphuric acid in 1 gal. water. Drum 15 minutes.

The quantities of permanganate and sodium bisulphite used in bleaching can of course be somewhat varied to suit requirements. For fairly clean stock smaller quantities will prove sufficient; but for very dirty skins larger quantities may be necessary. Stock bleached with small quantities may be rebleached in the same manner without harm if found not to be perfectly clean.

The use of permanganate makes for better grading and increased selling value of the leather at a very small cost. Especially in the making of whites and light colors it would seem to be a necessity, although it is claimed it will improve the quality of any leather.

Deliming Skins

Italian Patent 323,555

100 kg. pelts are delimed with 200 kg. water, 2 kg. sodium sulphate and 0.2 kg. ammonium citrate during one hour, followed by washing with water.

Degreasing Bristles and Horse-Hair

Castile Soap	6–8 g.
Soda Ash	1–2 g.
Tetralin	0.8–1 g.
Ammonia (20° Bé.)	1–1.5 g.
Water	1 l.

The above is used per 100 g. of hair and is used at 25° C.

Mordanting and Dyeing Furs

British Patent 474,589

Rabbit skins are treated for 12 hrs. at room temperature in

Acetic Acid (6%)	1 lb.
Water	1000 lb.

Dye for 4 hrs. in

Paraphenylenediamine	0.3 lb.
Paraaminophenol	1.5 lb.
Pyrogallol	0.32 lb.

Hydrogen Peroxide (12 Vol.)	21.2 lb.
Water	1000 lb.

The points are then brushed once with

Paraphenylenediamine	9 lb.
Paraaminophenol	4 lb.
Hydrogen Peroxide (12 Vol.)	300 lb.
Water	700 lb.

SOLE TANNING

Soaking must be regulated according to the kind of hides being worked. In all instances the soak waters should be kept at a temperature below 65° F. Thus if well cured packer hides are worked, soaking can be prolonged to 36 hours, with water at 65° F. or below. Country hides can also be soaked for the same length of time, but the temperature of the water should be no higher than 60° F.

General practice calls for soaking periods of from 14 to 18 hours at 65° F. Packs are made up of 5,000-lb. green salted weight, and preferably placed into paddle wheels of 3,000 gallon capacity. The stock should be milled several times during the soaking period. After the stock is properly soaked it should be washed with cold running water for 1 to 1½ hours to thoroughly cleanse it. Fleshing at this stage depends upon the condition of the hides. It is preferred to flesh after unhairing.

Unhairing

The process requires a seven day period. It is desirable to start with a mellow lime and advance the hides to a fresher lime so that at the end of the sixth day the hides are unhaired and fleshed and placed into a cold pool overnight.

Facilities for handling the hides greatly influence the process. Vats should be constructed so that the hides can be placed onto racks and suspended into the vats, hanging free. This necessitates deep vats and a Monorail system for handling from one vat to the next. The reel system can also be used to shift the stock; this requires toggeling the stock. In principle both methods are alike.

The limes are prepared by using lump lime, this is first slaked in the usual manner. Each vat should contain lime equivalent to 7%, on the weight of the hides placed into the vat. It is assumed that an old mellow lime is at hand.

The first vat is to contain approximately one-third of its volume of this old lime, then is added 20 lb. of sodium sulphide and 200 lb. of lime in the form of milk of lime. The hides remain in this vat for 24 hours during which time they have been handled once.

The second vat is similarly prepared, with 200 lb. of lime and 20 lb. of sulphide.

The third vat is prepared in the same manner as the first, but use only 10 lb. of sulphide.

The fourth vat is prepared in the same manner excepting no sulphide is used.

The fifth vat is prepared with 350 lb. of lime and water only.

The stock is handled once in 24 hours, i.e., if the stock is placed into the vats in the morning, it is raised in the afternoon of the same day, the lime liquor well agitated and the stock lowered again. The next day it is advanced to the second vat, etc. Each day two-thirds of the lime liquors are discarded, this, however, is governed according to the condition of the liquors and must be controlled by the attendant, who should be able to judge the amount necessary to retain. The fifth vat should be kept as "fresh" as possible. At times liquor from one vat may be pumped into another vat. In the course of a few weeks a well controlled "lime yard" will be obtained.

After the pack has passed through the five vats it is removed on the sixth day, unhaired and fleshed, after which it is placed for 24 hours into a cold water pool containing approximately 100 lb. of lime for each 2,000 gallons of water. From this pool, the hides are rinsed with fresh water and transferred to the bate wheel.

Bating

Bating is preferably performed with the pancreatic type of bate. This operation should be so regulated as to clear the grain only. Prepared bates for sole leather purposes are used at 85 to 90° F. for a period of from 20 to 30 minutes when ½ of 1% of the bate is used on the white weight of the stock. This weight is obtained after unhairing and before fleshing. After the stock is bated it is placed into a cold water pool, temperature 60 to 65° F. for several hours, then the hides are transferred to the rocker yard.

Trimming

If hides are to be trimmed for back, bends or crops, this should be done before the hides are bated. It is often desired to use whole shoulders for welting, in this case the whole double bend would pass through the bating and tanning stages, to be trimmed off after passing through the rockers. The shoulders may also be worked through whole into chrome retan sole leather. The same applies to the bellies. It will be assumed that the hides are trimmed with bellies off at the bating stage, although the tannage will permit of tanning bellies and shoulders up to and including the rocker yard.

As is well known to all sole leather tanners considerable time is required to "break in" a rocker system. A certain number of packs must pass through the whole yard before it will function properly. Even though an ideal mixture of tannins, proper acidity and pH and purity are obtained a certain mellowness is desirable. This condition can best be obtained by use.

Tanning and Finishing Pickled Cow Splits

Pickled splits should first be sorted as to size and heft after they have been trimmed properly. If they are bought in the open market it is possible that they are not of the same lot and may be an accumulation of various lots. This will require careful selection and it is well to give them a repickle in a liquor containing 10% of sulphuric acid on the weight of the stock as received. Mill the stock in this liquor in a paddle wheel for four hours then remove them and pile up and let drain for 24 hours.

This repickle also produces an even moisture content for some of the splits may have been dried out.

As it is essential to put splits through the tannery as rapidly and as cheaply as is possible a so-called "dry" tannage serves the purpose best. The chrome tanning solution is made as follows: To 65 lbs. of sodium bichromate add 10 gallons of water in a wooden barrel, or better still, in a lead lined tank; then add 60 lbs. of 66° sulphuric acid stirring well all the while; then slowly add 16 lbs. of tanners corn sugar which is first dissolved in 2 gallons of water. Extreme care must be exercised in adding the sugar. It must be done very slowly at the beginning or the chrome will boil over the top of the tank. After the sugar is all added use enough water to make a total of 30 gallons. For each 100 pounds of pickled drained weight of splits add 12 gallons of this chrome solution. No additional water or salt is necessary to add to the drum. Mill the stock in this amount of liquor for two hours and remove from the drum and pile up flat on a truck for 24 hours to drain and set. After this period the stock should stand a boil test of one minute. This test is made by taking cuttings and immersing them in boiling hot water for one minute. If it does not curl then it is ready for the next operation. If it does not stand the boil, it must be given a retan with more of the chrome solution.

After draining, the stock is set out and then shaved if necessary. It is then ready for coloring and fat-liquoring.

Coloring

Place the stock into a drum and for every 100 pounds of shaved weight of the splits add 15 gallons of water first heated to 120 degrees F. Mill for 15 minutes then add, over 15 minutes time, ¼ lb. borax which is first dissolved in one quart of water. After all the borax solution is added continue milling for 15 minutes longer. (Soda ash or bicarbonate can be used, but borax has been found to be best.) After this, wash the stock for 30 minutes with clean water, the drum revolving all the while. Then add the color and fat-liquor which has been previously prepared.

It is best to color splits with earth pigments and it is only necessary to obtain the primary colors and mix them to the desired shade wanted. For 100 lb. of splits use 6 lbs. of the pigments.

Prepare a fat-liquor as follows; for 100 lb. use:

Water (150° F.)	1 gal.
Sulphonated Cod Oil	2 lb.
Raw Cod Oil	1 lb.
Light Specific Gravity Mineral Oil	2 lb.
Tallow Soap, Dissolved in in 1 gal. Water	1 lb.

Add the above in the order given stirring all well as each addition is made. After a good emulsion is obtained add the 6 pounds of dry pigment and again stir, then add the mix to the drum while it is revolving. First it is necessary to add one-half gallon of water for each 100 pounds of stock in the drum and it is important that the temperature be no lower than 125° F. in the drum. Mill the stock in this bath for one hour, then rinse for 5 minutes with water at 125° F. Take stock out of the drum, pile up for 24 hours, then set out and tack wet.

After the stock is removed from the boards it is dry drummed for 2 to 3 hours. Remove from the drum and inspect; stake what stock is necessary. The usual judgment in tanning must be followed and it may be necessary to vary the amount of fat-liquor in order to obtain the proper feel and condition. The feel is often influenced by the type of pigment used and in some cases it is essential to add a small amount of French chalk to the fat-liquor to obtain the desired feel. It is obvious that the shaving job be done carefully for shaving after coloring is not desirable. When aniline dyes are used to color it is essential that the fat-liquor be added after the coloring operation. Aniline dyes, however, do not give the evenness of color that pigments do, and defects are not covered up as readily.

If changes in the fat-liquor are necessary it must be borne in mind that the amount of raw cod oil must not be increased too much for it may result in a harsh feel for cod oil is classed as a semi-drying oil and has a tendency to oxidize in the leather with the result of added harshness after the splits age for a week or two.

Gambier Drum Tannage for Fine Leathers

A mixture of gambier, myrobalans, quebracho and valonia can be used to produce a high quality leather specially suitable for hat linings. The method is as follows:

The sheepskins, or calfskins, are taken from the drench, or puer, and drummed in a weak solution of acetic acid 40 per cent strength, for 20 dozen sheepskins, about 1,500 cc. needed. After a run of ten minutes, the goods should be taken out of the drum and drained. A liquor consisting of 5 g. tannin per liter should be made up in the drum together with half a gallon of light mineral oil to reduce the surface tension. The tanning material used should consist of the following mixture:

Gambier	125 lb.
Myrobalans Extract	50 lb.
Quebracho Extract	85 lb.
Sumac Extract	40 lb.
Valonia Extracted with Hot Water	65 lb.
Water	200 gal.

This stock solution contains a nice blend of tannin and should be used to strengthen the weak liquor in the drum at the rate of 4 gallons every 2 working hours throughout the day. When tanning is complete, the goods require horsing up for a day then drumming in warm sumac liquor containing sulphonated castor oil.

Gambier Tannage for Modeling Calf

When it is desired to produce a calfskin leather with a very fine, smooth grain, useful results can be obtained by painting the skins on the flesh side with tannin solutions rich in gambier. One advantage of this method is that tanning takes only a short time, three days being sufficient for large calfskins.

The best solution is made by dissolving 50 lb. gambier, 25 lb. sumac extract, 25 lb. myrobalans extract, 10 lb. quebracho extract and 5 lb. oakwood extract in 75 gal. of water and adding to this 15 lb. turkey red oil.

Pickled skins are the best for this method of quick tanning, and they should be drummed in 15 per cent salt for 20 minutes before painting. After painting on the flesh, the skins should be placed grain to grain in small heaps. Too much liquor should not be given at first; in fact, all that is necessary is to apply as much tan liquor as the skin substance can soak up in a few minutes. Painting should take place every one and a half hours until the goods are tanned. They then need drumming in a warm and strong infusion of sumac to clear the grain and give it a good finish. If the skins are coated on the grain with a light mineral oil before painting they have less tendency to show any signs of grain contraction.

Gambier, Quebracho and Myrobalans

This is a popular commercial formula for tanning sheepskins, and by varying the proportions of the three tanning materials it is possible to alter the character of the crust leather to a considerable degree.

A rough basic tannage that produces a good leather is the following:

Drum 45 dozen pickled sheepskins in 10–15 per cent salt solution in a drum for 20 minutes. Drain the goods and transfer them to a paddle wheel, capacity 1,200 to 1,500 gallons, containing a weak solution of mixed tannins, equal proportions of gambier, quebracho extract and myrobalans extract, and with a strength of 7 g. tannin per liter of solution ready for use. The wheel should contain 4 buckets of common salt to reduce swelling. After a week's slow running in the paddle, motion being reduced to four hours daily, the goods should be passed into another paddle wheel containing 15 g. per liter of mixed tannins. After three days in this liquor, the goods will usually be thoroughly tanned, but it is advisable always to test cuttings in the laboratory with glacial acetic acid which will show the penetration of the tannin. No salt is needed in the last liquor, and it is also unnecessary to add acid.

To reduce the cost of the tannage, and also to obtain a slightly firmer leather, the proportions of the three tanning materials can be altered so that only half the quantity of gambier is used, extra amounts of the other extracts being used.

The addition of oakwood extract increases the firmness of all gambier leathers and is sometimes exceedingly useful.

Gambier and Alum

The ordinary combination tannage described above is not always suitable when the goods are to chromed, and a better, quicker and more economical method is to use an alum and gambier tannage. This is very simple. Drum the goods in salt liquor, 15 per cent, for 20 minutes, then drum or rock the goods in the following liquor:

Water	350 gal.
Alum	60 lb.
Gambier (sufficient to tan 40 dozens)	45 lb.
Salt	30 lb.

Three days should be sufficient to tan the goods, and they should then be horsed up for a day, then hung up to dry in slightly warm shed.

In some cases it may be desirable to take goods straight from the bran drench, or puer, instead of from the pickle, and for gloving leathers this method is to be preferred. The alum and gambier combination tannage is to be recommended for fly wing skivers intended for piano work. The goods can be processed in almost the same way as described above, only for these goods, it is necessary to feed with oatmeal and colloidal clay, or bentonite. The oatmeal should be mixed with lukewarm water not exceeding 98° F., otherwise it becomes cooked. Both clay and oatmeal have a very beneficial effect on the leather, and also fill up the objectionable pin-holes so often found with these extra thin splits. After tanning, the grains should be dried out in a cool shed, perched on the split side, brushed, ironed and examined for pinholes. If these are still present, then the goods must be wet down and fed-up with more oatmeal and colloidal clay. Ordinary clay is of no use, and only the finest colloidal variety should be used.

Tanning Extract

Hemlock Extract	10,000 lb.
Quebracho Extract	10,700 lb.
Chestnut Extract	6,664 lb.
Myrabolans Extract	1,668 lb.
Water sufficient to make	10,000 gal.

The extracts are placed into the dissolving tank, well agitated, then boiled with one-half of the necessary amount of water, agitating during the time of heating. After the extracts are well dissolved, the balance of the water is added.

It is preferred to use rain water if available, or a soft water as free from calcium salts as possible. This stock liquor should be adjusted to a pH-3.30 if the pH is above this figure. Either, lactic or acetic acids can be used for the purpose.

Leather Tanned with Hair On

Only the best and heaviest hides are used for this class of stock as it is used mostly for mechanical leathers. These hides are obtained mostly from continental Europe, the best of which are the Swiss Auction hides as they are almost always free from cuts.

Before going into process, hides are trimmed; the heads and bellies being trimmed off, sometimes a narrow shoulder is also taken off. Stock is thoroughly soaked which requires several days and then fleshed by machine. To aid the penetration of the tan and for a slight plumping, stock is hung in a very weak caustic soda solution, which helps to remove the grease. This is ordinarily done in the limes on grain leathers. If for chrome, stock is now pickled. For plumpness this is best carried on in pits, however a drum or a paddle may be used. The same also applies to the tanning. Any standard pickle may be used, preferably salt and alum. Pickling requires three to four days according to the weight of the stock. After pickling, stock is tanned with any of the one bath chrome liquors on the market. Then it is neutralized and fat-liquored.

The vegetable leathers are tanned in the rockers starting in clean weak liquors and working up the strength as in the tanning of belt leather. Only those tanning materials should be used that tend to make long fibre. These are oak bark, valonia and quebracho. A little gambier may be used to impart strength. Too much of the latter tends toward a stretchy piece of stock.

For mill work, leathers should be firm yet pliable, which practically eliminates the combination tannages. After stock is tanned it is washed and fat-liquored.

The stuffing and fat-liquoring are slight variations from the following, the use the different leathers are put to being the deciding factor.

Fat-Liquors

Soap	1½ lb.
Neatsfoot Oil	1½ lb.
Soda	¼ lb.
Water	97 lb.

or

2 lb. Sulphonated Cod Oil
2 lb. Stock solution made as—

Cod Oil	50 lb.
Degras	50 lb.
Soap	6 lb.
Bicarbonate of Soda	3 lb.
Water	5500 lb.

After fat-liquoring, stock is sammied and ready for stuffing. The following are a few examples of stuffing materials and may be varied to suit one's needs.

Tallow	4 lb.
White Wax	3 lb.
Moellen	1 lb.
Neatsfoot Oil	1½ lb.

or

Tallow	6 lb.
White Wax	2 lb.
Moellen	4 lb.
Cod Oil	1 lb.
Stearine	3 lb.

or eighteen percent of the following may be used

Stearine	30 lb.
Paraffin Wax	20 lb.
Tallow	20 lb.
Neatsfoot Oil	20 lb.

In stuffing, the drum should be heated between 140° and 160° F. according to whether chrome or vegetable leather is being stuffed. If steam is used for heating drum, excess water should be drained out. After stock is cooled, set out, sammie, stake and tack. When dry, finish and clip hair.

HOME TANNING OF HIDES

The equipment needed for home tanning can be found or made on any farm, and the whole process is very simple and inexpensive. Durable leather for making harness, harness repairs, belt and boot lacing, or beautiful and very serviceable rugs for the floor can be provided during spare time, at very little expense.

Materials and Equipment Needed

1. Fleshing beam.
2. Fleshing knife or dull drawing knife, or large butcher knife, to remove flesh.
3. Wooden or metal slicker for removing water.
4. Breaking stake for working hide or skin.
5. Large wooden barrel for tanning solution.
6. Common salt.
7. Commercial sulphuric acid.
8. Several small packages of washing powders.
9. Six to eight pounds of unslaked lime or eight to ten pounds of hydrated lime (unslaked preferred).

Selecting, Skinning and Fleshing

The kind of leather which can be made from a hide or skin depends largely upon the size and weight. Large heavy hides are best suited for sole, harness or belting leather, while lighter hides weighing from 15 to 40 pounds are better for lace leather and rugs.

Special care should be taken in removing the hide or skin from the animal as cuts, or scores make the hide almost useless for leather.

After the hide or pelt is removed from the animal it should be placed, with flesh side up on fleshing beam, and thoroughly scraped to remove all meat particles and blood. A dull butcher or drawing knife may be used for this purpose.

A satisfactory fleshing beam may be made by splitting a log that is 6 feet long and 2 feet thick. One-half of this log may be placed with the curved side up. One end is then raised about 3 feet and nailed to braces as a support. The other end will rest on the ground.

Washing and Curing

Whether the hide is to be cured and held, or tanned immediately it should be thoroughly cleaned. The hair or wool must be freed of manure, blood and other foreign material and if it is to be tanned "hair on," manure and other stains should be washed out. Plain cold water and a brush or broom will remove most of the foreign matter, and stains can be washed out with the following solution:

1 package washing powder
(small size)
1 gal. warm water

At this time it is well to trim off the feet just above the knee or hock, and smooth off all ragged edges.

The hides must first be thoroughly cooled, which may take from six to twelve hours depending upon the size of the hide and thickness of the hair. After cooling, spread flesh side up on a clean floor which has been sprinkled with salt, then cover with a layer of salt and rub in well. Use plenty of salt as it is impossible to use too much, but easily possible to use too little. A number of hides can be cured in one pile, and curing will be complete in from one to two weeks. The hides should then be dry and stiff, and if kept dry will keep for weeks, or even months in winter. Sheep pelts should not be piled longer than four to five days because the wool will cause them to heat. They should be tanned as soon as possible after animal heat has left them.

Tanning Formula

One may proceed with tanning a green or fresh hide as soon as it is properly fleshed and washed, but a cured hide that is dry and stiff must first be soaked in clear water until it is soft and pliable. It must then be placed on fleshing beam and thoroughly scraped with "slicker" to remove salt and water; then it can be treated with the tanning solution as though it were a green hide.

The tanning method recommended is called "salt acid" tanning as against the "oil," "bark," or "chrome" tanning. The formula used is:

Commercial Sulphuric Acid	3 fl. oz.
Common Salt	2 lb.
Soft Water	1 gal.

Tanning With Hair On

Make up enough of the solution to cover the number of hides that are to be tanned, but be sure to use a *wooden bucket or barrel for this purpose as the acid will destroy a metal container.* Each hide should be clean and soft before it is put into the tanning solution. For small thin hides, such as calf hides, leave in the tanning solution for 12 to 24 hours. For heavy cow hides the length of time will depend upon the size and thickness of the hide but usually three to six days will be sufficient. The hide should be stirred every few hours to insure even tanning. After removing from the tanning solution, wash in cold water, stretch on fleshing beam to drain, and scrape with slicker to remove excess salt, acid and water.

Sheep pelts should be spread out flat with the skin side up, and the tanning solution daubed on with a rag or handful of wool. This should be done several times so that the skin is thoroughly wet with the solution. After twelve hours wipe off the excess acid and salt with a damp cloth, then proceed with the working.

Tanning With Hair Removed

When it is desired to remove the hair, the hide may be immersed in a solution of lime water, made by slowly dissolving six pounds of unslaked lime or eight pounds of hydrated lime in five gallons of water. Leave the hide in this solution for three or four days or until the hair slips, and scrape hair off with fleshing knife. Then, wash out lime water and scrape with "slicker," and proceed with tanning as when hair is on.

Making the Leather Pliable

The pliability of a hide or the quality and flexibility of the leather will depend to a large extent upon the frequency with which the hide is "worked." When nearly dry it should be worked thoroughly over a breaking stake or the upper edge of the fleshing beam, in order to get rid of any stiffness or harshness.

A hide may also be "worked" by rolling it up tightly, with the flesh side out, then grasp one end firmly and beat it across a heavy block or table, changing the position of the "hand hold" frequently so that all parts of the hide will come in contact with block or table. When through beating, stretch a small area at a time over breaking stake until entire hide is stretched and worked.

As soon as the entire skin or hide is soft and pliable a thin coat of neatsfoot oil should be applied to the skin side, or if the hair has been removed, a thick coat of oil should be applied to both sides. After the hide or skin has been oiled it should be left stretched out until nearly dry, then worked at least two or three times per day until thoroughly dry. If the hide should become too dry to be worked it should be sprinkled with water and then reworked as it dries. When finished, either as hides or as leather, the products should be soft and pliable, but if still stiff or harsh after working they should again be sprinkled and reworked until of satisfactory pliableness when thoroughly dry.

This process gives a strong white leather, is easily followed, cheap to use and quickly finished, but if a black finish is desired apply back leather dye to hide before treating with neatsfoot oil and proceed as directed above.

Home Tanning of Calfskin

One of the easiest and simplest formulas to tan hides with hair on, is first to soak skin soft in water, carefully flesh it, removing bits of fat and muscle, and paring the skin down until it is about the same thickness all over. Then immerse in a solution composed of these proportions: 2 qt. common salt, 2 oz. commercial sulphuric acid, 2 gal. soft water.

Stir about twice daily, and let soak for 7 days in a moderately warm place. Remove and rinse. Soak 3 hours in pail of water to which you have added one cup of sal soda. Rinse well in fresh water. When partly dry, work, and twist the hide to soften it. Drawing it across edge of board will do this. When it dries hard, dampen, and repeat the working. Do this until hide dries soft. Then oil lightly on flesh side with neatsfoot oil, or tanner's oil.

Tanning Codfish Skins

The skins are soaked for 2 hours at 10–12° C. in 1 pound of water per 6 pounds of raw skins, treated with 1 pound per 5 pounds of skin of a solution of 2.5–3.5 g. soda ash per l. water at 10–12° C. for 12 hours, washed with water and the scale and flesh removed. The skins are pickled for 1–1.5 hours at 15–16° in a solution containing 5% salt and 5% alum. The chrome tanning is effected in the pickle solution to which 0.25% of the weight of the skins of chromium trioxide is added. After 1 hour 0.1% of soda ash is added. After another hour or hour and a half the skins are washed with water at 20° for 10 minutes and vegetable-tanned by first tanning with spent solutions of 2° Bé., then with a solution of willow-pine tannides (willow-pine = 1:1) of 2° Bé. which increases to 2.5–3° Bé. within 24 hours. The solution is strengthened with oak solutions. The skins are transferred after 24 hours into a spent solution of 3.5–4° Bé. and the strengthening is also effected with oak solution. The tanning procedure requires 48 hours. The skins are fat-liquored with 30% water and 10–12% chrome-oil. They are dyed with a brush on the flesh side with 3 kg. nigrosine and 30 l. blood per 100 l. of dye. A second dyeing is effected with the same dye.

Preparing Morocco Leather

Only goat skins from the same source should be worked at one time. Mixing domestic skins with skins from India, China or Arabia, for instance, will result in uneven soaking, necessitating sorting during soaking and a repetition of the process for part of the pack. Imported, dry skins are soaked one day in water, drummed following day ½ hr. and put back in clean water containing some sodium sulphide. If the hair is to be recovered the skins are pasted on the flesh side with a paste made up from 100 liters water in which 45–50 kg. lime is slaked. After cooling 1 per cent of arsenic and 4 per cent of sodium sulphide (62 per cent) are added. After the hair begins to slip the hides are washed in cold water and unhaired. If the hair is not wanted the unhairing is made in a drum with lime, arsenic and sodium sulphide by running for ½ hr. followed by rinsing in cold water. The skins are plumped in a sodium sulphide bath measuring 3–3½° Bé. at 15–18° C. The skins remain in this for 36–48 hrs. with frequent stirring, are then reeled in running water for 1–2 hrs. and laid away in clean water for 2–3 days to remove all of the sodium sulphide. This method of plumping gives a smooth, close grain.

The skins are bated until depleted, washed in water for ½ hr. and the grain slicked using moderate pressure. Morocco leather is always tanned by the two-bath method. First bath is made up of 250 liters water, 5 kg. potassium dichromate, 4 kg. potassium alum and 2½ kg. hydrochloric acid per 100 kg. skins. The solution is added in two portions 15 min. apart and run for 3 hrs., then left over night in the drum. After running 30 min. the following morning the skins are horsed up until following day, after which they go into the reducing bath made up of 250 liters water, 15 liters hypo and 5 liters hydrochloric acid. The hypo is added first with half the amount of acid, followed after 15–20 min. by the remainder of the acid. The skins are drummed 4–5 hrs., then left in drum over night and horsed up for 24–48 hrs., keeping them well covered, after which time they will stand the boiling test. Both baths are only used once. After neutralizing with 1 per cent soda, bicarbonate or calcium carbonate they are set out on the flesh side and leveled on the head and back.

Tanning Calf for Willow

For 800 lb. pickled calfskin 50 gallons of water, 100° F., and 50 lb. salt are used and the goods drummed 30 minutes in a slow drum. Allow to drain and then run on very slowly 24 gallons of chrome liquor containing 135 g. per liter chrome and having a basicity of 80. Run for two hours and then tray up until next day.

Wash with plenty of cold water until washwater is crystal clear; this usually takes 1½ hours. Add 36 lb. borax and run for 45 minutes. Wash a further hour, drain and then run on retan liquor through a large funnel. This liquor consists of the solution left over from the first stage of tanning together with 4 gallons of stock chrome. Run two hours and repeat the above operations of traying and re-tanning. Final washing should take 1¾ hours. The neutralization needs 26 lb. borax and must be continued until the goods are only faintly acid as tested by litmus. They then require a final washing for one hour in water at 100° F.

SUEDE CALF LEATHER TANNING

Raw Material

Calf skins measuring seven feet or less should be used. In the green salted state the skins will weigh up to seven pounds.

The skins are trimmed and made into packs of 3,000 pounds each. Skins weighing less than 5 pounds are kept separate from those weighing more than 5 pounds. Thus a pack will contain from 500 to 700 skins.

Soaking, Washing, and Fleshing

The skins are placed into a paddle vat having a total capacity of 2,500 gallons. The temperature of the water is adjusted to 65° F., soak for a period of 18 hours, milling the skins for a 5 minute period every 3 hours. After soaking, the skins are placed into a wash wheel and washed for 15 minutes with running water at 65° F. Remove from wheel and place into box trucks, permitting to drain for 30 minutes. The skins are now fleshed, trimmed and delivered to the lime paddles.

Liming

Total capacity of the paddle vat should be 2,500 gallons. This is filled with an old lime liquor (the old lime liquor is one from which the previous pack has been removed), the skins are placed into this liquor and milled for 5 minutes. The skins remain in this old lime liquor for 24 hours, during which time the skins are milled 4 times for 5 minute periods.

After 24 hours the liquor is run off and well drained. Refill the paddle vat with clean water at 70° F. and add 200 pounds of hydrated lime and 25 pounds of crystal sodium sulphide, previously dissolved in 25 gallons of water, turn paddle wheel while the materials are being added and mill 3 to 5 minutes longer. Turn paddle wheel two times for 3 to 5 minutes during the next 24 hours.

After the second 24 hours, or on the third day, add a solution of sulphide equivalent to 10 pounds of crystal sodium sulphide and 50 pounds of hydrated lime, while the paddle wheel is turning, heat the lime liquor to 75° F. Mill the stock for 5 minutes at the end of the day, let rest overnight. The fourth day the liquor is heated to 80° F. while the paddle is milling, let rest for 2 hours, then pull the skins and lay out flat on platform trucks. The skins are now unhaired on the scudding machine, inspect on beam and beam skins if necessary, head split and reflesh, at this stage obtain the "white weight." After each operation the skins should be placed flat on trucks.

After refleshing, the skins are placed into a paddle vat containing 2,500 gallons of water at 75° F. and 100 pounds of hydrated lime, mill for 5 minutes and leave there overnight.

Bating

The next morning the vat is drained and the skins lightly washed with clean water at 75° F. The skins are then acid washed and bated. Bating is done at 90° F. and the skins should be bated completely through, observing the conditions outlined in the reference above. After the stock is bated the paddle is drained and then filled with cold water 65 to 70° F., after which the skins are washed for 15 minutes, then pulled from the paddle and placed into the pickle solution.

Pickle

The pickle paddle vat should have a total capacity of 2,500 gallons. Sufficient salt is added to obtain a 10° Bé. solution, the skins are then placed into the vat and milled, while milling add 1¼ per cent sulphuric acid and 10 per cent salt on the "white weight" of the skins and continue milling for 4 hours. Remove the skins from the paddle vat and horse up to drain for 48 hours. The skins are made up into lots of 2,000 pounds each for the tanning operation.

Tanning

The chrome liquor used for tanning is made up as follows:

Sodium Bichromate	100 lb.
Aluminum Sulphate	40 lb.
Sulphuric Acid (66° Bé.)	80 lb.
Corn Syrup	25 lb.
Water	100 gal.

The bichromate and aluminum sulphate are placed into a lead lined tank to which 50 gallons of water is added, agitate well to dissolve, then add the sulphuric acid after which very slowly add the corn syrup. After the corn syrup is all added add ½ gallon of sodium bisulphite (33%) and enough water to make a total of 100 gallons. The chrome liquor should be allowed to age 10 days before it is used.

The liquor should obtain a basicity of 35 per cent and an equivalent of one pound bichromate per gallon.

The tan drum is prepared by placing into it 180 gallons of water (75% on weight of pickled stock) and 4 per cent or 80 pounds of salt with 2,000 pounds of pickled drained skins, mill for 10 minutes and add: 20 gallons chrome liquor, mill 10 minutes and add: 20 gallons chrome liquor, mill 10 minutes and add: 30 gallons chrome liquor, mill 3 hours then add: 1½% or 20 lbs. bicarbonate of soda. This is dissolved in 50 gallons of water and added at the rate of 5 gallons every 5 minutes. After the last of the soda has been added milling is continued for 3 hours, after this the drum is permitted to rest over night. The next morning the drum is run for 30 minutes. A boil test is then made. The stock should stand a 3 minute boil test, it is then removed from the drum, horsed up grain to grain and allowed to drain for 24 hours. The skins are now set out, first on the flesh then on the grain.

It is usually necessary to head split the skins; if so, this is done on the Union machine. The skins are now shaved all over the flesh side but a light cut is taken.

Pigskin Leather

To get the best possible results in pigskin tanning the skins should be thoroughly degreased with naphtha under pressure and then washed in a drum.

In using pigskin which has been naphtha degreased and washed for 5 minutes in water at 90° F. containing two pounds of sal soda per hundred pounds of skins the bristle root will be completely dissolved in a 3° Bé. sulphide liquor overnight.

The skins next go into straight lime for three days, after liming a few lots, sulphide will accumulate in the first lime and when this accumulation causes the skins to retain color from the sulphide the lime should be run off.

After liming, the skins are washed in an open drum, in water at 70° F. for five minutes and scudded on the machine. Deliming, especially if a nice white shoe leather is to be made, should be done with bisulphite, and the deliming liquor must be kept acid for at least 20 minutes after the last addition of bisulphite, about 2 pounds of powdered bisulphite on the scudded weight of skins will be necessary and should be added as follows, 1% at first and when this is taken, ¾% is added, and the balance necessary as soon as this is taken up. Keep the bath close to 100° F. and the neutralization can be completed in one hour. Bisulphite is a weak acid and does not dissolve skin substance, the paddle must be kept in constant motion until neutralization is completed. For white shoe leather tanning can be conveniently based on the scudded weight. For each 100 lb. of skins, make a pickle of 5 gal. of water, 3 lb. salt and 1½ lb. of sulphuric acid in a mill, put in the skins and run ½ hour, dissolve three pounds of bichromate of soda and 3 pounds of sulphate of alumina in 4 gallons of water and add 1½ pounds of sulphuric acid, run into mill without stopping the mill and run for three hours. Next dissolve twelve pounds of hyposulphite of soda in five gallons of water for each hundred pounds of skins and for each 12 pounds of hypo have one and three-quarter pounds of sulphuric acid ready and pour into the hypo, stirring gently with the acid container held close to the solution. Run three hours and let lay in the chrome liquor overnight.

In the morning if any trace of the yellow bichromate shows, complete the reduction with a little bisulphite of soda. When reduction is complete drain the drum, dissolve three pounds of barium chloride to each hundred pounds of skins in two gallons of water and add to the drum, run one-half hour, horse up to drain overnight. The skins are well set out on the machine and weighed for fatliquoring which should be done with sulphonated oil made from twenty degree neatsfoot oil. For each one hundred pounds of skins, 4 pounds of oil, one quart of egg yolk and 1 pound of French chalk are stirred into 10 gallons of warm water and when ready to use it is steamed up to 145° F. and for each 4 lb. of oil 1 ounce of ammonia is added to the fat-liquor solution. The skins are washed thoroughly with running water in the drum with plugs out or a slat door for three fourths of an hour and the washing should be ended with water at about 130° F. When the skins are washed, warmed up and drained, the drum is closed and started and the fat-liquor is run in and the drum run for twenty minutes. Drain the drum and horse up the skins and next day set out and sort out the heavy skins, for splitting. After splitting and drying the skins are damped back in sawdust and well staked out. The sawdust should not be quite wet enough to lump when squeezed in the hand and a belly staker with rubber roll and fibre blades should be used. After staking, the skins are tacked or toggled out and dried without heat overnight. In finishing pigskin those that have had a split of two ounces or over taken off will have the bristle holes opened up and are finished with a thin finish well rubbed in with a white plush pad and dried off with a dry pad and brush finished to keep the pores open for ventilation when made up into high-grade shoes.

Stock solutions of finish are made up as follows. One pound of casein per gallon of water is dissolved in water at 190° F. to which 5 ounces of ammonia has been added. Eight ounces of egg albumin per gallon of cold water is soaked up and 8 ounces of white shellac per gallon of water is boiled with the addition of three ounces of ammonia.

TANNING PIGSKIN STRIPS

Pigskin strips are used to quite an extent for a number of purposes. One of the principal uses is for insoles, other uses are razor strops, belts and novelties.

Strips are usually received in the salted condition, and because of their small size are tied into bundles. It is obvious that because of their size, they must be handled as economically as possible.

Liming

In a paddle of approximately 1,500 gallons capacity, place 3,000 pounds of the salted strips and wash them for one hour with a good stream of water. Then fill the paddle with water and add 200 pounds of hydrated lime. Mill for one hour and let rest for six hours, after which mill for another hour. The following day, add 100 pounds hydrated lime and mill the stock for ten minutes each hour through the day. Repeat the same operations on the third and fourth day. Leave in paddle two days longer, milling the stock intermittently, but add no more lime. On the seventh day drain the paddle and wash for one hour, then fill with water and add 15 pounds of caustic soda, mill one hour and wash thoroughly.

This beamhouse process does not entail scudding for it is assumed that the strips will be buffed after they are tanned. If it is desired to produce "full grain" strips, they must be removed from the paddle before the caustic treatment and scudded over the beam to remove all extraneous matter on both grain and flesh sides. The strips can also be removed from the paddle, placed into a drum and milled with 1 per cent of soda ash in a "short" liquor. In this manner a large amount of the extraneous matter is removed by friction in the drum.

Pickling

Fill the paddle with fresh water and throw in 1,000 lb. of common salt, and mill until all of the salt is dissolved. Then add 68 lb. of 66° sulphuric acid, mill for two hours, let stand overnight, and the next morning mill one hour longer.

Remove the strips from the paddle, place into box trucks and let drain for twenty-four hours.

Tanning

Prepare a paddle of 1,500 gallons capacity with 1,500 lb. liquid quebracho extract (35 per cent tannin) and 300 lb. of a good synthetic tanning agent. Place the stock into this liquor and mill intermittently each day until it is fully tanned. This should require about eight to ten days' time.

After the stock is tanned, remove it from the paddle wheel into box trucks and permit it to drain for twenty-four hours. The pack is then divided into three equal portions. Each portion is placed into a tan drum.

Fat-liquor

Wash the stock in the drum for ten minutes with water at 90° F., then drain the drum and add 75 gallons of water at 90° F. Through the funnel add:

Sulphonated Cod Oil	50 lb.
Colloidal Clay (in 50 gallons water at a temperature of 90° F.)	50 lb.

Mill the stock for thirty minutes, remove the drum to box trucks and let drain for twenty-four hours.

The strips are now hung up to dry in a cool dark room. Several days are required for the drying period. After the strips are dry, they are smooth plated at a low temperature after which they are buffed on the grain and flesh; first, with a coarse paper, then with a 280 paper. The strips are then again plated and sorted.

PIGSKIN TANNAGE FOR GLOVES

Whole skins are used for this purpose. Packs of 2,000 lb. are prepared. The skins are washed well in clear water at 65° F. until they are free from salt, then immediately placed into the limes.

Limes

The stock is best limed in paddle vats. Place into the vat 1,000 gal. water at 65° F., and 100 lb. hydrated lime; throw the stock into the vat and mill it for 30 minutes, then let it rest for one hour. Mill at hourly intervals for five minutes through the day. The second day, add another 100 lb. of hydrated lime and mill at two hour intervals for five minute periods. The stock is milled each day thereafter in the same manner until the fifth day at which time 5 lb. of caustic soda is added in the form of a solution. On the sixth day, the stock is removed from the lime and washed with water at 70° F. for one hour.

After washing, the stock is well scudded over the beam. Care must be exercised not to mar the grain. The flesh is also beamed by hand. After this operation, the stock is passed through water at 80° F., and immediately placed into the bate paddle.

Bate

The bate is prepared beforehand and is composed of 10 lb. of a strong pancreatic preparation containing approximately 85 per cent of ammonium sulfate. This is placed into 1,000 gal. of water and warmed to 85° F. The stock is bated according to the judgment of the tanner. After bating, it is washed with cold water (65° F.) for a half hour. It is now ready for pickling.

Pickle

From the bate paddle, the stock is transferred to the pickle paddle which is prepared as follows:

Water (70° F.)	1,000 gal.
Salt	500 lb.
Sulphuric Acid	30 lb.

Leave stock in the pickle for eight hours, paddling it at hourly intervals for 15 minute periods. Take out of paddles, and horse up and drain for 24 hours.

Tanning

Tanning is done in paddle vats which should be the same size as the lime vats. The tan liquor is prepared as follows:

New Paddle—

Water (70° F.)	1,000 gal.
Liquid Clarified Quebracho Extract	150 lb.
Synthetic Tanning Agent (Phenol-Formaldehyde Condensation Product)	30 lb.

The stock is placed into this liquor and milled intermittently during the day.

2nd Day—

While milling, add 150 lb. quebracho extract and 10 lb. synthetic tanning agent. Mill intermittently during the day.

3rd Day—

Repeat the operation of the second day.

4th Day—

Repeat the operation of the second day. The stock is then left in the tan until it is well tanned, milling intermittently each day. After it is tanned, the stock is removed from the paddle vat and horsed up to drain. It is then wrung and set out, after which it is oiled on the grain and flesh with a swab using the following mixture:

Sulphonated Cod Oil (Pure)	1 lb.
Sulphonated Neatsfoot Oil (Pure)	1 lb.
Water	1 lb.

The mixture is held at a temperature of 100° F. After oiling, the stock is piled down for an overnight period. It is then hung up to dry in a dark cool room and permitted to dry slowly. This will require about three days' time. The last day of the drying period, the temperature is raised to 105° F. After the stock is dry it is crusted for no less than five days.

Bleaching, Coloring and Fat-liquoring

The stock is sorted in the crust state into lots of 400 lb. and placed into the coloring drum with 150 gal. of water at 85° F., and milled for five minutes. Then add:

Borax (in 5 gal. of water) 20 oz.
Mill 10 minutes, then add:
Oxalic Acid (in 5 gal. of water) 20 oz.
Mill 10 minutes, then rinse with water at 85° F. for 10 minutes.

After the rinse, float the stock in 150 gal. water at 85° F., and add 8 oz. potassium titanium oxalate in 5 gal. water, mill fifteen minutes and rinse five minutes; then dye with the desired acid dye, followed with basic dye. (These dyes must be selected by the tanner as to source and shade.)

After coloring, the stock is rinsed and fat-liquored with 5 per cent of sulphonated neatsfoot oil, taken out of the drum, horsed up to drain overnight. The next day it is set out, shaved on the flesh or split if necessary.

The stock is then tacked, but not stretched, and permitted to dry slowly. After the stock is dry it is staked on machine, talced and arm staked.

Tanning Clothing and Glove Leather

The main features of a well dressed gloving leather are softness and run.

The crust leather is sorted for skins of fairly level substance, good grain quality and of intermediate "tightness." The sorted goods are damped, piled and shaved to a level substance, taking care not to break through the neck as weak leathers will not hold the stitches during manufacture.

The shaved goods are stripped in a drum using 2 per cent borax and 50 per cent water at 90° F. for one hour, thoroughly washed with cold water and chromed. The drum is run up with water, 10 per cent salt added, run for a few minutes and three portions each of 3 per cent of a suitable proprietary brand of chrome tanning salt are added at intervals of quarter of an hour. After the third portion the drum is run for a further three hours. The chrome is fixed by additions of about 1 per cent bicarbonate soda and the goods are horsed for a few days. When drained they are put back in a good float of water, washed for one hour and neutralized with 1 per cent bicarbonate soda. After further half hour washing the drum is run up at 120° F., 5 per cent sumac is added and run for one hour. The mordanted skins are run clear from liquor, warmed up to 140° F. with hot air or with the minimum of water, and fat-liquored for one hour by the addition of 12–18 per cent sulphonated oil. They are then hung to dry.

Up to 8 per cent of dye, depending upon the shade and quality of dyestuff, may be necessary to ensure a good penetration of color. The penetration is essential to avoid cut edges showing white in the finished glove. The dye is developed with formic acid and if necessary the color can be topped with basic dyes.

The skins are again hung to dry, allowed to mellow in a cool damp place, well staked by Slocomb machine, and pigment finished if necessary, in which case the color must be well fixed with a spray coat of formalin. For a final softening, the goods should be dry-drummed for two or three hours, restaked and finally plush-wheeled on the grain to produce a silky feel and a bright face.

The main point in dressing domestic sheepskins for semi-chrome clothing leather is to avoid prolonging any processing which tends to accentuate the natural looseness of the pelt.

The fellmongered skins are carefully washed and limed, avoiding excessive paddling, cobber, fleshed and delimed in the usual way. Puering should be of a light nature only and should be most carefully supervised as this process can cause the finished leather to be very loose and tender.

Tanning is carried out in a drum, entering the goods into an almost exhausted tan liquor and gradually increasing the strength by small additions of extract until the required amount has been added. Up to 90 per cent of a mixed extract such as quebracho-mimosa-myrabs, on the drained weight of goods, may be necessary to obtain penetration. After 75 per cent extract has been added it is an advantage to add 3 per cent sulphonated oil and after half an hour's drumming to leave the goods overnight. The following morning the tannage is completed, the goods are horsed for one day, struck out and hung to dry under natural drying conditions. It is essential in tanning to have a large float of water in a large slowly revolving drum which is run intermittently and not continuously.

The dried goods are lightly degreased by the petrol-benzine method, damped, shaved and lightly stripped with 2 per cent borax on the shaved weight. After a good but not too vigorous washing, the goods are retanned with 5 per cent sumac for one hour, 3 per cent basic chromium sulphate liquor is added and run for 1½ hours, after which a further 4 per cent is added. The goods are left in overnight, lightly fixed with 2 per cent borax, washed, neutralized and rewashed, mordanted with 2 per cent gambier and dyed, developing the color with formic acid and topping with basic dyes if necessary.

Four per cent sulphonated oil is used for fat-liquoring, after which the goods are hung, damped in sawdust, staked and strained. A light staking before finishing may be necessary, the goods being finished out with the spray gun, using a pigment finish which is well plasticized. A top clear lacquer either of cellulose or shellac, well plasticized, gives a finish which must be fast to wet and dry rubbing and stretch without cracking. "Face" can be produced by plush wheeling, brushing, or ironing.

Chrome Tanning Liquor

Sulphuric Acid, Concentrated	5 lb.
Potassium Bichromate	6 lb.
Glucose	7 lb.

In making the above chrome tanning solution the bichromate is placed in a vessel, preferably of stoneware or lead-lined, with 12 parts of water. The sulphuric acid is added gradually and with stirring. Because of the great heat produced, the bichromate is readily dissolved. Next, the glucose, dissolved in a small amount of the hot liquor is added very slowly. Much heat and gas is evolved because of the violent reaction which takes place.

SHARK LEATHER

The work of skinning the shark is generally done on a platform over the water such as a dock, or the deck of a boat. In taking off the hide, it is split along the back of the shark (not on the belly, as in the case with cow hides). It takes about 15 minutes to skin an average size shark, and about 10 minutes to flesh the hide, depending on the experience and skill of the skinners and fleshers. Wet salted hides as described below, are preferable.

The fins (which are valuable) should first be cut off with a sharp knife, in a curve, which will thereby leave little or no meat on the fins. Cut off the tail just above the root. The root is indicated by a small knob on the back of the shark. The hide on the tail has no value and is not taken in the length when the hides are measured.

Skinning

The knife is inserted in the holes made by removing the dorsal fins, and the hide is split in a straight line along the back. A sharp knife is required.

The actual flaying (skinning) is more easily done as follows: Turn the carcass on its belly again, and straddle same, facing in the direction of the head. Take the left side split of the section of the hide near the head, in the left hand, holding firmly while the right hand operates the skinning knife, (which should be very sharp), and the hide is then peeled (flayed) off by cutting away the carcass. Care should be used in operating the skinning knife, to avoid cuts into the hide. Do not be afraid to leave too much meat on the hide. This surplus meat can be removed by fleshing. If skinning is done too close, flesh cuts may result, which reduces the value of the hide.

After the left side is skinned, turn around facing the tail end, and skin (flay) the other side in same manner as before. The left hand should always keep the hide pulled tight while skinning. Leaving the hide slack will cause it to wrinkle, and cuts into the hide can then hardly be avoided.

After the hide is taken off the carcass, wash same thoroughly in sea water, removing all the blood and slime. Then put the hide in a barrel containing brine water, which facilitates fleshing. Use about 7½ lb. of salt to 25 gal. of sea water to make the brine water solution. An ordinary size barrel holds about 50 gal. Only put about 25 gal. of brine water solution in the barrel so that it will not run over when 15 or 20 hides are put in.

Fleshing

The hide can be fleshed better, and more quickly, if it is kept in a brine solution 3 or 4 hours or overnight, but it is not absolutely necessary to do this. It can be fleshed immediately after it is taken off the carcass. It must *not* be kept in the brine solution longer than overnight. The fleshing is done with a beaming knife on a beaming board. The beaming knife is a large curved knife with a handle on each end. The beaming board should be about 5 feet long and 3½ feet wide, and rounded to correspond to the curve of the beaming knife. One end rests on the floor, while the other end has a support, which keeps it to the height of a man's waist. The flesher leans against the raised end of the board, with the end of the hide in between, and removes the surplus flesh by pushing the knife away from him. The surface of the beaming board should be smooth and clean of meat particles, so that the hide will lay flat on the board, with the flesh side up.

While the hide is still on the beaming board, trim off the meat which may hang over after fleshing, especially around the fin holes. Then split the tail end by cutting from the hole made by the ventral fin, towards the tail end, passing through the hole left by the anal fin, and then in a straight line to the end of the hide. The tail end can be split before fleshing, if preferred.

Curing

Immediately after fleshing and trimming, the hides must be washed thoroughly in sea water, and salted for curing. No blood or slime should remain on the hides. The curing is done on a floor or platform, which has a slight incline, so that the water and brine can run off. Sprinkle some salt on the inclined platform, and then lay one hide out flat, flesh side up, and spread a generous amount of salt on the hide, over the entire surface. On top of this hide put the next one, flesh side up, and salt in the same manner, and so on, building up a pile about 3 or 4 feet high.

Packing and Shipping

After four or five days, the hides are cured. Do not let the hides remain in the pile any longer than six days. Shake off whatever salt remains on the hide, and put on a new supply of clean salt on the flesh side, then fold the hide so as to make a flat square bundle of each hide, with the flesh side in, so the salt does not fall out. The flat bundle can then be rolled into a round *bundle*, and tied with a string.

The kind of packing used depends upon the requirements of the steamship company. The *bundles* of hides can be packed in burlap or sisal bags. Some steamship companies require that they be packed in cases or barrels. Any kind of case or barrel will do. Slack (sugar or flour) barrels are preferred.

If watertight barrels are used, the bung must be left open, so that fresh air can reach the hides. Do *not* ship the hides in brine water. A barrel will hold about 25 average size shark hides.

CAUTION: Keep the shark as well as the hides, sheltered from the hot sun and the rain. Do not use fresh water. Sun-dried hides are not desirable. Hides burnt by the sun are of no value.

SALT: Mineral salt is preferable to sea water salt. Medium grain fishery salt gives the best results. It should not be too coarse. The surplus *clean* salt may be used over again.

Chrome Tanning of Sheepskins

Formula No. 1

For 800 lb. pickled sheepskins, the following quantities are used:

Temperature, 110° F.

Water	50 gal.
Salt	50 lb.
Hydrochloric Acid	1 gal.

The goods should be drummed in this liquor for 30 minutes. At the end of that time, 58 lb. of bichromate of soda dissolved in a small quantity of warm water, is added, together with 2¼ gal. of hydrochloric acid, and the temperature lowered to 94° F.

When yellow and thoroughly impregnated with chrome, which usually takes about two hours, the goods are horsed up for three hours, so as to fix the chrome. They are then thrown into a paddle wheel containing 110 lb. of "hypo" and 1 gal. of hydrochloric acid. After the wheel has been running 15 minutes, 4 gal. of hydrochloric acid diluted with 5 buckets of water, is run on slowly. At the end of one hour, 50 lb. "hypo" and 2 gal. hydrochloric acid, diluted with 5 buckets of cold water, are added, and at the end of a further hour, 20 lb. "hypo" and ½ gal. acid, suitably diluted, added and allowed to work for two hours, then the goods drained and washed in cold water for 3½ hours (running water). They are always drummed in warm water, 100° F., for 20 minutes before dyeing next morning.

No. 2

Per 100 lb. Pelt:

Salt	10 lb.
Sulphuric Acid	1 lb.
Water	10 gal.

To this pickle is added (after one or two hours' running) a solution of 3 lb. bichromate, dissolved in a small quantity of water. Drumming is continued for two hours, or until evenly chromed. A solution of 15 lb. "hypo" in 10 gal. of water is now added to the drum and 5 lb. dissolved hydrochloric acid gradually run in, in small portions. There is really no need to neutralize the leather, but it must be thoroughly washed in running cold water. If goods are to be fat-liquored, then neutralization is advised. Fat-liquoring should be carried out with olive oil and olive oil soap emulsions.

No. 3

Salt	36	lb.
Sodium Dichromate	33	lb.
Water	36	gal.
Hydrochloric Acid	2½	gal.
Sodium Thiosulphate	68	lb.
Hydrochloric Acid	5	gal

This is sufficient to tan 600 lb. pickled pelt.

Chrome Tan for Goat Skins

For each 100 lb. of pickled skins to be tanned, use bichromate of soda, 6 lb. muriatic acid, 3 lb. salt, 15 gal. of water. The liquor is prepared by adding the salt to the water, next the bichromate of soda, dissolved in hot water, and the acid is then slowly stirred in. A drum is used and, the skins having been thrown in, it is set in motion. The prepared liquor is poured into the drum through the hollow axle and the skins are turned for from one to two hours. They are then taken out of the drum and placed smoothly over horses to allow for draining and for the chrome to become fixed in the fibers. The process is completed the next morning. The skins are dipped, one at a time, into a 10 per cent solution of bisulphite of soda, and then thrown into a drum.

The second bath consists of hyposulphite of soda, 12 lb.; muriatic acid, 6 lb.; salt, 3 lb.; water, 15 gal. The "hypo" dissolved in boiling water is added to the water in a tub. The salt and acid are then added, and the skins are drummed in the liquor for 1½ hours, or until they have assumed a light blue color throughout. This completes the tanning. The leather is again placed over horses to press and drain from 12 to 24 hours before it is washed and neutralized.

Glace Kid Tanning

Per 100 lb. Pickled Skins:

Hydrochloric Acid	5	lb.
Sodium Bichromate	7	lb.
Sodium Acetate	1½	lb.
Water	15	gal.

The second, or reduction bath:

Hydrochloric Acid	6	lb.
Hyposulphite of Soda	12	lb.
Water	15	gal.

The skins should be horsed up for 12 hours after chroming and then struck out, horsed up for a further two hours and then reduced. It is preferable to give the skins a brief run in the "hypo" before adding the diluted acid. Chroming should be carried out in a drum and reduction in a paddle. There is no need to neutralize the goods after reduction, provided they are given a thorough washing for three to four hours in running water, cold, and finishing off in 100° F. for three-quarters of an hour. Some tanners find that neutralization, even with the weakest alkalies, has a harsh effect on the grain, and is therefore best omitted.

Preparing Sheepskins for Export

To ensure a complete and thorough pickling of sheepskins for export, the two solution method should be used.

The delimed sheepskins are run in a paddle of water and sufficient sulphuric acid and salt to give a concentration of 1 per cent and 7 per cent respectively in the paddle, are dissolved and added to the paddle as quickly as possible. The goods are allowed to run in this "rising" solution for one hour. A "falling" saturated salt solution is made up in another paddle and the goods are transferred from the "rising" to the "falling" solution. After a further hour the sheepskins are drained ready for packing.

The most important points in the process are uniformity of the finished pelt and supervision of the "rising" solution—attention to the latter usually resulting in the former. As the delimed skins may vary from pack to pack in their times of draining, it is an advantage to work by truckload rather than by weight, a certain number of truck loads to each paddle. It is very important when putting the skins into the "rising" solution to add them all at once and very quickly, as the first skins absorb acid immediately, and the pack does not level up during the process.

If it is desired to use the "rising" solution more than once by strengthening, it is important to check the acid and salt content of the spent liquor. Salt content can be ascertained simply with the hydrometer which can also be used to check the strength of a "falling" solution. Acid content can be checked by a simple titration against a standard alkali solution. When the amounts of salt and acid required have been calculated, they should be dissolved and added to the paddle in which the next pack of skins have been placed. The solution should be added as quickly as possible so that no one section of the pack may absorb more acid than another. No "rising" solution should be used more than six times due to the collection of buffer salts.

The drained, shaved goods are weighed and put into a drum, run up with a good float of water at 50° C. and well washed for half an hour. This water is then drained off and a fresh bath is run up for a further half hour's washing. After emptying, the goods are given several turns in the drum with a lattice door fitted and with water running in, the drum is finally run up with water at 40° C. and 1½ per cent sodium bicarbonate is added in two portions with a quarter of an hour interval. After three quarters of an hour the goods should be tested on the cut surface with litmus paper. Complete neutralization is not required, a thin streak in the center remaining very slightly acid. Two very thorough washings as previous are performed before the goods are ready for dyeing.

The two most important points in the process are very thorough washing and care not to over neutralize or to make the neutralizing bath too alkaline.

Box-calf in particular is liable to throw out a salt spue if the washing before and after neutralizing is insufficient. After shaving, the calf skins contain a high percentage of soluble salts which must be removed to prevent spue. More salts are introduced during the neutralizing and these again must be removed.

One of the sales features of chrome calf for shoe uppers is the fine silky grain. This grain is produced by adjusting the basicity during chrome tanning so that the goods will not quite stand the boil test. If then during neutralizing, excessive strength of alkali is used, this object is defeated and the grain surface becomes rubbery, losing all its smooth silky properties and becoming very harsh to the handle.

A further point in the amount of neutralizing, is that if a streak in the center is left incompletely neutralized it will, during fat-liquor, tend to split the emulsion, before it reaches the center, so leaving a central layer which is somewhat firmer, thus producing an upper leather which is firm and not "raggy" yet soft and silky on the grain.

Roller Leather from Sheepskins

Slack 2 gal. of lime in 6 gal. of water for each 100 skins of average size. After putting the lime into water in a vat, put the skins in and allow them to remain for one day, then remove them and add 1 gal. of lime slacked with 5 gal. of water. Put the skins back again for another day. Repeat this operation once more, only leave the skins in the lime water for two days. Next delime the skins with lactic acid. For each 100 skins use 2 lb. of acid and 2 lb. of salt. Be sure that the salt is of good quality. The water for the acid and salt should have a temperature of at least 80° F., otherwise more salt might be required. All of the salt and 1 lb. of acid are added to the water before the skins are put into it. Add the other pound of acid after the skins have been in the solution 15 minutes. Use 22 degree light color lactic acid. Allow the skins to remain 30 minutes longer. The solution may be used several times, but with each new lot of skins add 1½ lbs. of lactic acid, dividing the same into two lots, one half when the skins are first put in and the other half after 15 minutes. Lactic acid can be used alone without salt, if plump skins are required. Next rinse the skins in warm water. Watch the grain of the skins and see that it is perfectly smooth.

Then apply your first tan liquor for 3 weeks. Next press with a hydraulic press and sprinkle with sawdust to remove the grease. The skins are then separated and paddled in a very weak liquor and drummed in salt water until all press-creases are eliminated.

Skins tanned by the suspension process give smoother grain than when paddle or vat is used.

After the preliminary tanning, the skins are hung up and dried. The longer they are dried the better they are when finally finished. Next, the skins are dampened and shaved. After shaving, better roller skins are produced by a drumming in a weak sumac solution before they go back to receive the second and stronger tan liquor for 2 to 3 weeks. Some tanners who are not particular about the color of their skins eliminate this sumac drumming.

The next step is to rinse the skins in water and drain them. Then strike out on the flesh side and tack on boards to dry. Remove from boards when dry, and soften, trim, season, dry, roll, perch, reseason, glaze and trim. Milk and albumen can be used for seasoning. After trimming examine the skins for remaining hairs, then iron and sort.

Tanning Snake Skins

The skins of the snakes that an outdoorsman comes across either intentionally or accidentally can be used for many purposes when they have been properly tanned.

To start, cover the fresh skin with dry salt and let lie for two days. Then soak until soft, and flesh the hide, removing any bits of meat or fat. If you want the skin as a trophy, leave the scales on. To help tighten the scales, prepare a solution consisting of one part water, one part glycerin and one-quarter part thin carpenter's glue. Soak the skin in this for 10 minutes. Hang up to drain for the same length of time. Then wipe dry with a cloth.

If you expect to make a sort of leather to fashion into various articles, remove the scales.

Two formulas for tanning are recommended for amateurs. One is the standard sulphuric-acid pickle. It is mixed in the proportions of 1 qt. of salt and 1 oz. of sulphuric acid to 1 gal. of water. The acid must be commercial strength. If only the concentrated form can be had from the druggist, use only ½ oz. Leave the skins in this pickle for seven days.

The second formula is made in the proportions of 1 pt. of salt and 2 oz. of oxalic acid to 1 gal. of water. The time required is 12 hours. Stir the skins and turn frequently.

When they are removed from either of these acid solutions, rinse them well in clear water and put into a soda bath to neutralize any remaining acid. Mix one cup of washing or sal soda with 2 gal. of soft water and soak the skins in it for 4 hours. Rinse again, press flat with the scale side out, dry partially between layers of paper with a weight on top to prevent curling.

When skins are nearly dry, soften them by drawing lengthwise across the edge of a ½-inch board. Do this until skin is perfectly dry. Dampen again and repeat, working until the skin dries soft. Then burnish the scale side by pressing it with a smooth iron. A flatiron is good but it must be cool. As the last step, polish with white shellac and alcohol.

Picker Strap Leather

Buffalo or steer hide is best suited. Hides are soaked two days, if necessary with addition of sulphide or alkali. A paste made up of 80 kg. slaked lime, 20 kg. sodium sulphide, 2 kg. arsenic, 2 kg. salt to 1 cubic meter of water is applied and hides piled overnight. Hides intended for leather of high tensile strength should never be permitted to swell in the lime, hence the addition of salt to the lime paste. After unhairing, which may be made in the wash drum, the hides are hung in water for 12 hours at a temperature of 25–28° C., and then delimed as for ordinary hides either in paddle or drum. If a drum is used it should be slowly rotating, a pounding of the hide, whether in deliming or tanning must be avoided. Hides are pickled 30 minutes in a drum using 400 per cent water, 10 per cent salt, 1 per cent hydrochloric acid following which 3 per cent alum is added and the drum run an additional 30 minutes. One half of the pickle liquor is run away and the following chrome liquor slowly added: 200 l. water, 20 kg. chrome alum, 2.1 kg. sodium carbonate. The drum is run for 4 hours, during which time the liquor is neutralized in the customary manner. Hides are hung to drain the following morning and receive an after tannage consisting of 2 per cent potassium dichromate in 400 per cent water. After running 15 minutes 5 per cent hypo and 1.6 per cent hydrochloric acid are added and run for 45 minutes. After having been horsed up for 2 days the leather is neutralized with borax and fat-liquored in 200 per cent water, 1.5 per cent soap, 0.5 per cent water soluble oil and 0.15 per cent borax at a temperature of 65° C. This preliminary oiling helps the uniform take-up of the stuffing mixture which is applied after one day's storage.

Skirting Leather Tan

For a light colored leather a liquor can be made of alum, salt and sumac extract. To 100 gal. water, add 60 lb. alum, 35 lb. salt and 25 lb. liquid sumac extract. These ingredients should be thoroughly dissolved in the solution. Then mix 40 gal. of this solution in 500 gal. of water for making up a vat of liquor. Ten to twenty days will be consumed for tanning according to thickness of stock. Handle often during this time and add 7 to 10 gal. of the liquor for each handling. Wash and drain the leather after tanning and then fat-liquor with a high grade product. Then dry the stock, emery the flesh and double stake.

Patent Leather

It is desirable to have certain qualities in leather that is to be finished for patent. Among these are strength, fullness of feel, lack of unnecessary stretch and a tight break. In order to obtain some of these qualities it is necessary to choose carefully the right raw material. This will largely determine the grade of the finished leather.

Soaking can be done in the usual manner. The stock should then be fleshed. For tight leather it is necessary to use the sulphiding method for unhairing, that is, from 5% to 7% of crystal sodium sulphide on the hide house weight of the stock. Five thousand pounds of stock are placed in a paddle wheel with 3500 to 4000 gallons of water for a period of twelve to fourteen hours. The sulphide is then run off and fresh lime placed into the paddle, using 7% of lime. The paddle is run several times daily and after four days the stock is removed, unhaired and piled up overnight. The next day it is split and washed, bated and pickled. General practice of sulphiding indicates that looseness is nearly entirely overcome by its application and that liming is conducive to a loose grain and coarse break. Tanning can be carried out by the regular one bath process. Coloring can best be done without the use of wood dyes. A good direct black is best for this purpose. Wood dyes such as logwood, tend to a harsh grain.

Fat-liquoring depends upon whether the leather will be degreased later. For leather that is not to be degreased, a fat-liquor of 1% of a good grade of sulphonated neatsfoot will suffice. For leather that is to be degreased, an emulsion of neatsfoot oil, soap and cod oil to the extent of 7% on the weight of the stock, should be used. Whether stock is degreased or not it should lie in crust for at least ten days. This is one of the most important stages in the making of patent leather. Sammying should be very carefully watched. An even and uniform distribution of moisture is essential. This stage should require forty-eight hours before the stock is tacked. After tacking, it is well to rest the stock again for three or four days. Afer the leather is degreased, it should be finished as soon as possible as it has a tendency to become pipey if permitted to remain long in this condition.

Usually three coats of finish are applied to patent leather. Each is made differently. Two types of oil only are used.

The boiling of oil is best done in a

hooded kettle after the addition of 50 to 60 oz. of Turkey raw umber to each 50 gallons of oil. The temperature is slowly raised to 550° F., held there for ten minutes, cooled off to a temperature of 530° F. and again slowly raised to 550° F. This is repeated four times. It is then held at the high temperature until finished. This requires about two hours. During the heating period, the oil is continually stirred with a regulation ladle. The formation of leaf-like "slabs" on the mouth of the inverted ladle is an indication of the consistency. When the leaves persist it is necessary to use the fork and remove the kettle from the fire. When the sweetmeats form across the prongs of the fork, the kettle should be cooled as rapidly as possible. When a temperature of 400° F. is reached, it should be reduced immediately with varnish makers' naphtha. The naphtha must be well assimilated by the sweetmeats by continual "puddling." This is important for if the sweetmeats is not all broken up and solubleized at this stage it will be impossible to do anything with it later.

The sweetmeats is aged for at least one week before it is used. It is then further thinned with naphtha and the necessary coloring matter added. Application of this finish is either with a slicker or with a swab and palmed. The finish should dry overnight in a well ventilated room which must be kept at a uniform temperature of 105° F.

This finish as well as the final varnish coat comes from the same oil. This oil is also made from a selected North American seed. The seed should be of a better selection than that previously mentioned for the sweetmeats and they must be absolutely free from all foreign matters as well as other seed. It is pressed warm and then steamed to a high temperature after which it is filtered with fuller's earth, tanked and allowed to age for at least six weeks.

For each gallon of oil 3 oz. of Turkey umber and ½ oz. of leather is added. This is boiled in quantities of fifty gallons in the same kind of kettle that has been mentioned. The oil is rapidly brought to a temperature of 650° F. and held there for from three to four hours, with continual ladling. When strings of the boiled oil are observed forming on the inverted ladle, it is ready to be removed from the fire. Stirring continues until leaves form on the ladle. The kettle is then cooled as rapidly as possible to 300° F. when fifty gallons of naphtha are added to the contents of the kettle. Constant stirring is necessary. The finish is placed into storage tanks and permitted to age three weeks before use. For the application it is thinned to a working consistency with naphtha and applied with a flat camel hair brush. This second coat is dried in oven at a temperature of 140° F. for at least 18 hours. After the finish is thoroughly dried the surface of the leather is pumiced in order to remove all specks of dirt or foreign matter. The stock is now ready for the last or varnish coat.

Varnish

This finish probably receives more attention than other finishes for it is considered the most important of the three, as it must withstand more abuse than the finishes it covers. Its manufacture is especially guarded for this reason. It is made from the same oil as that for the second coat and for each fifty gallons 500 oz. of Prussian blue and 25 oz. of litharge is added. It is then heated as rapidly as possible to 550° F. with continuous ladling. When this temperature is reached it requires very careful handling to obtain the proper result. Over a period of 3½ hours the heating of the oil is interrupted every ten minutes. It is permitted to cool 15° and then the temperature is again brought up to 550° F. for ten minutes. This is continued until the oil shows a decided thickening and has the consistency of fresh honey when cool. Here it should be mentioned that all boilings must be checked with a sample off the finish from a previous boiling, especially one that has been proved to be of the proper consistency. After the varnish is at the right consistency it should be cooled to 350° F. and one gallon of naphtha is added to each gallon of oil. This finish must be aged at least six weeks before it is used and it should be well protected from dust and other dirt. After thinning to a working consistency it is applied with a flat brush. The leather is then placed in an oven to dry at a temperature of 150° F. for 18 hours. The leather is sunned for at least five hours after which it is removed from the frames and trimmed.

Wambat Sheep Leather

Cut 300 green salted shearlings into a 9 x 9 x 5½ foot paddle wheel; soak in fresh 70° F. water, about 3 o'clock in the afternoon and run about one-half hour, stop one-half hour and then run another half hour. Drain the dirty water and fill the paddle wheel with fresh cold water, run 15 minutes and then rest until the following day.

The next day, haul the skins from the paddle wheel on to a platform to drain. In the meantime, fill the wash drum within 12 inches of the gudgeon with 90° F. warm water and add 2 pails of soda ash and 2 pails of shredded soap, which has been previously boiled up in one-half barrel of water. Also add 6 gal. of V.M.P. naphtha to the wheel. Throw in 100 drained pelts at a time and run 30 minutes, haul out and deliver to the fleshing machine. Flesh four ways if necessary.

After fleshing, wash the skins again and run in the degreasing solution for 30 minutes. Then wash with slat or open door in 75° F. warm water for 10 or 15 minutes to remove all traces of soap. Pile on the platform for one hour to drain, then throw the 300 skins into the pickling paddle in cold water, and add enough salt to show 20° on the salometer. Add 1 gal. of 66° Bé. sulphuric acid and run 1½ hours and leave in the pickle overnight.

On the third day, haul, pile on platforms for about one hour and then put the skins into the tanning paddle, which has previously been made up of

Salt	600 lb.
Sulphate of Alum (Ground)	300 lb.
Sal Ammoniac	60 lb.

Steam the tanning vat up to 80° F., put in the skins and run one hour, stop an hour, then run 10 minutes every hour during the rest of the day. The second day in the tan, run 10 minutes every hour. On the morning of the next day, haul them out and throw on horses to drain. It is advisable to dye only 150 skins at a time in a paddle just large enough to accommodate that amount. The dye bath is made before entering the skins. To every gallon of dye solution the vat contains, add

Acetate of Lead	40 g.
Hyposulphite of Soda	20 g.
Sulphuric Acid	5 cc.

15 g. hydrosulphite powder. Before adding this, steam the water to 90° F. and keep running while adding the material. After the hydrosulphite is in, run about 5 minutes, then put in the skins, run for 2 hours, haul out, drain on platform or horses. Then, put skins through hydro extractor to remove as much water as possible. When extracted, open skins up and pile 20 to 30 skins flesh side up on the table to receive a retanning solution, which is made up of

Salt	120 g.
Alum	60 g.

per one gallon of water. Swab the retanning solution evenly over the entire skin, fold together to retain solution, let stand 24 hours and then fat-liquor by hand.

Fifty gallons of fat-liquor is made up as follows:

Fig Soap	12 lb.
Moellon	25 lb.
Sulphonated Cod Oil	25 lb.
Soda Ash	4 lb.

in 30 gal. water

Boil together for 1½ hours, let stand until following day, then fill barrel up to 50 gal. Put 20 to 30 skins on table and apply a liberal coat of the fat-liquor on the flesh side, fold together and rest 24 hours. Then hang up to dry in a room of moderate temperature.

When dry, put 100 skins in drum, add 6 pails sawdust; which has been moistened with a 3 to 3½ pails of hot water. Run skins in this for 2 hours, haul out and pile on floor, covering up with bags to retain the heat, so the skins will sweat.

The next day, stake twice all around and hang up to dry. Then put in the mill for cleaning. Put 100 skins in the drum and add 8 pails dry, hardwood sawdust and 4 pails fine dry sand and run for 2 hours. Haul out, stake once more all around, and buff the flesh side clean. Now give the skins a soap solution on the flesh side, consisting of 7½ lb. white shredded soap in 50 gal. water. Apply to flesh side luke warm, fold skins in to avoid solution from running out and pile in vat to sammy for 24 hours. Tack and dry. When dry, brush the skins four ways, clean in the revolving wheel to remove all sawdust and sand. Then shear and bleach.

The bleaching solution consists of

Oxalic Acid	150 g.
Hydrogen Peroxide (100%)	1 qt.

to 6 gal. water. Sprinkle cans with this bleach as evenly as possible. Let set for 10 minutes then spray with bleach under 80 lb. pressure. Hold air gun at least 3 ft. from skin. Immediately hang up to dry. When dry proceed to measure.

Leather Oil

Formula No. 1

a.	Spindle Oil, Refined	45 kg.
	Crude Rubber, Flake, Pink	2 kg.
b.	Coumarone Resin, Viscous	1 kg.
	Woolfat, Neutral	10 kg.
	Train Oil, Clear	42 kg.

No. 2

Stearin Pitch, Soft	10 kg.
Wood Tar	10 kg.
Aluminum Stearate	1 kg.
Train Oil, Dark	81 kg.

Spindle Oil, Distilled	40 kg.
Turpentine	8 kg.

Leather Stuffing

Train Oil or Woolfat or Lanolin	Fatty Acids	20 g.
Mineral Oil, 0.880–0.885		75 g.
Lime Hydrate		3 g.
Caustic Soda (40° Bé.)		1 g.

Dissolve the fatty acid in half of the mineral oil by heating to 80° C., and stir in the lime hydrate (diluted with 4 times the amount of water), to saponify. Add the remainder of the (heated) mineral oil, and stir thoroughly. Add the caustic soda and stir until cooled.

Run through homogenizer to give the fat a high lustre.

Loading for Leather Bellies

Corn Sugar	5%
Epsom Salts	3%
Cod Oil	2%
Mineral Oil	2%

This % is figured on weight of leather.

Hard Leather for Top Lifts

An extremely hard leather can be made by laying the tanned stock away in a strong hemlock liquor of at least 60 degrees barkometer strength for 30 days. A stronger liquor can be used if a board-like lather is desired. The temperature of the liquor should be kept at 80° F. or slightly higher. The acidity should be at least ½%. Add lactic acid if necessary to keep this percentage up.

These hemlock liquors can be used over again several times by adding a further quantity of tannin. They do not sap down much owing to the fact that the leather is in a tanned condition when treated in them.

Soaking Sun Dried Hides and Skins

Sun-dried hides can be soaked efficiently in any of the following solutions for 3 days.

Formula No. 1

Sodium Chloride Solution	5%

No. 2

Sodium Nitrate Solution	2%

No. 3

Sodium Bisulphite Solution (at pH 1.5)	1%

Sun-dried goatskins require 3 days immersion in

Sodium Chloride Solution	10 %
Sodium Citrate Solution	0.13%
Potassium Chlorate Solution	1 %
Sodium Nitrate Solution	1 %
Soda Ash Solution	0.5 %

SOLE LEATHER STUFFING AND DRYING

First Stuffing

Two thousand pounds of stock after pressing is placed into the drum, which is then steamed while the drum is in motion. A uniform temperature of 120° F. should be maintained. The following materials should be prepared beforehand and added to the drum while it is in motion:

Epsom Salts	20 lb.
Quebracho Extract (Highly Sulphited)	25 lb.
Dry Sulphite Cellulose Compound	25 lb.
Clay	25 lb.

The above are well mixed, heated to 140° F. before placing into the drum, then milled for 30 minutes, after which add:

Sugar, Melted	40 lb.

Mill 10 minutes and add:

Raw Cod Oil	15 lb.
Mineral Oil	15 lb.
Sulphonated Cod Oil	7½ lb.

The oils are first mixed and heated to 140° F., then milled for 15 minutes.

The stock is then taken out of the drum and transferred to the dry loft.

Dry Dip

After the stock has dried thoroughly it is "dry dipped." For this purpose a deep fat equipped with a basket or rack should be available. The stock is so fixed in the basket as to prevent it from floating on the surface. All metal parts should be of brass or bronze to prevent staining. The vat should be large enough to accommodate no less than 60 sides or crops. The dry dip liquor is made as follows:

Liquid Quebracho Extract (Highly Sulphited)	60%
Sulphite Cellulose Extract	35%
Synthetic Tanning Material	5%

A liquor having barkometer of 40 degrees is made of the above mixture. The pH should be adjusted to 3.0.

The liquor is heated to 125° F., the dry stock is then dipped into it and held there for 20 minutes, after which it is removed from the vat and allowed to drain. In the meantime, the second oil wheel is prepared.

Second Stuffing

The amount of stock for the second oil wheel should be equal to that of the first stuffing. The drum is heated to 120° F. The stock, after draining out of the dry dip, is immediately placed into the drum, then is added:

Epsom Salts	15 lb.

Mill 10 minutes, then add:

Sugar (Melted)	30 lb.

Mill 20 minutes, then add:

Raw Cod Oil	10 lb.
Mineral Oil	10 lb.
Sulphonated Cod Oil	2 lb.
Clay	10 lb.

Mix and heat to 130° F., and mill 20 minutes.

Take out of drum and hang in dry loft to dry.

Drying Sole Leather

Considerable experimental work on drying vegetable tanned leather, especially sole, has been done. It is evident that this stage cannot be hurried as in the drying of chrome tanned leather. Various types of tunnels have been erected, especially for the first drying. After many trials it was found that tunnel drying was not as satisfactory as loft drying.

Loft drying requires control, particularly as to change of air in the room. This should not be attempted by opening and closing windows at random, but by the application of exhaust fans at the proper time.

It is important that the loft be totally dark and that the stock dry very slowly. The first two days no change of air should be attempted. This requires that rooms be so constructed as to accommodate no more than one day's production. (From either the first oil wheel or the second oil wheel, i.e., both should have separate handling.) After the second day a change of air is in order, and, depending upon the appearance and condition of the stock after that time, air should be changed each following day until the last day, which should be the fifth or sixth, the temperature should be raised to 100° F. for the last 24 hours. This, however, should not be attempted if the stock shows wet areas either on the grain or on the flesh side.

The first drying should be to a point where no more than 5% of moisture is left in the leather. The stock should not be taken out of the dry room until it can be immediately sent to the dry dip, i.e., it should not be removed from the hooks before that operation and be permitted to adsorb moisture.

The second drying is done in approximately the same manner, excepting that after the stock is dry it is permitted to "crust" for 5 to 10 days before it is finished.

It is understood that all stock is hung up to dry by attaching to hooks at the head and tail, even though space may be saved by hanging the first oiled stock over sticks, the possibility of "stick marks" is thereby eliminated.

Shoe-Bottom Filler or Stiffener
U. S. Patent 2,052,579

A mixture of comminuted cork 47 and cottonseed oil pitch 53% is calendered, a fabric backing strip is applied to the mixture, the laminated material is allowed to set, and is coated with a plasticizer formed of water 60, a vegetable gum such as gum arabic 30 and glycerol 10%.

Shoe Tip Stiffener

Film Waste, Washed and Dried	22 lb.
Lacquer Solvent	25 lb.
Benzene	25 lb.
Alcohol	28 lb.

Sole Filler and Cement

Rosin	57 lb.
Spindle Oil	15 lb.
Cork, Shredded, According to Grain Size	28–35 lb.

The mass is melted up and mixed thoroughly, then poured thinly on a stone floor. When cold, it is broken up, and can be molded into cubes by pounding it into molds (boxes lined with sheet metal).

To be used hot.

Hardener for Shoe Soles
Formula No. 1

a. Gutta Percha	10 kg.
Benzine	100 kg.
b. Linseed Oil, Boiled	100 kg.

Make solution *a*, add *b*. Apply on a dry surface only.

No. 2

a. Asphalt	60 kg.
Ceresin	40 kg.
Train Oil	200 kg.
Linseed Oil	700 kg.
b. Rubber, 10% in Benzene	30 kg.

Dissolve *a* hot. Cool. Add *b*. Mix.

No. 3

Rosin	350 kg.
Linseed Oil	150 kg.
Turpentine Oil	500 kg.

No. 4

Sodium Silicate	400 g.
Linseed Oil	600 g.

Mix the two liquids together with vigorous shaking. Apply with sponge or brush.

No. 5

Linseed Oil Varnish	70 kg.
Train Oil	10 kg.

Copal Lacquer	12 kg.
Birch Oil	8 kg.

No. 6

Linseed Oil Varnish	1 kg.
Rosin	3 kg.
Benzine	1 kg.
Benzol	1 kg.
Turpentine Oil	2 kg.

No. 7

Tallow	500 g.
Beeswax	500 g.
Rosin	30 g.
Linseed Oil	15 g.

Apply hot.

No. 8

Castor Oil	4 lb.
Tallow	2 lb.
Crude Rubber	1 lb.

Melt together at 125° C. Apply hot.

No. 9

a.	Linseed Oil	100 g.
	Manganese Borate	1.5 g.
	Alum, Calcined	0.5 g.
b.	Shellac	1000 g.
	Sandarac	250 g.
	Mastic	60 g.
	Camphor	15 g.
	Venetian Turpentine	200 g.
	Alcohol	4 l.

Apply the drying oil *a*, dry on the open air. Impregnate on top of this with *b*. Let dry on the air.

No. 10

Beeswax	12.5 g.
Turpentine	12.5 g.
Castor Oil	12.5 g.
Wood Tar	3.25 g.
Linseed Oil	125 g.

Heat up the mixture to get a homogeneous oil.

Apply hot on dry soles.

No. 11

Aluminum Stearate in Naphtha Solution.

No. 12

British Patent 433,207

Sodium Silicate	7 lb.
Iron Oxide	1 lb.
Soap	1 lb.
Carnauba Wax	7 lb.
Gum Arabic	1 lb.
Sodium Carbonate	1 lb.

Yields a plastic mass which is applied between outer and inner soles.

Artificial Leather Coatings

Formula No. 1

Pyroxylin Solution (22 oz.)	70.1 oz.
Ethyl Acetate	17.2 oz.
Alcohol	7.1 oz.
Dibutyl Phthalate	2.7 oz.
Nigrosin Solution	3.6 oz.

No. 2

Pyroxylin Solution (22 oz.)	33 oz.
Ethyl Acetate	22½ oz.
Toluol	22½ oz.
Bone Black	11 oz.
Castor Oil	11 oz.

Artificial Leather Daubs

Formula No. 1

Pyroxylin Solution (22 oz.)	200 oz.
Castor Oil AA	10 oz.
Pigment } Ground	20 oz
Castor Oil } Together	20 oz

No. 2

Pyroxylin Solution (22 oz.)	59.2 oz.
Ethyl Acetate	5.8 oz.
Castor Oil AA	15.0 oz.
Bronze Powder	20.0 oz.

No. 3

Pyroxylin Solution (22 oz.)	200 oz.
Castor Oil AA	100 oz.
Bronze Powder	400 oz.
Ethyl Acetate	200 oz.
Toluol	100 oz.

No. 4

Pyroxylin Solution (22 oz.)	200 oz.
Castor Oil AA	25 oz.
Pigment } Ground	30 oz.
Castor Oil } Together	30 oz.
Ethyl Acetate	32½ oz.
Toluol	32½ oz.

No. 5

Pyroxylin Solution (22 oz.)	57.8 oz.
Oil Color } Ground	8.7 oz.
Castor Oil } Together	8.7 oz.
Blown Castor Oil	5.8 oz.
Ethyl Acetate	9.5 oz.
Toluol	9.5 oz.

No. 6

Pyroxylin Solution (22 oz.)	74.8 oz.
Castor Oil AA	9.0 oz.
Oil Color } Ground	7.5 oz.
Castor Oil } Together	7.5 oz.
Camphor	1.2 oz.

No. 7

Pyroxylin Solution (22 oz.)	51.5 oz.
Ethyl Acetate	16.5 oz.
Castor Oil AA	8.0 oz.
Gold Bronze	23.5 oz.
Aluminum Bronze	0.5 oz.

Patent Leather Coating

Pyroxylin Pigmented Base	30 oz.
Varnish	25 oz.
Denatured Alcohol	40 oz.
Amyl Acetate	5 oz.

This is a good protective over-coating for casein finishes.

Oiling Off of Leather

Formula No. 1

Sorbitol (85%)	1 lb.
Water	3 lb.

This mixture is applied by spreading the tanned, colored and fat-liquored skin on a flat surface with the grained side up. The skin is then lightly brushed manually or by machine with a brush dipped in the sorbitol mixture. Immediately afterward, the skins are hung up to dry. Sometimes a light coating of neatsfoot oil may be applied on the grain side of the skin following the sorbitol treatment and before drying.

Other ingredients may be added to the sorbitol solution given above, such as blood or egg albumen, milk, casein and dyes such as nigrosin, logwood extract and hematine. Such a finish is made up as follows:

No. 2

Blood Albumen	15 %
Nigrosin	1 %
Sorbitol (85%)	½%
Milk	10 %
Water	73½%

It is, moreover, possible, after the leather has been dyed, by rubbing sorbitol in on the non-dyed side to give it the necessary degree of suppleness.

LEATHER FINISHES

Wax Emulsion

Formula No. 1

Castile Soap	15 lb.
Carnauba Wax, No. 1 Yellow	5 lb.
Candelilla Wax	5 lb.

Dissolve the soap in 8 gallons of water by boiling for 1 hour, adding water as it is lost by evaporation, then add melted wax and continue boiling for two more hours, then add water enough to make a total of 10 gallons. Strain the mass through 4 layers of cheese cloth.

No. 2

Castile Soap	4 lb.
Carnauba Wax, No. 1 Yellow	10 lb.

The soap is chipped and placed into the double jacketed cooker. Break the wax into small pieces and add to the kettle, now heat the two together until the whole mass is melted. It may be necessary to add a very small quantity of hot water to aid in obtaining a complete flux. When this is accomplished hot water is continually added in small doses. After each addition the mass is well stirred. Hot water is continually added until the mass becomes limpid and finally the whole is made up to a total of 10 gallons. The finished emulsion, when diluted in the ratio of 1 to 10 with water should produce a slightly milky solution. It is then strained through four thicknesses of cheese cloth.

Blood Albumen Solution

Blood Albumen	10 lb.
Water	10 gal.
Di-nitrophenol	2 oz.

Mix all together, with the water at 80° F., let stand, stirring every 15 minutes until the whole is dissolved. Strain through 4 layers of cheese cloth.

Casein Solution

Casein	10 lb.
Borax	2½ lb.
Di-nitrophenol	2 oz.
Water	10 gal.

Place the whole into the cooker and boil vigorously for 1 hour. When cool, make up to 10 gallons and strain through 4 layers of cheese cloth.

Shellac Solution

Superfine Wax Free Shellac	10 lb.
Strong Ammonia	2½ lb.
Water	10 gal.

Place the whole into the cooker and boil for 1 hour. Cool and make up to a total of 10 gallons, strain through cheese cloth.

Black Pigment

Lamp Black	3½ lb.
Sulphonated Castor Oil (75%)	2 lb.
Nigrosine (Jet Black)	5½ lb.
Sassafras Oil	5 oz.
Water	3 gal.

Mix together and heat until the dye is dissolved, then add:

Wax Emulsion No. 1	2½ gal.
Casein Solution	1 gal.
Shellac Solution	2½ gal.

Mix well and grind in Harris mill, then add enough water to make 12½ gallons total.

Nigrosine Solution

Nigrosine (Jet Black)	1 lb.
Water	1 gal.

Boil together until all the dye is dissolved.

After the above solutions and emulsions are prepared, the skins are finished as follows:

Stain

Dissolve 10 ounces of hematine in 1 gallon of water by boiling vigorously, then add:

Bichromate of Soda	1 oz.
Nigrosine Solution	120 oz.

Water enough to make 5 gallons.

Apply 1 coat of the above with a swab, permit to dry, and then smooth plate at 150° F.

Then prepare the following:

Blood Albumen Solution	40 fl. oz.
Shellac Solution	20 fl. oz.

Casein Solution	20 fl. oz.
Nigrosine Solution	16 fl. oz.
Stain	32 fl. oz.
Water	160 fl. oz.

Apply two coats of the above, permit to dry between coats, and glaze. Then prepare the following:

Shellac Solution	20 fl. oz.
Casein Solution	30 fl. oz.
Sulphonated Castor Oil	1 fl. oz.
Nigrosine Solution	20 fl. oz.
Water	70 fl. oz.

Apply one coat of above with a swab and permit to dry. Then prepare the following:

Nigrosine Soluion	10 fl. oz.
Casein Solution	15 fl. oz.
Shellac Solution	10 fl. oz.
Sulphonated Castor Oil	½ fl. oz.
Wax Emulsion No. 2	6 fl. oz.
Water	42 fl. oz.

Apply one coat above, permit to dry, then iron or mangle.

LEATHER FINISHES

Colorless

a.	Methylated Spirit	36 lb.
	Shellac, Dewaxed, Bleached	18 lb.
	Camphor	4.2 lb.
b.	Water	6 lb.
	Oil Soap, Chipped Bars	4.25 lb.
c.	Rosin WW	4.2 lb.
d.	Water	2.25 lb.
	Potash Carbonate (96/98%)	1.1 lb.
e.	Methylated Spirit	24 lb.

Black

a.	Methylated Spirit	35 lb.
	Ruby Shellac, Dewaxed	16 lb.
	Camphor	4 lb.
	Brilliant Black T, Alcohol Soluble	1.5 lb.
b.	Water	6 lb.
	Oil Soap, Chipped Bars	4 lb.
c.	Rosin G-M (Dark)	6 lb.
d.	Water	4 lb.
	Potash Carbonate (96/98%)	1.5 lb.
e.	Methylated Spirit	22 lb.

a is dissolved separately in the cold, with stirring.

Melt *c*. Heat *b* to a boil, add the melted *c*, saponify with boiling *d*. Turn off heat. Use precautions to prevent boiling over. Cool, add *e*. Part of *e* may be added hot, after the boil is finished, to complete saponification.

Stir *b*, *c*, *d*, and *e* into *a* with good stirring. Add water to get 100% yield. Settle to clear.

Leather Finish

French Patent 786,233

a.	Cetyl Alcohol	87 lb.
	Stearic Acid	9 lb.
b.	Triethanolamine	4 lb.
	Water	400 lb.
c.	Ammoniacal Shellac Solution, consisting of: Bleached Shellac 24 oz. Water, Hot 170 oz. Ammonia (0.880) 6 oz.	1.64 lb.

Heat *a* to 85–90° C. Add the hot solution *b* to it with stirring. Prepare the lac solution separately, and add it, *c*, to the hot emulsion. Stir until cold.

Leather Finish, Nitrocellulose

Celluloid Solution A	
Movie Film Scrap	7 g.
Special Solvent	17 g.
Butyl Acetate (85%)	6 g.
Methyl Cyclohexanone	14 g.
Benzine (690/710)	9 g.
Benzine (765/775)	3 g.
Benzol	10 g.
Toluol	20 g.
Xylene	14 g.
Rosin Solution B	
Rosin WW	18 g.
Alcohol, Denatured	82 g.
Finished Dyes	
Pigment Paste	6–14 g.
Celluloid Solution A	70–75 g.
Rosin Solution B	10 g.
Alcohol	11–14 g.

This latter is a general formula, for which previously-prepared solutions and color-pastes are used.

Clear Leather Lacquer

Celluloid Solution A	72.5 g.
Rosin Solution B	9.0 g.
Methyl Cyclohexanone	3.5 g.
Alcohol	13.5 g.
Tricresyl Phosphate	1.5 g.

Leather Brown "Lasur" Dye

Clear Leather Lacquer	100 g.
Zapon Echt.—Orange G	1 g.
Bismarck Brown R, Oil-Soluble	0.05 g.
Zapon Echt.—Black M	0.03 g.

Suede Leather Dressing

Black

a.	Nigrosin Base	3 g.
	Oleic Acid	8 g.
b.	Benzene	40 g.
	Alcohol, Denatured	100 g.
	Benzine	100 g.

Melt *a*, and thin this with *b*.

Leather Coloring Compound

Pigment Emulsion

Pigment	10 kg.
Soap, Powdered	1 kg.
Wood Oil	10 kg.
Water	50 kg.

Of this emulsion, use

Pigment Emulsion	15 kg.
Ammonia- Casein (12–15%)	30 kg.
Glue Solution (10%)	25 kg.
Glycerin	8 kg.

Harden on the leather by brushing or spraying with formaldehyde solution.

Pyroxylin (Cellulose) Leather Finishes

Medium

Celluloid Scrap (High Viscosity)	10 lb.
Plasticizer	42 lb.
Methyl Acetone	20 lb.
Ethyl Acetate	20 lb.
Alcohol, Denatured	10 lb.
Toluol	80 lb.
Amyl Acetate	5 lb.
Diacetone Alcohol	10 lb.
Cellosolve	5 lb.

Formula No. 1

Above Medium	150 lb.
Plasticizer	51 lb.
Amyl Acetate	37½ lb.

No. 2

Split leather finishes. These are of eggshell type, and should have high filling and covering power.

Stock Clear Film*	10 pt.
Benzol	14 pt.
Black Dye	2 lb.
Tricresyl Phosphate	1 pt.
Carbon Black (Undercoat Paste)	10 oz.
Prussian Blue (Undercoat Paste)	1 oz.
Butyl Acetate	2 pt.
Butanol	1 pt.
Methylated Spirit	3 pt.
Bakelite Resin	2 lb.
Acetone	2 pt.

* Stock Clear Film is:

Clear Celluloid	18 lb.
Ethyl Acetate	8 gal.
Amyl Acetate	4 gal.

No. 3

Shoe upper finishes, which should be very adhesive and pliable to resisting bending of the foot.

4 sec. Cotton in Butanol	16 lb.
Methyl Acetone	20 lb.
Ethyl Acetate	20 lb.
Amyl Acetate	10 lb.
Benzol	70 lb.
Toluol	70 lb.
Castor Oil	4 lb.
Ethyl Abeitate	2 lb.
Butyl Stearate	4 lb.
Butyl Phthalate	4 lb.

No. 4

Shoe Quick Black (Waterproof)

Black Celluloid Scrap	½ lb.
Methylated Spirit	4 pt.
Methyl Acetone	1½ pt.
Typhophor Black Dye	3 oz.
Boiled Linseed Oil	4 fl. oz.
Castor Oil	4 fl. oz.
Carbon Black Paste	10 fl. oz.
Yellow Dye	3 g.

No. 5

Shoe sole finishes which can be polished with a buff or revolving pad.

Celluloid Film Scrap	3 oz.
Methyl Acetone	1½ pt.
Benzol	3 pt.
Methylated Spirit	4½ pt.
Barytes	1 lb.
Whiting	2 lb.
Asbestine	2 lb.
Castor Oil	4 fl. oz.
Boiled Linseed Oil	8 fl. oz.
Oxford Ochre (Undercoat Paste)	To shade

No. 6

Clothing leather finishes which are to be fast to wet rubbing, very soft, pliable and matt.

Medium, as in Formula No. 1 (3 pigment, 1 clear)	100 lb.
Castor Oil	8 lb.
Ethylene Glycol	25 lb.
Methyl Acetate	25 lb.
Plasticizing Solution*	1 lb.

* Plasticizing Solution is:

Blown Castor Oil	80 lb.
Diamyl Phthalate	15 lb.
Butyl Stearate	15 lb.

Diluted to 100 parts with methylated spirit.

No. 7

Glossy Enamel Finish for Patent Leathers, Etc.

Cotton (½ sec. in Butanol)	1½ lb.
Cotton (4 sec. in Butanol)	½ lb.
Amyl Acetate	1 gal.
Ethyl Acetate	¼ gal.
Acetone	¼ gal.
Toluol	¼ gal.
Boiled Linseed Oil	4 fl. oz.
Camphor	8 oz.
Dibutyl Tartrate	80 g.
Sextol	11 fl. oz.
Dewaxed Dammar	4 oz.
Williams Dye, No. 16128	To shade

No. 8

Hide Finishes for Upholstery

Medium

Bronzing Cotton (70 to 80 sec.)	2 lb.
Methyl Acetone	3 pt.
Sextone "B"	3 pt.
Diacetone Alcohol	¾ pt.

Toluol	2 pt.
Methylated Spirit	1½ pt.
Ethyl Acetate	1 pt.
Amyl Acetate	1 pt.
Camphor	1 lb.
Cellosolve	1 pt.
Castor Oil	1 pt.
Sipaline M.M.	1 pt.
Butyl Stearate	1¼ fl. oz.

No. 9
White Finish

To 1 gal. of medium add:

Titanium Oxide	1 lb.
Zinc Oxide	2 oz.
Castor Oil	4 oz.
Sipaline M.M.	4 oz.

No. 10
Green Finish

To 1 gal. of medium add:

Light Chrome Green	8⅛ oz.
Dark Chrome Green	5 oz.
Superfine Raw Sienna	3¼ oz.
Dark Yellow Ochre	6½ oz.
Lithopone	3¼ oz.
Nekal A.E.M.	⅛ oz.

No. 11
Blue Finish

To 1 gal. of medium add:

Non-Bronze Prussian Blue	5¾ oz.
Light Chrome Green	1⅞ oz.
Dark Chrome Green	¾ oz.
Titanium Oxide	11½ oz.
Nekal A.E.M.	⅛ oz.

Blood Albumin Leather Finishing
Finish for Colored Leather with Gloss
Formula No. 1

Blood Albumin, Light	250 g.
Milk	3 l.
Water	25 l.

No. 2

Linseed	300 g.
Milk	1.2 l.
Blood Albumin, Light	130 g.
Water	25 l.

No. 3

Blood Albumin, Light	150 g.
Gelatin	150 g.
Milk	1500 cc.
Water	25 l.

Finish for Black Leather
Formula No. 1

Blue Wood Extract	300 g.
Iron Acetate	100 g.
Milk	1.8 l.
Blood Albumin, Dark	50 g.
Water	25–30 l.

No. 2

Nigrosine	150 g.
Milk	1.8 l.
Glycerin	30 g.
Blood Albumin, Dark	60 g.
Phenol	25 g.
Water	14 l.

Plasticizer for Artificial Leather Finishes

Blown Castor Oil	30 lb.
Diamyl Phthalate	15 lb.
Butyl Stearate	15 lb.
Alcohol, Denatured	40 lb.

Restoring Fine Finish on Kid Uppers

Kid skins when placed on the cutters' boards are nearly perfect in finish according to grading, but the cut uppers in going through the factory become dull. When the shoes reach the finishing room it is up to the treer to bring the kid back to its original soft glossy appearance.

This cannot be done by deluging the upper with naphtha and filler, with the free use of too hot an iron. Such treatment creates an artificial finish and destroys the quality of the leather.

Use lukewarm water in which has been dissolved a little borax. A piece of piano felt dampened in the borax water can be used to go over a half dozen pairs of shoes, making them slightly damp. The dampened shoes should then be rubbed off with a piece of soft cheese cloth or canton flannel.

This will remove the grease adhering from the hands of the operators and any foreign matter collected in the factory. Iron with a warm iron and apply the dressing.

LEATHER FINISHES
Thinner Mixture
Formula No. 1

Ethyl Acetate (98–100%)	20 g.
Butanol	20 g.
Butyl Acetate (98–100%)	35 g.
Methyl Cyclohexanone (94%)	25 g.

No. 2

Alcohol, Denatured	65 g.
Toluol	17 g.
Xylene	18 g.

Nitrocellulose Stock Solution

Celluloid Waste	7.50 g.
Thinner Mixture No. 1	60.00 g.
Thinner Mixture No. 2	32.50 g.

Resin Stock Solution

Dammar, Dewaxed	10 g.
Butyl Acetate	45 g.
Toluol	45 g.

These solutions, (nitrocellulose and resin solution), are mixed and added to the pigment pastes in certain proportions, as indicated below.

White Pigment Paste

Titanium Dioxide	10.00 g.
Tricresyl Phosphate	2.50 g.
Methylhexalin Methyl-Adipate	1.00 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	1–2 g.

Mix thoroughly in a color mill.

Yellow Pigment Paste

Chromium Yellow 48	8.00 g.
Hansa Yellow G, Powdered	0.50 g.
Tricresyl Phosphate	2.25 g.
Methylhexalin Methyl-Adipate	1.00 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	0.40 g.

Orange Pigment Paste

Chrome Yellow 84	8.00 g.
Hansa Yellow GR, Powdered	0.90 g.
Lithol Echt Orange RN, Powdered	0.10 g.
Tricresyl Phosphate	2.25 g.
Methylhexalin Methyl-Adipate	1.00 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	0.60 g.

Brown Pigment Paste

Iron Oxide, Red	9.00 g.
Tricresyl Phosphate	2.25 g.
Methylhexalin Methyl-Adipate	1.00 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	1.30 g.

Pigment Paste, Bordeau

Heliobordo BLC, Powdered	2.00 g.
Tricresyl Phosphate	1.60 g.
Methylhexalin Methyl-Adipate	0.50 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	0.50 g.

Pigment Paste, Red

Same as the bordeau paste, but substituting:

Siegle Red 1	2.00 g.

for the heliobordo.

Pigment Paste, Blue

Indanthren Blue GGSL, Powdered	2.00 g.
Heliomarin RL, Powdered	0.20 g.
Tricresyl Phosphate	1.70 g.
Methylhexalin Methyl-Adipate	0.55 g.
Castor Oil	1.60 g.
Methyl Cyclohexanone	0.1–0.5 g.

Pigment Paste, Greenish Blue

Milori Blue 185	4.00 g.
Heliomarin RL, Powdered	0.40 g.
Tricresyl Phosphate	1.90 g.
Methylhexalin Methyl-Adipate	0.75 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	0.50 g.

Pigment Paste, Black

Pigment Deep Black Extra, Powdered	5.00 g.
Tricresyl Phosphate	1.90 g.
Methylhexalin Methyl-Adipate	0.75 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	0.50 g.

Pigment Paste, Silver

Aluminum Powder	9.00 g.
Tricresyl Phosphate	2.25 g.
Methylhexalin Methyl-Adipate	1.00 g.
Castor Oil	1.50 g.
Methyl Cyclohexanone	0.40 g.

The aforementioned pigment pastes, nitrocellulose and resin solutions are used for the finished leather dyes as follows:

White, Yellow, Orange, Brown or Silver

a. Pigment Paste, in Desired Color	14.00 g.
b. Nitrocellulose Stock Solution	68.00 g.
c. Resin Stock Solution	3.00 g.
d. Thinner Mixture No. 2	4.50 g.
Solvent Mixture No. 1	10.00 g.
Camphor	0.50 g.

The ingredients *a–d* are thoroughly mixed in a suitable mill.

Bordeau, Red, or Blue

a. Pigment Paste, in Desired Color	6.00 g.
b. Nitrocellulose Stock Solution	55.00 g.
c. Resin Stock Solution	3.00 g.
d. Thinner Mixture No. 2	9.50 g.
Solvent Mixture No. 1	18.00 g.
Camphor	0.50 g.

Greenish Blue or Black

a. Pigment Paste, Greenish Blue or Black	9.00 g.
b. Nitrocellulose Stock Solution	60.00 g.
c. Resin Stock Solution	3.00 g.
d. Thinner Mixture No. 2	9.50 g.
Solvent Mixture No. 1	18.00 g.
Camphor	0.50 g.

Gold Leather Dye

Corresponds in its composition to the silver dye given before, but requires a special nitrocellulose, and can only be made up shortly before use, because it is not stable. Therefore, the pigment has to be made up separately from the mixture of plasticizers, solvents, thinners, resins and nitrocellulose.

Black Leather Dyes

Formula No. 1

a.	Nigrosine Base	10 kg.
	Oleic Acid, Distilled	6 kg.
b.	Acetone	6 kg.
	Benzine (Gasoline)	100 kg.

No. 2

a.	Nigrosine Base	5 kg.
	Oleic Acid, Distilled	10 kg.
b.	Alcohol	25 kg.
	Acetone	29 kg.
	Benzine	40 kg.

Stir *a* till dissolved and smooth and thin with *b*.

Strain through cloth.

No. 3

Nigrosine Base	25 kg.
Oleic Acid	8 kg.
Acetone, or Turpentine	8 kg.
Benzine	130 kg.

No. 4

Nigrosine Base	5 g.
Oleic Acid	10 g.
Alcohol, Denatured	25 g.
Acetone	25 g.
Lacquer Benzine	50 g.

Dissolve the nigrosine base in the oleic acid, and add the solvents.

Gold and Silver Finishing of Pigskin

For gold finish, the leather should be preliminarily colored with a dye of the compn.-orange "PV" 0.05 and metanil yellow 0.04%, lacquered, and treated under a pressure of 4.5–5 atmospheres with a mixture of bronze powder 100, butyl acetate 750, amyl acetate 750, lacquer 1000, castor oil 1.5 and tritolyl phosphate 0.5 part by wt. For silver finish the leather is greased and neutralized, then treated under pressure with aluminum powder 100, butyl acetate 1000, amyl acetate 1000, Zapon lacquer 1000, castor oil 1.5 and tritolyl phosphate 0.5%.

Harness Stain

A hot 5 per cent solution of pyrolignite of iron is first applied to the grain by means of a stiff brush. This is scoured into the grain uniformly, then permitted to set for no less than two hours, after which the following is applied:

Water	15 gal.
Logwood Crystals	5 lb.

Boil for one hour, let cool and add one pint of ammonia.

This is also scoured into the grain with a stiff brush. After this, the stock is given a final waxing on the grain.

Casein Leather Coloring

German Patent 652,082

Casein	10 lb.
Ammonia (20%)	1.5 lb.
Indanthrene Blue GCD	2 lb.
Iron Oxide Brown	27 lb.
Special Castor Oil, Sulphonated*	20 lb.
Phenol	2 lb.
Water	935 lb.

This reaction is carried out in the usual fashion. The resulting oil is washed with water or ammonium sulphate solution, separated, and neutralized to a weak alkaline reaction by ammonia.

* Castor Oil	100 lb.
Sulphuric Acid	15 lb.

Black Burnishing Ink

Dye Solution:

Water	19 kg.
Nigrosin, Water-Soluble	1.5 kg.

Wax Solution:

Water	7 kg.
Hard Soap	0.5 kg.
Montan Wax, Crude	2 kg.
Carnauba Wax	1 kg.

Shellac Solution:

Water	5 kg.
Borax	0.03 kg.
Ruby Shellac	0.5 kg.
Potassium Carbonate	0.3 kg.

Mix the shellac solution (60–70° C.) into the wax emulsion (60–70° C.), and add the cold dye solution. Mix thoroughly, fill into bottles or cans.

Make a paste of the first three ingredients, if necessary slightly warming on a steam-bath. Thin the paste with benzine, and filter.

Burnishing Ink

Paraffin Wax	3 lb.
Carnauba Wax	3 lb.
Japan Wax	6 lb.
Rosin	6 lb.
Nigrosin, Water-Soluble	2.4 lb.
Soda Ash, Calcined	3 lb.
Water	76.6 lb.

Leather Black

Brilliant Black T, Alcohol-Soluble	7 lb.
Mirbane Oil (Nitrobenzol)	30 lb.
Benzol	33 lb.
Alcohol	30 lb.

Note: Caution in working with nitrobenzol is absolutely necessary.

Burnishing Solution for Shoes (Fake)

Montan Wax	16 lb. 12 oz.
Ceresine Wax	4 lb. 6 oz.
Soap	5 lb. 6 oz.
Turpentine	73 lb. 5 oz.

Melt the waxes at 200° F. and dissolve the soap in the turpentine, if necessary using heat cautiously and keeping naked flames away. Mix the turpentine-soap solution with the molten waxes and stir until fairly cool.

Wax Stick to Cover Small Defects of Shoe Leather

Black

Montan Wax, Crude	28 kg.
Carnauba Wax, Gray	7.5 kg.
Shellac Wax	7.5 kg.
Beeswax	20 kg.
Paraffin	20 kg.
Linseed Oil	2 kg.
Nigrosine Stearate	15 kg.

Brown

Montan Wax, Double Bleached	25 kg.
Beeswax	25 kg.
Paraffin	25 kg.
Linseed Oil	2 kg.
Iron Oxide Red or Brown	22 kg.
Brown Dye, Oil-Soluble	1 kg.

Shoe Sole Paint

Venetian Red	1 lb. 4 oz.
Fast Brown	2 lb. 8 oz.
Gum Arabic	2 lb. 12 oz.
Water	43 lb. 12 oz.

A mucilage is made with the gum, and then, using water, a paste is made with the pigment, and then thinned down, using more water. Make a solution of the dyestuff, mix the pigment-water mixture with the mucilage then add balance of water.

Pigmented Shoe Sole Paints

	A.	*B.*	*C.*	
Red Iron Oxide	2.0	4.0	16.0	lb.
China Clay	13.5	13.5	13.5	lb.
Yellow Ochre	11.0	12.0	—	lb.
Middle Chrome Yellow	3.0	—	—	lb.
Gum Arabic	9.5	9.5	5.0	lb.
Water	61.0	61.0	61.0	lb.

Bleaching for Shoe Bottoms

Acetone	55.0 kg.
Water	35.5 kg.
Oxalic Acid	5.5 kg.
Hydrochloric Acid, Concentrated	4.0 kg.
Havana Brown S	0.27 to 3%

Make up the solution of acids in acetone and water by stirring in the cold. Dissolve the dye. Allow to settle and filter.

Caution: Poisonous! Apply to the sole with a sponge or brush, if necessary repeat several times. Dry. Brush to obtain gloss.

Leather Preservative

Formula No. 1

Austrian Patent 145,045

a. Phenol	100 g.
Castor Oil	20 g.
Formaldehyde	40 g.
Colophony	40 g.
b. Benzine or Solvent Naphtha	to suit

a is mixed and heated to 180–200° C. for several hours. Dissolve in *b*. Used to impregnate soles and top leather of shoes.

No. 2

Woolfat, Neutral	6 kg.
Train Oil	4 kg.

No. 3

Ozokerite (68–70° C.)	6 oz.
Paraffin Wax (50–52° C.)	8 oz.
Whale Oil	5 oz.
Spindle Oil (35° Viscosity E)	50 oz.

Yellow, colored with I.G. Yellow R.

Black, colored with Nigrosin, Oil-Soluble.

No. 4

U. S. Patent 2,032,250

Lanolin	7 lb.
Oleic Acid	1 lb.
Triethanolamine	¼ lb.
Glycerin	12 lb.
Honey	2 lb.
Perfume	to suit
Water	78 lb.

No. 5

Swiss Patent 171,374

Linseed Oil	0.20 kg.
Beeswax	2.20 kg.
Naphtha	2.46 kg.
Turpentine	5.00 kg.

Preserving Hides and Skins

German Patent 632,335

The preservation of hides and skins is improved by the addition of 1¼% zinc oxide or carbonate to the usual salt.

Factory Shoe Protecting Film

U. S. Patent 2,052,393

Latex (60%)	59.52
Casein	3.25
Kaolin	16.10
Thymol	0.05

Water to give desired consistency

Leather Oil
Formula No. 1

Woolfat	10 kg.
Rapeseed Oil, Blown	10 kg.
Neatsfoot Oil	15 kg.
Pine Oil	10 kg.
Train Oil	55 kg.

No. 2

Train Oil, Brown, Clear	50 lb.
Tallow	30 lb.
Woolfat, Neutral	10 lb.
Degras	9 lb.
Birch Tar Oil	1 lb.

Leather Cleanser Oil

Tall Oil	15 kg.
Mineral Oil	70 kg.
Turkey Red Oil (100%)	10 kg.
Potassium Hydroxide (50° Bé.)	5 kg.

Waterproofing for Leather
Formula No. 1
U. S. Patent 2,026,453

Impregnate with following melted mixture:

Paraffin Wax	16	oz.
Rosin	2	oz.
Burgundy Pitch	1	oz.
Neatsfoot Oil	1½	oz.
Wood Alcohol	1	oz.
Cod Oil	1	oz.
Wintergreen Oil	5	drops

No. 2
French Patent 801,828

Rosin	100 g.
Paraffin Wax	100 g.
Petrolatum, Liquid	350 g.
Turpentine	100 g.
Beeswax	100 g.
Neatsfoot Oil	200 g.
Linseed Oil	50 g.
Benzaldehyde	1 cc.

Sport Shoe Waterproofing Oil

a. Crude Rubber, Soft	2 kg.
Spindle Oil, Pale Yellow	50 kg.
b. Spindle Oil, Pale Yellow	48 kg.
Liquid, High-Viscosity Coumarone Resin	1 kg.

Have *a* dissolve slowly on a water-bath and add *b*, previously dissolved at gentle heat. Mix thoroughly.

Shoe Waterproofing

Glycol Oleate	1 oz.
Aluminum Stearate	1 oz.
Carbon Tetrachloride	99 oz.

Stir until dissolved.

Waterproofing Leather Gun Cases

a. Gelatin	4	oz.
Hot Water	3	pt.
b. Formaldehyde	½	pt.
Water	2½	pt.

Apply solution *a* hot with a brush, over all the case. When the coating has dried brush over all with solution *b*. Repeat the two operations three times and allow the case to stand exposed to sunlight for several days, turning it about so that the light may act on the entire surface.

Protecting Hides Against Moths and Dermestids

Moth-infested hides are sprayed with *p*-dichlorbenzol. Hides infested with dermestids are sprayed with a 1:1 mixture of kerosene and turpentine.

Fireproofing Leather
British Patent 465,533

The prepared leather is placed in an ordinary tanner's drum together with an amount of water equivalent to its own weight, preferably at a temperature of 50° C. Five pounds of aluminum sulphate previously dissolved are added to 100 lb. of leather, and drumming prolonged for a period of sixty minutes. At the end of this time, five pounds of sodium phosphate are added and the drumming continued for a period of sixty minutes, when the leather may be removed and washed preliminary to drying.

Leather Binder

Film Waste, Washed and Dried	17 lb.
Lacquer Solvent*	50 lb.
Amyl Acetate	2 lb.
Trichlorethylene	31 lb.

* E.g., consisting of 40–50% of acetone and 60–50% denatured alcohol.

Shoemaker's Sewing Wax

Ozokerite, Refined	70 kg.
Beeswax	30 kg.
Linseed Oil	5–10 kg.

Shoemaker's Sewing Pitch

Rosin	84 lb.
Spindle Oil (sp.g. 0.880–0.885)	11 lb.
Caustic Soda (20–25° Bé.)	5 lb.

Leather Substitute
U. S. Patent 2,098,789

Impregnate a square weave unnapped cotton fabric weighing 5.3 oz. per linear yd. of 38 in. width with a gasoline dispersion of rubber 40, white factice 10, barytes 15, lithopone 30, magnesium carbonate 10 and a pigment 1 part, remove the gasoline, coat one face of the impregnated fabric with a dispersion of cotton flock 25 and a mixture as specified 75%, calender the coated impregnated fabric, coat it with a cement consisting of a dispersing agent and a rubber mixture as specified, dust the further coated material (suitably with potato starch) to avoid a tacky surface, and vulcanize. A product thus prepared is suitable for making shoe linings, etc.

Pre-Felting Treatment of Animal Fibers

Austrian Patent 148,693

Mercuric Sulphate	12– 52 g.
Sulphuric Acid (60%)	10– 40 cc.
Hydrogen Peroxide (30%)	150–300 cc.
Water to make	1 l.

After Chroming for Fur Felt Hats

Charge the bath with

Sulphuric Acid	1– 3%

(according to the depth of the shade to be dyed and the acid still contained in the goods)

and the

Requisite Dyestuff,

or, for thicker shapes and hat bodies with

Glauber's Salt	5–10%
Sulphuric Acid	1– 3%

and the

Requisite Dyestuff.

Enter the well wetted or boiled felts at 40–50° C. (105–120° F.), raise in ½ to ¾ hour to the boil, and dye at the boil for ½ to 1 hour. Hereupon cool the bath down to 60–70° C. (140–160° F.), add the corresponding quantity of bichrome (one-third of the quantity of dyestuff, and for half-milled felt, even in the case of deep shades not more than 1.5%), raise again gradually to the boil, and finally boil for another ½ hour.

Non-Slipping V-Belts

Slipping V-belts can often be remedied easily, especially in cases where the load is slightly too great by liberally coating them with finely powdered rosin. The surface of the belt should be softened slightly before applying the rosin. If the belt is leather this is best done by coating it with a mixture of rosin oil and mineral oil. If of rubber, talc or graphite is used.

Fur Carroting Solution

U. S. Patent 2,048,645

Sulphuric Acid	5 lb.
Hydrochloric Acid	1 lb.
Potassium Chlorate	3 lb.
Hydrogen Peroxide	4 lb.
Sodium Sulphate	15 lb.
Water	100 lb.

Carroting Rabbit Fur

U. S. Patent 2,070,927

Formula No. 1

Clipped white French rabbit fur is carroted with a solution carrying 12 per cent of nitric acid and 2 per cent potassium permanganate. After drying, the fur is started and sized and a total shrinkage of 78 per cent in area is noted.

No. 2

A heavier sample of clipped white French rabbit fur is carroted with a solution carrying 14 per cent nitric acid and 5 per cent of potassium permanganate, and started and sized, shows a total shrinkage of 76 per cent in area.

It is possible to substitute sulphuric acid for the nitric acid when used in such proportions as to yield approximately the same hydrogen ion content, or to mix these acids. The products of reaction with sulphuric acid, however, tend to injuriously affect the fur unless the fur is subsequently treated, as with ammonia or other alkali. A satisfactory procedure for treating sulphuric acid-treated fur is to expose the treated fur, in dried condition, to ammonia fumes or the fumes of a suitable ammonium salt, either before or after the carroted fur is cut from the skin, and either under pressure or after evacuating the air therefrom. This neutralizing operation turns the manganese pink, but renders it water-soluble so that it washes out in the felting operation, with the result that the carrot of the present invention does not discolor the finished felt which retains the natural color of the fur.

Bleaching Yellowed Furs

Treat leather side of fur with

Petrolatum	4 kg.
Benzine or Carbon Tetrachloride	10 kg.

Wet the hairs well with a 5% soda solution; wash with 7% curd soap solution and bleach with ammonia and hydrogen peroxide. Rinse with water at 30° C., acidify with formic acid and dry. A little bluing may be added to the acid if desired. Wash the dried fur in a suspension of

Talc	100 g.
Benzine	10 l.

Centrifuge and dry.

LUBRICANTS, OILS, FATS

Soluble Oil
Formula No. 1

Spindle Oil	100	kg.
Oleic Acid	12	kg.
Butanol	7	kg.
Triethanolamine	0.5	kg.
Caustic Potash (38° Bé.)	4.5	kg.

Heat the oils to about 70° C., add the butanol, and to this the triethanolamine. Add the lye, and leave standing hot to clarify.

No. 2

Alcohol, Denatured	15	oz.
Diglycol Laurate	85	oz.
Mineral Oil	400	oz.

No. 3

Mineral Oil	32	g.
Oleic Acid	10	g.
Alcohol	3	g.
Trigamine	5	g.

The above are thoroughly mixed cold and form a clear transparent oil which readily emulsifies on pouring into water with slight stirring.

No. 4
U. S. Patent 2,040,673

A method of making a soluble oil from impure mahogany soap comprises adding to this soap the light mineral oil to be used in the soluble oil, washing the mixture of mineral oil, and impure mahogany soap with 3 per cent to 10 per cent aqueous alkali metal hydroxide solution, separating the aqueous phase and impurities from the acid to form an emulsifying soap which will supplement the mahogany soap in the soluble oil. Mahogany soaps are sulphonic soaps derived from petroleum refining.

No. 5

Spindle Oil, Refined, 4–5 E. (20° C.)	50	kg.
Oleic Acid, Distilled	20	kg.
Sodium Hydroxide (29° Bé.)	about 12.5	kg.
Alcohol, to make clear	about 12.5	kg.

Soluble Mineral Oil
Formula No. 1

Mineral Oil	75	oz.
Naphthenic Acid Sludge	25	oz.

No. 2

Mineral Oil	75	oz.
Naphthenic Soap	25	oz.

Textile Lubricants
Formula No. 1

Monoamylamine Oleate	4	lb.
Paraffin Oil (28° Bé.)	96	lb.

Mix the above and stir into

Water	100	lb.

No. 2

a.	Rosin WW	6.4	g.
	Mineral Oil	20	g.
b.	Olein, Light	10.5	g.
c.	Spindle Oil	73.4	g.
d.	Alcohol	5.4	g.
e.	Caustic Soda (40° Bé.)	2.2	g.

Melt up *a* with agitation, until clear. Add *b*, *c*, cool down to 45° C., add *d*, and, with vigorous mixing, *e* in small portions, until the cloudiness disappears. If it does not go clear completely, add some olein with caution.

Lubricating Emulsion for Wool

Olive Oil	87	g.
Oleic Acid	10	g.
Trigamine	3	g.
Water	100	cc.

The above emulsion is suggested as a wool lubricant so that the wool fibers in the carding and combing operations pass over one another with the least possible amount of frictional resistance. The oil in emulsions made with trigamine is of an extremely fine particle size and comes into contact with the fibers very rapidly, thoroughly and uniformly. Furthermore, the oil emulsion is very easily removed during scouring.

Lubricant for Worsted

Oleic Acid	40	kg.
Triethanolamine	2.04	kg.
Water	60	kg.

Stir together at about 35° C., and transfer immediately into a homogenizer, where the emulsion is homogenized under about 150 atmospheres pressure.

Soluble Oil Base, Textile

a.	Oleic Acid	8	lb.
	Colza Oil	4	lb.
	Rosin	2	lb.
	Castor Oil Fatty Acid	2	lb.
	Spindle Oil	32	lb.
b.	Alcohol	2	lb.
	Methyl Glycol	1	lb.
c.	Caustic Potash (50°)	3.8	lb.

Melt *a* to dissolve, cool to 40–50° C., add *b*. Cool further, add *c*.

Should dissolve 1:10 in mineral oil, and emulsify.

Soluble Oil, Textile

a.	Turkey Red Oil (50%)	30 kg.
	Diglycol Laurate	1 kg.
	Alcohol	1 kg.
	Methyl Glycol	1 kg.
b.	Oleic Acid, White	15 kg.
c.	Caustic Potash	to neutralize
	Water, to make	100 kg.

Silk Throwing Oil

White Russian Mineral Oil	29 oz.
Pine Oil (Steam Distilled)	2 oz.
Neatsfoot Oil (Free Fatty Acid 6%)	68 oz.
White Oleic Acid	1 oz.

Spinning Oil for Light or White Fibers

White Oleic Acid	41 lb.
Denatured Alcohol	31 lb.
Caustic Potash (48° Bé.)	17½ lb.

Mix these three thoroughly and test for neutrality. Make exactly neutral, then add

Water	11 lb.
White Mineral Oil	854 lb.
White Oleic Acid	35 lb.

Add the free oleic acid gradually, with constant stirring, until the entire liquid becomes clear. This may require slightly more oleic acid than listed. When clear, add 11 lb. steam distilled pine oil.

Spinning Oil for Wool

Water	2.0 oz.
Caustic Potash	1.2 oz.
Light Mineral Oil	85.0 oz.
Diethylene Glycol	2.0 oz.
Oleic Acid	9.9 oz.

To the mineral oil add 6 parts of oleic acid, and the caustic potash dissolved in the water. Stir in the diethylene glycol. Then add slowly with constant stirring the remainder of the oleic acid, till the solution becomes clear. If properly made, this oil will emulsify when mixed with water.

Cotton Spraying Oil

U. S. Patent 2,074,555

Light Lubricating Oil	99.5–95 oz.
Butyl Acetyl Ricinoleate	0.5– 5 oz.

Fulling Oil

Formula No. 1

a.	Sulphonated Castor Oil (75%)	40 g.
	Oleic Acid, Distilled	20 g.
	Water	20 g.
b.	Caustic Soda (30–38° Bé.) to pH 6–7	
c.	Water, to make	100 g.

Mix *a*, neutralize with *b* to neutrality, thin down with water, as in *c*.

No. 2

a.	Monopol Soap	30 g.
	Water, Hot	40 cc.
b.	Oleic Acid, Distilled	20 g.
c.	Caustic Soda, to pH 6–7	
d.	Water, to make	100 g.

Dissolve *a* hot, cool down to 20–25° C., add *b*, neutralize with *c* to pH 6–7, thin with *d*.

Dressing for Yarn

Montan Wax, Double Bleached	8 g.
Paraffin Wax (40/42° C.)	10 g.
Rosin	7 g.
Potassium Carbonate	2 g.
Water	60 g.

Textile Lubricant for Spinning Jute, Hemp, Etc.

Formula No. 1

Train Oil, Dark	30–50 kg.
Spindle Oil, Distilled	70–50 kg.

No. 2

Lubricant Oil Emulsion.

Rope Lubricant

British Patent 455,652

Mineral Oil	72 oz.
Aluminum Oleate	2½ oz.
Hydroquinone	½ oz.

Warm together and stir until dissolved.

Leather Stuffing Grease

Formula No. 1

Montan Wax, Crude	12 kg.
Ceresin	3 kg.
Woolfat, Neutral	5 kg.
Car Waste Oil	50 kg.
Birch Tar	3 kg.
Train Oil	27 kg.

No. 2

Woolfat, Neutral	30 kg.
Train Oil	50 kg.
Tallow	20 kg.

No. 3

Sulphonated Grease	1 lb.
Castor Oil	½ lb.
Mineral Oil	½ lb.

No. 4

Train Oil, Brown, Clear	40 lb.
Woolfat, Crude	25 lb.
Rubber Solution (6%)	10 lb.
Crude Montan Wax	10 lb.
Spindle Oil	14 lb.
Birch Tar	1 lb.

No. 5

Yellow

Ozokerite-Ceresin, Yellow (58/60° C.)	17 kg.
Spindle Oil, Distilled	83 kg.

No. 6

Yellow

Scale Wax, Yellow, 50/52° C.	10 lb.
Montan Wax, Bleached	10 lb.
Rosin, Pale	5 lb.
Spindle Oil, Distilled	75 lb.

No. 7

Brown

Montan Wax, Crude	10 lb.
Rosin, Dark	10 lb.
Scale Wax	5 lb.
Spindle Oil, Distilled	75 lb.

No. 8

Black

Montan Wax, Crude	12 lb.
Rosin, Dark	10 lb.
Scale Wax	3 lb.
Spindle Oil, Distilled	73 lb.
Nigrosin, Oil-Soluble	2 lb.

No. 9

Black

Montan Wax, Crude	15 kg.
Ozokerite-Ceresin, Yellow	3 kg.
Woolfat, Crude	5 kg.
Black Leather Dye, Oil-Soluble	2 kg.
Spindle Oil, Distilled	75 kg.

No. 10

Ozokerite	3 kg.
Paraffin	5 kg.
Woolfat, Neutral	10 kg.
Mineral Oil	22 kg.
Train Oil	60 kg.

Leather "Adhesion Grease"

Woolfat, Neutral	6 kg.
Tallow	25 kg.
Castor Oil, Second Pressing	1.5 kg.

Liquid Belting Lubricant

a.	Rosin	7.5 lb.
	Woolfat	7.5 lb.
b.	Train Oil	30.0 lb.
	Rosin Oil or Mineral Oil	55.0 lb.

Melt *a* in a kettle. Dilute with *b* which is stirred in slowly.

To get more viscous compositions, the liquid components may be reduced.

Belt Adhesion Compounds

Formula No. 1

Rosin	25 kg.
Woolfat, Anhydrous	20 kg.
Rape Seed Oil, Blown	20 kg.
Tallow	25 kg.
Scale Wax (50/52° C.)	10 kg.

Melt all ingredients together and mix until uniform.

No. 2

Tallow	40 lb.
Train Oil	30 lb.
Woolfat, Neutral	10 lb.
Blown Oil, High-Viscosity	20 lb.

No. 3

Train Oil	50 kg.
Woolfat	15 kg.
Rape Seed Oil, Blown	15 kg.
Castor Oil (2nd Pressing)	5 kg.
Rubber Solution in Benzol	5 kg.

Belt Preserving Grease

Formula No. 1

Woolfat, Neutral	30 kg.
Tallow, Free of Acid	25 kg.
Degras	15 kg.
Train Oil	30 kg.

No. 2

(To protect and soften the leather)

Woolfat, Neutral	30 kg.
Tallow	30 kg.
Train Oil	25 kg.
Degras	14 kg.
Birch Tar	1 kg.

No. 3

Beef Tallow	50 g.
Paraffin Wax (50/52° C.)	10 g.
Turpentine	10 g.
"Saturated-Steam-Cylinder Oil," Very Fluid	50 g.
Rosin, Ground	10 g.

Melt the first three ingredients on the steam-bath, add the oil, stir until cooled, and stir in the rosin.

No. 4

A liquid belt dressing formula contains beeswax 4 lb., pitch 5 lb., resin 3 lb., neatsfoot oil 13 lb. The beeswax is melted first and the other ingredients are added in the order named.

No. 5

(Non-Static)

Fish Glue	100 lb.
Glycerin	80 lb.
Sulphonated Castor Oil	100 lb.
Water	170 lb.
Lampblack	82 lb.
Aqua Ammonia (26°)	1 gal.

Government Harness Dressing

Neatsfoot Oil	1 gal.
Bayberry Tallow	2 lb.
Beeswax	2 lb.
Beef Tallow	2 lb.
Castor Oil	1 qt.
Lampblack	1 oz.

Rubber Belt Dressing (Non-Static)

Lampblack	18 lb.
Spar Varnish	82 lb.
Carbon Tetrachloride	50 lb.

Belting Oil

Train Oil, Brown, Clear	50 lb.
Castor Oil, 2nd Pressing	10 lb.
Woolfat, Neutral	10 lb.
Blown Oil	25 lb.
Spindle Oil, Distilled	5 lb.

Belting Oil for the Tropics

Formula No. 1

Colza Oil, Blown	30 kg.
Train Oil	20 kg.
Spindle Oil	40 kg.

No. 2

a. Woolfat, Neutral	25 kg.
b. Train Oil	25 kg.
Castor Oil	25 kg.
Spindle Oil	25 kg.

Melt *a*, thin with the oils *b*.

Belt Adhesion Oil for Rubber Belting

Crude Rubber	6– 8 kg.
Benzene	92 kg.
Spindle Oil	5–10%

Soak, and stir until homogeneous. The exact composition (a material which does not dry too quickly but does not attack the belting to a great extent) must be tried out.

Leather Oils

Yellow

Woolfat, Neutral	5 kg.
Train Oil	20 kg.
Spindle Oil, Refined	75 kg.

Dark

Train Oil, Blown	20 kg.
Castor Oil, Mineral Oil-Soluble	10 kg.
Birch Tar Oil	3 kg.
Spindle Oil, Distilled	67 kg.

Leather Grease for Soles

English Patent 432,636

Train Oil	20 lb.
Mineral Oil, Light	70 lb.
Castor Oil, Sulphonated	10 lb.
Ammonia	0.5 lb.

Leather Oil for Sport Shoes

a. Caoutchouc, Rose Flakes	2 kg.
b. Spindle Oil, Pale Yellow (8–10° E. at 20° C.)	50 kg.
c. Spindle Oil	48 kg.
d. Cumar, Liquid, High-Viscosity	1 kg.

Soak *a* in *b* on a warm place until it begins to be transparent, and dissolve completely on a waterbath. Add *d* in *c* to this solution, and mix thoroughly.

Tanner's Grease

Woolfat	7 g.
Train Oil	3 g.
Spindle Oil, Refined	50 g.
Oleic Acid, Distilled	5 g.
Caustic Soda (42° Bé.)	3 g.
Water	32 g.

Fat-Liquors for Chrome Tannages

Formula No. 1

Sulphonated Neatsfoot Oil	20–40 lb.
Spindle Oil	10–20 lb.
Neatsfoot Oil	100–80 lb.

	No. 2	No. 3	No. 4	
Sulphonated Neatsfoot Oil	30	20	25	lb.
Neatsfoot Oil	40	40	30	lb.
Mineral Oil	20	20	20	lb.
Soap	10	20	25	lb.

5% emulsions of the above are used at pH of 6.5–8.0.

Stuffing Fat-Liquors for Leather

Formula No. 1

Montan Wax, Bleached	10 g.
Fish Train Oil	3 g.
Paraffin Oil	35 g.
Wool Fat	25 g.

No. 2

Montan Wax, Crude	10 g.
Ceresin (64–70° C.)	16 g.
Train Oil	30 g.
Spindle Oil	44 g.

No. 3

Castor Oil Soap	3 lb.
Sorbitol (85%)	2 lb.
Castor Oil	1½ lb.
Boiling Water	10 lb.

No. 4

Sorbitol (85%)	1 lb.
Castile Soap	1½ lb.
Neatsfoot Oil	2 lb.
Borax	4 oz.
Water	150 lb.

NOTE: Other vegetable oils, sulphonated oils, animal and marine oils may be used in place of the neatsfoot oil or castor oil.

No. 5

Degras	10 lb.
Olive Oil	10 lb.
Sorbitol (85%)	4 lb.
Soft Soap	5 lb.
Water (140° F.)	60–70 gal.

The skins are tumbled in this emulsion for a period in the neighborhood of 45 minutes and are then hung on a trestle for about 30 minutes to let the fat penetrate the leather.

No. 6

For white leathers, based on weight of tanned calfskins:

Sorbitol Monolaurate	2%
Neatsfoot Oil	1%
Water (120° F.)	150%

No. 7

Sorbitol Monolaurate	2%
Nopco White Pigment	1%
Water (120° F.)	150%

No. 8

Sorbitol Monolaurate	2%
Neatsfoot Oil	1%
Syntan Bleach	10%
Water	150%

No. 9

Train Oil, Neutral, Light	30 lb.
Castor Oil	20 lb.
Neatsfoot Oil	25 lb.
Benzine or Carbon Tetrachloride	25 lb.

Fat-Liquor for Lambskins

Flour	10 lb.
Kaolin	10 lb.
Best Curd Soap	10 lb.
Egg Yolks	20

The flour and clay should be made into a paste with cold water, then the soap dissolved in boiling water and when just tepid added to the first mixture. After thorough mixing and when the liquor has a temperature of 100 F. the egg yolks should be added and the solution thoroughly emulsified. A hot drum must be used for the processing, and the amount of liquor should be just sufficient to work the goods nicely. Two hours slow drumming is necessary for thorough feeding. Drying in a cool shed is advised.

Instead of curd soap, a good sulphonated oil can be used, preferably a fairly heavy one, such as sulphonated codliver or sperm oil. An alternative method is to use one-third weight of soap together with one-third to total weight of sulphonated oil.

Lubricating Grease
German Patent 613,362

Neutral Oil (Paraffin Base, Viscosity 6.22° E. at 37.8° C.)	1970 kg.
Aluminum Stearate	270 kg.

Heat up *slowly* to 127° C. (in about 7 hours). Cool quickly.

Gasoline-Proof Lubricating Grease

Oleic Acid	2.5 oz.
Ammonium Linoleate	17.5 oz.
Glycerol	37.0 oz.
Lubricating Oil	35.0 oz.

A simpler, readily prepared lubricant of this type is:

Oleic Acid	100 oz.
Glycerin	50 oz.

Anti-Freeze Lubricating Grease
U. S. Patent 2,071,488

Lime Rosin Soap	8–15%
Heavy Mineral Oil	35–60%
Wax Tailings	10–20%
Salt	20–35%
Water	1–5 %

Adherent Lubricating Grease
French Patent 797,054

Consistent greases having strong adherence properties contain a calcium soap, a lubricating oil and a small amount of rubber, which may be in latex form. An example contains calcium soap 12, rubber 0.5, glycerol 1, water 1 and red solar oil 85.5%. The mixture containing latex is heated to 188° and agitated to reduce the water content to 1%.

Lubricating Grease, Non-Separating
U. S. Patent 2,108,643

These greases may suitably be made by mixing the necessary lime with a small amount of water, and an amount of oil about equal to the fatty acid to be used in a steam-jacketed grease mixing kettle. The fatty acid to be used in the manufacture of the soap is then added and heat is applied. After an interval of about 40 to 60 minutes, when the temperature has reached 240–260° F., the soap is ready for mixing. About 2% to 3% of water is added, and when the batch foams up it is driven down by the addition of oil, the heat being abstracted by the addition of cold oil and by the vaporization of water so that the temperature drops to about 230° F. Oil is added until the batch contains about 25% soap, and during this interval the temperature drops gradually until it reaches about 205–210° F. If the desired soap percentage is about 15, the batch should reach a temperature of about 180–190° F. at this point. This process is about the same when fats are used instead of fatty acids except that it requires 12 to 20 hours at 240–260° F. to effect the saponification of the fats. After the addition of the final amount of oil, but prior to final cooling, the desired amount of stabilizing agent is added and stirred in and the grease is then cooled and packaged in the normal manner.

While it is preferable in some respects to manufacture these greases in accordance with the conventional cup grease practice in which a small amount of water, say from one-half to one and one-half percent, is left in the finished grease it is also possible to make these greases in a completely anhydrous form by boiling off all the water. In manufacturing the anhydrous greases, it is necessary to cool the grease rapidly in order to secure the desired structure. This can be done by the use of cooling coils, or chilled rolls or by pouring the hot grease out in layers of, preferably, not over about one inch in thickness at ordinary atmospheric temperatures. The result is a crystal clear grease, which like those containing water, will not separate at high temperatures. These anhydrous greases have some marked advantages but do not have the conventionally desirable structure and properties of the hydrous greases.

The use of fatty alcohol stabilizing agents is particularly valuable in connection with ordinary cup greases, i.e., calcium soap greases. It is preferable to use calcium hydrogenated fatty acid soap but calcium animal fatty acid soap and other calcium soaps are completely satisfactory. Relatively small amounts of soaps of other metals can be used along with the calcium soap, for instance, sodium soap, or the stabilizing agents may be used in greases which do not contain calcium soaps at all, for example, zinc soap greases. However, in these cases the effect is much less marked and the results are less desirable than in the case of calcium soap greases.

The greases made in accordance with this invention will normally have the following weight composition:

	Per cent		Per cent
Lubricating Oil	54–96	or preferably	67–92
Soap	3–35	or preferably	5–25
*Stabilizing Agent	1–8	or preferably	3–6
Water	0–3	or preferably	0–2

* The stabilizing agents used in the above composition are n-propanol, n-butanol, n-amyl alcohol, cetyl alcohol and ocenol (the latter being a proprietary higher alcohol). These various compositions are free from leakage after storage of two months or more and exhibited very favorable properties as to high temperature stability. These particular compositions are anhydrous. As previously indicated, greases superior in some respects can be made leaving a small amount of water in the finished grease.

However, relatively inert materials such as powdered metals, flake graphite, mica, asbestos fibers, small amounts of glycerin, fats, etc., can be included without departing from the spirit of this invention and these relatively inert materials are not to be included in figuring the composition of the grease.

As examples of this invention greases have been made using five different alcohol stabilizing agents, the grease in each case having the following composition: 22.5% calcium soap of fatty acids split from hydrogenated fats, 73.5% red oil (Mid-Continent distillate having a viscosity of about 300 seconds Saybolt at 100° F.), and 4% stabilizing agent.

Ball Bearing Grease
Formula No. 1
White

a.	Stearic Acid	10 kg.
	Paraffin Oil, White	30 kg.
b.	Lime Hydrate	2 kg.
	Water	
c.	Paraffin Oil, White	56 kg.

Melt *a*, saponify hot with *b*; add *c* in small portions. Keep stirring until cold. Homogenize.

No. 2
Yellow

a.	Train Oil Fatty Acid	16 kg.
	Mineral Oil, Pale	30 kg.
b.	Lime Hydrate	2 kg.
	Water	
c.	Mineral Oil, Pale	48 kg.

Prepare as above.

No. 3
High Speed Ball Bearing Grease
Canadian Patent 363,369

Calcium Soap	3.9 oz.
Sodium Soap	16.0 oz.
Mineral Oil (100–300 Saybolt at 100° F.)	78.7 oz.
Free Alkali	0.3 oz.

This has a melting point of 352° F.

No. 4
(Softening Point=60–70° C.)

Rapeseed Oil	8 kg.
Spindle Oil, Refined (Visc. 2.5–4° E. at 20° C.)	88.5 kg.
Lime Hydrate	1.5 kg.

No. 5

Whale Train Oil Fatty Acid	8 kg.
Spindle Oil, Refined (Visc. 2.5–4° E. at 20° C.)	88.5 kg.
Lime Hydrate	1.5 kg.

No. 6

Paraffin Wax (40–42° C.)	16 kg.
Ozokerite, Refined	4 kg.
Spindle Oil, Containing Paraffin (Visc. 2 E. at 50° C.)	80 kg.

Lubricant for Rubber Bearings
(Spring Shackles)
U. S. Patent 2,083,176

Glycerin	50.0 oz.
Water	50.0 oz.
Graphite, Fine Powdered	0.2 oz.

Lubricating Grease of Low Softening Point for Roller and Similar Bearings

Formula No. 1

Oleic Acid	8 oz.
Spindle Oil, Refined (Visc. 2.5–4 E. at 20° C.)	86.7 kg.
Lime Hydrate	1.3 kg.

No. 2

Crude Montan Wax	12 kg.
Paraffin Oil	84 kg.
Caustic Soda (38° Bé.)	2 kg.

No. 3

Woolfat Fatty Acid	5 kg.
Lanolin Fatty Acid	5 kg.
Spindle Oil (Containing Paraffin)	84.5 kg.
Lime Hydrate	1.5 kg.

Roller Bearing Lubricant

Formula No. 1

U. S. Patent 2,058,236

A lubricating grease for high speed ball and roller bearings consists essentially of a mixed soda-lime soap of stearic acid, in which the ratio of lime soap to soda soap is around 1 to 5, and about 65–85% of light lubricating oil, the grease being substantially anhydrous and free from glycerin and characterized by having a short fibre texture.

No. 2

U. S. Patent 702,197

Sodium Stearate	14.5 oz.
Sodium Naphthenate	6.9 oz.
Medium Heavy Mineral Lubricating Oil	77.89 oz.
Caustic Soda	0.32 oz.
Water	Trace

Lubricant for Hot Bearings

Formula No. 1

Tallow	300 kg.
Caustic Soda, Solid	42 kg.
Engine Oil, Refined (Viscosity 3.5° E. at 50° C.)	658 kg.

Kettle should be filled only to one-third. Heat the tallow to 50°C., start the mixer.

Dissolve the soda in 158 liters of water (yields 200 kg. lye); and add it to the melted tallow slowly. Heat until the tallow is completely saponified.

Add slowly 50 kg. oil, wait until smooth, add 250 kg. oil in small portions. Heat to 150° C., until all water is boiled away.

Add the remaining, pre-heated oil to the kettle, stir until cooled to 90° C., pour off.

A softer product can be gotten by adding the oil (50° C.) to the finished soap, stirring thoroughly, and by only heating to 65–70° C.

No. 2

Tallow	250 kg.
Caustic Soda, Solid	35 kg.
Engine Oil, Refined (Viscosity 3.5° E. at 50° C.)	715 kg.

No. 3

Tallow	200 kg.
Caustic Soda, Solid	27 kg.
Engine Oil, Refined (Viscosity 3.5° E. at 50° C.)	773 kg.

No. 4

Tallow	260 kg.
Caustic Soda, Solid	45 kg.
Engine Oil, Refined (Viscosity 8° E. at 50° C.)	695 kg.

Hot-Bearing Grease

(For heavily loaded, hot bearings)

Formula No. 1

Tallow Fatty Acid	14 kg.
Montan Wax, Refined	3 kg.
Engine Oil (6–7 E. at 50° C.)	79.5 kg.
Lime Hydrate	1.5 kg.
Caustic Soda (40° Bé.)	3 kg.

No. 2

Tallow	25 kg.
Engine Oil (4–8 E. at 50° C.)	70.5 kg.
Caustic Soda (40° Bé.)	10 kg.

Lubricants for Highly Loaded Bearings

Formula No. 1

Bone Fat	12 kg.
Cottonseed Oil	3 kg.
Engine Oil (2.5–5° E. at 50° C.)	79 5 kg.
Lime Hydrate	2.5 kg.

No. 2

Whale Train Oil Fatty Acid	15 kg.
Engine Oil (2.5–5° E. at 50° C.)	79.5 kg.
Lime Hydrate	2.5 kg.

No. 3

Soybean Oil	15 kg.
Tallow	5 kg.
Engine Oil (2.5–5° E. at 50° C.)	74 kg.
Lime Hydrate	3 kg.
Caustic Soda (40° Bé.)	1 kg.

Lubrication of Synthetic Resin Bearings

British Patent 481,154

Use ethylene glycol or glycerin. For "running-in" such bearings dissolve 1–20% of any water soluble hydroxides, carbonates or bi-carbonates, e.g., caustic soda or potassium carbonate.

Grease for Pressure Lubrication

Formula No. 1

Stearic Acid	10 kg.
Oleic Acid	8 kg.
Engine Oil (6–7° E. at 50° C.)	76 kg.
Lime Hydrate	3 kg.

No. 2

Tallow Fatty Acid	16 kg.
Bone Fat	4 kg.
Engine Oil (6–7° E. at 50° C.)	73.5 kg.
Lime Hydrate	3.5 kg.

No. 3

Refined Montan Wax	22 kg.
Oleic Acid	5 kg.
Engine Oil (6–7° E. at 50° C.)	67 kg.
Lime Hydrate	3 kg.

High Pressure Lubricant

U. S. Patent 2,094,202

A lubricant adapted to withstand high pressures comprises a mineral lubricating oil containing 0.1 to 5 per cent of diphenyl.

Hot-Roller Grease

(For roller-ways in rolling mills)

Formula No. 1

Tallow	25 kg.
Stearic Acid	3 kg.
Engine Oil (Viscosity 7–8 E. at 50° C.)	78 kg.
Caustic Soda (40° Bé.)	12 kg.

No. 2

Crude Woolfat	20 kg.
Rosin	10 kg.
Cylinder Oil (7 E. at 100° C.)	66.5 kg.
Caustic Soda (40° Bé.)	10 kg.

Hot-Roller Grease Brignets

(For rollers in rolling mills)

Formula No. 1

Stearin from Woolfat	20 kg.
Rosin	10 kg.
Woolfat Pitch	20 kg.
Cylinder Oil (7 E. at 100° C.)	46 kg.
Caustic Soda (40° Bé.)	12 kg.

No. 2

Stearin Pitch	25 kg.
Woolfat Pitch	23 kg.
Tallow	12 kg.
Cylinder Oil (7 E. at 100° C.)	36 kg.
Caustic Soda (40° Bé.)	12 kg.

Hot Roller Lubricant

(Dropping Point above 170° C.)

Formula No. 1

Tallow	250 kg.
Stearic Acid	30 kg.
Caustic Soda, Solid	45 kg.
Engine Oil, Distilled, Viscosity 8° at 50° C.	675 kg.

Use a fire-heated kettle, which should be filled only to ⅓. Put in the tallows, stearin, and 200 kg. of the oil; dissolve the soda in 135 liters of water. Start stirring the kettle and add the soda slowly into it, heat and, as soon as the saponification is complete, add the remaining oil. Heat up to 250–260° C. Pour into iron forms, 10 cm. high. Cool, cut, pack.

No. 2

Colophony (Rosin)	75 kg.
Lard Oil	75 kg.
Caustic Soda, Solid	20 kg.
Cylinder Oil, Dark, Asphalous, Viscosity 4 at 100° C.	830 kg.

No. 3

Stearic Acid	75 kg.
Colophony (Rosin)	75 kg.
Caustic Soda, Solid	25 kg.
Cylinder Oil, Dark, Asphaltous, Visc. 5–6 at 100° C.	825 kg.

(Dropping Point: 190° C.)

No. 4

Wool Fat, Crude	200 kg.
Wool Fat Pitch	200 kg.
Cylinder Oil, Asphaltous, Viscosity 5° E. at 100° C.	570 kg.
Caustic Soda, Solid	30 kg.

No. 5

Tallow	18 kg.
Caustic Soda, Solid	30 kg.
Asphaltum Base Cylinder Oil, 5–6 E. Viscosity at 100° C.	790 kg.

High Temperature Lubricant

French Patent 808,046

Formula No. 1

Caustic Soda	3 kg.
Ethyl Carbitol	10 kg.
Castor Oil	2 kg.
China Wood Oil	3 kg.
Linseed Oil	2 kg.
Soya Bean Oil	2.6 kg.

No. 2

Caustic Soda	3 kg.
Ethyl Carbitol	11 kg.
Castor Oil	0.4 kg.
China Wood Oil	0.6 kg.
Soya Bean Oil	2.6 kg.
Stearic Acid	10.5 kg.

No. 3

Woolfat Stearine	20 lb.
Woolfat, Crude	20 lb.
Rosin	10 lb.
Stearin Pitch, Soft	50 lb.
Goudron (Mineral Oil Residue)	100 lb.
Caustic Soda (40° Bé.)	12 lb.

"Cold-Roller Grease"

(Lubricant for Rollers, Pulleys, Bearings)

Formula No. 1

Crude Woolfat	15 kg.
Woolfat-Stearin	5 kg.
Engine Oil (Viscosity 7–8 E. at 50° C.)	78 kg.
Caustic Soda (40° Bé.)	6 kg.

No. 2

Train Oil Fatty Acid	15 kg.
Tallow	3 kg.
Engine Oil (Viscosity 7–8 E. at 50° C.)	79 kg.
Caustic Soda (40° Bé.)	8 kg.

"Cold Roller Grease Briquets"

(For large rollers and bearings)

Formula No. 1

Crude Woolfat	15 kg.
Stearin from Woolfat	5 kg.
Cylinder Oil (7 E. at 100° C.)	78 kg
Caustic Soda (40° Bé.)	6 kg.

No. 2

Tallow	20 kg.
Cylinder Oil (7 E. at 100° C.)	77 kg
Caustic Soda (40° Bé.)	8.5 kg.

Lubricating Briquets

Formula No. 1

Woolfat Fatty Acid	14 kg.
Rosin	8 kg.
Engine Oil (7–8 E. at 50° C.)	75 kg.
Caustic Soda (40° Bé.)	9 kg.

No. 2

Crude Woolfat	10 kg.
Rosin	10 kg.
Engine Oil (7–8 E. at 50° C.)	77.5 kg.
Caustic Soda (40° Bé.)	8 kg.

Lubricants for Cold Rollers

Formula No. 1

Tallow	150 kg.
Stearic Acid	30 kg.
Caustic Soda, Solid	about 30 kg.
Engine Oil, Distilled (Viscosity 8 at 50° C.)	790 kg.

No. 2

Wool Fat Stearin	50 kg.
Wool Fat	150 kg.
Caustic Soda, Solid	about 20 kg.
Cylinder Oil (Viscosity 4–5 at 100° C.)	780 kg.

Cock Valve Greases, Special

Formula No. 1

(For Temperatures Up to 165° C., and Resistant to Caustics, Water-Insoluble)

Petrolatum, Crude	**63 kg.**
Stearic Acid	**13 kg.**
Calcium Oxide	1 kg.
Aluminum Sulphate	3 kg.
Magnesium Chloride	2 kg.
Sodium Hydroxide, Solid	1.5 kg.
Graphite	2 kg.
Asbestos Linters	7.9 kg.
Mica	6 kg.
Water	—

Method (General)

(1) Melt Fatty acid and an equal part of the petrolatum (or mineral oil).

(2) Heat to 100° C.

(3) Add the calcium oxide (in water).

(4) Stir until the lime has been dissolved by the fatty acid.

(5) Add caustic alkali (in water), until the fatty acid is saponified completely.

(6) Add aluminum sulphate and magnesium chloride (in water), to form the corresponding soaps.

(7) Boil most of the water away.

(8) Add the remainder of the petrolatum (or mineral oil).

(9) Boil down to 0.5–0.6% water.

(10) Stir until cold.

(11) Put into cans, or press.

No. 2

(For Hot Steam, Gas, Oils. Not for Alkali or Acid)

Petrolatum, Crude	544 kg.
Stearic Acid	50 kg.
Tallow	50 kg.
Lard Oil	50 kg.
Calcium Oxide	20 kg.
Aluminum Sulphate	35 kg.
Magnesium Chloride	20 kg.
Sodium Hydroxide, Solid	15 kg.
Mica	50 kg.
Asbestos Fibre	40 kg.
Hair	40 kg.
Graphite	80 kg.

No. 3

(For Benzine, Gas, Organic Solvents, Below 180° C.)

Tallow	700 kg.
Paraffin Wax	80 kg.
Sodium Hydroxide, Solid	110 kg.
Potassium Hydroxide, Solid	20 kg.
Aluminum Sulphate	20 kg.
Calcium Oxide	30 kg.
Magnesium Chloride	30 kg.

No. 4

(For Wet Gases, Oils, Emulsions, Up to 120° C.)

Tallow	250 kg.
Stearic Acid	250 kg.
Engine Oil, Refined (Viscosity 6 E.)	350 kg.
Calcium Oxide	60 kg.
Aluminum Sulphate	150 kg.
Magnesium Chloride	150 kg.
Sodium Hydroxide, Solid	50 kg.

Cock Grease

Woolfat, Neutral	4.2 kg.
Spindle Oil	2.5 kg.
Ceresin (56/58° C.)	0.8 kg.
Graphite, Flakes	2.5 kg.

Engine Lubricating Grease (Softening at 70–90° C.)

Formula No. 1

Rapeseed Oil	8 kg.
Peanut Oil	4 kg.
Spindle Oil, Refined (Visc. 4–6° E. at 20° C.)	83 kg.
Lime Hydrate	2 kg.

No. 2

Train Oil or Bone Fat Fatty Acid	12 kg.
Spindle Oil, Refined (Visc. 4–6° E. at 20° C.)	83 kg.
Lime Hydrate	2 kg.

No. 3

Lanolin Fatty Acid	18 kg.
Spindle Oil, Containing Paraffin (Visc. 2° E. at 50° C.)	77 kg.
Lime Hydrate	1.5 kg.
Caustic Soda (40° Bé.)	1 kg.

Carriage Greases

Formula No. 1

Yellow

a.	Montan Wax, Bleached	20 kg.
	Rosin	5 kg.
b.	Mineral Oil, Pale	30 kg.
c.	Caustic Soda (24° Bé.)	5.5 kg.
d.	Mineral Oil, Pale	42 kg.

Melt *a*, dilute with *b*, saponify with *c*, dilute with *d*.

No. 2

Light Brown

a.	Woolfat Fatty Acid	15 kg.
	Mineral Oil	20 kg.
b.	Lime Hydrate (in Water)	2 kg.
c.	Mineral Oil, Pale	62 kg.

The melted *a* is saponified with *b*, and thinned by *c*.

No. 3

Natural Color

a.	Montan Wax, Crude	18 kg.
	Rosin	3 kg.
b.	Paraffin Oil, Dark	30 kg.
c.	Caustic Soda (36° Bé.)	5 kg.
d.	Mineral Oil	46 kg.

No. 4

a.	Talloil, Crude	20 kg.
	Blue Oil, from Rosin Distillation	20 kg.
b.	Caustic Soda (36° Bé.)	8.5 kg.
c.	Blue Oil, as above	55 kg.

No. 5

Black

a.	Montan Wax, Crude	18 kg.
	Rosin, Residual Blue Oil	3 kg.
b.	Lime Hydrate (in Water)	1.6 kg.
c.	Tar Oil	45 kg.

No. 6

Black

a.	Woolfat Fatty Acid	17 kg.
	Paraffin Oil, Dark	25 kg.
b.	Caustic Soda (24° Bé.)	10 kg.
c.	Paraffin Oil, Dark	53 kg.
	Ceres Black	0.5 kg.

No. 7

Yellow-Brown

a.	Woolfat Fatty Acid	10 kg.
	Rosin	2 kg.
	Mineral Oil	20 kg.
b.	Lime Hydrate (in Water)	1.5 kg.
c.	Mineral Oil	52 kg.
	Talcum	12 kg.

Carriage Greases, Unfilled

Yellow:

Formula No. 1

a.	Rosin (Stock) Oil	27 kg.
	Mineral Oil, Pale	40 kg.
b.	Lime Hydrate	9 kg.
	Mineral Oil, Pale	24 kg.

Dissolve *a* with heat and stirring, and grind *b* separately until smooth. Add the thin paste *b* to the oil *a* with thorough agitation. A very heavy gel is formed.

No. 2

a.	Rosin (Stock) Oil	24 kg.
	Mineral Oil, Pale	40 kg.
b.	Lime Hydrate	8 kg.
	Mineral Oil, Pale	28 kg.

Prepare as in No. 1.

Brown or Natural Color:

No. 3

As in Formula No. 1, using dark (waste) mineral oils for all or a part of the mineral oil.

Blue:

No. 4

Use Formula No. 1, 2 or 3, but dye with 0.3% lampblack or 0.5% Brilliant Oil Blue.

No. 5

a.	Rosin Oil	27.0 kg.
	Mineral Oil	40.0 kg.
b.	Mineral Oil	3.0 kg.
	Brilliant Blue, Oil-Soluble	0.6 kg.
c.	Lime Hydrate	9.0 kg.
	Paraffin Oil, Dark	20.4 kg.

Make up *a*, add *b*, and add to these, with thorough agitation, the suspension *c*.

Black:

No. 6

a.	Rosin Oil	27.0 kg.
	Dark Paraffin Oil	40.0 kg.

b. Lime Hydrate	9.0 kg.
Lampblack	0.8 kg.
Dark Paraffin Oil	23.2 kg.

No. 7

a. Rosin Oil	27.0 kg.
Blue Oil	40.0 kg.
b. Lime Hydrate	9.0 kg.
Lampblack	0.5 kg.
Blue (Mineral) Oil	23.5 kg.

No. 8

a. Rosin Oil	24.0 kg.
Tar Oil	40.0 kg.
b. Lime Hydrate	8.0 kg.
Lampblack	0.5 kg.
Dark Paraffin Oil	27.5 kg.

No. 9

a. Rosin Oil	24.0 kg.
Blue (Mineral) Oil	40.0 kg.
b. Ceres Black	0.3 kg.
Mineral Oil	1.7 kg.
c. Lime Hydrate	8.0 kg.
Paraffin Oil, Dark	26.0 kg.

No. 10

a. Rosin Oil	22 kg.
Tar Oil	50 kg.
b. Lime Hydrate	8 kg.
Gas Oil	20 kg.

As in all the previous formulae, make up the two components separately, and mix to form the gel.

No. 11

Blue Oil	45 lb.
Lime Hydrate	6 lb.
Rosin Oil	22.5 lb.
Oil-Soluble Blue	0.18 lb.

The grease is produced in the cold. It can be filled with calcium sulphate.

Carriage Greases, Filled

Pale Yellow:

Formula No. 1

a. Rosin Oil	18 kg.
Mineral Oil, Pale	31 kg.
b. Lime Hydrate	6 kg.
Barytes	20 kg.
Mineral Oil, Pale	25 kg.

Dissolve *a*, make *b* to obtain a smooth paste. Add *b* to *a* with good stirring, to form gel.

No. 2

a. Rosin Oil	16.5 kg.
Mineral Oil, Pale	18.0 kg.
b. Lime Hydrate	5.5 kg.
Barytes	30.0 kg.
Mineral Oil	30.0 kg.

Yellow:

No. 3

a. Rosin Oil	16 kg.
Mineral Oil, Pale	20 kg.
b. Lime Hydrate	6 kg.
Barytes	15 kg.
Gypsum	10 kg.
Ochre	6 kg.
Mineral Oil, Pale	27 kg.

Method as in No. 1, 2.

No. 4

a. Rosin Oil	18 kg.
Mineral Oil, Pale	29 kg.
b. Lime Hydrate	6 kg.
Gypsum	22 kg.
Gas Oil	25 kg.

No. 5

a. Montan Wax, Bleached	20 kg.
Rosin	6 kg.
b. Mineral Oil, Pale	25 kg.
c. Caustic Soda (24° Bé.)	8 kg.
d. Mineral Oil, Pale	35 kg.
Light Spar (Gypsum)	10 kg.

Melt *a*, thin it with *b*, saponify with *c*, and add to that the suspension *d*. Mix thoroughly.

Brown:

No. 6

a. Rosin Oil	18 kg.
Gas Oil	31 kg.
b. Lime Hydrate	6 kg.
Gypsum	15 kg.
Talc	5 kg.
Paraffin Oil, Dark	25 kg.

Make up solution *a* and suspension *b* separately. Mix, to obtain gel.

No. 7

a. Rosin Oil	15 kg.
Paraffin Oil, Dark	18 kg.
b. Lime Hydrate	5 kg.
Barytes	25 kg.
Ochre	5 kg.
Paraffin Oil, Dark	32 kg.

No. 8

Natural Color:

a. Montan Wax, Crude	18 kg.
Woolfat Fatty Acid	2 kg.
b. Paraffin Oil, Dark	22 kg.
c. Caustic Soda (24° Bé.)	7 kg.
d. Gas Oil	44 kg.
Barytes	10 kg.

Blue:

No. 9

a. Rosin Oil	18.0 kg.
Mineral Oil	31.0 kg.
b. Lime Hydrate	6.0 kg.
Gypsum	19.6 kg.
Lampblack	0.4 kg.
Blue (Mineral) Oil	25.0 kg.

No. 10

a. Rosin Oil	16.5 kg.
Blue Oil	18.0 kg.
b. Ceres Black	0.2 kg.
Mineral Oil	0.8 kg.
c. Lime Hydrate	5.5 kg.
Barytes	29.0 kg.
Blue (Mineral) Oil	30.0 kg.

No. 11

a. Woolfat Fatty Acid	15 kg.
b. Blue Oil	25 kg.

c. Caustic Soda (24° Bé.)	8.5 kg.
d. Blue Oil	41 kg.
Barytes	9 kg.
Lampblack	1 kg.

Black:

No. 12

a. Rosin Oil	18 kg.
Blue Oil	31 kg.
b. Lime Hydrate	6 kg.
Gypsum	19 kg.
Lampblack	1 kg.
Blue (Mineral) Oil	25 kg.

No. 13

a. Rosin Oil	16.5 kg.
Tar Oil	18.0 kg.
b. Lime Hydrate	5.5 kg.
Barytes	29.5 kg.
Lampblack	0.5 kg.
Tar Oil	30.0 kg.

No. 14

Blue Oil	45 lb.
Rosin Oil	17 lb.
Oil-Soluble Blue	0.2 lb.
Calcium Sulphate	20–30 lb.

No. 15

a. Rosin Oil	18 kg.
Gas Oil	31 kg.
b. Lime Hydrate	6 kg.
Gypsum	19 kg.
Lampblack	1 kg.
Blue (Mineral) Oil	25 kg.

No. 16

a. Montan Wax, Crude	20 kg.
Tar Oil	30 kg.
b. Lime Hydrate (in Water)	1.2 kg.
c. Paraffin Oil	36 kg.
Barytes	7 kg.
Lampblack	3 kg.

Carriage Grease, Medium Quality

Formula No. 1

Yellow

a. Rosin Oil	21 kg.
Mineral Oil, Pale	30 kg.
b. Lime Hydrate	7 kg.
Gypsum	12 kg.
Gas Oil	30 kg.

No. 2

Brown

a. Rosin Oil	21 kg.
Paraffin Oil, Dark	30 kg.
b. Lime Hydrate	7 kg.
Barytes	12 kg.
Paraffin Oil, Dark	30 kg.

No. 3

Blue

a. Rosin Oil	21.0 kg.
Blue Oil	30.0 kg.
b. Lime Hydrate	7.0 kg.
Gypsum	11.8 kg.
Lampblack	0.2 kg.
Blue (Mineral) Oil	30.0 kg.

No. 4

Black

a. Rosin Oil	21 kg.
Tar Oil	30 kg.
b. Lime Hydrate	7 kg.
Barytes	12 kg.
Blue (Mineral) Oil	30 kg.

Carriage Grease, High Luster

Formula No. 1

Yellow

a. Rosin Oil	24 kg.
Mineral Oil	34 kg.
Colophony	3 kg.
b. Lime Hydrate	9 kg.
Mineral Oil, Pale	30 kg.

Make up *a* and *b* separately, and mix, to get gel.

No. 2

Blue

a. Rosin Oil	27 kg.
Blue Oil (Rosin Distillate)	34 kg.
b. Lime Hydrate	9 kg.
Blue (Mineral Oil)	30 kg.

No. 3

Black

a. Rosin Oil	27 kg.
Blue Oil (Rosin Distillation)	34 kg.
b. Lime Hydrate	9 kg.
Tar Oil	30 kg.

Carriage Lubricant

Rosin (Stock) Oil	17 kg.
Lime Hydrate	8 kg.
Car Waste Oil	45–50 kg.

Lubricating Greases for Driving Gears

Formula No. 1

Castor Oil	30 kg.
Tallow	20 kg.
Colophony	20 kg.
Sodium Hydroxide, Solid	14 kg.
Cylinder Oil (Viscosity 3–4° E. at 100° C.)	1916 kg.

Procedure

Kettle: Should be open, steam-heated, to operate at 130–150° C.; should be equipped with cooling system and its stirring gear should be able to make 35–40 revolutions per minute.

(1) Put in the castor oil, tallow, colophony and 66 kg. of the cylinder oil.

(2) Mix thoroughly at 90° C.

(3) Make a 40° Bé. aqueous solution of the sodium hydroxide.

(4 Keep stirring all the time.

(5) Add slowly the caustic soda.

(6) Heat up slowly to 140° C., until, after about 2 hours, the water will be boiled away.

(7) Now add slowly the cylinder oil

(about 400 kg. should enter the kettle during 1 hour). Keep at 140° C.

(8) Test, as soon as all oil is added, if enough water has boiled away.

(9) If ready, cool as quickly as possible to secure a good consistency. Keep stirring until 35° C. is reached.

(10) Beware of too much air beaten into the mixtures.

(11) Draw off at 35° C.

No. 2

Tallow	25 kg.
Sodium Hydroxide, Solid	5 kg.
Cylinder Oil, Black (Viscosity 3–4° E. at 100° C.)	970 kg.

Procedure as in No. 1.

No. 3

Tallow	60 kg.
Stearic Acid	10 kg.
Sodium Hydroxide, Solid	12 kg.
Cylinder Oil (Viscosity 2–3° E. at 100° C.)	1918 kg.

Procedure

Put into the kettle the tallow, stearin, and 200 kg. of the cylinder oil, stir, and heat to 60° C.

Make a 30° Bé. caustic soda from the solid hydroxide, and add slowly into the kettle, mix thoroughly, start heating again, and add 200 kg. oil. Let stand overnight, keeping warm, but without mixing.

Stir up the mass next morning, and add 800 kg. cylinder oil, mix thoroughly and add slowly the remaining 718 kg. of oil.

Mix thoroughly again, then shut off steam; cool, until the consistency is correct. If necessary, more cylinder oil has to be added (test consistency by cooling samples).

Empty at about 60° C.

No. 4

Tallow	25 kg.
Lard Oil	60 kg.
Sodium Hydroxide, Solid	8 kg.
Engine Oil, Heavy, Refined (Viscosity 8–10° E. at 50° C.)	907 kg.

No. 5

Tallow	75 kg.
Sodium Hydroxide, Solid	12 kg.
Engine Oil, Refined (Viscosity 15° E. at 50° C.)	500 kg.
Engine Oil, Refined (Viscosity 6–8° E. at 50° C.)	413 kg.

No. 6

Tallow	65 kg.
Sodium Hydroxide, Solid	11 kg.
Oil Distillation Foots (Viscosity 8–10° E. at 50° C.)	600 kg.
Cylinder Oil (Viscosity 2° E. at 100° C.)	324 kg.

No. 7

Tallow	100 kg.
Sodium Hydroxide, Solid	16 kg.
Oil Distillation Foots (Viscosity 4–5° E. at 50° C.)	600 kg.
Cylinder Oil (Viscosity 2° E. at 100° C.)	284 kg.

Car-Gear Lubricant

a.	Stearic Acid (53/54° C.)	2 kg.
	Colza Oil	1 kg.
	Engine Oil, Refined	17 kg.
b.	Caustic Soda (40° Bé.)	0.8 kg.
	Caustic Potash	0.2 kg.

Saponify *a* with *b* at about 80–90° C.

Stuffing Box Grease

Formula No. 1

Montan Wax, Crude	25 g.
Rapeseed Oil	5 g.
Sodium Hydroxide (10%)	10 g.
Paraffin Oil, Dark (d. 0.910)	275 g.

(Drop-point 104° C.)

No. 2

Light Colored

Montan Wax, Double Bleached	25 g.
Oleic Acid	10 g.
Spindle Oil, Clear	80 g.
Slaked Lime, Powdered	5 g.

(Drop-point 104° C.)

No. 3

Hard Stuffing Grease

Montan Wax, Crude	15 g.
Sodium Hydroxide (38° Bé.)	3 g.
Paraffin Oil, Dark	82 g.

(Drop-point 70° C.)

Top Cylinder Lubricant Fuel

U. S. Patent 2,068,635

Formula No. 1

Motor Fuel	99.7%
Mixture	0.3%

Containing:

Lubricating Oil (220 S.S.U. @ 100° F.)	92–96%
Hexa Chlor Diphenyl Oxide	4– 2%
Ortho Dichlorbenzene	2– 1%
Butyl Stearate	2– 1%

No. 2

Motor Fuel		99.7%
Mixture		0.3%
Containing:		
Lubricating Oil (100 S.S.U. @ 100° F.)	90–97%	
Hexa Chlor Diphenyl Oxide	7– 2%	
Ortho Dichlorbenzene	2– 1%	

Metal Cylinder Surfacing Lubricant

Motor Oil	75 oz.
Vermicullite (50 mesh)	25 oz.

About one-half ounce of the above mixture is added to each cylinder through the spark plug opening. The engine is throttled down and allowed to idle for about 30 minutes then gradually speeded up and allowed to race for a few minutes. The Vermicullite particles are forced into the pores of the metal and expanded by the heat to present a solid surface.

Ford Spring Lubricant

Ice Machine Oil	75 oz.
Talc	20 oz.
Asbestos, Powdered	5 oz.

Cog Wheel Lubricant

(Liquid, leaving a tacky, solid mass on the wheel after cooling)

Ozokerite	7 kg.
Colza Oil, Blown	10 kg.
Tallow	20 kg.
Woolfat, Neutral	15 kg.
Carbon Tetrachloride or Other Solvent	8 kg.
Graphite (Flakes)	40 kg.

Cog Wheel Grease

Formula No. 1

Woolfat, Crude	20 kg.
Woolfat Pitch	10 kg.
Mineral Oil, Viscous	50 kg.
Caustic Soda (40° Bé.)	6 kg.
Graphite (Flakes)	16 kg.

No. 2

Woolfat	40 kg.
Blown Oil	10 kg.
Tallow	25 kg.
Graphite (Flakes)	25 kg.

Lubricant for Chains, Etc.

No. 1 (For Cars)

Tallow	230 kg.
Caustic Soda, Solid	30 kg.
Cylinder Oil (Asphaltum Base)	735 kg.

Procedure

500 kg. of the dark mineral oil or arrears of former batches are filled into the kettle; heat to 40° C., start stirrer.

Add the tallow, heat up to 60° C.

Dissolve the soda in water to give a concentration of 35–40° Bé. Add the soda lye to the kettle, stir for 20 minutes, open steam quickly, and after 10 minutes add 100 kg. of the dark oil (which conveniently is pre-heated), mix thoroughly, add the remaining oil in portions of 100 kg., stirring 5–8 minutes after each addition.

When all oil is added, let stand still overnight, without heating.

Crutch the mass the next morning. Warm to 112° C., until there is no water left.

If possible, let stand for a second night. Stir through for 30 minutes, test the consistency on a sample (if necessary add more mineral oil).

Take out at 55–60° C.

Trolley Electric Cable Lubricant

Ester Gum	4 lb.
Rosin Oil	1 lb.
Graphite	22 lb.
Talc	3 lb.
Naphtha	40 lb.
Tetrachlorethane	30 lb.

Chain Lubricant for Weaving Machines

Hard

Tallow	75 lb.
Cotton Seed or Olive Oil	25 lb.

Soft

Tallow	60 lb.
Rosin	5 lb.
Cotton Seed Oil	35 lb.

Cup Greases

Formula No. 1

a. Rosin Oil	24 kg.
Mineral Oil, White or Yellow	50 kg.
b. Caustic Potash (10° Bé.)	2 kg.
c. Lime Hydrate	9 kg.
Mineral Oil, Pale	15 kg.

Mix *a* thoroughly in a kettle.

Add *b* slowly, stirring vigorously.

Grind *c*, and add to *a* and *b*. When the gel is formed, let stand to next day.

No. 2

a. Montan Wax, Bleached	20 kg.
Mineral Oil, Pale	33 kg.
b. Caustic Potash (24° Bé.)	8.5 kg.
c. Mineral Oil, Pale	42 kg.

Melt *a*, and add *b* in thin jet with vigorous stirring, keeping the mass at boiling.

When saponified, add *c* and boil again. Stir until cold. Homogenize.

Yellow Grease:

Dye with a mixture of

Sudan Yellow	1 kg.
Stearic Acid	3 kg.

Red Grease:

Sudan Red	1 kg.
Stearic Acid	3 kg.

Green Grease:

Sudan Green	1 kg.
Stearic Acid	3 kg.

Melt the mixtures, and add 1–3% of these to the grease.

High Temperature Cup Grease

Barium Soap	15 lb.
Calcium Soap	5 lb.
Diglycol Stearate	3 lb.
Oil, Mineral	77 lb.

The above can suitably be made by mixing the hydrated lime and hydrated barium hydroxide stoichiometrically equivalent to the desired amount of soap with the stoichiometrical equivalent amount of fatty acid and an amount of oil equal to the amount of fatty acid. This mixture is then heated as rapidly as possible to about 300° F. Rapid heating avoids excessive foaming of the soap. When the foaming has subsided the batch is adjusted to the neutral point by adding a little hydroxide or fatty acid, whichever is required, the diglycol stearate is then added and the oil is gradually graded in. The resulting grease should be cooled rather rapidly, for instance in layers one-half to five-eighths inch thick. However, rapid cooling does not seem to be as essential as it is in some other types of greases.

One of the factors which makes the mixed calcium and barium soap greases highly desirable is the fact that each soap lends a high consistency within a particular temperature range.

Driving Journal Compound

U. S. Patent 2,070,014

Hard Tallow	18.0 lb.
Stearic Acid	18.0 lb.
Flake Caustic Soda	5.8 lb.
Steam Refined Cylinder Stock	58.2 lb.

This grease should be prepared in an open top direct fired kettle but should be so heated that the finished grease contains a small amount of glycerin.

Pipe Thread Lubricant

Zinc Dust	60%
No. 2 Cup Grease (18% Calcium Stearate; 82% 150 Vis. S.S.U. @ 100° F.)	35%
Boiled Linseed Oil	5%

Pipe Thread Lubricant

U. S. Patent 2,065,247

Lime Tallow Soap	10.7 lb.
Mineral Oil	63.7 lb.
Glycerin	1.0 lb.
Water	0.6 lb.
Zinc Dust	20.0 lb.
Sulphurized Sperm Oil	4.0 lb.

Tool Joint Lubricant Grease

The best tool-joint greases for use in oil-field work, are made by incorporating upwards of 15% red lead in the grease, which should carry a little rubber.

Non-Corrosive Lubricating Oils

French Patent 810,226

Formula No. 1

Mineral Oil	99–95 kg.
Cobalt Chromate	1– 5 kg.

No. 2

Mineral Oil	98 kg.
Nickel Chromate	2 kg.

No. 3

Whale Oil	99½ kg.
Manganese Chromate	½ kg.

No. 4

Castor Oil	99 kg.
Cobalt Chromate	½ kg.
Cobalt Oleate	½ kg.

No. 5

Mineral Oil, Heavy	95 kg.
Cobalt Oleate	5 kg.

Lowering Pour Point of Mineral Oils

Formula No. 1

U. S. Patent 2,055,417

The addition of 0.01– 1% of titanium tetrastearate lowers the pour-point of oils.

No. 2

The addition of 7.5–10% of blown rape-seed oil to mineral oil prevents undue thickening at low temperatures.

Low Pour Point Lubricant

Canadian Patent 363,725

Pennsylvania Turbine Oil	99.95 lb.
Titanic Stearate	0.05 lb.

The addition as above lowers pour point of oil from –4° to –20°.

Lubricant for Electrical Collectors

a. Tallow	24 kg.
Mineral Oil	66 kg.
Castor Oil	6 kg.
Ceresin	18 kg.
b. Graphite, Finest	6 kg.
Copper Powder, Finest	0.5 kg.

Melt *a*, and disperse *b*.

Weighted Oil-Base Drilling Fluid

U. S. Patent 2,055,666

A drilling fluid consists of oil, e.g., paraffin gas oil, containing a suspended powdered weighting material having a greater tendency to be wetted by oil than by water, e.g., powdered oyster shell, fuller's earth, iron pyrites or oxide, silica, or barytes.

Grease for Drilling Tube Couplings

Graphite, Silver or Casting	50 lb.
Suet	6 lb.
Caustic Soda	1¾ lb.
Machine Oil (E_{50} 4–5)	42¼ lb.

Gasometer Lubricant
German Patent 645,327

Graphite	10
"Soluble" Mineral Oil	60
Water	40

Mix vigorously.

Wire Rope Lubricant
U. S. Patent 2,028,155

Asbestos	10 oz.
Heavy Mineral Oil	39 oz.
Aluminum Oleate	1 oz.
Blown Oil	50 oz.

Boring Fluids
French Patent 803,828

	Formula No. 1	No. 2
Naphtha	83 cc.	84 cc.
Oleic Acid	2 cc.	1 cc.
Suspension of Hydrated Lime in Water	5 cc.	5 cc.
Suspension of Barium Sulphate in Water	10 cc.	5 cc.
Suspension of Bentonite in Water	—	5 cc.

Graphite Lubricants
Formula No. 1

Colloidal Graphite	100 kg.
Camphor Oil, Light	100 kg.
Trichlorethylene	300 kg.
Petroleum	500–600 kg.

No. 2

Colloidal Graphite	100 kg.
Camphor Oil, Light	100 kg.
Blown Castor Oil	200–300 kg.
Carbon Tetrachloride	300 kg.
Petroleum	200–300 kg.

Wire Drawing Lubricant
U. S. Patent 2,040,321

Tallow	3.0 lb.
Rape Oil	1.5 lb.
Soap	0.5 lb.
Water	95.0 lb.

Warm together and emulsify. In using maintain pH at 8–9.

Wire Drawing Composition
Canadian Patent 371,725

Bentonite	20 lb.
Kaolin	25 lb.
Soap	5 lb.
Soda Ash	30 lb.
Sodium Silicate	20 lb.
Water	to suit

Metal Drawing Lubricant
British Patent 467,050

Tallow	64 oz.
Mineral Oil	32 oz.
Soap	½ oz.
Colloidal Sulphur	3 oz.
Colloidal Graphite	½ oz.

Melt together and mix well.

Cold Drawing Metal Lubricant
U. S. Patent 2,008,939

Dipotassium Hydrogen Phosphate	20 g.
Water	80 g.
Sulphonated Castor Oil	1 g.
Glycerin	33 g.

Drawing Compound for Aluminum

Diglycol Stearate	6 lb.
Glycowax A	2 lb.
Water	56 lb.

The entire mass is heated to about 180° F. and then stirred at moderate speed until uniformly dispersed. For small parts, such as collapsible tube blanks, they are dipped into the hot disperson while in a wire basket and then centrifuged to remove excess lubricant. If a microscopic protective film is not required on the finished work, the glycowax may be replaced by additional diglycol stearate.

Brass Drawing Lubricating Emulsion
Formula No. 1

Lard Oil, Prime	40 lb.
Diglycol Laurate	10 lb.
Water	50 gal.

No. 2

Lard Oil, Prime	40 lb.
Soap, Neutral	5 lb.
Diglycol Laurate	5 lb.
Water	50 gal.

These emulsions wash off readily and do not attack brass.

Sheet Steel Drawing Lubricant

1. Soap, Neutral	10 lb.
2. Diglycol Laurate	7 lb.
3. Lard Oil, Prime	13 lb.
4. Mineral Oil	20 lb.
5. Water	200 gal.

Warm together 1, 2, 3 and 4 until clear and pour into water slowly and mix well. In certain cases it is desirable to add

White Lead	3 lb.

Non-Seizing Threads and Gaskets

Two applications of colloidal graphite are advisable, each followed by drying. Frequently, best results are obtained by hot dipping the bolts or studs in dilute graphite solutions. Where gaskets are used on flanges, sticking is eliminated by impregnating the gaskets with a dispersion of colloidal graphite in water, or by coating the gasket surface. Oftentimes, when bolts have become tight, penetrating oils containing colloidal graphite are effective in loosening them.

Machine Tool Lubricant

French Patent 818,256

Linseed Oil Neutralized	55 kg.
Olein	10 kg.
Caustic Potash	2½ kg.
Methyl Alcohol	10 kg.
Ethyl Alcohol	10 kg.
Isobutyl Alcohol	7½ kg.

Slushing Oil for Metal Protection

U. S. Patent 2,069,626

Pine Fatty Acids	3– 5%
Amber Petrolatum	8–15%
Light Paraffin Oil	89–80%

Horse-Shoe Grease

Formula No. 1

Woolfat, Neutral	5.2 kg.
Spindle Oil	2.0 kg.
Soft Tar	0.5 kg.
Paraffin Wax	0.3 kg.
Water	about 2.4 kg.

No. 2

Montan Wax, Crude	20 kg.
Woolfat, Crude	15 kg.
Train Oil	5 kg.
Black Color	1 kg.
Paraffin Oil, Dark	59 kg.

Lubricating Oil for Motor Cylinders

(Upper Cylinder Lubricant)

Lubricates and seals the space between cylinder-surface and piston, and is introduced together with the gasoline in which it ought to be soluble.

Castor Oil, Mineral Oil-Soluble	30 gal.
Engine Oil, Refined (Viscosity 7–8° E. at 50° C.; sp.g. 0.920–0.940; ignition point 200–230° C.; thickening point –4° C.)	30 gal.
Benzol or Benzine	30 gal.
Camphorated Oil	10 gal.

Use 2–3 volumes in 1,000 volumes gasoline.

Brake Oil

Castor Oil, Neutral	10 kg.
Alcohol	10 kg.

Flushing Oil for Crank Cases

Canadian Patent 359,288

Benzene	60 fl. oz.
Alcohol	30 fl. oz.
Acetone	10 fl. oz.
Ordinary Flushing Oil	100 fl. oz.

Chassis-Protecting Oil

a. Graphite	5 kg.
Filtered Waste Oil	10 kg.
b. Crude Oil	35 kg.

Mix *a* with heating till homogeneous, and add *b* while it is still hot. Penetrates into the non-accessible parts of the chassis, and leaves a protecting layer of graphite and oil. Loosens rust-tightened screws, valves, plungers, etc.

Rifle Oil

Paraffin Oil, Refined	85 kg.
Oleic Acid, Distilled	15 kg.
Caustic Potash (40%) or Ammonia (25%)	sufficient to saponify

or

Mineral Oil, Refined	85
Olein	11
Triethanolamine	5

Watch and Chronometer Oils

In the preparation of watch and chronometer oils much depends upon the freshness of the fat at the time the oil is rendered and the freedom of the material from adulterants. Fresh substance produces much better oil than that which has partly decomposed, the product being sweeter and less rancid. No choice seems to exist between the porpoise-jaw oil and the black-fish-head oil, both producing refined articles of equal merit; but that of the black-fish seems to be the favorite by a slight margin among the refiners, owing to its having more body, and possibly also to its greater abundance. A peculiarity of these oils is that they improve with age, differing in this particular from blubber oils. This is accounted for by the alternate gathering and emission of moisture upon exposure to changes of temperature, and by this and other treatment they become clear and brilliant, in consequence of which they are seldom used within less than a year or two after they are obtained.

On receipt of the oil at the factory the first step in the process of refining is to gently heat it to complete the process of cooking begun by the fishermen. The oil is then placed in tanks or casks to await the process of grading, and often two years may elapse ere the trained and skillful eye of the refiner can determine to what class it belongs. It is almost impossible to describe the extremely delicate variations in color, texture, odor, and flavor which enter into this grading. The claim is made that there are not half a dozen men in the world who have had the training and experience necessary to separate these delicate oils into their proper classes, and yet a very large part of the reliability of watch and chronometer lubricants lies in the gradation under the almost instinctive skill of the refiner.

After two years or more of rest, the oil has gotten to a condition where its surplus oxygen has united with whatever animal or loose organic matter may have been floating in miscroscopic particles within it, and they are easily removed by the ordinary strainers of an oil factory. But something is still left in the oil which is very sensible to the high or low range of temperature, and to remove this requires its subjection, while spread out in thin layers, to a temperature far below zero. No further change in its construction can be made except at this very low temperature, nor must it be cooled too rapidly. When properly done the process is one most interesting to watch. All through its liquid amber little flecks of translucent material appear, joining and rejoining like frost on a window pane into most beautiful forms, resembling a miniature forest whose foliage is white. By means of a certain fine and close-grained fabric these particles at this juncture are filtered out; and strange to say, this residuum, once a portion of a brilliant, almost colorless fluid, never even at normal temperature becomes anything but a slimy mass, resembling poor lard.

To be thoroughly satisfactory the refined oil must be of uniform quality, entirely devoid of acidulous properties, absolutely gumless, withstand the rigors of the coldest climate without congealing, and maintain its body or stability in a high temperature. This is the most delicate and highly refined lubricant known, and some has been produced for which a temperature of -50° F. has been claimed. While all watch-oil users do not prefer colorless fluid, the average customer demands an oil almost if not absolutely colorless and of crystal clearness. Much of the product is sold for repairers' use in wooden boxes containing 1 dozen half-ounce bottles, each bottle inclosed in a small pasteboard box. The remainder, in tin cans having capacity for 1 pint, 1 quart, or of larger capacity, goes to the manufacturers of watches, clocks, chronometers, typewriters, etc.

Laboratory Stopcock Lubricants

Formula No. 1

Standard Viscous Oil (#24 or #32)	80 g.
Beeswax	20 g.

Heat the oil to about 100–120° C., add the beeswax and mix thoroughly. Use of oil #24 gives a lubricant of medium body, #32 gives a very, very firm, viscous product. This formula is useful where one does not care to take the time needed for preparation of rubber products. Standard Viscous Oil is manufactured by the Standard Oil Company of California, Richmond, Calif.

No. 2

Petroleum Jelly (Petrolatum)	100 g.
Beeswax	10 g.
High-Grade Red Rubber Tubing (Small Pieces)	20 g.

Heat together for several hours at 150°, until the mixture is homogeneous. Pour into wide-mouthed jars.

No. 3

White Petrolatum	77.5 g.
Paraffin Wax	15 g.
Pale Rubber Latex	7.5 g.

Heat on an oil bath for 6 hours at 130°.

No. 4

Rubber Cement	20 g.
Petrolatum	80 g.

Mix and warm until all solvent has evaporated.

Anti-Corrosion Oil

Canadian Patent 362,601

Metallic parts in contact with water are protected by adding the following to the water to the extent of about 5%:

Spindle Oil	81 oz.
Sulphonic Acid (Oil-Soluble)	15 oz.

Core Oils for Foundries

The firmest core oils are produced by mixing linseed oil with water. Boiled linseed oil has the advantage of not being sticky, but the cores are not readily broken up after casting. As a rule linseed oil mixed with other oils is used. Care is required in the choice and incorporation of the core oils so that the "Parting" sand grains shall be covered with a regular coating of oil. Light and heavy tar oils are mixed with linseed oil, as, used alone, they lack strength. Recommended mixtures are 6 parts American gas oil, 3 parts linseed oil, and 1 part of dark whale oil. A cheaper mixture is made from 2 parts of rosin, 2 parts of fish oil ,and 6 parts of a mineral lubricating oil. Sulphite cellulose waste liquor is used for the purpose, the value depending on the presence of soluble resins, and the concentrated liquor is the best for this. A very good method is to grind the solid extract in with the sand, and when wetted with water can be shaped as desired. The extract burns off during casting, and the core can be readily removed when required.

Non-Crystallizing Rosin and Core Oils

U. S. Patent 2,042,877

A solution of rosin in gasoline, or other suitable solvent, and which solution may be that usually obtained by the extraction of disintegrated wood with gasoline, is fed to an evaporator simultaneously with a suspension of an alkali, as soda ash (2% on the rosin) in gasoline. The soda ash thus becomes intimately mixed with the rosin, a portion of which will react with the soda ash to produce a rosin soap which will be well incorporated with the rosin. In the illustration given there will be about 11.6% of soap incorporated with the rosin recovered from the evaporator.

Core Oils

40 parts (by weight) of rosin and 30 parts of raw linseed oil are melted together and to the melt is added 5 parts of soap, (in terms of dry soap) as sodium resinate and the mixture heated to about 165° C. until the water is evaporated and a homogeneous solution obtained. If desired, say about 30 parts of, for example, kerosene, containing, if desired though not necessary, about 5 parts of aniline, may be added to the rosin-linseed oil-soap solution, and the rosin will be found in solution and free from crystals after seventy-six days as compared with crystallization in about five days with similar rosin untreated. It will be appreciated that instead of adding soap to the rosin-linseed oil solution, there may be added an alkali with the production of the desired soap in the solution.

As a further illustration say 40 parts (by weight) of rosin and 30 parts of raw linseed oil are melted and brought to a temperature of about 165° C. then 30 parts of, for example, kerosene containing 5 parts of aniline are added to the rosin-linseed oil solution formed. The core oil thus produced will stand nineteen days without crystallization as compared with crystallization in five days where untreated rosin is used. The core oil produced as above may be improved so that the rosin will remain in solution without crystallization for forty-nine days by heating the rosin-linseed oil kerosene solution for a few minutes under a reflux condenser at a temperature of say 275° C.–300° C.

When it is desired to effect treatment of the rosin with an aldehyde as furfural, such may be incorporated in amounts of from 2–5% with the rosin alone or when compounding the rosin.

Plastic Mold Lubricant

Bright Drying Carnauba Wax Emulsion	2 oz.
Pine Oil	5 drops

The above is sprayed into mold, before use, and permits easy ejection of molded articles.

Molding Press Lubricant

Salt	200 g.
Water	700 g.
Alcohol	100 g.
Glycerin	100 g.

Ceramic Mold Lubricant

Crude Naphthenic Acids	5–20 oz.
Kerosene	60–95 oz.
Petroleum Sludge	20 oz.

Penetrating Oils

Formula No. 1

Heavy Lubricating Oil	30 oz.
Amyl Acetate	0.5 oz.
Cottonseed Oil	2.0 oz.
Kerosene	67.5 oz.

No. 2

Kerosene	20 oz.
Light Mineral Oil	70 oz.
Butyl Alcohol, Secondary	10 oz.

No. 3

Gas Oil	50 oz.
Kerosene	48 oz.
Cottonseed Oil	2 oz.

No. 4

U. S. Patent 2,041,076

Kerosene	60 –75 g.
Lubricating Oil (100 S.S.U. at 100° F.)	22 –37 g.
Chlorinated Stearic Acid	0.5– 3 g.
Butyl Butyrate	0.1– 2 g.

No. 5

U. S. Patent 2,021,448

Kerosene	60 g.
Sulphonated Castor Oil	20 g.
Sulphonated Coconut Oil (Neutralized with Rosin Soap)	20 g.
Alcohol	1 g.

This forms an emulsion when mixed with water.

No. 6

U. S. Patent 2,041,076

Kerosene	60 –75 lb.
Lubricating Oil	22 –37 lb.

Chlorinated Ethyl Oleate	0.5– 3.0 lb.
Amyl Acetate	0.1– 2.0 lb.

Penetrating or Rust Loosening Oils

Formula No. 1

British Patent 414,874

Engine Oil	1 qt.
Naphtha or Kerosene	3 qt.
Carbon Bisulphide	2 oz.
Camphor Oil	1–2 oz.
Graphite Powder	1–4 oz.

No. 2

Paraffin Oil	70 g.
White Spirit	100 g.
Pine Oil	30 g.
Blown Colza Oil	30 g.
Carbon Tetrachloride	10 g.

No. 3

Light Mineral Oil	70 g.
White Spirit	20 g.
Secondary Butyl Alcohol	10 g.

No. 4

Light mineral oil with 2 to 10 per cent graphite addition, and 0.05 per cent to 0.10 per cent nitrobenzene for purposes of rendering odor attractive.

It is probable that carbon bisulphide, carbon tetrachloride and butyl alcohol are something in the nature of ''creep'' compounds, improving the ''wetting'' characteristics, and therefore spreading power, of the mixture.

No. 5

Graphite (Coarse Flakes)	5.30 g.
Ethyl Acetate	0.05 g.
Paraffin Oil	94.60 g.

''Water-Soluble'' Oils
(For Cutting Edges, Drills, etc.)
Drilling Oils

Formula No. 1

Olein	16 g.
Spindle Oil, Refined	73 g.
Caustic Soda (36° Bé.)	6 g.
Alcohol, Denatured	5 g.

No. 2

Olein	20 g.
Spindle Oil, Refined	72 g.
Caustic Potash (40° Bé.)	8 g.

No. 3

Talloil, Refined	20 g.
Spindle Oil, Refined	70 g.
Caustic Potash (36° Bé.)	10 g.

No. 4

Talloil, Refined	20 g.
Spindle Oil, Refined	72 g.
Caustic Soda (36° Bé.)	8 g.

No. 5

Train Oil Fatty Acid	20 g.
Spindle Oil, Refined	70 g.
Caustic Potash (40° Bé.)	7 g.
Hexalin	3 g.

.No. 6

Naphthenic or Hydroxy-Fatty Acid	12 g.
Spindle Oil, Refined	80 g.
Caustic Soda (36° Bé.)	6 g.
Benzoline	2 g.

No. 7

Colophony (Rosin)	8 g.
Olein	6 g.
Spindle Oil, Refined	78 g.
Caustic Soda (24° Bé.)	8 g.

No. 8

Turkey Red Oil	15 g.
Olein	10 g.
Spindle Oil, Refined	65 g.
Caustic Potash (40° Bé.)	10 g.

No. 9

Bone Fat Fatty Acid	20 g.
Olein	5 g.
Spindle Oil, Refined	63 g.
Caustic Soda (24° Bé.)	12 g.

No. 10

Lanolin Fatty Acid	16 g.
Spindle Oil, Refined	75 g.
Caustic Potash (24° Bé.)	9 g.

No. 11

Woolfat Fatty Acid	7 g.
Lanolin Fatty Acid	8 g.
Spindle Oil, Refined	77 g.
Caustic Soda (24° Bé.)	8 g.

No. 12

Olein	18 g.
Spindle Oil, Refined	45 g.
Caustic Potash (40° Bé.)	7 g.
Water	30 g.

The amount of caustic must be varied since the saponifiable materials are not constant in acidity.

For Formulae 1–8 the following procedure is applied:

Put the saponifiable raw materials in the kettle, together with 50–70% of the spindle oil. Heat up to 90–100° C., and stir in the alkali thoroughly.

Boil with good continuous stirring.

The saponification can be considered finished, when the oils look homogeneous and do not thicken any further.

Then add the remainder of the refined spindle oil, which may be heated previously to about 60° C.

Carry on the heating and stirring until homogeneous.

If addition of alcohol or hexalin is intended, this should be done together with the alkali, because it helps the saponification. However, most of the alcohol is evaporated in this way and does not form a component of the formula.

If alcohol, hexalin, or benzoline are wanted in the oil, they ought to be added to the finished, cooled oil.

It should be kept in mind that a part of the water of the lye evaporates during the manufacture. Thus it might happen that the finished products gelatinize, and, of course, there is less yield. The evaporated water, therefore, ought to be substituted, either by adding enough water to the lye, or by introducing small portions of hot water during the manufacture. About 50% water (on the base of the amount of lye) are sufficient in most cases—depending, however, upon the method of manufacture.

If too much water is in the product, it can be eliminated by boiling. There should only be so much water left in the finished product that no cloudiness can be observed. Otherwise, the finished oil may separate into layers. However, the addition of alcohol, hexalin, or other such compounds tends to counteract such a separation.

The “water-soluble” oils (formulae No. 11 and 12 are manufactured in the same, hot way. They are made up with a higher water-content. They are filled when liquid.

When fatty acids are used, the manufacture can be done by the “half-warm” method:

The fatty acid and the total amount of spindle oil are saponified at 70° C. At this temperature the caustic lye is stirred in thoroughly (using lye in slight excess). Thereafter the kettle is covered and remains standing overnight to have a complete saponification.

Anti-Rust Soluble Oil

Light Mineral Oil	65 lb.
Sulphonated Cod Oil	27 lb.
Olein	10 lb.
Water	5 lb.
Caustic Soda	2 lb.
Cresol	1 lb.

Modified Turkey Red Oil
German Patent 636,193

Castor Oil	93 kg.
Phthalic Anhydride	15 kg.

React for 8 hours at 140–150° C. in an open kettle with good agitation.

Cool the product to 10° C., and sulphonate in the known way with concentrated sulphuric acid. Neutralize the sulphonate with alkali.

Soluble Oil Base

Rosin	15 lb.
Red Oil	15 lb.
Mineral Oil	10 lb.
Potassium Hydroxide (45%)	5 lb.
Isopropyl Alcohol	10 lb.
Wetanol or Other Wetting Out Agent	1 oz.

Warm together and mix until uniform.

“Soluble” Kerosene

a. Oleic Acid	15 g.
Rosin	15 g.
b. Kerosene	10 g.
c. Trigamine	20 g.

Melt *a* together at 85° C. with high speed stirring. Add *c* and continue stirring. Then turn off the heat and add *b* slowly with stirring. This gives a clear transparent liquid which emulsifies readily in water.

Boring Fluid for Heaving Shale Ground
French Patent 804,368

Bentonite	30 lb.
Quebracho Extract	2 lb.
Caustic Soda	7 lb.
Water	61 lb.

Non-Corrosive Rock Drill Lubricant
British Patent 469,889

Mineral Oil	90 lb.
Wool Wax	10 lb.
Lead Oleate	¼ lb.
Chromium Oleate	1/10 lb.

Cutting Oil

Talloil, Refined	20 kg.
Spindle Oil, Refined	72 kg.
Caustic Soda (38° Bé.)	8 kg.
Alcohol	to clear
Fatty Acid	a little, to clear

Cutting (Drill) Oil
U. S. Patent 2,086,479

Glyceryl Monostearate	75 g.
Sperm Oil	150 g.
Sodium Salt of Sulphonated Oleyl Alcohol	50 g.
Water	1200 cc.

Warm and mix vigorously.

Cutting Oil for Magnesium Alloys

Sulphonated Oil	11.5 oz.
Soap	17.5 oz.
Cottonseed Oil	8.5 oz.
Oleic Acid	10.5 oz.
Mineral Oil	2.0 oz.
Water	50.0 oz.

Fish Liver Oils
British Patent 438,349

In the extraction of oils from fish livers or other marine animal tissue by breaking down the tissue by dilute alkali, separating the scum containing the oil, and breaking this emulsion, there is used to break the emulsion a liquid—e.g., ethyl alcohol—which is miscible with water but not with the oil. For example, 6 cwt. of halibut livers is pulped by live steam, the volume made up to 135 gal. with water, about 5 per cent relative to livers of scale caustic potash added, and the mixture brought to boiling by steam and allowed to stand for 24 hours; the lower aqueous layer is run off, and the emulsion remaining is warmed by steam and broken by stirring in 5 gal. of industrial alcohol; 5 gal. of water is added to bring the oil to the surface, the aqueous layer run off, an equal volume of saturated brine added to the oil, and the whole boiled, settled, and passed through an oil separator.

Shark Oil

The size and weight of the liver varies with the season of the year, and the species of the shark. The weight of the liver is about one-fourth the total weight of the shark, and the Leopard or Tiger Shark yields more oil than most of the other species. The oil in a shark is concentrated in the liver, and the hide and the meat contain practically no oil.

As soon as the shark is skinned, remove the livers, cut out the galls, and render the livers when they are still fresh. The oil does not spoil after being rendered. If the livers are not rendered within a day after the shark is caught, the particles of meat and tissues become decomposed, and give off a strong putrid odor, and the oil when rendered, will retain this odor.

A high temperature is not required to render the livers. If the livers are hung up in the hot sun, the oil will drip out of them. This primitive method is sometimes used in gathering the oil.

Rendering

An ordinary kettle of about 60 gallon capacity is used with a *slow fire* underneath. Put water in the kettle to cover the bottom to a depth of 2 or 3 inches, to avoid burning the oil. Cut the fresh livers into large pieces, put them into the kettle, and stir *frequently* with a paddle. It takes 2 or 3 hours to render the oil. Allow the oil to cool, and the gurry to settle. Then remove the oil with a dipper, and strain same into a barrel. The straining is done with several layers of cheese cloth. Care should be used not to dip out any of the water, as the oil should be entirely free of water, and should also be free from gurry (meat and tissues).

Other Methods

If a steam packeted kettle is available, better results can be obtained. Even if steam is not available, water can be used in the steam jacket, with a slow fire underneath the kettle. Be sure *not* to plug up the pipes leading down to the steam jacket compartment when water is used, otherwise the steam jacket might burst. When a steam jacket kettle is used, it is not necessary to put water in the kettle. In this way *no* water is mixed with the oil, which makes the rendering more satisfactory, and improves the quality of the oil.

The methods described above are simple and rather crude, but are economical, and are used successfully in rendering the oil for industrial purposes. If steam is available, a steam jacketed kettle is used; or a rendering plant is constructed. In a rendering plant the steam is blown through perforated pipes into a tank or barrel containing the livers. As the livers are rendered, the water goes to the bottom, and is drawn off, and the oil floats to the top, and is allowed to flow by gravity through a pipe to settling tanks, and is then run off and strained into barrels.

Neatsfoot Oil

Neatsfoot oil is produced from a pure neatsfoot stock which is made from shin bones and feet of cattle. Feet are thoroughly washed, trimmed and the sinews tanked for glue. Bones are sawed and hoofs removed in hot water. The bones are then cooked in boiling water in an open vat. Feet bones are cooked for about 10 hours and shin bones 5 hours.

Fat is skimmed off and strained through heavy drilling into a steam-jacketed kettle where it is heated to about 240° F. It is then settled for about 7 hours at that temperature. Heat is then cut off and fat allowed to stand for 6 hours longer. Fat is drawn off and filtered through cotton flannel bags into an iron tank from which it may be run into barrels or otherwise packaged.

This is pure neatsfoot stock. In production of neatsfoot oil the stock is grained at a temperature of approximately 34° F. for about two weeks. It is then pressed, a temperature of 34° being maintained during the pressing process. This first pressing yields a pure neatsfoot oil, the finest grade obtainable, with a clouding point of 16 to 18 and a very low free fatty acid content.

Stearine is re-grained and pressed and a second grade neatsfoot oil obtained. The clouding point of this oil is about 26 to 28° F.

Inedible greases are sometimes grained and pressed to yield a commercial neatsfoot oil. The method followed is similar to that used in graining and pressing neatsfoot stock. Temperatures which are used vary according to the kinds of greases as these have different melting and solidifying points.

Real neatsfoot oil is always branded "pure" neatsfoot oil, as distinguished from the so-called "commercial" neatsfoot oil.

Castor Oil Soluble in Mineral Oil

Attempts that have been made to increase the viscosity of mineral oils by the addition of castor oil (the most viscous of all fatty oils) have led to various processes with the object of rendering castor oil soluble in mineral oils.

All the processes known up to the present involve profound chemical modifications of the castor oil, i.e., partial fission of the molecule. One process consists in rapidly heating castor oil to 300° C. when partial decomposition occurs with formation of oenanthol and undecylenic acid. Distillation is interrupted when the loss in weight reaches 10 to 12 per cent. The residue so obtained is miscible with mineral oils in all proportions.

According to another method, castor oil is heated in an autoclave for several hours under 8 to 10 atmospheres; the glycerin is completely separated and the ricinoleic acid is polymerized. On continuing to heat at 180° C. the greater part of the ricinoleic acid is transformed into triricinoleic acid, which is then esterified with castor oil to forms esters of fatty polyacids.

Again, it has been proposed to heat castor oil under pressure in an autoclave in presence of a gas such as air, nitrogen or carbon dioxide.

German Patent 608,973 states that solutions of castor oil in mineral oils can be prepared without drastic chemical modification of castor oil and without corresponding losses in weight by mixing the castor oil with high-molecular, more or less highly chlorinated aliphatic hydrocarbons in certain proportions. Castor oil is miscible in all proportions with these halogenated hydrocarbons. The clear mixtures obtained have the property of forming homogeneous mixtures with unmodified mineral oils under certain conditions.

In most cases it is advisable to heat the castor oil-chlorinated hydrocarbon mixture for a little time at 200° C. before adding the mineral oil; no fission whatever of the castor oil takes place nor is there any loss in weight. Alternatively the mineral oil may be mixed with the chlorinated hydrocarbon in the cold or at a moderate temperature before finally adding the castor oil.

The following examples illustrate the procedure:

Formula No. 1

On passing a stream of chlorine into molten paraffin, hydrochloric acid is evolved with the formation of chlorinated substitution products of varying consistencies. With a 10 per cent chlorine content, paste-like products are formed which on subsequent chlorination are transformed into yellow or red oils of varying viscosities. The chlorinated hydrocarbons are free from acid and miscible in all proportions with castor oil.

No. 2

95 parts by volume of a Russian spindle oil are mixed in the cold with 5 parts of a mixture of 30 parts by volume castor oil and 70 parts by volume chlorinated paraffin (30 per cent chlorine), to yield a clear oil which remains homogeneous and is very stable at low temperatures.

No. 3

80 parts by volume of spindle oil in admixture with 20 parts of a mixture of equal parts castor oil and chlorinated paraffin (30 per cent chlorine) yield a clear, homogeneous oil after heating for a short time at 200° C.

No. 4

40 parts by volume of spindle oil are mixed with 40 parts by volume of chlorinated paraffin (40 per cent chlorine) before adding in the cold 20 parts by volume castor oil. A clear oil is formed which remains clear and homogeneous after heating to 100° C. and then cooling.

No. 5

German Patent 632,478

Castor Oil	100 kg.
Bleaching Earth	4–6 kg.

Heat in a distillation apparatus to 140° C. for several hours, drawing off the air by a vacuum pump, to prevent oxidation. Filter.

The product is miscible with hydrocarbons of the paraffin series, as used in lubricating oils.

Castor Oil Miscible with Mineral Oil

Hungarian Patent 116,570

Heat castor oil with potassium bicarbonate in vacuo at 230–280° C.

Parting or Dividing Oil for the Greasing of Baking Forms

Refined Vegetable Oil	25	kg.
Methyl Cellulose	10	kg.

Potato Flour	1.5 kg.
Moldex (Preservative)	0.15 kg.
Water	63.35 kg.

Lubricant with Anti-Oxidant Properties

Lubricating Oil	99–99.9 lb.
Triphenyl Phosphite	1– 0.1 lb.

Lubricant, Bodied

Lubricating oil may be bodied to any desired viscosity, even to that of a grease, by the incorporation therein of Vistanex Medium. Heating the oil will facilitate making the mass homogeneous.

Improving the Bloom of Lubricating Oil

U. S. Patent 1,998,292

From 0.1% to 3% furfural is added to the lubricating oil stock just prior to the final sulphuric acid treatment. Solvent refined lubricating oils may be retreated with small amount (2 to 6 pounds per barrel) of sulphuric acid containing small amounts of furfural or the furfural may be added to the solvent treated oil before acid contacting.

Prevention of Sludge in Lubricating Oil

U. S. Patent 2,059,567

Sludging is prevented by the addition of:

Chromium Oleate	up to	0.4%
or Tin Oleate	up to	0.1%
or Tetraethyl Lead	up to	0.1%

Water in Oil Emulsion Lubricant

British Patent 440,575

50 grams of a heavy paraffin oil is mixed with 1 g. of n-lauryl-1-sulphuric acid and stirred with 0.25 g. of lead acetate dissolved in 48.75 g. of water. The resulting emulsion is a heavy grease and has good lubricating properties, and may readily be extended with oil.

Solidification of Mineral Oils

German Patent 620,260

1. Beeswax	5 g.
2. Kerosene	100 g.
3. Soft Soap, Medicinal	3 g.
4. Alcohol, Denatured	5 g.

Melt 1.; add 2., and thereafter the mixture of 3. and 4., which has been previously heated to 65° C.

This is done by pouring both additions at the same time, or in two separate thin jets. Quick and thorough stirring is necessary. Cool. Product is of petrolatum-consistency.

Recovering Used Lubricating Oil

Allow solids to settle and then pour off upper layer and heat to 40° C. and treat with 2% sodium silicate at 40° C. Then treat with 2% zinc sulphate. Allow coagulation to go to completion and filter.

Reclaiming Journal Box Oil

U. S. Patent 2,023,988

Sodium Silicate	660 lb.
Sodium Aluminate	5 gal.

Mix with 100 gal of waste oil and heat above 100° C. Allow to settle and decant.

Dewaxing Oil

Formula No. 1

British Patent 447,415

The oil is mixed with a 3 to 1 mixture of ethylene dichloride and benzene to give a solution denser than the wax precipitated by chilling. After chilling the wax is removed in a centrifugal separator.

No. 2

Canadian Patent 360,567

The oil is mixed with 4 volumes of methyl isobutyl ketone and chilled to −10° F. The wax precipitates and is filtered off.

Composition for Preventing Wax Deposits in Oil Wells

U. S. Patent 2,092,936

Sulphonated Castor Oil	25 gal.
Corn Oil and Oleic Acid Mixed Soap	5 gal.
Oxalic Acid (10° Bé.)	5 gal.
Sulphonated Pine Oil	5 gal.
Solution of Naphthalene 5 lb. Benzene 9 gal.	9 gal.

Ammonia to make slightly alkaline.

Removing Wax from Oil Well Tubing

The most successful of the various materials marketed for the removal of paraffin deposits from the tubing at water sand levels in pumping oil-wells, is a mixture of 70% carbon tetrachloride and 30% benzol. In use, this mixture is often diluted somewhat with naphtha. While it is claimed to be beneficial when merely poured into the tubing and allowed to work down through the crude for two or three hours before pumping, the only way to do a good job is to allow the crude to settle back down to sand level, then reseat the pump piston, pour in 10–15 gallons of the material, and start pumping.

Fluorescent Color for Lubricating Oil

British Patent 438,425

A mixture of finely powdered pyrene and 5 per cent of anhydrous aluminium chloride is gently boiled for ten minutes and allowed to cool; the black product is freed from aluminium chloride by boiling with dilute hydrochloric acid, dried, and extracted with boiling xylene, *s*-tetrachlorethane or other solvent of the fluorescent material; after removal of the solvent a reddish-brown powder remains; 1 lb. is added to 100,000 lb. of petroleum lubricating oil.

Transformer Insulating Oil

U. S. Patent 2,036,274

Trichlorbenzol	90 lb.
Tetrachlorethane	10 lb.

Finely divided zinc oxide is suspended in this.

Petroleum Demulsifiers

Formula No. 1

Some of the demulsifiers marketed to promote separation of water from crude oil are various dilutions of sulphonated vegetable oils. Such products are usually used in proportion of 1. to 10,000.

No. 2

U. S. Patent 2,074,183

The oil is mixed in continuous phase with

Caustic Soda	25 lb.
Sodium Acetate	10 lb.
Alcohol	20 lb.
Glycerin	10 lb.
Water	35–45 lb.

Lubricant for Milkers' Hands

Formula No. 1

Paraffin, Hard	16 kg.
Ceresin, White	14 kg.
Mineral Oil	200 kg.

No. 2

Mineral Oil, White	30 kg.
Ceresin, White	10 kg.
Woolfat, Neutral	10 kg.
Antiseptic*	

* 1% Boric acid, or
2% Salicylic Acid, or rather:

Methyl Parahydroxybenzoate	6.5 g.
Propyl Parahydroxybenzoate	3.5 g.
Per 1000 g. lubricant	

Fluid for Boring Holes in Rubber Stoppers

Anhydrous alcohol facilitates boring holes in rubber stoppers and evaporates leaving a clean bore.

Prevention of Clouding in Olive Oil

After addition of 0.1–0.5% of air-blown cacao butter, olive oil remains liquid and free from deposited stearin on storage at 2–4°.

Bleaching Fats, Oils, Waxes

German Patent 632,516

Formula No. 1

a. Rape Seed Oil	100 kg.
b. Acetic Anhydride	500 cc.
Hydrogen Peroxide (45%)	500 cc.

Add the freshly prepared mixture *b* to *a*, agitate, and heat to 60-70° C. Wash the oil with water.

No. 2

a. Sulphur-Olive Oil	100 kg.
b. Acetic Anhydride	1.5 l.
Hydrogen Peroxide (45%)	0.5 l.

Mix *b*, add it to *a*, mix well, heat to 70° C.

Rapid Etching of Glass for White and Silky Matte

For the speeding up of glass etching a dipping bath of the following composition is recommended:

Formula No. 1

2 lb. hydrofluoric acid; 4 lb. ammonium fluoride; and 1 lb. sal soda (crystalline): The bath should be mixed in a lead or a gutta percha tank, the ammonium fluoride being added to the hydrofluoric acid. For thorough dissolving it is necessary to keep the tank in a fairly warm place for about 8 hours. Before pouring the solution through a coarse linen filter into the etching tank, it should be well stirred. Small quantities of the soda are added under constant stirring until all of it is dissolved.

The glass is freed from all impurities prior to the etching process by rinsing it in slightly acid water (3 per cent nitric acid will suffice) but all of the water must drain off before dipping the glass quickly into the etching bath where it is moved about for 2 to 3 minutes. After drying the glass articles on a tri-cornered rack, they are rinsed in cold water and brushed and scrubbed in warm water. The workers should wear rubber gloves as a protection against the hydrofluoric acid.

The depth of the white is determined by the amount of sal soda. For a soft silky effect the quantity should be cut down. The temperature of the dipping room should not be below 50° F., preferably around 62° F.

No. 2

For the etching of the inside of hollow-ware the amount of hydrofluoric acid of the recipe should be cut down by 50 per cent and the sal soda 25 per cent. The etching fluid poured into the hollows is left there for 6 to 8 minutes. When the etching fluid is to be applied by brush, it should first be thickened by an extra amount of sal soda.

No. 3

Hydrofluoric Acid	2 oz.
Ammonium Fluoride	2 oz.
Soda Ash	1 oz.
Water	as needed

Glass Etching Resist

U. S. Patent 2,089,571

Rosin	2 oz.
Beeswax	6–7 oz.
Paraffin Wax	7–8 oz.
Asphalt	10 oz.
Chrome Yellow	16 oz.
Varnish	3 oz.
Turpentine	3 oz.
Tallow	3 oz.
Japan Drier	to suit

Glass Etching Paste

Glycerin	4 oz.
Gum Karaya	2 oz.

Rub well together and then work in

Ammonium Fluoride (Concentrated Solution)	94 oz.

Frosting Glass

U. S. Patent 2,111,576

The glass is immersed in melted lithium nitrate for 2–15 minutes.

Frosting for Inside of Glass Bulbs

Formula No. 1

U. S. Patent 1,997,375

Hydrofluoric Acid (40%)	38 oz.
Ammonium Fluoride	38 oz.
Sulphuric Acid	5 oz.
Water	15 oz.
Paraffin Wax, Powdered	19 oz.

No. 2

U. S. Patent 2,122,512

The method of inside frosting thin hollow glassware such as lamp bulbs, consists in injecting three successive shots of a glass etching fluid, each for approximately two seconds, against the interior of the ware in a position to flow down over all of the surface to be etched, the solution containing the following ingredients:

Ammonium Acid Fluoride	38 lb. 3 oz.
Hydrofluoric Acid (60%)	10 l.
Sodium Acid Sulphate	11 lb. 1 oz.
Sodium Fluoride	11 lb. 1 oz.
Molasses	12 l.
Water	6 l.

flowing water at approximately 63° C. over the exterior of the surface for approximately the same length of time that the etching fluid is flowing over the interior of the surface and thereafter washing out the interior of the surface with fluid under a higher pressure than that at which the etching fluid is impinged upon the interior of the ware.

Glass Decoration

U. S. Patent 1,977,625

The glass heated to about 600° C. is sprayed with the following:

Silver Oxide	0.06 oz.
Lead Borate	0.11 oz.
Rosin	32.62 oz.
Copiaba Balsam	10.00 oz.
Turpentine	56.67 oz.

Annealing then gives a bright silver film.

COLORED GLASSES

Red Ruby Glass

Sand	1000 g.
Soda Ash	180 g.
Potash	150 g.
Selenium	1 g.
Limespar	150 g.

The above should not be heated for too long a period of time, and the crucible should be kept well covered to prevent volatilization of the selenium.

Yellow Glass

Sand	630 g.
Potassium Carbonate	250 g.
Limespar	103 g.
Cadmium Sulphide	11 g.
Sulphur	6 g.

Bright Green Glass

Sand	1000.00 g.
Limespar	166.00 g.
Soda Ash	330.00 g.
Fluorspar	28.00 g.
Iron Oxide	0.45 g.
Chromic Oxide	0.65 g.
Potassium Chromate	0.45 g.
Lead Chromate	1.35 g.

Dark Green Glass

Sand	1000 g.
Soda Ash	240 g.
Nitre	20 g.
Limespar	100 g.
Potash	120 g.
Red Lead	20 g.
Potassium Chromate	20 g.
Chromic Oxide	10 g.
Copper Oxide	60 g.

Bright Blue Glass

Sand	1000.0 g.
Soda Ash	380.0 g.
Limespar	240.0 g.
Cobalt Oxide	2.8 g.
Manganese Dioxide	0.5 g.

Dark Blue Glass

Sand	500 g.
Limespar	75 g.
Soda Ash	175 g.
Cobalt Oxide	1 g.

Purple Glass

Sand	1000.00 g.
Limespar	250.00 g.
Potash	650.00 g.
Black Nickel Oxide	7.25 g.

Purple Glass

Sand	1000.00 g.
Limespar	250.00 g.
Soda Ash	500.00 g.
Black Nickel Oxide	7.25 g.

Violet Glass

Sand	1000 g.
Limespar	140 g.
Potash	300 g.
Niter	60 g.
Manganese Dioxide	40 g.

Amber Glass

Sand	635 g.
Sodium Sulphate	50 g.
Sodium Carbonate	160 g.
Limespar	142 g.
Sulphur	10 g.
Arsenious Oxide	3 g.

Black Glass

Sand	1000 g.
Soda Ash	350 g.
Limespar	150 g.
Black Oxide	60 g.

Brown Glass Batch

U. S. Patent 2,014,230

0.5–3.0% of ammonium sulphate and 0.5–5.0% of organic matter are added to the ordinary glass batch.

Tempering Glass

Formula No. 1

Canadian Patent 372,779

Glass is heated above its annealing temperature in a fusion of

Lithium Nitrate	33 lb.
Potassium Nitrate	30 lb.
Sodium Nitrate	26 lb.
Potassium Nitrite	11 lb.

At a temperature above 500° C. and then chilling.

No. 2

British Patent 449,602

A sheet of glass is heated to just short of the softening point and then subjected to a number of sprays of fine liquid mist equally on both sides, the liquid being aqueous or non-aqueous and the dispersing and motive fluid for dispersing being a gas. All operations are conducted with the sheet in a vertical position.

Laminated (Safety) Glass

U. S. Patent 2,003,288

A sheet of cellulose acetate or similar material is cemented between two glass sheets with a solution containing potassium borate or boxax 1 g., or boric acid 0.25 g., and saturated aqueous silicic, stannic, chromic, or arsenic acid 0.25 g. per 100 cc.; a pressure of 150 lb./sq. in. is employed at 117°.

Multicellular Glass

British Patent 447,805

Crushed glass mixed with materials which develop gas at a high temperature is placed in a mold which is then heated to the softening temperature of the glass and cooled when the desired degree of cellular structure is attained. The gas-producing materials may function by reaction among themselves or with the glass. A mixture of glass 90, silica 3, sodium sulphate 6, and carbon 1%, if heated to 850°, produces a glass of *d* 0.45. (b) The mixture is placed in a (graphite) mold preheated to 800–900°.

Luminescent Glass

German Patent 617,148

Fuse the following mixture:

Sand	74 lb.
Boric Acid	6.6 lb.
Soda Ash	18.5 lb.
Potassium Carbonate	10.3 lb.
Lanthanum Carbonate	0.33 lb.
Zinc Oxide	2.80 lb.
Later add	
Zinc	0.68 lb.
Selenium	0.90 lb.

Photoluminescent Glass

Formula No. 1

Glass that is luminescent to light of short wave lengths is made by fusing

Tin Oxide	14 g.
Potassium Permanganate	56 g.
Barium Carbonate	350 g.
Magnesium Oxide	110 g.
Aluminum Hydroxide	215 g.
Phosphoric Acid	2200 g.

The above may be flashed with turbid glass made by fusing

Zirconium Oxide	56 g.
Barium Carbonate	350 g.
Magnesium Oxide	110 g.
Aluminum Hydroxide	215 g.
Phosphoric Acid	2200 g.

No. 2

British Patent 460,210

Phosphoric Acid (d 1.75)	1000 lb.
Barium Carbonate	175 lb.
Alumina	70 lb.
Magnesium Oxide	55 lb.
Copper Oxide	10 lb.
Sugar	25 lb.

X-Ray Absorption Glass

U. S. Patent 2,025,099

The glass contains alkali substantially nil, lead oxide (62), and barium oxide (added as barium carbonate or barium nitrate) (5)%.

Telescope Mirror Glass

(Low Expansion)

British Patent 446,733

Sand	410 lb.
Boric Acid	148 lb.
Niter	14 lb.
Lithium Carbonate	3.6 lb.
Cryolite	3 lb.
Alumina	6 lb.
Arsenic Trioxide	5 lb.

Decolorizing Glass

German Patent 645,048

Coloration of glass by iron compounds is avoided by using a melt of the following composition:

Sand	50 lb.
Calcium Oxide	15 lb.
Soda	25 lb.
Sodium Fluoride	1½ lb.
Sodium Nitrate	½ lb.

Plaster Mold for Roofing Tiles

Use a slurry of well-burned slow-setting plaster (1 g.) in water (0.66 vol.) containing

Sodium Sulphate	15 g.
Magnesium Chloride	15 g.
Magnesium Carbonate, Powdered	10 g.
Cement, Powdered	25 g.
Water	1 l.

Cast into well greased molds and allow to set.

Building Tile Composition

Formula No. 1

U. S. Patent 2,049,882

A high-magnesia lime 40 is used with gypsum 10, ground blast-furnace slag 70, "silica quartz" 24, a pigment 5 and calcined sodium sulphate 1 part by weight).

No. 2

U. S. Patent 1,970,921

Marble Dust	60 lb.
Portland Cement	40 lb.
Casein	7 oz.
Water	7 gal.

The above after drying in forms is coated with a cement paste containing 2% of following:

Calcium Stearate	10	lb.
Marble Dust	2	lb.
Dye	2	lb.
Glue	1¼	lb.
Casein	1¼	lb.
Ammonium Chloride	2	oz.
Water	3	gal.

Artificial Marble
German Patent 625,892

White Portland Cement	1	kg.
Ground Quartzite	2–2.5	kg.
Ground Fat Lime	0.3–0.35	kg.
Mineral Coloring Matter	.006	kg.

Oil Coating for Glass Fibers
U. S. Patent 2,107,284

Bright Stock (Petroleum) Oil	20 –40 %
Oleic Acid	12.6–18.5%
Ammonia (28°)	4 %
Water	to make 100 %

Tridymite Stone
U. S. Patent 2,066,365

A method of manufacturing tridymite stone consists in burning for about 20 hours a silica mass of which part is finely ground mixed with sulphite of lye and the approximate proportions of 2% chalk, 1.5% soda ash and 1.5% iron oxide with pyrometer cone 15 to 16.

Soapstone Table Preservative

Boiled Linseed Oil	1 gal.
Turpentine	1 gal.
Ceresin	4 oz.

Apply hot.

Modelling Clay
Formula No. 1

Glycery Oleate	10 oz.
Red Oil	50 oz.
Beeswax, Crude	20 oz.
Castor Oil	15 oz.

Pipe-Clay, Powdered sufficient to suit

No. 2

Tallow	19 oz.
Gum Mastic	30 oz.
Beeswax, Crude	3 oz.
Ozokerite	2 oz.
Paraffin Wax	4 oz.
Gypsum	12 oz.
Pipe Clay	60 oz.

Ceramic Glaze

Aluminum Chloride (Anhydrous)	60 lb.
Magnesium Chloride (Anhydrous)	20 lb.
Salt	10 lb.
Borax	10 lb.

Kieselguhr Ceramics
British Patent 448,755

Kieselguhr is mixed into a paste with 4–5% of magnesium chloride molded, and baked at 800–1200° C.

High Strength Ceramic Ware
Canadian Patent 372,655

The strength of clay ware is improved by adding ½–2% chestnut extract and ½–2½% salt to clay in the plastic state.

Enamelware, Testing

Write with ink on the surface of the enamelware and allow to dry thoroughly. Wash off with cold water (do not rub). No stain will remain if the enamel is of good quality.

Pottery Saggers

Fat Plastic Bonding Clay	20 oz.
Medium to Open Burning Fire Clay	30 oz.
Calcined Broken Saggers or Fire Brick (¼" or smaller pieces)	50 oz.

Vitreous Enamels
Ground Coat

Material	Raw	Melted
	Formula No. 1	
Flint	680.00 lb.	
Borax	170.00 lb.	
Sodium Nitrate	50.00 lb.	
Red Lead	170.00 lb.	
Cobalt Oxide	0.85 lb.	
	1071.00 lb.	956 lb.
Clay	51 lb.	44 lb.
	1122.00 lb.	1000 lb.
	No. 2	
Flint	675.0 lb.	
Borax	390.0 lb.	
Sodium Nitrate	35.0 lb.	
Red Lead	52.5 lb.	
Cobalt Oxide	3.0 lb.	
	1155.5 lb.	948 lb.
Clay	60.0 lb.	52 lb.
	1215.5 lb.	1000 lb.
	No. 3	
Sand	200 lb.	
Feldspar	200 lb.	
Borax	390 lb.	
Sodium Nitrate	30 lb.	
Red Lead	100 lb.	
Magnesium Carbonate	10 lb.	
	930 lb.	720 lb.

Vallender Clay	325 lb.	279 lb.
Cobalt Oxide	1 lb.	1 lb.
	1256 lb.	1000 lb.

No. 4

Sand	275 lb.	
Potash Feldspar	435 lb.	
Borax	375 lb.	
Red Lead	41 lb.	
	1126 lb.	948 lb.
Vallender Clay	57 lb.	49 lb.
Cobalt Oxide	3 lb.	3 lb.
	1186 lb.	1000 lb.

White Enamel—Top Coat

Formula No. 1

Material	Raw	Melted
Quartz	50 lb.	
Borax	50 lb.	
Feldspar	75 lb.	
Cryolite	20 lb.	
Soda Ash	10 lb.	
Saltpeter	6 lb.	
	211 lb.	175 lb.
Tin Oxide	21 lb.	
Clay	12 lb.	10.4 lb.
	244 lb.	185.4 lb.

No. 2

Flint	1200 lb.
Barium Carbonate	256 lb.
Saltpeter	600 lb.
Soda Ash	424 lb.
Zinc Oxide	105 lb.
Magnesium Carbonate	24 lb.
	2609 lb.

Dusting Enamel (Vitreous) for Cast Iron Type

Material	Raw	Melted
Soda Ash	24 lb.	
Feldspar	343 lb.	
Vallender Clay	58 lb.	
Cryolite	114 lb.	
Borax	572 lb.	
Tin Oxide	194 lb.	
Saltpeter	6 lb.	
Ammonium Carbonate	9 lb.	
Magnesium Carbonate	6 lb.	
Fluorspar	6 lb.	
	1332 lb.	1000 lb.

The above should be screened through a 60 mesh sieve before using.

High Lead Enamel (Vitreous) Top Coat

Material	Raw	Melted
Soda Ash	50 lb.	
Borax	165 lb.	
Barium Carbonate	75 lb.	
Fluorspar	120 lb.	
Potash Feldspar	380 lb.	
Red Lead	175 lb.	
Sodium Nitrate	25 lb.	
Tin Oxide	85 lb.	
Zinc Oxide	60 lb.	
	1135 lb.	1000 lb.

High Tin (Vitreous) Enamel Top Coat for Cast Iron Type

Material	Raw	Melted
Soda Ash	21.0 lb.	
Borax	555.0 lb.	
Magnesium Carbonate	5.5 lb.	
Fluorspar	5.5 lb.	
Potash Feldspar	340.0 lb.	
Ammonium Carbonate	8.0 lb.	
Cryolite	110.0 lb.	
Sodium Nitrate	5.5 lb.	
Tin Oxide	188.5 lb.	
Vallender Clay	55.0 lb.	
	1294.0 lb.	1000 lb.

Vitreous Enamel

U. S. Patent 2,063,252

An enamel slip is formed by milling clay and water with a frit formed by smelting

Sodium Zirconium Silicate	26.43
Aluminum Hydrate	8.06
Potash Feldspar	9.20
Quartz	20.04
Sodium Nitrate	3.50
Borax	32.50
Fluorspar	5.41
Cryolite	3.44
Zinc Oxide	12.07
Titanium Dioxide	10.00

This forms a blue enamel for use on metals or ceramics.

Improved Vitreous Enamel

French Patent 806,654

	Formula No. 1	No. 2
Borax	20 lb.	14 lb.
Feldspar	30 lb.	40 lb.
Quartz	11.3 lb.	11 lb.
Sodium Carbonate	15 lb.	5 lb.
Fluorspar	4 lb.	—
Sodium Nitrate	1.7 lb.	5 lb.
Cobalt Oxide	0.36 lb.	—

Magnesium Borosilicate	17 lb.	9 lb.
Cryolite	—	14 lb.

Vitreous Enamel Glaze Base

British Patent 456,714

Magnesium Borosilicate	17 lb.
Borax	20 lb.
Fluorspar	4 lb.
Feldspar	30 lb.
Quartz	11.3 lb.
Soda Ash	15.0 lb.
Sodium Nitrate	1.7 lb.
Cobalt Oxide	0.36 lb.

Opaque Vitreous Enamel

British Patent 455,980

Borax	360 lb.
Feldspar	448 lb.
Quartz	280 lb.
Soda Ash	112 lb.
Sodium Silicofluoride	112 lb.
Fluorspar	60 lb.
Zinc Oxide	30 lb.

After mixing, melting and quenching 100 lb. of dried frit is milled with

White Clay	10 lb.
Zinc Sulphide	6 lb.
Zinc Oxide	7 lb.
Water	45–50 lb.

Up to 1 lb.

Extra White Vitreous Enamel

British Patent 455,771

Enamel Frit	1000 lb.
Water	500 lb.
Benzidine	¼ lb.
Uranium Oxide	4 lb.
Clay	100 lb.

Grind and apply and fire in usual way.

Blue Vitreous Enamel

U. S. Patent 2,063,252

Sodium zirconium silicate 26.43; aluminum hydrate 8.06; potash feldspar 9.20; quartz 20.04; sodium nitrate 3.50; borax 32.50; fluorspar 5.41; cryolite 3.44; zinc oxide 12.07; and white titanium oxide 10.00 to form a frit, and then milling the frit with clay and water to form the enamel slip.

Acid-Resistant Vitreous Enamel

U. S. Patent 2,010,776

A fusible enamel for sheet steel is prepared by fritting

Boron Oxide	2–10%
Sodium Oxide	15–30%
Silicon Dioxide	55–75%

Another frit consists of

Sodium Oxide	15–30%
Boron Oxide	2–10%
Silicon Dioxide	50–75%
Titanium Dioxide	1–10%
Antimony Oxide	1– 5%
Aluminum Oxide	0.5– 5%
Calcium Fluoride	1– 5%

Vitreous Porcelain Batch

U. S. Patent 2,077,610

H. P. 1 Canadian Ball Clay	6–23%
Spar	15–20%
Kaolin Clay	7– 8%
China Clay	17–32%
Whiting	1– 6%
Flint	38–40%

Electrical Range Enamel

1. Ground Coat

Borax	34.0 lb.
Feldspar	36.0 lb.
Quartz	22.0 lb.
Soda	7.5 lb.
Saltpeter	4.0 lb.
Fluorspar	3.5 lb.
Calcium Carbonate	2.0 lb.
Nickel Oxide	0.25 lb.
Cobalt Oxide	0.25 lb.

2. Finish Coat

Feldspar	63 lb.
Borax	54 lb.
Quartz	38 lb.
Soda Ash	234 lb.
Sodium Nitrate	180 lb.
Fluorspar	162 lb.
Antimony	236 lb.
Cryolite	25 lb.
Zinc	18 lb.
Boric Acid	27 lb.
Litharge	72 lb.
Barium Carbonate	38 lb.

In preparing enamel slips for application, the frit is ground wet and contains about 5 to 10% of plastic clay for the purpose of floating the enamels.

Removing Porcelain Enamel

British Patent 473,556

Hydrofluoric Acid	20 lb.
Sulphuric Acid	20 lb.
Water	60 lb.

Treat with the above including a pickling inhibitor.

Non-Organic Binder for Porcelain Enamel Frit

Abopon (Sodium Boro-Phosphate)	100 cc.
Water (over 170° F.)	100 cc.

This solution is added to 100 pounds of the regular frit mix. If it is then ground to 200 mesh fineness, it may be sprayed at about 90 pounds pressure.

The total solids should be about 55%. Abopon may not be used with sulphide colors because of the formation of soluble sulphates.

An enamel coat with the above binder is much firmer than is the case with gums and may be handled previous to firing with much less danger to the surface from finger marks, etc. The surface after firing seems to give higher gloss, smoother finish and enables finger marks to be removed with a dry rag. Certain colors are intensified, especially greens. The Abopon being entirely inorganic, there is no possibility of carbonization.

Brown Glaze for High Tension Insulators

Sodium Oxide	0.012
Potassium Oxide	0.247
Magnesium Oxide	0.001
Calcium Oxide	0.680
Aluminum Oxide	0.800
Iron Oxide	0.080
Chromium Oxide	0.044
Manganese Oxide	0.150
Silicon Dioxide	7.030

Ceramic Underglaze Color Medium for Stencil Color Printing

Copaiba Balsam	31 oz.
Oregon Balsam	9 oz.
Glyceryl Monoricinoleate	a few drops

Ceramic Overglaze Decoration Coating

Pine Oil	1 qt.
Dammar, White	4 oz.

Warm together until dissolved.

Preventing Efflorescence of Silicate Coatings

U. S. Patent 2,069,486

About 2-3% of formaldehyde, acetaldehyde or formamide is added to prevent efflorescence.

Colored Roofing Granules

U. S. Patent 2,054,317

Constancy of color is obtained by a preliminary fused coat on base material and then fusing on a mixture of pigment and the following:

Formula No. 1

Borax	16 lb.
Silica	20 lb.
Minium	20 lb.
Feldspar	30 lb.
Cryolite	20 lb.
Potassium Nitrate	5 lb.

No. 2

Feldspar	25 lb.
Flint	5 lb.
Minium	15 lb.
Plaster	1 lb.

The above mixtures are used at 540–870° C.

Coloring Roofing Granules

Canadian Patent 368,645

Granules are covered with

Phosphoric Acid (75%)	40 lb.
Chrome Oxide	18 lb.
Zinc Oxide	4 lb.

Light Household Cement

U. S. Patent 2,032,142

Powdered Flint	62 oz.
Sodium Silicate	14 oz.
Water	14 oz.
Aluminum Fluoride	10 oz.

Light Cellular Cement

U. S. Patent 2,053,842

The following is whipped to a stiff foam and used for gauging hydraulic cement:

Glue	1.0 lb.
Water	98.8 lb.
Formaldehyde	0.2 lb.

Heat Resisting Cement

U. S. Patent 2,063,102

Exfoliated vermiculite 60–70 is used with fire clay 20–30 and hair 0.5–2.0%, the hair burning out at high temperatures to form numerous voids.

Acid Resistant Cement

Acid Resistant Powder	100 oz.
Sodium Silicofluoride	3– 4 oz.
Sodium Silicate (d. 1.36)	17– 20 fl. oz.

Clinkerless Slag Cement

Granulated Blast Furnace Slag	88 lb.
Burned Dolomite	5 lb.
Anhydrite	5 lb.
Gypsum	2 lb.

Hardening Cement-Asbestos Surface

British Patent 462,251

Surface of asbestos-cement products may be hardened by coarse grinding, then using a 10% solution of zinc silicofluoride and finally subjecting the surface to fine grinding, and if desired, to a polishing operation.

Magnesium Oxychloride Cement

U. S. Patent 2,030,022

First mix dry the following:

Magnesium Oxide	40 lb.
Barium Sulphate	40 lb.
Chalk	20 lb.

Then mix the above with ⅖ of its volume of the following liquid mixture:

Magnesium Chloride (27° Bé. Solution)	60 lb.
Hydrochloric Acid (21° Bé.)	20 lb.
Sulphuric Acid (22° Bé.)	20 lb.

Toughened Cement
British Patent 445,613

Calcined Magnesite	6 lb.
Sawdust	3 lb.
Flint Flour	10 lb.
Soapstone	1 lb.
Aluminum Hydroxide	⅛ lb.

Mix the above with 18 lb. of the following:

Magnesium Chloride (20° Bé.)	20 lb.
Black Molasses	¼ lb.

Slow Setting Plaster of Paris

The addition of 2% gelatin to the water used prevents setting for 48 hours.

Dental Plaster Accelerator

An anti-expansion accelerating solution recommended a short time ago by a dental investigation committee contains 4 per cent potassium sulphate, 0.04 per cent alizarin sulphate, and amounts of borax varying between 0.4 per cent and 1 per cent.

Accelerator for Setting of Plaster of Paris

Same as above.

Cement Setting Accelerator

Use 0.4–2% borax to hasten setting of cements.

Colored Coating for Cement

Sodium Silicate (d. 1.13)	1.0 lb.
Sand	48.3 lb.
Cement	24.2 lb.
Water	6.3 lb.
Mineral Pigment	4.8– 9.7 lb.

This coating adheres well and eliminates hair cracks.

Colored Concrete

Pigments as below are ground in a ball mill with cement (1 lb. pigment, 9 lb. cement) and mixed with aggregate before adding water. White cement is used for full effects.

Color Desired	Pigment Used
Cream Buff Yellow	Brown or Yellow Sand
Blue	Ultramarine
Brown	Iron Oxide
Buff	Synthetic Iron Oxide or Yellow Ochre
Gray Slate	Black Iron Oxide or Lampblack Free from Oil
Red Pink	Red Iron Oxide
Green	Chromium Oxide

All pigments should be free from uncombined sulphur, soluble salts and organic material.

Light Weight Cement Concrete
British Patent 458,537

Portland Cement	1 lb.
Sand	½– 6 lb.
Seed Husks	2–12 lb.

Water to give sufficient fluidity for casting.

''Sealing'' Concrete

For every bag of concrete add 1–1.5 kg. of the following:

Oleic Acid, Distilled	100 kg.
Chalk	35 kg.
Water	300 kg.

Saponify by heating and agitating for some time. Collect the precipitated soap.

Concrete Sealing Compound
British Patent 460,736

Glue	1 lb.
Water, Boiling	480 lb.
Castor Oil, Sulphonated	30 lb.
Stearic Acid	54 lb.

Of this, enough is used to give 4.5 oz. of fatty acid (stearic, palmitic, oleic, linoleic, ricinoleic acid, etc.) for 1 cwt. of concrete.

Joint Compound
U. S. Patent 2,108,276

An improved joint compound comprises substantially the following elements: Quick-setting cement, two pounds; finely divided metallic aluminum, .02 of one per cent of the weight of the cement; finely divided, degreased iron filings, four per cent of the weight of cement; lamp black, two per cent of the weight of cement; fine, sharp clear sand, one-fourth of the bulk of cement; finely powdered hydraulic lime, one-tenth of the bulk of cement.

Porous Concrete
U. S. Patent 2,077,374

A concrete mixture for making porous and air-penetrable bodies comprises an aggregate of small particles of dustless coal cinders, cement and a water resisting coating binder consisting of burnt powdered dolomite limestone having an analysis of

Silica	27 %
Iron and Aluminum Oxides	1.30%
Magnesium Carbonate	32 %
Calcium Carbonate	39.70%

and to which is added 12% of wood-ash before burning.

Gas-Proof Concrete

Concrete (1:3) is made oxygen proof by incorporating 2½% calcium chloride.

Gas-Proof Mortar
Austrian Patent 150,003

Sand	25 kg.
Quick Lime	75 kg.
Cement, Chamotte	10 kg.
Bituminous Emulsion (50%)	1.2 kg.
Sodium Silicate (36–38° Bé.)	1 kg.
Water	10 l.
Magnesium Chloride (15–20° Bé.)	3 l.
Magnesium Silicofluoride	0.8 kg.

Hardening Concrete Floors

Dilution of one gallon of special concrete silicate of soda with four (4) gallons of water will give a solution that will cover 1000 sq. ft. of floor space. This treatment hardens the surface, improves the wearing qualities, and prevents excessive dusting. It also makes the floor impervious to oil and greases which tend to rot the concrete and cause it to disintegrate. Prior to this treatment, the floor should be cleaned thoroughly to remove grease spots, plaster, etc. Then, after scrubbing with clear water, the floor should be allowed to dry for several days if practical. The number of coats of silicate solution depends upon the porosity of the concrete.

Heavy Concreto

The proportions per cu. yd. are: cement 752 lb., magnetite 2700, gravel 1150, water 48 gal. The weight is 182 lb. per cu. ft. and strengths of 4800 lb. in 28 days are obtained. There is a tendency to late strength. The surface is hard and resistant to abrasion.

Refractory
U. S. Patent 2,033,886

Olivine	2 lb.
Chrome Ore	1 lb.
Calcined Magnesite	3 lb.

Refractory
Canadian Patent 358,842

Silicon carbide 95 parts by weight, 50 mesh or finer, bentonite about 3 parts, and sodium metasilicate 2 parts, mixed to a thick paste with water, placed in a covered container for enough time to permit the bentonite to absorb the silicate solution and fired.

Refractory Resistant to Caustic
U. S. Patent 2,062,962

Magnesium Oxide	50 lb.
Alumina	50 lb.

Refractory Furnace Bricks
U. S. Patent 2,043,640

Calcine 40 parts of dolomite, 30 parts of blast furnace slag, 20 parts ganister and 10 parts of bauxite, moisten the same with a liquid solution composed of equal parts of calcium magnesium chloride and aluminum chloride to chemically bind these elements and to render the same of proper consistency; mold the mixture into bricks and dry the same at a temperature between 200° and 400° F.

Petroleum Retort Lining
U. S. Patent 2,033,644

Portland Cement	50.0 lb.
Shredded Mineral Wool	33.0 lb.
Diatomaceous Earth	16.7 lb.

Plaster Molds for Roofing Tile

A slurry is made of well burned slow setting plaster in water (0.66 volume)

Sodium Sulphate	1 kg.
Magnesium Chloride	15 kg.
Magnesium Carbonate, Powdered	10 kg.
Cement, Powdered	25 kg.
Water	1000 l.

This is cast in well greased molds and allowed to set.

Graphite-Silicon Carbide Refractory
British Patent 465,313

Graphite	36 lb.
Silicon Carbide	60 lb.
Sand	12 lb.
Ferromanganese	16 lb.
Tar	50 lb.

Fire at 800–900° C. or 1100–1300° C.

Sound Insulating Composition
U. S. Patent 2,046,142

Sawdust	50 lb.
Calcined Dolomite	25 lb.
Ground Slag	10 lb.
Pulverized Clay	10 lb.
Dextrin	5 lb.

Add sufficient water to make workable; press into shape and dry at 80–120° C.

Sound Absorbing Composition

Formula No. 1

British Patent 417,922

Exfoliated mica is used with the following binder:

Casein	25 lb.
Water	32 lb.
Caustic Soda (15%)	10 lb.
Alum	2½ lb.

After the casein has swelled and mixed until smooth, run in slowly with good mixing

Water	57½ lb.
Gasoline	57½ lb.

Put into forms and allow to dry.

No. 2

U. S. Patent 2,049,832

A 7% rubber solution, 1 gal., is used with 13 lb. of a dry aggregate mixture containing granulated naval cork 8, granulated pumice 4 and powdered magnesia asbestos 1 part.

Acoustical Plaster

U. S. Patent 2,037,995

Gypsum	8 –10 lb.
Slag	8 –10 lb.
Exfoliated Vermiculite	0.8 – 1.1 lb.
Short Asbestos	0.8 – 1.1 lb.
Soap Bark, Powdered	0.15– 0.25 lb.

Acoustic Wall Board

Formula No. 1

Crushed wood is treated with live steam and then mixed with a 10% aluminum sulphate solution. Slabs, prepared from this by molding under pressure, are then dried at 90–130° C.

No. 2

Pumice (Powdered)	55–45 kg.
Lime	15 kg.
Portland Cement	30–40 kg.

Form into slabs (after guaging with water) and press at 10 kg./cm^{2}.

Sound and Heat Insulation

Kieselguhr is ground with 2–10% of lead oxide, moistened to give a plastic mass, molded, dried at 110°, and fired for a short time at 1000°. The diatom shells become fastened together by lead silicate at the points of contact, giving a mass with sufficient rigidity to permit its being formed into thin sheets.

Heat and Sound Insulation

U. S. Patent 2,041,120

Wood wool is rendered resistant to fire, rot and termites by treatment with

Ammonium Phosphate	2 lb.
Ammonium Sulphate	8 lb.
Wood Pulp	8–15 lb.

Water to make a workable pulp

Put in forms and apply pressure while drying.

Sound and Heat Insulation

British Patent 457,842

Slag or mineral wool is impregnated with

Sodium Silicate (d. 1.33)	10 lb.
Ammonium Sulphate (2.5% Solution)	20 lb.

After molding into desired shape, the forms are dried.

Sound and Heat Insulating Artificial Stone

Kieselguhr (Finely Ground)	100 lb.
Litharge	2 lb.

Heat together at 700–1000° C. for 5–20 minutes.

Heat Insulating Composition

Formula No. 1

U. S. Patent 2,033,106

Kieselguhr (Calcined at 1100° C.)	73 lb.
Bentonite	8 lb.
Asbestos Fiber	10 lb.
Sodium Silicate	1 lb.
Magnesium Carbonate, Light	8 lb.

Make into a slurry with water and force under pressure into a filtering mold to remove excess water. Dry and calcine.

No. 2

U. S. Patent 2,046,142

Sawdust	50 lb.
Calcined Dolomite	25 lb.
Ground Slag	10 lb.
Pulverized Clay	10 lb.
Dextrin	5 lb.

Water to make a paste or plastic.

Press into shape and dry at 175–250° F.

No. 3

U. S. Patent 2,050,089

Felt or asbestos is formed into sheets or rolls, using the following binder:

Starch	9 oz.
Gum Arabic	10 oz.

Water (at 50° C.) sufficient to give a specific gravity of 1.106.

Thermal Insulation

Russian Patent 45,149

Asbestos	58 lb.
Clay	42 lb.
Sawdust	100 lb.

Mix together with sufficient water for applying.

Plastic Heat Insulation

Formula No. 1

U. S. Patent 2,072,081

Blue Clay	40 lb.
Flaxseed Meal	15 lb.
Green Tow	22 lb.
Hemp Waste	5 lb.
Waste Sulphite Liquor	10 gal.

No. 2

U. S. Patent 2,062,996

A mixture for kneading with water to form a plastic heat insulating composition consists by volume ratio:

Pure Clay	0.8–1.3
Waste Hemp Fines	1.5–2.5
Balsa Wood Fine Particles	4.5–8.0
Milled Paper	1.2–2.2
Asbestos	1.2–2.5

No. 3

German Patent 645,182

Kieselguhr	10 kg.
Gypsum	100 kg.
Water	440 kg.

Spark Plug Insulator

U. S. Patent 2,045,318

Steatite	32.7 lb.
Kaolin	43.3 lb.
Feldspar	24.0 lb.

This acts as binder for the corundum used.

Electrical Insulation

British Patent 467,243

Silicic Acid (Freshly Precipitated)	42
Silica	50
Plastic Clay	5
Calcium Carbonate	3

Heat at 1300–1600° C.; cool and fill voids with molten low viscosity paraffin wax.

Wall Board, Insulating

Canadian Patent 356,833

Long fibrous material, such as excelsior is saturated in the following solution:

Water	250 gal.
Sodium Silicate	4 lb.
Magnesium Oxide	4–6 lb.

The surplus solution is drained off and the fibrous material is sprinkled with a coating of sifted cement to absorb residual moisture. The material is spread in molds and compressed until cement sets and then removed and dried.

Porous Ceramic Insulation for Cables

British Patent 476,629

Precipitated Silica (80–85% Water)	50 lb.
Powdered Glass	42 lb.
Plastic Clay	5 lb.
Precipitated Chalk	3 lb.

Fire at 1400° C.

Boiler Insulation

Asbestos	15 lb.
Magnesium Carbonate	85 lb.

Insulation for Dynamo and Transformer Plates

German Patent 645,182

Potato Flour	300 g.
Water	10 l.

Bring to a boil and while mixing vigorously add

Sodium Silicate (30–40%)	400 g.
Sugar Syrup	100 g.

Wood Floor Fillers

Sawdust	60 g.
Varnish	30 g.
Asbestine	10 g.

Hiding of Small Defects in Lumber for Furniture, Etc.

Formula No. 1

Spent Lime, Powdered	1 lb.
Rye Flour	2 lb.
Linseed Oil	1 lb.
Umbra, Burnt	to suit

Apply a thin coat of this putty.

No. 2

Shellac Solution Wood Meal	to suit

Make a paste and apply in a thin coat.

No. 3

Liquid (Plastic) Wood, that is a 5–7% solution of highly viscous nitrocellulose or film waste in suitable solvents, which is mixed with a suitable amount of finest dry wood flour, sawdust, or cork powder, and a suitable color (alcohol-soluble dye).

No. 4

Bleach with a solution of hydrogen peroxide, 3%, containing 1.2 g. of ammonia (0.910) per liter.

No. 5

Water	40 g.
Hydrogen Peroxide (8% Vol.)	8 g.
Sodium Silicate Solution	0.33 g.
Potassium Permanganate	*

* Enough not to give a colored solution but to induce gas development continuously.

Wood Preservative

Formula No. 1

French Patent 789,694

Dinitrophenol	5 kg.
Mineral Oil	95 kg.

The above may be emulsified with water and an emulsifying agent.

No. 2

French Patent 792,392

Potassium Acid Fluoride	38 kg.
Potassium Carbonate	34 kg.
Potassium Dichromate	36 kg.
Dinitrophenol	2 kg.

No. 3

U. S. Patent 2,041,655

Potassium Dichromate	34 oz.
Copper Sulphate	30 oz.
Chromium Acetate	6 oz.
Boric Acid	30 oz.

No. 4

U. S. Patent 2,106,978

Copper Sulphate	3 lb.
Sodium Arsenite	1 lb.
Sodium Dichromate	3–5 lb.

No. 5

British Patent 468,378

Sodium Dichromate	20.6 lb.
Arsenic Acid	55.9 lb.
Zinc Oxide	12.8 lb.
Zinc Chloride	10.7 lb.

This is dissolved in water before use and the wood is impregnated with it.

Wood Preservative Against Termites

British Patent 464,731

Formula No. 1

To a solution which contains 2 parts of arsenious oxide and 3 parts of glycerin in form of the glycerin ester, there are first added 7 parts ethyl alcohol, then 11 parts ethyl glycol. Seventy-seven parts of mono-chlornaphthalene are then added to mixture and stirred in. A clear solution is formed.

No. 2

To a solution which contains 1.8 parts arsenious acid and 2.0 parts glycerin in the form of the glycerin ester, there are first added 10.0 parts ethyl alcohol and then 17.4 parts ethyl glycol. 68.1 parts of decahydronaphthalene are then added to this mixture and stirred in. A clear solution is formed.

Exterior Millwork (Wood) Preservative

Formula No. 1

Pentachlorphenol	5 lb.
Pine Oil	1¼ gal.
Spreader	5 lb.
Petroleum Thinner	10¼ gal.

No. 2

Pine Oil	1¼ gal.
Spreader	5 lb.
Petroleum Thinner	10¼ gal.
Tetrachlorphenol	2½ lb.

Telegraph and Fence Pole Preservative

German Patent 644,978

Poles are soaked in a 1% solution of

Mercuric Chloride	20 lb.
Arsenic Pentoxide	80 lb.

Rot and Insect Proof Fiber Board

U. S. Patent 884,367

A rot-proof fiber and termite-proof product for the manufacture of building board, etc., has the following composition: fiber, 1,000 pounds, rosin size (bone dry basis) 20 pounds, zinc meta-arsenate, 3 pounds, water about 50,000 pounds. This pulp is thoroughly mixed and pressed out.

Rot-Vermin Proofed Fiber Board

U. S. Patent 1,884,367

A rot-proof and termite-proof fiber product for the manufacture of building board, etc., has the following composition: fiber, 1,000 pounds; rosin size (bone dry basis), 20 pounds; zinc meta-arsenate, 3 pounds; water, about 50,000 pounds. This pulp is thoroughly mixed and pressed out, formed and dried.

Flameproofing Wood

Borax	25 g.
Water	50 g.

Impregnate kiln dried wood in above solution kept at a boil. Drain and dip into following cold solution:

Magnesium Sulphate	25 g.
Sulfatate	½ g.
Water	50 g.

Fireproofing Wood

Formula No. 1

Sodium Acetate	85 kg.
Disodium Phosphate	15 kg.
Water, about	550 kg.

No. 2

U. S. Patent 2,100,787

A process of fireproofing wood consists of immersing the wood in a heated bath of an aqueous solution of ammonium chloride and acetic acid in the approximate proportions of 1 pound of ammonium chloride, 2 ounces of acetic acid and one gallon of water, and maintaining immersion until the wood has been impregnated to a substantial depth.

Slow Burning Wood Treatment

a. Machine pieces to dimensions.
b. Immerse in cold solution of ammonium phosphate (dissolved in hot water).
c. Leave wood pieces in solution at least 8 hours.
d. Remove and drain.
e. Bake for 8 days at about 50° C.

Timber Fire-Proofing and Preservative

British Patent 466,294

Gypsum Powder	8 lb.
Slaked Lime	8 lb.

Salt	4 lb.
Cement	1 lb.

Building Brick

U. S. Patent 2,043,642

Ground Blast Furnace Slag	150 lb.
Calcium Oxide	40 lb.
Calcium Silicofluoride	6 lb.
Calcium Chloride	3 lb.
Chrome Alum	1 lb.
Pigment	7 lb.

Wall Plaster

Formula No. 1

U. S. Patent 2,070,036

Alkali Waste	100 lb.
Blast Furnace Slag	50 lb.
Calcined Dolomite	25 lb.
Calcium Sulphate	10 lb.
Feldspar	7 lb.
Vegetable Fiber	3 lb.
Potassium Sulphate	3 lb.
Aluminum Sulphate	2 lb.

No. 2

U. S. Patent 1,989,712

a. Gypsum, Hydrated (Granulated)	1 lb.
b. Magnesium Sulphate Solution (23%)	3 lb.

Bring *b* to boil and mix with *a* while stirring. Filter sludge at 100° C.; wash and dry rapidly at 100° C.

Wall Plaster or Mortar

U. S. Patent 2,043,641

Granulated Blast Furnace Slag	50 lb.
Slaked Lime	20 lb.
Calcium Sulphate	12 lb.
Dextrin	7 lb.
Silica	6 lb.
Glass Sand	3 lb.
Potassium Sulphate	1 lb.
Magnesium Fluosilicate	1 lb.

Building Plaster

Canadian Patent 366,187

Gypsum	2000 lb.
Wood Dust	500 lb.
Coke, Powdered	50 lb.

Gypsum Plaster Retarders

British Patent 460,242

The following are used to slow down setting of gypsum plasters:

Calcium Citrate
Calcium Malate
Calcium Succinate

Artificial Building Slabs

U. S. Patent 2,104,477

Ground Corn Stalks	17 lb.
Anthracite Coal Ash	83 lb.
Portland Cement	50 lb.
Water	to suit

Plaster Impervious to Gasoline and Kerosene

Formula No. 1

Magnesium Oxide	1 lb.
Sand	2 lb.
Magnesium Chloride (20–22° Bé.)	to suit

No. 2

Portland Cement	1 lb.
Sand	2 lb.
Casein	0.2 lb.
Lime	0.1 lb.
Water	to suit

Impermeable Wall, Floor and Road Covering

British Patent 451,199

Lime	70 lb.
Rosin	15 lb.
Carnauba Wax	10 lb.
Mineral Oil	3½ lb.
Mineral Color	1½ lb.

Melt together and mix until uniform; apply hot.

Eliminating Dust on Dirt Roads

Dust is eliminated on a dirt road where necessary by applying 2½ pounds of calcium chloride per square yard, in 3 applications. The first application should be made at the rate of 1½ pounds per square yard after the heavy spring rains have ceased. Within 4 to 6 weeks a second application of ½ pound per square yard should be made. The last application of ½ pound per square yard should be made in the late summer or early fall.

Tennis Court Surface Dressing

U. S. Patent 2,058,335

A composition for use as a tennis court surface dressing consists essentially of 50–80 lb. rosin, 10–30 lb. of a drying oil, and 10–20 lb. of a petroleum oil of 20–40° Bé.

Non-Aging Road Binder

French Patent 808,633

Tar	50 kg.
Natural Bitumen	20 kg.
Sodium Silicate Solution	30 kg.
Filler	60 kg.

Molasses Binder for Roads

Ten tons of molasses are used to a mile of highway. This is mixed with well-slaked lime and charcoal powder in the ratio 4:2:1, respectively, by volume. It takes about four hours for the final coat to set and while still slightly soft, sand is spread over it and the surface is rolled. Traffic is allowed over the highway the next day.

This is most suitable for dry regions. Occasional rains do not wash out the binder unduly.

Paving Composition
U. S. Patent 2,051,577

Broken rock of various sizes 50–80, a liquefier such as naphtha or kerosene coating the rock pieces 0.5–1.0, asphalt cement 4.5–7.0 and a finely divided ore supplying iron oxide 3–5% are used together.

Asphalt Paving Composition
U. S. Patent 2,041,279

Stone aggregate is heated to 120°, coated with 5 wt.-% of melted asphalt, and then mixed with 4 wt.-% of water containing 0.5% of caustic soda. During mixing, 50% of the water is evaporated and a composition is thereby obtained which can be stock-piled and then employed for road-paving purposes without further heating.

Asphalt-Molasses Road Composition

Molasses	51.96–54.09%
(Concentrate by heating to 110–150° C.)	
Quick-lime	8.2 – 9.17%
Asphalt	37.71–38.87%

Such compositions have withstood 3 years' service in India.

Conditioning Mineral Road Aggregates
Canadian Patent 359,559

Individual pieces of mineral aggregate are treated to expel the air and moisture and to provide hydrocarbon hermetic seals to condition the pieces for shipment and use in making paving materials, by heating the pieces to evaporate the moisture and expel at least a portion of the air, reducing the temperature, chilling suddenly the dried and expanded pieces by applying a solution of bitumen in a volatile vehicle, such as 55% 12–14.5° Bé. fluxing asphalt, 35% naphtha' distillate, 5% kerosene and 5% tar naphtha.

Asphalt Sheeting
U. S. Patent 2,057,020

The sheets are made from blown petroleum asphalt (m.p. 105–107°) which may have mixed with it talc and gilsonite in the proportions asphalt 35, gilsonite 35, talc 30%. The material is cast into sheets and rolled out to the desired thickness. In use the sheets and structure to be covered are joined together by heat and pressure.

Pottery Bedding Composition
British Patent 465,539

A ground, 30 mesh, mixture of the following is used:

Alumina	60 lb.
China Clay	15 lb.
Bone	25 lb.

Waterproofing Cements

A method for making cement waterproof which has been largely tested may be used for coating tanks and troughing. Use one part cement, two parts sand, three-quarters of a pound of dry powdered alum to each cubic foot of sand. Mix the sand, alum and cement dry, and add water to which three-quarters of a pound of soap to each gallon has been dissolved. This mixture may be used for stopping leaks in concrete tanks or troughs, and may also be used for closing leaks in metal tanks. Use two plates, one on each side of the leak, drawn together by bolt and nut, enclosing some of the mixture between the plates.

For the purpose of waterproofing concrete there is nothing better than the commercial waterglass, which is a solution of sodium silicate. Dilute the waterglass with four parts of soft water; apply with a flat brush, thoroughly wetting the surface. The waterglass may be colored by mineral pigments if desired, thus at the same time forming a waterproof color for concrete.

Waterproofing Cement and Concrete

Ammonium stearate in the form of a 5% ''solution'' is used to a large extent. Because of its water content it cannot be mixed with the dry cement for shipment and must be used immediately. Because of its strong ammoniacal odor it is difficult to work with. It dries out rapidly and corrodes and discolors in contact with metals.

Dry ammonium stearate (anhydrous) is now available. Its use overcomes all the above disadvantages and in addition saves freight charges now paid for water.

Waterproofing for Cement and Lime-Plaster
British Patent 460,736

Glue	1 lb.
Water, Boiling	480 lb.
Sulphonated Castor Oil	30 lb.
Keep hot and add	
Stearic Acid (Melted)	54 lb.

and pass hot mixture through a colloid mill.

Waterproofing for Masonry

Formula No. 1

German Patent 634,761

a.	Oleic Acid	43.2 kg.
	Ammonia	12.2 kg.
b.	Alcohol	6.1 kg.
c.	Aluminum Chloride	4.3 kg.
	Calcium Chloride	3.7 kg.
	Water	30.5 kg.

Make soap *a*, thin with *b*, and add *c* to this very slowly with stirring.

The colloidal solution can be diluted with water in all proportions, and is very suitable for use in waterproofing construction.

No. 2

U. S. Patent 2,022,405

A waterproofing composition is made up as follows: 4 parts refined paraffin wax, 2 parts paracoumarin resin, 1 part white beeswax, and 4 parts aluminum palmitate. This is dissolved in xylol and carbon tetrachloride present in proportions about 3 to 1.

Waterproofing Cork

Dry cork at 100° C. and soak for a few minutes in 30–50% acetone solution of phenol formaldehyde resin. Drain; heat for 2 to 3 hours at 70 to 80° C. and keep overnight at 105–150° C. Cork treated in this way is resistant to salt water and may be used for life-preservers.

Waterproofing Composition

British Patent 455,533

This invention deals with the preparation of compositions intended for effecting waterproofing of stone, brick, wood, etc., an additional use being for marine anti-fouling purposes. The new composition consists of the following constituents, all proportions being by volume: Creamed latex 10 parts; waterglass 3 parts; warm milk 5 parts; a solution of camphor in a cellulose ester 1.5 parts; ammonia 0.25 part; cold milk 40 parts; and dried milk 0.5 part.

Slight variations from these quantities are permissible and fall within the scope of the invention.

The mixing procedure is as follows: A dispersion is made up of the waterglass in warm milk and the thinned camphor solution is added to it; the dried milk is now mixed in and the whole added to the ammonia and remaining milk. The mixture is allowed to stand and finally decanted, when the creamed latex is introduced.

Acid and Alkali Proofing Masonry

U. S. Patent 2,025,424

The process of treating porous building material for the purpose of making said material acid proof and alkali proof, consists in applying a solution containing about 15% anilin hydrochloride, then applying a solution containing about 15% copper chloride, about 5% acetic acid glacial, and about 1% potassium chlorate, and then applying a solution containing about 15% potassium bichromate and about 15% sulphuric acid.

Fireproofing Composition

British Patent 453,109

Diammonium Hydrogen Phosphate	25 lb.
Ammonium Chloride	50 lb.
Borax	18¾ lb.
Sodium Tungstate	6¼ lb.
Water	sufficient

Wood Fire-Proofing and Preservative

U. S. Patent 2,075,693

Zinc Chloride	1 lb.
Ferric Chloride	½ lb.
Boric Acid	1¼ lb.
Ammonium Phosphate	11 lb.
Water	7 gal.

Wood Preserving and Fireproofing Composition

U. S. Patent 2,075,693

Zinc Chloride	1 lb.
Iron Chloride	½ lb.
Boric Acid	1¼ lb.
Ammonium Phosphate	11 lb.
Water	7 gal.

Fireproofing for Wood and Textiles

Austrian Patent 149,356

Calcium Chloride, Anhydrous	40 lb.
Zinc Chloride	10 lb.
Formaldehyde	5 lb.

Mix the above with

Calcium Chloride, Anhydrous	30 lb.
Boric Acid	10 lb.
Ammonium Chloride	5 lb.

Of this mixture make up a 10–15% solution in water and use for coating or impregnating wood or textiles.

Modern Flameproofing

Publicity given to recent serious fires, and stringent enforcement of Fire Department regulations, has brought to the fore the necessity of more general application of flameproofing treatments. Heretofore restricted almost entirely to theatrical drapes and scenery, it is now compulsory for all public gathering places in many cities. Analysis of fires in private homes, however, indicates that very often inflammable drapes are here also the cause of converting a small blaze into an uncontrollable one. There is, therefore, a large present market for satisfactory flameproofing. This is especially true if its extension to upholstery fabrics, bed accessories and marine decoration is considered.

Flameproofing consists of the impregnation of ordinarily inflammable material with inorganic, or partially inorganic, preparations which, without objectionably altering other characteristics of the original material, will render it incapable of supporting combustion. (The word "objectionably" is used advisedly, because, while in most fabrics there is no change apparent to the lay person, the processing of non-absorptive surfaces, or painted surfaces, as in stage scenery, often results in a serious change in appearance.) This definition implies that, if any glowing area is left at a point where flame has been applied, it must decrease in size and disappear, even in a draft.

Except for one or two highly specialized and costly processes, application by water solution is obligatory. This is due to the nature of the effective compounds used. It is plain, then, that textiles, etc., to be treated must tolerate water (at a minimum temperature of about 50° F. for practical purposes).

A satisfactory flameproofing agent must fill the following specifications:

1. It must be simple to apply.
2. It should be reasonable in cost.
3. It must be non-toxic in solution, in a spray, or on the processed material.
4. It must be quite neutral chemically in order that no reactions should take place with textile fibers or with dyes and finishing compounds thereon, adversely affecting:
    a. Color and sheen.
    b. Flexibility and "feel."
    c. Tensile strength.
5. The flameproofing agent must not powder off or crystallize, thus (aside from the annoyance) losing effectiveness with age.
6. There must be no undue stiffening of fabrics.
7. Since laundering (without re-processing) is impractical, indefinite dry cleaning should be permissible.

Ordinary practice, and the limited literature on the subject, have apparently not changed in fifty years. They indicate the use of certain salts. These are phosphates, borates and ammonium salts in various mixtures. Boric acid is often used as an ingredient.

What essentially occurs when flame is applied to a fabric treated for flameproofing is the formation of a vitreous-like coating about each fiber, within which the fiber chars. This not only prevents rapid oxidation, i.e., burning, but also considerably raises the temperature of combustion. In addition, the ammonia gas given off by the less stable ammonia compounds helps prevent oxygen from reaching the combustible fiber.

However, it must be noted that this very latter characteristic is a distinct drawback. Under varying conditions of temperature and humidity, hydrolysis and decomposition of unstable ammonia salts will often occur. Ammonia will be lost, giving rise to acidity in the fabric, with resultant harmful effects upon tensile strength and color. This is particularly marked when fabrics are stored in bolts. Moisture carried over from a period of high humidity then remains indefinitely and gives increased reactivity to the acid residue. The hygroscopicity of the usual salt mixture aids retention of excess moisture. Considerable losses are known to have been suffered on account of this factor alone. In addition, reactions with finishing compounds often produce undesirable results.

Another drawback is due to the physical nature of the commonly used agents. Being crystalline originally, they will return to that state upon the inevitable evaporation of the water in which they have been dissolved during application. If the crystals are of microscopic size, there is no noticeable effect. But with the loss of sufficient moisture and the lapse of time, the increased formation and aggregation of crystals often bring them within the visible range. When this occurs, the treated fabric takes on a cloudy, white appearance in large, irregular patches. These patches gradually coalesce and cover the entire surface. Sheen, if originally present, is, of course, destroyed. In pile fabrics such as velvets, capillary action along the pile fibers may aggravate clouding. Depending upon temperature, humidity, proportions of salts and the type of fabric, this may happen within any time from 48 hours to 48 weeks after processing. The "powdering" mentioned in the specifications has essentially the same basis as the foregoing occurrence.

In general, clouding and powdering are most marked in fabrics having sheen, and are in direct proportion to the degree of sheen. But it is known that certain black cotton velours and duveteens take on a slight grayish cast immediately after ordinary salt treatment. It should also be pointed out that increased deterioration of fabric is not the only effect of excess moisture caused by hygroscopicity of ordinary salt mixtures. A more direct result, particularly in humid climes, is the formation of mildew. This may occur alone or together with all the preceding objectionable phenomena. And the first indication here, too, is in the surface appearance.

In view of the above situation, therefore, it is of considerable interest that a flameproofing agent recently developed has been found to overcome the serious objections to the old compounds, and to possess additional properties of some importance. This agent is a homogeneous compound in which have been synthesized in stable and neutral form the most effective ingredients of the old agents in a peculiarly effective form. This compound is a liquid "resin," soluble only in water. It is described chemically as an inorganic boro-phosphate. The viscosity is greater than that of glycerin but less than 68° Baumé sodium silicate. A gallon weighs 14 pounds. It is water white, odorless, of slightly salty taste, and non-toxic. It adheres strongly to practically all surfaces. Spread thinly, it dries quickly to give smooth, non-tacky, glossy and transparent films which show no hygroscopicity at ordinary humidities. It dissolves quickly and completely in hot or warm water at 130° F. or above.

It is well to note that this individual compound contains no ammonia, the least desirable and unstable flameproofing ingredient of traditional compounds, but does contain in high proportion the two most effective and stable ones, namely, the borate and phosphate radicals. Because of its liquid form it is easily handled and dissolves quickly in water. The resin thins down quickly so that even with an equal part of water it may be sprayed.

In making up the processing bath, experiments and practical operation have shown it to be the most advisable to begin by first dissolving the resin thoroughly in an equal volume of hot water (at least 130° F.). Sufficient additional tap water is then added to attain the proper dilution for the particular kind of material to be treated.

Methods Used

A. Runs of 100 yards or more in a regular finishing machine.

B. Treatment of finished drapes by dipping, extracting and drying by air.

C. Spraying of finished drapes.

Method A. In the treatment of yard goods, the speed is such as to give any one area of the cloth a soaking of somewhat less than one-half minute. It then goes through the quetch at high pressure, and is dried over hot calenders.

Method B. In the treatment of finished drapes, they are placed in an open tank, the solution covering them, and stirred with a paddle until thoroughly soaked (2–3 minutes). A tumbling barrel such as used in the laundry "break" may be used here with advantage. Extraction follows immediately, then air drying and ironing in the ordinary manner. In this method it is possible to avoid waste by recovering excess solution from the extractor and using it over again. It is important that drapes which have been in use for some time should be cleaned previous to flameproofing. This will avoid spotting, streaking or darkening due to accumulated dust and dirt.

Method C. Finished drapes are sprayed until thoroughly wet, but not so as to drip for more than a few minutes, if at all, after completion. A continuous pressure spray is used, and pains taken to give a uniform impregnation, but uniformity such as in the two foregoing methods is seldom obtainable. To assure sufficiently quick penetration, a wetting agent is necessary. Drapes with linings require separate spraying front and back.

In Methods A and B, the bath is maintained at a temperature of approximately 70° F. In Method C, the temperature on the cloth is roughly between tap water and 70°, or about 60° F.

According to the foregoing tests, dip tests on swatches are sufficiently accurate for reasonably close determination of solutions for Methods A and B. The degree of extraction by quetch or centrifuge apparently is equal for practical purposes. The following were found to be efficient solutions:

Velours Velvets Corduroys	11 parts of water to	1 part of boro-phosphate resin by volume or 1.68 parts by weight
Loose-woven soft wool Wool mixtures Silk mixtures Silk Burlap	9 parts of water to	
Cotton drapery fabrics of fine and coarse weave	7–8 parts of water to	
Plain printed cotton Ticking (after de-sizing)	7 parts of water to	
Rayon plush Rayon satin All-rayon	6½ parts of water to	
Damask (approx. equal parts rayon and cotton)	6 parts of water to	

For spraying, the most satisfactory solution for general use consists of 17 pounds of the boro-phosphate resin in 15 gallons of water with 2 ounces of a wetting agent (Sulfatate). Because of the difficulty of obtaining quick penetration and uniformity under spraying conditions, rather thorough wetting, varying in degree approximately according to the proportions in the above chart, is necessary.

Figures for the increase in weight due to flameproofing are available only for the damask of approximately equal parts of rayon and cotton and of heavy weight. These show an increase of approximately 1 ounce per square yard.

Since concentration of the flameproofing solution at a given temperature depends on the absorption characteristics of fabrics, which in turn depends on fiber composition and roughly on weave, it can be said that similar fabrics may be treated with the same solution with like results. But a difference of 10% in fabrics would call for preliminary dip tests. In any case, if there is doubt of the proper concentration of the flameproofing agent, dip tests on swatches is the safest procedure.

It may be said also that the higher the temperature, the more resin will be deposited in the cloth. Therefore it may be possible to develop one or two stock solutions to cover the entire range of fabrics, requiring that only the temperature be varied. Since this compound is not selectively absorbed, the bath may be renewed as often as necessary by adding solutions of the regular concentration.

1. This new flameproofing agent is simple in application.
2. In no form or concentration is there any toxicity.
3. It is essentially a neutral compound, the pH in the present tests varying from 7.3 to 7.9. Even should acids or alkalis be added, its buffering effect prevents great variation from the neutral.
   a. Colors including crimson, gold, delicate shades of blue and yellow have shown no detectable change. Sheen is entirely unaffected, dull fabrics are often brightened.
   b. There is no detectable breakage of fibers after repeated sharp creasing at the same point, showing flexibility maintained. In many cases of rayons, the "hand" was actually improved.
   c. Fabrics show no noticeable lessening of tensile strength after 8 months' exposure to ordinary conditions in New York City.
4. Its resinous, adhesive character prevents crystallization, whitening and powdering.
5. The sizing effect is no greater than with old compounds; on some rayons, less. In many cases it may be considerably lessened by the use of less than 1% of glycerin or diethylene glycol.
6. Adhesive character and absolute insolubility to all non-aqueous solvents permit indefinite dry cleaning. However, it is also interesting to note the following resistance to cold water: A close-woven cotton-rayon cloth of regular weave, already flameproofed, was soaked in water at approximately 60° F. and put through the quetch. After air drying, it exhibited 85%–90% of the original flameproofness. Occasional severe exposure to rain or high humidity will therefore not markedly affect the flameproof quality.

This new material shows outstanding adaptability to rayon fabrics. The resulting "hand" is such as to make it important in finishing knit goods; its high specific gravity (1.68) enables its use, at the same time, for weighting.

Also, in proper concentration, it may be used as a sizing agent. Thus one or more effects may be obtained through the medium of one bath, in addition to flameproofing.

It is of some importance to indicate the peculiar adaptability of this compound for flameproofing other materials. Even non-absorbent materials, such as certain papers, cardboard, wood-veneer, painted scenery and "Cellophane" may be satisfactorily treated because this resin is adhesive and quickly dries to form glossy, transparent films. Processing of Cellophane by the dip method requires a sufficient concentration of glycerin in the bath to prevent loss of glycerin from the Cellophane, which would cause brittleness. Preliminary investigation seems to show that a solution containing about 25% of the resin and 12% of glycerin is necessary. The increase in weight is approximately 20%.

Of considerable importance, too, is the matter of removing the hazard of highly inflammable Christmas trees and holiday decorations. This new material will adhere firmly to the fir needles. At the same time, its gloss and transparency enhances the green color. By penetration or adhesion, it will remain indefinitely on all types of party decorations.

In conclusion, it can be said that, without sacrificing esthetic appearance, economical and simple means are now available not only for greatly improved treatment of the usual fabrics, but also in new fields opened up by the peculiarly adaptable qualities of this remarkable new flameproofing agent.

Boro-phosphate resin is precipitated by solutions of heavy metallic salts. It does not discolor with age. It requires no preservative. It cannot be rendered water-insoluble without destroying its film characteristics.

If films are heated above 120° C., the films become discontinuous.

Spreading and penetration is aided by the addition of about 0.2% of a wetting agent.

Boro-phosphate resin is sold commercially under the name of Abopon.

Low Melting Point Alloys

The extent to which low melting point alloys are used in commercial developments is a matter of considerable surprise to many metallurgists and engineers. Even those who are familiar with the use of these alloys and their various modifications and manifestations are often unacquainted with the constituents involved in their composition and the effects of variation of each upon their physical properties, such as melting point, expansion, non-shrinkage, etc.

As is fairly well known, most fusible alloys and low melting solders consist of bismuth, tin and lead. Bismuth possesses the very unusual property of expanding on cooling. It is, therefore, used not only to make the alloy or solder more easily worked by lowering its melting point, but if it is present in sufficient quantities its expansive tendency counter-balances the effects of contraction of the other metals, and the net result is the prevention or reduction of shrinkage in the mold.

Some peculiar and even surprising results can be obtained by alloying varying proportions of bismuth, lead, tin and cadmium together. Thus, although the melting point of lead is 621° F., cadmium 610° F., bismuth 520° F., and tin 450° F., yet modification of the composition of these non-ferrous metals gives an almost endless series of alloys with melting points between 150° and 600° F. The quaternary "eutectic" mixture of bismuth, lead, tin and cadmium is the most fusible of all alloys of common metals except those containing mercury. Addition of sufficient mercury to the bismuth-lead-tin-cadmium alloys lowers the melting point to room temperature.

When making low melting point alloys, the lead should be melted first and when completely molten, rosin flux added. The metal is then thoroughly stirred and any dross formed during the stirring is removed before adding the tin, bismuth and cadmium. The metals should be stirred for several minutes after each addition is made (in the above mentioned order) and carefully regulating the temperature to prevent overheating.

In adding mercury to soft alloys a hardwood stirring rod instead of a metal rod should be used, the stirring end of the rod being charred on the surface before placing it into the molten alloy. It is inadvisable to breathe the fumes from metals holding mercury as they are dangerously poisonous. Experience teaches that there is little if any real economy in making low melting point alloys used in modern industry which must be made from virgin metals when they can be purchased from reliable sources.

The composition and melting points of some useful metal alloys which have very low melting points are given in the accompanying table:

Name	Melting Point ° F.	Bismuth	Composition Per Cent Lead	Tin	Cadmium	Antimony
Wood's Alloy	149	50.0	25.0	12.5	12.5	....
Lipowitz's Alloy	154	50.0	27.0	12.5	10.5	....
Cerrobend	160	50.0	26.7	13.3	10.0	....
Cerrosafe	180	40.0	40.0	11.5	8.5	....
D'Arcet's Alloy	200	50.0	25.0	25.0	...	....
Newton's Alloy	201	50.0	30.0	20.0	...	....
Cerro-Matrix	248	48.0	28.5	14.5	...	9
Cerro Base	255	52.0	48.0	...	...	....
Tinsmith's Solder	340	...	33.3	66.7	...	....
Plumber's Solder	440	...	66.7	33.3	...	....

Very Low Melting Alloy

Bismuth	50 oz.
Lead	27 oz.
Tin	13 oz.
Cadmium	10 oz.

Melt above and take 81.9 oz. of it and melt with

Indium	18.1 oz.

This alloy has a freezing point of 46.5° C.

SOFT SOLDERS

Composition		Melting Point Deg. F.*	Remarks
40 oz. Tin	60 oz. Lead	459	Plumbers wiping solder, long mushy stage.
50 oz. Tin	50 oz. Lead	415	Common solder. Excellent flowing properties on copper and brass.
63 oz. Tin	37 oz. Lead	358	Lead-tin eutectic. No mushy stage—goes directly from liquid to solid.
5 oz. Tin	95 oz. Lead	604	Inexpensive, high melting point lead-tin solder. Indifferent flowing on copper and brass.
95 oz. Tin	5 oz. Antimony	468	Non-toxic soft solder having higher creep strength than the lead-tin solders at 212° F. Good flowing properties on copper and brass.
5 oz. Silver	95 oz. Cadmium	730π	Good creep resistance at 212° F.

* = Completely liquid.
π = Estimated.

Melting and Pouring of Brass and Bronze

All foundrymen realize the importance of gating and molding to the manufacture of good castings. But granted that these two conditions have been adjusted to a satisfactory degree, there is still the question of melting and pouring procedure to consider.

Below there is given the consensus of opinion as to the best practice used.

1. Use a couple of handfuls of dry charcoal (coarse preferred) at bottom of pot. Place charge on same and melt.

2. After melting, skim, and then cool down to correct pouring temperature by adding gates or sprues.

3. Add from 1 to 2 oz. of 15% phosphor copper per 100 lb. of metal melted. Push slag back and place phosphor copper on the clean metal surface; otherwise slag will be deoxidized or absorb the phosphorus. Stir thoroughly and skim again (phosphor copper in any form will do, although shot is preferable).

4. Pour metal at the coldest temperature possible; in other words, just hot enough to avoid misruns and internal shrinkage. The metal should be taken out of the furnace at a slightly higher temperature than desired for actual casting and chilled down to proper pouring temperature, for this permits the entrapped gases to escape and any slag formed during melting will rise to surface of pot and it may be skimmed off.

5. Push slag back from the lip of crucible before pouring each mold. Do this before crucible is tilted over the mold in which metal is to be poured. Particles of slag will thus be prevented from falling into the open sprue, with resulting "cold shots" or "dirty castings."

6. Keep sprue filled at all times during pouring. Do not pour intermittently,

as air may be drawn into the sprue, resulting in "gassy" castings and occasional "cold shots."

Bronze Tablets

This class of work is generally made of an alloy containing:

Copper	86.6 oz.
Tin	6.8 oz.
Lead	3.3 oz.
Zinc	3.3 oz.

Such bronze must be made from all new metal—electrolytic copper, Straits tin, high purity zinc, and domestic refined lead. This mixture will be fluid when melted, file easily, and will take on green patina upon exposure to weather. This mixture does not cause spelter smoke to produce bad spots.

It melts at sufficiently low temperature to prevent the casting from chilling before it runs up full, and will not cause the sand to burn in. A facing sand should be composed of 3 lb. French sand, 2 lb. Windsor Lock sand, ⅛ lb. flour, and temper with molasses water. This will produce good castings. Skin dry molds.

As to the finishing: after the casting is cleaned and given as high a polish as possible with wire wheel brush, then flat-face the letters and the border and go over the letters for any imperfections that may occur in molding. See that each letter is clean cut. Brighten with sandpaper disc.

The finished plate is dipped in a solution of barium sulphide after spraying with clear lacquer. For the best work give the tablet two coats of clear lacquer, the first one a little heavy and the second one light. This will hold the finish and is necessary for outside work.

The solution gives the background an old bronze color and the polished parts a lighter shade, so that the letters and the border stand out. Barium sulphide solution should be about ½ oz. to 1 gal. of water; use warm water.

Production of Beryllium
Canadian Patent 371,194

The following mixture is electrolyzed at 260–300° C.

Beryllium Chloride	50.0 lb.
Lithium Chloride	20.2 lb.
Potassium Chloride	26.6 lb.
Sodium Chloride	3.2 lb.

Beryllium Bronze

Beryllium containing 8.72% iron and 3.16% aluminum is used to give a bronze which is quenched at 800°C. and drawn at 300–350° C. to give an alloy containing 2–2.5% beryllium. The inclusion of iron raises the drawing temperature and improves the mechanical properties.

Improved Bronze Alloy

Copper	92 lb.
Tin	8 lb.
Nickel	¼ lb.

POPULAR BRONZE BEARING ALLOYS

Bunting #143

Copper	84.0 –86.0 %
Tin	14.0 –16.0 %
Lead, Maximum	.50%
Zinc	None
Iron, Maximum	.10%
Antimony, Maximum	.10%
Phosphorus	.09– .12%
Aluminum	None
Other Elements, Maximum	.10%

An exceptionally hard bronze. Used only where excessive shock loads or pressures demand high resistance to deformation.

Bunting #164—SAE #640—GMC 4071-M

Copper	85.25–87.75%
Tin	10.00–12.00%
Lead	1.00– 1.50%
Phosphorus	.20– .30%
Nickel	.75– 1.25%
Iron, Maximum	.30%
Antimony, Maximum	.20%
Aluminum	None
Other Elements, Maximum	.10%

This is a high grade, hard gear bronze commonly used for cones of synchronizing gears.

Bunting #156—Similar to SAE 65, GMC 4052-M

Copper	89.0 –91.0 %
Tin	9.5 –10.5 %
Lead, Zinc and Other Elements, Maximum	.50%
Phosphorus	.05– .10%

This is a very hard bronze suitable for gears and worm wheels, where the requirements are severe.

Bunting #98—SAE 62—GMC 4048-M—Similar to ASTM B-10-18

Copper	86.0–89.0 %
Tin	9.0–11.0 %
Lead, Maximum	.35%
Zinc	1.0– 3.0 %
Iron, Maximum	.06%
Antimony, Maximum	.20%
Aluminum	None

Phosphorus, Maximum	.05%
Other Elements, Maximum	.25%

A hard bronze, commonly known as gun-metal or admiralty bronze. This bronze is suitable wherever a general utility bronze is required. It may be used for severe working conditions where heavy pressures obtain, as in gears and bearings difficult to machine.

Bunting #162—GMC 4075-M

Copper	69.00–71.00%
Tin	8.50– 9.50%
Lead	19.50–22.50%
Nickel, Maximum	.50%
Iron, Maximum	.20%
Antimony, Maximum	.20%
Phosphorus, Maximum	.05%
Aluminum	None
Other Elements, Maximum	.10%

A semi-plastic bronze—suitable for water pump bushings or places where lubrication is poor or water is present.

Bunting Alloy No. 72—GMC 4182-M

Copper	81.0–85.0 %
Tin	6.5– 7.5 %
Lead	6.0– 8.0 %
Zinc	2.0– 4.0 %
Iron, Maximum	.20%
Antimony, Maximum	.20%
Aluminum	None
Other Elements, Maximum	.50%

This alloy is one of the most widely used compositions for bronze bearings. In the automotive industry it is used extensively in such applications as spring bushings, torque tube, steering knuckle, piston pin.

This metal is an excellent composition to use where antifriction qualities are desired, standing up exceedingly well under heavy loads and severe usage.

More than half of the total tonnage of bearing bronze produced in the U. S. A. is made in this alloy.

Bunting #96—SAE 63—Similar to GMC 4046-M

Copper	86.0–89.0 %
Tin	9.0–11.0 %
Lead	2.0– 3.0 %
Zinc, Maximum	.75%
Iron, Maximum	.20%
Antimony, Maximum	.20%
Aluminum	None
Phosphorus, Maximum	.10%
Other Elements, Maximum	.50%

This alloy combines strength with fair machining qualities. It is especially suitable for bearings subjected to heavy shock loads and severe working conditions.

Bunting #27—SAE 64—GMC 4050-M—ASTM-B-31-21

Copper	78.5 –81.5 %
Tin	9.0 –11.0 %
Lead	9.0 –11.0 %
Zinc, Maximum	1.00%
Iron, Maximum	.20%
Antimony, Maximum	.20%
Phosphorus	.02– .07%
Aluminum	None
Other Elements, Maximum	.50%

Recommended for general bearing applications where good wearing anti-frictional qualities are desired. Stands up well under heavy loads and severe usage.

Bunting #135—Similar to SAE 67—GMC-4056-M

Copper	75.0–79.0 %
Tin	7.0– 9.0 %
Lead	13.0–17.0 %
Zinc, Maximum	1.0 %
Iron, Maximum	.20%
Antimony, Maximum	.20%
Aluminum	None
Other Elements, Maximum	.50%

A semi-plastic bronze intended for use where a soft bronze with good anti-friction qualities are desired.

Bunting #124—SAE #66—GMC-4054-M

Copper	84.00–86.00%
Tin	4.50– 5.50%
Lead	8.00–10.00%
Zinc, Maximum	1.50%
Iron, Maximum	.20%
Antimony, Maximum	.20%
Aluminum	None
Other Elements, Maximum	.50%

This composition has excellent anti-friction characteristics. Has proven very suitable in such applications as camshaft and piston pin, wherein the load is not too severe.

Bunting #125

Copper	72.00–76.00%
Tin	4.00– 5.00%
Lead	18.00–22.00%
Zinc, Maximum	.50%
Iron, Maximum	.20%
Antimony, Maximum	.20%

Aluminum	None
Other Elements, Maximum	.35%

A typical composition now popular in the higher lead content bearing bronzes. Has exceptional low friction properties.

Bunting #161

Copper	63.00–68.00%
Tin	1.00– 3.00%
Lead	30.00–35.00%
Zinc, Maximum	.25%
Iron, Maximum	.10%
Antimony, Maximum	.10%
Aluminum	None
Other Elements, Maximum	.25%

A copper-lead composition which when produced under special processes to insure uniform distribution of the lead gives a bearing metal having superior anti-frictional non-scoring properties. Very suitable for main and connecting rod bearings in gasoline and Diesel motors, compressors, etc. Replaces tin base babbitt in many applications.

Hot Working Copper Alloys
U. S. Patent 2,059,555–60

Formula No. 1

A hot workable copper-base alloy contains 3 to 10% tin, from .5 to 10% chromium, the remainder substantially all copper.

No. 2

A copper-base alloy which can be forged and rolled at elevated temperatures and which has substantially the composition: 3% to 10% tin; 0.5% to 10% chromium; a substantial amount not over 10% iron; and the remainder substantially all copper.

No. 3

A hot workable copper-base alloy contains about 3% to 10% tin, about 0.2% to 10% of mixtures of chromium and vanadium, which impart hot workability to the alloy, and the remainder substantially all copper.

No. 4

A hot workable copper-base alloy contains about 3% to 10% tin, about 0.2% to 10% mixtures of chromium and vanadium, about 0.2% to 10% iron, and the remainder substantially all copper.

No. 5

A hot workable copper-base alloy contains about 3% to 10% tin, about 0.2% to 10% vanadium, about 0.2% to 10% iron, and the remainder substantially all copper.

No. 6

A hot workable copper-base alloy contains about 3% to 10% tin, about 0.2% to 10% vanadium which imparts hot workability to the alloy, and the remainder substantially all copper.

Copper Alloy Stable to Steam
U. S. Patent 2,101,930

Copper	60.0 –98.7%
Cadmium	.05– 3.0%
Nickel	.5 –30.0%
Aluminum	.25– 4.0%
Zinc	.5 –39.2%
Manganese	0.0 – 1.0%

This alloy is characterized by superior resistance to intercrystalline attack or corrosion when exposed to steam or hot water.

Non-Staining Copper Alloy
U. S. Patent 2,007,430

Nickel	2.76 lb.
Cobalt	0.48 lb.
Silicon	0.47 lb.
Aluminum	2.53 lb.
Molybdenum	0.37 lb.
Iron	0.17 lb.
Calcium	0.06 lb.
Copper, to make	100.00 lb.

Machinable Copper-Base Alloy
British Patent 471,291

Lead	0.4 lb.
Silicon	3.0 lb.
Manganese	1.0 lb.
Copper	95.6 lb.

Copper-Iron Electrical Alloy
U. S. Patent 1,999,850

Ductile iron alloys of high electrical conductivity, containing copper 30–70 (55) and magnesium 0.02–1 (0.2)%, are annealed at 600–850° for ¼–4 hr. and cooled to 450° during 2 hr. prior to the final cold-drawing.

Silver Electrical Contact Alloy
U. S. Patent 2,046,056

Beryllium	0.5– 5%
Chromium	0.5– 1%
Silver, to make	100%

Electrical Contact Alloy
U. S. Patent 2,061,624

Silver	78%
Copper	12%
Cadmium	8%
Cobalt	2%

Hardening Magnesium Alloys
British Patent 474,812

Alloys of magnesium containing 9% aluminum and 0.2% manganese are homogenized at 420° C. for 10 hours; hot worked at 200–500° C.; extruded at 350° C. and then subjected to a precipitation treatment at 170° C.

Cable Sheath Lead Alloy
British Patent 479,215

Tellurium	0.001– 0.25%
Copper	0.03 – 1 %
Lead, to make	100 %

This alloy retains fine grained structure even after fusion-welding.

Bearing Alloy
U. S. Patent 2,059,019

Copper	5 %
Antimony	7– 8 %
Tellurium	0.1%
Tin, to make	100 %

Bearing Metal Alloy
U. S. Patent 2,116,851

Silver	1 – 4%
Antimony	0.1– 5%
Cadmium, to make	100%

BEARING METAL ALLOYS

	SAE-11	Cadmium No. 50	Cadmium No. 51	Copper-Lead	Bronze F
Copper	5.6%	0.5%	0.3%	58.9%	88.9%
Lead	0.3%	——%	——%	40.0%	——%
Cadmium	——%	98.7%	97.5%	——%	——%
Silver	——%	0.8%	2.2%	——%	——%
Tin	87.2%	——%	——%	——%	9.4%
Zinc	——%	——%	——%	——%	1.7%
Antimony	6.9%	——%	——%	——%	——%
Nickel	——%	——%	——%	1.1%	——%

Die Casting Alloy
British Patent 462,052

Aluminum	1.5 – 6 %
Magnesium	0.01– 0.3%
Titanium or Tantalum	0.01– 0.5%
Copper, to make	100 %

Pattern Alloy

Melt:

Copper	50 lb.
Silicon	15 lb.
Aluminum	35 lb.

Pour into ingots and use as hardener as follows:

Melt:

Aluminum	80 lb.

Add:

Hardener (above)	20 lb.

The above casts easily with minimum shrinkage.

Low Temperature Aluminum Brazing Alloy
British Patent 474,716

Tin	67.38 oz.
Silver	2.61 oz.
Lead	1.20 oz.
Antimony	0.04 oz.
Zinc	28.71 oz.

Aluminum Alloy Resistant to Sea Water
French Patent 807,457

Magnesium	10 %
Chromium	0.05– 0.5%
or Zinc	0.1 – 0.8%
or Silicon	0.2 – 1 %

Melting Aluminum Turnings

Melt about 50 lb. of new aluminum and add the turnings gradually, stirring them into the molten metal. After forming a body of metal, the turnings will go in readily. Keep pouring the metal into ingots while filling up the crucible by dipping out the metal, and keep adding turnings.

Non-Blistering Aluminum Castings
U. S. Patent 2,024,751

A method of preventing the formation of blisters due to the presence of gas in thermally treated aluminum and aluminum base alloys, comprises treating the molten metal prior to casting with from about 0.05 to 5 per cent by weight of sodium fluoborate.

Hard Strong Aluminum Alloy
U. S. Patent 2,118,686

Copper	8 lb.
Zinc	8 lb.
Iron	6 lb.
Aluminum	80 lb.

Hard and Low Thermal Expansion Aluminum Alloy
U. S. Patent 1,974,971

Silicon	16 –25 %
Nickel	0.1– 3 %
Magnesium	0.1– 1.25%
Copper	0.1– 1.75%
Aluminum	Balance

While metal is melted and covered with flux add

Sodium	0.05–1%

and cast in chill molds and age castings at 100–150° C.

Heavy Duty Babbitt Metal

Babbitt with a low tin content is melted, poured over heated cleaned bronze shavings and mixed while cooling.

Hints on Spraying Babbitt Metal

Two methods may be used in doing this work. One is simply to grit blast the box in the usual manner of preparing for sprayed metal. If possible, the metal should run over the edges a little on each side of the box. This will give a good bond. The second method is to tin the box in the usual manner, then just before applying the sprayed metal to apply a torch to heat up the tin so that it is soft. The babbitt can then be sprayed onto the hot tin and will form a fused bond with it. The tin already being fused to the box, a completely fused bond is obtained throughout.

Care must be used that there is no oil in the box—this usually gives considerable trouble because many of the boxes are soaked with oil. All of this oil should be drawn out by heating before spraying is attempted. The babbitt should be applied so that there will be just a slight excess either for machining or for scraping the bearing.

Sprayed babbitt also has been used extensively to eliminate the tinning operation in cases in which a great deal of babbitt must be cast. For instance, the usual procedure is to tin the box and then cast the babbitt. The procedure is to sand blast the box, spray on a light coat of babbitt, and then cast the bearing in the usual way. Thus tinning is completely eliminated. This type of work is done where the bearings are large and where heavy thicknesses of babbitt are necessary, requirements which would make spraying cost prohibitive.

Red Brass

Copper	80 lb.
Zinc	14 lb.
Lead	6 lb.

Imitation Gold
Formula No. 1
Japanese Patent 111,314

Zinc	16 – 30 %
Molybdenum	0.5– 2 %
Tungsten	0.2– 0.5%
Copper, to make	100 %

This alloy is malleable and acid-proof and is used in making foils and ornaments.

No. 2
Japanese Patent 113,972

Phosphorus	0.1– 0.25%
Nickel	1 – 1.5 %
Aluminum	1 – 2 %
Copper	46 – 60 %
Zinc, to make	100 %

Lustre is like 20-karat gold.

Coating Metals with Lead
British Patent 466,849

First pickle in acid and wash with a solution of sodium bicarbonate. Dip in aqueous zinc chloride (d. 1.45) at 28° C. and then immerse in molten lead covered with a layer of ammonium chloride and glycerin.

Watch Compensating Spring Alloy
U. S. Patent 2,099,474

A spring having a high elastic limit and variable modulus of elasticity at different temperatures within normal atmospheric limits of temperature, consists of an alloy having substantially the following composition:

Nickel	36.0%
Chromium	4.5%
Manganese	3.0%
Silicon	4.0%
Titanium	0.1%
Iron, to make	100 %

Pen Nibs
British Patent 466,972

Palladium	52–70%
Copper	10%
Silver	38–20%

This alloy is deoxidized with 0.005–0.05% copper phosphide.

Pen Point Alloy
U. S. Patent 2,041,381

Copper	15 oz.
Zinc	10 oz.
Silver	75 oz.

Hard Pen-Nib Alloy
U. S. Patent 2,082,719

Osmium or Ruthenium or Osmiridium	75 –94.5%
or Nickel or Cobalt	3 –25 %
Boron	0.1– 5 %

Low Temperature Thermometer Alloy

Mercury	91.5 g.
Thallium	8.5 g.

This acts like mercury in the thermometer down to –60° C.

Electrical Contact Alloy
U. S. Patent 1,980,801

Osmium	66 oz.
Rhenium	34 oz.

Electric Contact Point Alloys
French Patent 807,700

Formula No. 1

Iridium	7 g.
Tungsten Carbide	93 g.

No. 2

Osmium	3.5 g.
Tungsten Carbide	96.5 g.

No. 3

Rhenium	2.3 g.
Osmium	4.7 g.
Tungsten Carbide	93.0 g.

Low Expansion Lead-In Wire for Electric Bulbs
Canadian Patent 364,416

Tungsten	70–85%
Nickel	15–30%
Cobalt, less than	5%

Non-Corrosive Lead-In Wire for Gas Filled Lamps
Canadian Patent 364,148

Copper	95.5 oz.
Beryllium	1.5 oz.
Manganese	3.0 oz.

Tungsten Wire Forming Compound
U. S. Patent 2,078,609

12 g. of gallic acid are dissolved and boiled in ¼ l. of water. To this solution 12 g. of very finely pulverized ammonium tungstate are added. An organic tungsten compound is immediately formed, that is, without any further addition of acid; this compound is present as a precipitate. This compound can be filtered and proves to have extremely high plastic properties. To the remaining solution, approximately 5 cc. of diluted hydrochloric acid can be added, whereupon the remainder of the tungsten, which is approximately ½ of the total tungsten, will be precipitated in the form of a similarly highly plastic organic compound. In practice both operations can be combined, in which case the deposits can be filtered together. The precipitate is heated carefully in order to eliminate the greatest part of the water present therein.

Instead of ammonium tungstate, it is also possible to use other soluble compounds of tungstic acid, although the ammonium tungstate has proved to be the most suitable because of the high volatility of the ammonium radical. The concentration of the gallic acid solution may also be changed within narrow limits as long as the ratio between the gallic acid and the tungstate remains the same.

The organic tungsten compound obtained in this manner can be used for the manufacture of a large number of tungsten products. For instance, tungsten wires for illuminating purposes can be made by mixing finely pulverized tungsten with a suitable quantity of the organic tungsten compound, which has a considerably higher plasticity than the known tungsten compounds. Even when rather large amounts of tungsten powder are added (more than 100 g. can be used in connection with the above mentioned quantities) a mass is obtained which is so plastic that it can be formed into fine wires without difficulties, and even at low pressure through the ordinary metal nozzles or glass nozzles. It is not only possible to make wires with this compound but it is also possible to produce bars that are hammered and drawn, or even tubes or hollow bars.

Besides the addition of finely pulverized tungsten, it is also possible to add other metals in the pulverized state, depending on the purpose for which the product is to be used; for instance, molybdenum, tantalum, thorium or the like may be added.

For the radio industry, it is possible without difficulty to add oxides of zirconium or thorium as conductors of the second class to the finely divided metal which serves as a conductor of the first class. It was found that the plasticity and binding capacity of the organic tungsten compound produced according to the invention is so high that the quantity of such oxides could be increased up to 30% whereby the properties of the wires or bars could be increased considerably. Such wires have approximately 10 times the resistance of pure tungsten and have a high electron emissivity, even at low temperatures.

The produced wires, bars or tubes are sintered in the customary manner in an inert atmosphere or in hydrogen by means of an electric current.

Discharge Lamp Electrode Alloy
U. S. Patent 2,062,959

Copper	96 oz.
Silicon	3 oz.
Manganese	1 oz.

Hot Cathode Electrode
British Patent 459,163

Barium Oxide	40 oz.
Tungsten Carbide	20 oz.
Zirconium	10 oz.
Zirconium Oxide	30 oz.

The above in fine powders are mixed, pressed and heated to about 1300°.

Lead Alloy for Storage Battery Anodes

U. S. Patent 2,013,487

Strontium	0.2– 0.6 oz.
Tin	0.2– 2.0 oz.
Lead, to make	100 oz.

Frictional Alloy

British Patent 443,476

Copper	70–85%
Nickel	1– 4%
Silicon	1– 4%
Lead	6–15%
Tin	2–10%

The above powdered metals are sintered and pressed together in a form. It is toughened by heat treatment at 500–800° C. and coated with a little wax in boiled linseed oil.

Heat Hardening Spring Steel Alloy

French Patent 820,517

Cobalt	35.0%
Iron	53.1%
Chromium	9.0%
Manganese	0.8%
Silicon	0.1%
Beryllium	1.0%
Titanium	1.0%

Alloys Resistant to Hot Caustic Solutions

French Patent 803,545

Formula No. 1

Copper	83.80 kg.
Iron	4.18 kg.
Nickel	4.78 kg.
Aluminum	7.20 kg.

No. 2

Copper	83.25 kg.
Aluminum	7.87 kg.
Iron	3.55 kg.
Nickel	5.25 kg.

Ferro-Chromium

U. S. Patent 2,008,055

Chromite (48% Chromium Oxide)	65 lb.
Calcium Silicide	23 lb.
Aluminum	4 lb.
Calcium Fluoride	4 lb.
Ferro-Silicon	

Pouring Fusible Metal Models

To secure smooth models of fusible metal is not difficult but neither is it a task that can be "sloppily" performed. Keep in mind the following points to get smooth, accurate models.

1. A copper ladle is to be preferred in which to melt the metal.
2. Place the metal in the ladle and hold it over a bunsen flame, carrying it rapidly in and out of the flame till the ingot is about three-fourths melted.
3. Remove the ladle from the flame and allow the melted metal to gradually melt the remainder of the ingot. This will insure the minimum temperature at which the metal will be plastic.
4. When pouring the metal into the cast, jar the cast on the bench.

If the foregoing precautions are observed models that are smooth and free from surface defects will be gotten.

Overcoming Lead Sweat

To overcome separation of lead when making lead alloy castings, first refine the lead used by melting it in a separate pot with 5% lead oxide and 5% ground glass. Pole the metal well by inserting old leather to the bottom and let metal boil. All impurities come to the top and may be skimmed off.

Another method is to add ½ of 1% of 30% manganese copper to the melt.

Type Metal Dross Reducer

British Patent 441,033

The amount of dross on molten type metal is reduced by covering the surface with a mixture of

Salt	20–30 pt.
Ammonium Chloride	20–25 pt.
Wood Charcoal	30–35 pt.

Dental Plate Alloy

German Patent 628,572

Palladium	10 g.
Tin	0.5– 5 g.
Silver	89.5–85 g.

Cadmium or manganese to the amount of 3–5% may be added.

Dental Amalgam Alloy

U. S. Patent 2,083,052

Silver	71–78%
Tin	21–28%
Zinc	1%

Dental Amalgamating Alloy

U. S. Patent 2,024,545

Silver	65 oz.
Tin	25 oz.
Beryllium	0.06– 1 oz.

This alloy exhibits improved hardness and resistance to corrosion.

Dental Pin Alloy

U. S. Patent 2,107,310

Palladium	60 oz.
Platinum	30 oz.
Gold	10 oz.

Tooth Straightening Metal Alloy

British Patent 444,754

Platinum	15 –20%
Palladium	4 –15%
Gold	50 –60%
Silver	10 –20%
Copper	5 –15%
Zinc	2.5– 3%

Dental Plate Alloy

U. S. Patent 2,098,879

An alloy for dental plates consists of 20–40% of palladium, 35–65% of silver, 15–30% of copper and 0.05–0.25% of phosphorus, the amounts of silver and copper being present in percentages within 5% above or below the eutectic ratio.

Non-Blackening Silver Dental Alloy

Silver	70 oz.
Palladium	30 oz.

Dental Alloy

U. S. Patent 2,050,040

Platinum	13.2%
Palladium	11.6%
Copper	9.4%
Gold	65.0%
To the above alloy add	
Tin	1.5–3%

Quench at 900° and reheat at 650–700°.

Gold Sponge Dental Filling

British Patent 432,881

Precipitate gold from 5 to 10% aqueous gold chloride at 80° C. Wash precipitate and heat at 150–250° C. in concentrated sulphuric acid. Wash and dry.

Heat Treatment of Spring and Alloy Steels

Many blacksmiths endeavor to weld automotive spring leaves, but they are rarely successful, and all steel experts agree that it is largely a waste of time. It is far better to either use a new leaf, or a new spring. If a new leaf has to be turned out in the shop, the blacksmith can get a leaf that will give good service if he has good carbon steel of the proper grade. Steel should be from .90 per cent to 1.10 per cent carbon. Never use carbon steel as high as 1.25 per cent, as this makes a brittle spring that will easily break. The lower carbon steels are more suitable.

Aside from improper steel, the majority of spring failures are usually due to using too high a temperature for heating the spring for fitting, followed directly by quenching from whatever temperature the steel may happen to be, and then this is usually followed by drawing the temper of the spring by "flashing." The old practice of high temperatures in forming and hardening springs with a single heat cannot fail to give trouble. The blacksmith generally heats the steel to about as high a temperature as it will stand without burning. This has a very bad effect upon the structure of the steel, but even assuming that the proper temperature has been used in fitting the spring, the operation of fitting gives the steel a chance to cool down to a temperature where it will not harden properly.

Further, the steel is not all a uniform heat over its length, so that if quenched directly after forming it will set up internal strains in the steel, which will possibly lead to breakage later. The spring should always be put back in the heating furnace and re-heated for a few minutes uniformly throughout its whole length to the correct temperature. It is difficult in the open fire to get a uniform heat upon a spring. This is what makes it so hard for the average blacksmith shop to properly temper springs. Without a heating furnace the blacksmith is greatly handicapped.

For drawing the temper in the spring never use the "flashing" process. The policy of replacing the steel (after it is quenched) in a heating furnace until the *outside* of the steel reaches the desired temperature is very bad, because of the impossibility of getting uniform heat treatment. No time is allowed for the heat to soak to the centre, with the result that the hardness increases from the outside—a most undesirable condition. All spring steels should be drawn back in a suitable low temperature furnace, maintained at the proper heat. The steel must be kept in the furnace sufficiently long to give a uniform heat throughout its whole structure.

One of the difficulties in all heat-treatment of spring steel and alloy steel in the average shop is the impossibility of accurately determining the heat given the material, and the heat at which it is quenched or drawn. This is an easy matter in a furnace where pyrometers are used, but in the average shop it is very difficult to gauge the heat by color alone.

In handling springs a quenching temperature of 1,500° F. gives the best results, while the drawing temperature should be about 600 to 650° F. The accuracy of the eye in determining color comes into play. A quenching temperature of 1,500° F. means that you must get the steel to a bright red. The color for drawing back the spring at 600 to 650° F. should be a bluish green. There are scarcely two men who agree as to temperature by color, but without the aid of instruments the following temperatures and degrees F. are found at the heat colors given:

White heat, 2,200; light yellow, 1,975; lemon, 1,825; orange, 1,725; salmon, 1,650; bright red, 1,550 to 1,500; cherry red, 1,375; medium cherry, 1,250; dark cherry, 1,175; blood red, 1,050 and faint red, 900.

Below this scale there is, of course, a wide range of tempering colors which should be used, particularly in tool work. These run from a blue green heat at 630° F. to dark purple, 550; dark brown, 500, and a straw color at 460° F.

Quenching springs should be done in a good heavy tempering oil. Let it be stated emphatically that there is no such thing as a self-hardening spring steel manufactured, for there is no alloy steel that can cool off naturally in air and yet get the characteristics necessary in a good spring.

It is often considered by the gas welder that he can weld a spring with the torch. Since springs are made of specially heat-treated steel, it is surely evident that any application of heating from the welding torch will at once destroy the quality of the metal. This type of repair can never be recommended. It is far better to use a replacement spring than to weld it, if you have not the equipment for properly heat-treating and quenching the spring as outlined above.

It is obvious that alloy steel springs must combine great toughness with a high elastic limit. Carbon steel springs contain not only carbon but manganese, phosphorus, sulphur and silicon, and the carbon content must be correct, from .90 per cent to 1.10 per cent, or you will have a brittle spring. The quenching temperatures for alloy steel springs are very important. In a chrome vanadium steel which is now generally used, the steel should be brought up to a full cherry red heat, that is, about 1,475° F. and allowed to cool slowly, that is, sufficient time to allow uniform cooling.

These alloy steels cannot be handled as most carbon spring steels and still give maximum service. They are, however, lower in carbon and will stand much abuse in heat-treatment and still produce springs of good quality. Alloy steels should never be heated any higher for forming the spring than is absolutely necessary, but they must always be reheated to the proper temperature for quenching, and that temperature must be exact.

The mechanic should have a knowledge of the constituents of steel before he can effectively give it the proper heat-treatment. The structure of any particular steel may be modified or entirely changed by various degrees of heating, all of which take place in the steel while it is in the solid condition. These structural changes in the steel take place at temperatures known as the "critical" points or critical ranges of the steel.

In a low carbon steel, about 2 per cent, practically no change in the constituents occurs during heating until a temperature equivalent to about 1,300° F. is reached. In passing through this critical range there is a complete change in the "pearlite" in the structure of the steel. The steel consists of about 25 per cent "pearlite" and 75 per cent free ferrite. At the critical range the ferrite is converted into an entirely new constituent, so that the whole structure of the steel is changed.

Every class of steel has its particular critical point. In heating for hardening there must be much more care taken than heating for annealing. Heating for annealing is followed by slow cooling and the gradual release of all strains in the steel. The heating for hardening is followed by the most severe test the steel has to stand—very rapid cooling, which sets up a condition of stress and strain in the metal. In general, the heating of steel for hardening should be slow, uniform and thorough, and at the lowest temperature which will get you the right results.

Ordinary carbon steel loses its magnetism on heating. It becomes non-magnetic in passing through and beyond certain temperatures—its critical range. At first the steel changes from its original color to a faint yellow, straw color, purple and then to blue, until at a certain temperature it apparently stops heating, although still remaining in the fire. It holds a certain color for an appreciable time, after which it again starts to change color and appears to heat faster until a white heat is reached.

The blacksmith should note this point where the steel seems to get no hotter as indicated by the lack of change in color. This is the temperature at which the particles of the steel are re-arranging themselves, which we have referred to as the "critical point." The steel is actually absorbing heat without getting any hotter. You can check this critical point very accurately by using an ordinary horseshoe magnet suspended from a suitable rod. When the correct hardening temperature has been reached, there will be *no attraction between the magnet and the steel.* Use the ordinary horseshoe magnet, or magnetize a small diamond-shaped piece of steel and support it between two pins on the end of a forked rod.

For low carbon steels, or for small parts made of higher carbon, water quenching can be used without much danger. On the other hand, if the steel has got to be quenched and toughened, oil will be found superior. Brine should only be used in particular cases where a very hard surface is required.

In all heat-treatment of modern steels it is impossible to get the best results in the open forge. An oil furnace or gas furnace is necesary to get results. Where natural gas is available, the blacksmith can very readily build a satisfactory heat-treating furnace, and it is well worth the time and trouble. It should never be forgotten that in gas welding the heat generated in the metal in welding has a marked effect upon the structure of alloy steel, so that only by subsequent heat-treatment can the weld get the proper strength at points just beyond where the welded section unites with the original metal.

These alloy steels have properties that make them superior to plain carbon steels only after they have been heat-treated under carefully controlled conditions. Welding destroys the effect of the heat-treatment in the zone adjacent to the weld. It is, of course, possible to restore the properties of the alloy steel by heat-treating it again after welding, but this requires equipment that is beyond the average repair shop. As an example, welding of such parts as alloy steel automobile axles or steering knuckles should never be attempted. Owing to the effect of the welding heat, the welded section will not be as good as the rest of the metal, nor will it be strong enough for safe operation of the machine.

Colors Developed in Heating of Steel

Color	Temperature Degrees F.
Very Pale Yellow	430
Light Yellow	440
Pale Straw Yellow	450
Straw Yellow	460
Deep Straw Yellow	470
Dark Yellow	480
Yellowish Brown	490
Brownish Yellow	500
Reddish Brown	510
Purplish Brown	520
Light Purple	530
Full Purple	540
Dark Purple	550
Full Blue	560
Dark Blue	570
Pale Blue	600
Bluish Green	630
Red (in dark)	725
Red, room light	885
Blood Red	1,050
Red in Daylight	1,077
Dark Cherry	1,175
Medium Cherry	1,250
Full Red	1,375
Bright Red	1,550
Salmon Pink	1,650
Orange	1,725
Lemon	1,825
Light Yellow	1,975
White Heat	2,200
Forge Welding Heat	2,500
Oxygen-Acetylene Gas,	5,800 up to 6,300
Hydrogen-Oxygen Flame	4,000
Acetylene in Air	3,230
Natural Gas Flame	4,200

In tempering carbon steels, the temperature range varies from 300 degrees to 1,050 degrees F. Tempering high speed steel from 350 degrees to 1,100 degrees F.

Hardening carbon steel requires 1,350 degrees to 1,500 degrees F. Hardening alloy steels 1,500 to 1,950 degrees F. Hardening high speed steels 2,250 degrees to 2,400 degrees F.

Heat Treatment of Manganese Steel

U. S. Patent 1,968,960

Austenitic manganese steel articles, e.g., crusher jaws, are heated to 1000° and the portions to be subjected to pressure and wear, e.g. the ridges, are cooled to $<$ 920° by streams of compressed air or high-pressure steam to produce carbide precipitation; the whole article is then quenched.

Heat Treating Transformer Steel

British Patent 446,794

Sheets of 3–5% silicon steel are coated with a thin film of aluminum oxide by painting them with 10–12% sodium aluminate, drying them, and pack-annealing them for 6–8 hours at 850–875°. Since little or no scale is produced in the annealing the watt losses are reduced.

Carbonization of Nickel Cathodes

British Patent 442,878

Thermionic value parts of nickel are roughened, by sand-blasting or etching, and coated with a mixture of

Palmitic Acid	215 g.
Lampblack	88 g.
Lard Oil	120 g.

It is then heated above 350° C. in an inert atmosphere to drive off the binding medium.

Thermal Treating Bath for Light Metals

British Patent 464,697

A bath for use at 300–500° C. as follows has low corrosive properties:

Potassium Chloride	25–40 lb.
Sodium Chloride	15–25 lb.
Calcium Chloride	10–50 lb.
Barium Chloride	10–20 lb.
Strontium Chloride	5–20 lb.
Barium Carbonate	1–25 lb.
Caustic Soda	1–10 lb.

Tempering Powders (Steel)

Formula No. 1

Animal Coal (from Charred Horn)	24 lb.
Horn Filings	4 lb.
Glue	6 lb.
Potassium Nitrate	9.5 lb.
Sodium Chloride	55 lb.

No. 2

Potassium Ferrocyanide	30 lb.
Potassium Nitrate	30 lb.
Animal Coal (from Horn)	30 lb.
Aloe, Powdered	1 lb.
Gum Arabic	1 lb.
Salt	15 lb.

No. 3

Calcium Chromate	100 lb.
Coal	16 lb.

No. 4

Calcium Chromate	100 lb.
Coal	25 lb.

No. 5

Calcium Tungstate	100 lb.
Coal	14 lb.

No. 6

Coke Powder	79–84 lb.
Barium Carbonate	15–20 lb.
Soy Bean Flour	1 lb.

Steel Spring Quenching Emulsion

British Patent 435,223

Fish Oil	75 lb.
Caustic Soda	0.1 lb.
Water	25 lb.

The springs are heated to 850° F. and quenched in above emulsion.

Annealing Hack-Saw Blades and Files

Hack-saw blades, files, and other pieces of tool steel can be annealed dead soft in the following manner: Obtain a piece of ¾-in. or larger scrap pipe about 15 in. long. Thread both ends and obtain a pipe cap for each end. Insert the pieces, screw the caps on by hand, and throw the pipe into the furnace. Allow it to reach a red heat and remain so for about two hours; then remove and bury it immediately in ashes or lime until cold. Steel annealed in this manner does not scale or burn, and can be filed or cut with cold chisels easily. Hack-saw blades can be bent double and hammered flat without breaking. Temper can be restored in the usual manner.

Hardening or Tempering Copper

U. S. Patent 1,981,718

Molten copper is stirred with a 3 to 1 mixture of lime and rosin, then cast into molds and hot worked while applying powdered rosin to the surface of the hot ingot.

Acid Resistant Lining

Andesite	30 lb.
Chloronaphthalene	9 lb.
Pitch	1 lb.

Cementation Bath for Iron and Steel

British Patent 468,366

Sodium Cyanide	20 lb.
Sodium Chloride	22 lb.
Potassium Chloride	28 lb.
Barium Carbonate	30 lb.

Case Hardening Centrifugal Ferrous Castings

British Patent 467,152

The castings are packed in powdered beryllium or beryllium-iron (80% beryllium) and heated at 800–1150° C. for 2½–10 hours.

Case Hardening Steel

British Patent 468,757

Heat steel at 800–950° C. in

Charcoal (Powdered)	100 lb.
Manganese Dioxide	10–30 lb.
Caustic Potash	15 lb.
Ammonium Chloride	5 lb.

Case Hardening Steel

U. S. Patent 2,048,526

Steel is embedded in powdered boron carbide and heated for several hours at 1400°.

Steel Hardening Mixture

U. S. Patent 2,009,165

Silica	31.4 oz.
Feldspar	38.3 oz.
Borax	14 oz.
Sodium Bicarbonate	14 oz.
Ball Clay	2.3 oz.

This mix is fused and the steel is immersed in it.

Hardening Steel

U. S. Patent 2,032,700

The steel is passed through the following molten salt bath (760–840° C.).

Barium Chloride	45 lb.
Potassium Chloride	45 lb.
Sodium Chloride	10 lb.

then into a bath of molten lead below it; then draw up through the above salt bath and quenched in brine (d. 1.045).

Antimony Surface Hardening of Metals

U. S. Patent 2,032,912

The process of hardening articles made of workable metals and alloys having melting points between 750° C. and 1550° C. comprises coating articles with antimony, heating the coated articles at a temperature between 400° C. and 620° C. to thereby produce a hardened layer consisting of antimony and metals or alloys and containing phases the composition of which is a direct function of temperature, quenching said articles, and reheating to 200° C. to 350° C.

Case Hardening Composition

Formula No. 1

U. S. Patent 2,046,822

Sodium Cyanide	45.9 oz.
Barium Chloride	31.1 oz.
Sodium Fluoride	12.4 oz.
Calcium Fluoride	7.3 oz.

This fuses at about 600° C.

No. 2

U. S. Patent 2,002,180

Sodium Cyanide	9 oz.
Barium Chloride	6 oz.
Barium Carbonate	8 oz.
Calcium Fluoride	2 oz.

Use at 630–930° C.

Case Hardening Cast Iron Piston Rings

British Patent 447,932

The rings are hardened in ammonia gas at 500° while being "tensioned."

Iron Cementing

U. S. Patent 2,025,050

An iron and steel cementing bath composition, molten at cementing temperatures and containing material capable of supplying carbon to the metal at said temperatures, comprises an alkali metal cyanide in the neighborhood of 8%, sodium chloride in the neighborhood of 62% to 65%, potassium chloride in the neighborhood of 18% to 19%, and an activated carbon of low combustibility in the neighborhood of 8%.

Inhibitor, Steel Pickling

U. S. Patent 2,049,517

Hydrochloric Acid (1:1)	1 gal.
Copper Carbonate	0.0021 lb.
Methylene-o-toluidine	0.0083 lb.

Steel Nitriding Inhibitor

U. S. Patent 1,980,670

Parts which are not to be nitrided are painted with a mixture of

Tin Powder	70 lb.
Silica Powder	26 lb.
Kaolin	4 lb.

Made into a paste with a solution of

Diammonium Phosphate	21 lb.
Boric Acid	4 lb.
Zinc Chloride	5 lb.
Hydrochloric Acid	21 lb.
Water	49 lb.

Coating for Ingot Molds

French Patent 814,540

Formula No. 1

Aluminum	2 kg.
Graphite	18 kg.
Soda Ash	5 kg.
Silica	5 kg.
Water	70 kg.

No. 2

Aluminum	2.5 kg.
Graphite	24 kg.
Siliceous Sand	6 kg.
Soda Ash	6 kg.
Water	61.5 kg.

Preventing Cavities and Segregation in Steel Ingots

French Patent 806,748

Spread on top of ingot

Sawdust	20 kg.
Alkali	6.3 kg.
Wood Charcoal	38.7 kg.
Graphite	35.0 kg.

then add some molten metal over this.

Plastic Lead

Lead, Powdered	90 oz.
Mineral or Cottonseed Oil	10 oz.

Mix together in an ointment or roller mill. This material is readily molded by the hands.

Malleable Cast Iron

U. S. Patent 1,987,481

White cast iron is rendered malleable by heating for 4 hours at 900°, then for 4 hours at 1010°, and finally for 1 hour at 760°, cooling at 5.5° per hour to 650°, and allowing uncontrolled cooling to temperature.

Coating for Sand Molds for Light Metal Casting

U. S. Patent 2,045,913

Paraffin Wax	0.5–4 lb.
Talc	0.5–4 lb.
Carbon Tetrachloride	1 gal.

Mix vigorously just before use to get a uniform suspension.

Copper Foundry Mold Dressing Paste

U. S. Patent 2,050,375

Molds used for casting O-free Copper are dressed with a paste consisting of a mixture of bone ash or bone black 3 and rosin 1 lb. with 1 gal. of alcohol.

Foundry Mold (Casting) Powder

a.	Limestone, Finest Powder	25 kg.
b.	Montan Wax, Crude, Powdered	750 g.
	Sudan Yellow, Oil Soluble	12.5 g.
	Limestone Powder	200 g.

Heat *a* and *b* to 140° C. in an iron kettle until homogeneous.

Cool, grind thoroughly. Sift as fine as possible, e.g., through miller gauze.

FABRICATION AND TREATMENT OF USS STAINLESS AND HEAT RESISTING STEELS

Courtesy of Peter A. Frasse & Co., Inc.

Joining of USS Stainless and Heat Resisting Alloys

Generally speaking, in no other phase of metal working is the skill of the workman so important as in the operations of joining together individual pieces of metal. This is doubly true when applied to manually performed welding operations. For this reason, the principles of welding, as they apply to these alloys, will be discussed at some length; however, the suggested procedures should not be considered inflexible.

Welding

All grades of stainless steel products produced by the Subsidiary Companies of the U. S. Steel Corporation are weldable by all the common welding methods included in the following list. Each method is hereafter described. Hammer or forge welding alone cannot be done.

1. Electric Arc
2. Gas (acetylene welding)
3. Electrical Resistance
   a. Spot and line (seam) welding
   b. Flash welding
4. Atomic Hydrogen Welding

The selection of the best method for a particular job depends upon the conditions imposed, such as analysis, thickness of the metal, corrosion, mechanical considerations and appearance. Many fabricators, however, are limited by their equipment to a choice between the hand operated electric arc and the gas methods. Also, many jobs require the use of one of these methods. Usually the hand operated electric arc used with a coated metallic electrode is preferable since the probabilities of carbon pick-up and appreciable chromium loss in the deposited metal are considerably less.

All of the alloy grades included in the USS series may be classified into three metallurgical groups as follows:

1. Austenitic Alloy, non-magnetic (chromium and nickel)
   USS 18-8 (.08 carbon maximum; over .08 to .20 carbon)
   USS Stabilized 18-8
   USS 18 Mo
   USS 25-12
2. Ferritic Alloys, magnetic (straight chromium)
   USS 17
   USS 27
3. Ferritic-Martensitic Alloy, magnetic (straight chromium)
   USS 12

The alloys, from group to group, respond differently in their mechanical and corrosion resistant properties at the welds. The metallurgical characteristics of each group, for this reason, are briefly described.

Austenitic Alloys
USS 18-8, USS Stabilized 18-8, USS 18-8 Mo, USS 25-12

Under usual working practice these alloys will not harden or become brittle with heat treatment. They possess excellent ductility, together with great strength and toughness. These qualities make possible welds and adjacent areas with similar characteristics.

Under severe corrosive conditions, such as welded equipment must withstand in chemical and chemical processing plants and in high temperature exposure, the limitations of the plain chromium nickel grades, particularly those of analyses similar to USS 18-8, are now well understood. Experience and investigation show that USS Stabilized 18-8, a somewhat more costly alloy than either the low or high carbon grades of USS 18-8, should be used to meet conditions which are severe enough to cause inter-granular corrosion. This alloy is entirely immune to this form of attack. It is impossible to describe accurately the corrosive conditions which will or will not cause this form of attack in impaired areas of plain USS 18-8

The influence of low carbon content in minimizing this condition should be considered; also the tendency of stabilizing elements to entirely obviate such corrosion.

A question frequently raised concerns the type of welding rod to be used in welding USS Stabilized 18-8 when it is subjected to severely corrosive conditions. Except where welds are to be crossed, the ordinary low carbon 18-8 rod is satisfactory when only a single bead is required to make a joint. Usually not more than one bead is necessary for welding sections of sheet thicknesses. The deposited metal cools rapidly through the carbide precipitation range, and retains adequate corrosion resistance.

These welds, however, should not be exposed subsequently in fabrication or service to harmful temperatures. Where welds are to be crossed, where one bead is superimposed on another, or where the assemblage will be exposed in service to corrosive conditions at high temperature (either continuously or intermittently, in the carbide precipitation range) the use of an 18-8 rod containing a stabilizing element is advised. An excellent 18-8 rod for this purpose is one containing columbium.

Until recently, heat treating of welded 18-8 articles after welding was recommended as a cure-all for intergranular corrosion. In principle this is quite correct, and actually can be accomplished in small articles, usually with some sacrifice in shape, due to distortion. However, it is now generally considered impracticable for equipment such as large tanks and vessels constructed of heavy structural materials. In such equipment all parts cannot, even by air blasting or spraying with water, be cooled rapidly enough through the carbide precipitation range to avoid impairment. Another difficulty is that it is seldom possible to heat large equipment in its entirety up to suitable temperatures, at least 1700 degrees F. Massive supports and conveyances, such as beams, jacks and trucks which are necessary in order to prevent distortion of the article, cannot be heated to a high enough temperature without damaging or without soaking for long impractical periods. This condition, obviously, will cause local impairment of corrosion resistance in the heat treated equipment at the areas contacting the supports because of the insufficient temperatures and slower cooling at these points. Such a condition may be more undesirable than some slight susceptibility adjacent to the welds. It was for solutions of problems such as this that USS Stabilized 18-8 was developed.

USS 25-12 and USS 18-8 Mo generally do not present, to a marked degree, the problem of intergranular corrosion, and only in very unusual circumstances does this condition develop.

Ferritic Alloys—USS 17 and USS 27

These alloys, which contain over 15% chromium and 0.10% maximum carbon, may, for all practical purposes, be considered as non-responsive to hardening and toughening by quenching and drawing, a common procedure in the treatment of medium and high carbon plain steels and high carbon stainless cutlery steels. They are, however, prone to the growth of very large grains when exposed to welding temperatures, which frequently result in welds of insufficient ductility.

This condition may be lessened to an appreciable extent in USS 17, when welds are to withstand shock and stress at atmospheric temperatures, by completely annealing the welded unit or, when the former is impracticable, by torch annealing the welded zones at a temperature between 1400 and 1500 degrees F. The annealing treatment does not reduce the grain size, but will relieve weld stresses and eliminate the effects of a hardening constituent which occasionally is present in this lower chromium grade when cooled from welding temperatures. No practical correction can be made to offset the embrittlement of USS 27 welds. These alloys are not suggested for low temperature welded applications which are to be exposed to sudden impact of great stresses. Contrary to the chromium nickel grades, welds of these alloys do not possess strength and ductility approaching that of the original metal. This brittle condition is present to a marked degree only at or below atmospheric temperatures. Ductility and toughness in relation to the normal metal is increased appreciably at the higher temperatures.

The higher straight chromium grade, USS 27, is seldom required in atmospheric or low temperature service, and the brittleness problem, therefore, primarily concerns USS 17.

More ductile welds are frequently obtained in the alloys of this group by tack welding a seam together, by using the more ductile 18-8 or 18-8 columbium bearing filler rod, and by completing the weld with a rod of the same analysis as the parent metal. The ductile tacks serve to cushion the shock loads from the straight chromium beads between the tacks.

Ferritic—Martensitic Alloy—USS 12

USS 12 is the only grade of stainless steel currently produced by the Subsidiary Companies of the U. S. Steel Corporation which falls in this metallurgical classification; i.e., hardenable or strongly amenable to heat-treatment. Other commercial alloys of lower chromium content, not classed as stainless, such as those containing 4 to 6% chromium, will not be discussed.

This alloy differs from the higher straight chromium types in that it does respond to heat treatment, becoming much harder when cooled rapidly from temperatures of 1750 degrees F. Subsequent drawing at temperatures between 600 to 1500 degrees F. will toughen it appreciably. In the drawn condition, the alloy possesses a ferritic-martensitic structure, whereas in the dead soft annealed state it is essentially ferritic, similar to the higher straight chromium grades.

It is apparent from this brief resumé of the thermal-physical characteristics, that welds of this alloy in the "as welded" condition, will be air-hardened, withstanding comparatively little impact. This condition can be alleviated by complete drawing or tempering of a welded assemblage, or by torch annealing locally at a temperature preferably between 1300 and 1400 degrees F. Temperatures as low as 600 degrees F. will toughen the welds appreciably. For maximum corrosion resistance tempering at about 900 degrees F. is generally avoided.

Electric Arc Welding

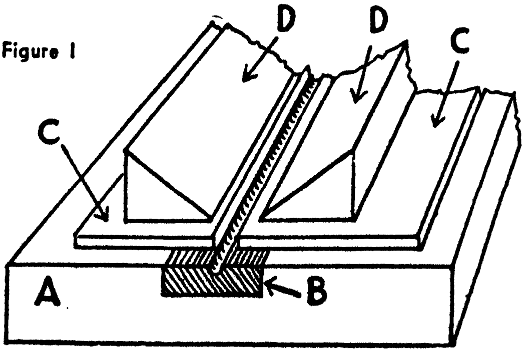
Electric arc welding is preferable to the acetylene gas method because it minimizes the possibility of carbon pickup and chromium loss. The effects of high carbon content in welds are harmful to the chromium nickel steel alloys because of the lowered corrosion resistance of the deposited metal. In the straight chromium grades excessive carbon reduces the toughness of welds. Oxidization of the chromium obviously lowers the corrosion resistance in any of the grades.

Low carbon coated electrodes, usually of the same analysis as the parent metal, should be used. Welding with carbon electrodes is not recommended for obvious reasons. Properly compounded coatings are an important factor in minimizing oxidation of the fusion. The brittle slag caps the weld bead and protects it from the air while cooling. The electrodes should be of smaller diameter than those employed in the welding of equivalent thicknesses of mild steel. Rods of the same diameter as material-thickness are satisfactory except where two or more beads must be deposited to complete a joint. The lower heat conductivities of the stainless steel alloys permit the use of lower currents than are employed for mild steel. Trial, however, is the best procedure in determining the quantity of current necessary to produce a suitable arc. The best results are obtained with an arc long enough only to afford good fusion. Direct current is usually preferred to alternating, especially in welding thin sections. *Reverse polarity* should be used. The rod should be connected to the *positive terminal* of the generator and the work to the negative.

In all methods before proceeding with welding, dirt, oxide, grease and foreign material should be thoroughly removed from the surfaces and edges of all parts to be joined. This is most important in the making of sound welds.

The parts of a seam to be welded should, when possible, be firmly held with jigs and clamps. The use of chill plates held in close contact with the surfaces of the metal subjected to heat, will do much to prevent buckling and warping. Because of their greater thermal expansion and lower heat conductivity, this procedure is especially important in welding the chromium-nickel grades. An excellent method for holding flat work is illustrated in Figure I.

Figure I



A—Heavy steel bar or plate, about 2″ thick.
B—Copper chill bar, grooved to permit penetration of weld metal.
C—Parts to be welded.
D—Heavy hold down bars which may be clamped if necessary.

When it is impossible to set a job in some such manner or in curved or angular seams, tack welding serves as a very helpful expedient. Tacks should be spaced about two to three inches apart. The spaces may then be filled in either by welding continuously in one direction or by using the back-step method as from 3 to 2, 4 to 3, 5 to 4, etc., as shown in Figure II, backing up the work with a hand block.

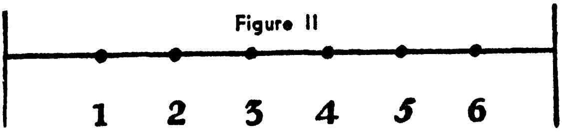


Figure II

This method, or the skipping of alternate spaces, will prevent concentration of excessive heat which causes warpage.

It is very advisable to proceed with the welding as rapidly as possible without sacrifice of good penetration. Where USS 18-8 is involved, this speed minimizes the degree of carbide precipitation.

When tacking, or when meeting one bead with another, the slag and oxide should always be removed from the tacks or the ends of the beads, so that the deposited metal may be free from inclusions and occluded gases. The brittle slag may be chipped off by light hammering, or picked out of any recesses with a pointed instrument. The oxide may be removed with coarse abrasive paper.

To prevent pitting and corrosion, the same procedure should be followed at the completion of a weld, especially if the joint will be exposed to solutions or moisture at low temperatures. A further precaution of pickling the weld is necessary except in cases where the deposited metal and oxidized areas are to be ground. Where the entire part cannot be immersed, an efficient local pickling solution (which seldom requires more than swabbing with one or two applications) contains approximately 20% nitric acid and 1% to 4% hydrofluoric acid in water. It should be heated to a temperature of about 150 degrees F. and discriminately applied with a brush to the parts to be cleaned. Workmen should wear rubber gloves and avoid breathing the fumes. The solution should be allowed to remain on the surface for five to ten minutes and then scrubbed and washed off thoroughly with an excess of cold water. A somewhat less hazardous hot solution contains 20% sulphuric acid or 10% hydrochloric acid, or mixtures of 10% of each are effective where parts can be immersed. It is essential to follow scrubbing and washing operations by swabbing the work with, or immersing it in, a 20% hot nitric acid solution. A final rewash should be given.

The use of the usual arc welding equipment is seldom practicable in gauges lighter than No. 16, although special machines, yielding low direct currents, very closely controlled, are available and have been used successfully on lighter gauges.

Acetylene Welding

The acetylene method is more commonly used for light work because it affords greater ease of temperature control. The flame should be as small as possible, consistent with good fusion, and should be pointed directly down at the work. Welding should progress rapidly. Puddling of the deposited metal should be avoided.

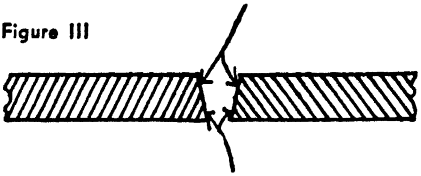
An uncoated filler rod of the same composition as the parent metal is generally recommended. Welding wire is preferable, although narrow shearings cut from scrap are often successfully used.

A neutral flame is the ideal one, since an oxidizing flame produces porous welds and lowers the chromium content in the weld metal. A flame which is severely reducing must be avoided on account of carbon pick-up. As strict neutrality is difficult to maintain at all times, on account of gas pressure fluctuations, the flame used should be slightly reducing in order to avoid oxidizing the chromium. This method envelops the fusion with a reducing atmosphere.

The use of welding fluxes is optional. Good gas welds may be made either with or without them. Fluxes are applied to the under surfaces of the edges to be joined. It is claimed that they aid penetration and prevent oxidation of surfaces not accessible to the atmosphere of the torch. Several proprietary fluxes for this purpose are available.

As in arc welding, jigs and clamps should be used, where possible, to hold the work rigidly. The edges of butted joints on light gauges may be placed together. In heavier gauges it is preferable to space the edges apart about half the thickness of the material. It is rarely necessary to scarf the edges of material lighter than 3/16" thick. When scarfing is necessary, it may be done by machining or grinding the edges as shown in Figure III.

Figure III



As in the case of arc welding when the use of jigs and clamps is not practicable, tack welding may be used. Adjustments to prevent buckling may be made by manipulating the material ahead of the welding with the hands or with weights. The same precautions for removing the oxide from the tacks and the finished welds which were suggested under arc welding, should be taken.

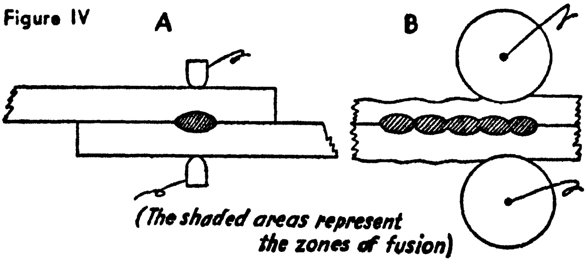
In order to prevent oxidation the filler rod should be kept in the flame at all times as welding progresses. It is usually desirable to use a tip one or two numbers smaller than required to weld the same job in mild steel.

ELECTRIC RESISTANCE WELDING

Spot and Line Welding

Spot and line welding are methods of joining overlapping thicknesses of metal by fusing the contacting surfaces together during the passage of electric current between two electrodes which are usually placed opposite on the outer surfaces of the lap at the point of weld. Line welding is a series of spots spaced closely enough to form a seam. For spot welding, stub-nosed, hardened copper electrodes are used. For line welding, rotating wheels of similar composition are used. See A and B, Figure IV.

Figure IV



(The shaded areas represent the zones of fusion)

Electric resistance welding is best performed with special equipment which provides accurate control of the current and close regulation of heat, time and size of the fusion. Because the welds are made quickly (usually not more than a fraction of a second is required) the small amount of heat necessary to make a weld is dissipated rapidly in the surrounding metal. Thus, there is no prolonged heating at temperatures which would impair the corrosion resistance of the metal in the heat gradient zone adjacent to the weld.

The straight chromium alloys, USS 12, USS 17 and USS 27, can also be welded by this method. However, there will be some brittleness at the joints in the "as welded condition." Annealing is necessary if the welds are to withstand shock.

Welds in the chromium-nickel alloys, when properly made, are strong and ductile, with excellent shear strength.

For maximum strength the extent of the fusion should not be less than fifty per cent nor more than eighty per cent of the total of the thicknesses to be welded. Avoidance of penetration to both outside surfaces also aids corrosion resistance. The chromium nickel grades are especially well adapted to this method of welding because of their greater electrical resistance which permits the use of less current than is required in spot welding metals and alloys of greater electrical conductivity. In welding, the magnitude and "dwell" of the current are important in order to avoid excessive heating and slow cooling of the zones surrounding the welds. Proper adjustments can be made by trial on samples of the same thicknesses as the metal to be welded. Mechanically and electrically controlled time and current equipment reduces the human error factor to a minimum; and when a suitable setting has been accomplished, welding should continue with assured duplication of results.

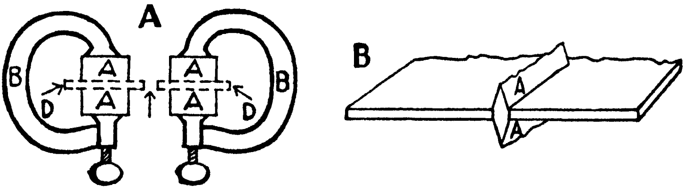
A common method of testing spot welds is to twist them through an angle. A good spot weld of USS 18-8 will twist through an angle of 60 to 90 degrees before shearing out. Design alone must determine the proper spacing of spot welds. The crushing of a test section is a good method to determine this.

Appearance often plays an important part at least on one surface of a spot welded section. Although actual fusion may not have extended through to outside surfaces, it is virtually impossible by conventional practice to avoid slight surface indentations at the spots because of the pressure of the electrodes and shrinkage of the fused metal. These may usually be eliminated on one surface by placing a block of copper, about ⅜" x 2" x 2", between one electrode and the favored surface. After a weld is finished the light oxide may be removed by pickling or, in the case of polished sheets, by light grinding and polishing or polishing alone. Since this method is suitable for lap welded joints which are often used on integral parts of structural members and in edge and flange seams, it has filled its place admirably among applications for stainless steel in the automotive, railway passenger car, electric refrigerator and aviation fields.

Flash Welding

Flash welding is a method of butt welding performed by bringing together two edges which have been fused by an electric arc in the course of the passage of electric current from one edge to the other. The principal is exemplified in Figure V, A and B.

Figure V



A flash welding machine is equipped with a transformer to change high voltage alternating current to low voltage high amperage current; also with welding dies, rigid clamping devices, which assure good contact of the dies to the surfaces of the parts to be welded, and a pressure mechanism, following the toggle press principle, for bringing the edges together after the proper heat has been developed.

In the welding process, the edges of the stock to be joined are placed between the dies and adjustments are made in the clamping and pressure mechanism to assure proper alignment and spacing of the edges. Thus uniform contact and fusion are provided. It is essential that dies fit the contour of the work very closely to avoid heat conductivity losses and non-uniform arcing which would cause poor welds.

The stainless steel alloys respond readily to this type of welding because of their greater electrical resistance and lower thermal conductivity. Also the chromium-nickel alloys yield much tougher and more ductile welds than straight chromium grades. The basic method of flash welding is the same as is used for carbon steels. Time, heat and pressure factors, however, will differ. The heat required to flash weld USS 18-8 is about 15% less and the time 50% less than that required for mild steel.

Because of their lower thermal conductivity, less extension of the metal should be allowed in gripping stainless steel sections in the dies than is the case with ordinary carbon steel sections. The extension, which will vary with the thickness or area of the joint, should be such as to provide not more than 1/16" between the dies at the completion of a weld.

After the edges have been lined up, spaced and clamped, the current is turned on, and the edges are brought within correct arcing distance. During arcing, the edges should be brought up to correct welding temperature. The current is then shut off and the two edges are squeezed together by means of the pressure mechanism. The pressure causes the excess metal to be forced out perpendicularly to form a flash about ½" long, as shown in Figure B.

The hard "flash" metal is removed by hard tool steel cutters. Where appearance is important, the small bead remaining after the cutting operation may be further removed by grind and polishing of the welded area. If the last step is unnecessary, the oxide on either side of the weld should be removed by pickling, as previously stated.

Atomic Hydrogen Welding

For atomic hydrogen welding an electric arc is used in connection with molecular hydrogen gas. The hydrogen is fed into an electric arc maintained between two tungsten electrodes. Upon exposure to this arc, the gas is broken down to atomic form. After passing through the arc, the dissociated hydrogen recombines to molecular form, giving off an intense heat which is an accumulation of the heats from combustion and combination in addition to the heat absorbed from the arc. The flame is fan-shaped, and the atmosphere created is highly reducing. An advantage lies in the fact that carbon is not present in the atmosphere to be absorbed by the fused metal as in the case of acetylene welding. The heat can be controlled within narrow limits, making possible the welding of gauges as light as number 24, which is not possible with the average arc welding equipment. The welding technique is virtually the same as for acetylene welding. An uncoated filler rod should be used and should be held in the flame while welding is in progress to avoid oxidization. The welding is done by the fringe of the fan-shaped flame.

Finishing of Stainless Steel Welds

In many welded stainless steel parts it is found necessary to grind off the excess metal in butt and in corner welded joints for appearance, sanitation and ease in the cleaning of surfaces. The inexperienced operator should prepare himself thoroughly by experimentation, before undertaking this work.

In most cases it is necessary to "dress down" only one surface of a weld. Since the side opposite from that on which the welding is done usually has less excess metal in the bead, it is desirable, when possible, to perform the welding from the side not to be finished.

The finishing procedure is determined by the type of final finish desired. For some work only one coarse grinding operation is required to remove the surface irregularities and cavities in the weld bead. However, when it is desirable to conceal the presence of a weld or when the welded area must match the polished or buffed finish of the adjacent metal, several other operations are necessary.

To remove the heavy stock from the weld, a rubber-bonded, aluminum-oxide, abrasive wheel of No. 15 to No. 35 grain is often used. In general, the greater the mass of the bead, the larger the grain should be. The thickness and diameter of the wheel depend upon the intricacy of the particular job. In hand work, the smaller the diameter, the easier it is to guide the direction of the grinding. The wheel is engaged through its central hole to a rotary driven arbor or shaft. For stationary work such as large tanks, irregular shapes and large flat sheets, a hand portable air or electric-driven motor is used. For small parts which can be held in the hands, the wheel is generally mounted on a stationary rotating shaft. A rubber-bonded rather than a vitrified wheel is preferable because of its faster cutting action and because it has less tendency to load with metal. Lard, oil, or a suitable cutting oil applied to the work, will reduce the tendency of the wheels to load and relieve the harshness of the abrasive scratches without detracting from the cutting efficiency. The oil also serves as a cooling medium. The diameter of the wheel should be true to prevent hammering when applied to the metal. The edges should be slightly rounded to prevent gouging.

A wheel speed of 5,000 to 6,000 lineal feet per minute is usually satisfactory for coarse grinding. The motor used should have sufficient power so that the speed will not fall below these limits when ordinary pressures are applied.

The first operation, almost without exception, should be done in the direction of the weld bead since, in cross grinding, the wheel will tend to grind away areas on either side of the weld, causing depressions in the normal surface.

Where possible on light gauge stock, it is desirable to back up the work with steel plates or wooden blocks in order to present a firm grinding surface.

In applying the wheel to the work, or vice versa, care should be exercised to prevent running off the bead and gouging the adjacent surfaces of the sheets or plates. The wheel should never be allowed to dwell on any spot, but should always be in moving contact, passing over the bead continuously. When one area becomes hot to the hand, it should be allowed to cool; and the operator should work a cooler section to avoid overheating and buckling. Frequent applications of a wet sponge or rag to the ground surface will prevent overheating. Only enough pressure should be applied to utilize the maximum cutting efficiency of the wheel which is a function of the grain size and speed. It does not hasten the removal of stock to ''bear down'' on the work, and is very apt to cause overheating.

For rough work, grinding may proceed to the plane of the sheet surface. Where additional grinding and polishing is required, it is desirable to stop before the bead is entirely removed.

When a very coarse grain wheel has been used in the first operation it is advisable, before proceeding with polishing operations, to regrind the surface of the bead with a finer abrasive wheel (No. 60 or 80 grit) to reduce the size and depth of the coarse scratches, and to make subsequent polishing easier.

The following polishing steps require the use of a fairly soft and resilient wheel. There is a very satisfactory patented wheel on the market in different diameters and widths of cutting surface, with webs constructed of pressed steel sheet discs. A resilient grade of sponge rubber is fitted around the periphery of the wheel and provides a base for a strip of abrasive paper or cloth which is clamped tightly around the wheel by a ratchet mechanism. The paper can be changed upon wearing out or when different size grain is required.

Other types of soft polishing wheels are built up of sections of cloth discs and an abrasive of the desired grain size, mixed with a good grade of first-run hide glue which is applied to working faces of the wheels. The proper degree of resiliency for a particular job and the preparation and application of the abrasive mixture are important factors. It is usually desirable in building up a new wheel to first size the cloth face with glue before applying the abrasive. Usually more than one coat of abrasive is desirable in order to lengthen the life of the wheel. Adequate time should be allowed between coatings and after the final coating for thorough drying. When a suitable head of abrasive has been built up and is thoroughly dry it is advisable to break in the wheel on scrap metal or to turn off the irregular abrasive surface by the use of a black diamond tool. Finally, before using the wheel the hard abrasive crust should be carefully broken up in order to take advantage of the resiliency of the underlying cloth. For additional information on wheels and their preparation, consult manufacturers of wheels and loose grain abrasives.

It is essential that all grinding and polishing wheels and buffs used on stainless be either freshly dressed or used only on stainless. It is highly important that wheels used for grinding or polishing ordinary steel, cast iron or non-ferrous metals or alloys should not be used on stainless.

Polishing steps performed to match sheets possessing a No. 4 finish should always be done in the direction in which the sheet is polished. When possible it is desirable to arrange the weld in this direction. It is easier to match the sheet surface by this procedure rather than by grinding across the weld, since longer strokes can be employed without appreciably overlapping the original sheet polish.

Frequently only one step is necessary after removing the heavy stock in finishing a weld bead to correspond with a No. 4 Finish sheet. This may be done with a wheel of one of the types mentioned above, coated with 120 mesh aluminum oxide or garnet grain or covered with a similar abrasive paper. Occasionally, however, it may be found necessary to follow this operation with a wheel coated with 150 mesh grain to obtain the desired effect.

The wheel may be operated at the same speed as that used for coarse grinding. Tallow should be liberally applied to both the work and the wheel. It is essential that the abrasive surface be well coated with grease, since any dry grain will cut harshly, giving a contrasting effect.

It requires a longer time to finish a seam that must be ground crosswise, since polishing must be continued until all of the lengthwise scratches left in the weld by the coarse grinding operation are removed. In stroking, passing backward and forward without raising the wheel at the end of a stroke is not recommended, since the stopping point will be apparent. Better blending of the finishes can be obtained by stroking in one direction only, bringing the wheel gradually into contact with the work at the beginning of the stroke and tapering off at its completion.

To match sheets having a No. 6 Finish (tampico brush finish) it is necessary, after the foregoing steps, to employ a rotary tampico brush which may be driven by the same equipment as that used for the abrasive wheels. The surface of the work is brushed in the same direction as the brush lines of the original sheet surface. A thin paste composed of 120 to 180 mesh loose grit and machine oil is thoroughly worked into the brush surface and applied to the work before the operation. The proper speed of the brush may be determined by experimentation. It should not be too fast because much of the paste will be thrown off the work. When too slow the desired brushing effect will not be attained. No pressure is necessary. The brush ends should whip the surface.

In matching higher finishes such as No. 7 (higher lustre polish, not free from abrasive scratches) and No. 8 (mirror polish), successively finer grain and buffing must be employed after polishing with No. 120 abrasive. The same type of wheel is suitable for all the polishing operations. Buffing wheels differ, however, and are discussed under "Finishing of Fabricated Articles."

For No. 7 and 8 Finishes, it is customary to finish the polishing operations with 220 and 320 mesh abrasive, respectively, and then follow with buffing operations. For No. 7 Finish, it is usually necessary to follow the 120 grain polish with a 220 grain polish before the buffing operations, in order to produce the desired final lustre. The intervention of an intermediate step employing either 150 or 180 grain may occasionally be advisable.

In matching a No. 8 Finish, the sequence of the polishing steps after the 120 polish may be 180 grain, 220 grain, 280 grain and 320 grain. The polishing direction of each successive step should be at right angles to the preceding one and polishing should be continued until all of the coarser polishing scratches are removed.

Final buffing, which is made easier when the surface has been polished with due regard for the removal of all coarse grain scratches, may be performed by the use of chromium oxide rouge or levigated alumina, compounded with paraffine free from all iron compounds. Iron oxide rouge should never be used. Very satisfactory proprietary buffing compounds may be purchased.

The foregoing has been given as a guide to polishing stainless steel welds and should not be construed as an inflexible practice. Experience and skill facilitate the dressing down of welds and usually make possible a reduction in the number of steps required to attain a given finish.

Soldering

All of the USS Stainless Steel grades can be soldered by customary procedures. Soft soldered joints, when not strengthened by double seaming, spot welding, or riveting should not be depended upon to resist mechanical loads or shocks and should serve only as closures to liquids and gases. Soldering is suggested only where corrosive conditions are relatively mild, such as in joints exposed to the atmosphere and water.

The ordinary lead tin solder composed of 50% of each metal is quite satisfactory. The operation, however, may be performed somewhat faster with a higher tin grade known commercially as 60-40, because of its lower melting point.

The adherence of the solder depends very largely on the character of the surface of the metal to be welded. Rough surfaces, such as No. 1 Finish, provide better adhesion than smooth surfaces such as are found in No. 2B and polished finishes. In soldering smooth surfaces, it is customary to roughen the areas to be covered, either with a file, coarse abrasive paper, or by etching. For this, a water solution of approximately 50 parts of ferric-chloride in 100 parts of concentrated hydrochloric (muriatic acid) is often used. The solution should be applied only to the areas to be soldered and not be allowed to run on to adjacent areas. It should be allowed to stand for five to fifteen minutes before soldering.

Stainless steel sheets may be soldered with or without tinning, although tinning the edges is preferable.

There are several commercial grades of stainless steel soldering flux on the market which perform nicely. Also, the usual acid flux consisting of commercial hydrochloric acid killed with zinc, with or without an addition of 10% commercial acetic acid, is satisfactory. A solution of approximately 10% phosphoric acid is preferred by some fabricators, since it is a weaker acid than hydrochloric acid and claims are made that it provides better joints. The flux can best be applied with a brush and care again should be taken not to coat excessive areas.

It is preferable to use large irons or "coppers" in soldering stainless steel, because of their greater heat capacity. Preheating the edges slightly with a soft torch is often helpful in soldering heavy gauges.

After soldering is completed it is *imperative* that the article be *carefully washed* immediately and rinsed to remove all traces of the soldering flux. It is advisable to wash the whole piece thoroughly—not merely the soldered joint, since it has been found that splattering and fumes from the flux cause a wetting of the metal with acid at points far removed from the joint itself. The soldering acid will cause pitting and corrosion of the metal unless *promptly* removed. The addition of 5 to 10% common washing soda to the wash water aids by neutralizing the soldering acid.

Silver Soldering

This method of soldering stainless steel has found practical application in joining parts where welding is not feasible, but where a fastening stronger than an ordinary solder joint is required and also in cases where, for reasons of appearance, it is desirable to have the deposited metal match the lustre and finish of adjacent polished surfaces more closely than is possible with soft solder. Silver soldering has been successfully used to join copper refrigerant tubes to stainless steel evaporators for electric refrigerators; also to join the corners of fabricated kitchen table tops, sinks and splash boards to drain boards. In such service the polished joint will retain its original lustre for a considerable period. However, the use of this method is not recommended for more severely corrosive service, particularly where the media are such as to set up galvanic attack.

Several satisfactory commercial grades of this solder are available. They are usually composed of silver, copper, zinc, cadmium, and sometimes nickel in varying proportions. The choice of the proper grade depends upon the job and the stainless steel grade to be joined. The low melting point grades are usually desired for soldering USS 18-8 since, in applying the high melting point grades, a temperature in the carbide precipitation range is necessary.

There are commercial fluxes available which are recommended by the manufacturers of silver solder for stainless steel. One very satisfactory flux which can be made up by the user contains about 60% potassium fluoride and 40% borax.

The work should be preheated with a torch; and the flux, which will melt, should be applied before the stainless steel surface oxidizes. The solder should then be applied with a torch, care being taken to apply only sufficient heat on the stainless to cause wetting by the solder. Excess heat will be of no benefit and should be avoided.

After soldering, the flux may be readily removed by softening with a steam jet. The oxide on stainless steel may be removed by either pickling, light grinding or polishing.

Brazing

Brazing is generally inadvisable because of the questionable metallurgical character of the brazed joint and because of the ease of welding. Also, a brazed joint, coupled with the surrounding stainless steel, is prone to galvanic corrosion when exposed to electrolytic media.

Riveting

The chromium nickel alloys may be either hot or cold riveted. Small rivets, up to about ¼ inch, may be driven cold and are set more easily by a few heavy blows than by numerous light blows because of the work-hardening properties of these alloys. Hot rivets should be heated out of contact with flame, never in a blacksmith forge, to a temperature between 2100° to 2200° F., so that mechanical deformation is finished before cooling below 1600° F.

Caulking of leaking rivets is difficult because of the toughness of these alloys. Frequently, the necessity for caulking may be eliminated in heavy rivets by using a rivet with the under side of the original head tapered and the holes counter sunk a short distance from both sides.

The straight chromium alloys, USS 12 and USS 17 may be riveted cold up to about ½" diameter. For hot riveting, the rivets should not be heated beyond 1400 degrees F. It will be found that these rivets set more easily than those of USS 18-8 and USS 25-12, since they are less tough and do not work-harden nearly as rapidly. However, after setting they do not possess the impact, tensile and shear strengths of the chromium-nickel rivets.

Before riveting, it is advisable to consider the feasibility of welding, since the latter is usually preferred for joining stainless steel parts.

Annealing
USS 18-8, USS 25-12, USS 18-8 MO

The term annealing, when applied to these alloys, differs somewhat from its general meaning. These alloys undergo no phase transformations upon cooling from softening temperatures and, therefore, cooling may and should be done as rapidly as possible. The purposes of annealing are to relieve strains set up in previous cold rolling or forming operations and to produce a homogenous, completely austenitic condition in which the metal possesses a maximum softness and corrosion resistance.

Annealing is done by heating to at least 1850° F. and cooling rapidly. The time required at this temperature is dependent upon the mass of the metal. For light sheet sections, 16 gauge and thinner, three to five minutes will suffice. Heavier sections, up to one-half inch thick will require, proportionately, up to one-half hour at this temperature. By increasing the temperature 1950° to 2000° F., the annealing time may be lessened and the metal will attain its maximum softness and greatest ductility upon rapid cooling.

Air cooling is usually sufficient for stock 14 gauge and lighter. An air blast or, preferably, a water spray or quench is desirable for heavier sections.

The chromium-nickel steels, with the exception of USS Stabilized 18-8, should not be allowed to remain at temperatures between 1000° and 1500° F., nor should they be allowed to cool slowly through this range, as this treatment lowers corrosion resistance.

Flame contact with the steel should be avoided to prevent heavy scaling and burning of the surface. For this reason furnaces of a muffle, semi-muffle or electric type are a distinct advantage. A blacksmith forge in which appreciable carburization may occur should never be used.

Before annealing, the surfaces of the metal should be thoroughly cleaned of all foreign materials such as dirt, oil, grease or other lubricants. Otherwise there will be carburization, pitting and non-uniformity of the surface after pickling. Even finger prints on the unannealed surface, if not removed before annealing, may be quite apparent after pickling.

Annealing USS Stabilized 18-8

In softening this alloy it is not necessary to consider the cooling rate through, or prolonged exposure within, a temperature range of about 1000° to 1600° F. An appreciable softening in the strained condition may be attained by heating the metal to temperatures between 1400° and 1600° F. The time at these temperatures, however, should be considerably longer than is necessary at higher temperatures.

Annealing USS 17 and USS 27

Annealing has a somewhat special meaning in the case of USS 17. It is usually done by heating to about 1400° F. Cooling may be rapid from the annealing temperature, although quenching in water is unnecessary. The effects of either hot or cold work are removed by this annealing, and ductile metals are provided for further working. The fine-grained structure secured by a low-temperature anneal after cold working is associated with the highest ductility.

The best method for annealing USS 27 is to soak the alloy for one hour or longer (depending on the cross section) at 1450° F. to 1600° F., and then cool rapidly.

Surfaces should be carefully cleaned before annealing, especialy when a smooth pickled finish is required for polishing. See the foregoing section on the chromium-nickel steels.

Annealing USS 12

For complete softening, the normally cooled or cold worked metal should be heated at 1300° to 1400° F. for a period of one to three hours, depending upon the cross-section. Good ductility, comparable with that of mild steel having a carbon content of about 0.10%, is thus developed.

Removal of Oxide and Scale

Pickling

A solution containing by volume approximately 20% of commercial nitric acid and 1 to 4% hydrofluoric acid (or an addition of 10% hydrochloric acid instead of hydrofluoric) has been found satisfactory for pickling the chromium-nickel steels. The latter solution should be renewed rather frequently in continuous service since, if an excessive amount of ferric chloride is formed, a very objectionable type of pitting will result.

Another pickling solution, which is satisfactory on both chromium-nickel and straight chromium steels with a dense surface and light oxide, is composed of 20% sodium hydroxide and 5% potassium permanganate, by weight, heated to boiling. The article to be pickled should be immersed for a period of fifteen to twenty-minutes to soften the oxide. The surface should then be cleaned up by an immersion for 5 to 10 minutes in a 20% nitric acid solution. This procedure is recommended only on uniform and light oxides such as those obtained in the controlled atmosphere of a muffle or electric furnace. This method yields an unetched pickled surface similar to the dense finish of the article before annealing. When the oxide is slightly heavier than it should be, it is sometimes necessary, before using the caustic-permanganate solution, to immerse the article for two or three minutes in a hot 10% sulphuric acid solution to "break up" the heavier scale.

All the grades may often be satisfactorily pickled as follows:—Use a hot 15 per cent sulphuric acid solution with

or without the addition of 2 to 4% hydrochloric acid or rock salt, which reacts to form the latter acid. Follow by immersing in a hot 15% nitric acid solution for five to ten minutes, in order to remove the loose oxide.

After each pickling step it is advisable to wash the article with clean water, and finally to scrub it thoroughly to remove any clinging oxide. If the stainless steel article or equipment is to be exposed in the pickled condition, the pickling should always be followed by a soak of at least 20 minutes in a 20% nitric acid bath held at approximately 145° F. The nitric acid exposure should be followed by a thorough rinse. This nitric acid treatment is termed "passivating."

Sandblasting

Heavy scale and oxide may be removed by this method when a smooth, finished surface is not required. Sandblasting should not be used when surfaces are to be subsequently polished.

The method is the same as is used for ordinary steels except that the article should be thoroughly immersed after the operation in a hot 15% nitric acid solution, and should then be scrubbed and washed, in order to remove any foreign materials which might cause staining of the surface or corrosion.

The blast should be passed over the surface continuously. Dwelling on any area for too long a period will cause severe local erosion and irregularities in the surface of the metal. With light gauges care should be exercised to avoid distortion and the blast should be no stronger than is necessary to remove the scale efficiently. Use clean sand which has not been used previously on mild steel or any non-ferrous metals. Metal shot should not be used.

MACHINING AND CUTTING OPERATIONS

Machining

The art of machining all of the stainless steel grades may be summarized as follows:—(1) slow speed, (2) heavy cut, (3) sharpest tools, (4) generous rake. If the work warms up considerably, the cutting is easier. They may be machined dry or with lard oil-sulphur lubricant. A speed of approximately half of that required for the same job in mild steel is generally used. A heavy cut should always be taken in machining the austenitic grades because of their cold work-hardening properties. It is necessary to cut beneath the virtually unmachinable, work-hardened skin suface of the previous cut. Tools should never be allowed to ride over the surface without cutting and it is desirable to complete without stopping.

The tools must be sharp and kept so. In shaper, planer or lathe work, it is desirable that the lip angle or top rake be greater than usual in order to free the chips or turnings rapidly. All of the stainless steel grades, excepting those of free machining analyses, possess high frictional properties which cause the chips to adhere to the lip. This results in clogging unless the rake angles are increased.

Drilling

The principles outlined in the foregoing apply also to drilling. Thus, a slower speed, about one-third of that required for ordinary steel, is usually maintained when drilling the chromium-nickel steel alloys. A somewhat faster speed is permissible with the straight chromium grades. High speed steel twist drills should always be used. The angle of cutting lips should be greater than usual in order to provide more clearance. Center punching should be done lightly. A triangular punch point is the most satisfactory. It is imperative that drilling proceed under continuous feed and at no time should the drill be allowed to rotate idly without cutting. Where the hole is to be drilled completely through, the stock should be backed up with a steel or cast iron block.

A lard oil and sulphur lubricant works well and should be used for deep holes.

Threading

The general rules for machining operations apply also to threading. A four- or five-thread lead is advisable except for fine threads where a short lead and fairly good speeds can be used.

Sawing

USS 18-8 is not cut with the same ease as ordinary annealed steel; nevertheless it may be satisfactorily sawed. A high speed steel coarse tooth saw, rather heavily weighted, should be used and so applied that the first stroke definitely cuts the metal. If the work heats it will cut somewhat better. A wavy set saw is particularly well adapted for this metal. Care should be taken not to permit the saw to ride over the work without cutting, as this quickly work-hardens the work and makes cutting more difficult.

Punching and Shearing

Because of the great toughness of the chromium-nickel steels, the engaging parts employed for shearing and punching must fit more neatly than those used for ordinary steel; otherwise, metal may drag between the punch and the die. In punch work it is necessary to punch all the way through the stock, in order to obtain clean edges and clean parting of the metal.

It requires about twice as much power to shear USS 18-8 as is necessary for mild steel of equivalent thickness. Therefore, a shear of a maximum power rating of ¼″ for ordinary steel should not be used in continuous service to shear heavier than ⅛″ thick USS 18-8. However, the safety factors in most equipment will allow the occasional shearing of heavier stock without damage to the work or the machinery.

Perforating

All the grades of USS Stainless and Heat Resisting Steel Sheets may be successfully perforated with the observance of proper precautions. Speeds slower than those commonly used in perforating steel or softer non-ferrous metals should be kept. For the chromium-nickel types the speed may be one-third of that required for perforating brass. The straight chromium grades may be perforated somewhat faster. Perforating tools must be kept sharp throughout the operation and die clearances should be less than customarily employed for softer metals. Experience has proven it generally inadvisable to attempt to perforate, in the austenitic grades, holes of diameters less than twice the thickness of the stock. For the straight chromium grades diameters of 1½ times the thickness are practicable. The dies should cut entirely through the metal. Lubricants should be used.

DRAWING AND FORMING

Application of Finishes

For rough or heavy work, where the finished surface is of little importance, No. 1 Finished sheet or hot rolled, annealed, and pickled plate is generally used. No. 2D Finish or No. 1 Finish strip are recommended for deep drawn parts involving either one or more severe draws. Materials of these finishes are comparatively free from surface irregularities and if care is taken throughout the forming operations, articles may be polished subsequently with relative ease. Stainless steel sheets and strip of these finishes possess the best drawing quality.

No. 2B Finish sheets and No. 2 Finish strip can withstand all but the most severe forming operations. They are not quite as soft as those referred to above since they receive a slight amount of final cold rolling. This finish is not recommended for articles involving annealing and pickling, since the bright cold rolled surface will be destroyed and consequently is not necessary. It is better suited for ''one draw stampings'' as for shallow pans which require a smooth, dense surface that may be readily cleaned in the ''as drawn'' condition or subsequently polished.

No. 4 Finish sheets and those of higher finishes are suitable only for very shallow stampings since the polished surfaces will be destroyed in severe operations and finished articles will often require as much repolishing as would have been required if unpolished finishes had been used originally.

USS 18-8; USS 25-12; USS 18-8 Mo

The *USS Stainless Steels* of chromium and nickel analyses are approximately 100 to 125% more ductile, as measured by elongation in the tensile test, than ordinary steel. The alloys are also stronger, work-harden more rapidly and accordingly require more power in forming operations. Slower speeds are advisable since, with these grades, work-hardening is more pronounced with rapid deformation. Solid hardened steel or alloy steel dies are preferable to cast iron dies because of their toughness and responsiveness to polishing. Extremely well polished dies are the most satisfactory and are generally used where drawn articles are to be subsequently polished. Dies should be designed for an allowance of spring back of two or three times that for ordinary steel. In heavy gauges clearance allowances of about twice those required for ordinary steel are recommended to permit the metal to flow freely. Light gauge allowances should be only slightly greater than those for mild steel.

Because of the greater pressures required to form these grades and the high temperatures developed during the drawing operation, effective lubricants are necessary. For some jobs, several of the proprietary water-soluble drawing compounds are quite satisfactory. For heavy work and where die clearances are scant, the following is often effective:—Linseed oil and whiting mixed to a consistency of 600 W engine oil; add to the mixture about 10% by volume of flowers of sulphur. For difficult or heavy work, better results are obtained if the drawing compound is rubbed well onto the surface of the blanks, rather than swabbed on. It is essential that the drawing compounds be thoroughly removed from the surfaces before annealing, otherwise carburizing and pitting of the surface may result. To remove an oil compound a solution of sodium-silicate at a temperature of 175° to 200° F. is generally satisfactory. Several proprietary cleaners are also efficient.

In deep drawing operations involving several draws such as cylindrical cups or containers, it is often desirable to make the depth of the first draw as great as possible. The diameter of the cup may be as little as 40% of the diameter of the blank although this is not a hard and fast rule. The number of draws necessary to complete an article depends upon the depth, diameter, and shape of the finished object and the power of the equipment. Because these alloys work-harden, more operations are usually necessary to complete a deep drawn article than would be required for the same shape in drawing quality mild steel. For example, where two draws may be necessary in working the latter, three or four may be required in the chromium-nickel steel alloys.

In a series of draws it is frequently found necessary to anneal and pickle after each draw to soften the metal for the subsequent operation. Occasionally, however, where a section of the part such as the bottom of a partially formed container has not been severely strained and the side walls have not been strained to the physical limits of the alloy, an additional draw may be made without intervening annealing and pickling operations.

It is desirable, in forming an article which requires a series of draws, to virtually complete the formation in the next to the final operation, and then to anneal and pickle. By this method the final step will serve to shape up the article without leaving it in an excessively strained condition, and thus eliminate annealing a part last which might cause distortion.

Partially or completely formed articles should not be allowed to remain long in a severely strained condition. It is important that they be annealed as soon after forming as possible, since the stresses set up by atmospheric temperature changes and slight metallurgical readjustments may occasionally be sufficient to cause spontaneous fracture of the article.

The use of draw rings is recommended and sufficient pressure should be applied uniformly to prevent wrinkling. Excessive pressure should be avoided in order that the metal may flow where necessary. For large shallow parts such as trays, the faces of the rings are often cut with engaging beads. These, when located properly, are helpful in adjusting the flow of the metal, in preventing wrinkling and out-of-flatness in the finished article.

Before drawing, the surfaces of the dies should be examined carefully. Any roughness should be stoned and polished out to avoid scoring the surface of the article and damaging the dies. Rigidity of the equipment and concentric engagement of the dies are highly important. Any eccentricity caused by loose parts or improper alignment will result in non-uniform drawing and possible destruction of the die surfaces.

The chromium-nickel steel alloys may be readily bent by any of the conventional bending devices. The same principle applies here as in shearing in that about one and one-half to twice as much power is required to bend these alloys as for mild steel of the same thickness and bend characteristics. Greater allowance must be made for spring back on account of the work-hardening capacities of these alloys.

USS 12, USS 17 and USS 27

Deep drawing operations on USS 12 and USS 17 require more power, more clearance and more carefully selected lubricants than are necessary for working ordinary steel. Because of the increased resistance to deformation in these metals, lower mechanical operating speeds are recommended. The dies must be strong and rigid, and kept smooth and well polished. They will not withstand some of the very severe deformations for which USS 18-8 is especially adapted. However, these alloys will work far more easily if they are warmed to 200° to 300° F.

When the draw is too severe for one operation, full ductilities can be restored if necessary, by heat treatments as described for these grades in the section dealing with annealing. During annealing, the metals may be carburized or the surfaces destroyed if the lubricant is not carefully removed before heating. The choice of a lubricant will depend upon the thickness of the metal and the size and shape of the article to be drawn. The water-soluble lubricants and soap have given satisfactory results in many of the less severe operations; and the lard oil or linseed oil-sulphur lubricants are better adapted where great pressures are required. Annealing for further working must be followed by pickling.

USS 27 is not suggested for any parts requiring deep drawing operations.

Spinning

USS 18-8, USS Stabilized 18-8, USS 25-12

Owing to the high ductilities of these alloys, they are well adapted to spinning operations; yet because of their work-hardening characteristics they cannot be spun as easily as brass. More power and pressure must be used. It is impossible to spin them in one operation to a degree approaching that to which copper can be spun. Therefore, several intervening annealings and picklings may be required before a deep cup or shape can be completed.

The spinning tool may be of hardened steel. A hardened cast iron alloy tool containing approximately 3% carbon, 1% chromium, 3% nickel, and 1.5% silicon is also very satisfactory. The tool should have a fairly large radius to provide a greater bearing surface than is ordinarily used in tools for softer metals. Spinning should be done at definitely slower speeds and greater pressures. Best results are obtained at speeds from one-fifth to one-third of those commonly used in spinning copper, brass or aluminum.

Generous applications of a lubricant are recommended. Both water soluble lubricants and soap have been successfully used in spinning light gauge metal. For heavy stock, heavy bodied lubricants, such as linseed oil and whiting mixed to a consistency of slow-flowing paste, are generally advisable because of the great pressures imposed.

In order to avoid wrinkling or breakage along the edge of a blank, it is advisable, where possible, to begin the spinning operation about one inch away from the edge, which can be spun last.

Excessive deformation in one operation should be avoided; otherwise cracking will occur. When the physical limits of the metal have been reached, the lubricant must be thoroughly removed from the surface of the work which should then be annealed and pickled, as previously explained, before spinning operations are continued.

USS 12, USS 17, USS 27

The spinning characteristics of USS 12 and USS 17 approach more closely those of ordinary steel, although somewhat slower speeds and tools of larger radii are helpful because of the greater strength of these alloys. The annealing and pickling practices previously outlined for these grades are suggested when softening is necessary between spinning operations.

It is seldom practicable to spin USS 27 on account of its inferior ductility at atmospheric temperatures.

When spinning is necessary, orders for stainless steel sheets should so specify, to assure receipt of material of suitable spinning quality.

FINISHING OF FABRICATED ARTICLES

Grinding, Polishing, Buffing and Brushing

The correct finishing of stainless steel articles with abrasives or abrasive compounds requires careful study. Methods vary widely because of the following factors:

1—Size and shape of the article to be finished.
2—Character of the original surface:
  (a) General density of metal surface.
  (b) Size and depth of surface imperfections such as pits, scratches, tool marks and scale marks in the starting surface.
  (c) Whether partially ground or polished as in the case of articles fabricated from No. 4 Finish sheets to be subsequently given a higher polish.
3—Quality and degree of lustre desired in the final finish.
4—Type of finishing equipment and its adaptability to the job.

Other important factors affecting the preparation and facility of execution of this type of work are:

1—Abrasives and abrasive compounds.
  (a) Type.
  (b) Grain size.
2—Wheels and abrasive agents for grinding, polishing and buffing.
  (a) Density or resiliency of wheels.
  (b) Preparation and application of abrasives to wheels.
  (c) Diameter and breadth of working face.
3—Speed.
4—Pressure.
5—Lubricants.

For clarification, the various methods of finishing will first be defined and briefly discussed.

Grinding

There has been much confusion caused by the inter-changeable use of the terms "grinding" and "polishing." There is usually a positive distinction between them. Grinding, as it pertains to the finishing of fabricated stainless steel articles, refers to the preparation of the original imperfect surfaces for subsequent polishing, buffing or brushing operation. Grinding is associated with the use of coarse abrasives. Grinding is not always necessary. Articles stamped or fabricated from No. 2B Finish sheets or cold rolled strip and having a dense surface, with little surface impairment, such as scratching and tool marking, frequently may be polished without this preliminary operation.

Polishing

Polishing is usually associated with operations designed to give lustrous or colored finishes which are not free, however, from fine abrasive scratches. Polishing may involve either one or a sequence of operations with successively finer abrasives which are usually coated on a flexible and resilient wheel or block. Whether polishing follows the grinding operation in the development of polished, buffed or brushed finishes, or whether it is the only operation used in finishing an article, depends on the considerations given in the introductory paragraph.

Polishing steps are invariably accompanied with the application of lubricants, preferably those of a stearic acid base such as tallow.

Buffing

Buffing gives highly reflective and colored finishes which may or may not be free from abrasive scratches from previous polishing. Buffing is usually done with soft cloth buffing wheels, operating at high speeds, and suitable buffing compounds.

Brushing

Brushing gives a dull matte finish on a finely ground or polished surface or a cold rolled surface. It is done with a tampico brush (metal wire brushes should never be used) and a brushing compound made of rather fine abrasive and machine oil mixed to the consistency of a light paste. It produces a pleasing finish on many articles.

Abrasives

Because of the toughness and hardness of the stainless steels, aluminum-oxide abrasive, which may be purchased under various trade names, is more satisfactory than silicon carbide, a more fragile abrasive. However, the latter, as well as flour emery, is used by some operators for high polishing.

Standard grain sizes customarily employed in finishing stainless steel articles are Nos. 60, 80, 120, 150, 180, 220, 280 and 320. Hereafter, when a grinding or polishing operation is mentioned, it will be designated by the grain number.

It is important that grain closely screened to narrow limits be used. The presence of small quantities of grain in the abrasive coating, which is distinctly coarser than the step requires, will cause coarse scratches in the finish with obvious results.

Buffing Compounds

Care should be used in selecting buffing compounds for stainless steel. The use of grades containing iron compounds must be strictly avoided, otherwise corrosion and surface staining of the metal may result. Several very satisfactory proprietary compounds are commercially available. Compounds containing levigated alumina or chromium oxide rouge are most widely used.

In all buffing operations, compounds should be applied sparingly. Excessive amounts tend to cloud the finish and make development of highly reflective surfaces impossible.

Brushing Compound

Brushing agents used in tampico brushing operations are usually made of machine oil and abrasive grain, numbers 120 to 180, mixed to the consistency of a light paste. Aluminum oxide or silicon carbide abrasives are satisfactory.

Grinding, Polishing and Buffing Wheels and Their Preparation

The selection of wheels suitable for these finishing operations is most important and recommendations in this connection should be obtained from concerns engaged in their manufacture.

Wheels previously used on other metals or alloys must not be used on stainless without redressing. If wheels contaminated by use on other metals are employed, staining of the finished article may result.

Coarse Grinding Wheels

For coarse grinding, which is seldom necessary on cold roll sheet finishes such as No. 2B or 2D, solid rubber bonded abrasive wheels are generally used. These are preferred to vitrified wheels because of their cutting effectiveness and lessened tendency to load with metal. The grain size of such wheels for grinding stainless steel surfaces is seldom greater than No. 36, since flexible or built-up cloth wheels are preferable for the finer grinding operations. The solid wheels are used more frequently in the removal of excess stock in welds; however, they are sometimes employed also in the preparation of rough plate surfaces for subsequent finer finishing operations.

Fine Grinding and Polishing Wheels

For finer grinding and polishing operations, softer and more flexible wheels are generally used, and they should be progressively softer for each finer step. Wheels are not standard. For example, in finer grinding operations requiring Nos. 60 to 100 abrasives, spirally wrapped machine-sewed wheels of tightly woven cotton fabric are widely used. For polishing operations it is customary to use a wheel made of a number of cloth disc sections, generally muslin or unbleached cotton. Each section is built up of plies of the cloth which are sewed together in spiral rows. The sections likewise may be joined by similar sewing. The density of such wheels may be varied by the use of smaller diameter metal or cardboard spacers between the sections and by using sections which are sewed only for a few rows around the arbor hole.

Another type of polishing and fine grinding wheel which has found favor is the patented sponge rubber type which provides for the use of abrasive paper or cloth. A description is given and its advantages are described in the section dealing with the finishing of welds.

The cloth-type polishing wheel requires the application of abrasive grain, through the medium of glue, to the cutting face. Consult leading manufacturers of abrasives and wheels for details. Some of the more important factors in the preparation of these wheels are outlined below:

1—It is first necessary to prepare the glue; great care should be exercised to develop the maximum strength in the glue and abrasive coating. Only a fine grade of first run hide glue should be used. The flakes should be soaked in cold distilled water until jelled. The amount of water added need not be more than a slight excess over that necessary to cover the glue. To the jelled stock sufficient pure water should then be added to give the proper consistency when heated. The latter should be done either in an electrically controlled pot or in a double boiler type container to a temperature of 140° F., with occasional stirring.

2—Before mixing with the glue, the abrasive should be heated to a somewhat higher temperature to avoid chilling the glue.

3—The proportion of abrasive to be added to the glue varies with the grain size. Information in this connection is obtainable from reliable abrasive manufacturers.

4—Before applying the glue and abrasive mixture to a new wheel, it is desirable to size the cloth cutting face with a thin coating of glue which should be allowed to dry thoroughly.

5—The wheel should be heated before applying the glue and abrasive mixture. In the latter operation the coating should be spread as evenly as possible.

6—At least two coats of the abrasive are desirable, with thorough drying after each.

7—After drying the final coat, the irregular abrasive face should be turned true by the use of a black diamond or at least broken in on scrap stainless steel. Greater flexibility of the cutting face may be obtained by hammering the abrasive head with a round instrument lightly at an oblique angle which will produce small cracks, allowing the resiliency of the cloth base to be imparted to the cutting surface.

8—In recoating wheels which have been used dry, it is necessary to apply only one or two additional coats to the warm face. When grease has been used the bead should be scoured with pumice stone before coating until the surface is dry.

Buffing Wheels

The selection of proper buffing wheels is even more important than the use of the right polishing wheels. Buffing wheels should be made of high count sheeting, with only one or two rows around the arbor hole spirally sewed. The cloth pack is very loose but is stiffened when the wheel is rotated at high buffing speeds. No glued abrasive coating is applied, since the buffing action is performed by the cloth ends whipping the surface of the wheel. A buffing compound is applied to the wheel during the operation.

Whether in buffing, polishing or grinding, the use of wheels previously used on other metals should be avoided.

Finishing Procedures

The following discussion covers the principles to be applied, when possible, in arranging the procedure for finishing a stainless steel article. For early attempts, particularly in producing high finishes, the operator should experiment and take, perhaps, more steps in the finishing that may later be necessary.

Finishing operations may involve from one to as many as eight steps depending upon the considerations outlined in the introductory section. In producing high finishes involving a number of steps, it is obvious that successively finer abrasives must be used. Sufficient work usually should be done in each step to remove all coarser abrasive scratches from the preceding operation. This is most important when finishes are to be buffed. In this case the direction of the preliminary grinding and polishing steps should be changed after each operation, in order to grind across the scratches produced in the prior steps. By this method the operator can judge readily when sufficient work has been done. For final polished finishes a change in direction may not be required or even advisable in some instances, but sufficient amount of grinding or polishing should be done in each operation to reduce the depth of the coarse scratches to the extent that they are not apparent in the final polish of an article.

In the coarser operations it is practical to use for each succeeding operation a grain size about 40 numbers finer than the preceding one. For fine polishing steps leading up to buffing operations, the difference may be increased to 60 and 80 numbers. In general, however, the size of the grain for the initial and subsequent finishing steps, should not be coarser than is required to remove efficiently the imperfections in the original surface or the coarser grinding scratches. It is usually mistaken economy leading to inferior results when "doubling up" is attempted; i.e., eliminating a necessary step with the idea of devoting a somewhat longer time than should be spent in a finer grain operation, to reduce or remove scratches that are obviously too coarse.

The proper linear speeds of all operations increase slightly with the decrease in grain size. The customary range, however, is from 5000 feet per minute for coarse grinding to 8000 feet per minute for fine polishing. Speeds, however, are not critical for any steps within this range. Buffing is best accomplished at speeds between 9000 to 12000 feet per minute.

Pressures in grinding and polishing should be applied carefully and should never be greater than required for efficient cutting. The speed of an operation is not increased by "bearing down," and over-heating with consequent burning and buckling is likely to occur. Pressures play no part in buffing or brushing operations, and the action of both depends upon the cloth or brush ends whipping the surface.

On account of the lower thermal conductivity of all stainless steels greater care must be used not to overheat or scorch in grinding and polishing operations than is necessary with steels or other metals having better conductivity.

Selection of Commercial Sheet Finishes

The selection of a suitable mill finish for an article that is to be subsequently ground and polished depends on the size, shape and surface contour and on the method of fabrication. If the design involves large and flat areas as in table and ice cream cabinet tops, doors and panels, it is unwise, unless the operator has rather elaborate equipment available, to attempt to perform his own grinding and polishing operations. For such work No. 4 Finish sheets, as furnished by the mill, are suggested which, after fabrication, can be finished more highly or left in the original polished condition. Some fabricators, however, prefer to do their own polishing of parts for which No. 2B Finish sheets or No. 2 Finish strip are best adapted. It should be remembered, however, when this course is followed, that the same degree of freedom from surface imperfections is not obtainable in heavy gauge sheets as is found in light gauge stock of this finish.

No. 2D Finish sheets and No. 1 Finish strip are well chosen for articles to be polished after forming, such as automobile head lamps, radiator shells, cooking utensils and other deep drawn or spun parts which require a maximum degree of softness in the original sheet with a dense surface relatively free from imperfections.

No. 2B Finish sheets and No. 2 Finish strip are well suited for parts to be finally ground and polished which are less severe in their formation than those mentioned in the previous paragraph, and do not require either intermediate or final annealing and pickling operations —for instance, shallow serving trays, plates, trim and small decorative stampings and novelties.

Nos. 4, 6 or 7 Finish sheets obviously should not be used for articles where the finish will be largely destroyed by annealing and pickling operations, or by abrasion marks and scratches resulting from dies and forming tools; this, however, does not apply to articles where the surface is disturbed only locally and which may, without undue cost, be touched up to match the unaffected surface.

MATCHING MILL POLISHED FINISHES

(The operations are designated by the grain size number)

No. 4 Finish

(Starting with No. 2B or 2D Finish Surfaces)

1—No. 80 to 100 grind, dry or with small amount of cutting oil.

2—No. 120 polish, using generous applications of tallow or a similar lubricant.

A third step using a No. 150 grain wheel may occasionally be necessary, particularly when polishing is done by manually controlled equipment.

No. 6 Finish

The same as above, except that the No. 150 step is omitted, and tampico brushing operation is necessary.

No. 7 Finish

Not scratch free but highly reflective. The same as a No. 4 Finish; requires, in addition, a polishing with Nos. 180 (this may be omitted if No. 150 step is used), 220 and 380 grain and finally, buffing.

No. 8 Finish—Mirror Finish

1—No. 60 to 80 grind—dry or with small amount of cutting oil.
2—No. 120—polish with tallow.
3—No. 180—polish with tallow.
4—No. 220—polish with tallow.
5—No. 280—polish with tallow.
6—No. 320—polish with tallow.
7—No. 420—polish with tallow.
8—Light tampico brushing (frequently omitted).
9—Buffing with suitable compound.

Miscellaneous Finishes

A dull but very pleasing finish may be obtained by omitting the second step in the procedure given for matching a No. 6 Finish and by tampico brushing the Nos. 80 to 100 ground surfaces.

Higher polished (not buffed) finishes than No. 4 may be obtained by carrying on the operations to Nos. 150, 180 or 220. These, however, are rarely required.

Pickling Metals

French Patent 796,096

The following liquids are applied by spraying:

Formula No. 1

Phosphoric Acid (50–5°)	12– 20 kg.
Terpinolene	300–500 kg.
Calcium Phosphate	180–220 kg.
Alcohol	300–500 kg.
Chromium Oxide	10– 20 kg.

No. 2

Phosphoric Acid	15– 25 kg.
Terpinolene	300–500 kg.
Calcium Phosphate	18– 25 kg.
Rice Flour	100–150 kg.
Barium Sulphate	40– 80 kg.
Alcohol	300–500 kg.
Chromium Oxide	12– 20 kg.

Pickling Iron

Formula No. 1

Iron is pickled in a 15% phosphoric acid bath containing an inhibitor at 80° C. and then in 1–2% phosphoric acid. The metal may then be dried and painted readily.

No. 2

French Patent 786,191

Water	97 lb.
Nitric Acid	1 lb.
Magnesium Sulphate	2 lb.

No. 3

Water	97 lb.
Sulphuric Acid	1 lb.
Potassium Nitrate	2 lb.

No. 4

Water	97 lb.
Hydrochloric Acid	1 lb.
Sodium Nitrate	2 lb.

These baths are heated above 50° C.

Stainless Steel Pickling Solution

U. S. Patent 1,973,087

Crude Petroleum	1 qt.
Potatoes, Mashed	10 lb.
Oak Bark	10 lb.
Walnut Bark	10 lb.
Wild Cherry Bark	10 lb.
Boneset	5 lb.
Caustic Potash	10 lb.
Water	200 gal.

Boil together; filter; add sulphuric acid to make 3% acid strength.

Removing Oxide Films from Metals

French Patent 808,179

The metal is drawn above its elastic limit so that residual stretching is at least 3%.

Pickling Bath for Duralumin

Sulphuric Acid	10 cc.
Water	90 cc.
Sodium Fluoride	1 g.

After dipping in above, the metal is dipped in 50% nitric acid.

Recovery of Waste Pickling Solutions
U. S. Patent 2,017,773

Exhausted solutions containing approximately 7% iron are filtered, evaporated at 95° C., cooled, and iron sulphate is allowed to crystallize on the sides of the vessel without agitation. The liquor, containing inhibitor and sulphuric acid 10–40%, is diluted and used again.

Pickling Inhibitor
Formula No. 1

Muriatic acid may be inhibited against iron, by the addition of formaldehyde. The amount required depends upon dilution, temperature, and object, and should be determined by small-scale experiment. Most acids sold to remove scale from engine-heads, etc., without injury to the metal, are made in this manner.

No. 2

The addition of 0.5% thiourea to 26.6% sulphuric acid used for pickling iron reduces corrosion tremendously.

No. 3

The following types of compounds generally function as inhibitors: phenols, quinones, amines, mercaptans, thiophenols, aromatic nitro compounds, halogens.

Stripping Metal Coatings

Iron, steel, or Brittania metal is stripped by reversing the current in alkaline cyanide solution in an iron tank with an iron cathode at 6–8 volts at 120° F. Agitation prevents pitting and produces a cleaner job. The concentration of the sodium cyanide is not critical and is usually kept at about 10%, i.e., from 8 to 15 oz./gal. Where the kind of metal deposit to be removed does not vary, this procedure is usually modified. Thus for stripping silver alone, the addition of 4–6 oz./gal. of caustic soda to the cyanide is recommended. A sheet of silver may be made the cathode and when built up with metal, melted down and rolled. An old silver anode serves the purpose very well. For the removal of gold, one or two oz./gal. each of copper cyanide, Rochelle salts and potassium ferrocyanide may be added to the cyanide strip and used at 150–170° F.

Nickel plated iron or steel is often stripped electrolytically in a solution made up of:

Sulphuric Acid	1 gal.
Water	1 pt.
Glycerin	1 oz.

The solution is kept in a lead lined tank and sheet lead cathodes are used. There is very little attack on the steel. This solution absorbs water very readily under which circumstances dissolved copper deposits by cementation and interferes with the operation. The water may be removed by heating the solution or by the addition of fuming sulphuric acid (Oleum). The oleum contains dissolved sulphur trioxide which reacts with the water to form sulphuric acid.

Chromium is sometimes removed electrolytically by making the article the anode in a chromium plating bath but this procedure is not recommended because of the contamination of the solution with dissolved iron which forms iron chromate and lowers the conductivity of the solution. Reverse current in caustic soda with agitation is the best method, the attack on the basis metal being so slight that the solution is used as a quantitative strip where the piece is weighed before and after stripping to determine the amount of chromium deposited.

An electric stripping solution which has been recommended for the removal of brazing solder is 5–10% sodium nitrate. Lead cathodes and a current density of 10–15 amp./sq. ft. are advised. During use this solution becomes alkaline due to the formation of ammonia which must be neutralized by the addition of nitric acid.

In stripping iron and steel with the use of current it is important that no chlorides be present since attack of the basis metal is accelerated. Electrolytic stripping solutions are more economical than straight chemical strips but the process is relatively slow so that where the deposit is quite heavy and the electrolytic strip of small capacity it may be best to remove the deposit by suitable reagents. The most effective reagent for the removal of deposits from iron and steel is fuming nitric acid, or, where the volume of the solution required is appreciable, a mixture of 3 parts concentrated nitric acid and 1 part fuming nitric acid. Iron and steel are passive in both solutions. Since chromium is also passive in this reagent, all chromium must be removed first by one of the above methods. A somewhat cheaper reagent which is suitable for the removal of copper, brass and bronze is a 10% solution of sodium cyanide to which 30% (100 vol.) hydrogen peroxide is added as required, at an operating temperature of about 130° F.

Zinc, tin and cadmium may be removed by using warm dilute hydrochloric acid. Cadmium may also be removed by a solution containing 1 lb./gal. of ammonium nitrate or a concentrated solution of hydrochloric acid containing about 10 oz./gal. of antimony trichloride as an inhibitor.

Sometimes nickel plated steel is worked after plating and annealed to remove the working stains. If fuming nitric acid is used to remove the deposit it may be noticed that the stripping is not entirely successful. This is due to the fact that an intermediate alloy of nickel and iron is formed. The removal of this alloy is effected with cold concentrated hydrochloric acid, 22° Bé., saturated with bromine.

Metal Cleaner and Brightener

U. S. Patent 2,062,038

Phthallic Anhydride	2 oz.
Sodium Sulphate	5 oz.
Soap	5 oz.
Soap Bark	5 oz.

2 oz. of the above is used with 98 oz. water for removing stains from polished metal.

Anodic Oxidation of Aluminum

British Patent 466,941

Glycol	1 oz.
Boric Acid	0.5 –1.5 oz.
Ammonium Carbonate	0.05–0.5 oz.

Use at 120–140° C.; c.d. 5–10 ma./sq. cm.

Anode Treatment of Aluminum

British Patent 467,267

The aluminum is treated in the following solution at 18–27° C. at 8–20 volts and at a current density of 5–14 amp./sq. ft.

Sulphuric Acid (d. 1.224)	1 l.
Potash Alum	60 g.
Potassium Sulphate	12 g.

Brightening Aluminum

Use a solution of caustic soda 4 oz. and 1 gal. of water for cleaning the aluminum.

The solution should be used hot and after the parts are left in the cleaning solution until a good gassing is noticeable, remove, rinse in cold water, and dip in a nitric acid solution to whiten the aluminum. The nitric acid dip is made by using 1 oz. of acid and 1 oz. of water.

Rapid Cleaning of Mercury

Take a 500-cc. glass-stoppered wide-mouthed bottle and fill half-way with dirty mercury; add 25 to 50 g. of mercurous nitrate crystals with about 10 cc. of water, and shake for about 5 minutes. Pour out into a dish and allow the water from the faucet to wash away the impurities. Then pass the mercury through several folds of toweling to dry it and it is ready for use again.

Reclaiming Water-Logged Electric Tools

Submersion has probably ruined the insulation in the tools as well as rendering the fibre parts unfit for use. Grease has become diluted and dirty and all parts covered with silt and mud.

Do not operate electric tools, motors or switch mechanisms until they have been taken down, cleaned and baked out.

For best results, send the tools to the nearest factory service branch for overhaul by trained men.

Where owner desires to service the tool himself, the following procedure is suggested.

Completely disassemble the tool, to get to all parts.

The armature and field should be put into an electric oven and baked for twenty-four hours at a temperature of 275° F.

They should then be checked for shorts and grounds. If O.K., apply a coat of insulating compound and bake again for 12 hours at 275° F.

All fibre switch and brush riggings should be replaced. Most switches will have to be replaced and all taped wire connections should be cleaned and retaped.

Clean all ventilating holes in the case of the tool.

Wash all grease from all gears, housings and bearings, using a suitable fluid. Repack with new lubricant, using a good grade of medium cup grease, such as "Non-Fluid Oil A-No. 3" or equal.

Clean rust and dirt from all parts.

These instructions apply to electric grinders (portable and bench), sanders, polishers, drills, screw-drivers, hammers, heat guns, saws, valve refacers and most types of motor driven electric tools.

Cleaning Motor Windings

Blow out dirt with compressed air. Squirt anhydrous denatured alcohol into coils with a spray gun or force pump and quickly blow out loosened dirt with compressed air. Do not start motor or bring an open flame near, until all the alcohol has been blown out.

Cleaning a Rusted Rifle

If the rusting process hasn't gone too far, so as to eat deep pits in the steel, you can probably stop it, and get the rifle back in condition. Get a .32 caliber rifle cleaner, consisting of brass washers on a spiral frame, which holds the cleaner in contact with the bore as you scour it out. Clean the barrel with an oiled rag, and follow this with a dry-rag cleaning, taking out as much rust as you can, and removing all the oil. Use the cleaner until the barrel is polished perfectly. Through a funnel inserted at the breech, pour 1 gal. of boiling water. Wipe out, dry, and oil the barrel. Repeat the process a day or two later, continuing until you can see no more rust forming. Then put in a heavy oil, or gun grease, and the rifle will stay rustless. If, however, there are deep pits in the barrel, your only course is to get a new barrel.

Coloring Metals

Metals may be given a lustrous colored finish ranging from yellow through brown to dark blue by dipping in following solution heated to 80–95° C.:

Sodium Thiosulphate	124 g.
Lead Acetate	38 g.
Water, to make	1 l.

This colors copper dark blue; zinc, bronze brown; iron, steel blue. By controlling time of dipping intermediate shades are obtained. By lowering temperature and increasing time, more uniform and denser coatings are gotten.

Antique Coloring of Metals

Immerse in following solution at 20° C.:

Lead Acetate	25 g.
Sodium Thiosulphite	240 g.
Argol	30 g.
Water	1000 g.

Green Coloring of Metals

The following solution is used at 0.2–0.4 amp./sq. cm. at 2.5 volts at room temperature:

Copper Sulphate	60 g.
Zinc Sulphate	45 g.
Ammonium Molybdate	30 g.
Potassium Cyanide	7 g.
Sodium Bisulphite (30%)	10–15 cc.
Water	1 l.

Coloring Brass Plate Brown

A rich brown oxidized finish may be obtained on brass plated steel articles by the following procedure:

1. Dip in 5% sulphuric acid pickle, rinse in cold water.
2. Scratch brush wet with brass wire wheel (.003″ wire) with pumice.
3. Dip in 3% liver of sulphur solution.
4. Scratch brush wet with brass wire wheel.
5. Dip in 3% liver of sulphur solution.
6. Scratch brush dry with brass wire wheel and lacquer.

If a very uniform color is desired brassed plated articles should be buffed and colored prior to oxidizing although a satisfactory color may be obtained directly without polishing.

Coloring Iron Blue

British Patent 464,749

Sodium Hydroxide	36 oz.
Litharge	7 oz.
Sodium Cyanide	2 oz.
Lead Acetate	2 oz.
Metol	1 oz.
Water	50 oz.

Heat to 100–135° C. Iron is colored by immersion for 2–4 minutes.

Coloring Cadmium Black

Formula No. 1

Dip in cold solution of:

Potassium Chlorate	60 g.
Copper Nitrate	35–40 g.
Water	1 l.

Brush; redip; rinse; dry and polish.

No. 2

Copper Nitrate	30 g.
Potassium Permanganate	2½ g.
Water	1 l.

Use at 60–80° C.

Coloring Cadmium Brown

Potassium Permanganate	160 g.
Cadmium Nitrate	60–250 g.
Water	1 l.

Coloring Iron Black

Caustic Soda	1.5 g.
Sodium Nitrate	25–50 g.
Tannic Acid	5 g.
Water	1 l.

Use at 60° C.

Bronzing Copper and Its Alloys

British Patent 447,446

The metal is degreased and etched by rubbing with

Hydrochloric Acid	20 cc.
Copper Sulphate	20 g.
Water	1 l.

It is then washed, dried and treated with a current of air which has been passed through 10–20% ammonium sulphide solution.

Bronzing Iron or Steel

French Patent 787,938

Articles of iron or steel are bronzed rapidly by dipping into bath of

Litharge	20	lb.
Potassium Cyanide	8	lb.
Ferrous Sulphate	5	lb.
Lead Sulphate	10	lb.
Manganese Dioxide	0.04	lb.
Water	100	lb.

Permanent Blacking Galvanized Sheet Metal

Permanent blacking of galvanized sheet metal uses a solution of 138 parts manganese sulphate and 130.5 parts barium nitrate (sp. gr. 1.125) in which the metal is dipped several times. The resulting coatings are said to be weather- and acid-resistant and do not peel off when hammered.

Bright Dip for Cast Bronze

It will be necessary to clean the castings of all sand before immersing them in the dip, in order to conserve the acid, which can be done by sand blasting water tumbling or wire wheel brush. The following dip is good for this purpose as it does not fume like the regular brass dip:

Sulphuric Acid	10 lb.
Saltpeter	2 lb.
Water	5 lb.

First, dissolve the saltpeter in water in an earthenware crock, add one pound of the acid pouring in a thin stream, stirring meanwhile with a piece of glass. This will heat the water and it is necessary to stop the addition of acid from time to time in order to allow the solution to cool and prevent it reaching a boiling temperature. For this reason the acid is added gradually, and only a pound at a time.

The solution should be prepared at night and before morning it will be cold, and after the acid has been poured off from the potassium sulphate that will be found in the bottom, it is ready for use.

The castings are dipped for a few seconds, strung on a wire, then they are rinsed in running water. They will keep their color better if they are dried by dipping in hot water in which a little lime has been dissolved.

Oxidizing Finish for Brass

A blue gray or blue-black color can be produced on brass by boiling the brass parts in the following solution until the proper color is obtained. This usually requires between 10 to 20 minutes.

Sodium Thiosulphate	8 oz./gal.
Lead Acetate	4 oz./gal.

Another solution may be made of the same ingredients by varying the concentration with a view to changing the color. This solution is as follows:

Hyposulphite of Soda	12.8 oz./gal.
Sugar of Lead	25.6 oz./gal.

An entirely different solution may also be used to produce the blue-black finish.

Copper Carbonate	16 oz.
Ammonia	1 qt.
Water	3 qt.

Add the water after the copper carbonate and ammonia have been thoroughly mixed. Use the solution at a temperature of 175° F. and immerse the work until the proper color is obtained. This usually requires one-half to one minute. For operation over a period of time there must be an excess of copper carbonate present.

Blackening Cast Iron

It is possible to produce a black finish on cast iron that has been polished and free from oil and grease by applying the following mixture:

Copper Sulphate	8 oz.
Nitric Acid	15 oz.
Alcohol	30 oz.
Water	125 oz.

Allow this solution to dry on work and when quite dry rub with woolen cloth. A thin film of oil should be applied for final protection.

Gun Metal Coloring of Pencil Tips

Single Nickel Salts	10 oz.
Double Nickel Salts	6 oz.
Zinc Sulphate	5 oz.
Sodium Sulphocyanide	2 oz.
pH	6.6
Temperature	70° F.

Use carbon anodes and a voltage *not over* about ¾ volt for still tank plating. For barrel plating an oblique type barrel insuring good mixing of the load is best. The black nickel can be deposited directly on the brass.

Bluing Steel Articles

A mixture of equal parts of sodium and potassium nitrate is melted in a cast iron or steel melting pot. The pot should be clean, as rust from any source affects the color of the work. The mixture is melted and then superheated to a temperature of 500° C. (900° F.) and manganese dioxide added in the ratio of 1 to 50 by volume. As bluing by this process forms an iron-oxide film on the piece, consumption of the manganese dioxide takes place and must be replaced every few hours of use.

The articles to be blued are first cleaned, and given a thin coating of oil, immersed in the hot niter at 315 to 345° C. for a short period and then raised to the working temperature. The time required varies with the temperature and with the size of the pieces but is never over four or five minutes. The higher the temperature the darker the finish.

After the right blue is obtained, the articles are quenched in cold, clean water to strike the color, then immersed in boiling water and finally in oil.

Cast iron, if highly polished, will blue like polished steel, but it requires about thirty minutes immersion at 540° C. (1000° F.) to accomplish this result.

Bluing Small Machine Parts

a. Clean in soda solution and rinse in hot water.

b. Dry thoroughly.

c. Dip in the following molten solution

Manganese Oxide	1 lb.
Saltpeter	10 lb.

d. Remove and wash in hot solution of sal soda as soon as possible.

e. Dry thoroughly.

f. Dip in sperm oil.

Treatment of Aluminum Before Plating

British Patent 465,078

To obtain more coherent deposits aluminum is degreased and pickled for 1 min. at 92–95° C. in

Ferrous Chloride	50 g.
Hydrochloric Acid (d. 1.16)	50 cc.
Water	1 l.

Protective Aluminum Coating

British Patent 455,412

The metal is treated with an alternating current in the following bath:

Potassium Titanium Oxalate	50 g.
Citric Acid	15 g.
Phosphoric Acid	6 g.
Glucose	20 g.
Water	1 l.

Use 5–6 amp./sq.dm. at 110 volts A.C. at 75° F., the film produced is impregnated with a fat. Wax or varnish.

Coating Iron with Molten Aluminum

Immerse in melted bath (kept at 450–500° C.)

Aluminum Chloride	1 lb.
Sodium Chloride	2 lb.
Copper Chloride	0.15 lb.

for 1–2 min. and then in molten aluminum at 700–720° C. for 20–40 sec. An adherent coating of aluminum 0.1 mm. thick is obtained.

Enameling Iron

Austrian Patent 148,151

Unpickled iron sheet is moistened with following:

Water	100 lb.
Iron Oxide	10 lb.
Calcium Fluoride	20 lb.
Boric Acid	30 lb.
Clay	7 lb.

Dry and heat to 785–795° C. for 7 min. in an atmosphere low in oxygen.

White Enamel for Cast Iron

Borax	16 lb.
Feldspar	1½ lb.
Litharge	48 lb.
Quartz	24 lb.
Cryolite	5 lb.
Fluorspar	1½ lb.
Magnesium Carbonate	4 lb.

Additions to the mill are:

Pipe Clay	7%
Opacifier (other than Tin Oxide)	7%
Borax	6%

If bubbles are formed the lead content must be reduced and the additions to the mill increased by a ground frit (quartz and borax).

Enamel Coating for Copper

U. S. Patent 2,032,236

Silica	59.20
Borax	8.45
Sodium Nitrate	6.90
Cryolite	6.95
Soda Ash	6.95
Calcium Fluoride	2.91
Litharge	25.00
Titanium Dioxide	6.20
Di-Potassium Hydrogen Phosphate	1.90
Barium Carbonate	9.00
Nickel Oxide	0.755
Iron Oxide	0.10
Potassium Permanganate	0.145

The frit is fired on at 815° F.

Radium Protection Sheathing

British Patent 447,567

Tungsten, Powdered	90 g.
Copper, Powdered	5 g.
Nickel, Powdered	5 g.

Press into shape and sinter at 1500° C.

Anode Coating of Magnesium Alloys

Magnesium alloys are coated in a bath of

Sodium Dihydrogen Phosphate	2–5 g.
Sodium Dichromate	10 g.
Water	90 g.

Current density 5–10 amp./sq. ft. anode surface.

The alloy is first cleaned electrolytically by making it the cathode for at least three minutes in a bath of soda ash and tri-sodium phosphate.

Corrosion Preventive Coating
British Patent 452,847

Zirconium Oxide (75%)	5
Aluminum Powder	4
Aluminum Silicate	120
Talc	30
Magnesium Oxide	10
Barium Sulphate	50
Zinc Oxide	20
Red Lead	50
White Lead	40
Chromium Oxide	5
Copper Oxide	4
Nickel Cyanide	2
Litharge	10
Titanium Dioxide	1
Soda Ash	1

The above is mixed with a binder as in a paint.

Metallographic Etching of Zinc and Alloys
Etching Fluid

Caustic Potash (Concentrated Solution	5 cc.
Water	50 cc.
Copper Nitrate (Concentrated Solution)	20 cc.
Potassium Cyanide (Powdered)	25 g.

Filter and add

Citric Acid (Concentrated Solution)	2.5 cc.

Immerse specimen in above for 10–20 seconds.

Molybdenum Etching Solution

Potassium Ferricyanide	360 g.
Caustic Soda	36 g.
Water	1 l.

Copper Etching Fluids
Formula No. 1

Nitric Acid (Conc.)	120 g.
Potassium Chloride	15 g.
Water	1 l.

No. 2

Ferric Chloride	400 g.
Hydrochloric Acid	30 g.
Water	1 l.

Printing Plate Etch, Copper
U. S. Patent 2,026,603

Ferric Chloride Solution, Neutral (d. 1.32–1.38)	1 gal.
Salt	4–5 oz.

Copper Printing Plate Etch
U. S. Patent 1,969,678

Ferric Chloride Solution (d. 1.38–1.53)	1.48 lb.
Ferric Sulphate	4–6 lb.
Glucose	½–3 lb.
Water	to make 100 lb.

Etch for Microscopic Study of Tin

Ammonium Persulphate	5%

or

Ferric Chloride, Hydrated	2 g.
Water	30 cc.
Hydrochloric Acid	5 cc.
Alcohol, Absolute	60 cc.

or

Acetic Acid (50%)	100 cc.
Hydrogen Peroxide	1 drop

Stainless Steel Etches
Formula No. 1

Copper Chloride	5 g.
Hydrochloric Acid	100 cc.
Alcohol	100 cc.
Water	100 cc.

No. 2

Iron Chloride	5 g.
Hydrochloric Acid	50 cc.
Water	100 cc.

The above formulae are used for macroscopic structures.

No. 3

Potassium Ferricyanide	10 g.
Potassium Hydroxide	10 g.
Water	100 cc.

This is useful for identifying carbides in austenitic stainless steels.

Micrographic Etch for Lead Specimens

Acetic Acid, Glacial	15 cc.
Nitric Acid, Conc.	15 cc.
Glycerin	60 cc.

Metal Etching Mordant
U. S. Patent 2,080,348

Potassium Dichromate	2 oz.
Hydrochloric Acid	1 oz.
Nitric Acid	1 oz.
Sulphuric Acid	½ oz.
Castile Soap Solution	½ oz.

Etching Designs on Copper

To etch designs of any desired intricacy on copper, the portions which are to stand out in relief are covered with an asphaltum varnish or quick-drying enamel, including the edges and back of the metal, and the whole article is immersed in dilute nitric acid. The degree of etching will depend on the concentration of the acid and the temperature. Nitric acid of 1 to 4 strength at 70° to 75° F. will usually give a sufficient depth of etching in 2 or 3 hours. Interesting effects can be produced by applying powdered vitreous enamels to the depressions in the etched metal, heating to about 1400° to 1500° F. until the enamel fuses, cooling, and finishing by wet polishing with a fine Carborundum stone.

Purifying Metallic Cadmium
British Patent 461,222

Cadmium containing zinc (as an impurity) is melted in an iron dish under a layer of dry caustic soda. Steam at 350° C. is injected beneath molten metal. The zinc forms a slag from which it may be recovered.

Removing Welding Scale from Stainless Steel

The solution consists of 10 percent concentration by weight of 60° Baumé sulphuric acid mixed with approximately 10 percent by weight of rock salt. This solution should be used at a temperature of about 150° F. In all pickling operations the pickling acid should be rinsed off in hot water and the work then dipped for 40 minutes or longer in a warm (120–145° F.) 10 to 20 percent by volume solution of 38° Baumé commercial nitric acid and followed by a wash in hot water. This puts the metal surface in the best possible condition to resist corrosion.

De-Scaling Stainless Steel

The removal of scale from heat treated stainless steel is fairly difficult due to the fact that it is not readily attacked by ordinary pickling solutions.

Extremely heavy scale is usually removed by sand-blasting. A mild pickling solution of 10% sulphuric acid in water at 150° F. will soften the scale but is not extremely active in its removal. A mixture of 10% rock salt and 10% sulphuric acid by weight in water at 150° F. is somewhat more active and will attack scale readily.

A solution of 50% hydrochloric acid in water will attack scale very rapidly at 160° F. Parts pickled in any of the above solutions must be rinsed immediately in warm water and then dipped in a 20% nitric acid solution, rinsed again in warm water and then dried. Parts should never be left in any pickling solution, only long enough to soften or remove scale, or metal itself will be attacked.

Descaling Iron
U. S. Patent 1,979,996

Iron is cathodically pickled in sulphuric acid (5–20%) containing tin (1.5–2 g. per litre) as tin sulphate.

Removing Fire Scale from Bronze

Bronze can be pickled in an 8% solution of sulphuric acid to which 2 oz./gal. of sodium dichromate has been added. Heat to 180° F. This will remove most of the scale.

Follow with a bright dip to get a good surface.

A preliminary dip in nitric acid may be necessary as some of the oxide scale on the bronze may have been reduced to metallic copper which is not soluble in the above pickle, or in a bright dip. This copper can only be removed by nitric acid.

Gas Free Aluminum
Formula No. 1
British Patent 435,104

Aluminum or its alloys are freed from hydrogen or other gases by melting under the following flux and bubbling nitrogen through melt:

Potassium Chloride	50 lb.
Salt	40 lb.
Sodium Fluoride	10 lb.

No. 2
British Patent 456,462

Heat with

Salt	2 lb.
Sodium Fluoride	1 lb.
Borax	1 lb.

The grain size of castings made later is refined.

No. 3
U. S. Patent 2,024,751

The molten metal is treated with 0.05–5% sodium borofluoride.

No. 4
U. S. Patent 2,056,233

A method of degassing molten aluminum and aluminum base alloys comprises adding thereto from about 0.01 to 1 per cent of sodium, maintaining molten charge at a temperature below about 1475° F. from ¼ to 10 hours, and introducing from about ½ to 4 ounces of anhydrous aluminum chloride per hundred pounds of melt.

No. 5
U. S. Patent 2,056,233

A method of degassing molten aluminum and aluminum base alloys comprises adding thereto from about 0.01 to 1 per cent of sodium, maintaining the melt at a temperature below about 1475° F. for a period of about ¼ to 10 hours and thereafter passing a gaseous fluorinated hydrocarbon through the melt for a period of about 1 to 15 minutes.

Dephosphorizing Steel

The following low melting slag is used in an induction furnace:

Silica	3 lb.
Lime	60 lb.

Iron Oxide	35 lb.
Fluorspar	2 lb.

Removing Residual Calcium from Lead

U. S. Patent 1,9[illegible]9,442

Molten lead containing residual calcium is stirred vigorously at 405–455° F. while being treated with three doses (per 100 tons of lead) of caustic soda 75 pounds and sodium nitrate 30 pounds, each treatment lasting one to one and one-half hours.

Copper Oxide Rectifier Metal

U. S. Patent 2,060,905

Copper sheet is heated in air containing 0.015–0.1 volume % of chlorine.

Removal of Aluminum Oxide from Alloys

Stir molten alloy by means of a stream of nitrogen gas for 8–10 minutes. The aluminum oxide floats to surface and may be skimmed off.

Wear Resistant Iron Surface

Canadian Patent 370,273

Cast iron 1 lb. and borax 1 oz. are fused together and mild steel 0.5 oz. and borax 0.5 oz. are fused together, and the two products fused together with 1 oz. borax, cooled at room temperature, and amount of the product is welded to an independent metallic body in the presence of a borax flux, and cooled slowly at room temperature. The applied mass is machined to desired shape and size, heated to a hardening temperature and quenched.

Brazing Flux

Formula No. 1

British Patent 454,070

Potassium Bifluoride	75–81 oz.
Water	37–43 oz.

Boil until dissolved
Add and dissolve in above

Boric Acid	28–34 oz.

Evaporate until a soft paste is formed.

No. 2

British Patent 454,070

Potassium Acid Fluoride	78 g.
Water	40 g.
Boric Acid	30 g.

Evaporate to desired consistency.

No. 3

(Low Melting)

Borax	**4 oz.**
Soda Ash	**3 oz.**
Potassium Carbonate	**3 oz.**

Brazing Solder

U. S. Patent 2,073,077

Tin	13 –17 oz.
Phosphorus	3½– 5½ oz.
Copper	83½–77½ oz.

Stop-off Paste for Use in the Silver Brazing of Monel

There is a need at times for preventing the flow of silver solder, at brazing temperatures, over portions of a metal surface to which it is being applied. A very useful way to do this on Monel is to first outline the area to which the molten silver solder is to be confined with a thick paste of flake graphite in sodium silicate solution (commercial waterglass).

The mixture fluxes at brazing temperature, but is easy to remove on cooling. Pastes of graphite or of powdered charcoal with shellac are also fairly effective. Powdered charcoal and waterglass paste is effective in confining the solder, but is hard to remove on cooling.

Galvanizing Flux

U. S. Patent 2,106,982

Triethanolamine	0.5– 2%
Zinc Chloride	99.5–98%

Welding Rod Flux

U. S. Patent 2,113,222

Sodium Carbonate	45 oz.
Borax	45 oz.
Carbon	3 oz.
Ferrosilicon	2 oz.
Gelatin	2 oz.
Silicate of Soda	3 oz.

Flux Coating for Welding Electrode

U. S. Patent 2,051,775

Ilmenite	25 oz.
Talc	25 oz.
Sodium Silicate	50 oz.

Flux for Welding Zinc

French Patent 815,320

Ammonium Chloride	**65 g.**
Zinc Chloride	**25 g.**
Salt	**4 g.**
Lithium Chloride	**3 g.**
Potassium Fluoride	**3 g.**

Torch Welding Flux

British Patent 470,868

Iron Oxide	**8.8 lb.**
Boron Oxide	**45.0 lb.**
Alumina	**4.4 lb.**
Unsaponifiable Mineral Grease	**41.8 lb.**

SOLDERING FLUXES

Liquid, Non-Acidic

Ammonium Chloride	100 g.
Mineral Oil, Neutral	900 g.

Shake before use.

For Tin and Baser Metals

Petrolatum	100 g.
Ammonium Chloride	25 g.

Melt at 75° C. Stir cold.

Paste

Formula No. 1

Woolfat Fatty Acid	50 g.
Zinc Oxide	3 g.

Saponify by not too strong heating for some time.

No. 2

a. Tallow	2 kg.
Rosin	2 kg.
b. Ammonium Chloride	1 kg.

Melt *a*, cool to near paste consistency, work in *b*. Stir until cold.

No. 3

Japan Wax	35 g.
Hard Paraffin	250 g.
Petrolatum	3250 g.
Ammonium Chloride	250 g.
Zinc Chloride	1250 g.

No. 4

Ammonium Chloride	1 kg.
Rosin	4 kg.
Tallow	5 kg.

No. 5

Rosin	450 g.
Tallow	450 g.
Ammonium Chloride	50–100 g.

No. 6

Rosin	250 g.
Tallow	650 g.
Ammonium Chloride	100 g.

No. 7

For Copper Wires

Rosin, Finely Powdered } to make
Ammonia (sp. gr. 0.880) } soap.

No. 8

a. Zinc Chloride, Anhydrous	20 lb.
Petrolatum	30 lb.
b. Petrolatum	50 lb.

Mix *a* thoroughly, then work in *b*.

No. 9

a. Vegetable Oil	100 lb.
Tallow	100 lb.
Rosin	50 lb.
b. Ammonium Chloride	20 lb.
Water	50 lb.

Melt *a*, stir until cold enough to have high viscosity. Mix in *b*.

For All Metals Except Aluminum

Formula No. 1

Rosin	7 lb.
Petrolatum, Yellow	45 lb.
Zinc Chloride, Anhydrous	15 lb.

No. 2

Ammonium Chloride	35 lb.
Zinc Chloride, Powdered	65 lb.
Petrolatum	900 lb.
or	
Petrolatum	800 lb.
Woolfat	50 lb.
Woolfat Fatty Acid	50 lb.

No. 3

a. Cottonseed Oil	226 kg.
Tallow	181 kg.
b. Rosin	1 kg.
c. Ammonium Chloride	120–200 g.

Melt *a*, work in *b*. Cool partly, add *c*. Stir until cold.

General Soldering Fluxes

Lead to lead with coarse solder	Tallow
Lead to brass or gunmetal with coarse solder	Tallow
Lead to brass or gunmetal with fine solder	Tallow or resin
Tinning brass or gunmetal for soldering	Tallow or resin
Clean zinc, copper, brass, etc., for soldering	Zinc chloride
Zinc, not cleaned	Dilute hydrochloric acid
Tinplate for bit soldering	Zinc chloride
Pewter and block tin	Olive oil, tallow, etc.
Tinning copper bits	Ammonium chloride or zinc chloride
Nickel or Monel metal Stainless Steel	Saturated zinc chloride 50 per cent in hydrochloric acid
Wrought iron	Zinc chloride
Cast iron	Zinc or ammonium chloride
Brass, gunmetal or copper	Zinc chloride, resin or ammonium chloride
Bronze	Zinc chloride or resin
Gold	Zinc chloride
Silver	Zinc chloride
Bismuth	Zinc chloride or resin
Terne plate	Zinc chloride

Soldering Flux

British Patent 471,202

Salicylic Acid	5 oz.
Rosin	95 oz.
Aniline Hydrochloride	2 oz.
Ethylene Glycol	100–500 oz.

Soldering Flux

Ethylene diamine hydrochloride as a saturated water solution is used as a soldering flux. It is found to be effective in soldering copper, brass, and galvanized iron when using a soldering iron. Excellent soldered joints are obtainable with white or yellow gold, nickel and silver. It is useful in making the joints in streamline flexible copper tubing.

It is soluble to the extent of 35 parts in 100 parts by weight of water at 25° C., the solubility increasing with temperature to 165 parts in 100 parts of water at the maximum boiling point (115° C.) of the solution.

Iron and Steel Soldering Flux

U. S. Patent 2,031,913

Zinc Chloride	99.75–99 oz.
Sodium Nitrate	0.25– 1 oz.

Aluminum Flux

British Patent 435,279

Barium Chloride	15 lb.
Sodium Sulphate	8 lb.
Potassium Permanganate	2 lb.
Zinc Chloride	27 lb.
Potassium Fluoride	24 lb.
Sodium Fluoride	24 lb.

Soft Soldering Flux

U. S. Patent 2,045,017

Petrolatum	70.0 oz.
Ammonium Chloride	4.5 oz.
Zinc Chloride	16.8 oz.
Stannous Chloride	5.0 oz.
Water	3.7 oz.

Soft Soldering Flux

U. S. Patent 1,974,436

Zinc Chloride	25 oz.
Alcohol	20 oz.
Ammonium Cetyl Sulphate	⅛ oz.

Easy Spreading Soldering Flux

Water	10 gal.
Zinc Chloride	37 lb.
Ammonium Chloride	3 lb.
Hydrochloric Acid (18%)	1 gal.
Butyl "Cellosolve"	1 gal.
Wetting Agent	3 oz.

Flux for Silver Soldering Stainless Steel

U. S. Patent 1,968,841

Formula No. 1

Borax	1 lb.
Ammonium Chloride	1 lb.
Boric Acid	1 lb.

No. 2

Borax	3 lb.
Ammonium Chloride	1 lb.
Boric Acid	2 lb.

Aluminum Solder

Formula No. 1

U. S. Patent 2,013,340

Zinc	95 oz.
Aluminum	5 oz.

Melt together under sodium cyanide.

No. 2

U. S. Patent 1,993,490

Tin	33 oz.
Zinc	11 oz.
Silver	23 oz.

No. 3

U. S. Patent 2,059,497

A solder for aluminum plates consists of 60 g. tin, 25 g. cadmium, 7.5 g. silver and 7.5 g. aluminum.

No. 4

French Patent 811,558

Tin	40 g.
Zinc	40 g.
Cadmium	20 g.
Diethylamine Hydrochloride	22 g.
Petrolatum	14 g.

No. 5

German Patent 652,572

Tin	60 g.
Cadmium	25 g.
Silver	7½ g.
Aluminum	7½ g.

Aluminum Plate Solder

Tin	60 oz.
Cadmium	25 oz.
Silver	7.5 oz.
Aluminum	7.5 oz.

Aluminum Cable Solder

Tin	40 g.
Zinc	40 g.
Cadmium	20 g.

The above is used with a flux which gives joints of good electrical conductivity.

Solder for Aluminum or Cast Iron

French Patent 795,882

Barium Chloride	60 g.
Sodium Chloride	25 g.
Calcium Chloride	5 g.
Magnesium Chloride	5 g
Sodium Fluoride	5 g.

Copper to Aluminum Solder

French Patent 796,352

Tin	52 g.
Aluminum	30 g.
Lead	10 g.
Copper	5 g.
Silver	3 g.

Duralumin Solder

French Patent 812,672

Tin	67.38 g.
Silver	2.61 g.
Lead	1.20 g.
Antimony	0.04 g.
Zinc	28.71 g.
Sulphur	0.02 g.
Aluminum	0.04 g.

Solder

U. S. Patent 2,025,323

Lead	12 oz.

is melted and to it is added

Ammonium Chloride	¼ g.

and the dross is skimmed off. Then add

Tin	3.13 oz.
Bismuth	0.87 oz.

Mix and cast into forms.

Soft Solder

U. S. Patent 2,033,102

Zinc Ammonium Chloride	60 oz.
Lead-Tin Solder, Powdered	37 oz.
Zinc Powder	3 oz.

Press into sticks without a binder.

Solders for Monel

Soft Solder

Lead	50 oz.
Tin	50 oz.

Hard Solder

Silver	60 oz.
Copper	25 oz.
Tin	15 oz.

Low Tin Solder

French Patent 796,433

Lead	75 –90%
Tin	5 –25%
Bismuth	1 – 5%
Cadmium	1 – 3%
Antimony	0.5– 5%

Silver Soldering

Silver soldering is no different in principle from soldering with plumber's or tinsmith's solder, which is familiar to everyone. But whereas ordinary solder is made of tin and lead, and melts at about 300° F., silver solder is made of silver and copper, with usually some zinc, and melts at higher temperatures: 1,200–1,600° F. The applications of silver solders in industry are discussed and up-to-date methods for using the solders also described.

The advantages of silver solder over other types of solder are strength, resistance to vibration and shock, resistance to corrosion, ease of fabrication. Practically all metals that can be heated without danger to 1,200° F. can be silver soldered.

The strongest silver soldered joints are made with the remarkably small gap of one and one-half thousandths of an inch between the parts to be joined. Being so thin, the joint has a neat appearance. In many cases, the silver soldered joint is invisible to the naked eye.

In addition to its high strength, which makes silver soldering suitable for joining electrical parts or piping that must withstand temperatures up to 850° F., the silver soldered joint has good corrosion resistance. Silver soldering is used especially in chemical equipment in which joints are exposed to severe corrosion by acids or other reagents.

Recent developments in silver soldering have made it extremely easy to produce excellent joints. A method that is often used for pipes requires simply a torch and a ring of silver solder of the same diameter as the pipe. The torch is fed with illuminating gas and air or oxygen. The ring of silver solder is slipped over the pipe to be soldered. The fitting is then slipped over the pipe and the ring. The joint is heated uniformly with the torch until silver solder is seen oozing out at the edge of the joint. Nothing more need be done.

Other developments include dip brazing, in which the joint to be made is dipped in a bath of molten silver solder, and resistance brazing. In the latter method inserts are used as described above, but the heat is supplied electrically rather than by a torch. These and other new developments are rapidly extending the fields of application of the highly efficient process of silver soldering.

Soldering Iron Tip

Canadian Patent 364,152

Copper	97.0 oz.
Cobalt	2.6 oz.
Beryllium	0.4 oz.

Quick Solders

Rose's Metal

Lead	1 lb.
Tin	1 lb.
Bismuth	2 lb.

Melts at 95° C. in a graphite, cast iron, or fire-clay crucible.

Weak Solder

Lead	1 lb.
Tin	2 lb.

Melts at 171° C.

Quick Solder

Lead	1 lb.
Tin	1 lb.

Melts at 181°C.

Strong Quick Solder

Lead	2 lb.
Tin	1 lb.

Melts at 224° C.

Soldering Fluids

Formula No. 1

Zinc Chloride, Anhydrous	10 g.
Glycerol	5 g.
Alcohol (Denatured)	10 g.
Water	75 g.

No. 2

Zinc Chloride, Anhydrous	26 g.
Ammonium Chloride	3 g.
Hydrochloric Acid (Sp. G. 1.18)	6 g.
"Cellosolve"	5 g.
Water	60 g.

No. 3

Antimony Oxide	5 g.
Glycerol	5 g.
Zinc Chloride, Anhydrous	20 g.
Hydrochloric Acid (Sp. G. 1.18)	5 g.
Water	65 g.

No. 4

Glycerol	25 g.
Alcohol (Denatured)	50 g.
Zinc Sulphate	25 g.

No. 5

Cuprous Chloride	10 g.
Copper Strips	3 g.
Methyl Alcohol	87 g.

No. 6

Rosin	53 g.
Benzine	47 g.

No. 7

Zinc Chloride, Anhydrous	20 g.
Sulphonated Mineral Oil	80 g.

No. 8

Zinc Chloride, Anhydrous	14 g.
Amyl or Butyl Acetate	86 g.

Soldering Pastes

Formula No. 1

Zinc Chloride	20 g.
Palm Oil	80 g.

The zinc chloride is mixed with sufficient water to form a heavy paste and is then triturated into the palm oil.

No. 2

Petrolatum	60 g.
Rosin	20 g.
Silicate or Filler (Fusible)	20 g.

No. 3

Hydrochloric Acid (Sp. G. 1.18)	10 g.
Phosphoric Acid (Syrupy)	8 g.
Lactic Acid	8 g.
Lanolin	74 g.

No. 4

Ceresin	10 g.
Stearic Acid	30 g.
Rosin	22 g.
Zinc Chloride, Anhydrous	38 g.

The first three components are melted in a steam heated kettle and when liquid the zinc chloride is stirred in. It will result in a granular structure.

No. 5

Ammonium Chloride	29 g.
Sulphur (Powder)	33 g.
Rosin	2 g.
Paraffin Wax	9 g.
Tallow	21 g.
Salt	5 g.
Balsam	1 g.

The paraffin and tallow are melted in a steam heated kettle and while molten the other solids are stirred in; the balsam is added after the mixture has been removed from the heat.

No. 6

Hydrofluoric Acid	2 g.
Phosphoric Acid (Syrupy)	1 g.
Borax	6 g.
Gum Arabic or Karaya	15 g.
Water	76 g.

The water is first heated to boiling and the source of heat is removed; the gum is added in small quantities and stirred in before adding more. When a homogeneous jelly is obtained the other components are added and stirred in thoroughly.

No. 7

Stearic Acid	35 g.
Borax	4 g.
Rosin	4 g.
Balsam	10 g.
Tin (Powdered)	32 g.
Zinc (Powdered)	15 g.

Soldering Powders

Formula No. 1

Iron (Powdered)	65 g.
Borax	20 g.
Sodium Carbonate	15 g.

No. 2

For Cast Iron

Zinc Chloride, Anhydrous	65 g.
Ammonium Chloride	10 g.
Potassium Chloride	14 g.
Sodium Chloride	11 g.

No. 3

For Aluminum

Potassium Chloride	45 g.
Sodium Chloride	30 g.
Potassium Fluoride	7 g.

Lithium Chloride	15 g.
Sodium Pyro Phosphate	3 g.

No. 4
For Iron, Copper and Brass

Calcium Hydroxide	1.5 g.
Aluminum Oxide	1.5 g.
Aluminum (Powdered)	1 g.
Borax	60 g.
Potassium Chlorate	36 g.

No. 5
For Aluminum

Barium Chloride	40 g.
Potassium Chloride	30 g.
Sodium Chloride	20 g.
Cryolite	10 g.

No. 6

Borax	52 g.
Sodium Phosphate (Tri)	13 g.
Solder (Powdered)	35 g.

No. 7

Zinc Chloride, Anhydrous	8 g.
Ammonium Chloride	80 g.
Sodium Fluoride	12 g.

No. 8

Ammonium Chloride	5 g.
Rosin	15 g.
Zinc Chloride, Anhydrous	20 g.
Urea	10 g.
Solder (Powdered)	50 g.

This combination is usually sold in pellet form.

No. 9

Thichlor naphthalene (melted upon the warm metal and then wiped off).

Arc Welding Electrodes
Formula No. 1
U. S. Patent 2,010,695

Flux for coating iron welding electrodes consists of (A) 1:1:1 mixture of finely ground feldspar, titanium dioxide and commercial water-glass solution, (B) a 1:2:2 mixture of the same components with 0.5–2(1)% of carbon, (C) ilmenite (21), feldspar (39), ferro-manganese (9), asbestos, and aqueous water-glass.

No. 2
British Patent 455,760

A metal rod is coated with the following:

Rutile	12 oz.
Sodium Silicate Glass	15 oz.
Vermont Talc	7 oz.
Silica, Amorphous	5 oz.
Asbestos, Short Fiber	5 oz.
Gum Arabic	5 oz.
Ferro-Manganese	10 oz.
Sodium Silicate, Liquid	24 oz.
Water	17 oz.

Welding Electrode
U. S. Patent 2,073,371

Silver	0.02– 0.5 oz.
Copper	99.98–99.5 oz.

Welding Electrode
U. S. Patent 2,045,138

Zinc	0.25 oz.
Chromium	0.50 oz.
Silver	1.00 oz.
Copper	98.25 oz.

This gives a hard alloy of high conductivity.

Resistance Welding Electrode
U. S. Patent 2,038,390

Cadmium	0.10– 1.5%
Beryllium	0.01– 2.5%
Copper, to make	100 %

Welding Flux
British Patent 461,418

Ferro-Manganese	14 lb.
Silicon Carbide	15 lb.
Ilmenite	34 lb.
Feldspar	5 lb.
Talc	4 lb.
Sodium Silicate	25 lb.
Water	3 lb.

Fluxes for Aluminum Welding
Formula No. 1

Potassium Chloride	45 oz.
Sodium Chloride	33 oz.
Lithium Chloride	15 oz.
Potassium Fluoride	7 oz.

No. 2

Potassium Chloride	30 oz.
Sodium Chloride	45 oz.
Lithium Chloride	10 oz.
Potassium Fluoride	15 oz.

No. 3

Potassium Chloride	45 oz.
Sodium Chloride	30 oz.
Lithium Chloride	15 oz.
Sodium Fluoride	3.5 oz.
Potassium Thiosulphate	3 oz.

No. 4

Potassium Chloride	50 oz.
Barium Chloride	35.5 oz.
Lithium Chloride	10 oz.
Potassium Fluoride	3 oz.
Sodium Fluoride	1.5 oz.

No. 5
Swiss Patent 179,169

Potassium Chloride	41.5 g.
Salt	32.5 g.
Lithium Chloride	10.0 g.
Sodium Fluoride	6.5 g.
Potassium Bromide	9.5 g.

Welding Powder

Linden Wood Charcoal, Powdered	650 g.
Calcium Carbonate, Heavy	350 g.

Mix and strain until no white crystals are visible.

Brass Welding Rod

U. S. Patent 2,035,423

Copper	57 lb.
Nickel	2 lb.
Iron	1 - 2 lb.
Vanadium	0.005- 1 lb.
Zinc, to make	100 lb.

Non-Fuming Brass Welding Rod

U. S. Patent 2,046,088

The addition of 0.01–0.1% chromium restrains fuming.

Welding Rod

U. S. Patent 2,087,202

This is used for hard wear-resisting metal parts.

Molybdenum	15- 25 %
Tungsten	3- 12 %
Boron	1- 3½%
Nickel	2- 10 %
Iron, to make	100 %

Iron Welding Rod

U. S. Patent 2,024,991

Coating	
Slag Forming Material	65–98 oz.
Cannel Coal	25- 2 oz.
Binder	
Slip Clay	50 oz.
Iron Oxide	20 oz.
Calcium Carbonate	20 oz.
Rutile	10 oz.
Manganese Dioxide	5 oz.
Coal	10 oz.

Flux for Cadmium and Its Alloys

British Patent 442,985

Cadmium Chloride	58 g.
Sodium Chloride	20 g.
Potassium Chloride	22 g.

Cadmium Refining Flux

French Patent 788,493

Cadmium Chloride	58 lb.
Potassium Chloride	22 lb.
Sodium Chloride	20 lb.

Steel Dephosphorizing and Desulphurizing Flux

French Patent 786,386

Lime	45 lb.
Silica	20 lb.
Iron Oxide	19 lb.
Manganese Dioxide	6 lb.
Fluorspar	10 lb.

Metal Melting Flux (For Down-Draft Furnaces)

Coke Dust, Ground Fine	60 lb.
Lime	20 lb.
Silica Sand or Fluorspar	10 lb.
Common Rock Salt	10 lb.

Use 5 to 10% of this mixture in the furnace and you will find cleaner, solider castings when this flux is used. It also keeps the furnace clean. Add 2% when charging the furnace, balance when metal is melted, which is in about 15 minutes. It protects the metal with a covering, at the same time decomposing oxides that may be taken up in the melting before the covering can cover the metal.

Bearing Metal

U. S. Patent 1,992,548

The following powdered metals are heated to 370° C., briquetted and sintered in a closed vessel with ammonium chloride as a flux.

Iron	50 oz.
Copper	80 oz.
Zinc	20 oz.
Tin	2 oz.

Tinning Gray Cast Iron

Castings to be tinned should be thoroughly cleaned either by sandblasting or by tumbling in a dry mill with star shot for 12 hours. The castings should be packed just loose enough for the shot to roll. They should be loose enough for the shot to get in between them but not so loose that they can roll themselves. A good operator knows from the sound of the mill whether or not the parts are rolling properly for the best results. The milling process gives the castings a bright, hard appearance, and any slight rust which may appear during storage will disappear during the next step in the process.

After cleaning, the castings should be pickled for about 12 hours in a solution of 1 part hydrofluoric acid in 400 parts of water. The pickling process can be accelerated by increasing the amount of acid. Too much pickling will produce a black sludge of carbon on the castings which is hard to remove. Because of the extreme corrosive nature of this acid, it is best to drain the used acid from the tanks and rinse the castings with a hose before removing them to save the operators' hands.

Just prior to the actual tinning the castings are wet milled using star shot and water. The same precautions with regard to packing apply as in the case of dry milling. It is essential that the water does not leak away and leave the castings exposed to air as they will become oxidized and the milling will have to be repeated.

After 10 to 12 hours of wet milling, some operators drain the water, add hydrochloric (muriatic) acid and more water to the mills, and roll them for another 30 to 60 minutes. The acid is added to the water in the proportion of 1 to 70, although this may be varied from 1 to 50 to 1 to 100 and still obtain good results. When acid milling is set up as a permanent part of the process, it is advisable to equip the mills with release valves, which allow the generated hydrogen to escape and yet seal the mills against water leakage.

While it might appear that the long wet milling would clean the castings sufficiently without the acid treatment, experience has determined that for steady production and uniformly bright tinning, the acid milling is necessary. This is due to the fact that during the wet milling a certain amount of oxidation takes place which is removed by the acid treatment.

After the acid treatment the castings are stored under water until they are to be tinned. This under water storage prevents rusting. If kept under water too long, the castings will not tin readily. Forty-eight hours is the limit of safety.

Just prior to tinning, the castings are dipped into the flux. Some operators refine this step of the process by using three tanks. The first tank contains a solution of 1 to 50 hydrofluoric acid and water. The second contains cold water, and the third a zinc chloride dipping flux readily obtainable commercially.

If quantities are relatively small, and the castings are of size to permit it, it will be found that an ordinary wooden washtub makes a suitable low-cost dip tank. A light-gage lead lining will increase the life of the tubs. The thin sheet metal bands of the commercial washtub should be removed and welded rods substituted. Dip tanks should be set on ''sleepers'' to facilitate cleaning around them.

Temperature Control Important

The tin pots should be kept at a temperature of approximately 550° F. at all times. In the absence of a pyrometer the pots should be kept at just such a heat that the flux smokes. If the tin chars a pine shaving, it is too hot for tinning purposes. To prevent oxidation of the molten metal, the surface of the first tin bath or roughing pot should be covered with flux, zinc ammonium chloride, to a thickness of ¼ to ⅜-inch. The flux melts down to a black fluid which covers the surface of the molten metal. It should be renewed by the operator as required. Skimming should be frequently carried out.

It is maintained by some that castings need only be held in the tin bath until the tongs cease to vibrate. Experience has determined, however, that it is necessary to hold them in the bath until they come to the temperature of the molten tin. The operators soon learn from experience how long castings should remain in the pots. The time of course is variable, depending upon the amount loaded in the pots at any given time.

After the castings have reached the temperature of the roughing pot they are removed with tongs and dropped into the finishing pot, which is covered with a layer of beef tallow. This pot can be run cooler than the roughing pot, and a little experience will indicate to the operator when the pot is running too cold. The melted tallow should be skimmed frequently from the finishing pot, if it begins to appear lumpy. The layer should be maintained at a thickness of approximately ½-inch.

It will be found economical to employ the same operator and the same tongs to remove castings from the roughing pot and place them in the finishing pot. After immersing the castings in the finishing pot, the operator should remove them with the same hot tongs and hand them to the *shaker,* who twirls them around to remove surplus tin. The shaker's tongs are cold. The reason for this is that it is almost impossible to use the same hot tongs for this part of the process as are used for the roughing pot. The hot tongs stick to the tinned surfaces.

After shaking, the castings are dipped in kerosene, then plunged into cold water, and finally laid away. The kerosene tub must be kept cool by a water jacket, and skimmed frequently.

For an extremely bright finish the castings are given a light buff with a soft cloth wheel. Practically the same results can be obtained at a lower cost by packing them fairly tightly in a wooden barrel with hardwood sawdust, and rolling them for an hour.

It may be interesting to note that malleable castings respond readily to the foregoing process.

Steel pieces tin readily and do not require the preliminary milling and hydrofluoric acid pickle. It is absolutely necessary to clean all grease or oil from the steel pieces by a cleaning solution.

Approved practice includes running them through a cleaner, then a cold rinse, and then immersing them in a boiling solution of 1 part hydrochloric acid and 50 parts water for five minutes.

Castings too small to be handled readily with tongs may be tinned in wire baskets. The basket should be of such size that the parts it holds will not weigh more than 15 to 18 pounds. The wire should roll outward over the top reinforcement and should be braced strongly. The handle should be about 40 inches long and preferably made of steel tubing, $\frac{7}{8}$-inch outside diameter, and $\frac{1}{16}$-inch wall.

At first operators may find that the small pieces in the basket stick together. This trouble disappears as the operator gains experience. The easiest remedy is to mix parts that are half-round with flat pieces, or to keep special spherical pieces for the purpose. Quick shaking and dumping will remove most of the trouble. Pieces with holes in them may be strung on wires, lowered into the pots, and shaken by the loop of wire which should resemble a hoop.

Retinning, which is always a difficult process at best, is most easily accomplished by milling the castings over again with the tin on them.

Freshly tinned work should be removed quickly from the acid and steam as they will dull quickly in a moist atmosphere. Special jobs for shelf merchandise should be wrapped in wax paper immediately.

Hot Tinning Cast Iron

As the hot dip tinning of cast iron castings is a very difficult matter, it is necessary to explain the cause of the trouble. The iron in making such castings often picks up sand. In addition to this feature, often cast iron is filled with graphite. Thus when any attempt is made to clean such castings, these two factors are difficult to overcome. Both very fine silica and graphite flakes or particles may be embedded in the surface skin of the castings, and when not entirely removed in the cleaning and pickling processes, the tin adheres as coating on a ''greasy'' surface. Thus to obtain a perfect tin coating on cast iron castings, all this fine silica and graphite must be entirely removed in the cleaning processes.

The most modern method of cleaning castings is by blast cleaning. This equipment, however, is expensive, and is used only where a very large production is available. The next best method of cleaning such castings for the very small plant is first to thoroughly sandblast the castings. This means that every corner and indentation has been perfectly sandblasted. In many cases, later coating troubles have been caused by not carefully cleaning the corners, and more difficult places. All rust should be entirely removed by the sandblasting. The next step is a thorough tumbling, when that is possible and practical, to obtain a smooth surface. Sandblasting gives a rough finish; tumbling will smooth this roughness off, and give a smooth surface for the tin to be deposited upon.

After sandblasting and tumbling, the next step is pickling. There is only one acid that will dissolve silica or the fine sand picked up by the iron from the runner, or from the molds. This acid is hydrofluoric acid, commercially known as ''casting acid.'' The castings should be given a light pickle for about 20 minutes to half an hour in a solution of one-half of 1 per cent sulphuric acid and $\frac{2}{10}$ of 1% hydrofluoric acid, at a pickle bath temperature of about 140° F. If this acid mixture does not absolutely clean the surface, then muriatic acid, which is stronger than sulphuric, can be used. Since this formula is giving satisfactory results no trouble should be encountered. If the pickling is done in a small tank of about 300 to 400 gallons of solution, it is cheaper to empty the pickle every night and make up a new pickle each day. This also gives better cleaning practice.

Tin melts at 449° F. The size of the tin bath, etc., size of articles, production, etc., will determine the exact tin bath temperature to use. About 475 to 500° F. should give a good finish. A good brand of Straits tin should be used in the tin pot. Sometimes much difficulty is encountered due to the use of hard tins. The castings, if small, should be carefully withdrawn from the bath so no ''run-off'' or ''drip'' places are left. They are then quenched in a kerosene oil bath, with a water jacket around it to take up the heat. They are finally dried in sawdust.

Hot Tinning of Copper

Copper that is to be tinned by the hot dip process is usually fabricated into some form or other. The first step therefore, is to be sure all oil and grease have been removed. This is done by putting the work through a good commercial cleaning bath. The solution is kept at about 180–200° F. All of the article must be submerged in the solution so as to avoid oxidation. When the oil and grease have all been removed then the next step is to wash thoroughly in a hot water rinse at the same temperature.

When the work has been thoroughly rinsed, the next step is pickling. This is done in a mixture of nitric and sulphuric acids in the proportion of 1 gal. of 38° nitric acid, 1 gal. of 66° sulphuric acid, 1 gal. of water, and a little muriatic acid. When these acids are mixed, heat is generated and therefore, much care should be used. All acids, etc., should be kept in stoneware. The pickling tank is a small acid-proof brick tank with a hood over it.

When the work has been given the bright dip in the pickling solution, it is again thoroughly rinsed, and then dipped in a liquid flux of zinc chloride. In order to have a high quality finish, attention is called to the fact that the solutions must be kept clean. The tin pot is filled with good commercial Straits tin and the temperature of the molten tin is held at 500–520° F., depending upon the character of the work. The work when fully coated with tin is slowly withdrawn so that it will drain clean. When the piece has completely drained, it is then quickly quenched in a kerosene oil bath, cooled by a cold running water jacket.

The last step is drying the articles. This can be done in sawdust, and then if the articles are large, they can be wiped with soft rags. If small articles, they can be thoroughly dried in the sawdust, sifted and then blown with an airblast.

Hot Tinning Tableware

The pieces must first be put through a good commercial cleaning bath. The temperature of the cleaning bath is held at about 200° F., and when the work is absolutely clean, it is removed and thoroughly rinsed in a hot water rinse at 200° F.

The next step is pickling which can be done in a muriatic acid solution. The strength can be tried at about 4% to start with; if too strong, try 2%; and if too weak, make it stronger. The strength will of course depend upon the condition of the work to be replated. A light solution will be all right if the articles are not rusted; if rusted, they will require a stronger solution. The pickle can be used cold or hot; if not enough action cold, then it can be heated to 100–120° F. After pickling, the work should be washed thoroughly and then dipped in a solution of Grasselli tinning flux; then drained well and laid in a warm place to dry slowly. If the articles are drained well it is not necessary to dry them as they can be put into the tin bath very slowly without spattering and throwing the tin.

Tin melts at about 450° F. and it should be possible to get a good bright coat at 480–500° F. If the work is not bright enough or smooth enough, raise the temperature to about 520° F. Use good Straits tin in the bath and see that the tin is always clean and is never burned or overheated. After the articles have been coated thoroughly, they are slowly withdrawn from the tin bath, allowing them to drain well, and turning so that the metal will run back over the piece and not make any lumps, run-off, or extra heavy coating spots. Then they are plunged into a kerosene oil bath, quenched in a running water jacketed tank. From here they are put in a sawdust box to dry up the oil, and then wiped clean with a soft smooth cloth.

Tinning Milk Cans

A method and one which may be considered to be practical for a small layout, and inexpensive operation is that of not taking the can apart but carefully doing the best job possible under the circumstances of tinning the can assembled.

First the cans *must* be put through a commercial cleaning solution to remove all the butter fats, etc., that may be lodged in the seams. It should be kept at about 200° F. After the can is absolutely clean, it is next washed thoroughly in a water tank. This removes the alkali from the cleaner, and washes out the greases and fats removed. If the can is rusted, or has places or spots on it that are rusted, these must be entirely pickled off in a solution of muriatic acid. The strength of the acid will depend upon the character of the rust. A light rust can be removed with a 2% solution at about 120° F., a heavy rust may require a 4% solution at about 120–140° F. The light rust may perhaps be removed in a cold solution; the acids should be used cold if possible. If this will not remove the rust, then they will have to be heated. When the rust and all oxide have been entirely removed, the cans are put in a liquid flux solution of zinc ammonium chloride solution. They are then drained well and very slowly immersed in the tin bath, which has about ¼ to ½ inch Grasselli tinning flux on it. The melting point of tin is 449° F. and the bath should be kept only shortly above the melting point, 500–475° F. If two pots are used, the first bath may be at 550° F. and the finishing bath at 500–475° F. The cans after coming from the tin bath are dipped into a large bath of heated fuel oil. This sets the coating and prevents oxidation and discoloration of the coating. From the fuel bath, they are taken to a wiping bench where they are first wiped with cedar sawdust, then with whiting, then with pine sawdust and finally are wiped with a clean soft rag. If the coating becomes tarnished by handling, it may be cleaned with gasoline and whiting.

Testing Tin Plate Pores

Pores in tin coating are revealed as spots of rust and copper when the tin plate is kept for 2 hours in boiling aqueous copper sulphate 1–5 parts per million of copper.

THE HOT-TINNING OF FABRICATED ARTICLES

The fabrication of pans, dishes, churns, wire, tubes, and other products from copper, steel and other metals, produces a surface which requires degreasing, pickling and fluxing, before it will take a satisfactory coating of tin by hot-dipping. It is proposed to discuss some of the variations in procedure and manipulation in these preliminary treatments, as well as in the actual tinning operation.

Degreasing can be effected in three ways; by emulsifying the grease in a suitable solution such as hot 10 per cent trisodium phosphate, by solution in the vapor of chlorinated hydrocarbons such as trichlorethylene, and by cathodic treatment in a suitable electrolyte. The addition of about 2 per cent of alumina to the solution of sodium carbonate, or preferably trisodium phosphate, which is used as the electrolyte, considerably increases the efficiency of a cathodic degrease. The use of water-miscible "cutting" oil, in preference to ordinary mineral oil in machining and pressing, makes the subsequent degreasing much easier. It may be mentioned here that cathodic treatment *after* pickling has been found to result in an improved tin coating on copper.

Both steel and copper are pickled in hot dilute sulphuric acid. In order to avoid dissolution of the metal and absorption of hydrogen, an inhibitor or restrainer is generally added to solutions used for pickling steel. This is not necessary, however, with copper, since the acid merely attacks the oxides. In some plants steel is pickled in cold hydrochloric acid solutions (5–50 vol.-%).

A suitable solution for pickling copper contains 124 g. of copper sulphate and 97 g. of sulphuric acid per kg. of solution. This is operated at 60° C. (140° F.) until dissolution of copper oxide has reduced the acid content to 59 g. per kg. The acid content is then brought back to its original figure by the addition of fresh acid, and the temperature raised to 70° C. (158° F.) whilst pickling is continued. When the acid content has fallen to 55 g. per kg., pickling is stopped and the solution, which will contain 171 g. per kg. of copper sulphate, is cooled to 50° C. (122° F.). After adjusting the acid content to 81 g. per kg., cooling is continued down to 20° C. (68° F.). This causes the excess copper sulphate to crystallize out and brings the pickle back to its original composition. The pickling and recovery cycle is then repeated.

In some cases the dissolved copper is recovered electrolytically. The pickle used contains 150 g. per litre of $CuSO_4,5H_2O$ and 50 g. per litre of H_2SO_4 and is operated at 40–50° C. (104–122° F.). During pickling the solution is circulated from the pickling vat through an electrolytic cell by means of a pump, and copper deposited on copper sheet cathodes at a potential of 2 volts and a current density of 4 amp. per sq. dm.

The oxide scale on brass may be removed with negligible attack of the metal by use of a solution of $ZnCl_2,2NH_4Cl$ (400 g. per kg. solution) at 65° C. (150° F.). When the zinc content reaches about 160 g. per kg., the pickle is regenerated as follows. The copper is precipitated by adding the calculated quantity of metallic zinc and removed by filtration. Enough ammonium chloride is then added to transform the excess zinc chloride into the double salt. Sufficient liquid is then taken to give the bulk necessary for pickling after dilution, and the excess liquor is concentrated by evaporation.

After pickling, the work should be thoroughly washed and tinned with as little delay as possible. The pickled articles are stored, prior to tinning, under water to which a little hydrochloric acid has been added. Immediately before tinning the articles are fluxed. The composition and method of use vary with the basis metal and type of article, as will be seen later. The cleaning and preparation of cast iron for tinning is different from the usual run of pickling processes and will be discussed in detail under cast iron.

The Tinning of Copper Tubes

This has been described in detail by Pettis. The tin pot is a flanged cast iron trough. U-shaped, about 10 inches wide across the top, 7 inches deep and many feet long. A V-shaped wooden trough of the same length is used for fluxing.

The tubes, having been dipped in the solution of zinc chloride, used as a flux, are allowed to rest at an angle, to drain off surplus solution. The tinner and his helper then lift it by inserting iron hooks in the ends and slowly lower it, one end first, into the tin which is kept at about 270° C. (518° F.). On removal from the tin, one end is held high to allow the tin to run out of the tube back into the bath, and the tube is then transferred to the wiping rack. This is a wooden horse about two and a half feet high, on one end of which the tube rests. The other end rests on the floor. The tinner holds the tube firm with a pair of tongs which grip the inner and outer walls at the top end, and the wipers rapidly draw pieces of tow, one held in each hand, down the outside of the tube. The inside is then wiped, either by thrusting a rod, with one end wrapped in tow, through the tube, or, in the case of smaller tubes, by pushing a snugly fitting cork through the bore. Wooden rods are used to avoid scratching the coating. The addition of about 8–10 per cent of lead to the tin makes the wiping operation easier. For use in contact with foodstuffs, milk, beer, etc., however, it is necessary to avoid the presence of lead in the tin coating. When the insides only of the tubes are to be tinned, the outsides are coated with distemper.

The Tinning of Steel Hollow-Ware

In a process described recently tallow is used as a flux. The pickled articles, having been wiped with a rag or scrubbed with a brush, are rough-tinned at about 370° C. (698° F.) by immersing in molten tin on which floats a layer of thickened tallow to a depth of two or three inches. (This thickened fat is a scum from the pure tallow on the finishing pot). The pot is slowly filled with the articles, which are then taken out in the reverse order, after the fat has been skimmed from the surface of the tin, and passed to the brusher.

The brusher treats one article at a time, dipping it in a bath of tin, the surface of which is kept skimmed clean. This pot is maintained at about 320° C. (608° F.). The article is immersed long enough to melt off the coarse surface produced in the rough-tinning, and is then brushed with a soft, fine hemp brush, dipped in fat. The article is again immersed for a few seconds to remove all traces of brush marks, and passed to the finisher.

The finishing pot contains molten tallow in which hangs an iron rack. The article is placed on this rack and left long enough to melt off the surplus tin. The thickness of the tin coating is determined by the time and temperature of this operation. A suitable working temperature is 250° C. (482° F.). The work is then removed, shaken to remove most of the fat and such tin as has lodged in re-entrant parts, and then placed on a rack at the side of the pot to cool. The drainage beads are then carefully melted off in a listing-pot containing pure tin, and the re-melted portion of the coating set by dipping in water. Most of the tallow remaining on the articles is removed by the rubber, using rags and sharps, and a final polish is given by the cleaner, using fresh sharps and soft rags. If the articles have very long handles the finisher, after allowing the tin on the body of the article to set, immerses the handle in the molten tin in the listing-pot and then in the melted fat, in order to remove any runs or other blemishes produced while the body was being finished.

The re-tinning of articles which have been pressed from tinned sheets is carried out by the brusher, who allows them to soak for a short while in the pot of fat, and then treats them in the same way as work that has been rough-tinned. If the articles are slightly rusty they are dipped first of all in a solution of stannous chloride.

In another method of tinning sheet-ware, the articles are pickled in hydrochloric acid, fluxed with zinc chloride solution and tinned in a single bath at about 260° C. (500° F.) A bright finish is produced by quenching in a bath of water on which floats a layer of paraffin oil three inches or so deep. Cleaning in hot alkali solution is followed by washing and rubbing with moist sand. The articles are finally cleaned in sawdust.

Another process applied to tinplate stampings and pressings is conducted as follows. The articles are dipped in ammonium chloride solution and then soaked in a mixture of palm oil and molten tallow. After tinning in a single bath, which has no flux cover other than that introduced by the articles, they are allowed to drain in a finishing oil-pot. After quenching in water the articles are cleaned and polished with sharps. Copper stampings are tinned in a similar way, but shaken violently to remove excess tin before quenching, instead of draining in hot oil. Large steel parts, etc. are best tinned by wiping, using zinc chloride as a flux.

The Tinning of Milk Churns

Owing to the large size of these articles, the method of tinning differs somewhat from that applied to small hollow-ware, and it is usual to use a chloride flux on the roughing bath instead of tallow. The process is conducted somewhat as follows.

The suitably cleaned churn is laid horizontally in a cradle and lowered slowly into the first tinning pot which contains tin at about 260–280° C. (500–536° F.), and is covered with about one and a half inches of flux, such as "Baker's soldering fluid." When about three-quarters of the churn is immersed, it is rotated so that every part goes under the tin, this being continued for two or three minutes. The churn is then slung out, drained, and transferred to the finishing pot for an immersion of a few seconds only. This second bath is worked at about 250° C. (482° F.), and has a little tallow floating on its surface.

For a high-class finish with a heavy coating, the churn is then quenched in water containing a little "cutting" oil or soap, care being taken that the water does not get inside. For a thinner and less expensive finish, the churn is drained on removal from the finishing bath, a flame being used to keep the tin from setting until sufficient drainage has taken place. The coating is then allowed to set in air.

The neck and shoulders of the churn are best tinned separately and soldered on afterwards, unless, of course, they are made an integral part of the churn during fabrication. They are tinned by immersion in one bath only and quenched.

The Tinning of Copper Wire

Wire tinning differs from the processes just described in that the work passes continuously through the fluxing, tinning, wiping and other operations, so that individual attention to portions which respond least readily to any of the treatments is no longer possible.

The tanks containing the pickle, wash water, flux, etc. are placed in line between the pay-off reels and the tin-pot, the wires running through each in turn. For conducting the wires through the plant up to the tin-pot, free-running porcelain pulleys are used. Five or more wires are run side by side through each tinning unit. In order to reduce contamination of each bath by the one preceding it to a minimum, immediately after leaving each bath the wire is passed through a cleaning wiper, which is simply a small square of rubber, cut from an old tire, through which the wire is threaded.

A cold, 5–10 per cent solution of sulphuric acid is generally used for pickling. Sometimes electrolytic pickling is employed. Occasionally, the cleaning of the wires is assisted by passing them through damp sand before running them through the acid. From the pickling vat the wires pass through a small tank of running water and then through the flux solution. An increasing number of plants are giving the wire an additional cleaning treatment before fluxing, making the wire the cathode of an electrolytic cell. This, as Jones has shown recently, reduces surface inclusions of cuprous oxide to metallic copper and leads to a more uniform and less porous tin coating. This treatment is followed by a final washing before fluxing.

There is a wide variation in the composition of the flux used. The usual zinc chloride or zinc ammonium chloride solutions are tending to be replaced. In some plants a solution of stannous chloride and glycerin, to which a little ammonium chloride may be added, is used. In others, purely organic compounds are employed; for instance, lactic acid, glycerin, or mixtures of these two. A quite different flux, namely alcohol, has been suggested recently. The copper wire is treated with alcohol and passed into the tin *via* a tube furnace, the exit end of which dips into the tin. The oxides on the wire are reduced by the alcohol so that the wire takes a coating on passing through the tin, which it enters without coming in contact with the air.

After passing through a cleaning wiper, which removes excess of flux, the wires are taken through a bath of molten tin. A grooved steel wheel is generally used to submerge each wire. In some plants a polished chromium-steel shoe has been found to be more satisfactory. The wires pass vertically up and out of the bath, through a suitable wiping device which removes excess tin, and continue to a sufficient height to allow the coating to set before passing over a pulley and down to the coilers. Thick wire may be given an additional water cool immediately before reaching the take-up reels.

The wipers generally used are made of asbestos string which has been dipped in molten tallow. A short length of this is wound tightly three times round the wire in a close spiral and knotted firmly in place. It is then allowed to pass on the wire through the tin and is brought to a stop against the wiper bar, which is fixed about a foot above the tin surface. The weight of coating produced is determined by the speed of the wire, the temperature and composition of the tin, and the distance the wire passes before passing through the wiper.

The tin used should be pure. Contamination with copper during use is, of course, inevitable, but will not be serious unless the bath is worked at too high a temperature. The tin-pot may be of welded mild steel or of cast iron, and should be heated with gas or electricity with automatic temperature control. The temperature of the tin is generally about 250–265° C. (482–509° F.). When the time of immersion and the temperature of tinning and the activity of the flux (which is a contributory factor) are suitably adjusted, it is possible to maintain the copper content of the bath at a satisfactory figure, dilution on adding fresh tin keeping pace with the formation of copper-tin compound. If, for any reason, too much copper is absorbed, it will be necessary to cool the bath to crystallize it out, so that it can be removed with perforated ladles.

Some writers state that the tin surface should be protected against oxidation by the use of a flux cover. Mixtures of zinc chloride, stannous chloride and sodium chloride (80:10:10) or of zinc chloride, ammonium chloride and sodium chloride (70:20:10) have been suggested for this purpose. Resin and tallow have also been used. In many cases, however, the tin is left uncovered. Loss of tin by oxidation is not serious if the temperature is kept low, and if the metal is free from impurities, particularly iron and zinc.

The Tinning of Steel Wire

This is carried out in much the same way as the tinning of copper wire, the flux always being zinc chloride solution. The importance of working at a low temperature to avoid spoiling the appearance of the tinned surface and to keep down dross formation has been emphasized recently. According to Bonzel, by regulating the temperature between 250° and 260° C. (482 and 500° F.) and protecting the surface with charcoal, oxidation is very much reduced and the tin used is almost all employed in covering the wire.

Certain articles, such as refrigerator shelves, are made up of steel wire and then tinned. The finished articles are required to stand up to the salt spray test for periods varying from 24 to 100 hours. In current American practice the cleaning of the shelves is carried out in five stages: (1) Vapor degrease in trichloroethylene. (2) First pickle in 7½ per cent sulphuric acid at 82–88° C. (180–190° F.). (3) Second pickle in a similar solution at 60–71° C. (140–160° F.). (4) Wash in hot water, heated with live steam. (5) Fluxing dip in unheated zinc chloride solution (50° Bé.).

After removal from the tinning bath, the shelves are hung in a bath of high-flash-point oil maintained at a temperature a little above the melting-point of the coating. The bar from which they are suspended is agitated slowly by a suitable mechanism. When the excess tin has been removed by this oil stripper, the shelves are immersed in a hot alkaline cleaning solution, and then in an oil solution, to remove the cleaner. Finally, they are inspected and dipped in clear lacquer. Some plants coat the shelves with solder, but pure tin should, of course, be employed wherever there is any question of contact with food.

The Tinning of Cast Iron

The very nature of the metal to be coated raises a number of difficulties in the tinning of cast iron. In addition to the combined carbon (Fe_3C), present in all iron-carbon alloys, including steel, free carbon or graphite is dispersed throughout the metal. The absence of combination between tin and carbon causes defective adherence and covering power wherever graphite flakes occur in the cast-iron article. An additional source of trouble lies in the "casting skin," which, due to burning-on of the moulding sand during casting, is often highly siliceous. To overcome these difficulties considerable care must be taken in preparing the surface for tinning, and various methods have been suggested and used from time to time.

A very simple process described recently consists in pickling in hydrochloric acid diluted with an equal volume of water, after sand-blasting. The castings are then dried in an oven without rinsing. Just before tinning they are dipped in weak pickle (1 hydrochloric acid : 20 water) and then in killed spirits. Rough-tinning is carried out in tin covered with a layer of zinc chloride plus sal-ammoniac, and heated at 260–274° C. (500–525° F.). The finishing kettle is operated at 250° C. (482° F.) and is covered with a layer of beef tallow. After shaking to remove surplus tin, the castings are quenched in kerosene, washed in hot water and dried in sawdust.

De Lattre considers that sulphuric acid is preferable to hydrochloric acid for the pickling of cast iron prior to tinning. Hydrochloric acid is supposed to diffuse into the casting, react on the metal, and form iron chloride which later spoils the coating. He recommends pickling at 40° C. (104° F.) in sulphuric acid (50–60 g. per litre), which must contain an inhibitor. In many plants a hydrofluoric acid pickle is used. The castings are immersed for about 15 minutes in cold 5 per cent solution. This removes surface inclusions of silica. It will attack the iron itself unduly if too strong, particularly if there is much pearlite present.

Removal of graphite flakes, slag inclusions and sand grains from the surface of the castings is best carried out mechanically, by milling or tumbling. This is sometimes followed by a light pickle and a dip in an acidified solution of copper chloride or sulphate, which gives the casting a thin coating of copper. A small percentage of copper is often introduced into the tinning bath itself.

Much can be done to render the tinning operation easier by choice of a suitable iron, and by care in the foundry. According to Jaeschke the impurities in iron for tinning should be less than: silicon 0.75, manganese 0.70, phosphorus 0.30, sulphur 0.08 per cent. Becker suggests a carbon content of less than 3 per cent and manganese below 0.5 per cent.

Dry-sand castings are preferable to those cast in green-sand on account of their better surface. It is advisable to avoid the use of coal dust or black-leading, and linseed oil or flour should be used instead of resin as a core binder. Carbon-rich castings should be heated with iron or manganese oxides in order to decarbonize the surface prior to tinning. Malleable castings and thin-walled fine grey castings are not given this treatment.

The following process has recently been described in detail by Swanton. Following dry milling for 12 hours the castings are pickled for 12 hours in dilute hydrochloric acid (1 acid: 100 water). They are then wet-milled with star shot and water for 10–12 hours. At the end of that time the water is drained from the mill and replaced by dilute hydrochloric acid (1 acid: 20–100 water), and the milling continued for 30–60 minutes. The barrel should be supplied with a valve to allow the hydrogen produced to escape. The castings are removed and stored under water. Tinning follows as soon as possible. Prior to dipping in the zinc chloride solution which is used for fluxing, the castings are dipped in a mixture of 1 part hydrochloric acid and 50 parts water, and then in clean cold water. They are then rough-tinned at approximately 290° C. (550° F.), the tin being covered with a layer of zinc and ammonium chlorides about one quarter of an inch thick. The final tinning is carried out at a slightly lower temperature in another bath of tin which is covered with tallow to a depth of half an inch. After the excess tin has been shaken off, the castings are dipped in kerosene and then in cold water.

A different process, which is used very successfully, depends on plating the casting with pure iron before tinning. The castings are first milled with sand and water for 12 hours, electroplated with iron and stored in acidified water until the tinners can deal with them. Two tinning pots are used, both being covered with a saturated solution of zinc chloride plus some sal-ammoniac. The first is operated at 320° C. (608° F.), and the second at 250° C. (482° F.). The castings are dipped in killed spirits before immersion in both the roughing and finishing kettles. After shaking off the excess tin, the coating is set by dipping in kerosene.

The Tinning of Brass and Bronze

This follows the general lines of copper tinning and it is usual to use a tin-pot specially reserved for these alloys, since contamination with zinc tends to spoil the molten metal. The tinning temperature is higher than that used for unalloyed copper. A recent description of the tinning of small bronze articles states that they are dipped in zinc chloride solution and then into tin which is kept at about 440° C. (825° F.). They are then taken out to see that they are properly coated, re-dipped, drawn out and shaken, and finally wiped with cotton waste. Any threaded parts are brushed clean with a small brush.

A tinning procedure which has been found to give a good finish on bronze plates consists in rough-tinning at 330° C. (625° F.), after fluxing with killed spirits, followed by a soak in palm oil at the same temperature before finish-tinning in a bath kept at 335° C. (635° F.) and covered with palm oil. On withdrawal from the second bath, the plate is quenched in kerosene, and after washing in hot and cold water, is finally dried with sawdust.

Aluminum bronze is difficult to tin unless it is first given a coating of copper. This may be done by immersing in a solution of copper sulphate, acidified with sulphuric acid, and connecting electrically with a piece of iron or steel also immersed. After coppering, the bronze article should be rinsed and dried, and then tinned in the usual way.

Brass stampings may be tinned as follows. After cleaning they are dipped in chloride flux and then into tin at 480–490° C. (896–914° F.), the bath being covered with a mixture of zinc and ammonium chlorides. The articles are then removed, immersed immediately in palm oil and re-dipped in the molten tin. The oil is stated to give the articles a brighter and smoother finish when they are again withdrawn from the tin bath. After the second dip, they are shaken to remove surplus tin and wiped with a pad of cotton wool or clean tow. In some works a little copper is added to the tin bath used for dipping brass.

When the number and shape of the objects are such that electroplating is economical, it is undoubtedly better to apply the tin coating to articles made of brass by that method.

The Tinning of Miscellaneous Articles

It is sometimes desired to tin steel containing chromium. The readiness with which such steels resist the action of cleaners and fluxes, and the fact that chromium has no affinity for tin and is not wetted by it, raises difficulties. The pickling may consist of two treatments, the first in 5 per cent sulphuric acid followed by 20 per cent cold nitric acid, or one, using a cold mixture of 20 per cent hydrochloric acid and 5 per cent nitric acid. After washing, the articles should be fluxed with zinc chloride to which has been added 10 per cent of hydrochloric acid. The usual feebly-acid killed spirits is of little use. A dip in a coppering solution is frequently given before fluxing and tinning.

Another material which is troublesome to tin is aluminum. This is sometimes done, however, as in the babbitting of aluminum-alloy connecting rods. According to Silberstein, the tinning temperature should not exceed 260° C. (500° F.). A stiff wire brush is mounted above the tin-pot and rotated mechanically. The article is heated in the tin-bath and the oxide cleared from it by means of the rotating brush. The rod, or the brush, or both together, are then dipped into the tin and the adhering tin brushed thoroughly in. A similar procedure is recommended for aluminum and may also be used for duralumin. Wire wool is often used instead of the rotating brush.

Rustproofing Composition
British Patent 473,328

Ferric Hydroxide	5 g.
Nitrobenzene	5 g.
Ferric Chloride	5 g.
Benzoquinone	5 g.
Benzyl Benzoate	100 cc.

Rust Cleaning and Rust Proofing
British Patent 464,656

Water	2.7–3.3 lb.
Sodium Nitrite	2.0 lb.
Sodium Nitrate	2.0 lb.
Sodium Hydroxide	2.0 lb.

Use at 145–155° C.

Rustproofing Iron

Iron is Treated with Water	89.5 lb.
Trisodium Phosphate	1.0 lb.
Soda Ash	0.5 lb.
Sodium Silicate	10.0 lb.

Use at room temperature for 15 min. or with

Trisodium Phospate	5 lb.
Soda Ash	5 lb.
Water	90 lb.

at boiling temperature for 1 minute.

Rustproofing for Iron and Steel
U. S. Patent 2,105,672

Ammonium Sulphocyanide	27 g.
Methyl Alcohol	75 cc.
Gasoline	200 cc.
Butyl Alcohol	125 cc.

Rustproofing Steel (Phosphatizing)
British Patent 473,285

Sodium Nitrate	17.5 g.
Zinc Dihydrogen Phosphate	5.5 g.
Copper Carbonate	0.5 g.
Water	to make 1.0 l.

Spray above at 65–70° C. at 20 lb. per sq. in.

Black Iron Stain for Rust Prevention

Ferrous Chloride	70 g.
Ferric Chloride	10 g.
Mercuric Chloride	2 g.
Hydrochloric Acid	2–3 drops
Water	to make 1 l.

The blank or dull (abrasive-heated) iron objects are heated with this liquor, and are kept in a warm place for some time. They are now dried in a dry-steam oven, until they show a rust-colored surface. These rusty objects are boiled in water containing a little tannin. After ½ hour, they appear bluish-black, are dried, and polished with wire brushes. They are rust-resistant.

Rust Remover

Phosphoric Acid	35 g.
Water	30 cc.
Methyl Isobutyl Ketone	10 g.
"Cellosolve"	25 g.

Rustproofing Composition

Formula No. 1

U. S. Patent 2,030,601

Iron and steel are coated with a thin film of following suspension and then baked at 200° F.:

Bentonite	5–20 lb.
Sodium Dichromate	20 lb.
Phosphoric Acid (75%)	30 lb.

No. 2

British Patent 419,487

Iron Sulphide	336 g.
Phosphoric Acid (d. 1.7)	1 l.

No. 3

Canadian Patent 360,672

Iron objects are coated with

Sodium Dichromate	13.3 oz.
Phosphoric Acid (10–20%)	15.0 oz.
Water	71.7 oz.

Bake at 200° C. for ½ hour.

No. 4

To prevent the steel bolts from rusting, it is necessary that the adhering soluble oil compound be removed by the use of a suitable alkaline cleaning solution, rinsed well in clean, hot water and dried.

After drying parts can be immersed in a solution made up by mixing 10 parts by volume of a good grade of mineral oil with a viscosity of about 220 seconds and 90 parts of either gasoline or carbon tetrachloride. This will leave a thin film of oil on parts and prevent rust without affecting the finish.

No. 5

U. S. Patent 2,081,449

Treat with a hot solution of

Oxalic Acid	4–12 oz.
Nitric Acid	1–3 oz.
Nickel Nitrate	½ oz.

Rust Removal

Formula No. 1

Japanese Patent 113,854

Rusty iron or steel is introduced into 3% caustic soda solution and is then put into a 15% solution of aluminum sulphate and used as an anode at 60 amp/ft. at 5 volts.

No. 2

Steel or cast iron is treated with 50% hydrochloric acid and then with a freshly prepared mixture of

Arsenic Trioxide	1 g.
Hydrochloric Acid, Concentrated	100 cc.
Stannous Chloride	2.5 g.
Formaldehyde	5 cc.
Water	250 cc.

Anti-Tarnish Bags for Silver

Cadmium Acetate	8 oz.
Water	1 gal.

Dissolve and impregnate flannel bags with it. Allow bags to dry.

Silver Tarnish Inhibitor

U. S. Patent 2,117,657

Stannous Chloride	1 g.
Hydrochloric Acid	160 drops
Water	to suit

Corrosion Proofing Aluminum

U. S. Patent 2,018,694

Aluminum is immersed in the following boiling solution

Borax	200 g.
Boric Acid	166 g.
Water	to make 1 l.

Corrosion Proofing Iron

U. S. Patent 2,106,227

Chromic Acid	1–20%
Hydrofluoric Acid	0.5–5 %
Water	to make 100%

Corrosion Resistant Radiator Pipe

Bronze	96.17 lb.
Silicon	3.00 lb.
Manganese	0.83 lb.

This is not affected by hot water or moist air.

Brass, Corrosion Resistant

German Patent 652,696

Copper		76 %
Zinc	up to	22 %
Aluminum	up to	2 %
Chromium	up to	0.5%

Coating Iron Strips with Carbon

U. S. Patent 2,043,549

A strip or wire of soft iron or steel is heated to about 650° C. in the presence of an oxidizing medium such as air for a time of about 4 min., the material is subjected to air cooling for about 4 min. and the oxidized strip or wire is then subjected to a temp. of about 600° in the presence of a gas rich in carbon such as natural gas or producer gas for a period of over 4 min.

Foundry Core

Sand	100 lb.
Clay	5– 7 lb.
Sulphite Liquor	5– 7 lb.
Heavy Petroleum Oil	1 lb.

Foundry Core

British Patent 466,904

Sand is mixed with 1% of a 1:1 mixture of sugar with gelatin or egg—or milk albumen

Foundry Mold Coating, Asphalt

Highly satisfactory results are credited a mold coating recently developed. The solutions consists of 63 per cent hard asphalt, 27 per cent turpentine, 1 per cent manganese borate and 9 per cent lubricating oil. Caution should be taken not to use asphalt derived from soft coal. The success of the mixture depends upon the use of natural asphalt.

Foundry Mold Wash for Green Sand

Graphite	3 lb.
Gypsum	1 lb.
Soapstone	1 lb.
Charcoal, Powdered	1½ lb.

Alcohol, sufficient to give fluidity.

Regenerating Foundry Core and Molding Sand

British Patent 455,569

Used molding sand is regenerated by agitating vigorously in a rotary kiln in an oxidizing atmosphere at 760° F.

Copper Mold Dressing

U. S. Patent 2,050,375

Bone Ash	3 lb.
Rosin	1 lb.
Alcohol	1 gal.

Mold for Casting Stainless Steel

U. S. Patent 2,027,932

Aluminum Oxide, Powdered	99¾ lb.
Magnesium Oxide, Powdered	¼ lb.

Make into a thick paste with partially hydrolyzed ethyl silicate; form into shape desired and fire at 800° F.

Molds for Precision Castings

British Patent 461,104

Quartz Powder (0.1 mm.)	80 lb.
Sodium Silicofluoride	0.3– 5 lb.
Sodium Silicate	8 lb.

Bake for 1 hr. at 1300° before use.

Nickel Casting Facing

Silica Sand	15 shovels
Old Sand	3 shovels
Bentonite	½ shovel
Clay	½ shovel

Put through a 200-mesh. Temper with water. The blending and aerating of the sand are very important for the success of the casting, and it should be put through a muller or some kind of aerating machine for proper blending. Paint mold with silica flour wash.

Care of Platinum Vessels

Platinum is unattacked by any single acid, but (like gold and silver) is dissolved readily by aqua regia. It can be heated up to its melting point in air or oxygen without oxidizing, but when heated in the presence of highly carburetted gases, it takes up carbon, part of which remains in solid solution, the rest being precipitated as graphite on cooling, with the consequent embrittlement of the apparatus. Thus excessive heating, for example, in the reducing flame of a Bunsen should be avoided. Moreover platinum at high temperature is permeable to hydrogen which diffuses through the metal and in prolonged ignitions may cause errors in analyses by reducing oxides that may be present. In addition, the reduced metal may attack the platinum to form low melting alloys. The diffusion of hydrogen is augmented by the relatively rapid grain growth of platinum on prolonged heating at high temperatures.

The development of this coarse grain structure is the common cause of failure in platinum crucibles, since it causes any brittle impurities present to segregate to the grain boundaries. The addition of iridium, or preferably rhodium to platinum, tends to restrain grain growth and to diminish the grain size of the recrystallized metal, but the safest course is to avoid prolonged heating at temperatures above 1,000° C.

At high temperatures platinum is attacked by arsenic, selenium and mixtures of their compounds, or of those of sulphur or phosphorus, with reducing agents, as well as by fused caustic alkalis, alkali nitrates and cyanides. Metals such as lead, tin, zinc and bismuth, should not be heated in platinum crucibles and dishes, as they readily form low-melting alloys with the platinum.

Hot crucibles and dishes should always be placed upon some clean refractory material to cool and not upon a metallic surface, especially rusty iron, where they are likely to pick up impurities. After use, the apparatus can be kept in excellent shape by placing it in box-wood formers which are supplied by the makers of the apparatus.

The best materials for cleaning platinum and other precious metal apparatus are alumina and heavy magnesia of the grade used for polishing. Silver sand may be used so long as it is borne in mind that an extremely hard material is being used against a soft metal. Care should be taken that the platinum is not unduly scratched, and only the finest grade of sand with the particles well rounded and free from sharp edges should be used. In many cases, sand or similar abrasives are not necessary. If the apparatus cannot be cleaned with alumina or magnesia, satisfactory results can be obtained by fusing potassium bisulfate or carbonate in the crucible or dish.

Tumbling Castings

If aluminum or brass castings are rough and it is necessary to remove metal to bring up a smooth finish, abrasive rolling is required. Abrasive rolling is naturally somewhat messy but it is essential in order to cut down rough surfaces.

For rolling aluminum castings, use a fine grade of sea sand (about 2 pecks for medium size load and enough water to cover work). Add about 2 oz. of soda ash to water so that it is slightly alkaline. Roll for about 5 to 10 minutes, allow abrasive to settle and drain off dirty water; add more water and alkali and repeat rolling operation. This is done until solution is fairly clear. After solution has cleared, roll until desired finish is obtained. Time is entirely dependent upon roughness of castings. Speed of barrel from 15 to 30 r.p.m.

After rolling, rinse well in cold running water to remove abrasive. A high lustre may be obtained by ball burnishing after sand rolling, or may be used to finish castings directly if they are not rough as burnishing has no cutting action but has a peening effect in that it applies pressure to projecting points or particles and flattens or spreads them out.

Castings can be ball burnished in a hardwood lined barrel using about 5/32″ diam. hardened polished steel ball. Approximate ratio of balls to work should be about 2 to 1 by volume.

Work which has been previously cleaned is placed in barrel about 2/3 filled with water and about 2 to 4 oz. neutral soap flakes added. Rotate barrel at about 25 to 35 r.p.m. for about 1/2 hr. and remove dirty solutions; rinse barrel and add clean water and soap; roll until desired finish is obtained; time is dependent upon size of castings, finish desired and size of load.

The same procedure outlined for aluminum castings both sand rolling and ball burnishing can be used for brass castings with the following exception: add 2 oz. caustic soda to water in sand rolling instead of soda ash.

Aluminum Powder

Aluminum foil is ground with

Paraffin Wax	3 lb.
Stearic Acid	1 lb.

This amount is sufficient for about 105 lb. of aluminum.

Froth Flotation Compound

Formula No. 1

U. S. Patent 1,974,885

Alcohol	25 lb.
Butyl Alcohol	25 lb.
Ammonia (28%)	60 lb.
O-tolidine	25 lb.
Treat below 40° C. with	
Phosphorus Pentasulphide	65 lb.

No. 2

U. S. Patent 1,974,704

Phosphorus Pentasulphide	1 lb.
Tar Acids	2–3 lb.

Heat together at 100° C.

Froth Flotation Agent for Oxide Ores

U. S. Patent 2,069,365

Oleic Acid	57.1 lb.
Cresylic Acid	28.7 lb.
Soda Ash	7.1 lb.
Sodium Silicate	7.1 lb.

Froth Flotation Cleaning of Fire Clays

Clay	2000 lb.
Water	750 gal.
Creosote	0.5 pt.
Kerosene	0.5 pt.

Recovering Tin from Scrap Tin Plate

Scrap tin is immersed in

Formula No. 1

Caustic Soda	120 g.
Stannous Chloride	23– 50 g.
Gelatin	1– 20 g.
Glue	5 g.
Water, to make	1 l.

Keep at 70° C. at 40 amp./cu.m. while mixing vigorously.

No. 2

Sulphuric Acid (d. 1.84)	35 g.
Stannous Chloride	50 g.
Water	1 l.

Use at 80° C. and 50 amp./sq.m.

Recovering Tin from Dross

The high cost of tin makes it desirable to recover as much as possible from the dross, and drippings. If the shaking is done over a sawdust box, place the caked sawdust into a melting pot and heat. A black mass comes to the top which can be skimmed readily, leaving a good grade of tin at the bottom. Experience has shown that the dross must be melted down in a steel or cast iron pot, and tapped from the bottom as it melts. High temperatures are to be avoided and flames should not be allowed to come into direct contact with the tin. Reclaimed tin should be used in conjunction with fresh tin and then only in the roughing pots.

Cutting Wire Cable

Once the point to be cut is determined, the cable is bound with wire in four places. The wire winding is done twice on each side of the spot to be cut, the first or second winding to the line of cut being about 2 inches away. The second winding is placed 3 to 4 inches back from the line of cut.

When the cable is thoroughly bound up in this fashion, the cut is made, and the loose ends are then secured from unraveling by the application of bronze welding rod. In one plant, a steel hook is bronze welded onto the end of the cable remaining on the reel so as to assist when unwinding the cable as small orders come in.

Reconditioning Steel Splice Bars

U. S. Patent 2,061,264

Worn bars, with a carbon content of 0.3–0.7% are heated to 860–950° C.; cooled slowly; reheated to 790–980°; forged to shape, quenched and finally tempered at 315° C.

Impregnation of Metals

British Patent 453,226

Articles of aluminum or magnesium are alternately boiled and cooled for 5 hours in a solution of

Sodium Silicate	150 g.
Potassium Dichromate	23 g.
Water	1 l.

Non-Oil-Wetting Metal Surfaces

British Patent 458,723

The surface is first cleaned with aqueous caustic soda or benzol, then coated with a solution of

Ferric Stearate	10
Kerosene	90

at 120°.

Freeing Frozen (Stuck) Pistons

Stuck pistons, caused by use of motor fuel in which unsaturated hydrocarbons have oxidized to gums, may easily be freed by removing spark plugs and pouring 4 or 5 ounces of Methanol into each cylinder. Ordinary anti-freeze grade Methanol is satisfactory, and quickly dissolves the gum without injury to the motor.

Steel and Iron Identification

From time to time methods or processes have been printed for determining if a pipe is iron or steel. The majority of the methods suggested are so complicated or tedious that comparatively few engineers will go to the trouble to try out any of them.

Just mix 5 drops of nitric acid with 10 drops of water, file a clear spot on the surface of the pipe that is to be tested, place a drop of the mixture on the clear spot. If the metal is steel, the liquid will turn the metal surface black instantly; if the metal is wrought or malleable iron, the surface will remain bright for a considerable length of time.

Seasoning (Drying) Wood

U. S. Patent 2,060,902

Formula No. 1

Heat the green wood in ethylene glycol monoethyl ether for 24 hours at a temperature of 50° C. to replace the water by ethylene glycol monoethyl ether and then apply a reduced pressure of 10 centimeters of mercury to distill off the water.

No. 2

Heat the ethylene glycol monoethyl ether saturated wood in molten paraffin for 24 hours to replace the ethylene glycol monoethyl ether by paraffin and then apply a reduced pressure of 10 centimeters of mercury and heating of 80° C. to distill off the ethylene glycol monoethyl ether.

RESPONSE OF METALS TO IDENTIFICATION TESTS

Magnetic Test Reaction to Magnet	Nitric Acid Test			Test for Copper Confirmatory Test Using Piece of Steel	Metal Probably Is
	Reaction to Conc. Acid	Reaction to Acid After Dilution	Color of the Solution		
magnetic*	reacts slowly	reacts slowly	pale green	none	Nickel
magnetic†*	reacts	reacts slowly	green to blue	copper plates out	Monel†
non-magnetic	reacts	reacts slowly	blue to green	copper plates out	Nickel Silver
magnetic*	reacts slowly	reacts	brown to black	none	Steel or Iron
non-magnetic	none	none	colorless	none	Inconel or** Chromium-Nickel-Iron, Stainless Steel
magnetic*	none	none	colorless	none	Chromium-Iron, Stainless Iron

* Note that the magnetic test is not a true indication of the presence of iron in the metals. Steel, iron and chromium-iron (82%–88% iron) are magnetic, but so is pure nickel and also Monel which contains only traces or very small amounts of iron. Chromium-nickel-iron (such as Allegheny metal, Enduro KA2, etc.), contains large amounts of iron (usually 70–76%) but is quite non-magnetic.

† Monel is almost always magnetic but the test is not infallible. When it is doubtful whether the metal is Monel or nickel silver an analysis should be made. Magnetic properties are not developed in nickel-copper alloys unless the nickel content is at least 58%. Sometimes alloys of considerably higher nickel content (up to possibly 70%) do not react to the magnet. Annealing, cold working, etc., influence the magnetic properties of such alloys which are only feebly magnetic.

** Analysis required to distinguish.

Dyeing Ivory

The dyeing is done in nested copper kettles, the inner one being perforated so that the contents may be removed from the dye bath without trouble or loss of solution. After nesting the kettles, they are filled with cold water and the pieces of ivory to be dyed. The water is heated to a boil by means of a live steam jet and boiled from 1½ to 2½ hours so as to soften up the hard outer shell of the ivory to insure penetration of the dyestuff. The kettle containing the ivory is transferred to another bath containing warm water (not over 140° F.). It is left here from five hours to overnight and the ivory is then ready to be dyed. The dyes used in this method are natural dyestuffs such as cutch, logwood or sumac with copper sulphate or pyrogallic acid. The copper sulphate is used when gray shades are desired and the pyrogallic acid for browns. In actual work it appears necessary to use two or three colors together to get the proper shade. The dyeing is conducted at about 180° F. and the time depends upon the depth of shade desired. After dyeing the color is developed in a solution of potassium bichromate (15–20%) at about 180° F. The material is rinsed several times to remove the yellow cast of the bichromate. The water is removed by centrifuging and the ivory dried at a low temperature (not higher than 110° F.).

Another method entails the use of powdered prepared dyes which are concentrated natural dyes in powder form. In this method the material does not have to be soaked after boiling. The dye is dissolved, some copper sulphate of pyrogallic acid is added and the bath brought to a boil. The material is then added and boiling continued. This method does not necessitate any development but bichromate is used to darken up the shade.

According to still another method for the preparation of blacks the ivory is first plunged into a hot bath of alkali. It may be boiled but should afterward be plunged into cold water. The ivory should then be bleached with hydrogen peroxide. The unpolished ivory will absorb the dyestuff better than the polished article. Following are two separate processes, for obtaining blacks.

Black on Ivory
Formula No. 1

1. Wash or steep in an alkaline lye solution.
2. Immerse in a weak solution of silver nitrate.
3. Expose to the sun, thereby developing a black color.

Note—Instead of (3), the ivory may be dried and dipped in a weak solution of ammonium sulfide.

No. 2
Heavy Black

1. Clean as above.
2. Prepare a logwood solution and strain.
3. Boil the ivory in the logwood.
4. Steep in a solution of iron acetate or iron sulphate.

For coal tar dyes the following method has been used. It is to be noted however that the dyes which will dye ivory are not generally fast to light. The ivory is first thoroughly cleaned and then etched in acid which removes the outer film of bony material exposing the cartilaginous material underneath. It is necessary to observe extreme caution in this operation as the etching may go too far and prevent satisfactory polishing thereafter. A small amount of nitric acid is used for the acid etching bath. The acid is then rinsed off and the ivory dyed in the color solution.

Another method which has been recommended is to use a dye which is soluble in alcohol. The ivory is first cleaned with a mild alkaline solution, etching with acid to increase penetration, and then dyeing. The alcohol solution has no solvent action on the ivory. These dyes are not fast to light and the penetration is very poor.

It is not recommended to attempt the coloring of whole tusks of ivory in the absence of necessary machines for forcing the dye liquor throughout the tusk.

Acid dyes are usually applied with about one-half pint acetic acid per 20 gallons of liquor. Dyeing is carried on for about one hour at the boil. In order to secure better penetration, it is better to use the requisite amount of acid in two or three additions.

Basic dyes may be applied similarly to acid colors, but boiling for about half an hour, usually suffices.

Direct dyes are dyed for one hour at the boil, with the addition of about 1 pound of Glauber's salt and 4 ounces of soap per 20 gallons of liquor. The ratio of ivory to liquor is usually about one part of ivory (by weight, of course) to fifteen parts of water. More soap is required if there are any signs of too speedy absorption of the dyestuff.

It is most essential to see that in all cases the dyestuff is thoroughly dissolved, otherwise splotches easily form on the ivory and these are most difficult to disperse.

After dyeing, the ivory is allowed to dry by packing in hot sawdust, and the pieces are then examined for signs of inequality in color. Any light places may then be touched up with a camel hair brush, charged with a weak solution of dyestuff in alcohol, benzine or other suitable solvent of quick drying properties.

A finish is usually obtained by oiling and polishing. Olive oil is frequently used, but in this event, it is well to add also a small proportion of laurel oil to counteract decomposition and subsequent clouding of the luster.

White Enamel Opacifiers
French Patent 817,310
Formula No. 1

Borax	22 kg.
Cryolite	18 kg.
Soda Ash	4 kg.
Potassium Nitrate	2 kg.
Quartz	54 kg.

No. 2

Borax	14 kg.
Cryolite	16 kg.
Soda Ash	4 kg.
Potassium Nitrate	3 kg.
Quartz	43 kg.
Feldspar	20 kg.

No. 3

Borax	22 kg.
Cryolite	12 kg.
Sodium Fluosilicate	4 kg.
Soda Ash	4 kg.
Potassium Nitrate	3 kg.
Quartz	40 kg.
Feldspar	15 kg.

Binder for Tile Manufacture
Canadian Patent 379,911

Cumarone Resin (m.p. 245° F.)	66.67 lb.
Fatty Acid Pitch (m.p. 122° F.)	33.33 lb.

Binder for Ceramic Spark-Plugs
German Patent 655,082

Talc	32.7 kg.
Kaolin	43.3 kg.
Feldspar	24.0 kg.

Ceramic Dielectric

French Patent 814,744

Titanium Dioxide	85–95%
Lead Oxide	15– 5%

Compress and heat to 1100–1180° C.

Dielectric for Condensers

British Patent 466,388

Magnesium Oxide	80 oz.
Beryllium Oxide	20 oz.

This mixture is fired in the usual manner.

Joining for Housings of Bearings

French Patent 821,827

Formula No. 1

Copper	66.7 g.
Lead	33.3 g.

No. 2

Copper	70 g.
Tellurium	30 g.

The above alloys are interposed between housing and bearing.

Increasing Rate of Settling of Gold and Silver Slimes

British Patent 467,455

In the cyaniding of gold- and silver-bearing slimes (solution : solid = 4:1), the rate of settling is greatly increased by adding a solution of starch (4 lb.) in 5% caustic soda (40 gals. per ton of solids).

Retarding Setting of Amalgams

By cooling amalgams to 39.5° F. with dry ice setting can be slowed up sufficiently so that a day's supply of amalgam can be made up in bulk.

Casting Gold Dental Plates

In the pressure-casting of gold alloy dental plates smooth castings the dimensions of which are 0–0.4% greater than those of the wax pattern are obtained with an investment made from a 3:1 cristobalite-plaster of Paris mixture; the inclusion of a small amount of metallic copper powder in the investment to prevent tarnishing of the casting has no effect on the dimensions or smoothness of the cast plate. When the Solbrig press is used for casting, the metal fills the mold space in about 0.1 second and is completely solidified in 1 second. When the asbestos pad is moistened with water the pressure developed at the moment of casting is 3 lb./sq. in., which increases to a maximum of 12 lb./sq. in. in 8 seconds, the best results being obtained with a very wet pad and a very hot ring; if a 3:1 mixture of alcohol and carbon tetrachloride is used instead of water for moistening the pad, pressures of up to 50 lb./sq. in. may be obtained.

Surface Lining for Furnaces

For superficial lining of furnaces, sand 120, litharge 225 and calcined borax 200 are recommended. It is applied fused at 900–1000° so that it will penetrate into brick linings.

Metallurgical Scavenger

U. S. Patent 2,044,908

Titanium Carbide (40 mesh)	100 lb.
Iron (40 mesh)	400 lb.
Sodium Silicate (d. 1.3)	7½ lb.

This is molded into briquettes which are more reactive than ferro-carbon titanium as they are free from graphite.

Ferro-Magnetic Powdered Iron Cores

British Patent 466,678

Iron Dust	100
Sodium Silicate	2

Heat to 70° C. and then mix with

Bakelite Varnish	10 oz.

and compress.

Magnetic Core

French Patent 813,068

Iron	60 kg.
Nickel	40 kg.
Copper	3 kg.

The above powdered mixture is used.

Permanent Magnet

British Patent 476,702

Steels containing

Cobalt	35%
Nickel	18%
Titanium	8%
Aluminum	6%

are quenched from 1000° C. and reheated at 500–750° C.

Stabilizing Aluminum Reflectors

U. S. Patent 2,045,286

Boil reflectors for 15–30 minutes in

Potassium Dichromate	10 oz.
Water	90 oz.

Revetment Mat

U. S. Patent 2,051,578

Asphalt	50– 57.5% by vol.
Pulverized Calcareous Material	42– 33.6% by vol.
Iron Oxide, Pulverized, to make	100 % by vol.

Stable Invar
U. S. Patent 2,050,387

Electrolytic iron and nickel powders are annealed in dry hydrogen at 1150° for 20 hr. The appropriate mixture of the two metals is then melted and allowed to solidify in pure hydrogen.

Oil-less (Self Lubricating) Bearing
French Patent 819,616

Copper	68.4 oz.
Tin	5.3 oz.
Lead	5.3 oz.
Graphite	8.0 oz.
Lubricating Oil	7.0 oz.
Diphenyl	2.5 oz.
Chlorodiphenylene Oxide	3.5 oz.

Preparing Steel Surfaces for Rubber Adhesion

A solution consisting of copper cyanide (4 oz./gal.), zinc cyanide (2 oz./gal.), and sodium cyanide (7 oz./gal.) serves excellently to provide a brass-plated surface on steel which will permit good adherence of rubber. Where especially strong adhesion is required, a slight increase should be made in the zinc cyanide concentration, while for barrel plating the proportions should be doubled, just as in regular brass plating. Ten minutes is the recommended plating time.

The brass plating solution should be operated at a temperature of about 80° F., using 70–30 brass anodes and maintaining a cathode current density of approximately 10 amperes per square foot. Anode current density should not exceed 300 amperes per square foot. When the solution is made up, the alkalinity must be adjusted with ammonium hydroxide and sodium bisulphite so as to give the deposit the right color. A constant pH is important in obtaining a uniform deposit, the suitable range being 10.3–11.7, maintained by the usual colorimetric methods.

Special care must be taken in the rinsing to prevent staining. After plating, the work should be immediately painted with the cement used for rubber adhesion. Experience indicates that the best rubber adhesion is obtained when the composition of the brass is 70% copper and 30% zinc. Even small changes, such as 3–5%, can reduce adhesion appreciably. Metal carbonates should not be used in brass plating for rubber adhesion. Large amounts of carbonates simply complicate control of the solution. Any savings effected by the use of carbonates is usually offset by poor results and difficulties in control.

Valve Grinding Compounds
Formula No. 1

Ceresin	5 g.
Glass Powder	40 g.
Cylinder Oil, Pale	55 g.

No. 2

Montan Wax, Double Bleached	5 g.
Montan Wax, Crude	25 g.
Abrasive	70 g.

No. 3

a. Potassium Stearate
Beeswax
Japan Wax
Mineral Oil
b. Silicon Carbide, Powdered
Corondum, Powdered
Glycerin-Water

Knead *a* together, mix with paste *b*.

No. 4

Ceresine	3 kg.
Oleic Acid	17 kg.
Petrolatum	4 kg.
Spindle Oil	6 kg.
Quartz or Pumice, Powdered	45 kg.
Chrome Oxide, Powdered	25 kg.

No. 5

Ceresine	8 kg.
Oleic Acid	10 kg.
Spindle Oil	12 kg.
Neuburg Chalk	20 kg.
Quartz, Powdered	10 kg.
Emery, Powdered	25 kg.
Silicon Carbide	15 kg.

No. 6

a. Ceresine	5 kg.
Tallow	2 kg.
Oleic Acid, Distilled	30 kg.
Mineral Oil	10 kg.
b. Abrasive Powdered*	53 kg.

Melt *a* at 80–90° C. Mix in *b* in small portions. Stir until cooled to sufficient viscosity.

* Emery, Quartz, Tripoli, Carborundum, Slate Powder, Iron Oxide, Diatomaceous Earth, Chrome Oxide, Graphite, Viennese Chalk.

Greaseproofing Barrels

Commercial silicate of soda is used to coat the inside of lard kegs, pails, barrels and tierces to prevent loss of lard by seepage into the wood, and also through any small openings in the container. Silicate of soda is a transparent, heavy liquid and is reduced with hot water to the consistency of a light syrup.

While it is still hot the silicate is applied to inside of open containers by spraying or painting or merely by putting some in container which is then rolled around. The latter treatment is often used for applying the silicate to barrels and tierces.

If a bung is placed in the bung hole of the barrel or tierce, the silicate is forced into pores of wood by expansion of the air inside container which is heated by hot silicate. The hot solution may also be driven into pores by about 5 lbs. air pressure supplied from an air line. When silicate has been driven into staves, the bung is removed and surplus liquid drained out.

The container is not used until coating of silicate is thoroughly dry. This can be determined in case of barrels by feeling the interior near bung hole which is the last area to dry.

Tennis Court Surface Dressing
U. S. Patent 2,058,335

Rosin	50–80%
Linseed Oil	10–30%
Petroleum	10–20%

PAINTS, LACQUERS

WATER COLORS

Show Card or Poster Colors

Gum Arabic Solution—To 125 lb. of gum arabic add sufficient water to make a volume of 50 gal. After the gum has been dissolved add one quart of formaldehyde.

Dextrin Solution—To 200 lb. of tapioca dextrin add enough water to make 50 gal. After solution, add 1 quart of formaldehyde.

Starch Solution—50 lb. of starch are dissolved in enough warm water to make 50 gal. Then add 1 quart of formaldehyde.

White

Dextrin Solution	3 gal.
Arabic Solution	4 gal.
Syrup	5 gal.
Starch	2 gal.
Titanox B	200 lb.
Titanox A	100 lb.
Lithopone	200 lb.

Water to make 50 gal. yield. Grind 2 times. Add 1 qt. formaldehyde to finished material.

Orange

Gum Arabic Solution	10 gal.
Syrup	1 gal.
Starch	2 gal.
Barytes	50 lb.
Whiting	100 lb.
Lithopone	50 lb.
Asbestine	50 lb.
Orange Pigment	115 lb.

Grind 2 times

Black

Gum Arabic Solution	7½ gal.
Dextrin Solution	4½ gal.
Water	7½ gal.
Hoover Black #6	160 gal.

Mix and add 7½ gal. more of water and ½ gal. of glycerin. Grind 2 times and to finished batch add 1 qt. formaldehyde.

Primrose Yellow

Gum Arabic Solution	6 gal.
Dextrin Solution	6 gal.
Syrup	4 gal.
Starch Solution	2 gal.
Pigment	200 gal.
Blanc Fixe	50 gal.
Asbestine	50 gal.
Whiting	100 gal.

Ultra Blue

Gum Arabic Solution	8 gal.
Dextrin Solution	2 gal.
Syrup	6 gal.
Dry Sugar	1 lb.
Starch Solution	2 gal.
Ultramarine Blue	200 lb.

Grind 3 times.

Light Red

Gum Arabic Solution	4 gal.
Dextrin Solution	2 gal.
Starch Solution	4 gal.
Syrup	1 gal.
Whiting	50 lb.
Blanc Fixe	50 lb.
Pigment	120 lb.

Grind 3 times.

Emerald Green

Gum Arabic Solution	2 gal.
Dextrin Solution	2 gal.
Starch Solution	4 gal.
Whiting	150 lb.
Blanc Fixe	60 lb.
Asbestine	12 lb.
Green Toner	40 lb.
Primrose Yellow	20 lb.

Turquoise Blue

Dextrin Solution	6 gal.
Color	50 lb.
Whiting	50 lb.
Blanc Fixe	50 lb.
Barytes	50 lb.

Grind 3 times.

Vermilion

Gum Arabic Solution	6 gal.
Dextrin Solution	4 gal.
Starch Solution	2 gal.
Pigment	65 lb.
Blanc Fixe	50 lb.
Whiting	50 lb.
Asbestine	12 lb.

Grind 3 times.

Casein Paints for Show Card Work

Vehicle

Phenol	½ oz.
Sodium Fluoride	½ oz.
Bentonite	1 oz.
Sodium Caseinate	1¼ lb.

Dissolve in ¾ gal. of warm water.

White

2½ gal.

Vehicle	17	lb.
Lithopone	13	lb.
Titanox B	2	lb.
Barytes	14	lb.
Ultramarine Blue	¼	oz.

Light Yellow

2½ gal.

Vehicle	18	lb.
Water	1	lb.
Primrose Yellow	14	lb.
Barytes	6	lb.
Asbestine	4	lb.

Dark Red

2½ gal.

Vehicle	18½	lb.
Red	4	lb.
Blanc Fixe	1	lb.
Asbestine	5	lb.

Blue

2½ gal.

Vehicle	18½	lb.
Ultra Blue	8	lb.
Barytes	4	lb.
Asbestine	6	lb.

Dark Yellow

2½ gal.

Vehicle	18½	lb.
Water	1	lb.
Chrome Yellow	6	lb.
Barytes	8	lb.
Asbestine	4	lb.

Ochre

2½ gal.

Vehicle	19½	lb.
Water	1	lb.
Ochre	7	lb.
Asbestine	2	lb.

Black

2½ gal.

Vehicle	19	lb.
Bentonite	2	oz.
Ivory Black	8	lb.

Light Red

2½ gal.

Vehicle	18½	lb.
Red	4	lb.
Blanc Fixe	1	lb.
Barytes	5	lb.

Burnt Sienna

2½ gal.

Vehicle	19½	lb.
Water	1	lb.
Burnt Sienna	7	lb.
Asbestine	2	lb.

In all the above grind twice.

Casein Paint

Water Ground Mica	2 lb.
Lithopone or Titanox	6 lb.
Casein, Muriatic 80 Mesh	1 lb.
Sodium Fluoride	2 oz.
Borax	2 oz.
Water	5 pt.
Boiled Linseed Oil	1 pt.
Pine Oil	1 oz.

Heat the water to boiling, stir in the mica and lithophone, then add the sodium fluoride and borax and stir, add the casein and stir until the mass becomes creamy, now put in the oils and beat until smooth. The above proportions make one gallon of concentrated paste paint. The paste is diluted with water for use.

Rubber-Casein Paint

U. S. Patent 2,052,393

Rubber Latex (60%)	59.52 oz.
Casein	3.25 oz.
Kaolin	16.10 oz.
Thymol	0.05 oz.

Water in proportion to get fluidity desired.

Casein Water Paint

Casein	15 lb.
Lime Hydrate	10 lb.
Clay, Floated	8 lb.
Pigment	17 lb.
Chalk	50 lb.

Water Paint and Sizing

French Patent 803,992

Casein	5–20 g.
Asbestos	5–20 g.
White Cement	15–35 g.
Water	to suit

Plastic Paint Powders

Formula No. 1

Gypsum and Keen's Cement	40–60 oz.
Ground Mica	15–35 oz.
Asbestos Powder	10–15 oz.
Casein	8–10 oz.
Slaked Lime	6– 7 oz.

No. 2

Plaster of Paris	10 oz.
Mica	30 oz.
Asbestos	10 oz.
Asbestine	30 oz.
Casein	10 oz.
Lithopone	9 oz.
Soda Ash	1 oz.

No. 3

Keene's Cement	100 oz.
Asbestos Powder	20 oz.
Wheat Flour	5 oz.
Gum Arabic Powder	6 oz.
Alum	5–10 oz.

Cold Water Paint, Powdered

U. S. Patent 2,099,423

Whiting	50 lb.
Gluten	1 lb.
Asbestos, Powdered	1 lb.

Outdoor, Cold Water Paint

U. S. Patent 2,032,071

Slaked Lime	43.0	lb.
Hydraulic Cement	19.5	lb.
Talc or Asbestine	23.5	lb.
Salt	6.5	lb.
Mica	5.0	lb.
Gum Arabic	1.6	lb.
Gum Karaya	0.5	lb.
Irish Moss	0.1	lb.
Calcium Stearate	0.3	lb.

Alginate Cold Water Paint

Lithopone	60.0	lb.
Asbestine	20.0	lb.
Mica	8.0	lb.
Vehicle		
Water	51.0	lb.
Dowicide "B"	0.45	lb.
Sodium Alginate	1.0	lb.
Raw Chinawood Oil	9.0	lb.
6% Cobalt Drier	0.48	oz.
Wetting Agent	1.68	oz.

Place the water (preferably from the hot water tap at approximately 100° F.) in the mixer. Add the Dowicide "B" and stir until dissolved. Add the sodium alginate and stir for a full 20 minutes or until completely dispersed. Add wetting agent and then the chinawood oil (with the drier added to the oil before adding to the water mixture). Stir the oil and alginate mixture for 10 minutes and then add pigment and filler. Stir for one hour. Remove from mixer and put into containers.

Enamel Vehicle
(With Perilla Oil)

Perilla Oil (4 hr. 585°)	20	gal.
Durez 550 Resin	15	lb.

Run to 600° F. and at an 18″ string check with

S-5930 Checking Oil	2	gal.
Durez 210 Resin	65	lb.
Ester Gum	20	lb.

When the resin is taken up, reduce with

Mineral Spirits	42	gal.

Drier for Above

Naphthenate Lead	4¼	lb.
Naphthenate Cobalt	1¼	lb.

Baking White Enamel

Titanium Dioxide	170	lb.
Lithopone	113	lb.
Enamel Vehicle	410	lb.
Zinc Naphthenate (10%)	2	lb.
Cobalt Naphthenate (4%)	½	lb.
Mineral Spirits	100	lb.

This enamel is non-skinning in a dipping tank. At a baking temperature of 220–225° F. for one and one-half hours, it has excellent color, medium gloss and gives a tough, durable, elastic film. It will stand reduction to any spraying or dipping consistency with straight mineral thinners. It is entirely gas-proof, may be baked in gas ovens, and is very free from edge-wrinkle.

Gloss White Enamel Base

Dry Nitrocellulose	100	oz.
Rezyl 19	120	oz.
Pale Castor Oil	10– 20	oz.
Dibutyl Phthalate	30– 50	oz.
Titanium Oxide	70– 90	oz.

Air Drying Enamel

Rezyl 114	90	oz.
Teglac 65	10	oz.
Lead Linoleate (.56% Pb)	2	oz.
Cobalt Lineolate (.04% Co)	¾	oz.
Pigment (depending on color)	2– 70	oz.
Coal Tar Naphtha	200	oz.

Semi-Flat Enamel

U. S. Patent 2,092,285

Disperse 11.5 parts carbon black and 30.6 parts of dry resin into 57.9 parts xylol in a ball mill, then to 36% of ball mill mix add 20.4 parts of resin and 43.6 parts of xylol to produce a glossy enamel composed of 4.14% carbon black, 31.42% dry resin and 64.44% xylol, then disperse 11.5 parts carbon black into 17.7 parts of hexahydrophenol and 70 parts xylol in a ball mill, and add to 36% of last mentioned ball mill mix 32.87% xylol and 31.42% of dry resin to produce a flat enamel having the same proportions of pigment, resin and thinner as said glossy enamel, and then mix said flat and glossy enamels in half and half proportions to obtain the desired semi-flat enamel.

Lacquer Enamel

Dry Nitrocellulose	100	oz.
Rezyl 12	150	oz.
Teglac 65	175	oz.
Dibutyl Phthalate	20	oz.
Pigment (depending on color)	20– 90	oz.
Lacquer Solvents	1000	oz.

Urea Resin Enamels

Urea Resin (e.g. Paralac 2001)	100	oz.
Titanium Dioxide	30	oz.
"Cellosolve"	150	oz.

This should be ground in a ball mill, and then thinned out to spraying con-

sistency with a mixture of resin and solvent in the proportion of 1 of resin to 2 of solvent.

If it is desired to obtain a more flexible film, or to increase the proportion of pigment, a plasticizer such as Paralac 285X should be incorporated.

The above enamel when sprayed on metal and stoved at 100–130° C. gives a hard adhesive film. The minimum stoving time should be one hour at 100° C., and this time can be shortened as the temperature is raised.

Any heat-resisting pigment may replace the titanium dioxide, but in such cases it is as well to ascertain from the maker—especially in the case of lakes—what is the maximum temperature the color in question will stand without alteration. It should be pointed out that colors of the Fanal, Brillfast, etc., type are to be used with caution, as if there is any alcohol present in the solvent, such as methylated spirit or butyl alcohol, the pigment loses its non-fading properties, and will rapidly alter under the stoving process.

The following is a useful clear lacquer for metal protection:

Urea Resin	100 oz.
Tricresyl Phosphate	15– 25 oz.
Butyl Alcohol	20 oz.
Toluol	45 oz.

An alternative formula is:

Urea Resin (as Paralac 2001)	100 oz.
Plasticizer	10 oz.
Methylated Spirit	150 oz.
Toluol	100 oz.

This gives a very thin lacquer, and care must be taken not to over-stove, as otherwise the film tends to strip off the metal in large pieces. This lacquer can be dyed with heat-resistant dyes and used for the lacquering of electric lamps used in flashing signs, exposed to rain and moisture, but in such cases it is essential to incorporate a small percentage of phenol formaldehyde resin to increase the water-resisting properties of the resin solution.

Though their high price at present militates against extensive employment, urea resins are used and will continue to be used, despite the cost, for finishes where non-discoloration and hardness are essential.

Auto Enamel Base

Dry Nitrocellulose	100 oz.
Rezyl 12	70–150 oz.
Blown Castor Oil	10– 20 oz.
Dibutyl Phthalate	30– 50 oz.
Pigment	10–100 oz.

Aluminum Weaving Spool Finish

A good finish for this purpose is produced by heating to 500° F. 80 parts coumarone, 15 parts Super-Beckacite and 50 parts wood oil. This enamel is baked at 340° F.

Refrigerator Enamels

Undercoat

Zinc Oxide	4 lb.
Lithopone	32 lb.
Linseed Oil (Boiled)	7 lb.
White Spirit	7 lb.
Stock Epok R 33 (8 lb. Cut in White Spirit)	2 lb.

Driers as required in proportion:

Cobalt	6
Lead	2
Manganese	1

Enamel

Prepared Enamel Oil	6 lb.
Lithopone or Titanium White (26%)	4½ lb.
Zinc Oxide	4½ lb.
White Spirit and Turpentine (Mixed)	3–4 lb.
Albertol 177 C	4 lb.

Driers as required in proportion:

Cobalt	6
Lead	2
Manganese	1

Odorless White Glossy Enamel

Undercoat

Lithopone	122 lb.
Four-Hour Wood Oil Varnish	160 lb.
Turpentine and White Spirit (Mixed)	180 lb.

Enamel

Stock ½ Second Pyroxylin (2 lb. Cut in Usual Mixed Acetate Solvents)	40 lb.
White Glyptal Resin (Stock 8 lb. Cut in Toluol)	18 lb.
Thinners (Low Boiling Mixed Cellulose Thinners; Mixtures of Ethyl Acetate, Methylated Spirits, Toluol and Butanol)	40 lb.
Plasticizer	7 lb.
"Cellosolve"	6 lb.
Pigment (Mixture of Timonox and Titanium White or Zinc Oxide)	34 lb.

White Primer (Baking)

Paralac 17 or Rezyl 116 or Similar Resin	30 lb.
Paralac 18X	30 lb.
Thinners	95 lb.
Zinc Oxide	48 lb.

A trace of lead and manganese dryers as required.

White Undercoat

Paralac 19X or Rezyl 110 or Similar Resin	40 lb.
Thinners	85 lb.
Barytes	8 lb.
Lithopone	64 lb.
Asbestine	4 lb.

Dryers, a trace as required.

Enamel Coating for Cans
U. S. Patent 2,055,507

Varnish	1 gal.
Mica	5 lb.

Furniture Enamel Base

Dry Nitrocellulose	100 oz.
Rezyl 12	150–200 oz.
Dibutyl Phthalate	20– 40 oz.
Blown Castor Oil	10– 20 oz.
Pigment	10–100 oz.

Porch and Deck Enamel (Gray)

Lithopone, High Strength	63 oz.
Aluminum Stearate	1 oz.
Blue Tone Lamp Black	1 oz.
25-Gal. Length, Hard Through Drying Spar Varnish (Vis. About B to D)	35 oz.

Grind above paste in roller mill and thin with twice its weight of varnish which should give the optimum consistency.

Wet Wall Primer

Manila Gum, Dust	12 lb.
Toluol	3 gal.
Denatured Alcohol	3 gal.

Wood Priming Paint

Leaded Zinc Oxide (35%)	160 lb.
Bleached Diatomite	20 lb.
Raw Linseed Oil	5 gal.
White Spirit, Containing 3% Copper Naphthenate	1– 1¼ gal.

Semi-Gloss Wall Paint

Titanium Calcium Pigment	60 oz.
Aluminum Stearate	2 oz.
Lithopone	28 oz.
Silica	5 oz.
Asbestine	5 oz.

Grind above in a flatting liquid which has a non-volatile content of about 50%.

Painting Calcimined Walls

For a good, lasting job remove all traces of the coatings now on the walls. A thorough scrubbing with warm water ought to remove the water paints. When all the calcimine and old glue size has been cleaned off, it would be a good idea, before painting, to test the plaster in several places for signs of active alkali. Do this with a couple of ounces of phenolphthalein solution that your druggist will prepare for you at small cost. Dab the water-white phenolphthalein on the walls at intervals and watch its action. If the wet spots turn pink or red, the plaster still contains free alkali which may spoil any paint spread on the walls. In this event, the plaster should be treated with a zinc sulphate solution. This is made by dissolving two pounds of zinc sulphate in a gallon of water. After this solution has been applied to the walls, allow sufficient time for the plaster to dry before priming.

High Grade Outside White House Paint

Pigment

Basic Carbonate of Lead	60 oz.
Zinc Oxide	30 oz.
Barium Titanium Pigment	10 oz.

Vehicle

Raw Linseed Oil	45 oz.
Refined Linseed Oil	45 oz.
Turpentine & Drier	8 oz.
Pine Oil	2 oz.

Paint

Pigment	65 oz.
Vehicle	35 oz.

Quick Drying Outdoor Paint
British Patent 450,288

300 kg. of linseed oil are heated in an autoclave at 120° C. with 200 kg. of water and 120 kg. of barium hydrate for one hour; mass is then allowed to cool, and the glycerin-containing water is withdrawn. Barium soap remains in the autoclave and is collected; it weighs in the wet state about 390 kg; it is a yellowish plastic material.

If 40 kg. of this product are heated in a closed vessel at about 100° C. with 60 kg. of turpentine, a cloudy liquid is obtained after cooling, which when mixed with pigments (for instance, with 100 kg. of red lead or with 50 kg. of zinc oxide) yields a very stable paint of high covering power, and drying after about half an hour. In this paint the particles of pigments are coated with a layer of plastic barium soap, acting protectively against the action of rain, snow, etc.

Solution in turpentine oil of the plastic material may also be advantageously used for waterproofing textiles. Paper and cardboard may be treated in a similar manner. Concrete and plaster objects may be coated with the solution; after the solvent has been evaporated, they are waterproof.

New material, on being heated in a proportion of 60 parts by weight of white spirit with 40 parts by weight of barium soap, gives a colloidal jelly which is semi-solid in the cold. This colloidal jelly is very useful for holding pigments in suspension, for instance, carbon black and plumbago for the manufacture of liquid black polish for stoves.

Disinfectant "Paint"

Italian Patent 288,514

Beeswax	70 g.
Japan Wax	44 g.
Montan Wax	25 g.
Shellac	10 g.
Potassium Carbonate	30 g.
Water	730 cc.

Boil together and mix well until emulsified. Cool and add with stirring

Alcohol	40 g.
Trioxymethylene	50 g.

Roof Paint

Formula No. 1

a. Stearin Pitch	30 lb.
Pit-Coal Tar Pitch	30 lb.
Asphaltum	20 lb.
Rosin	20 lb.
b. Mineral Oil	
c. Slate, Powdered	
Asbestos, Powdered	

Melt up the mixture *a* and mix in *b* to the desired viscosity. *c* may be added as filler. Solvents may be added if quick drying is desirable.

No. 2

Pit-Coal Tar Pitch	10 kg.
Coumarone Resin	2 kg.
Benzine	4 kg.
Light Tar Oil	5 kg.

No. 3

a. Rosin, Medium Pale	30 kg.
Anthracene Oil	20 kg.
Gas Oil, or Heavy Benzine	12 kg.
b. Earthy Pigment	35 kg.
Clay-Schist Powder	15 kg.

Make solution *a* hot, and work in the powders *b*. A paste is obtained which will remain plastic in the cold.

No. 4

Green

Stearine Pitch (Hard)	45 lb.
Stearine Pitch (Soft)	17 lb.
Wool Fat	5 lb.
Green Chromium Oxide	33 lb.

No. 5

Gilsonite	25 lb.
Stearine Pitch (Medium Soft)	25 lb.
Wool Fat Pitch	20 lb.
Red Oxide of Iron	30 lb.

For melting up the base materials, a steam-jacketed pot is recommended on safety grounds since 35–45% of solvent (solvent naphtha or white spirit) must be incorporated by heat. The low-melting fat pitches are first melted, the temperature being gradually raised to 150° C. before gradually adding the natural asphalts and continuing to heat until the small percentage of moisture normally present in the latter has been eliminated. The molten mixture of base substances is allowed to cool down to 80° C. before proceeding to incorporate the pigments and, last of all, the solvent. Throughout the entire operation the stirring gear must be kept running.

(Black) Roof Coating

a. Stearin Pitch, Semi-Soft, Dark	100 kg.
b. Litharge	5 kg.
Woolfat, Crude	10 kg.
Linseed Oil, Crude	2 kg.
Soot	2 kg.
c. White Spirit	130 l.

Heat *a* to 250° C.; mix *b* thoroughly in a grinding mill, and add to *a*. Cool to 160° C., and thin with *c*.

The same can be made in other colors, using, instead:

For Red: A pale pitch, 6 kg. of linseed oil, and 15 kg. of iron oxide red.

For Green: As for red, but as pigment use

Chrome Oxide Green	5 kg.
Iron Oxide Yellow	7 kg.
Paris Blue	½ kg.

For Brown: Mix red and black.

Black Roof Coating

(Does Not Alligator, Powder, or Crack)

Asphalt (Roofers' Grade 20–30 Penetration)	950 lb.
Gilsonite	400 lb.

Run to clear melt. Hold for one hour. Thin at 400° F. with

Mineral Spirits	215 gal.

At 300° F. add

Refined Coal Tar	40 gal.
Sardine Oil, Heavy Bodied, Refined	10 gal.

"Silver" Roof Paint

Limed Hard Rosin	100 kg.
White Spirit	80 kg.
Solvent Naphtha	40 kg.
Aluminum Bronze	40 kg.

Painting Over Dark-Stained Shingles

J. P. St. George

Before any stained job is painted, a test for "bleeding" should be made. This is best accomplished by spreading a small amount of white-lead and oil paint on an inconspicuous but representative area of the surface. It may be possible to coat in a couple of shingles located at the rear of the house where the test won't be objectionable.

This test portion should be given time to dry out and harden. Two to four weeks should be long enough. In most cases of discoloration due to "bleeding" the trouble shows up within the first week after painting. If "bleeding" occurs on the test area, the building should be restained, rather than painted. There is no practical or economical way to prevent the staining because the vehicle in any oil paint reactivates the creosote and causes it to come through subsequent paint coats. If bleeding does not occur on the test area and if this area is a true sample of the whole surface, it should be safe to go ahead with the painting. White-lead paint mixed according to the usual priming, body and finishing coat formulas will do a satisfactory job.

On some old houses, the shingles of which were last stained many years ago, it will be found that the creosote has lost its potency, its tendency to bleed. Naturally the shingles will be unusually porous and need more oil than is used in paint for less thirsty surfaces. In these cases, the first coat would consist of:

All-Purpose Soft Paste White-Lead	100	lb.
Raw Linseed Oil	4	gal.
Turpentine	1¾	gal.
Liquid Drier	1	pt.

This mix yields 9 gal of paint that will cover about 400 square feet per gal. on the average shingled surface.

The second coat, to be applied after the first coat is dry and hard, should consist of:

All-Purpose Soft Paste White-Lead	100	lb.
Raw Linseed Oil	2	gal.
Turpentine	¾	gal.
Liquid Drier	1	pt.

This mix yields 6 gal. of paint that will cover about 600 square feet per gal. If the job is not to be pure white, tint the second coat with some of the color to be used in the final coat.

The finishing coat, to be applied after the second coat has dried and hardened, should consist of:

All-Purpose Soft Paste White-Lead	100	lb.
Raw Linseed Oil	3	gal.
Liquid Drier	1	pt.

This mix yields 6¼ gal. of paint that will cover about 700 square feet per gal.

If boiled linseed oil is used in any instance, use half the quantity of drier specified. Painters who prefer to use standoil type linseed oil in their finishing coats should add a quart of turpentine to the mix.

Some owners of shingled houses prefer a glossless finish when the job is painted. To satisfy this desire, mix the final coat on the basis of 100 lb. of all-purpose soft paste white-lead and 3 gal. of lead mixing oil. This will make 6 gal. of paint that will cover about 700 square feet per gal.

All of the paint-mixing directions given thus far are based on the supposition that the customer wants a white or light tinted job. It is on this type of work that creosote "bleeding" is most objectionable. Obviously, dark-colored pains are not much affected by this type of discoloration.

Here are some color formulas for dark-colored finishing coats. These produce straight, flat colors, no white-lead being required. The colors in oil should be thinned, in each instance, with 3 qt. of lead mixing oil and require ½ pt. of liquid drier:

Indian Red—yield: 1¾ gal.	
Venetian Red	½ gal.
Indian Red	½ gal.
Red Brown—yield: 2 gal.	
Indian Red	½ gal.
Raw Sienna	¾ gal.
Chromium Oxide—yield: 1¾ gal.	
C.P. Chromium Oxide Green	1 gal.
Chocolate Brown—yield: 2 gal.	
Burnt Umber	1 gal.
Indian Red	1 qt.

Variations of these colors are, of course, easily produced.

To sum up, the safest practice to follow when called on to paint dark-stained shingles, is to first test the old stain for "bleeding". If this discoloration appears, tell the home owner that it will be better to restain the job unless he wants dark-colored paint used. If no "bleeding" tendency shows up in the test, use paint formulated as indicated, brush it out properly and allow plenty of drying time between coats.

Painting Stained Shingles

It is always risky to apply paint over a stain the composition of which is unknown to the painter. Creosote stains, even though old and weatherworn, often bleed through oil paints applied over them. Creosote is a non-drying oil that tends to remain in the wood in a permanently soluble condition.

If the shingles were stained with a linseed oil preparation containing chrome green or chromium oxide, they may now safely be painted with lead and oil.

In the absence of definite information as to the previous treatment, apply a light-colored lead and oil paint to a shingle or two on the rear of the house, in an inconspicuous but typical location, and see what happens. Of course, you will have to wait several weeks or perhaps a couple of months before you decide the underlying stain has or has not discolored the paint. If no discoloration occurs, you are pretty safe in doing the whole job.

If, however, the test paint indicates a definite reaction from the old stains, stain the job again. In this event, the test paint can be taken off with some paint remover .

Wood Preservation Paint Primer

Zinc Oxide (35% Leaded)	73	kg.
Bleached Diatomite	9.1	kg.
Raw Linseed Oil	18.9	l.
White Mineral Spirits	3.8 – 4.7	l.
Copper Naphthenate	.11– .14	kg.

This limits fungoid growths when used as a priming coat.

Acid and Water Resistant Coating for Table Tops

Apply a coat of furfuryl alcohol to the table top. Follow this with a coat of 15% sulphuric acid. The acid causes the furfuryl alcohol to polymerize, and the resulting resin, formed *in situ,* is highly water and acid resistant.

Refinishing Damaged Table Top

Mix a small quantity of kerosene and common baking soda in an old saucer or any sort of earthware vessel and apply over the stain. Let it stand a few minutes and wipe off with a soft cloth. If the stain is obstinate apply the material a second time and leave it on a little longer than before. Wash off with mild soap and cold water and repolish. This will not injure the varnish.

Filler for Fine Cracks Before Painting

Mix a little flour with the paint to be used to form a soft putty.

Painting Pine Log Cabin

Formula No. 1

The best finish for peeled pine logs is warm linseed oil. The first coat should be thinned with 20% turpentine; the second coat with 10% turpentine and the last coat should be straight linseed oil. Allow two weeks to elapse between each coat.

No. 2

Use equal parts of boiled linseed oil and lead mixing oil. Apply two coats.

Paints for Cedar, Cypress and Redwood

Priming Coat

White-Lead	100	lb.
Raw Linseed Oil	4	gal.
Turpentine	1¾	gal.
Liquid Drier	1	pt.

This mix makes 9 gal. of paint which will prime about 5,400 square feet of surface.

Second Coat

White-Lead	100	lb.
Raw Linseed Oil	1½	gal.
Turpentine	1¼	gal.
Liquid Drier	1	pt.

This mix makes 6 gal. of paint which will cover about 4,200 square feet of surface.

Third Coat

White-Lead	100	lb.
Raw Linseed Oil	3	gal.
Liquid Drier	1	pt.

Barn Paint

Fish Oil, Heavy Bodied, Refined	25	gal.
Red Iron Oxide	50	lb.
Mineral Spirits	15	gal.
Talc	5	lb.
Spar Varnish, Neutral	5	gal.

Barrel Paints

Formula No. 1

Vinsol Barrel Paint Liquid

(15 gal. long)

Vinsol	50	lb.
Belro Resin	50	lb.
Tung Oil	5	gal.
Tung Oil	10	gal.
Solvesso No. 2	36	gal.
Mixed Cobalt, Lead Manganese, Nuodex Driers	2	gal.
Gross yield	61	gal.

Heat the Vinsol and Belro Resin and 5 gal. tung oil quickly to 575° F.; hold until foaming stops, and then add balance of tung oil, run slowly to 540° F. top heat for body, cool and reduce at 400° F.

No. 2

Orange Vinsol Barrel Paint

Basic Chromate of Lead	4	lb.
Vinsol Barrel Paint Varnish	1	gal.

Grind 15 hr. in pebble mill.

No. 3

Red Vinsol Barrel Paint

C.P. Red Iron Oxide	1 lb.
Asbestine	½ lb.
Vinsol Barrel Paint Varnish	1 gal.

Grind 15 hr. in pebble mill.

No. 4

Black Vinsol Barrel Paint

Carbon Black	3½ oz.
Mineral Black	2 lb.
Vinsol Barrel Paint Varnish	1 gal.
Mineral Spirits	¼ gal.

Grind 24 hr. in pebble mill.

Alcohol Resistant Bar Finishing

The wood bar top may be stained and filled in the customary manner, followed with a very thin shellac coat; then sanded down heavily to prepare the surface for a finishing coat of paraffin oil. The moisture-proofing efficiency of paraffin oil for this type of work is improved by adding a small amount of vinegar. The vinegar tends to emulsify the oil, thus facilitating good penetration into the wood. Very little vinegar is required—about a tablespoonful to a quart of oil. Two coats of the vinegarized oil are recommended. To keep the bar in condition after installation, the bartender should carefully rub the bar every night for several weeks with a rag moistened in the same mixture.

Coating for Butter Tubs

Casein	7 lb.
Borax	1 lb.
Water	42 lb.

Warm and stir until uniform. Coat inside of tub with this and wash with

Formaldehyde	1 lb.
Water	7 lb.

Dry at 60° C.

This prevents wood taint of butter.

Glue Paints

Glue colors, i.e., coatings with vegetable or animal glue as binders, can be applied to wood or masonry but not well over oil colors. If mortar is dry and porous or if the surface is gypsum, the aluminum salt of a fatty acid may be used as a sizing. A good water-resistant coating for masonry is glue 50, sodium silicate 50, zinc oxide 50, caustic soda solution (sp. gr. 1.34) 2 kg. The dry glue coating may be washed with tannin to increase further the water resistance.

Protective Paint for Stone Surfaces

In order to replace or enhance the naturally protective layer of silicate on stone, use is made of sodium silicate. Commercial sodium silicate is an aqueous solution of 36–40° Bé. This is diluted with water to 22, 24 or 26° Bé. and must be used at once, preferably preparing no more than is needed for one day's work at a time. For an imitation stone effect unground zinc oxide is employed in the proportion of 750 g. of oxide to 1 kg. of silicate. The silicate will not adhere unless the surface is well washed, and as the product dries extremely quickly it is advisable to apply it on a cloudy, damp day; details of application are given. On very porous stone three coats are generally applied, increasing the amount of pigment and density for each coat.

Artificial Wall Stone Coating

German Patent 619,379

Lime, Unslaked	5 kg.
Magnesium Chloride	2 kg.
Alum	2 kg.
Asbestos	10–15 kg.
Cement	40–50 kg.
Pigment	2– 6 kg.
Water	30 kg.

Blackboard Slating Paint

Moisten four ounces of dry lampblack with denatured alcohol, rubbing the mixture out on a piece of glass or a marble slab with a wide spatula until free from lumps. Put the black paste in a pail and add, while stirring constantly, one quart of orange shellac varnish, and three ounces each of the finest powdered pumice stone and powdered rottenstone, sifting the dry materials through a fine sieve. If the mixture is too stout to flow freely, add more denatured alcohol. Apply this slating with a wide, soft brush (preferably a regular slating brush, made for the purpose) being sure to work rapidly enough to avoid laps. Two or three coats of the slating may be necessary, all of which may be applied in one day, but the job should stand a day or two to become perfectly hard, and the surface should then be rubbed lightly with curled hair or fine steel wool before the blackboard is put into service. If the surface to which the slating is to be applied has not been previously finished and used as a blackboard it will be necessary to build the surface up with oil paint, which must become thoroughly dry before the slating is put on.

FINISHES FOR SLATE

Imitation Marble

This effect is produced in one of two ways. The first is by brush application of a bituminous paint which is baked on; water colors are then applied by dabbing the outline over a stencil laid on the slate, followed by hand shading by feather or fine brush. The second method is to scatter an oil paint from a stick onto the surface of water in a long, narrow trough and afterwards immerse the panel of slate, coated with a thin film of linseed oil from a rag, in this trough. On removing the panel it picks up a thin film of paint from the surface of the water, and this is allowed to dry. Afterwards a hard copal varnish may be applied and the slate is stoved overnight; polishing follows.

A colored or black synthetic filler may be sprayed on the slate (after the primer has been applied and baked), and baked hard, usually at 160–200° F. for 1–2 hours, when it is rubbed down smooth with rottenstone; the veining is then applied by hand with a feather dipped in white or colored synthetic lacquer and allowed to air dry, when a good thick coat of clear synthetic lacquer is sprayed on and baked. The surface is subsequently smoothed down and polished to a mirror-like smoothness and gloss. Any amount of variation of base colors and veining can be done in a similar way. For shadow veining or marble effect the synthetic color or veining may be sprayed through a wide mesh rope stencil instead of applying with a feather. Colored finishes are often called for.

Undercoats

The usual baking synthetic finishes are either straight glyptals, ureas or bakelites, whilst the primers and undercoats and fillers are combinations of synthetics and drying oils; usually the primer has a greater oil content than the undercoat and filler, and often the oil in the primer is linseed whereas the oil in the undercoat may be tung oil. For outside exposure a combination of oil and synthetic (often 50:50) is absolutely necessary as a final coating to withstand all weathers, and this is applied after flatting down the clear or colored finish and is then baked hard for some hours with a good supply of air at a lower temperature, say 150° F., and finally highly polished. The polishing is very severe, and it is therefore absolutely necessary that the finishes should bake very hard indeed; consequently the heat-convertible synthetic resin finishes have proved exceedingly satisfactory.

Very good results have been had with combinations of ureas and glyptals suitably plasticized. For whites and clear colorless lacquers the question of the yellowing of plasticizers is exceedingly important, as so many of them turn yellow or brown. However, it has been found that tricresyl phosphate can be used in small quantities, but not blown oils as are so often recommended, as these are liable to turn brown. The urea resins have a great advantage here over the glyptals, as the former never turn yellow on stoving under any conditions, but they are more brittle and lack adhesion, and their plasticization is far more important, whereas with glyptals a soft non-curing type can generally be added to the heat-curing resin to plasticize it and to give the necessary adhesion.

As regards waterproofness, the straight ureas and glyptals are inferior to the bakelites. The acidity of the resin would seem to have a marked effect on the quick curing of the ureas particularly, hence their admixture with acid glyptals.

For the primer an oil-modified glyptal can be suitably diluted with mineral spirits and a small amount of lead driers added, and then pigmented as follows:

Resin (100 lb. in 15 gal. Solvent Naphtha and 15 gal. White Spirit)	55 lb.
Titanium White (26%)	33 lb.
Pure Titanium Oxide	9 lb.
Asbestine	3 lb.

For the undercoat a resin compounded with far less oil should be used, similarly thinned with mineral spirits, and suitable driers and pigments added.

Resin Solution	39.6 lb.
Titanium White (26%)	23.7 lb.
Xylol	36.7 lb.

Straight Color Trim Paint

Formula No. 1

Light Brown

C.P. Chrome Yellow—Medium	3 qt.
Indian Red	1 qt.
Raw Linseed Oil	2¾ qt.
Outside Spar Varnish	1 qt.
Liquid Drier	⅓ pt.

No. 2

Medium Reddish Brown

C.P. Chrome Yellow—Orange	½ gal.
Indian Red	½ gal.
Raw Linseed Oil	2½ qt.
Outside Spar Varnish	1 qt.
Liquid Drier	⅓ pt.

No. 3

Deep Brown

C.P. Bulletin Red	2½ qt.
Lampblack	1½ qt
Raw Linseed Oil	2¾ qt.

Outside Spar Varnish	1	qt.
Liquid Drier	1	pt.

No. 4
Trim Red

C.P. Bulletin Red	1½	qt.
Tuscan Red	2½	qt.
Raw Linseed Oil	3½	pt.
Outside Spar Varnish	1	qt.
Liquid Drier	1	pt.

No. 5
Bright Green

C.P. Chrome Green—Light	1	gal.
Raw Linseed Oil	1¼	gal.
Outside Spar Varnish	½	gal.
Liquid Drier	1	pt.

No. 6
Dark Green

C.P. Chrome Green—Dark	1	gal.
Raw Linseed Oil	1¼	gal.
Outside Spar Varnish	½	gal.
Liquid Drier	1	pt.

No. 7
Chromium Oxide Green

C.P. Chromium Oxide Green	1	gal.
Raw Linseed Oil	2½	qt.
Outside Spar Varnish	1	qt.
Liquid Drier	½	pt.

No. 8
Bright Yellow

C.P. Chrome Yellow—Lemon	1	gal.
Raw Linseed Oil	4¼	qt.
Outside Spar Varnish	1½	qt.
Liquid Drier	½	pt.

No. 9
Bright Orange

C.P. Chrome Yellow—Orange	1	gal.
Raw Linseed Oil	2¾	qt.
Outside Spar Varnish	1	qt.
Liquid Drier	½	pt.

No. 10
Black

Lampblack	1	gal.
Raw Linseed Oil	2¾	qt.
Outside Spar Varnish	1	qt.
Liquid Drier	1	pt.

For quick setting and good, thorough drying of these straight colors, four ounces of powdered litharge, wet with a little turpentine, may be stirred into each gallon of paint just before application. This practice is particularly helpful in paints containing considerable lampblack or dropblack which are "slow driers" and which sometimes remain tacky for a long time. When litharge is added to any batch of paint, or when boiled linseed oil instead of raw is employed, only half the liquid drier specified for the batch need be used.

Olive Drab Paint
Formula No. 1

Soft Paste White-Lead	50	lb.
Raw Turkey Umber	1	qt.
Raw Linseed Oil	1¾	gal.
Liquid Drier	1	pt.

No. 2

Soft Paste White-Lead	50	lb.
French Ochre	1¼	gal.
Lampblack	½	pt.
Raw Linseed Oil	2¾	gal.
Liquid Drier	1	pt.

No. 3

French Ochre	1	gal.
Lampblack	½	pt.
Raw Linseed Oil	3	qt.
Outside Spar Varnish	1	qt.
Turpentine	1	qt.
Liquid Drier	1	pt.

No. 4

Soft Paste White-Lead	50	lb.
C.P. Medium Chrome Yellow	1	pt.
Lampblack	1	oz.
Raw Linseed Oil	1½	gal.
Liquid Drier	1	pt.

Mica Paints

The preparation is of very simple character. The necessary quantity of the medium is poured upon the flakes, and thoroughly mixed with a spatula. The paint is then ready for use.

As a standard composition, the mediums for which may be linseed oil (boiled), fatty varnishes, water-proof varnishes, bronzing or gilding liquids, or paints in general, the proportions suggested are 200 g. of mica flakes for 1 kg. of medium. Where the medium is a cellulose lacquer, the proportions are 100–120 g. of mica flakes for 1 kg. of medium.

In order to protect and to increase the durability of any painting slightly increase the amount of coloring matter to preserve the same shade of color, which the flakes have a tendency to lighten to a certain degree. A suitable proportion will be an additional 50–100 g. of mica flakes per kg. of prepared paint. Experiment alone will determine the exact quantity to be mixed, as this depends, not only upon the medium, but also upon the coloring matter employed.

The paints should not be prepared for too long a time in advance; it is preferable to make the mixtures shortly before using. Application can be made by brush or with the spraying gun.

ALUMINUM PAINT
Instructions for Use

1. Mixing: Aluminum paint shall be freshly mixed and only enough for one day's use shall be mixed at one time. Any paint remaining after this period may be mixed with freshly prepared paint, if it does not exceed 10% of total newly-mixed paint. The paint shall be mixed in the proportion of 2 lb. of aluminum powder or aluminum paste per gal. of vehicle, or as otherwise specified. The weighed amount of pigment shall be placed in a suitable mixing container, and a measured volume of vehicle shall be *gradually* added to it with continuous stirring until a uniform paint is obtained. Each time any paint is removed from the mixing container, the paint shall again be thoroughly stirred to insure proper mixing. The paint shall also be frequently stirred during use.

2. Application: Aluminum paint may be applied with either spray gun or hand brush. If spraying equipment is employed, only sufficient pressure should be used to secure adequate atomization. Excessive pressure should be avoided. For spraying purposes, thinners may be added as required but not to exceed 10% of the total volume of paint. If a brush is used, care should be taken that all final brush strokes are made in the same direction. Excessive brushing will result in streaking and darkening, and should be avoided.

3. Painting Weather-Exposed Steel—New Work: The steel surface to be painted shall be thoroughly clean and dry. Oil and grease shall be removed with mineral spirits. Rust, mill scale, dirt or other foreign matter shall be removed by scratch-brushing, scraping or sand-blasting. No painting shall be done in wet weather or when the temperature is below 40° F. or when there is frost or moisture condensation on the steel. At temperatures below 50° F., the use of a maximum of 10% thinner, such as mineral spirits, is permissible. A good rust inhibitive priming coat shall be applied and allowed to dry for at least 48 hours. Two coats* of aluminum paint shall then be applied over the priming coat, allowing at least 48 hours drying time between coats.

4. Painting Weather-Exposed Steel—Old Work: The steel surface shall be free from rust, loose paint, loosely adhering mill scale, dirt and other foreign matter. Oil and grease shall be removed with mineral spirits. No painting shall be done in wet weather or when the temperature is below 40° F. or when there is frost or moisture condensation on the steel. At temperatures below 50° F. the use of a maximum of 10% thinner, such as mineral spirits, is permissible. All bare spots shall be touched up with a good rust inhibitive priming paint. Two coats* of aluminum paint shall then be applied, allowing at least 48 hours drying time between coats.

5. Painting Weather-Exposed Wood—New Work: The surface to be painted shall be thoroughly clean and dry. No painting shall be done in wet or freezing weather or within 24 hours following a rain. A priming coat of aluminum paint shall be applied over the entire surface. The paint shall consist of 1½ lb. of aluminum powder or 2 lb. of aluminum paste per gal. of a varnish vehicle for wood (very long oil varnish). Cracks as well as counter sunk nailheads shall be filled with a *good* putty before additional paint coats are applied. If 2 coats of aluminum paint are specified, the second coat shall consist of a paint made with 2 lb. of aluminum powder or paste per gal. of vehicle. At least 48 hours drying time shall be allowed between coats. Other top coats may be used as specified, allowing the same drying time.

6. Painting Weather-Exposed Wood—Repaint Work: The surface to be painted shall be scraped and scratch-brushed to remove blistered or loosely adhering paint and then thoroughly dusted. Cracks shall be filled with putty. No painting shall be done in wet or freezing weather or within 24 hours following a rain. A first coat of aluminum paint made with 2 lb. of aluminum powder or paste per gal. of the varnish vehicle for wood (very long oil varnish), shall then be applied. A drying time of at least 48 hours shall be allowed before top coats of paint are applied. If 2 coats of aluminum paint are specified, the second coat shall consist of a paint made with 2 lb. of aluminum powder or paste per gal. of vehicle. Other top coats may be used as specified, allowing the same drying time.

7. Painting Wood—Interior: If the wood has previously been painted with a high gloss finish, the surface should be sanded before any paint is applied. (This applies particularly to interior trim). The aluminum paint shall consist of aluminum powder or paste mixed with an interior varnish, in the proportions of 1½ lb. per gal. of vehicle. If the work is specified to be left in the aluminum finish, 2 coats of the same aluminum paint shall be applied, allowing at least 48 hours drying time between coats.

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* The first coat of aluminum paint may be tinted with Prussian Blue. Two ounces of Prussian Blue paste shall be added to each gallon of the clear vehicle before mixing with the aluminum pigment.

8. Painting Brick, Concrete and Plaster: The surface to be painted shall be dry and free from all loose paint, dirt and calcimine. The paint shall consist of 1½–2 lb. of aluminum powder or paste per gal. of a varnish vehicle. If the surfaces are exposed to the weather, 2 coats of aluminum paint shall be applied, using 2 lb. of pigment per gal. of vehicle for the second coat, and allowing at least 48 hours drying time between coats. For interiors, one coat may be sufficient.

9a. General Interior Work: For ordinary interior work, one coat of aluminum paint is usually sufficient. The paint shall consist of 1½–2 lb. of aluminum powder or paste per gal. of an interior varnish.

9b. For Interiors Exposed to Unusual Conditions: Where unusual exposure conditions exist, such as acid fumes, high humidity, etc., all steel to be painted shall have a rust inhibitive priming coat applied. Two coats of aluminum paint, using varnishes mixed with 2 lb. of aluminum powder or 2½ lb. of aluminum paste per gal. of vehicle shall then be applied over the priming coat. Two coats of the same aluminum paint shall be applied on all other surfaces. The painting procedure described in Paragraphs 2 to 6 shall be followed.

10. Painting Metal Surfaces Subject to High Temperatures: In Painting metal surfaces which reach high temperatures, special care shall be taken to insure a clean surface. A roughened surface will also improve the adherence of the aluminum paint film. For surfaces which reach temperatures in excess of 400° F., an aluminum paint consisting of aluminum powder or paste mixed with a heat-resisting vehicle in the proportion of 2–3 lb. of pigment per gal. of vehicle shall be applied. For surfaces, the temperature of which does not exceed 400° F., spar varnish may be used as the vehicle if diluted with at least 50%, by volume, with thinner such as mineral spirits.

The above recommendations do not apply to heated surfaces exposed to the weather such as unlined stacks or stack breachings.

Aluminum Paint
Formula No. 1

Linseed Oil	30 g.
Engine Oil, Refined	15 g.
Cumarone Resin, Hard	8 g.
Heavy Benzine	85 g.
Aluminum Powder	85 g.

Important:

The finer the aluminum powder, the greater is its hiding power, but the lower is its lustre. Furthermore, for coarser powders, the vehicle has to be more viscous. Choose medium-size, tinsel-like powder.

No. 2
British Patent 445,110

An aluminum sheet is primed with a material consisting of

Polymerized Vinyl Acetate	15 lb.
Zinc Oxide	10 lb.
Ethyl Acetate	35 lb.
Toluene	20 lb.
Xylene	20 lb.

After drying, the protective coating is applied as lacquer of the following composition:

Chlorinated Rubber (64% Chlorine Content)	20 lb.
Toluene	20 lb.
Xylene	40 lb.
Tricresyl Phosphate	6–8 lb.
Butyl Stearate	4 lb.
Aluminum Bronze Powder	10 lb.

Heat Resisting Aluminum Paint Vehicle

Gloss Oil (60% Solids)	20 lb.
Aluminum Powder	15 lb.
Xylol	20 lb.
V. M. & P. Naphtha	60 lb.

Aluminum Coating for Ovens

Coumaron Resin	12 g.
Benzol	30 g.
Benzolene	30 g.
Aluminum Powder	to suit

Aluminum Priming for Wood

Tung oil vehicles are recommended by reason of their elasticity and waterproofing properties. A suitable vehicle is obtained by thinning a tung oil spar varnish to the desired consistency, and adding aluminum powder in the proportion of 2 lb. per gal. For an oil medium use:

Raw Linseed Oil	70 oz.
Bodied Linseed Oil	8 oz.
Naphtha	7 oz.
Turpentine	15 oz.

Add a lead-free drier to suit.

Vehicles for aluminium paints must have a low acid value, and the concentration of aluminum powder should not exceed 2 lb. per gal.

Steel Paint

Zinc Chromate	12.5 kg.
Basic Lead Chromate	12.5 kg.
Lead Sulphate	25 kg.
Magnesium Sulphate	50 kg.
Tung Oil	50 kg.
Turpentine Oil	25 kg.
Linseed Oil	12.5 kg.
Naphtha	12.5 kg.

Paint Pre-treatment for Steel Sheets

U. S. Patent 1,980,518

Fuller's Earth	30	lb.
Calcium Dihydrogen Phosphate	5	lb.
Copper Nitrate	0.5	lb.
Butyl Alcohol	2.4	lb.
Water	6.32	gal.

Coating Underground Metal Pipes

U. S. Patent 2,047,772

Mica, Finely Divided	10–30 lb.
Pitch (m.p. 65–95° F.)	90–70 lb.

Apply at 160–200° F.

Cork Coating for Ship Metal Surfaces

The overhead steel surfaces, including angles, frames, and probably the ship's side in mess spaces, accommodation for men, store-rooms, etc., are usually covered with granulated cork. This has the function of reducing condensation by acting as an insulator, particularly so in the case of steel surfaces on the under side of the decks, which are not planked on the upper side.

The procedure of applying the cork is as follows: An adhesive composition, of which the following formula has been found suitable, is thickly applied, either by hand or spray, to the surfaces already painted with red lead, aluminum paint or other protective coating and then covered with granulated cork.

White Lead (Paste)	38	lb.
Yellow Ochre (Paste)	38	lb.
Paste Driers	14	lb.
Hard Drying Varnish	10	pt.
Boiled Linseed Oil	10	pt.

A small quantity of japan gold size can be added for quicker drying if considered necessary.

Granulated cork free from dust, of a size which must pass through a sieve 8 meshes to the linear inch and be retained on a seive 16 meshes to the linear inch, is either thrown or pressed on the adhesive composition. This can be quickly and efficiently applied to the overhead surfaces by using a thin but stiff piece of aluminium alloy sheeting approximately 9 inches square, upon which the cork is placed in a thick layer, and then pressed up to the composition, a small clip underneath the plate ensuring a firm hold. An alternative method is to use a shallow tray of a similar size having the bottom covered with canvas and filled with the cork. In this case the hand is placed underneath the canvas and pressed up on the adhesive composition. To make sure of the complete covering of the surfaces, granulated cork is also thrown up afterwards.

An interval of about four days is necessary for hardening the corked surfaces before painting is possible. The paint is usually in the form of a thick white zinc or titanium white flatting.

Beer Can Coating (Internal)

British Patent 463,797

Blown Asphalt	2 lb.
Gilsonite	1 lb.
Carbon Tetrachloride	14 lb.

Coating for Ends

Asphalt	100 lb.
Montan Wax	10 lb.
Cumarone Resin	½–2 lb.

Thin to suit with a mixture of equal parts of toluol and carbon tetrachloride.

Paint for Asbestos Pipe Covering

White-Lead in Oil	100 lb.
Pure Kettle-Boiled Linseed Oil	7 gal.
Turpentine	1 gal.

This formula will make about 11 gallons of paint. It is very difficult, however, to estimate its covering power when applied to surfaces such as asbestos whose surface is very likely to be more porous in some spots than others. As near as one can figure the priming coat should average approximately 300 square feet per gallon.

The second coat should be based on one of the following formulas:

Second coat (a):

White-Lead in Oil	100	lb.
Pure Raw Linseed Oil	1½	gal.
Turpentine	1½	gal.
Pure Drier	1	pt.

This formula takes about 6 gallons of paint which should cover approximately 3000 square feet one coat.

Second coat (b):

White-Lead in Oil	100 lb.
Flatting Oil	2–3 gal.

This formula should make from 5 to 6 gallons of paint which should cover from 2500 to 3000 square feet one coat.

Protective Coating for Concrete and Iron

Asphaltum	50 lb.
Coal Tar Pitch, Hard	50 lb.
Rosin, Dark	40 lb.
Linseed Oil Varnish	20 lb.
Coal Tar Oil	50 lb.
Heavy Benzoline	30 lb.

Concrete Coating

U. S. Patent 2,048,932

Cement	100 lb.
Sodium Phosphate	4 lb.
Calcium Chloride	6 lb.

Water sufficient to make desired consistency.

Industrial Paints

Vinsol Paint Oil	100	lb.
Tung Oil	30	gal.
Menhaden Fish Oil	50	gal.
Kerosene	50	gal.
V. M. & P. Naphtha	50	gal.
Lead Naphthenate Paste Drier or Equivalent Weight of Lead as Litharge	6	lb.

Heat the Vinsol and all the tung oil to 450° F., add lead paste drier (work in the drier if litharge is used), raise heat quickly to 575° F., check with the fish oil and hold at 560° F. for 12-inch string, cool and reduce at 500 with kerosene, follow with the V. M. & P. Naphtha at 375° F.

Red Paint

C.P. Red Oxide	2	lb.
Asbestine	3	lb.
Vinsol Paint Oil	1	gal.

Grind 15 hr. in pebble mill.

Brown Paint

Prince's Metallic Brown	4	lb.
Asbestine	1	lb.
Vinsol Paint Oil	1	gal.

Grind 15 hr. in pebble mill.

Green Paint

C.P. Chrome Green Dark	1½	lb.
Asbestine	2	lb.
Vinsol Paint Oil	1	gal.

Grind 15 hr. in pebble mill.

Black Paint

Carbon Black	3½	oz.
Mineral Black	1	lb.
Vinsol Paint Oil	1	gal.

Grind 24 hr. in pebble mill.

Note: This paint is suggested as an excellent general utility black maintenance paint for metal and wood protection in industrial plants. It has better adhesion and holds its gloss longer than the asphalt paints frequently used in this work.

Oil Plastic Paint

Heavy Paste White Lead	100	lb.
Dry Bolted Whiting	22	lb.
Flatting Oil	1½	gal.
Japan Drier	1	gill

Break up the white lead in half of the oil and the whiting in the other half. When both are well mixed pour together and mix until smooth.

Ship Bottom Paint

Zinc Oxide	187	lb.
Indian Red	93	lb.
Silica	93	lb.
Vinsol	146	lb.
Hi-flash Coal Tar Naphtha	383	lb.
Coal Tar	48	lb.
Manganese Linoleate	130	lb.
Beeswax	3.3	lb.

Melt the Vinsol alone to a top heat of 350° F., and when all melted add the coal tar, linoleate and beeswax and heat till thoroughly melted then cool to 400° F., and reduce with naphtha. When cold grind with pigments in ball mill.

Toxic Anti-Fouling Material

U. S. Patent 2,041,130

An anti-fouling marine paint toxic to marine animal organisms comprises a suitable vehicle having incorporated therein zinc tellurite. A suitable formula is: Zinc tellurite 50 g., zinc oxide 50 g., tar 30 g., shellac 5 g., alcohol 500 g.

Black Finish for Auto Fenders

a.	Asphaltum	54	lb.
	Rosin	54	lb.
	Roseen Oil	1	gal.
b.	Linseed Oil	12	gal.
c.	Turpentine	17	gal.
d.	Litharge	6	lb.
	Cobalt Linoleate (4% Cobalt)	2.5	lb.

Heat *a* with part of *b* to 250° C., to melt, and add the balance of *b*, heating further to get a good, clear solution. Add *d* slowly with agitation. Cool, and add *c* at 150° C. Allow to settle in tanks for several months, centrifuge, and fill into containers.

Refinishing Paint for Autos

U. S. Patent 2,044,493

Gasoline (Low Test)	95	gal.
Anise Oil	1–2	gal.
Clear Spar Varnish	32	gal.

Repainting Drums

Scrape off all the old paint and sand the surface with very fine sandpaper, then apply a priming coat of white lead in oil. After the priming coat is dry apply two coats of paint made from colors ground in japan. This should be thinned with turpentine only. When the final coat of color is dry, varnish the surface with a good thin-bodied hard gum varnish. When the varnish is dry, if the surface is not sufficiently glossy, rub the varnished surface with curled hair or fine steel wool to remove the gloss and apply a second coat of varnish.

Preventing Paint Hardening

Melted paraffin poured over the top of a can of paint will prevent its hardening. When can of paint is again desired the coating of paraffin can be readily removed.

Painting Airplane Alloys

In the use of paints on magnesium alloys such as used for airplanes, it is important that the surface first be cleaned with 2% solution of sodium hydroxide. Aluminium alloys can only be cleaned by sand-blasting. Oil varnishes for application on magnesium-aluminium alloys should contain three parts of oil to one part of resin. Ferric oxide and zinc chromate is the best pigment for use in paints for iron or steel, whereas chrome yellows with or without the use of titanium dioxide is the best for aluminium. Zinc oxide is the best for magnesium alloys. Silica increases the adhesion to the various types of metals and alloys. Copals and dammar are satisfactory resins to use in the formulation of paints for alloys, but ester gum is not satisfactory.

FORMULAS FOR PAINTING STRUCTURES HAZARDOUS TO AIR TRAFFIC

1. Priming Coat

A. Wood

White-Lead (Soft Paste*)	100	lb.
Linseed Oil	4	gal.
Pure Turpentine	1¾	gal.
Liquid Drier	†1	pt.

Makes 9 gal. of paint which covers about 600 sq. ft. per gal.

B. Metal

Paste Red-Lead	100	lb.
Raw Linseed Oil	2⅜	gal.
Pure Turpentine	1½	pt.
Liquid Drier	1½	pt.

Makes 5 gal. of paint which covers about 600 sq. ft. per gal.

C. Concrete, Stucco, Stone, Brick

White-Lead (Soft or Heavy Paste)	100	lb.
Lead Mixing Oil	4–5	gal.

Makes 7 to 8 gal. of paint which covers about 200 sq. ft. per gal.

2. Second Coat

A. Wood and Metal

White-Lead (Soft Paste*)	100	lb.
Linseed Oil	1½	gal.
Pure Turpentine	1¼	gal.
Liquid Drier	†1	pt.

Makes 6 gal. of paint which covers about 700 sq. ft. per gal.

B. Concrete, Stucco, Stone, Brick

White-Lead (Soft or Heavy Paste)	100	lb.
Lead Mixing Oil	3–4	gal.

Makes 6 to 7 gal. of paint which covers about 400 sq. ft. per gal.

3. Third Coat—Orange Finish

For All Surfaces

Basic Lead Chromate	1	gal.
Raw Linseed Oil	1	gal.

Makes 2 gal. of paint which covers about 600 sq. ft. per gal.

4. Third Coat—White Finish

A. Wood and Metal

White-Lead (Soft Paste*)	100	lb.
Linseed Oil	3	gal.
Liquid Drier	†1	pt.

Makes 6¼ gal. of paint which covers about 700 sq. ft. per gal.

B. Concrete, Stucco, Stone, Brick

White-Lead (Soft or Heavy Paste)	100	lb.
Lead Mixing Oil	3–4	gal.

Makes 6 to 7 gal. of paint which covers about 600 sq. ft. per gal.

Traffic Line Paint
(High Quality)
Formula No. 1

Sixty-five per cent of pigment and 35 per cent of vehicle. The pigment is 65 per cent light-proof lithopone, 25 per cent lead-free zinc oxide, and 10 per cent magnesium silicate.

The vehicle is a varnish made in the proportions of 9 gallons of China wood oil and 6 gallons of linseed oil per 100 pounds of modified phenolic resin and thinned with V. M. & P. naphtha and drier to contain 40 per cent of nonvolatile material.

No. 2

Sixty-five per cent of pigment and 35 per cent of vehicle. The pigment is 56 per cent titanium-barium pigment, 24 per cent lead-free zinc oxide, 10 per cent magnesium silicate and 10 per cent silica. The vehicle is 40 per cent nonvolatile and made of the same constituents as above, but in the proportions of 12 gallons of China wood oil and 8 gallons of linseed oil per 100 pounds of resin.

Cheap Traffic Line Paint

Hydrated Lime	100 lb.
Casein	20 lb.
Trisodium Phosphate	12 lb.
Whiting	30 lb.
Water	to proper consistency

Permanent Window Paint

Mix 30 pounds of sodium silicate with five gallons of water and mix in two

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* If heavy paste is used in these formulas, increase turpentine by one quart.

† When boiled oil is used, reduce drier to ½ pint.

gallons of raw linseed oil with vigorous stirring. The oil must be emulsified in the water before adding pigment. For a white paint stir in 25 pounds of whiting. A blue color may be obtained with ultramarine, red with iron oxide, yellow with lead or zinc chromate, and green with chrome green.

To avoid brush marks apply with a spray gun. To remove, apply vinegar and allow it to soak in, before scraping.

Frosted Window Paint

When a temporary paint is desired for a window a supersaturated solution of magnesium sulphate (Epsom Salt) gives excellent results. Simply paint or daub the warm solution over a window paint and beautiful frosted effects are obtained. The coating is easily and completely removed by water.

Painting Glass

Thoroughly clean inside of glass and apply a first coat of a very thin mixture of white lead and turpentine, containing a pint of hard-drying varnish per gallon of turpentine. Spread rapidly on glass with a soft brush and immediately stipple the paint with a wall stippler.

Glass Masking Coating

Formula No. 1

For masking automobile glass while painting:

Kaolin	2 lb.
Glycerin	1.5 lb.
Water	4.5 lb.
Butyl Alcohol	0.25 lb.

Mix above ingredients thoroughly, apply to glass of car with a brush and let dry. After painting with a spray gun, the mask may be removed with a putty knife, cloth or by washing with a hose. This leaves the glass free of paint.

No. 2

U. S. Patent 2,029,008

Toluol	55 oz.
Rubber Cement	30 oz.
Latex	5 oz.
Mineral Oil, Heavy	5 oz.

Protective Coating for Mirrors

U. S. Patent 2,071,553

A process for producing a protective coating against air, dampness, tropical moisture and acid vapors, consists in melting 40 parts by weight of asphalt, diluting the same with spirits of turpentine, adding 30 parts by weight of copal resin dissolved in spirits of turpentine whilst continually stirring the mass, adding to each kilogram of the mixture 10 parts by weight of red lead and egg albumin in a quantity equivalent to five whites of eggs and applying this mass upon the coating of the mirror maintained in lukewarm condition.

Lamp Shade Decorating Paint

Low Strength Glue	19 oz.
Corn Starch	14 oz.
Cane Sugar	14 oz.
Water	26 oz.
Alcohol	27 oz.
Color	to suit
Clove Oil	to suit

Dissolve glue, starch and sugar in water with gentle heat; add color; incorporate alcohol with constant stirring to make a smooth thin paste; add clove oil.

Apply from collapsible tubes with thin nozzle, or with a cake icer.

Painting Canvas (Non-Folding)

Make up a batch of cooked rye flour paste, brush a coat on the canvas, let dry, then run over the surface of the roof with No. ½ sandpaper to knock off the nibs. Dust well, and apply a coat of paint made by mixing together five pounds of white lead in oil and one pound of bolted whiting. Reduce this paste, after tinting to a very light gray, with a liquid composed of one part of raw linseed oil, two parts of good coach japan and two parts of turpentine. Apply this and when dry apply a second coat of light gray paint, made by reducing white lead in oil to brushing consistency with a liquid composed of one part of raw linseed oil and three parts of coach japan. When dry apply a coat of aluminum paint, made by stirring pure aluminum powder into a first-class extra long oil exterior spar varnish or a high-grade coach or finishing varnish.

Canoe Finishing

Canvas canoes take a good finish, and remain not only water-tight but also attractive over a considerable period—if the job is done right.

1. Wash inside and out; then dry thoroughly.
2. Remove old paint, using any standard varnish remover according to the manufacturer's directions.
3. Dry entire canoe thoroughly. For this use a small motor-driven blower, taking warm air from around a heater improvised from one of the common "air-tight" wood-burning stoves. This warm dry air is blown gently into a canvas-covered box completely covering

the canoe, the blower being tied in at one end while the other end is left open as a vent. After partially drying the canoe with the stern toward the blower lift the cover, turn the canoe halfway around, and complete the drying.

4. After making sure that the canoe is dry, and regardless of the final color desired, prime it with a thin coating—little more than a wash—of aluminum paint, using a long-oil varnish as the vehicle.

5. Then the canoe is given two color coats of best grade marine paint, the material for each coat being cut with the addition of one-half pint of turpentine or wood spirits to the gallon as received. After the first coat has dried thoroughly, it is sanded lightly to assure a better bond with the following coat.

6. The job is finished with a coating of spar varnish. The varnish is flowed on, with as little brushing as possible, beginning at the keel and working toward the gunwales. The boat is in upsidedown position, of course, during all this work.

Where any lettering, initials or decorative design is desired, it is put on over the last coat of color and covered with the spar varnish along with the rest of the canvas.

Jobs turned out in the manner outlined last from three to five years, depending upon usage (care being taken to drain the craft after each trip) and the amount of abrasion suffered from sandy beaches and rocky shoals.

Metal Coating for Paper and Fabrics

British Patent 433,218

Glyptal Resin (Tung Oil Type)	43.88 lb.
Naphtha	53.13 lb.
Cobalt Linoleate	2.99 lb.

The paper or fabric is coated with above solution and then sprayed with a powdered metal and burnished before varnish has dried completely then bake to harden varnish.

Auto Top Dressing

Formula No. 1

Dissolve 4 oz. Orange Shellac in 1 gal. denatured alcohol and add ½ oz. castor oil and sufficient spirit soluble nigrosine to give the depth of color desired.

No. 2

U. S. Patent 2,046,793

Varnish 1.25 gal., tung oil 1 gal., raw linseed oil 6 gal., creosote 1 pint, a drier such as Japan drier about 0.5 gal., raw rubber, 2.5 gal., turpentine 1 qt., white lead 12.5 lb. and a black material such as lampblack about 1.5 lb. are used together.

Coating Inside of Latex Drums

Latex (Containing 0.7% Ammonia)	1 gal.

to which add a smooth paste of

Zinc Oxide	2 lb.
Water	1 qt.

Completely wet inside of drum with above, drain out and dry by sun's heat.

Ink Resistant Fountain Pen Barrel

U. S. Patent 2,044,181

The inner surface of the barrel is coated with a solution of ethylcellulose and dried.

Dental Model Coating

U. S. Patent 2,057,289

Cellulose Acetate	9½ oz.
Triphenyl Phosphate	8 oz.
Methyl Phthallate	25 cc.
Formaldehyde	25 cc.
Dioxan	3½ qt.

Quick Drying Temporary Protective Coating

Glycol Bori-Borate	10 g.
Corn Sugar	8 g.
Water	182 cc.

Heat to 140° F. and apply with a spray gun. This coating is removed with a damp cloth.

Fireproof Paint

French Patent 821,566

Zinc Oxide	407.48 g.
Titanium Dioxide	150.00 g.
Linseed Oil	170.00 g.
Stand Oil	70.00 g.
Turpentine	20.00 g.
Manganese Resinate	90.00 g.
Barium Sulphate	36.48 g.
Silica	2.00 g.
Calcium Silicate	0.19 g.
Zinc Sulphide	15.53 g.
Iron Oxide	1.44 g.
Alumina	2.10 g.
Magnesia	2.61 g.
Calcium Carbonate	32.25 g.

Fireproofing Coating

French Patent 802,021

Tetrachloronaphthalene	450 g.
Chlorinated Rubber	60 g.
Tritolyl Phosphate	40 g.
Lampblack	20 g.

Non-Inflammable Paint

U. S. Patent 2,044,176

Chlorinated Rubber	100 g.
Stand Oil	100 g.

Antimony Trioxide	50 g.
Basic Carbonate White Lead	10 g.
Bone Black	100 g.
Toluene	250 cc.

Peelable Adhesive Protective Coating
U. S. Patent 2,046,925

Pyroxylin	10 lb.
Castor Oil	7 lb.
Butyl Acetate	25 lb.
Butyl Alcohol	10 lb.
Ethyl Acetate	10 lb.
Alcohol	5 lb.
Toluol	50 lb.

The consistency may be varied by increasing or decreasing the above solvents.

Filler, Marking and Coating Composition
U. S. Patent 2,046,557

Shellac Wax	2 lb.

Heat at 60–175° C. and add with thorough mixing

Aluminum Powder	1 lb.

Cellulose Acetate Cloth Coatings
Formula No. 1

Cellulose Acetate (Low Acetyl Content, 2 to 5 sec.)	10 lb.
Acetone	49 lb.
Methyl Cellulose	11 lb.
Toluol	10 lb.
Methyl Phthalyl Ethyl Glycollate	20 lb.

No. 2

Cellulose Acetate (High Acetyl Content, 15 to 30 sec.)	10 lb.
Acetone	52 lb.
Ethyl Acetate (85–88%)	10 lb.
Methyl Cellosolve	8 lb.
Butyl Phthalyl Butyl Glycollate	20 lb.

Sound Insulating Coating

Satisfactory sound-insulating adhesives, equal in quality to the product of Ford Motor Co., are obtained from (1) soft petroleum (Grozny) bitumen 39.5, waste rubber 11.8, wood flour 5.5, gasoline 33.2 and kerosene 10 grams, and (2) soft petroleum bitumen 44.6, boiled linseed oil (43% polymerized) 6.7, wood flour 5.6, gasoline 33.1 and kerosene 10 grams.

Electrical Insulating Tape Coating
British Patent 452,361

Reclaimed Rubber	15 lb.
Rubber Resin	28 lb.
French Chalk	57 lb.

Warm together and mix until smooth.

Battery Terminal Coating Compound

Asphaltum	36 oz.
Pyridine	4 oz.
Solvent Naphtha	60 oz.

The pyridine is mixed with the solvent naphtha and the lumps of asphaltum added, stirring occasionally until these lumps have passed into solution. This composition may be applied to the battery terminals and cables by means of a brush or spray gun. The pyridine has a neutralizing effect on the acid spray as well as acting as a plasticizing agent preventing embrittlement of the asphaltum coating. The adhesion is excellent, and forms a completely non-pervious acid resistant film.

Corrosion Proof Cable Coating
British Patent 450,802

A 1:1 mixture of quartz flour and ethyl acrylate is applied to the cable and heated to polymerize the ester and harden the resulting resin.

Ozone Resistant Cable Coating
U. S. Patent 2,007,761

Palm Oil Pitch	50 oz.
Rape Seed Oil	50 oz.
Sulphur	5 oz.

Heat at 150° C. for 6 hours.

Protecting Underground Pipes
U. S. Patent 2,047,772

Coat pipes with a hot mixture of

Pitch	75 lb.
Mica (60-100 Mesh)	25 lb.

Graphite Paints
Formula No. 1

Graphite	75 lb.
Boiled Linseed Oil	25 lb.

No. 2

Graphite	40 lb.
Zinc Oxide	40 lb.
Boiled Linseed Oil	40 lb.

Acid Resisting Paint

Tornesit (130 Cps.)	20 oz.
Heat Bodied Tung Oil	10 oz.
Toluol	20 oz.
High Solvent Naphtha	50 oz.

Acid Resisting Paint

Tornesit	15 lb.
Thermolized Tung Oil	10 lb.
Xylol	60 lb.
Red Oxide	15 lb.

Paint for Chemical Laboratories

Paint applied in chemical laboratories and other places where conditions are severe often suffers decided depreciation in color within a short time. This is due, of course, to attack by acid fumes. The fumes then attack the underlying metal surface, which the paint is supposed to protect.

Aluminum paint has good light-reflecting qualities and serves well under some conditions. Certain acids, however, attack it readily.

Protecting the paint film by a coat of clear Bakelite varnish is necessary. This material, although very smooth and glossy after application, darkens after a few weeks to an amber shade which is permanent.

In preparing the surfaces for painting, they are thoroughly cleaned and all rust spots sandpapered. All of the old paint which had been affected by the acid fumes is removed. Pipes are given particular attention. The surface is then given a coat of aluminum mixed in a Bakelite vehicle, followed by a coat of clear Bakelite varnish. This treatment is applied to all metal and wood surfaces.

Cement and brick are given a coat of white enamel, followed by a coat of the Bakelite varnish.

The initial cost is somewhat higher than for ordinary paints, but when the long life is taken into consideration the cost of application is preponderantly in favor of the higher-priced aluminum paint.

Matrix Coating Composition

U. S. Patent 2,047,087

Silicate of Soda	1.25– 17.5 oz.
Water	25 –140 oz.

Colloidal Graphite Suspension sufficient to give 1 oz. of dry graphite.

Coating for Candles

Formula No. 1

U. S. Patent 1,968,269

Methanol	500 cc.
Acetone	500 cc.
Copal	100 g.
Resin, Elemi	200 g.
Aluminum Powder	400 g.

No. 2

U. S. Patent 1,967,879

Colophony	10
Carbon Tetrachloride or Diethylene Glycol	90
Disperse in this solution	
Gold or Silver Bronze Powder	10

Paint Drier

German Patent 636,760

Naphthenic Acids	250 g.
Lanolin Fatty Acids	750 g.

Heat to 100° C. and while raising temperature to 150° C. add slowly, while mixing

Lead Oxide (PbO)	260 g.

Continue heating and stirring until dissolved.

Stabilized Paint Drier

Canadian Patent 358,972

Manganese Napthenate	20 g.
Petroleum Thinner	100 g.

Dissolve by heating to 250° F. and stirring; then add

Amyl Alcohol	0.4 g.

This drier will not gel or crystallize, even in the presence of moisture when stored for long periods.

Cobalt Drier

A special drier giving about 1% cobalt content is made by dissolving 500 parts rosin in 500 parts naphtha and 15 parts linseed oil, with 16 parts of a 65% cobalt hydroxide preparation and 15 parts slaked lime.

Silk Screen Stencil Filler

Russia Cement	8 oz.
Glycerin	2 oz.
Water	2 oz.

Warm and stir until dissolved. Cool before using.

After this coating is dry it should be given a coat of lacquer to protect it against moisture.

Paint Filler

Canadian Patent 360,167

Sodium Stearate	8.80 oz.
Gelatin	0.40 oz.
Borax	0.40 oz.

Dissolve separately in hot water and then mix. To this add a solution of

Zinc Sulphate	0.25 oz.
Aluminum Sulphate	0.25 oz.
Mix well and stir in	
Amyl Acetate	0.20 oz.
Beechwood Creosote	0.20 oz.

Furniture Filler

Formula No. 1

Quick drying (1 hour in thin layer)

Whiting	64 g.
Gum Arabic, Powder	20 g.
Barium Sulphate	17 g.
Pigment	about 5 g.
Linseed Oil	1 g.
Water	to suit
Plant Glue	6 g.
Perfume (to hide smell)	to suit
Preservative	only for storage

No. 2

Schist Powder	100 g.
Barium Sulphate	20 g.
Lead Linoleate	30 g.
Hard Laquer*	50 g.
Toluol (To Get Right Consistency)	about 15 g.
Drier (Siccative)	5 g.

* Hard Laquer:

Artificial Resin (e.g. Albertol 111 L)	40 g.
Linseed-Wood Oils	30 g.

No. 3

Nitrocellulose Film Scrap, Lowest Possible Viscosity	10 g.
Nitrocellulose Film Scrap, Higher Viscosity	2 g.
Artificial Resin (e.g. Albertol 111 L)	12 g.
Wood Oil—"Stand" Oil (Nitro-Type)	5 g.
Drier, to suit	0.5 g.
Ethyl Lactate	10 g.
Fillers to get Right Consistency: Schist Powder, Barium Sulphate, Zinc Oxide, etc.	to suit
Toluol	5 g.

Clear Primer for Polished Surfaces

a. ½" Cotton Solution (25%)	2 lb.
Resin DAI	½ lb.
Amberol 801	2 lb.
Paraplex 5B	1 lb.

Dissolve in

b. Toluol	50 oz.
Butyl Acetate	25 oz.
Butyl Alcohol	25 oz.

Zinc White-Paste for Paints

Zinc White	78–75 kg.
Linseed Oil, Not Boiled, "of Acid No. 4"	22–25 kg.

It is important to introduce the pigment in small portions.

METALLIC PIGMENTS

	Composition				
Color of Pigments	Copper %	Zinc %	Iron %	Aluminum %	Tin %
Green Bronze	84.32	15.02	0.30	——	——
Violet Bronze	98.22	0.50	Trace	——	——
Coppery Bronze	99.90	——	0.20	——	——
Orange-Yellow Bronze	98.93	0.73	0.20	——	——
Reddish Bronze	99.00	9.60	0.07	——	——
Pale Yellow Bronze	82.33	16.69	——	——	——
Dark Yellow Bronze	84.50	15.30	0.16	——	——
Aluminum Bronze	90.00	——	——	10.00	——
Silver Matte	——	2.30	0.03	——	96.45

Chrome Green Pigment
British Patent 461,799

An intimate mixture of 100 g. of sodium dichromate, 11 g. of sulphur and 300 g. of boric acid are heated for one hour to 600–620° C. After heating, the still hot mass is thrown into 2 l. of water, boiled for a short time, and further washed and dried in the usual manner. About 80 g. of chromium hydroxide green is obtained.

Lead Chromate Pigment

Chrome Alum	156 lb.
Litharge	94 lb.
Bleaching Powder	78 lb.
Water	to wet thoroughly

Grind in a ball mill, leading off the chlorine evolved.

Dispersible Carbon Black
U. S. Patent 2,062,159

25 parts by weight of gas black is slurred in 1000 parts of water and heated to the boil. A solution of sodium naphthenate, prepared by treating 2.5 parts of naphthenic acid with 0.32 parts of caustic soda in 50 parts of boiling water is then added to the carbon black suspension. This is then boiled for 15 minutes and diluted to about 2000 parts water.

A solution of 10 parts barium chloride crystals in 100 parts of water is then slowly run into the above suspension, after which it is boiled for one hour. It is then filtered, washed free from excess reagents, dried and ground. The resulting product is a carbon black containing adsorbed barium naphthenate. It is readily dispersible in non-aqueous vehicles and is eminently suited for incorporation into printing inks, lithographic and other varnishes, plastic compositions, synthetic resins, etc., or for compounding rubber.

Barium Carbonate from Heavy Spar

Barium Sulphate	58 lb.
Soda Ash	60 lb.
Water	500 lb.

Heat in an autoclave at 320° C. for four hours.

Lake Colors
(How to Precipitate Them in the Presence of Pigments)

Acid Lakes

a. Aluminum Sulphate	6	kg.
Water	156	l.
b. Ammonium Carbonate	2	kg.
Water	40	l.
c. Barium Sulphate, Precipitated	10	kg.
d. Lake Color	3.5	kg.
Water	350	l.
e. Barium Chloride	9	kg.
Water	180	l.

Mix the solutions *a* and *b*, add *c*. To this, the color solution *d* is added, and finally, *e* is added to precipitate.

The barium sulphate can be replaced by strontium sulphate, or colloidal clay.

Basic Lakes

a. Strontium Sulphate	20	kg.
b. Lake Color	1	kg.
Water	100	l.
c. Tannic Acid	1.5	kg.
Water	60	l.
d. Sodium Acetate	1.6	kg.
Water	60	kg.

Mix *a* and *b*, add *c*, and, ultimately, *d*.

Direct Method
(To Precipitate Lakes)

a. Lake Color,* Water-Soluble	1	kg.
Water	100	l.
b. Aluminum Hydrate, Freshly Prepared	10	kg.

Luminous Paints, Pigments

In the manufacture of luminous pigments the quality and purity of the raw materials are of the greatest importance. The calcium oxide used in most luminous pigments is obtained by calcining pure marble or Iceland spar. The sulphur used should be recrystallized from carbon bisulfide. Only purest rice starch and not impure potato starch should be used as reducing agent.

Luminous Base

Calcium Oxide	5	g.
Sulphur	10	g.
Starch	2	g.

This base can be activated with a solution of ½% thorium nitrate and ½% bismuth nitrate in alcohol slightly acidified with nitric acid. One of the fundamental requirements is a good and uniform distribution of the effective heavy metals throughout the whole mass. This is accomplished by grinding thoroughly a portion of the base in the solution and slowly adding more base until all ingredients have been mixed carefully.

The color of the luminescence can be varied and controlled within wide limits. A blue luminescence is emitted by the following pigment:

Luminous Base	15	g.
Potassium Sulphate	0.25	g.
Sodium Sulphate	0.25	g.
Bismuth Nitrate Solution	0.5	cc.
Thorium Nitrate Solution	1.0	cc.

This mixture is calcined for fifteen minutes at white heat. The crucible is first charged with a layer of charcoal or coke on which the mixture is pressed and allowed to dry thoroughly. The crucible is then covered with a lid and sealed with a magnesia cement. After calcination is completed the crucible is removed from the furnace and cooled quickly. The resultant luminous pigment should be kept in large pieces in well sealed containers. For incorporation in luminous paints the pigment should be powdered only coarsely since very fine grinding affects luminosity adversely.

The following pigments can be prepared in a similar manner.

Yellow Luminous Pigment:

Barium Oxide	10	g.
Sulphur	3	g.
Starch	1	g.
Potassium Sulphate	0.1	g.
Bismuth Nitrate Solution	0.5	cc.
Thorium Nitrate Solution	1.0	cc.

Calcining time 35 minutes at white heat.

Green Luminous Pigment:

Strontium Oxide	10	g.
Sulphur	8	g.
Starch	2	g.
Potassium Sulphate	0.25	g.
Bismuth Nitrate Solution	0.5	cc.
Thorium Nitrate Solution	1.0	cc.

Calcining time 25 minutes at white heat.

Other colors can be produced by varying the activating salt. Uranium salts give blue to bluish violet luminescence; cerium salts, reddish-yellow; antimony salts, greenish-yellow; mercury salts, green; manganese sulphide, golden yellow; gold salts, green; copper salts, green; molybdenum sulphide, orange; and lead sulphide, blue-green. Colloidal solutions of metallics or sulphides which can be kept in colloidal solution by the formation of complex salts may also be used as activators.

Some of the luminous pigments have a very fleeting life in lacquers, most var-

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* Eosines, Rhodamines, etc.

nishes, including spirit varnishes, and water-soluble gum solutions. However, if the pigments are coated with gelatin the mixtures will remain ungelled for a few weeks in lacquers or varnishes. If the lacquer suspensions are applied before gelatin, fairly good results may be expected. Liquid and paste waxes, especially those rich in the high-melting paraffins, may be used to apply luminous pigments to some surfaces. In this medium they maintain their brilliance for a long period without additional exposure to light. One of the most satisfactory vehicles consists of four-fifths of a pound "cut" of petroleum-soluble East India copal gum of light color. By using various high- and low-boiling fractions of petroleum drying speeds ranging from a few minutes to any slower rate may be secured.

The addition of finely ground diatomaceous earth to the luminous paints will aid suspension and speed of drying; and reduce the brilliance about in proportion to the amount of fluorescent material displaced. The earths also help to mask the yellow color of the pigments. A trace of prussian blue will also give apparently increased whiteness in daytime but great care must be exercised not to mask the luminescence.

Fluorescent Paints Under Ultra Violet Light from an Argon Bulb

Under the irradiation of invisible ultra-violet light, many substances have the unique property of giving out a visible radiation. Among these substances may be mentioned anthracene, mercurous chloride, and sodium salicylate.

Anthracene when dissolved in benzene forms a paint which is entirely invisible in ordinary light, but presents a yellowish glow in the light of an argon bulb emitting ultra-violet light. To make this paint, dissolve:

Anthracene	1 g.
Benzene	100 cc.

Shake to dissolve the chemical and paint with this solution, using a fine camel's hair brush. When this painting is dry and viewed under ultra-violet light from an argon bulb it will appear with a yellowish glow.

Mercurous chloride, on the other hand, presents a beautiful deep pink fluorescence when excited with ultra-violet radiations from an argon glow lamp. You can make some of this pink fluorescent paint by mixing:

Mercurous Chloride	2 g.
Dextrin	¼ g.

Water to form a thin paste.

After mixing thoroughly spread some of this paste on a piece of black paper or cardboard with a knife. When this material has dried it will appear pure white in daylight, but assume a pink color when examined under ultra-violet radiation from an argon glow lamp.

Sodium salicylate gives a blue fluorescence when examined under ultra-violet light from an argon glow lamp. You can make some fluorescent paint as follows:

Sodium Salicylate	2 g.
Dextrin	¼ g.

Water to form a thin paste.

Thoroughly compound this material and apply some of the mixture to a piece of black paper or cardboard. When it has dried, examine under ultra-violet light from an argon bulb and notice the bright blue fluorescence of this paint.

Under the iron arc the three preceding chemicals fluoresce as follows:

Anthracene—Yellowish.
Mercurous Chloride—None.
Sodium Salicylate—Light Blue.

Among other chemicals which fluoresce under the ultra-violet light may be mentioned:

Barium Sulphide—Red, orange to yellow (according to how it has been prepared).
Zinc Sulphide—Yellow, orange to green (according to purity).
Uranium Salts—Vivid yellow.

Water Varnish

Glue, Strong	400 g.
Nigrosine, Water-Soluble	35 g.
Oxalic Acid (Saturated Solution)	48 cc.
Water	1 l.

Staining Gut Leaders for Fishing

Cut a small piece of green or brown color of the Eastman Velox Water Color and dissolve in luke warm water. Immerse leaders until desired color has been obtained, remove from color bath and immerse in vinegar for a few minutes, remove and wash thoroughly in water and dry. This gives a clear fast color.

If brown only is wanted, strong coffee may be substituted for the Eastman Water Colors.

Varnish for Flies, Etc.

Dissolve clear or colored celluloid in acetone, containing a little amyl acetate. This gives a good air-drying covering suitable for heads of fishing flies, etc.

Dyes may be added to give any desired color.

Brick Coating Varnish

British Patent 448,807

Linseed Oil	4 oz.
Barley Sugar	1.6 oz.
Gelatin	0.4 oz.
Water	6 oz.

Warm together and mix rapidly to emulsify.

VARNISHES FOR PAPER

For Colored Paper and for Labels

Gum Dammar	10 kg.
Nitrocellulose	6 kg.
Alcohol	5 kg.
Petroleum, Refined	5 kg.
Ethyl Acetate	5 kg.
Amyl Acetate	5 kg.
Butyl Phthalate	0.25 kg.
Turpentine	5 kg.
"Sextone B" or "Santicizers"	1 kg.

Poster Varnish

Manila Gum (29% Solution in Alcohol)	28 kg.
Lacquer	58 kg.
Triphenyl Phosphate	1 kg.
Butyl Alcohol	3 kg.
Acetone	1.25 kg.
Plasticizo	3.75 kg.
Alcohol	5 kg.

Cellulose Varnish

Nitrocellulose (⅛ to 12 sec.)	38 kg.
Butyl Acetate	41 kg.
Ethyl Acetate	21 kg.
Petroleum Naphtha, Refined	16 kg.
Alcohol	9 kg.
Methyl Ketone	4 kg.
Ethyl Phthalate	2 kg.

Transparent Paper Varnish

a. Gelva 2	14 kg.
Benzol or Toluol	18 kg.
b. Nitrocellulose (½ sec.)	7 kg.
Ethyl Acetate	4 kg.
Butyl Acetate	5 kg.
Benzol or Toluol	14 kg.
Alcohol	14 kg.
Butyl Stearate	0.5 kg.
Butyl Phthalate	5 kg.
Butanol	5 kg.

Make the resin solution *a*, and separately the cotton solution *b*.

Mix thoroughly.

For more hygroscopic mixtures, use 1 kg. ethylene glycol instead of alcohol.

Paper Varnishes

Formula No. 1

Dammar, Gum	16 lb.
Rosin	3 lb.
Turpentine	½ gal.
Solvent Naphtha	1 gal.

No. 2

Dammar, Gum	18 lb.
White Spirit	¾ gal.
Xylol	¼ gal.

Varnishing Wall Paper

A weak solution of gelatin is recommended, with addition of 5 per cent of a saturated solution of alum. This should be applied quickly, thinly and evenly, with a large brush, allowed to dry, and the process repeated the following day. Any varnish may be applied on top.

Wall Primer Varnish

(10 gal. Oil Length)

Zinc Sulphide	606 lb.
Aratone	142 lb.
Asbestine	1420 lb.
Whiting	710 lb.
10 Gal. Phenolic Varnish	
Fixed Vehicle	1203 lb.
Volatile and Driers	994 lb.
Varsol	369 lb.

Wall Primer Varnish

(15 gal. Oil Length)

Titanox C	890 lb.
Aratone	142 lb.
Asbestine	1278 lb.
15 Gal. Phenolic Varnish	
Fixed Vehicle	1048 lb.
Volatile and Driers	1063 lb.
Varsol	415 lb.

Varnish for Rubber

French Patent 803,134

Chlorinated Rubber	100 g.
Toluol	200 g.
Dye	50 g.
Cymene	40 g.
China Wood Oil	120 g.
Ethyl Methyl Ketone	300 g.

"Anchoring" Varnish to Rubber

British Patent 458,904

Rubber is pretreated by immersing in a solution of bromine in carbon tetrachloride to get good adhesion of chlorinated rubber varnish.

Varnish (5 gal. Oil Length)

Abalyn	150 lb.
Bakelite BR 3360	50 lb.
Tung Oil	78 lb.
Lead Naphthenate (24% Pb) Drier	2 lb.
Manganese Naphthenate (6% Mn) Drier	2½ lb.
Cobalt Naphthenate (6% Co) Drier	½ lb.
Mineral Spirit (Varsol)	150 lb.

Net Weight per Gallon—7.87 lb.

Approximate Yield—52.8 gal. (allowing 4% loss).

Cooking Instructions: Run Abalyn and tung oil to 300° F. Add BR 3360 and gain 450° F. Hold for reaction. Cool, thin, and add driers.

Varnish (10 gal. Oil Length)

Abalyn	450 lb.
Super-Beckacite 1001	150 lb.
Tung Oil	468 lb.
Lead Naphthenate (24% Pb) Drier	6 lb.
Cobalt Naphthenate (6% Co) Drier	3 lb.
Mineral Spirit (Varsol)	874 lb.

Varnish (15 gal. Oil Length)

Abalyn	225 lb.
Super-Beckacite 1001	75 lb.
Tung Oil	351 lb.
Lead Naphthenate (24% Pb) Drier	6 lb.
Cobalt Naphthenate (6% Co) Drier	3 lb.
Mineral Spirit (Varsol)	651 lb.

Net Weight per Gallon—7.44 lb.

Approximate Yield—167.4 gal. (allowing 5% loss).

Cooking Instructions: Run Abalyn, Super-Beckacite, and 117 parts tung oil to 450° F. Hold until reaction is complete. Add remainder of tung oil and gain 565° F. Drop to 465° F. and hold for soft pill. Cool, thin, and add driers.

Tar Oil Varnishes

A regenerated or prepared tar obtained by the admixture of solid pitch with neutral coal-tar oil of specific gravity 0.99 is used and the following compositions are given as proving satisfactory in preliminary tests:

Red Roofing Varnish—2 kg. dark rosin, 0.5 kg. coal-tar pitch, 2.2 kg. rosin oil, 0.3 kg. precipitated manganese resinate, 1.2 kg. heavy tar oil, 1.5 kg. red iron oxide.

Black Roofing Varnish—2 kg. coal-tar pitch, 2 kg. crude rosin oil, 0.3 kg. precipitated manganese resinate, 1 kg. heavy coal-tar oil, 0.3 kg. carbon black.

Black Tar Varnish for Iron—2.5 kg. coal-tar pitch, 1 kg. asphalt, 0.5 kg 5 per cent gloss varnish, 0.001 kg. litharge, 2.5 to 3 kg. heavy tar oil.

Tar Oil Varnish—1 kg. rosin, 0.1 kg. litharge, 4 kg. pale tar oil.

As a general binding agent for the preparation of tar varnishes: Melt 2.2 kg. rosin, then add 0.4 kg. linseed oil varnish and 0.05 kg. precipitated manganese resinate. Heat for one hour at 150° C., and after cooling add 1.8 kg heavy tar oil. This binding agent is mixed with pigments in various proportions to give varnishes of quite general applicability.

Soybean Oil Varnishes

Formula No. 1

Bakelite Resin BR No. 254	100	lb.
A.D.M. Nonbreak Soybean Oil	20	gal.
Mineral Spirits	23½	gal.
Toluol	5	gal.
Cobalt Nuodex Drier	3	pt.

The entire batch of oil and resin is placed in the kettle and heated to 585° to 600° F. as rapidly as possible and then held for a 3–5 inch string, which requires approximately 1–1.5 hours. After the batch is cooled sufficiently, the mineral spirits are added, and when the mixture is cold the drier is added, followed by toluol to bring it to the desired viscosity.

No. 2

Rosin Ester	100	lb.
A.D.M. Superb Soybean Oil	20	gal.
Mineral Spirits	24	gal.
Cobalt Nuodex Drier	3	pt.

The oil and resin are placed in the kettle and heated to 585° to 600° F. as rapidly as possible and held for a 5–8 inch string, which requires approximately 1.5–1.75 hours. After the mixture is cooled sufficiently, the bulk of the mineral spirits is added, and when cold the drier and enough additional spirits to bring it to the desired viscosity are added.

Medium Long Oil Varnish Without China Wood Oil

100 lb. Albertol, 100 lb. varnish linseed oil, 125 lb. linseed stand oil, 75 lb. thickened tung oil are used. The varnish linseed is heated to 302–392° F. and the resin gradually fed into the hot oil at such a rate that no accumulation of undissolved resin takes place. When the resin is all in, the batch is heated to 464–500° F. and the temperature maintained until a small sample taken from the batch and thinned with a double portion of thinners shows no sign of cloudiness, when cool. When this point is reached and not before, the two thickened oils are added and the heating of the batch is continued at 392–428° F. until a further sample remains quite bright when tested as above described. The batch is allowed to cool and during the cooling, first the driers and then

finally the thinners are added. When using a fluid siccative containing 2% of metallic cobalt, the quantity required for the above is 15 lb. The thinner is from 150 to 200 lb. The varnish dries dust-free in about one hour and is completely hard in 24 hours at the outside.

OITICICA STAND OILS AND VARNISHES

In using oiticica oil it has to be remembered that, although it is very similar to tung oil, it differs from it in some respects. It polymerizes less rapidly than tung oil, and the danger of gelatinizing is therefore, less. At the same temperature it takes about twice the time to gelatinize. If the oil is heated with resins the difference is more noticeable, and this property is an advantage. On the other hand, longer heating and higher temperature is required when producing stand oils or varnish from oiticica oil. It is possible to heat the oil and resin together. It is usual to polymerize oiticica oil at 280° C. The special propereies of the oil develop only at this and higher temperatures. Thus treated, the products obtained dry quickly, possess great hardness and resistance to water. The heating-time depends on the particular plant used and the amount and type of resin used.

All resins (natural or artificial) which can be used with tung or linseed oils can be used with oiticica oil. Although mixtures of equal parts of this oil and resin can be used, it is generally recommended to use, in products containing less resin, some linseed, tung or perilla oil.

Varnishes containing much resin should be heated until a sample taken from the kettle sets throughout and comes away from the glass cleanly.

A. Stand Oil

Oiticica oil can be heated alone, or with tung or linseed oils, for the production of stand oils. For the preparation of pure oiticica stand oil the oil should be polymerized to the greatest possible extent (about 200 poises at 20° C.). In this way there is a certainty of obtaining a product which, on long standing, does not give a deposit. If the oil is heated for a short time only to 150° C. it is liable to coagulate after some days' standing.

Pure Stand Oil

50 kg. oiticica oil are heated quickly to 280° C. and stirred. After two minutes the batch is quickly cooled. This is necessary in order to obtain high viscosity without gelatinization.

Stand Oil from Oiticica and Linseed Oils

120 kg. linseed oil and 60 kg. oiticica oil are heated to 280° C. and kept at this temperature until the viscosity is 40 poises. This can be used to replace a tung-linseed stand oil in quick-drying varnishes.

Enamels and Industrial Varnishes

100 kg. rosin, 6 kg. marble lime, 100 kg. oiticica stand oil, 300 kg. varnish benzine, 10 kg. lead-manganese drier. The rosin is hardened by means of the lime and is then added to the stand oil at 250° C. The mixture is heated to 280°–300° C. until a drop on glass comes away clean by pressure of the finger. The heating must be continued until this stage is reached, otherwise the resultant varnish will be sticky and slow-drying.

For a similar varnish raw oiticica oil and the rosin are heated together to 280° C. and the lime is added. As soon as the frothing has ceased the temperature is again raised to 280° C. and kept there until a sample withdrawn becomes quite hard on cooling. This varnish dries quickly and lasts well.

General Purposes Varnish

300 kg. oiticica oil, 100 kg. suitable synthetic resin, 300 kg. varnish spirit, 15 kg. paste drier. The oil is heated to 150° C., the synthetic resin is added and the temperature raised to 300° C. Heating is continued until the desired viscosity is reached. This should be as high as possible. After cooling the drier and spirit is added. This serves well as a mixing varnish for addition to pigments ground in stand oil, and makes a good japan varnish also.

Spar and Boat Varnish

120 kg. oiticica oil, 150 kg. tung oil, 30 kg. linseed oil, 100 kg. synthetic resin. A stand oil is first prepared, either from both oils together or separately. The resin is then added and the whole mixture is heated for a short time to 250° C. Drier and turpentine, as required, are then added.

Exterior Varnish

150 kg. oiticica oil, 150 kg. linseed-stand oil, 80 kg. synthetic resin. The oiticica oil is heated with the resin to 300° C. for 20 minutes and the batch cooled by the addition of the linseed-

stand oil. The oiticica oil may be first converted into a stand oil and then be used either with or without the linseed-stand oil.

Varnish for Outside Work

Oiticica Oil (Raw)	150 oz.
Linseed Stand Oil	150 oz.
Albertol 111L, Amberol BS/1 or Beckacite 100	80 oz.

Oiticica oil is heated together with the synthetic gums for about twenty minutes at 300° C., and then the batch is cooled by adding the linseed stand oil. Oiticica stand oil can be substituted in whole or in part for the raw Oiticica oil.

Spar and Yacht Varnish

Oiticica Oil	120 oz.
China Wood Oil	150 oz.
Linseed Oil	30 oz.
Albertol 111L, Amberol Bs/1 or Beckacite 100	100 oz.

The oils are first converted into a stand oil, gum is then added and heated to 250° C. The varnish is thinned with driers and turpentine.

When synthetic resins such as Albertols are employed, it is generally preferable to heat the Oiticica oil to a stand oil, rather than starting from the crude oil.

Quick-Drying Interior Varnish

Rosin	100 oz.
Marble Lime	6 oz.
Oiticica Stand Oil	100 oz.
White Spirit	300 oz.
Lead Manganese Driers	10 oz.

The rosin is hardened with lime and next added to the stand oil at 250° C. This mixture is heated at 280°–300° C. until a cooled drop snaps from a glass slide.

Oiticica oil may be substituted for the Oiticica stand oil in the above formula; in which case, the resin and Oiticica oil are melted together and lime added at 280° C.

Both these varnishes flow easily and dry well. The coats are durable and neither wrinkled nor shrivelled.

Crystal Varnish (Indoor)

Dammar, Gum	80 lb.
Turpentine	10 gal.

Stir until dissolved.

Hard Varnish for Floors

It is made by reacting a mixture of 1 part Beckacite, 1½ parts linseed stand oil containing some wood oil, with 5%–10% straight phenolic resin and diluted with mineral spirits to a solid content of 35%.

Colored Linseed Oil Floor Dressing

Formula No. 1

Yellow:

Linseed Oil	100 oz.
Orange R (I.G.)	0.7 oz.

No. 2

Brown:

Linseed Oil	100 oz.
Brown 3B (I.G.)	0.7 oz.

No. 3

Red-Brown:

Linseed Oil	100 oz.
Red 7B (I.G.)	0.35 oz.
Brown 3B	0.35 oz.

Wrinkle Finish Varnish

Gas Black	25 lb.
Rosin-Tung Oil Varnish (not more than 1 part Rosin to two parts Oil)	50 gal.

Grind, then add 128 gal. of the same varnish and 34 gal. Raw Tung Oil.

After application, the film is immediately baked at a temperature of 110–115° F. until the wrinkles are formed. Baking is then continued at a temperature of 300° F. for three hours in order to harden the film.

Brewer's Pitch and Keg Varnishes

Besides paraffin, which is now added to almost every pitch, no natural or composition pitch is entirely resistant to the action of beer. A satisfactory product contains 87% rosin, 8% tasteless resin oil and 5% paraffin; another contains 60% rosin, 30% pine oil, 6% resin oil and 4% paraffin. If the mixture is heated above 200° C., disagreeable tastes develop. Lacquers are considered as finishes for kegs. To be most satisfactory they should possess a shellac base. A good one is prepared as follows: 4 parts shellac and 5 parts resin are dissolved in 90% alcohol, and to increase the elasticity 1 part castor oil is added.

Undercoat Varnish

Linseed Stand Oil	21 g.
"Glyptal" Resin	16 g.
Ester Gum	12 g.
Drier	1 g.
Naphtha	50 g.

Quick Drying Varnish

100 lb. Albertol IIIL are dissolved in 300 lb. thickened china wood oil, to which is added 0.3 lb. metallic cobalt drier;

300 lb diluents such as 1 part naphtha, 2 parts white spirit.

This varnish dries dust free in about 40 minutes, is set to the touch in 2 hours and hard in 24 hours. Any of the usual pigments can be ground into this medium and the consistency adjusted to spraying with a mixture of equal parts turpentine and white spirit.

Mastic Varnish

Formula No. 1

Mastic	3 lb.
Rosin (WW)	2 lb.
Dammar	3 lb.
Turpentine	1 gal.

No. 2

Mastic	6 lb.
Turpentine	1 gal.

Spirit Finish

An interesting new spirit type of finish has been recently developed by a prolonged heat treatment of Vinsol and wood oil. 100 pounds of Vinsol and 10 gallons of wood oil are melted together quickly to 575° F. in one-half hour. The heat is then reduced to 500° F., and the batch held at that temperature for four hours and then poured into cooling pans. This material is hard and tough and a 4-pound cut in butyl acetate air dries in 20 minutes to a tough, clear, hard film. A half-hour bake at 100° C. greatly increases the hardness of this film, but darkens it a little. This process may be modified to suit requirements. Driers may be incorporated and other solvents and combinations will undoubtedly be found practical. Longer cooks of the Vinsol wood oil increase the hardness and toughness. Decreasing the wood oil lowers the cost and increases the brittleness.

"EL" Varnish

Formula No. 1

"EL" varnish has been produced to meet a shortage of linseed oil in Germany and contains ester gum (12), alkyd resin (16), linseed stand oil (21), drying agent (1), and benzoline (50%) by weight.

No. 2

Glycerol Phthalate Resin	4.4 kg.
Fatty Oil	36.4 kg.
Ester Gum	13.1 kg.
White Spirit	45 kg.
Metal Drier	1.1 kg.

Glossy Machine Paints and Varnishes

All varnishes containing pigments must be ground thicker than ordinarily as the pigments tend to reduce the gloss. Glossy machine paints and varnishes of maximum gloss and highest covering power are alcohol varnishes or enamels which dry rapidly, forming a uniformly smooth and non-sticking surface, if the material has been prepared and applied correctly. The films do not soften in the heat and are highly resistant to the action of lubricants. Their resistance towards alkalies also is comparatively high. The prime cost of these paints can be reduced somewhat by the addition of colophony, but only small quantities should be used for this purpose in order to avoid serious deterioration of technical properties.

The resins after pulverization should be added to spiritus, not vice versa, as the addition of spiritus to the resins may cause conglomeration of the latter. Attention is called to the fact that if Manila copal varnishes are mixed with other resin solutions, the latter must be added to the former slowly and gradually as rapid mixing is bound to lead to sliming of the Manila copal. Suitable mixtures are the following:

10 parts of shellac and 3 parts of oil of turpentine, or

10 parts of shellac and 3 parts of galipot are dissolved in 40 parts of 96-percent alcohol. The higher the quality of the copals employed for this purpose the larger must be the relative quantities of alcohol used. Satisfactory gloss can be obtained only with products of a sufficiently high degree of consistency.

20 to 25 parts of 96-percent alcohol are used for 10 parts of Accaroid resin yellow or red and 3 parts of oil of turpentine. In this case the relative quantity of alcohol required depends on the percentage of impurities introduced with the constituents of the mixture. If the accaroid solutions are too thin, they are not glossy enough, even if the finished mixtures containing this solution are of the correct consistency.

18 parts of 96-percent alcohol are required for 10 parts of Manila copal and 3 parts of oil of turpentine or galipot, although the better grades of this copal require a larger quantity of alcohol than the lower grades, and the consistency should always be high.

18 parts of 96-percent alcohol are used with 10 parts of colophony and 3 parts of oil of turpentine. Mixtures must never contain more than 25 percent of colophony solution as these solutions will yield a high degree of gloss, but relatively weak mechanical properties. Some types of colophony do not yield clear solutions or may even lead to precipitation but this can be stopped by adding

copal or synthetic resin solutions. The elasticity of these films, which is not particularly high in mixtures of this type containing a large percentage of colophony, is noticeably increased by the addition of 5 percent of castor oil or linoleic acid. More than 5 percent of these substances must never be added, as they tend to cause stickiness of the film and bad drying properties.

Glossy varnish compositions are the following:

White—10 parts of varnish-lithopone mixed with 19 parts of Manila copal solution (produced as indicated above).

Red—10 parts of varnish-red, light or dark, mixed with 20 parts of Manila copal solution.

Yellow—10 parts of chromium-yellow with 26 parts of Manila copal solution.

Orange—10 parts of chromium-orange with 26 parts of Manila copal solution.

Green—10 parts of chromium-green, light or dark, with 24 parts of Manila copal solution. Another suitable mixture is 10 parts of varnish-green, light or dark, with 20 parts of copal solution, or 10 parts of chromium oxide green with 24 parts of copal solution.

Brown—5 parts umber, light or dark, with 16 parts of Manila copal solution. Tinting by means of varnish-lithopone or Sienna earth, natural or burnt.

Brownish Red—5 parts of Sienna earth, burnt and 1 part of umber bark with 23 parts of Manila copal solution. Beautiful colors of this type can also be obtained by mixing varnish-red with black.

Black—1 part of lamp black and 20 parts of Manila copal solution, or 10 parts of ivory black with 22 parts of Manila copal solution. Both mixtures can be given a beautiful bluish tint by grinding 1 to 2 parts of Berlin blue together with the black pigment.

Gray—There are innumerable ways of producing grays of every possible tint, the mixtures with carbon black usually having a brownish tint while those of other black pigments generally appear bluish black. Greenish, bluish, reddish or yellow tints are easily obtained with these mixtures.

Light Gray—10 parts of varnish-lithopone and 0.5 parts of lamp black with 29 parts of Manila copal solution.

Medium Gray—10 parts of varnish-lithopone and 1 part of lamp black with 35 parts of Manila copal solution.

Dark Gray—10 parts of varnish-lithopone and 1.5 parts of lamp black with 45 parts of Manila copal solution.

GASOLINE PUMP ENAMEL VARNISH

Vinsol Pump Enamel Varnish

Vinsol	100	lb.
Tung Oil	21	gal.
Bodied Linseed (2 hr. at 575° F.)	4	gal.
Litharge	3	lb.
Precipitated Manganese Resinate	2	lb.
V. M. & P. Naphtha	62½	gal.

Add liquid cobalt driers if quicker dry is wanted.

Cooking Directions: Melt the Vinsol and all the tung oil quickly, run heat to 575° F. top heat, remove from fire and let cool to 460° F., remove one quart of the melt and make a sludge with the litharge in a separate container. Put kettle on the fire and at 460° F. add the litharge sludge. Run to 560° F. and hold for 12-inch string, check with the linseed oil, add the manganese at 450° F. on the way down, and reduce to 350° F. with the V. M. & P. Naphtha.

Green Enamel: Grind 1¼ lbs. C.P. light chrome green to a gallon of the above varnish 15 hrs. in the pebble mill.

Red Enamel: Grind 12 oz. C.P. toluidine toner to a gallon of the above varnish 15 hrs. in the pebble mill.

Stove-Pipe Varnish

Formula No. 1

Asphalt	2 lb.
Boiled Linseed Oil	1 pt.
Turpentine	2 qt.

No. 2

Linseed-Oil Varnish	10 fl. oz.
Burnt Umber	2 oz.
Asphalt	4 oz.
Turpentine	sufficient

No. 3

Asphalt	2 oz.
Rosin	2 oz.
Turpentine	12 oz.

Tough Varnish

Vinsol Resin No. 1	100 lb.
Thermolized Tung Oil	12 gal.
Raw Linseed Oil	3 gal.

Heat to 250° C. in twenty-three minutes and hold at 250–255° C. for forty minutes. Cool to 200° C. in twenty minutes and reduce with 18 gal. heavy coal tar naphtha. By reducing this further with naphtha before application, a very good wire enamel varnish for high temperature baking has been obtained. If more rapid drying is found necessary, the addition of manganese naphthenate drier has been found to be of advantage.

Tougher Varnishes

Formula No. 1

Formula for 5-Gallon Oil-Length Varnish

Abalyn	150	lb.
Bakelite 3360	50	lb.
China-wood Oil	10	gal.
(23½ gallon) Mineral Spirits	150	lb.
(24%) Lead Naphthenate Solution	2	lb.
(6%) Manganese Naphthenate Solution	2½	lb.
(6%) Cobalt Naphthenate Solution	½	lb.

Cooking Procedure: Abalyn, resin, and China-wood oil are run to 450° F. and held until reaction is complete, reduced, and driers added.

Characteristics:
Non-Volatile = 65%
Viscosity (Gardner-Holdt) = A
Color (Hellige) = 5 L

No. 2

Formula for 10-Gallon Oil-Length Varnish

Abalyn	100	lb.
Amberol ST 137	100	lb.
China-wood Oil	20	gal.
(45 gal.) Mineral Spirits	291	lb.
(24%) Lead Naphthenate Solution	2⅔	lb.
(6%) Cobalt Naphthenate Solution	1⅓	lb.

Cooking Procedure: Abalyn, Amberol, and 3 gal. of China-wood oil are run to 450° F. and held until reaction is complete (15–20 min.). Balance of China-wood oil is added and the batch run to 565° F. The cook is cooled to 465° F. and held for 40 in. string off of a cold pill. The batch is cooled, reduced, and driers added.

Characteristics:
Non-Volatile = 55%
Viscosity (Gardner-Holdt) = C
Color (Hellige) = 6

No. 3

Formula for 15-Gallon Oil-Length Varnish

Abalyn	150	lb.
Super-Beckacite 1001	50	lb.
China-wood Oil	30	gal.
(67 gal.) Mineral Spirits	434	lb.
(24%) Lead Naphthenate Solution	4	lb.
(6%) Cobalt Naphthenate Solution	2½	lb.

Cooking Procedure: Same as in No. 2 except China-wood oil is not added until after reaction of Abalyn and Beckacite is complete.

Characteristics:
Non-Volatile = 50%
Viscosity (Gardner-Holdt) = C
Color (Hellige) = 5 L

Ethyl Cellulose Varnishes

	Formula No. 1	No. 2
Raw Linseed Oil	12	— lb.
Blown Linseed Oil	—	10 lb.
Cumar W	8	— lb.
Amberol ST 137	—	10 lb.
Ethyl Cellulose (Low Visc.)	4	10 lb.
Toluol	43	— lb.
Xylol	10	56 lb.
Butanol	6	14 lb.
Butyl Acetate	17	— lb.
% Lead as Metal (Based on Solids)	3.85%	no drier
% Cobalt as Metal (Based on Solids)	0.08%	
Drying Time	3.5 hrs.	45 min.

Cellulose Acetate Varnish

Cellulose Acetate	10 oz.
Acetone	30 oz.
Methyl Propionate	50 oz.
Ethyl Alcohol	8 oz.
Plasticizer	2 oz.

Lacquer, Brush or Roller

Nitrocellulose (5 sec.)	15 oz.
Thinner	25 oz.
Mesityl Oxide	25 oz.
Denatured Ethyl Alcohol	12 oz.
Isobutyl Alcohol	10 oz.
Plasticizer	13 oz.

Hard, Flexible, Colorless Lacquer for Roller Application

Film Scrap	10 oz.
Acetone	35 oz.
Plasticizer	3 oz.
Methyl Alcohol	32 oz.
Mesityl Oxide	20 oz.

Vinsol Varnish

Vinsol Resin	100 lb.
Raw China-wood Oil	5 gal.

Heat to 575° F. and hold until foaming subsides (5 to 10 minutes). Add 20 gallons of oil (more if longer varnish is desired). Heat to 565° F. and hold to a string from glass. Allow to cool and reduce with 60 gallons of mineral spirits.

This method can be adapted to the production of varnishes of any oil length by varying the amount of the second addition of oil, but in all cases the first melt must be made with 5 gallons of oil, a temperature of 575° F. minimum must be reached, and heating until the foaming ceases must be adhered to strictly. In the case of varnishes of less than 25-gallon oil length, if it is desired to reduce to below 50 per cent or 60 per cent solids concentration, it is found advisable to use higher powered solvents than straight mineral spirits. For this purpose, the hydrogenated petroleum solvents, such as Solvesso No. 2, are recommended as being the most satisfactory tested to date.

25 Gal. Vinsol Varnish

Vinsol	100	lb.
Raw China-wood Oil	21	gal.
2-Hour Bodied Linseed Oil	4	gal.
Litharge	30	lb.
Precipitated Manganese Resinate	20	lb.
V. M. & P. Naphtha	62½	gal.

Add liquid cobalt naphthenate driers if quicker dry is wanted.

Melt the Vinsol and all the wood oil quickly, run heat to 575° F. top heat, remove from fire and let cool to 460° F., remove one gallon of the melt and make a sludge with the litharge in a separate container. Put kettle on the fire and at 460° F. add the litharge sludge. Run heat to 560° F., and hold for a 12-inch string. Check with the linseed oil. Add the manganese at 450° F. on the way down and reduce at 350° F. with the V. M. and P. naphtha.

Vinso-Fossil Resin Varnish

Vinsol	80	lb.
Congo Dust	20	lb.
Raw Wood Oil	10	lb.
Mineral Spirits	28	gal.

Add liquid naphthenate driers to requirements.

Run the Vinsol and the Congo together for about one hour at 600° F., raise the heat to 650° F. for 15 minutes. The two gums will fuse together and drip off the paddle like oil. When the foaming subsides drop the heat to 500° F., and add the wood oil which should be previously heated to 450° F. in a separate kettle. Run the mix to 575° F. and hold for 12-inch string. The ingredients will be found to combine perfectly and may be reduced at 450° F. with mineral spirits or with V. M. & P. at 350° F.

This varnish offers definite possibilities as a vehicle for low-cost pigmented enamels of the chassis black types and is gasoline and oil resisting.

Shellac, Compound

60 per cent zinc-hardened Vinsol and 40 per cent dry orange shellac by weight. The Vinsol is melted to 450° F. and 3 per cent of zinc oxide on the weight of the Vinsol is sifted in and the temperature gradually raised to 575° F., then cooled to 400° F., at which point the shellac is added and when thoroughly blended the mix is poured into cooling pans. A 4-pound cut of this blend behaves very much as pure shellac in the majority of tests.

Shellac Substitute

Formula No. 1

5–6 sec. SS Nitrocellulose	2	lb.
Vinsol Resin No. 1	8	lb.
Dibutyl Phthalate	2	lb.

The nitrocellulose is first put into solution in a mixture of 30 parts toluol and 70 parts denatured alcohol. The resin and plasticizer are then added. When complete solution is obtained, the composition can be thinned to any desired consistency with alcohol without precipitation of any of the constituents. To use RS nitrocellulose, it is necessary to include some ester solvents or other solvents for nitrocellulose so as to obtain compatibility.

This type of film has all the desirable characteristics of a shellac, except that it is too dark in color to replace bleached shellac.

No. 2

Copal gum (Congo, Manila) is masticated, while plastic, at 32–49° C. under pressure (<50 lb./sq. in.) for <15 min., giving a product completely soluble in alcohol.

No. 3

Canadian Patent 354,087

Pontianak Gum	250	oz.
Soda Ash	8	oz.
Alcohol	375	oz.
Toluol	375	oz.

Electrolytic Bleaching of Shellac

Japanese Patent 11,607

An alternating current of 0.005–0.01 ampere per sq. cm. is passed through a 10% aqueous alkaline solution of shellac below 70° C.

Shellac Paints for Bituminous Surfaces

First paint or spray with a 10–15% shellac solution in alcohol-toluol to improve adhesion. Then spray with a paint of following composition.

Formula No. 1

Cashew Nut Shell Oil	15	lb.

Heat at 120° C. for 1 hr. Cool and add

Alcohol	60 lb.
Shellac	25 lb.
Lithopone or Other Pigment	100 lb.

No. 2

Lithopone	150 lb.
Shellac	45 lb.
Methyl Cyclohexyl Phthalate	20 lb.
Castor Oil	2 lb.
Alcohol	150 lb.
Butyl Alcohol	3 lb.

Furniture Dye (Stain)

Dark Smoky Brown

Potassium Bichromate	3.5 g.
Copper Sulphate	5 g.
Ebony Dye	3.5 g.
Orange Dye	5 g.
Yellow Dye	0.5 g.
Water	900 g.
Ammonia	100 g.

Shingle Stain

Sardine Oil, Heavy Bodied, Refined	50 gal.
Chrome Green (25%)	50 lb.
Talc	5 lb.
Mineral Spirits	20–30 gal.

Shingle Stains

Many shingle stains are made by diluting a cheap paste paint or color with linseed oil and distillate. The use of anthracene oil instead of the distillate, will give a much better product at little additional cost, and requires about 20% less linseed oil.

Wax Stains and Finishes

Wax is one of the most useful and desirable raw materials for protective coatings of all kinds. Its chemical inertness and extreme resistance to moisture and other agents that tend to attack and destroy finishes make it perhaps the ideal base material on which to build a finishing system. Its high price and some other undesirable properties have militated against its more general application in the paint and varnish industry. With the introduction of synthetic waxes, most of these objections have been removed and it is to be hoped that waxes receive more attention. Waxes seem to offer possible solutions of a number of problems which, so far, have resisted all attempts at successful solution with the ordinary means at the disposal of the paint formulator.

Wax finishes are usually made from a solution of shellac into which some wax is incorporated. The shellac cut in alcohol is mixed with a solution of wax in turpentine or turpentine substitute. A thick emulsion results which has good application and drying properties and yields a finish with good gloss. The gloss of this finish depends largely on the ratio of shellac to wax decreasing with increasing wax content. The gloss may also be modified by rubbing or brushing the film.

The shellac solution may be replaced by a synthetic resin which can be dissolved in a suitable solvent. The choice of the wax depends to a large degree on the effect desired. Among the more common waxes are beeswax, carnauba, montan, ozokerite, paraffin, shellac, and a large number of synthetic waxes. A typical formula follows:

Wax Finish

Orange Shellac	14 oz.
Alcohol	60 oz.
Carnauba Wax	2 oz.
Paraffin (50/52° C.)	1 oz.
Turpentine	23 oz.

The shellac is dissolved in the alcohol either in the cold or with the aid of heat. The waxes are melted and thinned with the turpentine. The shellac solution is warmed to about 122° F. and the warm (140° F.) wax solution is slowly stirred into the alcohol solution. The mixture is allowed to cool under constant stirring. The mixture may be colored with suitable dyestuffs.

The wax stains are either solutions of wax in turpentine or emulsions of wax in water. The emulsions are stabilized with the aid of alkalies, such as ammonia or potash. They are colored with water soluble dyes. The proper selection of waxes insures the desired gloss, harder waxes giving a higher gloss than so-called soft waxes. Such a stain may have the following composition:

Wax Stain

Carnauba Wax	4 oz.
Ozokerite, Refined	2 oz.
Paraffin (50/52° F.)	2 oz.
Sudan Yellow Dye	2 oz.
Thinner	90 oz.

When preparing a turpentine stain, the waxes are melted and thinned. The dye is best dissolved in the waxes before adding the ozokerite. The thinner should be warmed before adding it to the molten waxes. The mixture is allowed to cool while stirring constantly to avoid a separation of the components.

A water emulsion stain may have the following composition:

Emulsion Stain

Montan Wax, Double Bleached	7 oz.

Potassium Oleate	3 oz.
Potash, Caustic	0.8 oz.
Water Soluble Dye	2 oz.
Water	87.2 oz.

The potash, the soap and the dye are dissolved in the boiling water. The boiling solution is then slowly poured into the wax melt adding it in small portions at a time. Care must be taken that a drop in temperature does not cause a separation. It is essential that the mixture be stirred constantly while cooling.

FURNITURE LACQUERS

	Formula No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
R.S. ½ Sec. Nitrocellulose	8.0 g.	8.0 g.	8.0 g.	8.0 g.	8.0 g.	8.0 g.	8.0 g.
Castor Oil No. 15	2.4 g.	2.4 g.	—	—	—	—	2.4 g.
Dibutylphthalate	1.6 g.	1.6 g.	—	—	—	—	1.6 g.
Hercolyn	—	—	6.4 g.	5.0 g.	5.0 g.	5.0 g.	—
Petrex No. 1	—	—	—	—	—	7.0 g.	8.0 g.
Rosin Modified, Maleate Resin No. I	8.0 g.	—	3.2 g.	—	7.0 g.	—	—
Rosin Modified, Maleate Resin No. II	—	8.0 g.	—	7.0 g.	—	—	—

Solvent to make 100 g.

No. 8

Rosin, Pale	30 kg.
Lime Hydrate (To Harden Rosin)	1.5 kg.
Zinc Oxide	0.3 kg.
Tung Oil	20 kg.
Linseed Oil	10 kg.
Litharge	0.3 kg.
Benzine	37 kg.
Cobalt Linoleate Drier	0.9 kg.
This Lacquer	75 kg.

is used combined with

Linseed Oil-Wood Oil (9:1)	22 kg.
Benzine	2 kg.
Cobalt Linoleate Drier	1 kg.

Flat Lacquer
German Patent 647,416

Clear Lacquer	100 g.
Boric Acid Solution (20% Solution in Methanol)	10 g.

Clear Lacquer
German Patent 647,416

Nitrocellulose	50 g.
Ethylene Glycol	15 g.
Butanol	30 g.
Butyl Acetate	15 g.
Dibutyl Phthalate	15 g.
Ethyl Acetate	35 g.
Shellac Solution (1:1 Wax Free Shellac in Alcohol)	64 g.

Clear Furniture Lacquer Base

Dry Nitrocellulose	100 oz.
Teglac Resin	100–200 oz.
Blown Castor Oil	10– 20 oz.
Dibutyl Phthalate	10– 20 oz.

Wood Lacquer

Nitrocellulose R.S. ½ Second Viscosity (Dry Weight)	10 oz.
Vinsol Resin	8 oz.
Dibutyl Phthalate	4 oz.
Solvent	78 oz.

Lacquer for Wooden Floors

Albertol 117R	100 lb.
Linseed Oil Stand Oil	40 lb.
Wood Oil, Bodied	80 lb.
Lead-Manganese Resinate Drier (4% Lead, 1% Manganese)	4 lb.
Cobalt Drier (1% Cobalt)	1 lb.
Benzine	175 lb.

Floor Polish (Lacquer)

Orange Shellac	280 g.
Linseed Oil Varnish, Light	80 g.
Ochre, Light or Dark	50 g.
Alcohol, Denatured	1 l.

Stir altogether, and let stand in a container.

Inside Gloss White Lacquer

Gelva (2.5)	415 lb.
Titanox C	460 lb.
Xylol	50 gal.
Amyl Acetate	40 gal.
Butyl Alcohol	5 gal.
Naphtha, V. M. & P.	5 gal.

Typical Cellulose (Nitro.) Lacquer

Nitrocellulose	8 lb.
Shellac	5 lb.
Plasticizer	10 lb.
Alcohol	17 lb.
Butyl Acetate	40 lb.
Butanol	10 lb.
Acetone	5 lb.
Glycol Mono Acetate	5 lb.

Oil Resisting Lacquer

Wet (5–6 Sec.) Nitrocellulose	15
Vinsol Resin #2 (7 lb. Cut)	25
Toluol	25

Butyl Alcohol	5
Ethyl Acetate	10
Butyl Acetate	15
Lindol	5

Durable Brushing Lacquer

Wet (¼ Sec.) Nitrocellulose	17 oz.
Blown Soya Bean Oil	30 oz.
Titanium Dioxide	13 oz.
Zinc Oxide	3 oz.
Varnoline	15 oz.
Butyl Alcohol	7 oz.
Butyl Lactate	15 oz.

Ski Lacquer (to Use as Base for Waxes)

Shellac	20 g.
Manila Copal	5 g.
Linoleic Acid	1 g.
Alcohol, Denatured	100 g.

Put the liquid on the dry bottom of the skis. Apply several times until well impregnated.

Ski Lacqeur
Swiss Patent 176,071

Nitrocellulose	6 g.
Shellac	4 g.
Amyl Acetate	6 g.
Butyl Acetate	3 g.
Alcohol	1 g.
Ethyl Acetate	5 g.

Wax "Lacquer"

a.	Orange Shellac	14 kg.
	Alcohol	60 kg.
b.	Carnauba Wax	2 kg.
	Paraffin, 50/52° C.	1 kg.
	Turpentine	23 kg.

Heat *a* to 50° C. on steam-bath, *b* to 60° C. separately.

Add *b* to *a* with thorough stirring; agitate until cold.

"Lacquer" for Furniture, Shellac

White:	
Shellac, Bleached	50 kg.
Alcohol	100 kg.
Linseed Oil Fatty Acid	1 kg.
Yellow:	
Shellac, Lemon	50 kg.
Alcohol	150 kg.
Linseed Oil Fatty Acid	up to 5 kg.
Brown:	
Ruby Shellac	50 kg.
Alcohol	160 kg.
Linseed Oil Fatty Acid	up to 5 kg.

Gelva Outside Lacquers

Toluol	70 gal.
Xylol	20 gal.
Tetrachlorethane	10 gal.
Gelva (7)	250 lb.

To get colored and metallic finishes add any one of the following:

For		
White	Titanox C	420 lb.
Red	Toluidine Red Toner	50 lb.
Blue	Ultramarine	155 lb.
Black	Lampblack	13 lb.
	Sudan Black B	3 lb.
Bronze	Copper Bronze Powder	105 lb.
Aluminum	Aluminum Powder	210 lb.

Luminous Outdoor Lacquer
U. S. Patent 2,039,734

Formula No. 1

¼ kilogram of polystyrene is dissolved in a mixture of ¼ kilogram each of toluene, xylene and butyl acetate; about 40 grams of tricresyl phosphate are added as a softening agent and about 1 kilogram of a luminous paint, for instance on the base of strontium sulfide/bismuth and rubidium, is carefully introduced, while stirring. The lacquer of luminous paint thus obtained can be applied on ceiling-plaster and wall-plaster, porcelain, glass, wood, aluminum, metallic supports, paper, pasteboard, artificial foils or the like, i.e., on any desired base. In some cases it is advisable to apply a suitable first coating, for instance titanium white or lithopone in a lacquer of polystyrene, previously to the application of the luminous paint in order to secure a well reflecting and weatherproof support.

No. 2

Into a solution consisting of 200 grams of vinyl naphthalene in a mixture of 200 grams of toluene, 200 grams of xylene, 200 grams of butyl acetate and 30 grams of tricresyl phosphate there are introduced about 0.8 kilogram of a luminous paint, for instance a well luminescent zinc sulfide or an organic boric acid luminous substance. The lacquer of luminous paint thus obtained is applied on any desired surfaces or articles which are to be made luminescent.

No. 3

For the preparation of fluorescent and phosphorescent shaped bodies and foils or the like, about 2½ kilograms of a luminous paint, for instance on the base of calcium sulfide, strontium sulfide or zinc sulfide, are introduced into about 12 liters of styrene; a small quantity of sulfuric acid is added and the whole is heated for about 4 hours to about 140° C. in order to produce polymerization. As soon as the required consistency is obtained, the mass is poured into the desired moulds and allowed to solidify. Foils can likewise be sprayed or rolled from this product.

Luminous Lacquer Coating

Five lbs. luminous pigment is mixed with sufficient lacquer to make a gallon. No grinding of the pigment with vehicle required. For air brush application 7 oz. luminous pigment with sufficient lacquer to make a pint. The same proportions hold where dammar varnish is employed as a vehicle in place of the lacquer. The lacquer possesses numerous advantages over varnishes. It is rapid drying, does not discolor when exposed to sunlight and has good weathering properties.

Lacquers—The usual water clear variety answers, but the coating must be applied shortly after mixing, as jellying will take place. It masks any possible odor from the pigment and stands severe weather conditions over a long period. When the luminous lacquer coating is applied to old painted surfaces a base coat of white pigment lacquer enamel free from lead is put on and over it the luminous coating. As a finish and to add to life out-doors a finishing coat of the clear lacquer is recommended.

Luminous surfaces should be left exposed to daylight up until darkness or to artificial light during the evening.

Crystallizing Lacquer

Paradichlorbenzene	20 lb.
Nitrocellulose (½ Sec.)	10 lb.
"Cellosolve"	1¼ gal.
Butyl Acetate	1¾ gal.
Ethyl Acetate	2½ gal.
Toluol	3¾ gal.
Petroleum Ether	4½ gal.

Clear Auto Lacquer Base

Dry Nitrocellulose	100 oz.
REZYL 19	250 oz.
Dibutyl Phthalate	60 oz.

Black Automobile Lacquer

Asphaltum	54 lb.
Resin (Kongo or Kauri, or Modified Phenol Resin)	54 lb.
Linseed Oil	12 gal.
Turpentine Oil	18 gal.
Litharge	6 lb.
Cobalt Linoleate (4% Cobalt)	2.5 lb.

Melt the asphaltum with some oil with stirring at 250° C., and add the resin. Add the balance of the oil, heat for half an hour, until all is well dissolved and homogeneous. Stir in the drier, and keep heating, to disperse the drier well, stirring all the time.

Allow to cool to 180° C., and add the turpentine.

Store for several months in tanks. Centrifuge, and fill into cans.

Aluminum Lacquer for Automobile Cylinders

a. Hard Rosin	4 kg.
Turpentine	14 kg.
Linseed Oil	0.5 kg.
b. Aluminum Filings	5 kg.

Make a solution of the melted rosin *a* and work in *b*. Caution, inflammable!

Black Lacquer for Steering Wheels

Shellac	4 kg.
Black Dye	1 kg.
Alcohol	5 kg.
Plasticizer	0.2 kg.

Clear Metal Lacquer Base

Dry Nitrocellulose	100 oz.
REZYL 14	100–200 oz.
Dibutyl Phthalate	35– 50 oz.

Treatment for Adhering Lacquer to Chromium Plate

Trisodium Phosphate	30 oz.
Caustic Soda	4 oz.
Water	200 oz.

The solution is used boiling hot. Clean one minute and rinse twice in clean boiling water. Dry with air.

Beer Can Lacquer

U. S. Patent 2,060,572

Partially Resinified Vinyl Resins	15.20 oz.
Methyl Ethyl Ketone	12.16 oz.
Hexone	12.16 oz.
Butyrone	6.08 oz.
Toluol	24.00 oz.
Naphtha (Coal Tar)	7.00 oz.
Phosphoric Acid (85%)	0.60 oz.

Spray on cleaned inner walls of cans and bake for 15 minutes.

Stove Lacquer

Gilsonite Asphaltum	40 kg.
Copal	5 kg.
Ester Gum	5 kg.
Lampblack	5 kg.
Lacquer Benzine	100 kg.

Asphaltum Lacquer for Iron

Asphaltum	24 lb.
Ester Gum	7 lb.
Carbon Black	3 lb.
Benzol	33 lb.
Benzine	33 lb.

Shellac Lacquers for Tin Foils

Base:

Shellac, Bleached	25 kg.
Alcohol	100 kg.
Boric Acid, Crystals	1 kg.

Dyes: 0.25–0.5 kg. of coal-tar dyes, such as Brilliant Green, Tropeolin, Auramin, etc.

Metal Foil Lacquer

British Patent 427,864

Nitrocellulose	18 oz.
Dibutyl Phthalate	4 oz.
Ethyl Alcohol	9 oz.
Methanol	9 oz.
Acetone	36 oz.
Butyl Acetate	24 oz.

Insulating Cable Lacquer

U. S. Patent 2,096,448

Nitrocellulose	12.5 oz.
Tricresyl Phosphate	15.5 oz.
Mineral Oil	00.7 oz.
Ethyl Acetate	25.0 oz.
Alcohol	15.0 oz.
Toluol	31.3 oz.

Insulating Lacquer

Italian Patent 273,391

Ethyl Cellulose	10 g.
Cumarone Resin	3 g.
Benzol	60 cc.
Solvent Naphtha	24 cc.
Alcohol	2 cc.

RUBBER LACQUER

(For adhesion to rubber mats and floor coverings)

½" Cotton Solution (25%)	3½ lb.
Resin Solution	½ lb.
Paraplex 5 B	1 lb.
Anon	¼ lb.

Dissolve in lacquer thinner.

Rubbing Clear Lacquer

½" Cotton Solution (25%)	3 lb.
Ester Gum (#8 Cut)	½ lb.
Amberol 801 (#8 Cut)	½ lb.
Butyl Stearate	⅛ lb.
Dibutyl Phthalate	½ lb.

Dissolve in solvent.

Latex Dope

Cotton Solution #3	3 lb.
Paraplex R92	½ lb.

Dissolve in solvent.

Rubber Lacquer

Cotton	½ lb.
Resins	3 oz.
Paraplex 5 B	2 oz.

Dissolve in solvent.

Gloss Rubber Coating Lacquer

Wet (15–20 Sec.)

Nitrocellulose	18 oz.
Toluol	32 oz.
Ethyl Alcohol	10 oz.
Ethyl Acetate	15 oz.
Butyl Acetate	5 oz.
Blown Linseed Oil	10 oz.
Blown Soya Bean Oil	10 oz.

Electric Cable Lacquer

U. S. Patent 2,096,448

Nitrocellulose	12.5 oz.
Tritolyl Phosphate	15.5 oz.
Mineral Oil	0.7 oz.
Ethyl Acetate	25.0 oz.
Alcohol	15.0 oz.
Toluol	31.3 oz.

Lacquer for Shoe Tips

Formula No. 1

Ruby Shellac	30 lb.
Turpentine, Venice	1 lb.
Sandarac	1 lb.
Castor Oil	1 lb.
Alcohol	150 lb.
Aniline Black	5 lb.
Carbon Black	to desired consistence

No. 2

Beckacite 100	800 g.
Wood Oil	500 g.
Stand Oil	300 g.
Turpentine	1250 g.
Drier	as needed

Suede Finish Lacquer

U. S. Patent 2,069,470

On material such as metal or wood there is applied a coating consisting of polyhydric alcohol-polybasic acid resin 30, a pigment 18, cobalt naphthenate 0.1, "mineral spirits" 11.9, turpentine 20 and xylene 20% and, before drying, there is blown on the viscous material a body of flock corresponding substantially to the color of the viscous material, the rate of drying being sufficiently slow to allow time for the application of the flock but rapid enough to air-dry sufficiently to permit packing and shipping within 2–6 hours.

Cloth Coating Lacquer

Wet (15–20 Sec.)

Nitrocellulose	18 oz.
Solvesso #1	30 oz.
Ethyl Alcohol	10 oz.
Ethyl Acetate	17 oz.
Butyl Acetate	7 oz.
Blown Castor Oil	9 oz.
Baker's Plasticizer P-6	9 oz.

"Lacquer" for Glassine Paper

U. S. Patent 2,096,662

Chlorinated Rubber	100 oz.
Cumarone Resin	10–50 oz.
Paraffin Wax	3 oz.
Magnesium Oxide	3 oz.
Hexamethylenetetramine	3 oz.

Mix together in a heated mill.

Gloss Paper Coating Lacquer

Nitrocellulose (¼ Sec.)	20 lb.
Toluol	15 lb.
Methyl Ethyl Ketone	15 lb.
"Cellosolve	5 lb.
Ester Gum (#8 Cut)	35 lb.
Lindol	5 lb.

Sealing Lacquer for Bottles Quick-Drying

Collodion Wool (Pyroxylin)	3– 5 g.
Rosin	20–25 g.
Boric Acid	1 g.
Ether-Alcohol (1:1)	100 g.

For colored lacquers, add

Pigment (Chromium Yellow, Ochre, Zinc Green, Ultramarine)	15–20 g.

Bottle Lacquer

Rosin	25 kg.
Collodion	25 kg.
Ether	30 kg.

Blue Lacquer for Electric Bulbs to Darken Light for Air Protection

Amyl Acetate, Hot	100 g.
Zapon Lacquer	900 g.

Plus:

Ceres Blue 4 Base	0.2 g.

Or instead for deeper shades:

Ceres Blue 4 Base	1.2 g.

or

Ceres Blue	5 g.
Ceres Violet	0.4 g.

or

Ceres Blue	0.67 g.
Ceres Yellow	0.2 g.
Ceres Red	0.14 g.
Ceres Black	0.08 g.

Make the dye solution, as desired, filter hot (caution, inflammable), add hot to Zapon lacquer, to prevent separation of the dyes.

Lacquer for Putty

Formula No. 1

Albertol Resin 111L	1 kg.
Linseed Oil Stand Oil	0.8 kg.
Wood Oil Stand Oil	0.2 kg.

No. 2

Albertol Resin 111L	1 kg.
Heavy-Bodied Oil	1.5–2 kg.

No. 3

Albertol Resin 111L	1 kg.
Heavy Bodied Tung Oil	2.5 kg.

Stencil Correcting-Lacquer

Resin, Sandarac	4 kg.
Turpentine, Thick	2 kg.
Alcohol	12 kg.
Ether	2 kg.

Correcting Lacquer for Multigraph Stencil

Collodion Wool	6 g.
Butyl Acetate	25 g.
Ethyl Lactate	20 g.
Butanol	5 g.
Alcohol	45 g.

Black-Board "Lacquer"

a. Copal	200 g.
Ether	400 g.
Shellac	1000 g.
Sandarac	500 g.
Alcohol	4 l.
b. Turpentine	30 g.
Pine Soot	150 g.
Ultramarine Blue	50 g.
Naxos Emery, Finest	1000 g.

Make solution *a* and suspend the materials *b* in it by thorough grinding and stirring.

Smooth the board, before applying this lacquer, with pumice abrasive powder.

Burn the lacquer into the wood.

Dry, and polish with pumice powder again. Repeat application of lacquer, but let it dry regularly this time.

Sealing Lacquer

Turpentine, Heavy	10 kg.
Shellac	6 kg.
Rosin, Pale	5 kg.
Turpentine Oil	1 kg.
Chalk	3 kg.
Kieselguhr	3 kg.
Barytes	1 kg.
Light Iron Oxide Red	4 kg.

Black Lacquer

Formula No. 1

Nitrocellulose (½ Sec.)	15 oz.
Oxidized Castor Oil	23 oz.
Kauri Copal	9 oz.
Isobutyl Alcohol	110 oz.
Normal Butyl Acetate	110 oz.
Urea Resin	23 oz.
Normal Butyl Alcohol	45 oz.

No. 2

Nitrocellulose (½ Sec.)	28 oz.
Tricresyl Phosphate	4 oz.
Amyl Acetate	18.2 oz.
Butyl Acetate	16.2 oz.
Butanol	26.4 oz.
Toluol	47.4 oz.
Ester Gum (Fused at 300° C.)	15 oz.

Heat Bodied Linseed Oil (Fused together at 300° C.)	15 oz.
Xylol	6 oz.

For a pigment use a high-grade carbon black ground in a plasticizer, employing the minimum quantity that will give solid obliteration in one coat.

No. 3

Cheap Black Lacquer

Wet (5–6 Sec.)

Nitrocellulose	10 oz.
Vinsol Resin #2 (7 lb. Cut)	35 oz.
Castor Oil	6 oz.
Ethyl Acetate	15 oz.
Butyl Acetate	5 oz.
Toluol	23.5 oz.
Carbon Black	0.5 oz.

Bronze Lacquer

Coumarone Resin, Hard	10 kg.
White Spirit or Heavy Benzine	40 kg.
Benzol	20 kg.
Bronze or Aluminum Powder	to suit

Bronzing Lacquer, Non-Gelling

Ethyl Cellulose	10 oz.
Ethyl Alcohol	10 oz.
Toluol	65 oz.
Cumar Gum W1/2 (8 lb. Cut)	10 oz.
Dibutyl Phthalate	1 oz.
Butyl Lactate	4 oz.

Marbleizing Lacquer

A nitrocellulose lacquer suitable for a marble-like multi-colored coating has been developed in Italy. It consists of a mixture of 1 part of acetone and 2 parts of moistened, colored nitrocellulose with a small amount of castor oil. This mixture is introduced into a water bath containing 2 per cent of acetone. After the lacquer has settled out on top of the solution, suitable pigments or dies are added. The objects to be lacquered are then dipped.

Dull Finish Lacquer

Dull nitrocellulose lacquer films can be produced by adding a concentrated methyl alcoholic boric acid solution to the usual lacquers. A nitrocellulose lacquer specially suited to this purpose consists of 5,000 parts of a low-viscosity collodion cotton soluble in esters and moistened with half its own amount of alcohol, 1.5 parts of ethylene glycol, 3 parts of butanol, 1.5 parts of butyl acetate, 3.5 parts acetic acid ether, 10 parts of toluol, 1.5 parts of dibutyl phthalate and 6.5 parts of shellac solution; the boric acid solution to be added to this lacquer in order to obtain the mat effect consists of 10 parts of boric acid and 5 parts of methyl alcohol, 10 to 15 parts of the boric acid solution being added to 100 parts of the above nitrocellulose lacquer.

Colored Master Batch for Lacquers

Canadian Patent 360,993

A color master material is prepared by mixing a pigment with nitrocellulose in the presence of a plasticizer deficient in solvent power for the nitrocellulose, a high-boiling solvent for the nitrocellulose, and a low-boiling diluent. E.g., 20 parts of colloidal C black is placed in the bottom of a Banbury mixer, 30 parts of a 1:1:1 mixture of anhydrous alcohol, butyl alcohol and butyl acetate added after the mixer is started, 50 parts of nitrocellulose with 15 parts alcohol added immediately, 30 parts of a 25:5 mixture of tritolyl phosphate and castor oil added, 50 more parts nitrocellulose with 15 parts of alcohol added, and mixing continued for 5 minutes. The batch is worked as thin as consistency allows in malaxating rolls, sprinkled with 30 parts of a 1:1:1 mixture of anhydrous alcohol, butyl alcohol and butyl acetate, stored in sealed containers for 24 hours, again worked on the rolls, and dried at 70° to reduce the amount of low-boiling solvent to less than 3%.

Colored Lacquer Chips

French Patent 803,516

In a porcelain mill, 15 kg. of lamp black are treated with 150 kg. of benzol containing 0.091 kg. of oleic acid. After five hours, the excess of benzol is filtered off and the paste is mixed with 40 kg. of nitrocellulose, 5 kg. of ethyl alcohol and 18 kg. of dibutyl phthalate. The resultant chips may be kept in an air tight container. In the manufacture of lacquers the balance of the lacquer ingredients is added to these chips. For example, 25 kg. of chips, 5 kg. of nitrocellulose, and 8 kg. of estergum are dissolved in 62 kg. of solvent. A lacquer of superior quality is obtained in this manner.

Lacquer Finish Rejuvenator

Tri-Cresyl Phosphate	5 cc.
Clear Dope	20 cc.
Butyl Acetate (Normal)	10 cc.
Ethyl Acetate	55 cc.
Methyl Acetone (Refined C. P.)	10 cc.

Undercoat for Lacquer

U. S. Patent 2,104,240

Casein	6.0 oz.
Metronite	59.7 oz.
Titanium Dioxide Pigment	20.0 oz.
Zinc Oxide	3.0 oz.
Irish Moss	0.1 oz.
Tribromophenol	0.2 oz.
Borax	2.0 oz.
Hydrated Lime	9.0 oz.

Dental Model Lacquer

U. S. Patent 2,057,289

A coating composition for molds and the like, consists of

Cellulose Acetate (Viscosity-5)	9½ oz.
Triphenyl Phosphate	8 oz.
Dimethyl Phthalate	25 cc.
Formaldehyde	25 cc.
Dioxan	3½ qt.

Confectionery Lacquer (Glaze)

Formula No. 1

Gum Benzoin, Sumatra	100 g.
Alcohol (90%)	500 g.

No. 2

Gum Benzoin, Sumatra	100 g.
Alcohol (90%)	500 g.
Peruvian Balsam	10 g.

No. 3

Sandarac	100 g.
Benzoin, Sumatra	100 g.
Larch Turpentine (Venice)	20 g.
Alcohol (95%)	800 g.

No. 4

Benzoin, Sumatra	150 g.
Shellac, Pale	50 g.
Vanillin	1 g.
Alcohol (95%)	800 g.

No. 5

Benzoin, Sumatra	200 g.
Peruvian Balsam	5 g.
Alcohol	800 g.

No. 6

Benzoin, Sumatra	125 g.
Sandarac	125 g.
Larch Turpentine	10 g.
Alcohol	740 g.

No. 7

Benzoin, Sumatra	160 g.
Rosin, Pale, Purified	40 g.
Alcohol	800 g.

No. 8

Benzoin, Sumatra	75 g.
Shellac, Lemon	75 g.
Vanillin	1 g.
Alcohol	850 g.

Filter and wash the filter paper with alcohol, to make 1000 g.

No. 9

Benzoin, Sumatra	90 g.
Colophony	45 g.
Alcohol	960 g.
Vanillin	1 g.

Lacquers for Chocolate (Glazes)

Formula No. 1

Resin Benzoin	10 lb.
Alcohol	20–30 lb.

No. 2

Resin Sandarac	2–2.5 lb.
Alcohol	8–7.5 lb.

"Lacquer" for Washable Wall Papers

Borax	10 kg.
Shellac, Sticklac, or Sandarac	30 kg.
Water	200 kg.

Lacquering Cardboard for Chair and Floor Coverings

Jugoslavia Patent 12,572

The well-glued upper surface of cardboard is treated with a 2 mm. thick transparent coat consisting of 100 g. glue, 10 g. latex and 6 g. glycerol dissolved in 250 cc. warm water. A hardening coat is then applied, consisting of 100 g. 40% formaldehyde, 500 cc. water, 500 cc. alcohol and 5 cc. glycerol; finally this coat is covered with an elastic pyroxylin lacquer. The covering may be washed with warm or cold water and soap.

CUMARONE BASE LACQUERS

Cumarone Lacquer Base

Nitrocellulose	7 oz.
Butyl Acetate	10 oz.
Cumarone Resin	6 oz.
Ethyl Acetate	10 oz.
Toluol	18 oz.
Alcohol	20 oz.

	Formula No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Lacquer Base (Above)	71 oz.	71 oz.	71 oz.	71 oz.	71 oz.	71 oz.
Tricresyl Phosphate	6 oz.	6 oz.	—	—	6 oz.	6 oz.
Dibutyl Phthalate	—	—	6 oz.	6 oz.	—	—
Cyclohexanone	5 oz.	—	5 oz.	10 oz.	—	6 oz.
Cyclohexanol Acetate	—	5 oz.	—	—	6 oz.	—
Ethyl Acetate	18 oz.	18 oz.	18 oz.	7 oz.	7 oz.	7 oz.
Alcohol	—	—	—	6 oz.	—	—
Benzine	—	—	—	—	10 oz.	10 oz.

CELLULOSE ACETATE COATINGS

Spraying and Dipping Lacquers

Acetone	40 g.
Ethyl Acetate	10 g.
Ethyl Lactate	10 g.
Toluol	10 g.
Cellulose Acetate	15 g.
Resin and Plasticizer	15 g.

This is used as a base solution and should be thinned to the consistency desired with the following thinner:

Acetone	40 g.
Ethyl Lactate	10 g.
Ethyl Acetate	10 g.
Toluol	10 g.

Leather Coating

Acetone	59 g.
Ethyl Acetate	5 g.
Methyl Cellosolve	5 g.
Cellulose Acetate	12 g.
Resin and Plasticizer	19 g.

Wire Coating

Acetone	30 g.
Ethyl Acetate	30 g.
Methyl Cellosolve	5 g.
Cellulose Acetate	14 g.
Plasticizer	21 g.

Cloth Coating

Acetone	48 g.
Methyl Cellosolve	10 g.
Toluol	10 g.
Cellulose Acetate	12 g.
Resin and Plasticizer	20 g.

In mixing a lacquer such as those suggested above, better results will be obtained if the entire solvent combination is not added at one time. This is especially true if a lean solvent combination is to be used. The general practice is to employ for the actual dissolving operation all of the solvent specified and only a small portion of the diluent. When the cellulose acetate is completely in solution, the remainder of the solvent combination, consisting now of diluents only, is added slowly with constant mixing. Care should be taken that the diluents are not added so fast that the material precipitates at any point.

HERCOSE C COATINGS

(Hercose C is a cellulose acetobutyrate)

Overcoating for Dark Lacquers

Lacquer:

Hercose C	36 g.
Dibutyl Phthalate	12 g.
Dammar	12 g.
Toluol	72 g.
Solvent	400 g.

Solvent:

Ethylene Dichloride	68.5 g.
Butanol	11.3 g.
Butyl Acetate	9.1 g.
"Cellosolve" Acetate	11.3 g.

On applying 9.94 pounds per 100 sq. ft. of the above lacquer to an unpolished commercial black and maroon nitrocellulose enamel, a good gloss is obtained that maintains its gloss after weathering a month and retains a good measure of its original gloss after four months' exposure. After about seven months' exposure, it showed a prominent check failure and a slight chalkiness on the surface of the overcoat. Those that had not been overcoated chalked badly, but they could be rubbed to a good polish.

Some difficulty has been encountered with Hercose C lacquer shrinking or splitting when applied over nitrocellulose enamels. This is most readily controlled by proper choice of solvents, of which a few preferred examples will be given:

Solvent A:

Ethyl Acetate	49.9 cc.
Toluol	4.3 cc.
Butyl Acetate	4.4 cc.
Dichlordiethyl Ether	27.6 cc.
Butanol	13.8 cc.

Solvent B:

Ethylene Dichloride	49.9 cc.
Toluol	4.3 cc.
Butyl Acetate	4.4 cc.
Dichlordiethyl Ether	27.6 cc.
Butanol	13.8 cc.

Such a solvent, used to dissolve solids of formulae similar to those shown above, can be sprayed over any type of nitrocellulose finish giving good gloss and no splitting, even at re-entrant angles. A solvent such as the following gives even better gloss, but will split when the coating is applied over a surface with sharp angles such as mold lines, etc.:

Solvent C:

Ethylene Dichloride	49.9 cc.
Toluol	4.3 cc.
Butyl Acetate	4.4 cc.
Trichlorethane	20.7 cc.
Methyl "Cellosolve" Acetate	20.7 cc.

It usually is better to hold the gun a little farther away from the work when spraying Hercose C lacquers than when spraying nitrocellulose enamels and with the acetone formula it should be held about 15 inches away from the work. Acetone accentuates shrinking and should be avoided. The softer formulae shrink more than the harder ones and cutting down on the plasticizer helps to reduce shrinking.

Clear Metal Lacquers

In view of the fact that Hercose C lacquers resist discoloration very well, they are quite desirable as clear finishes for polished and ornamental metal.

The following clear Hercose C lacquer was applied to thoroughly cleaned iron. The film did not start to crack until after fourteen months' exposure, covering one winter and parts of two summers.

Clear Lacquer

Base Solution:

Hercose C, Low Viscosity	20 g.
Acetone	80 g.

Solvent Mixture:

Methyl "Cellosolve" Acetate	10 g.
Ethyl Lactate	2 g.
Butanol	3 g.
Ethylene Dichloride	45 g.
Toluol	40 g.

Lacquer:

Base Solution	60.0 g.
Dewaxed Dammar Solution (45% Resin)	1.0 g.
Dibutyl Phthalate	3.5 g.
Solvent	135.5 g.

The following lacquer was applied and tested as above. It failed after being exposed over steel for two years on a test fence, and is the only clear lacquer which will withstand six months' weathering in Florida without failure.

Base Solution:

Hercose C, Low Viscosity	20 g.
Ethylene Dichloride	40 g.
Acetone	12 g.
Methyl "Cellosolve" Acetate	28 g.

Solvent Mixture:

Ethylene Dichloride	20 g.
Ethyl Acetate	15 g.
Methyl "Cellosolve" Acetate	15 g.
Toluol	40 g.
Hexone	10 g.

Lacquer:

Base Solution	62.5 g.
Rezyl 14	7.5 g.
Dibutyl Phthalate	2.5 g.
Solvent	85.0 g.

The Rezyl 14 may be varied in amount from 2.5 to 12.5 parts in these formulae.

Lacquers for Special Metals

Finishes such as the above have good adhesion for such metals as Allegheny, monel, copper, and certain aluminum alloys. With duralumin, a solids formula such as that given as No. 2 in the section on overcoating seems to work best. With brass, it has been found that the Rezyl formulae will not adhere so well as on other metals, but this may be counteracted to some extent on this metal as well as the others by use of some Vinsol resin in place of part of the Rezyl, in order to improve adhesion.

Cork Tile Lacquers

Low Flammability

Lacquer:

Hercose C, Low Viscosity	12 g.
Dibutyl Phthalate	6 g.
Dammar Gum	4 g.
Solvent	180 g.

Solvent:

Acetone	32 cc.
Ethyl Lactate	4 cc.
Butyl Acetate	2 cc.
Toluol	62 cc.

Bronzing Liquids

Hercose C solutions are particularly well suited for use as vehicles for bronzing liquids, as gelation does not occur in them. Lacquers have been prepared which have stood for more than ten months, in which the gold bronze can be completely dispersed simply by shaking the container for a few minutes. By proper choice of solvents, a finish can be made which will not develop a green color in the solution on aging. Formulae with these properties are:

	A	*B*	*C*	*D*	
Hercose C, High Viscosity	6	6	6	6	g.
Acetone	32	32	32	24	g.
Ethyl Acetate	20	20	20	28	g.
Diacetone Alcohol	6	6	6	6	g.
Ethyl Lactate	12	12	12	13	g.
Elemi Gum	—	—	—	—	
50% Ester Gum Solution in Toluol	2	2	—	2	g.
Dibutyl Phthalate	1	1	1	1	g.
Toluol	21	21	21	21	g.
Gold Bronze	5	3	5	10	g.
Aluminum Bronze	—	3	—	—	g.

The Hercose C is best dissolved in acetone, a 20% concentration being convenient to handle; the rest of the formula then is added and mixed thoroughly, the bronze being stirred in as the final step.

In other solvent formulae, such as those containing methyl "cellosolve" acetate or ethylene dichloride, certain bronzes will turn the solution green; this can be prevented by the addition of 0.2 to 0.5% oxalic or phosphoric acid to the solution. Green colors also result when resins of appreciable acidity are used (dammar, alkyds, shellac); resins in the formula should be as neutral as possible. The use of sodium acetate in amounts 0.2 to 0.5% of solutions has been found to retard this color development.

Sealer Between Coats

An excellent sealing lacquer which prevented interpenetration between coats of nitrocellulose lacquer follows:

Hercose C (Low Viscosity)	8 g.
*Dammar Solution	2 g.
Dibutyl Phthalate	1 g.
Ethylene Dichloride	89 g.
Dichlorobutane	20 g.

* Settled solution from 50 parts of dammar gum dispersed in 12.5 parts of toluol and 87.5 parts denatured ethyl alcohol.

Textile and Paper Lacquers

	H_1	H_2	A_1	A_2	
Hercose C, Medium Viscosity	20	20	—	—	g.
Cellulose Acetate	—	—	20	20	g.
Dibutyl Phthalate	2	4	2	4	g.
Triphenyl Phosphate	2	4	2	4	g.
Acetone	76	72	76	72	g.

Hercose C, Medium Viscosity	8 g.
Triethyl Citrate	6 g.
Triphenyl Phosphate	6 g.
Rezyl 14	1.4 g.
Ethylene Dichloride	30.0 g.
Acetone	28.6 g.
Hexone	10.0 g.
Methyl "Cellosolve" Acetate	10.0 g.

The coating is applied in eight gasket coats.

Airplane Lacquer (Dope)

Hercose C, High Viscosity	7.1 g.
Triphenyl Phosphate	1.1 g.
Acetone	46.8 g.
Ethyl Acetate	20.0 g.
Alcohol	10.0 g.
Butanol	5.0 g.
Ethyl Lactate	10.0 g.

Airplane Fabric "Dopes"

Formula No. 1

22.3 Second Film Scrap	300 g.
Ethyl Acetate	1056 cc.
Butyl Acetate	528 cc.
Benzol	816 cc.

Procedure: Dissolve the film scrap in the solvents and add the benzol slowly while stirring.

No. 2

22.3 Light Film Scrap	300 g.
Butyl Acetate	240 cc.
Ethyl Acetate	480 cc.
Anhydrous Isopropyl Acetate	96 cc.
Butyl Lactate	48 cc.
Shell TS11 Solvent	744 cc.

Dissolve the above and thin with Shell TS11—792 as above.

No. 3

22.3 Sec. Light Film Scrap	300 g.
200 Proof Alcohol	92 cc.
Butyl Acetate	240 cc.
Methyl Ethyl Ketone	480 cc.
Isopropyl Acetate	96 cc.
No. 8 Union Solvent	792 cc.

Dissolve in mixer (flows about ½" per second) and add 700 cc. No. 8 Union Solvent as above.

No. 4

DD Filac (4 Sec.)	300 g.
No. 8 Union Solvent	800 cc.
Butyl Acetate	800 cc.
200 Proof Alcohol	100 cc.
Dissolve and dilute with No. 8 Union Solvent	700 cc.

Color Coat Lacquer

¼" Nitrocellulose	36 lb.
Rezyl 12	25 lb.
Dibutyl Phthalate	5 lb.
Castor Oil	12.5 lb.
Solvent: 61% Toluene, 13% Butanol, 26% Butyl Acetate	7.75 gal.

Usually the per cent of a color in oil required to "color up" a lacquer is so small that one can neglect figuring how much oil to leave out; but in case it is a large item (over 2.5% of non-vol.) it is a simple matter to calculate how much to omit when we realize that the following percentages of pigment based on the non-volatile by weight, will be found to be practically correct for most lacquers.

Titanium Dioxide	25%
Prussian Blue	11%
Medium Chrome Yellow	19%
Medium Chrome Green	13%
Super Spectra Black	4%
Cadmium Red Medium	25%
Para Toluidine Toner	10%

Since the titanium pigmented lacquers, especially and those made from chrome yellow tend to powder slightly after a few months in the weather, it is a good idea to put a light coat of the clear over them. Any reasonably good thinner may be used with the above lacquer and if desired 4–5 sec. film scrap may be substituted for the ¼ second nitrocellulose. It will then require much more solvent and thinner before it can be sprayed or brushed over the dope.

This rezyl or alkyd lacquer may be applied directly to clean metal without a primer and it will adhere and weather extremely well. The more heavily pigmented products such as a chrome yellow require a primer for the best adhesion, and this may be a drying alkyd resin primer or a lacquer primer made as follows:

Lacquer Primer

Rezyl (Oxidizing Type)	110	lb.
Film Scrap Solution	1	gal.
Dibutyl Phthalate	0.25	lb.

This lacquer may be thinned with a low cost lacquer thinner, for example:

Union Solvent No. 1 or Equivalent	66%
Ethyl Acetate	9%
Butyl Acetate	8%
Butyl Alcohol	8%
Ethyl Alcohol	9%

Nitrocellulose Solvents

Formula No. 1

Ethyl Acetate	50 lb.
Butyl Acetate	20 lb.
Butanol	5 lb.
Benzene	25 lb.

No. 2

Ethyl Acetate	10 lb.
Butyl Acetate	40 lb.
Alcohol	25 lb.
Benzene	10 lb.

No. 3

Ethyl Acetate	20 cc.
Butyl Acetate	10 cc.
Alcohol, Denatured	15 cc.
Benzol	15 cc.
Paraffin Wax	5 g.

Solvent for Vinyl Lacquers

Hexone	40 oz.
Methyl *n*-Amyl Ketone	10 oz.
Toluol	40 oz.
Xylol	10 oz.

Thinners for Vinyl Acetate Resins (Gelva)

Formula No. 1

For Spraying Lacquers

Xylol	50 oz.
Amyl Acetate	40 oz.
Butyl Alcohol	5 oz.
Naphtha, V. M. & P.	5 oz.

No. 2

For Spraying and Brushing Lacquers

Toluol	70 oz.
Xylol	20 oz.
Tetrachlorethane	10 oz.

No. 3

For Brushing Lacquers

Benzol	60 oz.
Toluol	15 oz.
Xylol	15 oz.
Tetrachlorethane	5 oz.
Naphtha, V. M. & P.	5 oz.

Barrel Sealing Compound

Paraffin Wax (42/44° C.) or Petrolatum	98 kg.
Tallow, Hard-Fat, or Crude Palm Oil	2 kg.

Sealer for Asphalt Emulsion Coated Walls

Casein	1	lb.
Water Ground Mica	2	lb.
Asbestine	5	lb.
Borax	0.25	lb.
Sodium Fluoride	0.25	lb.

Mix into 3 quarts of boiling water until smooth and apply with brush.

Seal for Gasoline, Oil and Water Pipes

Shellac	2	kg.
Rosin	0.5	kg.
Alcohol	1.5	kg.
Plasticizer	0.1	kg.
Aluminum Filings, Fine	5	g.

Claimed to be heat-resistant, elastic, and uninfluenced by gasoline, water, and oil.

Quick Seal for Radiators (External)

Cellulose Lacquer, Colorless	1	kg.
Aluminum Filings, Fine	0.3	kg.

Sanding Sealer

Dry Nitrocellulose	100 oz.
Teglac Resin	100–150 oz.
Zinc Stearate	5– 20 oz.
Magnesium Carbonate	0– 5 oz.

Hat Stiffeners, Water Soluble

Several different alkalies may be used to produce water shellacs, but borax has been found most satisfactory. The following type of water shellac may be made by hand in one-half to one gallon batches; but a putty mixer is necessary for large batches. Eleven pounds of pure borax is added to five gallons of boiling water and brought to boil. 107 pounds of bone dry shellac is added and stirring maintained while heat is applied to the bottom of the machine. When the mixture looks like white taffy fifteen to twenty gallons of water, depending on the specific gravity required, is added slowly to the batch as stirring continues. When the water starts to mix quickly, heating may be discontinued. Water shellac solutions are often sold by the Twaddle scale which is, practically, a very much refined specific gravity scale.

For real dark felt hats or bodies, boil together until dissolved:

Water	3 gal.
Borax	3 lb.
Bone Dry Shellac	20 lb.

Another formula which gives results, but which requires considerable skill to make, runs as follows:

8 lb. Cut White Shellac	1 gal.
28% Ammonia	400 cc.

Stir together quickly, and ten seconds after addition of ammonia dilute instantly with a mixture of:

Water	3 gal.
28% Ammonia	120–160 cc.

according to the grade and freshness of the shellac. A white solution is most desirable.

Small amounts of titanium barium pigment may be added to these formulae to secure maximum whiteness for white bodies and real light tints.

Hat Sizings or Stiffeners

Shellac, Super Fine White Bleached	4 lb.
Alcohol	4 gal.
Butyl Alcohol	1 pt.

For obtaining the highest possible gloss use a dewaxed shellac.

Low Priced Waterproof Hat Stiffener

Manila Gum, D. K.	52 lb.
Benzine	45 pt.
Alcohol	55 pt.
Butyl Alcohol	5 pt.

Let stand for several days, draw clear liquid from the top, and strain out the floating bark. This solution is customarily thinned three to one with a thinner similar to the solvent. A better grade, glossier, and faster drying varnish is made by using for the solvent:

Toluene	75%
No. 1 Alcohol	22%
Butanol	3%

The gum solution may be plasticized with 3% by volume of blown castor oil.

An elastic hat varnish is made by mixing a four to four and one-half pound cut of the D. K. Manila Gum in the latter solvent with 9% blown castor oil. This varnish works well in the hat block and gives a good gloss. It will allow bending without cracking.

Cheap Dope Hat Sizings

Inexpensive competitive sizings are made from movie film scrap which has been cleaned with boiling water and weak alkali or by various other methods. The scrap should be added piece by piece to a lacquer solvent, or if sold in rolls should be allowed to fall into the solvent in a twisted wettable mass. If several pieces get stuck together one may be bothered with slowly dissolving lumps.

Film Scrap	10 lb.
Low Boiling Petroleum Thinner	3 gal.
Toluol	3 gal.
Ethyl Acetate	2 gal.
Butyl Acetate	2 gal.

Six gallons of No. 8 Union Solvent may be used in place of the above diluents and the new ketone solvents may be used to get lower viscosity in place of ethyl and butyl acetate.

Hat Finishing
Formula No. 1

a.	Water	70 kg.
	Borax	5 kg.
b.	Ruby or Orange Shellac	25 kg.

No. 2

a.	Water	70.5 kg.
	Borax	5.5 kg.
b.	Powdered Shellac, Dry	24.0 kg.

To the borax solution, the shellac is added at boiling temperature, keeping hot, with agitation, until all is dispersed.

Using such formulae necessitates an after-treatment with vapors of acetic acid to make the finish insoluble. This is avoided when using formulae of the following type:

No. 3

a.	Water	23.3 kg.
	Borax	4.0 kg.
	Ruby or Orange Shellac	25.0 kg.
b.	Water, Hot	47.7 kg.

No. 4

a.	Water	20.0 kg.
	Borax	3.4 kg.
	Powdered Shellac, Dry	24.0 kg.
b.	Water, Hot	52.6 kg.

Heat the three ingredients of *a* together, until pasty and free from lumps. Thin by adding *b* in small portions, agitating thoroughly.

Wall Glaze
U. S. Patent 2,078,504

Sodium Silicate	112 cc.
Ammonia	6 oz.
Casein	14 oz.
Water	1 gal.

Stone Sizing Material
(Use before painting)
U. S. Patent 2,008,304

Petroleum Naphtha	100 gal.
Acetone	2 gal.
Aluminum Stearate	30 lb.
Acetic Acid	1 lb.
Nitric Acid	6 lb.

Size for Lettering on Galvanized Iron
Mix two tablespoonfuls of oxalic acid to a pint of white vinegar and allow the mixture to stand. The longer it stands the better it will act as an oxidizing agent on the metal. It is used to best advantage after being set aside for two months. Apply the liquid to the metal surface to be painted with a brush or cloth and allow time for drying. No brushing down is needed.

Gold Size

Kauri Copal	50 lb.
Linseed Oil	35 gal.
Litharge	18 gal.
Red Lead	18 lb.
Turpentine Oil	75 gal.

Applying Gold Leaf on Molding
Method No. 1

Sandpaper the wood to a very smooth surface. Apply a coat of flat paint and when this is thoroughly dry, sandpaper it to a smooth surface. Over this smoothly painted surface brush on a thin coat of good quality shellac. When this is thoroughly dry and hard, apply japan gold size. Allow this to dry until there is practically no stickiness to the touch; then lay on the gold with tip or cotton and thoroughly batten it down. Allow the frame to dry for about 24 hours, and then apply a very thin coat of the best grade bleached shellac that can be purchased. This shellac will not destroy the luster of the gold, and it is necessary to protect the gold. When this system is used, the gold cannot be burnished with an agate.

Method No. 2
(To be used when gold must be burnished with an agate)

Sandpaper the wood to a very smooth surface. Apply a thin coating of whiting made up as follows:

Rabbit Skin Glue	½ lb.
Water	3 pt.
Whiting, Imported French	4 pt.

To put the glue in solution, allow it to stand overnight in warm water. This solution should be applied hot in order to prevent cracking. When the whiting-coated surface is thoroughly dry, sandpaper it perfectly smooth. The next coating is made up of gilder's gold size, which should be mixed with glue according to directions on the package. This should be about the consistency of heavy cream when it is being applied. When it is dry, none of the red clay should rub off. This coating also should be smoothed with sandpaper. When the gold is laid on, only the amount of frame should be moistened which is to be covered by the leaf. For moistening, use the following formula:

Water	1 pt.
Alcohol	10 cc.
Glue	10 g.

The gold should be well battened down in this process. Allow it to dry for about 12 hours. Then burnish with agate, and apply a thin coating of a good grade bleached shellac, as in the first method.

Liquid Varnish Remover

Denatured Alcohol	50 gal.
Light Coal Tar Oil	35 gal.
Carbolic Acid (90%)	15 gal.

Varnish and Lacquer Remover
Formula No. 1
Canadian Patent 367,059

Ethylene Dichloride	77.5 oz.
Alcohol	10.0 oz.
Toluol	2.5 oz.
Benzene	2.5 oz.
Cellulose Acetate	2.5 oz.
Paraffin Wax	5.0 oz.

No. 2

Acetone	40 cc.
Benzene	20 cc.
Solvent Naphtha	10 cc.
Alcohol	30 cc.

By addition of paraffin to this solvent mixture, a cleansing material of pasty consistency can be obtained.

Remover for Lacquers of Oil, Chlorinated Rubber, Oil Paints

Liquids

Formula No. 1

Benzol	60 kg.
Ethylene Dichloride	30 kg.
Hexalin	10 kg.

No. 2

Benzol	60 kg.
Toluol	10 kg.
Xylol	30 kg.

No. 3

Ethylene Dichloride	40 kg.
Benzol	40 kg.
Tetralin	20 kg.

Pastes

No. 4

Scale Paraffin Wax (40/42° C.)	15 kg.
Ozokerite	5 kg.
Benzol	50 kg.
Tetralin	20 kg.
Methylene Chloride	10 kg.

No. 5

Scale Paraffin Wax (40/42° C.)	15 kg.
Benzol	45 kg.
Toluol	40 kg.

No. 6

Scale Paraffin Wax (40/42° C.)	20 kg.
Benzol	60 kg.
Hexalin	20 kg.

Paint Remover

a. Paraffin Wax, High Melting	5 lb.
Trichlorethylene	95 lb.
b. Aluminum Naphthenate	5 lb.
Trichlorethylene	95 lb.

Make solutions *a* and *b*, let stand for 24 hours separately, mix.

Paint and Lacquer Removers, Non-Inflammable

Liquids

Formula No. 1

Carbon Tetrachloride or Trichlor Ethylene	70 kg.
Xylol	10 kg.
Toluol	10 kg.
Ethyl Lactate	10 kg.

No. 2

Carbon Tetrachloride or Trichlor Ethylene	60 kg.
Ethylene Dichloride	25 kg.
Hexalin	15 kg.

No. 3

Methylene Chloride	40 kg.
Carbon Tetrachloride or Trichlor Ethylene	10 kg.
Tetralin	50 kg.

Pastes

No. 4

Scale Paraffin Wax (40/42° C.)	20 kg.
Carbon Tetrachloride or Trichlor Ethylene	60 kg.
Toluol	10 kg.
Hexalin	10 kg.

No. 5

Scale Paraffin Wax (40/42° C.)	15 kg.
Carbon Tetrachloride or Trichlor Ethylene	45 kg.
Benzol	20 kg.
Methylene Chloride	20 kg.

No. 6

Scale Paraffin Wax (40/42° C.)	15 kg.
Ozokerite	5 kg.
Carbon Tetrachloride or Trichlor Ethylene	40 kg.
Tetralin	40 kg.

Removers for Cellulose and "Spirit" Lacquers

Liquid, Inflammable

Formula No. 1

Acetone	50 kg.
Butyl Acetate	20 kg.
Isopropyl Alcohol	30 kg.

Paste, Inflammable

No. 2

Cellulose Acetate	20 kg.
Acetone	40 kg.
Dioxan	20 kg.
Isopropyl Alcohol	20 kg.

Removers for Chlorinated Rubber, Oil, Cellulose and "Spirit" Lacquers and Paints

Liquid, Inflammable

Formula No. 1

Acetone	30 kg.
Methylcyclohexanone	30 kg.
Alcohol	20 kg.
Tetralin	20 kg.

Pastes, Inflammable

No. 2

Cellulose Acetate	15 kg.
Acetone	35 kg.
Isopropyl Alcohol	10 kg.
Tetralin	30 kg.
Methylcyclohexanone	10 kg.

No. 3

Celluloid Scrap	15 kg.
Acetone	20 kg.
Dioxan	15 kg.
Methylcyclohexanone	20 kg.
Cyclohexanone	10 kg.
Benzol	10 kg.
Hexalin	10 kg.

Removers for Lacquers and Paints

Powders

Formula No. 1

Lime Hydrate, Powdered	60 lb.
Soda Ash	40 lb.

No. 2

Caustic Soda, Powdered	35 lb.
Whiting	65 lb.

No. 3

Lime Hydrate, Powdered	60 lb.
Potash Carbonate, Calcined	40 lb.

No. 4

Caustic Potash, Powdered	30 lb.
Calcium Carbonate, Powdered	70 lb.

No. 5

Caustic Soda, Powdered	20 lb.
Caustic Potash, Powdered	15 lb.
Whiting	35 lb.
Pumice Powder	30 lb.

The production consists in simple mixing and packing into sealed containers.

No. 6

Caustic Soda, Powdered	65 lb.
Potato or Corn Flour	35 lb.

No. 7

Lime Hydrate, Powdered	35 lb.
Soda or Potash Carbonate, Calcined	35 lb.
Potato or Corn Flour	30 lb.

Mix dry in sealed containers.

Pastes

No. 8

Soft Soap	30 lb.
Caustic Soda	10 lb.
Water	30 lb.
Whiting	20 lb.
Pumice Powder	10 lb.

No. 9

Soft Soap	20 lb.
Lime Hydrate, Powdered	15 lb.
Soda Ash	15 lb.
Water	30 lb.
Calcium Carbonate	20 lb.

No. 10

Soft Soap	40 lb.
Caustic Potash (40° Bé.)	25 lb.
Lime Hydrate, Powdered	35 lb.

No. 11

Soft Soap	40 lb.
Ammonia (0.910)	30 lb.
Whiting	30 lb.

No. 12

Potato or Corn Starch	5 lb.
Caustic Soda or Potash	10 lb.
Water	60 lb.
Whiting	10 lb.
Wood Saw Dust	15 lb.

No. 13

Potato or Corn Starch	5 lb.
Soda or Potash Carbonate, Calcined	15 lb.
Lime Hydrate, Powdered	15 lb.
Water	60 lb.
Pumice Powder	5 lb.

No. 14

Potato or Corn Starch	5 lb.
Ammonia (0.910)	30 lb.
Water	40 lb.
Calcium Carbonate	25 lb.

Paint Removers (for Oil Paints)

Liquids

Formula No. 1

Oleic Acid	4 lb.
Benzol	20 lb.
Carbon Tetrachloride or Trichlor Ethylene	20 lb.
Alcohol	20 lb.
Ammonia (0.910)	16 lb.
Water	20 lb.

No. 2

Methyl Hexalin	18.0 lb.
Oleic Acid	3.5 lb.
Caustic Potash (50° Bé.)	1.5 lb.
Water	3.5 lb.
Tetralin	73.5 lb.

Pastes

No. 3

Soft Soap	40 lb.
Methyl Hexalin	20 lb.
Carbon Tetrachloride or Trichlor Ethylene	40 lb.

No. 4

Potato Flour	5 lb.
Water	10 lb.
Potassium Hydroxide, Scales	10 lb.
Water	40 lb.
Carbon Tetrachloride	20 lb.
Whiting	15 lb.

Removers for Oil, Rubber, Cellulose Lacquers or Paints

Liquid, Non-Inflammable

Carbon Tetrachloride or Trichlor Ethylene	40 kg.
Tetralin	10 kg.
Methylcyclohexanone	40 kg.
Methanol	10 kg.

Paste, Non-Inflammable

Scale Wax, 40/42° C.	15 kg.
Ozokerite	5 kg.
Carbon Tetrachloride or Trichlor Ethylene	30 kg.
Hexalin	10 kg.
Methylhexalin	40 kg.

Miscellaneous Paint Removers

Formula No. 1

Acetone Oil	40 lb.
Tetralin	30 lb.
Xylol	20 lb.
Turpentine Oil	10 lb.
Whiting	to make paste

No. 2

Carbon Tetrachloride or Trichlor Ethylene	80 g.
Acetone	10 g.
Amyl Acetate	10 g.

If this solvent is desired to be more viscous, mix with melted

Ceresin	10 g.

NOTE: Paint Removers containing trichlorethylene or carbon tetrachloride *do not* remove nitrocellulose coatings.

No. 3

Corn Flour	80 lb.
Sesqui Carbonate of Soda	80 lb.
Light Soda Ash	40 lb.

No. 4

British Patent 455,618

Successive layers of dry soda ash (4 lb.) and quick lime (4 lb.) are spread on a layer of soft soap (3 lb.) in a vat, boiling water is added, and the whole thoroughly admixed (the formation of insoluble calcium soaps being thus avoided) and allowed to set solid by cooling. Aqueous ammonia (*d* 0.880; 2 oz.) is then added and allowed to soak in, and the whole is reduced to a paste by sufficient water to make 3½ gal.

Paint and Varnish Remover

Formula No. 1

Benzol	15 oz.
Toluol	15 oz.
Alcohol	20 oz.
Acetone	25 oz.
Ethylene Dichloride	20 oz.
Ethyl Acetate	5 oz.

(Melt in about 1% paraffin wax.)

No. 2

Furfural (Technical)	2 qt.
Benzol Saturated With Paraffin Wax	1 qt.

Mop or brush on, and let stand for 10 to 15 minutes. Then rub off with a cloth, or scrape with a paint scraping tool.

No. 3

Benzol	104 gal.
Methanol	30 gal.
Paraffin Wax	50 lb.
Phenol	6 lb.
Alcohol	50 gal.

No. 4

Dissolve 30 g. paraffin wax in 500 cc. benzol and add 500 cc. acetone.

Sop on painted surface, allow to penetrate and then scrape off.

Care of Brushes

Brushes should never be left standing in finishing materials, especially if the bristles are long. The weight of the brush handle causes the bristles to bend or curl, and this curl may become permanent. If a brush is not cleaned after it is used, the paint or other finishing material left in it will become hard and a thick hard crust will form around the base of the brush where the bristles enter the handle. Then, when the brush is used again, this hard crust near the handle will gradually break into fine particles which come out from time to time and make specks on the finish.

When a used brush is not in service, it should be hung in a brush-keeper, which is a container partly filled with some gentle solvent for the material last used in the brush.

Brushes should be hung so their ends do not touch the bottom of the brush-keeper. Brushes used for paints should be kept in different containers from those used in varnish or lacquer, and shellac brushes should be kept to themselves. Paint and enamel brushes may be kept in a 50/50 mixture of turpentine and linseed oil. The same mixture can be used for keeping varnish brushes. Lacquer brushes may be kept in lacquer thinner, and shellac brushes in alcohol. However, since lacquer thinner and alcohol evaporate rapidly it is advisable, when the brushes are to be laid aside for several days or weeks, to clean them in the proper solvent, wrap them in brown paper and then lay them away to dry so they will be clean and ready for use when they are to go into service again. Brushes for paint, varnish or enamel, when taken out of the brush-keeper, should be carefully rinsed in clean solvent before being used.

Brush-keepers can be purchased from painters' supply houses or they can be made of some suitable container that happens to be available. Whatever type of container is used, however, it should have a cover to exclude dirt, dust, etc. Some brush users simply drill a small hole through the wide part of the brush handle and hang it on a wire.

Cleaning Paint Brushes

1. Rinse with turpentine.
2. Squeeze out.
3. Soak in gasoline.
4. Squeeze out
5. Soak in fresh gasoline.
6. Squeeze out.
7. Wash with strong soap or trisodium phosphate and water.
8. Squeeze out.
9. Rinse in soft water.
10. Dry.

Paint Brush Cleaner

Trisodium Phosphate	160 lb.
Light Soda Ash	40 lb.

Paint Deodorizer

U. S. Patent 2,103,830

Amyl Butyrate	6
Benzyl Acetate	21.6
Phenyl Ethyl Alcohol	31.2
Citral	5.6
Geraniol	20.0
Phenyl Acetic Acid	7.8
Coumarin	7.8

Use about 1 lb. per 1300 lb. of paint.

Rust Preventing Mixture

Linseed Oil Varnish	30–40 lb.
Cement, Powdered	30 lb.
Quartz, Powdered	10 lb.
Pigment Color	20–30 lb.

Waterproofing Composition

Refined Paraffin Wax	4 oz.
Paracoumarin Resin	2 oz.
White Beeswax	1 oz.
Aluminum Palmitate	4 oz.

These ingredients are blended together and dissolved in a composite solvent of xylol and carbon tetrachloride in the proportions of about three parts by volume of xylol to one part by volume of carbon tetrachloride, and the amount of solvent being such that about two and three-quarters ounces of the above composition is contained in each gallon of solution.

Waterproofing Compound

U. S. Patent 2,107,511

Coal Tar	50 lb.
Raw Rubber	3 lb.
Air-Slaked Lime	2 lb.
Sugar of Lead	1 lb.
Gasoline	5 lb.

Waterproofing Adhesive Composition

British Patent 456,820

Formula No. 1

Amorphous Petroleum Wax	75 oz.
Ester Gum	24 oz.
Aluminum Stearate	1 oz.

No. 2

Amorphous Petroleum Wax	75 oz.
Ester Gum	15 oz.

Heat until fluid; mix and add

Cumarone Resin	10 oz.

Heat with stirring at 285° F. until uniform.

Transparent, Flexible, Moisture-Proofing

U. S. Patent 2,094,771

Paraffin Wax (M. P. 60° C.–62° C.)	7.5 oz.
Pyroxylin	2.5 oz.
Hydrogenated Rosin	1.0 oz.
Amyl Acetate	123.5 oz.
Alcohol	20.0 oz.
Toluol	47.5 oz.

Apply the above and dry at 62–70° C.

Waterproofing for Casein Finish

U. S. Patent 2,043,324

Aluminum Sulphate	10 lb.
Sodium Acetate	3 lb.
Borax	2 lb.
Water	100 lb.

The casein finished surface is treated with the above to make it waterproof.

Fireproof and Waterproof Coating Composition

French Patent 796,827

Chlorinated Rubber	100 oz.
Sodium Tritolyl Phospate	100 oz.
Toluol	200 oz.

Insoluble Albumen Coatings

Dissolve 1 kilogram albumen in 8 liters water.

Add about 800 cc. water in which have been dissolved 40 to 50 cc. formaldehyde (40%).

Upon the addition of formaldehyde, the albumen solution becomes jellylike and hard, the time of setting being delayed by the addition of a small amount of ammonium hydroxide to the solution. Therefore, it is imperative to make immediate use of this jelly as a coating, since setting takes place rapidly, and only what one might be prepared to use in a short time should be made up. After 24 hours, the coating becomes insoluble in water.

Moisture Proof Coating for "Cellophane"

U. S. Patent 2,108,810

Formula No. 1

Solids:	
Rosin	57.0 g.
Ethyl Cellulose	28.5 g.
Paraffin Wax	7.4 g.
Triethylene Glycol	7.1 g.
Solvent:	
Toluene	85.0 g.
Monobutyl Ether of Ethylene Glycol	15.0 g.

No. 2

Solids:	
Rosin	48.8 g.
Ethyl Cellulose	24.4 g.
Ethyl Meta-Toluene Sulphonamide	6.1 g.
Paraffin Wax	7.3 g.
Diethylene Glycol	13.4 g.

Solvent:

Low Flash Naphtha	90.0 g.
Acetone	1.0 g.
Ethyl Alcohol	9.0 g.

No. 3

Solids:

Ester Gum	42.5 g.
Ethyl Cellulose	34.1 g.
Dibutyl Phthalate	6.4 g.
Paraffin Wax	4.3 g.
Diethylene Glycol	12.7 g.

Solvent:

High Flash Naphtha	80.0 g.
Acetone	2.0 g.
Ethyl Alcohol	18.0 g.

No. 4

Solids:

Ethyl Cellulose	69.3 g.
Ethyl Meta-Toluene Sulphonamide	7.0 g.
Paraffin Wax	2.8 g.
Diethylene Glycol	7.0 g.
Monoethyl Ether of Glycerol	13.9 g.

Solvent:

Toluol	85.0 g.
Monobutyl Ether of Ethylene Glycol	15.0 g.

No. 5

Solids:

Ethyl Cellulose	75.7 g.
Paraffin Wax	1.6 g.
Triethylene Glycol	15.1 g.
Diethylene Glycol	7.6 g.

Solvent:

Toluol	85.0 g.
Monobutyl Ether of Ethylene Glycol	15.0 g.

No. 6

Solids:

Rosin	76.9 g.
Ethyl Meta-Toluene Sulphonamide	7.7 g.
Paraffin Wax	7.7 g.
Diethylene Glycol	7.7 g.

Solvent:

Toluol	85.0 g.
Monobutyl Ether of Ethylene Glycol	15.0 g.

No. 7

Solids:

Rosin	66.6 g.
Paraffin Wax	13.4 g.
Diethylene Glycol	20.0 g.

Solvent:

Toluol	85.0 g.
Monobutyl Ether of Ethylene Glycol	15.0 g.

No. 8

Solids:

½ Second Nitrocotton	71.4 g.
Triethanolamine	14.3 g.
Triethylene Glycol	14.3 g.

Solvent:

Ethyl Acetate	72.0 g.
Ethyl Alcohol	4.0 g.
Monobutyl Ether of Ethylene Glycol	24.0 g.

No. 9

Solids:

½ Second Nitrocotton	52.6 g.
Rosin Ester of Diethylene Glycol	26.3 g.
Diethylene Glycol	10.5 g.
Sulphonated Castor Oil	10.6 g.

Solvent:

Ethyl Acetate	64.8 g.
Amyl Acetate	16.2 g.
Monobutyl Ether of Ethylene Glycol	16.2 g.
Ethyl Alcohol	2.8 g.

Moisture Proof Coating for "Cellophane"

Formula No. 1

U. S. Patent 2,073,310

Cellulose Acetate Stearate	10
Glyceryl Tristearate	8
Ester Gum	10
Butyl Acetate	400

No. 2

Moisture Proofing for "Cellophane"

Canadian Patent 364,301

Paraffin Wax	7.5 oz.
Pyroxylin	2.5 oz.
Hydrogenated Rosin	1.0 oz.
Amyl Acetate	123.5 oz.
Alcohol	20.0 oz.
Toluol	47.5 oz.

Waterproof Casein Coating

U. S. Patent 2,101,574

Casein	18.9 g.
Formamide	18.9 g.
Ammonia (20%)	4.0 g.
Water	56.6 g.
Paraformaldehyde	1.6 g.

Apply air dry and bake at 80° C. for 5 hrs.

Waterproof Gelatin Coating

U. S. Patent 2,101,574

Gelatin, Crude	100 g.
Water	500 cc.
Formamide	50 g.
Dissolve above and add	
Formaldehyde	50 cc.

Apply as under Waterproof Casein Coating.

Making a Surface Non-Wettable by Mineral Oil

U. S. Patent 2,108,616

A method of making a surface non-wettable by mineral oil comprises incorporating about 5% by weight of calcium stearate into a moisture-free varnish, applying said mixture to the cleaned surface to be treated and allowing the coated surface to dry.

Waterproof Insulation for Textiles, Paper, Etc.

British Patent 462,008

Chlorinated Rubber	100 oz.
Cumarone Resin	25 oz.
Tricresyl Phosphate	15–30 oz.

The above is dissolved in a solvent for coating.

Translucent Waterproofing for Paper and Leather

U. S. Patent 2,073,630

Hydrogenated Fish Oil	7½ oz.
Rubber	2½ oz.
Petroleum Solvent, Light	90 oz.

Resurfacing and Waterproofing for Roofs

U. S. Patent 2,107,511

Coal Tar	50 lb.
Rubber, Raw	3 lb.
Air Slaked Lime	2 lb.
Lead Acetate	1 lb.
Gasoline	5 lb.

Moisture Proof Coating for Wood

U. S. Patent 2,066,295

Linseed Oil	313 gal.
China-Wood Oil	94 gal.
Solution Containing 60% Limed Rosin and 40% Varnish Makers and Painters' Naphtha	130 gal.
Paraffin Wax	724 lb.
Zinc Stearate	50 lb.
Varnish Makers and Painters' Naphtha	365 gal.

Waterproofing Brick Walls with Paint

Before beginning the job make sure that structural defects are not a contributing cause of water penetration. Window casings that fit poorly, insufficient or improperly placed metal flashing, leaking gutter linings and the like lead to moisture difficulties that no paint, of course, can cure.

The mortar joints should be gone over carefully by a competent mason and properly pointed up. Loose and defective joints should be raked and chipped out and then refilled with one part fresh cement and two parts sifted, sharp sand or some similar mortar.

Unpainted brick requires no special preparation before painting. In the event that there is a considerable accumulation of dust and dirt, the surface should be brushed vigorously with a wire brush or scrubbed with water. This procedure will also remove the efflorescence of water soluble salts which often appears on unpainted brick. These soluble salts are brought to the surface by rain water absorbed by the brick. They are easily removed and, of course, do not form on paint-protected brick.

The right time, in fact the only time, to paint brick is when it is dry. Before letting the painter apply the priming coat, therefore, wait until several days, preferably a week, of fine, clear weather has gone by. This will give the sun a chance to draw out moisture absorbed in the brick. The drying-out period is especially important for court and light-well walls which are not exposed to sunlight. Here it is the continued dryness of the atmosphere which must be depended upon to draw out trapped moisture.

Since common brick—the type generally used for facing the side and rear walls of large structures—is very porous, the priming coat should contain a fairly high proportion of vehicle to pigment for proper sealing. One hundred pounds of white-lead, thinned with 4 to 5 gallons of linseed oil is the right mixture. The paint should be applied freely and brushed well into the surface. The coverage will be limited—probably not more than 200 sq. ft. to the gallon—but a solid, even foundation will have been established.

After the priming coat has been permitted to dry thoroughly, the second coat may be applied. Paint for this purpose is usually mixed on the basis of 100 pounds of white-lead to 3 or 4 gallons of Linseed Oil. The second coat will stop suction in any porous area not entirely sealed by the first coat, and furnish the right type of ground for the weather-facing top coat.

The paint for the third coat is the same as that used for the second coat. Paint mixed on this basis has all the qualities needed for economically long service. It is tough and elastic—and it remains so. In addition, its ability to chalk slowly insures a continued fine clean appearance.

Dyeing and Finishing Wood Awning Slats

The resistance which wood offers to a force which tends to make fibers slip or one another is its shearing strength. Awnings of all kinds are subjected to the force of air currents that cause strains on the wood in all directions. If the wood presented for dyeing has poor shearing strength, it should be rejected as the constant fiber movement arising from wind pressure will in time affect the color and produce streakiness. Shearing strength, parallel to the grain of any wood, can be determined with testing instruments at any lumber dealer's office. It is not a bad idea to have all awning wood tested by a timber engineer before dyeing it. The wood should be tough.

When dyeing wood for outside service, its moisture content should be known. Water occurs in wood by filling the spaces between the cells, or by saturating the walls of the cells. It is impossible to dye the wood when there is enough moisture present to obstruct the penetration of the dye liquor. Hence, the wood should be well seasoned before it is submitted to the dye beck.

The chief woods used are oak, cypress, yellow pine, spruce, maple and hemlock.

Wood awning slats picked for light colors are bleached. Sometimes it is a problem to remove the rust stains, sap stains and other sorts of stains in addition to whitening the entire wood surfaces of the slats before any dyeing can be resorted to.

There are many chemical solutions in the market suitable for the purpose. These slats are laid on the cross pieces in a vat in a manner which will give the solutions time to circulate freely and reach all of the surfaces of the wood. Such woods as oak, birch, walnut and maple usually are selected for the pale colors, and are bleached preliminary to dyeing.

A good bleach for such woods is found in a chlorinated soda bath followed by saturation in a solution of peroxide of hydrogen. A formula which has been successfully used on such woods most likely to be cut for awning slats is made with 200 gallons of water heated up to 150° F. to which is added 12 pounds of silicate of soda, water white, 42° Bé., previously dissolved with warm water to a 6 gallon solution. Then add 2 gallons of peroxide of hydrogen. Stir well and run the mixture into the vat in which the slats were previously placed. Raise the temperature to 180° F., and finish the bleaching at this heat. When the wood has been brought to the shade of white desired, the exhausted liquor is run off, and the slats washed with warm water preparatory to dyeing them.

The practical dyer of thin sheets of wood for the window and porch awning industry has several things to work with in addition to those commonly appertaining to the dyeing of textiles. Some of these things are quite new to dyers who have devoted most of their working years to mastering the theories and practices of coloring a material which is quite distinct in its physical and chemical properties from wood, yet which is not short of many of the features of textile materials that enable it to absorb dyestuffs and retain the colors well.

Passing on to the next phase in the discussion relative to the coloring of wood slats for awnings, we find that the standardization of color shades for the wood in question, or any other wood, has not been very far advanced. There is no systemized method tabulated to make it easier for the dyer to work. He has the shade, the dyestuff and the material to be dyed to consider.

There is not much about the shade of the color that the practical dyer of any material does not already know. The shade is theoretically fixed for him. But the dyestuff is of prime importance if a good job is going to be done on wood which is going to be exposed to constant weather conditions. Fastness properties, leveling and economical coloration are among the things not to be overlooked. The coloring power of the dye solution as well as the degree of affinity the wood has for the dyestuffs must be considered in connection with available dyeing apparatus.

The basic, acid and some of the natural dyestuffs like logwood and indigo, are used with satisfactory results on the wood slats by immersion, by brushing or by spraying. Experience or experimenting will determine just which way is the best to insure a permanent color on the wood under treatment. Wood which has undergone unusual preparatory operations and has shrunk, warped or cracked in places, no longer can ward off conditions that create trouble. Then in order to produce certain shades wanted by the customer, the dyer may be compelled to use dyestuffs that do not level well on wood.

The painters and decorators are employing the brushing and spraying methods to some extent on wood awning slats, but dyers who are doing color work of this kind are getting remarkably good work with dyestuffs.

When using dyes selected from the direct class, those having the greatest degree of solubility are employed.

Impregnation of Corks

(To make sterile and impervious)

Formula No. 1

Dip the corks into a 5% egg white solution, after having sterilized them by heating them to 110° C.

When soaked sufficiently, the corks are dipped into a solution of

Tannic Acid	0.6 g.
Moldex or Other Good Preservative	0.5 g.
Water	100 cc.

No. 2

Make solution of

Nitrocellulose, or Cellulose Acetate, Highly Acetylated	0.5–1 g.
Salicylic Acid	0.5 g.
Acetone or Suitable Solvent	99 g.

And dip the corks into it.—Dry.

No. 3

Put the cork into a chamber under reduced pressure, keep at 120° C. for 10 minutes under reduced pressure.

Allow steam at 130° C. to enter the evacuated chamber, and keep the chamber at 130° C. for 10 minutes.

Such corks are sterile, and do not act upon the flavor of the content of the bottles.

Dark Paint Oil

Sardine Oil, Heavy Bodied Refined	5 gal.
Mineral Spirits	5 gal.

Linseed Oil Substitute

Sardine Oil, Solidified Oxidized	100 gal.
Mineral Spirits	60–70 gal.
Cobalt Drier (4½%)	1 gal.

Oil Tank Lining

French Patent 796,085

Base: Concrete and Sand.
First Coating: 25% Sodium Silicate.
Second Coating: 40% Sodium Silicate.
Third Coating: 50% Sodium Silicate.

Stand Oils with Tung Oil Character

German Patent 635,926

Formula No. 1

a. Lacquer Linseed Oil	1000 kg.
Maleic Anhydride	98 kg.
b. Glycerin	62 kg.

Heat *a* for 30 minutes to 150° C., bring up to 250° C. Add *b* and heat to 290° C. for 30 minutes.

No. 2

a. Soybean Oil	1000 kg.
b. Citraconic Acid	65 kg.
Linseed Oil Fatty Acid	56 kg.
Glycerin	40 kg.

Heat *a* alone to 290° C. for 5 hours, cool to 150° C., add the materials *b.* Heat up to 280° C. slowly, and keep at that temperature for 90 minutes.

No. 3

a. Perilla Oil	500 kg.
Poppyseed Oil	500 kg.
b. Maleic Acid	58 kg.
Glycol	31 kg.
c. Abietic Acid—Phenol—Formaldehyde Resin	550 kg.
d. Mineral Oil (B.P. 140–180° C.)	1000 kg.

Heat *a* to 300° C. for a short time, until a low-viscosity stand oil is formed. Cool to 100° C., add *b*, and heat to 250° C. for 3 hours.

When cooling dissolve *c* in the oil, and thin with *d*. Add drier.

Baking Vehicle

Durez No. 210	75 lb.
China Wood Oil	18¾ gal.

Run to 585° and hold for string. Check with 25 pounds Durez No. 210 and enough of 6½ gallon Alkali Refined Perilla to drop temperature to 500° F. Hold for string and check with balance of Perilla Oil.

Reduce with:

Mineral Spirits	27 gal.
V.M.P. Naphtha	19 gal.

To Remove Moss Before Painting

Before painting, wash moss-covered stone or brick with water to which has been added 2 per cent by volume of carbolic acid and follow up with the application of plain water with a stiff brush. The growth is said to come off easily under this treatment.

Refinishing a Gun Stock in Oil

Remove the varnish with a good liquid paint and varnish remover, and clean the surface. Or, if it can be done fairly easily, scrape the old finish off with a good steel scraper. When the old finish has been removed, sand the surface until smooth with very fine sandpaper. Heat a quantity of raw linseed oil to almost the boiling point, and brush a good coat of this hot oil on the stock. Let stand twenty-four hours, then wipe off the surplus oil remaining on the surface with a rag.

Zinc and Galvanized Iron "Washes"

The following treatments are used to prepare zinc or galvanized iron for painting:

Formula No. 1

Vinegar or weak acetic acid.

No. 2

One oz. of commercial hydrochloric or muriatic acid to four oz. of water.

No. 3

Copper Chloride	12	oz.
Copper Nitrate	12	oz.
Sal Ammoniac	12	oz.
Water	4½	gal.
Hydrochloric Acid	12	oz.

Mixed in given order.

No. 4

A weak solution of ammonia.

No. 5

Copper Acetate	6 oz.
Water	1 gal.

These solutions should be mixed and kept in glass or earthen vessels and applied with a brush. After the solution has dried the work should be washed with water, dried and coated as soon as possible afterward.

Preventing Condensation on Water Pipes

Sweating, of course, is caused by circulation of moisture laden air in the vicinity of cold pipes. These pipes may first be treated with an acid neutralizer such as vinegar, straight. Allow this to dry thoroughly and apply a heavy undercoat of white lead paste from which most of the oil has been drawn and sufficient drier added to make the primer set as fast as possible.

For the next coat use oil drawn white lead paste. Thin to wood primer consistency with turpentine and drier only. Into this stir powdered asbestos slowly and thoroughly until a heavy paste is obtained. Apply as thickly as possible to the dry pipes. If after a reasonable time the pipes still sweat, apply a second coat of asbestos and lead paste mixed as before. After this has dried, the pipes can be painted with aluminum paint mixed in a high grade vehicle. This will form a perfect seal. Or, if preferred, a good grade of enamel can be used over a sealer.

Another satisfactory method is sheet asbestos wrapped twice around the pipes and sealed. The pipes should be acid treated first. Care must be taken to seal and cover all joints and connections. The pipes will not look as well as they will if the first mentioned method is used.

Acid-Proofing Wood Surfaces

Mix 100 g. of aniline hydrochloride, and 40 g. ammonium chloride in 650 g. of water. Coat the surface with this mixture until the desired shade is produced and when perfectly dry rub by hand with white vaseline. Use plenty of vaseline and when the pores are filled wipe with a clean cloth.

Paint Mildew Preventive

Zinc Oxide	73.8 oz.
Bichloride of Mercury	1.2 oz.
Linseed Oil	25.0 oz.

This produces a smooth, easily workable paste, which can be packed in containers properly labeled with the usual caution suggestions and used by the painter on a job in localities where mildew is prevalent. To each gallon of paint which has been made ready for the finishing coat, there should be added ½ pint of the paste, where a concentration of 1 part of bichloride of mercury to 900 parts of paint is desired. This should be sufficient for most localities. Where mildew conditions are extremely severe, as high as three gills of the paste can be added to each gallon of the paint. The additional amount of zinc oxide which would thus go into the paint at the same time, would be from 1 to 1½ pounds. The limited mercury content makes the paste relatively safe to handle. While the zinc oxide is used as a carrier for the mercury, its application should be of distinct benefit in causing surface firmness of the film, and in its inhibiting and fungicidal action on mildew.

Combatting Dry Rot in Painted Surfaces

True dry rot is one of the most dangerous enemies of finishes. As protective agents are recommended fungus poisons consisting of inorganic salts in admixture with phenol and cresol derivatives, or better still, anhydrous liquid respiratory poisons, e.g. xylamon (naphthalene chloride, s. g. 1.25) obtainable as an oily liquid best applied by spraying. This wets well and evaporates very slowly; its peculiar smell is harmless to man and domestic animals. The breathing of the concentrated mist when engaged in spraying gives rise, however, to a passing irritation of the mucous membrane, and a mask should be worn.

Mold Resistant Whitewash

British Patent 461,305

Oxalic Acid	1 lb.
Boric Acid	1 lb.
Slaked Lime, Moist	10 lb.

Mix well and dilute with water before application.

Bleaching Wood

U. S. Patent 2,096,400

Immerse a wood veneer in an aqueous solution of mono-ethanolamine containing about 10% of mono-ethanolamine by volume, which solution is previously brought up to a temperature of about 60° C. The veneer is maintained in this bath for approximately fifteen to twenty minutes after which it is removed and drained to remove the excess of mono-ethanolamine adhering to the surface of the veneer. The "conditioned" veneer is then immersed in a bath of 100 volume hydrogen peroxide (30% by weight of hydrogen peroxide), previously brought to a temperature of about 60° C., and allowed to remain in this bath for about fifteen to twenty minutes. Considerable care should be taken when the "conditioned" veneer is immersed in the hydrogen peroxide solution since a semi-violent reaction takes place when the veneer contacts the hydrogen peroxide solution, oxygen being given off and the hydrogen peroxide solution spattering about. Care should be taken to prevent the hydrogen peroxide solution from touching the bare skin. In the event that some should contact the skin, a satisfactory antidote is cold water.

After immersion in the hydrogen peroxide solution for fifteen or twenty minutes, the veneer is removed and given a thorough washing with water at a temperature of 60° C. to 70° C. to wash out all traces of the hydrogen peroxide. The veneer is then dried and it may be finished in ways well known in the art. It will be found that the bleaching action has exerted itself to such an extent that the veneer is bleached for a distance approximately 1/25 of an inch beneath the surface of the wood. It is evident that longer periods of immersion, more elevated temperatures, and greater concentrations of materials will result in a greater depth of the bleaching action.

Protecting Hands from Paint

A new method has been devised for the washing of hands when making or using paint. This consists of first washing the hands with a dilute soft soap or perborate solution. While the hands are still damp they are sprinkled and rubbed with hypo. They are finally rinsed with pure water and covered with lanolin. Experiments over a period of eighteen months failed to reveal any irritation, even in persons having a hypersensitive skin or subject to exematous affections. The process is preferable to the use of bleaching powder and bisulfite.

Caulking Compound
(Gun Grade)

Medium Oil Lithopone	10 lb.
Asbestine	40 lb.
Domestic Whiting	50 lb.
Short Fibre Asbestos	20 lb.
Elastoil 7-L (Fish Oil)	73.8 lb.
Kerosene	13.5 lb.
Bleached and Blown Soya Bean Oil (Visc. Z3–4)	16.6 lb.
*V-1 Drier	3.5 lb.

* V-1 Drier: Cobalt, Lead Naphthenate Drier containing 1% Co as metal, 2% Pb as metal.

Painters' Glaze
U. S. Patent 2,078,504

Sodium Silicate	112 cc.
Ammonia	6 oz.
Casein	14 oz.
Water	1 gal.

Electromotor Sealing Compound

Polyvinyl Acetate or Polymerized Acrylate	5 g.
Solvent (Benzene, Toluene, Carbon Tetrachloride)	85 g.

Embossing Ink for Artificial Leather
U. S. Patent 2,102,715

Cellulose Nitrate	9.06 oz.
Pigment	20.51 oz.
Castor Oil	10.25 oz.
Ethyl Acetate	10.22 oz.
Ethyl Alcohol	15.34 oz.
Butyl Acetate	34.62 oz.

Preventing Crawling of Oil Films

The addition of 0.01% Calco Oil Red I-1289 to perilla, safflower, Chia and other drying oils prevents "crawling".

Preventing Asphalt from Sticking to Porous Surfaces
U. S. Patent 2,094,040

Formula No. 1

Water	800 gal.
Zinc Chloride	200 lb.
Corn Starch	16 lb.

In making up this solution the corn starch may be stirred into about 30 gallons of water, then the entire amount of zinc chloride may be added and the whole agitated until the dissolution heat has swollen the starch. After that, the mixture may be diluted with the remainder of the water. If instead of zinc chloride a salt is used which does not create with water an exothermic reaction, external heat must, of course, be applied to swell the starch.

Another example of this composition is:

No. 2

Water	800 gal.
Urea	250 lb.
Starch	16 lb.

When these or similar solutions are applied to bricks, concrete or other porous surfaces, and hot pitch or asphalt is poured thereover, it will be found that after partial or complete cooling the bituminous material can be lifted off practically without any effort. An outstanding feature is that when a brick or other porous surface is coated but once with this composition, hot bituminous material may be poured thereon and removed without difficulty several times in succession leaving, in each case, a clean and unmarred surface.

Decalcomania

Canadian Patents 365,470–1

A protective coating of resinous water-resistant material, such as gum sandarac 778 g., rosin 1036 g. and denatured alcohol 910 g., is applied to a backing sheet and a water-resistant coumarone-resin coating applied over the protective coating. The protective coating is substantially insoluble in a solvent which readily dissolves the outer coating. The decalcomania is freed from the backing sheet by applying a solvent such as gasoline. A protective coating of a rubbery nature such as rubber latex 30, casein glue 2.5, water 40 and ammonia 1, is applied to the backing sheet. An outer coumarone-resin waterproof sheet to take decalcomania printing is applied over the protective coating.

Phenol-Formaldehyde Hard-Baking Finishes

These are suitably used for blacks and dark shades. The resin is heated at 330° F. for an hour to polymerize, and then thinned down with coal-tar naphtha and white spirit and a small amount of naphthenate drier is added. Alternatively a suitably polymerized resin may be dissolved in methylated spirits and a little butyl alcohol and cellosolve added. These finishes can be pigmented as desired. Carbon black and certain dyes may be used for blacks. These finishes require a baking temperature of 250–300° F., maintained for 2 hours or more to become thoroughly polymerized, and then are unaffected by coal-tar naphtha or gasoline.

Baking Finishes

Combined Glyptal/Phenol Formaldehyde

Paralac 2001	54.6 lb.
Paralac 285X	13.9 lb.
Paralac 113 or Epok R 500	3.9 lb.
Titanium Oxide	12.3 lb.
Methylated Spirits*	9.2 lb.
Toluol	6.2 lb.

* A little Cellosolve, butyl alcohol and xylol is advantageous to improve flow.

Combined Glyptal and Urea

Urea Resin U. F.	28.0 lb.
Rezyl II	13.0 lb.
Pure Titanium Oxide	8.5 lb.
Antimony Oxide	8.5 lb.
Methylated Spirits and Toluol	38.0 lb.
Cellosolve	4.0 lb.

Urea Baking Finish

Urea Resin U. F.	27 lb.
Blown Castor Oil	6 lb.
Tricresyl Phosphate	5 lb.
Titanium White	30 lb.
Xylol	32 lb.

Exterior Glyptal Stoving Finish

Pine Oil	8.7 lb.
Paralac 18X	44.0 lb.
Ester Gum	2.6 lb.
Titanium Dioxide	29.1 lb.
Xylol	13.8 lb.
Tetralin	1.8 lb.
Lead—Manganese Resinate drier corresponding to—	
Metallic Lead	0.076%
Metallic Manganese	0.006%

PAPER

Sizing Paper
U. S. Patent 2,058,085

Ten parts by weight of soy bean protein are treated with 0.7 part of sodium carbonate by heating to 60° C. under mild agitation with 60 parts of water. To this are added five parts of ammonium oleate for other suitable emulsifying agent, such as turkey red oil, gums like gum arabic, sodium stearate, etc. To this mixture, 40 parts of molten paraffin are slowly run in under agitation. The mixture of casein, emulsifier, and paraffin is stirred with a high speed stirrer or other suitable equipment. The time of mixing is usually approximately 15 minutes, the mixture then being diluted with about 1000 parts of water at approximately 60° C. These temperatures can be adjusted, depending upon the melting point of the paraffin used. The emulsion can likewise be made through the use of a colloid mill or other suitable equipment.

The preferred way in which this casein-paraffin size is used is to add it to the pulp in the beater, and then set the size through the use of alum in the usual manner to give an acidity of from about pH 4.5 to 6.0. After about five minutes, which will ordinarily be sufficient time for the setting of the size, the calcium carbonate or other alkaline earth filler may be introduced in slurry form at a concentration of about two pounds per gallon, if such filler is desired. The usual treatments which are given to pulp in the beater, such as coloring or the possible addition of starch, may also be practiced, if desired. In case it is desired to use some rosin size in conjunction with the special casein-paraffin size, then both types of size may be added to the pulp and set with alum in the usual manner.

It can be made up with fresh water at the normal concentration of beater stock, say, from 4 to 6 per cent. However, the diluting water for the dropping of the beaters may be white water if it is available, and thickened stock such as might be recovered from the usual white water systems may be added just prior to dropping. In case no filler is used or in case any fillers other than alkaline-earth fillers are used, such as ordinary clay, no precautions need be taken with regard to the use of white water, and it may be used to make up the beaters or may be omitted as desired. Wet and dry broke should be handled separately in a broke beater and proportionately dropped to the beater chest, or it may be added in slush form to the beater after the sizing operation.

A typical example for the production of book paper would be about as follows:

Bleached Soda Pulp	500 lb.
Bleached Sulphite Pulp	500 lb.

To this pulp is added about 5 per cent by dry weight of the casein-paraffin size, which is then set with alum, as described. To this mixture may be added 300 lb. of alkaline-earth filler, the whole beater having been made up with fresh water but using any excess white water which may be available during the operation of dropping the beater.

The stock from the beater is handled in the usual manner over the paper machine.

Paper Filler
U. S. Patent 2,034,519

Clay	1300 lb.
Alum	120 lb.
Calcium Oxide	60 lb.
Trisodium Phosphate	15 lb.
Calcium Carbonate	25 lb.

Add to water to form a thick slurry and mix with pulp.

Stiffening for Shoe Papers
(Toecap Paste)

Dextrin	10 lb.	5¾ oz.
Whiting	26 lb.	9 oz.
Calcium Sulphate Anhydrous	2 lb.	12 oz.
China Clay	1 lb.	1½ oz.
Gum Arabic (Powder)		8 oz.

Mix well and sieve (80-mesh).

Water (Boiling)	2 gal.
Nitrobenzol	1 oz.
Water-Soluble Brown Dye	¼ oz.

The dextrin is dissolved in the hot water and the remainder of the ingredients added except the dye and perfume, the dye being dissolved in a small amount of water and added together with the perfume. The next operation consists of removing about half the weight of the water from the mass, conveniently done by gently heating the contents in a large surface dimensioned pan, with frequent stirring. The heating is continued until the paste has been reduced to 50 lb. weight. It can be filled while still moderately warm into wide-mouthed lever lid tins of about 28 lb. capacity.

Bleaching Paper for Foxing and Other Stains

Bleaching of paper for removal of foxing and other stains may be done by several chemicals, all with the advantages and disadvantages of such treatment. The fly in the ointment appears in shape of the warning that many chemicals remove spots and also weaken the paper, Bleaching is perfectly possible, but it is recommended only when it will not do more harm than good.

Excellent results for bleaching may be secured by the use of potassium permanganate and potassium metabisulphite, when in the hands of competent and intelligent workmen. Three shallow trays are needed, one filled with permanganate, the second with water, the third with the metabisulphite, each of the potassium compounds diluted to the strength of one ounce to sixteen ounces of water.

Put the paper in the permanganate solution for thirty to sixty seconds. The sheet will turn a deep, purplish brown in this straining solution. Lay it next in the clear water and wash off the permanganate. Then comes the turn of the potassium metabisulphite, and in it the sheet will turn white almost instantly. Leave it in this pan until all the stains and spots disappear, and then put it into running water to wash till all traces of the chemicals have been completely removed. Let it dry between blotters and then put it to press to remove wrinkles.

Now and then a stain will greet the workman with refusal to disappear in the metabisulphite solution. In such a case wash off the metabisulphite with clear water, put the sheet in a pan containing a solution of potassium ferricyanide of the same 1:16 strength. If it does not disappear quickly the case is almost hopeless. But another attack may be made with a hydrochloric acid solution of the same strength, after having washed off the previous chemicals. If the spot still persists it may be written down as practically removal proof.

Bleaching Newspaper
U. S. Patent 1,993,362

The following is applied to newspaper pulp in amount of 5 lb. per ton of paper:

Soda Ash	50 lb.
Pine Oil	5 lb.
Chlorine	30 lb.
Pyridin	5 lb.

Bleached Half-Stuff from Mulberry Bark

The bark is pulped with caustic soda (14% of dry weight) at 3.5 atmospheres for 7.5 hours and bleached with 5% active chlorine. The product equals rag stock.

Argentine or Silver Paper

Argentine Pulp (40%)	90	lb.
Casein Solution*	2½	gal.
Carnauba Wax Emulsion†	½	gal.
Gasoline	1	pt.
Carbon Tetrachloride	1	pt.
Nigrosine	9	oz.

This mixture coated on paper gives a gray colored coating. When friction calendered, the coating develops a metallic luster, closely approximating a leaf or foil paper.

* Casein Solution

Casein	62 lb.
Borax	7 lb.
Trisodium Phosphate	7 lb.
Water, to make	50 gal.

† Carnauba Wax Emulsion

# 2 Carnauba Wax	140 lb.
Castile Soap	20 lb.
Water, to make	140 gal.

Paper Carton Coating

Montan Wax, Crude	9	g.
Paraffin Wax (50/52° C.)	1	g.
Soap, Castile	0.8	g.
Borax	0.2	g.
Distilled Water	50	g.

Paper Glaze

Montan Wax	6	g.
Soap, Castile	1.9	g.
Distilled Water	40	g.

Tissue Paper Treatment
British Patent 452,352

Tissue paper is made strong, supple, soft and absorbent by treatment with

Glycerin	1	gal.
Alcohol	2	gal.
Water	3	gal.
Talcum Powder	5½	oz.

The treated paper is passed through rolls and dried.

Tissue Paper Bed Sheets
U. S. Patent 2,106,096

Tissue paper is saturated with the following suspension and then passed between wringers and dried.

Alcohol	2	gal.
Glycerin	1	gal.
Water	3	gal.
Talc	5½	oz.

Absorbent Paper
U. S. Patent 2,013,841

Bleached or unbleached rag or rope half-stuff is beaten, and treated with a solution of an alkali (*e.g.*, by boiling with 1—3% aqueous caustic soda for 1—3 hours) to dissolve the hydrated mucilage formed during beating. It is claimed that a highly absorbent paper can be made therefrom.

Cigarette Paper Treatment
Formula No. 1
British Patent 455,416

Cigarette paper is left for one hour in following solution and then dried:

Agar-agar	0.2	g.
Water, Distilled	100	cc.

Formula No. 2
French Patent 798,186

The paper is made to contain

Stearic Acid	0.8%
Titanium Dioxide or Asbestos	2.0%

Production of Fine Paper from Tarred and Oiled Waste

Canvas and fish-net waste are cooked with 8–10% lime and 2–5% caustic soda at 3–4 atmospheres for 6–10 hrs. Bleach with 12% aqueous calcium hypochlorite. After re-working it may be mixed with 25% each of bleached and unbleached sulphite pulp for production of high-grade cigarette paper.

Light Protective Wrapper
U. S. Patent 2,058,786

A thin, flexible transparent wrapper of regenerated cellulose, for articles tending to deteriorate if subjected to actinic light, comprises a colorless substance adapted to prevent the passage of objectionable amounts of such light, in which the colorless substance is a coating having the following approximate composition:

Pyroxylin	3	oz.
Amyl Acetate	5–25	oz.
Colorless Absorber of Actinic Light	0.5– 5	oz.
Carbitol	8–10	oz.
Ethyl Acetate,	10–30	oz.
Castor Oil	2– 5	oz.
Benzol, Toluol, or other diluent	30–70	oz.

Dielectric Paper
U. S. Patent 2,020,468

Paper is impregnated with

Chlorinated Naphthalene	9	lb.
Paraffin Wax	1	lb.

Hectograph Paper Coating
U. S. Patent 2,021,938

More copies are obtained by coating paper with

Glue	8	lb.
Sodium Bicarbonate	15	lb.
Starch	30	lb.
Sodium Silicate (1:14 solution)	1¾	lb.
Alum (1:6 solution)	10	lb.

Playing Card Composition
Canadian Patent 358,377

Cellulose Acetate	85–95	oz.
Cellulose Nitrate	5–15	oz.
Dibutyl Phthallate or Tricresyl Phosphate	20–35	oz.
Titanium Dioxide	10–25	oz.

Paper Bonding Composition
U. S. Patent 1,977,514

Starch	100	lb.
Alum, Iron Free	9	lb.
Sodium Aluminate	3	lb.

Ground together to 100 mesh.

Transparentizing Paper for Blue-Prints

Immerse paper in

Diethyl Phthalate	25	fl. oz.
Alcohol, Anhydrous	75	fl. oz.

and dry.

Oilproofing for Paper

Starch	65	oz.
Sodium Silicate	15	oz.
Molasses	20	oz.
Sodium Salicylate	0.4	oz.
Water	400	oz.

The sodium silicate is mixed with the water and then the starch is added. Any form of starch may be used, though the root starches such as potato and cassava are preferable to the cereal starches like corn and rice. This mixture is heated in a water jacket to the bursting of the starch granules, which will take place at about 165° F., and the mass is kept heated at this temperature or not exceeding 190° F. until the plastic clarifies, which may require about a half hour.

Wax-Oil Proofing for Paper

Starch	7.0 oz.
Glycerin	2.0 oz.
Sugar	0.60 oz.
Sodium Salicylate	0.20 oz.
Sodium Hydroxide	0.10 oz.
Water	90 oz.

Each constituent is dissolved separately in a portion of the water and the solutions thoroughly mixed.

Grease and Moisture Proof Paper
U. S. Patent 2,021,947

Paper is coated with

Modified Starch	9.5 oz.
Casein or Glue	9.5 oz.
Ammonium Hydroxide	0.6 oz.
Clay	37.8 oz.
Glycerin	14.2 oz.
Rubber Latex	23.7 oz.
Shellac	4.7 oz.

Water to suit.

Greaseproofing for Paper & Textiles, Odorless
British Patent 431,191

Chlorinated Rubber	15– 20 lb.
Nitrocellulose	60– 80 lb.
Trichlorethylene	90– 120 lb.
Acetone	1000–1300 lb.

The above may be plasticized with diethyl phthallate.

Mothproof Paper

Spray or paint paper with a warm solution of following

Eucalyptus Oil	1 oz.
Naphthalene	42 oz.
Paraffin Wax	25 oz.
Naphtha	11 oz.
Cedar Wood Oil	1 oz.

Difficultly Inflammable Paper

For 100 kg of pulp use 20–60 g. zinc sulphate, 20–60 g. sulphuric acid, and 250 g. calcium chloride, added in the hollander, followed by 2–4 kg. tallow soap, 2–4 kg. size, and 5–10 kg. alum. 10 kg. of soda ash or potassium carbonate and 4 kg. of ammonium borate in 100 kg. of water renders the product non-inflammable at 300–400° C.

Fireproofing Paper, Cloth and Wood
French Patent 817,321.

Magnesium Chloride	4.0 g.
Ammonium Sulphate	4.5 g.
Ammonium Phosphate	2 g.
Ammonium Glycoborate	1.2 g.
Sodium Borate	2.8 g.
Boric Acid	3.2 g.
Ammonium Carbonate	2.7 g.
Water	100.0 g.

Paper Pulp from Straw
French Patent 782,378

Straw is subjected to a mechanical treatment, *e.g.*, in a hammer mill, which breaks it up into pieces about 10 mm. long, and is treated for about 4 hours at about 80° C. with 4 to 5 per cent of lime on the weight of the straw, in the form of a 10 per cent milk of lime.

Froth Prevention
(For Paper Pulp Solutions)
French Patent 793,173

For every 100 kg. of pulp 50 g. of the following is used:

Liquid Petrolatum	60 g.
Cyclohexanol	16 g.
Decalin	10 g.
Amyl Acetate	12 g.
Madder Oil	2 g.

German Autograph Paper

Impregnate strong printing paper free of glue, as follows:

a. Gelatin	10 g.
Water	100 g.
b. Tannic Acid	5 g.
Water	100 g.

in the order given.

Laminated Box Board Counting Aid

Methyl red has been found by the United States Forest Products Laboratory, Madison, Wis., to be the best reagent for staining the edge of laminated boxboard for the purpose of counting the number of plies. When stained with a 0.1 percent aqueous solution of the reagent the edge of the board shows the adhesive as yellow lines on a red field.

Marbled Coloring of Book Edges

A mucilage is made from Carraghen moss and water and placed in a tray and on to the surface of this mucilage, *i.e.*, the "carrier," drops of various Chlorazol dye solutions are placed. A piece of wood, into which a number of nails have been driven, in order to produce a comb-like effect, is then passed across the surface of the carrier so as to cause the drops of dye solution to assume a wave-like formation. The edges of the ledger are then placd in contact with the colored surface of the carrier and, in consequence, the colored wavy effect is transferred to the edges of the paper.

Linen Paper Pulp

U. S. Patent 2,099,399

An improved method of producing bleached pulp from linen rags, which consists in subjecting the rags to a cooking operation in a digester with a solution of water of approximately 2½ to 4 times the dry weight of the rags, 1% to 4% sulphur, 4% to 10% calcium oxide, and 12% to 20% sodium carbonate, the quantities of the chemicals employed being based on the dry weight of the rags; washing the cooked rags to remove excess shive and water soluble impurities and then bleaching.

Flax and Hemp Paper Pulp

U. S. Patent 2,099,400

An improved method of producing bleached pulp from flax or hemp tow, which consists in subjecting the tow to a cooking operation in a digester with a solution of water of approximately 2½ to 4 times the dry weight of the fiber, and 14% to 20% sodium hydroxide and 1% to 4% sulphur, the quantities of the chemicals employed in the solution being based on the dry weight of tow; then washing the cooked fiber to remove shive fiber and water soluble impurities, and bleaching the fiber.

PHOTOGRAPHY

General Hints for Improving the Quality and Keeping Properties of Developing Solutions

1. Use the best grade of chemicals available, preferably those recommended for photographic uses.
2. If possible, mix developer just before using, use up as rapidly as possible, and discard exhausted bath.
3. Follow closely the directions accompanying any formula, regarding both the order and manner of mixing, and the use of the solution.
4. When making up a batch of developing solution for use over a long period of time in tray or small batch developments, store it in a number of tightly stoppered containers, each holding about the quantity to be used at any one time. This prevents oxidation of the developing agent by the air inside a partly emptied bottle.
5. Two-solution stock developers, in which the developing agent and some sulfite are kept in one solution, and the alkali and the rest of the sulfite are kept in another, have in general better keeping properties than single solution developers.

Developer Preservatives and Fog Preventing Agents

1. To prevent fog during development and to get blue-black tones on papers, add 0.05 to 0.35 grams nitrobenzimidazole per liter of a metol-hydroquinone developer.
2. To preserve a pyro developer add ½ oz. of acetone sulphite for each ounce of dry pyro used. 10 parts of acetone sulphite are equivalent to 7 parts of potassium metabisulfite and 20 parts of anhydrous sodium sulphite.
3. Addition of 10% of alcohol has a beneficial effect on the keeping of sodium sulfite solutions. Neutralizing with sulfuric, oxalic, or citric acid is often used.
4. The addition of small amounts of triazoles and tetrazoles to developers prevents fog.
5. Dissolve 5 grams stannous chloride and 5 grams tartaric acid in 30 cc. hot water, dilute to 1 liter and filter. This solution added to 1000 cc. of a diaminophenol developer preserves it from atmospheric oxidation for a long time.
6. Safranine will keep a metol-hydroquinone developer undeteriorated for a long time.
7. Acetylene prevents fog in alkaline developers. The higher the alkalinity, the greater the fog prevention. Acetylene derivatives of propargyl alcohol and propiolic acid also show the same effect.

Bacteriological Growths in Developing Tanks

To rid a deep developing tank of bacteriological growths, drain the tank, clean and wash well with water, treat with a dilute hydrochloric acid solution, and rinse well with water. Carbolic acid may also be used in conjunction with a thorough scrubbing and rinsing with water.

The addition of lead acetate (60 grains per gallon or 1 gram per liter) to deep tank developers is recommended to clear up the fog caused by the action of bacteria in reducing the sulfite to sulfide.

Occasional sterilization of deep tanks with bleaching powder removes slimy deposits of fungi or bacteriological growths.

Developers with Good Keeping Properties

Formula No. 1

For Negatives and Prints

Water	1 l.
Metol	1 g.
Hydroquinone	11 g.
Sodium Sulphite	42.5 g.
Potassium Carbonate	75 g.
Glycine	12.5 g.
Potassium Bromide	5.6 g.

For contact and enlargement papers dilute 1:1, and develop 3 to 7 min. at 70° F. For softer work add another part of water.

For negative developments add 1 part solution to 2 parts water, and develop 4 to 5 min. at 65° F.

No. 2
Developer for Fine Grain Tank Development

Metol	4.5 g.
Anhydrous Sodium Sulphite	85 g.
Sodium Carbonate (Monohydrated)	1 g.
Potassium Bromide	0.5 g.
Water	1 l.

Develop 15 to 20 min. at 65° F.

No. 3
Fine Grain Tank Developer

Metol	0.7 g.
Anhydrous Sodium Sulphite	65 g.
Hydroquinone	0.9 g.
Borax	0.7 g.
Water	1 l.

Develop 12 to 16 min. at 65° F.

Fine Grain Developer
Formula No. 1

Water	500 cc.
Sodium Sulphite	45 g.
O-Phenylenediamine	6 g.
Metol	6 g.
Potassium Thiosulphate	7.5 g.

Time of development 18 min.

No. 2

Metol	1 g.
Sodium Sulphite	100 g.
Pyrogallol	5 g.
Triethanolamine	1 g.
Water, Distilled to	1 l.

Time of development for fast panchromatic emulsions is 5–7 min. at 19–20° C.

Metol-Pyro Developer

Solution A:		
Water	1 l.	32 oz.
Sodium Bisulphite	7.5 g.	109 gr.
Metol	7.5 g.	109 gr.
Pyro	30 g.	1 oz.
Potassium Bromide	4.2 g.	63 gr.
Solution B:		
Water	1 l.	32 oz.
Sodium Sulphite (Anhydrous)	150 g.	5 oz.
Solution C:		
Water	1 l.	32 oz.
Sodium Carbonate (Monohydrated)	80 g.	2 oz. 292 gr.

Tank development: take one part each of solutions A, B, and C and 13 parts of water. Develop 8 to 10 minutes at 65° F.

Process for Physical Development

Forebath:

Potassium Iodide	75 gr.	5 g.
Sodium Sulphite (Anhydrous)	190 gr.	12.5 g.
Water to make	16 oz.	500 cc.

Expose negative normally. Place in forebath for exactly 1½ minutes, remove, rinse slightly and place in physical developing bath.

Physical Developing Bath:

Stock solution:

Hypo	2⅝ oz.	80 g.
Sodium Sulphite (Anhydrous)	1 oz.	30 g.
Silver Nitrate (Crystals)	120 gr.	8 g.
Distilled Water to make	16 oz.	500 cc.

Dissolve sodium sulphite and hypo in 10 ounces of water. Dissolve silver nitrate in remaining 6 ounces of water. Add silver nitrate solution to hyposulphite solution slowly with vigorous stirring with a glass rod.

First mix:	
Stock solution	1 oz.
Water	1 oz.
Second mix:	
Amidol	3½ gr.
Water	2 oz.

Mix first and second solutions making 4 ounces in all.

Develop in the developer for 45 minutes at 65° F. Fix in ordinary acid hypo for 20 minutes. Wash two hours in running water.

Be sure that all of the film is wetted by each solution in its turn. Conduct operations in safe light.

Development of Agfa Color Plates

Solutions Required:

Agfacolor Plate Developer:

Water	1000 cc.	32 oz.
Metol	3.25 g.	50 gr.
Sodium Sulphite (Anhydrous)	25 g.	375 gr.
Hydroquinone	1 g.	15 gr.
Potassium Bromide	1.5 g.	23 gr.
Ammonia (25% or sp. gr. = 0.91)	7.5 cc.	2 dr. (120 min.)

(If a stock solution is to be kept, do not add the ammonia until ready to use.)

Reversing Bath:

Water 32 oz.
(or 1 l.)

Potassium
Bichromate 1 oz. and 340 gr.
(or 53 g.)
Concentrated Sulphuric Acid 3¼ oz.
(or 100 cc.)
(For use take 10 fl. oz. water and to this add 1 fl. oz. stock solution.)

Procedure:

Strain developer through filter paper before use. About 2 oz. of the developer is sufficient for one 3¼ x 4¼ plate. Use a fresh batch of developer for every plate. Do not allow temperature to exceed 65° F. during use. If the plate is correctly exposed, development will be complete in approximately 3 minutes. Development and all manipulation before partial completion of reversal should take place in total darkness. The plate may, however, be briefly inspected from time to time during the development by means of a dark-room lamp equipped with the Agfa Safelight Glass No. 103 (green).

After development wash for one minute in running water. Place the plate in the reversing bath for one minute. Then turn on a white light and proceed with the reversal until all the blackened silver has been removed; this can be determined by examining the plate by transmitted light.

Next, wash two minutes in running water. Then place the plate in the original developer for two or more minutes in the presence of strong white light. Rinse for one half minute in running water, and dry immediately with the use of an electric fan.

Table for the Methodical Development of Doubtfully Exposed Color Plates

First appearance of the picture	Total developing time including time for observation	As a precaution against future failures
30 seconds	5 minutes	Expose 3 times longer
25 seconds	4 minutes	Expose 2 times longer
20 seconds	3½ minutes	Expose 50% longer
15 seconds	3 minutes	*Correctly exposed.*
10 seconds	2 minutes	Expose 50% shorter
8 seconds	1½ minutes	Expose 75% shorter

Development and Fixing of Agfa Direct Duplicating Film

Developer:

Water	1 l.	32 oz.
Metol	5 g.	75 gr.
Sodium Sulphite (Anhydrous)	40 g.	1⅓ oz.
Hydroquinone	6 g.	90 gr.
Sodium Carbonate (Monohydrated)	40 g.	1⅓ oz.
Potassium Bromide	2 g.	30 gr.

Use without dilution. Normal developing time, 4 to 5 minutes at 65 degrees Fahrenheit (18° C.).

Fixing Bath:

Solution A:

Water	1 l.	32 oz.
Hypo	240 g.	8 oz.

Solution B:

Water	75 cc.	2½ oz.
Sodium Sulphite (Anhydrous)	15 g.	½ oz.
Acetic Acid (28%)	45 cc.	1½ oz.
Potassium Alum	15 g.	½ oz.

Dissolve chemicals thoroughly in order given; then add solution B to Solution A, stirring rapidly. Fix film until clear, and then leave in the bath for another 5 minutes to be safe.

Wash film for ½ hour in running water.

Conduct all operations in light provided by a safe lamp provided with an Agfa Safelight Filter No. 105 with a 25 watt lamp.

Photographic Developer
U. S. Patent 1,990,800

Metol	1 g.
Quinol	5 g.
Sodium Sulphite	50 g.
Borax	20 g.
Sodium Hydroxide	5 g.
Potassium Bromide	1 g.
Water to make	1 l.

Blistering is prevented and the life of the hardening bath is prolonged.

Rapid Photographic Developer

Soak film for 8 seconds in

Hydroquinone	5 g.
Sodium Sulphite	2½ g.
Water	92½ cc.

Transfer without washing to

Potassium Hydroxide	30 g.
Water	70 cc.

for 2 seconds. Baths should be at 25–27° C. Objectionable softening of gelatin does not occur.

Long Lasting Developer (Richardson's)

a. Water, Hot	96 oz.
Sodium Bisulphite	12 oz.

	Sodium Sulphite	12 oz.
	Cool to 70° F. and add	
	Pyro	1 oz.
b.	Water, Hot	64 oz.
	Elon	1 oz.
	Hydroquinone	4 oz.
	Cool to 70° F. and add *b* to *a*.	
	Then add	
	Water	160 oz.
c.	Water, Warm	128 oz.
	Sodium Carbonate	15 oz.
	Cool to 70° F. and add to above.	

Fine Grain Developers
Formula No. 1

Water	500 cc.
p-Phenylenediamine	1.2 g.
Sodium Sulphate, Hydrated	10 g.
Caustic Soda	2 g.

No. 2

Water	100.0 g.
Metol	0.3 g.
Triethanolamine	3.5 g.
Sodium Bisulphite	1.0 g.

No. 3

Water	1000.0 cc.
Metol	2.5 g.
Sodium Sulphite	45.0 g.
Benzoic Acid	1.0 g.
Salicylic Acid	0.5 g.
Boric Acid	2.5 g.
Glycin	11.5 g.
p-Phenylenediamine	11.5 g.

Develop Panatomic 13 min., Super-X and DuPont Superior 19.5 min. at 70° F. Gives a fine grain with increased emulsion speed.

Fine Grain Glossy Paper Developer

Water (125° F.)	10 oz.
Sodium Sulphite	1¼ oz.
p-Phenylenediamine	90 gr.
Glycin	15 gr.
Cold water to make	16 oz.

Development 30 minutes at 65° F. for correctly exposed negatives of subjects of medium contrast which are to be enlarged upon bromide or chloro-bromide. Low contrast subjects should receive slightly longer development, possibly 40%, for same printing medium. High contrast subjects—shorten development about 20%.

These times are relative and are offered as a guide only, one must by experiment with the particular film used determine the correct development time for the gamma he desires. Films vary in development time. Panatomic requires one half the time of super speed panchromatic.

Maximum Speed Fine Grain Developer

Sodium Sulphite	90 g.
p- Phenylenediamine Hydrochloride	16.8 g.
Glycin	6 g.
Ammonium Hydroxide (Normal)	186 cc.
Water to make	1000 cc.

"Piramid" Extra Fine Grain Developer

Water, Cool	500 cc.
Potassium Pyrosulphite	2.5 g.
Amidol	0.5 g.
Pyrogallol	1.5 g.
Glycin	0.5 g.
Tribasic Sodium Phosphate	3.5 g.

Dissolve in above order, with good stirring. Development time at 18° C. is about 20 minutes.

Gives a finer grain than Eastman D76 or Agfa 14 developers.

One Bath Rapid Photographic Developer

Hydroquinone	30 g.
Sodium Sulphite	25 g.
Potassium Hydroxide	60 g.
Phenosafranine (0.1%)	20 cc.
Water to make	1 l.

Development time at 23–27° C. is 25 seconds.

Chaplin No. 15 Fine-Grain Developer

Water	1000 cc.
Pyrogallol	3.5 g.
Sodium Sulphite	60 g.
Benzoic Acid	1.2 g.
Salicylic Acid	0.5 g.
Boric Acid	2.5 g.
Tannic Acid	1 g.
Glycin	11.5 g.
p-Phenylenediamine	11.5 g.
Isopropyl Alcohol (97%)	50 cc.
Nickel and Ammonium Sulphate, cryst.	1 g.

Dissolve the p-phenylenediamine separately in a small amount of the water which has been heated to about 180° F. Similarly dissolve the nickel and ammonium sulphate in about 30 cc. of the water. Dissolve all the rest of the constituents in the balance of the water, add the p-phenylenediamine solution, then add the nickel and ammonium sulphate solution and filter through common chemists' filter paper.

New Metol-Hydroquinone Developer

"Hard" Bath:

Water	2 l.
Sodium Pyrosulphite	2 g.
Metol	3 g.
Sodium Sulphite	75 g.
Hydroquinone	10 g.

Potassium Carbonate	40 g.
Potassium Bromide	5 g.
"Soft" Bath:	
Metol	10 g.
Hydroquinone	3 g.
Potassium Bromide	3 g.
Sodium Pyrosulphite	2 g.
Sodium Sulphite	75 g.
Potassium Carbonate	40 g.
Water	1 l.

Time of development at 18° C. is 6 minutes for films and plates and 4 minutes for paper.

Metol-Hydroquinone Developer

Metol	1 g.
Hydroquinone	4 g.
Sodium Sulphite	20 g.
Potassium Carbonate	20 g.
Ammonium Bromide	1 g.
Water to make	1 l.

Pyrocatechol Developer Without Sulphite

Solution A:	
Pyrocatechol	4 g.
Water	100 cc.
Lactic Acid	10 drops
Developer:	
Water	100 cc.
Solution A	10 cc.
Sodium Carbonate (3.4% solution)	5 cc.

This developer requires 10 minutes.

Too contrasty negatives are bleached with 1 g. potassium permanganate, 25 g. hydrochloric acid, 1000 cc. water, and developed with usual pyrocatechol sulphite.

For toning prints bleached with potassium ferricyanide and potassium bromide the following developer is used:

Solution A	10 cc.
Potassium Carbonate (26% solution)	10 cc.
Water	150 cc.

Alkali Free Developer

Sodium Sulphite	30 g.
Chrome Alum	20 g.
Water	1 l.
Before using add	
Amidol	5 g.

Color Forming Photographic Developers

Formula No. 1

Canadian Patent 362,821

a.	Diethyl-p-phenylenediamine Hydrochloride	3 g.
	Sodium Sulphite	10 g.
	Sodium Carbonate	20 g.
	Potassium Sulphocyanide	1 g.
	Water to make	1500 cc.
b.	2, 3, 4-trichloro-α-naphthol	2 g.
	Acetone	100 cc.

Add *b* to *a*.

No. 2

Canadian Patent 362,822

a.	Diethyl-p-phenylenediamine Hydrochloride	2 g.
	Sodium Sulphite	5 g.
	Sodium Carbonate	30 g.
	Water to make	1000 cc.
b.	p-bromo-acetoacetanilide	2 g.
	Acetone	100 cc.

Add *b* to *a*.

Dufay Color Film Development

Metol	16.25 g.	250 gr.
Hydroquinone	5.0 g.	77 gr.
Sodium Sulphite	250.0 g.	9 oz.
Potassium Bromide	6.98 g.	108 gr.
Ammonia (0.910)	3.75 cc.	63 min.
Water up to	2500 cc.	98 oz.

The film being thin curls during development, and it is a good plan to use a film-sheath, or to attach it to a sheet of clean glass by small pieces of adhesive tape at the four corners. Development for a correctly exposed film takes five minutes. Total darkness is advisable, or a desensitizer such as pinacryptol yellow may be employed.

Following development, the film is given a brief rinse in order to remove the developer, and it is then ready for reversal. The reversing bath recommended is made up as follows:

a.	Sulphuric Acid (concentrated)	50 cc.	840 mm.
	Water to	2500 cc.	88 oz.
b.	Potassium Permanganate	10 g.	154 gr.
	Water to	2500 cc.	88 oz.

After the film has been in the reversing bath for about two minutes, the white light may be turned on. Reversal takes from four to five minutes, and care should be taken to see that the action is complete and that there are no dark patches on the film when the image is viewed against transmitted light. After reversal is complete, the film is given a rinse and placed for one minute in the following clearing bath.

Potassium Metabisulphite	3 oz.
Water	20 oz.

This will remove the brown stain left by the permanganate and will also brighten the image.

Photostat Developer

Metol	13.9 g.
Sodium Sulphite	20.4 g.
Hydroquinone	55.8 g.
Sodium Carbonate	30.6 g.

Potassium Bromide	3.3	g.
Water to make	10	qt.

Developing time 50–55 seconds. Does not stain and gives good blacks.

Blue Print Developer

U. S. Patent 1,998,883

Urea Peroxide	0.3	g.
Water	1	l.

This solution is applied for 3 to 5 seconds and is non-staining and need not be washed out.

Fixing Developers

a. Pyrocatechol	7	g.
Sodium Sulphite	15	g.
Caustic Potash	7	g.
Water	75	cc.
to 12 cc. of *a* add		
Sodium Hyposulphite (20%)	30	cc.
Water	30	cc.
b. Pyrogallol	12.5	g.
Water	500	cc.
Sodium Sulphite	80	g.
to 40 cc. of *b* add		
Sodium Hydroxide (1.6%)	40	cc.
Sodium Hyposulphite (20%)	35	g.
c. Metol	4.2	g.
Hydroquinone	8.18	g.
Sodium Sulphite	32	g.
Trisodium Phosphate	100	g.
Sodium Hyposulphite	40	g.
Water	1	l.

Development time 5–30 minutes.

Development of Dot-Etching Positives

The most important factor in the development of etching positives is to continue the operation until the light-exposed image has been completely reduced to metallic silver. A safe guide is to have the developed image appear visible in a decided black color on the glass side of the plate, signifying complete reduction of the lower as well as surface particles of exposed silver salt in the gelatin emulsion.

In warm weather, when the temperature of the tap water is relatively high, it may be found advantageous to edge the "Super Contrast" plate *after exposure* and *before development* with a heavy solution of india-rubber, so as to prevent entry of the photographic and etching solutions under the emulsion at the edges of the plate.

Developers best suited for dot etching purposes are those which give the greatest density in a reasonable time of development. Caustic soda (sodium hydroxide-hydroquinone) developers should not be used, as they exert a damaging effect on the gelatin emulsion. Metol-hydroquinone developers, such as the following, have been found very satisfactory:

Hot Water (125° F.)	64	oz.
Metol (Elon, Pictol)	56	gr.
Sodium Sulphite	10	oz.
Hydroquinone	560	gr.
Sodium Carbonate	5½	oz.
Potassium Carbonate	1½	oz.
Potassium Bromide	280	gr.
Cold Water to make	1	gal.

Develop for about 7 minutes at 65° F.

Hot Water (125° F.)	64	oz.
Metol	60	gr.
Sodium Sulphite	12	oz.
Hydroquinone	3	oz.
Potassium Carbonate	12	oz.
Sulphuric Acid	2	min.
Potassium Bromide	1	oz.
Cold water to make	1	gal.

Develop from 3 to 4 minutes at 70° F.

A popular practise among etchers during hot weather is to augment the resistance of the "Super Contrast" plate against possible physical injury during manipulation in warm tap water by recourse to the following procedure: immediately after development—*without washing the negative*—place the plate for about 30 seconds in a 25% solution of chrome alum, then, *without washing*, immerse it in the fixing bath.

Claims have been made that dry plates possessed of an emulsion able to withstand very high temperatures are better suited for warm-weather dot etching. While the physical characteristics of such plates may have a certain appeal, the abnormally hard emulsion resists the action of etching, and considerable re-etching time must be spent in reducing large sized dots to the small size required in delicate highlight effects.

During warm weather, some operators prefer to immerse the developed "Super Contrast" plate in a 5 or 10 per cent solution of formaldehyde before placing it in the fixing bath. This effectively hardens the emulsion, but the treatment should not be overdone, or extreme tanning of the gelatin film will result.

Soft-Working Fine-Grain Borax Tank Developer

This fine-grain developer gives an even scale of gradation and brings out full detail in the shadow portions of the negative.

Hot Water (125° F. or 52° C.)	750	cc.
Metol	0.7	g.
Sodium Sulphite, Anhydrous	65	g.

Hydroquinone	0.9 g.
Borax	0.7 g.
Water to Make	1 l.

Do not dilute for use.

Normal development time at 65° F. (18° C.) Fine-Grain miniature-films (except Superpan): 12–16 minutes; F. G. Superpan film; roll, pack and cut film: 16–20 minutes.

Fine-Grain Tank Developer

This fine-grain formula keeps well and makes an excellent tank developer.

Hot Water (125– F. or 52° C.)	750 cc.
Metol	8 g.
Sodium Sulphite, Anhydrous	125 g.
Sodium Carbonate Monohydrated	5.75 g.
Potassium Bromide	2.5 g.
Water to Make	1 l.

Do not dilute for use.

Develop 8 to 12 minutes at 65° F. (18° C.).

Fine-Grain Tray Developer

This is a vigorous, rapid tray developer, giving brilliant results.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	8 g.
Sodium Sulphite, Anhydrous	125 g.
Sodium Carbonate, Monohydrated	14 g.
Potassium Bromide	1.5 g.
Water to Make	1 l.

Do not dilute for use.

For normal contrast develop 3 to 5 minutes at 65° F. (18° C.).

For greater contrast develop about 6 to 10 minutes.

Fine-Grain Borax Tank Developer

In addition to its usefulness as a fine-grain developer, this formula is satisfactory for obtaining soft gradation with Agfa Direct Copy Film, Agfa Direct Duplicating Film and portrait cut films.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	1.5 g.
Sodium Sulphite, Anhydrous	80 g.
Hydroquinone	3 g.
Borax	3 g.
Potassium Bromide	0.5 g.
Water to Make	1 l.

Do not dilute for use.

Development time at 65° F. (18° C), 10 to 15 minutes for fine-grain films, 12 to 20 minutes for Direct Copy, Direct Duplicating, and portrait cut films.

Renewal Formula for Above

Add whenever necessary to tank up to full volume.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	2.2 g.
Sodium Sulphite, Anhydrous	80 g.
Hydroquinone	4.5 g.
Borax	30 g.
Water to Make	1 l.

M-H Positive Developer

This clean-working developer is recommended for normal contrast with tray or tank development of lantern slides and positive film.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	2 g.
Sodium Sulphite, Anhydrous	25 g.
Hydroquinone	4 g.
Sodium Carbonate, Monohydrated	18.5 g.
Potassium Bromide	2 g.
Water to Make	1 l.

Do not dilute for use. Normal developing time 3 to 4 minutes at 65° F. (18° C.)

M-H Title Developer

This formula is recommended for tray or tank development of lantern slides, cine title film and positive film to obtain results of high contrast.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	0.8 g.
Sodium Sulphite, Anhydrous	40 g.
Hydroquinone	8 g.
Sodium Carbonate, Monohydrated	50 g.
Potassium Bromide	5 g.
Water to Make	1 l.

Do not dilute for use. Normal developing time 5 to 8 minutes at 65° F. (18° C.).

X-Ray Developer

This developer is recommended for use with Agfa X-Ray Film and for use with Agfa Direct Copy Film and Direct Duplicating Film when results of maximum brilliance are desired. It is also suitable for Agfa S. S. Pan-Aero film as it is clean-working, has long life and gives high contrast.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	3.5 g.
Sodium Sulphite, Anhydrous	60 g.

Hydroquinone	9	g.
Sodium Carbonate, Monohydrated	40	g.
Potassium Bromide	2	g.
Water to Make	1	l.

Do not dilute for use.

Normal development time at 65° F. (18° C.), for X-Ray Film, 5 minutes, for Non-Screen X-Ray Film 8 minutes, for Direct Copy Film and Direct Duplicating Film, 4 to 5 minutes, for S. S. Pan-Aero film 10–15 minutes depending upon the type of developing machine.

M-H Tray Developer

This is a brilliant Metol-Hydroquinone tray developer for roll, pack and cut film.

Stock Solution

Hot Water (125° F. or 52° C.)	900	cc.
Metol	4.5	g.
Sodium Sulphite, Anhydrous	54	g.
Hydroquinone	7.5	g.
Sodium Carbonate, Monohydrated	54	g.
Potassium Bromide	3	g.
Water to Make	1	l.

For use dilute 1 part stock solution with 2 parts water.

Development time 4 to 5 minutes at 65° F. (18° C.).

M-H Tank Developer

This is a soft-working tank formula recommended for pack, roll and portrait films.

Hot Water (125° F. or 52° C.)	750	cc.
Metol	0.8	g.
Sodium Sulphite, Anhydrous	45	g.
Hydroquinone	1.2	g.
Sodium Carbonate, Monohydrated	8	g.
Potassium Metabisulphite	4	g.
Potassium Bromide	1.5	g.
Water to Make	1	l.

Do not dilute for use.

Develop 15 to 20 minutes at 65° F. (18° C.).

Pyro Developer

This formula is recommended to those who prefer Pyro development. Stock solutions should be kept in stoppered bottles.

Solution 1

Sodium Bisulphite	9.8	g.
Pyro	60	g.
Potassium Bromide	1.1	g.
Water to Make	1	l.

Solution 2

Sodium Sulphite, Anhydrous	105	g.
Water to Make	1	l.

Solution 3

Sodium Carbonate, Monohydrated	85	g.
Water to Make	1	l.

Tank Development: Take one part each Solutions 1, 2, 3 and add 11 parts water. Normal development time, from 9 to 12 minutes at 65° F. (18° C.). Tray Development: Take 1 part each Solutions 1, 2, 3 and add 7 parts water. Normal development time, from 6 to 8 minutes at 65° F. (18° C.). Solutions will keep well when stored separately but final developer should be used immediately after mixing.

Metol Hydroquinone Developer

This is a long-life, clean-working formula which will give excellent results for either tray or tank development.

Hot Water (125° F. or 52° C.)	750	cc.
Metol	1.5	g.
Sodium Sulphite, Anhydrous	45	g.
Sodium Bisulphite	1	g.
Hydroquinone	3	g.
Sodium Carbonate, Monohydrated	6	g.
Potassium Bromide	0.8	g.
Water to Make	1	l.

Do not dilute for use.

Tank Development: Normal development time, 6 to 8 minutes at 65° F. (18° C.) with occasional agitation. Tray Development: Normal development time 5 to 7 minutes at 65° F. (18° C.).

M-H Tray Developer

This developer is recommended for use with commercial film to produce negatives of normal contrast. It may also be used satisfactorily for roll, pack and cut film for negatives of average brilliance.

Hot Water (125° F. or 52° C.)	750	cc.
Metol	1	g.
Sodium Sulphite, Anhydrous	15	g.
Hydroquinone	2	g.
Sodium Carbonate, Monohydrated	15	g.
Potassium Bromide	1	g.
Water to Make	1	l.

Do not dilute for use. Normal development time, 4 to 6 minutes at 65° F. (18° C.).

Rapid M-H (Tropical) Developer

This is a clean-working developer of particular value for rapid development or development at high temperatures.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	2.5 g.
Sodium Sulphite, Anhydrous	25 g.
Hydroquinone	6.5 g.
Sodium Carbonate, Monohydrated	16 g.
Potassium Bromide	1 g.
Water to Make	1 l.

Do not dilute for use.

Normal development time:
3 to 4 minutes at 65° F. (18° C.).
2 to 3 minutes at 85° F. (29° C.)

Hydroquinone Caustic Developer

This developer is recommended for Process film used in reproduction work.

Solution 1

Hot Water (125° F. or 52° C.)	750 cc.
Hydroquinone	25 g.
Potassium Metabisulphite	25 g.
Potassium Bromide	25 g.
Cold Water	1 l.

Solution 2

Cold Water	1 l.
*Sodium Hydroxide (Caustic Soda Flakes)	36 g.

Mix equal parts of Solutions 1 and 2 immediately before use.

Develop films within 3 minutes at 65° F. (18° C.).

* May be substituted by Potassium Hydroxide 50 g.

Glycin Developer

This formula is recommended for use with commercial films in reproduction work and is also suitable for development of roll, pack and cut film.

Stock Solution

Sodium Sulphite, Anhydrous	125 g.
Potassium Carbonate	250 g.
Glycin	50 g.
Water to Make	1 l.

Tank Development: Take one part stock solution, fifteen parts water and develop 20 to 25 minutes at 65° F. (18° C.). Tray Development: Take one part stock solution, four parts water and develop 5 to 10 minutes at 65° F. (18° C.).

M-H Tray Developer

This formula is recommended for development of Direct Copy and Direct Duplicating Films to obtain results of normal brilliance.

Stock Solution

Hot Water (125° F. or 52° C.)	750 cc.
Metol	5 g.
Sodium Sulphite, Anhydrous	35 g.
Hydroquinone	8 g.
Sodium Carbonate, Monohydrated	30 g.
Potassium Bromide	1 g.
Water to Make	1 l.

For use dilute one part stock solution with one part water.

Normal developing time 5 minutes at 65° F. (18° C.).

Paraformaldehyde Developer

This is a standard formula recommended for development of Reprolith and Reprolith Ortho Films.

Solution 1

Hot Water (125° F. or 52° C.)	750 cc.
Sodium Sulphite, Anhydrous	1 g.
Paraformaldehyde	30 g.
Potassium Metabisulphite	10.5 g.
Water to Make	1 l.

Solution 2

Hot Water (125° F. or 52° C.)	750 cc.
Sodium Sulphite, Anhydrous	120 g.
Boric Acid	30 g.
Hydroquinone	90 g.
Potassium Bromide	6 g.
Water to Make	3 l.

For use mix one part Solution 1 with three parts Solution 2.

Normal development time 2 to 3 minutes at 65 to 70° F. (18 to 21° C.).

Long-Life Reprolith Developer

A single-solution developer of excellent keeping quality for the development of Reprolith Film.

Hot Water (125° F. or 52° C.)	750 cc.
Hydroquinone	35 g.
Sodium Sulphite, Anhydrous	55 g.
Sodium Carbonate, Monohydrated	80 g.
Citric Acid	5.5 g.
Potassium Bromide	10 g.
Water to Make	1 l.

Do not dilute for use. Normal development time within 3 minutes at 65° F. (18° C.).

High Contrast M-H Tray Developer

This developer has been particularly designed for use with Commercial and Process films * to produce contrasty negatives.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	5 g.

Sodium Sulphite, Anhydrous	40 g.
Hydroquinone	6 g.
Sodium Carbonate, Monohydrated	40 g.
Potassium Bromide	3 g.
Water to Make	1 l.

Do not dilute for use.

Normal development time, 4 to 6 minutes at 65° F. (18° C.).

* This developer may be adapted for high-contrast work with Printon Film by the addition of 9 g. of Potassium Bromide per liter of stock solution (¼ oz. 20 gr. per 32 oz.) and development of 2 to 3 minutes at 65° F. (18° C.).

Metol Pyro Aero Developer

This developer is recommended for use with S. S. Pan Aero-Film for negatives of average brilliance.

Hot Water (125° F. or 52° C.)	750.0 cc.
Potassium Metabisulphite	4.6 g.
Metol	1.6 g.
Sodium Sulphite, Anhydrous	18.0 g.
Sodium Carbonate, Monohydrated	37.0 g.
Potassium Bromide	1.5 g.
Pyro Crystals	12.5 g.
Water to Make	1.0 l.

Dissolve chemicals thoroughly in order given. Add Pyro immediately before use. Do not dilute for use. Normal development time 15 to 20 minutes at 65° F. (18° C.).

Universal Film and Paper Developer

This formula may be used both as a developer for film and as a developer for Convira and Brovira papers when cold, blue-black tones are desired.

Stock Solution

Hot Water (125° F. or 52° C.)	750 cc.
Metol	3.5 g.
Sodium Sulphite, Anhydrous	57 g.
Hydroquinone	11.5 g.
Sodium Carbonate, Monohydrated	78 g.
Potassium Bromide	1.2 g.
Water to Make	1 l.

Film: Dilute one part stock solution with two parts water. Normal development time 5 minutes at 65° F. (18° C.).

Convira Paper: Dilute one part stock solution with two parts water. Normal development time 1 minute at 70° F. (21° C.).

Brovira Paper: Dilute one part developer with four parts water. Normal development time 1½ minutes to two minutes at 70° F. (21° C.).

Warm-Tone Developer for Chloride Paper

This developer is recommended for producing pronounced warm, olive-black tones with Convira and other Chloride Papers.

Hot Water (125° F. or 52° C.)	750 cc.
Metol	0.7 g.
Sodium Sulphite, Anhydrous	11.5 g.
Hydroquinone	3.5 g.
Sodium Carbonate, Monohydrated	10.0 g.
Potassium Bromide	2.4 g.
Water to Make	1.0 l.

Do not dilute for use.

Normal development time, 1 minute at 70° F. (21° C.).

Direct Brown-Black Paper Developer

Beautiful warm tones may be obtained with this developer on both contact and projection papers.

Stock Solution

Hot Water (125° F. or 52° C.)	750.00 cc.
Hydroquinone	22.50 g.
Sodium Sulphite, Anhydrous	57.00 g.
Sodium Carbonate, Monohydrated	75.00 g.
Potassium Bromide	2.75 g.
Water to Make	1.00 l.

For use dilute one part stock solution with 5 parts water.

Give prints 3 to 4 times normal exposure and develop from 5 to 7 minutes at 70° F. (21° C.).

Amidol Paper Developer

This formula is intended for tray development only and must be mixed fresh each time. It is recommended only for small lots of prints.

Amidol	6.60 g.
Sodium Sulphite, Anhydrous	44.00 g.
Potassium Bromide	0.55 g.
Water to Make	1.00 l.

Do not dilute for use. If hot water is used for dissolving chemicals the sodium sulphite and potassium bromide should be dissolved first and the amidol added only after the solution has cooled.

Develop 1 to 2 minutes at 70° F. (21° C.).

Glycin-Hydroquinone Developer

This is a warm-tone developer suitable for Indiatone, Portrait Enlarging, Brovira and other projection papers.

Stock Solution

Hot Water (125° F. or 52° C.)	750.0 cc.
Sodium Sulphite, Anhydrous	90.0 g.

Sodium Carbonate, Monohydrated	150.0 g.
Glycin	30.0 g.
Hydroquinone	9.5 g.
Potassium Bromide	4.0 g.
Water to Make	1.0 l.

For use, dilute 1 part stock solution with 3 parts of water.

Normal development time, 2½ to 3 minutes at 70° F. (21° C.).

Soft-Working Paper Developer

This is a soft-working developer, primarily intended for portrait work where soft gradation is required.

Stock Solution

Hot Water (125° F. or 52° C.)	750.0 cc.
Metol	12.3 g.
Sodium Sulphite, Anhydrous	36.0 g.
Sodium Carbonate, Monohydrated	36.0 g.
Potassium Bromide	1.8 g.
Water to Make	1.0 l.

For use, dilute 1 part stock solution with 2 parts water.

Normal developing time, 1½ to 3 minutes at 70° F. (21° C.).

Developer for Bromide Paper

This formula is recommended for development of Brovira and other projection papers.

Stock Solution

Hot Water)125° F. or 52° C.)	750 cc.
Metol	3 g.
Sodium Sulphite, Anhydrous	44 g.
Hydroquinone	12 g.
Sodium Carbonate, Monohydrated	65 g.
Potassium Bromide	2 g.
Water to Make	1 l.

For use, dilute 1 part stock solution with 4 parts water.

Normal development time, 1½ minutes at 70° F. (21° C.). For greater brilliance, shorten the exposure slightly and lengthen the development time. For greater softness, lengthen the exposure slightly and shorten the development time.

Universal Paper Developer

This formula is a universal developer for all projection and contact papers. It gives rich black tones with excellent brilliance and detail and provides unusual latitude in development and is clean-working even with long developing times.

Stock Solution

Hot Water (125° F. or 52° C.)	750 cc.
Metol	2.2 g.
Sodium Sulphite, Anhydrous	50 g.
Hydroquinone	11 g.
Sodium Carbonate. Monohydrated	78 g.
Potassium Bromide	5.5 g.
Glycin	11 g.
Water to Make	1 l.

The prepared stock solution is clear but slightly colored. The coloration in this case does not indicate the developer has deteriorated or is unfit for use.

For use dilute 1 part stock solution with 1 part water.

Normal developing time at 70° F. (21° C.) for Brovira and Portrait Enlarging 2 to 6 minutes, for Indiatone, Convira and Professional Cyko 1½ to 3 minutes.

Greater contrast can be obtained by using the developer stock solution full strength. Softer results can be obtained by diluting 1 part stock solution with 2 parts water.

Warm-Toned Paper Developer

This developer is recommended for rich, warm-black tones with chloride and bromide papers.

Stock Solution

Hot Water (125° F. or 52° C.)	750.0 cc.
Metol	1.6 g.
Sodium Sulphite, Anhydrous	24.0 g.
Hydroquinone	6.6 g.
Sodium Carbonate, Monohydrated	24.0 g.
Potassium Bromide	2.8 g.
Water to Make	1.0 l.

For use, dilute 1 part stock solution with 1 part water. A properly exposed print will be fully developed at 70° F. (21° C.) in about 1½ to 2 minutes. Complete development may be expected to take slightly longer with rough-surfaced papers than with semi-glossy or luster-surfaced papers. For greater softness, dilute the bath with water up to equal quantities of developer and water. To increase the warmth, add bromide up to double the amount in the formula. The quantity of bromide specified in the formula, however, assures rich, warm, well-balanced tones.

Acid Short-Stop Bath

This solution is recommended for use between developer and fixer, to prevent staining of film negatives and prints.

Acetic Acid (28%)	45 cc.
Water to Make	1 l.

Glacial Acetic Acid (99.5%) may be diluted to the 28% concentration by mixing three parts of Glacial Acetic Acid with eight parts of water.

Chrome Alum Hardening Bath

This bath may be used in place of the regular acetic acid short-stop to give additional hardening to film. It is particularly desirable in hot weather, for tropical development, and for negatives which have to be enlarged wet.

Potassium Chrome Alum	30 g.
Water	1 l.

Films should be agitated thoroughly when immersed in the solution. Maximum hardening will be obtained with about three minutes treatment.

The solution should be used fresh as it does not keep well. Formation of greenish sludge is an indication that the solution should be replaced by a fresh bath.

If the chrom alum used is such that a sludge is formed when the bath is first used an addition of concentrated sulphuric acid (2 cc. per liter or ½ dram per 32 ounces) can be made to the solution to overcome this condition.

Acid Hardening Fixer

This hardening fixing bath for use with either film or paper may be stored indefinitely and used repeatedly until exhausted. If the fixing bath froths, turns cloudy, or takes longer than 10 minutes to fix out completely, it must be replaced by a fresh solution.

Solution 1

Hot Water (125° F. or 52° C.)	500 cc.
Hypo	240 g.

Solution 2

Hot Water (125° F. or 52° C.)	150 cc.
Sodium Sulphite, Anhydrous	15 g.
Acetic Acid (28%)	45 cc.
Potassium Alum	15 g.
Add Solution 2 to 1 and add water to make	1 l.

Dissolve chemicals thoroughly in order given and stir rapidly while adding solution 2 to solution 1. Glacial acetic acid may be diluted to 28% concentration by adding 3 parts of acid to 8 parts of water. Do not dilute for use. Normal fixing time 5 to 10 minutes at 65 to 70° F. (18 to 21° C.).

Chrome Alum Fixer

This hardening fixing bath for use with films in hot weather should be used fresh, as it will not keep well.

Solution 1

Hot Water (125° F. or 52° C.)	2.5 l.
Hypo	960.0 g.
Sodium Sulphite	60.0 g.
Water to Make	3.0 l.

Solution 2

Water	1 l.
Potassium Chrome Alum	60 g.
Sulphuric Acid C.P.	8 cc.

Slowly pour Solution 2 into Solution 1 while rapidly stirring the latter. Do not dilute for use. Do not dissolve the chrome alum at a temperature higher than 150° F. (66° C.). Always rinse films thoroughly before fixing. Normal fixing time 5 to 10 minutes at 65° F. (18°C.).

Non-Hardening Metabisulphite Fixer

This fixing bath is recommended for use when hardening is not desired. It is highly desirable for accuracy of registration in color work with Printon Film.

Hypo	1900 g.
Potassium Metabisulphite	270 g.
Water to Make	4 l.

The Metabisulphite should be added only when the hypo solution is cool. Do not dilute for use. Normal fixing time 5 to 10 minutes at 65° F. (18° C.).

Flattening Reducer

This reducer is useful for lessening the density and contrast of heavy negatives.

Solution 1

Potassium Ferricyanide	35 g.
Potassium Bromide	10 g.
Water to Make	1 l.

Bleach in Solution 1 and after thorough washing, redevelop to desired density and contrast in Agfa 47 or other negative developer. Conduct operation in subdued light.

Mercury Intensifier

This intensifier is recommended for increasing the printing density of thin, flat negatives.

Potassium Bromide	10 g.
* Mercuric Chloride	10 g.
Water to Make	1 l.

Do not dilute for use. Negatives to be intensified must be very thoroughly washed first or yellow stains may result on the intensified negative. Immerse negatives in above solution until thoroughly bleached to the base of the film and then wash in water containing a few drops of hydrochloric acid. Redevelop bleached negatives in 5% sodium sulphite or any standard developer. Surface scum which forms during storage of the bleaching solution does not affect the bleacher but should be removed before using the solution.

* Poison—Danger.

Monckhoven's Intensifier
(For Reproduction Films)

This formula gives very great intesification and contrast for line drawing and halftone reproduction work.

Solution 1

Potassium Bromide	23 g.
* Mercuric Chloride	23 g.
Water to Make	1 l.

Solution 2

Cold Water	1 l.
* Potassium Cyanide	23 g.
Silver Nitrate	23 g.

* WARNING—Because of the deadly poisonous nature of this intensifier, it should be used with care and bottles containing it should be suitably marked. Never mix cyanide solutions with acids or use them in poorly ventilated rooms. Discard waste solutions into running water.

The silver nitrate and the potassium cyanide should be dissolved in separate lots of water, and the former added to the latter until a permanent precipitate is produced. The mixture is allowed to stand 15 minutes, and after filtering, forms Solution 2.

Place negatives in Solution 1 until bleached through, then rinse and place in Solution 2. If intensification is carried too far, the negative may be reduced with a weak solution of hypo.

Chromium Intensifier

This formula is recommended because it is convenient in use and gives more permanent results.

Potassium Bichromate	9 g.
Hydrochloric Acid	6 cc.
Water to Make	1 l.

Immerse negatives in this solution until bleached, wash for 5 minutes in running water, and redevelop in bright but diffused light in a Metol Hydroquinone developer. Negatives should then be given a 15-minute wash before drying. Intensification may be repeated for increased effect.

If any blue coloration of the film base is noticeable after intensification, it may be easily removed by washing the film for two or three seconds in water containing a few drops of ammonia, in a 5% solution of potassium metabisulphite, or in a 5% solution of sodium sulphite. This treatment should be followed by a thorough washing in water.

Sepia Toner

This toner is recommended for warm-brown sepia tones.

Solution 1

Potassium Ferricyanide Solution (10%)	500 cc.
Potassium Bromide Solution (10%)	100 cc.
Sodium Carbonate Solution (10%)	200 cc.
Water	200 cc.

Do not dilute for use.

Solution 2

Sodium Sulphide	45 g.
Water to Make	500 cc.

For use as described below, dilute one part solution 2 with eight parts water.

IMPORTANT—Be sure to use sodium sulphide, not sodium sulphite, in compounding the Re-Developer. Also, use clean trays, free from exposed iron spots, especially with Bleaching Bath. Otherwise blue spots may form on prints.

Prints should be washed thoroughly and then bleached in Solution 1 until the black image is converted to a very light brown color (about 1 minute). Prints should then be washed for 10 to 15 minutes and redeveloped in diluted Solution 2.

Redevelopment should be complete in about 1 minute. After redevelopment the prints should be washed for about 30 minutes and then dried. If the toner should leave sediment which results in streaks or finger marks on the surface of the paper the print should be immersed for a few seconds in a 3% solution of acetic acid. A washing of about 10 minutes after this procedure is necessary.

Hypo Alum Toner

This toner is recommended for beautiful reddish-brown tones.

Solution 1

Water	2350 cc.
Hypo	450 g.

Solution 2

Water	30 cc.
Silver Nitrate	1¼ g.

Solution 3

Water	30 cc.
Potassium Iodide	2½ g.

Add Solution 2 to Solution 1. Then add Solution 3 to the mixture. Finally add 105 grams (3½ ounces) of potassium alum to this solution, and heat the entire bath to the boiling point, or until sulphurization takes place (indicated by a milky appearance of the solution). Tone prints 20 to 60 minutes in this bath at 110–125° F. (43–52° C.). Agitate prints occasionally until toning is complete.

Care should be taken to see that the blacks are fully converted before removing the prints from the toning bath, otherwise double tones may result.

Pinakryptol Green Desensitizer

Stock Solution

Pinakryptol Green	1 g.
* Water to Make	500 cc.

For use dilute one part stock desensitizing solution with ten parts water. Immerse films in total darkness for two minutes at 65° F. (18° C.). Development may then be carried out in bright green light. (Agfa Safelight Filter No. 103 with a 25-watt lamp).

The same stock solution may be used, if preferred, directly in the developer in the proportion: desensitizer: one part, developer: thirty parts. After two minutes' development in total darkness, bright green light may be used as above.

* Use of a 50–50 water-alcohol mixture for solution will improve the keeping qualities of the desensitizer.

Pinakryptol Yellow Desensitizer

Pinakryptol Yellow	1 g.
* Water to Make	1 l.

Use without dilution at a temperature of 65° F. (18° C.). Immerse films in total darkness for two minutes. Orthochromatic film and Agfacolor Plates may then be handled in bright red light (Agfa Safelight Filter No. 107 with 25-watt lamp), panchromatic film in bright green light (Agfa Safelight Filter No. 103 with 25-watt lamp). Pinakryptol Yellow desensitizer should be used as a separate bath and not mixed with the developer.

* Use of a 50–50 water-alcohol mixture for solution will improve the keeping qualities of the desensitizer.

Acid Hardening Fixing Bath

Water (about 125° F.)	40	oz.
Hypo	16	oz.
Sodium Sulphite, Desiccated	1	oz.
Acetic Acid (20%)	3	fl. oz.
Boric Acid, Crystals	½	oz.
Potassium Alum	1	oz.
Cold Water to make	64	oz.

Fixation of Etching Positives

Acid-hypo and chrome alum baths can be used for the purpose. To insure permanency and freedom from any stain, the time-honored principle of leaving the plates in the fixing bath from ten to twenty minutes after disappearance of the final vestiges of creamy silver salt cannot be too strongly emphasized.

A simple and efficient formula for an acid-hypo fixing bath is:

Hypo	32 oz.
Potassium Metabisulphite	4 oz.
Water to make	1 gal.

Chrome alum baths are in wide use, chiefly because of their hardening properties, but such baths should be used as soon as possible after preparation, as they lose their hardening property in a few days. A representative chrome alum fixing bath consists of:

a.	Hypo	32 oz.
	Sodium Sulphite	2 oz.
	Water to make	96 oz.
b.	Water	32 oz.
	Potassium Chrome Alum	2 oz.
	Sulphuric Acid, C.P.	¼ oz.

Pour *b* into *a* while stirring *a* rapidly, so as to prevent precipitation.

Intensification of Color Plates

a.	Water	32 oz.
	Hydroquinone	46 gr.
	Citric Acid	46 gr.
b.	Water	3¼ oz.
	Silver Nitrate	77 gr.

(This procedure can be carried out in daylight. The plate should be immersed for 15 seconds in pure water before proceeding with this process).

For use, take 10 fl. oz. solution *a* to 1 fl. oz. solution *b*. Intensification will be complete in from 2 to 5 minutes. During its progress the plate should be inspected frequently. Do not attempt to save the used solution, as it decomposes too rapidly. The separate solutions, however, may be kept for some time.

Should the whites of the picture become veiled or fogged during intensification, they can be cleared by a brief immersion of the plate (after rinsing) in the following bath:

Water	32 oz. or 1 l.
Potassium Permanganate	15½ gr. or 1 g.

after which the plate should be given a short rinse, then placed in an acid fixing bath for from 1 to 2 minutes, and finally rinsed again for 5 minutes in gently running water.

Hardening Bath for Movie Positive Film
U. S. Patent 1,997,269

Tannic Acid	1 oz.
Glycerin	3 oz.
Mixture A	8 qt.
Mixture A:	
Carbon Tetrachloride	3 qt.
Turpentine	2 qt.
Formaldehyde	1 qt.
Eucalyptus Oil	1 qt.
Water	1 qt.

Alcohol to make clear.

Photographic Film Hardener
French Patent 803,459

Alcohol	50 g.
Glycerin	5 g.
Formalin	30 g.
Water	300 cc.

Photographic Bleaches
Formula No. 1
Wellington Paper

Warm Water	25 oz.
Copper Sulphate	2 oz.
Potassium Bromide	2 oz.
Potassium Bichromate	50 gr.
Sulphuric Acid	40 min.

For use, take one part of this stock solution to three parts of water. A print immersed in this bath at a temperature of 65° F. will bleach entirely in three minutes.

No. 2

Copper Sulphate (20% Solution)	3 fl. oz.
Potassium Bromide (20% Solution)	3 fl. oz.
Potassium Bichromate (10% Solution)	1 fl. oz.
Water	15 fl. oz.
Hydrochloric Acid	0.04 fl. min.

If the parts are taken as fluid ounces, the hydrochloric acid comes out at 20 minims or drops.

No. 3

Copper Sulphate (10% Solution)	5 oz.
Potassium Bromide (10% Solution)	5 oz.
Potassium Bichromate (1% Solution)	2¼ oz.
Acetic Acid, Glacial	8 min.

For use, dilute one part of the above solution with two parts of water. This bath is preferably made with distilled water and bleaching is allowed to continue for thirty seconds after the disappearance of the image.

No. 4

Copper Sulphate (Saturated Solution)	20 cc.
Potassium Bromide (Saturated Solution)	8 cc.
Chromic Acid (1% Solution)	18 cc.
Water	600 cc.

Though the print may be bleached directly after it has been developed, fixed and washed, it is better to dry it and then soak it in water, since it will then take the ink much more easily. The bleaching solution should be strong enough to complete the process in 3 to 5 minutes, continuing ½ minute after the image takes on an olive green tint. There should be no light brown color left. Green or brown shadows mean the bleacher is too weak, and the print should not be fixed until these are removed. Fred T. Usher suggests a remedy for this by rinsing the print and then rocking it for a minute or two in ½ pint of water and 60 min. of sulphuric acid. After this it is washed for 5 minutes in running water, fixed in hypo and washed again for ten minutes. Bleachers containing much bichromate should be avoided as they have a tendency to stain.

No. 5

The bleaching solution usually recommended for removing the photographic image after the pen and ink work is completed is:

Resublimed Iodine	100 gr.
Potassium Iodide	275 gr.
Water	20 oz.

As iodine is practically insoluble in water, the potassium iodide is added to render it soluble, but even with this addition, the iodine dissolves very slowly in a weak solution of iodide, so it is best to dissolve the iodide in about 5 ounces of water to make a highly concentrated solution and then in this dissolve the iodine, adding water to make the total bulk up to the required quantity. This solution can be used until it becomes too slow acting and then it can be brought up to strength by adding more iodine.

No. 6

Water	100 cc.
Potassium Permanganate	0.3 g.
Acetic Acid	5 cc.
Potassium Bromide	0.8 g.

If a silver chloride image is desired use 0.6 g. sodium chloride in place of potassium bromide.

This bath has a lesser softening effect on the gelatin and a lesser tendency to liberate halogen.

Flattening Reducer

Potassium Ferricyanide	100 gr.
Ammonium Sulphocyanide	200 gr.
Water	20 oz.

This is superior to persulphate flattening reducers.

Gas Light Paper Reducer

Ammonia (28%)	200 cc.
Copper Sulphate ($5H_2O$)	25 g.

To use, add 3 to 5 cc. of above to 100 cc. of a 10% hypo solution.

Reducing Blue Trichrome Carbro

Metol	150 gr.
Water	64 oz.

Use without further dilution and when color has been reduced to the desired density fix in following bath.

Citric Acid	1 oz.
Meta Bisulphite	1 oz.
Water	64 oz.

Wash for half hour and dry.

Reduction of Color Plates

Soak plate for 15 seconds in pure water.

Reducer:

Hypo Solution (10%)	100 fl. oz.
Potassium Ferricyanide Solution (10%)	2 fl. oz.

Reduction proceeds very quickly and therefore should be most carefully watched. The reversing bath may also be used for reduction, in which case the solution should be diluted ten times as much as when used in the regular development and reversal process. In any case the action must be carefully observed and the plate, shortly before it has reached the desired condition, should be washed for one minute in running water and quickly dried.

This whole procedure can be carried out in daylight.

Blue Print Paper Sensitizer

Formula No. 1

Tartaric Acid	100 g.
Water	600 cc.

Dissolve the above and to it add

Ferric Chloride (45° Bé.)	15 cc.
Ammonia (20%)	120 cc.
Sodium Ferricyanide (10%)	500 cc.

No. 2

a. Ferric Ammonium Citrate (Green Scales)	110 gr.
Water	1 oz.
b. Potassium Ferricyanide	40 gr.
Water	1 oz.

Both of these solutions should be kept in yellow glass bottles, in the dark. Just before use, take equal parts of *a* and *b*, filter, and paint over the paper with a wad of absorbent cotton or a Blanchard brush. It it advisable to sensitize and dry the paper well away from the window, to prevent fog, and to pull down the shades if the light is strong. As soon as the paper is dry, it can be printed by exposure to daylight under a negative, stopping the printing when details are of proper intensity.

Sensitizing Offset Plates for Printing

Zinc plates are washed with 1½–2% formic acid followed by 5% alum and 2% nitric acid. The plate must lie perfectly level on the whites. Heaters should be placed so that all parts of the plate dry at same rate.

Brown Toning

Very beautiful sepia tones may be obtained on photos (and enlargings) by the following simple bath:

Water, Warm	18 oz.
Saturated Solution of Hypo	2 oz.
Liver of Sulphur	¼ oz.

Care must be taken that the liver of sulphur is fresh; scrape off all oxidized layers until only the fresh dark brown sulphur remains.

Brown Toning for Developing Papers

The print is first bleached in the following solution: water 1000 cc., potassium ferricyanide 20 g., potassium bromide 15 g.: after being washed well it is toned in a 3-solution toning bath: solution (1) water 500 cc., Schlippe's salt 5 g.; solution (2) water 100 cc., potassium carbonate 20 g.; solution (3) water 100 cc., caustic soda (purified) 5 g. Mix 100 cc. of solution (1) with 5 cc. of solution (2) and put the bleached image in it and wash thoroughly. A pleasing reddish brown tone is obtained. The toning bath should always be used freshly mixed. The color of the tone obtained is dependent on the kind of paper employed. Treatment in the following solution yields darker tones: solution (1) 100 cc.; solution (3), 2 cc. Addition of solution (3) to this bath (up to 6 cc. for every 100 cc. of solution 1) enhances the tone of the print.

Toning Bath

a. Distilled Water	1000 cc.
Potassium Ferricyanide	100 g.
Potassium Bromide	50 g.
b. Distilled Water	1000 cc.
Mercuric Chloride	25 g.

By varying ratio of *a* and *b* black to cold brown tones are obtained.

Removing Stains from Negatives and Prints

The methods to be adopted in removing stains from negatives and prints depends very largely on what is the cause of the stain. Developer stains caused by oxidization during fixing may usually be removed by first hardening the emulsion for 2 or 3 minutes in a 5% solution of formalin, then washing for 5 minutes and bleaching in:

a.	Potassium Permanganate	75 gr.
	Water to make	32 oz.
b.	Sodium Chloride	2½ oz.
	Sulphuric Acid, pure	⅛ oz.
	Water to make	32 oz.

use equal parts of *a* and *b*. The solutions should not be mixed until ready for use as they do not keep well after mixing. Bleaching should be complete in two or three minutes. The brown stain of manganese dioxide found in the bleach bath is best removed by immersing the negative in a 1% solution of sodium bisulphite. Then rinse well and develop in strong light with any non-staining developer such as metol-hydroquinone.

Stains on old prints may be due to age and such stains are usually impossible to remove. Prints stored in a damp place may become stained.

Removal of Picric Acid Stains

Picric acid stains on the hands may be removed by washing with fresh milk or with warm water sweetened with sugar.

Removing Photographic Stains from the Hands

First wash the hands in a solution of potassium permanganate, then rinse in a solution of oxalic acid, and lastly wash with a solution of hydrogen peroxide. The first two solutions should not be too strong—they are poisonous. Do not use these solutions at all if there are any cuts or abrasions on the skin of the hands.

Removing Pyrogallol Stains

To remove stains of pyrogallol from negatives or from fingers, use a solution of:

Alum	1 oz.
Ferrous Sulphate	3 oz.
Citric Acid	1 oz.
Water	20 oz.

Removing Silver Nitrate Stains

The following mixture will immediately remove the stains of silver nitrate from the skin:

Mercuric Chloride	1 oz.
Ammonium Chloride	1 oz.
Potassium Bromide	4 dr.

The mixed salts are to be rubbed on the stain. Because of the poisonous nature of the mercury salt, this mixture should be used with great caution and never on skin with cuts or abrasions.

Film Reversal

Sixteen-millimeter motion picture film is the only film at present on the market that may be chemically reversed; that is, in which the developed result of the exposed film is a positive instead of a negative, the procedure being direct. However, any film may be "reversed" by developing it in the usual way and then printing on positive film, the latter being used for projection or as a transparency. The professional 35-mm motion picture film is "reversed" for projection in this manner. As to projection, machines are at present limited to 35 and 16-mm film sizes, in addition to the lantern slide projector which takes glass slides 2¼ by 3¼ inches. Sizes other than these may be used as transparencies.

The formula for developing reversible film is D-16, which follows:

Water	10 gal.
Elon	180 gr.
Sodium Sulphite	3 lb. 5 oz.
Hydroquinone	8 oz.
Sodium Carbonate	1 lb. 9 oz.
Potassium Bromide	1 oz. 63 gr.
Citric Acid	400 gr.
Potassium Metabisulphite	2 oz.

Develop 7 to 15 minutes at 65° F.

Brometching Clearing or Etching Bath

a.	Common Salt (25%)	3 dr.
	Strong Sulphuric Acid (10%)	2 dr.
	Water to make	20 oz.
b.	Potassium Permanganate (5%)	3 dr.
	Water to make	20 oz.

This quantity is sufficient for an 8 x 10 to 12 x 15 print.

Give the bromide print 3 or 4 times the normal exposure. Develop fully, for 3 minutes or 50% longer than the usual time.

Rinse the print and leave it in water while mixing 10 ounces each of *a* and *b*.

Drain the print and flood with some of the mixed etch, being careful that it is not poured directly on to any part that will form the final image. To provide for this it is best to have masked one end or side of the paper during exposure.

When the print has been flooded with the etch, a strong white light may be turned on so that the progress of the etching may better be watched.

The solution will soon become slightly discolored, when it should be poured off, the print rinsed, and replaced by fresh. This will last longer but should again soon be replaced. The third or fourth bath will probably make the print nearly light enough, and it should now be watched carefully. In order to do this at greater leisure a more dilute solution —half strength—may be employed. Because of this and because it deteriorates rapidly when mixed, half of the etch has been reserved unmixed.

Directly the highest light that is required to be absolutely white in the finished picture is cleared of silver, the print is rinsed until the wash water is free of all pink coloration—two or three changes—and placed in a fixing bath acidified with metabisulphite.

The image that was flat, veiled, and stained, clears at once and stands out boldly in a rich charcoal black. After fixation is complete the print requires only to be washed in the usual way.

The greatest control of gradation on any one grade of paper—preferably the normal—can be exercised by modification of the developer, as the etching bath corrects any muddiness or poor color such as results with bromides. Using Ilford paper use the Ilford developer formula, but divide into three solutions:

m.	Sodium Sulphite	2	oz.
	Metol	60	gr.
	Water to	20	oz.
q.	Hydroquinone	½	oz.
	Sodium Sulphite	2	oz.
	Potassium Bromide	80	gr.
	Water to	20	oz.
c.	Sodium Carbonate (Crystal)	6	oz.
	Water to	20	oz.

For normal negatives use one part *m*, one part *q*, one part *c* and eight parts water. Either *m* or *q* can take the place of the other, entirely or in part, as required.

If a print is found to be developing softly owing to too little *q* having been used in the developer to suit the negative in hand, its final contrast may be increased by continuing development for four minutes. Conversely, if the print develops harshly, this may be corrected by developing for about 2 minutes only.

Local control of values may also be practiced, for which purpose differently proportioned developer may be used on different parts of the print.

Caring for Photo Engraving Solutions

One of the first points to learn in photo-engraving, is the importance of good solutions. If the solution is not properly mixed, it cannot function as it should; furthermore, if it is not carefully preserved, a solution can "go bad" within a short time.

The first solution used in photo-engraving is, of course, the developer. In mixing developer, the operator should use good chemicals, good water, and give the chemicals a thorough chance to dissolve before attempting to use it. The main thing in prolonging the natural life of developer is to keep it tightly closed in a jar, completely filled. One should never attempt to keep a quart of developer in a half gallon jar, since the excessive air space allows the solution to deteriorate. If other negative-making operations are as they should be, signs which might warn an operator that his developer is going bad are: (1) failure of film to develop completely in four minutes; (2) the presence of a yellowish stain in the developed negative; (3) lack of contrast in the negative caused by fogged transparencies, and weak blacks; (4) an extremely dirty appearance of the developer. When one or more of these conditions prevail, the developer should be thrown away and a new batch mixed.

Fortunately, fixing solution is very easy to keep, but of course, it should be mixed just as carefully as any of the other solutions. This especially applies to fixing solutions containing an acid for a hardener, since if they are not mixed according to directions, a bad chemical reaction may take place. It is well for an operator to know just what to look for when a fixing solution begins to go bad. Very little "acid odor" is present in worn out fixer and the film must be submerged longer than is otherwise necessary if it is to fix out thoroughly. It will also be found that the film cannot be lifted from the paper base as readily as when good fixer is used.

A very elementary, but none-the-less important point is to be sure that the developer and fixer are kept entirely apart and that no part of either solution finds its way into the other.

All metal printing solutions, such as hot top, ink top, cold top, etc., should be kept tightly closed in subdued light, with the temperature somewhere between 40 and 50 degrees Fahrenheit.

The chromic acid hardening bath used with glue top sensitizer deteriorates to some extent with exposure to air, and should be kept tightly closed when not in use. When it begins to take on a darker color, throw it away and mix a new solution.

An easy way to prepare the aniline dye used in the hot top process is to pack a piece of wet cotton in the neck of a funnel, then place a small quantity of dye on top of the cotton. Pour water into the funnel and let it run through the cotton into the jar. This method enables you to mix and filter the solution simultaneously. If, later on, the aniline dye solution becomes rather grainy, it can be re-filtered and a little bit of dye added at the same time.

Lithographic Plate Lacquer

Type S. For high humidity.

Film Dope	300 g.
*Elemi Solution	125 g.
Dibutyl Phthalate	40 g.
†Solvent No. 3 to make	1 gal.

Type W. For winter use.

Film Dope	500 g.
Dibutyl Phthalate	250 g.
*Elemi Solution	350 g.
Nitrobenzene	150 g.
‡Solvent No. 4 to make	1 gal.

* Elemi Solution

Xylol or Toluol	300 cc.
Butyl Alcohol	50 cc.
Ethyl Acetate	75 cc.
"Cellosolve"	75 cc.
	500 cc. = 430 g.
Gum Elemi	215 g.

† Solvent # 3

Clear Gasoline	200 cc.
Toluene	400 cc.
Butyl Alcohol	50 cc.
Ethyl Acetate	250 cc.
"Cellosolve" Acetate	100 cc.
Oil Red Dye	2 g.

‡ Solvent # 4

Clear Gasoline	400 cc.
Toluene	150 cc.
Butyl Alcohol	100 cc.
"Cellosolve"	150 cc.
Ethyl Acetate	150 cc.
Butyl "Cellosolve"	50 cc.
Oil Red Dye	2 g.

Lithographic Asphaltum Washout Solutions

Pressroom Use

Wood Spirits of Turpentine	3000 cc.
Powdered Egyptian Asphaltum	750 g.
Palm Oil	190 cc.

Transfer Dep't.

Powdered Egyptian Asphaltum	5100 g.
Oleic Acid	945 cc.
Wood Spirits of Turpentine to make	5 gal.

Old Plate Washout

Wood Spirits of Turpentine	3000 cc.
Powdered Egyptian Asphaltum	750 g.
Crude Carbolic Acid	190 cc.

Lithographic Rubbing-up Ink

Transfer Ink	5 lb.
Crayon Ink	10 lb.
Wood Spirits of Turpentine to make	2 gal.

"Electricoat" Litho Plate Coating

When using these plates it must be understood that the coating is definitely porous. Liquid, however, is not retained by collecting in the miniature reservoirs of a grain but is absorbed into the plate. Micrometer measurements show that this absorbent surface is about .0005 inches thick, or half a thousandth of an inch, which is about the distance from the peaks to the hollows of a 60 grain. It will be seen, therefore, that the Electricoat surface with its uniform depth of porosity will hold more liquid than a coarse grain. This fact must be borne in mind as it has a pronounced effect on the working of the plate.

In photo-litho work this point makes itself very apparent when coating with the albumen-bichromate sensitizer and it is essential that the whole of the depth of the surface of the plate be filled with sensitizer. If this state is not obtained, certain parts of the Electricoat surface will be left above the level of the sensitizer which has sunk into it, leaving the top surface of the plate devoid of albumen. It is imperative to fully charge the whole depth of the surface with albumen. The following formula is suggested: water, 80 oz.; ammonium bichromate 1½ oz.; albumen 17 oz.; ammonia 10 oz. If this is used the image on the plate will be in solid hardened albumen to the full depth of the Electricoat surface, giving a strong base with a corresponding longevity of run. Exposure will have to be slightly increased, the actual amount depending on the speed of the sensitizer in regular use. Experienced photo-lithographers will be able to estimate this without difficulty.

The foregoing remarks also apply to gum, as the plate will behave in the same manner as with the albumen solution. The same remedy applies, that is, a thicker solution of gum is necessary to prevent areas of the Electricoat surface being left free of gum which will retain the asphaltum when the gum is washed from under it.

Litho Plate Stripping Solution

Sodium Hydroxide	60 g.
Sodium Meta-Silcate	25 g.
Sodium Carbonate	15 g.
Water, sufficient to suit.	

Bichromate Process for Making Relief Photographs

The photo-relief method of Prof. Namias is as follows: an ounce of fine gelatin is soaked in 3½ oz. of water and the vessel is heated in a warm bath until all is dissolved, after which 1 fl. dr. of glycerine is stirred in. The mixture having been strained through fine muslin, is poured on levelled glass or metal plates, 1 fl. dr. being allowed for 3 sq. in. of surface. When dry, the coated plates may be kept for any length of time and sensitizing is performed by soaking a plate for 15 minutes in a 6% solution of ammonium bichromate and drying in the dark. Exposure under a negative in a printing frame should be continued sufficiently long to give a fully detailed image in brown, the time required being about the same as would be involved in making a print on ordinary printing-out paper. On soaking the exposed plate in water, the relief is produced, and the plate can be moulded with plaster or with a waxy composition upon which an electrotype is made. If the swelled relief be very gently heated there is such a redistribution of the gelatin as makes the relief persist after the gelatin stratum is dry.

Photographers Cold Top Enamel

50–60 g. of purified dewaxed shellac are heated with 75 ml. of ammonia (*d* 0.91) and 250 ml. of water until dissolved: the solution is treated with 70 ml. of 3% ammonium dichromate solution and diluted with 100 ml. of 90% alcohol. Plates coated with this preparation are light-sensitive, and require 50–90 sec. exposure to an open arc to give a fully exposed negative. Development is carred out by 20–40 sec. immersion in 1000 ml. of methylorethyl alcohol (preferably denatured with solvent naphtha) containing 10–15 g. of castor oil, 30–35 ml. of glacial acetic acid, and 4–5 g. of dye (Rhoduline-blue or Malachite-green).

Rehalogenization in Dot Etching

This is nothing more than a secondary development of the plate to still further increase the opacity of the dot formation. Coupled with a slightly greater increase in density of dot, rehalogenization also promotes a faint relief to the dot formation, a feature occasionally useful in staging and crayoning the image because of the added "tooth" afforded the brush and litho crayon.

Rehalogenization (frequently called "metallizing") may be carried out on the "Super Contrast" plate after fixation, though the operation is by no means necessary with a properly exposed and developed positive. The commencing step is to bleach the thoroughly fixed and washed plate in:

Copper Sulphate	4	oz.
Potassium Bromide	4	oz.
Ammonium Bichromate	½	oz.
Hydrochloric Acid	2	oz.
Water to make	1	gal.

After the image has been bleached to a uniform creamy color, it is washed well to remove the yellowish discoloration of bichromate—then taken into *very bright* light (sunlight, if necessary) and blackened in the developer used for the original exposure. The image must be completely blackened, which can be determined by examining the glass side of the positive. The operation may be repeated, if desired, some operators contending that still greater density of image is obtained by this procedure. After blackening, the plate is washed and dried before commencing the process of etching.

Etching of Halftone Positives

What is termed "etching" is actually a systematic chemical reduction of dot size in the halftone positive. It is parallel to the "cutting" of the wet collodion photographer—but with the certainty and accuracy of the photoengraving copper etcher.

The etching solutions used on dry plates must naturally be of a photographic character, the most commonly used being the familiar Farmer's reducer of the dry plate worker, and the iodocyanide reducer used in wet collodion photography. The latter is of a poisonous nature, but is much more reliable than the mixture of hypo and ferricyanide used in the Farmer type.

Farmer's reducer may be preferred by some etchers because of its non-poisonous properties, and the fact that it is quickly and easily prepared by mixture of stock solutions of sodium thiosulphate and potassium ferricyanide. Probably the most convenient method of using Farmer's reducer is to prepare a stock solution of sodium thiosulphate (hypo) of a standard strength, 35° with a Baume hydrometer; also a 30% solution of potassium ferricyanide. These are kept separate, and both mixed together in a sufficient quantity just before use. The practise among experienced workers is to gage the strength of the etching bath by the color of the solution, which should be of a yellowish hue.

Quite elaborate instructions and formulae have been devised for the use of Farmer's reducer in re-etching of halftone images, some of which are based on the addition of glycerin to the etching solution, with the aim of promoting greater control of the operation. The objection voiced by the average workman against such methods is the time and care required in the preparation of solutions according to strict hydrometric tests.

Compared to Farmer's reducer, iodocyanide is possessed of far greater reliability (especially for the systematic requirements of dot etching), also necessitating less washing of the image for removal of the etching solution. Objections may be raised by the uninformed regarding its poisonous nature: against this may be cited the fact that iodocyanide has been in use in the wet collodion process for over half a century, with cases of accidental fatal poisoning an extremely rare occurrence.

One or two precautionary measures should be held in mind: first, any smarting sensation felt when beginners' hands come into contact with cyanide baths should be followed by an application of ferrous sulphate solution; secondly, and most important, *never permit acids to come into contact with cyanide solutions,* as a very poisonous gas, *hydrocyanic acid,* is liberated by such mixtures. But since acids of any kind are taboo in actual etching solutions for dry plates, there is no good reason why such an intermixture should occur.

In company with Farmer's reducer, two stock solutions are required for preparation of the iodo-cyanide etching solution:

Iodine Stock Solution		
Potassium Iodide	2¾	oz.
Iodine Resublimed	1	oz.
Water	32	oz.
Cyanide Stock Solution		
Sodium Cyanide	6	oz.
Water	32	oz.
For use in tray, take:		
Iodine Stock Solution	4	oz.
Cyanide Stock Solution	12	oz.
Water	64	oz.

This strength of bath will permit of considerable latitude in etching, a desirable condition during the first trials. If more rapid action is desired for brush re-etching, reduce the quantity of water by half.

Using a bath of the above proportions, the "flat" or sharpening etch for a properly prepared positive will range between one and two minutes, depending on the nature of the desired preliminary correction.

Always soak the plate in water for about 30 seconds before commencing etching, so as to promote a uniform action of the solution on the plate, and also to determine whether the staging materials have been applied in sufficient thickness to repel the etching bath. On examination by transmitted light, any insufficiently protected areas will be immediately noticeable by a suspicious transparency in the applied coating. For safety sake, such positives should be quickly dried and another application of staging fluid given these parts, so as to prevent the etching solution from penetrating the resist and probably ruining the positive by streaky action on supposedly protected parts.

After completion of the first "bite" or etching period, wash the plate for about 1 minute, then place before a fan to dry.

The next step usually is protection of some area wherein the dots have arrived at a size correct for proper tonal representation. This is known as "staging," a term borrowed from the photoengraving industry, and indicating application of a greasy or impervious material that is capable of resisting the action of the etching solution wherever it is applied.

Special solutions are marketed for this purpose, though the staging preparation of the copper etcher can also be used, if it is rendered thicker by the addition of asphaltum or a small percentage of beeswax dissolved in warm turpentine.

Other materials may be used, such as brown Duco paint, first rendered rather greasy by adding a bit of tallow dissolved in turpentine. A very efficient staging solution for dot etching is composed of Egyptian asphaltum dissolved in naphtha to about the consistency of a heavy paint. After application of this solution, bronze powder is dusted over the staged parts, and the surplus powder dusted off the plate with a dry cotton pad which has been previously charged with finely powdered talc or magnesia.

As to what areas require staging will

naturally depend entirely on the positive and the type of original. Nothing definite can be said in this respect; the positive is the guide to the entire procedure.

When the parts of correct tonal strength have been stopped out with staging solution, the plate is given another etch, after which it is examined with a magnifying glass to study the exact size of the dot formation throughout the image. The most convenient arrangement for dot etching is to have the sink illuminated along its sides with electric lights (the tube variety) fitted into marine sockets for protection against moisture. The light is then transmitted through the positive, thus affording the necessary illumination for examining the image while the plate is lying on the rack in the sink.

Successive stages may be applied at any time, so as to protect any areas that have been etched to the proper dot size. The staging solution is applied wherever necessary, and the positive then submitted to another etch.

Photographic Screening Dye
Canadian Patent 362,816

Benzene azoresorcinol	1 g.
Water	5 cc.
Acetone	5 cc.

Dissolve and mix with a gelatin solution and coat over emulsion layer.

Color Photography Solution
U. S. Patent 2,100,594

A solution for discharging dye in the presence of silver and dissolving a silver image in color photography comprises equal parts of

Solution I

Water	6250 cc.
Iodine	17 g.
Potassium Iodide	33 g.
Concentrated Sulphuric Acid	525 cc.

and

Solution II

Water	6250 cc.
Sodium Sulphite	330 g.
Thiourea	330 g.

Yellow Photographic Filter

Warm Alcohol	25 cc.
Aurin	0.2 g.
Collodion	75 cc.

A solution of the above is filtered very carefully to avoid any air bubbles. A perfectly clean glass plate is then coated with this solution and is allowed to dry at room temperature. When dry, such a filter may be used either before or behind the objective.

It is also possible to remove the dried film from the glass and place this directly into the objective.

To preserve such a filter against incidental damage, the colored film is placed in a horizontal position and is covered with Venetian balsam. A perfectly clean glass plate of the same size is then carefully placed over this and any air bubbles which may be formed are worked out carefully towards one side. This is then allowed to dry in a horizontal position. Sometimes several weeks are required for complete drying.

Alcohol is the best medium for cleaning such filters.

Instead of the collodion it is also possible to use a solution of celluloid prepared as follows:

Celluloid (in Fine Particles)	1 g.
Amyl Acetate	10 cc.
Petroleum Ether	10 cc.
Alcohol	30 cc.

The celluloid is first placed in alcohol for some time to remove the camphor. When the camphor is thus removed, the celluloid is again dried and is used in the above formula. The solution is shaken from time to time and when all the ingredients are completely dissolved, it is filtered. The solution is then used as in the first formula.

Colored Filter for Cloud Effects

Distilled Water	500 cc.
Picric Acid	1 g.

This solution produces best results when used as such in thin-walled glass cells rather than in the form of a dry filter.

Such a filter is particularly adaptable for scenic effects. The solution absorbs to a large extent the blue rays of the skies, thus obtaining a clear distant horizon and beautiful cloud formations.

Varnishing Finished Color Plates

Solution:

Gum Dammar	8 oz.
Benzol	100 oz.

Pour a small quantity on the thoroughly dried emulsion, and by tilting the plate cause it to run all over the surface without forming lines. If too much solution has been poured out, the surplus can be run off at a corner of the plate back into the bottle. Do not try to use a brush. The edges of the plate can now be bound up, and the coated side still further protected by binding a coverglass to it.

Spotting Glossy Prints

While it is seldom that a photographer has to spot a glossy print, the occasion arises when he has a hurried job and cannot find enough time to do the spotting on the negative. In such cases, the following procedure is very effective:

Dope the glossy print in exactly the same fashion that you dope a negative but be careful to avoid finger marks. Just a few drops are required. Do all the necessary spotting with an ordinary retouching pencil. You can build up and spot as much as needed and not one pencil mark will show.

Luster Prints

A method of adding luster to prints and enlargements on matt surface papers as well as of providing a medium for spotting with a pencil is given below.

The formula calls for one part mastic varnish, one part linseed oil, and two parts turpentine, all these materials of artists' quality. After this mixture has been shaken, a wad of cotton is dipped into it and then rubbed well into the print, the surplus being removed with clean cotton. After a day or so it will be dry, without surface gloss or stickiness. Spotting with a pencil may then be done where needed, though spotting with water color will have to be done before the treatment is applied.

Imitation of Old Masterpieces

Two exposures are made on the one negative; first the picture proper is reproduced and then a second exposure is made of a piece of canvas similar to that used for oil paintings. For best results it is preferable to use an olive green canvas for the second exposure.

Photographs on Metal

A suitable white metal plate is selected. A large variety of white colored metals or electroplates exist. Some of the more popular are stainless steel, nickel-silver alloy, white brass, Monel metal, nickel-cobalt plate (whitest colored metal plate), silver plate, nickel plate, and silvery chrome plate. Stainless steel sheet is the most applicable in the case.

The line and/or half-tone copy is photographed through a screen not exceeding 100 lines per inch as before. A positive is secured from this by re-exposure. The selected plate is coated with light-sensitive film and exposed under the said screened positive in a manner that the transfer will result in a representation on the metal plate identical in position to the original copy. After suitable light exposure the sheet is washed and the unaffected portion of the film is removed. The exposed metal areas are then deeply etched by deplating in a concentrated chromic acid bath for approximately ½ hour at 20 amperes. After an adequate etch, the metal base plate is rinsed in a 10% alkaline rinse and after washing with water, immediately placed in a *black* chrome plating bath ready to electroplate. The alkaline rinse is necessary to dissolve the protective film characteristic of stainless and placing in the bath with the electrical connections on will plate a small film of black chrome which will prevent oxidation of the surface by the chromic acid in the bath.

Black Chrome Plate

The following are the bath formulas for *black* chrome plating:

1—A black chrome deposit is obtained by using 8-9 times the normal current density, 80-100 amperes per dm^2 or more, at a temperature not over 15° C. The solution should contain 250-400 g/l. of chromic acid with the addition of acetic acid or some other organic acid instead of sulphuric; 11-14 volts are used and it is *absolutely* necessary to cool the solution to keep the temperature down; otherwise grey deposits result. It can be plated with or without a nickel undercoat. The nickel must be free from strains. Bright chromium coating followed by black chrome may be plated on an article so as to make it partly bright and partly black for use as a sign. Throwing power of black chrome is no better than that of bright chromium. Black chrome is very hard.

2. .52—. 83 lb./qt. chromic acid, 0.8—1.2% of acetic acid. Bath operated at more than 67 amperes per square inch and kept below 15° C.

After plating for a suitable length of time the stainless metal base is then cleaned in a hot alkali solution and immersed in hot chromic acid to etch the surface for better color. Reproductions should be placed on etched stainless steel sheet or sheet that has been slightly deplated in a chromic acid bath; otherwise the directional polish and light reflection will blur the picture.

The finished product is an unusually beautiful reproduction composed solely of metal. It is exceptionally suitable for outdoor or indoor decoration, where wear-resistance is of vital importance. Portraits, commemorative signs and plaques, in stainless steel metal frames, can be secured which are quite permanent and also very artistic. Quite a large variety of uses can be found for such metal pictures.

Black Chrome Contrasts on Stainless Steel

For the electroplater who has not the equipment or knowledge of photo-engraving practice the following is a simplified procedure for making black chrome metal contrast on stainless steel metal base pictures from the prepared plates secured from a photo-engraver. A screened positive (with any line insertions the copy calls for) is placed on the etched stainless steel sheet, with the resist intact and no etch of metal. The metal base is then deplated and after rinsing plated with black chrome. Upon cleaning the metal picture is complete.

Fingerprint Photography
U. S. Patent 2,028,619

The method claimed is applicable where, owing to poor light, inaccessibility, etc., the fingerprints cannot be photographed directly. The fingerprints are dusted over with a powder of 8 oz. of quinol and 1 oz. of gum arabic, and the lines brushed out in known manner. A sheet of photographic paper or film is soaked for a few minutes in a solution of 25 g., caustic soda and 25 g. of sodium sulphite in 1 litre of water, and is then pressed over the fingerprint; after lifting off, development proceeds until a clear image is obtained, and the the paper is then placed in an acid fixing bath for 3 minutes, rinsed, and dried.

X-Ray Photography
Non-Irritating Opaque Medium

Skiodan	40 g.
Gum Arabic (20% Solution)	60 g.

Flashlight Powder
U. S. Patent 2,098,341

Magnesium (Powdered)	120–140 g.
Aluminum (Powdered)	25–32 g.
Calcium Carbonate (Precipitated)	45–56 g.
Silica (Powdered)	18–24 g.
Magnesium Oxide (Calcined)	8–12 g.

Activated Photographic Flash Lamp

The addition of 2% manganese to the aluminum foil used in flash bulbs and filling latter with oxygen gives a flash of about 500,000 candle power.

Photographing on Rubber
U. S. Patent 1,761,424

A hard rubber surface with a high polish is washed with hydrochloric and wiped dry. On exposing the treated surface, under a photographic negative, to light and developing in a mixture of nitric acid and water (1:1) the light affected portions become etched, a positive image being thereby produced.

Projection Screen
U. S. Patent 1,980,285

A screen which acts as a diaphragm for reproduction of sound and for display of pictures from behind it is coated with the following:

Gelatin	450 oz.
Glycerin	570 oz.
Water	900 oz.
Zinc Oxide	20 oz.
Sodium Fluoride	25 oz.
Formaldehyde (10%)	14 oz.
Cobalt Oxide	6 oz.
Berryllium Oxide	40 oz.

Projection Screen for Rear Projection
U. S. Patent 2,032,363

Stretch a sheet of natural or artificial silk on a frame for 5 minutes and dip it in the following bath and then allow to drain and dry for 1–2 days:

Linseed Oil	97.8 oz.
Lithargo	0.1 oz.
Manganese Dioxide	0.1 oz.

The above mixture has been previously heated to 260–315° F. until of a density of 0.932–0.935 and then adding

Caustic Soda	2 oz.

and keeping mixture for 4 days before filtering.

Recovery of Silver from Photographic Fixing Solutions

The usual fixing bath contains about 10% by weight of fixing salt (sodium thiosulphate). The theoretical maximum of 26 g. silver per liter in such a solution is rarely reached, because with about 8–10 g. of silver in solution, the bath is too weak for further use. According to this, a solution of 10–15 g. of sodium sulphide (or of 6–8 g. of potassium sulphide) per liter of fixing bath has to be applied.

Use sufficient of a 20% sulphide solution to precipitate the silver from the (neutralized) fixing bath, stir, and let the brownish-black sulphide precipitate settle out for a few days. Test for further precipitation by adding a little of the sulphide solution to the supernatant liquid. When no further precipitate forms, syphon off the clear liquor, and filter the precipitate on the bottom, either by suction, or through a filter press. Wash the filter-cake, and dry on dishes in a drying oven.

The dried sulphide can then be reduced to metallic silver.

Safe Light for Infra-Red Sensitive Materials

Glass is coated with usual green and yellow dye coatings and then with following:

Gelatin	10 g.
Potassium Ferrocyanide	4.56 g.
Water	150 cc.

Mix until dissolved: then add following solution at 40° C. mixing vigorously.

Ferric Chloride	2 g.
Water	50 cc.

For a 9 x 12 plate about 13.5 cc. of this mixture is used.

Washing of Movie Film To Remove Photographic Layer

Put into a hot 0.1% solution of caustic soda for 2–5 minutes. Repeat same operation in a second and a third vat.

The remaining celluloid film is washed in hot water.

The drying-operation is dangerous (fire hazard!). Spontaneous combustion during the hot-air drying operation is easily caused by static electricity which has to be removed.

Hypo Eliminator

Place the negative in a very weak solution of potassium permanganate—*i. e.*, containing just sufficient potassium permanganate to give it a pink tint. Repeat the operation until the color is no longer discharged.

Place the negative for a few minutes in the following solution:

Ammonium Persulphate	30 gr.
Water	4 oz.
Solution of Ammonia	10 drops

Then wash for a few minutes.

Eliminating Line Fog in Photography

The addition of 1–3 g. sodium metaphosphate per liter of developer prevents deposition of calcium salts from hard water.

For Limp Prints

The bugaboo of curled prints is being shooed away by some workers through the use of a glycerin bath between the washing and the drying. The bath gives to the prints brilliance and the requisite limpness for easy handling and mounting. The prints are immersed in the following bath for one minute and then dried in the usual way:

Glycerin	1 oz.
Water	19 oz.

Care of Films

The best conditions for storing cellulose acetate film are 21–26.7° and a relative humidity of 50%. Cellulose nitrate film is more perishable and a low temperature and low relative humidity, with facilities for free escape of decomposition products, are necessary.

Prevention of Sticking of Prints to Glass

The effect of ox-gall in preventing the adherence of prints to the glass is due to reduction of surface tension; hence it can be replaced by wetting agents, using such substances as will not give a precipitate of calcium salts. Sulphonated fatty alcohols are preferred, in 1% aqueous solution.

Elimination of Air Bells on Photographic Films

Add 1–5 cc. glycerin per liter of solution.

Film Cabinet Humidifier

Triphenyl Phosphate	1 dr.
Camphor	1 dr.
Menthol	1 dr.
Eucalyptus Oil	1 dr.
Glycerin to make	4 oz.

Dilute with water before use.

Tray Cleaner

Dissolve 4 ounces of potassium bichromate in 16 ounces of hot water and add 4 ounces of commercial sulphuric acid. After swishing this solution around in the dirty tray for a couple of minutes, rinse the tray with clean running water. This cleaning solution can be used a number of times.

Production of Cold Light (Chemiluminescence)

Crude lophine (triphenylglyoxaline) is easily prepared as follows: twenty-five cc. of benzaldehyde is shaken well with 100 cc. of ammonium hydroxide, and the mixture is allowed to stand in a stoppered flask for three days. A white cake of hydrobenzamide forms. This cake is broken up, washed with water, then with alcohol, and is placed in an evaporating dish. It is then heated and stirred constantly until it becomes a dark brown liquid. Then it is allowed to cool. It hardens to a glassy-looking mass. This is crude lophine. From the standpoint of light production it is unnecessary to attempt further purification of the lophine.

The reagents are then prepared as follows.

A. Lophine Solution.—About 2 g. of crude lophine dissolved in 100 cc. of alcohol (methyl or ethyl alcohol or acetone may be used).

B. Hydrogen Peroxide Solution.—Ten cc. of the commercial 3 per cent hydrogen peroxide solution is added to 90 cc. of ethyl or methyl alcohol.

C. Alcoholic Potash Solution.—Five g. of potassium hydroxide is dissolved in 75 cc. of water, and 25 cc. of alcohol is added.

D. Sodium Hypochlorite Solution.—The commercial cleaning fluid "Clorox" may be used. To make up this solution 10 cc. of Clorox is added to 90 cc. of water.

To produce chemiluminescence place 10 cc. of solution *A* in a beaker, then add 25 cc. of solution *B*, and 20 cc. of solution *C*. In a second beaker place 25 cc. of solution *D*. The room is darkened, and the contents of the first beaker are poured into those of the second beaker. A beautiful yellow luminescence will immediately occur.

Other Luminescent Substances

While lophine luminescence is more intense, many other substances of much more common occurrence will also give light and may be substituted for the lophine. The same reagents that were described previously may be used (in the same proportions) except that these other substances may be substituted in place of the lophine.

The following substances have been found to be luminescent in alkaline solution upon oxidation with Clorox and hydrogen peroxide: coffee, cayenne pepper, black pepper, tea, cocoa, ginger, yeast, mustard, and urine. Either a hot-water or an alcohol extraction of these substances may be used. In repeating the experiments with these substances, it is well to remember that the intensity of the light is very small. Therefore, the eyes must be thoroughly adapted to dark before performing the experiment. A number of carbohydrates have also been tried. They gave no light themselves. The carbohydrates were then heated or fused and the new samples were tried. After this treatment they were, without exception, luminescent.

Chemiluminescence Experiments

1. Ozone on safranin. A solution of safranin in alcohol (25 g. per 100 cc.) is placed in a Woulff bottle and sprayed into an inverted wide-mouthed 500-cc. flask, where it comes in contact with ozonized air and gives a brilliant fluorescence.

2. Hydrogen peroxide on a pyrogallol-formaldehyde mixture. The following solutions are made up.

Pyrogallol in Water	10%
Potassium Hydroxide Solution	40%
Formaldehyde	40%
Hydrogen Peroxide	30%

A mixture of 50 cc. pyrogallol, 50 cc. potassium hydroxide, and 35 cc. of formaldehyde is placed in a tap-funnel, and the hydrogen peroxide, in a second funnel; both funnels are inclined over an ordinary filter-funnel or glass spiral. The rates of flow of the two solutions can be adjusted to give a brilliant red glow.

Fluorescent Screen

British Patent 444,949

Barium Tungstate	55–65 oz.
Zinc Phosphate	25–35 oz.
Zinc Silicate	5–15 oz.

This emits a creamy white light under cathode ray exposure.

Fluorescent Screen Materials

Salts[*]	*Color of Fluorescence*	*Best Exciters*[‡]
Zinc Sulphide	Yellow Green	UV
Zinc Sulphide	Yellow Green	CR
(Zinc Sulphide) special treatment	Blue White	CR or UV
Calcium Sulphide	Deep Blue	UV
Synthetic Willemite	Yellow Green	CR[†]
Sodium Fluoride	Yellow	UV or CR
Calcium Carbonate	Orange	CR
Uranyl Potassium Sulphate	Yellow	UV or CR
Sodium Chloride (Type A)	Pink	CR
Sodium Chloride (Type B)	Bluish White	CR
Aluminum Oxide (Type A)	Red	CR
Aluminum Oxide (Type B)	Yellow Green	CR
Magnesium Oxide	Blue—Low Vacuum Red—High Vacuum	CR
Zinc Chloride	Green	UV
Cadmium Chloride	Pink, Red Afterglow	UV
Cadmium Sulphate	Yellow	UV or CR
Calcium Tungstate	Blue	CR or XR
Calcium Oxide	Red	CR
Mercury Bromide	Orange	CR
Cuprous Iodide	Violet Red	CR
Potassium Iodide	Green	CR
Lead Sulphate	Blue	CR
Sodium Bromide	Bluish White	CR
Sodium Iodide	Greenish White	CR
Potassium Chloride	Bluish White	CR
Magnesium Sulphate (Type A)	Red	CR
Zinc Sulphate (Type A)	Red	UV or CR
Zinc Sulphate (Type B)	White	CR
Zinc Sulphate (Type C)	Blue	CR
Calcium Fluoride	Green	CR
Phenocite	Blue	CR
Cadmium Silicate	Orange	CR
Calcite (B)	Violet	CR
Calcite (OO)	Red	CR
Calcite (L)	Green	CR
Sodium Carbonate	Green	CR
Minerals		
Natural Willemite	Yellow Green	UV or CR
Kunzite	Orange	CR or XR
Calcite (MP)	Orange	CR
Calcite (ST)	Green	CR
Calcite S	Orange Red	CR
Fluorite	Green	CR, UV, XR
Cyanite A	Yellow	CR
Cyanite B	Red	CR

[*] The color depends on the concentration and type of activator; a given base material will fluoresce with different colors. Variations are designated A, B, etc.

[†] Fast rate of decay.

[‡] UV = Ultra Violet.
CR = Cathode Ray.
XR = X-Ray.

PLATING

Copper Plating on Glass

This process gives mirrorlike surfaces with the red color of copper, if the directions are followed exactly. Old glass can only be used after repolishing. New blown surfaces are admirably suited.

Clean glass thoroughly with hot soap solution, nitric acid (1 part concentrated acid and 1 part water), and 10% potassium hydroxide solution using a pad of absorbent cotton soaked in these liquids, and washing well between the successive operations.

Add slowly with stirring potassium hydroxide solution to cupric suphate solution until precipitation is complete. Let settle. Wash several times by decantation. Make a saturated solution of the cupric hydroxide suspension in warm concentrated ammonium hydroxide.

Mix 1 part by volume phenylhydrazine (freshly distilled) with 2 parts by volume of water. Heat until a clear solution results. To this add ½ its volume of the warm saturated solution of cupric hydroxide in ammonia. Finally add hot 10% potassium hydroxide solution with stirring until a slight permanent precipitate of cuprous hydroxide is formed. The final liquid should be colorless or pale yellow.

To copper plate, heat the perfectly clean glass in contact with the liquid. Agitate the glass to allow the bubbles of nitrogen to escape and to prevent adherence of tarry byproducts. Allow to remain in contact with the warm solution for an hour and then allow to cool to room temperature. Pour off liquid, wash with water, then alcohol and ether. When dry apply several coats of lacquer or varnish.

If the glass is not perfectly coated, it is best to dissolve off plate with nitric acid and repeat entire process.

Very little of the phenylhydrazine is actually used up in the reduction and the liquid may be employed again, after filtering through absorbent cotton while warm, and adding more of the cupric hydroxide solution and some phenylhydrazine to compensate for the dilution. Keep in a well stoppered completely filled bottle.

Copperizing Iron and Steel Surfaces

Wash metal at 200° F. for 5 minutes in a solution of

Water	1 gal.
Caustic Potash	4 oz.
Trisodium Phosphate	2 oz.

Clean in cold running water.

Pickle 10–30 seconds in 50% solution of hydrochloric acid.

Rinse in cold running water.

Immerse in either plating solution *a* or *b* until desired deposit is obtained.

Remove, rinse, wash in a neutral soap solution 1 oz. to 1 gal.

Rinse cold, rinse boiling water. Dry in maple sawdust or by dipping in acetone. Lacquer by dipping if desired.

a.	Water	1 gal.
	Sulphuric Acid	8 fl. oz.
	Copper Carbonate	4 oz.
b.	Water	1 gal.
	Sulphuric Acid (60° Bé.)	1½ fl. oz.
	Copper Sulphate	1 oz.

Coloring Copper Green
British Patent 450,459

A green patina is obtained by spraying or brushing the metal with

Ammonium Sulphate (Saturated Water Solution)	8 oz.
Hydrochloric Acid, Concentrated	1 oz.

Jet Black Finish for Copper and Nickel Alloys

Water	1 gal.
Muriatic Acid (3%)	8 oz.
White Arsenic	1 oz.
Oxide of Iron	1 oz.
Sulphate of Copper	1 oz.

Use steel anodes, Voltage, 1 to 3; Amperage, 5 to 15 per sq. ft.

In preparing, the arsenic should be dissolved in full strength, muriatic acid, slightly warmed. If used for heavy production solution should be replenished frequently, the deposit is very rapid if solution is run at about 110° F.

Bronze Finish for Copper and Its Alloys
U. S. Patent 2,064,301

The degreased metal is immersed for 15 minutes in a hot concentrated solution of copper nitrate, then washed and buffed.

Coloring Brass, Blue-Black

In order to obtain a uniform color from an immersion dip it is absolutely necessary that metallic surface be free of oxide film that may be produced in the cleaning operation.

Such a film may be removed after cleaning and rinsing in cold running water, by dipping in a muriatic acid pickle; then rinsing again in cold water before immersing in coloring dip.

The muriatic acid pickle can be made by adding 10% muriatic acid by volume to necessary volume of water. The use of a bright dip after cleaning operation on parts will be of help in obtaining a more uniform color from copper carbonate immersion dips. A bright dip of the following composition may be used:

Sulphuric Acid	2 gal.
Nitric Acid	1 gal.
Water	1 qt.

Add 1 oz. muriatic acid for 5 gal. of above; water should only be added in making up new solution. It is essential that dipping solution be used in an acid proof stoneware crock and must be used cold. Cooling of dip may be accomplished by placing crock in tank with cold running water. In mixing of solution, the sulphuric acid must be added last and gradually so as to avoid overheating and tendency to spatter.

Coloring Brass Blue

A blue on brass can be obtained with the following solution:

Sodium Thiosulphate	50 g.
Lead Acetate	25 g.
Water	1 l.

Use at 160–180° F.

In order to obtain a satisfactory blue on steel a heat process is necessary.

Fire Bronze for Brass Instruments

The following bronze used with discretion in conjunction with colorless lacquer on parts of the instrument that may be finished first produces a pleasing black and yellow design. The method used in making the bronze is to let concentrated nitric acid react on copper until reaction is complete. Then add an equal part of distilled water to prevent crystallizing and store in a corked glass container. It can be made in any quantity and is always ready for use.

To bronze a piece of brass there are no preliminaries. Warm the brass in a moderate flame and dip into the bronzing fluid, then reheat until the brass turns black, three dippings usually being sufficient. It is then laid aside to cool. When cold brush vigorously with a medium haired boot brush and the shiny bronze finish will appear. The bronze is very useful for finishing awkward pieces of an instrument where lacquering would take time and is a fair conductor to a terminal without any cleaning. The bronze wears extremely well.

Oxidizing Brass Castings

The following procedure has been found satisfactory in the oxidizing of a certain type of brass castings and may be generally employed with minor changes to obtain the desired finish.

1. Clean and prepare the work in the usual manner.

Free the castings from sand, and dip in a green acid dip of 2 oz. Sulphuric, 1 oz. Nitric and 1 oz. Hydrochloric Acid. Rinse the articles in water, neutralize in a cyanide solution, rinse again in water and dry. Cut down on the highlights with tripoli and a cotton buff. Clean in an alkaline cleaner, rinse in water and then put through a cyanide dip to remove any tarnish. The articles are then ready for the Burnt Brass English Finish.

2. Pour 2 quarts of aqua ammonia into a one-gallon crock. Add sufficient Golden Sulphuret of Antimony to make a saturated solution, omitting water.
3. Place the crock in a container holding water. Heat the water to the boiling point.
4. Place the articles in this oxidizing solution and keep them immersed for at least one-half hour. If necessary, extend this period until the proper surface coating is obtained. Stir the solution at intervals and allow it to settle on the articles.
5. Remove the work and dry in an oven at about 200° F. This should result in a caked coating on the surface of the work.
6. When perfectly dried, buff the work, using rouge and a soft cotton wheel or bristle brush to remove the dried coating from the highlights.
7. Dip the articles in lacquer.

Brass Plating Zinc Die Castings

The most satisfactory brass plating procedure with Zamak* is to clean the alloy with a trisodium phosphate solution, 6 oz./gal. (45 g./l.). This solution is used boiling hot as an electrocleaner with the article as the cathode and with sufficient current to cause gas-

sing. This treatment will completely remove, in ½ to 3 minutes, the grease normally present. Recessed articles are often difficult to free from grease. The use of a solvent type cleaner prior to alkaline cleaning is suggested in such cases. The cleaning solution may be removed from any minute pores or surface of the article by alternate rinsing in hot and cold water. The use of a cold water rinse immediately following alkaline cleaning is not advisable since the solubility of alkaline zinc salts is reduced by the lowered temperature and the problem of complete removal is complicated.

With a current density of 4–5 amperes per sq. ft. the zinc alloy is plated 18 minutes in a brass plating bath of the following composition (40° to 50° C.):

Cuprous Cyanide	19 g./l.
Zinc Cyanide	8 g./l.
Sodium Cyanide	34 g./l.
Sodium Carbonate	7.5 g./l.

Finishing Brass

The following is a formula for bright dipping brass:

Sulphuric Acid	2 gal.
Nitric Acid	1 gal.
Water	1 pt.

Add 1 oz. of table salt to each 5 gal. of dip solution to improve the brightness of the work.

The dip should be allowed to cool properly before being used. Once the dip is made, water should not be added any more on replenishing it, since the work dipped always carries some water along with it. On the other hand if the shape and recesses of the work causes too much water to be carried into the dip, the results will be immediately noticed by the dullness of the dipped work.

There are a few other factors to consider outside of the formula. The following is an outline of the procedure of the average brass dipping job:

1. Hot potash cleaner rinse (to remove grease or oil film); then cold water rinse.
2. Immerse in acid dip for a few seconds; then quickly rinse in running cold water. The timing of this procedure is according to the strength of the dip. If the articles dipped seem to bunch together they should be shaken during this operation.
3. Cyanide rinse and cold water rinse to remove possible tarnish. The cyanide rinse is made of 2 oz. of sodium cyanide to each gal of water.
4. A soap water rinse made of ½ oz. soap flakes to each gal. of water.
5. Hot water rinse and allow to dry in hard maplewood sawdust.

If the work is to be lacquered it can be rinsed in a water-white lacquer immediately after the hot water rinse, thereby eliminating sawdust drying. This depends on the size of the articles.

There is a satin finish on the brass that can be produced without bright-dipping the work. This finish is produced with a buffing compound. The composition is applied to a loose-leaf buff revolving on a lathe at about 1800 r.p.m. The articles are dry when buffed with this material. To preserve the brushed brass effect, the work is to be lacquered after finishing.

Nickel Plating Preparations
Rules for Use

Clean the surface of the metal by removing all (grease, dust, oxide) stains. Apply with a cotton pad. The abrasive must be very fine to avoid scratches.

Polish with some chalk-powder (precipitated) on a woolen rag.

Nickel Plating Liquid

Nickel Ammonium Sulphate	45 g.
Cream of Tartar	17 g.
Ammonium Chloride	9 oz.
Nickel Sulphate	27 g.
Sodium Chloride	4 g.
Tin Chloride	18 g.
Water	880 g.

Nickel Plating Paste

Nickel Ammonium Sulphate	225 g.
Nickel Sulphate	155 g.
Cream of Tartar	100 g.
Tin Chloride	100 g.
Ammonium Chloride	50 g.
Sodium Chloride	30 g.
Whiting	210 g.
Copper Dust, Fine	100 g.

Apply after making paste with water.

Depitter for Nickel Plating Bath

An effective preventative of pitting in a nickel plating bath is potassium permanganate. The salt should be added in the proportion of one ounce per 500 gallons of solution, the contents of the tank stirred and then allowed to settle for ten to twelve hours.

"Black Nickel" Plating Solution

Numerous formulas have been proposed for the production of "black nickel" deposits such as are used extensively for producing a dark or black finish on brass or other metals. Two

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* N. J. Zinc Co. Special zinc die-casting alloy.

types of solutions have been used, namely, the alkaline cyanide solutions and the neutral sulphocyanide solutions. Experiments show that the former are rather difficult to prepare and maintain at uniform composition, and therefore are not recommended. It was found that a sulphocyanide solution having the following composition is very satisfactory:

Nickel Ammonium Sulphate	60 g. per. l.
Zinc Sulphate	7.5 g. per. l.
Sodium Sulphocyanide	15 g. per l.

It is desirable to keep in suspension an excess of zinc carbonate which maintains the neutrality and the zinc content of the solution.

Black nickel plating may be applied successfully to brass, either directly or after copper plating, to copper, and to steel that has been first coated with copper, nickel or zinc. Where protection against corrosion is desired, the "black nickel" should be preceded by zinc plating. The wearing properties of the black surface are largely determined by the quality of lacquer applied over the surface.

Sequence for Nickel and Chromium Plating Lead Alloys

1. Clean in solvent cleaner or vapor degreaser.
2. Electroclean as cathode from 1 to 3 minutes using 20 to 50 amps. per sq. ft.
3. Reverse clean making the work the anode for 10 to 15 seconds in the solution for (2) or in a 4 oz. per gal. solution of sodium carbonate.
4. Dip in a warm solution (120° F.) of 2 oz. per gal. of caustic soda, and 2 oz. of sodium cyanide if copper is also to be cleaned.
5. Dip in 20% hydrochloric acid solution.
6. Nickel plate in a warm nickel solution.
7. Wipe clean, if necessary, after color-buffing.
8. Chromium plate not over 3 minutes at 100 amps. per sq. ft.

If the work is to be given a copper plate previous to nickel plating after operation (5), follow with a dip in 3% sodium cyanide solution before copper plating.

Nickel Plating Lead Alloys

After the work is dipped in 20% hydrochloric acid and rinsed in cold water, it is transferred directly to a warm nickel plating solution, making an immediate and secure electrical contact. Every precaution should be made to secure a soft, non-strained nickel plate, especially if the thickness of the nickel is to be over .0005 in.

	Oz. per Gal.
Single Nickel Salts	20 to 25
Nickel Chloride	4 to 6
Boric Acid	4 to 3

Conveyor speed, 1 to 3 ft. per minute; current density, 10 to 20 amp. per sq. ft.; pH, 5.0 to 5.6; temperature, 100 to 115° F.

Low metal concentration, cold, still nickel plating baths are not recommended for deposits over .0005 in. thick.

Nickel Plating Solution for Zinc

U. S. Patent 2,069,566

Sodium Sulphate	16.00 oz.
Sodium Pyrophosphate	8.5 oz.
Sodium Bisulphite	0.25 oz.
Sodium Citrate	8.00 oz.
Citric Acid	2.00 oz.
Sodium Chloride	4.00 oz.
Ammonia (28%)	4.00–8.00 oz.
Water	1 gal.

Nickel Plating Stereotypes

Stereotypes can be nickel plated in a warm nickel solution of the following composition:

Single Nickel Salts	27	oz./gal.
Nickel Chloride	6	oz./gal.
Boric Acid	4	oz./gal.
pH	5.8	

Run at a temperature of 130° F.

Use 99% plus rolled nickel anodes, bagged.

This is a faster plating solution than the room temperature nickel using double salts. Also, it gives a ductile and tougher deposit. The room temp. nickel is more brittle. For press work the former type of deposit is found superior.

Nickel Plating and Ball Burnishing

1. Parts should be made of cold rolled steel of fairly smooth finish. A No. 2 cold rolled steel finish (U. S. Standard) is satisfactory.
2. Clean parts after fabricating in either a solvent degreaser or in a hot alkaline cleaner. Parts should be cleaned in baskets of proper size and mesh.
3. Ball burnish parts in either oblique open end or horizontal wood lined barrel; size depending upon quantity of parts. Burnishing mixture made up of about 2 oz. neutral soap chips or flake to 5 gal. of water, to which is added about 1 oz. sodium cyanide; hardened polished steel balls, 5/32" to ¼" diameter, using

approximately twice the weight of steel balls to that of the weight of work. Rolling time dependent upon finish designed, varying from 2 to 12 hrs. Speed of barrels about 35 to 45 r.p.m.

4. After ball burnishing, parts should be rinsed first in boiling hot water to remove soap film and then rinsed in cold running water.

5. After cold water rinse, parts are placed in a plating barrel of suitable size and given a required deposit of nickel. A nickel solution of following composition can be used:

Single Nickel Salts	12	oz.
Double Nickel Salts	4	oz.
Ammonium Chloride	3	oz.
Boric Acid	3	oz.
Water	1	gal.
pH	5.8 to 6.0	

Temperature 75–80° F., anodes 99% rolled, depolarized nickel.

Time of deposit at least 1 to 1½ hours depending upon size of load. It is necessary to use a line voltage of 12 volts to obtain most satisfactory results. This will necessitate the use of 12 volt D.C. generator.

6. After plating, parts are rinsed in cold running water.

7. After rinsing, parts are again ball burnished to obtain lustre. The same procedure should be followed as outlined in item No. 3 with these exceptions:

a. The use of cyanide in soap solution should be eliminated.

b. After hot water rinse, rinse in cold and in hot water and then finally dry in hot, clean hardwood sawdust. Burnishing time in soap solution between 20 to 30 minutes.

The recommendations as outlined above can be modified to suit conditions.

Bright Nickel Cobalt Plating
British Patent 461,126

Nickel Sulphate	200 g.
Cobalt Sulphate	15 g.
Sodium Bicarbonate	35 g.
Boric Acid	30 g.
Water to make	1 l.

Use at pH of 4.1–5.1 at current density of 5–60 amp. per sq. ft.

Nickel Plating on Zinc

The following solution has been used commercially for several years:

Nickel Sulphate	10 oz./gal.
Anhydrous Sodium Sulphate	10–15 oz./gal.
Ammonium Chloride	2– 3 oz./gal.
Boric Acid	2 oz./gal.
Nickel Sulphate	75 g./l.
Anhydrous Sodium Sulphate	75–112.5 g./l.
Ammonium Chloride	15– 22.5 g./l.
Boric Acid	15 g./l.

Operating details for this solution are given below:

pH.—This should be held between 5.3 and 5.7 electrometric or 5.8–6.2 colorimetric. The anode area should be controlled to minimize pH changes. pH should be checked daily and adjustments made by the addition of ammonium hydroxide or sulphuric acid as needed. Under best operating conditions this solution will tend slowly to become alkaline.

Temperature.—For use in applying nickel directly on zinc this solution should be kept at or preferably slightly above room temperature (70 to 80° F.). If the temperature falls below 70° F. the deposits will be hard and brittle showing cracks. Temperatures above 80° F. will tend to cause the formation of black streaks in recesses.

Nickel Content.—The prescribed nickel sulphate content corresponds to about 2 oz. per gal. of nickel calculated as metal. No harm will result if this increases somewhat in use.

Sodium Sulphate Content.—The amount of sodium sulphate present in the solution should be regulated to suit the complexity of the articles to be plated. Simple shapes may require not more than 10 oz. per gal. of sodium sulphate. More complicated shapes may require the presence of 15 oz. per gal. or more. Some commercial platers add as high as 30 oz. per gal. In general, the sodium sulphate content should be the lowest possible for the articles being plated.

Current Density.—When made up according to the formula given, the bath should be operated at between 12 and 20 amp. per sq. ft. The maximum current density will be determined by the tendency for the deposits to burn. In the presence of very high sodium sulphate concentrations, burning may develop at current densities lower than 20 amp. per sq. ft. If streaking occurs at the maximum current density, purification of the solution may be necessary.

Agitation.—Agitation reduces porosity and permits the use of somewhat higher current densities. With certain shapes, agitation will be found absolutely necessary for successful plating.

Pitting.—Like all other nickel solutions this bath will at times develop a tendency towards pitting. This is usually an indication that foreign matter is present. A temporary cure can be effected by adding hydrogen peroxide or sodium perborate to the solution. Permanent freedom from pitting can only be obtained by continuous filtration and scrupulous care in avoiding the presence of foreign material in the solution. Pitting may on occasion develop from faulty cleaning.

A somewhat more concentrated solution permitting the use of higher current densities has been developed. This solution has been used commercially with entire success. The formula is as follows:

Nickel Sulphate	15 oz./gal.
Anhydrous Sodium Sulphate	15 oz./gal.
Ammonium Chloride	3 oz./gal.
Boric Acid	2 oz./gal.
Nickel Sulphate	112.5 g./l.
Anhydrous Sodium Sulphate	112.5 g./l.
Ammonium Chloride	22.5 g./l.
Boric Acid	15 g./l.

Operating details for this solution are given below:

pH.—Should be kept between 4.9 and 5.4 electrometric or 5.4–5.9 colorimetric by means of additions of sodium hydroxide or hydrochloric acid. Ammonium hydroxide and sulphuric acid should not be used as the solution is nearly saturated with respect to nickel ammonium sulphate.

Temperature.—The more concentrated solution permits the use of somewhat higher current densities which in turn permit the use of higher temperatures of operation which may be reflected in slightly softer deposits. The minimum safe temperature is 75° F. and the maximum is 87° F.

Nickel Content.—Corresponds to about 3 oz. per gal. calculated as nickel metal. Any large increase in nickel content may result in crystallization of double nickel salts from solution.

Sodium Sulphate Content.—Should be regulated as for the 2 oz. (nickel content) solution. In general somewhat higher sodium sulphate contents will be required in the present case.

Current Density.—This more concentrated solution permits the use of higher current densities, the range in the present case lying between 24 and 36 amperes per sq. ft.

Agitation. — *Pitting.* — The considerations above outlined obtain in the present case.

Either of these two solutions can be used to produce deposits up to about 0.0005 in. in thickness. If the attempt is made to furnish the heavier coatings required for still better outdoor service life, a tendency toward cracking will be noted. While the degree of this effect can be controlled to some extent by proper operation of the solutions, other plating methods will be required in most cases.

Properly formulated warm nickel solutions may be operated at high current densities and will produce a substantially softer type of deposit which while not entirely free from cracking under certain conditions, will nevertheless be acceptable. While such solutions cannot be used directly on zinc, advantage may be taken of their desirable characteristics by the application of a multiple nickel coating. This method consists essentially of depositing on zinc articles, from either of the two cold solutions already described, a coating of nickel 0.0001 to 0.0002 in. thick, following which the articles are thoroughly rinsed in cold water and placed in a warm nickel solution for completion of the plating to the required thickness.

The multiple nickel method may be used on any work on which it is possible to produce a satisfactory strike coating in the sodium sulphate type solution. Any warm nickel solution capable of producing soft deposit may be used. The solution used in the New Jersey Zinc Company laboratory is as follows:

	oz./gal.	g./l.
Nickel Sulphate	20	150
Ammonium Chloride	4	30
Boric Acid	2	15

Operating details for this solution are given below:

pH.—The pH of this solution should be held between 5.0 and 5.3 electrometric (5.5–5.8 colorimetric). Higher pH will cause cracking and peeling while lower pH will tend to increase the attack of the solution on exposed portions of the base.

Temperature.—Should be between 105 and 115° F. (40–45° C.). Lower temperatures will not permit the deposition of soft nickel. Higher temperatures, while allowable, tend to cause excessive loss of water by evaporation.

Current Density.—The current density should under no circumstances fall below 40 amp. per sq. ft. and preferably should be maintained at 60 amp. per sq. ft. or higher. Not only does the speed of production fall off at the lower current densities but contamination of the solution becomes more serious. These current densities are similar to those required for chromium plating and suitable generator capacity should be available.

Agitation.—Agitation will tend to reduce pitting and porosity.

Pitting.—Like most warm solutions new baths of this composition may develop an exaggerated type of pitting. This condition can be readily overcome by additions of hydrogen peroxide. Sodium perborate should never be used for the reasons given below.

Sodium Salts.—Sodium salts should not be permitted to enter this solution. When the solution is pure very high current densities can be employed without burning. The presence of sodium salts very definitely restricts the operation to low current densities which not only do not utilize the full production capacity of the solution but also permit excessive zinc pickup. For these reasons the rinsing between nickel tanks should be thorough, sodium perborate should not be used to prevent pitting, and additions of alkali to raise pH should be made with ammonium hydroxide rather than sodium hydroxide.

The following comments are offered in connection with the method as a whole:

Strike Coating.—The strike coating must be adequate to protect the zinc base from the action of the subsequently used warm solution. For simple shapes a five-minute deposit at 25 amp. per sq. ft. may be sufficient. More complicated shapes will need ten minutes at this current lensity.

Rinsing.—In the interval between the two nickel tanks the articles should not be allowed to dry. If drying does occur poor adhesion of the second coat will develop. The use of cold water in the rinse will minimize the danger of this happening.

Rotation of Work—It is advisable to rotate the work being plated so that a load of complicated shapes (radiator caps, for instance) which accelerate zinc pickup is followed by several loads of simple shapes on which more zinc will plate out than is dissolved (such as door handles, etc.). This practice tends to hold the zinc content of the warm solution at a level which does not harm the quality or appearance of the deposit.

Copper-Nickel Deposits

While the system of plating nickel direct has a great many advantages, good results have also been obtained commercially by plating with copper-nickel deposits totalling 0.001 in. in thickness.

In this system of plating the work is cleaned substantially as described in the earlier part of this article, a coating of copper is applied to a thickness of 0.0002 in. from a copper cyanide solution, followed, after rinsing, by the application of 0.0008 in. of nickel in a warm nickel solution.

The copper cyanide solution may be any one of those commonly used. A typical formula follows:

	Oz. per gal.	g. per l.
Sodium Cyanide	4–6	30–45
Copper Cyanide	4	30
Sodium Bicarbonate	1	7.5
Sodium Bisulphite	¼	1.87

The solution should be used at 70 to 113 deg. F. (21 to 45 deg. C.) with a current density of 10–15 amp. per sq. ft.

The nickel coat may be applied from any warm nickel solution. The formula given above would be suitable for the purpose.

The following comments may be made on the method:

Thickness of Coating.—The copper-nickel system of plating is adapted to the production of heavy deposits. Its use is not advocated for coatings less than 0.0005 in. in thickness. The copper layer should be at least 0.0002 in. thick in order to avoid complete absorption by the zinc base and to provide protection of the zinc base from attack by the warm nickel solution. The copper layer fills the same role here as the primary or strike nickel deposit in the multiple nickel system of plating.

The nickel deposit must be at least 0.0003 in. thick for outdoor use. Thinner deposits will readily permit the seepage through pores of copper salts which will stain the surface with an unsightly brown film.

Blistering.—Cyanide solutions, particularly when used on zinc, may at times produce deposits which blister readily. This seems to be related in some way to the cleaning practice used and often can be minimized by care in avoiding over cleaning.

Absorption.—Zinc metal absorbs copper deposits even at room temperature. The rate of absorption is very rapid for thin flash deposits but becomes progressively slower as the amount of copper present is increased. Deposits of copper 0.0002 in. thick should not be completely absorbed during the normal lifetime of a plated part, although diffusion is taking place continuously.

After some period of exposure it will be found that a zone of diffusion alloys has formed between the copper layer and the zinc base. Certain of these alloys are brittle and may fail under stress causing separation of the plate from the base.

W. Kastell and F. Carl have shown photographic confirmation of this separation.

Nickel-Copper-Nickel Deposits

When coatings ranging from 0.00075 in. upward are desired multiple coatings are necessary to minimize the tendency toward cracking. We have already discussed the multiple nickel coatings. The system nickel-copper-nickel also deserves consideration for this weight of coating and the procedure is given below:

Clean as described earlier in this article.

Plate 0.0002 in. of nickel in either of the cold solutions previously described.

Plate 0.0004 in. of copper from an acid copper solution.

Color copper coat and clean.

Plate 0.0004 in. of nickel from any warm nickel solution. The bath previously described is suitable for the purpose.

The buffing operation is not essential if the two primary coats are sufficiently smooth to make coloring of the final nickel readily accomplished.

The acid copper solution may be of any accepted composition. The following formula is typical:

Copper Sulphate, 24 oz. per gal. (180 grams per l.)

Sulphuric Acid, 6–8 oz. per gal. (45–60 grams per l.)

This solution is used at room temperature to 113 deg. F. (45 deg. C.) with a current density of 10–50 amp. per sq. ft. Animal glue may be used as a brightener in amounts of ⅛ oz. per gal. (0.9 grams per l.).

The primary nickel coating should be at least .0001 in. thick to prevent attack on the zinc base by the acid copper solution. The final nickel should be not less than 0.0003 in. thick to prevent copper stains when exposed outdoors.

Plating Time

The approximate time of plating required to produce various thicknesses of coating in nickel at various current densities is compiled in Table 1. The times given are calculated on the basis of 100 per cent cathode efficiency. In the type of solution discussed in this article this value will be nearly approached. It may be necessary, however, to add a few minutes to the plating time in some cases to insure full weight of coating.

Purification of Solution

Nickel solutions used on zinc tend to accumulate zinc in solution. When the amount present becomes sufficiently great, streaking will occur as the result of the plating of nickel-zinc alloys of relatively high zinc content. In the case of the cold sodium sulphate solution this difficulty arises when 0.3 grams per liter of zinc is present. In the warm nickel solution approximately 1 gram per liter of zinc must be present before streaking develops. Definite brightening and some tendency toward cracking are observed, however, when the amount of zinc in this bath greatly exceeds 0.3 grams per liter.

Table 1. Approximate Time in Minutes to Produce Nickel Coatings of Various Thicknesses

Current Density	Thickness (inches)				
Amp. per Sq. Ft.	0.00015	0.0003	0.0005	0.00075	0.001
15	10	20	34	52	69
20	9	18	29	44	59
25	7	14	23	36	48
30	6	12	20	30	40
35	5	10	16	24	31
40	4	9	14	22	29
50	3½	7	12	17	23
60	3	6	10	15	20
70	2½	5	8	12	16

Several methods are available by which to remove excess zinc and bring the solution back to a workable condition.

Basic Nickel Carbonate Treatment

Raise the pH until nickel hydroxide begins to precipitate (about 6.8 electrometric). Heat the solution to 140 deg. F. (60 deg. C.) and add a small amount (1–3 oz. per gal. or 7.5–22.5 grams per l.) of freshly prepared basic nickel carbonate. A heavy white precipitate should form. If no precipitate is evident add more basic nickel carbonate until the precipitate does form. If the solution is to be used cold, allow to cool overnight and filter. If the warm type of bath is treated, allow to stand overnight and filter hot. Adjust pH and nickel content before starting to plate. Should excessive gassing be encountered work the bath heavily until the condition is overcome.

Basic nickel carbonate may be prepared by adding 1 part of sodium carbonate to 7 parts of nickel sulphate in just sufficient water to dissolve the nickel sulphate.

This treatment will remove virtually all of the zinc, iron and/or aluminum which may have accumulated.

Sodium Carbonate Treatment

The sodium carbonate system is operated in the same manner as the basic nickel carbonate treatment with the single exception that sodium carbonate is added in amounts of about ⅛–⅜ oz. per gal. (1–3 grams per 1.) in place of the basic nickel carbonate. This method should not be used with the warm solution because of the effects which sodium salts have on the permissible current densities.

Ammonia Treatment

Heat the bath to 140 deg. F. (60 deg. C.) and add ammonium hydroxide until a pH of 6.8 is reached. Allow to stand overnight (cooling to room temperature for cold solutions and holding at temperature for warm solutions), filter, and adjust pH and nickel content.

Stripping Methods

The question of how best to handle the occasional defective platings is a serious one. In the long run, it is probably more economical to scrap the parts than to strip and replate them. The percentage of rejections in replating stripped work is very high and, in the case of zinc die-castings, the durability of the plated coating is inferior to that obtained over a new surface.

Where stripping is necessary the following information is offered.

Nickel Coatings

Immerse in the following cold solution:

Water	1 oz.
Sulphuric Acid	2 oz.
Nitric Acid	2 oz.
Hydrochloric Acid	1/16 oz.

Prepare by adding the sulphuric and nitric acids to water and, after allowing the solution to cool, adding the hydrochloric acid.

The Nickel Dip Process Prior to Enameling

The Nickel Dip tank is usually placed after the acid rinse, and before the neutralizer, and the ware proceeds from acid to rinse to nickel dip, to neutralizer.

Either a wood, lead, or acid resisting brick with lead heating coils are usually employed. Iron cannot be used as the nickel will deposit on the tank rather than on the ware. The nickel is usually added as a single nickel salt ($NiSO_4 \cdot 7H_2O$) although occasionally double nickel salt is used ($NiSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$) is used as the metal source. The former contains approximately 1⅛ the quantity of nickel as the latter, is much more economical, and accomplishes the required work just as efficiently as the latter.

Usually two to four ounces per gallon of nickel is added, along with 0.25 oz. per gallon of boric acid. The latter is the "buffer" employed, and also brings about the proper pH for most efficient operation. A "buffer" has a resistance to change of pH, as its use allows the addition of acid, or base, or dilution of solution without materially effecting the pH. Therefore, its use within reason, practically insures a constant pH. This is very necessary if proper plating conditions are to prevail in the nickel dip tank, for if the pH is too low the solution is too acidic, and the deposited nickel will be dissolved, and if too high, the solution approaches the basic side, and precipitation of the nickel rather than deposition will result. The pH is usually maintained between 5.6 to 6.2, and if, through carry over of the acid, it should become too low (less than 5.6) ammonia water or ammonium carbonate are added until the pH is within the proper range. If the solution should become too basic (greater than 6.2) acid is added.

The tank is maintained by heating at approximately 160–190° F., although there are some operators who run the tank at 130° F., this to prevent excessive agitation of the sludge.

As the solution grows older an increasing quantity of iron hydroxide separates out of the solution as a heavy brown sludge. Some of this rises to the surface making it advisable to skim off the surface of the tank at intervals.

The usual practice involved in the removal of sludge other than discarding the tank entirely, is the addition of ammonia to the tank until the pH is 6.4 or above, heat the tank to 180° F. with air agitation to oxidize the iron, and allow to cool. On cooling overnight the iron hydroxide will be found to have settled to the bottom of the tank whereupon the nickel solution may be siphoned off, and the sludge removed. The nickel solution may again be run into the tank, with the additions necessary to bring about normal operating conditions.

Besides the amount of nickel deposition which has taken place in the tank the concentration of nickel maintained and the hardness of the water, play an important part in the length of time of service of the tank before it becomes necessary to dump the tank because of excessive sludge.

If hard water is used, ammonia water additions, rather than ammonium carbonate are said to help, as there is then less carbonate to precipitate.

The solutions required and the procedures involved are outlined below:

1. *Standard Nickel Solution*
   Dissolve 2 oz. of single nickel salts in one quart of water.
2. *Standard Potassium Cyanide Solution*
   Dissolve 75 grams of 95–96% Potassium Cyanide in 1 liter of water. 7.5% solution by weight.
3. *Standard Silver Nitrate Solution*
   Dissolve 1.13 grams of Silver Nitrate in 1 liter of water. 0.113% solution by weight.
4. *Potassium Iodide Solution*
   Dissolve 25 grams of Potassium Iodide in 100 cc. of water. 25.0% Solution by weight.
5. *Citrate Solution*
   Dissolve 150 cc. of concentrated Chemically Pure Ammonia, and 120 grams of Citric acid crystals, and 200 grams of Chemically Pure Ammonium Sulphate in 1 liter of water.

Note—In all of the solutions above, where water is called for, distilled water should be used.

It is first necessary to standardize the Potassium Cyanide solution. Pipette 10 cc. of the Standard nickel solution into a 250 cc. beaker, add 50 cc. of the citrate solution, 2 cc. of the Potassium Iodide solution, and 5 cc. of the Silver Nitrate solution. This is titrated with the Potassium Cyanide until the cloudy precipitate obtained in the beaker is just cleared. The number eight divided by the number of cubic centimeters required for the titration provides a factor which is used in all determinations of nickel hereafter.

To determine the concentration of nickel in the tank filter 100 cc. of the solution to remove the iron sludge, pipette 10 cc. of this filtrate into a 250 cc. beaker and make the remainder of the additions as indicated above. Titrate with Potassium Cyanide, rapidly, and with constant stirring until one drop just clears the solution, of the cloudy, yellow precipitate. The number of cc.'s required for the titration multiplied by the factor mentioned above, gives the concentration in oz./gallon and in terms of single nickel salts in the tank. The results will be high, if too long a time is consumed in the titration.

The blisters arising when repickling ware is perhaps one of the major difficulties encountered; however, there are remedies should repickling prove desirable. One might satisfactorily solve this by segregating the ware, and putting it through the regular cycle, but missing the nickel tank entirely. It is said that a thorough sponging of the ware without pickling is efficacious.

If the deposition of nickel is too great, difficulty in the drain of the ground coat may be experienced, or if the ware should become scratched while in this condition, a series of blisters will form in the scratch. The proper deposition is very thin, and the ware will appear to the eye to be covered with a uniform dusty black coating.

Inasmuch as it is a well known fact that in plating, the deposition is heaviest in scratches and holes and these holes might conceivably contain inclusions of dirt, acid or matter which instead of being removed in succeeding tanks are covered by the nickel to become copperheads or blisters by volatilization after firing.

Chromium Plating China or Glass
U. S. Patent 2,025,528

Non-metallic rigid articles are plated by immersing in tin sulphate (5° Bé.) then washed superficially. Then pour on them simultaneously a solution of 1 ounce silver nitrate and 1 ounce 28% ammonia in a quart of water together with a solution of formaldehyde; rinse and submerge in a solution of copper sulphate (25° Bé.) to which an electric current of 5 to 15 amperes is applied; rinse and immerse in a solution of nickel sulphate (25° Bé.); wash; dry; polish wash in an alkaline solution and plate in chromic acid solution (25–40° Bé.) for 3 to 10 minutes at 100 to 200 amperes and rinse and dry.

Chromium Plating

U. S. Patent 2,093,428

The object to be plated is first coated with a thin film of zinc or cadmium by electro-deposition from

Caustic Soda	8	oz.
Sodium Cyanide	8	oz.
Water	1	gal.
Zinc or Cadmium	0.03	lb.

then plate from following bath:

Sodium Dichrmate	2½	lb.
Chrome Acid	15	lb.
Water	4	lb.

Bring to a boil and add gradually

Aluminum Hydrate	2½	lb.

Boil for 15 min.; cool and add

Chrome Acid	75	lb.
Zinc Carbonate	8	oz.

Mix and dissolve in water to give a 28° Bé. solution. Plating with this bath avoids undue oxidation of metal being plated.

Coloring Cadmium

Cadmium may be colored by immersion in the following solution:

Copper Nitrate	10–15	g.
Potassium Permanganate	2½	g.
Water	1	l.

Colors ranging from yellowish to reddish and greenish brown may be obtained, depending on the time of immersion, concentration of the bath, and age of the bath. The surface after treatment should be given a light dry brushing to bring out the true color.

Treating Aluminum for Plating

German Patent 631,371

Smooth adherent deposits are obtained if the aluminum or alloy is treated for 3 minutes in 1% hydriodic acid at 200 amp/sq. m.

Electrolytic Polishing of Aluminum

The electrolyte is prepared by pouring very slowly 785 cc. acetic anhydride into 215 cc. well-cooled perchloric acid (d. 1.480). (The aluminum to be polished is completely immersed, vertically if a sheet, in this solution a few cm. from the cathode (a sheet of aluminum), and connected with the anode. The voltage should be 50–100 v. The circuit should include a variable resistance so that the c. d. can be kept at 3–5 amp./sq. dm. of the anode surface, and the electrolyte maintained at 45–50° with constant stirring. The duration of the polishing depends on the surface; for a sheet of rolled pure aluminum in good condition it is about 15 min. When polishing is completed, the surface is washed successively in water, alcohol and ether. About 0.004 mg. aluminum is dissolved per min., and the electrolyte works better when it has dissolved 4–5 g./l. aluminum. The reflecting power of the aluminum thus obtained is much greater than that obtainable by mechanical polishing, and the surface is especially suited for examination of the structure of the metal.

Anodic Treatment of Aluminum

U. S. Patent 2,066,327

Formula No. 1

Chromic Acid	5	oz.
Chromium Acetate	5–11	oz.
Water	84–90	oz.

Operate at 30–40 Volts at 30–40° C. for 30–60 minutes.

No. 2

British Patent 474,608

Aluminum or its alloys is treated anodically in 8–15% sulphuric acid at 20–25° C. with 9–4 amp./sq. ft. It is then boiled with a non-metalliferous dye containing a small amount of potassium dichromate.

No. 3

British Patent 447,420

Acetic Acid	10–12	fl. oz.
Phosporic Acid	2–2.5	fl. oz.
Sulphuric Acid	2.5–3	fl. oz.
Water	82.5	fl. oz.

Operate at 27–30° C. at 3–4 amp./sq. ft.

No. 4

Sulphuric Acid	7–8.25	oz.
Gallic Acid	0.55	oz.
Boric Acid	0.55	oz.
Water to Make	1	gal.

Operate at 25–35° C. at 8–12 amp./sq. ft.

Aluminum Reflectors by Anode Process

The electrolyte is an aqueous solution containing approximately 15 percent sodium carbonate (anhydrous) and 5 percent tribasic sodium phosphate, the working temperature being about 80° C. (176° F.).

The material to be treated is immersed in this solution connected to the anode bar, with the current off, and allowed to remain until a vigorous etching action, which starts almost immediately, has persisted for about 20 seconds. Direct current at about 10 volts is then switched on with a current density of about 35 amps. per sq. ft. of anode surface. Within about 30 seconds of switching on, the initial etching of the metal should cease entirely, and at the same time the current density should decrease to about half its original value, the voltage being kept within 9–12 volts. The anodic treatment is then continued for about 5 minutes, after which the metal is removed from the bath and rapidly washed in clean cold water.

The reflectivity of the surface compared with the original mill finish is now considerably improved, and if the specimen is allowed to dry, brilliant interference colors may be seen, indicating the presence of an extremely thin transparent film presumably of aluminum oxide. This seems to be confirmed by the fact that the surface is now capable of being dyed by aniline dyes. This film is, however, too thin to withstand much wear and needs to be reinforced. For the second part of the process, an aqueous solution is used containing approximately 20 percent sodium bisulphate worked at about 35° C. (95° F.). It is a straightforward anodic treatment using d.c. at 10 volts and a current density of about 5 amps. per sq. ft. anode surface, treatment being continued for 15 minutes.

Some care is necessary in the finishing of treated material if a rather unpleasant defect is to be avoided. If a sheet is treated by both processes and finally washed and allowed to dry in air, a very brilliant surface is obtained which remains so until it is rubbed or fingered, when a permanent white streak appears which is rendered worse by further rubbing. This appears to be due to the formation in the first bath, of an extremely thin powdery layer, which is only rendered visible when rubbed in the dry state. The layer can be readily removed, however, without damage to the surface, by light scrubbing using clean water and a rubber sponge; this treatment must be applied before drying.

Several difficulties have arisen in the after-treatment or sealing of these reflector films, as most of the oils, waxes, etc., in general use reduce the reflectivity value, but very good results have been obtained by the application of soap and water. The soap should be applied with a second rubber sponge and worked into a good lather evenly over the reflector surface; this treatment produces a rather greasy effect, on rinsing which disappears, however, when the metal is dried by rubbing in hot sawdust. Subsequent cleaning with soap and water and drying with a cloth may be done as often as desired.

Matte Finish for Aluminum

The simplest method of producing a matte finish on sheet aluminum is an immersion treatment. Simply dip the aluminum parts for one to two minutes in a solution of 2.5 oz. per gal. of sodium hydroxide, and 5.9 oz. per gal. of trisodium phosphate. This solution should be operated at 200 degrees F. and no electric current should be used. After the parts are treated they should be dipped quickly in cold water and then in hot water. If the drying is then accelerated by a compressed air blast, staining will be prevented.

The finish obtained by this method will vary with the composition of the aluminum parts and the composition of the solution. If the suggested formula does not produce a satisfactory surface, the amount of sodium hydroxide can be varied and some experiments made to determine the proper formula. The solution suggested is, however, a well-balanced solution and should work well with most commercial aluminum sheets.

Coloring Aluminum Black
French Patent 801,608

Boric Acid	0.8–1.2 g.
Disodium Hydrogen Phosphate	0.2–0.4 g.
Salt	30 g.
Water	1 l.

Use hot at pH of 8–9.

Black Finish for Aluminum
Formula No. 1

A black color may be obtained on aluminum by immersing in the following solution:

Potassium Permanganate	1½ oz.
Nitric Acid (20° Bé.)	⅛ oz.
Copper Nitrate	4 oz.
Water	1 gal.
Temperature	175° F.

Time of immersion 20 to 30 minutes; dry and protect with clear lacquer.

No. 2

A deposit of black nickel applied directly to aluminum will produce a coating that is sufficiently durable for interior service.

Nickel Ammonium Sulphate	8 oz.
Zinc Sulphate	1 oz.
Sodium Sulphocyanide	2 oz.
Water	1 gal.

Nickel anodes, voltage 1 volt, cathode current density 1 to 2 amps; solution is maintained nearly neutral with zinc carbonate.

Black, Brown and Grey Coloring of Aluminum

In cases where simple immersion methods for producing protective coloring of aluminum instead of the more elaborate and costly eloxal processes (anodic treatment) are desired, the following recipes are found to give satisfactory results. A solution in one liter of water of 5–10 g. potassium permanganate, 2–4 cc. nitric acid of 1.35 specific gravity (28° Bé.), and 20–25 g. copper nitrate is used for black coloring; and 5 g. copper nitrate for brown coloring. The solution is applied almost boiling, at 80° C. The depth of color depends on the time of immersion, light brown is obtained in about 5 minutes, deep brown in 10 to 15 minutes, deep black requires 20 to 30 minutes.

A solution of 10–20 g. ammonium molybdate, 5–20 g. sodium acetate in 1 l. water to which some ammonium chloride was added gave a deep black color in about 1 minute. The color is quite durable, it will stand bending without coming off. The objects must be well washed to remove all chloride from pores.

A fine, velvety grey color is obtained by immersion in boiling solutions of 100 g. diammonium phosphate and 5 g. manganese nitrate in 1 l. water.

In general, mechanical cleaning of the objects by scraping, brushing, and sandblasting gave better coloring than pickling before immersion; pickling often resulted in a spotty appearance.

Copper Plating Anodized Aluminum

The articles are degreased by immersion for 10 minutes in cold 10% caustic soda solution, followed by a rinse of 2% hydrochloric acid. The oxide film is then produced by immersion for 15 minutes at 95° C. in a sodium carbonate solution containing sodium chromate or sodium metavanadate; the articles are then washed well in cold water and dried. The copper-plating bath contains copper sulphate crystals 150, 60% sulphuric acid 60, and gelatin 0.01–0.1 g. per liter; plating is carried out at 20–25° C. using 1–1.1 amp. per sq. dm. for 60–90 minutes. During electrolysis the oxide film is gradually dissolved and replaced by a firmly adherent deposit of copper, which shows no sign of flaking or cracking when the metal is subjected to the Erichsen test, bent through 180°, or heated to 400° C. in air. Using 95.5% aluminum as basis metal, the minimum porosity of the plate is obtained when the aluminum is previously annealed at 550° C. for 90 minutes and the maximum when the metal is plated in the hard-rolled state.

Electroplating Aluminum with Silver

German Patent 621,489

The cleaned metal is dipped into the following bath:

Hydrochloric Acid (36.3%)	3 oz.
Nitric Acid (65%)	1 oz.
Hydrofluoric Acid (40%)	1 oz.
Water	15 oz.

Wash and dip in 10% caustic soda solution saturated with salt. Then plate with silver by any standard formula.

Gold Plating Bath

Gold Fulminate	8 g.
Sodium Phosphate	7.5 g.
Sodium Cyanide	15 g.
Water	1 l.

This solution avoids a harmful alkali salt excess.

Jewelry Gold Plating Bath

Formula No. 1

Gold Cyanide	1.55 g.
Sodium Cyanide	2.35 g.
Water	1 l.

Use at 0.1 amp. at 50–60° C.

For plating contact pieces of aluminum, brass, copper or steel use.

No. 2

Gold Cyanide	9.35 g.
Sodium Cyanide	14.00 g.
Water	1 l.

The pieces should be degreased in trichlorethylene vapor or in following solution:

Sulphuric Acid (sp. gr. 1.84)	6 g.
Nitric Acid (sp. gr. 1.42)	3 g.
Water	2 g.

Green Gold Plating Bath

Gold	2.00 g.
Silver	0.75 g.
Sodium Cyanide	4.00 g.
Sodium Carbonate	5.00 g.
Trisodium Phosphate	20.00 g.
Potassium Sulphite	5.00 g.
Water	1.00 l.

Use hot at a low current density.

Imitation Gold on Cold Rolled Strip Steel Articles

This has been applied on various parts such as hardware, bag frames, belt, dress and millinery buckles and ornaments, novelty jewelry, etc. (made of steel only and a combination of brass and its alloys, riveted, soldered, welded, etc.) for years very satisfactorily; but the control of the "Gold Solution" (bronze or rich low brass) must be done by a man who knows how. Temperature is an important factor and should be controlled by a thermostat otherwise trouble will be encountered. The results may be all right for a while, but without an automatic control it just cannot last long. A formula for the solution that has stood the test is:

Formula for Bronze Solution

Copper Cyanide	4	oz.
Zinc Cyanide	½	oz.
Sodium Cyanide	5	oz.
Sodium Carbonate	2	oz.
Rochelle Salts	2	oz.
Water	1	gal.

Temperature 95° F.; thermostatically controlled.

Cathode current density 2 to 2½ amp. per sq. ft.; 2 to 3 volts.

Anodes: rolled 90% copper and 10% zinc; (sometimes referred to as rich low brass).

To replenish metal content, don't make a stock solution of copper cyanide, zinc cyanide and sodium cyanide. It is impossible to control the constituents in proper proportion to produce a uniform color in the deposit.

Separate stock solutions of the zinc salts and copper salts are better. They are prepared by dissolving equal parts of copper cyanide and sodium cyanide, and zinc cyanide and sodium cyanide in water and placing in separate containers until needed for adding to solution.

Rochelle salts are added when necessary to remove oxides by dissolving them from the anodes. This should be done when the deposit is not uniform. Don't add more than 1 to 2 ounces per gallon of water.

Cheap Rose Gold Finish for Brass

The article to be finished is first immersed in the following dip until a deep red smut is formed on the surface:

Copper Sulphate	16	oz.
Muriatic Acid	½	gal.
Water	1	gal.

Dissolve the copper sulphate in water and then add the acid. Use at normal temperature. A stone crock can be used for a container.

After the deep red smut has been formed it should be lightened somewhat by placing in a saturated salt solution for a few seconds and then rinsed in clean cold water. Plate in a fine gold solution for about 30 seconds; then relieve high lights with a fine brass or tampico wheel with bicarbonate of soda. After relieving plate for a few seconds in the same gold solution, dry and lacquer.

The fine gold solution may be made up as follows:

Sodium Gold Cyanide	½	oz.
Sodium Cyanide	½–1	oz.
Disodium Phosphate	2	oz.
Water	1	gal.

Temperature 120–130° F. Current density 1–5 amp./sq. ft. Insoluble stainless steel anodes or 24K gold anodes may be used.

Platinum Plating

Formula No. 1

Chloroplatinic Acid	0.60	oz.
Caustic Soda	0.25	oz.
Disodium Hydrogen Phosphate	6.00	oz.
Sodium Bicarbonate	1.00	oz.
Potassium Nitrate	1.00	oz.
Boric Acid	1–2	oz.
Water to make	1	gal.

No. 2

Ammonium Platinochloride	15.50	g.
Ammonium Chloride	6.25	g.
Sodium Citrate	125.00	g.
Water to make	1.00	l.

No. 3

Sodium Platinic Hydroxide	18.5	g.
Sodium Hydroxide	5.1	g.
Sodium Oxalate	5.1	g.
Sodium Sulphate	30.8	g.
Water	1	l.

Operate at 65–80° C. at 7.5 amp./sq. ft. For heavy deposits use 2–3 amp./sq. ft. Platinum plated copper anodes are used.

No. 4

Make three solutions as follows:

Platinum (as chloride) 5 g. per l. (12.3 g. $PtCl_4(H_2O)_5$).

Ammonium Phosphate $(NH_4)_2HPO_4$ 45 g. per l.

Sodium Phosphate $Na_2HPO_4(H_2O)_{12}$ 240 g. per l.

Dissolve substances separately. Add the ammonium phosphate solution to the platinum chloride solution. To the mixture add the sodium phosphate solution, which dissolves most or all of the precipitate. Boil for several hours or until odor of ammonia is gone.

After cleaning suspend object in plating bath with current on. Keep bath at 70° C. Use initial current density of 0.3 amp. per sq. dm. for approximately 5 to ten minutes to get plating to start. Then plate with current density of 0.10 to 0.13 amp. per sq. dm. This will deposit 0.00085 mm. of platinum per hour.

Silver Plating Preparations

Rules for Use:

Clean the surface of the metal by removing all (grease, dust, oxide) stains. Apply with a cotton pad. The abrasive must be very fine to avoid scratches.

Polish with some chalk powder (precipitated) on a woolen rag.

Silver-Plating Liquid

Silver Nitrate	45 g.
Ammonia	45 g.
Sodium Hyposulphite	75 g.
Whiting, Finest Grade	75 g.
Distilled Water	760 g.

Silvering Fluid

Silver Nitrate	20 g.
Whiting	40 g.
Ammonia	10 g.
Turkey Red Oil	5 g.
Sodium Hyposulphite	35 g.
Water, Distilled	400 g.

Silver Plating Paste

Silver Chloride	79 g.
Cream of Tartar, Powdered	526 g.
Sodium Chloride	395 g.

To use, add a little water and make a paste. Apply with a piece of cotton.

Economical Silver Plating

Silver Nitrate	4 oz./gal.
Sodium Cyanide	4 oz./gal.
Potassium Nitrate	16 oz./gal.

With the usual type of agitation and operating between 75 and 80° F. uniform bright plate is obtained on flatware at from 12 to 18 amp. per sq. ft. average, and on hollowware at from 7 to 10 amp. per sq. ft. average. As with the conventional solution, higher current density is possible, but uniformity of deposit is sacrificed. With this solution the lower limit of uniform bright plate is not so marked as with the conventional solution.

A brighter color is obtainable by reduction of the free cyanide to .15 to .20 N. At this concentration anode polarization may become a problem and no advantage is evident in the finishing of the deposit. If the free cyanide content is increased to about .5 N, a milkier deposit results.

Concentration of silver is best held above .15 N (2 troy oz. per gal.) but little limitation in average current density, .13 N (1.75 troy oz. per gal.), is evident.

It is suggested that carbonate be removed when the concentration reaches .4 N, a slight change in the character of the deposit becoming apparent at a concentration of about .5 N.

Filtration becomes very important in this type of solution and should be done in the presence of a filter aid of the diatomaceous type.

Making Silver Cyanide from Silver

(A) Conversion

For a gal. of plating solution, take 2 troy oz. of pure silver, roll it thin, twist the strips so they will not lie flat, place them in an evaporating dish or porcelain casserole, and cover them with nitric acid. Dilute the acid with about one-third water. Ordinary tap water contains salts that cause a cloudiness in the solution, but this does no harm (beyond worrying the inexperienced worker) and so tap water is commonly used. However, if you have distilled water on hand, use it.

Usually the acid goes to work at once; in cold weather you may have to warm it a little. Dangerous fumes appear, so work near a flue or fan. Do not use any more acid than necessary; this is accomplished by adding the acid a little at a time, and leaving a small piece of silver undissolved.

Next, evaporate the solution slowly to dryness to drive off any unused nitric acid. Do not overheat. White crystals of silver nitrate will be seen as the liquid cools. If you started work with pure silver, and use pure nitric acid, you should now have silver nitrate of such purity that no repurification of these crystals is called for.

(B) Precipitation

Wash the silver nitrate into a big jar, and make up to about ½ gal. with water, preferably distilled. In a separate vessel dissolve about 4 oz. avoirdupois of potassium cyanide, in ½ gal. of water. Sodium cyanide is cheaper and goes further, but many workers maintain that potassium cyanide gives better results. Cyanide alters on standing, and changes strength, so it is impossible to say exactly how much will be necessary. Now add a little of the cyanide solution to the silver nitrate solution, and stir. Do not breathe any fumes that may appear—they are especially dangerous if your nitrate contains any unused nitric acid.

The heavy white insoluble salt, silver cyanide, will settle slowly. Use only just enough cyanide solution to convert all the silver into the solid form; this is hard to do because you do not know exactly how much cyanide will do the work. Most workers add too much and thereby waste silver. So work slowly, add a little cyanide and then let the mixture settle in a dark place; then add another drop or two of cyanide and see if it produces more of the white precipitate; if so, add a few more drops and let settle again. Finally you will find that no more white cloud forms; this will probably use up about a third of your cyanide solution, more or less, according to its strength.

Now set the jar aside until all the white stuff has settled well, then pour off the clear solution, which should be of no value. (If you used too much cyanide it will contain a little silver.) Now you must wash this white sediment by filling the jar with clean water, stirring well, and letting it settle again. Pour off the clear wash-water and throw it away. Repeat this washing two or three times, and leave the silver cyanide sediment in the jar.

(C) Solution in Cyanide

Next, dissolve this washed silver cyanide in the potassium cyanide solution, watching to see how much solution you use. You can keep a record of this by having the cyanide solution in a graduate and pouring from it, very slowly, stirring all the time, until the last grain of white sediment dissolves. Note how many ounces of the liquid were required. It will probably be about one-half of what remained from process B.

Your jar now contains a solution of the double salt, potassium-silver-cyanide. If you had been working with sodium cyanide it would now be the sodium-silver-cyanide. These are the essential salts in silver-plating baths.

For successful plating, other substances are added, primarily a certain amount of "free" cyanide. Therefore, for each oz. of solution that you poured out of your graduate in process C, add 1/5 of an oz. more of that same cyanide solution. This constitutes the "free" cyanide. Let settle; usually there is a slight precipitate that should be filtered out and discarded. Your complex silver cyanide is now ready for use; add enough water to bring the volume to a gallon.

Hot Tinning

Equipment required for the usual small article that is to be hot dip tinned, consists of a cleaning tank, a wash tank, pickling tank and a wash tank, a flux tank and a tin pot. In some cases in tinning various metal parts they are either tumbled or sandblasted in the cleaning process; the kind and character of the metal part will determine whether these steps are necessary.

The hot dip tinning process consists first in cleaning off any oil, grease or foreign matter from the metal parts by putting them through a good commercial cleaning solution. This solution is kept at a temperature of 180 to 200° F. The tanks can be steel tanks. After passing through the cleaning solution, the parts are then washed thoroughly in clear running water. This removes the alkali of the cleaner and the solution is generally held at about the same temperature.

After cleaning, the work must be pickled to remove all scale and iron oxides. If the parts to be tinned are castings, a small quantity of hydrofluoric acid must be used in the pickle to remove all traces of sand or siliceous material. The sulphuric acid solution for steel is generally about a 2 to 4% solution in acid strength, and is carried at about 140° F. The acid strength and temperature of the pickle depend entirely upon the character of the scale and iron oxide to be removed. After pickling the parts are washed thoroughly and then put into a liquid flux solution of zinc chloride.

The last step is putting them through the tin bath. They should be allowed to drain thoroughly and then be slowly put into the tin bath which is held at a temperature from 480 to 520° F. depending upon the size of the articles to be tinned and the production put through the bath in a unit time. Tin melts at 450° F. and a little practice will quickly determine which temperature is most suitable to use for the work at hand. The tin bath has a light film of zinc chloride over it and this is skimmed back with a skimmer when the articles are slowly drawn out. They may be placed on a rack if they are very small parts or work that can be conveniently handled in such a manner.

Very small metal parts are cooled in kerosene oil. This bath is surrounded by a water jacket, and the tank usually has a small mesh basket in it that the parts can be emptied into. The basket is then quickly lifted out of the oil, and the parts dried in sawdust, and then the sawdust is sifted out later. With certain kinds of work it is often put in a tumbling barrel with cedar sawdust and given a very light tumbling to dry the work of oil and give a very clean, bright finish.

Tin Coating by the Hot-Tinning Process

Good wetting of a solid metal by a liquid one is possible only when the formation of a compound or a solid solution is possible. Thus copper can be coated with bismuth only if 1% of tin is added. The type of the boundary alloy in the coating of copper with tin is not clearly understood. Its crystal form cannot be determined microscopically. In the deposition of tin and copper which contains 8% aluminum there is formed an alloy of 46.4% tin, 49.0% copper and 3.9% aluminum. In the ''tinning'' of copper in a tin-lead eutectic an adherent coating is obtained at 188° when the eutectic fluxing material contains 1 part of ammonium chloride and 3 of zinc chloride; with 2 parts of ammonium chloride to 1 of zinc chloride such a deposit is not obtained under 320°. A concentrated solution of tin tetrabromide which melts at 31° is well suited as a fluxing material for the tin plating of copper. Since hydrogen reduces tin and copper oxides even under 300°, it is possible to coat copper wire with tin in an atmosphere of hydrogen without a fluxing material. Steel which has been cleaned by polishing with emery can be coated with tin by dipping in tin which contains 0.05% phosphorus. Under certain circumstances a wavy surface is formed during the hardening of the tin coating. This can be prevented by the addition of 0.04% cobalt or 0.1% nickel. It is probable, therefore, that such alloys, which give smooth surfaces, possess a hardening or solidification range within which crystals of the compound form. At working temperatures between 240° and 280°, tin with 1.1% copper gives a smooth surface. The addition of bismuth to the tin causes the formation of large crystal spangles, similar to those formed in lead-containing tin.

Tinning Steel Sheets

A common procedure used for hot tinning consists of pickling the steel strip in a hot 2% sulphuric acid bath at 170–180° F. then rinsing in cold water. It is essential of course to have the steel clean before pickling. After pickling the strip is passed through a zinc chloride flux then through a molten tin bath, which has a layer of palm or cottonseed oil. In some instances two tin baths are used the first being run at a somewhat higher temperature than the second.

The temperature of the tin should be around 570° F. for good results, while the temperature of the oil layer should be around 475° F.

The strip should be run between rolls to squeeze off excess tin as it leaves the bath. The oil can be removed by rubbing with some substance such as bran or middlings.

The strip is then cleaned by running through a hot 1% sodium hydroxide bath, rinsed first in cold water, then in hot water for drying. This will produce a high lustre on tinned strip.

If an oil layer is not used on the tinning bath some suitable means for wiping should be employed as the strip leaves bath. A wipe made of loose stranded cotton rope about ⅜" diameter can be employed to good advantage. After the wiping, strip is passed through the alkaline bath as mentioned above.

Tin Plating without Electricity

Tin Chloride	½ oz.
Aluminum Sulphate	2 oz.
Cream of Tartar	2 oz.
Water	1 gal.

The work is immersed in an iron wire basket, large quantities of work being separated by sheets of zinc. The tank is of copper or cast iron lined with sheet zinc. The work is boiled for 30–45 minutes.

Tin Wash

The following procedure may be used for depositing tin on steel tacks and nails:

1. Removal of oil and dirt either by electro-cleaning in alkaline cleaning solution or by the use of solvent and vapor degreasing. If electro-cleaner is used follow by hot water and cold water rinses.
2. Rolling in neutral soap solutions in a wood lined barrel or an open end oblique wood barrel to obtain bright finish. If hard water is used it may be necessary to soften by the addition of borax or soda ash.
3. After rolling rinse in clean hot and then cold running water.
4. Electro-clean in suitable brass wire mesh baskets or other suitable container. Rinse in clean hot water, then cold water; dip in 10% muriatic acid pickle; rinse in cold water; dip in cyanide pickle solution, 5° Bé.; rinse in cold water and then place in plating barrel.
5. After tin plating the parts should be rinsed in clean cold running water. To obtain high lustre parts should be tumbled in an open end oblique wood barrel using a neutral soap solution. Rolling time should not be over 10 minutes.
6. After rolling in soap solution parts are rinsed in cold water and then rolled in cold hardwood sawdust in type of barrel mentioned to dry.
7. After drying in sawdust, parts are riddled to separate sawdust. The size of

mesh in riddle depending upon size of parts.

The tin solution used is as follows:

Sodium Stannate	24 oz./gal.
Sodium Acetate	4 oz./gal.
Powdered Rosin	3 oz./gal.

Temperature 130° F. Current density 12 amp. per sq. ft.

It is advisable to add small amounts daily of 100 volume hydrogen peroxide to oxidize the stannite salts back to stannate condition. This will prevent the building up of stannite salts.

Time of plating at least 30 minutes. The panels of the cylinder used in barrel must either be canvas or hard rubber with perforations of such a size to prevent parts coming through.

Blacking Coating for Tin

A relatively hard, blue-black film is produced on tin and its alloys in the following:

Disodium Hydrogen Phosphate	200 g.
Water	1 l.

Phosphoric Acid sufficient to give pH 3. Operate at 90°; c.d. 30–40 amp./sq. ft.

Lead Plating on Iron Bath

Lead Silicofluoride	135 g.
Hydrosilicofluoric Acid	30 g.
Boric Acid	5 g.
Glue	1 g.
Water to make	1 l.

Use at 40° C. at 0.3–1.0 amp./sq. dm. with a lead anode for 90 hours.

Black Glossy Protective Coating for Iron

U. S. Patent 2,046,061

A black, lustrous, rust-resisting film is produced on the surface of ferrous metals by immersing them for 5 minutes at 50–90° C. in a solution pH 1–3) of vanadous oxide (1.66%) in oxalic acid (2.6%); formation of the film is accelerated by aerating the solution or adding hydrogen peroxide. The toughness and adherence of the film are improved by baking the articles at 100–200° C.

Bluing Iron

British Patent 464,749

Iron articles are immersed in

Caustic Soda	36 oz.
Litharge	7 oz.
Sodium Cyanide	2 oz.
Lead Acetate	2 oz.
Water	50 oz.
Metol	1 oz.

At 100–135° C. for 2–4 minutes.

Plating Lead Castings with Brass

Copper Cyanide	3.6 oz.
Zinc Cyanide	1.2 oz.
Sodium Cyanide	7.5 oz.
Sodium Carbonate	4.0 oz.
Water	1 gal.

Temperature 75–100° F., anodes 80% copper, 20% zinc, free cyanide 2.5 oz./gal.

One pt. of ammonia added to each 100 gal. will aid in producing a good color when starting a new solution.

Arsenic is used as a brightener. Dissolve 2 lb. caustic soda in ½ gal. water, and then add 1 lb. white arsenic. Use 1 oz. of this solution to each 100 gal. plating solution. An excess must be avoided as it will cause the anodes to turn black.

Protecting Surface of Magnesium Alloys

U. S. Patent 2,066,842

A method of coating a surface the major ingredient of which is magnesium, consists in treating the surface with an approximately 1% solution of oxalic acid at about 100° C.

Electro-Rubbing Plating of Lead

By "electro-rubbing" is meant the electrodeposition of a metal by wrapping the anode with a cloth impregnated with electrolyte and rubbing it on the cathodic surface. The anode must be of lead because separation of lead peroxide occurs at an insoluble anode, producing exhaustion of the electrolyte. The most suitable electrolyte is found to be borofluoride solution of the following composition: basic lead carbonate, 142 g. per l.; hydrofluoric acid (100%), 120 g. per l.; boric acid, 106 g. per l.; glue 0.2 g. per l. With this electrolyte, very high current densities can be employed both at anode and at cathode. Lead coatings produced by "electro-rubbing" are found to be quite satisfactory in respect of resistance to corrosion, adhesion, and appearance.

Bright Cobalt Plating Solutions

Formula No. 1

Cobalt Ammonium Sulphate	200 g.
Water	1000 cc.
Sulphuric Acid	10 g.
Hydroquinone	0.2 g.
Sodium Bisulphite	0.05 g.

No. 2

Cobalt Ammonium Sulphate	200 g.
Water	1000 cc.
Ammonium Acetate	30 g.
Acetic Acid	3 g.
Cadmium Sulphate	0.2 g.
Formaldehyde	3 g.

Formula No. 2 can be used on steel, brass, copper or zinc and requires no polishing, if temperature is kept below 25° C. Above 25° C. more cadmium sulphate is necessary.

Zinc Plating Anode
U. S. Patent 2,064,307

Nickel	0.1–1.0%
Mercury	0.1–0.3%
or Aluminum	0.5–1.0%
Zinc to make	100 %

Zinc Plating Bath
British Patent 473,147

Zinc Oxide	45 g.
Sodium Hydroxide	38 g.
Sodium Cyanide	80 g.
Molybdenum Oxide	1 g.
Thiourea	10 g.
Water to	1 l.

Bright Zinc Plating
British Patent 470,624

Sodium Cyanide	10 oz.
Zinc Cyanide	8–10 oz.
Sodium Thiosulphate	¾– 2 oz.
Sodium Hydroxide	8–10 oz.
Water to	1 gal.

Use at 15–30 amp./sq. ft. and then dip in

Chromium Oxide	40 oz.
Sodium Sulphate	2 oz.
Nitric Acid	7/10 oz.
Water to	1 gal.

Coating Zinc with Lead
British Patent 464,367

Immerse zinc articles for 30 seconds in the following hot solution:

Ammonium chloride (60% solution) withdraw; allow to dry and dip into molten lead.

Black Finish on Zinc

A good black deposit, said to equal results from Black Nickel, can be obtained on surfaces plated with zinc by the following:

Water	1 gal.
Temperature	100° F.
Nickel Chloride	4 oz.
Ammonium Chloride	6 oz.
Sodium Sulphocyanide	2 oz.
Zinc Chloride	2 oz.

Zinc Cyanide Plating Solutions

It was found that satisfactory zinc plating solutions can be made by using zinc oxide to replace part or all of the zinc cyanide formerly employed for this purpose. The following conditions yield satisfactory results in practice. A solution may be prepared according to the following formula in which the concentrations have been rounded off to convenient values.

Zinc Oxide	45 g./l.
Sodium Cyanide	75 g./l.
Sodium Hydroxide	15 g./l.

It should be operated at temperatures below 40° C. in order to reduce the decomposition of the cyanides. Current densities up to 3 amp. per sq. dm. (28 amp./sq. ft.) may be employed upon smooth surfaces but for general work 2 amp./sq. dm. (19 amp./sq. ft.) is preferable. The presence of large amounts of carbonate causes rough or striated deposits. Carbonates should therefore be removed from the solution at intervals by cooling the solution to low temperatures.

Zinc Plating of Iron

Zinc Sulphate	200.0 g.
Sodium Sulphate	50.0 g.
Zinc Chloride	20.0 g.
Sulphuric Acid	5.0 g.
Starch	3.0 g.
Mercuric Sulphate	0.2 g.
Water	1000 g.

Use above at pH 2.1 with current density of 3 amp./sq. dm. at room temperature. The iron should have been pickled in 15% hydrochloric acid or 20% sulphuric acid and degreased electrolytically in 10% caustic soda.

Rhodium Plating
Canadian Patent 365,965

Ammonium Rhodium Nitrate (to give Rhodium 2 g.). Sulphuric Acid (5%), 1000 cc.

Heat until dissolved. Cool to 50° C. Use at 4 volts and current density of 20–30 amp./sq. dm. This gives a silver like coating which does not tarnish.

Burnishing of Iron, Electrolytic

The iron is oxidized anodically in 20 to 40% caustic soda solution at a current density of 1 to 6 amp./sq. dm. at 1 to 2 volts at 60–70° C.

Metallizing Baby Shoes

To plate baby shoes, make up a weak solution of shellac in denatured or wood alcohol. Dip shoes in this solution. Allow to dry. Repeat until leather is impregnated. Then spray with a bronze lacquer, that is, a clear lacquer to which has been added some thinner and some bronze powder.

Platers' Copper Bronze Powder	3 oz.
Cellulose Lacquer Free from Gum	¼ pt.
Lacquer Thinner	¾ pt.

Allow the bronze to dry. Apply another coat. Dry. Then hang in a copper sulphate solution with connections made at several points with copper wires. Use a copper sulphate solution made up of:

Copper Sulphate	27 oz./gal.
Sulphuric Acid	6.5 oz./gal.

METAL CONTENT OF PLATING SALTS

Salt	*Formula*	*% Metal Content*
Cadmium Oxide	CdO	87.5
Chromium Trioxide	CrO_3	52.0
Cobalt Sulphate	$CoSO_4 \cdot 7H_2O$	21.0
Copper Cyanide	$CuCN$	71.0
Copper Carbonate (Basic)	$Cu(OH)_2 \cdot CuCO_3$	55.3
Copper Sulphate	$CuSO_4 \cdot 5H_2O$	25.5
Gold Chloride	$AuCl_3$	65.0
Chlorauric Acid	$HAuCl_4 \cdot 4H_2O$	47.8
Gold Cyanide	$AuCN$	87.7
Iron Chloride	$FeCl_2 \cdot 4H_2O$	28.1
Ferrous Ammonium Sulphate	$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	14.2
Nickel Carbonate (Basic)	$2NiCO_3 \cdot 3Ni(OH)_2 \cdot 4H_2O$	49.9
Nickel Chloride	$NiCl_2 \cdot 6H_2O$	24.7
Nickel Salts—Single	$NiSO_4 .\ 6H_2O$	22.3
Nickel Salts—Single	$NiSO_4 .\ 7H_2O$	20.9
Nickel Salts—Double	$NiSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	14.9
Platinum Chloride	$PtCl_4$	57.8
Chlorplatinic Acid	H_2PtCl_6	37.7
Silver Chloride	$AgCl$	75.2
Silver Cyanide	$AgCN$	80.5
Silver Nitrate	$AgNO_3$	63.5
Tin Chloride	$SnCl_2$	52.5
Sodium Stannate	$Na_2SnO_3 \cdot 3H_2O$	44.4
Zinc Carbonate	$ZnCO_3$	52.2
Zinc Chloride	$ZnCl_2$	48.0
Zinc Cyanide	$Zn(CN)_2$	55.7
Zinc Oxide	ZnO	80.3
Zinc Sulphate	$ZnSO_4 \cdot 7H_2O$	22.8
Lead Carbonate (Basic)	$2PbCO_3\ Pb(OH)_2$	79.2

The metal contents, as listed above, are for the pure compounds. The purity of the salt should be considered in using these figures. Also, due to the fact that some of the salts, like tin chloride and zinc chloride are hygroscopic and absorb water, while others like single nickel salts and copper sulphate lose part of their water of hydration on standing, the actual metal content of a commercial chemical may differ somewhat from the figure given in the above table.

Weather-Proof Mirrors

British Patent 473,869

Glass plates are coated with rhodium by sublimation from strips heated at 1400–1850° C. under 10^{-4} mm. pressure or by cathodic sputtering.

POLISHES, ABRASIVES

Auto-Polishes

Formula No. 1

Water	55 g.
Glue, Pale	6 g.
Lactic Acid	3 g.
Sand, Finely Sifted, "0000," or "Silver-Tripoli," or Kieselguhr	7 g.
Turpentine	15 g.
Spindle Oil, Thin	14 g.
Perfume (Pine Needle Oil, or similar oil)	to suit

No. 2

1.	Acetic Acid, 80%, or, Lactic Acid Water	4 g.
2.	Spindle Oil, Refined	9 g.
	Roseen Oil	4 g.
	Camphor Oil, Viscous	2 g.
3.	Neuburger Chalk, or Tripoli, Finest	7 g.

To solution 1 add the mixture 2. Stir until homogeneous, and stir in 3.

No. 3

1.	Carnauba Wax, (N.C.)	500 g.
	Paraffin Wax (50/52° C)	200 g.
	Beeswax	100 g.
	Colophony	150 g.
2.	Turpentine Oil	4000 g.
	Tetralin	800 g.
	Methyl Hexalin	800 g.
3.	Potash Carbonate	100 g.
	Soft Soap	50 g.
	Water	5000 g.
4.	Neuburger Chalk	600 g.
	Methanol	100 g.

Melt 1., with stirring, add 2. (which is warmed up to 55° C), cool for a while, add 3., and finally 4.

No. 4 ("Autodoktor")

1.	Sulphuric Acid, (44° Bé)	12.5 g.
	Water	295 g.
2.	Spindle Oil, Refined	33 g.
	Turpentine or Rosin Oil	12.5 g.
	Camphor Oil	2 g.
3.	Neuburger Chalk	10 g.

Prepare 1. and 2. separately, and mix by vigorous stirring. To the emulsion thus formed add 3.

No. 5

Turpentine	38.5 g.
Oleic Acid	15 g.
Kaolin	20 g.
Kieselguhr	5 g.
Iron Oxide	5 g.
Mineral Oil	5 g.
Water	10 g.
Potash, Caustic	1½ g.

No. 6

Turpentine	25 g.
Naphtha	15 g.
Oleic Acid	10 g.
Kaolin	15 g.
Whiting	15 g.
Iron Oxide	5 g.
Mineral Oil	2 g.
Water	10 g.
Triethanolamine	3 g.

No. 7

Soap	20 g.
Kieselguhr	10 g.
Kaolin	15 g.
Iron Oxide	5 g.
Mineral Oil	5 g.
Naphtha	5 g.
Water	40 g.

No. 8

Wax	25 g.
Stearic Acid	2.5 g.
Potash, Caustic	2.5 g.
Turpentine	20 g.
Water	to make 100 g.

No. 9

Wax	20 g.
Stearic Acid	2.5 g.
Ammonia (0.88)	2 g.
Triethanolamine	1.5 g.
Turpentine	25 g.
Water	to make 100 g.

No. 10

Carnauba, or Ig. Wax O	12 lb.
Montan Wax, Bleached	4 lb.
Beeswax	3 lb.
Ozokerite-Ceresin (56–58° C.)	6 lb.

Of this melted mixture of waxes take (changing with the season)

Waxes	6–8 lb.
Heavy Benzoline, or Turpentine	80 lb.
Petroleum	12–14 lb.

The cooled finished product should be a still-liquid jelly.

No. 11

Montan Wax A, Double Bleached	14 kg.
Beeswax	6 kg.
Turpentine	60 kg.
Petroleum	20 kg.

Melt waxes with gentle heat. Put out fire and stir in the solvents; at about 55–60° C. the preparation can be put into containers. Close as soon as a non-transparent skin has formed on the surface.

No. 12

Cellite	75 g.
Isopropyl Alcohol	60.8 cc.
Glycerin	20.8 cc.
Varnolene	28.5 cc.
Camphor Oil	28.5 cc.
Spindle Oil	147.5 cc.
Saponin	6. g.
Water	470. cc.
Bentonite	8 g.
Oxalic Acid	2 g.

Let last four ingredients stand overnight. Then mix in other ingredients in a mayonnaise or churn type mixer. Mix intermittently for a few hours.

No. 13

Olein, Distilled	15 g.
White Spirit (Lacquer Benzoline)	90 g.
Chalk, Neuburg, Fine	45 g.
Ammonia, 25%	1 g.

Saponify this mixture adding the ammonia with thorough agitation.

No. 14

Paraffin Wax	8 oz.
Carnauba Wax	24 oz.
Turpentine	68 oz.

No. 15

Lavender Oil	5 oz.
Ceresin	25 oz.
Stearic Acid	40 oz.
Beeswax	40 oz.
Paraffin Wax	80 oz.
Turpentine	810 oz.

No. 16

(Non-Greasy Finish)

Naphtha V. M. & P.	25 lb.
Mineral Oil (Spindle)	20 lb.
Perilla Oil	8 lb.
Emulsifier L83A	8 lb.
Water	30 lb.
Silica	20 lb.

Disperse the silica in water add the emulsifier and stir thoroughly. Mix the oils and add slowly to the above with high speed agitation.

An oil polish which does not leave a greasy or oily film on the car.

No. 17

Mineral Oil, White	35 kg.
Beeswax	5 kg.
Carbon Tetrachloride	10 kg.
Kieselguhr	3 kg.
Oleic Acid	3 kg.
Potash Carbonate	0.5 kg.
Ammonia	0.5 kg.
Water	43 l.

No. 18

a. White Oil	20 kg.
Castor Oil	10 kg.
Solvent Naphtha	5 kg.
Glycerin	5 kg.
Turpentine	15 kg.
Diglycol Laurate	2.5 kg.
b. Water	100 kg.
Neuburg Chalk	25 kg.
Kaolin, Finest	5 kg.
Bentonite	3 kg.

Make mixtures *a* and *b*, and add *a* to *b*. Homogenize, if desired.

No. 19

Linseed Oil	200 g.
Dipentene	300 g.
Paraffin Oil	200 g.
Petroleum, Refined	250 g.
Camphor Oil, Light	50 g.

Apply simply with a rag.

No. 20

(Non-abrasive)

Spindle Oil, Yellow	450 g.
Linseed Oil	300 g.
Petroleum, Refined	150 g.
Turpentine	100 g.
Citronella Oil	1–1.5 g.
Orange, Oil-Soluble Dye	

No. 21

(Abrasive)

Mineral Oil, Yellow	70 g.
Linseed Oil, De-Slimed	30 g.
Petroleum, Refined	50 g.
Dekalin	50 g.
Methyl Hexalin	10 g.
Neuburg Chalk	90 g.
Lactic Acid (50%)	50 g.
Water	400 g.

Mix the first six ingredients, adding them in the given order with good agitation. The lactic acid is thinned with the water, and the solution is added in a thin jet and with good agitation to the oil-chalk mixture.

No. 22

a. Carnauba Wax	500 lb.
Paraffin Wax (50/52° C.)	200 lb.
Beeswax	200 lb.
Rosin	150 lb.
b. Turpentine Substitute	4000 lb.
"Tetralin" or Methylhexalin	600–800 lb.

c.	Potash Carbonate	100 lb.
	Soft Soap	50 lb.
	Water	5 lb.
d.	Whiting or Neuburg Chalk	600 lb.
	Methanol	100 lb.

Melt *a,* add the hot solvents *b,* stir until about 55° C., add *c.* When all are mixed thoroughly, add *d.*

No. 23

a.	Yellow Beeswax or Montan Wax, Refined	36 lb.
b.	Potash Carbonate	3 lb.
	Water	140 lb.
c.	Turpentine or Substitute	10.5 lb.

Melt *a* carefully; add slowly a *boiling* solution *b,* boil until the saponification is completed. Cool, thin with *c.*

Wax Paste Auto and Furniture Polish

Carnauba Wax	8 oz.
Montan Wax	5 oz.
Ceraflux	13 oz.
Naphtha	40 oz.
Turpentine	40 oz.

Warm on a water or steam bath until waxes have melted; stir until thick and pour into tight closing cans.

Automobile Polishes (Oils)

No. 1

a.	Water-Soluble Oil	35
	Talloil	30
b.	Caustic Soda (38° Bé.)	8
c.	Water-Soluble Oil	25
	Kerosene	15
d.	Water	5–10
e.	Turkey Red Oil	5– 7

Mix *a,* add *b* at 70° C., very slowly with agitation. Boil. When saponified, add *c,* and *d* with stirring (all hot); *e* may be added if desired.

No. 2

a.	Oleic Acid	5
	Rosin, in small pieces	6
	Alcohol	
b.	Caustic Soda (38° Bé.)	2.5
c.	Kerosene	70
	Turkey Red Oil	8
d.	Water	5–10

Heat *a*—with the amount of alcohol desired. Mix well, and add *b* at about 70° C. Add *c* with continuous agitation. The addition of *d* is optional.

Automobile Polishes (Pastes)

Formula No. 1

a.	Carnauba Wax, Gray	10
	Montan Wax, Bleached	3
	Japan Wax	5
	Scale Wax (50–52° C.)	2
b.	Black Soap	1.5
	Water	10
c.	Solvent (Turpentine White Spirit, etc.)	60

Melt *a* at 95–100° C., prepare the hot soap solution *b.*

Add *c* with good agitation, and stir until it begins to go heavy (at about 48° C.).

No. 2

a.	Carnauba Wax, Gray	15
	Beeswax or Japan Wax	5
	Glycowax	5
b.	Kaolin or Floated Chalk	30–35
c.	Solvent (Turpentine, White Spirit, or a Mixture of both and 10 parts of Kerosene)	30
d.	Black Soap	1
	Water	7–10

Melt *a,* stir in *b* very thoroughly; add slowly *c,* with continuous agitation.

Add hot *d* and stir until a paste forms on cooling.

No. 3

a.	Montan Wax, Bleached	3
	Carnauba Wax Residues	4
	Yellow Beeswax	1.5
	Japan Wax	1.5
	Glycowax	1
b.	Potash Carbonate	0.2
	Borax	0.3
	Black Soap	0.5
	Water	35
c.	Kerosene	10
	Turpentine	10

Melt *a* at about 100° C., and add *b,* of equal temperature, to it with very good agitation. Watch closely to prevent from foaming over (carbon dioxide formed!) and keep boiling until the saponification is finished and add *c.* Stir until cold.

Automobile Polishes

Formula No. 1

Solvent—Drying Oil Type

Paraffin Oil, (Straw-Colored)	60.0 lb.
Linseed Oil	24.0 lb.
Chinawood Oil	5.0 lb.
Soya Bean Oil	3.5 lb.
Turpentine	3.0 lb.
Naphtha	4.5 lb.

No. 2

Abrasive—Drying Oil Type

Paraffin Oil, (Straw-Colored)	20.0 lb.
Blown Castor Oil	2.0 lb.
Kieselguhr	4.0 lb.
China clay, Colloidal	1.0 lb.
Tragacanth, Gum	0.6 lb.
Sodium Benzoate	0.2 lb.
Water	72.2 lb.

No. 3

Wax-Solvent Type

Carnauba Wax	4.5 lb.
Ceresine Wax	5.5 lb.
Candelilla Wax	7.5 lb.
Paraffin Wax	12.0 lb.
Naphtha	60.5 lb.
Turpentine	10.0 lb.

No. 4

	A.	*B.*
Carnauba Wax	4.0	3.0 lb.
Yellow Beeswax	2.0	2.0 lb.
Paraffin Wax	2.0	1.5 lb.
Tripoli	—	12.0 lb.
Bentonite	—	3.0 lb.
Kieselguhr	15.0	— lb.
Naphtha	30.0	34.0 lb.
White Spirit	5.0	— lb.
Kerosene	—	3.0 lb.
Oleine	—	4.0 lb.
Triethanolamine Stearate	5.0	5.0 lb.
Water	37.0	36.0 lb.

Automobile Cleansers

Formula No. 1

a.	Sulphuric Acid (66°)	12.5 lb.
	Water	295 lb.
b.	Spindle Oil or Linseed Oil	35 lb.
	Turpentine or Pine Oil	12.5 lb.
	Camphorated Oil	2 lb.
c.	Neuburg Chalk	10 lb.

Make up *a* and *b* separately. Add *b* to *a* with vigorous stirring, until emulsified. Add *c*.

Shake before use.

No. 2

a.	Carnauba Wax, Waste	5 kg.
	Paraffin Wax	2 kg.
	Beeswax	1 kg.
	Rosin	1.5 kg.
b.	Turpentine	40 kg.
	Tetralin	8 kg.
c.	Potash Carbonate	1 kg.
	Soft Soap	0.5 kg.
	Water	50 l.
d.	Neuburg Chalk	6 kg.
	Methanol	1 kg.

Melt *a*, take off the fire, and stir in *b*. When cooled to 60° C., add the solution *c* with good stirring. When at 55° C., add *d*. Stir until cooled completely.

No. 3

a.	Sulphuric Acid, Concentrated	4 kg.
	Water	79 kg.
b.	Camphorated Oil, Heavy	7.5 kg.
	Linseed Oil	7.5 kg.
	Pumice Powder, Finest	2 kg.

Mix *a*, grind up *b* until completely smooth.

Add *a* slowly to *b*, agitating thoroughly.

No. 4

a.	Acetic Acid, Concentrated	4 kg.
	Water	74 kg.
b.	Spindle Oil, Refined	9 kg.
	Turpentine	4 kg.
	Clovel	2 kg.
	Neuburg Chalk	7 kg.

Method as in No. 3.

No. 5

Petroleum Jelly, Yellow	200 g.
Mineral Polishing Oil, Yellow	70 g.
Linseed Oil	30 g.
Dekalin	50 g.
Petroleum	50 g.
Neuburg Chalk	100 g.

Mix the chalk with the hot melted mixture. Stir until cooled.

No. 6

a.	Methyl Hexalin	10 lb.
	Linseed Oil	30 lb.
	Dekalin	50 lb.
	Petroleum	50 lb.
	Polishing Oil	70 lb.
b.	Neuburg Chalk	90 lb.
c.	Lactic Acid, (50%)	50 lb.
	Water	400 lb.

Mix *a*, grind with *b* until homogeneous. Mix in *c* and emulsify in a homogenizer.

Polishing Wax for Rotating Discs

Montan Wax	3 lb.
Tallow	3 lb.
Stearic Acid	4 lb.
Mineral Oil, Yellow	24 lb.
Viennese Chalk	to desired consistency

Non-Scratching Polish

Used for highly polished metal surfaces.

U. S. Patent 2,093,660

Whiting	250 g.
Feldspar (400 mesh)	250 g.
Wetting Agent	12½–18 g.
Water	125–205 cc.

Emulsion Polish

U. S. Patent 2,081,073

Mineral Spirits	169.00 g.
Light Mineral Oil	187.50 g.
Castor Oil	93.60 g.
Ricinoleic Acid	11.03 g.
Water	624.75 g.
Water solution of Potassium Hydroxide containing 1.65 g. of Potassium Hydroxide	19.25 g.
"Lannette" Wax	30.00 g.

Lacquer Polish

British Patent 446,146

Water	49.0 lb.
Sulphuric Acid	2.6 lb.

Denatured Alcohol	7.8 lb.
Glycerin	9.4 lb.
Ethyl Lactate	1.9 lb.
Butyl Acetate	3.4 lb.
Neuburg Chalk	17.4 lb.
Burnt Turkey Umber	1.7 lb.
Spindle Oil	1.9 lb.
Naphtha	5.0 lb.

Liquid Metal Polishes

Formula No. 1

a. Diglycol Stearate	5 kg.
Water	20 kg.
b. Oleic Acid	4 kg.
Mineral Oil	5 kg.
Alcohol	10 kg.
c. Ammonia (0.910)	3 kg.
d. Neuburg Chalk	25 kg.
e. Water, 60° C.	27 kg.

Make solution *a*. Separately, mix the "oils" *b*, and emulsify them by adding *c*. To the emulsion add *a*, stir thoroughly, and work in *d*. Add *e* in small portions, stirring strongly. Let stand overnight.

No. 2

a. Oleic Acid or Talloil	15 kg.
Diglycol Laurate	5 kg.
Petroleum	15 kg.
Alcohol	5 kg.
b. Ammonia (0.960)	12 kg.
c. Kieselguhr	30 kg.
d. Water, 60° C.	28 kg.

To the solution *a* add *b* with stirring. To the emulsion thus formed add slowly with agitation *c*, and afterwards, in the same way, *d*. Run through a mill the following morning.

No. 3

a. Diglycol Laurate	20 kg.
Water	35 kg.
b. Whiting	25 kg.
c. Alcohol	10 kg.
Benzine	10 kg.

Add *b* with stirring to *a*. Let stand overnight.

Add the mixture *c* with stirring. Let stand for 6 hours. Strain.

No. 4

a. Hard Soap, Powdered	4 kg.
Water	30 kg.
b. Oleic Acid	5 kg.
c. Whiting	25 kg.
d. Ammonia (0.910)	5 kg.
Water	5 kg.
e. Oxalic Acid	3 kg.
Water	15 kg.
f. Alcohol	8 kg.

Dissolve *a*, and stir in slowly in the order given *b*, *c*, *d*, *e*. Allow to stand overnight.

Add *f*. Mix, let stand for 6 hours, and strain.

No. 5

a. Hard Soap, Powdered	12 kg.
Water	55 kg.
b. Whiting	15 kg.
Kieselguhr	10 kg.
c. Alcohol	8 kg.

Make the hot soap solution *a*, add in *b* slowly with mixing. Let stand covered.

Add *c* the next morning. Allow to rest for 6 hours. Mill.

No. 6

a. Oleic Acid	15 kg.
Turpentine	30 kg.
Spindle Oil, Refined	10 kg.
Alcohol	12 kg.
b. Ammonia (0.910)	6 kg.
c. Methyl Hexalin	2 kg.
d. Kieselguhr	25 kg.

Mix *a* at room temperature. Add *b* with good agitation, and thereafter stir in *c* and *d*.

Let stand for 12 hours. Strain.

No. 7

a. Rosin	12 kg.
b. Turpentine	25 kg.
Benzine	20 kg.
c. Ammonia (0.910)	8 kg.
Alcohol	5 kg.
d. Kieselguhr	30 kg.

Melt *a*. Shut off all heat, and add the mixture *b*. Stir thoroughly and emulsify with *c*.

Work in *d*. Allow to stand for several hours. Strain.

No. 8

a. Oleic Acid or Talloil, Distilled	16 kg.
Mineral Oil	16 kg.
Alcohol	40 kg.
b. Ammonia (0.910)	8 kg.
c. Whiting	20 kg.

Add *b* to the mixture *a* with agitation. Add *c* to this emulsion in small portions. Strain.

No. 9

3 gal. batch

Naphtha	3 gal.
Silica (Air Floated 350 mesh)	2 lb.
Red Oil	4 fl. oz.
Aqua Ammonia (26°)	1 pt.
Water to make up to	3 gal.

Stir the silica into the naphtha, add the red oil and stir, then pour in the ammonia with continuous stirring, add some of the water, when the emulsion becomes complete, add rest of water needed and color if desired. To make a creamier product double the amount of red oil and ammonia, more silica may also be used.

No. 10

Type "Sidol"

Oleic Acid, Distilled	20 kg.
Alcohol	15 kg.
Heavy Benzine	15 kg.
Ammonia (sp. g. 0.91)	12 kg.
Neuburg Chalk	18 kg.
Kieselguhr	12 kg.
White Bolus	8 kg.

The oleic acid, dissolved in the solvent mixture, is saponified on the water-bath at temperature below the boiling point of the alcohol (60–70° C.). The strongly smelling liquid is now thickened with the abrasives which are added with good agitation.

No. 11

a. Neuburg Chalk	80 lb
Kieselguhr	4 lb.
Water	300 lb.
b. Oleic Acid	3.5 lb.
Ammonia (0.91)	1 lb.
Alcohol	6.5 lb.
Naphtha	10 lb.

To the mixture *a*, made 24 hours earlier and left overnight, add *b*, which is made by saponification at gentle heat to a soft-soap like mass.

No. 12

Water	110 kg.
Oxalic Acid	16 kg.
Oleic Acid	25 kg.
Stearic Acid	4 kg.
Alcohol	15 kg.
Turpentine	7.5 kg
Neuburg Chalk	125 kg.
Water	215 kg.
Ammonia (0.910)	27.5 kg.

Dissolve the oxalic acid in ⅛ of the necessary water by heating to about 60° C. and add the remainder of the water.

Melt up the fatty acids, turn out any flames, and add the solvents with stirring.

Add the oils to the water, with stirring, add the chalk, and ultimately saponify with the ammonia, until, after an initial thickening, the mass starts to go thin again.

Keep in kettle for 2 days, stirring intermittently.

If the mass still settles, add more oleic acid.

No. 13

a. Olein, Distilled	9 oz.
Stearic Acid	2 oz.
Alcohol	10 oz.
b. Ammonia (sp. g. 0.91)	14 oz.
c. Oxalic Acid	2 oz.
Water (50–60° C.)	70 oz.
d. Neuburg Chalk, Fine	25 oz.

Dissolve *a* by heating to about 50–60° C. on water bath, saponify with *b*, and add the solution *c*. The resulting liquid is mixed with *d* in a good mixer.

No. 14

Oleic Acid	16 oz.
Ammonia	10 oz.
Clay, Powdered	60 oz.
Alcohol	10 oz.
White Spirit	10 oz.
Oxalic Acid	8 oz.
Water	160 oz.

No. 15

Oleic Acid	18 oz.
White Spirit	150 oz.
Clay, Powdered	56 oz.
Ammonia	6 oz.
Alcohol	4 oz.

No. 16

Spindle Oil	4 oz.
Oleic Acid	10 oz.
White Spirit	3 oz.
Ozokerite	4 oz.
Clay	15 oz.
Ammonia	0.5 oz.

No. 17

a. Ammonium Oleate	2.1 kg.
Water	19.5 kg.
b. Stearic Acid	1 kg.
c. Ammonia (0.91)	0.5 kg.
d. Alcohol	2.1 kg.
e. Neuburg Chalk	6 kg.

Heat *a* to almost a boil to dissolve; add *b* with good stirring, cool to 75° C., and saponify with *c*. Cool to 50° C., add *d* and work in *e* with very thorough mixing.

No. 18

Water	60 oz.
Bentonite	1 oz.
Naphthenic Soap	6 oz.
Silica or Tripoli	15 oz.
Mineral Oil	18 oz.

Metal-Polish Cake

Montan Wax, Crude	25 g.
Montan Wax, Double Bleached	5 g.
Chromium Oxide	70 g.

Melt together and stir until cool.

Metal Polish (Non-Inflammable)

Ammonium Linoleate R.	20 lb.
Oxalic Acid	2 lb.
Ammonia	4 lb.
Water	150 lb.
Naphtha V. M. & P.	10 lb.
Silica	60 lb.
Alcohol	5 lb.

Heat the water to 70° C. Dissolve the oxalic acid, add the silica and stir until dispersed. Add the ammonia and stir for a few minutes keeping at 70° C. Then add the ammonium linoleate R. and stir until dissolved. Add the naphtha slowly and stir. The mixture becomes very heavy. The alcohol is then added slowly until the desired body and viscosity are obtained.

Metal Polish (Solvent Type)

Ammonium Linoleate R.	20 lb.
Naphtha V. M. & P.	100 lb.
Silica	40 lb.
Ammonia	2 lb.
Alcohol	2 lb.

Heat the naphtha cautiously to 60° C. Dissolve the ammonium linoleate R. and disperse the silica. Add the ammonia when the mixture becomes very heavy. It is then thinned down as desired by the addition of the alcohol.

Metal Polish Pastes

Formula No. 1

a. Ceraflux	8 lb.
Ozokerite	2 lb.
Oleic Acid	40 lb.
b. Whiting, Finest	50 lb.

Melt up *a*, and work in the well sifted *b*.

No. 2

a. Paraffin Wax (50/52° C.)	5 lb.
Stearic Acid	16 lb.
Oleic Acid	29 lb.
b. Whiting, Finest	20 lb.
Magnesium Carbonate	30 lb.

Combine as in No. 1.

No. 3

a. Paraffin or Scale Wax (50/52° C.)	17 lb.
Montan Wax, Refined	3 lb.
Spindle Oil, Refined	30 lb.
b. Whiting, Finest, Sifted	46 lb.
Iron Oxide, Red	4 lb.

Combine as in No. 1.

No. 4

(For chrome and nickel)

a. Paraffin Wax (50/52° C.)	10 lb.
Montan Wax, Refined	2 lb.
Spindle Oil, Refined	38 lb.
b. Kieselguhr	49 lb.
Iron Oxide Red	1 lb.

Combine as in No. 1.

No. 5

a. Ammonium Linoleate	9 lb.
Turpentine	20 lb.
b. Alcohol	4 lb.
Water	22 lb.
c. Whiting	40 lb.
Chrome Oxide	5 lb.

Mix *a*, which has been previously heated to about 50° C. with *b*, adding the latter with good agitation work in *c*.

No. 6

a. Soft Soap	20 lb.
Turpentine	15 lb.
Alcohol	5 lb.
b. Water	15 lb.
c. Whiting	35 lb.
Yellow Ochre	10 lb.

Make solution *a*, add *b*, and when homogeneous, use to make a paste with *c*.

No. 6

Pumice, Powdered	25 lb.
Whiting	20 lb.
Glass, Powdered	10 lb.
Chrome Oxide	10 lb.
Oleic Acid, or Spindle Oil, Refined (Thickened by 8% of Paraffin Wax)	35 lb.

No. 7

a. Paraffin Wax (50/52° C.)	20 lb.
Spindle Oil, Refined	30 lb.
b. Whiting	20 lb.
Emery	20 lb.
Carbon Black	10 lb.

Mix *a* hot, and work in slowly *b* with good agitation.

No. 8

a. Soft Soap	30 lb.
b. Turpentine	10 lb.
c. Alcohol	5 lb.
d. Water	10 lb.
e. Kieselguhr	20 lb.
Emery	20 lb.
Chrome Oxide	5 lb.

Thin *a* with *b*, *c*. *d* in the given order work in *e*.

No. 9

a. Oleic Acid or Talloil	5 lb.
Turpentine	15 lb.
b. Ammonia	3 lb.
c. Water	30 lb.
d. Whiting	10 lb.
Emery	20 lb.
Glass, Powdered	10 lb.
Graphite Dust	7 lb.

To the solution *a* add *b* with good agitation. Thin with *c*. Work in *d* to get a paste.

No. 10

a. Soft Soap	20 lb.
b. Potato Flour	2 lb.
Water	28 lb.
c. Pumice, Powdered	30 lb.
Emery, Finest	10 lb.
Iron Oxide Red	10 lb.

Mix *a* add starch dispersion *b*, and make a paste with *c*. Thorough stirring is necessary.

No. 11

"Globus" Type

Distilled Olein	3 lb.
Wool Fat	2 lb.

Paraffin Wax	1 lb.
Spindle Oil	25 lb.
Neuburg Chalk	35–40 lb.

No. 12

"Globol" Type

Scale Wax (50/52° C.)	5 g.
Ceresin (58/60° C.)	3 g.
Stearin	15 g.
Olein, Distilled	17 g.
Spindle Oil	10 g.
Calcium Carbonate, Floated	30 g.
Neuburg Chalk	15 g.
Chrome Green	5 g.

Melt up the 5 first ingredients and stir in the abrasive powder.

Metal Polishing Cloths

Cloths used for polishing vary only slightly in their treatment. There are two classes—those which depend upon some abrasive mechanically held on the fibre, and those which have an acid such as oxalic as their effective agent. The abrasive cloths can be prepared in many ways; by the use of a wax to hold the abrasive, which requires mechanical manipulation to apply, and by the use of a volatile solvent with a fixed oil or fatty acid to fix the abrasive in the fibre. Cloths dipped in the following suspension will give satisfactory results:

Formula No. 1

Benzine	500 cc.
Whiting	200 g.
Infusorial Earth	50 g.
Oleic Acid	3 g.

The mixture should be kept in constant agitation; the cloths are dipped, slightly wrung out, and allowed to dry in a place remote from fire. The whiting or infusorial earth may be replaced by white bole or jeweller's rouge if desired.

Canton flannel is the usual fabric employed and it is cut about 18 x 24 or 18 x 36 inches in size. The cloth may be bound or left unbound. The fabric is immersed in the polish solution and the excess squeezed out by passing through an ordinary clothes wringer with the rolls set quite tight. An alternative method is to suspend fabric in a spray booth and spray with a spray gun containing the polish.

No. 2

The polishing liquid may be straight oleic acid suitably scented. Sometimes petrolatum or stearic acid, or both, are dissolved in it to the extent of 5 to 10% to render it less oily. The oleic acid may be replaced in whole or in part with paraffin oil. To facilitate absorption and reduce the final oil content it may be thinned with a volatile solvent allowing the cloth to dry before packaging.

No. 3

a.	Whiting	12 kg.
	Iron Oxide, Red	5 kg.
b.	Hard Soap	6 kg.
	Diglycol Stearate	2 kg.
	Water	75 kg.

Add *a*, finely powdered, to the solution *b* which is made by boiling. Stir thoroughly. Dip the rags into the solution, press out, and dry them.

No. 4

a.	Whiting	15 kg.
	Lime, Green	5 kg.
b.	Gum Arabic	7 kg.
	Water	73 kg.

Mix the powders *a* with the gum dispersion *b*. The latter is made by stirring the gum into the cold water, and heating till the solution is clear.

Strain. Dip rags as in No. 1.

No. 5

a.	Kieselguhr	12 kg.
	Yellow Ochre	3 kg.
b.	Ammonium Linoleate	8 kg.
	Water	77 kg.

Stir *a* into the soap solution *b*. Strain. Dip rags as in No. 1.

No. 6

Red Oil	20 oz.
Castor Oil	3 oz.
Gasoline or Benzine	10 oz.
Infusorial Earth	6 oz.
Citronella Oil	1 oz.
Nitrobenzol	1 oz.

Mix well by shaking. Use outing flannel of desired size and saturate with the liquid. Wring out the excess of the oil and expose to the air in order to permit the gasoline or benzine to evaporate completely. Put up in Glassine paper envelopes.

No. 7

Dissolve 1 lb. of best (neutral) castile soap in ½ gal. of water and add ½ lb. of powdered Tripoli. Cut fluffy woolen cloth or outing flannel to proper size and thoroughly soak in the liquid mixture. Hang up to dry. Put up in Glassine envelopes.

No. 8

a.	Hard Soap	5 kg.
	Water, Boiling	35 kg.
	Glycerin	5 kg.
b.	Oleic Acid	7 kg.
	Tripoli, Fine	35 kg.
c.	Ammonia (0.96)	5 kg.
d.	Alcohol, Denatured	8 kg.

Heat solution *a*, add *b*, saponify with *c*. Cool to 40–45° C. and add *d*.

Impregnate at 45/40° C., dry the cloths, dust out gently, pack.

No. 9

U. S. Patent 2,098,607

Cloth is impregnated with the following and dried:

Water	97 oz.
Mineral Oil	3 oz.
Vinegar	1 oz.
Turpentine	½ oz.
Linseed Oil	½ oz.

Tripoli Compo (Polish)

Stearic Acid	55 lb.
Edible Tallow	2 lb.
Oleo Stearine	5 lb.
Rosin	9 lb.
Petrolatum	40 lb.
Japan Wax	1 lb.
Flint	315 lb.
Tripoli Flour, Double Ground	93 lb.
Ponolith	2 lb.

Tripoli Buffing Stick

Double Pressed Saponified Stearic Acid	30 g.
Edible Tallow	25 g.
Paraffin Wax	25 g.
Tripoli Flour (or as much as will be absorbed)	20 g.

A buffing or polishing paste may be made, using the above formulae, with the addition of a small amount of turpentine and of water to bring to the consistency desired.

Metal Cleaner and Brightener

U. S. Patent 2,062,038

Phthalic Anhydride	2 oz.
Sodium Sulphate	5 oz.
Soap	5 oz.
Soap Bark	5 oz.

Water to suit.

Polishing Metals for Metallographic Analysis

Preliminary to a final felt polishing a metal sample is burnished with chromium oxide wetted with kerosene. The chromium oxide is prepared by heating a mixture of potassium dichromate with sulphur at 1500° for a coarse paste and at 1000° C. for a fine paste for 3–5 hours. The grinding is best effected upon Pyrex plates.

Metal Cleaner for Beer Pipes and Apparatus

British Patent 458,163

Formula No. 1

Acetamide	12 oz.
Nitric Acid (50%)	25 oz.
Urea	16 oz.

No. 2

Nitric Acid (50%).

No. 3

Methyl Amine (33% Solution)	10 oz.
Nitric Acid (25%)	32 oz.

The above can be made into pastes by mixing with Kieselguhr.

Brass Polish Paste

Stearic Acid	10 kg.
Naphtha	30 kg.
Caustic Potash (30° Bé)	5 kg.
Alcohol	6 kg.
Mixture of Clay, Tripoli 1:4	to make paste

To the naphtha-stearic acid solution add the alkali, then the alcohol. Work into a paste with the minerals.

Aluminum Polish Powders

Formula No. 1

Pink

Stearic Acid or Paraffin Wax (Powdered)	10 g.
Magnesium Oxide	40 g.
Calcium Carbonate, Precipitated	30 g.
Iron Oxide Red	20 g.

No. 2

Magnesium Oxide	40 g.
Whiting	40 g.
Bole, White	20 g.

No. 3

White

Whiting	40 g.
Kieselguhr	30 g.
Alum, Powdered	30 g.

Polishing Powders for Copper, Brass, Nickel, Chromium, etc.

For Copper and Brass

Formula No. 1

Hard Soap, Powdered	10 g.
Whiting	50 g.
Kieselguhr, Calcined	20 g.
Iron Oxide Red	20 g.

No. 2

Vienna Chalk	30 g.
Kieselguhr, Calcined	30 g.
Whiting	20 g.
Lime Green	20 g.

Copper and Steel Polish

Oxalic Acid, Powdered	3 lb.
Silica	50 lb.

Nickel and Chrome Polish

Magnesium Oxide	30 g.
Calcium Carbonate, Precipitated	30 g.
Iron Oxide Red	40 g.

Polish for Nickel, Chrome and Alloys

Kieselguhr, Calcined	50 g.
Calcium Carbonate, Precipitated	40 g.
Chrome Oxide	10 g.

Nickel, Chrome, Copper and Brass Polish

Kieselguhr, Calcined	40 g.
Whiting	35 g.
Iron Oxide Red	10 g.
Paraffin (50/52° C.)	15 g.

Melt and grind in a mill.

Copper Kettle Polish

Hard Soap, Powdered	10 g.
Pumice Flour	20 g.
Kieselguhr, Calcined	50 g.
Iron Oxide Red	20 g.

Iron and Steel Polishing Powder For Forks, Knives, etc.

Formula No. 1

Hard Soap, Powdered	10 g.
Kieselguhr, Calcined	30 g.
Pumice, Powdered	35 g.
Emery	10 g.
Lime, Green	15 g.

No. 2

Whiting	40 g.
Pumice, Finely Powdered	40 g.
Chrome Oxide	20 g.

Oven Frame Polish

Whiting or Infusorial Earth	40 g.
Emery	40 g.
Powdered Glass	15 g.
Frankfurt Black	5 g.

Oven Cover Polish

Pumice, Powdered	50 g.
Whiting	35 g.
Chromium Oxide	15 g.

Liquid Chromium or Nickel Polish

Formula No. 1

a.	Diglycol Stearate	6 kg.
	Water	66 kg.
b.	Oleic Acid	5 kg.
c.	Kieselguhr	14 kg.
	Iron Oxide Red	6 kg.
d.	Ammonia (0.910)	3 kg.

Mix *b* with the hot solution *a*. Work in the abrasives *c*, and saponify with *d*. Mix thoroughly, and allow to stand over night. Strain.

No. 2

a.	Diglycol Laurate	8 kg.
	Water	50 kg.
b.	Oleic Acid or Talloil, Distilled	4 kg.
c.	Kieselguhr, Calcined	20 kg.
	Lime Green	4 kg.
d.	Ammonia (0.910)	4 kg.
e.	Alcohol	10 kg.

Mix *b* with *a*, work in *c* with good agitation; saponify with *d*. Let stand overnight. Keep covered.

Add *e*. Strain 6 hours later.

No. 3

a.	Oleic Acid or Talloil, Distilled	20 kg.
	Benzine	14 kg.
	Methylhexalin	2 kg.
b.	Alcohol	16 kg.
	Ammonia (0.960)	13 kg.
c.	Kieselguhr, Finest	35 kg.

Add the mixture *b* to the solution *a* with agitation. Work in *c*.

Let stand overnight. Strain.

Liquid Polishes for Iron or Steel

Formula No. 1

a.	Ammonium Linoleate	9 lb.
	Turpentine Substitute	16 lb.
	Alcohol	2 lb.
b.	Emery	20 lb.
	Whiting	25 lb.
	Glass Powder	10 lb.
c.	Water	18 lb.

Mix *a*, and wet thoroughly *b* in this oil-solvent mixture. Add *c* to the whole with thorough agitation and in small portions.

No. 2

a.	Ammonium Linoleate	25 lb.
	Water	40 lb.
b.	Whiting	15 lb.
	Quartz Flour	10 lb.
	Chromium Oxide	10 lb.

No. 3

a.	Soft Soap	15 lb.
	Methyl Cyclohexanol	2 lb.
b.	Turpentine	15 lb.
c.	Ammonia (0.910)	5 lb.
	Water	23 lb.
d.	Green Earth	10 lb.
	Whiting	10 lb.
	Pumice Meal	10 lb.
	Emery	10 lb.

Stir together *a* and *b*, add *c* with good agitation. Now add the powders *d*, mixing very thoroughly.

No. 4

For Forks and Knives

a.	Oleic Acid	15 lb.
	Mineral Oil, White	10 lb.
	Alcohol	45 lb.
b.	Ammonia (0.910)	5 lb.
c.	Chrome Oxide	25 lb.

Emulsify adding *b* to *a* with stirring. Work in *c* with thorough agitation.

No. 5
For Forks and Knives

a.	Methyl Cellulose	2 lb.
b.	Water	30 lb.
c.	Tri-Sodium Phosphate	5 lb.
	Water	33 lb.
d.	Whiting	15 lb.
	Chrome Oxide or Emery	15 lb.

Pour boiling *b* over *a* and let soak overnight. Add the solution *c* to it the next morning, and add now, with agitation, the abrasives *d*.

Polish for Silver, Nickel, Brass, Chromium, etc.
Formula No. 1

Diatomaceous Earth	18 oz.
Gum Arabic	5 oz.
Mica (Coarse Grade)	12 oz.
Phenol	¼ oz.
Water	65 oz.
Kerosene	5 oz.

No. 2

Diatomaceous Earth	80 oz.
Gum Karaya	2 oz.
Mica (Coarse Grade)	24 oz.
China Clay	24 oz.
Phenol	1 oz.
Water	260 oz.
Kerosene	24 oz.

After the powders and the phenol have been mixed together, thoroughly, the water should be added with constant stirring to prevent the formation of small lumps. Thereupon the kerosene can be incorporated into the paste. The latter fulfills a two-fold purpose in that it assists materially in dissolving and removing stubborn stains and tarnish, and furthermore remains in the cracks and crevices of the metal to retard further corrosion.

Silver Polishes
Formula No. 1

a.	Stearic Acid	10 lb.
	Glyceryl Oleate	50 lb.
b.	Calcium Carbonate, Fine	35 lb.
	Paris Red	5 lb.

Melt up *a*, and add the strained powders *b*, mixing thoroughly.

No. 2

a.	Paraffin Wax (50/52° C.)	8 lb.
	Mineral Oil, White	45 lb.
b.	Magnesium Carbonate	35 lb.
	Calcium Carbonate	12 lb.

Method as in No. 1.

No. 3

a.	Ammonium Linoleate	6 lb.
	Benzine	16 lb.
b.	Water	28 lb.
c.	Calcium Carbonate	40 lb.
	Pigment (e.g. Ultramarine)	10 lb.

Make emulsion by adding *b* to *a* with stirring. Work into this the fine powder *c*.

No. 1 and 2 are for tin cans, No. 3 is for collapsible tubes.

Liquid Silver Polishes
Formula No. 1

a.	Diglycol Stearate	7 g.
	Water	60 g.
b.	Oleic Acid	5 g.
c.	Ammonia (0.910)	3 g.
d.	Alcohol	10 g.
e.	Magnesium Carbonate	10 g.
	Paris Red	5 g.

Make a hot solution of *a*, add *b* with stirring. Add carefully *c*, cool to some extent, and add *d*.

The abrasives *e* which should be of the finest powder-grade are then suspended with good agitation.

No. 2

a.	Ammonium Linoleate	8 g.
	Water	30 g.
b.	Calcium Carbonate, Precipitated	25 g.
c.	Water	37 g.

Make a hot solution of *a*. Work in *b* thoroughly. Add *c* in small portions with good agitation. A water-soluble aniline-dye may be added. The abrasive is to be of the finest grade.

No. 3

a.	Oleic Acid	15 g.
b.	Alcohol	58 g.
c.	Ammonia (0.910)	7 g.
d.	Calcium Carbonate, Precipitated	10 g.
	Magnesium Carbonate	10 g.

To *a* add *b*. When homogeneous, add *c* slowly with good agitation. The abrasives, *d*—which should be of the finest grade—are suspended by good stirring for a sufficient period of time.

No. 4

Kaolin	7.5 g.
Kieselguhr	7.5 g.
Ammonia	5.0 g.
Carbon Tetrachloride	15 cc.
Alcohol, Denatured	60 cc.
Water	75 cc.

Silver Plating Polish

Silver Nitrate	60 g.
Ammonia (0.910)	60 g.
Sodium Thiosulphate	100 g.
Water	1000 g.
Whiting	100 g.

Shake before use. Polish is to be applied by a flock of cotton, and shined up afterwards with a linen rag.

Silver Polish Powders

White

Kieselguhr, Calcined	80 lb.
Soap Powder	20 lb.

Yellow:

Calcium Carbonate, Precipitated, or Magnesium Carbonate, Light	80 lb.
Yellow Ochre	20 lb.

Red

Calcium or Magnesium Carbonate, Finest	90 lb.
Iron Oxide Red	10 lb.

Green

Kieselguhr, Calcined	80 lb.
Lime, Green	20 lb.

Blue

Calcium Carbonate, Precipitated	60 lb.
Magnesium Carbonate, Light	20 lb.
Ultramarine Blue	20 lb.

Gray

Calcium Carbonate, Precipitated	40 lb.
Kieselguhr, Calcined	40 lb.
Frankfurt Black	20 lb.

Silver Polishing Cloths

No. 1

a. Diglycol Stearate	15 kg.
Water	55 kg.
b. Glycerin (28° Bé.)	5 kg.
c. Calcium Carbonate, Precipitated	10 kg.
Magnesium Carbonate	10 kg.
Paris Red	5 kg.

Dissolve *a* boiling, add *b*, and add through a strainer, while stirring, the powders *c*. Impregnate rags or cotton pads at 30–40° C., press off the excess liquid between rollers, and dry.

No. 2

Bath 1:	
Potassium Silicate Solution (30/33° Bé.)	16 kg.
Water	84 kg.
Bath 2:	
Hydrochloric Acid (20° Bé.)	8 kg.
Water	92 kg.

Dip rags into the first and afterwards into the second bath, thus precipitating silicic acid on the fiber.

No. 3

a. Hard Soap	10 lb.
Water	45 lb.
b. Oleic Acid	6 lb.
c. Calcium Carbonate	20 lb.
Iron Oxide Red	5 lb.
d. Ammonia (0.910)	4 lb.
e. Alcohol	10 lb.

Make solution *a* by taking up to a boil. Cool to 60° C., and add *b* with stirring; add *c* through a fine strainer.

When homogeneous, stir in *d*, let stand overnight in a covered kettle (should be enamelled). Add *c* with stirring to the cold emulsion. Strain or mill.

Impregnate rags or cotton pads in this bath, and dry.

No. 4

a. Hard Soap	6 g.
Water	50 g.
b. Oleic Acid, Distilled	10 g.
c. Ammonia (25%)	2 g.
d. Tripoli	10 g.
Calcium Carbonate, Precipitated	8 g.
Caput Mortuum (Paris Red)	7 g.

Dissolve *a* by heating, add *b*, *c*, and the mixture *d*. Keep stirring while the cotton is dipped into the bath.

Removing Silver Tarnish

U. S. Patent 2,051,697

Immerse silver in following:

Diaminopropanol	2 oz.
Ammonium Chloride	½ oz.
Water	97½ oz.

Stove and Oven Polishes

Aqueous Paste

a. Soap Powder	50 g.
Alcohol	25 g.
Water	100 g.
b. Chrome Oxide	200 g.
Infusorial Earth	125 g.

Dissolve the soap first in alcohol, add the water, and to this solution *a*, stir in the strained, finely powdered abrasives *b*.

Liquid

Chrome Oxide	200 g.
Kieselguhr	125 g.
Alcohol	65 g.
Water	200 g.

Oily Paste

Formula No. 1

a. Stearic Acid	50 g.
b. Oleic Acid, Distilled	125 g.
c. Chrome Oxide, Green	200 g.
Kieselguhr or Neuburg Chalk	125 g.

Melt *a*, thin with *b*. Work in the finely ground and sifted *c*.

No. 2

Oleic Acid, High Titer	3 kg.
Paraffin, Soft Grade	4 kg.
Emery, Powdered, 000	12.5 kg.
Chrome Oxide	0.5 kg.

Viscous Oily Liquid

Chrome Oxide	200 g.
Kieselguhr	125 g.

Oleic Acid	275 g.
Alcohol, to thin to desired viscosity	

Wax Emulsion Stove Polish

a. Montan Wax, Crude	2 kg.
Rosin	1 kg.
Carnauba Wax	2 kg.
b. Potassium Carbonate	2 kg.
Water	83 kg.
c. Lampblack	3 kg.
Graphite Flakes	5 kg.
d. Nigrosine, Water Soluble	3–4 kg.

Wax Block Stove Polish

Stearic Acid	30–40 kg.
Infusorial Earth, Neuburg Chalk, Chrome Oxide, Iron Oxide Red, Tripoli, Emery, Carborundum or Slate Flour	60–70 kg.

Wax Paste Stove Polish

Formula No. 1

Ceresin (56/58° C.)	8 kg.
Oleic Acid	10 kg.
Spindle Oil	12 kg.
Neuburg Chalk	20 g.
Quartz Flour	10 kg.
Emery, Powdered	25 kg.
Carborundum	15 kg.

No. 2

Ceresin (56/58° C.)	3 kg.
Oleic Acid	17 kg.
Petroleum Jelly, Natural	4 kg.
Spindle Oil	6 kg.
Quartz or Pumice, Powdered	45 kg.
Chrome Oxide	25 kg.

Stove Polish, Paste

Formula No. 1

a. Crude Montan Wax	5.0 lb.
Ceraflux	1.5 lb.
Beeswax	0.5 lb.
b. Nigrosin Oil-Soluble	0.5 lb.
c. Graphite	40.0 lb.
Lampblack	2.5 lb.
Turpentine	50 lb.

Melt *a*, dissolve *b* in the melted *a* with stirring.

Prepare suspension *c*, and stir it slowly into the melted wax—color. Let solidify in cans.

No. 2

Ceraflux	10 lb.
I. G. Wax OP	2 lb.
Turpentine	48 lb.
Graphite	25 lb.
Lampblack	15 lb.

Prepare as in No. 1.

No. 3

a. Montan Wax, Crude	2.5 lb.
Rosin	0.8 lb.
Japan Wax	0.7 lb.
b. Nigrosin, Oil Soluble	0.6 lb.
c. Potassium Carbonate	1.5 lb.
Water	53.9 lb.
d. Graphite	28.0 lb.
Soot	12.0 lb.

Melt *a*. Dissolve *b* in the melted *a*.

Boil *c*, and stir in *d* to get a smooth suspension.

Mix *c* + *d* into *a* + *b* with good stirring. Put into cans while hot.

No. 4

a. Gum Arabic or Dextrin	1 lb.
Water	45 lb.
b. Nigrosin, Water Soluble	2 lb.
Diglycol Stearate	7 lb.
c. Graphite	45 lb.

Dissolve *a* hot, add *b* with good stirring; mix thoroughly with *c*. Fill into cans while hot.

No. 5

a. Potato Flour	5 lb.
Water	40 lb.
b. Caustic Soda (35° Bé.)	1.5 lb.
c. Rosin, Powdered	2.5 lb.
Nigrosin, Water-Soluble	1.0 lb.
d. Graphite	40.0 lb.
Lampblack	10.0 lb.

Mix *a* to give a starch milk; stir in *b* in the cold, agitating until a heavy paste has formed.

Add *c* when homogeneous, mix with *d* in a kneading machine.

Stove Polish, Semi-Liquid

Formula No. 1

a. IG Wax CR	1.0 lb.
Beeswax	1.5 lb.
Paraffin Wax (50/52° C.)	1.0 lb.
Rosin	1.0 lb.
b. Hard Soap Chips	1.0 lb.
Nigrosin, Water-Soluble	0.5 lb.
Potassium Carbonate	0.5 lb.
Water	28.5 lb.
c. Graphite	35.0 lb.
Lampblack	5.0 lb.
Turpentine	25.0 lb.

Melt *a*, add *b*, and boil with good stirring. Prepare suspension *c*, stir into the hot emulsion.

No. 2

a. Nigrosin, Water-Soluble	1 lb.
Hard Soap	3 lb.
Water	32 lb.
b. Paraffin Wax	3 lb.
Ozokerite	1 lb.
Nigrosin, Oil-Soluble	1 lb.
c. Turpentine	20 lb.
d. Graphite	39 lb.

Melt *b*, thin with *c*; make a paste of this wax solution with *d*.

Boil *a* separately, and add *b*, *c*, and *d* to this with good stirring.

Liquid Stove Polish

Formula No. 1

a.	Montan Wax, Crude	2.0 lb.
	Beeswax	1.0 lb.
b.	Turpentine	64.0 lb.
	Graphite	20.0 lb.
	Lampblack	3.0 lb.
c.	Ammonium Linoleate	2.5 lb.
	Water	8.5 lb.

Melt *a.* Make suspension *b; thin a* with *b.*

Heat *c* to almost boiling temperature, add to *a* and *b.*

No. 2

a.	Crude Montan Wax	2 lb.
	Carnauba Wax	2 lb.
	Rosin	1 lb.
	Potash Carbonate	2 lb.
	Water	72 lb.
b.	Nigrosin, Water-Soluble	1 lb.
	Graphite	20 lb.

Boil *a* until homogeneous. Stir in *b* gradually, until smooth.

No. 3

a.	Crude Montan Wax	2 lb.
	Rosin	1 lb.
	Potash Carbonate	1 lb.
	Water	30 lb.
b.	Paraffin Wax (40/42° C.)	2 lb.
	Nigrosin, Oil-Soluble	1 lb.
c.	Turpentine	38 lb.
d.	Graphite	20 lb.
	Lampblack	5 lb.

Boil up *a* until homogeneous. Melt *b* separately, thin it with *c,* and suspend *d* in it.

Add to *a* with good stirring.

No. 4

a.	Ammonium Linoleate	8 lb.
	Water	60 lb.
b.	Water	5 lb.
	Potato Flour	2 lb.
c.	Graphite	20 lb.
	Lampblack	5 lb.

Make solution *a,* and separately paste *b.* Add *b* to *a,* mixing thoroughly. Work *c* slowly into this dispersion.

Stove Blacking

Formula No. 1

a.	Carnauba Wax	6 lb.
	Montan Wax, Bleached	3 lb.
	Beeswax	3 lb.
	Rosin	1 lb.
	Diglycol Stearate	1 lb.
	Potash Carbonate	1 lb.
	Water	45 lb.
b.	Turpentine	40 lb.

Boil *a* until a homogeneous mass is formed.

Thin with *b.*

No. 2

Montan Wax, Crude	5 g.
Rosin	1.5 g.
Paraffin Wax (40/42° C)	1.5 g.
Graphite	56 g.
Carbon Black	24 g.
Nigrosine Base BB	10 g.
Potassium Carbonate	3 g.
Water	200 g.

No. 3

a.	Graphite	24 lb.
	Glycerin, Crude	5 lb.
	Formaldehyde	1 lb.
b.	Hard Soap	3.2 lb.
	Water	26 lb.
	Paraffin	4 lb.

Prepare the solution *b* by boiling, and add it to the paste *a.*

Stir till cold, and pour.

Stove Polish

(to clean shiny metallic parts of ovens)

Stearic Acid	10 g.
Spindle Oil	20 g.
Triethanolamine Linoleate	27 g.
Water	13 g.
Spindle Oil	20 g.
Tetralin	10 g.
Abrasive (Emery, Tripoli, Silicaceous Earth, etc.)	until pasty

Dissolve the fatty acids in the first spindle oil, mix with triethanolamine linoleate; add the second spindle oil, the tetralin, and ultimately the abrasive.

Non-Inflammable Stove Polish

Roseen Oil	2 oz.
Montan Wax (Black)	2 oz.
Carnauba Wax	2 oz.
Water	82 oz.
Caustic Potash	2 oz.
Nigrosine	3 oz.
Graphite	5 oz.
Lampblack	3 oz.

The oil and waxes are carefully melted. The potash and nigrosine are dissolved in the water and gradually stirred into the wax mixture at 85° to 90° C. The resultant product is agitated thoroughly during the cooling, when the graphite and lampblack are uniformly incorporated. The caustic potash forms a soap with the resin and aids emulsification and retards settling of the black.

Quick Drying Stove Polish

The following formulæ include inflammable but quick drying solvents:—

Formula No. 1

Asphalt or Petroleum Bitumen (80° C.)	15 oz.
White Spirit, or Coal Tar Naphtha	40 oz.

Lampblack	5 oz.
Fine Graphite	40 oz.

The bituminous constituent is dissolved in the spirit, warming if necessary, and the blacks are stirred in thoroughly.

No. 2

Rosin	3 oz.
Turpentine	84 oz.
Lampblack	1 oz.
Graphite	12 oz.

This separates more readily than the previous composition and requires well shaking before use. It is prepared as for (1).

No. 3

Ceresin or Ozokerite Wax	8 oz.
Japan Wax	7 oz.
Turpentine	70 oz.
Lampblack	8 oz.
Graphite	7 oz.

The waxes are dissolved in the turpentine, either by refluxing under heat, or by melting and carefully stirring the turpentine in at 80/90° C., and then the blacks are incorporated.

No. 4

Ceresin or Ozokerite Wax	5 oz.
Carnauba Wax	1 oz.
Turpentine	39 oz.
Lampblack	50 oz.
Graphite	5 oz.

This is similar to (3) except that carnauba wax forms the hardening constituent, and additionally it aids, polishing. It is prepared in a like manner.

Stove Cleanser

a. Kieselguhr	25 kg.
Glass Powder	25 kg.
Soot	5 kg.
b. Ammonium Linoleate	10 kg.
Petroleum Jelly	10 kg.
c. Ammonia	½ kg.
d. Water	10 kg.
e. Heavy Benzine	15 kg.

Melt *b*, and saponify with *c*, thin with *d*, cool, add *e*, and make a paste with part or all of the powders *a*.

Liquid Oven Polish

a. Oleic Acid, Distilled	5 lb.
Stearic Acid, Distilled	3 lb.
b. Petroleum	15 lb.
c. Ammonia (0.910)	5 lb.
d. Water	30 lb.

Dissolve *a* in *b* on the water bath. Saponify with *c*, and dilute with *d*.

This can be mixed with

e. Kaolin	10 lb.
Emery, Finest	30 lb.
Graphite	5 lb.

To give the desired consistency.

Stove and Oven Polish Powders

Formula No. 1

Trisodium Phosphate	10 lb.
Soda Ash	10 lb.
Sodium Perborate	20 lb.

No. 2

Trisodium Phosphate	20 lb.
Soda Ash	30 lb.
Sodium Hydroxide, Powdered	50 lb.

No. 3

Trisodium Phosphate	50 lb.
Soda Ash	10 lb.
Sodium Perborate	30 lb.

To all these, about 3–5% of abrasives and powdered soap are usually added.

No. 4

Pumice, Powdered	3 lb.
Alum	1 lb.
Salt	1 lb.
Red Iron Oxide	2 lb.

Stove and Oven Polishes, Liquid

Formula No. 1

Tripoli	45 lb.
Alcohol	10 lb.
Sodium Hydroxide Solution	5 lb.
Oleic Acid	10 lb.
Naphtha	30 lb.

No. 2

Bole	80–100 lb.
Soft Soap	30 lb.
Water	60 lb.
Alcohol	10 lb.

No. 3

Tripoli	200 lb.
Naphtha	200 lb.
Oleic Acid	50 lb.
Alcohol	10 lb.
Water	50 lb.
Ammonia	15 lb.

Oven Polish, Solid

Emery	25 lb.
Quartz, Powdered	25 lb.
Scale Wax (52/54° C.)	10 lb.
Oleic Acid, Distilled	10 lb.
Spindle Oil	10 lb.

Oven Polish

Flake Graphite	33 lb.
Lampblack	1.7 lb.
Beeswax	4 lb.
Ceresin (58/60° C.)	1 lb.

Nigrosin, Oil-Soluble	4 lb.
Heavy Benzine or Carbon Tetrachloride	25 lb.

Oven Polish Emulsion

Montan Wax, Crude	2 lb.
Rosin	1 lb.
Carnauba Wax, Dark	2 lb.
Potash (Carbonate) (2.5% Boiling Solution)	87 lb.
Soot	3 lb.
Flake Graphite	5 lb.
Nigrosin, Alkali-Proof	3–5 lb.

Oven Polish, White

Stearic Acid	5 kg.
Ammonium Linoleate	19 kg.
Spindle Oil	20 kg.

Either:

Alcohol	until liquid

Or:

Abrasive (Neuburg Chalk, Marble Powder, Quartz Powder, Pumice, etc.) to make paste

Stove "Lacquer"

Formula No. 1

Black:

Gilsonite	40 g.
Copal	5 g.
Flexoresin DA1	5 g.
Lampblack	5 g.
White Spirit	100 g.

No. 2

Bronze:

Coumarone Resin, Pale, Hard,	10 g.
White Spirit-Benzol (4:2)	60 g.
Bronze Powder	

Liquid Grate Polish

Crude Montan Wax	2 oz.
Rosin	1 oz.
Carnauba Wax	2 oz.

Heat to 90° C. with stirring, and to it add slowly:

Caustic Potash	2 oz.
Water (Boiling)	86 oz.
Nigrosin	2 oz.

Keep on heat and agitate vigorously until uniform. Cool and work in:

Graphite (Flake)	5 oz.
Lampblack	3 oz.

Mix thoroughly until uniform. This formula is capable of variation of ingredients and color.

Water-Resistant Floor Emulsion Polish

Morpholine in combination with fatty acids is an excellent emulsifying agent for polishes, paper coatings, paints, lacquers and other mixtures which are benefited by a volatile emulsifier. The moderate volatility of morpholine is such that it gradually evaporates along with water from the drying emulsion film, thus leaving the emulsion film water resistant; that is, it is not hygroscopic nor will be spotted and removed by water. At the same time, morpholine can be satisfactorily employed in wax-emulsion technique, since it does not evaporate selectively from a hot solution, and it is not lost from emulsions standing in open containers.

A translucent, almost clear solution of morpholine, oleic acid and wax makes a water-resistant polish which gives a film of high brilliance with little or no rubbing. All that is necessary is to spread the solution evenly over a surface and allow it to evaporate. However, it is essential that a good grade of light-colored wax and fresh shellac be used and that attention be given to all the details of preparation.

Formula No. 1

a.	Carnauba Wax	11.2 lb.
	Oleic Acid	2.4 lb.
	Morpholine	2.2 lb.
	Water	67.0 lb.
b.	Shellac	1.5 lb.
	Morpholine	0.2 lb.
	Water	15.5 lb.

Preparation

Melt the carnauba wax carefully with the oleic acid and maintain the temperature closely at 90 deg. C. Stir until well mixed, add the morpholine, and stir constantly until the whole mass is quite clear. In the meantime, the water should have been brought to a simmer in a separate kettle. Add it slowly to the hot wax mixture with steady stirring, making certain that each small portion is well incorporated before further addition. The mixture becomes increasingly viscous and should be of the appearance of petrolatum when two-thirds of the water has been added. After this stage has been reached, the mixture begins to thin out and the remainder of the water may be added rapidly. The total time for adding the water should be 30–40 minutes. A steam-jacketed kettle and a hand-operated paddle, or slow-speed, large-bladed propeller are recommended for successful production.

Allow the mixture to cool. While slowly stirring, add the shellac solution. This has been made by warming together the morpholine, water and shellac indicated in *b* above and filtering if necessary.

Another morpholine dry-bright polish

is formulated as follows, using paraffin as a substitute for part of the carnauba wax:

No. 2

Carnauba Wax	64.8 lb.
Paraffin Wax	7.2 lb.
Morpholine	14.4 lb.
Oleic Acid	15.3 lb.
Boiling Water	430.0 lb.
Cold Water	100.0 lb.

Preparation

By observing great care in the gradual addition of boiling water up to the point of emulsion inversion (see above), a polish is prepared which is exceptionally translucent.

Non-Slippery Bright Drying Floor Wax

U. S. Patent 2,088,795

Vulcanized Rubber Latex	5–30 g.
Bright Drying Floor Wax Emulsion	95–70 g.

Bright Drying (Non-Rubbing) Polish

Formula No. 1

Carnauba Wax	11.9 g.
Paraffin Wax	1.3 g.
Oleic Acid	3.0 g.
Triethanolamine	1.9 g.
Water (hot)	50.0 g.
Water (cold)	50.0 g.

Melt the wax and add the oleic acid and triethanolamine. With the temperature at 95° C., add small (5-part) portions of boiling water, stirring between each addition and continuing them until a heavy translucent paste is formed. Add the remaining boiling water and stir until homogeneous. Add the cold water; cool the complete dispersion to room temperature. If desired, all of the water may be added at boiling temperature.

Due to the possible variation in the composition of some of the suggested ingredients and to the varying methods and conditions which may attend the compounding, modifications to meet individual requirements may be necessary.

This is a low priced product which is not as good as the subsequent formulae.

Rubless Bright Drying Water Wax Polishes

The following formulae give rubless floor polishes characterized by high initial lustre and durability.

Formula No. 1

Carnauba Wax No. 2	120 lb.
Oleic Acid	13.7 lb.
Trigamine	19 lb.
Caustic Soda (47%)	3.5 lb.
Water	843.5 lb.

Melt the wax in the oleic acid, add trigamine and heat to 90° C. Then add the caustic soda and 25 cc. of water at about 95° C. Stir until jell is formed. Then add the rest of the water which must be boiling. Stir thoroughly till cool.

No. 2

Hydromalin	138 lb.
Carnauba Wax No. 1 or No. 2 Yellow	250 lb.

Heat to 120° C.–140° C. half an hour.

Cool to 100° C.–105° C.

Add to the above slowly with stirring.

Water (at 100° C.)	280 lb.

Stir to smooth paste then add slowly with good stirring.

Water (at 100° C.)	1500 lb.

Keep as close to 100° as possible for 15 minutes with rapid stirring. Then stir till cool.

No. 3

Aquamel	15 lb.
Carnauba Wax No. 2 Yellow or No. 3 Refined	25 lb.
Water	225 lb.

Heat the wax and Aquamel together till a clear jelly is obtained. Then add the water which must be as near boiling as possible. Stir thoroughly till cool.

Transparent Bright Dry Wax Emulsion

a.	Carnauba Wax	120 g.
	Oleic Acid	20 g.
b.	Trigamine	20 g.
c.	Caustic Soda (50%)	8 g.
	Water	32 g.
d.	Water	800 g.

Use method given for Rubless Bright Drying Water Wax Polish.

Semi Bright Drying Wax Emulsion Polishes

Formula No. 1

a.	Carnuba Wax # 2	10 g.
	Candelilla Wax	10 g.
	Oleic Acid	3 g.

Use method given under Candelilla Wax Emulsions on this and others in this group.

b.	Triethanolamine	4 g.
	Borax	2 g.
	Water	185 cc.

No. 2

a.	Carnauba Wax # 2	10 g.
	Candelilla Wax	10 g.
	Oleic Acid	3 g.
b.	Triethanolamine	4 g.
	Borax	1½ g.
	Water	185 cc.

Bright Drying Floor Polish (Non-Rubbing)

U. S. Patent 2,045,455

Carnauba Wax	10.0 oz.
Triethanolamine	1.4 oz.
Oleic Acid	1.4 oz.
Borax	1.0 oz.
Refined Shellac	1.4 oz.
Ammonium Hydroxide	0.2 oz.
Water to make	100.0 fl. oz.

This composition is of the "Drybrite" Type. It is prepared by melting the carnauba wax and adding the oleic acid to same. To about one third of the above amount of water is added the triethanolamine, the ammonium hydroxide and the borax dissolved in this mixture. This is warmed and the shellac added and stirred until same is completely passed into solution. To this last solution, which is being agitated vigorously by means of an electric homogenizer, is added the carnauba wax oleic acid mixture which should be very close to the boiling point of water. For best results this emulsion should be passed through a colloid mill in order to keep its viscosity low, and prevent separation. All or a portion of the remainder of the water may be added.

Floor Polish For Inlaid Floor

a.	Carnauba Wax	6 kg.
	Montan Wax, Bleached	4 kg.
	Ozokerite, Low grade	2 kg.
	Paraffin Wax (50/52° C.)	4 kg.
b.	Heavy Benzine	160 kg.
	Turpentine	24–20 kg.

Melt *a*, thin with *b*. By using more or less solvent, the product can be adapted to various requirements.

Floor Polishes

Formula	No. 1	No. 2	No. 3
Carnauba Wax	15 oz.	15 oz.	15 oz.
Cumarone Resin	6 oz.	10 oz.	4 oz.
Oleic Acid	4 oz.	5 oz.	5 oz.

Melt together and while hot add following mixture brought to a boil.

Triethanolamine	4 oz.	5 oz.	5 oz.
Borax	6 oz.	6 oz.	3 oz.
Water	25 oz.	25 oz.	185 oz.

The above dry dull but polish on rubbing to give a hard glossy finish.

No. 4

I. G. Wax O-P	6 oz.
Ozokerite (68°–70° C.)	4 oz.
Paraffin Wax (50°–52° C.)	40 oz.
Turpentine	70 oz.
Naphtha	60 oz.

Colored with oil soluble colors.

No. 5

I. G. Wax V	0.5 oz.
I. G. Wax OP	1.5 oz.
Montan Wax, Bleached	3 oz.
Ozokerite (68°–70° C.)	1 oz.
Paraffin Wax (50°–52° C.)	8 oz.
Turpentine	100 oz.

No. 6

Montan Wax, Bleached	5 oz.
Ozokerite (74°–76° C.)	2 oz.
Carnauba Wax	2 oz.
Paraffin Wax (50°–52° C.)	6 oz.
Turpentine	80 oz.

Colored Floor Polish

Beeswax	2.4 oz.
I. G. Wax	1.6 oz.
Ozokerite	2.4 oz.
Montan Wax, Bleached	1.2 oz.
Paraffin Wax (50°–52° C.)	42 oz.
Turpentine	38 oz.
Naphtha	58 oz.

Colored with oil soluble colors.

Brown:	
Cerolbrown (I. G.)	0.75 oz.
Red Brown:	
Cerolblue (I. G.)	0.2 oz.
Brown R (I. G.)	0.3 oz.
Red BB (I. G.)	0.72 oz.

Floor Polish (for Rubber Floor)

Montan Wax, Bleached	8 kg.
"Rilan Wax"	2 kg.
Rosin	2 kg.
Paraffin Wax	12 kg.
Hard Soap	1 kg.
Potassium Carbonate	2 kg.
Water	70 kg.

Liquid Floor Wax 5 gal. Batch

Ceraflux	1 lb.
Mineral Seal Paraffin Oil	5 gal.

Melt the wax and stir into the oil.

Antiseptic Insecticidal Floor & Furniture Polish

Turpentine	65 g.
Terpineol	5 g.
Derris, Powdered	3 g.
Pyrethrum, Powdered	3 g.

Heat on a water bath for ½ hour and then add

Bornyl Acetate	2 g.
Bornyl Chloride	7 g.
Zinc Resinate	½ g.

Filter after 2–3 days.

Beeswax may be incorporated if desired and the turpentine content increased.

Floor Polish Powders

Formula No. 1

Mix powdered waxes (ceresin, stearic acid, paraffin) in any desired ratio.

No. 2

Melt a composition of waxes (such as carnauba wax, ceresin, paraffin) on the water bath in the desired ratio, pour in thin plates. Cool, and grind.

No. 3

Scale Wax, Powdered	20–30 g.
Talcum	70–80 g.
Ochre	to suit

Mix thoroughly, and sift.

No. 4

Stearic Acid, Powdered	80 g.
Ceresin, Powdered	15 g.
Hard Soap, Powdered	5 g.

No. 5

Stearic Acid, Powdered	80 g.
Ceresin, Powdered	20 g.

No. 6

Paraffin Wax, Powdered	70 g.
Talcum	30 g.

Dance Floor Wax

Formula No. 1

Ceresin	10 kg.
Stearic Acid	10 kg.
Paraffin Wax	80 kg.
Pine Needle Perfume	to suit

No. 2

(Discs)

Paraffin Wax (50°–52° C.)	100 oz.
Ozokerite (68°–70° C.)	5 oz.

Colored with oil soluble color yellow and cast in discs.

No. 3

Stearic Acid	20 kg.
Paraffin Wax	50 kg.
Zinc Stearate	½ kg.
Talcum	30 kg.
Pine Needle Oil	to suit

Ball Room Wax

Formula No. 1

Stearic Acid	20 g.
Ceraflux	50 g.
Talc	30 g.

No. 2

Stearic Acid	10 g.
Paraffin Wax, Hard	30 g.
Talc	60 g.

No. 3

Stearic Acid	5 g.
Paraffin Wax, Hard	35 g.
Talc	60 g.

No. 4

Stearic Acid, Soft	50 g.
Talc	50 g.

No. 5

Stearic Acid	5 g.
Ceresin	5 g.
Paraffin Wax, Soft	40 g.
Talc	50 g.

No. 6

Ceraflux	50 kg.
Aluminum Stearate	½ kg.
Stearic Acid	5–10 kg.
Talc	45–40 kg.

Non- Slippery Linoleum Wax

Carnauba Wax	15 lb.
Montan Wax	5 lb.
Rosin, Light	5 lb.
Turpentine	20 lb.
Potash Carbonate	5 lb.
Diglycol Stearate	5 lb.
Water	45 lb.
Alkaline Yellow Dye	to suit

Melt the first three ingredients on the water-bath, stir in the turpentine and add the hot solution of soap and alkali in a thin jet with stirring. Keep at 55–60° C. on bath until completely "bound". Pour at lowest possible temperature.

Floor Mop Oil

For Floors

Formula No. 1

Spindle Oil, Distilled, Thin, (Yellow)	60 cc.
Diglycol Laurate	5 cc.
Naphtha	40 cc.
Hydroterpin (or Turpentine)	15 cc.
Citronella Oil, Ceylon	5 cc.

No. 2

Spindle Oil, Refined, Pale (2–7° E/20° C.) (Flash point above 150°C.)	99 lb.
Perfume*	1 lb.

* Perfume for Floor Oils.

Pine Needle Oil, Siberian	5.0 oz.
Bornyl Acetate	3.0 oz.
Camphorated Oil	1.5 oz.
Borneol	1.0 oz.
Lemonone	0.5 oz.

No. 3

Spindle Oil (3.5° E Viscosity)	100 oz.
Linseed Oil	3 oz.
Oil Soluble Dye	0.005 oz.
Amyl Acetate	0.3 oz.

No. 4

Spindle Oil, Refined (1.8–2.5° E/20° C.)	60 lb.
White Spirit	36 lb.
Clovel	4 lb.

No. 5

Paraffin (Mineral) Oil	40 fl. oz.
Turpentine	20 fl. oz.
Cedar Oil	¼ fl. oz.

Furniture Polish
Formula No. 1

Beeswax	25 kg.
Diglycol Stearate	10 kg.
Montan Wax, Bleached	25 kg.
Rosin	3 kg.
Ozokerite, (60/62° C.)	17 kg.
Ammonia (0.91)	70 kg.
Water	850 kg.
Dye,* Water Soluble	0.3–0.5%

* *Yellow*: Metanil Yellow, Extra X
Orange: Orange II Concentrated.

No. 2

Turpentine	8 oz.
Naphtha	30 oz.
Spindle Oil	49 oz.
Acetic Acid (36%)	6 oz.
Antimony Chloride	4 oz.
Lemon Oil	1 oz.
Gum Arabic	100 gm.
Water	40 oz.

Dissolve gum in water and then mix in other ingredients in a rapidly beating churn type mixer.

No. 3

Beeswax	500 g.
Water	400 g.
Calcium Carbonate	100 g.
Water	4000 cc.

Boil the first three ingredients for a period. Thin with the water. To 3 kg. of the resulting mixture add

Kassel Brown (Dye)	125 g.
Potash Carbonate	250 g.
Water	500 g.

Boil altogether with stirring. The product is applied when it is still warm, putting it on the furniture in a thin layer and polishing with a brush.

No. 4

Montan Wax, Double Bleached	5 kg.
Paraffin Wax, 50/52° C.	5 kg.
Diglycol Stearate	1 kg.
Water	67 kg.
Ammonia (0.910)	2 kg.
Alcohol	20 kg.

Soap and waxes are cut into small pieces and taken up to a boil in the water and the ammonia, stirring thoroughly. When the mass is homogeneous, cool with stirring, and add the alcohol when cooled sufficiently. Keep agitating until it goes heavy.

No. 5
(Quick Drying)

Mineral Oil (Spindle)	15 lb.
Perilla Oil	8 lb.
Emulsifier L83A	8 lb.
Naphtha, V. M. & P.	25 lb.
Water	50 lb.

Mix the oils and emulsifier. Add the water slowly with high speed stirring. Continue stirring for about five minutes after all the water has been added.

This gives a polish that dries rapidly, leaves a hard high-lustrous surface with the minimum amount of finger-marking.

No 5

Linseed Oil	20 g.
Yellow Mineral Oil	20 g.
Naphtha, Refined	20 g.
White Spirit	30 g.
Camphor Oil	5 g.
Citronella Oil, Ceylon	5 g.
Orange Yellow, Oil soluble	to suit

French Polishing

In French polishing the wood surface is first carefully sandpapered and smoothed, then stained to the desired color, oiled with linseed oil, and again sandpapered with extremely fine sandpaper and left to dry thoroughly. Then the French polish, or shellac gum dissolved with alcohol to a very thin solution, is applied very sparingly by means of a pad, and applied with a rotary rubbing motion.

During this rubbing process the skillful polisher at intervals adds to the solution a drop of raw linseed oil or sweet oil and allows this to be spread over the surface with the shellac gum flowing lightly from the saturated cotton and linen pad. This process has to be continued, according to the size of the article, for about an hour and then allowed to dry overnight, and the same operation repeated the next day and a third time a few days after. The final application is made about a week later. By this method the thinnest film can be applied with a maximum of lustre and transparency.

It is possible to obtain with the French polishing process any desired effect from a thin patina finish to an egg-shell finish or high polish. If an egg-shell finish is required the polisher should be informed of this when beginning his work as he will have to reduce the use of oil to a minimum during the polishing process. When the surface is finished it should be left to dry for one day. The polisher should then take a pad of wadding saturated with turpentine and quickly moisten the whole surface, and should next sprinkle or scatter fine pumice powder moderately and evenly over it. He should then take a fair-sized brush somewhat like those used for shoe polishing and lightly brush the pumice stone in the direction of the grain of the wood until the pumice has absorbed all the turpentine on the surface. The craftsman should finally wipe the surface clean with a very soft rag, always following the direction of the grain of the wood, and the result will be an even egg-shell finish.

French polishing is practiced today in America in finishing only the finest examples of hand-made furniture.

Polish For Piano Keys

Montan Wax	30 g.
Tallow	20 g.
Diglycol-Laurate	100 g.
Micro-Asbestos	1200 g.

Furniture and Automobile Polish

Nelgin	8 lb.
Water	126 lb.
Moldex	5 oz.

Allow to soak a few hours, heat, stir and then add the following mixture to it slowly with good stirring.

Light Mineral (Spindle Oil)	26 lb.
Perilla Oil	18 lb.
Varnolene or Solvent Naphtha	16 lb.
Lemonone, Crude	16 lb.

Exceptionally good on lacquered, painted or varnished metal surfaces.

Oil Polish

Mineral Oil	48 lb.
Sulphonated Castor Oil	16 lb.
Oleic Acid	1.3 lb.
Triethanolamine	1.0 lb.
Gum Tragacanth Powder	1.0 lb.
Formaldehyde (40%)	0.5 lb.
Water	80.0 lb.

Warm the triethanolamine, gum tragacanth, and water to 40° C. and stir until the gum is uniformly dispersed. Add the formaldehyde and a mixture of the mineral and sulphonated oils and the oleic acid, agitating rapidly to obtain complete emulsification.

An oil polish of this type can be used both for furniture and automobiles. It can be rubbed dry to leave a glossy finish on the varnish or lacquer surface. Such a polish is more easily applied than a wax polish but it does not leave the same hard and permanent film.

The cleaning action of this polish can be increased with a slight alteration in formula; namely by the substitution of part of the mineral oil with kerosene or naphtha. (Pine oil may also be substituted for some of the naphtha, or other solvent changes made.) When this polish is to be used for lacquers, a fine abrasive is frequently added in small quantity. A perfuming agent such as sassafras or cedarwood oil may also be incorporated.

Cleaning and Polishing Table Tops

Wash the table top with warm (not hot) soapsuds, made by adding a little finely shaved mild soap to warm water, rinse with clear water, and when dry repolish with a good furniture polish or paste wax. Or, wipe the table top with a soft cloth saturated with gasoline, and repolish with prepared furniture polish or paste wax.

Ski Wax

Formula No. 1

Wood Tar	70 kg.
Diglycol Stearate	20 kg.
Carnauba Wax	10 kg.

No. 2 (For cold weather)

Wood Tar	50 kg.
Paraffin Wax	25 kg.
Turpentine	5 kg.

No. 3 (For melting weather)

Montan Wax	17 kg.
Woolfat	18 kg.
Paraffin Wax	10 kg.
Rosin	28 kg.
Ozokerite	25 kg.
Spindle Oil	5 kg.
Wood Tar	2 kg.

No. 4 (For collapsible tubes)

Montan Wax	10 kg.
Rosin	5 kg.
Beeswax	5 kg.
Roseen Oil	30 kg.
Linseed Oil	10 kg.
Spindle Oil	20 kg.
Wood Tar	20 kg.

No. 5 Climbing and Gliding

Paraffin Wax (50–53° C.)	40 lb.
Crude Montan Wax	15 lb.
Woolfat, Neutral	15 lb.
Colophony	10 lb.
Mineral Oil	15 lb.
Wood Tar	5 lb.

No. 6 Climbing (Klister)

Crude Montan Wax	17 lb.
Woolfat, Neutral	18 lb.
Paraffin Wax	10 lb.
Rosin	28 lb.
Ozokerite	25 lb.
Mineral Oil	5 lb.
Wood Tar	2 lb.

No. 7
"Skate"

Crude Montan Wax	10 lb.
Rosin	12 lb.
Paraffin Wax	30 lb.
Ozokerite	20 lb.
Petrolatum	8 lb.
Wood Tar	5 lb.

No. 8
Climbing

Rosin	10 kg.
Ceresin	5 kg.
Montan Wax	5 kg.
Paraffin	5 kg.
Japan Wax	10 kg.
Beeswax	5 kg.
Tallow	5 kg.
Lanosyn	5 kg.

No. 9
Gliding

Rosin	5 kg.
Ceresin	20 kg.
Montan Wax	7.5 kg.
Ceraflux	5 kg.
Japan Wax	7.5 kg.
Woolfat	5 kg.

No. 10
Climbing and Gliding

Montan Wax, Crude	30 g.
Rosin	10 g.
Woolfat	25 g.
Wood Tar	8 g.
Paraffin (52/54° C.)	20 g.
Ozokerite-Ceresin	7 g.

Apply on dry ski. Rub in (until shiny) using a cork or the palm of the hand. For climbing rub in some wax transverse to axis of ski. Polish this down before gliding.

Window Polishes
Formula No. 1

a.	Diglycol Stearate	15 lb.
	Water	50 lb.
b.	Magnesium Carbonate	15 lb.
	Viennese Chalk	10 lb.
	White Bole	10 lb.

Dissolve the soap in boiling water *a*, and mix in the abrasives *b*. Strain, cool, fill into containers.

No. 2

a.	Ammonium Linoleate	20 lb.
	Water	30 lb.
b.	Viennese Chalk	20 lb.
	Whiting	10 lb.
c.	Alcohol	20 lb.

Into the solution *a* is added the abrasives *b*.. Stir till cooled, and thin with *c*. Strain or mill.

No. 3

a.	Hard Soap, Powdered	10 lb.
	Water	60 lb.
b.	Whiting	16 lb.
	Magnesium Oxide	4 lb.
c.	Alcohol	10 lb.

Make solution *a* using boiling water, add the abrasives *b*. Cool. Strain or mill. Stir in *c*.

No. 4

a.	Hard Soap, Powdered	12 lb.
	Water	56 lb.
b.	Whiting	22 lb.
c.	Alcohol	10 lb.

Dissolve *a* hot, add in *b* with agitation. Cool. Strain or mill. Add *c*.

No. 5

a.	Methyl Cellulose	2.0 lb.
	Water	30.0 lb.
b.	Soap Bark	2.0 lb.
	Water	40.9 lb.
c.	Whiting	20.0 lb.
	Iron Oxide Red	5.0 lb.
d.	Salicylic Acid	0.1 lb.

The (boiling) water is poured on *a*. The dispersion is allowed to stand over night. The next morning, make up *b* using boiling water, strain it, and add to *a*. Add *c* and *d* for preservation.

No. 6

Precipitated Chalk	10 oz.
Quassia (Ground)	1 oz.
Ammonium Carbonate	1 oz.

Grind together to form a uniform powder. Apply with a wet rag.

Paste for Wax Calf Leather

Add 5 lb. of flour to sufficient water until a fairly thin mixture is obtained. Then cut up 1 lb. of soap into small pieces and add to this mixture. Also add 1 qt. of cod oil, 4 oz. of nigrosine and ½ lb. of glue that has been thoroughly soaked in 2 qt. of water. Boil this entire mixture for at least half an hour and then allow it to stand for 8 to 10 hours. Add sufficient water to thin it so that it can be fed through a machine if necessary. Apply a light coat of this thinned mixture to the leather and then hang the stock up until it is almost dry. Next gloss the leather on a jack and hang it up again and allow it to remain until the mixture is bone dry before applying any finish.

Leather Cleaning and Polishing Stick
British Patent 456,281

A mixture of white ceresine (100 g.), carnauba and bleached montan waxes (60 g.), shellac wax and white ozokerite (15 g.), and coloring matter dissolved in white stearine is cast into a mould with conically tapered apertures. The material is applied to the leather with a special pad of soft material.

Belt Wax

Rosin	25 kg.
Paraffin Wax	15 kg.
Japan Wax	10 kg.
Tallow	50 kg.
Lanosyn	20 kg.
Turpentine, Venice	10 kg.

White Shoe Cleaner Formulation

Cleaners for shoes are almost as old as shoes themselves. No part of our wearing apparel gets dirty so quickly, or needs cleaning so often as do our shoes. This is especially true of light colored shoes.

This so-called cleaning operation is really a two stage task. One is the removal or near removal of dirt or foreign matter, the other is the reconditioning of the surface to simulate that of the new shoe. This undertaking is usually achieved with greater or less success with a single composition of the present day types. However, the effectiveness of the present day cleaner is largely measured by its ability to form a successful coating of great hiding power. The actual cleaning operation or dirt removal may be accomplished by either brushing dry or wet, or wiping while wet with water or the particular shoe cleaner.

Types of Cleaners

One of the early varieties of cleaners was a bar of chalk which was rubbed on the shoe to renew its appearance. This had in its favor ease of application, relatively low initial cost, as well as cost per application. The cleaning job, however, was short lived, and the wearer experienced the additional difficulty of readily dusting off on the clothes. This product is still offered to the limited consuming public who still prefer this type. It is prepared by kneading a white chalk such as calcium carbonate with a minimum of water carrying in solution a small amount of glue or other adhesive. This paste is then placed in molds, pressure applied to form the mass to the shape of the mold. Heat is applied to drive off the water. On removal from the mold the bar or cake possesses the desired firmness, yet it is sufficiently loosely bound to permit the particles to be readily transferred from the stick to the shoe surface. A representative composition of this type is:

Calcium Carbonate	99	lb.
Animal Glue	0.995	lb.
Sodium Salicylate	0.005	lb.
Water	3	gals.

The sodium salicylate is dissolved in about ¼ of the water. The glue is allowed to soak in the water for several hours. The mass is then heated in a water jacket until all the glue passes into solution. The rest of the water is then added. The calcium carbonate is placed in a kneading machine. While the machine is operating the glue solution is sprayed in through a large number of small jets which disperse it throughout the mass.

Liquid types of cleaners came next, and these were paralleled by the paste form because of the concurrent popularity of the collapsible tube as a convenient container. Representative compositions of the early liquid types were made up as follows:

Lithopone	22	lb.
Dextrin	3	lb.
Borax	0.5	lb.
Water	74.5	lb.

The early paste forms were of the same composition, except only about one-third of the amount of water was used; this was sufficient to make a paste of the viscosity desirable for collapsible tubes.

All types of cleaners are made up essentially of two elemental constituents: a pigment and a vehicle. This automatically characterizes them as a typical coating composition. Seldom, however, is either component a single substance, but rather a mixture of several of the same general type, each contributing a desirable property by its addition in properly formulated products.

The vehicle in turn is made up of a volatile and a non-volatile portion in the liquid. Certain of the paste type of cleaners, and also the solid forms of cleaners, which come in sticks, cakes or shallow cans, contain only a very small percentage of vehicle, all of which is non-volatile.

There are essentially two forms of vehicle mixtures: the water and the organic solvent types. Obviously, the non-volatile constituent of the vehicle must be more or less soluble in the volatile solvent to facilitate satisfactory application and formation of a continuous uniform coating film.

In lower priced liquid cleaners the water type of vehicle is invariably used. It usually carries a non-volatile vehicle consisting of some water soluble gum or resin. Very often the carbohydrate gums, such as the pentosans and pentose sugars, are employed. In these groups are included such gums as arabic, acacia, senegal, tragacanth, karaya, locust bean gum, and plant mucilages like quince seed and Irish moss. Treated starches and the dextrins also act in a similar manner. Of course, water solutions of glue, gelatin, the alginates, alkali caseinates, agar, blood and egg albumen may also be used. In addition, there are now available several types of water soluble resins which serve excellently in this role. As water solutions of these products are unstable as well as excellent culture media for bacteria and mold growths, adequate amounts of preservatives must be included to act as inhibitors. Toxic inorganic salts and the phenolic types of preservatives are in general use.

Representative compositions in this class are made up in accordance with a general formula as below:

Mixed Pigments (Lithopone, Zinc Oxide, etc.)	25 lb.
Vehicle (Dextrine, Arabic, Glue, etc.)	6 lb.
Preservative (Sodium Salicylate, Thymol, etc.)	0.02 lb.
Water	69 lb.

The material cost of this type will vary from 15c to 25c per gallon depending upon the form of pigment and vehicle used.

With a demand for a waterproof form of cleaner, it became necessary to shift from water to the organic solvents. The petroleum hydrocarbons being the lowest in price and available with the proper boiling range, became the preferred solvent. However, if non-inflammability is a prerequisite, then more than three quarters of the petroleum hydrocarbon must be replaced with the carbon tetrachloride. The petroleum fraction which finds most extensive use is solvent naphtha with a boiling range of 200° to 300° F.

As the non-volatile vehicle for this type, the natural and synthetic resins are largely used. Many of these require the addition of more active solvents than the petroleum oils; for example, the aromatic hydrocarbons, and esters and ketones to bring them into solution. In fact the maximum amount of solvent naphtha is used as a diluent or thinner to a point just prior to precipitation of the resin from its solution in the active solvents.

In this same class, the lacquer type which is made up of a properly formulated solution of the cellulose esters such as the nitrate and acetate, might also be included. These cellulose derivatives are dissolved in their respective solvents and then diluted with non-solvents to their toleration point. To these products must be added suitable plasticizers in proper amounts to give the ultimate coating the desired flexibility. This type of composition is more frequently used as a permanent coating rather than for the uses referred to above. It is used for the trimming of the edges of the soles and the side faces of the heels, giving them a good wearing surface which dries to a hard permanent gloss in several minutes. A lacquer for this purpose is made up according to the following formulation:

Titanium Dioxide	25 oz.
Cellulose Nitrate (½ sec. viscosity)	8 oz.
Ester Gum, Pale	6 oz.
Dibutyl Phthalate	6 oz.
Ethyl Lactate	8 oz.
Butyl Acetate	12 oz.
Butanol	10 oz.
Toluol	25 oz.

Among the natural resins used in the solvent type of cleaner are dammar and extra pale rosin. Shellac, mastic, sandarac, etc. could be used, but would require alcohol as the solvent. The synthetic resins include pale ester gum, cumar, phenol-aldehyde, vinyl esters, glyceryl-phthalate and the like. These are worked into a solution in a manner similar to that described for the cellulose esters. Plasticizers are added to these gums and are of the same general type as for the cellulose derivatives, but include the various fatty glycerides. This variety would then be formulated as follows:

Mixed Pigments (Lithopone, Zinc Oxide, etc.)	22 oz.
Vehicle (Pale Ester Gum, Dammar, etc.)	4 oz.
Plasticizer (Tricresyl Phosphate, Castor Oil, etc.)	1 oz.
Solvent Mixture:	
Active Solvent (Ethyl Acetate)	18 oz.
Diluent (Solvent Naphtha)	55 oz.

The agent primarily responsible for the final appearance of shoes so treated is the pigment. This is the only visible component, and upon its value rests most of the merit of the dressing. It gives to the surface its seeming cleanliness, freshness and new-like appearance. The vehicle, however, determines the longevity of these properties, barring accidents. The cheapest of these pigments is calcium carbonate as whiting, then certain clays, Abestine, etc. The zinc pigments such as lithopone, zinc oxide and zinc sulphide are more costly on a pound basis, but as they require less to give equivalent hiding power and have better whiteness, they are of greater economic worth. This is equally true of the titanium pigments. Pure titanium dioxide is almost prohibitive because of its cost, but when used with calcium or barium sulphate as extenders it is almost as effective at a substantially reduced cost. These pigments are used in both the water and solvent types.

The emulsion type variety is a hybrid between the solvent and water types. It consists of an emulsion of the oil in a water type. A suitable emulsifying agent is added to a resin solution as above described, and at least half of the volatile solvent replaced by water. It is considered by some as a general utility composition. It can be formulated to be nearly non-inflammable and almost waterproof. It works nearly as effectively as a dressing for leather as for cloth. A typical composition under this classification is:

Titanium Dioxide	5 oz.
Barium Sulphate	15 oz.
Gum Dammar	4 oz.
Carbon Tetrachloride	10 oz.
Solvent Naphtha	13 oz.
Triethanolamine Linoleate	3 oz.
Water	50 oz.

In preparing this product, the carbon tetrachloride is mixed with the solvent naphtha and the gum dammar is dissolved in this mixture. This pigment combination is obtained already mixed and is incorporated with the above solution. The triethanolamine linoleate is dissolved in the water which should preferably be around 60° C. This is agitated vigorously with a suitable electric mixer while the pigment, gum and solvent mixture is being slowly added. Better results and a more permanent emulsion are obtained if this composition is passed through a colloid mill.

In compounding a suitable ''Shoe White'' certain ratios of the components are fairly closely adhered to in most of the satisfactory brands now on the market. The ratio of the dry pigment to the total weight of the finished product is between 15% and 30% depending on the type of pigment used. To this is usually added about 4% (all per cents are based on the total weight of the finished product) of Asbestine to prevent packing of the pigment. If the product is of the water type, 5% to 7% of the proper type of gum is used. In addition a thickening gum such as tragacanth is added to give satisfactory body or viscosity to further prevent pigment settling and also to improve the flowing qualities of the preparation. A fraction of a per cent of the preservative is added and a very small amount of a blue dye or pigment is added to correct the color. It has recently become popular to add a small amount of the proper type of perfume to increase the sales appeal. The above is of course subject to wide variations depending upon the type, use, and price requirements for the product in mind.

In fabricating these compositions it is quite essential that the pigment be thoroughly divided and wet with the vehicle. This operation may be performed in a ball or bar mill, or in the usual pigment rolls used by the paint manufacturers. In the compounding operation the vehicle is dissolved in the solvent, and the pigment added to this mixture. This product should be passed through a fine screen of 100 mesh, and then allowed to stand for several hours to allow the entrapped air to be released before packaging.

Most of these compositions described have to be swabbed on, and result in a fairly heavy layer for the finish. As each subsequent application of these solutions has the capacity of dissolving the residue of the preceding treatment, it is desirable to make a two operation job out of cleaning. This should consist of: First, the cleaning of the surface using the preparation as the cleansing agent through the solvent action of its vehicle and solvent. The rag, paper, cotton or dauber will carry most of the removed dirt (possibly back into the bottle containing the cleaner). Second, the flowing on or swabbing of the preparation as a coating composition to hide the spots and stains, leaving a uniform smooth matte surface simulating new shoes.

While many of these types of compositions are fairly meritorious products, they have many shortcomings and much remains to be done in the further development of products which are more effective, easily applied, and whose useful life is longer.

White Shoe Polish

Formula No. 1

Sodium Silicate	40	lb.
Water	60	gal.
Trisodium Phosphate	16	lb.
Soda Ash	1	lb.
Acetone	5	gal.
Gum Tragacanth (1% Solution)	6	gal.
Gum Arabic	2	lb.
Titanium Dioxide	8	lb.
Lithopone	180	lb.
Moldex or Other Preservative	½	lb.

No. 2
(Oil-Paste)

Carnauba Wax	3.5 oz.
Beeswax, White	3.0 oz.

Ozokerite (68–70° C.)	3.0 oz.
Ceraflux	3.0 oz.
Turpentine	40.0 oz.

No. 3

The following formula gives a white shoe dressing equally good for buckskin, leather and canvas. The pigment gives the minimum settling and is easily redispersed on shaking. Based on a new type of emulsion (water-in-oil) a dressing is obtained with the least amount of "rub-off".

Diglycol Oleate	5 lb.
Naphtha	20 lb.
Toluol	25 lb.
Titanox C	30 lb.

Mix the above together, wetting the pigment thoroughly.

Then add with high speed stirring:

Hydrowax Liquid N. L.	60 lb.
Water	20 lb.

Finally add with high speed stirring:

Trichlorethylene	40 lb.
Diglycol Oleate	1 lb.

No. 4

Methyl Cellulose	2 oz.
Water	100 oz.
Zinc Oxide	25 oz.
Magnesium Carbonate	5 oz.
Perfume	0.3 oz.
Gelatin	2 oz.
Tragacanth, Gum	2 oz.

No. 5

Casein	4 oz.
Triethanolamine	½ oz.
Titanium Dioxide	20 oz.
Whiting	4 oz.
Phenol	1 oz.
Clovel to suit for odor	
Water	70½ oz.

No. 6

Calcium Carbonate, Precipitated	5 kg.
Magnesium Carbonate	9 kg.
Zinc White	3 kg.
Carageheen Moss Mucilage (2%)	90 kg.
Preservative (of the Para Hydroxy Benzoate type)	0.25 kg.
Formalin (40%)	2 kg.

White Shoe Dressing

a.	Triethanolamine Oleate	3 oz.
	Naphtha	10 oz.
	Carbon Tetrachloride	11 oz.
	Spirit Varnish	6 oz.
b.	Titanium Dioxide	10 oz.
	Precipitated Chalk	10 oz.
	Water	50 oz.

Add *a* to *b* slowly with vigorous mixing with a high speed mixer. For maximum stability run through a colloid mill.

WHITE SHOE DRESSINGS

Ingredients Formula	No. 1	No. 2	No. 3	No. 4	
Titanox A, W.D.	15	15	15	15	oz.
Gum Arabic	5	4	5	..	oz.
Bentonite	1½	..	1½	1½	oz.
Pine Oil	1	..	1	..	oz.
Preservative (Moldex)	1/10	1/10	1/10	..	oz.
Water	77	80	77	78	oz.
Castile Soap, Powdered	..	½	..	¼	oz.
Glue	..	..	..	5	oz.

White Kid Cleaner

a.	Carnauba Wax, Gray	50 g.
	Montan Wax, Bleached	50 g.
	Paraffin Wax (50/52° C.)	20 g.
	Japan Wax	20 g.
	Rosin	15 g.
	Diglycol Stearate	10 g.
	Potassium Carbonate	32 g.
	Water	600 g.
b.	Turpentine	150 ml.
	Benzene	100 ml.
	Trichlor Ethylene	150 ml.
	Acetone	50 ml.

Boil *a* together with stirring, until a homogeneous emulsion has been formed. Cool to 40° C., and add the solvents *b*. Stir until cooled.

White Leather Polish

A white cleaner which has stood the test of application by a large number of retail shoe dealers and given quite general satisfaction is made as follows:

a.	Shellac Solution:	
	Super-Fine Wax Free Bleached Shellac	16 oz.
	Borax	3 oz.

Final volume, 1 gal. with water.

To the shellac and borax, add 3 qt. of water and boil for one hour in a double jacketed kettle. At the end of 1 hour, remove from kettle and permit to cool, then add enough water to make 1 gal. and strain through a double layer of cheesecloth.

b. **Wax Emulsion:**

Carnauba Wax (Yellow)	16 oz.
Castile Soap (Pure)	8 oz.

Final volume, 1 gal. with water.

The wax is broken into very small pieces and the soap is shaved or diced into small pieces. Place into a double jacketed kettle and heat until the mass is homogeneous. A very small amount of hot water may be added to attain a homogeneous mass. When both are melted, add hot water in small amounts, keep the mass boiling and well stirred all this time. After each addition of hot water, the mass must be stirred to a smooth petrolatum-like consistency. Addition of hot water is continued until the mass becomes quite liquid, but it must remain translucent, finally heating is discontinued and enough water is added to obtain 1 gal. in volume. The emulsion is correctly made, if and when, on dilution with ten parts of water a clear opalescent solution is obtained.

Formula:

a.	(Above)	½ pt.
	Water	4 pt.
b.	(Above)	½ pt.
	Titanium Oxide	2 lb.

Mix in the order given and grind in a ball mill or a burrstone mill. Then add:

Water	1 pt.
Methyl "Cellosolve"	2 pt.

The above formula is subject to change to meet the requirements of different types of leather. It was especially developed for white elk leather. It is applied with a soft cloth or sponge with gentle rubbing to remove dirt, then a thin coat is applied which is permitted to dry. When dry, it is brushed up with a soft cloth to obtain a polish.

Shoe Polishes

Formula No. 1

Base

Paraffin Wax (50/52° C.)	**2.50 kg.**
Carnauba Wax, Pale	**0.65 kg.**
Beeswax, White	**0.80 kg.**
Turpentine	**10.00 kg.**

Dyes for this Formula

Brown:	
Brown 1435	**2 g.**
Brown 3148	**10 g.**
Orange, in Pieces	**2.5 g.**
Pale Brown:	
Brown 1435	**1 g.**
Brown 3148	**6 g.**
Orange, in Pieces	**1.5 g.**
Dark Brown:	
Brown 1435	**1.5 g.**
Brown 3148	**13 g.**
Orange, in Pieces	**3 g.**
Reddish Brown:	
Brown 1435	6 g.
Brown 20162	6 g.
Brown 17484	6 g.
R. L. Ponceau	1 g.

No. 2
Brown

Carnauba Wax	2 lb.
Candelilla Wax	2 lb.
Wax L33	12 lb.
Ozokerite Wax (74–76° C.)	1.5 lb.
Paraffin Wax	5 lb.
Turpentine	50 lb.

Oil Soluble Brown as required.

Melt the waxes together, add the oil soluble color and stir thoroughly. Allow the temperature to drop to 85° C., add the turpentine. Stir thoroughly. This can be poured at 48° C. and air cooled.

No. 3
(Water Paste Type) Black

Montan Wax (Bleached)	10 lb.
Montan Wax (Crude)	5 lb.
Color L34	6 lb.
Candelilla Wax	4 lb.
Carnauba Wax	2 lb.
Paraffin Wax	5 lb.
Diglycol Stearate	3 lb.
Soap (Powdered)	2 lb.
Water	50 lb.
Turpentine	70 lb.

Melt the waxes, color and diglycol stearate together. Dissolve the soap in the water which must be boiling and add slowly with stirring to the melted waxes. When the temperature has fallen to 80° C. add the turpentine slowly with thorough agitation. Pour at 55° C.

For colors, use oil soluble colors dissolved in the waxes.

No. 4
Black

a.	**Montan Wax, Crude**	**5 kg.**
	Ceresin	**15 kg.**
	Beeswax	**5 kg.**
	Nigrosin, Oil-Soluble	**2 kg.**
b.	**Turpentine**	**50 kg.**

Melt *a* at 90–100° C. on a waterbath, cool to 80–90° C., and add *b*. Pour into cans at 40° C.

No. 5
Black

Paraffin Wax	**8.3 kg.**
Dye, Black*	**3 kg.**
Montan Wax	**3.5 kg.**
Carnauba Wax	**2.9 kg.**
Turpentine	**48.0 kg.**

* **Dye:**

Montan Wax, Crude	**1 kg.**
Oleic Acid	**1 kg.**
Nigrosin Base	**1 kg.**

Melt waxes in the given order in a steam-heated kettle, not heating above

90° C. The dye is added to the melted waxes. To the whole, the solvents (at room temperature) are added in thin jet, with good stirring.

Fill up at 40/45° C. into cans.

No. 6

Black

Montan Wax, Crude	15 lb.
Carbon Black	3 lb.
Color L34	2 lb.
Wax L33	15 lb.
Carnauba Wax No. 3	2 lb.
Candelilla Wax	1 lb.
Paraffin Wax	17 lb.
Turpentine	70 lb.

Melt the crude montan wax and color L34. Disperse the carbon black thoroughly and add the other waxes. Allow the temperature to fall to 85° C. and add the turpentine. Stir thoroughly. This can be poured at 48° C. and air cooled.

No. 7

Black

Carnauba Wax	4989 g.
Solvent Naphtha	7000 g.
Stearic Acid	1360 g.
Nigrosin, Oil Soluble	907 g.
Diglycol Laurate	200 g.
Triethanolamine	450 g.
Water	29937 g.
Nigrosin, Water Soluble	453 g.

Dissolve the water-soluble Nigrosin in the water, add the triethanolamine, and, while hot, the stearic acid and diglycol laurate. Take up to a boil.

Add to this the solution of carnauba wax and the oil-soluble nigrosin in the naphtha, at 85–90° C. Stir until cold.

No. 8

Non-Alkaline

It has recently been shown that alkalies and alkali-soaps used in the manufacture of shoe creams cause the leather to dry out and crack. The following formula contains no borax, caustic soda, caustic potash or amines.

Carnauba Wax	6 lb.
Ceresin Wax	3 lb.
Candelilla Wax	3 lb.
Turpentine	5 lb.
Lemongrass Oil	½ lb.
Light Mineral Oil	1 lb.
Diglycol Stearate	5 lb.

Heat together below 90° C. and stir until clear. Pour slowly while stirring with high speed stirrer into

Water (Boiling) 100 lb.

Stir until temperature falls to 70° C. The finished product is snow white, applies easily and rubs to a high gloss. If a paste polish is desired reduce the water to about 50 to 60 parts. If a colored paste is desired an aniline dye is dissolved in the water used.

Shoe or Floor Polish

Formula No. 1

a.	Carnauba Wax	5 g.
	Ceresin Wax	15 g.
	Rosin	30 g.
	Paraffin Wax	60 g.
	Naphtna	165 g.
b.	Glue	35 g.
	Water	75 g.
	Soft Soap	3 g.
	Starch	0.1 g.

Warm *a* and *b* separately and stir until uniform then mix together while stirring vigorously.

No. 2

a.	Beeswax	100 g.
	Paraffin Wax	20 g.
	Carnauba Wax, Gray	8 g.
	Naphtha	80 g.
	Turpentine	70 g.
b.	Water	200 g.
	Potassium Carbonate, Calcined	6 g.
	Glue	35 g.

Method as above.

Liquid Shoe Polish

Formula No. 1

Neutral

I. G. Wax O	2.25 oz.
I. G. Wax E	3.15 oz.
Paraffin Wax	1.8 oz.
Beeswax	0.9 oz.
Montan Color	2 oz.
Water	3.15 oz.
Potassium Carbonate	0.85 oz.
Turpentine	41 oz.

No. 2

Carnauba Wax	1.5 oz.
I. G. Special Wax	2.5 oz.
Ozokerite (68°–70° C.)	1.5 oz.
Carnauba Wax, Residue	12 oz.
Paraffin Wax (50°–52° C.)	7 oz.
Turpentine	50 oz.

Colored with oil soluble colors.

No. 3

Carnauba Wax	30 g.
Paraffin Wax	45 g.
Ozokerite	10 g.
V.M.&P. Naphtha	215 cc.
Turpentine	20 cc.
Stearic Acid	20 g.
Triethanolamine	7.5 g.
Water	650 cc.
Oil Soluble Black	15 g.
Water Soluble Black	5 g.

No. 4
Emulsion Type

I. G. Wax N	1.5 oz.
Montan Wax, Bleached	4 oz.
Japan Wax	1 oz.
Rosin	0.25 oz.
Potassium Carbonate	0.6 oz.
Soap, Powdered	0.4 oz.
Turpentine	22 oz.
Water	60 oz.

Shoe Polish-Paste
Formula No. 1

Candelilla Wax	30 g.
Paraffin Wax	45 g.
Ozokerite	10 g.
Turpentine	20 cc.
V.M.&P. Naphtha	80 cc.
Oil Soluble Black	15 g.

No. 2
Emulsion Type

Montan Wax Crude	4 oz.
Japan Wax	0.3 oz.
Paraffin Wax (50°–52° C.)	1 oz.
Carnauba Wax Residue	2 oz.
Carnauba Wax	0.5 oz.
Rosin	0.7 oz.
Beeswax	0.3 oz.
Potassium Carbonate	1.15 oz.
Water	30 oz.
Turpentine	10 oz.

No. 4

Albacer	15 oz.
Ceraflux	30 oz.
1G—Wax—OP	4 oz.
Hexalin	4 oz.
Varnolene or Naphtha	47 oz.

Melt the first four items, heating to 130° C.

Remove from heat and add the varnolene.

This gives a white wax paste which spreads well, shines easily and takes a high polish. For a black paste add oil soluble nigrosine to give the desired shade. For a tan polish, add oil soluble brown to produce a light or dark tan as desired.

Tropical Shoe Creams
Black

Montan Wax, Crude	4.5 kg.
Nigrosin Base	1.2 kg.
Carnauba Wax, Gray	5.5 kg.
Paraffin Wax (54/56° C.)	8 kg.
Ozokerite, Yellow (66° C.)	1.3 kg.
Candelilla Wax	1.3 kg.
Shellac Wax	1.2 kg.
Turpentine, American	77 kg.

Mahogany

Carnauba Wax, Gray	8.5 kg.
Ozokerite, Yellow	3.5 kg.
Paraffin Wax (54/56°)	4.5 kg.
Shellac Wax, Refined	0.5 kg.
Sudan Brown 5B	0.1 kg.
Sudan Red 5B	0.05 kg.
Turpentine	83 kg.

Shoe Creams
High Temperature Pouring (75° to 80° C.)

Wax Mass:	
Crude Montan Wax	20 kg.
Paraffin Wax (50° to 52° C.)	10 kg.
Rosin	5 kg.
Saponifying Solution:	
Potassium Carbonate	6 kg.
Water	60 kg.
Dye Solution:	
Nigrosin T.	5.5 kg.
Water	50 kg.

Final additional water 50 kg.

Low Temperature Pouring High Grade Cream (40° to 50° C.)

Wax Mass:	
Crude Montan Wax	10 kg.
Beeswax	4 kg.
Carnauba Wax	1 kg.
Japan Wax	5 kg.
Shellac Wax	1.25 kg.
Saponifying Solution:	
Potassium Carbonate	1.5 kg.
Boiling Water	75 kg.
Borax	0.5 kg.
Diglycol Stearate	1 kg.
Palm Oil Soap	1.5 kg.
Dye Solution:	
Water	50 kg.
Nigrosin	5 kg.

Final additional water 150 kg.

Colored Water Creams

Wax Mass:	
Bleached Carnauba Wax	10 kg.
Japan Wax	5 kg.
Bleached Beeswax	2 kg.
Pale Rosin	0.5 kg.
Bleached Montan Wax	3 kg.
Stearin	0.5 kg.
Saponifying Solution:	
White Tallow Curd Soap	0.75 kg.
Potassium Carbonate	1.5 kg.
Caustic Soda, (36° Bé.)	0.25 kg.
Water	35 kg.
Turpentine	1 kg.
Dye Solution for Dark Reddish-Brown Cream (per 100 kg. of above mass):	
Brown R	350 gm.
Mars Red	250 g.
Nigrosin G	15 g.
Tartrazine X	50 g.

Final additional water 40 kg.

Saponified Shoe Cream

Formula No. 1

Montan Wax, Crude	10 g.
Montan Wax, Double Bleached	3 g.
Rosin	2 g.
Paraffin Wax (50/52° C.)	2 g.
Potassium Carbonate	2.2 g.
Soap, Castile	0.3 g.
Sodium Tetraborate	0.3 g.
Nigrosine, Water Soluble	2 g.
Metanil Yellow Dye	0.08 g.
Water	95 g.

Pour at 65° C.

No. 2

Montan Wax, Crude	15 g.
Paraffin Wax (40/42° C.)	20 g.
Rosin	5 g.
Potassium Carbonate	3 g.
Water	96 g.
Metanil Yellow	0.9 g.
Yellow Mandarin Dye, Water Soluble	0.8 g.

Pour at 40–45° C.

No. 3

Montan Wax, Double Bleached	15 g.
Paraffin Wax (40–42° C.)	20 g.
Rosin	5 g.
Potassium Carbonate	3 g.
Water	95 g.
Metanil Yellow	0.05 g.
Yellow Mandarin Dye, Water Soluble	0.1 g.

Pour at 40–42° C.

Shoe Stain:

a.	Montan Wax Crude	15 g.
	Rosin	2 g.
	Paraffin Wax (40/42° C.)	3 g.
	Potassium Carbonate	0.5 g.
	Soap, Castile	4 g.
	Water	65 g.
b.	Shellac	20 g.
	Sodium Tetraborate	7 g.
	Water	75 g.
c.	Nigrosin, Water Soluble	5.5 g.
	Water	25 g.

a, b, c, are prepared separately and then mixed together.

‘‘Polishing Dye’’ (or Polishing Ink) (to dye and polish shoes by means of a ‘‘rag wheel’’)

a.	Water	80 kg.
	Marseilles Soap	3 kg.
	Carnauba Wax	4 kg.
	Japan Wax	2 kg.
b.	Water	20 kg.
	Methyl Cellulose	1 kg.
c.	Turpentine Oil	1 kg.
	Citronella Oil	0.3 kg.

Boil the mixture *a*, when cooled, add the dispersion *b* which has been boiled separately. When cooled, add *c*.

Shoemaker's Waxes

Black, Soft:

Rosin	5 kg.
Paraffin	70 kg.
Beeswax	5 kg.
Asphaltum	20 kg.
Black Color	to suit

Black, Hard:

Rosin	10 kg.
Paraffin	45 kg.
Beeswax	5 kg.
Asphaltum	10 kg.
Black Color	to suit

Yellow, Soft:

Rosin	10 kg.
Paraffin	85 kg.
Beeswax	5 kg.
Yellow, Oil Soluble Color	to suit

Yellow, Hard:

Rosin	10 kg.
Paraffin	55 kg.
Beeswax	5 kg.
Yellow, Oil Soluble Color	to suit

Wax Polish

Carnauba Wax	6 kg.
Beeswax	4 kg.
Ceresin	4 kg.
Turpentine	70 kg.
Trichlor Ethylene	2 kg.
Oleic Acid	7 kg.
Triethanolamine	2.5 kg.
Water	75 kg.
Petroleum	40 kg.

Mix triethanolamine, oleic acid, and water, and take up to a boil. Melt waxes on a waterbath and thin with the solvents in the absence of open flames. Add now the hot soap solution and stir till a smooth emulsion has formed. Stir till cooled.

If the polish appears too heavy, thin with hot water.

Wax Polish

Bleached Beeswax	2 oz.
Carnauba Wax	6 oz.
Halowax No. 1013	4 oz.
Turpentine	20 oz.
Stearic or Oleic Acid	3.5 oz.
Triethanolamine	1.5 oz.
Water	63 oz.
Perfume	to suit

Melt the three waxes and add the turpentine with agitation. Prepare the soap solution by heating the triethanolamine dissolved in the water almost to the boil and adding the molten stearic acid or liquid oleic. The soap may also be prepared by heating the triethanolamine and water with stearic acid in powdered form. Run the former solution into the latter with agitation. Continue to agitate until cool. If properly made the emulsion is stable.

Hard Polishing Paste Wax

Shellac Wax, Bleached	2 oz.
I. G. Wax O	6 oz.
I. G. Wax OP	2 oz.
Ozokerite	3 oz.
Paraffin Wax	12 oz.
Turpentine	140 oz.

Polishing Wax

Carnauba Wax	10 kg.
Paraffin Wax	60 kg.
Japan Wax	15 kg.
Beeswax	15 kg.

Turpentine Wax-Polish

Carnauba Wax	4 kg.
Ozokerite, Refined	2 kg.
Paraffin, 50–52° C.	2 kg.
Sudan Yellow	2 kg.
Thinner (Turpentine, or Substitute	90 kg.

Emulsion Wax-Polish

a. Montan Wax, Double Bleached	7 kg.
b. Potash Soap	3 kg.
Caustic Potash	0.8 kg.
Dye, Water Soluble	2 kg.
Water	87.2 kg.

Add the hot *b* to the melted *a* in small portions with good agitation.

POLISHING, LAPPING AND TUMBLING

Abrasive polishing is the process whereby tool marks, scratches, etc., are removed from metals and other substances and a smooth finish secured. The work is done by abrasive grains or powders glued to the surface of polishing wheels or strapping belts. There are three divisions:

Roughing is done dry with abrasives in sizes numbers 24 to 60. Examples of roughing are plow polishing, for which synthetic abrasives are used; and automobile bumpers for which coarser grain is commonly employed.

Dry fining is the second operation. This is also done dry, but the sizes of grains used run from 70 to 120.

Finishing, sometimes called *oiling*, is the third operation, and is done with sizes 120 and finer. The wheel is first smoothed down a little and is then "greased" with lard oil, tallow, or suet. This improves the finish of the work. For a high color, beeswax or charcoal is used.

The exact size of grain used in the above operations will depend on the final finish required or the condition in which it is desired to leave the work for the next operation.

The purpose of *lapping* is to produce a true, accurate surface as well as a smooth one. This is done by rubbing the work on a carefully prepared master surface called a lap, the top side of which is filled with a fine abrasive powder. Lapping blocks are usually made of soft, close grained cast-iron and the abrasive powder is pressed in with a hard steel block or rolled in with a steel roller. The addition of the abrasive powder has to be repeated from time to time as the lap loses its sharpness. Cylindrical laps are charged by rolling them on a hard steel block covered with abrasive powder.

Tumbling is comparable to polishing in that it prepares metal surfaces for plating or ball-burnishing. The operation is performed by placing the articles in a revolving barrel with a charge of abrasive. The sizes of abrasive commonly used are Nos. 24 and 36. Tumbling is confined to small cast articles which must be easily and cheaply smoothed up. To obtain a lasting finish on such articles, the castings must be smooth and free from sand or scale.

Abrasives

Formerly emery was universally used for polishing. This abrasive is an exceedingly impure form of crystalline alumina, containing from 25 to 50 per cent of iron oxide, as well as other impurities possessing little or no abrasive value. These impurities make the grains soft and porous compared with high grade modern abrasives produced in the electric furnace. On this account emery grains quickly lose their sharpness in use.

Emery, like all other ores, is subject to wide variations in quality. The best Turkish emery contains from 60 to 65 per cent alumina. Some American emery contains less than 50 per cent alumina. Crystalline alumina is the part of the abrasive which makes it cut. The other ingredients are merely adulterants. Emery grains lack the rapid cutting qualities, the durability, and the uniformity of the manufactured abrasives.

Synthetic abrasives produced in the electric furnace are made by melting, purifying, and crystallizing bauxite. They contain upwards of 94 per cent crystalline alumina, are extremely hard and strong. They will carry a heavy cut and remain sharp where emery grains would soon become dull and useless. This difference in hardness is easily shown by the scratch test. They will scratch emery, but emery will not scratch them.

Polishing wheels, if properly set up with such abrasives, will do from two to six times as much work as wheels set up with emery, and will do the work quicker and better. This means a great saving of abrasive and glue, time used in setting up wheels, number of wheels required, and time lost in changing. They are also more uniform than emery.

Polishers sometimes assume that because these abrasives are harder than emery, that a high finish cannot be obtained with them. The following illustrations show the fallacy of this idea. Abrasive grains are cutting tools. A sharp tool will give a cleaner, smoother cut than a dull one. Depth of marks is determined by size of grain used. By selecting the proper grain size any desired finish can be obtained.

"Carbonite" or other synthetic abrasives of this type is a compound of carbon and silicon, made from sand and coke. It is never found in nature and is formed only at the high temperature of the electric furnace. The charge is packed around a core of granular coke, through which a powerful current is passed. The core soon becomes white hot and the heat gradually radiates through the charge, converting it into carbide of silicon.

Carbonite is nearly as hard as the diamond but the crystals are brittle. In granular form it finds its widest application in the granite and glass industries.

These abrasives are graded into many different sizes by passing them over silk screens of great accuracy.

Floated Flours of extreme accuracy and fineness are graded by means of an elaborate water flotation system. They are numbered 280, 320, 400, 500, and 600. For optical work, fine cutlery polishing, and similar operations.

Too much emphasis cannot be laid on the importance of buying good glue and preparing it correctly. Synthetic abrasive grains are harder and sharper than emery and will take heavier and cleaner cuts provided they are held securely to the polishing wheel. To accomplish this, good glue, properly prepared, must be used. It must be strong and tough, not brittle. Should the glue become brittle, it can be made more flexible by adding a small amount of glycerin.

Most of the glue manufacturers know what the requirements are and supply a high grade glue for the polishing trade. It costs a little more than common, impure glue, but is well worth the difference. Cheap glue always costs more in the end, because it wastes the abrasive.

Either ground or flake glue may be used, but the latter requires longer soaking. Soak ground glue in *cold* water for two to four hours; flake glue three times as long. Use pure water free from alkalis, acids, and other substances harmful to glue. Use definite weights of glue and water. Equal weights of glue and water generally will produce the right consistency for setting up grains from No. 20 to No. 60, although some glues require more water. For finer grains it will have to be thinned down a little. Grains cannot be properly imbedded in glue that is too thick. In every case the glue should be thin enough so that the grains will actually enter it and so be surrounded by it.

After soaking, the glue should be heated to a temperature of 145° to 150° for half an hour and then allowed to cool to 135°, the temperature at which glue is strongest. *Never allow the glue to boil.* Boiling will spoil any glue.

Glue heaters, using either electricity, gas, or steam are now obtainable with automatic temperature control. These will be found profitable wherever much polishing is done. In smaller plants, where an automatic heater is considered unnecessary, a glue thermometer will avoid any uncertainty about temperature. Glue pots made of aluminum are best, as they are easiest to clean, but copper pots are satisfactory.

Heat up only small batches at a time and never allow glue to remain in the pot overnight. Tests have shown that after heating for 12 hours glue loses more than half its strength. Therefore only freshly heated glue should be used, preferably within four (4) hours after heating. Pots should be cleaned thoroughly every night.

Polishing Wheels

Polishing wheels are made of a variety of materials. The most used wheels are those made of canvas, cloth, leather of various kinds, and wood (leather covered). Other materials used for polishing wheels include felt, composition (duck and rubber), sheepskin, walrus, and paper. The best kind of wheel to use depends on the character of the work and the finish desired.

A widely used type of wheel is the compress polishing wheel which is constructed by compressing the material radially and clamping it between steel flanges on iron centers. Compress wheels are usually made of leather or canvas, and can be had in various degrees of density. They make a strong, resilient and smooth cutting wheel, run true and hold the abrasive well. They are employed for almost every variety of polishing. Used dry or with oil and grease, they make an excellent finishing wheel.

Canvas Wheels are used for a wide range of work, including agricultural tools, stove parts, tubing, and a great variety of steel and cast iron parts. Canvas wheels, having their sections glued together, are excellent for roughing out. They are also used extensively for dry fining. They hold the abrasive well, and are readily cleaned with a buff stick or abrasive brick,—a much quicker and better method than washing off.

Glued Cloth Wheels are used for finishing shovel work, stoves, plows, and other agricultural tools. In the smaller sizes they are popular as a jobbing wheel for blacksmiths. Cloth wheels are made in a variety of grades, from both bleached and unbleached cloth.

Sheepskin Wheels also make an excellent wheel for fine finishing. The disks are cemented, stitched, or used loose. The loose disks, make a very soft, pliable wheel, often used for buffing and polishing irregular surfaces. The stitched wheels are used principally by the silver trade on soft metals. The cemented wheels make an extra good wheel for fine finishing on small work.

Felt Wheels are made of Mexican and Spanish felt and are employed for fine finishing, especially on stove work and cut glass work.

Bull Neck Leather Wheels are very efficient for oiling and finishing and are well adapted for quick work and hard service. Disks of the required diameter are cut from oak-tanned bull neck leather ¼″ to ¾″ thick and cemented together. Bull neck wheels are used for polishing forgings, stove trimmings, brass goods, tools and similar work.

Walrus Wheels are made from the thick hide of the walrus. Wheels up to 1½″ in thickness can be made without seams. Owing to the tough, resilient quality of walrus leather, it is particularly adapted for fine finishing. For such work walrus wheels enjoy the highest reputation. They are widely used for finishing cutlery, guns, pistols, brass, silverware, and wherever a fine polish is required on iron or steel.

Wood Wheels (Leather Covered) were formerly used for nearly every sort of polishing. With the advent of pliable wheels of canvas and sheepskin, their use has become restricted mainly to polishing flat surfaces or to work requiring a square corner. They are widely employed where wheels of large diameter are used, as in concaving shears and scissors. They are built up in layers with the grain of alternate layers crossing and glued together under pressure. The face is then covered with a strip of leather (back, bull neck or other kind) 3/16″ or ¼″ thick. Where wood wheels are used for fine finishing a double thickness of leather is desirable. This makes a more resilient working face suitable for fine work.

Solid Paper Wheels are another of the old styles. Their use now is largely limited to the tableware and silver trades. They may be readily balanced, will maintain their shape and run true.

Speed of Polishing Wheels. Make certain that all polishing wheels are operated at the proper surface speed. For ordinary work the surface speed should be about 7,500 feet per minute. Where small polishing wheels are used and the pieces are not large, a lower wheel speed may be used with good results. Slower speeds are also used for coloring work. If wheels are run too fast the glue may be overheated and melt. If too slow, the work is likely to tear the abrasive from the face of the wheel. This causes waste, shortens the life of the wheel and impairs the finish. A few trials will soon determine the best speed for any particular operation. It is a good plan to occasionally use a revolution counter to make sure the speed is not varying on account of loose belts or other cause.

Strapping Belts

Strapping Belts are made of canvas, rubber, and leather and are useful for polishing recesses which cannot be reached with a polishing wheel. They are also used for finishing irregular surfaces, particularly on brass work. The belt runs over a pair of pulleys. The face is coated with glue and abrasive, the same as that of a polishing wheel. For flat surfaces a rest underneath or behind the working face is often provided to help support the belt which is from 4″ to 18″ wide, according to the size of the pieces to be finished. Belts supported in this way are used for surfacing parts of airtight stoves, flat irons, valves, etc. Strapping belts should be operated at about 2,800 feet per minute.

Automatic Polishing Machines

A recent development in polishing is the automatic machine for flat work. In one such machine, several polishing wheels are mounted above a revolving circular table which carries the work. The latter is held in place by magnetic chucks or mechanical fixtures. Roughing, dry fining, and finishing may all be done on one revolution of the table. The capacity is very large. For example, in the machine above referred to, as many as 600 flatiron bases can be polished in one hour with one operator. Other machines of even larger capacity are available, but these employ more operators.

PREPARING AND SETTING UP POLISHING WHEELS

It has long been customary to remove the glue and used grains from polishing wheels by washing on water rollers. There are serious objections to this. Water is ruinous to leather and may warp a wood wheel. It is much better to dry clean all polishing wheels with an abrasive brick. This should be at least three numbers coarser than the grains on the wheels. Special wheel dressing machines also are available and are coming into more general use.

Where oil or grease has been used in the polishing operations, be sure that the wheel is thoroughly cleaned and dried before setting it up. Glue will not adhere strongly to an oily surface.

Balancing and Truing

Polishing wheels must be kept in balance to give the best results. This can readily be done on balancing ways made for the purpose. Small pieces of lead should be nailed on the light side until the wheel will stand in any position. Some polishing wheels are provided with balancing holes and weights.

After the wheel is balanced it may be put on an arbor and speeded to see if it runs true on the face; if not, it may be trued by holding an old file against the face. The file should be supported on a solid rest. A wheel trued in this way will come in contact with the work throughout its entire periphery.

Setting Up

After all oil and moisture have been removed from the polishing wheel, and it has been made to run true, apply a sizing coat of glue and dry for four hours. Then apply another coat and roll and pound the wheel in the abrasive grains. The work should be done quickly to avoid premature cooling of the glue. For the same reason it is important to preheat both the wheel and the grains to a temperature of about 120° F. The work should be done in a room arranged for the purpose so that drafts cannot strike the wheel and chill the glue. The grains should be put in a trough (heated where possible) and this should be long enough to allow one complete revolution of the wheel. This will help to get the grains on evenly. After coating, the wheel should be dried.

On finishing wheels only one coat of abrasive should be used, but on roughing wheels two or more coats may be applied to lengthen their period of service. In the latter case the wheel should be dried between each coat.

If all wheels are set up by one experienced man it will result in economy of materials and increase in the efficiency of the polishing department.

Drying

Recent investigations have shown that most of the variation in performance of polishing wheels is directly due to faulty drying. Glue develops its maximum strength when allowed to set slowly and naturally. The dry room temperature should not exceed 85° F. If drying is hastened by using higher temperatures the glue will shrink away from the grains and fail to grip them strongly.

Of equal or greater importance in drying are atmospheric conditions. Too much moisture in the air will prevent the glue from setting and holding properly. Wheels dried in a hot, moist atmosphere have a short life. In damp weather the relative humidity of the air is high. This condition is likely to be most serious in plants located near the ocean or close to lakes and rivers, but at times it may be a prolific source of trouble almost anywhere. Tests show that with a dry room temperature of 75° to 85° F. excellent results are obtained if the relative humidity is kept between 45% and 55%. Every plant should have an hygrometer to determine the humidity and if the humidity is frequently low or high, an air conditioning cabinet should be installed.

Wheels should be thoroughly dry before they are used. Forty-eight (48) hours is necessary for glue to set. If used before the glue is thoroughly set, the wheels will wear out too fast.

If production per polishing wheel falls off, drying conditions should always be checked up first. If the relative humidity is above 55 or the temperature *above 85° F. it will not be necessary to look farther for the cause of the difficulty.*

Using Synthetic Abrasive Wheels

Avoid using too much pressure. With a dull abrasive such as emery, heavy pressure is often necessary. But synthetic abrasives are hard and sharp. On this account they work quickly, with less pressure. Too much pressure tears out the grains and shortens the life of the wheel.

To break in a finishing wheel set up with synthetic abrasive rough out or dry fine a few pieces first to take off the harshness. Add a little grease or other lubricant now and then. In finishing it is particularly important to avoid excessive pressure. To force the wheel will make it cut deeper than necessary, and may also cause it to heat and break out.

If synthetic abrasives are used in the way described and the foregoing suggestions are followed in regard to glue, setting up, and drying the wheels, *one setting will last from* 2 *to* 6 *times as long as emery* and the work will be done faster and better. Less abrasive grains and fewer polishing wheels will be needed, more pieces can be polished per day, time will be saved in setting up and changing wheels, and the finish will be better and more uniform.

Abrasive
Russian Patent 45,412

Aluminum Oxide	97.75 oz.
Antimony	1.50 oz.
Wood Charcoal	0.75 oz.

Form then bake at about 1700° C.

Abrasive Polish Pastes
Formula No. 1

a.	Paraffin Wax (50/52° C.)	5 g.
	Diglycol Stearate	16 g.
b.	Oleic Acid	25 g.
c.	Whiting	20 g.
	Magnesium Carbonate	30 g.

Melt *a,* add *b,* and at last *c* in small portions.

No. 2

a.	Ammonium Linoleate	20 g.
	Turpentine	15 g.
b.	Alcohol	5 g.
c.	Water	15 g.
d.	Whiting	45 g.

Dissolve *a,* add *b, c,* and ultimately *d.* Mix thoroughly.

Abrasive Emulsion Polish

1.	Naphtha	60 kg.
	Oleic Acid, Distilled	5 kg.
2.	Triethanolamine	2 kg.
	Water	125 kg.
3.	Naphtha	5 kg.
4.	Ammonia	2–3 kg.
5.	Clay	1 kg.
	Tripoli	11 kg.
	Aluminum Oxide	77 kg.

To the solution 1 add with good agitation the solution 2. When emulsified, add 3, 4, and finally the mixture 5 to get a paste.

Liquid Abrasive Polish

Methyl Cellulose Solution (1%)	20 oz.
Water	40 oz.
Clay, Powdered	30 oz.
Emulphor O (I. G.)	0.5 oz.
Chromium Oxide	6 oz.
Oleic Acid	4 oz.
Spindle Oil	4 oz.
Gasoline	5 oz.
White Spirit	30 oz.
Glass Dust	50 oz.
Alcohol	5 oz.

Buffing Compound
U. S. Patent 2,078,876

Formula No. 1

100 lb. oleo-stearine and 20 lb. of double-pressed stearic acid is placed in a kettle and melted by being brought to a temperature slightly above 130 degrees F.

To this hot mixture, add five lb. of triethanolamine and allow the resultant mixture to stand, while still hot, a sufficient time for thorough commingling and to enable the chemical reaction of saponification to be completed.

The above mixture is fed into a suitable mixing machine, which has been previously heated, and there slowly commingled with 220 lb. of tripoli powder and 180 lb. of powdered flint, this mixing operation generally requiring about one and one-half hours. The compound is transferred to suitable molds in which it is allowed to solidify and harden into cakes of suitable size and shape for convenience in application to buffing wheels.

No. 2

White Buffing Compound

50 pounds of stearic acid is melted and mixed thoroughly with 37½ pounds of beef tallow. To this mixture is added two pounds of triethanolamine, and the resultant mass is allowed to stand till completely commingled and saponified.

While maintaining the above mixture at 130 degrees F., 215 pounds of powdered white silica is slowly added, as before, and the compound placed in molds to solidify and harden.

No. 3
White Stainless Buffing Compound

Stearic Acid	14 lb.
Beef Tallow	9¾ lb.
Triethanolamine	2 oz.

Warm and mix as above and add Aluminum Oxide, White 72 lb. and mix as above.

Diamond Dust Abrasive
German Patent 626,512

Diamond Dust	20–30 g.
Iron Powder	80–70 g.

Heat until sintered and press into desired shape.

Dental Grinding Wheel Composition
British Patent 466,065

Sodium Silicate	15–30%
Shellac	½– 5%
Glass, Powdered to make	100%

Mold and bake at a temperature high enough to "burn-out" the organic material.

Jeweler's Polishing Bar

Refined Tallow	8 oz.
Iron Oxide	2 oz.
Oxalic Acid	1½ dr.

Powder the acid, mix with oxide and mold with the tallow into bars like soap. The oxide must be quite free from grit, or it may scratch valuable work. It may be prepared by calcining equal quantities of oxalic acid and iron sulphate in a crucible for about fifteen minutes with a good draught.

White Polishing Paste
Formula No. 1

White Petrolatum	9 oz.
Kieselguhr	3 oz.
Paraffin Wax	1 oz.
Whiting	1 oz.
Sodium Thiosulphate	1 oz.

No. 2

Tallow	9 oz.
White Petrolatum	5 oz.
Chalk	8 oz.
Levitigated Flint	1 oz.
Powdered Pumice	1 oz.
Oxalic Acid	½ oz.

Polishing Powder
Formula No. 1

Kieselguhr	6 oz.
Putty Powder	2 oz.
Pipe Clay	2 oz.
Tartaric Acid	2 dr.

No. 2

Kieselguhr	7 oz.
Powdered Pipe Clay	6 oz.
Flake White	2 oz.
Sodium Thiosulphate	1 oz.
Iron Oxide	½ oz.

Liquid Polish

Malt Vinegar	4 oz.
Lemon Juice	1 oz.
Paraffin Oil	1 oz.
Kieselguhr	1 oz.
Powdered Bath Brick	½ oz.
Lemon Oil	sufficient

Cutting Compound for Cellulose Lacquer

Any hard wax polish can be used as a base, and to this are added abrasive compounds such as silica, air-floated tripoli powder, pumice flour, kieselguhr, etc. A suitable wax polish base is

Beeswax	5 lb.
Carnauba Wax	6 lb.
Xylol	10 lb.
Benzine	20 lb.
Paraffin Oil	2½ lb.
Turpentine	6½ lb.

The proportion of abrasive will depend upon the type used and the degree of cutting action required. The abrasive should be mixed with a proportion of the paraffin and turpentine to wet it thoroughly and is then mixed thoroughly into the wax base.

Polishing Powders for Plastics

Plastics having an albumin base are polished first with emery and then with kaolin and tripoli; asphalt base plastics with powdered glass, tin dust, and red iron oxide in the order given; phenol plastics with micro-asbestos, kieselguhr, kaolin and red iron oxide.

Abrasive Polish Paste for Galalith
(Synthetic Resin Polish)

Petrolatum	as required
Emery 0000	50 g.
Sulphur, Flowers of	5 g.
Tin Oxide	27 g.

Bakelite-Polish
Formula No. 1

Montan Wax	3 kg.
Tallow or Bone Fat	2 kg.
Diglycol Oleate	1 kg.
Asbestos, Fine Fibres	12 kg.

No. 2

Montan Wax	1.5 kg.
Tallow or Bone Fat	1.5 kg.
Diglycol Stearate	2 kg.
Mineral Oil	12 kg.
Chalk, Vienna	to suit

Burnishing Clay

Glue	¼ lb.
Water	¾ lb.

Warm in a double boiler and stir until smooth.

In a separate container put

Clay	1 lb.
Water (Warm)	1½ lb.

and mix thoroughly.

Add the glue solution, a little at a time to the clay mixture, while stirring. Finally add

Denatured Alcohol	1 oz.

Marble or Wood Polish

French Patent 796,186

Linseed Oil	200 g.
Mineral Oil	200 g.
Fine Sawdust	1000 g.

Abrasive Polishing in Drums

Polishing in drums is a method best suitable for mass production on small articles, especially those plated with copper, brass, nickel or cadmium; chrome-plated articles can not be polished in this manner. If the articles are very rusty or scaly they must first be scoured before polishing. This is usually done in cylindrical and watertight drums of hard wood. The articles are placed in sand wetted with water or dilute sulphuric acid, the drum rotating at 30 to 60 rpm. Brass and bronze require 10 to 12 hours, steel 20 to 30 hours, and cast parts 40 to 60 hours.

The polishing liquid must contain a slip agent which permits an easy rubbing of the parts against one another and permits wear without hindering the polishing action. The polishing liquid must be slightly pickling so that thin oxide films are dissolved. A polishing solution for brass, bronze or nickel-silver (German silver) consists of potash and sodium cyanide which can be used for 8 hours without renewal.

A mixture of 200 g. "Nekal" and 800 g. sodium bisulphate is applied for iron and steel objects; 10 g. of the mixture are used for 1 liter solution; or also a mixture of 500 g. tartar, 300 g. sodium bisulphate and 200 g. boric acid in 100 liters of water.

For aluminum and its alloys: 500 g. acidic potassium fluoride, 100 g. "Nekal," 400 g. sodium bisulphate, in 100 liters of water is used.

If soap is to be used to obtain a particularly fine polish, a solution for iron and steel is: soap flakes 4 kg., soda 2 kg., sodium cyanide 0.5 kg., water 100 liters. For aluminum: soap flakes 3 kg., concentrated ammonia solution 1 kg., and water 100 liters is used. For copper and copper alloys the following solutions are suitable: (1) soap powder 3 kg., potash 2 kg., sodium cyanide 1 kg., water 100 liters; or (2) grain soap 4 kg., tartar 1 kg., sodium bisulphate 1 kg., water 100 liters.

Strongly profiled parts are best polished by the ball-polishing method; the balls should be very hard and of highly polished chrome steel of 0.5 to 10 mm. diameter. The sizes should be well mixed according to the shape of the article so that the small balls can act in the recesses. The drum rotates at 20 to 40 rpm. The time required for fine polish varies between 1 hour and 3 hours according to material and shape.

Tumbling Barrel Sawdust, for 1st Stage

Sawdust	60 lb.
Pumice, Powdered	13 lb.
Mineral Oil	1 lb.

Tumbling Barrel Polish

Chalk, Precipitated	2 oz.
Turkelene	8 oz.
Hydrogenated Castor Oil Wax	4 oz.
Sawdust	56 oz.

Razor-Strop Preparations

Formula No. 1

Tallow, Acidless	250 g.
Caput Mortuum	750 g.

Melt the fat, and work in the iron pigment.

No. 2

Emery, Finest Powder	30 g.
Tin Oxide	15 g.
Paris Red	15 g.
Petrolatum, Natural	30 g.
Beeswax	30 g.

No. 3

Petrolatum, Natural	82 g.
English Red (Iron Oxide)	18 g.

For collapsible tubes. Run through a mill.

Razor Hone Paste

Levigated or washed emery or carborundum powder 400–500 or 600 mesh, 6 lb., beef suet (freshly rendered) 2 lb. and yellow beeswax 1 lb. Melt the suet and the wax then incorporate the emery or carborundum. Cool and cut into small bars.

Abrasive Polish (For Tubes)

Methyl Cellulose Solution (10%)	30 oz.
Stearic Acid	1 oz.
Oleic Acid	3 oz.
Gasoline	10 oz.
White Spirit	25 oz.
Ammonia	2 oz.
Glass Dust	50 oz.
Clay, Powdered	10 oz.
Chromium Oxide	5 oz.

Grinding Paste for Valves, etc.

Ammonium Linoleate	1 kg.
Oleic Acid	0.1 kg.
Water	5 kg.
Silicon Carbide, Green	5 kg.
Quartz, Powdered	1.5 kg.

Keep wet while applying.

Abrasive for Aluminum Surfaces

Tripoli	60 g.
Fuller's Earth	10 g.
Stearic Acid, Powdered	10 g.

Knife-Polishing Stones

Formula No. 1

a. Paraffin Wax (50/52° C.)	10 lb.
Ozokerite	5 lb.
b. Diglycol Laurate	10 lb.
c. Pumice, Powdered	30 lb.
Emery	25 lb.
Lime Green	20 lb.

Melt *a*, add *b*, and stir in slowly *c*. Cool till the paste sets, and pour into molds.

No. 2

a. Stearic Acid	10 lb.
Japan Wax	10 lb.
b. Oleic Acid	10 lb.
c. Pumice, Finely Powdered	60 lb.
Chrome Oxide	10 lb.

As in No. 1.

No. 3

a. Paraffin Wax (50/52° C.)	10 lb.
Stearic Acid	10 lb.
Japan Wax	8 lb.
b. Pumice, Powdered	25 lb.
Kieselguhr	25 lb.
Yellow Ochre	22 lb.

Stir the powders *b* into the melted waxes *a*. Stir till the paste sets, and pour into forms.

No. 4

a. Paraffin Wax (50/52° C.)	25 lb.
Montan Wax	10 lb.
b. Whiting	40 lb.
Emery	20 lb.
Carbon Black	5 lb.

As in No. 3.

Copper Polishing Stone

Sodium Bisulphate, Powdered	30 lb.
Calcium Sulphate, (Gypsum)	10 lb.
Clay	20 lb.
Quartz, Powdered	40 lb.

Moisten with water just to make it possible to press the material into blocks. Package in lead-foil.

TABLE OF ABRASIVES COMMONLY USED ON METALS

Metal or Surface	Hardness	Polishing	Cutting Down	Color Buffing
Aluminum	2.9	Aluminum Oxide	Tripoli	Silica
Brass	3.5	Aluminum Oxide	Tripoli	Silica, Lime
Copper	3	Emery	Silica	Lime
Chromium Plate	9	....	Chromium Oxide	Unfused Alumina
Gold	2.5	....	Tripoli	Rouge
Hard Rubber	..	....	Pumice	Tripoli
Monel Metal	4.5	Aluminum Oxide, Emery	Tripoli	Unfused Alumina
Molded Resins	..	....	Tripoli	Unfused Alumina
Nickel	4	Aluminum Oxide, Emery	Tripoli	Lime
Nickel Silver	4.2	Emery	Tripoli	Lime, Rouge
Stainless Steel	7	Aluminum Oxide, Silicon Carbide	Unfused Alumina, Emery	Chromium Oxide
Silver	2.7	....	Hard Rouge	Soft Rouge
Steel	4–7*	Aluminum Oxide, Silicon Carbide	Emery	Lime
Tin	1.8	....	Tin Oxide	Crocus
Zinc Die Cast	2.5	Aluminum Oxide, Emery	Tripoli	Lime

* Depending upon carbon content and heat treatment.

TABLE OF ABRASIVES USED IN POLISHING AND BUFFING

Name	Source	Formula	Color	Hardness*	Structure	Specific Gravity
Silicon Carbide	Manufactured	SiC	Green and Black	9.5–9.75	Needles & Cubical	3.12–
Electrically Fused Alumina	Manufactured	Al_2O_3	Light Brown	9.2–9.6	Cubical	3.94
Corundum	Natural	Al_2O_3	Light Brown	9	Hexagonal	4
Turkish Emery	Natural	Al_2O_3, Fe_2O_3	Black	8–9	Granular	3.8
Pumice	Natural	SiO_2, Al_2O_3, Na_2O	Grey White	6	Porous	2.5
Rouge	Manufactured	Fe_2O_3	Red	6	Rounded	5.20
Chromium Oxide	Manufactured	Cr_2O_3	Green	6	Cubical	5.20
Unfused Alumina	Manufactured	Al_2O_3	White	9	Amorphous	3.73
Quartz	Natural	SiO_2	Colorless or White	7	Needles	2.64
Tripoli	Natural	SiO_2	Pink	7	Porous	2.15
Lime	Manufactured	CaO	White	2	Amorphous	3.5
Diatomaceous Earth	Natural	SiO_2	White	1–1.5	Diatoms	2.1
Rottenstone	Natural	Varies	Olive-Grey	1.5	Earthy	2.2
Chalk	Natural	$CaCO_3$	White	2	Amorphous	2.8
Colloidal Clay	Natural	$Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$	White	2.5	Colloidal	2.6

* Hardness is referred to the Moh scale which gives carbon (diamond) a hardness of 10.

PYROTECHNICS

Safety Matches

Aspen splints are immersed for 30–60 seconds in the following solutions to prevent after-glow.

Formula No. 1

Di-Ammonium Phosphate	1.4 oz.
or Phosphoric Acid (sp. gr. 1.5)	1.5 oz.
Water	99.5 oz.

Use cold.

No. 2

Di-Ammonium Phosphate	1.0 oz.
or Phosphoric Acid (sp. gr. 1.5)	1.1 oz.
Water	98 oz.

Use at about 60–70° C.

The splints are then dried, while rotating in a special drying oven.

The dried splints are now polished by rotating in a large cylindrical drum, cleaned from wood flour and broken splints, and fed into the match-making machine. The thoroughly dried splints are passed over steam coils, which ensures the drying and prepares the splints for the first dipping. This consists of dipping the splints into molten paraffin wax (m. p. 45° C. to a depth of about 7 mm. at a temperature of 110° C. The heating of the splints prior to dipping helps and makes the absorption more uniform.

After paraffining, the splints are cooled and dipped in a heading paste; a thick, sticky paste with the consistency of thick honey. After dipping and during drying the matches pass through the machine, where they are inverted two or three times at intervals of about five minutes, to ensure the formation of well-shaped heads. The complete cycle of this machine takes forty-five minutes.

Chemicals used for safety match compositions are generally mixed in the following proportions:

Binding Materials	6–10 lb.
Oxygen Providers	35–45 lb.
Fillers	15–20 lb.
Water	25–35 lb.

The glue and gum, previously soaked in the requisite amount of water, are cooked at that temperature and for that length of time found suitable for the adhesives in use. After cooling to about 40° C. the gum is gently stirred into the glue and the potassium dichromate added with stirring until solution is complete. All the other finely ground chemicals with the exception of the potassium chlorate are well mixed in a ball mill and then added to the mixture. Finally, the potassium chlorate, damped with the remainder of the water, is added and the mixture thoroughly stirred. The composition is then ground in a flat plate mill until the desired smoothness is obtained. Throughout the mixing and manufacture of matches this paste has to be kept at a temperature of 34° to 40° C., and great care has to be taken to avoid loss of moisture due to evaporation. Owing to the fact that the paste is mainly a suspension of insolubles, loss of moisture causes it to become lumpy and difficult to work.

Formula No. 1

Glue	5.0 lb.
Gum Tragacanth	1.0 lb.
Potassium Dichromate	3.5 lb.
Potassium Chlorate	37.0 lb.
Glass Powder	8.5 lb.
Zinc Oxide	0.5 lb.
Manganese Dioxide	4.7 lb.
Sulphur	3.5 lb.
Iron Oxide	3.8 lb.
Kieselguhr	1.0 lb.
Water	31.5 lb.

No. 2

Glue	2.5 lb.
Gum Arabic	7.5 lb.
Gum Tragacanth	0.6 lb.
Potassium Dichromate	2.5 lb.
Potassium Chlorate	32.3 lb.
Glass Powder	8.7 lb.
Kieselguhr	1.2 lb.
Sulphur	5.0 lb.
Manganese Dioxide	4.0 lb.
Iron Oxide	1.0 lb.
Water	34.7 lb.

It will be noticed that the second formula contains considerably more adhesives than the first, mostly gum. Gum arabic, which is not such a strong adhesive as glue, has replaced part of the glue in order to obtain a smoother working paste and consequently better shaped heads on the matches.

Red-headed book matches of the safety type are made from the following formula:

No. 3

Glue	5.5 lb.
Gum Tragacanth	0.5 lb.
Gum Senegal	2.5 lb.
Potassium Dichromate	2.5 lb.
Potassium Chlorate	34.6 lb.
Sulphur	3.3 lb.
Zinc Oxide	7.2 lb.
Glass Powder	7.2 lb.
Kieselguhr	1.2 lb.
Rhodamine Color	0.5 lb.
Water	35.0 lb.

For Continental use yellow-headed safety matches are manufactured from formulae similar to the one above, with the omission of the rhodamine. The large percentage of potassium dichromate and sulphur, together with a large percentage of good quality zinc oxide, produces a very good yellow head.

Match Box Compositions

Whereas heading compositions present the greatest troubles in manufacture and still more so in the working, box compositions present no difficulties whatsoever. The analysis on the dry basis is usually of the order—

Binding materials	20 lb.
Red phosphorus	40 lb.
Fillers	40 lb.

The phosphorus content can be varied to suit the manufacturer. If a sharper striking paste is required, the percentage of phosphorus is increased and *vice versa*. Generally speaking, owing to the high cost of phosphorus, it is the aim of the match manufacturers to use as little as possible, with due regard to quality. This is the reason for grinding the composition as fine as possible and painting the boxes with the thinnest layer sufficient to strike 50 matches. In this way it is possible to paint 150,000 to 250,000 boxes with 10 lb. of phosphorus.

The preparation of the composition is similar to that for heading pastes. The powdered chemicals, with the exception of the red phosphorus, are added to the prepared adhesives and stirred in. Finally, the phosphorus is carefully added and well mixed in. The mixture is then ground in an eccentric mill or ball mill until the required fineness is obtained.

Formula No. 1

Red Phosphorus	40.0 lb.
Gum Arabic	12.0 lb.
Gum Tragacanth	0.7 lb.
Dextrin	3.1 lb.
Glass Powder	1.8 lb.
Asbestos Powder	3.1 lb.
Barium Chromate	1.3 lb.
Antimony Sulphide	37.0 lb.
Iron Oxide	1.0 lb.

No. 2

Red Phosphorus	49.5 lb.
Gum Arabic	20.9 lb.
Gum Tragacanth	0.8 lb.
Antimony Sulphide	27.6 lb.

Formula 1, which appears to be unnecessarily complicated, is less sharp than formula 2 and has been in use for several years in the production of a high-class Continental match.

Match Head Composition

Sulphur Powdered	1 lb.
Manganese Dioxide	2 lb.
Ferric Oxide	½ lb.
Glass, Powdered	1¼ lb.
Glue, Powdered	1 lb.
Potassium Bichromate	0.8 lb.
Potassium Chlorate	6¾ lb.
Paraffin Wax, Powdered	1 oz.

This should be mixed with great caution as it is explosive.

Match Box Striking Composition
U. S. Patent 2,030,892

Rosin	85
Shellac	3
Paraffin Wax	1
Beeswax	1
Gutta Percha	10

The above is melted together and mixed until uniform. Grains of abrasive are embedded in a coating of the above.

Self Lighting Cigarette Tip
U. S. Patent 2,040,733

A composite sheet is used consisting of a layer of following:

Glass, Powdered	0.36 g.
Potassium Dichromate	0.27 g.
Manganese Dioxide	0.18 g.
Potassium Chlorate	3.60 g.
Sulphur	0.75 g.
Cellulose Acetate Solution	2 cc.

united with a layer of

Glass, Powdered	0.22 g.
Potassium Dichromate	0.59 g.
Manganese Dioxide	0.13 g.
Potassium Chlorate	3.15 g.
Hickory Wood, Powdered	3.60 g.
Cellulose Acetate Solution	2 cc.

Explosives
German Patent 583,179

Formula No. 1

Ammonium Nitrate	75 g.
Plant Meal	6 g.
Mineral Oil	4 g.
Nitroglycerin	15 g.

No. 2

Ammonium Nitrate	71 g.
Plant Meal	6 g.
Liquid Hydrocarbons	3 g.
Nitrocellulose	0.2 g.
Nitroglycerin	19.8 g.

No. 3

Canadian Patent 364,079

Potassium Chlorate	10 lb.
Sugar or Antimony	5 lb.
Sulphur	2½ lb.
Sodium Bicarbonate	2 oz.

Explosives for Shells

French Patent 742,312

Ethylene Diamine Nitrate	45 g.
Ammonium Nitrate	55 g.

or

Ammonium Nitrate	60 g.
Methylamine Nitrate	40 g.

or

Ammonium Nitrate	55 g.
Ethylene Diamine Nitrate	40 g.
Methylamine Nitrate	5 g.

Granular Explosive

U. S. Patent 2,109,049

Potassium Chlorate	35
Sugar	35
Finely Divided Cellulose	10
Dinitrotoluene	12
Toluene	6
Petrolatum	2

A method of making an explosive comprises heating dinitrotoluene, toluene and petrolatum to the boiling point, adding a small quantity of nitric acid thereto and continuing the boiling until the nitric acid fumes have passed off, and adding to the mixture finely divided cellulose and a granulated powder made of potassium chlorate and sugar, the granulated powder and the cellulose being taken in proportion that the total mixture results in a granulated powder.

Mining Explosive

British Patent 435,588

Ammonium Nitrate	90 lb.
Aluminum Powder	6½ lb.
Manganese Dioxide	3½ lb.

The above mixture is coated with a waterproofing material.

Improved Plasticity & Safety Explosive

British Patent 460,576

Nitroglycerin-Nitroglycol Mixture	30.0 oz.
Nitro Cotton	1.3 oz.
Dinitrotoluene	3.0 oz.
Bentonite	5.0 oz.
Ammonium Nitrate	45.7 oz.
Sodium Nitrate	10.0 oz.
Starch, Maize (Corn)	5.0 oz.

Blasting Cartridge

British Patent 432,850

Binder consists of

Orthoclase	55 lb.
Potassium Sulphate	35 lb.
Clay	10 lb.

The above is packed in a sleeve surrounding composition below or mixed with it in proportion of 30% by weight.

Explosive.

Nitroglycerin	11 lb.
Dinitrotoluene	1 lb.
Salt	22 lb.
Ammonium Nitrate	59 lb.
Cellulose	6.85 lb.
Lampblack	0.15 lb.

Flashlight Cartridge Powder

U. S. Patent 2,098,341

Magnesium, Powdered	120–140 oz.
Aluminum, Powdered	25– 32 oz.
Precipitated Chalk	45– 56 oz.
Silica, Powdered	18– 24 oz.
Magnesia	8– 12 oz.

Black Powder

U. S. Patent 2,030,096

Sodium Nitrate	60.0 lb.
Sulphur	10.0 lb.
Charcoal	17.9 lb.
Ammonium Nitrate	10.0 lb.
Calcium Carbonate	1.2 lb.
Urea	1.0 lb.

Priming Mixture

Formula No. 1

U. S. Patent 1,918,920

Lead Sulphocyanide	30–50 oz.
Oxidants, like Potassium Chlorate	10–30 oz.
Nitrocellulose, or Smoke-Free Powder	30–40 oz.

No. 2

Polish Patent 15,569

Potassium Chlorate	85 g.
Asbestos Fibre	1.5 g.
Nitrotoluol	4.5 g.
Petroleum	8.5 g.
Castor Oil	0.5 g.

Cartridge Priming Mixture

Formula No. 1

U. S. Patent 2,035,597

Potassium Chlorate	48 –53⅓ oz.
Potassium Ferrocyanide	33⅓–36 oz.
Glass, Powdered	13⅓–16 oz.

No. 2

U. S. Patent 2,009,556

For Center-Fire Cartridges

Tetrazene	1– 4%
Diazonitrophenol	12–18%

Barium Nitrate	25–40%
Antimony Trisulphide	8–18%
Lead Peroxide	15–25%
Calcium Silicide	8–20%

No. 3
For Rim-Fire Cartridges

Tetrazene	4– 7%
Diazonitrophenol	15–20%
Basic Lead Azide	6–12%
Barium Nitrate	20–30%
Lead Peroxide	12–20%
Ground Glass	20–28%

No. 4
For Rim-Fire Cartridges
U. S. Patent 2,001,212

Lead Azide	20–25 oz.
Powdered Glass	20–25 oz.
Flake Aluminum	6– 8 oz.
Barium Nitrate	35–38.5 oz.
Trinitrotoluol	0– 2.5 oz.
Canada Balsam or Cellulose Acetate	0– 2.5 oz.
m-Toluenesulphonethylamide	0– 1 oz.

No. 5
U. S. Patent 2,027,825

Mercury Fulminate	20–50%
Barium Nitrate	10–45%
Lead Chromate	2–20%
Lead Sulphocyanide	3–25%
Zirconium Powder	2–30%
Ground Glass	30%

Explosive Primer
French Patent 818,285

Mercury Fulminate	65 g.
Barium Nitrate	22 g.
Antimony Sulphide	11 g.
Hexogene	15.5 g.
Barium Carbonate	1.5 g.

Explosive Priming Mixture
Formula No. 1
U. S. Patent 2,002,960

Basic Lead Trinitroresorcinol	27 oz.
Lead Dinitrophenylazide	13 oz.
Potassium Nitrate	30 oz.
Antimony Trisulphide	7 oz.
Ground Glass	23 oz.

No. 2
French Patent 737,561

Mercury Fulminate	33 g.
Thallium Nitrate	40 g.
Cobalt Nitrate	10 g.
Antimony Tri-Sulphide	17 g.

Retarder for Burning Primer
(For Shells)
U. S. Patent 1,877,127

Lead Oxide	44 oz.
Lead Chromate	39 oz.
Ferrosilicon	16 oz.
Linseed Oil	1 oz.

Detonating Mixture
French Patent 41,470 (to 721,636)

Gum Arabic	30 g.
Phosphorus Sulphide (P_4S_3)	15 g.
Magnesium Carbonate	12 g.
Calcium Carbonate	5 g.
Ochre	25 g.
Potassium Chlorate	60 g.

Detonator Igniter Powder
U. S. Patent 2,008,366

Zirconium	20
Mercury Fulminate	23.5
Potassium Chlorate	37.6
Nitrostarch	11.3
Charcoal, Powdered	7.5

Pyrotechnic Sparklers
Formula No. 1

Barium Nitrate	22 lb.
Iron Filings	10 lb.
Aluminum Powder	2 lb.
Starch Flower	6 lb.
Water, Boiling	to form dough

No. 2

Barium Nitrate	55 lb.
Aluminum Powder	5 lb.
Iron Filings	25 lb.
Dextrin	15 lb.
Water	to form a dough

No. 3

Iron, Coarsely Powdered	1.0 lb.
Aluminum Powder	0.2 lb.
Barium Nitrate	2.2 lb.
Starch	0.6 lb.
Water	to form dough

The materials are mixed, moistened with hot water to give a sticky, viscous dough, and then put on to ⅔ of the the length of thin iron wires of 10–20 cm. length.

Non-Toxic, Non-Hygroscopic Pyrotechnic
U. S. Patent 2,096,258

A non-toxic and non-hygroscopic firework composition adapted to produce successive detonations when ignited, consists of

Potassium Chlorate	45 oz.
Magnesium Oxide (Heavy)	20 oz.
Magnesium Oxide (Light)	11 oz.
Magnesium Sulphate (Hydrated)	30 oz.
Gum Arabic	4 oz.
Together with a solid solution of:	
Sesquisulphide of Phosphorus	12 oz.
Sulphur	2 oz.

Chemical Snakes

Add an excess of red mercuric oxide to 50 cc. concentrated nitric acid. Shake and let stand till saturated. Decant solution. Add a 10% solution of ammonium sulphocyanide until mercury is completely precipitated as mercury sulphocyanide. Filter and dry. Before entirely dry, it may be made into tablets or pills.

White Pyrotechnic Light

U. S. Patent 2,035,509

Barium Nitrate	38 oz.
Strontium Nitrate	7 oz.
Magnesium, Powdered	52 oz.
Paraffin Wax	3 oz.

Signal Rocket Powder

Swiss Patent 179,091

Sodium Nitrate	5 g.
Sulphur, Powdered	4 g.
Wood Charcoal, Powdered	3¼ g.

Make into a paste with alcohol and dry in forms.

Orange Smoke

U. S. Patent 1,975,785

Lead Peroxide	50 g.
Potassium Dichromate	35 g.
Magnesium	15 g.

Brown Smoke

U. S. Patent 1,975,099

Copper Oxide	50 g.
Lead Peroxide	25 g.
Magnesium	15 g.

Smoke Cloud

Zinc Dust	648 g.
Hexachlorethane	864 g.
*Thermite	44 g.
Ammonium Chloride	48 g.

* Thermite Type Powder

Aluminum Powder	23 g.
Iron Oxide Powder	73 g.

Tracing Bullet, Smoke Colored

German Patent 629,803

To the usual tracer compositions is added 5% nitronaphthalene to get a green color or 2% nitro aniline and 3% acetanilide to get a red color.

Safety and Distress Signals

Railroads have used for many years red, yellow and green fusees as signals for various specified emergencies. The frequency of the trains and nature of the existing emergency determine not only the color of the flare but also the burning interval of five or ten minutes. The following are typical formulae for the manufacture of railway fusees:

Red Fusees

Strontium Nitrate	71.1 oz.
Potassium Perchlorate	13.1 oz.
Sulphur	11.1 oz.
Sawdust	4.2 oz.
Charcoal	0.5 oz.

Green Fusees

Barium Nitrate	68.7 oz.
Sawdust	9.2 oz.
Potassium Perchlorate	8.4 oz.
Sulphur	5.3 oz.
Rosin	4.6 oz.
Kauri Gum	3.8 oz.

Yellow Fusees

Barium Nitrate	47.4 oz.
Strontium Nitrate	23.7 oz.
Sulphur	12.1 oz.
Potassium Perchlorate	9.0 oz.
Sawdust	3.2 oz.
Sodium Oxalate	3.2 oz.
Stearine	1.0 oz.
Charcoal	0.4 oz.

In red fusees color of the flame is produced by strontium nitrate. Potassium perchlorate is the oxidizing agent upon which the rate of burning depends. The amount is variable and therefore may be increased or decreased if necessary to increase or decrease the time of burning. The sulphur serves to increase the ignitability of the mixture and the character of the flux resulting from the burning. The sawdust is obtained from hard wood, maple preferably, and is used to give structure to the composition. This requires it to be coarse, approaching what might be termed the chip stage. The charcoal of necessity must be fine and preferably low ash willow charcoal. It serves as a fuel and the percentage used may be varied. An increase of one-half per cent enhances the rate of burning and adds materially to the vigorous disposal of the flux formed from burning. This point is essential since the formation of flux, if it is not blown away, will cause a chemical chimney to be formed which obscures the flame.

The addition of lithium carbonate to the extent of 2 to 5% greatly improves the color of red flares. Lithium carbonate is non-hygroscopic and its price is not prohibitive due to the effect produced by the addition of relatively small amounts. Flame coloration produced by volatile strontium compounds contains a large percentage of green and orange, which are to a large extent neutralized by the monochromatic red of lithium salts.

Green fusees are produced by the substitution of barium nitrate for the corresponding strontium salt.

Yellow fusees are produced by combining barium and strontium nitrates with sodium salts. The proportions are set forth in the formula for yellow fusees.

The ingredients for the desired colors must be absolutely dry, of a standard fineness and intimately mixed to secure a homogeneous mass. The composition is then carefully loaded mechanically in Kraft paper tubes of suitable diameters.

Marine Signals

Barium and strontium nitrates and non-hygroscopic lithium salts are chiefly used for the production of emergency and distress signals in the various fields of navigation. The red stars and flares of marine ship rockets depend solely on the use of strontium nitrate, strontium carbonate and non-hygroscopic salts of lithium for their red flame. The candle power is increased by the addition of fine aluminum or magnesium metal powder. However, the candle power when it exceeds 30,000 reduces the intensity and quality of the red. If a green flare is desired, barium nitrate is generally used. Barium nitrate is also used to produce an intense white light in connection with different proportions of metallic magnesium and aluminum.

Aviation Signals

United States Army and Navy aircraft, as well as commercial aircraft, are provided with emergency landing signals. For these the following are used: Red Star Parachute, White Star Parachute, Aircraft Parachute Flare, Wind Flares and Floatlights for the aviator flying over water. These flares are held in racks in the cockpit of the plane and a pistol is provided to project the flare well beyond the plane.

The small white star parachute is shot into space while reconnoitering at night. The red star signal is used to indicate distress. The Aircraft parachute flare is used for emergency landing. This flare produces a dazzling white light for one minute with a candlepower in excess of 125,000.

The main ingredient in the small red parachute flare is strontium nitrate, plus an oxidizing agent, as for example, potassium perchlorate, sulphur, aluminum and magnesium metal powders. The white flares are loaded with a composition, chiefly barium nitrate, an additional oxidizing agent, and the metallic elements magnesium and aluminum subjected to a pressure of five to ten tons.

Military Signals

The most important type of military signal is the red and green star, three in number, which are attached to an asbestos string, suspended from a parachute. The United States Army fires this signal into the air with a discharger attached to a Springfield rifle. The Navy launches it under water from a submarine with compressed air. It is buoyant, and as it reaches the surface, a grenade is shot into the air, releasing a parachute bearing a chain of three red or green stars. Typical formulae for each star are as follows:

Red Star

Potassium Perchlorate	63.0 oz.
Strontium Nitrate	19.5 oz.
Shellac	15.5 oz.
Rosin	2.0 oz.

Green Star

Barium Nitrate	75.5 oz.
Aluminum	21.8 oz.
Sulphur	2.7 oz.

These formulae can be varied for brilliancy of color and variation of burning time.

The general use of barium and strontium nitrates in the formulae given is apparent. The preference is given to potassium perchlorate over the usual potassium chlorate. The perchlorates are more stable and less sensitive than the chlorates, even though they contain a large percentage of oxygen. This is natural when the nature of free chloric and perchloric acid is taken into consideration. Chloric acid is more unstable than perchloric acid, and this instability is reflected in its salts. Mixtures of perchlorates with reducing agents are not only less sensitive to shock, but in addition the free acid does not produce the same dangerous decomposition. Sulphur is omitted wherever it is possible, chiefly for the avoidance of potential manufacturing hazards. Screening of sulphur causes it to become statically charged and it is therefore preferable to use substitutes.

Presence of a chloride in the mixtures intended to produce a red or green flame coloration will accentuate color of the flame and produce the same beneficial effect in color obtained by use of barium chlorate and potassium chlorate. For this purpose, the chlorides of strontium or barium are preferable. Uniform degrees of fineness, dryness and purity are most essential. Barium and strontium nitrates should be at least 99.5% pure and virtually free from sodium.

RUBBER, RESINS, PLASTICS, WAXES

Rubber Latex

Liquid latex is a natural emulsion or suspension of rubber in water It is obtained from the rubber tree chiefly the Heva brasiliensis. It is not the sap as many suppose but an excretion found between the bark and the trunk of the tree. Normally, it exists as a white fluid containing about 36% rubber and 64% water.

Normal latex may, however, be concentrated by a variety of means such as centrifugalization, evaporation, etc. Such concentrated latices contain as high as 60% to 70% rubber in the solution. The consistency of such solutions varies from that of a good grade of cream to somewhat pasty masses.

In most instances, a small amount of ammonia is added to the solution, as a stabilizing agent. In other instances, soaps are added for the same purpose.

For most applications, the normal or 36% latex will suffice. It is sometimes desirable however, to employ heavier coatings, such as in the manufacture of what is known as "dipped goods" which include toy ballons, bathing caps, gloves, etc. and in such cases, the concentrated varieties best serve the purpose.

Latex mixes well with most substances that are soluble in water or may be held in water suspension provided that they are of an alkaline nature. Some of them, however, have a tendency to thicken the resultant solution on standing.

Latex solutions may be thickened artificially by the addition of small amounts of such clays as bentonite, gums such as tragacanth, arabic, and other substances such as casein.

Casein in particular is rather widely used in latex mixtures. It functions not only as a thickener but also increases the adhesiveness and serves also to retain pigments, if present, in suspension.

Casein solutions may be prepared by soaking casein overnight in water with about 1.5% of borax on the weight of the casein and then heating with gentle stirring. Solutions of high concentration and consistency may be prepared in this manner. If desired, ammonia may be substituted for the borax but a somewhat higher percentage on the weight of the casein must be employed.

Latex and casein solutions can be mixed together in almost any desired proportions depending upon the effect desired. In the event that the casein solution has been prepared by the use of borax, some ammonia should be added and the latex solution stirred into it.

A variety of other water soluble materials may be substituted, or used with casein. These include:

Ammonium Alginate
Dextrin
Gum Tragacanth
Gum Arabic
Irish Moss
Glue
Gelatine
Diglycol Stearate

Substances of the above type may function simply as thickening agents or may add other properties such as adhesiveness, lustre, hardness, etc. to the deposited coating.

Latex adhesives may be prepared for several different purposes:

1. Simple adhesion—stickiness.
2. As a waterproof adhesive.
3. To adhere but peel readily.

Combinations for the first purpose have been used for a considerable period for the lamination of chair backs. Latex-casein mixtures adhere well to wood as well as paper and other materials ordinarily thought of in this connection.

In other instances, a waterproof adhesive is desired. Certain types of wall paper for example are laminated, consisting of the printed sheet with a blank sheet pasted on the reverse side. The laminated sheet is then put through engraved rollers and embossed while still moist. The latex solution serves as a waterproof adhesive which is necessary as the embossing would disappear when the paste is applied when it is pasted on the wall. Latex, casein, and dextrin mixtures are being applied to good advantage for this purpose.

In other instances, such as the pasting of photographs in albums, preparation of business charts, etc., it is desired to have good adherence and still permit the pasted subject to be removed readily without tearing. In this instance such substances as casein, dextrin and the like are kept to a minimum.

Another useful compounding ingredient for latex solutions is sodium silicate or what is odinarily known as "water glass". Care must be used in employing this substance, however, as it has a decided tendency to thicken the solution when used in even small amounts. Some grades of sodium silicate tend to cause coagulation (clotting) of the latex. One of its functions is that it imparts something of a gloss to the surface when dry.

Very closely allied to the field of adhesives is the coating of paper and paperboard. There are wide uses for waterproof and greaseproof papers. These may vary from such simple purposes as to stop the penetration of moisture on paper used for the wrapping of vegetables to proofing against such penetrating substances as mineral, vegetable, and fish oils. Butchers' paper for example must be proof against both grease and blood.

The proofing of paperboard is of great importance, particularly those types which are used in the manufacture of food containers. In most instances, the proofing must be directed against both grease and moisture and in some instances serve also to retain the moisture in the packaged product.

Proofing of this type has not as yet found wide application due to the fact that the coating must be absolutely odorless. The odor of rubber while not pronounced ordinarily is readily absorbed by many substances particularly if allowed to remain at something above ordinary room temperatures.

For mixtures of this type, somewhat different compositions are employed than in the case of adhesives. Emulsified waxes may be used to good advantage with sodium silicate to give the desired surface effect.

A typical mixture of this kind may be prepared as follows:

Paraffin Wax Emulsion	800 g.
60% Latex	300 g.
Sodium Silicate (Water Glass)	100 g.

The paraffin wax emulsion is prepared by emulsifying 150 g. of paraffin in 650 g. of water with the aid of heat, stirring, and emulsifying agents. When cool, the sodium silicate is stirred in the emulsion, made slightly alkaline with ammonia, and the latex then added with mild stirring.

A coating of the above type has a consistency not much greater than that of water but may be readily applied to the paper on an inclined bed coating machine or any other machine of a similar character.

In some instances, however, if the coating is to be applied by means of a doctor blade, the solution may be thickened by the addition of bentonite or similar substances.

Latex Compounding Hints

In compounding latex no dry materials should be added. The latter should be dissolved or dispersed. Zinc oxide should always be added last.

Latex Molding or Casting Compound

Latex (60%)	100 oz.
Sulphur	5 oz.
Castor Oil	6 oz.
Ultra-Accelerator (B.Z.)	1 oz.
Zinc Oxide	5 oz.
Casein (10% Solution)	3 oz.

Latex Mixing for Molding

A typical mix for use in a process for making cast rubber shoes and other open hollow articles follows:

"Revertex" (Concentrated Latex)	1,300 g.
Zinc Carbonate	150 g.
Sulphur	30 g.
Zinc Diethyl Dithiocarbamate	10 g.
Water	415 cc.

This mix is rendered unstable by the addition of 230 cc. of a 30% ammonium nitrate solution, and the resultant mixture is poured into a mold. To obtain the quick setting which is so desirable, the mold should be heated to, for example, 80 to 90° C. (176 to 194° F.). If, however, cold setting is desired, the proportion of the setting agent should be increased, for example, by taking 380 cc. of a 71% ammonium nitrate solution.

Stabilized Latex

The stability of natural latex, for shipment is greatly increased by the following additions:

Formula No. 1

Ammonia (28° Bé)	0.1%
Sodium Arsenite	0.3%

No. 2

Ammonia (28° Bé)	0.1%
Sodium Arsenite	0.5%

Adhesive Rubber Latex Coating
British Patent 455,538

Adhesive latex compositions are made by compounding at 50–70° C. rubber latex, preferably of 60% rubber content,

with a solution (50% or 60%) of resinous matter in an organic solvent. The resinous matter may be rosin, ester gum, synthetic resin or resinified or oxidized rubber. When the latex is stabilized by casein, calcium hydroxide may be dissolved or dispersed in the resinous solution in amount sufficient to convert the casein to insoluble calcium caseinate. Rubber compounding ingredients and fillers may be added. If cork dust is added, the composition may form a linoleum cement. E.g., 21 lb. of ester gum and 8 lb. of coumarone resin of m.p. 125° C. are dissolved in 17 lb. of benzol and 17 of trichlorethylene and brought to an end wt. of 88 lb. Three lb. of the solution are mixed with 3–4% of calcium hydroxide warmed to 60° C., and mixed with 8 lb. of 10–20% casein solution. During mixing the batch is warmed to 60° C. The mixture may be thinned with 2–4 lb. of warm water to a suitable consistency.

Latex from Coagulated Rubber

French Patent 794,787

Artificial dispersions of coagulated rubber, gutta-percha, balata and resins are obtained by using coagulated products obtained from a latex which before coagulation has had added to it all or some of the dispersion and (or) protection agents necessary for return to the dispersed state. Thus, to natural latex is added oleic acid 6, caustic potash 2 and glue 4 lb. for 100 lb. of rubber before coagulating.

Powdered Rubber Latex

Dutch Patent 37,343

Latex is mixed with a 20% solution of cassava starch and heated with an equal volume of water containing 0.01–0.1% sulphuric acid and 5% phenol. It is then sprayed and dried at 100° C.

Rubber Thread

British Patent 442,304

The following mixture is extruded onto a moving belt for drying:

Latex (70%)	145	g.
Zinc Oxide	5	g.
Sulphur	2	g.
Tetramethylthiuramdisulphide	0.2	g.
Oleic Acid	0.5	g.
Light Mineral Oil	5	g.

To the above is added 10 cc. of following mixture:

Sodium Silicate Solution (d. 1.2)	10	cc.
Water	10	cc.
Benzine	10	cc.

Toy Balloon Dipping Compound

Latex (60%)	100	oz.
Casein (10% Solution)	½	oz.
Caustic Potash	½	oz.
Zinc Oxide	¾	oz.
Sulphur	2	oz.
Accelerator	½	oz.
Mineral Oil	5	oz.
Karaya Gum	1/10	oz.
Color	2–3	oz.

Ballon Fabric Coating

Viscose	250	oz.
Latex (40%)	30	oz.
Sulphur	3	oz.
Zinc Oxide	5	oz.
Ultra-Accelerator (P.P.D.)	⅓	oz.
Acetone	18	oz.
Water	420	oz.
Zinc Sulphate	4	oz.
Ammonia (26° Bé)	10	oz.

1. Size fabric with glue.
2. Apply 6 thin coats drying each coat at 55° C. and 40% relative humidity.
3. Pass fabric through 25% magnesium sulphate solution to harden viscose.
4. Pass through a sodium bisulphite solution to whiten coating.
5. Wash in water and finally dip in 15% glycerine.

Cloth Proofing Compound

Latex (40%)	100	oz.
Casein (10% Solution)	1	oz.
Caustic Potash	1	oz.
Whiting	250	oz.
Gum Karaya (2% Solution)	4	oz.
Sulphur	5	oz.
Zinc Oxide	3	oz.
Ultra-Accelerator (P.P.D.)	¼	oz.
Castor Oil	10	oz.

Combining Cloth Compound

Latex (60%)	100	oz.
Sulphur	3	oz.
Zinc Oxide	3	oz.
Ultra-Accelerator (B.Z.)	½	oz.
Mineral Oil	10	oz.
Clay	50	oz.
Casein (10% Solution)	6	oz.

Preservation of Crude Rubber Latex

U. S. Patent 2,004,156

Phenol	0.3–0.5 lb.
Soap	0.1–0.5 lb.
Ammonia	0.1–0.3 lb.

The above is used per 100 lb. latex.

Plantation Latex Preservative

A mixture of soda, paranitrophenol (PNP), and suphite of soda, is effective and costs less than half as much as ammonia to use. PNP gives great stability and prevents the formation of mold on smoked sheet and dry crepe. It has the property of coloring acid latices yellow; while it gives alkaline latices a deeper tint tending to orange. When a coagulent is subsequently added, the latex becomes white again. Advantage is taken of this tendency to coloration to determine the correct strength of the solution and the right amount to be added to the latex in the field to correct the acidity. A solution consisting of 1.55 kilos of 99% NaoH, 1.25 kilos of commercial PNP, and 10 kilos or 98% sulphite of soda in 100 liters of water is satisfactory. The dose recommended is 100 cc. for 10 liters of latex; this proportion may be increased as necessary, without harmful effect.

Artificial Reclaimed Rubber

Smoked Sheet Rubber	100	oz.
Mineral Rubber	50	oz.
Gilders Whiting	41	oz.
Zinc Oxide	5	oz.
Heptene	3/5	oz.

Reclaiming Rubber
U. S. Patent 2,069,151

1,000 lb. of properly shredded waste rubber stock are placed in a digestor with 3,000 lb. of water and 150 lb. of caustic soda. To the digestor 3 to 5 lb. of ammonium persulphate crystals are added. The digestor is sealed, and the mass heated and agitated for 12 to 16 hours at 370 to 390° F. The reclaimed rubber mass is then discharged from the digestors, washed, and dried. The process provides a reclaim which may be refined in the usual way and is not markedly elastic or resilient.

Reclaiming Scrap Rubber

The various types of scrap to be reclaimed and also the type of product to be made will determine which of several methods shall be used as the manufacturing process. These processes may be enumerated as:

1. The alkali digestion process.
2. The water digestion process.
3. The acid process.
4. The open steam process.
5. The mechanical process.

The alkali digestion process will be discussed and illustrated in some detail, whereas in the remaining processes the important operations will be only briefly described.

The Alkali Digestion Process:

The method commonly used in the reclaiming of rubber is known as the alkali process. This process was patented in 1899 and derives its name from the fact that the fabric is removed from fabric bearing scrap, chiefly whole tire scrap, by means of caustic soda.

The scrap tires are received from the brokers in box cars and occasionally by truck. Beads are removed from the scrap tires by debeading machines of which there are several types. The debeaded tire is then ground by passing it through cracker rolls and past rapidly rotating knives in order to comminute the scrap so that it will be in a condition suitable for digestion under pressure with caustic soda. The degree of fineness to which the scrap is ground influences to a large extent the thoroughness of the subsequent heating and plasticizing operation, since a uniformly ground and finer scrap will offer a much greater surface per unit weight. After the scrap is ground, it is passed over magnetic separators which remove a large percentage of the magnetic metal, such as steel.

The next step is the treatment of the scrap in autoclaves. These machines are steam-jacketed vessels equipped with stirring devices and having a capacity of 2 to 4 tons of ground tire scrap. In the digestion, solutions of caustic soda of from 4 to 8% strength are used together with oils or swelling agents as required. The strength of the caustic soda solution is determined by the temperature, pressure and duration of the heat treatment.

Different oils and swelling agents have specific effects on the final product and are chosen for these results. Generally speaking, a neutral oil used at this point gives a flatter and less nervy final product, whereas a saponifiable oil makes the product seem to have more body and nerve. This effect is due to the soap formed during the digestion. The pressures used may vary from 160 to 200 lb. per sq. in., and the time from 8 to 24 hours. The longer times are used for bus or giant tires which are in general less aged and consequently tougher and require a more drastic treatment.

After the digestion, or "devulcanization" as it is incorrectly called, is completed, the scrap is blown under pressure into wash tanks and thence over de-watering screens in which process it is washed free of residual caustic and dirt. A considerable amount of fine partially hydrolyzed cellulose passes through the dewatering screens. This material is thickened continuously and thereafter filtered on a rotating drum filter. After its recovery, it may be dried and used in special products. The digested and washed scrap is then passed through a squeezing press to remove as much water as possible before it is dried. It is necessary to control the washing and de-watering operations in order to remove all foreign material and also to keep a uniform residual alkalinity. The effect of this alkalinity will be discussed later.

The digesting operation is intermittent, a considerable quantity of material being discharged at one time, and it has been found necessary to have storage bins from which the digested and washed scrap is fed manually into the dryers. Automatic feeders have not been particularly successful. The dryers in common use are belt dryers utilizing temperatures of from 200° to 250° F. Depending upon its type, the scrap is usually dried to a moisture content of 3 to 5%.

The finishing operation in the reclaiming of rubber is one requiring careful attention. The dried scrap is first milled either on an open roll mill or in an internal mixer for the purpose of further plasticizing. During this operation, it is sometimes desirable to add certain ingredients to give the reclaimed rubber specific properties. After the milling operation, the massed slabs are given a first pass through a refiner. A refiner is similar to a two-roll mill, the rolls usually being 30 to 36 inches long and capable of being squeezed together with enormous pressure in order to compress the particles of rubber into a very fine sheet. In order to produce a uniform sheet the refiner rolls have crowns correctly determined by test and continually kept to specification. The roll surface temperature should be between 180° and 210° F. for best results of quality and production.

During the first refining operation, this sheet may have a thickness of .010 in., and in the final operation, it may be from .002 to .005 in. The refining operation derives its name from the fact that any hard, unsoftened pieces of scrap are left behind in the "bite" of the rolls or are passed out at the edges of the rolls, the unrefined pieces being called "tailings." These "tailings" are quite dry and hard and must be re-worked through the devulcanization process.

After the first refining, the scrap is usually in condition to be strained; that is, it is put into a machine equipped with a barrel and screw, similar to a tubing machine, which forces the scrap through a fine screen to remove the non-magnetic metals such as brass and copper and the last traces of the steel. These screens generally have openings of from .015 to .025 in.

The final refining operation is then performed, giving a thin uniform sheet of rubber which is wound on a rotating drum to a given thickness, after which it may be cut to form a square flat slab. These slabs are dusted with powder to prevent them from adhering.

Occasionally after the last refining operation the slabs are passed through a sheeting mill purely for the purpose of blending and putting them in condition for shipment. The objection to this procedure is that it covers up any roughness which may have been present in the original slabs, whereas the slabs direct from the refiner are very easily inspected.

The Water Digestion Process:

In the processing of scrap which does not contain fabric, such for example as airbags, the same process may be applied as outlined above except that caustic soda is not used and the washing process may be minimized.

The Acid Process:

In order to impart certain qualities of inertness and dryness to whole tire scrap and boot and shoe scrap, it may be subected to what is commonly known as the "double process" or "acid process." Two separate operations are involved for the removal of fibre and the plasticization. The scrap is prepared as usual but is first digested in sulphuric or hydrochloric acid for the purpose of removing the cellulose. This operation is carried out at low temperatures in open tanks and after digestion, the acid is removed by washing and neutralization, followed by further washing and riffling.

In riffling, the scrap plus wash water passes through a long trough equipped with cross pieces or riffles which hold back the dirt and metal during the passage of the scrap down the trough. This whole operation of washing and riffling also removes the water-soluble materials, thereby giving a product which offers greater resistance to water absorption.

If desired, the defiberized scrap may be ground and further washed. It is then dried and treated by the pan or open steam process described below. Occasionally the plasticized scrap is further washed to remove any soluble soaps formed during the steam treatment. The finishing, straining and refining operations are carried out in the same manner as described for the alkali digestion process.

The Open Steam Process:

The open steam (or pan) process is used chiefly on inner tubes and acid-treated fabric scrap. In this process, the scrap is commonly ground to about pea size or finer, after which it is mixed with caustic, swelling agents or oils, as desired. This mixing is carried out in an open internal mixer, the scrap then being placed in containers such as open pans four to six in. deep. These pans are stacked on cars which are rolled into a cylindrical, horizontal heater into which live steam may be passed. The material is subjected to this live steam treatment at pressures from 100 to 175 lb. for varying periods of time. After the treatment is finished, the "biscuits" as they are called, are removed, dried, and are then ready for the mill room operations as described above.

The Mechanical Process:

A great deal of scrap is partially reclaimed by what may be called a "mechanical process," namely, grinding the scrap without previous heating. Many plants carry out this operation in order to utilize their overflow and defective production. The operations consist only in grinding, screening and cooling, the size of the ground particles being determined by the particular requirements. The product thus obtained is used as a filler. It has a low specific gravity, assists molding, and cuts down shrinkage.

Reclaimed Rubber in Tires

The use of reclaim in first-grade carcass stocks for passenger cars tires is generally considered when crude rubber prices are on a rising market. One compound incorporating reclaim, consists of the following: 85 lb. smoked sheets, 30 lb. high zinc oxide truck tire reclaim, 13.5 lb. whiting (fine particle size, such as Calcene), 0.5 lb. stearic acid, 1.5 lb. palm oil, 0.3 lb. Accelerator 808, 3 lb. sulphur, and 1 lb. Neozone D. 45 minutes of optimum press cure at 274° F. for a thin sheet is used. The stock is suitable for the carcass of first-line passenger car tires.

Tire Tread

	A	*B*	*C*	*D*	*E*	*F*	
Rubber	100	100	100	100	100	100	lb.
Whole Tire Reclaim	22	22	22	22	22	22	lb.
Carbon Black	42	42	42	42	42	42	lb.
Zinc Oxide	10	10	10	10	10	10	lb.
Stearic Acid	2	2	2	2	2	2	lb.
Mineral Rubber	6	6	6	6	6	6	lb.
Pine Tar	2	2	2	2	2	2	lb.
Sulphur	3.875	3.875	3.875	3.875	3.875	3.875	lb.
Monex	0.20	0.25	0.30	0.20	0.25	0.30	lb.
DPG	0.60	0.75	0.90	...	...	...	lb.
Trimene Base	...	...	...	0.30	0.375	0.45	lb.

Cure at 30 lb. steam pressure.

Tread Type Stock

Rubber	100.000	lb.
Whole Tire Reclaim	22.000	lb.
Carbon Black	42.000	lb.
Zinc Oxide	10.000	lb.
Stearic Acid	2.000	lb.
Mineral Rubber	6.000	lb.
Pine Tar	2.000	lb.
VGB	1.125	lb.
Safex	1.000	lb.
Sulphur	3.875	lb.

Cure 30 minutes at 25 lb.

Tire Carcass Type Stock

Rubber	100.00	lb.
Tube Reclaim	30.00	lb.
Carcass Reclaim	40.00	lb.
Zinc Oxide	11.00	lb.
Mineral Oil	6.00	lb.
Pine Tar	2.00	lb.
VGB	2.00	lb.
Safex	.75	lb.
Sulphur	4.50	lb.

Cure 30 minutes at 25 lb.

Rubber

Red Molded Inner Tube:

	1st Qual.	2nd Qual.	
Rubber	100.00	100.00	lb.
Sulphur	2.00	2.00	lb.
"808" Accelerator	1.00	1.00	lb.
Age Rite Resin	.75	1.00	lb.
Zinc Oxide	10.00	5.00	lb.
Blanc Fixe	25.00	60.00	lb.
Mineral Oil	5.00	1.00	lb.
Stearic Acid	.50	.75	lb.

Gray Molded Inner Tube:

	1st Qual.	2nd Qual.	
Rubber	100.00	100.00	lb.
Sulphur	3.60	3.60	lb.

"808"		
Accelerator	.90	.90 lb.
Age Rite Resin	1.00	1.00 lb.
Zinc Oxide	10.00	5.00 lb.
Blanc Fixe	28.00	95.00 lb.
Mineral Oil	5.00	1.00 lb.
Palm Oil	.60	.30 lb.

Molded Truck Tube

	White	Black
Rubber	100.0	100.0 lb.
Captax	2.0	2.0 lb.
Sulphur	2.25	1.5 lb.
Stearic Acid	1.5	1.5 lb.
AgeRite	1.0	1.5 lb.
Zinc Oxide	65.0	5.0 lb.
P-33	——	40.0 lb.

Cure for 5 minutes at 50 lb. steam pressure.

Heat Resisting Truck Tube

Smoked Sheet	100.000 lb.
F. P. D.	.567 lb.
D. P. G.	.567 lb.
Sulphur	2.000 lb.
Zinc Oxide	10.000 lb.
Red Iron Oxide	5.000 lb.
Blanc Fixe	20.375 lb.
Stearic Acid	.500 lb.
Neozone C	1.000 lb.

Cure 4½ minutes at 55 lb. steam pressure.

Non-Adhesive Tire Mold Liner
Formula No. 1

A mixture of casein 45, glycerol 45, and kaolin 10 parts is moistened with water to the required consistency, applied 2—3 times on both sides of cotton material, dried for 1–1.5 hr., and treated with formaldehyde.

The following formulas are (g. per kg. of final product): No. 2 gelatin 75, tech. glycerol 85, talc 30, dye of any color 10, water 800, and No. 2 10% formaldehyde solution. The gelatin is dissolved in water at 80°, and while stirring the talc, glycerol and dye are added. The cotton is worked up with mixture 2 from both sides and is dried; afterward the cotton material is worked into mixture 3, dried again and put through a roller or calender. One thousand sq. m. of cotton material requires (in kg.): gelatin 37.5, glycerol (or polyglycol) 42.5, talc 15, dye 0.5 and formaldehyde 25.0.

Tire Puncture Sealing Compound
Canadian Patent 359,821

Asbestos (Fine Fibers)	25 lb.
Yellow Ocher	5 lb.
Ethylene Glycol (50–80%)	2 gal.
Water	2 gal.

Mix thoroughly and introduce into the tire tube, under pressure, while the tube is inflated.

To Bleach White Side Wall Tires

Unsightly white side wall tires may be made completely black by painting with a 10% solution of Typophor Black in toluene.

Red Force Cup Rubber

Reclaim Rubber	60.0 lb.
Pale Crepe	30.0 lb.
Iron Oxide	5.0 lb.
Zinc Oxide	2.0 lb.
Trimene	1.0 lb.
Stearic Acid	.5 lb.
Sulphur	1.5 lb.

Chocolate Rubber Stair Tread

Reclaim Rubber	32.000 lb.
Whiting	24.625 lb.
Mineral Rubber	12.000 lb.
Clay	24.000 lb.
Iron Oxide	4.000 lb.
Zinc Oxide	1.000 lb.
Paraffin Wax	1.000 lb.
Stearic Acid	.250 lb.
Sulphur	.875 lb.
Mercaptobenzothiazole	.250 lb.

Oil Proof Rubber
Formula No. 1

Rubber	30 lb.
Accelerator A-16	4 lb.
Drying Oil	20 lb.
Sulphur	10 lb.
Clay	40 lb.

Cure at 325° F. for 40 minutes. Any drying oil such as linseed, tung, chinawood, perilla, etc. may be used.

No. 2

Rubber, Smoked Sheets	100 kg.
Whiting	112 kg.
"Gastex" Carbon Black	38 kg.
Glue	15 kg.
Zinc Oxide	10 kg.
Cotton Seed Oil	1 kg.
Stearic Acid	1 kg.
Phenyl-β-Naphthylamine	2 kg.
Sulphur	6 kg.
Butyraldehyde-Aniline	1 kg.

Oil-Resistent Duprene Rubber

Duprene	100 kg.
Whiting	85 kg.
"Gastex" Carbon Black	28.5 kg.
Glue	11.5 kg.
Zinc Oxide	10 kg.

Magnesia	10 kg.
Cotton Seed Oil	2 kg.
Wood Rosin	5 kg.
Phenyl-β-Naphthylamine	2 kg.
Sulphur	1.5 kg.

Duprene Rubber Mixture of High Temperature Resistance

Duprene	100 kg.
Zinc Oxide	50 kg.
Magnesia	25 kg.
Phenyl-β-Naphthylamine	5 kg.
Colophony (Rosin)	5 kg.

Duprene Rubber Compositions

Duprene Type D	100 kg.
Wood Rosin	5.0 kg.
Medium Process Oil	4.2 kg.
Pine Tar	2.0 kg.
Magnesia	10.0 kg.
Zinc Oxide	5.0 kg.
Carbon Black	114.0 kg.

Thiokol Rubber Composition

Thiokol D	100 kg.
"Gastex" (Gas Carbon)	55 kg.
Zinc Oxide	10 kg.
Stearic Acid	0.5 kg.
"Altax" (Dibenzoyl-Thiazyl-Disulphide)	0.3 kg.

Duprene Rubber Mixture of High Friction Resistance

Duprene	100 kg.
Active Gas Carbon	45 kg.
Zinc Oxide	10 kg.
Magnesia	10 kg.
Colophony (Rosin)	5 kg.
Cotton Seed Oil	3 kg.
Phenyl-β-Naphthylamine	2 kg.
Sulphur	1 kg.

This mixture is to be vulcanized for 40 minutes at 60° C.

PRODUCTION OF SPONGE RUBBER

Solution A

Water	25 gal.
Ammonium Carbonate	50 lb.

Compound B

Pale Crepe Rubber	44. lb.
Amber Petrolatum	1.75 lb.
Aldol Alpha Naphthylamine	0.5 lb.
Vulcacit D (D.P.G.)	0.15 lb.
Paraffin Wax	2.85 lb.
Total	49.25 lb.

Compound C

Compound B (above)	49.25 lb.
Zinc Oxide	2.2 lb.
Chalk	41.8 lb.
Magnesium Carbonate	3. lb.
Sulphur	3. lb.
Paraffin Oil	8.35 lb.
Titanium Dioxide	2. lb.
Vulcan Red	0.66 lb.
Vulcan Orange	0.40 lb.
Total	110.66 lb.

Compound D

Compound C (above)	55 lb.
Solution A (above)	35 oz.
Ethyl Alcohol	13 oz.

Method of Processing

A sixteen by forty-two inch mill is used.

Compound B.—The rubber is milled for 30 minutes with the rolls set to form a small rolling bank. Water is circulated through the rolls to keep the mill at ordinary milling temperatures (*i. e.*, about 160° F.). At the end of the 30-minute mastication period, the compounding ingredients are added. The addition of the compounding materials takes about 30 minutes, including the time to cross roll and cross cut, to insure uniform dispersion. This is aged for 24 hours before use in compound C.

Compound C.—The milling of compound C is also in accordance with standard procedure, *i. e.*, the mill is cooled to the normal milling temperature of approximately 160° F. and compound B is allowed to sheet to form a small rolling bank. As soon as the compound is sheeting smoothly, the compounding ingredients are added in the usual way and cross cut and cross rolled to insure uniform dispersion, after which the batch is slabbed off and allowed to cool thoroughly before piling. This compounding operation takes about 20 minutes.

Compound D.—For mixing this compound, the mill is cooled to as low a temperature as possible. The rolls should, under no circumstances during the mixing operation, exceed a temperature of 100° F. The roll opening is such that when compound C is sheeting it forms a small rolling bank. The gas-forming solutions are added as rapidly as the compound will absorb them and the batch cross cut and cross rolled as soon as all of the solutions are absorbed, and the batch is slabbed off. The total time for this operation should not exceed 8 minutes.

Preparation for Curing

The mill is cooled as for mixing compound D, *i. e.*, the roll temperature should not exceed 100° F. Twenty-two pounds of compound D are placed on the mill and allowed to form a sheet on the front roll. The opening between the mill rolls is such that the sheet, when slabbed off, will be approximately one inch thick. The sheet is allowed to roll until free of blisters when the entire sheet is cut off from the mill roll and laid out on a flat table. As soon as initial rapid shrinkage has stopped, sheets 22 x 22 inches are cut out of the slab. The scrap from these sheets is mixed with sufficient additional compound D to make a total of 22 pounds to be sheeted out in the same manner and to be cut into sheets 22 inches square by one inch thick.

As rapidly as possible after sheeting, these 22 x 22 inch by 1 inch thick sheets of compound D are placed in a metal frame the same size as the sheet (*i. e.*, 22 x 22 inches inside dimensions x 1 inch thick). The frame and sheet are placed between one-eighth inch thick metal plates sufficiently large to completely cover the frame and rubber sheet. The frame and rubber sheet and the metal plates are dusted lightly with soapstone or mica before assembly. This assembly is placed in a press cooled with water at 70° F. for 10 to 15 minutes. The hydraulic pressure on a press with a fifteen-inch ram should be about 250 pounds per square inch.

Vulcanization

A horizontal cylindrical steam vulcanizer five feet in diameter by twelve feet long may be used for vulcanization. This is equipped with tracks to carry the truck containing the rubber sheets and frames.

A mixture of steam and air is used for vulcanization. Both the steam and air lines are equipped with quick-acting pressure regulators so that the pressure may be adjusted rapidly and accurately. Also, the steam and air lines should be manifolded to one inlet to the vulcanizer between the respective regulators and the vulcanizer. The size of the steam and air inlet pipes leading to the manifold are adjusted to furnish air and steam in the right proportions to uniformly obtain the temperatures specified below for curing. The outlet must be sufficiently large so that the pressure may be reduced in the very short space of time specified below in the description of the vulcanizing cycle. This outlet is, of course, by-passed around the steam trap —the steam trap being of the usual type.

An open rack, mounted on wheels to form a truck which may be rolled onto the tracks in the vulcanizer, is utilized for supporting the sheets during the process of vulcanization. The inside dimensions of the rack forming the super structure of this truck are 38 inches wide by 40 inches high by 130 inches long. The center and each of the end uprights of the rack are tied together by a tier of ten round metal rods one-half inch in diameter and spaced four inches apart vertically from center to center. In addition to stiffening the rack, these metal rods act as supports for the perforated metal sheets carrying the rubber sheet during the process of vulcanization.

Metal sheets about ¼-in. thick and 37 in. wide by 130 in. long are used for supporting the rubber sheets and metal frames surrounding them during vulcanization. These metal plates are perforated with holes approximately one-quarter of an inch in diameter and spaced approximately one-half inch apart on centers. The metal plate is laid on a table and a sheet of light tissue paper laid over it to cover it completely. Three metal frames, the inside dimensions of which are 36 x 42 inches, are spaced equally on the tissue over the metal plate. This assembly is then lightly dusted with mica or talc. Then a sheet of compound D which has been prepared as described above to a size of 22 inches square by 1 inch thick is centered in each of these metal frames on the dusted tissue which has been laid on a perforated metal plate. The assembly is then placed on the bottom set of horizontal supporting rods in the wheeled rack described above. Nine more plates containing rubber sheets centered in metal frames are assembled as described immediately above and placed in a tier to completely fill the movable rack.

The movable rack is wheeled into the vulcanizer and the door closed. The by-pass around the steam trap on the outlet of the vulcanizer is opened. The regulators on the air and steam lines leading to the manifold attached to the inlet of the vulcanizer are set to 48 pounds per square inch pressure. The manifold valve is then opened and the mixed air and steam admitted to the vulcanizer at such a rate that the temperature of the vulcanizer reaches 270° F. within ten minutes. In the meantime, as soon as relatively dry steam is flowing from the outlet, the by-pass is closed and the outlet exhausted through the steam trap. The temperature of 270° F. is maintained for 46 minutes.

The timing of this next operation is *very important*. The temperature must be reduced from 270° F. to 256° F. in one minute. To accomplish this, the regulators on the inlet steam and air lines leading to the manifold must be adjusted to reduce the incoming pressure from 48 pounds to 30 pounds and the by-pass on the outlet opened immediately and kept open until the temperature in the vulcanizer drops to 256° F. and the pressure from the previous one of 48 pounds to 30 pounds per square inch. As soon as these new lower temperature and pressure conditions are established in the vulcanizer, which should be *within one minute*, the by-pass on the outlet is again closed and the vulcanizer maintained at a temperature of 256° F. for a period of 80 minutes longer. The incoming steam and air are then turned off and the by-pass on the outlet and the vents in the vulcanizer are opened.

As soon as the pressure in the vulcanizer has reached zero the vulcanizer is opened and emptied. The sheets will be vulcanized and expanded from an original size of 22 inches by 22 inches by 1 inch thick to a size of 42 inches by 36 inches square by 3 inches thick. The original volume of the unvulcanized sheet was 484 cubic inches while the volume of the vulcanized sheet is 4560 cubic inches, *i. e.*, if the processing and vulcanization have been carried on under carefully controlled conditions, the expansion of the vulcanized sheet is on the order of nine times that of the unvulcanized sheet. The cell structure will be round and of a uniform diameter of approximately 3/16ths of an inch throughout the entire body of the sheet.

Non-Metallic Dies for Molding Rubber

The object that is to be molded in rubber is carved or shaped in wax and the plaster mold is cast from this wax pattern. The molds are plastered in a special metal flask, and the wax boiled out. Rubber stock is packed in the mold and then vulcanized in an oven.

With a little practice wax can be easily handled, and objects of any desired shape can be quickly carved or modeled. It is true that making the wax pattern is an operation requiring some degree of skill, but, on the other hand, the operations to be described are very simple and can be quickly and easily mastered.

The following formula is one that can be varied so that the wax will not be too brittle in the winter or too soft in the summer. It can also be varied to make a hard wax for sharp carving of small objects, or soft for easy modeling in big masses. One part paraffine, one quarter part beeswax, and one fifth part carnauba wax is placed in a pail, or other suitable container, and water added to make the container two-thirds full. The pail is placed on a small flame, just enough to melt the wax and yet not hot enough to boil the water.

A quart bottle with a smooth surface is cleaned thoroughly. It is filled with cold water and the outside surface rinsed in a strong solution of soap and water. The bottle is then dipped in the melted wax and immediately withdrawn. This will deposit a thin smooth layer of wax on the bottle. After a wait of thirty seconds to one minute, for the wax on the bottle to cool, the bottle is dipped again. This is continued until enough layers of wax have been built up to give the needed thickness.

If the wax does not pile up fast enough, it is because the wax in the pail is too hot, and instead of piling layer upon layer, it melts the wax already on the bottle. If the bottle is kept in the wax too long, or not enough time is allowed to elapse between dippings, the wax may also fail to pile up. If the wax piles up heavy and rough, the wax is too cold.

When the desired amount of wax has been built up, the bottle is chilled slightly under running cold water. However, the wax should not be chilled too much as it will become brittle and break. The bottom and top edges of the wax are then cut around the bottle and a slit is made lengthwise. If the bottle has been soaped and chilled properly the wax sheet should peel off without difficulty. If the wax sticks to the bottle the soap solution may not have been strong enough or the surface of the bottle may not have been clean.

The sheets of wax are laid flat and cut to the size needed. If very long strips are needed the wax is cut in a spiral around the bottle. The scraps are thrown back in the pail and remelted. When the wax has cooled to room temperature, it is tested, and if found too soft, more paraffine is added. If too hard, more beeswax is added. More carnauba wax will make the wax harder for fine detail carving. The wax can be colored by dissolving oil paint of any color in a small can containing hot wax, and then adding it to the wax in the pail. To form wax rods, a sheet of wax is heated over a Bunsen burner flame and shaped by hand slightly wider than desired. It is then rolled between two sheets of glass to the exact gauge.

Wherever possible full size drawings should be made. A tracing of the drawing outlining the body of the object is then made. This, in turn, is traced on a sheet of wax which is then cut to shape. For the raised sides of the pattern, a strip of wax of the proper gauge is fused to the base with a hot tool. Rods of the proper dimensions are cut to exact lengths and also fused at the necessary places. The wax pattern is then chilled and holes drilled. Finally, it is sandpapered smoothly over rough parts with a fine grade of sandpaper and then polished by rubbing with a piece of smooth silk.

Wherever possible rods (wires, round or square) of aluminum, iron or steel can be used by fusing them in the wax pattern. These will subsequently become part of the plaster and stone mold. In this case, wires are inserted into the holes to extend 1/32" through the base, leaving exposed ⅜" on the surface of the pattern. The ⅜" parts of exposed wires will subsequently be embedded in the mold. The wires, therefore, are notched to give them a better grip. The shorter part of exposed wire on the base will make a notch in the opposite half of the mold in which it will fit when the mold is closed.

Casting the Plaster Mold

The wax pattern is placed on a board, and, with artists' plasteline, a flange is built around the pattern. This flange determines where the mold will separate. The simpler, or least complicated surface of the pattern, is left exposed. This simpler part is to be cast in plaster and the other part in dental stone.

The best place to separate the mold is at a point where the subsequent trimming of the surplus rubber will be most convenient. The wires extending out at the side of the pattern are covered with a thick layer of plasteline in order to allow a sufficient thickness of stone to hold the wires in place. In addition, a piece of plaster or wood is shaped into a triangular cone and pressed into a few places in the plasteline flange to form a notch which will act as a registry between both halves of the mold. A mix of plaster is then applied over the pattern and the plasteline flange. Care must be taken to break all air bubbles as the plaster is applied.

As the plaster jells, it is built up to about one-half inch. When the plaster is set hard, the entire mass is turned over, the plasteline is removed and, thus, the wax pattern is left on the plaster half of the mold. Now the complex surface of the pattern which is to be cast in dental stone is exposed.

Casting the Stone Mold

A heavy sheet of wax is cut into a strip, and the plaster mold with the wax pattern is boxed by fusing the strip of wax around the plaster. The boxing should extend at least ¼" above the wires of the pattern. The plaster flange is then given three thin coats of shellac which has been diluted with one-third alcohol. (A heavy coat of shellac does not dry well and leaves a rough surface.)

When the shellac coatings are thoroughly dry, one coat of sandarac varnish is applied, and, when the sandarac varnish is dry, the plaster flange is rubbed well by a brush which has been rubbed on a piece of stearine wax. The shellac, sandarac and stearine, properly applied, will assure a clean separation between the two halves of the mold. The boxed mold is then immersed in water for about 15 minutes after which it is drained by turning it upside down.

The second half of the mold is cast in dental or artificial stone. When stone is cast against stone, there is a tendency for the two castings to fuse regardless of how carefully the surface has been prepared. For this reason the whole mold is not cast in stone, the simpler half of the mold being cast in plaster as described above.

To obtain a dense cast in dental stone, it is necessary to vibrate the mixture vigorously while it is being poured, otherwise the mold will be full of air bubbles. The plaster half of the mold is boxed to hold the stone in place while it is vibrated. Dental stone is mixed in a heavier consistency and for a longer period than plaster. The stone mixture is poured from one side and allowed to flow in place while, at the same time, the mold is being vibrated vigorously. Dental stone begins to set in about 30 minutes. At the end of that time it is immersed in cold water and allowed to remain thus for another hour and a half or until the cast becomes as hard as stone.

Flasking the Mold

A special cast iron or bronze flask is needed for this work. It is made in three parts, a bottom, an extension frame and a top that has three ¾" holes. Two guide pins are fixed to the bottom part and run through the frame to the top part of the flask. For very flat work the extension is eliminated. Molds for large objects will, of course, require a larger flask.

The bottom of the flask is filled flush with a plaster mix, and the plaster part of the mold is pressed into it. As the plaster jells, it is shaped even with the line of separation in the mold. When the plaster in the flask is set hard, it is sandpapered smooth, the sides of the flask scraped clean, and the plaster on the bottom of the flask only painted with a heavy coat of petrolatum. The frame extension and top of the flask is then fitted over the bottom, and a mix of plaster poured through the holes.

When the plaster is set hard, the flask is placed in a pail of water and boiled for 15 minutes. This will soften the wax in the mold. The flask is then separated and boiling water poured over the mold until all traces of wax have washed away. The wax in the mold should not be washed by boiling the mold in water as this will carbonize the wax and make it more difficult to clean.

Packing the Rubber in the Mold

While the flask is still hot the mold is packed with rubber stock which has been cut into pieces of different sizes. Some of the pieces should be small enough so that they can be packed into the deep and narrow parts of the mold. The rubber is packed by means of smooth wooden tools. When the deep recesses in the mold have been packed, enough rubber is placed in the mold to form a surplus. The mold is then closed and screwed tight with nuts and bolts.

Vulcanizing the Rubber

Vulcanizing is accomplished in an oven at a constant heat of 360° F. At that heat in the oven the heat in the flask will not rise above 220° F. during the time it takes to vulcanize the rubber and as long as the plaster is wet. A higher degree of heat will dry the plaster quickly and raise the heat in the flask so fast that control is impossible. The size flask used in the description requires one hour and forty minutes. We have, therefore, a slow steam vulcanization that insures thorough curing of even heavy masses of rubber. The time of vulcanization will, of course, vary with the size of the flask.

As soon as the time of vulcanization is completed the flask is put under cold running water, and when cool enough it is opened. When vulcanizing the first few times, it is best, when in doubt, to under-vulcanize. When the flask is opened and the rubber is found to require additional curing the part of the flask containing the rubber can be returned to the oven and the curing continued in the open mold until completed.

To make duplicates, the rubber object is treated in the same manner as was the wax pattern. Wires are inserted into the holes and plasteline is formed into a flange around the rubber object. The plaster and then the stone halves of the mold are cast as previously described. When both halves of the mold are cast, the mold is separated and the rubber removed. As many molds are made from the original rubber object as are required. The molds are then closed and sealed around the edge with wax. As many molds are placed in the flask as the flask will hold. Objects of unlimited size can be produced by this process.

Before attempting the curing process, it is advisable to make a test with a piece of rubber embedded in a flask filled with plaster. After making a few tests, a routine process of vulcanization that gives uniform results can be developed.

Hard Rubber Coating

U. S. Patent 2,023,582

Smoked Sheet Rubber	500 lb.
Sulphur	180 lb.
Diphenylguanidine	2½ lb.
Thiobenzthiazol	2½ lb.
Benzine	2500 lb.

Mix until dissolved. This solution is applied to form a coating which is then vulcanized.

Resistant Coating for Rubber

Canadian Patent 366,029

Rubber	100 lb.
Carbon Black	150 lb.
Asphalt (High Melting)	50 lb.
Sulphur	15–20 lb.

Vulcanize on rubber surface to form a semi-hard coating resistant to chalking action of chlorine water.

Improving Surface of Rubber Goods

French Patent 816,466

The suppleness and appearance of rubber goods is improved by dipping in

Glycerin	80 g.
Almond Oil	4 g.
Lavender Oil	4 g.
Sugar	4 g.
Petrolatum	3 g.
Lemon Peel, Powdered	2 g.
Lemon Juice	3 g.

Mix well continuously.

Gas Impervious Rubber Coating

British Patent 454,316

Gelatin	16⅔ oz.
Polyglycerol	33⅓ oz.
Water	50 oz.

Warm and stir until uniform.

Fire-Resisting Rubber

Canadian Patent 358,696

Raw Rubber	10	lb.
Vulcanized Rubber	40	lb.
Sulphur	2½	lb.
Litharge	4	lb.
Zinc Oxide	23½	lb.
Stearin Pitch	20	lb.

After vulcanization free stearin pitch is no longer present.

Fire Resistant Rubber for Cables

British Patent 447,926

Rubber	33	oz.
Carbon Black	½	oz.
Sulphur	½	oz.
Kaolin	5	oz.
Magnesium Carbonate	42	oz.
Chlorinated Mineral Rubber	14	oz.
Chlorinated Naphthalene	2	oz.
Selenium	1½	oz.

An antioxidant and accelerator may be included.

Shock Resistant Rubber

British Patent 469,269

Smoked Sheet Rubber	56	lb.
"Super Floss" Silica	160	lb.
Zinc Oxide	8	lb.
Gutta Percha, Deresinated	320	lb.
French Chalk	320	lb.
Aromatic Oil	1	lb.
Turkey Red Oil	1	lb.

Mill, press between heated plates and chill.

Coloring Rubber

Rubber colors can be divided into three main classes:—(1) those soluble in rubber; (2) an intermediate class slightly soluble in rubber; (3) those insoluble in rubber. The first two classes are purely organic dyestuffs, but the third class may be divided into three groups: *a* inorganic pigments; *b* organic pigments; and *c* lakes.

The most common colors belonging to the class of rubber-soluble colors are the reds and yellows. Blues and violets are also found and are exceptionally fast to light, but they are rather too expensive for everyday use.

As a class these colors have one great failing; not only do they dissolve in rubber but they crystallize from rubber. To use them successfully, therefore, it is necessary to determine their solubility at the ordinary temperature in the particular mix used, and not to exceed this concentration. In ordinary pale crêpe this figure is very low indeed, about 0.5 per cent. If this figure is exceeded the dyestuff will crystallize out and the crystals will slowly migrate to the surface of the rubber with the production of a dull brown "bloom" (in the case of Vulcafor Red III). Certain substances, to which reference will be made later, tend to delay this crystallization but still more remarkable, certain substances which would be expected to be quite inert in this respect tend to accelerate it; thus, if iron oxide is added to a mix containing Vulcafor Yellow I in such concentration as to be perfectly stable under normal conditions, the Yellow will soon commence to "bloom" out from both uncured and cured rubber.

The incorporation of these colors into the rubber is often attended with difficulties due to the big difference in solubilities at milling and curing temperatures. A small speck of dyestuff may remain undissolved after the milling, but during the curing will dissolve and produce a darker colored spot, which owing to diffusion may become a large blot. Various attempts have been made to overcome this difficulty, such as prolonged grinding of the color with some white pigment, e. g., blanc fixe, but only with partial success. There is, however, a method by which not only can easy incorporation be secured, but also a slight decrease in the risk of "blooming," viz., first to convert these colors into their stearates by melting them with about twice their weight of crude stearic acid. The fused mass on cooling may be roughly broken up and milled into the rubber into which it will pass with the greatest ease and perfect solubility. A mixture of stearic acid and common rosin has been suggested, but offers little, if any advantage, over crude stearic acid. The ideal solution to this problem would be to discover a protective colloid which would prevent the growth of the color particles, but such protective colloids for substances which crystallize easily are difficult to find.

Rubber-soluble colors have great limitations in use, because they bleed from one piece of rubber to another, or into paper placed in contact. They are not fast to naphtha or most organic solvents. They are used for special purposes, e. g., marking the position of valve patches.

Colors Slightly Soluble in Rubber

The most characteristic members of the small slightly rubber-soluble group are Vulcafor Yellow and Vulcafor Scarlet. These colors are not sufficiently soluble to bleed from one piece of cold rubber to another, but when the rubber is hot they do show this tendency to a slight degree. Under no conditions will these colors bleed from rubber to packing paper.

For most purposes these colors are ideal, since they need not necessarily be in a fine state of division in order to secure dispersion; they contain the maximum amount of dyestuff and the minimum amount of filler.

Colors Insoluble in Rubber

The rubber-insoluble class comprise inorganic and organic pigments, and the lakes made from water-soluble organic colors. It is difficult to decide in some cases whether a given organic pigment should be classified as belonging to this or the prior group. Generally speaking, if it is possible to use an organic pigment as such, it will be found to be more easily dispersible in rubber than the corresponding lake, although for certain purposes the lake is to be preferred.

In the case of open-air cures, with or without pressure, the straight pigments are perfectly satisfactory, and the same remark applies to press-cures.

Transparent Rubber

The pale crêpe to be used for transparent rubber should be as free from suspended matter as possible, and great care should be taken to ensure that the rubber and compounding ingredients are perfectly dry, or turbidity will result during the cure.

The accelerator and activator should be selected with a view to perfect solubility in the rubber. Zinc or cadmium stearates are perhaps the safest activators, since there is less danger of undissolved particles than when the oxides are employed. For coloring transparent rubber, the ideal color is one perfectly soluble in the rubber, and used at such concentration that there is no fear of any separation or blooming on storage. Rubber-soluble colors are, however, not absolutely essential, since certain colors given in rubber colloidal dispersions which do not aggregate may be employed with success.

Another novel and interesting effect, which requires the same technique, is the production of rubbers with metallic lustres. These effects may be obtained by compounding aluminum powder into white transparent rubber for a silver effect or into a transparent rubber colored with Vulcafor Yellow I for a gold effect.

Jazz Effects

In many of the early attempts to produce marbled and jazz effects the colored pigment was simply dusted upon the mix as it passed through the calender. The result was neither pleasing nor practical. The best effects can only be obtained by the partial mixing of different portions of the basic rubber compound into which the various colored pigments have been properly incorporated.

There are three important considerations to be kept in mind in the production of these effects, (1) the colors employed must be practically insoluble in rubber, both in the cold and during the cure. In steam-cured goods, the selection of pigments is still further narrowed down, since some colors which do not bleed in press cures will do so in open steam; (2) the various portions of colored mix should be of the same plasticity when put through the rolls, producing the jazz effect; and (3) the degree of mixing must be just sufficient to give the effect and no more, or dull patches will result from the bleeding of complementary colors.

A novel method of obtaining a far more natural marble pattern is to split the rubber as it leaves the calender upon which the jazz mixing has been effected (*U.S.P.* 255,017). From the aesthetic point of view a pleasing jazz will always be found to contain a predominanace of white, or some bright color, such as yellow. With regard to the most suitable accelerators for use in the curing of colored soft rubbers, in press-cured goods, a thiuram accelerator should be employed, and for use in dry heat preferably an accelerator of the type of zinc diethyldithiocarbamate. Quite satisfactory results can be obtained with most of the slower accelerators, e. g., D.O.T.G., except in the case of one or two vat colors, which appear under certain conditions to be partially reduced during the cure; in such cases quite excellent results may be obtained by the substitution of aldehyde-ammonia as the accelerator. The only class of accelerators which should be definitely ruled out in these effects is the resin type made from aromatic amines, since these discolor the rubber.

Ebonite

In the coloring of ebonite there is the obvious difficulty of covering up its natural brownish-black color; this involves the use of large proportions of color. If this color is first covered by the use of a white pigment such as lithopone, it is necessary to overcome the hiding power of this, and furthermore the introduction of the inorganic pigment tends to give rise to a stone-like ebonite. In most cases the brightest results can be obtained by the correct balance of white pigment and color, in fact in the case of the darker colors the use of white pigment is essential, since at the necessary concentration these colors are in themselves very dark. With the paler colors, however, such as yellow or orange, quite bright products can be obtained in the absence of inorganic pigments with consequent improvement in physical properties.

In the successful production of colored ebonite it is necessary to balance the three factors of time, temperature, and sulphur. It is unfortunate from the point of view of colored ebonite that the action of accelerators in its production differs fundamentally from their action in soft rubber, inasmuch as the accelerator has no effect upon the physical properties of the vulcanizate and hence the sulphur cannot be reduced. Accelerators merely speed up the inevitable result and the beneficial effect consists in either reducing the temperature, or shortening the time, of the cure. If powerful accelerators are not used carefully they do more harm than good in the production of colored hard rubber, since under certain conditions they tend to generate sulphuretted hydrogen, which, apart from the harmful effect of the resulting microporosity upon the ease of polishing the product, tends to destroy the colors by reduction. Since many of the best ebonite colors, especially the vermilion substitutes, are vat dyes, this generation of a reducing gas is especially harmful. It can, however, be avoided by employing a well-regulated temperature rise in curing. In thick layers or masses of accelerated mix, this generation of gas may become sufficiently powerful and spontaneous to assume the character of an explosion, and cases are known where quite heavy presses have been completely disrupted by this effect.

A typical bright reddish-orange hard rubber, suitable for, e. g., fountain pen stocks, may be made as follows: rubber 100, Vulcafor Orange 125, magnesia 4, sulphur 40, Vulcafor Resin 4.

Generally speaking, the best ebonite colors are insoluble colors, especially vat dyestuffs, but these colors vary considerably, probably depending upon their ease of reduction to the leuco compounds by hydrogen sulphide. The rubber soluble colors are on the whole unsuitable for ebonite, since not only do they change in color during vulcanization, but they tend to cause evolution of hydrogen sulphide. In all cases the surface must be carefully protected against the action of live steam. Unlike soft rubber, the surface of ebonite cannot be protected by mere cloth wrapping. Although this destructive action is only a surface effect which can be removed in the final polishing, it is in most cases too deep seated to allow the use of colors, e.g., Vulcafor Orange, in the production of dental plates, which are cured in open steam, since the plaster mould is not steam-tight. Certain vat colors, however, have been used successfully in the coloring of dental ebonites.

Another method of manufacture is press-moulding from ebonite dust. It is difficult to produce satisfactory colored ebonite by moulding a mixture of ordinary ebonite moulding powder and color, but satisfactory results can be obtained when the moulding powder is made from properly prepared colored ebonite dust.

Colored Powdered Rubber

U. S. Patent 2,053,530

A colored, powdered rubber may be prepared in accordance with the following procedure. About 60 pounds of a 10% casein solution is added, with stirring, to about 250 pounds of ammonia-preserved latex of 40% solids content. An aqueous suspension of coloring matter, the particles of which are of colloidal fineness, is then added in desired amount to the latex-casein mixture. The resulting colored mixture may, if desired, be diluted with water to a solids content of about 20%. The mixture is then treated while being stirred with a solution prepared by dissolving five pounds of zinc chloride and about one ounce of acetic acid in about 200 to 500 pounds of water. The mixture thus treated may have a pH value of approximately eight. It gradually thickens, and its solids content is finally resolved into a slurry of rubber flocs. The slurry of dyed rubber flocs is then dewatered, as in a filter press, producing a cake of about 60% to 70% solids content which will crumble readily. It is preferably dusted with talc, zinc stearate, or other suitable dust and passed through a rotary cutter, that reduces it to a powder of about 50 or finer mesh, after which it is dried.

The colored powdered rubber can be readily worked in the desired amount into a rubber batch as it is being milled, the dyed rubber particles tending to disperse uniformly throughout the batch and to color it substantially uniformly. Not only does this practice make possible increased capacity in a rubber mill and a saving of power, but it enables the realization of maximum coloring effect in the resulting rubber compound through the use of a given amount of coloring agent.

These principles apply to the compounding with rubber of other than coloring agents, for instance, vulcanizing agents, accelerators of vulcanization, antioxidants, etc., all of which have heretofore presented to a greater or less degree the same compounding difficulties as have been experienced with coloring agents.

Rubber Color Finish

U. S. Patent 1,940,315

Colored luster finish is imparted to the surface of a rubber article by applying finely powdered aluminum and a solution of rubber in an organic solvent. The rubber solution is prepared by first depolymerizing the rubber either by milling it excessively or by heating it at high temperatures with the solvent. Such a solution is of low viscosity and adapted to spraying operations. At the same time it contains sufficient rubber to embed the aluminum powder in the layer of rubber laid down from the solution. To such a solution is added a coloring material as eosin lake. This mixture is considered as a rubber ink.

The aluminum powder and rubber ink are mixed in various proportions according to the luster on the article desired. Suitable proportions of the ingredients follow:

Formula No. 1

Blue Ink	20 fl. oz.
Aluminum Powder	1 oz.
Solvent	16 fl. oz.

No. 2

Red Ink	12 fl. oz.
Aluminum Powder	1 oz.
Solvent	20 fl. oz.

No. 3

Green Ink	14 fl. oz.
Aluminum Powder	1 oz.
Solvent	16 fl. oz.

The solvent is any of the naphtha solvents and is added to give the mixture the proper fluidity.

The aluminum and rubber ink are kept in intimate mixture by continual stirring or shaking which may be effected as an additional operation in which the mixture is applied.

Application may be by spraying the mixture under air pressure, using the ordinary type of spray gun, by dipping the article into the mixture, or by brushing it onto the surface. The article, if in the unvulcanized state when the mixture is applied, is then vulcanized in the ordinary manner. If in the vulcanized state when the mixture is applied, it may be finished by merely drying the mixture, or in addition the mixture may be treated with sulphur chloride or bromine to remove surface tack. The ink may contain vulcanizing agents if desired.

This process is applicable to a large variety of rubber articles such as bathing caps, toys, hot water bottles, bathing shoes, golf balls, gloves, aprons, bibs, playing balls, raincoats, overshoes, etc.

Neutral Colored Rubber Mat

Reclaim Rubber	38.00 lb.
Smoked Sheets	4.00 lb.
Sulphur	.75 lb.
Diphenylguanidine	.25 lb.
Zinc Oxide	1.00 lb.
Clay	27.00 lb.
Whiting	25.25 lb.
Medium Process Oil	3.00 lb.
Paraffin Wax	.50 lb.
Stearic Acid	.25 lb.

Wire Insulation

Formula No. 1

Reclaim Rubber	40.0 lb.
Smoked Sheets	10.0 lb.
Whiting	34.3 lb.
Mineral Rubber	10.0 lb.
Zinc Oxide	2.5 lb.
Paraffin Wax	1.5 lb.
Stearic Acid	.5 lb.
Sulphur	1.0 lb.
Captax	.2 lb.

No. 2

U. S. Patent 2,047,736

Conductive cores such as metal wires are provided with a vulcanized insulation formed of crude rubber 22, reclaimed rubber 20, ''mineral rubber'' 5, whiting 44.7, zinc oxide 2.5, antioxidant 1.5, sulphur 1, pine tar oil 3 and ultra-accelerator 0.3 lb. each.

No. 3

Canadian Patent 367,225

Reclaimed Rubber	30–45 lb.
Vegetable Pitch or Blown Asphalt	50–45 lb.
Ground Silica or Asbestos Fibers	20–10 lb.

Splicing Large Rubber Belts

This method of connecting belts permits an endless splice of an 8-inch belt in one hour by the aid of the air-acetylene torch. In making the splice the plies are cut out out at an angle and in steps in each end of the belt with the plies of one belt fitting into the plies of the other, as is the customary practice in such splices. This gives a belt joint of the same thickness as the original and as near maximum strength as possible. About 28 inches extra is required for making the splice in an 8-inch rubber belt.

After separating and cutting the plies to match, all excess rubber is carefully removed from the surfaces of the fabric so as not to injure the threads. Two or three coatings of Balata gum cement are then applied carefully to the fabric, allowing each coating to dry thoroughly. Excess gum should be removed from the corners of the cut because, if the gum is not dry enough when heat is applied, gas pockets are created which result in "bootlegging" or separation of the plies. This is especially true with large belts. Two applications of cement are considered ample for 8-inch belts.

When the gum cement is dry the two ends of the belt are joined carefully. The belt is then placed in a belt press and compressed until perfectly flat and even. An air-acetylene torch is then applied to the entire surface over the top joint which is heated thoroughly but carefully to prevent burning or discoloring the surface of the belt. This requires rapid movement of the torch over the surface of the belt. In the case of an 8-inch belt the torch is used for approximately 5 minutes.

The heat draws the cement into the fabric, thus creating a firm bond. Immediately after heating, the spliced section should again be placed in the belt press for a few minutes until the belt is reasonably cool. For an 8-inch belt this requires about 5 minutes. Water may be used to hasten cooling.

For large rubber belts the two ends of the splice should be stitched to prevent the ends opening. This is not considered necessary on the lighter and smaller sizes.

On completion of this work the belt is ready for use. With 8-inch belts the entire splice can be made in an hour or less depending upon the skill and speed of the workman. This represents an important saving in time compared to splices made with cold cement, which usually require a stoppage of 8 hours or more depending upon the size and number of plies in the belt.

Microporous Rubber Soles
Base Formula

Rubber	**100.0 lb.**
Lampblack	**50.0 lb.**
Pine Tar	**5.0 lb.**
Cotton Linters	30.0 lb.
Zinc Oxide	5.0 lb.
Stearic Acid	5.0 lb.
Sulphur	3.5 lb.
Mercaptobenzothiazole	0.8 lb.
Aldol-Naphthylamine	2.0 lb.

The cotton linters are milled before using. To the above batch is added 15–17 lb. of following emulsion:

Sodium Bicarbonate	6 lb.
Casein	5 lb.
Ammonium Hydroxide	3 lb.
Water	84 lb.

Warm and stir until uniform and then mix in

Alizarin Oil	8 lb.

Cure in steam at 3.5 atmospheres or in a press at 142° C.

A mixture that may be used in place of the above emulsion is a paste consisting of:

Sodium Bicarbonate	60 lb.
"Agerite"	8 lb.
Paraffin Wax	2 lb.
Glue	12 lb.
Liquid Petrolatum	18 lb.

Water Dispersible Rubber
British Patent 445,542

To 100 lb. of finely divided spray or film dried rubber there is added

Oleic Acid	6 lb.
Caustic Potash	2 lb.
Glue	4 lb.

It is then plasticized on rolls and worked in an internal mixer with ammonium hydroxide.

Non-Tacky Rubber Goods
British Patent 445,534

The form is dipped into latex containing following figured on 100 lb. dry rubber:

Piperidine penta methylene dithiocarbamate	1 lb.
Zinc Oxide	1 lb.
Sulphur	2 lb.
Condensation Product (produced by heating lecithin (3) and oleic acid (1) at 60° C. for 45 minutes with stirring and dispersing in dilute ammonia)	3 lb.

Deodorized Vulcanized Rubber

37½ lb. pale crepe rubber; 14 oz. sulphur; 2⅝ oz. Thionex; 3 lb. zinc oxide; 36 lb. whiting; 10 lb. barytes; and ¼ oz. green color. To this is added ¾ lb. Para-Dor and the compound is cured at 56 pounds for 8 minutes.

Non-Tarnishing Rubber

Rubber	85.0 oz.
Captax	2.0 oz.
Zinc Oxide	2.0 oz.
Stearic Acid	4.0 oz.
Sulphur	.4 oz.

Cure at 240° F. for 60 minutes.

Flexible Hardened Slip Finish For Rubber Goods

U. S. Patent 2,057,717

Surfaces of latex treated materials are treated for a short time with

Sulphuric Acid	5 oz.
Glycerin	15 oz.

Forming Rough Surface on Rubber Goods

British Patent 448,214

The following mixture is applied to the surface of unvulcanized rubber goods: dried and vulcanized. Melt together rubber waste (100), colophony (200), and mineral pitch (400), treating this with turpentine oil (200), and adding a mixture of benzol (1000) and benzine (2000) all parts by weight.

Transparent Chlorinated Rubber Film

Canadian Patent 358,457

A solution of 7% of a partially saturated rubber hydrochloride, e. g., rubber hydrochloride containing 29–30.5% chlorine dissolved in benzol is spread as a thin film on a smooth endless belt, and the benzol evaporated until the solvent content is reduced to 5–15% of the weight. The film is passed between polished pressure rollers, and the rest of the solvent evaporated. An operating temperature of 190–200° F. is preferred.

Incorporating Glue in Rubber

First 100 grams of strong glue are allowed to swell 24 hours in 100 grams of water; then it is melted by heating over a hot water bath. With the mixture still over the hot bath, 10 cubic centimeters of ammonia at 22° Bé. are added; then 166 grams of 60% latex are poured into the liquid glue while being stirred. After a homogeneous mixture is obtained, it is poured into a shallow mold and allowed to cool. After unmolding and drying, a horny product results which can easily be incorporated into rubber on an ordinary mixer. Dispersion is excellent and very easily effected. This process can, of course, be modified so as to yield a product with different proportions of rubber and glue. The above formula gives a product with 50% of rubber and 50% of glue. The ammonia may be omitted. In this case a few lumps of coagulated rubber may appear, but this does not affect the rest of the procedure.

Removing Bonded Rubber From Metal

U. S. Patent 2,077,785

The process of removing rubber from metal which has been bonded thereto by vulcanization, consists of immersing the rubber and metal in a bath of lubricating oil, and maintaining bath of oil at a temperature of approximately 250° to 300° F. for a period of about 36 hours.

Plastic Rubber

U. S. Patent 2,041,223

Crude Rubber	120 lb.
Rubber Solvent	78 gal.
Asbestos Fiber	200 lb.
Portland Cement	200 lb.
Carbon Black	12 lb.
Rosin	10 lb.
Stearic Acid	3 lb.
Sulphur	14 lb.
Zinc Oxide	14 lb.
Denatured Alcohol	2 gal.
Ground Rubber Tires	155 lb.

This is milled together to give a non-sticky plastic, hardening without shrinkage.

Rubber Display Figure Composition

French Patent 810,765

Latex (75%)	250 g.
Casein (Ammonia Dispersion 10%)	40 g.
Chalk	250 g.
Titanium Dioxide	50 g.
Asbestos, Powdered	50 g.
Sulphur	5 g.
Zinc Oxide	10 g.
Accelerator, Rapid	2 g.
Acetic Acid	100 g.
Water	40 g.

This is coagulated by drying.

Softening Rubber Goods

Practically all rubber articles, may be softened with little difficulty by a simple process. First cleanse the article by scrubbing thoroughly with a brush dipped in warm water and place in a solution of one part of ammonia to two parts of water, allowing it to remain an hour or so until the ammonia has evaporated. Then rinse the articles with a dilute solution of glycerin and water, wipe off and dry, and store in a cool spot away from the light.

Calculating Equivalent Time of Cure

It is frequently necessary to change the time (and therefore the temperature) or the temperature (and therefore the time) of cure of a rubber compound. The relation is a complicated one but is easily determined by solving the expotential equation

$$M_2 = M_1 \times 2^{\frac{T_1 - T_2}{16.2}}$$

Where M_1 and M_2 are given and required times in minutes T_1 and T_2 are given and required temperatures (° F.)

Rubber Storage Battery Separators

Canadian Patent 370,360

Smoked Sheet Rubber	100 lb.
Sulphur	50 lb.
Stearic Acid	5 lb.
Porous Rubber Dust	24 lb.
Silica Gel	226 lb.

Synthetic Rubber Emulsion Cement

a.	Water	40 oz.
	Casein (Acid)	5.4 oz.
	Ammonia	1.45 oz.
b.	Oleic Acid	0.34 oz.
	Synthetic Rubber	13.2 oz.
	Gasoline	39.34 oz.

Dissolve ingredients *b* and add slowly to *a* while mixing vigorously.

Printers' Rollers

	Hard	Medium Hard	Medium Soft	Soft
Glue	100	100	100	100
Glycerin	62	73	91	94
Sorbitol (85%)	45	63	100	128
Water	43	39	33	28

The figures refer to gross weights of materials as received. The range covers all seasons. In practice, old remeltable composition is generally added, as these compositions are remeltable; this makes for an economic advantage over non-melt composition. To make the above mixture "non-melt," about 1 oz. of paraformaldehyde, or some similar material, may be added for each 100 lbs. of mixture.

These compositions give printers rollers that have greater resistance to humidity changes, greater toughness, increased heat resistance, greater resistance to ink solvents and longer life than the straight glue-glycerin composition.

The ingredients are mixed together and cooked for about 2 hours in a steam jacketed kettle at about 170° F., the mixture being stirred constantly in such a way that air bubbles are kept to a minimum. After cooking, the composition is cast in molds of the proper size, and cooled.

Rubber Dispersion

A mixture of smoked sheet 37, reclaimed rubber 37, Rubberax 6, rosin 10, zinc oxide 3, oleic acid 2, and wheat flour 5 is milled until very plastic and hydrophilic fillers were added. The product is mixed with 2% aqueous caustic potash at 40–60°, the latter being added gradually. As the water is increased there is a sudden reversal of phases and the rubber becomes the disperse phase.

Synthetic Rubber Dispersions

Two mixtures: (1) natural rubber 67, synthetic rubber 33, oleic acid 12, dextrin 10, kaolin 30, caustic soda 1.5, and (2) synthetic rubber 100, oleic acid 18, kaolin 30, dextrin 18, caustic soda 2, are dispersed. The natural rubber is milled at 20–35° for 20 minutes, following which are added oleic acid, synthetic rubber and the remaining ingredients except caustic soda. At the end, 0.5 of the caustic soda is added very gradually. The mass is mixed in a Werner-Pfleiderer mixer (preheated to 35–50°), vulcanizing agents and the remaining caustic soda solution are added very gradually until a change of phase takes place, and the mass is diluted with water to the required concentration. Addition of 10% dry casein improves considerably the quality of the dispersion. The dispersion keeps for 2 weeks; in hot weather a small proportion of phenol is added.

Doll's Head Composition

U. S. Patent 2,024,124

Broken down rubber	35 lb.
Coumarone Resin	35 lb.
Mineral Oil, Heavy	10–40 lb.
Gum Chicle	20–40 lb.

Rubber Printing Blanket Softener

Castor Oil	25 oz.
"Cellosolve"	75 oz.

Rub into blanket and allow it to soften. Then wash out with dry cleaners' naphtha.

Rubber Bottle Caps

50 per cent Colloidal Sulphur Paste	2 oz.
Colloidal Zinc Oxide	1 oz.
Accelerator	0.5 oz.
60 per cent Latex	96.5 oz.

In mixing, the zinc oxide and accelerator are moistened with distilled water, or dilute ammonia, and ground with the sulphur paste to a smooth cream. The latter is then added to the latex with continual stirring till uniform dispersion is effected.

If carbon black is included, it can be dispersed in potassium oleate solution, or in casein solution. But in any case, if an appreciable quantity of filler is used, it is advisable to use a mill or homogeniser to disperse it in water before adding to the latex.

"Preserver" for Rubber Rugs

Rubber, Crude, Cut	4 kg.
Coumarone Resin	1 kg.
Spindle Oil	100 kg.
Camphorated Oil, or Spike Oil	to perfume

Heat the rubber and the resin in the spindle oil until dissolved. Cool, and perfume (if desired).

Non-Blooming Rubber Flux

U. S. Patent 1,985,261

Coumarone Resin	8.65 lb.
Stearic Acid	5.00 lb.
Paraffin Wax	1.35 lb.

The above is used in following proportions:

Rubber	25 lb.
Above Flux	1¼ lb.
Zinc Oxide	3 lb.
Sulphur	1¾ lb.
Accelerator	¾ lb.
Pigment	10 lb.
Filler	60 lb

Granulated Rubber

U. S. Patent 2,019,055

A specific procedure cited by the inventor follows. To about 250 pounds of ammonia-preserved latex of about 40% solids content is added, with stirring, about 60 pounds of a 10% casein solution. The casein solution may be prepared by swelling dry casein in water, dissolving it with strong ammonia water under heat to form ammonium caseinate, and diluting with water to 10% casein strength.

The latex-caseinate mixture is preferably, though not necessarily, diluted with water so that its rubber content is less than 20%, as such practice tends to produce a smaller particle size in the resulting granulated rubber. To the mixture of latex and ammonium caseinate is then added with stirring a solution prepared by dissolving about five pounds of zinc chloride and about an ounce more or less of acetic acid in about 200 to 500 pounds of water. As the zinc chloride solution is being added, the mixture thickens and is finally completely flocculated. The flocculated rubber has a pH value of about 8.2. The slurry of rubber flocs is filter-pressed until a cake of about 60% to 70% solids content is reached. The cake is characterized by its crumbliness and tends to fall apart into a powder upon merely being rubbed between the fingers. Upon removal of the cake from the press, it is preferably dusted with talc, zinc stearate, or other suitable powder in the amount of preferably only about 1 to 2%. The powder facilitates the comminution of the cake into particles or granules of the desired fineness and inhibits cohesion of the particles during handling, drying, and afterwards; so they are possessed of a free-flowing quality. The dusted cake is subjected to comminuting action in a suitable machine, for instance, in an Abbe rotary cutter, equipped at its outlet with a screen permitting discharge from the machine of only rubber particles or granules of the desired fineness, for instance, particles or granules of 20 to 50, or even finer mesh.

Mixtures of Phosphatides and Caoutchouc

German Patent 627,580

a. Soybean Lecithin, containing 30–70% Oil	100 g.
Acetone	to extract
b. 10% Rubber Solution in Benzine	100 g.

Extract all the oil from the lecithin. The remaining lecithin, containing some acetone, is miscible with the rubber-solution *b.*

Chicle Substitute

U. S. Patent 2,078,078

Amyrin Acetate	26–31 lb.
Amyrin Caproate	40–50 lb.
Resenes	5– 8 lb.
Depolymerized Rubber	15–20 lb.
Cocoa Butter	0– 5 lb.

The ingredients specified in the above formula may be mixed in the kettle at a temperature up to 105° C., and the mixture stirred in the kettle until a homogeneous mass is secured. It is best to reduce the viscosity of the rubber to a predetermined point before combining it with the major portion of the resins. This can be done by masticating the rubber with about 25% of its own weight of resin or cocoa butter in a kettle at a temperature of 140–150° C. until the desired degree of depolymerization has been obtained. If rubber is used which has been previously depolymerized, melt the resins and to combine them with the rubber in a mixing kettle at a temperature preferably not exceeding 105° C.

Synthetic Molding Resin

The reaction product (1½ mols.) of Hydrogen sulphide and formalin in aqueous solution at pH 4–7.5 is heated at 40–50° C. with urea (1 mol.). The products can be molded or cast.

Synthetic Resin Molding Composition

U. S. Patent 2,038,113

Phenol-Formaldehyde Resin	288 oz.
Gluten	330 oz.
Wood Flour	350 oz.
Calcium Oxide	5 oz.
Wax	4 oz.
Zinc Stearate	3 oz.
Color	20 oz.

Glass Like Synthetic Resin

U. S. Patent 2,019,453

Formaldehyde	2–2.5 mols.
Urea	1 mol.

Heat in a slightly acid solution (pH 5–6) and then make alkaline (pH 7–8) with triethanolamine and evaporate to a syrup; add more urea and acidify to pH 3.5–5 with an alkyd resin and evaporate. Pulverize to get molding powder.

Cotton Mill Roller Covering

British Patent 457,937

Chloroprene	100 oz.
Gas Black, Soft	50 oz.
Magnesium Oxide	10 oz.
Zinc Oxide	10 oz.
Rosin	5 oz.
Phenyl-β-Naphthylamine	½ oz.

Water Soluble "Glyceryl Phthalate"

Glycerin	920 g.
Phthalic Anhydride	1480 g.

Heat with stirring at 145–150° C. for five hours. Add

Sodium Bisulphite	50 g.

and stir until no more sulphur dioxide is evolved. Neutralize with

Caustic Potash (45% solution)	600 cc.

Vinyl Resin Insulation

British Patent 470,380

Lead Oxide	5 oz.
Carbon Black	5 oz.
Polymerized Vinyl Chloride	52 oz.
Tricresyl Phosphate	38 oz.

This composition has a low dielectric and power factor loss.

Floor Coverings

German Patent 644,389

A composition comprising a filler, a natural or synthetic resin, and an unoxidized drying oil is strewn on a support of fabric, cardboard or like material and, after rolling, is warmed to about 45° C. to effect oxidation of the oil. After further rolling, the product is finally dried at a temperature rising to 80°. A typical composition contains linseed oil 100, colophony 11, wood meal 60, cork meal 60, and ochre 45 parts by weight.

Retarding Crystallization of Rosin

U. S. Patent 2,042,877

2–5% of a fatty acid soap is added to gum or wood rosin to prevent or retard crystallization.

Testing for Different Resins

A quick test comprises heating a few grams of the synthetic or natural resin-shellac, for example—with about half gram of sulphur and soda for a few minutes in a porcelain dish while stirring with a glass rod during the melting process. When completely melted the contents are allowed to cool and the color change is carefully noted. The test, originally devised for shellac, is equally indicative for other gums. Resultant colors for specific resins are as follows:

Shellac, green to deep green; Rosin, brown; Dammar, yellowish brown; Copal, yellowish brown; Sandarac, light brown; Mastic, light green; Glyptals, no color change; Colophony, yellow-brown.

Molding Compound

Ethyl Cellulose	80 oz.
Baker's Plasticizer P-6	20 oz.

Mix or Process on a Rubber Mill and Hot Mold.

Molding Composition

Formula No. 1

U. S. Patent 2,026,106

Wood Flour	60 oz.
Sulphide Liquor Residue, Dried	40 oz.
Water	to make a paste

Add

Phenyl Chloride	12 oz.

Heat to 200° C. for 3 hours and pulverize to get a black molding powder.

No. 2

U. S. Patent 2,054,243

a.	Coal Tar Pitch	10 lb.
	Cumarone Resin	10 lb.
	Rubber	10 lb.
b.	Wood Four or Other Filler to suit.	

Mill *a* in a heated heavy duty mixer until uniform and then mill in the filler *b*.

No. 3

Austrian Patent 150,629

Casein	50 kg.
Calcium Oxide	5 kg.
Zinc White	15 kg.
Portland Cement	10 kg.
Water	20 kg.

Pour into molds and dry at 60° C. Remove while warm and treat with 5% formaldehyde.

Cold Molding Composition

Canadian Patent 362,451

Cumarone Resin	7-10 oz.
Rubber	8-10 oz.
Coal Tar Pitch	9-14 oz.

Fillers to suit.

Molding Plastic

U. S. Patent 2,036,574

Paraffin Wax	50 oz.
Rosin	35 oz.
Sulphur	10 oz.
Carnauba Wax	5 oz.

Melt together and mix until uniform.

SHELLAC MOLDING COMPOSITIONS

	Formula No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Shellac, Powdered	30.0 g.	30.0 g.	30.0 g.	30.0 g.	30.0 g.	30.0 g.
Kaolin	32.5 g.	——	——	32.5 g.	——	——
Barytes	32.5 g.	——	——	32.5 g.	——	——
Bone-Black	5.0 g.	5.0 g.	5.0 g.	5.0 g.	5.0 g.	5.0 g.
Micro-Asbestos	——	65.0 g.	——	——	65.0 g.	——
Wood Four	——	——	65.0 g.	——	——	65.0 g.
Urea	——	——	——	1.8 g.	1.8 g.	1.8 g.

Where urea is not present a mold temperature of 120° C. with ejection at 40° C. is used. With urea, mold at 130–150° C. and eject at 80° C.

Gasoline and Oil Resistant Plastic

U. S. Patent 2,096,662

Chlorinated Rubber	100 oz.
Cumarone Resin (Low Melting)	5 oz.
Magnesium Oxide	15 oz.

Mix in a heated rubber mill.

Vase Decoration Plastic

U. S. Patent 2,047,058

Cement	35 lb.
Sand, Dry Bank	55 lb.
Whiting	10 lb.
Water	15 qt.
Vinegar	5 qt.

Button & Buckle Composition

German Patent 655.989

Paper Pulp	45 oz.
Rye Meal	45 oz.
Gypsum	10 oz.

Add water to suit. Mix well and press into forms.

Cold-Molding Composition for Small Objects

Take 55 grams of hydrofuramide and heat it at 120° C. for 1 hour. This converts it into furfurin. Take 50 grams of this furfurin and dissolve it in 200 grams of furfural (tech.) to make solution A. This solution will keep for an indefinite length of time. To 45 parts by volume of solution A add 25 parts by volume of technical furfural just before the solution is to be used. Add 30 parts of concentrated hydrochloric acid (sp. gr. 1.18) to 70 parts of furfurin-furfural solution and stir vigorously. Pour this solution immediately into an acid resistant mold (e.g. glass) and allow it to set for 24 hours. After removing the objects from the mold, place them in storage and allow them to dry for about a week at ordinary room temperatures. The black material formed is quite strong and has a lustrous finish. This method can be used only for small objects.

Molded Asbestos Plastic

U. S. Patent 1,985,764

A mixture of asbestos fibre 40, wood fibre 60, and slaked lime 10—15 oz. with water is rolled into sheets; utensils are molded from the material, and stiffened by immersion in sodium silicate (d. 1·16).

Powder for Casting Molds

(to substitute for lycopodium powder)

Calcspar, Finely Ground	100 g.
Montan Wax, Coarsely Powdered, Light, Refined	5 oz.

Heat together for 30 minutes at 110–120° C. in an agitated kettle, until homogeneous. May be dyed with 0.1–0.2 per cent of oil-soluble dye, to match the yellow color of the lycopodium.

Cool, powder, sift.

Molds for Metal Casting are usually

"dusted in" on their inside surfaces with charcoal powder in a bag.

Papier Maché

Paper Powder	100 kg.
Zinc White	75 kg.
Barium Oxide	25 kg.

Cellulose Acetate or Phenol Formaldehyde Laquer (20%) to suit.

Electrical Resistance Molding Composition

British Patent 444,023

Resin Base

Novolak-Type Resin	100 oz.
Pyridine	8 oz.
Calcium Stearate	2 oz.
Calcium Hydroxide	10 oz.

Cure at 150–170° C.

Molding Mixture

Above Resin Base (Powdered)	350 oz.
Glass (Powdered)	645 oz.
Montan Wax	2.1 oz.

Mold this cold and then under heat and pressure until resin partially polymerizes: then immerse in etching bath of 10% caustic soda solution, washed, dried and baked to complete polymerization.

This composition can be painted with following resistant paint:

Coating Mixture

Above Resin Base (Powdered)	65 oz.
Carbon Black	17.5 oz.
Graphite	17.5 oz.
Acetone	200 oz.
Amyl Acetate	200 oz.

This paint after application and thorough drying is heated to polymerize the resin.

Dentist's Molding Mass

Manila Copal, Soft	30 g.
Colophony, Light, French	30 g.
Carnauba Wax, Refined	10 g.
Stearin	5 g.
Peruvian Balsam	2.5 g.

Dental Mold

British Patent 447,478

Quartz, Powdered	60 g.
Kaolin	5 g.
Grog	10 g.
Alumina	15 g.
Magnesium Oxide	5 g.
Zinc Oxide	5 g.

Mix the above with

Phosphoric Acid (25%)	50 g.

and

Phosphoric Acid	9 g.
Water	40 g.

This mold is suitable for casting stainless steel and porcelain.

Dental Impression Composition

U. S. Patent 2,077,418

Solid Portion

Zinc Oxide	80 g.
Rosin	19 g.
Magnesium Chloride, Anhydrous	1 g.

In making up the solid formula, the magnesium chloride is preferably mixed with 4 parts of zinc oxide before addition to the balance of the ingredients. Likewise the rosin is finely ground and preferably mixed with an equal part of zinc oxide. A finely ground air floated rosin is desirable although the air flotation is not absolutely essential. Both the rosin and zinc oxide should be in the form of very finely divided powder if the best results are to be obtained, preferably of such fineness as to pass through a 100 mesh screen. The balance of the zinc oxide is then added to the mixture of magnesium chloride and zinc oxide and the rosin and zinc oxide mixture is mixed in thoroughly to obtain a uniform distribution of the magnesium chloride throughout the powdered material. The mixing must be very carefully performed to obtain the necessary uniformity of distribution of the magnesium chloride in view of its relatively small percentage of the whole. The mixing must be particularly well done, if the ingredients are all mixed in a single step.

Liquid Portion

Eugenol or Clove Oil	100 g.
Rosin	30 g.
Olive Oil	30 g.
Linseed Oil	10 g.
Light Mineral Oil	10 g.

When the preparation is to be used, a definite quantity of the solid formula is measured out, as, for instance, a half-teaspoonful (approximately 1 g.), and placed on a glass slab or the like, and then a definite quantity of the oil formula, such as 10 drops (approximately 0.3 g.), is measured out onto the slab and the oil and powder thoroughly mixed to form a paste. No water is added, nor should any moisture or water be present on the slab during the mixing process. After the paste has been prepared, it may be allowed to stand for upwards of an hour or longer without setting. In case the humidity is very high, the setting occurs more rapidly. The setting may be retarded somewhat under these conditions by using a heated mixing slab.

When the paste is used in the mouth, however, it sets into a relatively hard, dense, coherent and somewhat flexible mass within a very short period, as for instance, within 5 minutes.

Technical Beeswax Substitute

Japan Wax	20 g.
Indene or Paracumarone	5 g.
Glyceryl Tristearate	1 g.

Melt together and stir until quite thick.

Modeling Clay

Asbestine—or Talc	40 oz.
Whiting	15 oz.
Glucose	20 oz.
Magnesium Chloride	10 oz.
Water	15 oz.

The magnesium chloride is added to the water in which it dissolves quickly, and the glucose is then added to this solution. If glucose is not available sucrose may be used. The pigments are mixed and then incorporated with the viscous solution. The consistency can be varied by changing the ratio of the pigments and the vehicle. Colored pigments may be added to vary the shade of the clay.

Moisture Proof Gelatin

U. S. Patent 2,065,792

A method of making a transparent, flexible, non-tacky and moistureproof sheet material suitable for use as a wrapping tissue wherein the moistureproof coating effectively adheres and is secured to the base, the steps which comprise treating the surface of a film of gelatin with an aqueous solution containing 1 to 2% of acetic acid at a temperature of approximately between 50° to 90° C. for approximately 1 to 10 minutes to form a hydrolyzed gelatin surface to which a moistureproof composition will effectively adhere, and thereafter applying to the hydrolyzed surface a moistureproofing composition comprising a cellulose derivative and a wax in proportions to produce a transparent, flexible, adhering, non-tacky and moistureproof coating, whereby a moistureproof coating is effectively secured to the gelatin base sheet or film.

Light Protective "Cellophane" Type Wrappers

U. S. Patent 2,058,786

Films of regenerated cellulose are coated with:

Pyroxylin	3 oz.
Amyl Acetate	5 –25 oz.
Aesculin	0.5– 5 oz.
"Cellosolve"	3 –10 oz.
Ethyl Acetate	11 –30 oz.
Blown Castor Oil	2 – 5 oz.
Lacquer Thinner	30 –70 oz.

Preventing Adhesion of Cellophane and Similar Materials

British Patent 459,344

A coating lacquer is applied containing:

Aluminum Stearate	0.03%
or	
Ceresin	0.05%

Transparent Cellulosic Film Wrapping

Canadian Patent 356,860

Ethyl Cellulose	20 g.
Paraffin Wax	1 g.
Chloroform	70 g.
Ligroin	30 g.

Dissolve and cast into forms and dry for 18 to 20 hours.

Moisture-Proofing "Cellophane"

Canadian Patent 359,729

The following solution is applied to the "Cellophane" and the solvent is evaporated at a temperature just below the melting point of the waxes used:

Carnauba Wax	4 oz.
Paraffin Wax (m.p. 62° C.)	4 oz.
Candelilla Wax	1½ oz.
Triethanolamine Oleate	⅒ oz.
Toluol	100 oz.

Synthetic Wool From Casein

Casein is dissolved in 2% caustic soda solution containing 2% carbon bisulphide and the solution is spun in a precipitating bath of:

Sulphuric Acid	120–420 g.
Sodium Sulphate	240 g.
Formaldehyde	40 g.
Water to make	1 l.

Wash fibers alternately with water and dilute formaldehyde.

Flexible Transparent Casein Film

Casein	60 g.
Ammonia (26° Bé.)	15 g.
Water	540 g.
Moldex	1.3 g.

Soak and warm to 40° C. and stir until smooth. Add

Glycerin	60 g.

Boil off water with good stirring. Allow air bubbles to come out, keeping at lowest fluid temperature. Pour on glass or smooth metal plates.

Flexible Casein Films

U. S. Patent 2,030,226

Formula No. 1

Casein	10.00 g.
Ethyl Cellulose	10.00 g.
Ethyl Alcohol	50.00 g.
Sulphonated Castor Oil	30.00 g.

The casein is dispersed in sulphonated castor oil and part of the ethyl alcohol and then blended with the ethyl cellulose dispersed in the remainder of the ethyl alcohol.

The compositions illustrated in the following examples are prepared as in Formula No. 1.

No. 2

Casein	10.00 g.
Ethyl Cellulose	10.00 g.
Butyl Alcohol	45.00 g.
Sulphonated Olive Oil	35.00 g.

No. 3

Casein	9.30 g.
Ethyl Cellulose	9.30 g.
Methyl Alcohol	46.51 g.
Sulphonated Castor Oil	27.92 g.
Diethylene Glycol	6.97 g.

The diethylene glycol in this example functions to give films of increased flexibility.

No. 4

Casein	5.55 g.
Benzyl Cellulose	5.55 g.
Benzyl Alcohol	27.75 g.
Ethyl Alcohol	55.60 g.
Sulphonated Castor Oil	5.55 g.

Tear Resistant Flexible Film

Canadian Patent 366,072

Chlorinated Rubber	90 oz.
Butyl Stearate	10 oz.

Phonograph Records Without Shellac

Benzyl Cellulose	29–32%
Tritolyl Phosphate	3–4%
Cotton Linters	3%
Kaolin	32–28%
Nephelite	10–12%
Rosin	2%
Charcoal, Powdered	9%
Nigrosin	2–3%
Stearin	1%
Asphalt	4–6%

Press mixture into sheets (3–3.75 m.m.) at 140–150° C. Heat to 155–165° and press cold at 150–200 kg./sq. cm.

Wire Glass Substitute

Canadian Patent 353,940

Wire is coated with following to give a clear flexible "glass":

Cellulose Acetate	100 lb.
Ethyl-*p*-Toluenesulfonamide	20 lb.
Acetone or Other Solvent	100 gal.

Lampblack or talc may be incorporated to reduce transparency.

Imitation Gem Material

U. S. Patent 2,012,411

Colorless masses which may be cut and polished to resemble diamonds are obtained by condensing urea (1 mol.) and formaldehyde (2.0–2.5 mol.) in presence of activated silica gel or sodium silicate, *e.g.*, by boiling for about 35 min., filtering, and concentrating.

Leather Waste Plastic

Russian Patent 35,754

Plastic masses are prepared from leather waste ground to powder, mixed with polyatomic alcohols or phenols or their mixtures, followed by pressing while hot. Formalin may be introduced in the powder mixture or the pressed mass may be treated with formalin. The following illustrations are cited: (1) 100 kg. finely ground leather powder are mixed with 10 kg. glycerin and pressed in forms at 120° C. and 250 atm.; (2) 100 kg. finely ground leather powder are mixed with 5 kg. of technical phenol and pressed at 150° C. and 300 atm. The goods are then placed for 12 hours in a 5% solution of formaldehyde and dried; (3) 100 kg. finely ground leather powder are mixed with 3 kg. glycerin, 4 kg. tricresol and 3 kg. (of 40%) formaldehyde. The mass is then pressed as in (2).

Artificial Woven Leather

French Patent 810,694

Manila hemp paper is coated with

Vinyl Acetate	20 g.
Diethylphthalate	3 g.
Methanol	77 g.

dried and then cut up into strands which are woven or knitted together.

Leather Substitute

U. S. Patent 2,098,789

This process comprises impregnating a square weave unnapped cotton fabric weighing 5⅛ ounces per linear yard of 38 inch width with a gasoline dispersion of

Formula No. 1

Rubber	40 lb.
Factice (White)	10 lb.
Barytes	15 lb.
Lithopone	30 lb.
Magnesium Carbonate	10 lb.
Pigment	1 lb.

removing the gasoline, coating one face of the impregnated fabric with a dispersion of one part of cotton flock and three parts of a composition consisting of the same above formula; calendering the coated, impregnated fabric, coating the calendered, coated, impregnated fabric with a cement consisting of dispersing agent and above formula; dusting the coated, calendered, coated, impregnated fabric to avoid a tacky surface and vulcanizing.

No. 2

Rubber	100 lb.
Light Petroleum	175–200 lb.
Leather Waste or Vegetable Fibres	120 lb.
Lampblack	20 lb.
Zinc Oxide	10 lb.
Sulphur	2 lb.
Tirazh	2 lb.
Pine Tar	6 lb.

The mixture is rolled onto a fabric between heated cylinders.

No. 3

Rubber, Finely Divided	100 lb.
Rosin	19 lb.
Oleic Acid	5 lb.
Wheat Flour	15 lb.
Glue	5 lb.
Kaolin	10 lb.
Sulphur	5 lb.

Mill together and vulcanize.

No. 4

Canadian Patent 358,833

The following composition is applied on a fabric base: (All parts are by weight.)

Cellulose acetate 100, triacetin 60, ethyl-*p*-toluenesulfonamide 40, triphenyl phosphate 30, latex (50% rubber content) 60, chrome green 80 parts, which is suspended in 500–600 parts water and fed to a colloid mill.

Shoe Sole Composition

German Patent 648,254

Water	5 kg.
Calcium Oxide	1 kg.
Casein	2 kg.
Rubber Solution	2 kg.
Rubber Latex	30–40 kg.
Rubber, Powdered or Other Filler	50–25 kg.

Synthetic Wicker or Fiber

Canadian Patent 364,775

A mixture of cellulose acetate 100, diethyl phthalate 25, ethyl *p*-toluenesulfonamide 15, tritolyl phosphate 10, chrome green pigment 33, and rubber 50 oz. homogeneously compounded, is rolled into a hot plastic layer, assembled with preheated craft paper, the product treated with heat and pressure until the plastic layer has permeated the paper to form a coating on both sides, the treated paper embossed or decorated to imitate wicker or other fibrous substance, slit into strips, twisted into strands, and made into wicker-like furniture.

Wood Substitute

Australian Patent 100,119

Wood Dust	20
Casein	1
Sodium Silicate (9% Solution)	1

Mix well until thoroughly homogeneous and press and air-dry.

Neoprene Artificial Leather

Neoprene	1 lb.
Benzol	2½ lb.
Dichloroethane	2½ lb.

Dissolve the above and work into it

Rosin	142 lb.
Coal Tar	142 lb.
Carbon Black	154 lb.
Zinc Oxide	60 lb.
Magnesium Oxide	60 lb.
Chrome Fiber, Dry	1000 lb.

Asphalt Plastic Flooring

Petroleum Asphalt	45–50 lb.
Ferric Chloride	5 lb.

Heat for one hour at 300° C. and add

Tung Oil	50 lb.

Oilcloth Coating

A typical coating for making oil cloth is 650 gallons of linseed oil heated to 375° F. and 60 lbs. of litharge added, the heating is then continued until the temperature reaches 525° F. and held at this temperature for about nine hours or until the oil reaches the proper viscosity. It is then allowed to cool overnight to about 250° C. and is drawn off into storage tanks in the morning where it is thinned to coating consistency. The oil is allowed to stand for some time before use in order to allow the "break" and other impurities to settle out.

Non-Inflammable Linoleum

British Patent 443,645

26 parts of chlorinated paraffin wax (42 per cent chlorine) are thoroughly mixed in a steam-heated apparatus with 17 parts of chlorinated rubber.When the mass is uniform, additions are made of 40 parts of cork powder and 17 parts of iron oxide pigment. The mixer is used for the first portions of the additives, but steam-heated rollers finally become

necessary. A sheet, some 5/16 inch thick, is then produced and backed before cooling with a jute backing. If desired, the mixture can be applied to the surface to be coated directly without a backing material, pressure being employed to ensure good adhesion and surfacing.

Plugging Composition

(For filling holes or imbedding nails, screws, etc., in walls or other solids).

Mill Puff (Wood Flour)	26 oz.
Petroleum Jelly	21 oz.
Dextrin	29 oz.
Slate Powder	20 oz.
Zinc Chromate	5 oz.

Screw Putty

Rosin	30 lb.
Spindle Oil	70 lb.
Iron Oxide Red	as desired

Packing for Fluid Seals

U. S. Patent 2,027,389

Asbestos is steeped in following at 200° F. then drained and cooled.

Hydrogenated Castor Oil	78 oz.
Sodium Stearate	10 oz.
Graphite	12 oz.

Gasket & Packing Composition

U. S. Patent 2,040,348

Asbestos millboard is impregnated with the following:

China Wood Oil	50–90 oz.
Linseed Oil	5–25 oz.
Turpentine	5–30 oz.
Metallic Resinates	1– 2 oz.

Packing Composition, High Temperature

U. S. Patent 1,987,109

Asbestos	9 lb.
Antimony	75 lb.
Graphite, Flake	10 lb.
Palm Oil	2 lb.
Rubber Solution (4%)	10–15 lb.

Packing for Stuffing Boxes

Formula No. 1

U. S. Patent 2,099,241

Asbestos	20–30%
Graphite	30–45%
Aluminum Powder	13–18%
Lubricating Oil	3–10%
Dispersed "Thiokol"	2–13%

No. 2

U. S. Patent 2,099,242

Rubber (Vulcanized)	7 –12.5%
Lubricating Oil	5 –10 %
Asbestos Fiber	25 –37 %
Aluminum Powder	14.5–18.5%
Graphite	28 –44 %

No. 3

Kaolin	69%
Beeswax	8%
Rubber	23%

The above is worked together in a rubber mill. As a filler the following may be added:

Barium Carbonate	4%
Calcium Carbonate	1%

Friction Brake Lining

U. S. Patent 2,081,578

Rubber	77 oz.
Asbestos Fiber	112 oz.
Graphite	28 oz.
Zinc Oxide	28 oz.
Sulphur	42 oz.
Gasoline	368 oz.
Phenolic Resin, Powdered	22 oz.

Fireproof Film Container

German Patent 601,571

A container is molded from the following composition wetted with water:

Sawdust	25 g.
Magnesite	25 g.
Magnesium Chloride	30 g.
Potassium Alum	10 g.
Asbestos Fiber	10 g.

Acid Proof Composition ("Haveg" Type)

Sand	80 lb.
Coal or Oil Bitumen	15 lb.
Acid Resisting Mineral	5 lb.

Heat at 150–200° C. and mold.

Printing Matrix Compound

U. S. Patent 1,974,714

Cardboard or asbestos millboard is impregnated with a suspension of:

Glue	200 oz.
Paraffin Wax	70 oz.
Bronze Powder	100 oz.
Nitric Acid (0.2%)	5000 oz.

Then coat with a paste of

Bronze Powder	50 oz.
Casein	35 oz.
Mineral Powder	4000 oz.
Paraffin Wax	10 oz.
Glycerin	10 oz.
Nitric Acid	1½ oz.
Alcohol	20 oz.
Water	500 oz.

An aluminum foil backing may be applied to the board.

Revetment Mat

U. S. Patent 2,051,578

A flexible sheet is formed of asphalt 50–57.5, pulverized calciferous material such as limestone dust 42–33.6% and pulverized iron oxide.

Preserving Cellulose Bottle Caps

U. S. Patent 2,013,739

Regenerated cellulose bottle caps are preserved in a solution of

Glycerin	5.0 oz.
Chlorinated Cresol	0.1 oz.
Water	94.9 oz.

Removing Dents From Celluloid Toys

Puncture with a sharp pin and blow into hole. The air pressure will force out all dents.

Drilling and Tapping Bakelite

Machining—especially drilling and tapping—Bakelite products, is hard upon milling cutters, drills, and taps. It is also difficult to get good threads, and clean, small-sized holes. Drilling and tapping sheet and molded Bakelite is greatly facilitated when carbon tetrachloride is used as a cutting lubricant. It is possible to tap 8–32 holes in ¼-inch laminated stock at a relatively high speed without stripping threads or producing ragged edges, when the tap is kept moist with carbon tetrachloride. Tap wear is very greatly reduced when this fluid is used.

Polyvinyl Acetate Solvents

French Patent 44,809

Formula No. 1

Methyl Alcohol	38 cc.
Benzene	62 cc.

No. 2

Ethyl Alcohol	100 cc.
Benzene	135 cc.
Water	13 cc.

"Soluble" Waxes

The following formulae will give waxes which are readily dispersible in hot water to form stable, white emulsions of different viscosities. These are useful in the textile industry for sizing, finishing, etc., in the polishing industries for furniture, floor and automobile polishes, for leather finishing, paper sizing and finishing, etc.

Carnauba Wax ("Soluble")

a. Carnauba Wax	90 g.
Oleic Acid	10 g.
Trigamine	10 g.
b. Caustic Soda (50%)	6 g.
Water	24 g.

a is melted. *b* is mixed together and heated. It is added to *a* slowly with stirring and the whole stirred until it begins to solidify. One part of the above disperses easily in five parts of boiling water.

Paraffin Wax ("Soluble")

a. Paraffin Wax	50 g.
Stearic Acid	14 g.
b. Trigamine	7 g.

Melt *a* to about 70° C. Turn off the heat and add *b* stirring thoroughly. Continue stirring till it begins to solidify. One part of the above disperses easily in two parts of hot water.

Japan Wax ("Soluble")

a. Japan Wax	50 g.
Stearic Acid	14 g.
b. Trigamine	7 g.

Procedure as for paraffin wax. Emulsion obtained by dispersing one part of above in eight parts of hot water.

Purifying Lignite, Ozokerite or Montan Waxes

Crude Wax	100 lb.
Benzol	220 lb.

Warm and stir until dissolved. Add

Alcohol	400–800 lb.

Filter and wash residue with

Alcohol	1200 lb.
Benzol	300 lb.

Bleach by heating at 105–115° C. for 7 hours using

Potassium Dichromate	1 lb.
Sulphuric Acid (48%)	10 lb.
Nitric Acid (4%)	10 lb.

High Melting "Wax"

Iron Sulphide	1 lb.
Zinc Sulphide	1 lb.
Lead Sulphide	1 lb.
Sulphur	1 lb.

These should be melted together with mechanical mixing and allowed to cool. The result is a very tough grey compound of specific gravity 3.4, and a melting point of about 160° C. On cooling it expands and fills every little crevice, and will withstand the action of all acids, alkalis, and atmospheric conditions.

Master Record Wax

British Patent 473,459

Stearic Acid	632 g.
Montan Wax	140 g.

Heat to 175° C.

Mixture of	Soda Ash	55 g.
	Basic Lead Carbonate	84 g.

After reaction has ceased, mix in a plasticizer such as sperm oil or dimethyl phthallate.

Sealing Wax

Bleached, or Orange Shellac	35	kg.
Heavy Turpentine	25	kg.
Turpentine	6	kg.
Magnesium Carbonate	20	kg.
Cinnabar	25	kg.
Carmine	0.5	kg.

Wax Molds

Melt together

Paraffin Wax	10	oz.
Beeswax	2¼	oz.
Carnauba Wax	2	oz.

Melt together and mix until uniform. Pour into a box or other form (the inside of which has been painted with a soap solution). When cool, tap out. Cut out and engrave design desired. With this plaster casts can be made.

Parting Wax for Molding Work

U. S. Patent 2,103,527

a.	Paraffin Wax, Melted	1	pt.
	Gasoline	1	pt.
	Light Cylinder Oil	1	pt.
	Kerosene	⅔	gal.
	Castor Oil	½	oz.
b.	Rosin	1/6	lb.
	Gasoline	½	pt.

Modelling Wax

Formula No. 1

Beeswax	10	g.
Mastic	10	g.
Ceresin	7.5	g.
Paraffin Wax, Hard	15	g.
Tallow	65	g.
Sulphur (Flowers)	90	g.
Calcium Sulphide	42.5	g.
Kaolin	120	g.

Grind the powders into the melted waxes. A mineral pigment, e.g. Armenian bolus, is added. (4%). Stir thoroughly and cool.

No. 2

Montan Wax, Bleached	10	g.
Paraffin Wax (40–42° C.)	20	g.
Petrolatum, Yellow	2	g.
Wool Fat	15	g.
Clay, Fine Powdered	50	g.
Mineral Color	20	g.

Jewelers' Molding Wax

Cumar Resin	5	oz.
Beeswax	20	oz.
Carnauba Wax	5	oz.
Diglycol Stearate	5	oz.
Montan Wax	35	oz.
Ceresin Wax	30	oz.

This wax gives sharper moldings and is tough and sufficiently elastic. It burns out easily without leaving a residue.

Dental Molding Wax

Formula No. 1

Paraffin Wax	75	g.
Japan Wax	10	g.
Beeswax	15	g.
Thymol	0.05	g.
Menthol	0.05	g.

No. 2

Carnauba Wax	5	g.
Beeswax	40	g.
Kauri Copal	15	g.
Ozokerite, 58/60° C.	10	g.
Soft-Paraffin, 40/42° C.	30	g.

This plastic mass softens at 55° C.

No. 3

Manila Copal	15	g.
Dammar Resin	15	g.
Stearin (53/54° C. Titer)	1	g.
Ceresin (58/60° C.)	2	g.
Peru Balsam	1	g.
Barium Sulphate, Precipitated	20	g.
Carmine	to color to suit	

Melt the first five ingredients together, work in the barium sulphate, dye with some carmine, and stir down to very little above the solidification point, where plates can be poured without danger of separation of the barium sulphate.

Shoemaker's Thread Wax

Formula No. 1

Rosin	76.5	oz.
Tallow	8.5	oz.
Beeswax, Yellow	15.0	oz.

Melt and stir until uniform. Pour into containers at lowest possible temperature.

No. 2

Rosin	54	lb.
Beeswax	6	lb.

Melt and stir until uniform. Cool to 150° F. and add

Benzene	9½	gal.

Shoemaker's Polishing Wax

Carnauba Wax Yellow	26–28	lb.
Olein (Low titer)	10– 7	lb.
Abrasive (Tripoli, Bole, Clay, etc.)	64–65	lb.

Shoemaker's Brushing Wax

Carnauba Wax, Yellow to Tan	63	lb.
Lacquer Benzine (0.78–0.80)	37	lb.

Polishing Wax for Lacquered Heels

Paraffin Wax (50/52° C.)	27.5	lb.
Spindle Oil, Pale	13.5	lb.
Chalk, Finest Powder	59.0	lb.

Filler Wax for Soles

Beeswax	25 lb.
Ozokerite or High Melting Petrolatum	40 lb.
Rosin	35 lb.

Shoemaker's Pitch

Formula No. 1

Petroleum Pitch	40 g.
Rosin Pitch	45 g.
Woolfat, Crude	15 g.

No. 2

Colophony	85 g.
Rosin Oil, Blue	15 g.

Color with lampblack, or with earth pigments.

Tailor's Wax

Ceresin	15 kg.
Paraffin Wax	15 kg.
Japan Wax	25 kg.
Beeswax	45 kg.

Ironing Wax

Ceresin	10 kg.
Stearic Acid	30 kg.
Japan Wax	5 kg.
Beeswax	5 kg.

Bed Wax

To Tighten the Cover Cloths of Feather Beds

Formula No. 1

Beeswax	10 kg.
Rosin	1 kg.
Caustic Soda (30° Bé.)	1.5 kg.
Water, Hot	47.5 kg.

Melt first two ingredients, saponify, and stir with the water to obtain a white, smooth cream.

No. 2

Rosin	2 kg.
Ceresin	3 kg.
Paraffin	20 kg.
Japan Wax	5 kg.
Beeswax	20 kg.

Wax Composition To Protect Parts of Surface of Painted Tiles Against the Adhesion of Glaze

Colophony	10 g.
Montan Wax, Bleached	20 g.
Ozokerite, Soft	40 g.
Paraffin, Soft, 48/50° C.	30 g.

Engraver's Transfer Wax

Beeswax	3 oz.
Tallow	3 oz.
Balsam, Fir	1 oz.
Olive Oil	1 oz.

Melt together and stir while cooling.

Fixed Electrical Condenser Wax

U. S. Patent 2,083,007

Chlorinated Naphthalene	25–40 oz.
Gilsonite	20–30 oz.
Montan Wax	30–35 oz.

This gives a product of minimum shrinkage.

Electrical Arc Resistant Insulation

U. S. Patent 2,049,370

A material suitable for panels consists of asbestos board carrying throughout its surface and interior a mixture of carnauba wax 2 and paraffin wax 1 part.

Cable Wax

Rosin	10 kg.
Ozokerite	5 kg.
Ceresin	30 kg.
Montan Wax	10 kg.
Stearin Pitch	15 kg.
Paraffin Wax	20 kg.

Wax Strings for Foundry Work

Montan Wax, Bleached	10
Beeswax	10
Paraffin Wax (40–42° C.)	20
Wool Fat	5
Nigrosine, Oil Soluble	0.5

Wax, Imitation for Figures

Montan Wax, Bleached	40
Barium Sulphate	60
Red Iron Oxide	0.5

Bottle Sealing Wax

Rosin	5 kg.
Ceresin	10 kg.
Paraffin Wax	5 kg.
Japan Wax	10 kg.
Beeswax	30 kg.
Turpentine, Venice	2 kg.

Hand Dipped Candles

White

135/137° F. Paraffin Wax	90 lb.
Stearic Acid (Double Pressed)	10 lb.

To make colored candles add any one of the following amounts per 100 lb. of above white composition.

Red	
Oil Red GRO National	1½ oz.
Rose	
Oil Red GRO National	3½ g.
Med. Green	
Quinolene Yellow Base	21 g.
Quinizarine Green Base	2½ g.
Yellow	
Quinolene Yellow Base	1½ oz.
Jade Green	
Quinizarine Green Base	24 g.

Quinolene Yellow Base	4 g.
Sk. Green	
Quinizarine Green Base	1 oz.
Pink	
Cebos Pink	3½ g.
Brilliant Orange	¼ g.
Brown	
Oil Brown	1½ oz.
Violet	
Violet Oil Soluble Base	3½ g.
Orange	
Orange Oil #2R669	3½ g.
Black	
Nigrosine Oil Soluble	21 g.
Violet Oil Soluble	2½ g.

Colored Light—Candles

(German Patent 646,129)

Red Light

Paraformaldehyde	30 g.
Paraffin Wax (Scale)	5 g.
Lithium Chloride	0.1 g.
Menthol	0.2 g.
Coumarin	0.2 g.
Lithium Nitrate	0.025 g.

Blue Light

Paraformaldehyde	30 g.
Paraffin Wax (Scale)	3.5 g.
Copper Chloride	0.15 g.
Menthol	0.2 g.
Coumarin	0.2 g.

Green Light

Paraformaldehyde	30 g.
Paraffin Wax (Scale)	3 g.
Copper Chloride	0.05 g.
Barium Nitrate	0.4 g.
Boric Acid	0.3 g.
Menthol	0.2 g.
Coumarin	0.2 g.

The mixtures are pressed into the shape of candles, without wicks.

The candles are wrapped in a thin cellulosic fiber foil, and covered with a thin coating of paraffin to give the impression of real candles.

Candle Strings

Summer

Paraffin Pitch, Pale (44/46° C.)	70 kg.
Woolfat	20 kg.
Ozokerite, Yellow	5 kg.
Rosin, Pale	5 kg.

Winter

Paraffin Pitch (38/40° C.)	30 kg.
Paraffin Pitch (44/46° C.)	40 kg.
Ozokerite, Second Quality	5 kg.
Woolfat, Crude	25 kg.

The wicks are made from strings, unbleached yarn, cotton strings or jute.

The production is easiest in winter (quick, cheap cooling). Colors: Yellow and black.

Candle Decoration Wax

Paraffin	30 kg.
Beeswax	40 kg.
Turpentine, Venice	30 kg.

Candle Wick Impregnant

Borax	4 oz.
Potassium Chlorate	1 oz.
Ammonium Chloride	1 oz.
Potassium Nitrate	1 oz.
Water	3 qt.

Soak wicks in above solution and dry thoroughly.

Extraction of Sugar Cane Wax

U. S. Patent 2,009,522

The filter cake obtained in clarification of raw cane juice is dried and extracted with

Alcohol	100 l.
Ether	10 l.
Methyl Alcohol	2 l.

De-Oiling Beeswax

10 lb. beeswax in 1 gal. water are melted over a direct flame. As soon as the melted beeswax begins to rise to the surface 1 oz. potassium hydroxide dissolved in a little water is added and the mixture stirred for 3 minutes. Hydrochloric acid is then added until the reaction to litmus is neutral, when heating is interrupted and cold water stirred in with the object of forming an emulsion with the oil which runs out through a strainer at the botton. The de-oiled wax is dried by spreading in thin layers and is finally obtained in the form of a somewhat gummy fawn powder.

Colored Liquid Wax-Emulsions

Formula No. 1

Black

Montan Wax, Crude	7 lb.
Rosin, Dark	1 lb.
Potash Carbonate	1 lb.
Water	120 lb.
Nigrosine, Water-Soluble	4 lb.
Water, 80–90° C.	12 lb.

No. 2

Carnauba Wax	10 lb.
Montan Wax, Bleached	5 lb.
Marseilles Soap	3 lb.
Potassium Carbonate	3 lb.
Water	160 lb.
Nigrosin, Water-Soluble	0.1– 0.4 lb.
English Red	15 lb.
Chrome Orange	6 lb.

Emulsify the melted waxes with the alkali (soap) solution; in the former case, the dye-solution is added last. In the latter case, the dye is dissolved in the emulsification water. The pigments are then worked in on a pigment mill.

SOAPS, CLEANSERS

Soaps Containing Silicates

A well-made cake of soap has a firm, smooth texture. The use of silicates tend to harden the finished cake and keep it firm, even in a warm or hot climate. Silicated soaps, therefore, are not unduly softened and wasted in hot water. They are less likely to "bloom" than soaps made with other builders. Chips are readily made from the silicated soaps.

When silicate is used in flake soaps the amount added must not be too great. Large quantities of silicate in soaps to be flaked give white, crumpled flakes. If a clear, smooth flake is desired, the amount of silicate used should not be too great. However, by special procedures, the silicate content can be increased and the smooth quality of the flakes still retained.

Soaps made from some kinds of fat stocks become rancid on exposure to the air. The presence of silicate prevents this. For that reason, small quantities (2 to 4%) of "N" or "S" Brand silicate are added to toilet soaps.

Grades of Silicates of Soda

Perhaps some explanation of the difference between the various grades of silicate of soda may be helpful. Silicates of soda are made by melting together soda ash (sodium carbonate) and silica in furnaces that are heated over 2000° Fahrenheit. The resulting products are combinations of sodium oxide (Na_2O) and silica (SiO_2). As they come from the furnace they resemble glass, but can be made to dissolve in water. Since the commercial silicates are not definite chemical compounds, glasses containing different relative amounts of sodium oxide and silica may be produced. Special treatment is necessary to dissolve in water the silicates that are used in soap making. The solutions are usually made as concentrated as possible in order to save freight. When the solid content is too high, the more alkaline silicates become very viscous ("like molasses in January") and the more siliceous ones become stiff jellies. Each brand of P.Q. silicate is made within fixed standards of ratio and concentration. The grades which are most likely to be of interest to the soapmaker are given in the following table.

Brand	"N"	"K"	"U"	"C"
Sodium Oxide (Na_2O)	8.9%	11.0%	13.8%	18.0%
Silica (SiO_2)	28.7%	31.2%	33.7%	36.0%
Water	62.1%	57.4%	52.0%	45.5%
Ratio $Na_2O:SiO_2$	1:3.22	1:2.84	1:2.44	1:2.00
Baumé	41°	47°	52°	59°

Soap makers who encounter difficulties with the mottling of the crutched soap, use more alkaline silicates such as "K", "U" and "C" Brands. Here again, if the concentration and alkalinity of the mixture becomes too high, there may be mottling.

Mixing Soap and Silicate

In the cold and semi-boiled processes, P.Q. silicate is added directly to the soap batch. In the boiled process, it is mixed in a crutcher with the settled soap from the kettle. The procedure sounds relatively simple, but actually it takes considerable skill to get smooth mixtures which will give uniform bars.

If the silicate of soda is properly incorporated into the soap while it is being made, the silicate will readily mix in. As the soap cools and stiffens, the silicate also stiffens up. The water which the silicate contains is combined with the water which is in the soap, so that when the soap dries out, the whole mass becomes uniformly hardened. The silicate in the course of drying tends to become harder than the soap itself would naturally become. Therefore, as already stated, the use of silicate makes the soap firmer. It is this action that enables the manufacturer to produce soap of satisfactory working qualities from fats or formulae that would otherwise make a very soft soap.

With certain stocks and with the correct moisture content, considerable quantities of "N" Brand or even "S" Brand silicate of soda may be mixed with the settled soap from the kettle and a satisfactory uniform bar obtained. Under carefully controlled conditions there will be no tendency to mottle. Some soapmakers however, as above noted, prefer to use a silicate of soda which is more alkaline than the "N" Brand.

Because of a saving in cost most soap makers prefer to buy "N" Brand and obtain the increased alkalinity by adding caustic soda. Some of the additional alkali may be supplied by having the grained soap from the kettles finished "strong". Usually, however, a suitable amount of caustic soda lye is added to the silicate at least 24 hours before the silicate is mixed with the soap. The amount of caustic thus added varies with the character of the soap stock and the judgment of the soapmaker. For example, one may add 1.85 pounds of solid caustic (containing 76% Na_2O) per hundred pounds of "N" Brand. This is equivalent to 1.41 parts of Na_2O and makes a silicate solution of a ratio approximately 1:2.8, which would be similar to diluting the "K" Brand already mentioned. Sometimes more caustic is used, but it is best not to exceed 5.85 pounds per hundred pounds of "N" Brand. The amount is equivalent to 4.45 pounds of Na_2O, making a silicate of a ratio about 1:2.2. The caustic is added to the silicate in the form of a lye solution varying from 30° to 36° Baumé.

POUNDS OF CAUSTIC OR LYE REQUIRED TO GIVE THE INDICATED $Na_2O:SiO_2$ RATIO WITH 100 POUNDS OF "N" BRAND

Ratio $Na_2O:SiO_2$	1:3.0	1:2.8	1:2.5	1:2.2
Solid Caustic (76% Na_2O)	0.95 lb.	1.85 lb.	3.45 lb.	5.85 lb.
"Liquid Caustic" (38% Na_2O)	1.90 lb.	3.70 lb.	6.90 lb.	11.70 lb.
36° Lye	3.07 lb.	5.98 lb.	11.23 lb.	17.93 lb.
30° Lye	3.90 lb.	7.59 lb.	14.26 lb.	22.77 lb.

The use of an already prepared alkaline silicate has several advantages.

(1) The soapmaker saves the labor and other costs necessary to make up the caustic solutions to be added to the silicate.

(2) He also avoids a separate storage tank for causticized silicate.

(3) The proportions of Na_2O and SiO_2 of the prepared silicates are carefully controlled. To obtain equivalent control the soap manufacturer must analyze each mixture he makes and correct by the addition of one or the other solution if necessary.

(4) The reaction between the caustic and the silicate is slow and a period of at least 24 hours should elapse before the mixture is used. No matter how carefully the caustic is added to the silicate, under the conditions ordinarily prevailing in soap plants, there is usually some chance that complete reaction will not take place. Any silicate more siliceous than $Na_2O:2SiO_2$ ("C" Brand) will reduce the free alkali in the soap, but causticized silicate which has not fully reacted, may introduce free alkali. Free alkali might result in injury to the hands when packing the soap.

Soap Processes

Essentially the manufacture of soap consists in treating fats or oils with an alkali under such conditions that the alkali and the fatty acids combine to form soap and liberate glycerin. If the boiled or settled soap process is used, the glycerin can be recovered. In the cold and semi-boiled processes the glycerin remains in the soap and likewise all the impurities from all the materials used are retained. In the settled process, however, many of the impurities are removed during the "changes". Consequently when using badly contaminated stocks, the boiled process is preferable. Variations in the stock can be taken care of without any additional attention during the boiling process while only minor adjustments are possible in the other processes after they are once started. The manufacture of soap by the settled method is better suited to the production of large quantities rather than small ones. The soapmaker's choice of the correct method must be based on the type of soap to be made, the capital or equipment available, the kind of stock, the cost of recovery, the market for glycerin, etc.

Silicates in Boiled Soaps

The following formula is one which has been used for boiled laundry soap. It may be modified when other stocks or other proportions are used.

Tallow	400 lb.
Cottonseed Oil	120 lb.

The first treatment with weak lye is

called the "killing change". Melt the stock with gentle heat, then add approximately 25 gallons of 8° to 10° Baumé caustic soda lye and heat to boiling. When the whole mass becomes homogeneous, add 28° caustic soda lye if open steam is used or 8° lye if closed steam is used at such a rate that the mixture remains alkaline but not fast enough to make the soap grain. Continue until the soap becomes partially transparent and maintains a sharp taste on continued boiling. Then open with salt or brine and allow to settle. Then draw off the lower aqueous layer from which the glycerin is recovered.

When rosin is added, the rosin change comes next. Add at least sufficient 18° to 20° caustic soda lye to cover any closed steam pipes. Boil until the soap grains. Then gradually add the desired amount of rosin and sufficient additional lye to keep the soap grained or "open". When all the rosin is in and saponified, add brine to improve the separation and then settle.

Next the soap from the "killing change", or if rosin is used from the rosin change, is treated to be sure all the stock is saponified. This is the "strengthening change". Add lye at 13° to 14° Baumé if closed steam is used or 20° to 22° if open steam. In the former case the lye should cover the steam pipes. Boil, adding fresh lye as required. A "head" or foam will rise on the surface of the soap; continue boiling until the foam disappears and the soap settles to a smaller space in the kettle. The soap should be in a pea grain, and lye thrown up by the boiling should settle down quickly through it. When the soap reaches this condition, it has taken up all the strength with which it will combine. Add water and boil with open steam. The soap grains will soften. Continue the dilution until the soap is in large soft curds from which the lye will separate on a paddle. Settle over night and draw off the lye into a tank for future use.

The soap should now contain approximately 31% water. Melt it and run it into the crutchers at about 185° to 200° F. While crutching, add the silicate, the temperature of which should be between 85° and 110° F. Crutch thoroughly and drop into the frames at about 140° F. Usually the frames can be stripped after about forty-eight hours and the soap cut after another three days.

The amount of silicate added to the kettle soap varies. A common proportion for the crutcher charge is 200 pounds of soap to 100 pounds of silicate. Larger amounts can be used in bar soaps. However, as the proportion of silicate increases, more attention must be paid to details of temperature, moisture content, and general practice. Differences in the stock used also affect the amount of silicate which can be incorporated.

In making cold-process and semi-boiled soaps, a suitable amount of additional caustic is provided in the formulae for the batches and none needs be added to the silicate before using. If a more alkaline silicate is used, there should be a proportionate decrease in the amount of caustic.

Silicates in Cold Process Soap

In the cold process of soap making, instead of prolonged boiling of the fats with weak lye, settling, reboiling, etc., as already outlined, the whole process is carried out in a crutcher, in a single operation and in a very short time. The exact quantities of fats, strong lye and other ingredients required are carefully weighed and measured out, and everything that goes into the crutcher remains in the soap. There is no spent lye to drain off and the glycerin is retained in the soap. The equipment required for the cold process is much less than for boiling, as no kettles are needed. It is hard to make a good, uniform soap by the cold process. Unless the mixing is very thorough, there will be spots containing excess alkali and others containing excess fats and oils.

Many formulae are in regular use, but the following have been successfully used for many years and may be taken as illustrations of the process.

Formula No. 1

Tallow	75 lb.
Cocoanut Oil	25 lb.
Caustic Soda Lye (35.5° Bé. made of 76% Caustic)	75 lb.
"N" Silicate of Soda	125 lb.
Soap	300 lb.

No. 2

Tallow	75 lb.
Cocoanut Oil	25 lb.
Caustic Soda Lye (35.5° Bé. made of 76% Caustic)	70 lb.
"N" Silicate of Soda	100 lb.
Soap	270 lb.

If the tallow contains connective tissue or other impurities, it should be boiled on salt brine and allowed to settle in order to remove them.

Three weighing tanks are usually arranged.

1. To supply the exact amount of grease stock.
2. For the exact amount of lye.
3. For the silicate.

The whole amount of grease stock is first run into the crutcher. Its temperature should be about 145° to 150° F. in cold weather and 125° to 130° F. in summer. The crutcher is started and then the whole amount of the lye is quickly run into the grease. This should not take over two minutes. The mixture is crutched rapidly until it begins to thicken. At this time considerable heat is liberated by the reaction between the stock and the caustic. The silicate is added quickly while the crutcher is running. At first the mixture becomes thinner, but the crutching is continued and in a few minutes the whole mass will gradually turn creamy. The whole process is a quick one, taking from ten to fifteen minutes. As soon as the soap is thick enough for a mark made on it to remain, it is quickly dropped into a frame and the frame moved immediately to the spot where it is to stand to cool. The formation of the soap goes on to some extent in the frame while standing, and it is particularly important that the frame should not be moved or shaken until the soap is cold.

Semi-Boiled Process

The semi-boiled method is similar to the cold process except that a longer period at a high temperature is provided. A more uniform soap results with less chance of incomplete saponification. No kettle is needed but the crutcher must be steam jacketed. There perhaps are more variations in the details of the process than in the others. The following formula illustrates the general principles.

Tallow	315 lb.
Cocoanut Oil	55 lb.
Caustic Soda Lye (35° Bé.)	280 lb.
''N'' Silicate of Soda	185 lb.

The stock is warmed to 140° F. and the lye and the silicate added, as described in the cold process. Some soapmakers prefer to mix the silicate with the lye and add them together. As soon as the silicate or the silicate and lye is thoroughly mixed with the stock, the crutcher is stopped and the mixture allowed to stand for one to one and a half hours. The temperature should then be about 180° F. Steam is used to bring up the temperature if necessary. The crutcher is next started slowly. After ten or fifteen minutes, the alkalinity of the soap can be adjusted by the addition of 8° to 10° Baumé lye or of cocoanut oil. When the materials have combined into a homegeneous mass, the soap is run into a frame or frames. Further mixing here may be necessary to prevent the formation of streaks. It is desirable to reduce the temperature until the mixture will just discharge from crutchers without sticking. This will prevent separation in the frames.

Care is necessary to prevent crutching too much air into the soap in the semi boiled process. The movement should be slow. In the center-well type of crutcher, the tube should be covered with the soap batch to avoid trapping air in the soap thrown out by the screw.

Some soapmakers prefer to use some carbonate in their formulae. In semi-boiled soap the addition of pearl ash (potassium carbonate), for example, 30 lb. of 32° Baumé lye in the above formula, will make the soap more fluid and easier to work, due to the formation of some potassium soaps. It would be preferable to replace part of the caustic soda with caustic potash to obtain this result. Soaps in which sodium carbonate (soda ash, etc.) is used are more likely to effloresce or ''bloom''. Since sodium carbonate crystallizes with large amounts of water at temperatures below 95° F., it will set the cake in the frame more rapidly. On the other hand, it has a salting-out tendency. In general, the disadvantages of adding carbonates outweigh the advantages, particularly in boiled soaps.

Variations in Soap Stock

The choice of fats and oils depends on the type of soap to be produced, the stocks available and the relative prices. When other stocks are used, their saponification numbers and behavior with lyes of different strengths must be considered. The effect on the hardness and resistance to washing away will be influenced. For example, in the cold process formulae given above cottonseed oil can be substituted for part of the tallow. The resulting soap will take longer to harden during the process and the final product will be softer. Packing house grease may be used in place of cottonseed oil. The amount of tallow which can be replaced will depend on the hardness of the tallow itself and the titre of the fatty acids from the oil or grease. Up to 50 per cent of hard tallow can be replaced.

In the manufacture of boiled soap the melting point of the soap, which is directly proportional to the titre of the fatty acids, will control the temperatures in the crutcher. Thus, if cocoanut oil were substituted for cottonseed in the boiled soap formula above, the temperatures would be lower than those given.

The solubility of the soap in water will affect the conditions of saponification and separation. The substitution of cocoanut oil for cottonseed as mentioned in the preceding paragraph would also make it desirable to use salt in place of brine in the salting-out operation. With extremely soluble soaps, such as those made from linseed oil, special procedures are necessary to avoid the loss of too much soap in the lye.

Fatty acids may be used in place of fats or oils. In making boiled soap from fatty acids, there is no separation of glycerin, as the glycerin has already been removed. But otherwise, the process is similar to that already described. Soda ash may be used instead of caustic soda lye, though care must then be taken to guard against excessive foaming from the carbon dioxide of the soda ash.

The ease of saponification is not dependent on the melting point of the stock. Tallow is much more readily saponified than soya bean oil. Each stock has different characteristics and, in addition, of course, there are variations between lots of the fats and oils. These facts simply emphasize the complexity of the subject.

White Soft Soaps
(Fatty Stock Only)
For Summer
Formula No. 1

Cottonseed Oil, Pale	700 kg.
Tallow	300 kg.

No. 2

Cottonseed Oil, Pale	600 kg.
Pig Fat, Pale	300 kg.
Palm Oil, Bleached	100 kg.

No. 3

Cottonseed Oil, Pale	900 kg.
Tallow	100 kg.

For Winter
No. 4

Cottonseed Oil, Pale	800 kg.
Pig Fat, Pale	200 kg.

No. 5

Cottonseed Oil, Pale	700 kg.
Tallow	200 kg.
Palm Oil, Bleached	100 kg.

No. 6

Cottonseed Oil, Pale	900 kg.
Tallow	100 kg.

The caustic potash lye used for the saponification (50° Bé.) is partially replaced by caustic soda (10–30%) to harden the soap and give it pearliness.

The causticity is "reduced" by the use of about 25 kg. potassium carbonate per 100 kg. of caustic potash.

Fatty Stock for Yellow Soft Soaps
For Summer
Formula No. 1

Cottonseed Oil	600 kg.
Tallow	300 kg.
Palm Oil, Crude	100 kg.

No. 2

Cottonseed Oil	600 kg.
Neck Fat	300 kg.
Palm Oil, Crude	100 kg.

For Winter
No. 3

Cottonseed Oil	500 kg.
Peanut Oil	200 kg.
Tallow	200 kg.
Palm Oil, Crude	100 kg.

No. 4

Cottonseed Oil	600 kg.
Peanut Oil	200 kg.
Palm Kernel Oil	100 kg.
Palm Oil, Crude	100 kg.

The caustic lye used is as for white soft soaps (see).

Soft Soaps
For Summer
Formula No. 1

Linseed Oil	1000 g.
Water	150 g.
Potash Lye (25° Bé.)	about 850 g.
Soda Lye (25° Bé.)	about 350 g.

No. 2

Maize, Bean, or Similar Oil	500 g.
Colza, Peanut, or Cottonseed Oil	500 g.
Rosin	50 g.
Water	150 g.
Potash Lye (25° Bé.)	about 1000 g.
Soda Lye (25° Bé.)	about 240 g.

For Spring and Fall
No. 3

Linseed Oil	1000 g.
Water	150 g.
Potash Lye (25° Bé.)	about 950 g.
Soda Lye (25° Bé.)	about 250 g.

For Winter
No. 4

Linseed Oil	1000 g.
Water	150 g.

Potash Lye (25° Bé.)	about 1150 g.
Soda Lye (25° Bé.)	about 50 g.

Important: The potash lye is a 50% commercial lye (or a 50° Bé. lye, from solid potassium hydroxide), "reduced" with 15 per cent potassium carbonate. Then the alkali is diluted to a 25° Bé. strength.

The "*Soda Lye*" is prepared correspondingly.

Transparent Soap Novelties

This transparent soap base has been specially made to withstand shrinkage and to avoid the absorption of moisture during the rainy season. The soap has the following composition:

Stearine	35 lb.
Castor Oil	25 lb.
Coconut Oil	40 lb.
Caustic Soda (37° Bé.)	50 lb.
Sugar Syrup (24° Bé.)	50 lb.
Glycerin	30 lb.
Alcohol	50 lb.
Spirit-Soluble Color (If Required)	to suit
Perfume	to suit

Saponification is accomplished with caustic soda. The stearine, oil, etc., are warmed and filtered to remove suspended impurities. The caustic soda solution is mixed with 15 parts of alcohol and added to the melted oil stock at intervals at a temperature between 60° C. and 70° C. The vessel is kept on a water-bath, where the desired temperature may be maintained during the operation. In order to prevent evaporation of alcohol and other volatile materials, the vessel must have a lid that fits tightly—it being a useful precaution in most cases to wrap a wet rag tightly round the lid, to stop any further leakage. The following precautions should be taken, both during saponification and after:

(1) Alcoholic caustic soda should be used for rapid saponification.

(2) The temperature of the hot soap should not exceed 80° C. to 85° C. after the whole of the rectified spirit has been added.

(3) Two hours at least should be allowed for saponification.

(4) The sugar solution and glycerin should be added hot, after saponification.

(5) Color, if added, should be dissolved in some of the alcohol and must be clearly soluble in the latter, leaving no residue. The color solution *must* be filtered before use.

(6) Rapid cooling of the liquid soap (by means of mechanical devices such as a cold-water cooling-frame) is essential for maximum transparency.

Transparent Milled Soap

Formula No. 1

Saponify 60 kg. of tallow, 12 kg. of olive oil, 18 kg. of coconut oil and 10 kg. of castor oil with 46 kg. of 32.5% caustic soda. Run the white soap at 90° on to cooled cylinders. Dry and mill the transparent soap strips.

No. 2

Treat, as in No. 1, 60 kg. of tallow, 12 kg. of olive oil, 10 kg. of castor oil, 8 kg. of coconut oil, 10 kg. of palm-kernel oil fatty acids, 2.5 kg. of glycerol. A transparent soap is obtained which, with the addition of a small quantity of glycerol, is even clearer than that of No. 1.

No. 3

Treat 68 kg. of tallow fatty acids, 20 kg. of palm-kernel oil fatty acids, and 12 kg. of castor oil fatty acids with caustic soda lye containing 16 kg. of 75% sugar solution.

Transparent Soft Soap

For Summer

Formula No. 1

a.	Soybean Oil	800 kg.
	Train Oil, Brown, Clear	200 kg.
b.	Caustic Potash (50° Bé.)	410 kg.
	Soda Ash	80 kg.
c.	Potassium Chloride	20 kg.
	Water	about 600 kg.
d.	Bleaching Lye (10–12° Bé.) (*not* Hypochlorite Solution)	300 kg.

If using sodium hypochlorite solution, as bleaching lye, no soda ash, but only potash carbonate or potassium chloride (130–140 kg.) can be used.

No. 2

Linseed Oil	300 kg.
Peanut Oil	500 kg.
Pig Fat, Light	200 kg.
Water	150 kg.
Caustic Soda (36° Bé.)	50 kg.

No. 3

Soy Bean Oil	600 kg.
Cottonseed Oil	250 kg.
Train Oil	150 kg.
Water	150 kg.
Caustic Soda (25° Bé.)	75 kg.

The soaps containing train oil can be freed of the unpleasant odor by a chlorine bleaching.

For Winter
(Only Soap Bases)
No. 4

Peanut Oil	500 kg.
Bean Oil	300 kg.
Rosin	150 kg.
Rape Oil	40 kg.
Palm Oil	10 kg.
Water	150 kg.

No. 5

Bean Oil	800 kg.
Cottonseed Oil	100 kg.
Train Oil	50 kg.
Pig Fat	50 kg.
Water	150 kg.

"Elaidine" Soaps
For Summer
Formula No. 1

Linseed Oil	300 kg.
Cottonseed Oil	160 kg.
Pig Fat, Light	160 kg.
Palm Oil	30 kg.
Tallow	350 kg.

No. 2

Soy Bean Oil	450 kg.
Beef Fat	200 kg.
Palm Oil, Crude	20 kg.
Tallow	330 kg.

For Winter
No. 3

Bean Oil	500 kg.
Train Oil	150 kg.
Tallow	350 kg.

No. 4

Bean Oil	300 kg.
Linseed Oil	200 kg.
Cottonseed Oil	100 kg.
Bone Fat	40 kg.
Tallow	360 kg.

Methyl Cellulose Soft Soap

a. Fatty Acids	1000 kg.
Potassium Hydroxide (50° Bé.)	370 kg.
Sodium Carbonate	42 kg.
Sodium Hydroxide	24 kg.
b. Potassium Chloride (20° Bé.)	50 kg.
Potassium Carbonate (36° Bé.)	25 kg.
c. Methyl Cellulose Solution*	500 kg.
d. Sodium Hydroxide (38° Bé.)	25 kg.

Make *a* in the usual fashion, adjust to 40% fatty acids, and treat with bleach lye. Add *b*, and to this, in *alternative* small portions *c* and *d*.

The soap resulting should have 32 to 33% fatty acids.

*Methyl Cellulose Solution for Use as Soap Filler

a. *Water*	200 kg.
Caustic Lye† (38–39° Bé.)	40 kg.
b. Methyl Cellulose	40 kg.
c. Water, to make	1000 kg.

To the boiling *a*, *b* is added with stirring. Let stand and swell for about ½ hour. Stir in *c*, cold. Let stand over night, stir up again.

† Soda for hard soaps, potash for soft soaps.

Methyl Cellulose Transparent Soap

a. Fatty Acid	1000 kg.
Potassium Hydroxide, about	370 kg.
b. Potassium Chloride (20° Bé.)	54 kg.
Potash Carbonate (36° Bé.)	53 kg.
c. Methyl Cellulose Solution (as in preceding formula)	600 kg.
d. Sodium Silicate (50%)	100 kg.
e. Potassium Hydroxide 38° Bé.)	53 kg.

Method as given above. Sodium silicate and methyl cellulose solutions are added alternatively.

Soap resulting should have 30% fatty acids.

Soap-Stocks for Pearly Soft Soaps
For Summer
Formula No. 1

Tallow	1000 lb.
Mutton Tallow	500 lb.
Light Bone Fat	500 lb.

No. 2

Cotton Seed Oil	400 lb.
Mutton Tallow	300 lb.
Palm Kernel Oil	100 lb.
Light Pork Fat	300 lb.

No. 3

Mutton Tallow	500 lb.
Light Pork Fat	500 lb.

No. 4

Tallow	200 lb.
Hard Fat	300 lb.
Light Bone Fat	200 lb.
Light Pork Fat	300 lb.

For Winter
No. 5

Cotton Seed Oil	600 lb.
Peanut Oil	200 lb.
Pork Fat	200 lb.

No. 6

Cotton Seed Oil	500 lb.
Soy Bean Oil, Bleached	200 lb.
Tallow	300 lb.

No. 7

Cotton Seed Oil	600 lb.
Train Oil	150 lb.
Palm Kernel Oil	100 lb.
Tallow	150 lb.

No. 8

Soy Bean Oil, Bleached	500 lb.
Neat's Foot Oil	250 lb.
Pork Fat	250 lb.

No. 9

Cotton Seed Oil	300 lb.
Linseed Oil	100 lb.
Tallow	150 lb.
Pork Fat	250 lb.
Soy Bean Oil	200 lb.

No. 10

Soy Bean Oil, Bleached	300 lb.
Pork Fat	200 lb.
Peanut Oil	200 lb.
Palm Kernel Oil	100 lb.
Tallow	200 lb.

The pure tallow soaps are usually made with potassium hydroxide. The other soaps, which are filled with starch, etc., are made from sodium hydroxide, using it together with a high amount of potassium carbonate solution.

Soft Soap

Cottonseed Oil	430 g.
Dekanormal Solution of Potassium Hydroxide	100 cc.
Dekanormal Solution of Sodium Hydroxide	50 cc.
Water, a sufficient quantity To make	1000 g.

Mix the dekanormal solutions with the oil. Stir occasionally during the three hours, then set aside for twenty-four hours. Add warm water enough to make the product weight 1000 g.

Transparent Rosin Soap

a.	Palm Kernel Oil	750 kg.
	Palm Oil, Lagos	250 kg.
	Rosin, Pale	100 kg.
b.	Waterglass	about 100 kg.
c.	Caustic Soda (30° Bé.)	as required

Melt *a* slowly, strain.

Heat the correct amount of *c* and add to *a* in little portions, with good agitation. When three quarters is added, the soap will remain stable. The remaining caustic is added and mixed in thoroughly. Add the hot *b* which perhaps has to be brought to the correct strength, according to the alkalinity of the soap sample.

Harden with a little salt solution. Pour at low temperature after thorough mixing.

Cool quickly in shallow molds.

Rosin Soft Soaps

Formula No. 1

a.	Palm Kernel or Coconut Oil	216 kg.
	Palm Oil	80 kg.
b.	Rosin	60 kg.
c.	Caustic Soda (30° Bé.)	400 kg.
	Waterglass	150 kg.
	Water	40 kg.

Heat *a* in the first kettle, and melt *b* in the hot oil. Strain.

Heat *c* separately in a second kettle to a boil, and crutch it into the rosin-fat mixture in the other kettle. Caution is necessary lest the soap boil over. When the rising is over, the soap is finished, and should be solid when cooled (sample).

If not solid enough, the soap can be hardened by the addition of a soda ash solution (35° Bé.).

No. 2

a.	Rosin, Dark	250 kg.
	Palm Kernel Oil	180 kg.
	Woolfat	70 kg.
b.	Waterglass	50 kg.
	Caustic Soda (39° Bé.)	238 kg.
	Water	30 kg.

No. 3

a.	Palm Kernel Oil	525 kg.
	Palm Oil	225 kg.
	Rosin	150 kg.
b.	Caustic Soda (30° Bé.)	1000 kg.
	Waterglass	375 kg.
	Water	100 kg.

No. 4

a.	Palm Kernel Oil	110 kg.
	Rosin	30 kg.
	Palm Oil	10 kg.
b.	Caustic Soda (24° Bé.)	132 kg.
	Water	if desired
c.	Salt Water (20° Bé.)	180 kg.
	Potassium Carbonate (20° Bé.)	160 kg.

Melt *a*, add the hot *b* with good and thorough agitation. When the soap has a satisfactory consistency, run in *c* and crutch the whole thoroughly. Samples should now be solid and dry on cooling. Let stand in the covered kettle, and mold at 65° C.

Rosin Soaps with Silicate Filler

Formula No. 1

a.	Palm Kernel Oil	103 kg.
	Palm Oil, Red	2 kg.
	Rosin	120 kg.
b.	Soap-Stone, Very Finely Powdered	20 kg.
c.	Caustic Soda (38° Bé.)	105 kg.
	Sodium Silicate	75 kg.

In the first kettle, the mixture *a* is melted and well mixed, strained hot, and returned into the hot kettle, which should be spacious enough to take in the hot alkali *c*—heated to 60–70° C.—which has been prepared by evaporating it down in a second kettle to 40–42° Bé. concentration.

Before adding *c*, *b* is mixed with *a* in the first kettle. When *c* is added to the first kettle, vigorous agitation is necessary, and precautions should be taken to spray cold water on the soap if it threatens to boil over.

When heavy enough, pour into molds. Cut quickly, because the soap hardens very much when cold.

No. 2

a.	Rosin	250 kg.
	Palm Kernel Oil	180 kg.
	Woolfat	70 kg.
b.	Caustic Soda (39° Bé.)	238 kg.
	Sodium Waterglass	50 kg.
	Water	20–30 kg.

No. 3

a.	Rosin	150 kg.
	Palm Kernel Oil	110 kg.
	Tallow	20 kg.
	Palm Oil, Red	20 kg.
b.	Caustic Soda (36° Bé.)	152 kg.
	Potassium Carbonate (30° Bé.)	15 kg.
	Waterglass	10 kg.

No. 4

a.	Rosin	60 kg.
	Palm Kernel Oil	60 kg.
b.	Caustic Soda (39° Bé.)	57 kg.
c.	Soap Yellow	35 g.
	Water, Boiling	3 kg.
d.	Waterglass	to suit

The procedure for Formulas 2, 3, 4 corresponds to that of No. 1, except that the waterglass, at 80° C., is added directly to the unsaponified rosin-fat before adding the caustics.

Fillers for Hard Soaps

Formula No. 1

Water	192 g.
Salt	22 g.
Potassium Carbonate	17 g.
Sugar	24 g.
Borax	3 g.

No. 2

Water	800 g.
Sugar	200 g.
Potassium Carbonate	100 g.
Salt	100 g.
Caustic Soda (38–40° Bé.; used in dilution to 20–24° Bé.)	40 g.

No. 3

Sugar	30 g.
Potassium Carbonate	25 g.
Salt	20 g.
Water	160 g.

Dissolve hot at 60–70° C. Cool and thin the cold solution to 24° Bé. with cold water.

Filled Hard Soap

Palm Kernel Oil or Fatty Acid	70 g.
Soft Fat	27 g.
Palm Oil, Crude	3 g.
Sodium Silicate	25 g.
Caustic Soda (40° Bé.)	50 g.

Preparation (in the "half-hot" way): Add the waterglass to the caustic soda which has been calculated for the saponification of the fats. Heat to 80–85° C.

To this add the fat mixture with continuous stirring. The fats should be at the lowest temperature possible.

Keep covered for ½–1 hour.

Mottled Soap

Formula No. 1

Palm Kernel Oil	400 kg.
Caustic Soda (20° Bé.)	480 kg.
Potassium Carbonate (30° Bé.)	175 kg.
Salt Water (24° Bé.)	350 kg.
Color with:	
Frankfurt Black	200 g.
Ultramarine Blue	800 g.
Sodium Silicate Solution	8000 g.
Potassium Carbonate (20° Bé.)	4000 g.

No. 2

Palm Kernel Oil	50 kg.
Caustic Soda (20° Bé.)	60 kg.
Potassium Carbonate (30° Bé.)	50 kg.
Salt Water (25° Bé.)	70 kg.

Color:
As in No. 1.

No. 3

Palm Kernel Oil	50 kg.
Caustic Soda (20° Bé.)	59 kg.
Potassium Carbonate (30° Bé.)	40 kg.
Salt Water (24° Bé.)	50 kg.
Color:	
Waterglass	2.5 kg.
Water	1.5 kg.
Caustic Soda (20° Bé.)	1.25 kg.
Black or Blue Colors	100 kg.

The formation of the mottled soap is, in the main, due to the tendency of the silicate to lump, as a result of lack of alkali, because of the difference in specific gravity, and also because of the presence of the salt.

Procedure: Saponify regularly with sodium hydroxide and potassium carbonate, crutch in the salt solution. Allow to clear. Skim off foam. Crutch in the color solution at 75–80° C.

If the soap is white with large blue "flames", some caustic is lacking, and the mottles will settle out.

If a sample is blue throughout, there is too much alkali in the soap.

Cooled sample should show a very slightly dyed white, that is, should have a shade of blue. This soap will remain mottled.

Bile Soaps

Formula No. 1

Coconut Oil	100 kg.
Sodium Hydroxide (38° Bé.)	50 kg.
Ox Bile (Evaporated)	3 kg.

The bile is to be added as a solution in a little hot water, as soon as the lye and the oil are forming an emulsion.

No. 2

Coconut Oil	50 kg.
Palm Kernel Oil	50 kg.
Sodium Hydroxide (38° Bé.)	50 kg.
Sodium Silicate	4 kg.
Bile (Evaporated)	5 kg.

No. 3

Coconut Oil	100 kg.
Sodium Hydroxide (38° Bé.)	50 kg.
Bile (Evaporated)	2 kg.
Ammonia	4 kg.
Turpentine	2 kg.

No. 4

Coconut Oil	50 kg.
Palm Kernel Oil	50 kg.
Sodium Hydroxide (38° Bé.)	50 kg.
Sodium Taurocholate	0.5 kg.
Brilliant Green Dye	to suit
Rosemary or Spike Oil	

No. 5

Coconut Oil Fatty Acid	50 kg.
Caustic Soda (38° Bé.)	30.5 kg.
Ox Bile Concentrate*	10 kg.
Filler	28 kg.

* Made by evaporating 63 kg. of fresh ox bile and adding 0.5% of ethyl acetate at 80° C. Take off foam.

Guillaya Bark Soap

Coconut Oil Fatty Acid	50 kg.
Caustic Soda (38° Bé.)	30.5 kg.
Filler	31.5 kg.
Guillaya Bark	1.5 kg.
Ox Bile	5 kg.

Controlled Alkalinity Soap

U. S. Patent 2,087,267

In the manufacture of soaps having a controlled alkalinity by cold processing and producing a pink color when moistened with phenolphthalein solution, the improvement comprises mixing together 200 parts of beef tallow and 50 parts of coconut oil, heating the mixture to between 50° and 52° C., stirring the hot mixture and adding 1.2 parts of hydrogen peroxide solution, continuing the stirring and adding a preheated caustic soda solution, obtained by dissolving 38.65 parts of flake caustic soda in 40 parts of water and having a temperature of 90° to 92° C., discontinuing the stirring upon the thickening of the emulsion and causing the spontaneous reaction to proceed with the simultaneous generation of heat until substantially complete, the generated heat bringing the soap mixture to about 120° C. and the hot mixture being intermittently stirred to control the reaction, again stirring the mixture after the exothermic reaction has subsided and adding to the hot soap mixture a preheated alkaline aqueous solution of silicate, said solution of silicate being obtained by mixing together 8 parts of water, 5 parts of silicate and 1 part of a caustic soda solution of the strength employed for saponification and heating the silicate mixture to 90° C., the said silicate solution being gradually added and the stirring being continued until the soap mixture has the desired alkalinity, and recovering the soap so produced.

Acid Soap

French Patent 752,879

Peanut Oil Fatty Acid	40 kg.
Coconut Oil Fatty Acid	15 kg.
Palm Oil Fatty Acid	15 kg.
Soy Bean Oil, Sulphonated	30 kg.
Sodium Carbonate, Anhydrous	9 kg.

Mix the oils and the carbonate to get a homogeneous mixture.

Soaps Containing Chlorinated Hydrocarbons

German Patent 639,733

Formula No. 1

a. Soft Soap	250 lb.
b. Glycol Monobutyl Ether	40 lb.
c. Carbon Tetrachloride	200 lb.

Mix *a* and *b* hot, cool to moderate temperature and stir in *c*. This soap does not separate when dissolved in water.

No. 2

a. Hard Soap	50 lb.
Soft Soap	200 lb.
b. Glycol Monomethyl Ether	40 lb.
c. Carbon Tetrachloride	200 lb.

Mix *a* thoroughly (hot), add *b*, and add in *c* with good mixing thereafter. A stiff gel. Clearly water-soluble.

No. 3

Sodium Soap, Unseparated	250 lb.
Glycol Monoethyl Ether	40 lb.
Carbon Tetrachloride	200 lb.

A stiff paste, clearly soluble in water.

Half-Boiled Soap Containing Glycerin

Coconut Oil	80 g.
Tallow	40 g.
Caustic Soda (38° Bé.)	60 g.
Phenol	3 g.

The fat and lye are agitated together at 35° C. until reaction is complete. The phenol, dissolved in a little water, is then introduced. The soap may be perfumed with a small amount of clove, lavender, or rosemary. The soap wrappings should be air-tight.

Saponified Starch Soap

A little-known form of soap that finds its uses in the cheaper market is the saponified starch soap which may be made either for toilet or household use.

The ingredients are undried milling soap base, coconut oil fatty acids, maize starch and caustic soda of 93° Tw.

The 62–63 per cent fatty acid milling base is framed or put through the cooler in the usual manner and cut into bars; then it is chipped as though it were going to the drying room.

Twenty pounds of the chipped base is placed in a dough mixer with 44 lb. of the acid oil and 32 lb. of fine maize starch and the whole is thoroughly mixed for fifteen minutes and kneaded to a stiff paste. The strong caustic solution is now added in a thin stream. The mass begins to thin out and become very hot. Mixing is continued until there is no longer a color reaction to phenolphthalein solution and all lumps have been dispersed, the whole operation taking about half an hour.

The soap is now properly formed and may be removed from the mixer. It is then spread out on a clean wooden floor and left to mature for at least 24 hours; the longer the better, up to a week. After maturation it is broken up into small pieces and is ready to be milled and plodded in the usual way of toilet soaps, adding colors and perfumes as one would do to ordinary milling base. The natural color of the soap is somewhat creamy, so delicate shades are not attainable.

If the neat soap is found to be too coarse, it may be mixed in all proportions with ordinary toilet millings but a reasonably good soap results if high-speed metal roller mills are used.

The household variety is produced on exactly the same principle throughout but the ingredients are not quite the same.

The charge is as follows:

Undried Milling Soap Base	15 lb.
Acid Oil	30 lb.
Starch	32 lb.
Caustic Soda (93° Tw.°)	12 lb.
Silicate of Soda (140° Tw.°)	10 lb.
Water may be added up to	16 lb.

The mixing process is carried out in the same manner as for the toilet variety and when the soap is properly formed, the silicate, mixed with the water (if any) is added and well mixed in just prior to removing the mass from the mixer. After maturing it is milled and plodded in the usual way.

Salt Water Soap

Coconut Oil	282 lb.
Caustic Soda (30° Bé.)	282 lb.
Caustic Potash (30° Bé.)	85 lb.
Sodium Silicate	281 lb.
Water	70 lb.

Sea Water Soap

Formula No. 1

Coconut Oil or Fatty Acid	25 lb.
Castor Oil Fatty Acid	3 lb.
Caustic Soda (38° Bé.)	15 lb.
Water	10 lb.
Sodium Silicate (36° Bé.)	25 lb.
Potassium Carbonate (30° Bé.)	8 lb.

No. 2

Coconut Oil	50 lb.
Caustic Soda (30° Bé.)	60 lb.
Waterglass (38° Bé.)	20 lb.
Turkey Red Oil	5 lb.
Potash Solution (30° Bé.)	15 lb.

Oil(Fat)-Dissolving Soap

Triethanolamine Oleate	1 kg.
Lacquer Benzine (White Spirit) or Turpentine, Acetone, Xylol	2 kg.
Potash Soap Solution	2–4 kg.

Pure Vegetable Oil Soap

(4000 lb. batch)

Cotton Seed Oil Fatty Acids	800 lb.
F or G Wood Rosin	160 lb.
Soda Ash	128 lb.
Caustic Soda	100 lb.
Ultramarine Blue	6 lb.

Melt fatty acids, add the soda ash and heat until reaction subsides, now add the lye in water at 33° Bé., and continue boiling until soap is clear solution, introducing water as needed, then add the rosin and bring the volume up to 500 gal., stir in the ultramarine which has been previously well mixed with 2 gal of warm water.

Quick, Lasting Lather Soap
U. S. Patent 2,055,581

150 oz. of commercial triethanolamine are warmed slightly and mixed with 125 oz. of benzoic acid. The heating and agitation is continued until the acid dissolves in the triethanolamine to a pale yellow semi-liquid mass which solidifies on cooling.

This compound, namely the benzoic acid salts of the alkylolamines which is more or less crystalline, is dissolved in warm water or in warm glycerinated water, that is water containing a small percentage of glycerin. The compound is then incorporated with soap in a proportion equal to about 20 times the weight of the alkylolamine salt, and the compound may be added at any stage during the manufacture of the soap.

For instance, the agent can be added during or soon after the boiling process or it can be crutched-in or it can be mixed with the soap chips or flakes during milling operations, or, again, it can be added to the perfume with which the soap is to be scented.

Another example is the following: 205 oz. of potassium hydrogen phthalate are mixed with 150 oz. of triethanolamine with the aid of heat if necessary until combination results.

Incorporating Borax into Toilet Soap

To a suitable soap base (such as the shaving soap type), the glycerin is added as follows:

Borax	3 kg.
Glycerin	5 kg.
Water	4 kg.
Superfatting Agent	5 kg.

This emulsion paste (which is obtained when adding the superfatting agent to the borax solution) can be incorporated into the soap base.

Anti-Rancidity Composition for Soaps

a.	White Beeswax	300 g.
	Lanolin	400 g.
	Mineral Oil, White	390 g.
b.	Water	300 g.
	Borax	17 g.
c.	Sodium Thiosulphate	690 g.
	Water	200 g.

Melt *a* to about 90° C., and add to it boiling *b*—cautiously, to prevent boiling over. Keep boiling for a couple of minutes, take off and let stand with occasional stirring. *c* is now dissolved by boiling and added to the emulsion in a thin jet with good agitation.

2% of this is added to the soap chips.

Casein Paste (To Be Added to Soaps to Make Them Smoother)

a.	Casein	16 lb.
	Water	59 lb.
b.	Borax	1.6 lb.
	Water	8 lb.
	Preservative	

Mix *a* in the cold and let soak over night.

Take up *b* to a boil, and add into *a* with stirring. Heat all together to 70° C. on a waterbath for about 2 hours, until all is dispersed smoothly.

Add 5% to the (*hard*) soap.

Preventing Soap Discoloration

If the total salt content does not amount to more than 54 per cent, a smooth, firm, pliable soap is obtained. With a higher salt content, the soap becomes flaky and shows a tendency to crack. If a soap, for example, contains 0.4 per cent to 5 per cent salt and is to be treated with 0.2 per cent sodium thiosulphate, it is necessary to increase the pliability. This is best done by kneading into the dry soap, before milling, 0.7 per cent of the following mixture:

Beeswax 300, anhydrous lanolin 400, liquid paraffin 390, water 300, borax 17, sodium thiosulphate 690, water 200. Melt together the wax, lanolin and paraffin oil; then dissolve the borax in 300 parts of water and pour this solution in a thin jet into the hot mass of molten fats at a temperature of about 95° C. Boil for a few minutes longer, then set aside and let cool to 50° C., stirring frequently. Pour the hot solution of sodium thiosulphate in 200 g. of water into the fat-borax emulsion in a thin jet and stir until smooth. In some cases, for example, when using an unusually large quantity of perfume, it is advisable to add 1 per cent of the following:

Beeswax 200, anhydrous lanolin 600, liquid paraffin 390, water 200, borax 17, sodium thiosulphate 690, water 200, sodium silicate 450, granulated sugar 253.

The use of sodium thiosulphate prevents cracking as well as the formation of metallic sulphides, which are formed under certain conditions—for example, in iron frames—and which cause decomposition and discoloration.

Liquid Soap
Formula No. 1

Coconut Oil	12 lb.
Sesame, Sunflower, Light Soya Bean, Olive, or Sulphur Olive Oil	4 lb.

Caustic Potash (50° Bé.)	about 7.8 lb.
Potassium Chloride	0.2 lb.
Water, Distilled	70 lb.
Glycerin, or Alcohol	6 lb.

Keep the finished soap for 1–2 weeks at the lowest possible temperature, and filter at this same temperature.

No. 2

Coconut Oil	16 lb.
Caustic Potash	4½ lb.
Pine Oil	14 lb.
Sodium Naphthenate	5 lb.
Water	60½ lb.

No. 3

Coconut Oil	21.0 lb.
Caustic Potash (50%)	9.5 lb.
Sugar	12.0 lb.
Borax	2.0 lb.
Water	55.5 lb.

No. 4

Soya Bean Oil	8.0 lb.
Caustic Potash (50%)	4.6 lb.
Sugar	8.0 lb.
Glycerin	6.0 lb.
Potassium Carbonate	2.0 lb.
Water	71.4 lb.

No. 5

Coconut Oil	6.0 lb.
Soya Bean Oil	12.0 lb.
Caustic Potash (50%)	9.6 lb.
Glycerin	12.0 lb.
Water	60.2 lb.
Lavender Oil	0.1 lb.
Linalyl Acetate	0.1 lb.

In the formulas 3–5 saponify by adding the caustic alkali slowly to the oil which has been heated to 70° C. by an open steam coil. Near the end of the saponification, water should be added to prevent foaming.

After the saponification add the other ingredients, such as sugar, glycerin, etc., and finally the bulk of the water. Cool, and add perfumes and dye.

Fatty Acid Liquid Soaps

Formula No. 1

Coconut Oil Fatty Acid	100 kg.
Caustic Potash (50° Bé.)	55.3 kg.
Water, Distilled	509.7 kg.

No. 2

Coconut Oil Fatty Acid	30 kg.
Castor Oil Fatty Acid	15 kg.
Potassium Carbonate	2.5 kg.
Sugar	5 kg.
Caustic Potash (50° Bé.)	22.8 kg.
Water, Distilled	224.4 kg.

No. 3

Coconut Oil Fatty Acid	50 kg.
Soya Bean Oil Fatty Acid	10 kg.
Potassium Carbonate	3 kg.
Caustic Potash (50° Bé.)	31.8 kg.
Water, Distilled	304.8 kg.

No. 4

Coconut Oil Fatty Acid	45 kg.
Oleic Acid, White	20 kg.
Potassium Carbonate or Chloride	3.5 kg.
Caustic Potash (50° Bé.)	33 kg.
Water, Distilled	332.5 kg.

In all these soaps, the saponification has to be brought about by adding the fatty acids to the hot lye—with very thorough mixing and in small portions, since the reaction is quite violent and the soap will rise high in the kettle. Finally put in the filler, to bring the soap down.

Transparent Soap
(Without Glycerin)

Coconut Oil Fatty Acid, Light	20 kg.
Tallow Fatty Acid, Light	18 kg.
Castor Oil Fatty Acid, Light	12 kg.
Caustic Soda (38° Bé.)	about 26 kg.
Sugar	10 kg.
Alcohol	25 kg.
Water	15 kg.

The sugar should be added to the finished soap.—If the use of glycerin is possible, it is recommended to take

Glycerin	10 kg.

substituting it for the alcohol or the water, or for parts of both water and alcohol.

Vegetable Oil Liquid Soap

Coconut Oil	600 lb.
Soya Bean Oil	300 lb.
Caustic Potash	211 lb.

Melt fats together, add the lye at 33° Bé.; heat with caution to control the saponification. Add water slowly on completion to bring volume to 620 gal. Age, filter or decant.

Coconut Oil Liquid Soap

Coconut Oil	100 lb.
Caustic Potash	25.5 lb.
Water, to make	73.5 gal.

Liquid Soap Base

Coconut Oil	100 lb.
Linseed Oil	100 lb.
Caustic Potash	44.8 lb.
Water	158 lb.

Green Soap (65%)

Soya Bean Oil	350 lb.
Corn Oil Fatty Acids	350 lb.

Soap Stock Base	75	lb.
Caustic Potash	132.6	lb.
Water, to make	1350	lb.

Liquid Soap for Dispensers

Coconut Oil	16	oz.
Caustic Potash	4½	oz.
Pine Oil	14	oz.
Sodium Naphthenate	5	oz.
Water	60½	oz.

Pine Oil Jelly Soap

a. Red Oil	96	oz.
Caustic Soda	13	oz.
Water	640	oz.
b. Pine Oil	23	oz.
"Carbitol"	11	oz.

Mix *a* until uniform and then stir *b* into it.

Stiff Soap Gels

German Patent 639,583

Formula No. 1

a. Linseed Oil	240	g.
Monoethyl Ether of Polyethylene Glycol	100	g.
b. Caustic Potash	54	g.
Water	81	g.
c. Carbon Tetrachloride	180	g.

Mix *a*, saponify hot with *b*. Add *c* with thorough stirring. The product is a very heavy gel.

No. 2

Ethyl Ether of Polyethylene Glycol	100	g.
Hard Soap	200	g.

Product is a solid gel.

No. 3

a. Soft Soap	400	g.
Polyethylene Glycol Ethyl Ether	100	g.
b. Tetrahydronaphthalene	150	g.

Dissolve *a* in the hot. Add *b* to the clear solution, to give a heavy gel.

No. 4

a. Soft Soap	400	g.
Polyethylene Glycol Ethyl Ether	100	g.
b. Toluol	150	g.

Dissolve *a* hot, till clear, and add *b* to give a very heavy gel.

Soap, Palm and Olive

Tallow, Best, Fresh	50	lb.
Palm Oil, Bleached	30	lb.
Coconut Oil, Cochin	10	lb.
Sulphur-Olive Oil	10	lb.

Perfume for this soap (use ½–¾ lb. on 100 lb. of soap):

Citronal	400	g.
Geranium Oil, Bourbon	400	g.
Citronellal	250	g.
Spike Lavender Oil	140	g.
Rosemary Oil	100	g.
Peppermint Oil	80	g.
Lavender Oil	80	g.
Sandal Wood Oil, Australian	80	g.
Methyl Acetate	50	g.
Vetivert Oil, Bourbon	45	g.
Tonkarol	40	g.

Mechanics Soap

Formula No. 1

Silica	175	lb.
Fine Sand	240	lb.
Pure Vegetable Oil Soap	135	lb.
Water	10	gal.

No. 2

Sand	525	lb.
Soap	160	lb.

Water to secure desired consistency.

No. 3

A popular grit soap in which the grit is 200-mesh feldspar, is as follows:

Soap	8	lb.
Feldspar	92	lb.

The hot soap solution is put into a dough mixer, and the requisite amount of feldspar added. These are mixed until a stiff dough is produced. It is sometimes necessary to blow open steam directly into the mixer so as to plasticize the mix without the use of an excessive amount of water. The soap is then dropped into frames. When cool it is cut into bars and racked off for a month or more to harden.

No. 4

Moisture	0.68	lb.
Soap	24.45	lb.
Soda Ash	0.32	lb.
Mineral Grit	74.02	lb.

No. 5

Coconut Oil Fatty Acid	50	kg.
Caustic Soda (38° Bé.)	30.5	kg.
Fillers and Builders	13	kg.
Pumice, Finely Powdered	25	kg.

Pumice Soaps

Formula No. 1

Coconut Oil Fatty Acid	50	kg.
Caustic Soda (38° Bé.)	30.5	kg.
Sand, Finest	15	kg.
Pumice Powder	10	kg.
Filler or Builder	13	kg.

No. 2

Coconut Oil Fatty Acid	50	kg.
Caustic Soda (38° Bé.)	30.5	kg.
Pumice Powder	20	kg.
Filler	3	kg.
Tetralin, Benzine and Turpentine (1:1:2)	15	kg.

No. 3

Coconut Oil Fatty Acid	50 kg.
Caustic Soda (38° Bé.)	30.5 kg.
Sodium Silicate Solution	5 kg.
Pumice Powder	10 kg.
Pine Oil	10 kg.
Sand	5 kg.
Filler	8 kg.

Sand Soap
(Type "Abrador")

Coconut or Palm Kernel Oil, Ceylon	50 kg.
Caustic Soda (38° Bé.)	26 kg.
Water	4 kg.
Sand, Very Fine, or Pumice, Finely Powdered, or Neuburg Chalk	30 kg.

Perfume:

Spike Oil	150 g.
Rosemary Oil	100 g.
Caraway Oil	30 g.
Peppermint Oil	25 g.

The perfume should be added to the melted fats, since the soap gets heavy too rapidly.

Dye: Ultramarine Blue.

Powdered Hand Soap

Soda Ash	5 lb.
Powdered Soap (88%)	20 lb.
Pumicite	75 lb.

Hand Cleansing Powder

a.	Saw Dust	40 kg.
	Pumice, Finely Powdered	20 kg.
b.	Wool Fat	5 kg.
	Pine Oil	10 kg.
c.	Hard Soap, Powdered	10 kg.
	Sodium Carbonate	10 kg.
	Sodium Metaphosphate	5 kg.

The fine powder *a* is wetted with the solution *b*, and to this, the powders *c* are added.

Mix thoroughly.

Hand Cleanser
Formula No. 1

a.	Soft Soap	40 lb.
	Water	20 lb.
	Alcohol	20 lb.
b.	Triethanolamine Oleate	8 lb.
	Decalin or Heavy Benzine	12 lb.
c.	Saw Dust	to make paste

Dissolve *a*, add *b*; mix—until homogeneous and pasty—with *c*.

No. 2
Austrian Patent 147,024

Potassium Soap	120 g.
Marble Dust	70 g.
Glycerin	3 g.
Turpentine	1 g.
Petrolatum	1 g.
Citronella Oil	3 g.

No. 3

a.	Oleic Acid	11 kg.
	Triethanolamine	5 kg.
	Mineral Oil	34 kg.
	Kerosene	50 kg.
b.	Saw Dust	1 kg.
	Pumice, Powdered	3 kg.

Mix *a* till clear; stir in *b* to get a paste.

Waterless Hand Cleanser
French Patent 653,584

Water	3 l.
Tallow Soap	450 g.
Agar-Agar, Alkalized	4– 5 g.
Saw Dust	up to 17%

Medicated Soaps

Most medical works refer only to liquid and paste soaps, but medicated solid soaps can be made just as well. Precautions in the latter case are to keep the amount of free alkali low, limit the salt content to a maximum of 0.2 per cent, and also keep the water content down. Before crutching, the water content should be 10–11 per cent. If the soap should be drier than this and the added material is of a hygroscopic nature, the latter is best treated with an equal amount of water and allowed to stand for a few hours before addition to the soap. It is then mixed into the soap and the whole allowed to stand covered overnight. The following is a general formula:

Caustic Soda	120 lb.
Lard	50 lb.
Olive Oil	40 lb.
Alcohol	12 lb.
Sodium Chloride	25 lb.
Soda Ash	3 lb.
Water	280 lb.

The lye is heated on a water bath and the melted lard and olive oil mixed into it and heated with stirring for a half hour. The alcohol is added and then 200 parts of water in small portions with continued warming, until a homogeneous mass is obtained. A sample portion of this should give a completely clear solution in hot distilled water. If this is the case, a filtered solution of the salt and soda in 80 parts of water is added and the heating continued until the soap is separated out. The cooled soap, separated from the salt liquor, is washed several times with water, pressed, cut into cakes and dried in a warm place.

Medicinal soap so prepared is tested

by dissolving 1 gram in 10 cc. of alcohol. It should not turn red on addition of phenolphthalein or form a precipitate on addition of hydrogen sulphide. The soap is generally powdered before use. Various combinations of fats can be used in place of those given for *sapo medicatus*, based on the experience of the soapboiler.

Suitable additions for medicinal soap are as follows:

Thymol Soap

Thymol	1.5 kg.
Soap Base	48.5 kg.

Tannin Soap

Tannin	2.5 kg.
Soap Base	47.5 kg.

Camphor Soap

Camphor	2.5 kg.
Soap Base	47.5 kg.

Naphthol Soap

B-Naphthol	2.5 kg.
Soap Base	47.5 kg.

Formaldehyde Soap

Soap Base and 1% Formalin

Iodide Soap

Soap Base and 1% Potassium Iodide

Menthol Soap

Menthol	1 kg.
Soap Base	49 kg.

Naphthalene Soap

Naphthalene	4 kg.
Soap Base	46 kg.

One of the oldest medicaments is sulphur. The action of free sulphur is weakly reducing and antiparasitic, so that it finds use in such skin ailments as acne, seborrhea, etc. Although amorphous and crystalline sulphur are used, colloidal sulphur is more effective on account of its greater surface area.

Sulphur Soaps

Formula No. 1

Colloidal Sulphur	5 kg.
Soap Base	45 kg.

No. 2

β-Naphthol	2.5 kg.
Ichthyol	5 kg.
Soap Base	42.5 kg.

No. 3

Sulphur	3 kg.
Potassium Iodide	1 kg.
Soap Base	46 kg.

Tar soaps are doubtless among the more popular medicated soaps. Tar soap may be a hard white soap, for which anthrasol is mostly used. Anthrasol is a light yellow oil obtained from pitch or coal tar. Tar soap may be combined with sulphur soap.

Tar Soap

Soap Base	100 kg.
Anthrasol	5– 7 kg.

Tar-Sulphur Soap

Anthrasol	5 kg.
Sulphur	5 kg.
Fine Sand	20 kg.
Soap Base	70 kg.

A soap paste used in making soap plasters and in other such products may be prepared from the following:

Soybean or Linseed Oil	30 kg.
Caustic Potash (17° Bé.)	40 kg.
Alcohol	3 kg.

Germicidal Soap

Sodium Silicate	3 g.
Dry Sodium Abietate	15 g.
Sodium Hexametaphosphate	13 g.
Soda Ash	15½ g.
Sodium Chloro-*o*-phenylphenolate	1 g.

Use 1 g. of above per 100 cc. water at 45° C. for best results.

Surgical Soap

Corn Oil	700 lb.
Soap Stock Base	75 lb.
Caustic Potash	132.6 lb.
Water, to make	1340 lb.

Medicinal Potash Soap
(For Dental Soaps)

Linseed Oil	43 g.
Caustic Potash (50° Bé.)	about 17 g.
Alcohol	5 g.

Heat the oil in a double boiler to about 70° C. To it add the caustic potash which has been thinned with some distilled water and with the alcohol. There are two possibilities of further treatment:

1. Leave alone as soon as a good emulsion is formed, until saponified.
2. Speed up the saponification by blowing hot steam into the mixture, stir. Caution is necessary to prevent boiling over.

Medicinal Sodium Soap
(For Dental Soaps)

Tallow, Best, Non-Acidic	7000 g.
Caustic Soda (38° Bé.)	3250 g.
Caustic Potash (20° Bé.)	500 g.

Melt the tallow, take up to 75° C., and stir in slowly the mixture of soda and potash (35–40° C.). After ½ hour of agitation let stand to finish saponification. Stir up every hour.

Dental Soap

Formula No. 1

a.	Sodium Soap, as above	10,750 g.
b.	Yellow Ochre	500 g.
	Umber, Brown	125 g.
	Calcium Carbonate, Precipitated	1,500 g.
	Water	2,000 g.
c.	Peppermint Oil	150 g.
	Clove Oil	25 g.

Make the soap *a* as given above. Add to it the suspension *b,* and perfume with *c.* Keep stirring all the time, making homogeneous before each addition.

No. 2

Glycerin, Hot	6 g.
Magnesium Oxide	0.5 g.
Sodium Bicarbonate	4 g.
Medicinal Soap	30 g.
Peppermint Oil	1 g.

Mix glycerin, magnesia, and sodium bicarbonate thoroughly, and mix in the peppermint oil.

Heat up soap until liquid, and add the mixture of the other ingredients to it. Mix thoroughly. Cool with agitation.

No. 3

Soap Powder (60%)	250 g.
Calcium Carbonate	500 g.
Glycerin	50 g.
Alcohol (50%)	150 g.
Peppermint Oil	10 g.
Talc	15 g.
Water	30 g.

Make a solution of the soap powder in the alcohol and perfume, warming as little as possible. To this solution add all the other ingredients with thorough mixing.

Liquid Dental Soap

Olive Oil	70 g.
Caustic Potash (38° Bé.)	about 35 g.
Alcohol	280 g.
Glycerin	230 g.
Water	350 g.
Perfume	35 g.

Saponify the oil with the caustic potash which is dissolved in about an equal weight of the alcohol.

To the soap formed add the water and the glycerin with good agitation, both being warmed up before the addition.

Let stand for some time in the kettle, to cool.

Add the rest of the alcohol and the perfume with good agitation.

Let settle for 8–14 days in smaller vessels. Filter.

Transparent Tooth Soap

English Patent 453,995

Cocoa Butter	20 kg.
Glycerin	70 kg.
Water	6.9 kg.
Thymol	0.5 kg.
Menthol	2.6 kg.

Carbolic (Phenol) Soap

Formula No. 1

Coconut Oil	80 lb.
Tallow	40 lb.
Caustic Soda (38° Bé.)	60 lb.
Phenol	3 lb.

Stir the fat and the lye together at 35° C. until the reaction is complete. Add the phenol (in a little water).

Perfume: Clove, lavender, or rosemary.

No. 2

Bone Fat	150 g.
Rosin	150 g.
Phenol	25 g.
Caustic Soda (37° Bé.)	150 g.

Bring the mixture of fat and rosin to 75° C., add the phenol and agitate. Add gradually to the lye, warming until the reaction is complete. Cool and cut into bars.

No. 3

Bone Fat	150 lb.
Rosin	150 lb.
Phenol	25 lb.
Caustic Soda Lye (37° Bé.)	150 lb.

Bring the mixture of fat and rosin to 75° C., add the phenol and agitate. Add gradually to the lye, warming until the reaction is complete. Cool and cut into bars of the usual size. The presence of phenol in this type of soap lends it a rather refreshing odor, which masks the undesirable odor of the cheap bone fat. As to the actual antiseptic value of such a soap, it must be admitted that soap chemists are aware of the fact that it is relatively small.

A half-boiled soap containing glycerin can be made from the following formula:

Coconut Oil	80 lb.
Tallow	40 lb.
Caustic Soda Lye (38° Bé.)	60 lb.
Phenol	3 lb.

The fat and lye are agitated together at 35° C. until reaction is complete. The phenol, dissolved in a little water, is then introduced. The soap may be perfumed with a small amount of clove, lavender, or rosemary. The soap wrappings should be air-tight.

Cresols can be used in place of phenols. They have the advantages of being less corrosive and somewhat less expensive.

Iodine Soap

The antiseptic action of iodine is well known but this action is not very great when the iodine is in the form of its derivatives. The most active form is in solution in alcohol or potassium iodide. Iodine can not be used in this form in soap as it is unstable. The best method of introducing it into soap is in the form of a compound with an unsaturated acid such as oleic acid. The procedure is to add 6 to 7 per cent of potassium iodide dissolved in a small quantity of warm water to the liquid soap, at the same time adding 0.5 per cent of sodium bisulphate.

Liquid Soap (Antiseptic)

Coconut Oil	16 oz.
Caustic Potash	4½ oz.
Pine Oil	14 oz.
Sodium Naphthenate	5 oz.
Diglycol Laurate	1 oz.
Water, to make	100 oz.

"Formobor," for Sterilizing Instruments

An aqueous solution containing 4 per cent of formaldehyde, and 1.5 per cent of borax.

Textile Scouring Soap

Soft Soap	84 oz.
Hexalin	6 oz.
Tetralin	10 oz.

Textile Spot-Wash

(For removing oil spots picked up in mill)

Castile Soap	10½ lb.
Chloroform	½ lb.
Ammonia (26° Bé.)	3 lb.
Water, to make	300 lb.

Textile Soap

French Patent 685,412

Marseille Soap	200 g.
Tallow-Soap, Powdered	95 g.
Soda Ash	20 g.
Borax	10 g.
Turpentine	25 g.
{Potassium Hydroxide	20 g.
{Water	30 g.

Use 40 pts. in 1000 pts. of water for the washing of fabrics.

Dry Cleaning Soap Concentrate

"Stoddard" Solvent	2 gal.
Diglycol Laurate	15 lb.
Alcohol	½ gal.
Sulphonated Castor Oil	1 pt.
Ammonia	½ pt.

Dry Cleaning Soap

Formula No. 1

Carbon Tetrachloride	10 oz.
Cyclohexanol	10 oz.
Sodium Naphthenate	10 oz.

No. 2

Liquid Soap (15%)	40 lb.
Hydrocarbon Solvent	10 lb.
Turkey Red Oil or Other Emulsifier	25 lb.
Alcohol (Methyl Glycol, Ethanol, etc.)	25 lb.

No. 3

a. Oleic Acid	10 g.
Trigamine	4 g.
b. Carbon Tetrachloride	17 g.
Solvent Naphtha	69 g.

Heat *a* to about 50° C. Turn off the heat and add *b* with high speed stirring. This gives a very efficient soap which does not build up on filters.

No. 4

Oleic Acid	7 lb.
Hexalin	4 lb.
Caustic Potash	1½ lb.
Water	8½ lb.

No. 5

U. S. Patent 2,070,908

Sodium Oleate	1.08 lb.
Trichlorethylene	1.47 lb.
Triethylene Glycol	7.00 lb.

1 lb. of the above is used per 99 lb. trichlorethylene.

Rug Cleaners Soap

Formula No. 1

a. Oleic Acid	35 g.
Trigamine	15 g.
Water	125 g.
b. Butyl Cellosolve	5 g.
Ethylene Dichloride	13 g.
c. Diethylene Glycol	15 g.
Isopropyl Alcohol	20 g.

Mix *a* and add *b* with high speed agitation. Add *c* slowly. Continue stirring. This gives a clear liquid which readily emulsifies in water. It is an energetic cleaner which does not affect color or harshen the fiber.

No. 2

Sodium Naphthenate	30 oz.
Trisodium Phosphate	65 oz.
Triethanolamine	5 oz.

Rug and Carpet Cleaners Soap

Formula No. 1

Trisodium Phosphate	23 oz.
Borax	27 oz.
Sodium Metasilicate	3 oz.
Soda Soap	30 oz.
Soda Ash	8 oz.
Para-dichlorbenzene	3 oz.

No. 2

Naphthalene	1 oz.
Borax	30 oz.
Trisodium Phosphate	15 oz.
Sodium Tallow Soap	54 oz.

Upholstery Cleanser

Coal-tar Naphtha	27 oz.
Tallow Soap	1 oz.
Triethanolamine Soap (as oleate)	1 oz.
Water	71 oz.

Dry Cleaners Emulsion

This removes grease as well as water soluble materials.

Xylol	10 oz.
Carbon Tetrachloride	10 oz.
Diglycol Laurate	7 oz.
Water	23 oz.

Add other materials slowly to water while mixing with high speed stirrer.

Dry-Cleaning Fluid

Formula No. 1

a. Oleic Acid	46 kg.
b. Caustic Soda (25%)	27 kg.
c. Alcohol	45.4 l.
d. Trichlorethylene	900 kg.

Saponify *a* with *b* at elevated temperature, on a waterbath. Add *c* and reflux to clear solution. Add this clear alcoholic soap solution to *d* with stirring, and let cool.

No. 2

Trichlorethylene	7 kg.
Benzene	2 kg.
Amyl Acetate	0.5 kg.

No. 3

U. S. Patent 2,053,007

60% by volume of carbon tetrachloride, approximately 20% by volume of tetrachlorethylene and approximately 20% by volume of petroleum naphtha, and between approximately 0.01% and approximately 1% by weight of a substantially neutral oil soluble petroleum sulphonic soap dissolved therein.

No. 4

French Patent 798,796

Alcoholic Ammonia	5– 50 oz.
Methyl Alcohol	20–250 oz.
Oleic Acid	5–250 oz.
Cyclohexanol	20–250 oz.

The above is mixed well and added to dry cleaners' naphtha in proportion of 1 pint to 50 gallons.

No. 5

U. S. Patent 2,111,571

A liquid composition for dry cleaning fabrics, furs and leather apparel and which is non-injurious thereto, consists of:

Benzol	53 lb.
Stoddard Solvent	32 lb.
Denatured Alcohol	11 lb.
Amyl Acetate	3 lb.
Distilled Water	8 lb.
Castile Soap	2 lb.
Oleic Acid	16 lb.
Ammonia Water (28%)	3 lb.
Caustic Potash	¼ lb.
Ethyl Acetate	1–5 lb.

Non-Inflammable Dry Cleaning Solvents

U. S. Patent 2,031,144

Formula No. 1

Petroleum Naphtha (70–105° F.)	35–40 fl. oz.
Carbon Tetrachloride	65–60 fl. oz.

No. 2

Petroleum Naphtha (140–165° F.)	35–40 fl. oz.
Tetrachlorethane	65–60 fl. oz.

Dry Cleaners Fluid

(Inflammable)

Formula No. 1

Ethyl Ether	20 lb.
Isopropyl Alcohol	20 lb.
Benzene	60 lb.

No. 2

Ethyl Ether	20 kg.
Ethyl Acetate	20 kg.
Toluol	20 kg.
Benzene	40 kg.

No. 3

Acetone	30 lb.
Methyl Alcohol	30 lb.
Benzene	40 lb.

No. 4

Ethyl Ether	60 lb.
Methyl Acetate	30 lb.
Butyl Acetate	10 lb.

No. 5

Ethyl Ether	40 lb.
Benzine	50 lb.
Amyl Acetate	10 lb.

(Non-Inflammable)

Formula No. 1

Carbon Tetrachloride or Trichlorethylene	80 lb.
Benzine	15 lb.
Butyl Acetate	5 lb.

No. 2

Carbon Tetrachloride or Trichlorethylene	65 kg.
Xylene	25 kg.
Benzene	10 kg.

No. 3

Carbon Tetrachloride or Trichlorethylene	70 lb.
Methyl Alcohol	10 lb.

Ethyl Acetate	10 lb.
Benzine	5 lb.
Amyl Acetate	5 lb.

No. 4

Methylene Chloride	30 lb.
Carbon Tetrachloride or Trichlorethylene	30 lb.
Toluol	20 lb.
Xylene	20 lb.

No. 5

Carbon Tetrachloride or Trichlorethylene	75 lb.
Xylene	15 lb.
Ethyl Ether	10 lb.

No. 6

Carbon Tetrachloride or Trichlorethylene	75 lb.
Methyl Acetate	10 lb.
Ethyl Alcohol	10 lb.
Amyl Acetate	5 lb.

No. 7

Carbon Tetrachloride or Trichlorethylene	80 lb.
Acetone	15 lb.
Toluol	5 lb.

Important: Perfume with citronella oil or similar substances, if amyl acetate is not included.

Dry Cleaners' Pre-Spotting Fluid

Oleic Acid	3 pt.
Carbon Tetrachloride	1 qt.
Hexalin	1 qt.

Mix together and add slowly with vigorous stirring

Ammonia (28%)	½ pt.

To this add slowly with strong mixing

Water	1½ pt.

Dry Cleaners' Spot Bleaches

Formula No. 1

Oxalic Acid	1 oz.
Water	1 pt.

No. 2

Oxalic Acid	1 oz.
Alcohol	1 pt.

No. 3

a.	Oxalic Acid	1 oz.
	Water	1 pt.
b.	Sodium Bisulphite	1 oz.
	Water	1 pt.

Mix *a* and *b* in equal parts before use.

No. 4

Water	½ pt.
Alcohol	½ pt.
Acetic Acid, Glacial	1 oz.
Oxalic Acid	1 oz.

No. 5

Sodium Bisulphite	1 oz.
Water	1 pt.

Mix till dissolved and add

Acetic Acid, Glacial	½ fl. oz.

This should always be made up fresh before use.

No. 6

Sodium Bisulphite	1 oz.
Water	1 pt.

Benzene Jelly
(For Dry Cleaning)

a.	Quillaya Bark	2 lb.
	Water	8–10 lb.

Soak cold for several hours, take up to boil for ½ hour, strain, cool, and use for

b.	Quillaya Extract	1 gal.
	Benzine	3 gal.

Shake this for about ½ hour, or stir by a mixer. Let stand for a day, and remove the water.

The benzine should gel.

Perfume may be added.

Benzine Emulsion Paste

a.	Benzine	87 lb.
	Oleic Acid	5 lb.
b.	Ammonia	1 lb.
	Triethanolamine	4 lb.
c.	Water, Distilled	50–60 lb.

Mix *a* and *b* at slightly elevated temperature (caution!). Add water *c* of same temperature. Stir till cooled sufficiently.

Oil-Spot Remover for Fine Textiles

Formula No. 1

Carbon Tetrachloride	60 kg.
Trichlorethylene	10 kg.
Xylene	15 kg.
Alcohol	10 kg.
Ethylene Dichloride	5 kg.

No. 2

Carbon Tetrachloride	60 kg.
Hydroterpin	15 kg.
Xylene	15 kg.
Alcohol	10 kg.

Do not keep these cleaners in metallic vessels!

Rust Remover—For Textiles and Paper

Ammonium Bifluoride	25 oz.
Citric Acid	1 oz.
Distilled Water	74 oz.

The remover is applied to the rust spots by a swab or brush made of pure cotton; the spots are then rinsed with pure water.

Scouring Solution for Piece Goods

Trisodium Phosphate	¼–½ oz.
Wetting Agent	¼–½ oz.
Water	1 gal.

Textile Scouring Emulsion

Oleic Acid	10 g.
Pine Oil	87 g.
Trigamine	3 g.
Water	100 g.

Mix 30 grams of the pine oil with the trigamine, and oleic acid and stir thoroughly. Then add slowly 35 grams of water and stir till a smooth thick emulsion is formed. Then add the remainder of the oil with high speed agitation and finally the rest of the water.

Cleaning Tarnished Metal Fabrics

(1) Rub the cloth with a weak solution of ammonia followed by dilute acetic acid, using a soft clean cloth.

(2) Polish with jeweler's rouge, just as you would table silver, only handling the fabric more carefully.

Spotting Heavy Pile Fabrics

A successful formula for spotting velvet, plush, corduroy or any goods having a heavy pile: Mix one-half pint each of acetone, denatured alcohol and water. This mixture is used in the same way that plain water would be and for the same kinds of stains. Cannot be used on cellulose acetates or mixtures.

Cleaning Upholstery

Make a warm soapsuds of ordinary strength and sponge the surface of the upholstery with this. If necessary use a scrub brush to assist in removing the dirt. When the dirt is softened sponge the surface with clear water to thoroughly rinse it. When dry you will find the surface well cleaned.

Soapless Rug Shampoo or Cleaner

Monoethanolamine	1 g.
Sulfatate	4 g.
Wetanol	20 g.
Isopropyl Alcohol	18 g.
Water	500 g.

Stir until dissolved. Allow to stand overnight in a cool place. Filter. This is an excellent cleaner which does not affect colors or "feel".

Carpet Cleaner

Alcohol	1 lb.
Vinegar	5 lb.
Sulfatate	⅛ oz.

Cleaning Leather Belting

Immerse the loosely wound coil, on edge, in the liquid, and allow to soak overnight. Then stand on the other edge for 10 hours. If the belt is dirty in addition to being oil soaked, the dirt usually loosens and settles to the bottom. The dirt that does not loosen and settle can generally be removed with ease by brushing or scraping. To hasten drying the belt may be run through an ordinary washing wringer, provided the belt is not too wide. If too wide for a wringer, dry with a cloth.

A putty knife or similar broad scraping device having rounded corners is a good tool for scraping leather belts. Fibers of a belt, whether leather or substitute, must never be injured.

Place dry sawdust on the belt after laying the belt flat on the floor and clean with a stiff broom. Then turn the belt and do the same to the other side. After this pack the belt in powdered chalk, Fuller's earth, or fine sawdust and keep it in a warm place. The warmth improves capillary attraction and will aid the material in absorbing the oil. After the belt is dry lubricate it with a suitable dressing.

Cleaning Suede Gloves

Dissolve neatsfoot oil in benzol in the proportion of one part of the oil to four parts of benzol. Apply the mixture by dipping a piece of cheesecloth into it and rubbing lightly over the entire glove. As each glove is treated, lay it aside. The benzol will evaporate, leaving the oil in the leather, so it makes no difference whether the rinsing is done immediately following the completion of the first treatment or any time later. There will be no appreciable effect on the color. The oil solution may be applied quickly with a soft-bristle brush.

The next procedure is to rinse the gloves, one at a time, in dry cleaning solvent and squeeze out well, or roll up in a cloth, to dispose of the excess solvent, then hang to dry at ordinary temperature. The idea is to make quick work of the rinsing and so reduce loss of color to a minimum. Do not allow the glove to lie in the solvent, nor should it be brushed. Simply rub and squeeze in the hands to remove the oil, and with the oil the soil that can be removed in that way.

Glacé Kid Renovator

A renovator is made from 1 lb. shellac, 2 oz. castor oil to 5½ pints of spirit, stained with the appropriate dyestuff, spirit soluble nigrosine for black, and a spirit soluble tan for browns.

Cleaning Straw and Panama Hats

A simple wet process for cleaning and bleaching straws is to go over the hat with sponge dipped in soapy water, then rinsing under a water tap. The hat is then wiped nearly dry with a soft cloth, after which a solution of oxalic acid (one-half ounce in one quart of water) is applied and allowed a few minutes time. Then rinse under a water tap. This method, though used by many, is not recommended, since it may cause tendering of the straw if not well rinsed out.

Panamas are usually cleaned by placing on a block and sponging or brushing over with soap and water, rinsing and allowing to dry. If greasy around the band, the hat should first be brushed with dry cleaning solvent. The main thing in cleaning a panama is to remove all the old sulphur dressing.

A fairly simple and satisfactory finish or dressing for panamas is to make up a solution of gum arabic by dissolving a rounding tablespoonful in one quart of water and letting stand overnight. This is used with lac sulphur by having a dish of the sulphur at hand and lightly squeezing a sponge out of the gum arabic solution, then dipping it into the sulphur and applying to the hat. This should be done evenly and the hat allowed to dry. When dry, the hat is brushed over well with the dry sulphur, then the excess sulphur is brushed off and the hat rubbed over with a soft cloth to finish.

Some hatters prefer to use the gum arabic solution in mixture with the lac sulphur in proper proportions to make a creamy paste which is applied to the hat and allowed to dry. When dry the hat is brushed over with the dry sulphur, which is then brushed off and the hat rubbed with a soft cloth.

Still another method is to make up a creamy solution by mixing lac (precipitated) sulphur with either full strength hydrogen peroxide or a solution of perborate, as above, which is applied evenly to the hat and allowed to dry. When dry the loose powder is brushed off. This gives some bleaching effect, but since the proper application of sulphur with a gum arabic solution (as above) has covering power, the matter of bleaching becomes of less significance.

Washing Clothes Without Boiling

British Patent 443,615

Clothes are washed without boiling by introducing them into a bath at about 80° containing per 100 l. of water and addition of a clear solution in 1–2 l. of water of 60 grams of sodium peroxide and a further addition of 250 g. of liquid waterglass at 34–38° Bé., maintaining them in the bath about 12 hours, wringing and rinsing in cold water.

Modified or Neutral Laundry Sodas

Formula No.	1	2	3
Sodium Bicarbonate	27	50	64 lb.
Sodium Carbonate	60	37	27 lb.

Poison Gases, Washing Off

For the removal of chlorine, phosgene, chlorpicrin and chloroacetophenone from objects, air for 1 hour then rub with 10% sodium carbonate solution. Dichlor arsine is neutralized with a 5% solution of calcium chloride or chloramine. Metal parts should be rubbed with oil after washing and drying to prevent rusting. Yperite is removed by a 10% solution of chloramine and airing for two hours.

Mildew Removal

Mildew on white goods is rather difficult to remove. Above all it is important not to use such strong chemicals that the spots will be changed into holes. The mildewed part should be first rubbed lightly with soap paste, then washed and dried. Sometimes the spots are bleached out by this process alone. For further treatment use a solution of 2 to 5 parts of citric acid in 100 parts of water, or a mixture of 30 parts of commercial hydrogen peroxide, 5 parts of ammonia water, and 125 parts of water. Moisten the spots frequently with this and then rinse in plain water. In extreme cases even this method will fail, for sometimes the structure of the material itself is changed. In any event the spots will not be removed by friction, that is by heavy pounding in the wheel.

Enzyme-Containing Detergents

Swiss Patent 176,622

Formula No. 1

Sodium Alginate	15 g.
Salt	5 g.
Sodium Carbonate	75 g.
Pancreatin	5 g.

No. 2

Sulphonated Fatty Alcohol	20 g.
Salt	5 g.
Sodium Carbonate	70 g.
Pancreatin	5 g.

REMOVAL OF MILL SPOTS IN TEXTILE PLANTS

It is hoped that the publication of some problems and their respective answers of one textile chemist will not only give aid to the chemists now in the industry, but offer hints to the newly initiated members of the profession.

The most important problems cannot be enumerated, but we all agree that the successful elimination of mineral oil spots from textile fabrics is a mutual ground on which we may begin a discussion.

Removal of Mineral Oil

Many effective solvents and emulsifiers are available. A spot remover, which leaves the least trace of a "spot-washed" place, is the chief factor which governs one in the choice of the solvent or emulsifier. Now consider the removal of mineral oil or grease spots from grey goods. These spots probably came from the loom, though oil has been known to get on yarn in the spinning and winding departments. The chief problem is to remove the oil and not take out the natural fats, waxes or color of the fiber. A solution of 100 cc. of methyl alcohol in which is dissolved 50 g. of neutral soap in 100 cc. water will remove the oil if the spot is rubbed lightly with a glass rod. After the oil or grease is sufficiently loose, wipe it with a damp cloth and absorb the remaining moisture with a dry cloth or paper towel. The precaution of absorbing the moisture is taken to prevent a subsequent mold or mildew growth.

The method of "spot washing" is accomplished by rubbing the spot with a glass rod 4 to 6 inches long. It is advisable to heat each end of the rod in a Bunsen flame and form a knob by pressing the heated end against a flat surface. A dressed pine board free of knots forms a good surface on which to rub the oil or grease spot.

An oil which is light in color such as lubricating mineral oil, S.A.E. 20 or 30, will not usually be hard to remove, but the hot oils and grease from the dry cans or tenter frame penetrate the fiber and it is difficult to remove the spots caused by hot oil or grease. An effective solution which has been found to readily emulsify these spots and effect their removal is prepared as follows in the order given:

Tetralin	280 cc.
Hexalin	200 cc.
Sulphonated Castor or Olive Oil	100 cc.
Neutral Soap Dissolved in 50 cc. Water	4 g.

The addition of 75 cc. carbon tetrachloride is optional.

Removal of Paint

Treat the goods in kier under 4 pounds pressure for 5 hours, using 2 per cent of the weight of the goods of the following solution: 50 per cent by volume tetralin, 35 per cent by volume hexalin, 10 per cent by volume sulphonated castor oil, and 5 per cent by volume water. Pull the goods from the kier through a hot wash and then to the finishing wash mill and process as originally planned.

Removal of Graphite and Other Stains

It is a too frequent occurrence for some weaving mills to get the griege goods soiled with graphite and loom oil stains. There is also another type of stain which is caused when a broken warp end is retied by a weaver. A long black stain is usually left after the broken end is tied. This consists of perspiration mixed with the soil and grime from the weaver's hands. It is practically impossible to entirely remove all traces of these stains. However, some can be completely removed and others can be made so much lighter that the stains are no longer noticeable. An inexpensive means of treating such stains consists of passing the cloth through a two roll mangle containing the following solution:

Hexalin	2 qt.
Pine Oil	4 qt.
Soap Solution (1%)	3 gal.

These are mixed together to form a fairly stable emulsion. Hot water is added while stirring constantly until the emulsion is diluted to 50 gallons.

After passing the cloth through this mixture the batched-up goods are left rolled up on the shell overnight. If time does not permit, the cloth is held at least three hours before further processing. The fabric is now treated like any other griege goods. It will be found after boil-off that this preliminary treatment has helped to remove practically all the objectionable oil and graphite stains.

Soft Transparent Laundering Soap

Coconut Oil	90 g.
Tallow or Hard Fat	10 g.
Caustic Potash (40° Bé.)	50 g.

Use cold way of saponification to obtain light-colored soaps.

Seal against air, since the high content of coconut oil makes the soap hygroscopic.

Perborate Laundry Soap

British Patent 435,710

Sodium Hexametaphosphate	15 lb.
Sal Soda	10 lb.
Sodium Perborate	10 lb.
Magnesium Silicate	1 lb.
Soap, Powdered	50 lb.

Polishing Soap

Formula No. 1

Coconut Oil Fatty Acid	50 kg.
Caustic Soda (38° Bé.)	30.5 kg.
Filler	15 kg.
Whiting, Finest	15 kg.
Talcum	3 kg.

No. 2

Coconut Oil Fatty Acid	50 kg.
Caustic Soda (38° Bé.)	30.5 kg.
Tripoli	8 kg.
Pumice, Finest Powder	5 kg.
Neuburg Chalk	25 kg.

Saddle Soap

a. Palm Oil, Lagos	14 kg.
Rosin, Light	1 kg.
b. Caustic Soda, 38° Bé.	7 kg.
c. Water	35–40 kg.
Glycerin, 30° Bé., Light	5 kg.
d. Talcum	0.2 kg.

Melt *a* and saponify in the usual manner with *b*, to the desired consistency; add *c*, finally *d*. Let cool in molds. Some of these soaps contain 1–2% beeswax.

Dog Soap

a. Potassium Hydroxide	4.05 kg.
Water	6.15 kg.
b. Linseed Oil	18 kg.
c. Alcohol	to clear
d. Cresol	1.55 kg.

Mix *a* and *b*, add *c*. Let stand at room temperature, shaking intermittently, until saponified. Add *d*. Mix until dissolved.

Shampoo for Young Puppies

Starch, De-greased	75 lb.
Silica Gel	10 lb.
Borax, or Bicarbonate	10 lb.
Pyrethrum Powder or Paradichlorbenzene	5 lb.
Perfume*	1 lb.

* Consisting of:

Thymol	10 oz.
Laurel Oil	15 oz.
Eucalyptus Oil	10 oz.

Dog Bath Powders

Formula No. 1

Sodium Bicarbonate	200 g.
Sodium Chloride	750 g.
Soap Powder	30 g.
Chloramine	20 g.

No. 2

Trisodium Phosphate	650 g.
Sodium Biborate	200 g.
Sodium Chloride	120 g.
Boric Acid	30 g.

No. 3

Sodium Chloride	500 g.
Sodium Perborate	100 g.
Soap Powder	90 g.
Sodium Bicarbonate	300 g.
β-Naphthol	10 g.

No. 4

Soap Powder	650 g.
Trisodium Phosphate	250 g.
Sodium Bicarbonate	70 g.
Boric Acid	30 g.

No. 5

Soap Powder	700 g.
Sodium Bicarbonate	280 g.
Chinosol	20 g.

No. 6

Soap Powder	550 g.
Sodium Biborate	430 g.
Chloramine	20 g.

Liquid Dog Soap

a. Coconut Oil	10 kg.
b. Caustic Potash (50° Bé.)	5.3 kg.
Water	3 kg.
c. Potassium Carbonate	1 kg.
Calcium Chloride	1 kg.
Sugar	10 kg.
Water	46 kg.
d. Liquefied Phenol	4 kg.

Melt *a* to 50° C., add *b* and keep hot till the saponification is finished. Must be just alkaline to phenolphthalein. Add *d*, and the hot solution *c*. Mix thoroughly. Cool. Filter through glass-wool.

Bulk Paste Soap

Tallow	50 kg.
Hard Fat	50 kg.
Caustic Soda (25° Bé.)	100 kg.
Water	500 kg.
Agar-Agar Solution (½–1%)	100 kg.

The fats (other fats can be taken) are saponified with the soda, after thinning the latter with a part of the water to 10–12° Bé. The remainder of the water is added hot to the finished soap, and the whole is mixed with the agar mucilage in the crutcher. Fill into barrels.

Gritless Soap Paste

Soap Chips	8 lb.
Soda Ash	4 lb.
Borax	1 lb.
Water	80 lb.
Sassafras Oil	3 lb.

Dissolve soap, soda ash and borax in half the water under slow heat, add oil and rest of water, let boil 10 min.

White, Cheap Paste Soap

a. Hard Soap, Chips	100 kg.
Water (90° C.)	650 kg.
b. Agar-Agar	1– 2 kg.
Water	80–100 kg.

Cleanser Paste

Hard Soap, Powdered	5 kg.
Sodium Carbonate	10 kg.
Pumice Powder, Fine	60 kg.
Sea Sand	25 kg.
Glycerin-Water (5–10%)	to paste

Soap Powder

Formula No. 1

Soap	42 g.
Soda Ash	42 g.
Borax, Powdered	15 g.
Salt	1 g.

No. 2

Coconut or Palm Kernel Oil Fatty Acid	20 lb.
Tallow or Bleached Palm Oil, or Pale Bone Fat Fatty Acid	20 lb.
Caustic Soda (38° Bé.)	20 lb.
Sodium Carbonate	22 lb.
Sodium Silicate (36–38° Bé.)	4 lb.
Water	20 lb.

Mix the thus obtained, finished powdered soap with sodium perborate, 9:1.

No. 3

Soap Stock Base	400 lb.
Soda Ash	350 lb.
Neutral Soda	700 lb.

No. 4

Soap Stock Base	480 lb.
Soda Ash	350 lb.
Neutral Soda	250 lb.

No. 5

"Persil" Type

Palm Kernel Oil Fatty Acid	15–17 kg.
Tallow- or Hard Fat Fatty Acid	17–15 kg.
Caustic Soda (38° Bé.)	17 kg.
Sodium Silicate (38° Bé.)	8 kg.
Sodium Carbonate	20 kg.
Water	23 kg.
To the Finished Powder	90 kg.
add Sodium Perborate	10 kg.

Soap Chips

Soap from the Kettle	1000 kg.
Borax, Powdered	130 kg.
Caustic Soda (40%)	23 kg.
Perfume	to suit

Scrubbing Powder

Abrasive Powder	63 lb.
Soda Ash	15 lb.
Trisodium Phosphate	10 lb.
Sodium Meta Phosphate	5 lb.

Scouring Powder

Formula No. 1

Soap Powder	7 lb.
Silica, Powdered	93 lb.

Mix thoroughly.

No. 2

Silica	100 lb.
Neutral Soda	10 lb.

Detergent Powder

Silica	30 lb.
Soap Powder	10 lb.
Neutral Soda	65 lb.

Detergent Soap Powder

Soap Powder	140 lb.
Neutral Soda	315 lb.
Silica	245 lb.

Powder Cleanser

Formula No. 1

Trisodium Phosphate	15 lb.
Sal Soda, Powdered	85 lb.

No. 2

Soda Ash	95 oz.
Ammonium Sulphate	5 oz.

Some tricalcium phosphate or dried starch may be added if desired, to obviate caking.

No. 3

U. S. Patent 2,041,744

Diatomaceous Earth, Grit-Free (30–150 Mesh)	65–90 oz.
Soap, Powdered	2–10 oz.
Soda Ash	30 oz.

Floor and Tile Grit Cleansers

Formula No. 1

Moisture	6.74 lb.
Volcanic Ash	66.28 lb.
Soda Ash	20.01 lb.
Anhydrous Soap	7.14 lb.

No. 2

Soap	5 lb.
Soda Ash	10 lb.
Volcanic Ash	85 lb.

The fineness called for is that not more than 5 per cent shall be retained on the 20-mesh screen, 70 per cent shall pass through a 60-mesh screen, and 25 per cent shall be retained on the 100-mesh. A variation of 10 per cent in any of the above shall not be considered sufficient cause for rejection. The volcanic ash shall be free from any hard particles that will scratch glass under 12 lb. pressure. The soap used shall be true anhydrous soap of either animal or vegetable origin, excluding fish oil soaps.

The soap employed in such a powder should be of relatively low titre, so that specks of soap shall not stick to the surface being cleaned.

The Pennsylvania R.R. furnishes the following specifications for "soap powder" for cleaning painted and varnished surfaces:

The powder shall be a mixture containing 30 per cent of neutral soap, the remainder being a siliceous abrasive material consisting of pulverized pumice, tripoli, quartz, or feldspar. The abrasive used must be of such fineness and character that it will not scratch varnish.

This railroad also uses a scouring powder for marble, tile, and generally where painted surfaces are not involved. It is a mixture of soap 5 per cent, soda ash 2 to 8 per cent, and siliceous abrasive 90 per cent. In either of these powders the abrasive must pass 90 per cent through the 200-mesh sieve.

A product which has been found a very effective garage floor cleaner consists of 12 per cent low titre soap and 88 per cent sodium metasilicate.

Gritty Powdered Cleansers

The purpose of cleansers containing water-insoluble substances is to assist the cleansing operation by means of their abrasive properties. The most common of these are the household cleansers used for pots and pans, bath tubs, tile, etc. The average composition is:

Anhydrous Soap	5 lb.
Soda Ash	10 lb.
Silica	85 lb.

In practice, such a product is made by mixing powdered soap with the requisite amount of alkali and silex, of about 140 mesh, in a horizontal mixer.

Floor Scrubbing Powder

Pumice, Powdered	85 lb.
Soda Ash	10 lb.
Soap, Powdered	5 lb.

Garage Floor Cleaner

Soap, Powdered	12 lb.
Sodium Metasilicate	86 lb.

Floor Cleaner

Carbon Tetrachloride	60 oz.
Gasoline	40 oz.
Amyl Acetate	0.5 oz.

Mopping Powder

Silica	100 lb.
Soap Powder	20 lb.
Neutral Soda	10 lb.

Washing Powder for Dairies

Soda Ash	60 lb.
Trisodium Phosphate	40 lb.

Cleaning Dairy Equipment

Metal equipment is more effectively freed from bacteria by 5% trisodium phosphate solution than by customary chlorine solutions. The corrosive action of the alkaline solution is eliminated by addition of 3% of sodium chromate to the dry crystals.

Floor and Wall Soap

Pure vegetable oil soap (see index) without ultramarine blue while still hot and fluid when made is diluted with an equal volume of water. Product is a soap jelly of fine texture.

Soap Bubble Composition

Coconut Potash Soap (Anhydrous Basis)	15.0 oz.
Gum Arabic	2.0 oz.
Glycerol	6.0 oz.
Dye, Basic, to color, about	0.3 oz.
Water	76.7 oz.

This composition is used to prepare very large soap bubbles of lasting value. If warm air is blown into same they will rise rapidly. This has been used for advertising purposes and for spectacular effects, mostly indoors. It is usable outdoors if there is not a high wind. Dyes may be omitted and a very small amount of petroleum oil added when an irridescent effect upon the surface is produced. The percentages may be varied widely which applies particularly to the glycerol content. This value will have to be increased if the relative humidity that day is low. The gum arabic may be increased if it is desired to increase the longevity of the balloons or bubbles, though it will substantially diminish their size. While any kind of a soap may be used, coconut potash usually produces the best suds.

Scouring Powder for Kitchen and Household

Hard Soap, Powdered	7 g.
Sodium Metaphosphate	5 g.
Sodium Carbonate	8 g.
Trisodium Phosphate	5 g.
Neuburg Chalk (or partially substituted by Kieselguhr or Pumice)	75 g.

Mix powders thoroughly. Use ingredients of equal particle size to get a homogeneous product.

Household Cleaner

Soap	25 lb.
Trisodium Phosphate	10 lb.
Silica, Powdered	65 lb.

Paste Detergent, Household

Water	19.88 lb.
Silica	71.42 lb.
Soap	9.04 lb.

The silica used is about 140 mesh. The soap is made of tallow and coconut oil. To produce such a product the soap is dissolved in the requisite amount of hot water, then cooled to about 150° F., and the silica is added and mixed in. The mixture is filled into cans before it starts to gel, so that the sand has not sufficient time to settle out.

Pipe and Sink Cleanser

German Patent 527,293

Sodium Hydroxide, Solid	80 lb.
Sodium Carbonate	10 lb.
Aluminum Filings	7 lb.
Zinc Filings	3 lb.

(Beer-, Milk-) Pipe Cleaning Compound

Formula No. 1

Soda Ash	25 lb.
Sodium Perborate	75 lb.

No. 2

Soda Ash	320 lb.
Sodium Hydroxide, Powdered	64 lb.
Potassium Chlorate, Powdered	40 lb.

Caution: Do not grind or press in mixing.

No. 3

Caustic Soda Lye, Technical	4 lb.
Chlorine Solution, Concentrated	1 lb.

Must be diluted for use.

Enamel Cleanser

Soap Powder	10 kg.
Sodium Carbonate	15 kg.
Sodium Metaphosphate	5 kg.
Pumice, Finest Powder	70 kg.

Sink Cleanser

German Patent 527,293

Caustic Soda, Powder or Scale	80 kg.
Soda Ash	10 kg.
Aluminum Filings	7 kg.
Zinc Filings	3 kg.

To Clean Sinks and Basins

A little paraffin oil on a clean rag or cloth will easily clean the dirtiest wash basin or sink. The paraffin smell may be removed by rinsing with cold water.

Bathtub Cleaners

Suitable bathtub cleansers may be made with the following ingredients:

Formula No. 1

Trisodium Phosphate	25 oz.
Soap, Powdered	25 oz.
Fine Abrasive (Chalk)	50 oz.

No. 2

Trisodium Phosphate	10 oz.
Soap, Powdered	20 oz.
Fine Abrasive (Chalk)	70 oz.

These give efficient mechanical and detergent action.

Bath Tub and Porcelain Cleanser

Trisodium Phosphate	250 g.
Soap Powder	250 g.
Whiting	500 g.

Toilet Cleanser

Muriatic Acid	27 lb.
Water	2 gal.

Water-soluble red color is added if desired.

Lavatory Cleaner

Sodium Hydrogen Sulphate	6 lb.
Alum (Powdered)	3 lb.
Salt	1 lb.

The powdered ingredients are well mixed and kept away from air.

Glass Windshield Cleaners

Formula No. 1

Trisodium Phosphate	4 oz.
Water	96 oz.
Green Dye	to suit

No. 2

Caustic Soda	3 oz.
Sodium Metasilicate	1 oz.
Green Dye Benzaldehyde	to suit

No. 3

Sodium Metasilicate	1 oz.
Water	99 oz.
Dye	to suit

No. 4

Denatured Alcohol	20 oz.
Water	80 oz.
Perfume and Color	to suit

No. 5

Denatured Alcohol	35 oz.
Ethylene Glycol	1 oz.

No. 6

Kerosene	100 oz.
Paraffin Wax	¼ oz.

No. 7

Kerosene	65 oz.
Carbon Tetrachloride	35 oz.

No. 8

Light Petroleum Oil	40 oz.
Dipentene	60 oz.

No. 9

Triethanolamine Oleate	2 oz.
Kerosene	15 oz.
Beeswax	4 oz.
Carnauba Wax	1 oz.
Celite (Light Abrasive)	16 oz.

Window-Glass Spray Cleaner

A glass spray cleaner consists of an approximately 5% water solution of some organic solvent which, like soap, greatly reduces the surface tension of water, but which is also volatile, thus excelling soap for the purpose. The liquid thus spreads quietly over the glass and does not separate in droplets. The solvent is usually one which is only slightly soluble in water. Of the following examples, the second is somewhat cheaper, but of slightly more offensive smell. Perfumes and identifying dyes may of course be added.

Formula No. 1

Cellosolve Acetate	1 pt.
Sulfatate (Wetting Agent)	10 g.
Water	19 pt.

No. 2

n-Butyl Alcohol	1 pt.
Sulfatate (Wetting Agent)	10 g.
Water	19 pt.

Window Cleanser

Formula No. 1

a. Quillaya Bark, Powdered	1.5 kg.
Water, Boiling	about 100 l.
b. Sulphuric Acid (66° Bé.)	5 l.
Copper Sulphate	20 g.
c. Kieselguhr	to make paste

No. 2

Cologne Chalk (Whiting)	60 g.
Tripoli	30 g.
Bolus	15 g.

Apply with a linen cloth, to the moistened glass.

Glass Cleanser Powders

For Windows, Etc.

Hard Soap, Powdered	15 g.
Whiting	50 g.
Kieselguhr, Calcined	25 g.
Bole, White	10 g.

For Windows, Etc.

Whiting	30 g.
Calcium Carbonate, Precipitated	50 g.
Kieselguhr, Calcined	20 g.

For Beer Glasses, Etc.

Lime Hydrate, Screened	25 g.
Whiting	50 g.
Pumice Flour	25 g.

For Beer Jars, Etc.

Trisodium Phosphate	20 g.
Whiting	40 g.
Kieselguhr, Calcined	40 g.

For All Glassware

Sodium Metasilicate	30 g.
Sodium Carbonate	20 g.
Trisodium Phosphate	50 g.

The first two powders are wetted with water or alcohol and thus smeared on the glass. When they are dried there, the powder is wiped off with dry paper or rags.

The following two powders (which should be packed in parchment bags) are used suspended in water. They should be rinsed out at once with clear water. The last powder is water-soluble (1:10 in boiling water). Wash the glass in this solution, and rinse out with clear water.

Glass Cleaner

Formula No. 1

Formalin	1 oz.
Alcohol	1 gal.
Glycerin	2 oz.

No. 2

Olive Oil	14 kg.
Ammonia	about 7 kg.
Water	8 kg.

No. 3

French Patent 802,615

Chlorbenzol	60 g.
p-Dichlorbenzol	5 g.
Turpentine	6 g.
Sawdust	19 g.
Fullers Earth	10 g.

Scrubbing Powder for Glass (Bon Ami Type)

Powdered Soap (90%)	5 lb.
Silica (200 Mesh)	90 lb.

Cleaner for Glass Molds

U. S. Patent 2,116,034

Tartaric Acid	¼ oz.
Stannous Chloride	5 lb.
Water	1 gal.

Cleanser for Dishes

Pumice Powder, Fine	60 g.
Soap Powder (30%)	30 g.
Trisodium Phosphate	10 g.

Hard Water Dish Cleaner

U. S. Patent 2,035,652

Sodium Hexametaphosphate	40 oz.
Sodium Metasilicate	40 oz.
Trisodium Phosphate	15 oz.
Caustic Soda	5 oz.

Dish Washing Powder

Neutral Soda	70 lb.
Soap Powder	80 lb.

Dish Cleaner and Disinfectant

Trisodium Phosphate	15 oz.
Sodium Hexametaphosphate	40 oz.
Sodium Silicate	40 oz.
Caustic Soda	5 oz.

Use 1 oz. of above mixture to 99 oz. of water at 60° C. Rinse with water at 75° C.

Bottle Washing Solutions

For soak tanks, 1–2% caustic soda solution is the most economical, but for soaker washers 1 pt. of sodium phosphate or metasilicate, sodium silicate or trisodium phosphate to 4 pts. of caustic soda is advisable. The caustic soda-metasilicate combination gives a more brilliant bottle and is further enhanced by small additions of metaphosphate. The sludge formed by trisodium phosphate is objectionable.

Cleaning Cloth for Glass, Metal and Furniture

U. S. Patent 2,051,435

A cloth of cotton or wool is impregnated with

Ammonium Hydroxide	1 fl. oz.
Sulphonated Castor Oil	29 fl. oz.
Ammonium Citrate (20% Solution)	70 fl. oz.

Lens Cleaning Fluid (Lens "Oil")

Use isopropyl alcohol (98–99%).

Dishwashing Water Softener

French Patent 811,602

Sodium Fluoride	100 g.
Soda Ash	50 g.

Wall Paper Cleaners

Formula No. 1

a. Wheat Starch	500 g.
Water	500 g.
b. Copper Sulphate	80 g.
Soda Ash, Crystallized	20 g.
Alum	10 g.

Heat *a* to obtain a (still viscous) starch solution.

Make a concentrate of the salts *b*, and work it into *a*.

No. 2

a. Water	20 g.
Wheat Flour	65 g.
Yeast	1.5 g.
b. Alum	5 g.
Borax	5 g.
Clay	2 g.
Ultramarine	0.5 g.
Perfume	1 g.

Make a dough of *a* and bake it. Dry completely, grind, and mix with *b*.

Paste with water for use.

No. 3

Wheat Starch, Powdered	300 g.
Sodium Chloride, Saturated Solution	650 g.

Heat on steam-bath, stirring continually.

No. 4

Potato Flour	20 lb.
Pumice Powder	4 lb.
Ammonia	a little
Water	to give paste

Heat to 60° C. for some time to get a viscous paste.

No. 5

a. Bran	500 g.
b. Waterglass	2 g.
Water	330 g.
c. Petroleum	a little

Add *a* to a boiling solution *b*. Stir till cold, add *c*.

No. 6

a. Wheat Starch	10 kg.
Water	10 kg.
b. Copper Sulphate	1 kg.
Sodium Carbonate, Crystals	0.5 kg.
Alum	0.3 kg.
Water, to make	concentrated solution

To the starch paste made by gentle warming add the concentrated solution of salts.

No. 7

a. Copper Sulphate	40 g.
Sodium Carbonate, Crystallized	4 g.
Water	1000 cc.
b. Ammonia	a few drops
c. Wheat Flour	1000 g.

To the solution *a* add *b*, and work in *c* while boiling.

Knead the product thoroughly, and apply like a rubber eraser. Make up freshly each day.

Cleanser for Natural and Artificial Stones

Caustic Soda	30 g.
Trisodium Phosphate	20 g.
Sodium Carbonate, Calcined	10 g.
Whiting	20 g.
Wood Flour	20 g.

Use a 10% aqueous dilution.

Cleaning Stone Work

A mixture consisting of one gallon good soft soap, two pounds finely powdered pumice stone and one pint clear ammonia solution usually works satisfactorily on both glazed and unglazed stone. First remove the soot and dust from the surface, then apply a liberal coating of the soap-pumice-ammonia mixture. Let it stand a half hour or so, then with a stiff brush or stubby broom, scrub the mixture well into the surface. Following this, rinse the stone thoroughly with clean water. If one treatment fails to do the work, a second should do a complete job.

Tile Cleanser for Swimming Pools

Soap Powder (30%)	25 lb.
Sodium Carbonate	50 lb.
Trisodium Phosphate	20 lb.
Sodium Metaphosphate	5 lb.

Cleaning Sandstone Buildings

If the surface is begrimed with smoke and dirt, a strong solution of caustic soda or pearlash, applied with a long-handled fibre brush and left to work for fifteen minutes will usually accomplish the desired results. The surface should then be washed and rinsed several times with clear water and a stiff brush or broom to remove the last trace of the caustic solution. Use rubber gloves while handling or applying the solution, and be sure not to get any of the solution on the face nor in the eyes. If possible, use a hose in washing the solution off the surface, but if a hose is not available then use plenty of water and a large, soft sponge. If the surface is not perfectly clean when it becomes dry, scrub again with a stiff fibre brush, using a mixture of soft soap, concentrated lye and fine sand. Allow this to remain on the surface until nearly dry, then remove the cleansing material by brushing hard with a stiff fibre brush and plenty of cold water. The hands should also be protected by rubber gloves while handling the soap, lye and sand mixture. A sandblast outfit will also prove effective in removing dirt and grime from sandstone surfaces. Tombstones and grave vaults of sandstone may be cleaned the same as buildings.

Cleaning Terra Cotta Buildings

To one gallon of soft soap add two pounds of powdered pumice stone and one pint of household ammonia and beat the mixture to a soft, smooth batter. After sweeping and dusting the surface apply the batter with a flat fibre brush or a whitewash brush. Let the material remain on the surface from twenty to thirty minutes, then rub the surface with a good household scrubbing brush, to loosen the dirt. Have plenty of warm water ready, and rinse the surface down, using a large sponge or a hose. This will effectively remove smoke stains and dirt. If you have no soft soap, and cannot obtain any, linseed oil soap may be used, or you can make a soft soap by shaving high-grade laundry soap in hot water and heating on a stove until the soap is dissolved. As a rule one large bar of good laundry soap will make one gallon of soft soap. The soft soap must not be thinner than a fairly heavy paste, however, after it is cold.

Efficient Cleanser for Hands

a.	Cottonseed Oil Fatty Acid	6 g.
	Coconut or Palm Kernel Oil Fatty Acid	6 g.
	Lanolin	1 g.
	Castor Oil Fatty Acid	3 g.
b.	Alcohol, Denatured	6 g.
	Camphorated Oil, Light	6 g.
c.	Caustic Potash (50° Bé.)	5 g.
	Water	6 g.
d.	Ammonia (10%)	5 g.
	Triethanolamine Oleate	5 g.
	Cananga Oil	10 g.
	Turpentine Oil	5 g.
e.	Bolus, White	1 g.
	Pumice, Fine, #000	4 g.
	Perfume (Citronella Oil, Spike Oil or Sassafras Oil)	

Dissolve *a* in *b* on waterbath, saponify with *c* until a sample dissolves clearly in water, add the mixture *d*. Work in *e* until pasty. Perfume if desired.

Hand Cleanser Paste for Automobilists

Vegetable Oil Fatty Acid	6 lb.
Coconut or Palm Kernel Oil Fatty Acid	6 lb.
Castor Oil Fatty Acid	3 lb.
Turpentine	6 lb.
Alcohol	6 lb.
Caustic Potash (50° Bé.)	5 lb.
Water	6 lb.
Pumice, Finely Ground	to form paste
Citronella or Spike Oil	as perfume

Metal Cleaner

Formula No. 1

Trisodium Phosphate	15 lb.
Soda Ash	60 lb.
Neutral Soda	25 lb.

No. 2

U. S. Patent 1,967,394

Formula No. 1

Amyl Alcohol	1 lb.
Cyclohexanol	1 lb.

No. 2

Trisodium Phosphate	4 lb.
Organic Wetting Out Agent	0.4 lb.
Cyclohexanol	1 lb.

No. 3

U. S. Patent 2,062,038

A dry metal cleaning and brightening composition consists essentially of 2 parts by weight of phthalic anhydride, 5 parts of sodium sulphate, 5 parts of soap, and 5 parts of soap bark, adapted to be dissolved in water for removing deposits and stains on metals, and preventing tarnishing.

No. 4

Hungarian Patent 115,327

Chalk, Precipitated	120 g.
Oleic Acid	10 g.
Ammonium Carbonate	8 g.
Soda Ash	12 g.
Oxalic Acid	11 g.

The above is applied with a wet cloth.

Aluminum Cleansers

Formula No. 1

Magnesium Oxide	30 lb.
Whiting	30 lb.
Iron Oxide Red	40 lb.

No. 2

Vienna Chalk	50 lb.
Infusorial Earth, Calcined	30 lb.
Red Bole	20 lb.

No. 3

Tartaric Acid, Powdered	5 lb.
Magnesium Oxide	30 lb.
Calcium Carbonate, Precipitated	40 lb.
White Kieselguhr, Calcined	30 lb.

No. 4

Neuburg Chalk, Finest	60 lb.
Clay	20 lb.
Magnesium Carbonate	10 lb.
Tartaric Acid	10 lb.
Dextrin	1 lb.
Water	15 lb.
Diglycol Stearate	1 lb.

All formulae can be made up into pastes by using dextrin solution as in No. 4.

No. 3 and No. 4 are for fine-polishing.

No. 5

Caustic Soda, Powdered	6 lb.
Soda Ash, Light	56 lb.
Trisodium Phosphate, Powdered	30 lb.
Sodium Metasilicate	3 lb.

No. 6

Soap Chips	15 lb.
Tripoli	85 lb.

Block Cleanser for Aluminum

Diglycol Stearate	10 g.
Stearic Acid	20 g.
Tripoli	200 g.

Mix hot very thoroughly, strain. The fatty powder which results can be pressed into bricks.

Cleaner for Tin, Zinc and Aluminum

U. S. Patent 2,037,566

Trisodium Phosphate	63 oz.
Sodium Borate	10 oz.
Sodium Silicate	25 oz.
Magnesium Sulphate	2 oz.

Tin Ware Cleanser

British Patent 451,025

Sal Soda	10 lb.
Sodium Sulphite	1 lb.

Tin Equipment Cleaner

The following cleaners have a minimum corrosive effect on tin.

Formula No. 1

Sodium Sulphite	1 lb.
Sal Soda	10 lb.

No. 2

Sodium Sulphite	1 lb.
Sal Soda	4 lb.

Silver Cleanser

Viennese Chalk	20 g.
Emery, Finely Powdered	15 g.
Iron Oxide Red	15 g.
Powdered Soap	20 g.
Triethanolamine Oleate (10% Solution)	to make paste

Cleaning Corroded or Discolored Copper

First wash with 5% ammonium hydroxide; then with an oxalic acid solution; then with water.

Cleaner for Auto Radiators and Cooling System

U. S. Patent 2,036,848

Kerosene	4 oz.
Ortho-dichlorbenzol	7 oz.
Oleic Acid	1 oz.

Add the above to water (while circulating). This deposits on and softens dirt and grease. Then add 2 oz. caustic soda and circulate to saponify grease and oil. Wash out with water.

Automobile Radiator Cleaner

U. S. Patent 2,104,385

Kerosene	50 oz.
Sodium Metasilicate	50 oz.
Sodium Dichromate	½- 2 oz.
Water	20–50 gal.

Auto Degreaser

Trisodium Phosphate, Powdered	7 lb.
Sodium Carbonate	2 lb.
Sodium Metasilicate	1 lb.

Cleanser for Electrical Collectors*

a. Solar Oil (Mineral Oil)	12 kg.
Oleic Acid	10 kg.
Benzene	45 kg.
b. Ammonia	3 kg.
Alcohol	2 kg.
c. Neuburg Chalk	28 kg.

Mix *a*, and stir in *b*. Use ½ of the emulsion to mix with *c*, then add the other half to thin the suspension.

Benzene can also be replaced by another solvent, such as carbon tetrachloride, etc.

* Of motors and generators.

Drain Pipe Cleaner

Sodium Hydroxide	99 g.
Aluminum Filings	1 g.

Cleanser for Beer Piping

Formula No. 1

Caustic Soda	10–25 g.
Soda Ash	10–25 g.
Water	1 l.

No. 2

German Patent 628,795

Aluminum Sulphate	25 g.
Water	75 cc.
Kieselguhr	5 g.

Mix thoroughly and force through pipes under pressure.

Milk Utensil Antiseptic

Sodium Sulphate	1.3 kg.
Sodium Bisulphate	3.7 kg.
Aluminium Sulphate	1.4 kg.
Sodium Rhodanide	3.6 kg.
Water, to make	100 kg.

Cleanser for Printing Machinery

Pure Vegetable Oil Soap	16 lb.
Soda Ash, Light	4 lb.
Petrolatum	4.5 lb.
Kerosene	3 lb.

Melt soap and petrolatum, stir in soda ash then kerosene, continue slow agitation until cold.

Type Cleaner

Trichlorethylene	80 lb.
Dichlorbenzene	10 lb.
Decahydronaphthalene	10 lb.

Typewriter Type Cleaner

Diglycol Oleate	18 oz.
"Carbitol"	82 oz.

This makes an excellent fast working non-inflammable cleaner.

Rust Remover

U. S. Patent 1,988,823

Ammonium Chloride	100 lb.
Ammonium Acetate	50 lb.
Sugar	18 lb.
Glue	18 lb.
Pyrogallol	1 lb.
Water	100 gal.

Cleaners for Printing Rolls

Decahydro Naphthalene	50 lb.
Turpentine or White Spirits	30 lb.
Benzol	20 lb.

Cleaner Emulsion for Printing Rolls

a. Oleic Acid	45.5 lb.
Caustic Soda	8.5 lb.
Water	26.5 lb.
b. Alcohol	45.5 lb.
c. Trichlorethylene	900.0 lb.

Saponify *a* to give a clear soap gel. Dissolve by working in *b*; stir steadily and add *c* slowly, until completely mixed.

Gives an emulsion with water, valuable for cleaning the rolls of printing machines, etc.

Abrasive Cleaner

a. Scale Wax (50/52° C.)	5 lb.
Ceresin	5 lb.
Oleic Acid	8 lb.
Spindle Oil	5 lb.
Petroleum	3 lb.
b. Neuburg Chalk	25 lb.
Bitter Almond Oil, Artificial	0.1 lb.

Melt *a*, and mix thoroughly with *b*. Fill into cans, while hot.

Paint Cleaner

Formula No. 1

Dry Soap, Powdered	10 oz.
Trisodium Phosphate	20 oz.
Soda Ash	40 oz.
Air-Blown Silica	5 oz.
Finely Powdered Kaolin	5 oz.
Water	20 oz.
Citronella Oil	0.15 oz.

All ingredients should be mixed and well ground and milled. A trace of color may be added.

No. 2

Soap, Powdered	10 lb.
Caustic Soda	5 lb.
Trisodium Phosphate	85 lb.
Sulfatate	1 lb.

Dissolve 1 lb. in 10 gal. hot water.

No. 3

a. Naphtha	½ gal.
Diglycol Stearate	1 lb.

b. Trisodium Phosphate	4	oz.
Water	3	qt.

Heat *a* on a water bath and stir until dissolved. Heat *b* to a boil and run into *a* slowly while mixing vigorously.

Removing Blood Stains from Paint

Apply lukewarm water to the stained places repeatedly until the dried blood is dissolved, then wash the surface clean with lukewarm water. Do not have the water hot, or it will be likely to "set" the blood, but lukewarm water should gradually soften and remove the blood and dissolve it. If a little liquid ammonia is added to the water this will help to dissolve and remove the blood, but great care must be exercised to avoid getting enough ammonia in the water to injure the paint. Just keep rubbing the surface with a sponge wet in the lukewarm water until the blood is all removed. A little mild soap added to the water will also assist in removing the blood. If any stains persist in remaining on the surface, a rag wet with peroxide of hydrogen and passed over the surface a few times, followed by the lukewarm water or water-ammonia solution, should remove every trace of the blood.

Removing Picric Acid Stains from Skin

Dust with powdered potassium sulphate; wet slightly; rub into skin and wash off with soap and water.

Lacquer Remover for Hands

U. S. Patent 2,056,916

Butyl Acetate	13 oz.
Soap	15 oz.
Carbon Tetrachloride	7 oz.
Glycerin	7 oz.
Diatomaceous Earth	14 oz.
Sand	19 oz.
Water	25 oz.

Removing Lacquer from Skin

U. S. Patent 2,064,725

A relatively harmless, water rinsible detergent composition for the removal of cellulose lacquer and stains from the skin consists essentially of:

A highly volatile cellulose lacquer solvent capable of loosening cellulose lacquer from the skin and selected from the group consisting of ethyl acetate, butyl acetate, pentyl acetate, ethyl propionate, ethylene-glycol-mono-ethyl-ether acetate, ethylene-glycol-mono-butyl-ether acetate and mixtures thereof, approximately	10 to 20 lb.
Soap	8 to 20 lb.
Glycerin	5.5 to 16 lb.
Carbon Tetrachloride	1.85 to 8 lb.
Water	15 to 30 lb.
An alkali from the group consisting of sodium hydroxide, sodium carbonate and mixtures thereof approximately	.75 to 3.5 lb.

Removing Ink from Hands

U. S. Patent 2,056,916

Titanium Trichloride	1 oz.
Glycerin	1 oz.
Alcohol	3 oz.

Removers for Iodine Stains

Formula No. 1

a. Potassium Iodide (10% Solution)
b. Sodium Thiosulphate (10% Solution)
c. Water.

Apply in the order given. *a* may not be necessary.

No. 2

Ammonia (Sp. gr. 0.960)

No. 3

Sodium Bicarbonate, Powdered.

Apply on the moistened stains.

Removers for Silver Nitrate Stains

Formula No. 1

a. Copper Chloride (20% Solution)
b. Sodium Thiosulphate (10% Solution).

Treat with *a*, and afterwards with *b*. Rinse thoroughly.

No. 2

a. Copper Sulphate	8 g.
Hydrochloric Acid	2 g.
Water	90 g.
b. As in No. 1.	

No. 3

a. Potassium Permanganate So.(5% lution)
b. Sodium Thiosulphate (10% Solution)
c. Diluted Hydrochloric Acid (1 to 2, or 1 to 4)
d. Rinse thoroughly.

No. 4

a. Lugol's Solution (Iodine-Potassium Iodide)
b. Ammonia.

Always use in the order given.

Cleaning Upholstery

CANDY—Rub the spot with a cloth wet with very hot water. If necessary, follow by sponging the spot after drying, with a cloth dampened with approved cleaner or carbon tetrachloride.

CHEWING GUM—Wet the spot with

cleaner or carbon tetrachloride and work the gum off with a dull table knife while moist.

Fruits—Wet with very hot water, scraping any pulp from the fabric. An extreme case may make it necessary to pour very hot water, boiling if necessary, directly on the spot before scraping. This works, too, for wine or liquor stains.

Grease and Oil—Clean and rub spots with a clean cloth wet with approved cleaner or with carbon tetrachloride.

Ice Cream—Rub with a cloth wet with warm soap suds and clean with a cloth wet with cold water. After drying, cleaning fluid may be used to clear up any last traces.

Lipstick—Apply a small amount of cleaning fluid or tetrachloride directly to the stain and immediately press a blotter firmly on the spot. Repeat this until the stain is removed.

Water Spots—Dampen the entire panel showing the stain with a clean cloth wet with cold water. Allow to dry and sponge the spot with cloth wet with cleaning fluid.

Shoe Polish and Dressings—After the polish has become thoroughly dry brush vigorously. If necessary, moisten the spot with cold water, allow to dry, and again repeat the brushing operation.

Stain Removers
(Ink, Rust, Fruit Juice, Wine etc.)

Formula No. 1

a.	Chloride of Lime	6 kg.
	Water	72 kg.
b.	Sodium Carbonate, Crystallized	12 kg.
	Water	24 kg.

Add the solution *b* to the suspension *a*, let stand and settle.

Syphon off the supernatant solution, filter it, and fill it into brown bottles. Seal corks with paraffin.

Use this way, or in aqueous dilution; on dyed cloth; test out the resistance of the dye against the bleaching action of the preparation.

This solution is know as *Eau de Labarraque* (Sodium Hypochlorite Solution).

No. 2

Eau de Labarraque (See No. 1)	90 kg.
Oxalic Acid	10 kg.

Special for ink and rust stains.

No. 3

Oxalic Acid	10 kg.
Sodium Thiosulphate	3 kg.
Water	87 kg.

For ink or rust stains.

No. 4

Hydrogen Peroxide (2%)	50 kg.
Ammonia	50 kg.

For fruit juice and wine stains.

No. 5

Soft Soap, Unfilled	25 g.
Triethanolamine Oleate	5 g.
Water	30 g.
Alcohol	20 g.
Acetone	10 g.
Talcum	10 g.

Shake before use.

Let dry on stain, and remove by brushing.

Preventing Zinc Stains on Linens
French Patent 817,828

To prevent zinc stains on linen boiled in zinc containers, add 3% of sodium thiosulphate to solution.

Ink Remover

Oxalic Acid	8 kg.
Sodium Hyposulphite	2 kg.
Water	90 kg.

Removal of Ink Stains

If all other methods fail try a solution of potassium permanganate followed by a solution of sodium thiosulphate and citric acid. Then wash with clear water.

Glycerin as a Stain Remover

Glycerin applied warm to stains made by mustard, coffee, cocoa, and so on, on delicately colored fabrics is efficient in removing them without damaging the color or the fabric. After application it is allowed to stand for a few minutes and then rinsed off with water.

For removing grease and other stains, a cleaner made by mixing glycerin (1 ounce), alcohol (1 ounce), ether (1 ounce), ammonia (4 ounces), and castile soap (1 ounce) mixed and stirred into enough water to make two quarts, has been recommended.

Rust and ink spots can be removed by using a solution of two ounces of potassium binoxalate in 88 ounces of water, to which 11 ounces of glycerin have been added. In use, the rust or ink spot is moistened with this solution and rinsed out carefully after three hours. Lipstick stains are said to yield to a mixture of glycerin (1 part), glacial acetic acid (1 part), and methyl alcohol (3 parts). Although this is not unfailing, it is said to be highly efficient.

Removing Oil Stains from Fabrics

Aniline Oil	1 oz.
Powdered Soap	1 oz.
Water	10 oz.

The stained portion of the goods should be allowed to remain in the solution for some time and then be well washed with water.

Removal of Rust Stains

Use a solution of Potassium Acid Oxalate.

Removing Nail Polish Stains from "Celanese"

Two ounces of amyl acetate; one ounce of benzol and one-half ounce of denatured alcohol.

Since nail polishes are of different composition, this formula may not apply to all of them, but only to the cellulose nitrate polishes, which are the most common.

Removing Automobile Grease Stains

First rub lard or white petrolatum on the spot on the wrong side. Use a clean rag to remove this, with as much of the black grease as possible, lay the spot face down on a clean pad, apply carbon tetrachloride on the wrong side, to push the dirt out, rather than rub it in from the right side. Brush lightly or "feather" the edge of the spot, so there will be no ring.

To Remove Mold-Stains from (White) Laundry:

1. Pre-spot with soft soap by rubbing it in gently; wash out in clear water.—Dry.
2. Bleach with

Water	100 cc.
Citric Acid	2–5 g.
or	
Hydrogen Peroxide	50 g.
Ammonia	5 g.
Water, Distilled	125 g.

Wet the stains repeatedly with the solution, and then wash with clear water.

Dried Milk Stain Cleaner

Ammonium Carbonate	50 g.
Trisodium Phosphate	40 g.
Sodium Metasilicate	10 g.
Sodium Meta Phosphate	5–10 g.

Chewing Gum Remover

Carbon tetrachloride or its emulsion is used.

Cleaner for Carbon Paper, Ink and Typewriter Ribbon Stains

U. S. Patent 2,091,220

Titanium Trichloride (20% Solution)	1 oz.
Glycerin	1 oz.
Alcohol	3 oz.

Cleanser for Milk Vessels

Ammonium Carbonate	50 kg.
Caustic Soda, Powdered	5 kg.
Sodium Meta Phosphate	5 kg.
Sodium Meta Silicate	10 kg.
TriSodium Phosphate	15 kg.
Sodium Sulphite*	15 kg.

* Anti-corrosive.

Composition to Clean Wooden Surfaces

Montan Wax, Double Bleached	4 g.
Paraffin Wax (50/52° C.)	6 g.
Soap, Castile	1 g.
Water	68 g.
Methyl Alcohol	20 g.
Ammonia (Concentrated)	1 g.

Color with any water soluble color.

Cleaning Light Oak Desks

Make up a wash of 8 ounces of soda ash in a gallon of warm water and scrub with a soft bristle brush. Follow this with a wash of warm water and then dry with a cloth.

Washing Butter Churns

A small quantity, not to exceed 35 or 40 gallons, of hot water is added to the churn as a first wash. This first water should be added to the churn as quickly as possible, the churn placed in high gear and permitted to operate for 8 or 10 revolutions. The water is then removed as quickly as possible. This procedure eliminates the fat that is adhering to the walls of the churn and assists in preventing the churn from becoming oil-soaked.

Following the first washing, the churn should be washed with a hot water (water at about 200° F.) which may contain (occasionally) a small amount (not more than ¼ per cent) of such washing powder as may be employed in the plant.

Following the washing of the churn with a second washing, a third washing is given with clear hot water as a rinse. If it is desired to add a solution containing chlorine, it may be added with this last rinsing. When the churn is ready for use, it should be rinsed with cold water. A chlorine solution may be used if desired, followed by a cold water rinse.

Cleaning Piano Keys

Use a soft rag dipped in alcohol in which a small piece of camphor has been dissolved.

Cleaning Gilded Surfaces

Slake two ounces of quick lime in a little hot water, then gradually add two and one-half pints of boiling water to form a milk of lime. In another vessel dissolve four ounces of pearlash in three and three-fourths pints of boiling water, and mix the two solutions, keeping the vessel containing the mixture covered for one hour, shaking occasionally. When cool pour the clear liquid off and apply it to the gilded surface with a soft sponge until all dirt and tarnish are removed, and wash the surface with plenty of clear water. Another preparation that is used for cleaning gilded surfaces is made by dissolving seven ounces of bicarbonate of soda, seven ounces of chloride of lime and two ounces of table salt in one and one-half pints of distilled water. This solution is to be kept in a well-stoppered glass bottle for use. Apply the solution to the gilded surface with a soft sponge and rub lightly. Repeat the operation until all dirt and tarnish are loosened, wipe loose material off with a clean rag, then wipe the surface of the cross with a clean rag wet with denatured alcohol. If neither of the foregoing solutions remove the dirt and tarnish, apply a solution of one-half ounce of cyanide of potassium in one pint of distilled water. Let this solution dry on the surface, and brush off with prepared chalk. Cyanide of potassium is one of the most deadly poisons known. Wear rubber gloves, and exercise the greatest possible caution both while handling the material and in keeping it where no one else will be able to get hold of it. Mark all vessels containing the cyanide solution DEADLY POISON.

Cleanser of Wax-Polished Surfaces

Tetralin	50 lb.
Hydroterpin	30 lb.
Sangajol, Terlitol, or Terapin (Turpentine Oil Substitutes)	20 lb.

Cleanser for Rubber Rugs

Oleic Acid	8 kg.
Triethanolamine	3 kg.
Water	30 kg.
Spindle Oil	40 kg.

The cleanser should not be left on the rubber for too long because it has a softening action on it.

Cleansing Greasy Household Mops

Trisodium Phosphate	2	oz.
Hot, Strong Soap Solution (enough soap to make good suds)	2	gal.
Cleaning Solvent or Other Light Petroleum Solvent	½	pt.

Stir this mixture vigorously with the mop in a pail, and rinse in water.

Shoe Cleaner

Carbon Tetrachloride	70 oz.
Gasoline	30 oz.
Amyl Acetate	0.5 oz.

Feed Water Heater Cleaning

U. S. Patent 2,057,189

The process of removing the gummy coating formed by the deposit of burned and carbonized lubricating oil from exhaust steam, resulting from the high temperature of the exhaust steam in exhaust steam heated feed water heaters, and the like, comprises immersing the heater in a composition comprising 60 to 85 per cent paraffin oil distilled off directly above gas oil having a Saybolt viscosity at 100° F. of about 50 to 200 and a flash point of about 265° F. to 410° F., and 15 to 40 per cent coal oil at a temperature substantially between 150° F. and 250° F., the proportions being by volume.

Cleaning Surgical and Dental Instruments

Formula No. 1

Sulfuric Acid	1 g.
Alcohol	50 g.

Pour the acid gradually into the alcohol.

Place the instruments in the liquid for 10 minutes, then remove, wash in hot water and dry in clean sawdust.

No. 2

Prepared Chalk	2 oz.
Ammonia	2 oz.
Alcohol	2 oz.
Water	4 oz.

Rub the instruments with a cloth saturated with this mixture and then wipe them with a dry cloth.

No. 3

Ammonium Carbonate	30 g.
Water	120 g.
Dissolve and add	
Precipitated Chalk	480 g.

Spread the paste upon the instruments and then rub them first with soft flannel and lastly with chamois.

Washing Compound for Canning Industry

Caustic Soda	28 oz.
Soap	2 oz.
Sodium Silicate	141 oz.
Sodium Hypochlorite	48 oz.

Removing Insects from Windshields

Diglycol Laurate	2
Sulfatate	2
Soda Ash	1
Water	95

Apply to windshield; allow to soak in and wipe off with a wet cloth.

Cleanser Similar to the ''P_3'' of Henkel

Trisodium Phosphate	60 g.
Sodium Carbonate, Calcined	20 g.
Waterglass, 38° Bé.	20 g.

Mix, allow to solidify, grind.

Watch Cleaning Fluid

Solution #1. Boil 1 oz. oleic acid in 1 quart of water. Keep hot until ready to use.

Solution #2. Boil 4 oz. household ammonia (6%) with 1 quart of water. Add 2 oz. of acetone and bring to boiling. Slowly mix solutions one and two and stir until uniform.

Warren's Dust Cleaning Compound

Sift sawdust (that is, not fine sawdust but the kind preferably which comes from a lathe. Take 150 lb. calcium chloride and heat up with 6 pails water in an iron kettle. Considerable time is taken for all the calcium chloride to go into solution. Take out 1 pail hot calcium chloride solution and add 1 lb. red dye. Stir this in when it will go into solution. Then pour this pail of red solution slowly into an electric dough mixer with the sawdust. After 5 or 10 minutes mixing pour in another pail, etc., until it comes to the fifth pail. In this dissolve one-fourth lb. dye again and pour in. Finally pour in sixth pail of calcium chloride solution and let mix for 20 minutes. Then barrel while warm. Add a little safrol or pine oil (as perfume) as soon as last pail calcium chloride has been poured in.

Sweeping Compound

Formula No. 1

Sand	100 lb.
Sawdust	40 lb.
Paraffin Oil	3 gal.
Venetian Red or Chrome Green	1 lb.

No. 2

Sand	100 lb.
Salt	15 lb.
Sawdust	40 lb.

Cloudy Ammonia

Formula No. 1

Into a two gallon iron container, pour three pints of water and then add two ounces of stearic acid and three-quarters of an ounce of oleic acid. Bring to a boil and stir to dissolve all lumps. While solution is still hot (above 160° F.), pour in one gallon of 16 degree Baumé aqua ammonia. Stir vigorously until the mixture becomes uniformly milky. There should then be no lumps or solid matter remaining. If for any reason, there does remain any solid matter, strain it out with a cloth or absorbent cotton filter.

This stock solution is then added to solutions of ammonia and water until the desired cloud is made. The usual concentration will be the entire above batch to fifty gallons of ammonia solution.

No. 2

Heat one and one-half ounces of stearic acid to melting and pour into three ounces of oleic acid. Pour this mixture, while warm, into one and one-half pints of hot water. Then slowly add one-half pint of 26 degree Baumé aqua ammonia with vigorous stirring. A creamy white liquid will result. Dissolve three ounces of powdered castile soap in one quart of hot water and when completely dissolved add it slowly to the oleic acid and stearic acid mixture. Mix well and make up to one gallon by adding hot water, this is the stock solution (f). Mix ammonia and water to the desired concentration for the final product and to every gallon of this ammonia solution (h), add one-half ounce of clear lime water. Stir well.

To each 200 parts of ammonia and water, already containing lime water (h), add slowly one part of the stock solution (f).

Stir while adding. The cloud will form slowly.

Milky Ammonia

Into a two gallon iron container, pour three pints of water and add two ounces of stearic acid. Bring to a boil and stir vigorously to break up any lumps.

While solution is still hot (above 160° F.) pour in while stirring, one gallon of 16° Baumé aqua ammonia. Continue stirring until the mixture becomes uniformly milky. When cool dilute with more 16° Baumé aqua ammonia or bottle without dilution. The product will remain permanently milky with only slight sediment formation, for a period of years.

If a sediment is formed when ammonia and water are mixed, it is usually caused by the use of a very hard water or the presence of alum or rust in the water. Alum is commonly used in the treatment of municipal water supplies, which would account for its presence in ordinary tap water. Rust is generally picked up in pipe lines.

If cloudy ammonia containing lime

water curdles, add less lime water or cut it out entirely. If city water itself is hard, the addition of more lime may aggravate any curdling tendency. Trouble can usually be expected when using lime water.

If cloudy ammonia made from soap curdles and the curd floats, it is a sign that during preparation the stearic and oleic acids were mixed with too little ammonia or at too low a temperature. Add the ammonia while stearic acid and oleic acid are hotter. Stir more vigorously. Be sure you are adding ammonia to hot acid and not hot acid to ammonia. If the curd settles to the bottom, try using less stock solution thus forming a light cloud that will be less likely to curdle.

No. 3

Powdered Borax	2 dr.
Water	6 oz.
Ammonia Water (30%)	5 oz.
Oleic Acid	2 dr.
Cologne Water	4 dr.

Dissolve the borax in the water; add the ammonia water, and then the oleic acid previously mixed with the cologne water.

Instead of the oleic acid, 4 drams of soft soap may be used.

The cologne water used has the following formula:

COLOGNE WATER.

Bergamot Oil	10 cc.
Orange Oil, Sweet	10 cc.
Neroli Oil	2 cc.
Lemon Oil	2 cc.
Cologne Spirit	1000 cc.
Stronger Orange Flower Water	to suit

The oils are dissolved in the spirit; and enough orange flower water is added to cause a slight opalescence. The liquid is allowed to age as much as possible before filtration.

No. 4

Castile Soap	2 oz.
Ammonia (0.880)	2 pt.
Slaked Lime	5 g.
Oil of Lavender	2 fl. dr.
Water, to make	1 gal.

Dissolve the soap in 5 pints of water, then add the liquid ammonia and stir in the oil of lavender. Dissolve the calcium hydroxide in the remainder of the water and mix all together.

Removing Stains from Window Sash

Sandpaper the discolored surface, then apply the oxalic acid solution, made as follows: Place a small quantity (a pint or a quart) of boiling water in an earthenware or glass vessel, and add, a little at a time, while stirring, oxalic crystals until no more will dissolve. Apply this solution with a brush, and leave it on overnight, if possible. The next day remove the acid by washing, first with warm water, then several times with cold. When the surface becomes dry it will be found to be beautifully bleached, and ready for repainting or varnishing. Oxalic acid is a deadly poison and the occupants of the building must be warned that no one must be permitted to go near the windows while the white coating formed by the acid is on the surface. Leftover acid must be destroyed just as soon as the application is completed, and must not, under any circumstances, be left standing for a single instant where children or pets can get at it.

Removing Wax from Woodwork

If the woodwork was filled with a paste filler and varnished before the wax was applied, heat a quantity of turpentine by placing some in a tin vessel and placing this in a pail of hot water. Let the turpentine stand in the hot water, and apply it to the surface of the woodwork with a stub of a brush, scrubbing the surface with the hot turpentine. As soon as the wax has been melted, wash the surface with a clean rag or bunch of cotton waste dipped in gasoline. This should remove every trace of the wax and fit the surface to receive paint. If the surface has not been filled with paste filler, but the wax has found its way into the pores of the wood, the problem is more complicated. In such a case it will be better to apply hot solutions of one of the new dry powder floor cleaners. This treatment will remove the wax completely, if enough applications of the hot solution are put on. Wash the surface thoroughly after the hot cleaner has done its work, and when dry the surface will be both clean and beautifully bleached. Before applying any paint, fill the surface with paste wood filler, and when the filler is thoroughly dry sandpaper lightly with fine sandpaper. After a good dusting the surface will be ready to receive the first coat of undercoater. It is assumed, of course, that the surplus filler will be wiped in the usual way before the filler dries.

Bleaching Powder

U. S. Patent 2,075,913

Calcium Hypochlorite	10 oz.
Monocalcium Phosphate	10 oz.

Laundry Bleach

(For use in water containing iron)

French Patent 46,658

Tetra Sodium Pyrophosphate	50 g.
Sodium Perborate	17 g.
Soda Ash	34 g.

Bleaching Agent

French Patent 792,904

Sodium Perborate	1 kg.
Soap	2–6 kg.
Tetra Sodium Pyrophosphate	1–3 kg.
Soda Ash	1–3 kg.

This does not give a precipitate in water containing iron.

Laundry Sours

Laundry sours are used to neutralize any alkali which may remain in the fabrics after washing. Ammonium silico fluoride 98 per cent is used for neutralizing only. Ammonium bi-fluoride (93 per cent minimum for use with iron bearing water supplies) is used alone or in conjunction with ammonium silico fluoride as a neutral sour and as an aid in prevention of discoloration caused by iron-bearing water. This material being more soluble than sodium bifluoride is suitable for souring to a pH as low as 4.2.

Formula No. 1

Sodium Bifluoride	25 oz.
Sodium Silico Fluoride	75 oz.

No. 2

Sodium Bifluoride	50 oz.
Sodium Silico Fluoride	50 oz.

No. 3

Ammonium Bifluoride	25 oz.
Ammonium Silicofluoride	75 oz.

No. 4

Ammonium Bifluoride	50 oz.
Ammonium Silicofluoride	50 oz.

Another authority recommends the following type of laundry sour because it removes iron stains, by virtue of the formation of complex iron oxalate anions. Three pounds of oxalic acid dissolved in three gallons of hot water, and when cool, 3½ pounds of acetic acid (56 per cent) added. One pint of this sour is used per 200 pounds of goods.

No. 5

Sodium Silicofluoride	3.4 oz.
Sodium Bifluoride	1.0 oz.

No. 6

Sodium Silicofluoride	78 oz.
Sodium Bifluoride	10 oz.
Gelatin	0.85 oz.

No. 7

Acetic Acid	4 oz.
Oxalic Acid	1 oz.
Sodium Silicofluoride	1 oz.
Sodium Bifluoride	1 oz.

No. 8

U. S. Patent 1,989,312

Sodium Bifluoride	50 g.
Ammonium Silicofluoride	30 g.
Ammonium Dihydrogen Phosphate	20 g.
Water	1 l.

Laundry Gloss

Gloss preparations to be used with starch are widely employed in the laundry, not only to lend a fine smooth finish, but also to prevent scorching and sticking of the iron. The following is a typical formula:

Acacia, Gum	1 oz.
Borax	2 oz.
Glycerin	1 oz.
Water	32 oz.

Soak the acacia in the water for six hours, add the borax, then heat to a boil and add the glycerin, let cool and strain. To use, add two ounces of this preparation to 3 quarts of the usual starch solution.

Laundry Starch Solution

British Patent 450,192

The following gives a better penetrating starch and yields a more uniform and glossier finish.

Sodium Hexametaphosphate (25% Solution)	1 qt.
Prepared Starch Solution	25 gal.

Collar Glaze for Laundries

Stearic Acid, Powdered, Double Pressed	75 kg.
Borax, Powdered, Finest	25 kg.
Wheat Starch, Finest	100 kg.
Ultramarine Blue	a little

Starch Wax

Formula No. 1

Stearic Acid	2 kg.
Caustic Soda (10% Solution)	0.2 kg.
Water, Hot	10 kg.
Starch, Moistened	50 kg.

Saponify the stearic acid with the soda, then thin with the water, and mix in the wetted starch. Mix thoroughly, dry.

No. 2

Use a stearic acid solution in petroleum ether instead of making a soap solution. To such solution, starch is added and mixed thoroughly to a paste. This is dried by spreading in the air.

Preventing Water Marks

Saturate the stain and the fabric for some space around the stain with naphtha, then use the water solution on the stain immediately. When the stain has been dissolved, take up the moisture by wiping over the treated section lightly with a soft cotton cloth.

Detergent Block

U. S. Patent 1,992,692

A mixture of trisodium phosphate (90), water-glass (5), vegetable oil soap (2½), and paraffin oil containing 5% of aluminum stearate (2½%) is softened by heat, kneaded into granules, and compressed into blocks under 30,000–40,000 lb./sq.in.

Stable Perborate Detergents

British Patent 436,235

Formula No. 1

Soap	57 oz.
Sodium Pyrophosphate	12 oz.
Sodium Perborate	12 oz.
Soda Ash	14 oz.
Aluminium Hydroxide	5 oz.

No. 2

Soda Ash	30 oz.
Sodium Pyrophosphate	30 oz.
Sodium Perborate	30 oz.
Aluminium Hydroxide	10 oz.

Dairy Detergent

Soda Ash	40 kg.
Trisodium Phosphate	35 kg.
Waterglass	10 kg.
Caustic Soda, Powdered	5 kg.
Sodium Sulphite	7 kg.
Chloramin (Aktivin)	3 kg.

Bleaching of Soaps, Fats, and Oils

a. Sodium Bisulphite, Ground	7 kg.
b. Zinc Dust	1.35 kg.
c. Sulphuric Acid, Diluted 1:2.5, and Cooled	7 kg.
d. Water, Cold	60 kg.

Put the water *d* into a handy container, which can be emptied at once into the kettle of soap, or oil. Dissolve *a* in the water with good agitation, add the 1:2.5 diluted acid *c* which ought to be prepared several hours before to be completely cold. Add right after it the zinc dust *b*, stir thoroughly, and empty the container into the kettle with the soap.

TEXTILES, FIBRES

Clearing Processing Spots on Textiles

One of the hardest tasks to undertake, in a dyeing or printing plant, is the removal of spots. There are so many ways that spots will occur that the cause of this trouble is often undetermined. If the spot is simply dirt, then a good soaping will clear this up. If it is grease, there are two ways of removal. The first method is usually used for light grease spots and consists of running the cloth in a jig with a soap, soda and carbon tetrachloride bath at a low temperature. The second method is to spot the blot with ordinary Red oil and then run into a hot caustic soda bath. Color spots are usually quite hard to get rid of. Sometimes the remedy will spoil the rest of the pattern or color and this is unavoidable.

There are two general methods of removal, namely the oxidation and the reduction method. The oxidation method includes the use of chlorine water, hydrogen peroxide and potassium permanganate followed by sodium bisulphite. The reduction method uses sodium hydrosulphite, sodium sulfoxalate-formaldehyde, sodium bisulphite, potassium ferricyanide with caustic soda.

In the oxidation method using chlorine water, it is best to run at a weak concentration into luke warm water and after immersion to spy for a short period of time followed by a warm rinse, dilute acetic acid and another rinse. Hydrogen peroxide is run about the same way but the concentration may be increased. When using the permanganate method it is best to pad with a weak solution of potassium permanganate and then dry. Follow this up with a passage through a weak hot sodium bisulphite bath and subsequently rinse well.

In the reduction method using sodium hydrosulphite and caustic soda, it is best to run at a uniform speed through a controlled reduced bath at a temperature not exceeding 130° F., spy for a few seconds and follow with a run through warm water, hot soap then cold water. When using sodium sulfoxalate formaldehyde, it is best to pad at a weak concentration and dry. Then run the goods through a rapid ager and subsequently rinse, soap, rinse and dry. For the potassium ferricyanide with caustic soda treatment, it is necessary to run through a hot bath, spy and follow with a warm rinse, hot soap and cold rinse and dry.

In all the above mentioned treatments, it is necessary to vary the quantity of ingredients in every case in order to remove various types of spots. A trial should be run on all the above mentioned remedies before the cloth is actually run. This prevents any poor work and will often solve the problem where otherwise the cloth is ruined.

Removal of Ink Stains from Cloth

Ink stains are best removed by first applying a dilute oxalic acid solution (2%). Dab the spot with this and allow the cloth to stand 1–2 minutes, meanwhile having a cotton cloth pad underneath the spot. Then gently apply a dilute chemic solution (½ to 1% available chlorine). When the spot is removed, spot well with water followed by a very weak acetic acid solution and subsequently more water, then dry.

The Cleaning and Bleaching of Linen

The pieces to be treated must be singed, de-sized and boiled out. The best known de-sizing processes are the following:

1. The goods are placed in a cold sulphuric acid bath, of from 1 to 2° Bé., preferably overnight;
2. They are placed for several days in warm water, when the sizing ferments, whereupon they are thoroughly rinsed;
3. They are treated with a malt or diastafor solution—2 to 4 g. malt or diastafor to 1 l. of bath—and placed in the de-sizing bath at 50° C., preferably overnight.

After the de-sizing, the goods are boiled for five or six hours under pressure or on the jigger, or if necessary on the reel, for which there are used per 100 kg. of goods from 2 to 2.5 kg. of caustic soda, 0.75 to 1 kg. of calcined soda, 0.3 to 0.4 kg. of Marseille soap, and from 100 to 200 cc. bisulphite, 38° Bé. When the goods are well rinsed, the bleaching follows.

Chloride of lime is almost exclusively used for the bleaching, the goods being turned several times in a cold chloride of lime solution, of from 0.5° to 1° Bé. They are then soaked several hours or overnight, afterwards rinsed, slightly acidified with hydrochloric acid, and well rinsed again. If the goods are not sufficiently bleached the treatment is repeated. The chloride of lime solution needed for the bleaching is made by grinding chloride of lime as fine as possible in a wooden or earthen vessel, stirring it in a quantity of water, and allowing it to settle. The clear liquid is then poured through a cloth into the bleaching bath, which is prepared in a wooden tub, whereupon the liquor is diluted to the proper strength.

After bleaching and acidifying, in order to obviate later undesirable action of the chlorine, the goods are passed several times through a bath in which 100 g. of sodium thiosulphate per 100 l. of water are dissolved, and afterwards rinsed. In place of chloride of lime, hypochlorite of soda can be used. It is prepared by stirring 1 kg. of chloride of lime to a paste, as above described, to which is added a solution of 600 g. calcined soda dissolved in 3 l. of boiling water. The whole is then stirred for 15 or 20 minutes. After being allowed to settle, the bleaching bath prepared from this should also be from 0.5 to 1° Bé.

Hydrogen peroxide and sodium peroxide can also be used for bleaching linen, but are, in practice, more expensive than chlorine.

Bleaching White Woolens, Silks and Other Fine Fabrics

Formula No. 1

Water (Not Over 100° F.)	5	gal.
Soap, Neutral	½	lb.
Modified Soda	½	oz.
Sodium Perborate	1	oz.

No. 2

Water (Not Over 100° F.)	5	gal.
Hydrogen Peroxide (100 vol.)	1	pt.
Sodium Bicarbonate	10–20	g.
Soap, Neutral	½	lb.

Soak for four or five hours, and although the baths are not expended at the end of this time they must be strengthened by adding half of the above quantities before entering each new batch.

Work must be carried out in wood or enamel, earthenware or stainless steel. Iron, brass or copper should be avoided.

When the goods do not require a full bleach the solutions can be added to the ordinary washing process about ½ gal. to each article washed in usual suds. Colored goods can be bleached clear in tone without damage to colors provided they are first of all fast to soap and water.

Caution: Never use Javelle Water, which is sodium hypochlorite, on wool, silk or any fine fabric. Javelle Water is suitable only for cottons, linens and rayons which are white. Never use Javelle Water on colored goods of any description.

Bleaching (Angora) Rabbit Wool

The material has to be lightly scoured before bleaching or dyeing it. Soap and ammonia, with or without an addition of a proportion of one of the proprietary scouring assistants, are the usual detergents employed. Scouring is carried out at a temperature of about 106° F. The small amount of natural fatty substance in the fibre is easily saponified by the use of very little alkali in the scouring bath. Scouring is usually performed in apparatus of similar type to that used for cleansing sheep's wool.

Bleaching of raw Angora rabbit wool is preferably done with peroxide of hydrogen, as this agent yields a purer white than is obtainable by the use of bisulphite of soda bleach. Furthermore, the material handles softer owing to the nonacid character of the peroxide bleaching process. To carry out the peroxide bleach, the bath is prepared with 8 pt. of peroxide of hydrogen (12 volumes) per 100 lb. of material. The liquor should be made faintly alkaline before entering the rabbit wool. A small proportion of sodium silicate may be employed in making the bath, after which the temperature should be raised during one hour to 100° F. The batch may be then left to steep several hours in the cooling bath. The material should be finally given a thorough rinsing in cold water to free the fiber from sodium silicate, since the presence of this harshens the handle.

Bleaching Tussah Silk

For 50 lb. of tussah silk a bath is prepared containing 30 lb. of magnesium sulphate dissolved in 110 gal. of water. The silk after being well boiled-off and washed, is thoroughly impregnated with this liquor and then lifted from the bath, while 6 lb., 10 oz. of sodium peroxide is carefully added in three portions during 45 minutes, working the silk in the bath after each addition. It is important not to neglect to first impregnate the silk with the magnesium sulphate solution, otherwise the luster of the fiber would be impaired by the strongly alkaline solution of sodium peroxide acting on the silk. After the final addition of the sodium peroxide, the bath is heated during 45 minutes to 190° F. Dilute sulphuric acid is then added to clear the liquor which will have become milky through the precipitation of magnesium hydrate. The silk is then given two or three turns in this liquor, washed and worked for 30 minutes in a bath containing 30 per cent of soap for the purpose of restoring and increasing the luster; it is finally washed and brightened.

Stripping Shoddy Materials

Boil for ½–¾ hour with

Potassium Bichromate	3– 6%
Sulphuric Acid	6–12%
adding to advantage also	
Oxalic Acid	3– 6%

After stripping, rinse well, neutralize if necessary, and rinse.

Stripping in Presence of Wool

Formula No. 1

20 yards Shoddy-Wool Cloth; finished weight 18 oz.
Potassium Permanganate, 2 lb. per 100 gal.
1 hour cold.
Drain and rinse.
Sodium Bisulphite, 7 lb. per 100 gal.
Sulphuric Acid, ¾ pt.
1 hour cold.
Wash thoroughly.
Required per cent of Sodium Sulfoxylate Formaldehyde to strip the shoddy.
Formic Acid, 2 per cent.
Bring to boil in one-half hour; boil one-half hour.
Rinse.
Ammonia, 5 per cent (to neutralize formic acid thus making it easier to dye cotton specks).
Bring to boil in one-half hour; boil 10 minutes.
Wash.
Dye.

Results:—All the sulphur black dyed threads are stripped. The cloth may be tendered more than desired.

No. 2

15 yards Shoddy-Wool Cloth; finished weight 18oz.
Permanganate of Potash, 2 lb. per 100 gal.
1 hour cold.
Drain and wash.
Usual per cent of Sodium Sulfoxylate Formaldehyde.
Formic Acid, 8 per cent (4 times the usual amount but determined as the most effective).
Bring to boil in one-half hour; boil one-half hour.
Rinse.
Ammonia, 5 per cent.
Bring to boil in one-half hour; boil 10 minutes.
Rinse.
Dye.

Results:—Sulphur black threads are all stripped. Cloth is tendered about the same as in Formula No. 1. The shade is a little dull due to the fact that the shoddy is not stripped quite thoroughly. Further stripping will probably have tendered the fabric too much.

In both of the above procedures a sulphonated alcohol is used as a wetting-out agent in the permanganate bath.

Dye Stripper

U. S. Patent 2,046,317

Mono Calcium Phosphate	3 lb.
Zinc Sulphoxylate-formaldehyde	8 lb.
Sodium Hyposulphite	8 lb.
Sodium Sulphite	6 lb.

Bleaching Gray Goods

The gray goods, after being steeped in a dilute solution of soda ash or sulphuric acid in order to hydrolyze the starchy impurities added during weaving, should be thoroughly washed in a plentiful supply of water and then directly led into the pressure kier and boiled for 8–10 hours with about 30–35 lb. pressure in the following:

Soda Ash	2 lb.
Caustic Soda	3 lb.
Soap	¼ lb.
Water	95 lb.

Of course, the above proportions which are to be calculated on the weight of the cloth would vary considerably with the variation in the nature of the materials to be treated. However, it should be pointed out that the above will give quite satisfactory results with heavy goods woven with 20s to 30s yarn.

After boiling, the cloth is well washed on an ordinary washing machine and then treated for five to six hours with the following bleaching liquor at 90° C. to 95° C.:

Hydrogen Peroxide (40% by Volume)	1½ lb.
Silicate of Soda	1 lb.
Soda Ash	⅛ lb.
Water	97 lb.

At the end of the treatment, the cloth is washed for half an hour in the kier and then on the washing machine. By this method, the cloth acquires the necessary whiteness and there is no need of any further treatment. The goods, after washing, can be directly taken up for the finishing operations.

Peroxide Bleaching of Dhoties

The cloth, after being de-sized and washed, should be fed into the kier containing:

Silicate of Soda	1.0 %
Turkey Red Oil	0.2 %
Soap	1.0 %
Caustic Soda	0.17%
Hydrogen Peroxide (40% by Volume)	0.2 %

and the whole should be boiled for 8–10 hours. After washing, the kier is refilled with the material. The bleaching liquor should consist of the following:

Silicate of Soda	0.75%
Hydrogen Peroxide (40% by Volume)	0.75%
Soda Ash	0.3 %
Turkey Red Oil	0.2 %

The liquor should be heated to 160° F. and kept at that temperature for five to six hours. This treatment leaves a slight yellowish tinge which can be removed by treating the goods with a ½° Tw. bleaching powder for three to four hours. The whiteness in this case is also satisfactory but the processes are longer.

In the case of dhoties, no trouble is experienced in bleaching by the peroxide method.

Bleaching Hemp

For string and light ropes a rough bleach is sometimes employed. For this purpose the goods are first boiled for half an hour in a solution of 10 kg. silicate of soda at 70° Tw. in 500 l. water. They are then boiled in water alone, after which they are rinsed and steeped for 24 hours in a solution of 10 kg. bleaching-powder in 1,500 l. water. After being allowed to drain they are hydro-extracted and soured in hydrochloric acid (1 l. commercial hydrochloric acid in 1,000 l. water). They are then well washed in water and dried. A better white is obtained by repeating these processes.

Bleaching Flax

Flax is treated with boiling 1% sodium silicate solution in 1% caustic soda for 45 minutes. Then with a bleach containing 3 g. active chlorine and 5 g. hydrochloric acid per l. Then with hydrogen peroxide (3 g. active oxygen per 100 g. flax in 0.2% sodium silicate and 0.7% caustic soda) for 90 minutes at 90° C. Finally treat with diluted sulphuric acid for 10 minutes.

Bleach for Hair and Feathers

German Patent 636,258

Hydrogen Peroxide (30%)	100 g.
Ammonium Persulphate	30 g.
Alcohol	20– 30 g.
Water	1000 cc.

Immerse in above bath for a few hours until bleached.

Fur Bleaching Bath

U. S. Patent 2,092,746

Water	100 gal.
Hydrogen Peroxide (100 Vol.)	5 gal.
Sodium Silicate	12 lb.
Sodium Oxalate	2 lb.

Bleaching of Natural Sponges

Bath a:	
Potassium Permanganate	5 g.
Water	100 g.
Bath b:	
Sodium Thiosulphate	100 g.
Water	1000 g.
Bath c:	
Hydrochloric Acid (Free of Arsenic)	25 g.
Water	1000 g.

Remove sand and other impurities, then dip into the baths *a*, *b*, *c* for 5–10 minutes each; the solutions should be pressed out from the sponges before changing to the next bath. After bath *c* wash with clean water until neutral.

Dry with air-blower.

Protecting Iron Bleaching Kiers

The kier, after being well scraped off with an iron brush, should be coated with a mixture of portland cement and lime. This coating must be uniform and so deposited that the surface is not too brittle. The consistency of the cement-lime mixture and also the thickness of the film play an essential role. After the first coating, the surface is allowed to dry for 24 hours. If the coat is not found to be completely dried and set even after this period, it should be kept longer. After the coating has been well dried, the kier should be filled with water containing the following:

Silicate of Soda	40 lb.
Caustic Soda	10 lb.
Lime	5 lb.
Magnesium Oxide	5 lb.

and the solution circulated at or near the boil for at least eight hours. It should then be allowed to cool. The kier should then be kept overnight in order to allow the thin film of the above mixture to set in. This process would also give a good and efficient initial lining to the circulating pump.

Another effective method of coating an iron kier is to make a paste of the following materials:

Portland Cement	4 lb.
Lime	1 lb.
Magnesium Oxide	1 lb.

Paste up the above ingredients with a 20° Tw. silicate of soda and apply it to the kier with a brush. Allow the coat to set and dry.

Stabilizing Peroxide Bleaching Baths

The comparatively rapid decomposition of peroxide baths depends very largely upon the general working conditions. Catalytic action of iron or copper may cause rapid decomposition in alkaline baths, but not in acid baths. Even at higher temperatures an acidified hydrogen peroxide bath remains fairly stable. In a certain sense the fibers of the fabric also have a catalytic action, since in their presence the bleaching bath decomposes much more rapidly. It remains an open question whether the fibers themselves have this action, or whether it may be attributed to the impurities contained in the fibers. In the case of catalytic decomposition of the peroxide, it is characteristic that a very small quantity of catalytic substance will decompose a considerable part of the peroxide. The fact that it has been ascertained that germs and enzymes can act as catalyzers points to the possibility of eliminating this action by adding sterilizing agents. For this purpose hypochlorite has been found effective for vegetable fibers, and hydrofluoric acid, hydrosulphites and sulfoxalates for animal fibers.

Carbonizing Wool Rags

Woolen rags or loose wool are immersed for 2 to 12 hours in dilute sulphuric acid at from 2° to 8° Tw., the duration of the immersion depending upon the strength of the acid. After the excess of acid has been removed in hydroextractors, the rags are carefully dried, first at a temperature of 30° to 45° F. which is raised after two to three hours to 70° to 80° F., at which temperature the vegetable fiber is carbonized. The material is now taken out, and the vegetable fiber, which crumbles to dust by friction, is mechanically removed.

Textile Fibers from Plants

British Patent 452,082

Flax, hemp, jute, etc. is boiled with agitation in 1% soap solution, drained, and similarly treated several times with 1% trisodium phosphate. It is then rinsed several times and finally treated with a solution containing 1% of soap and 0.1% of calcium chloride, and dried. The fibres are drained after each treatment and rinsed.

Purifying Bast Fibres

U. S. Patent 2,054,779

Hemp, flax, ramie, etc., is boiled at 30–90 lb./sq. in. for 2–6 hr. with 15–40% sodium sulphite solution. The pulp is then rinsed, digested with ammonium oleate solution at 30 lb./sq. in. for 4 hr. and then washed.

Textile Finishing

The materials used in finishing may be classified as follows:

1. Stiffening Materials
   Starches and Gums
2. Binders
   Casein, Glue, "Tragasol", Rosin
3. Fillers
   China Clay, Talc, Pigments
4. Softening Agents
   Sulphonated Tallows
   Soluble Oils
   Waxes
5. Luster Producing Materials
   Waxes
6. Weighting Materials
   Glucose
7. Hygroscopic Materials
   Glycerin
8. Waterproofing Agents
   Aluminum Stearate
   Paraffin

On dark shades for stiffening agents, it is best to use potato or tapioca starch and not corn starch. The latter is too white and not transparent enough so that the shade is affected more.

To produce ordinary luster, a shriner calender is used. For high luster, a friction calender will produce excellent results. To avoid luster, pass through a rup of a cold steel cylinder.

Most finishes are produced by running through a hot solution of the finishing agents and then drying. This is followed in turn by a calendering operation.

Textile Finishing Compound

a.	Calcium Chloride	58 kg.
	Water	42 kg.
b.	Magnesium Chloride	57 kg.
	Water	43 kg.

c. Calcium Chloride Solution (*a*)	68	kg.
Magnesium Chloride Solution (*b*)	18	kg.
Potato Flour	22	kg.
Water	to make paste	

Finishing Baths for Linen Fabrics

Fine, bleached articles of mixed fabric are finished in a bath like the following:

Formula No. 1

Water	100	l.
Starch	7	kg.
Solubilized Starch	3	kg.
Talc	2.5	kg.
White Soap	1	kg.
or		
Fatty Alcohol Sulphonate	0.3	kg.

The pieces are dried while spread, sprayed with water, run through a "beating-machine" (to soften and stretch the fabric), and folded.

No. 2

For thin handkerchief-fabrics the following bath gives a sizing effect and pleasant touch:

Water	200	l.
Laundry Starch	16	kg.
Swelling Starch	1	kg.
Talc	6	kg.
Softener	2	kg.

For fine handkerchiefs the following two baths will give a particularly fine touch:

Water	100	l.
Laundry Starch	10	kg.
Talc	1.5	kg.
Alabaster	10	kg.
Soft Soap	0.25	kg.
Cocoa Butter	0.25	kg.
Ultramarine	0.02	kg.

No. 4

Soft Water	100	l.
Starch	12	kg.
Laundry Starch	3	kg.
White Soap	0.5	kg.

No. 5

Table-Cloths are dipped into a finishing bath of:

Water	250	l.
Laundry Starch	8	kg.
Solubilized Starch	8	kg.
Talc	15	kg.
Borax	0.5	kg.
Marseilles Soap	0.75	kg.
Ultramarine	0.0075	kg.

Dry on frames, spray with water to dampen, and press in a calender.

No. 6

Mattress-Tickings are sized and finished in a bath of:

Water	120	l.
Solubilized Starch	10–8	kg.
Magnesium Sulphate	10–8	kg.
Glycerin	0.5	kg.
Sulphonated Fatty Alcohol	1	kg.

No. 7

Water	400	l.
Starch	15	kg.
Gelatin	5	kg.
Solubilized Starch	8	kg.
Sodium Sulphoricinoleate	1.5	kg.

The tickings are dried on frames, dampened, and pressed in a calender.

Linen Damask Finish Solution

a. Senegal Gum	36	lb.
Cream Gloss Softener	40	lb.
Starch, Wheat	20	lb.
Starch, Potato	20	lb.
Water	13	gal.

Strain to remove lumps.

b. Zinc Sulphate	1	lb.
Ammonia (28%)	1	lb.
Water	27	gal.
c. Glycerin	1⅕	lb.
China Clay	5	lb.
Water	150	gal.

Mix solutions of *a, b* and *c* vigorously and bring to a boil.

Cotton Dress Goods Finish

Corn Starch	25	lb.
Potato Starch	25	lb.
Tapioca Starch	25	lb.
*Cotton Softener A	40	lb.
Water, to make	140	gal.

Heat and mix until proper consistency is gotten.

* Cotton Softener A

Stearic Acid	15	lb.
Paraffin Wax	5	lb.
Water	100–400	lb.
Ammonia	1	lb.

Melt the stearic acid wax and water and while agitating vigorously run in the ammonia in a thin stream.

Black Latex for Textiles

The following mixture after grinding in a ball mill for 3 hours produces a rich black flexible film when added to the latex:

Carbon Black	25	lb.
Sulfatate or Other Wetting Out Agent	2	lb.
Water	10	gal.

Three parts of this dispersion is added to five parts of normal latex made alkaline with one-half part of 1% sodium hydroxide solution.

Decreasing Luster of Cellulose Acetate Rayon

Impregnate cloth for 5–10 minutes with:

Isobutyl Alcohol	30– 40 g.
Soap	2– 3 g.
Water	950 cc.

then treat at 95° for 5–10 minutes with:

Soap	3–4 g.
Water	1 l.

Finishing Deluster for Rayon

This is an excellent practical working deluster for toning down the highly lusterous sheen that rayon ordinarily has.

Fullers' Earth	50 lb.
Titanium Dioxide	40 lb.
Sulphonated Castor Oil (30%)	150 lb.
Stearic-Tallow Softener (28%)	15 lb.

Mix the fullers' earth and titanium dioxide well and wet out with the sulphonated castor oil. Finally add the softener and grind well. Use varying amounts together with other assistants in finishing to obtain the desired delustered effects.

Partially Saponifying Celanese

Celanese is sometimes partially saponified for direct and uniform dyeing with certain dyes such as direct colors. This is done by padding with the following and then drying:

Soda Ash	30 lb.
Glycerin	2 gal.
Water, to make	50 gal.

After drying steam for 4 minutes in a rapid ager. Then rinse well and dye with any direct dyestuff.

Restoration of Luster to Celanese

Sometimes celanese is delustered by soap at a high temperature. This may be restored by padding with 28% acetic acid. Enter and dry under tension. Then rinse well and re-dry.

Starch Finishing of Rayon

Starch Solution:

Water	100 l.
Starch	10 kg.
Aktavin-S*	250 g.

Boil ½ hour.
Of this, use:

For a soft effect:

Starch Solution	10 l.
Soft Soap	3 kg.
Water	100 l.

For a medium stiff effect:

Starch Solution	50 l.
Glycerin	1 l.
Water	100 l.

For a stiff effect:

Starch Solution	100 l.
Glycerin	1 l.
Water	100 l.

Rayon Finish

a. Starch	8 kg.
Water	60 l.
Aktavin-S	120 g.
Glycerin	800 g.
b. Finishing Oil	1 kg.

The solubilizing is obtained by ½ hour boiling of *a*. After *b* is added and the solution cooled down, use it diluted with 10 to 12 parts of water of about 30° C.

Rayon Lubricants and Finishes
U. S. Patent 2,079,108

Formula No. 1

Diethylene Glycol	50 lb.
Glycerin Mono-Oleate	50 lb.

Before use both of these materials are stabilized as to the atmosphere, that is they are permitted to absorb as much moisture as they can.

The above mixture is applied to an acetone-soluble cellulose acetate yarn, by causing such yarn to pass over wicks, rollers or other suitable devices for applying such mixture, in their transit to a winding machine. The amount of finish applied is 10% of the weight of the yarn. The yarn so treated is more pliable, knits with less distortion and irregularities, takes high twists more smoothly and generally exhibits improved properties from a textile manipulation point of view. Fabrics en greige comprising this yarn scour oil-free very readily and also wet out rapidly.

If instead of employing the above mixture, glycerin mono-oleate alone is applied in amounts of about 10% of the weight of the yarn, similar benefits are obtained.

No. 2

The process of Formula No. 1 is repeated, with the exception that the finish also contains 2 parts by weight of soaps such as the oleate of sodium, potassium or triethanolamine. Similar improved results are obtained. The fabrics, yarns and the like so treated scour and wet out with remarkable ease, the finish diffusing from the yarn quite readily, even in cold water.

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* "A preparation to solubilize starch."

No. 3

The following spinning solution is prepared

Cellulose Acetate	25	lb.
Acetone	72	lb.
Water	3	lb.
Glycerin Mono-Oleate	1.25	lb.

The solution is thoroughly mixed and filtered and then is forced through orifices of a spinneret into a warm evaporative atmosphere where the acetone and water are substantially evaporated off. The filaments thus formed are twisted to form yarn. The yarn so formed is immediately ready for textile operations and has the improved properties of the yarn described in the preceding examples. The yarn also has the property of delustering or assuming a subdued luster, when scoured or dyed in aqueous baths at temperatures below boiling, such as at 75° C. or over, which property is not shared by yarns prepared from spinning solutions not containing the glycerin mono-oleate.

Oiling Viscose Yarn

Ammonium Oleate (Containing 25–30% Oleic Acid)	85 oz.
Alcohol	15 oz.

A 1% emulsion of the above in water is applied at 40° C. for 25–30 minutes.

Lubricant for Synthetic Textile Fibers

British Patent 450,420

Formula No. 1

Triethanolamine Oleate	1 lb.
Diethylene Glycol	9 lb.
Fugitive Color	trace

No. 2

Triethanolamine Stearate	10 lb.
"Carbitol"	45 lb.
Diethylene Glycol	45 lb.

Textile Emulsion

Japanese Patent 110,729

Lecithin	5– 10 oz.
Cyclohexanol	50– 100 oz.
Tetralin	500–1000 oz.
Water	1000 oz.

Thread and Yarn Lubricant

British Patent 440,404

Pass through a bath of

Gelatin	4	g.
Dextrin	5	g.
Glycerin	2	g.
Olive Oil	½–1	g.
Hexylresorcin	¼	g.
Water	100	cc.

allowing the yarn to take up 5% of its weight of solid materials.

Tallow Emulsion for Textile Softening

Formula No. 1

Water	7 lb.
Soap	3 lb.
Tallow	1 lb.

No. 2

Tallow	100 lb.
Caustic Potash (45%)	30 lb.

Artificial Chamois Finishes

The treatment of cotton and other cellulosic fibers to give a water resistant or a chamois leather-like finish may involve both mechanical and chemical processes. First, the knit cotton material, dry, is teazled, carded or ground to raise a nap or downy layer on either one side or on both. It is then steeped in a pyridine solution of stearic acid chloride at 95° to 100° C. until the fabric gains in weight by 15 to 25 per cent. The fatty acid chloride reacts with and esterifies the hydroxyl groups of the cellulose and, as a result, the treated fabric acquires a handle somewhat like deer skin or chamois leather. Dyeing may either precede or follow the chemical process.

Stearic acid chloride is formed when the acid is treated with phosphorus pentachloride.

The acid chloride should be present to the extent of 1 part per 8 to 15 parts of pyridine. There should be no water present during the esterification, hence the need for drying the fabric before treatment. All other dressing and filling ingredients in the cloth should be removed too. Esterification should not be continued longer than two hours and the fabric should be maintained in motion meanwhile. To neutralize any free acid formed, finely divided alkali carbonate should be suspended in the reaction mixture. After the esterification, the fabric should be washed in warm soap and soda, since acid chlorides are liable to decompose and liberate hydrochloric acid.

An increase in weight of 15 to 25 per cent improves the feel of the fabric, but if only 2 per cent is taken up, water repellent qualities are acquired.

Another and entirely different method of getting a chamois finish on a fabric is suggested. A napped woven fabric is immersed in a dilute "solution" of softened crepe rubber in gasoline containing also a hygroscopic agent compatible with rubber. Thus, pale crepe gum rubber is milled with a softener, a filler and glycerol, or glycol, taken up in gasoline, benzol or naphtha, and the fabric dipped. Excess liquor is squeezed out, the fabric dried and dipped again several times over. After dusting the rubbered fabric with talc, it is vulcanized with sulphur chloride in the usual manner. Certain inorganic hygroscopic agents are suitable besides glycerol, namely, sodium lactate, ammonium, zinc or sodium acetate.

String Impregnations

Waxing

Formula No. 1

Pull the string through melted paraffin and rub off with leather when cooled.

No. 2

Turpentine, Venice	500 g.
Wax, Vegetable	400 g.
Ozokerite	300 g.
Spermaceti	250 g.

Tanning

Dip the string into a decoction of oak bark, to which some cutch has been added, dry, wipe over with an oiled rag.

Fulling Oil

a. Turkey Red Oil, 100%, Commercial	80 kg.
Cyclonol	3 kg.
Methyl Cyclo Hexanol	12 kg.
b. Caustic Soda	to neutralize

The mixture *a* is neutralized until it colors phenolphthalein weakly.

Soapy Fulling Oil

a. Oleic Acid	70 kg.
Methyl Cyclo Hexanol	5 kg.
Carbon Tetrachloride	20 kg.
b. Caustic Potash (50° Bé.)	

To *a* add enough *b* to just neutralize to phenolphthalein.

Rope-Makers Grease

Formula No. 1

Petrolatum, Yellow	5 g.
Linseed Oil Varnish, Hot	15 g.
Tallow	80 g.

No. 2

Rosin, Dark	10 g.
Soft Soap, Yellow	24 g.
Woolfat, Neutral	25 g.
Linseed Oil, Crude	30 g.

Sizing Cotton Materials

The requirements of a good sizing agent are flexibility, low frictional surface, cohesion of the filaments and ability to wash out.

The materials used vary with the count. For cotton and viscose, starches and dextrins are mostly used. For acetate yarns, animal proteins such as gelatin are employed. For hygroscopic agents, glycerin and waxes in small quantities are used. The percentage of size put on varies, but ordinarily on an airdry basis is 12½% on viscose and 5% on acetate rayon.

In testing size, it is best to dry out on a glass plate and then note transparency, flexibility and strength. The viscosity of the size should not be greater than an ordinary printing paste. It should not be too "short," due to insufficient adhesiveness. Potato and tapioca starch are good for adhesiveness. For a given yarn to be sized, viscosity should be maintained constant. In using potato starch, in order to obtain the maximum value, it should be brought to the boiling point and boiled at least 10 minutes. Then run at a temperature of 180–190° F. Corn starch is not as affected as potato starch is by excessive boiling but neither should be boiled more than 10 minutes.

Acetate size is usually composed of a good grade of gelatin, manufactured by cooking with water and jellying. In using this size, dilute with one part water and bring to 140° F.

Cotton Sizings

The following mixtures are suitable for light sizing. They can be made to give greater or less percentage, according to the density of the mixture.

Formula No. 1

Wheat Flour	91 lb.
Tallow	9 lb.

No. 2

Sago	31 lb.
Farina	59 lb.
Tallow	8 lb.
Soap	2 lb.

A mixture which may be used for fine counts is:

No. 3

Farina	79 lb.
Wax	12 lb.
Tallow	9 lb.

1 gal. of Water to 1 lb. of Farina

For adding weight to the cloth china clay is the chief ingredient used, because of its easy assimilation with other ingredients, and its smoothness. French chalk is better in color, but is not so heavy and is more costly. Sulphate of magnesia and sulphate of soda are chiefly used for weighting yarns which are intended for bleaching or dyeing.

For what is termed medium sizing, that is, adding about 30 to 50 per cent to the weight of the cloth, the following ingredients are used in various proportions, the proportion given being an example.

Flour	66% per 150 lb.
Clay	26% per 150 lb.
Tallow	8% per 150 lb.

Chloride of Magnesium*	1 gal.
Chloride of Zinc*	½ gal.

For heavy sizing the proportions of clay and mineral ingredients are increased. In some cases over 100 per cent is added to the weight of the yarn. The adhesive ingredient most used is wheat flour, as it carries the added ingredients better than farina or sago. Sometimes two parts clay to one of flour is used for very heavy sizing.

For 100 per cent sizing the following proportions are given as an example:

Flour	37% per 250 lb.
Clay	56% per 250 lb.
Tallow	7% per 250 lb.
Chloride of Magnesium*	5½ gal.
Chloride of Zinc*	2½ gal.

It will be noticed that chloride of magnesium and chloride of zinc are introduced along with china clay. Chloride of magnesium is a powerful softener as well as a weighting material, and one of its uses is to prevent the gritty feel which the addition of clay alone would give to the cloth.

Cotton Corset Filling Composition

Formula No. 1

Corn Starch	56 lb.
Paraffin Wax Emulsion	1½ gal.
China Clay	5 lb.
Glycerin	8 lb.
Water	100 gal.
Bluing	to suit

No. 2

Corn Starch	35 lb.
Dextrin, White	12 lb.
Paraffin Wax Emulsion	8 lb.
Sulphonated Castor Oil	4 lb.
Water, to make	65 gal.

No. 3

Corn Starch	25 lb.
Dextrin, White	4 lb.
Paraffin Wax Emulsion	8 lb.
Sulphonated Castor Oil	8 lb.
Water, to make	80 gal.

No. 4

Borax	5 oz.
Farina	35 lb.
Water, to make	100 gal.

No. 5

Dextrin, Yellow	65 lb.
Soda Ash	3 oz.
Water, to make	80 gal.

Medium Cotton Warp Size

Talc	400 g.
Farina	550 kg.
Carageen Moss	4 kg.
Copper Sulphate	100 g.
Water	300 l.

Non-Mildewing Rayon Size

British Patent 446,404

Gelatin	40 oz.
Dextrin	50 oz.
Glycerin	20 oz.
Olive Oil	5–10 oz.
Hexylresorcinol	⅛ oz.
Water	sufficient

Rayon Warp Size

Water	50 gal.
Gelatin	20 lb.
Sorbitol (85%)	7 lb.
Penetrant	½ lb.

Wool and Hair Setting Compound

British Patent 443,359

Sodium Cetyl Sulphate	50 lb.
Sodium Sulphite	40 lb.
Borax	40 lb.
Water	2600 gal.

Worsted or other fiber is steeped in above solution at 60° C. for 20 minutes.

Drapery and Suiting Size

Formula No. 1

Drapery (1.50 yd./lb.)

Avitex C	15 lb.
Glucose	170 lb.
Dextrin	20 lb.
Water	100 gal.

No. 2

Drapery (2.00 yd./lb.)

Avitex C	10 lb.
Dextrin	100 lb.
Water	100 gal.

No. 3

Suiting

Avitex C	25 lb.
Tapioca Starch	5 lb.
Water	100 gal.

Size for Transparent Velvet

Canadian Patent 365,468

Thiourea	10 lb.
Urea	60 lb.
Formaldehyde	140 lb.
Ammonia (26° Bé.)	14 lb.
Water	160 lb.
Diammonium Hydrogen Phosphate	0.5 lb.
Ammonium Sulphate	0.5 lb.

Latex Backing for Rugs

Tapioca Flour	55 lb.
cooked in	
Water	128 gal.

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* Both chloride of magnesium and chloride of zinc are commercially sold in the liquid form. The percentage of the chloride varying from as low as 30% in some cases to as high as 45%. The above recipe is based upon a product approximating 40–45% of the content.

made alkaline and added to

Normal Latex	26 gal.

in which are dispersed

Clay	90 lb.
Whiting	90 lb.
Zinc Oxide	3 lb.
Sulphur	1 lb.
Accelerator No. 552	1 lb.
Agerite White Anti-Oxidant	7 oz.

Dry Cleaners' Sizing

This is used to restore stiffness and luster to garments that have been dry cleaned.

Put 1 lb. flax seed in a muslin bag and suspend in 1 gal. water. Cook until seeds burst and stop when a brown oil begins coming out. Squeeze the rest of liquid from bag into rest of solution and dilute with water if too thick. Then add ⅝ oz. Wetanol to preserve and make solution spread more easily.

Thinning Starch "Solutions"

It is desirable in some cases to reduce "stiffness" of a starch paste or to reduce "heaviness" of the starch syrup, without making the solution or paste alkaline.

Addition of small amount (3–5%) of gelatin solution to the starch solution, will substantially decrease the stiffness of the paste or increase the fluidity of the syrup.

Cold Swelling Starch

British Patent 447,810

Starch	60–25 lb.
Sodium Silicate, Powdered	40–75 lb.

Laundry Starch

U. S. Patent 2,014,794

Rice Starch	99 oz.
Sulphated Higher Fatty Alcohol	1 oz.

If tablets are desired mix with 2 oz. glucose and form.

Gelatin Sizing Compound

Water	80.25 oz.
Oleic Acid	2.56 oz.
Triethanolamine	1.33 oz.
Gelatin	6.25 oz.
Benzoate of Soda	0.31 oz.
Coconut Oil	9.25 oz.

Wax Sizing Compound

Water	59.60 oz.
Beeswax	9.40 oz.
Japan Wax	11.00 oz.
Stearic Acid	11.00 oz.
Oleic Acid	3.00 oz.
Caustic Soda	3.00 oz.
Soluble Olive Oil	3.00 oz.

Textile Printing Standard Thickener

Starch	6 lb.
British Gum (80% Soluble Corn)	6 lb.
Soda Ash	13½ lb.
Sulfoxylate	12 lb.
Glycerin	6 lb.
Water	56½ lb.

Procedure: The cooking is started with the starch, British Gum and water. When the starch has thickened (about 175° F. with corn starch), the soda ash is added and the cooking continued for the specified time at a temperature of 205° F. to 210° F. Boiling water is added every half hour to replace that which has evaporated so that there are only slight changes in concentration during the preparation. At the end of the cooking time, the heaters are removed. Stirring is continued until the samples are cooled to room temperature, the sulfoxylate and glycerin being added at about 150° F.

Crimping Cotton

Beautiful effects may be obtained by printing on a gum resist and then passing the cloth through a strong caustic soda solution. The dry content of the gum used is very important. A very highly converted British gum is usually used and the strength will run 3–4 pounds per gallon. The greater the dry content of a gum resist, the more effective is its power to resist the caustic soda. The latter will vary in strength from 25–30% according to the length of time the cloth is let lie after immersing and squeezing and prior to washing out. For best results it is advisable to select a light weight cotton cloth and print a design that is largely composed of lines running parallel to the selvage of the cloth. The reason for this is that the shrinkage, for the most part, takes place in the warp. After printing, run the cloth through the strong caustic soda in a pad box and let set 1–2 minutes. Finally rinse well with cold and hot water, hydro-extract and dry in a crepe dryer. In dyeing grounds for this type of work it is best to select colors that will not be affected by the caustic soda. If crepe dyeing is possible then beautiful two-toned effects may be obtained by dyeing the cloth after crimping. In dyeing the latter the dyestuff will have much more affinity for that part of the cloth that has been attacked by the caustic and as a result this portion will come out much heavier. Other effects may be obtained by selecting printing colors that will develop in a steaming operation and that will work well with a gum resist. These colors are printed on with the gum resist and then steamed, padded with the caustic and finished as above. The final result is a crimp in the colored or printed parts of the cloth. By selecting dyed grounds that may be discharged, it is possible to obtain a crinkle in the white parts of the cloth. A discharge is made up with the gum resist and upon printing and steaming the color is discharged at the printed part. After running through the caustic soda and finishing as mentioned above, it will be noted that the crimp is in the white portion of the cloth whereas the colored portion is uncrimped.

Lacquer Printing of Cloth with Metallic and Pigment Colors

This type of work is largely being carried out on silk, rayon and Celanese where excessive handling is to be avoided. The advantage of this type of printing is in the fact that finished goods may be printed, dried and shipped without any intermediate process of steaming, washing, etc. The colors are really, in a sense, painted on the cloth and the secret of success of this type of printing lies chiefly in the softness of the resultant print. Formerly bronze and pigment prints were extremely harsh when printed.

Bronze or metallic prints are not nearly as fast as the pigment class of colors. They tend to go dull on standing and will wash out in time. Pigment colors are extremely fast and will even stand a good rubbing. In order to do a perfect job the engraver, printer and colorist must work together. The engraving is very important as to shallow a depth will make the color stick-in. The colorist must have the proper amounts of solvents in his printing paste so that the paste will not dry too fast in the engraving. The printer must run at a uniform speed so that the paste as worked out by the colorist will give even results. Too fast a drying paste will make the color stick-in whereas too slow a drying paste will not dry fast enough over the dry cans. A nitrocellulose lacquer of cellulose acetate can be made in accordance with formulae given in section on lacquers. In using pigment pastes it is advisable to have them extremely finely ground in a solvent such as acetone together with castor oil. A paint or ointment mill is necessary for good results.

Dressing for Prepared Yarns of Upholstery Cottons

Montan Wax, Double Bleached	10 g.
Stearic Acid	15 g.
Soap	2.5 g.
Gelatin	2.5 g.
Soda Ash	0.3 g.
Starch	10 g.
Water	400 g.

Artificially Crinkled Fibers

If a synthetic resin is fully formed within a fiber while this is in a deformed condition, particularly while crinkled, this deformation is permanently "set"; it is even highly resistant to washing and other wet processes to which it may be desirable to subject the fibers afterwards.

The most useful synthetic resins for application to textiles are those made from urea and formaldehyde since these are white and not easily discolored by reaction with other chemicals. Hence it is a resin of this type which is recommended for giving fibers a permanent crinkle, and the following examples illustrate how this can be carried out satisfactorily.

For treating viscose rayon it is first necessary to prepare a resin preparation thus:

50 grams of urea and 200 cc. of 40% formaldehyde solution are boiled together for 3 minutes and then cooled. Then 4 cc. of 33% solution of tartaric acid are added and the mixture further boiled for 10 to 15 minutes; it is then diluted with about one-half its volume of water.

Viscose rayon yarn is impregnated with the above liquor and squeezed so that it retains about its own weight of the liquor and then dried at 60° to 80° C. The yarn is then passed between fluted rollers to deform it so that the individual fibers become crinkled. It is preferable that the rollers be hot enough to cause hardening and insolubilization of the resin in the yarn; but if not, the yarn should be further heated to a high temperature (say, 160° C.) for a few seconds to complete this hardening process.

Instead of the resin liquor described above, it is also satisfactory to use one prepared by boiling together for 3 minutes the following mixture:

Urea	50 g.
Formaldehyde (40%)	100 cc.
Ammonia (0.880 sp. gr.)	4.5 g.

followed by cooling and the addition of 3 cc. of a 33% solution of tartaric acid, and finally diluting the whole with an equal amount of water.

The crinkled yarns may be untwisted and then twisted in the reverse direction before incorporating them in the pile of carpets where they tend to untwist and so give a special attractive appearance.

Cupro-Ammonium Rayon
U. S. Patent 204,766

Mix one hundred fifty (150) pounds of copper hydroxide, three hundred (300) pounds of cotton linters and nine hundred (900) pounds of 26° (Baumé) ammonia water; abstract by vacuum one hundred fifty (150) pounds of anhydrous ammonia and then dilute with water to secure a concentration of about 4 per cent of cellulose in the solution to be spun.

Anti-Static Agents for Rayon

Mixtures may be made from diethylene glycol, water, magnesium chloride; or triethanolamine oleate or triethanolamine stearate with a trace of free triethanolamine. The amount to apply is 2 to 10 per cent on the basis of 100 diethylene glycol to 30 water and 6, 7, or 10 of the other ingredients.

Anti-static materials which also have lubricating properties are used up to 2 per cent and include emulsions of oil, water, and such substances as triethanolamine lactate, tartrate, citrate or borate; or similar salts of ethylene diamin or similar amines; also solutions of alkylolamine salts of fatty acids, like oleic, in glycols or other polyhydric alcohols.

Filling Soaking for Rayon

Gelatin		1¼	lb.
Dextrin		1¼	lb.
Sulphonated Coconut and Olive Oil		18	lb.
Water	to make	55	gal.

The above is used for 110 lb. of yarn.

Wool, Unshrinkable
Formula No. 1

The process consists essentially of steeping the wool material for about one hour at room temperature in a 2% solution of sulphuryl chloride in white spirit (carbon tetrachloride and trichloroethylene are also cited as suitable alternative organic solvents which can take the place of white spirit but which have the disadvantage of being more costly). At the end of this steeping the wool is unshrinkable and thereafter it is simply necessary to remove excess of the solution by hydroextraction followed by thorough washing with water and neutralization of the hydrochloric and sulphuric acids formed. In this treatment there is lost per 100 lb. of air dry wool, 1½ gallons of white spirit and not more than 10 lb. of sulphuryl chloride.

It is also possible to use the vapor of sulphuryl chloride instead of a solution of this substance. In this case, the wool is placed in a closed chamber and the air evacuated by means of an air pump. The sulphuryl chloride is then admitted in sufficient amount to make the wool unshrinkable (under low pressures and a moderately high temperature the sulphuryl chloride readily volatilizes). Finally the vapor of the sulphuryl chloride is blown out of the wool with a current of warm air and it is then thoroughly washed and neutralized.

No. 2
British Patent 475,422

Wool which has been scoured is impregnated with following solution:

Formaldehyde	19	oz.
Boric Acid	4	oz.
Glycerin	3	oz.
Urea	10	oz.
Water	95	oz.

The wool material is then dried almost bone dry (the moisture content should not then exceed 2%) so that the urea-formaldehyde resin is formed. Excess of chemicals is then removed by a light scouring in a soap liquor and the wool is left soft and unshrinkable.

Imitation Chamois
U. S. Patent 2,075,967

A napped woven cotton fabric base is impregnated with a rubber dispersion containing in proportion 40 lb. of raw pale crepe rubber, 10 lb. of white factice, 10 lb. of glycerine, 31 lb. of pigment, and 33 lb. of filler, this compound being dispersed in 49 gal. of gasoline passing the fabric through squeeze rolls, repeating the impregnating and squeezing until the desired amount of rubber compound has been deposited in the fabric, drying, dusting both sides of the fabric with talc, vulcanizing by means of sulphur chloride and then subjecting the treated fabric to an atmosphere of ammonia.

Translucent Tracing Cloth
British Patent 464,280

Translucent waterproof tracing cloths are made by treating thin opaque cloth with

Formula No. 1

Nitrocellulose (Low Viscosity)	20	lb.
Alcohol	10	lb.

Tritolyl Phosphate	17 lb.
Carbitol	5.6 gal.

No. 2

Chlorinated Rubber	40 lb.
Poppyseed Oil	20 lb.
Xylene	100 lb.
Cyclohexanol	10 lb.

Mercering Wetting Agents

Formula No. 1

Cresol	90–75%
Oleic Acid	1–11%
Pine Oil	9–14%

2% of the above is used in mercerizing bath.

No. 2

Xylenol	80 lb.
Rosin	18 lb.
Diethylene Glycol and Butyl Ether	2 lb.

Anti-Slip and Non-Wrinkling Backing for Rugs

U. S. Patent 2,073,831

Wheat Flour	1 lb.
Magnesium Chloride (36° Bé.)	3 lb.

Apply to back of rug and imbed in it powdered silica, sawdust or burlap.

Non-Curling Rug Backing

A filler that will both prevent the rug from curling and leave it flexible may be prepared by mixing three parts, by weight, of laundry starch, and five parts, by weight, of chemically pure glycerin. Make a batter of the starch by adding cold water and beating until all lumps have been dissolved, then add the glycerin and water, a little at a time, stirring constantly until the size is of a consistency to be spread easily. Apply with a soft sponge, smoothing the material all over the back of the rug. When dry the rug will be ready for use.

Another size, that will make the rugs stiffer, is made by mixing seven and one-half parts, by weight, of gypsum and thirteen and one-half parts, by weight, of china clay in sufficient water to make a soft batter. Add three parts, by weight, of chemically pure glycerin as a binder. Apply with a soft brush, and when dry brush smooth with a stiff brush.

Crease-Resistant Textiles

In this process, during which the natural feel and wetting-out properties of the fabric are not affected, impregnation rather than coating is employed, while vulcanization takes place in two separate stages. The cotton goods are treated with latex and squeezed through heavy rolls so that 5 to 10% of latex on the weight of the material is finally taken up. After this the goods are dried by hot air, out of contact with metallic surfaces. Next, the goods are immersed for three and one-half hours in a boiling, aqueous dispersion of sulphur and accelerator, as follows:

Formula No. 1

Colloidal Sulphur	24% on wt. of rubber
Zinc Oxide	2% on wt. of rubber
Accelerator	2% on wt. of rubber

The bath contains 10 volumes of water to 1 of fabric. At the expiration of the time period the bath is generally exhausted; the goods are then rinsed, dried and treated in a chamber for 15 to 45 minutes at 115° C. Tests conducted on fabrics made by this process are said to have shown a 92% recovery from creasing in two minutes.

No. 2

Viscose rayon fabric is impregnated with a solution of colophony in tetrahydrofurfuralcohol (1 part dissolved in 20 parts). The fabric is then squeezed uniformly and entered into a 5% solution of formaldehyde containing ½% of acetic acid, the period of immersion being about 2 minutes. The fabric is again squeezed and then dried and heated at 150° C. for 20 minutes. After this treatment the fabric can be hard scrumpled yet it will regain its uncreased condition quickly.

When paraffin wax is used, trichloroethylene can be used as a cheap and suitable solvent. For example,, a cotton-linen mixture fabric which readily creases can be impregnated within about 5 minutes by a 5% solution of paraffin wax (melting point about 63° C.) in trichloroethylene (this solvent is non-inflammable). After squeezing out excess of solution, the fabric is then saturated with a solution containing 5% of formaldehyde and ½% of acetic acid; it is then dried and heated at 150° C. for 20 minutes.

It is possible to vary the order of procedure and this is illustrated by an example dealing with knitted viscose rayon fabric. This is first impregnated with the solution containing 5% of formaldehyde and ½% of acetic acid, and then impregnated with a 5% solution of spermaceti in trichloroethylene. The fabric is then squeezed uniformly, and heated for 20 minutes at 150° C.

No. 3

British Patent 447,651

Treat fabric at 60° C. with an emulsion of

Hydrogenated Sperm Oil	50 g.
Olive Oil Soap	10 g.
Glue, Pearl Hide	5 g.
Water	1 l.

Squeeze out excess from fabric and treat with

Formaldehyde	5 g.
Acetic Acid, Glacial	5 g.
Alum	5 g.
Water	100 cc.

Dry at 150° F. for 20 minutes.

No. 4

Rayon or cotton is impregnated with

Urea	10 kg.
Water, Cold	60 l.

Dissolve and mix with

Succinic Acid	500 g.
Ammonium Chloride	75 g.

Just before use add

Formaldehyde	30 l.

Impregnate; squeeze and stretch fabric.

No. 5

Cellulosic material, especially rayon (not cellulose acetate), is freed from size and stiffening agents, and impregnated with a non-resinous vitreous or (semi-) transparent (not finely-divided or dispersed) metallic salt of an inorganic or organic acid (excepting salicylic acid, or acids which polymerise to form resins), *e.g.*, silicic, boric, lactic, or citric acid. Small amounts of non-acidic substances that cannot form, or are present in such a small amount as to be incapable of forming, a synthetic resin (polyhydric alcohols, lactic acid, etc.) may be included. Heating to 100–150° improves the effect. *E.g.*, The fabric is impregnated with 5% aqueous calcium lactate containing 0.5–1.0% of glycerol, squeezed, dried, steeped in 5–10% sodium silicate containing 0.5–1.0% of glycerol, dried in hot air, and calendered at 100–150°.

DYEING PENETRANTS, SOFTENERS, AND LEVELERS

Denatured alcohol and pyridine are the cheapest and most useful.

Pyridine is a solvent with a boiling point of 116° C. and is an excellent dyeing assistant and wetting out agent. The great objection to its use is its odor but this is a minor fault because of its great efficiency.

In the dyeing of Franklin yarns or in any package or raw stock machine an addition of 2–4 oz. per 100 gallons will insure level dyeings and clean shades.

In dyeing cotton or mercerized yarns in the package, after filling the machine add 2–4 oz. per 100 gallons dependent upon the depth of shade or the winding of the package—circulate both ways while heating to about 120° F. then add the dissolved color and proceed with the regular dyeing operation. In this manner you have no need to give a preliminary scour thus scouring and dyeing in one operation.

Dyeing Hosiery

Frequently a dyer produces some bath which has unevenly penetrated due to the papers plugging the openings in the impeller—or to uneven winding—or too rapid an addition of salt—or failure to properly operate the shift lever. Simply put the batch back (if dyed with Direct Colors) add pyridine (4 oz. per 100 gal.) bring to a sufficiently high temperature to start the color, then add approximately ten per cent more of the color or colors and proceed as though starting a new dyeing—salting on reaching a boil.

Denatured alcohol is used most effectively in wetting out raw stock (simply adding it to the water in the machine) in vacuum dyeing machines prior to their dyeing with vat colors.

Hosiery Composed of Rayon, Mercerized Cotton Top-heal and Toe, with Dye Resist Spun Silk Clockings

This is a difficult combination to dye uniformly and leave the C.R. spun silk clear especially where white is used in the clocking.

After scouring (use no alkali for it has a disastrous effect upon D.R silk) add one per cent of either Katanol W or Thiotan RS or similar product to the dye bath, then the color, then heat slowly taking at the least twenty minutes in bringing the bath to temperature dependent upon the color dyed; then add Glaubers salt (or for dark shades, common salt), in portions, and run at the proper temperature for at least ¾ hr. Some sample formulae are given below:

Slate

100 lb. goods

Direct Fast Gray 2G	0.45 lb.
Pontamine Yellow NNL	0.12 lb.
Diphenyl Red B	0.18 lb.
Glaubers Salt Crystals	115 lb.

One lb. of Katanol W or Thiotan RS added to bath before the color. Dye at 160° F. for 45 minutes. Rinse at 120° F., lukewarm, then cold.

Maroon

Pontamine Fast Scarlet 4BS	2.2 lb.
Pontamine Fast Scarlet 8BS	0.4 lb.
Pontamine Diazo Black BHSW	.52 lb.

Glaubers Salt	35 lb.
Dye at 160° F. for 45 min.	
Katanol W or Thiotan RS	1 lb.
Good Grade Sulphonated Red Oil or Castor Oil	2 lb.*

* With dark shades the castor oil insures better results.

Navy

100 lb. goods	
Pontamine Diazo Black BHSW	3½ lb.
Sulphonated Oil	2 lb.
Glaubers Salt	30 lb.
Temp. 170° F. for 45 min.	

The above color being a silk white color requires no Thiotan or Katanol and the same happens to be true where the black is dyed.

Black

Pontamine Fast Black GCW	5 lb.
Sulphonated Oil	2 lb.
Salt at 160° F. for 45 min.	20 lb.

Nigger

100 lb. goods	
Pontamine F. Orange EG	1.81 lb.
Pontamine F. Scarlet	1.7 lb.
Direct Fast Gray 2G	3 lb.
Katanol or Thiotan	1 lb.
Sulphonated Oil	2 lb.
Salt at 160° F. for 45 min.	25 lb.

*Dark Green**

Amidine Green ST	3½ lb.
Katanol or Thiotan	1 lb.
Sulphonated Oil	2 lb.
Salt at 170° F. for 45 min.	30 lb.

* In dyeing a dark green nearly all greens impart a yellowish tinge to the white D.R. Spun Silk—the above color was prepared especially for leaving the white D.R. Spun Silk clear.

NOTE: Sometimes immunized cotton is used to replace the D.R. Spun Silk but this is for a cheaper grade stocking. Where immunized cotton replaces the D.R. Spun Silk it is unnecessary to use Thiotan or Katanol.

Dyeing 50% Merino Underhose
Flesh Shade

100 lb. Stock	
Diamine Orange F Pontamine Fast Orange S Erie Fast Orange A	13 g.
Diamine Orange B	16½ g.
Polar Red RS Conc.	9½ g.
Glaubers Salt	5 g.

Start dyeing at 120° F. bring to boil in ½ hour and boil 10 min.

Gunmetals

A gunmetal shade on hosiery particularly hosiery made up of rayon face—worsted back and mercerized heel and toe is a difficult shade unless done with proper selection of colors for the tendency is for the rayon to have a shiny bronze appearance and the worsted will show through, imparting a sort of snowy cast when viewed overhand.

This formula eliminates these bad features:

100 lb. Stock	
Erie Black NRX	.50 lb.
Erie Yellow WB	.05 lb.
Trisulphon Brown BT	.02 lb.
Burol Black B	.04 lb.
Glaubers Salt	20 lb.

Up in 20 min.—boil 30—steep 30.

If no worsted is present use:

Erie Black NRX	.06 lb.
Erie Yellow WB	.06 lb.
Trisulphon Brown BT	.24 lb.
Common Salt	15 lb.

Light Gunmetal

This is an excellent combination for all constructions of hosiery and requires no change.

Pont. Fast Black LN	.03 lb.
Trisulphon Brown BT	.09 lb.
Pont. Caled 3G	.06 lb.
Durol Black B	.03 lb.
Glaubers Salt	10 lb.

Up to a boil in ½ hour, add Glaubers and dye cooking ½ hour.

Bleaching

Albone C (100 vol. Hydrogen Peroxide)

Albone C	10 %
Silicate of Soda	2½%

Irrespective of the hosiery construction these amounts are standard. The silicate must be W.W. (water-white) and iron free.

Add silicate to the bleach bath and have water at about 90–100° F., add Albone "C" and heat bath gently to 140° F. for all cotton or cotton rayon combinations, run at this temperature for at least 45 min.; rinse thoroughly first hot, then lukewarm, then cold.

On merino combinations, heat gradually to 120° for one hr., then raise to 125° F. for one hr., give two warm rinses, then enter into a bath containing 1½–2 lb. of Blankit I per gallon and run at 115° F. for 20–30 min. then give an acidulated rinse water (1–2 parts per 1000 parts of sulphuric acid).

This is done to bring out the white to the fullest, for otherwise the worsted shows a creamy tinge. Of course the best bleaches are those made by allowing the goods to lie overnight but the formulae submitted here are given for the purpose of obtaining the maximum result in a minimum of time.

After bleaching some dyers wish to give a special white effect. This is done by blueing in the final rinsing bath. If the dyer finds it difficult to secure uniform results he can overcome this difficulty by doing it in a slightly frothy soap bath.

For this purpose there are a number of colors to choose from.

Alizarine Sky Blue B
Acid Violet 4BN and 6BN
Any Methyl Violet or
Crystal Violet crystals

and where an extremely fast blue white is required it would be advisable to use a vat blue such as Indanthrene Blue RZ powder. This product is stirred well in water and added to the bath by allowing to filter through a linen bag.

Never use a combination of Methyl or Crystal Violet with any of the acid colors, though they alone or together are suitable for blueing.

Fancy Half Hose Containing (Celanese) Acetate Silk

Construction: Mercerized cotton top 36/2 ply

125 Celanese }
125 Mercerized C.P. Yarn } leg.

Single 80/1 Mercerized CP in H.S. and 2 ends 60/2 ply mercerized Heel and Toe.

Black/White

100 lb. Goods

Pontamine Fast Black GCW	5	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed at 120–175° F. for 45 min.– 1 hr.

Black/Maroon

Black GCW	5	lb.
Setacyl Orange 2R Powder	.15	lb.
Setacyl Blue 2GS Powder	.06	lb.
Setacyl Violet R Powder	.07	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed as above.

Black/Rust

100 lb. Goods

Black GCW	5	lb.
Setacyl Direct Orange 2R Powder	1	lb.
Setacyl Direct Red B Powder	0.8	lb.
Setacyl Direct Blue 2GS Powder	0.16	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed as previous shades.

Navy/Iris

Diphenyl Fast Blue 2GL Conc.	3	lb.
Direct Gray 2G	85	lb.
Setacyl Direct Blue 2GS	.09	lb.
Setacyl Direct Violet R	.07	lb.
Setacyl Direct Orange 2R	.01	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed as above.

Navy/Muscadine

Diphenyl Fast Blue 2GL Conc.	3	lb.
Diphenyl Direct Gray 2G	.85	lb.
Setacyl Direct Orange 2R Powder	.14	lb.
Setacyl Direct Blue 2GS Powder	.05	lb.
Setacyl Direct Violet R Powder	.12	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed as above.

Navy/Burgundy

100 lb. Goods

Diphenyl Fast Blue 4GL	3	lb.
Direct Gray 2G	.85	lb.
Setacyl Violet R	2.2	lb.
Setacyl Orange 2R	.8	lb.
Setacyl Blue 2GS	.7	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed as previous.

Steel Gray/White

Pontamine Fast Black LN	.16	lb.
Trisulphon Brown BP	.08	lb.
Pontamine Yellow NNL	.01	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	20	lb.

Dyed as above.

Steel Gray/Gold

Pontamine Fast Black LN	.16	lb.
Trisulphon Brown BP	.08	lb.
Pontamine Yellow NNL	.01	lb.
Setacyl Direct Orange 2R Powder	.48	lb.
Setacyl Direct Blue 2GS	.03	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	20	lb.

Smoke/Rust

100 lb. Goods

Pontamine Fast Black FF	.5	lb.
Diphenyl Catechine R	.05	lb.
Diphenyl Red B	.01	lb.
Setacyl Direct Orange 2R	1	lb.
Setacyl Direct Red B Powder	.8	lb.
Setacyl Direct Blue 2GS	.16	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dyed as previous.

Cocoa/White

Diphenyl Catechine R	1	lb.
Direct Gray 2G	.1	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	20	lb.

Medium Brown/White

Diphenyl Catechine R	1.2	lb.
Diphenyl Catechine BB	.06	lb.

Sulphonated Oil	2	lb.
Glaubers Salt	30	lb.

Chestnut/White

Trisulphon Brown BP	1½	lb.
Diphenyl Catechine BB	½	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	30	lb.

Chestnut/Rust

100 lb. Goods

Trisulphon Brown BP	1.5	lb.
Diphenyl Catechine BB	.5	lb.
Setacyl Direct Orange 2R	1	lb.
Setacyl Direct Red B. Powder	.8	lb.
Setacyl Direct Blue 2GS Powder	.16	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Pastel Shades

Green/White

100 lb. Goods

Direct Gray 2G	.15	lb.
Diphenyl Blue 2GL Conc.	.075	lb.
Pontamine Yellow NNL	.12	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	20	lb.

Tan/White

Diphenyl Catechine	.42	lb.
Pontamine Fast Red 8BLN	.05	lb.
Direct Gray 2G	.05	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	20	lb.

Blue/Ching or Copenhagen

100 lb. Goods

Direct Gray 2G	.15	lb.
Diphenyl Blue 2GL	.06	lb.
Setacyl Direct Blue 2GS Powder	.15	lb.
Setacyl Direct Yellow 2G Powder	.1	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	30	lb.

Black/Dark Red

Pontamine Fast Black GCW	5	lb.
Setacyl Direct Red B Powder	5	lb.
Setacyl Direct Blue 2GS Powder	1	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Navy/Dark Blue

Pontamine Diazo Black BHSW	3.2	lb.
Setacyl Direct Blue 2GS Powder	1	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Cordovan/White

Benzochrome Brown B	2.5	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Gun Gray/White

100 lb. Goods

Erie Black NRX	.6	lb.
Erie Yellow WB	.06	lb.
Trisulphon Brown BP	.24	lb.
Sulphonated Oil	2	lb.
Common Salt	15	lb.

Pastels

French Blue/White

Pyrazol Fast Blue BS	.04	lb.
Sulphonated Oil	2	lb.
Run 20 min.		
Glaubers Salt	10	lb.
Run 30 min.		

Maize/White

Pontamine Yellow CH	.15	lb.
Diphenyl Red B	.01	lb.
Sulphonated Oil	2	lb.
Run 10 min.		
Glaubers Salt	10	lb.
Run 35 min.		

Light Gray/White

Pontamine Fast Black LN	.042	lb.
Diphenyl Catechine G	.03	lb.
Diphenyl Red B	.003	lb.
Sulphonated Oil	2	lb.
Run 10 min.		
Glaubers Salt	10	lb.
Run 15 min.		
Salt	5	lb.
Run 20 min.		

Nile Green/White

Tastusol Green LBB	.2	lb.
Sulphonated Oil	2	lb.
Run 20 min.		
Salt	5	lb.
Run 30 min.		

Black/Red

Pontamine Fast Black GCW	5	lb.
Artisil Direct F. Red BP Con.	2	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Brown/Champagne

Trisulphon Brown BP	2.5	lb.
Diphenyl Fast Blue 4 Gl	.25	lb.
Celanthrene Scarlet G	.025	lb.
Sulphonated Oil	2	lb.
Glaubers Salt	40	lb.

Dark Cordovan Nigger/Blue

Benzochrome Brown	2.5	lb.
Setacyl Direct Blue 2GS	2	lb.
Glaubers Salt	40	lb.
Sulphonated Oil	2	lb.

All above dyeings except the pastels are dyed between 170–175° F. for 45 min.–1hr. and the Glaubers salt added in portions after reaching that temperature.

The Celanese or Acetate colors are first pasted with the sulphonated oil then added to the bath.

Hosiery Dyeing

In the dyeing of hosiery, frequently, there is a demand for oxford gray heather yarn for ingrains. The customary method has been for the manufacturer to purchase a merino blend and knit up the half hose from this yarn. A formula has been developed whereby it is only necessary to purchase 70 cotton/30 or 60 cotton/40 white merino yarn and produce at a low cost a very fast dyeing oxford gray.

After the usual scour the bath is given 1% sodium carbonate and run with just the chill off the water for ten minutes —then 3% Developed Black (any standard diazo black BH type) is added to the bath (previously dissolved) and run a few minutes, the steam is turned on and the temperature brought to 140° F. —then add slowly and in portions 30% common salt and run at 140° F. for at least 30 minutes.

Rinse well and diazotize cold for 20 minutes using

Sodium Nitrite	3 %
Muriatic or 5% Sulphuric Acid	7.5%

Rinse thoroughly and develop, using

Metatoluenediamine	.2%
Beta Naphthol	.8%
Caustic Soda	.8%

and run cold for 10-15 minutes.

It is extremely important to use the mixed developers as stated for this reason. If M.T.D. and soda ash alone are used the animal fibers take on a yellow to golden stain (due no doubt to formation of chrysoidine).

If beta naphthol and caustic alone are used the animal fibers will be clear but there will be a blueness to the cotton present.

This formula has ben used on thousands of dozens of half hose in production of English rib and plain merino clocked numbers and in the Franklin machines.

It is not necessary to use any of the many products for resisting animal fibers to replace the soda ash and no destructive action has been evident nor have the results been improved by such change.

To produce a good *Navy* in a similar manner for heather effect the following is used:

Navy Heather

Diazo Black BHSW	1.5%
Diazo Blue BR	1.5%
Diazo Violet BL	.5%
Soda Ash	1 %
Salt	25 %

at 140° F.—30 min.

Mix well—diazotize as for Oxford. Develop using

Beta Naphthol	1%
Caustic Soda	1%

Cold—10° F.

Brown Heather

Diazo Orange 3G	2.5%
Diazo Bordeaux 7B	1.3%
Diazo Black BHSW	.5%

(Dyed as for Navy)

For the production of very dark *cordovan heather* with reasonable fastness and at a minimum of cost:

Diamine Brown M	3½%
Direct Brown D3G	1½%

may be used and although they are ordinary direct (or substantive) colors they are capable of being diazotized and developed and produce when dyed a very fine *Cordovan Heather* at a minimum cost.

The dyeing procedure is identical with that for the Navy Heather and Brown Heather.

Textile Printing Pastes

China Blue (Bleu Fayence)

10 gal. hot water—50 lb. green copperas—25 lb. acetate of lead; dissolve and let settle; thicken the clear with gum Senegal very thick. Indigo, 1 lb. ground up well, with 3 qt. of the acetate of iron above—½ lb. crystals of tin—1 gal. of the thickened acetate of iron.

Process of fixing—(1) lime—(2) copperas liquor 6 lb. per 10 gal.—(3) Strong lime vat—(4) copperas liquor at 11 lb. per 10 gal.—(5) caustic soda or potash 14° Tw.—(6) sulphuric acid at 4° or 5° Tw.

China Blue

1 lb. indigo, best quality—1 lb. sulphate of iron (green copperas)—1 qt. water. Grind well together and add 4 lb. iron liquor at 14° Tw.—½ pt. water; heat gently up to 140° F. and thicken with gum.

Process of fixing.—There are four vats. (1) lime—(2) sulphate of iron at 10° Tw.—(3) caustic potash or soda—(4) sulphuric acid at 4° Tw. Three dips alternately in the first and second vats of fifteen minutes each; thirty minutes in No. 3 vat and fifteen minutes in No. 4.

Dark China Blue

12 lb. indigo—2½ gal. iron liquor at 12° Tw.; heat to 212° F. and leave to steep—12 lb. green copperas—3 lb. crpiment; grind all together perfectly, and

add 1 gal. iron liquor at 12° Tw.—4 lb. Barbary or Senegal; grind all together. For darkest color and standard add 4 gal. iron liquor at 12° Tw. thickened with 16 lb. gum. Reduce for lighter shades with iron liquor at 12° Tw. thickened with gum.

The colors having been printed, the prints are allowed to age for some time prior to further processing.

Textile Printing Paste

German Patent 601,860

Sirius Yellow	20 g.
Urea	50 g.
Phenol	25 g.
Furfural Alcohol	10 g.
Glycol	15 g.
Water	230 cc.
Gum Tragacanth Thickening	650 g.

Textile Printing Paste

Starch-Tragacanth or Starch-British Gum Thickening	4–5 pt.
Dyestuff in Paste Form	1 lb.
Lactic Acid	8 oz.
Tartaric Acid	4 oz.
Glycerin	½ gill
Ferrous Sulphate (1:2)	1½ pt.
Bulk to	
Print Paste	1 gal.

Textile Resist for China Blue

Water	1 gal.
Sulphate of Copper	2 lb.
Sugar of Lead	2 lb.
Flour	2½ lb.
Boil, and when nearly cool, add	
Nitrate of Copper Crystals	5 lb.
Strong Lime Juice	1 qt.

Textile Resist

Stock Vat with Ferrous Sulphate and Tin Crystals

Vat Dyestuff Paste	10 lb.
Caustic Soda (70° Tw.)	4 gal.
Add	
Ferrous Sulphate	13 lb.
dissolved in	
Water	3–4 gal.
and	
Tin Crystals	2½ lb.
dissolved in	
Water	1 gal.
Bulk to	10 gal.

Stir well—cover and allow to stand for ½ hour. If kept covered this solution will be stable for several days. The foregoing proportions are, of course, only set forth in a general way to illustrate the preparation of a stock vat of this type.

Textile Resist

A copperas-lime vat containing approximately 800 gal. of liquor consists of roughly the following proportions of ingredients:

Ground Indigo	36 lb.
Ferrous Sulphate or Copperas	60 lb.
Slaked Lime	85 lb.

Textile Printing Resist, White

Starch-British Gum Thickening	3 gal.
Soft Soap	4 lb.
Zinc Sulphate	10 lb.
Nitrate of Copper	1 pt.
Bulk to	
Print Paste	5 gal.

Vat Printing Pastes

Formula No. 1

Corn Starch	55 lb.
Dark Burnt British Gum	220 lb.
Potash, Calcined	220 lb.
Hydrosulphite, Lump	160 lb.
Glycerin	5 gal.
Hydrocarbon Oil	2 gal.
Water, to make	100 gal.

No. 2

Corn Starch	60 lb.
Light Burnt British Gum	180 lb.
Potash, Calcined	220 lb.
Hydrosulphite, Lump	160 lb.
Glycerin	5 gal.
Textile Gum	5 gal.
Hydrocarbon Oil	2 gal.
Water, to make	100 gal.

No. 3

Wheat Starch	40 lb.
Gum Tragacanth Paste (6%)	30 gal.
Glycerin	8 gal.
Soda Ash	160 lb.
Hydrosulphite, Lumps	125 lb.
Water, to make	100 gal.

Steaming Recipe for Soluble Vat Dyes

Soluble Vat Dyestuff	50 g.
dissolved in	
Water	2 pt.
and added to	
Neutral Starch-Tragacanth	½ gal.
Add	
Chlorate of Soda, 4 lb. per gal.	¼ pt.
and just before use	
Ammonium Vanadate Solution (1%)	⅝ glass
Ammonia (25%)	⅝ glass
Bulk to	
Print Paste	1 gal.

Non-Caking Starch Paste

French Patent 811,598

Starch	97–95 g.
Lecithin	3– 5 g.

The above will swell without caking in cold water.

Zinc Dust Color Discharge Paste

Basic Dyestuff	4 oz.
pasted up with	
Acetin	½ gill
Aniline	½ gill
Glycerin	½ gill
and dissolved in	
Hot Water	1 pt.
Add this solution to	
British Gum Thickening	3–4 pt.
Zinc Dust	2 lb.
Formaldehyde	¼– ½ gill
Sodium Bisulphite (71° Tw.)	1½ pt.
Tannin-Acetic Acid (1:1)	½ pt.
Print Paste	1 gal.

Steam Black Dyeing of Cotton

Steam Black is produced by padding the cotton pieces with a solution containing aniline salt, sodium chlorate and yellow prussiate of potash. This is followed by steaming in a rapid ager of the Mather-Platt type for about 2 minutes and by chroming for about 1 minute in a solution of potassium bichromate (5 lb. per 100 gal.) at 122° F.

The following padding solution is recommended: 40 lb. aniline salt, dissolved in 6 gal. of water, 26 lb. yellow prussiate, dissolved in 15 gal. of water, and 15 lb. of sodium chlorate, dissolved in 3 gal. of water.

For very thin, light goods, it is advisable to make the padding liquor slightly alkaline by the addition of a small quantity of ammonia.

DYEING PROCEDURE WITH LOGWOOD BLACK

Logwood black is produced on cotton piece goods by mordanting the cotton first with a metal hydrate and afterwards treating with logwood. The following is a procedure which may be adopted: The goods are first given two ends in warm water, which removes any loose size that may be present and might in the course of time interfere with the myrabolam liquor. The goods are then given two ends boiling in a 10% solution of myrabolam extract, and allowed to lie overnight. Next day, the pieces are mangled, and treated on a padding machine or ordinary mangle with iron liquor at 8° Tw. and again allowed to lie overnight in the wet state. The cloth is subsequently treated at the boil in a bath containing 10% burnt lime. Great care must be taken in ensuring that the lime is boiling and remains alkaline at the end of the operation so that complete fixation of the iron salt is obtained. The cloth is then given four ends through cold water and dyed with the following mixing:

For 100 lb. Material.	
Hematine Crystals 2A	5 lb.
Bark Extract	4 lb.
	30 gal.

8 ends at the boil.

Precautions During Dyeing and Washing

The pieces are finally washed-off very well in cold water and are ready for mangling and drying. It should be noted that the myrabolam extract is best added in two portions, i.e., one half at the beginning of the first and second ends, and also the same remarks apply as far as the Hematine crystals are concerned. There is no question however of this being necessary with the iron liquor or lime solution.

It is important to take care that the myrabolam is at the boil during the whole run through, in order to ensure a complete saturation of the cotton. A very important operation is the washing-off after liming, and to obtain a clean black, the loose iron salt must be completely removed before the goods enter the dye liquor. Finally the dyestuff must be thoroughly dissolved before adding to the jig and the liquor kept well stirred until the solution is complete.

The shade of logwood black is not fully produced for some time after dyeing and results cannot be judged on the tone immediately the pieces leave the drying cylinders. There is no question with logwood blacks of taking out patterns, because the process is more of a chemical one and depends mainly upon the correct proportions of the various products. If the right quantities and conditions prevail each time, the shade will more or less automatically come up the same subsequently. There is a tendency however for the black sometimes to come up on the purple side, and this can be rectified by the addition of a little fustic or bark extract to the starch.

"Beetling" to Obtain Finish and Luster

After drying and conditioning, black silesias are lighly damped and stretched to about 38½". They are then transferred to the beetles for a "slabbing," ranging from 16–48 hours, according to the nature of the cloth and the required degree of luster. Very low qualities of blacks are rarely beetled longer than 16 hours, but some of the old-time heavy weights will stand as long as 64 hours beetling before the best results are obtained. This initial beetling or "slabbing" serves not only for luster, but to give a closeness of fabric unobtainable by any other means. Beetling is preferably carried out on metal beams with the heavy type of wooden fallers; the pieces will be changed round every four hours or so.

Application of Colored Starch

After beetling, the goods are starched once or twice with a mixing similar to the following:

For 25 pcs. Blk. Silesias. Weight 18 lb./70 yd.

Sago Flour	90	lb.
Dextrine	100	lb.
Oleine Oil (50%)	¾	gal.
Direct Black B	4	oz.
	60	gal.

The above mixing serves for this particular weight of cloth, but the quantity of filling must obviously be regulated according to the weight of the pieces being dealt with. Roughly speaking the heavier the cloth, then the less filling is required.

Viscose-Cotton Mixture Dyeings

Turquoise Shade

Turquoise Blue GGS	5¼	oz.
Victoria Blue B	½	oz.
dissolved in		
Acetic Acid (40%) (210° F.)	½	gal.
Wheat Starch Standard (1 lb./1 gal.)	5	gal.
Color Oil	2	pt.
When cold add		
Tannic Acid Solution (4 lb./1 gal.)	¾	gal.
Bulk to	6	gal.

Chocolate Shade

Bismark Brown R	8	oz.
Auramine O	1	oz.
dissolved in		
Acetic Acid (40%) (180° F.)	½	gal.
Wheat Starch Standard (1 lb./1 gal.)	4	gal.
Color Oil	2	pt.
Standard Logwood Black	3	pt.
When cold add		
Tannic Acid Standard	½	gal.
Bulk to	6	gal.

After printing, the goods are steamed for half an hour in a cottage steamer at about 40 lbs. pressure. In some cases, to cheapen the process, this latter procedure is omitted, though inferior fastness obviously results.

Cotton Yarn Brightener

Brightening with an emulsion of oil is applied chiefly for blacks; the dyeings not only gain thereby considerably in fullness and depth of shade, but also acquire a much softer handle.

This brightening is also useful if the shades have been dyed too deep and thereby appear bronzy; in such cases 1½–3 oz. glue previously soaked in cold water are added to the bath in addition to the following weights.

The ingredients per 10 gal. liquor are approximately:

Neutral Soap	3 –8	oz.
Olive Oil	1½–4½	oz.
Soda Ash	¾–1½	oz.

To commence with, they are boiled well for 20 or 30 minutes with 1–2 gal. of water as free from lime as possible, and are then added to the bath for which as soft water as possible should also be used.

In this bath the yarns are treated for 15 to 20 minutes, whereupon they are whizzed without rinsing, and dried.

Vat Color Printing Paste for Shirtings

Dyestuff Pastes	2	pt.
Starch-Tragacanth	4–5	pt.
Tartaric Acid (1–1)	½	pt.
Glucose (1–1)	¼	pt.
Tin Crystals (1–1)	3/16	pt.
Ferrous Sulphate	1½	lb.
Water	2	pt.

Dyeing Cotton and Rayon, Leaving Rayon White

Dye at 120–130° F. using ¼% sodium stannate (based on total weight of dye liquor).

Preliminary to Dyeing of Spun Rayons

Treat for two hours at 70–75° C. in a bath of

Hydrogen Peroxide (30%)	1 l. 4 cc.
Sodium Silicate	6.0 g.
Caustic Soda	0.5 g.

Sodium Pyrophosphate	5.0 g.
Wetting Out Agent (Sulfatate Type)	1–2 g.

Then treat for one hour at room temperature with 1 g. active chlorine per l. Rinse and treat for two hours at 70–75° C. with

Hydrogen Peroxide (30%)	1 l. 1 cc.
Sodium Silicate	6 g.
Caustic Soda	0.5 g.
Wetting Out Agent	1–2 g.

Mordanting Rayon

In mordanting either viscose or cuprammonium silks for the basic dyes, the rayon should remain for 2–3 hours in a bath containing 2–5% of tannin and 1% of hydrochloric acid, on the weight of the goods, at 50° C. (122° F.). The material is then removed, the excess of liquor removed (but not rinsed), and treated for about 20 minutes in a fresh cold bath containing 1–2.5%, or about half of the percentage of tannin used, of tartar emetic. More even shades are obtained on viscose mordanted with Katanol than on tannin-antimony mordanted viscose. If particularly fast dyeings are wanted, such as for cross-dyeing, the basic dyes should also have a top mordant by repeating the above process after dyeing. Basic dyes are often used to top the substantive dyes on rayons, thus brightening the shade.

INDIGOSOL DYEING ON RAYON

The indigosols, acid ester salts of vat colors are especially adapted for the production of fast colors in light shades on rayons. Any of the rayons, lustrous or delustered, excepting the acetates, can be dyed either on the jig, or padded. Clear, even shades are obtained, and bar or weave marks are eliminated.

The color is dissolved in hot water; (do not boil or heat with live steam as that will destroy the color). An addition of 1% Nekal BX is recommended. Glauber's salt is required, about 25–50 g. per l. depending upon the depth of shade dyed. The dyeing is started at a temperature of 40–60° C., using about ½ the required amount of color. Run 1 end, then add the remainder of the color and run another end. Add ½ the required amount of Glauber's salt, run 2 more ends, add remainder of Glauber's salt and run 2 or 4 more ends to shade. Then without rinsing or drying give 2 ends in a developing bath containing 20 cc. sulphuric acid and 1 g. sodium nitrite per l. at 20–70° C. depending upon the color used. After developing, the goods are thoroughly rinsed and neutralized in a warm soda ash solution (2–3 g. per l.)

Dyestuff which has been dissolved in hot water (no direct steam)

Soda Ash	1/10%
Gum Tragacanth (8 oz. Paste)	5 %
Nekal BX or Other Wetting Out Agent	1/10%
Sodium Nitrite	1 %

All chemicals are dissolved and added to the padding bath. The addition of Sodium Hydrosulphite N.F. concentrated is also advantageous, ranging from ¼–1 lb. per 100 gal. depending upon the color used. Temperature of padding bath 40–60° C.

The goods are padded on the nip passing through the liquor before it hits the nip which insures better penetration. After padding, the goods are batched up and developed wet in 20 cc. sulphuric acid per l. at a temperature from 40–60° C. for 5 seconds, then skyed for 20 seconds, rinsed, neutralized, soaped and rinsed. All this is done continuously in the open.

The Printing of Rayons, Both Lustrous and Delustered with Indigosols and Pharmasols

The Indigosols and Pharmasols are particularly interesting for printing rayons, both lustrous and delustered, by the various processes given herewith. Exceptionally bright colorings are obtainable possessing excellent all around fastness properties.

Printing Lustrous Rayon with Indigosols

There are 3 methods of printing Indigosols on rayon:

(a) Steam process.
(b) Nitrite process.
(c) Nitrite and Chromate combination process.

All 3 give good results and the method used depends largely upon the equipment available.

a. *Steam Process*

The colors are made up as follows:

Color	1 oz.
Urea	1 oz.
"Cellosolve"	2 oz.
Water Gum Tragacanth	90 cc.
Sodium Chlorate (1:3)	6 cc.
Ammonium Vanadate (1:100)	1 cc.
Ammonia (26%)	1 cc.

Print, dry, and steam without pressure 20 minutes. Rinse and soap.

b. *Nitrite Process*

Color	1 oz.
Urea	1 oz.
"Cellosolve"	2 oz.
Water Gum Tragacanth	96 cc.
Sodium Nitrite	1 oz.

Print, dry and age 8 minutes. Then develop with 2% sulphuric acid by volume 5 seconds at 60–70° C. Sky 20 seconds, rinse and neutralize with warm soda ash solution (2–3 g. per l.). Rinse and soap. If aged in acetic acid fumes the nitrite is omitted in the print paste and 1 g. per l. is added to the developing bath to oxidize the Indigosols.

Dyeing Rayon Black

Aniline Hydrochloride	80 oz.
Aniline	5 oz.
Sodium Chlorate	50 oz.
Copper Sulphate	5 oz.
Methylethyl Acetone	173 oz.
Diethylene Glycol	86 oz.
Water	600 oz.

Acetate Rayon Printing Paste

Anthraquinone Dye Powder	1– 8 oz.
paste up with	
Sulfonated Olive Oil, Glycerin, or Glycol, etc.	2–16 oz.
add	
Boiling Water	2 qt.
strain into	
Textile Gum	2 qt.

Black Printing Paste for Acetate Rayon

Diphenyl Black Base I	4½ oz.
dissolved in	
Lactic Acid (Tech.)	12 oz.
Formic Acid (90%)	12 oz.
add to	
Starch-Tragacanth Thickening	2½ qt.
Add when cold	
Sodium Chlorate (25%)	12 oz.
Aluminum Chloride Crystals	4 oz.
dissolved in	
Water	12 oz.
Ammonium Vanadate (1 to 500)	1 oz.

Printing Delustered Designs on Acetate Rayon

U. S. Patent 1,989,209

Starch	15 lb.
Water	45 lb.
Gum Tragacanth Thickening	20 lb.
Pine Oil Mixture A	20 lb.

Pine oil mixture A consists of the following ingredients:

Pine Oil	70 lb.
Monopole Oil (or Turkey Red Oil)	15 lb.
Caustic Soda	15 lb.

The cellulose acetate fabric is printed with the above described paste, then dried, and steamed for 30 minutes at 100° C. Under these conditions the printed portions acquire an opaque chalky appearance which is in distinct contrast to the surrounding lustrous fabric.

It may be remarked that cellulose acetate rayon fabrics may also be uniformly delustered all-over by boiling in a soap liquor containing pine oil. If the liquor is maintained at 99 to 150° C. this delustering occurs quite rapidly, but if the temperature reaches only 95° C. then delustering is slow and may require at least 1½ hours to complete it. It will therefore be concluded that delustering in a winch machine is likely to be slow since it is difficult, because of the large surface of the liquor which allows evaporation, to secure a temperature of more than 95° C. For the most rapid delustering it is advisable to hang the acetate rayon material in a pine oil liquor heated by means of closed steam coils placed at the bottom of the vessel; this enables a temperature of 100° C. to be obtained with certainty.

By means of the printing process described above it is possible to secure some very pleasing luster patterns, but it should be noted that the delustered parts regain their luster if hot ironed at too high a temperature.

Crepe Dye Liquor Baths

Formula No. 1

Olive Oil Soap	8 lb.
"Gardinol" WA	12 oz.
Soda Ash	1 lb.

No. 2

Olive Oil Soap	6 lb.
Sulphonated Castor Oil	3 lb.
Brilliant "Avirol" L-144	8 oz.
Sodium Hexametaphosphate	1 lb.

Anti-Static Cellulose Acetate Dyeing

British Patent 452,160

Glycol	100 oz.
Magnesium Chloride	30 oz.
Dye (Fugitive)	1 oz.
Water	10 oz.

Dyeing Cellulose Esters

British Patent 468,863

Water	300 l.
Olive Oil Soap	300 g.

Calcium Sulphate	3000 g.
1-Amino-4-Hydroxy-anthraquinone	25 g.

Use at 70–75° C. for 45–50 min. while blowing warm air through solution.

Translucent Printing Ink for Cellulosic Fabrics

German Patent 639,186

Calcium Thiocyanate	710 g.
Water	106 cc.
Viscose Waste	22 g.
Formaldehyde (40%)	162 g.

The patterns are developed by treating printed fabrics with steam or calcium chloride solution.

Silk Brightening

Boil with open steam 3–6% olive oil with about one-half this amount of soda ash and three times the quantity of soft water to form an emulsion; add this emulsion to the brightening bath previously heated to about 30° C. (85° F.), and immediately enter the silk. Give the silk a few quick turns in this liquor, then acidify the bath with an organic acid, adding with advantage at the same time one of the protective agents, sulphocyanides, thiourea or hydroxylamine (which are patented as protective agents), then turn the silk again a few times, and finish it off in the customary manner. Olive oil and potassium hydrate emulsions are used for the same purpose.

Dyeing Bleached Jute and Coir

For 100 lb. stock, processed in a bath of 300 gal. Sulfocyanine Navy type, 1½ lb.; Direct Black BH type, 3 lb.; Sulfocyanine Black type, 12 oz.; Roccelline or Fast Red A type, 1 oz.; Direct Black E type, 5 oz.; common salt, 5 lb.; ground potash alum, 1 lb. The load should be entered into the dyebath at about half-boil, the salt and the alum being omitted. When the stock is properly saturated, the common salt may be put in the kettle, this then being raised to 90° C. during about one-half hour; the alum may next be used, preferably in solution with about a pailful of hot water. It is advisable to add the alum solution slowly to the kettle because its effect is to encourage the fiber to take up both the acid dye and the substantive color; should the latter be absorbed in an irregular manner, the unlevelness cannot readily be rectified by vigorously boiling the kettle, as is the case when it is desired to level-out acid color. Wherever possible, dyeing should be completed without raising the temperature of the kettle over about 90° C., for processing at, or too near, the boil prevents development of a rich, deep shade of blue or navy.

Logwood extract may be used as foundation dyestuff for processing inexpensive navy on half-bleached jute, or jute in an unbleached condition, where the amount of yellowish-brown natural coloring matter in the fiber is insufficient to seriously flatten the shade of logwood blue. Brilliant-toned acid violet dyes are used to enliven logwood blue on bast fiber; two methods of processing these compound blues will now be given. The cleanest dyeings are secured first by mordanting the stock and then coloring it with logwood extract in a fresh bath; the mordanting process is as follows: The kettle is prepared with 5% copperas, 2% potash alum and 2% of acid violet similar to Pontacyl Violet C 4B or Wool Violet 4 BN. The load is entered in the dry condition in the boiling kettle, about fifteen minutes processing at boiling temperature being allowed; steam is then turned off, processing being continued in the cooling liquor for a further half-hour. The load is then raised out of the kettle and transferred to another apparatus for rinsing in cold water. The dye-kettle is then prepared with 2% or more of dry logwood extract, the stock being entered into the lukewarm liquor. Absorption of the hematine is rapid, even at a lukewarm temperature. Care should be taken to slowly heat the kettle, for if the hematine is absorbed in an irregular manner, it will be necessary to boil the bath to rectify the unlevelness; if boiling is resorted to, a good deal of the acid violet leaves the bast fiber and is not re-absorbed entirely, even if processing without steam is continued until the liquor has cooled to a lukewarm condition. It is therefore advisable to process logwood blue at little more than half boil.

Color Printing on Wool

Firstly, the wool must be clean and in the right condition for the process. A mixture of 15 lb. sodium bisulphite liquor of 35° Bé. and 85 lb. of water is made up and a small piece of wool placed on the surface of this solution. If the skein sinks in 30 to 50 seconds, that wool is suitable for printing, but if not, if sinking takes longer, the goods must be given a boil in dilute vitriol containing a little wetting-out agent.

The dyestuff paste is made up of dyestuff, 50 lb.; British gum, 400 lb.; 50 per cent Monopole soap, 50 lb., and water, 500 lb.

A paste for printing purposes may be

made up from the foregoing color paste as follows:

Color Paste (as above)	540 lb.
Gum Tragacanth (6%)	335 lb.
Sodium Bisulphite (35° Bé.)	125 lb.

After applying the paste on the drums, the yarn is dried but only just, and then steamed for one hour without pressure, after which it may be washed.

Logwood Dyeing of Wool

The method adopted for carrying out the one-dip process with logwood proceeds on the following lines. When the goods are entered into the hot prepared dyebath, the wool almost immediately begins to attract some of the metal salts contained in the solubilized color lake and the fiber becomes gradually mordanted as a result of the process. The fiber is then in a condition to attract the hematine simultaneously liberated from the combination with the metal salts as the color lake commences to dissociate, and provided no excess of oxalic acid is present in the bath, a certain amount of an insoluble black color lake is gradually deposited within the wool fiber. It is thus perceived that the goods are now colored a black of an intensity commensurate with the amounts of logwood, etc., that have been employed.

A sure guide to the proper condition of a one-dip logwood black bath before entering the goods is the color of the solution. This should be a golden brown shortly after the oxalic acid has been put in. If the liquor is black or greenish, it is a sign of the existence of undissolved color lake, hence a little more oxalic acid should be added. A method of stuffing the bath for one-dip black consists in boiling up the requisite amounts of ferrous sulphate and copper sulphate in a volume of water practically equivalent to that which constitutes the normal working amount for a certain batch of goods. When the metal salts have been dissolved, an appropriate amount of hematone red paste is stirred into the bath and the liquor is then well raked. The liquor will then be found to have turned black, and if a little is poured on to a piece of blotting paper, a black deposit of color lake will be left behind. Finally, the oxalic acid may be put in the bath, the crystals being added just as they are, since they readily dissolve. Alternatively, a slightly increased amount of brown tartar crystals may be used in place of oxalic acid. In this event, the black color produced on the goods will be a little bluer and more bloomy than if oxalic acid had been employed. When it is perceived that the liquor has assumed the proper yellowish-brown hue, the goods may be entered into the boiling bath, for the color usually levels very well. If the fabric is of a densely milled and rather thick variety, it is better to enter the batch at about half-boil. Hematine crystals, if used instead of hematone red paste, should be well dissolved before adding them to the solution of the sulphates. It is best in such a case to boil up the hematine crystals in the bath, in a large volume of water, before adding the well dissolved copper and iron sulphates.

One factor influencing the tone of the black produced by the one-dip process is the relative proportions of copper sulphate and iron sulphate. If an excess of the iron salt is employed, the resultant black shade possesses a more brownish tone than a black processed with a lesser proportion of iron sulphate. It is, in fact, quite feasible to omit the ferrous sulphate in a formula for one-dip logwood black; in this event, the shade is frequently less rich than one processed in the presence of iron sulphate. The following formula for one-dip black is used for 180 lb. of worsted piecegoods:

Formula No. 1

One bath method

Ferrous Sulphate	1 lb.
Copper Sulphate	2½ lb.
Hematone Red Paste	50 lb.
Oxalic Acid	1 lb.

No. 2

Two bath method

Potassium Bichromate	4 lb.
Brown Tartar Crystals	3 lb.
Hematone Red Paste	42 lb.

No. 3

One bath method

Ferrous Sulphate	½ lb.
Copper Sulphate	1¼ lb.
Hematone Red Paste	27 lb.
Oxalic Acid	1 lb.
Acid Black 4B	8 lb.

Multi-Color Effects on Skein Wool

The goods are passed through a cold bath of about 300 liters of water, five liters of hypochlorite of soda solution 5° Bé. and 2 liters of 66° Bé. sulphuric acid. They are then rinsed. This chlorinating has of course certain disadvantages as far as the wool is concerned. The spinning and fulling capacity is always more or less affected, and there is also the possibility of weakening the fiber. Therefore, as a substitute for chlorination, tin can be used for bottoming. In this case the wool is treated in a 3–6° Bé. solution of sodium stannate, allowed to remain in the solution for several hours, passed through a sulphuric acid bath of 10° Bé., thoroughly rinsed, and dried. This tin treatment can also be combined with the chlorine treatment, in which case it precedes the chlorinating. In the case of combed silver which is very delicate, it is better to omit the chlorinating altogether. For the printing paste any of the various dyestuff classes can be used. Yarns intended for men's wear are printed if possible with mordant dyestuffs, for the sake of greater fastness, while for women's fabrics ordinary acid, basic, and direct dyestuffs suffice. The following is an example for a printing paste:

One-Dip Chrome Blue	50	g.
Water	515	g.
British Gum	250	g.
Oxalic Acid	30	g.
Sodium Chlorate	5	g.
Acetic Acid (7° Bé.)	30	g.
Chromium Fluoride (in 50 g. Water)	50	g.
Glycerin	20	g.
Sulphonated Castor Oil	10	g.

A formula for ordinary acid dyestuffs is:

Dyestuff	30	g.
Water	600	g.
British Gum	250	g.
Oxalic Acid	25	g.
Glycerin	50	g.
Acetic Acid (7° Bé.)	50	g.

After the printing, the wool is not dried, but is steamed immediately twice, each time for one hour and a half, and washed.

Rayon Plush and Velvet Dye Bath

Formula No. 1

Substantive Dyestuff	2	lb.
Glycerin, Brown	4	lb.
Water, Condensed	2	gal.
British Gum Thickening	6	gal.
Caustic Soda (75° Tw.)	1	gal.

No. 2

Basic Color	1	lb.
Acetic Acid (30%)	20	lb.
British Gum Thickening	8	gal.

No. 3

Basic Color	2	lb.
Acetic Acid (30%)	15	lb.
Acetone	1½	lb.
Water	5	gal.
British Gum	18	lb.
Tannic Acid *	5	lb.
Water	5	lb.

* This solution is only added when color solution is cold.

After steaming, the pieces are treated for a few minutes in a lukewarm bath charged with 12 oz. of tartar emetic per 10 gallons of water. This operation is commonly performed in a star machine but it may also be carried out in a winch apparatus where the more robust velvets are being dealt with. After being treated with tartar emetic, the batch is given a light rinse in cold water, after which the pieces are hydro-extracted.

The following basic colors may be used for printing upon acetate rayon velvet: Magenta Crystals; Victoria Blue B, R; Safranine T; Rhodamine 6G and B; Methyl Violet, all brands; Bismarck Brown; Acronol Yellow TS; Acridine Orange; Nigrosine, etc.

No. 4

Paste Vat Color	10	lb.
Glycerin, Brown	3½	lb.
Potassium Carbonate	14	lb.
Hydrosulphite Reducer (Formosul)	7	lb.
British Gum Thickening	7	gal.

No. 5

Diphenyl Brown BBN Extra	8	oz.
Direct Orange G	3	oz.
Chrysophenine G	8	oz.
British Gum, Dry	8	oz.
Glycerin	10	oz.
Trisodium Phosphate	12	oz.
Water, Condensed	1	gal.

Coloring Plush Brown

Permanganate of Potash	8	oz.
Epsom Salts	6	oz.
Gray China Clay	4	lb.
Boiling Water	6	pt.

When cold the mixture is ready for use.

No steaming is required to fix this color, and after printing, the plush is simply rinsed in cold water. In the production of discharge styles, the tips of the pile are brushed over with a cutting liquor made up as follows:

Hydrogen Peroxide (12 vol.)	1	gal.
Acetic Acid (30%)	¾	pt.
Oxalic Acid (20%)	¾	pt.

In some instances, the brown and white color is subsequently changed into black and white by treating the material for a few minutes in a bath containing aniline salt and a little sulphuric acid.

Blotch Printing Paste for Pile Fabrics

Acid Dyestuff	1½	lb.
British Gum, Powdered	25	oz.
Glycerin	6	oz.
Sodium Chlorate	2	oz.

Ammonium Oxalate	10	oz.
Ammonia	½	pt.
Water	2½	gal.

This recipe will also serve for use in printing substantive dyestuffs upon animal fiber.

Where union materials are to be printed with substantive colors, an addition of phosphate of soda is made to the print color, the acid developing salt being frequently omitted. The following is an example of a print color for wool, cotton, silk union:

Substantive Color	6	part
Sodium Phosphate	3	lb.
Brown Glycerin	1½	part

Thickening according to requirement.

In certain instances, chrome dyestuffs are employed in the preparation of color pastes for stencil printing on pile fabrics. The following recipe represents a typical chrome print color:

Chrome Dyestuff, 20% Paste	4	lb.
Chromium Acetate	2½	lb.
Ammonium Oxalate	2½	lb.

The foregoing substances are brought into solution and suitably thickened.

Logwood Black Overprint Color

(A) Thickening		
Iron Liquor (32° Tw.)	5	gal.
Tapioca	15	lb.
Corn Starch	7½	lb.
(B) Logwood Standard		
Hematine Paste	10	gal.
Acetic Acid (30%)	2	gal.
Sulphate of Iron	22½	lb.
Nitrite of Soda	4⅝	lb.
Bisulphite of Soda (72° Tw.)	11	pt.

To use, mix one part of thickening (A) with two parts of Logwood Standard (B). After printing and lightly drying the fabric, steaming is done in the ordinary manner for wool prints.

Dyeing Casein Buttons

Sharp edges are removed by barrelling and the buttons well polished, preferably by hand-buffing, with or without pretreatment with sodium hypochlorite or "dip" polish. They are then treated with ammonia (0.5% of conc. solution) at 80–90° C. for 5–10 min., rinsed with water, and immersed in a dye bath, at 80–90°, using organic dyes of the acid type, in presence of a diluted organic acid, e.g., 0.1 vol.-% of formic acid dried, and finally polished. Unsatisfactory dyes can be removed by hot dilute ammonia solution. Two-color effects may be obtained by ornamentation after dyeing.

Dyeing Sponges

The natural dark brown coloring matter is first bleached by immersion of the sponges for ½ hr. in 0.25 per cent potassium permanganate solution. Excess solution is removed by squeezing and the sponges then treated in one per cent sodium hydrosulphite solution. Finally, they are rinsed well in cold water, soaped in a one per cent soap solution, and dyed with caledon and Durindone dyes. Caustic soda cannot be used in the preparation of the vats, but reduction in presence of sodium phosphate yields dye baths which are quite satisfactory. After dyeing, the sponges are allowed to oxidize for 15 min., and then scoured in warm very dilute acetic acid. Finally, they are rinsed well in cold water and soaped for 10 min. in a one per cent hot soap solution.

Coloring "Cellophane"

The following salt solutions in 1–2% strength are used, the "Cellophane" being dipped in one first, drained and then in the other.

Ferric Chloride Potassium Ferrocyanide	Blue
Cadmium Sulphate Sodium Sulphide	Yellow
Potassium Antimony Tartrate Hydrogen Sulphide	Orange Yellow
Uranium Nitrate Potassium Ferricyanide	Burnt Orange
Ferric Chloride Water, Boiling	Orange
Potassium Permanganate Soda Ash	Brown
Gold Chloride Tannin	Purple
Silver Nitrate Tannin	Brown
Copper Sulphate Potassium Ferricyanide	Red-Brown
Cobalt Chloride Potassium Ferrocyanide	Light Purple Brown
Potassium Dichromate Sulphur Dioxide	Light Green
Lead Acetate Potassium Dichromate	Yellow
Nickel Chloride Dimethylglyoxime	Pink

Bleachers Blue

Ultramarine Blue	2½ lb.
Make into a paste with	
Monoethanolamine	1 pt.
Sulphonated Castor Oil (30%)	1 pt.
Water to make	2½ gal.

Testing Colors for Fastness to Dry Cleaning

Place dyed swatch in beaker and cover with dry cleaning solvent. If the solvent is colored on standing the dye is not fast.

Discharging Celanese Ground Shade White

Print with	
British Gum (Solution of 3 lb. per gal.)	5 gal.
Sodium Sulphoxylate (4 lb. per gal.)	2 gal.
Diethylene Glycol	1 gal.
Potassium Sulphocyanide	8 lb.

After printing, age for 5 minutes in a rapid ager and then rinse well and dry.

Colored Discharges on Celanese Ground

Sodium Sulphoxalate Formaldehyde (4 lb. per gal.)	1 pt.
Anthraquinone	4 oz.
Diethylene Glycol	1 pt.
Potassium Sulphocyanide	1 lb.

Discharging Indigoid Vat Colors.

Print with	
British Gum	40 lb.
Water	11 lb.
Glycerin	4 lb.
Zinc Oxide	10 lb.
Leucotrope W	15 lb.
Sodium Sulphoxalate Formaldehyde	10 lb.
Potassium Carbonate	10 lb.

After printing, age for 5 minutes in a rapid ager and then run into a bath containing 2 oz. sodium silicate per gal. Finally soap at the boil to clear whites.

Delustering a Ground Shade

Print with	
Sodium Tungstate	1½ lb.
Water	1 gal.

Using a starch-tragacanth thickening. After printing and drying pass through a cold barium chloride solution (8 oz. per gal.) and then rinse cold and dry.

Delustering Compound for Fabrics

Titanium Pigment	32 lb.
Clay	8 lb.
Glue and Binders	10 lb.
Water	50 lb.

Cotton Padding Liquor

In the preparation of a padding liquor it will be found that the following liquor will give good results, but it is capable of slight modification to suit local circumstances:

Aniline	35 lb.
Hydrochloric Acid (28 Tw.)	35 lb.
Yellow Prussiate	31 lb.
Sodium Chlorate	23 lb.

Water to make the whole to a total volume of 50 gallons.

It will be seen that a liquor made as indicated above contains about 7 per cent of aniline, and although a certain amount of this may be lost during the steaming process, most of this aniline is converted into aniline black pigment, so that the dyed fabric will contain this percentage of pigment.

Rayon Padding Liquor

Aniline Hydrochloride	80 oz.
Aniline	5 oz.
Formic Acid	300 oz.
Potassium Ferrocyanide	70 oz.
Sodium Chlorate	26 oz.
Water	518 oz.

Hosiery Black Dye Padding Liquor

Aniline Hydrochloride	80 oz.
Aniline	5 oz.
Formic Acid	300 oz.
Potassium Ferrocyanide	70 oz.
Sodium Chlorate	20 oz.
Water	518 oz.

The acetate rayon is padded with the above liquor and dried at a moderate temperature and the full black shade is developed on subsequent chroming and soaping.

Vanadium Aniline Black for Textile Printing

1 lb. wheat starch is boiled with
5 pt. water
6 oz. Chlorate of Soda are added while the mixture is hot. Cool and add
1¼ lb. Aniline Salt dissolved in
1 pt. Water. Bulk to
1 gallon and just before use add
⅝ glass Vanadium Chloride Solution (1:1000).

It will be noticed that the addition of the vanadate is recommended to be made just immediately prior to printing, and also when the color is quite cold. The reason for these precautions is fairly obvious in that the object is to prevent premature oxidation of the black in the print color.

Aniline Black Padding Liquors

Tragacanth Thickening (60:1000)	500 lb.
Aniline Salt	900 lb.
Aniline Oil	50 lb.
Water	2500 lb.
Yellow Prussiate of Potash	500 lb.
Water	2500 lb.
Sodium Chlorate	300 lb.
Water	1200 lb.

Use on a two-roller pad with the lower roller wrapped. The three above solutions are mixed before use and made up to 10,000 lb.

The goods are immediately dried on the drying cylinders, steamed neutral for 3–5 minutes, treated at 100° F. with 2 lb. bichromate of potash and 5 lb. soda ash per 100 gallons, rinsed thoroughly, soaped at the boil for 10 minutes, rinsed and dried.

Dyeing with Aniline Black

Water	12	lb.
Hydrochloric Acid (20° Bé.)	12	lb.
Aniline	10	lb.
Formic Acid	1.3	lb.
Sodium Nitrite	0.05	lb.
Sal-Ammoniac	1.2	lb.
Potassium Ferrocyanide, dissolved in 30 lb. Water	10.2	lb.
Sodium Chlorate, dissolved in 20 lb. of Water	4.76	lb.

The whole is diluted to 185 lb.

The same bath, without the nitrite, cannot exceed 145 to 148 parts, to attain the same depth of tone.

The bath must be acid to Congo paper before addition of the nitrite solution, which latter should be added at about 40° C., which temperature must be maintained until the cerise-red color formed has reached its maximum.

A single short passage through the Mather-Platt gives a good black, while with the ordinary bath (without nitrite, and 20 per cent stronger) would give in that time only a dirty green. It will be seen that, with such rapid development of the color, the loss and danger from escape of aniline vapor is greatly less.

Aniline Black Printing Oxidation Catalyst

Vanadate of Ammonia	10 g.
Glycerin	7 g.
Hydrochloric Acid (32° Tw.)	70 cc.
Water	300 cc.

Heat until color of solution has become pure blue and reduction is complete. Make up to 10,000 cc. volume. Add 150 cc. of above to 10 gallon tub of aniline black.

Aniline Black Dyeing

Prepare in adequately cooled apparatus a mixture of the following proportions:

Aniline Oil	275 lb.
Muriatic Acid (32° Tw.)	300 lb.
Water	355 lb.

The amount of aniline oil specified is about 10 per cent in excess of theoretical and is desirable for the best results in developing an ungreenable Aniline Black.

Any quantity desired may be made up. A wooden tank of suitable size is used. This is provided with a hood and draft to carry away the fumes. The acid is reduced in strength to 14° Tw. with water. This can be done in a barrel provided with a stoneware faucet which delivers the 14° acid through a lead pipe to the oil. The lead pipe extends below the surface of the aniline oil to reduce the fumes evolved. After adding the acid the solution is allowed to stand for some time until cooled off, and is then brought to 16° Tw. or such other strength as desired. Before bringing to strength, the solution should be tested for neutrality with a very weak solution of Methyl Violet. If on the oil side the dyestuff solution will remain red violet; if strictly neutral it will turn blue; while if on the acid side it will turn green. It is usually desirable to have the solution on the oil side. After testing, more oil or more acid may be added to bring the solution to whatever condition is desired. For best results either for printing or dyeing, a 10 per cent excess of oil is desirable to insure a non-greening black after oxidation.

The most widely dyed Aniline Blacks are of the Prussiate type and properly operated conform to the three essentials:

1. Non-greenable
2. Minimum tendering of the fabric
3. Deep pleasing tone of shade

Pad Liquor	*Solid Blacks Unmercerized*		*Solid Blacks Mercerized*	
Muriate of Aniline (16° Tw.)	20	gal.	20	gal.
Prussiate Liquor	44	gal.	37	gal.
Acetic Acid (56%)	½	gal.	½	gal.
Aniline Oil	1	gal.	1	gal.
Gum Tragacanth (6 oz. per gal.)	2½	gal.	2½	gal.
Water	32	gal.	39	gal.

Prussiate Liquor

Sodium Chlorate	80 lb.
Yellow Prussiate of Potash	140 lb.
Water	50 gal.

Bulk to 100 gal.

Run the cloth through the pad liquor, then through the squeeze rolls, and directly on to the dry cans.

For heavier cloths or unscoured or only partially scoured cloths a double dip and double squeeze or even more may be required to insure penetration and the depth of shade desired. A three bowl mangle is used for the purpose, or two padders may be used. For deeper blacks of greater solidity, a double dip is preferable.

Scouring and bleaching should be carried only to the point where sufficient absorbency to wet out readily is attained, and maximum strength preserved. Mercerized fabrics require about 10 per cent weaker pad liquors than unmercerized.

After padding, the goods are dried on dry cans and should come off slightly greenish in shade, and after running in the rapid aniline ager for one minute they should come out a green black. Passage through hot soda ash solution to neutralize the acidity, together with hot sodium dichromate to develop the oxidation to the ungreenable black, and a good soaping completes the processing. Common practice is to utilize the open range, but a rope soaper is more thorough in washing effectively.

Black and white resists employ a thinner liquor:

Muriate of Aniline (16° Tw.)	12	gal.
Yellow Prussiate Liquor	30	gal.
Acetic Acid (56%)	½	gal.
Aniline Oil	½	gal.
Gum Tragacanth (6 oz. per gal.)	18	gal.
Water	39	gal.

and are run face up through the nip only in order to preserve the whites as much as possible. A full bleached cloth is best employed for this style as the cloth is more absorbent and the liquor is taken up more readily.

White resists are not run through chrome as this treatment tends to yellow the whites. Soap converts the green black to a denser or bluer black which while not ungreenable, does meet trade requirements.

Prussiate Aniline Black

“A”—Muriate of Aniline Paste

Water	32 gal.
Cornstarch	50 lb.
Muriate of Aniline (16° Tw.)*	20 gal.

Boil up in a steam jacketed copper kettle, cool and add:

Calcozine Violet Ex. (C.I. 680) (4 oz. Solution)	3 pt.

“B”—Yellow Prussiate Paste

Water	40	gal.
Cornstarch	60	lb.
British Gum	30	lb.
Stearic Acid	½	lb.

Boil up in a steam jacketed copper kettle and add:

Sodium Chlorate	35	lb.
Yellow Prussiate of Potash	70	lb.
Corn Oil	1	gal.

Cool and bulk to 50 gal.

Mix “A” and “B” in equal proportions and add such quantities of reduction paste as may be desired. Print, dry moderately on dry cans, age one minute in the rapid aniline ager, or four minutes in the vat ager if printed.

* 70 lb. aniline salt dissolved in 15 gal. of water, may be substituted.

Thread Dressing Composition
U. S. Patent 2,017,242

Mineral Oil	75
Olive Oil	20
Kerosene	3
Lecithin	2

Shrinking Loosely Woven Rayon Taffeta
Canadian Patent 370,720

Treat for 1 second in following bath at 88° C.:

Water	4 gal.
Alcohol	1 gal.

Shrinking Cellulose Acetate Fabrics
British Patent 444,300

Immerse for 1 second at 88° in a bath of:

Water	40 lb.
Alcohol	10 lb.

Squeeze and dry.

A shrinkage of 17% in warp and 11% in weft direction results.

Reducing Shrinkage of Fabrics
British Patent 445,891

Cotton or other fabric is impregnated with a 20% aqueous solution of a partly formed synthetic resin (e.g., urea + thiourea + formaldehyde) or a natural resin, then stentered and thereby stretched as required, heated at 120–140°, washed in water, and again stentered. The ordinary washing-shrinkage of cotton-voile fabric is thereby reduced from 7–9% to 0.09–1.8%.

Storing Dyestuffs

To obtain a color true to sample, the necessary requirement is the use of an absolutely reliable dyestuff. Unpleasant surprises can be had as regards the shade and depth of the color, when a dyestuff is used that, owing to careless treatment during storage, may no longer be considered quite true to type. Dyestuffs are standardized by their producers, as to shade and the regulation intensity, with meticulous precision. And it is the consumer's duty to see to it by careful treatment and handling that the quality of the dyestuff does not deteriorate. Whenever possible, the tins or barrels of dyestuff should be stored in a room separate from the dyehouse, for instance, the sample room, in order to prevent the steam and fumes of the dyehouse from affecting the dyestuff. The temperature in the storage room should be low and as even as feasible, and the danger of freezing should be obviated as far as possible. The conducting of steam pipes through the room is likewise undesirable, since this also causes changes in the atmospheric humidity. Increasing humidity will make powdered dyestuffs pasty, and too dry an atmosphere will dry out dyestuffs in paste form. In the latter case, it is difficult to recondition the finely and evenly dispersed dyestuff paste. The same is also true should the paste be frozen in cold weather, as, when it is melted, a homogeneous preparation is not readily obtained, since freezing frequently causes formation of sediment and disintegration. The best thing to do is to melt the paste gradually by applying mild heat, and to stir it well before use.

Dyestuffs in powder form should be stored in closed tins, that is, the lids should be kept on. It is a regrettable fact that dyestuffs that are used often, especially those needed for shading, are frequently allowed to stand open. It should be considered that some types not only dust very easily, but at the same time they tend to absorb atmospheric moisture and therefore to coagulate. Such hygroscopic dyestuffs are the cause of difficulties in dissolving and weighing.

It is advisable to store paste dyestuffs separate from the powder kind. To prevent their drying up, the usual procedure is to spread a damp cloth over the top of the barrel and then to put the cover over the cloth. Whenever dyestuff paste is weighed, the entire content must be thoroughly stirred to make sure that the required quantity will be homogeneous. This offers a guarantee that, as regards the yield, the last batch of the barrel will be quite the same as the first.

Waterproofing for Textiles

Formula No. 1

U. S. Patent 2,057,960

Paraffin Wax	100 oz.
Tetralin	15 oz.
Hexalin	15 oz.

Warm and mix till clear. Add to following brought to a boil:

Casein	70 oz.
Aluminum Formate	30 oz.
Water	600 oz.

No. 2

German Patent 626,730

Textiles are impregnated in following solution at 90° C.:

Aluminum Chloride Solution (30%)	33 kg.
Soda Ash Solution (90%)	8 kg.
Water	100 kg.

No. 3

British Patent 463,187

Water	15 gal.
Caustic Soda	15 lb.

Dissolve by heating and bring to a boil. Then add following melted mixture slowly while mixing vigorously.

Rosin	180 lb.
Paraffin Wax	20 lb.

Keep boiling and mixing until uniformly emulsified.

The finished emulsion may be diluted with water as desired.

Coated Waterproof Fabrics

Formula No. 1

British Patent 451,669

Fabric is impregnated with:

Cellulose Nitrate	3 oz.
Ceresin	3– 4 oz.
Heavy Mineral Oil	3– 9 oz.
Volatile Solvents	81–84 oz.

After drying the reverse side is coated with:

Cellulose Nitrate	32–39 oz.
Softener	44–46 oz.
Pigment	15–24 oz.
Volatile Solvent	to make plastic

Roll and dry at 150–200° F.

No. 2

U. S. Patent 2,082,592

A process for producing a flexible, waterproof material comprises impregnating a suitable textile fabric with a composition having the approximate formula by weight:

Cellulose Nitrate	3.05
Dibutyl Phthalate	6.00
Ceresin Wax	4.05
Paraffin Oil	3.00
Ethyl Acetate	22.60
Ethyl Alcohol	32.60
Toluene	28.70

applying to one face of impregnated fabric a continuous film of a composition of the approximate formula by weight:

Cellulose Nitrate	32.0
Softener	44.0
Pigment	24.0

dispersed in an organic dispersing agent, the amount of the impregnating composition applied to the fabric being insufficient to destroy the fabric weave on the face of the finished material.

Waterproof Coated Book Cloth

British Patent 464,280

Medium cotton cambric is treated with a "dope" of the following composition:

Low Viscosity Nitrocellulose	20	lb.
Alcohol	10	lb.
"Cellosolve"	5.6	gal.
Tritolyl Phosphate	17	lb.

Cloth is passed through this dope and rolled up without drying. Allow to remain for one hour and dry in drying chamber; then pass through a calender. Then coat twice on each side with same "dope" and dry.

Waterproofing Cotton Goods

Pad the cloth with a 2° Tw. aluminum acetate and dry. Then immerse the cloth in a 5% solution of sodium stearate at 120° F. Rinse well and dry.

Waterproofing of Canvas and Duck

U. S. Navy Material C47-C

Three gallons of soya-bean oil compound is poured into an ordinary tub and to this is added 1½ gallons of toluol. (The reduction is, of course, controlled by the viscosity of the soya-bean oil compound.) This mixture is stirred thoroughly and the fabric is placed into the mixture, care being taken to avoid excessive wrinkling. The fabric is allowed to soak two hours.

Two 4-in. rollers of wood are used in the manner of an ordinary clothes wringer; the fabric is carefully run between these rollers so that all excess compound is removed. In the case of the 12-oz. material it is necessary to run this through the roller three times, increasing the tension after each run. In addition to removing the excess compound these rollers iron out the wrinkles in the fabric.

After rolling, the fabric is hung over lines to dry, care being taken to avoid any contact between two layers of fabric to prevent their adhering to each other and also to accelerate drying of the compound.

After allowing the treated fabric to dry for 18 hours, each one of four different pieces may be given a different finish. One may be sprayed with aluminum varnish; one with navy gray enamel; one with aluminum lacquer, and one with navy gray lacquer. All coats are sprayed in a full wet coat. A slight raise in the nap of the fabric occurs, but there is no lifting or poor adhesion noticed.

Brush coats are applied with better appearing results, but two spray coats give a wonderful appearance.

With a paint, varnish or enamel top coat, this fabric remains wonderfully flexible; it can be creased, folded and wrinkled but will not crack. It can be machine-sewn or hand stitched after coating and has the advantage of not being greasy or oily to handle.

When lacquer is applied as a finish coat it is advisable to only use this material on flat surfaces as it is slightly less flexible than when coated with oil-base top coats.

Waterproof Mattress Coating

U. S. Patent 2,082,592

Cellulose Nitrate	3.05 lb.
Dibutyl Phthallate	6.00 lb.
Ceresin	4.05 lb.
Paraffin Oil	3.00 lb.
Ethyl Acetate	22.60 lb.
Alcohol	32.60 lb.
Toluene	28.70 lb.

Waterproofing Canvas Gun Cases

a.	Gelatin	5 oz.
	Rain Water	300 oz.
b.	Alum	10 oz.
	Water	300 oz.
c.	Rosin Soap	5 oz.
	Hot Water	300 oz.

Mix equal portions of *a*, *b* and *c*, and apply with a soft brush.

Canvas Waterproofing

Aluminum Oleate	2– 3 kg.
Paraffin Wax	7– 8 kg.
Linseed Oil Varnish	100 kg.

Apply by brush from both sides of the canvas.

Waterproofing for Tarpaulins

Crude Fuel Oil	60 oz.
Paraffin Wax, Hard	20 oz.

Paraffin Wax, Soft	5 oz.
Montan Wax	10 oz.
Wood Pitch	10 oz.

The hardness of the coating may be varied by changing the relative proportions of the first three ingredients.

Waterproofing of Tent Cloth

a.	Glue, Light	10 kg.
	Water	50 kg.
	Glycerin	10 kg.
b.	Formalin	100 kg.
	Water	900 kg.

Apply glue solution *a* on both sides of the cloth, let dry and harden in a bath of the composition *b*. Dry.

Fish Net Preservative

Formula No. 1

Copper Naphthenate	30 oz.
Benzol	50 oz.
Mineral Spirits	20 oz.
Antioxidant	0.5 oz.

The copper naphthenate is dissolved in the benzol and then the mineral spirits added with stirring. The antioxidant is dissolved in a small portion of the above solution, and this mixture added to the whole. The antioxidant is a complex amine and substantially increases the longevity of the nets treated with same.

No. 2

a.	Oak or Hemlock Bark	12 oz.
	Water	88 oz.
b.	Potassium Bichromate	0.4 oz.
	Water	99.6 oz.

The above bark is boiled with water for about a half hour with continued stirring. The net is placed in the boiling solution and allowed to remain for 15 to 20 minutes. It is then removed and placed in solution *b*, which has been previously prepared and also brought to a boil. The net is allowed to remain in this solution for 15 minutes, removed and hung in the shade to dry.

No. 3

Coal Tar for Fish Nets	50 oz.
Tar Base Oil	10 oz.
Benzol	30 oz.
Kerosene	10 oz.

This type of coal tar is heated and the tar base oil added to reduce the body of the same. When cooled off, the benzol is added and finally the kerosene.

Preservation of Ropes and Nets

The preservation of ropes and nets against the effects of alternate wettings in sea water and drying has always been a problem.

Olie's method of applying cutch and ammoniacal copper sulphate (every four months) gives very good results with cotton. It is better than cutch alone or cutch and chrome.

Copper soaps are used for such purposes and the best is claimed to be copper naphthenate (Cuprinol). The effect of such soap is improved by the addition of tar or benzol.

Cotton and flax fish lines can also be preserved by a solution of copper naphthenate and tar in gasoline or by copper oleate or resinate with but little or no tar.

Manila rope when kept under sea water for 10½ months had only 13% of its original strength but it retained over 70% when properly treated. Suitable agents are copper naphthenate containing tar, 10% copper oleate in light coal tar, 10% copper resinate in creosote oil or 10% of copper oleate and 20% coal tar in a light tar oil (coalite).

Copper resinate at the rate of 10% in light tar oil kept sisal rope at 80–97% of its initial strength for a year's immersion.

Coal tars are superior to wood tars when used alone but all are improved by 10% of copper oleate or resinate.

Preserving Vegetable Fibers

U. S. Patent 2,119,525

The art of preserving cordage comprises the soaking thereof in an aqueous solution of approximately 6% of catechu extract at approximately 210° F. for approximately twelve hours, boiling the material for approximately 15 minutes in an aqueous solution of approximately ½% of potassium dichromate, rinsing in water and drying the material thus treated, and thereafter immersing the dried material for approximately 3 minutes in coal tar at a temperature of approximately 200° F.

Waterproofing for Jute

British Patent 437,083

Rubber Latex	10– 20 oz.
Linseed Oil	5 oz.
Casein	2 oz.
Water	160 oz.

Waterproofing Bristles

U. S. Patent 2,055,321

Formula No. 1

The bristles to be treated are bleached by any suitable method and then soaked in a solution containing from 1–3% by weight of a dissolved aluminum salt, such as aluminum acetate. After soaking the bristles in this solution until thoroughly impregnated, they are transferred to a solution of any suitable soap, such as a 4% solution of a castile soap in water. The bristles are removed, drained and dried.

No. 2

1600 parts by weight of aluminum palmitate are dissolved, with the aid of gentle heat, in about 7200 parts by weight of cyclohexanol (hexohydro phenol).

In a separate step, 800 parts by weight of white ceresin wax are melted and added to 5400 parts by weight of carbon tetrachloride. The aluminum palmitate solution in cyclohexanol is then added to the ceresin wax solution, together with 20,000 parts by weight of carbon tetrachloride and 7,000 parts by weight of V. M. & P. naphtha. The mixed solutions are heated on a steam bath or steam plate with continuous stirring until a fairly thin solution results. This solution may be advantageously left overnight or for an equivalent period before using. Upon standing, the solution becomes more fluid and therefore more satisfactory for impregnating purposes.

In treating bristles with the foregoing solution of aluminum palmitate and ceresin wax, bundles of the bristles are immersed and soaked in the solution for approximately 30 minutes. The bundles of bristles are then removed and drained for not over 5 minutes and subsequently are whirled very slightly in a centrifugal extractor. They are then removed to a drier and dried at between 100 and 110° F. for 4 or 5 hours.

Sizing and Waterproofing Emulsion

Paraffin Wax	40 g.
Oleic Acid	5 g.
Trigamine	3 g.
Water	112 cc.

The trigamine is dissolved in the water and the oleic acid is added, stirring thoroughly until completely homogeneous. This is then heated to 65–70° C. and the wax, previously melted, added with rapid agitation. Stirring is continued until the emulsion is cold. This emulsion can be diluted readily with warm water.

Colloidal Copper Fungicide for Mildew

200 g. of copper sulphate and 50 g. of citric acid are dissolved in 100 l. of water. Solution is then treated with ferric chloride and finally with soda, until its reaction is neutral, or at the most, only very slightly acid.

Awning Fireproofing and Waterproofing

French Patent 796,827

Chlorinated Rubber	100 g.
Sodium Tritolyl Phosphate	100 g.
Toluol	200 g.

Allow to swell and mix until dissolved.

Rayon Fireproofing

Sodium Tungstate	20 lb.
Disodium Hydrogen Phosphate	4 lb.
Water	76 lb.

Fireproofing Canvas Belting

Sodium Boro-Phosphate (Abopon)	15 lb.
Water	85 lb.

Heat to 75° C. and dip belting into it for ½–2 minutes. Remove and dry.

Fireproofing Straw for Packing

Straw can be satisfactorily fireproofed by immersion in a solution of 45 g. of boric acid and 65 g. of borax per l. Another fireproofing treatment consists in immersing the straw in a solution of 50 g. of ammonium phosphate, 25 g. of ammonium sulphate, and 25 g. of ammonium chloride per l. A further treatment consists in the use of a solution containing (per l.) 75 g. of sodium acetate, 75 g. of trisodium phosphate, and 20 cc. of pale neutral 28° Bé. glycerin. This last-mentioned method of treatment has been employed for fireproofing the straw packing for carboys of nitric acid in Germany.

Fireproofing for Electric Heating Pads

British Patent 435,240

This fabric is impregnated with a 20–40% aqueous solution of:

Ammonium Sulphate	5 –10 oz.
Ammonium Chloride	1 – 4 oz.
Boric Acid	2 – 5 oz.
Borax	1 – 3 oz.
Urea-Formaldehyde Resin	0.4– 0.8 oz.

Moth-Proofing Fabrics

A simple process has been developed for moth-proofing fabrics by the use of chromium and antimony fluorides, while at the same time it affords considerable protection against the growth of fungi. Woolens so treated are said to have no harmful effects on the skin.

The process is carried out by simple immersion. For example, 100 lb. of cow hair are placed in a vessel containing water at 180° F., in which 3 lb. of chromium fluoride have been dissolved, just sufficient water being employed to cover the materials to be treated. The hair is agitated for 20 minutes to ensure complete saturation. It is then removed from the solution, allowed to drain and is then hydro-extracted and dried in a hot air chamber at 150° F. In the case of woolen or felted material, this is passed at full width through a wooden box fitted with suitable rollers to guide the materials and to keep them at full width. The padding box contains a solution of chromium fluoride, 1¼ lb. dissolved in 160 lb. of water at 80° F. On issuing from the machine, the thoroughly saturated material passes between two squeezing rollers, the pressure on which is so arranged that 12 parts by weight of material retain 10 parts by weight of the solution. The treated and squeezed material is then dried in a hot air chamber or on a tentering machine at a temperature of 155° F. After complete drying, the treated material contains 0.65% of the chromium compounds permanently fixed in the fibers.

It is known that chromium oxides are valuable mordants for dyestuffs and in some small measure such combinations do act as deterrents to the larvae of moths, but it has been found that the amount of chromium requires to be greater than that necessary for mordanting and if the equivalent of 0.65% of chromium fluoride is introduced into the fibers in the way set out there will be fixed in the fibers, partly combined with the constituents of the fiber, basic chromium compounds, free oxides and fluorides, which will render the fibers proof against spoilation by moth larvae.

It has been found that the slightly greenish tint of the chromium oxide affects delicate shades and it is therefore proposed to minimize or neutralize its influence by precipitating a certain amount of hydrated antimony oxide along with chromium oxide.

In this process, woolen and felted materials are treated on a padding machine, being passed at full width through a solution of chromium fluoride plus an amount of antimony fluoride, in the proportion of 4:1, at 80° F. The fabric is then passed between two suitable rollers, the pressure of which is so arranged that 12 lbs. of woolen material will retain 1 imperial gallon of the solution. The squeezed material is dried in a hot air chamber or on a tentering machine at a temperature of 155° F. The drying temperature should never fall below 150° F., in order to obtain the complete fixation of the chromium compounds in the fiber, at which temperature the antimony is also precipitated and this double precipitate is sufficient to nullify the pale green tint of the chromium oxides.

Textile Moth-Proofing

Sodium Silico-Fluoride	0.60 g.
Potash Alum	0.30 g.
Oxalic Acid	0.03 g.
Water	99.07 g.

Moth-Proofing

British Patent 467,701

The following solution is applied by brushing, dipping or spraying:

Thianthrene	20 g.
Alcohol	980 g.

Gas-Proofing for Fabrics

A resin is made by mixing glycerol 9 g., triethanolamine 30 g., phthalic anhydride 50 g., and adipic acid 25 g., heating for ½ hour at 180° C. and for 25 minutes at 210°, and dissolving in 114 g. glycerol at 220°. When cool, the product is mixed with a solution of 114 g. gelatin and 456 g. water.

Proofing Cloth Against Poison Gases

French Patent 802,816

Sodium Sulphoricinoleate	100 g.
Blood Albumen	50 g.
Water	to make a paste

The above coating when dry is covered with a flexible varnish or lacquer.

Rot-Proofing Canvas
(Willesden Type)

The principle of the production of Willesden canvas and similar goods lies in the solubility of cellulose (paper, cotton, etc.) in cuprammonium solutions. When fabrics are immersed in the latter, their surfaces only become effected by solvent action, and re-precipitation can produce a continuous surface of relatively good water impermeability. By treating the fabric in a second solution containing, for example, caustic soda, copper as hydroxide can be precipitated and retained in the fiber, which aids resistance to deterioration other than that caused by water or moisture. A typical procedure for this type of treatment is given below:

1. *Cuprammonium solution*

The fabric is thoroughly steeped in a cuprammonium solution (cupric sulphate solution with sufficient ammonia added to re-dissolve all hydroxide) of specific gravity about 1.075 at 80–100°F. The fabric after draining is treated in a solution of caustic soda, sp. gr. 1.01 to 1.015, and dried. A solution of aluminum sulphate can substitute the caustic soda with advantage.

Another type of treatment involves soaking in solutions containing aluminum compounds, the general object being to precipitate aluminum hydroxide in the pores for water resistance.

2. *Aluminum acetate solution*

Immerse in aluminum acetate (sp. gr. 1.04) for 12 hours, drain, dry, and evaporate at 140 to 150° F.

The acetate solution can be followed by immersion in 5% hard soap solution, then by 2% alum solution, and finally by air drying.

The aluminum acetate can be produced from mixtures of lead acetate and aluminum sulphate, or purchased as such in aqueous solution.

A third class of proofing utilizes glue or gelatin in one solution, and a fixative in a second, *e.g.*—

3. *Gelatin treatment*

Soak in a 7% solution of 1% gelatin at 100 to 110° F. and after drying pass through a 4% solution of alum. Dry, rinse in water, and re-dry.

Some heavy fabrics are treated by applying the following composition by means of rollers:

4. *Wax composition*

Japan Wax	28 oz.
Paraffin Wax	22 oz.
Rosin Soap	12 oz.
Starch	33 oz.
Alum Solution (5%)	5 oz.

Finally, a modern efficient type of formulation intended for a one-bath process includes alum and lead acetate as the source of aluminum hydroxide for waterproofing, paraffin wax for softening or providing pliability, soap as emulsifier, and gum to improve wetting properties. The following formula is quoted from British Patent 382,073:

Alum	2 lb.
Lead Acetate	2.5 lb.
Paraffin Wax	6.5 oz.
Hard Soap	4 oz.
Gum Tragacanth	4 oz.
Water	67 lb.

Rot-Proofing Jute
British Patent 462,306

The material is first boiled in a 3.3% aqueous solution of cutch for three hours, and then boiled in a 1.5% solution of potassium bichromate for twenty minutes, after which it is washed free from bichromate and dried.

Mildew Proofing Wetting Agent
U. S. Patent 2,110,074

Isopropyl Naphthalene Sodium Sulphonate	10.0 g.
Orthophenyl Phenol	2.2 g.
Water	71.5 g.
Ethylene Chlorhydrin	6.0 g.
Alcohol	10.0 g.

MISCELLANEOUS

Swimming Pool Maintenance

(*a*) Vacuum clean the bottom of the pool daily, watching especially for any materials which may have been dropped in the water.

(*b*) Wash the high-water mark off the tiles before adding the fresh water to replace that removed by the suction. This also furnishes an opportunity to clean the scum gutter thoroughly.

(*c*) Refill pool, warming when necessary to maintain a satisfactory water temperature.

(*d*) Circulate water through a sand filter from six to eight hours during the day and while the pool is in use. Only four times during five years is it necessary to use the alum pot which is provided as part of the filter equipment.

(*e*) Daily (and this is important) check the pH of the pool, adding soda ash to correct for any acidity, and at the same time add sodium hypochlorite solution to the water. If the pH of the water is kept between 7.8 and 8.2, no free chlorine is liberated from the hypochlorite, thus avoiding odors in the room and the water, and serving to retain a residual available chlorine content in the water which is not only desirable but also absolutely essential if the water is to remain practically sterile. It is of interest to note that in the spring of the year an odor does develop, caused by the chlorination of phenolic compounds probably coming from surface or swamp drainage in the water supply, but even at this time no *free* chlorine is present.

In actual practice, on a seven-day-a-week treatment, soda ash in the form of two-pound fused bricks is dropped in the pool at the deepest point where the outlet to the filter is located. It usually takes one or two of these bricks each day, the number being regulated by a determination of the pH. If no comparator is at hand, four drops of a 0.5 per cent solution of phenolphthalein indicator added to a test-tube of the pool water and turning a good clear pink approximates the desired pH. This careful control of the pH is most important, as it allows the retention of residual available chlorine; furthermore, an alkaline medium is unfavorable for the multiplication of many bacteria. This degree of alkalinity, on the other hand, is not hard on the eyes.

If a comparator is at hand, the amount of residual chlorine may also be determined. This should not go below 0.2 p.p.m., nor above 0.5 p.p.m. Less residual chlorine is inadequate for properly protecting the water from pollution, and more results in body and eye irritation. If no comparator is at hand, the problem becomes largely one of try and see what happens. Potassium iodide, starch, and hydrochloric acid will give the starch-iodide blue if excess hypochlorite is present.

Again, in actual practice, it has been found that from two to three quarts per day of a commercial solution of sodium hypochlorite of nine per cent strength has usually proved adequate, though, of course, in this as in the use of soda ash, the amount needed depends on the extent to which the pool is used.

Water Purification

30% liquid sodium aluminate is in general use as a coagulent in water treatment in ice-plants, swimming-pools, etc. The use of the extra-soluble powdered sodium aluminate now available on the market, is equally efficient, and will effect a 60% saving. The powdered material is 90%, and usually sells at about the same price per cwt. as does the 30% liquid.

Purifying Small Amounts of Water

To 200 l. water, containing clay, is added:

a. Water	1	l.
Soda Ash	5	g.
b. Water	5	l.
Ferric Chloride (45° Bé.)	1	cc.
c. Water	1	l.
Disodium Hydrogen Phosphate	1.8	g.
Calcium Oxychloride	0.6	g.

Stir vigorously and let stand for 30 minutes. The bottom five litres is removed. The upper liquid is germ free.

Water De-Chlorinating Agent

Calcium Sulphite	74.93
Calcium Oxide	2.00
Calcium Sulphate	4.00
Carbon, Activated	19.07

Base Exchanger (Water Softening)

British Patent 450,574

Lignite, Powder	100 lb.
Sulphuric Acid	400 lb.

Heat to 150° C.; filter off excess acid and wash the residue until neutral.

Boiler Compounds

Many commercial boiler-compounds contain sodium silicates. Besides having a tendency to carry over and stick valves, this material leaves a lot to be desired with any water, and is entirely valueless with some. Sodium aluminate is better by far; but is higher-priced. While lime-soda or zeolite softening is always to be preferred, the following are recommended for use as boiler compounds:

For water with very high pH—Monosodium Phosphate.

For water with low pH value—Trisodium Phosphate.

For water containing sulphates—Sodium Metasilicate.

Any of the above may be used in conjunction with tannic acid or similar material, to advantage.

Boiler Compound

Formula No. 1

Hungarian Patent 116,686

To a 25 kg. catechu in 7 kg. water, add 10 kg. ammonia soda, 7 kg. borax and 5 kg. tri-sodium phosphate in 16 kg. water. A greasy product is formed, 750 g. of which is generally required for 1 cu. m. of water.

No. 2

Canadian Patent 366,214

Pulverized Iron	30 oz.
Carbon, Powdered	50 oz.
Starch	20 oz.

No. 3

Canadian Patent 368,212

Soda Ash	44 lb.
Disodium Hydrogen Phosphate (Anhydrous)	47 lb.
Starch	9 lb.

No. 4

U. S. Patent 2,097,649

Trisodium Phosphate	75 oz.
Soda Ash	20 oz.
Starch	5 oz.

The above is used to give a concentration of not less than 7 ounces starch per pound of calcium in water.

Boiler Scale Preventives

U. S. Navy Specification 13 C 3 G

Anhydrous Sodium Carbonate	44 lb.
Anhydrous Disodium Phosphate	47 lb.
Corn Starch	9 lb.

U. S. Dept. of Commerce Lighthouse Service Spec. No. 542

Calcined Sodium Carbonate	68–70 lb.
Trisodium Phosphate	19–22 lb.
Dextrine or Starch	1–2 lb.
Tannic Acid	4 lb.

City of N. Y. Boiler Comp. Spec. 5-C-1

Anhydrous Sodium Carbonate	76 lb.
Trisodium Phosphate	10 lb.
Starch	1 lb.
Cutch (to yield 2% Tannic Acid)	— lb.

Elimination of Scale Formation in (Glycerol) Concentration.

Experiments in the concentration of glycerol solutions show that on the addition of graphite (0.005%) based on the weight of the evaporated water the scale formation on the pipes is eliminated. The coarse-grained aggregates of the salts formed are deposited at the bottom of the evaporator and are easily removed and separated from the glycerol. By this method the time required for evaporation is reduced 50%. The organic and inorganic residues in the crude glycerols obtained by evaporation with and without the addition of graphite are 4.9 and 5.26% respectively.

Alcohol Gasoline Fuels

Formula No. 1

Gasoline	70 gal.
Alcohol	30 gal.
Isoamyl Alcohol	6 gal.

No. 2

Heavy Motor Gasoline (sp. gr. 0.735–0.775)	80 l.
Alcohol, Anhydrous	20 l.

No. 3

Contardi's Motor Fuel

Methanol	50 l.
Acetal	25 l.
Gasoline	25 l.

Stabilized "Ethyl" Gasoline

British Patent 464,055

Lecithin	7.5–22.5 lb.
Ethyl Gasoline	1000 barrels

Anti-Knock Gasoline

U. S. Patent 2,088,997

0.2% of mercuric salt of cobalt carbonyl hydride is added to gasoline.

Non-Corrosive Powdered Writing Ink

U. S. Patent 2,088,006

Gallic Acid	10 oz.
Ferrous Sulphate	15 oz.
Tartaric Acid	1 oz.

Anti-Knock Motor Fuel

U. S. Patent 2,021,088

Ethylene diamine to the extent of 0.5–1% is added to decrease "knocking."

Anti-Knock Alcohol Blend Fuel

Formula No. 1

French Patent 794,829

Gasoline	75 lb.
Alcohol	22 lb.
Hydrogen Peroxide	3 lb.

No. 2

Benzene	30 lb.
Alcohol	65 lb.
Hydrogen Peroxide	5 lb.

Alcohol Blend Motor Fuel

Alcohol	40 gal.
Benzol	40 gal.
Gasoline	20 gal.

Automobile Racing Fuels

Formula No. 1

Alcohol, Anhydrous	90.8 l.
Benzine	8.2 l.

No. 2

Alcohol, Ethyl	36.3 l.
Alcohol, Methyl	26.0 l.
Benzine	37.7 l.

No. 3

Alcohol, Methyl	93.74 l.
Water	6.24 l.
Castor Oil	0.02 l.

No. 4

Alcohol, Methyl	99.98 l.
Castor Oil	0.02 l.

No. 5

Alcohol, Anhydrous	83.295 l.
Water	13.877 l.
Denaturants	2.820 l.

No. 6

Benzene	10 l.
Alcohol, Ethyl	85 l.
Naphthalene	3.0 kg.
Petroleum Ether	1.6 kg.
Castor Oil	0.3 kg.
Phenol	1.0 kg.

No. 7

Benzine	30 l.
Alcohol, Anhydrous	43 l.
Methanol (96.4%)	10 l.
Treated Medium Tar Oil	15 l.
Nitrogen Peroxide	2 l.

No. 8

Alcohol, Ethyl	90 l.
Acetylene	20 l.

No. 9

Alcohol, Ethyl	72 l.
Methanol (96.4%)	10 l.
Treated Medium Tar Oil	15 l.
Nitrogen Peroxide	2 l.

Non-Gumming Motor Fuel

U. S. Patent 2,071,064

Gum formation in motor fuels is inhibited by the addition of 0.002–0.003% p-hydroxy-N-phenyl morpholine.

Fuel Oil

"Mineral Colza" Oil

[Heavy Petroleum, sp.g. 0.84–0.85 at 20° C.]	750 g.
Colza Oil, Refined	250 g.

Fuel Combustion Catalyst

British Patent 440,224

Manganese Dioxide	32.1 g.
Charcoal	2.5 g.
Salt	27.7 g.
Sodium Chlorate	37.7 g.

One to two kilograms of the above mixture is used per ton of fuel.

Activated Motor Gasoline

U. S. Patent 2,088,000

1% of following solution is added to gasoline to improve its acceleration:

Naphthalene	1 g.
Alcohol	5 g.
Acetone	10 g.

Motor Fuel Energizer

British Patent 448,446

A mixture of paraldehyde (20–50 pts. by vol.) and a polycyclic hydrocarbon (50–80), *e.g.,* tetrahydronaphthalene, with or without a thin lubricating oil as upper-cylinder lubricant, is added to liquid fuels for internal-combustion engines in order to assist in initiating or promoting combustion of the fuel. An aromatic amine, *e.g.,* aniline, or preferably aminocymene, may also be present. Normally 0.5% of the composition is added to gasoline and 1% to diesel fuels.

Anti-Vapor Lock Compound

U. S. Patent 2,067,384

A composition to be added in small amounts to hydrocarbon internal combustion engine fuel for eliminating vapor lock conditions in internal combustion engines consists of the following ingredients taken in the appended approximate proportions for the production of a fifty gallon batch:

Kerosene	27 gal.	44 oz.
Mirbane Oil	5 gal.	60 oz.
Creosote Oil (U. S. P.)	10 gal.	120 oz.
Turpentine	2 gal.	44 oz.
Cedar Wood Oil	2 gal.	44 oz.
Camphorated Oil	1 gal.	72 oz.

Stabilizing Color in Motor Fuels

U. S. Patent 2,052,193

0.005–0.1% of cobalt or manganese oleate or naphthenate is dissolved in the fuel to prevent color from fading when exposed to sunlight.

Gasoline Fuel Improver

U. S. Patent 2,055,503

Basic Cadmium Nitrate	16 g.
Isopropyl Alcohol	500 cc.
Benzol	500 cc.
Potassium Bromide	4 g.
Potassium Hydroxide	4 g.

The above is mixed to give a uniform suspension and 2–4 cc. of it is added to each gal. of gasoline. Corrosion and gum formation is lessened and combustion is improved.

Stabilizing "Cracked" Gasoline

Naphthol (0.014%) and a wood-tar fraction b. 260–90° (0.07–0.14%) inhibit gum formation in gasoline for 6 months. Stable gasolines are obtained by rectifying a distillate with the above inhibitors. A cracked gasoline of low b. p., purified with 1% sulphuric acid and stabilized with 0.013% naphthol is stable for 11 months.

Preventing Turbidity in Gasoline

To eliminate turbidity in gasoline add one gal. of completely denatured alcohol, 188 proof, to 30 or 40 thousand gal. of gasoline. Before using alcohol for clarification, it was noted that certain gasoline turned to a milky-white color when exposed to light for four or five minutes. When this small percentage of denatured alcohol is added, gasoline does not become turbid until exposed to light for four or five hours.

Gasoline Gum Inhibitors

Formula No. 1

Gum inhibitors, intended to inhibit oxidation of cracked gasoline are alpha-naphthol, mono-benzyl, di-benzyl, or similar para-amino-phenols, dissolved preferably in benzol, but occasionally in solvent No. 1 alcohol. Successful application implies total absence of moisture, and addition of an adequate amount of the material, i.e., 1½–2½ gallons per 10,000. Proper use eliminates need of acid treatment of distillate from cracking stills and subsequent redistillation, and the corresponding 5% loss.

No. 2

U. S. Patent 2,053,511

About 6.01% 5-benzylamino-2-cresol or 5-amino-2-hydroxytoluene is added to gasoline.

No. 3

U. S. Patent 2,070,304

Add 2–5 lb. benzamide or phthalamide to 100 barrels of "cracked" gasoline.

No. 4

U. S. Patent 2,034,283

0.005–0.025% of any of the following is added:

Glyceryl Monostearate
Glyceryl Monoacetate
Glyceryl Monobenzoate

No. 5

U. S. Patent 1,999,830

The gum formation during storage is prevented by the addition of 0.1% of a dihydroxyanisole.

Removing Gum Forming Materials From Naphtha

U. S. Patent 2,062,377

The process of treating naphtha for the production of gasoline of improved color and reduced sulphur content and gum-forming tendency comprises agitating the naphtha with a treating agent belonging to the class consisting of boron fluoride and boron fluoride dissolved in sulphuric acid in the absence of other treating agents of acid nature, the boron fluoride being employed in an amount ranging from 0.06 to 0.15 lb. per barrel of naphtha, and separating the sludge formed from the naphtha.

Engine Carbon Remover

British Patent 470,322

Benzol or Edeleneau Extract	41.5 gal.
Lubricating Oil	40.0 gal.
Soap	4.0 gal.
Secondary Butyl Alcohol	12.0 gal.
Water	2.5 gal.

Fuel Briquettes

Formula No. 1

U. S. Patent 1,990,948

Coal is briquetted under pressure, using as binder (60 to 75 lb. per ton of fuel) a mixture of hydraulic cement 75 to 99.6% pitch or asphalt 0.2 to 10%, calcium chloride 0.1 to 10%, sodium dichromate 0.5 to 5%. The binder is finely ground and the binder coal mixture is suitably moistened before briquetting.

No. 2

U. S. Patent 2,036,642

A mixture of petroleum-coke fines 88.5, crude crushed rosin 4.42, fuel oil (*d* 1.07—1.16) 5.31, and slaked lime 1.77 lb. is passed into a heated space wherein further mixing takes place, partly cooled, water-sprayed, and then molded wet.

No. 3

U. S. Patent 2,040,609

Comminuted carbonaceous material, *e.g.*, coal, is briquetted by first mixing with a 5% solution of molasses to a slushy mass, then cooking until white steam ceases to be evolved, and carbonising in molds at 340–370° C.

No. 4

U. S. Patent 2,066,457

Bituminous Coal	66⅔ lb.
Wood Pulp Paper	20⅚ lb.
Asphalt	12½ lb.

Grind in water; squeeze; dry and compress.

No. 5

British Patent 437,870

Powdered Coking Coal	30 lb.
Starch, Powdered	1.8 lb.
Anthracite Fines	68.2 lb.

Mix well and heat to 80–100° C. and briquette; then heat rapidly to 550–600° C. and bake at this temperature for an hour.

Briquetting Coal

German Patent 648,714

Coal Dust	94 lb.
Peat Fiber, Dry	3 lb.
Pitch, Hard	3 lb.

Heat to 70° C. and press at 120 atmospheres.

Waste Wood Fuel Briquettes

Canadian Patent 358,647

Sawdust 50, wood powder 28 and slivery sticks 22% by vol. are dried under controlled heat to eliminate moisture and leave the resins, compressed while hot into briquettes, and dipped into a paraffin bath to seal the surface against moisture absorption.

Saw Dust Briquettes

Rosin Waste	20 kg.
Montan Wax Pitch	20 kg.
Montan Grease	60 kg.
Saw Dust	to suit

Melt the binders in a kettle and mix thoroughly with the saw dust. Cool in cast-iron molds, or press into shape in a hydraulic soap-press.

Solidified Benzine

German Patent 630,280

a.	Beeswax, Yellow, Crude	3 g.
	Benzine	100 g.
b.	Caustic Soda (.33%)	0.5 g.
c.	Ammonium Stearate	1–2 g.

To the solution *a* add *b*, heat to saponify the beeswax, and add *c* while hot. Let cool.

Activated Coal

British Patent 414,361

The combustion properties of coal are improved by the addition of ½% of borax or calcium borate with or without a similar amount of salt.

Improving Bituminous Coal

U. S. Patent 2,059,388

A process of treating ordinary coal comprises mixing with 1 gallon of water, 14 fluid ounces of sodium silicate having a ratio of sodium oxide to silicon dioxide of about one to three, respectively, 8½ ounces of sodium silicate having a ratio of sodium oxide to silicon dioxide of about one to two, respectively, 1½ pounds of salt, and applying the same evenly to the mass of coal to form a thin coating thereon.

Coal Combustion Improver

British Patent 469,241

Manganese Dioxide	26 lb.
Iron Oxide	8 lb.
Salt	24 lb.
Sodium Chlorate	23 lb.
Potassium Chlorate	5 lb.
Potassium Dichromate	3 lb.
Barium Hydroxide	8 lb.
Wood Charcoal	3 lb.

The above is sprinkled on coal in ratio of 2–2½ lb. per ton of coal.

Illuminating Gas Purification

U. S. Patent 2,019,468

Hydrogen sulphide is removed by scrubbing the gas containing oxygen, 0.5 lb. per sq. in. under pressure (85–125 lb. per sq. in.) with 1–5% soda ash or caustic soda solution containing 0.01–4% nickel, manganese, copper, iron or zinc salt.

Dustproofing Coke

Coke is sprayed with refined petroleum oil (d. 0.905) at rate of 0.2 gal. per ton of coke.

Soot Remover

Throwing a piece of zinc on a hot fire is said to be an excellent way to loosen chimney soot.

The same result may be secured by throwing an old white truck inner tube on the fire, about a square foot at a time. These tubes contain a high percentage of zinc oxide which is the effective agent obtained by burning zinc.

If the fire is hot and the draft good, no odor of burning rubber will penetrate into the house. If the odor comes up through the registers from a hot air furnace, it is a sure sign the furnace needs resetting.

Flue Soot Removers

Formula No. 1

Salt	54 g.
Zinc Oxide	33 g.
Zinc Sulphate	3 g.
Manganese Dioxide	10 g.

No. 2

Salt	99 g.
Manganese Dioxide	99 g.

No. 3

Salt	50 g.
Zinc Oxide	50 g.

No. 4

Salt	90 g.
Zinc, Powdered	10 g.

No. 5

Salt	50 g.
Zinc, Powdered	50 g.

Fire Lighters

Convenient fire lighters may be prepared for picnic or camping by using a heat vulcanizing rubber cement. This usually comes in two cans. Mix the contents and pour into the original containers. After two or three days the cement will have vulcanized into a firm mass. Pieces the size of one's thumb will start a quick hot flame which will ignite wood or coal with ease.

The bulk and mass of this composition may be increased by adding about one pound of sawdust per quart of cement. The blaze is not so fierce but lasts longer.

Plastic Cable Insulation

French Patent 809,261

Vinyl Chloride	70 g.
Vinyl Formate	30 g.
Ethylene Dichloride	50 g.
Benzoyl Peroxide	0.4 g.

Heat together until reaction is over.

Above product	100 g.
Di-Isobuty Phthalate	25 g.
Graphite	50 g.

Mix until uniform.

Electrolytic Condenser Electrolyte

Formula No. 1

U. S. Patent 1,999,408

Potassium or Ammonium Tartrate	1 oz.
Gum Arabic	24 oz.
Glycerin c.p.	104 oz.

No. 2

U. S. Patent 2,028,775

Agar-agar	1 oz.
Potato Starch	7 oz.
Ammonium Borate	56 oz.
Glycerin	36 oz.

No. 3

U. S. Patent 2,036,669

Diethylamine Borate	80 g.
Ethylene Glycol	1 l.

No. 4

British Patent 448,830

Sorbitol	50 g.
Boric Acid	100 g.
Ammonia (d. 0.88)	20 cc.

Heat until boiling point reaches 115° C.

No. 5

British Patent 449,947

Ethylene Glycol	90–10 oz.
Ammonium Citrate	10–90 oz.

Heat together to 120° C.

Electrolytic Condensers

British Patent 449,947

Aluminum strip is etched electrolytically using a carbon cathode by passing a bath of aqueous sodium chloride or a mixture of hydrochloric acid (d. 1.16) 8cc. and nitric acid (d. 1.42) 1.4cc. and sulphuric acid (d. 1.84) 0.7 cc. per liter at 70° C. Oxide is removed by a bath of aqueous caustic soda or potash (2%) at 70° C. Then pass through 5% sulphuric acid and clean in glycerin at 100° C.

Rectifier Electrode

U. S. Patent 2,017,842

A copper plate is heated in a furnace to 1060° C. until a good oxide coating is formed. Cool to 600° C. and quench in a bath of heavy mineral oil heated to 70° C. and then cool to room temperature in a bath of relatively thin mineral oil.

Beck Effect Arc Electrode

British Patent 456,040

Iron	11 oz.
Cerium Fluoride	41 oz.
Carbon	48 oz.

Electric Discharge Tube Cathodes

British Patent 459,163

The following mixtures are pressed and heated at 1300° C.

Formula No. 1

Barium Oxide	40 oz.
Tungston Carbide	20 oz.
Zirconium	10 oz.
Zirconium Oxide	30 oz.

No. 2

Barium Hydroxide	50 oz.
Tungsten Oxide	20 oz.
Graphite	5 oz.
Thorium Oxide	25 oz.

Electrical Conducting Hydrogenation Catalyst

French Patent 807,157

Iron, Powdered	60
Tin Hydroxide	30
Boric Acid	10
Aluminum Hydroxide	20
Phosphoric Acid	5
Graphite	5

The above is mixed with any aqueous solution of stannous chloride, aluminum chloride, zinc bromide and chromium fluoride to form a plastic mass which is molded and dried.

Brake Lining

U. S. Patent 2,026,767

Thoroughly mix 18 parts of drying vegetable oil and 2.7 parts sulphur with 25 parts finely divided pyrobituminous material and 65 parts of short fiber asbestos, form mixture into shapes, and then cure shapes in a baking oven without pressure for four to five hours at approximately 125° F. and then for five to six hours at approximately 300° F. to set the oil by sulphuration to bond the ingredients of the element.

Brake Lining Treatment

U. S. Patent 2,037,189

The lining is dipped at 90°, baked at 190°, and calendered while hot; after drying and ageing, it is treated with 1:1 thinner-castor oil mixture for 10 min. and again calendered.

The dipping solution consists of:

Castor Oil	0.5 lb.
Rosin	2.0 lb.
Gilsonite	16.0 lb.
Minium	1.5 lb.
Carbon Black	0.5 lb.
Tung Oil	5.0 lb.
Linseed Oil	2.5 lb.

These are heated together at 230° before mineral thinner and pigments (72%) are added.

Transmission Material for Hydraulic Presses

U. S. Patent 1,977,012

A semi-fluid material is used comprising asphalt 60–90 oz. and a greasy fluid such as oil or paraffin 10–40 oz.

Hydraulic Brake Fluid

Formula No. 1

U. S. Patent 2,020,543

Ethyl Acetate	3 oz.
Castor Oil	2 oz.

No. 2

German Patent 645,939

Castor Oil	80 lb.
Cyclohexanone-Glycerin	50 lb.

No. 3

Glycerin	50 lb.
Diacetone-Erythritol	50 lb.

No. 4

Glycerin	65 lb.
Acetone-Mannitol	35 lb.

No. 5

Acetone-Glycerine Cetyl Ether	45 lb.
Castor Oil	55 lb.

No. 6

Ethylene Glycol Mono Ethyl Ether	30 lb.
Cyclopentanone-Glycerin Phthalate	70 lb.

Hydraulic Shock Absorber Fluid

Formula No. 1

U. S. Patent 2,060,110

Glucose	5–20 lb.
Glycerin	20– 5 lb.
Alcohol	37.5 lb.
Water	37.5 lb.

No. 2

U. S. Patent 2,084,404

Fusel Oil	75 oz.
Triethanolamine	25 oz.

Automobile Anti-Freeze Solution

U. S. Patent 2,071,482

Formula No. 1

Glycerin	85 g.
Alcohol	1 g.
Water	14 g.
Urea	4 g.
Flaxseed	5 g.
Tertiary Butyl Phenol	4 g.
Soda Ash	1 g.
Dye	to suit

No. 2

German Patent 641,156

a. Di Potassium Phosphate	70 g.
Mono Potassium Phosphate	21 g.

Water, Distilled, to make	100 cc.
b. Potassium Carbonate	5 g.
Sodium Pyrophosphate	2 g.
Boric Acid	1.5 g.
Potassium Hydroxide	2.8 g.

To the solution *a* add *b*. The freezing point is −37° C.

Non-Corrosive Anti-Freeze Solution
Canadian Patent 360,963

A noncorrosive antifreeze compound is prepared by adding to commercial denatured absolute ethyl alcohol sufficient 40% aqueous sodium nitrite solution to introduce 0.25 g. of the salt/100 cc. of alcoholic kerosene in the proportion of 3 cc./100 cc. of alcohol and 0.09 g. soap/100 g. alcohol.

Preventing Leakage of Glycol Anti-Freeze
U. S. Patent 2,042,830

Lard Oil	0.25
Mineral Oil	3.00
Triethanolamine	0.75

4 fluid oz. of above is used to 96 fluid oz. anti-freeze mixture.

Preventing Corrosion of Anti-Freeze Alcohol
French Patent 785,117

0.03% ethyl or diethylamine is added to alcohol to prevent corrosion of steel and attacking of copper.

Radiator Scale Preventing Compound
French Patent 810,744

Trisodium Phosphate	10 g.
Sodium Silicate	30 g.

Radiator Stop Leak Compounds

Formula No. 1	oz.
Iron Filings	25.00
Ferrous Sulphate	5.00
Rye Meal	33.30
Graphite	16.70
Red Lead	10.00
Asbestos (Powder)	10.00

No. 2

Graphite	47.00
Molasses	37.00
Phenol	0.50
Sodium Bisulphate	0.50
Water	15.00

No. 3

Asbestos (Powder)	6.00
Dry Paper Pulp	7.00
Wheat Paste	82.00
Salicylic Acid	1.00
Gum Arabic	2.00
Rosin	2.00

No. 4	oz.
Flaxseed Meal	70.00
Powdered Aluminum	9.00
Sodium Silicate, Dry	9.00
Casein	12.00

No. 5

Linseed Meal	80.00
Lampblack	3.00
Umber Brown	3.00
Water	14.00

No. 6

White Lead	16.00
Lard	16.00
Tallow	18.00
Soap	30.00
Caustic Soda	7.00
Linseed Oil	7.00
Cinnamon	6.00

No. 7

Powdered Aluminum	12.00
Corn Meal	50.00
Sodium Carbonate	12.00
Soap	11.00
Sodium Phosphate	15.00

No. 8

Lampblack	6.00
Ground Linseed	47.00
Oatmeal	23.00
Sodium Carbonate	8.00
Flour	15.00
Camphor	1.00

No. 9

Powdered Aluminum	20.00
Nitrocellulose	20.00
Butyl Acetate	20.00
Alcohol	40.00

No. 10

Graphite	20.00
Tannin	40.00
Gum Guaiac	10.00
Irish Moss	10.00
Caustic Soda	3.00
Cutch	7.00
Red Oak Bark Extract	10.00

No. 11

Flour	50.00
Lime	23.00
Sulphur	20.00
Gum Arabic	7.00

No. 12

Powdered Aluminum	15.00
Flaxseed Meal	50.00
Sulphur	20.00
Soap	15.00

No. 13

Powdered Aluminum	15.00
Sodium Silicate, Dry	5.00
Flaxseed Meal	60.00
Sodium Phosphate	20.00

No. 14

Powdered Aluminum	15.00
Soap	17.00

Linseed Meal	60.00
Ammonium Carbonate	8.00

No. 15

Powdered Aluminum	12.00
Corn Meal	60.00
Soap	18.00
Borax	10.00

Storage Battery Plates

Formula No. 1
U. S. Patent 2,035,315
Positive Plate

Litharge	65 oz.
Red Lead	35 oz.
Water containing 0.05 part of Sodium Borophosphate	10 oz.
Sulphuric Acid 1.250 sp. gr.	8 oz.

No. 2
Negative Plate

Litharge	100.0 oz.
Blanc Fixe	1.0 oz.
Lampblack	0.2 oz.
Water containing 0.05 part Sodium Borophosphate	8.0 oz.
Sulphuric Acid 1.250 sp. gr.	10.0 oz.

No. 3

Litharge	100.0 oz.
Cellulose or Other Organic Agent	0.5 oz.
Blanc Fixe	0.5 oz.
Lampblack	0.2 oz.
Water containing 0.10 part Sodium Borophosphate	8.0 oz.
Sulphuric Acid 1.250 sp. gr.	10.0 oz.

The prepared active material is pasted in the plates in conventional manner and dried in an oven under controlled humidity conditions bonding to an electrode of excellent physical strength. Excellent results are gotten with these electrodes when dried at a speed of thirty minutes or more total treating and drying time. In those cases where the total treating and drying time is less than thirty minutes the results achieved are not as satisfactory as in those cases of thirty minutes or more. Plates so made are entirely sound and of uniform structure throughout, a result very much to be desired.

Cleaning Sulphated Storage Battery Plates

French Patent 793,677

Pass a current of less than 15 amperes for one half hour through plates immersed in following solution:

Trisodium Phosphate	160 g.
Lead Oxide, Powdered	24 g.
Malachite Green	1 g.
Water	1 l.

Sulphation Preventive for Storage Batteries

British Patent 461,836

Tartaric Acid	40 g.
Magnesium Sulphate	40 g.
Water	2000 cc.

Liquid Primary Battery Fluids

U. S. Patent 1,988,139

The carbon electrode is surrounded by following depolarizer:

Sodium Dichromate	30 g.
Magnesium Chloride	18 g.
Sulphuric Acid	72 g.

The zinc electrode is surrounded by

Zinc Chloride	10 g.
Sodium Sulphate	30 g.
Sulphuric Acid	5 g.

Pocket Lamp Battery Compositions

Formula No. 1

a. Pyrolusite	75 g.
Graphite Powder	25 g.

b. Ammonium Chloride as Electrolyte Solution.

No. 2

a. Pyrolusite	64 g.
Manganese Dioxide, Synthetic	11 g.
Graphite Powder	25 g.

b. Ammonium Chloride as Electrolyte Solution.

No. 3

Pyrolusite	60 g.
Manganese Dioxide, Synthetic	12 g.
Graphite Powder	18 g.
Acetylene Soot	3 g.
Ammonium Chloride	7 g.

Pure Zinc Metal and Good Coal Electrodes are necessary.

Electrolyte:

Ammonium Chloride	20 g.
Magnesium Chloride	10 g.
Calcium Chloride	5 g.
Zinc Chloride	5 g.
Water	100 g.
Slaked Lime, to neutralize exactly	about 2 g.

No. 4

Infusorial Earth or Paper Pulp	100 kg.
Magnesium Sulphate	20 kg.
Ammonium Chloride	60 kg.
Zinc Chloride	50 kg.
Hydrochloric Acid	5 kg.
Water	to suit

Non-Blackening Discharge Lamp

British Patent 431,651

A double wall tube is used; the space between tubes is filled with oxygen, air, carbon dioxide or nitrogen. The glass has following composition:

Silica	54 lb.
Calcium Oxide	15 lb.
Boron Oxide	8 lb.
Aluminum Oxide	21 lb.
Sodium Oxide	1 lb.
Barium Oxide	½ lb.

White Insulating Tape
U. S. Patent 2,044,175

Asbestos tape is soaked in

Boric Acid	5 lb.
Water	95 lb.

for 10–18 hr. to take up 3–4% by weight; drained and dried at 100° C.

Chemical Heating Pad Fillers
Formula No. 1

Iron Powder	1 kg.
Potassium Chlorate	1 kg.

1 kg. of this mixture yields 1000 Heat-Units, that is 3 times as much as obtained with burned lime.

No. 2

Sodium Acetate is used which is melted inside a rubber bag by dipping the bag into hot water, and which keeps heat for hours.

No. 3
U. S. Patent 2,040,406

Aluminum, Powdered	2 oz.
Copper Carbonate	4 oz.
Oxalic Acid	3 oz.
Barium Chloride	3 oz.

On addition of water, heat is generated.

Heating Pad Chemicals
British Patent 474,249

Iron Filings	8 oz.
Ammonium Chloride	1 oz.

Wet well and mix thoroughly. Then disintegrate the mass and add 1/16 oz. of the following mixture:

Manganese Oxide	10 oz.
Calcium Chloride	1 oz.
Iodine or Thymol	.005 oz.

Heat Producing (Thermophoric) Composition
U. S. Patent 2,118,586

Manganous Chloride, Tetrahydrate	3.3 oz.
Sodium Acetate, Trihydrate	94.0 oz.
Ethylene Glycol	2.7 oz.

Heating Pad Powder, Safe

Sodium Acetate	135.1 g.
Glycerin	4.5 g.
Sodium Sulphate Crystals	3.0 g.
Sodium Sulphate Anhydrous	6.7 g.

The rubber pad containing above is prepared for therapeutic use by placing it in boiling water and boiling it for not more than ten minutes. After this, the element will be found to be partially liquefied and during recrystallization will give off heat at a comparatively even temperature for approximately one hour, after which the element will have solidified completely. The temperature will range from approximately 114 F. down to approximately 108 F.

The pad cannot be used until boiled, so it is necessarily sterilized before each application.

Activated (Adsorbent) Carbon
Formula No. 1

An active carbon suitable for use in respirators has been prepared, under both experimental and large-scale conditions, by carbonising a coal of low caking power (durain) at 480° C. or 650° C. and subsequently activating the coke in a current of steam at about 950° C. The yield of carbon is 26–32% of the coke. It compares favorably in activity with a carbon produced from a briquetted coal, but the latter has the lower friability. Choice of the coal is an important factor in the process.

No. 2
U. S. Patent 2,056,854

Shells of cocoa beans are impregnated with a sodium sulphide solution and then heated to 500° C.

Regenerating Spent "Carbide"

Spent Calcium Carbide (Containing less than 75% water)	850 kg.
Powdered Coke	600 kg.

Heat at 550° C.

Recovering Gas Works Sulphur

Gasworks sulphide paste, containing about 50% of water is heated in an autoclave at 154°/4–5 atm., whereby molten sulphur separates as the lower layer, leaving the soluble impurities in the upper aqueous layer, and the insoluble ones as a slag at the phase interface.

Regeneration of Fat Hydrogenation Catalyst

The method consists in first treating the used catalyst with a boiling solution of caustic (8° Bé.) sufficient in quantity to saponify half the fat contained on the catalyst; on the formation of an emulsion additional caustic (3° Bé.) is added, sufficient to saponify the remaining half of the fat, and boiling is continued for a couple of hours. The next stage is to add to the mixture a solution of hypochlorite (containing 1.4 per cent of available chlorine) in a quantity approximately equal to that of the catalyst being treated, followed by an equal weight of water; the mixture is then further heated at 60° C. for an hour. At the end of this period the solution is diluted with 3–4 times its bulk of water and boiled for a few hours, the supernatant emulsion of fat and foreign matter is then decanted off and the catalyst washed with boiling water (acidified with sulphuric acid) placed in a filter press, and washed till free from any reaction for sulphate; it is then dried and is ready for use. The loss of nickel by the above method of regeneration is 6–10 per cent, which compares favorably with losses of 40 per cent and more that are experienced when it is sought to recover the metal in the form of one of its salts.

Sulphuric Acid Catalyst

Sulphuric Acid contact catalysts are prepared as follows: magnesium sulphate crystallized with 1 molecule of water (prepared by dehydration at 100 to 120° C. of the fully hydrated salt) is powdered, mixed with half its weight of water to a paste and evaporated to dryness with vigorous stirring. After final calcination in an electric furnace at 600° C., product in the form of granules (2.5 to 3.5 mm. diameter) is platinized in platinum chloride solution, concentration of which is equivalent to 0.1% platinum. After dehydration in the air at 350° C., catalyst is activated at the same temperature with a gas containing 2% sulphur dioxide.

Barium Linoleate

This metallic soap is useful as a fungicide and preservative for fish nets. It is also used in compounding greases.

In brief, the method of preparation of barium linoleate may be described as follows:

(1) Determine the saponification value of the linseed oil to be used.

(2) Add just under the amount of caustic soda required to neutralize. Boil.

(3) Add more dilute caustic until the soap is just a faint pink to phenolphthalein.

(4) Add barium chloride solution at the boil until precipitation is complete and boil for a few minutes.

(5) Wash three times with boiling water and dry. It is impossible to give exact figures, but one sample of linseed oil worked out as follows:

Linseed Oil	881 lb.
Caustic Soda	120 lb.
Barium Chloride Crystals	244 lb.

Triphenyl and Tricresyl Phosphates
U. S. Patent 1,983,588

a. Phenol or Cresol	15 mols.
b. Phosphorous Pentachloride	3 mols.
c. Phosphorous Pentoxide	1 mol.

Add *a* to *b* at less than 90° C. and when clear add to *c*. Heat for three hours at 210–215° C. If a catalyst such as aluminum chloride is used the reaction proceeds at 150° C.

Stable Calcium Hypochlorite Pellets
U. S. Patent 2,023,459

Bleaching Powder (65% Available Chlorine)	60 lb.
Plaster of Paris	30 lb.
Water	40 lb.

Mix well and form into pellets and dry. Finished product contains 36% available chlorine.

Coarsely Crystalline Ammonium Sulphate
U. S. Patent 2,021,093

A solution of the following is allowed to crystallize:

Ammonium Sulphate	100 lb.
Water	100 lb.
Urea	2–8 lb.

The crystals contain less than ½% urea.

Stabilizer for Carbon Tetrachloride
U. S. Patent 2,094,367 & 2,094,368

The addition of 0.34% naphthylamine or diphenylamine stabilizes and inhibits corrosive properties of carbon tetrachloride.

Protecting Calcium Carbide
U. S. Patent 2,048,962

Calcium carbide is sprayed with 4% of its weight of gasoline or kerosene to protect it against atmospheric moisture.

Antioxidants for Decalin

Autoxidation of decalin can be greatly retarded by 0.001–0.01% of pyrogallol, hydroquinone or α-naphthol.

Salt Denaturants

For 100 kg. of salt use

Formula No. 1

Mineral Oil	0.25 kg.

No. 2

Iron Oxide	0.25 kg.

No. 3

Soap Powder or Flakes	1 kg.

No. 4

Soda	2 kg.
Heliotropin	20 g.
Chicago Blue 6B	0.5 g.

Alumina

The charge used is

Bauxite	49 kg.
Calcium Carbonate	28 kg.
Soda Ash	23 kg.

After calcining the alumina is extracted with aqueous sodium carbonate at 70° C.

Artificial Perspiration

Fresh	
Salt	10 g.
Lactic Acid	1 g.
Sodium Dihydrogen Phosphate	1 g.
Water	1 l.
Old	
Salt	10 g.
Ammonium Carbonate	4 g.
Disodium Hydrogen Phosphate	1 g.
Water	1 l.

Drying Agents for Gases

Commercial operations on a large scale in many industries require dry gases. The most efficient methods of water removal depending on either physical or chemical action are listed below.

Physical

Silica Gel
Charcoal (Active)
Kieselguhr
Clay, Porcelain, Alumina
(Low temperature fired)
Asbestos
Glass Wool
Refrigeration

Chemical

Phosphoric Anhydride
Magnesium Perchlorate (Anhydrous)
Magnesium Perchlorate Trihydrate
("Dehydrite")
Barium Oxide
Calcium Sulphate Hemihydrate ("Anhydrite")
Sulphuric Acid, Conc.
Fused Potassium Hydroxide
Magnesium Oxide
Barium Perchlorate ("Desicchlora")
Copper Sulphate (Anhydrous)

Air Conditioning Dehumidifier Solution

U. S. Patent 2,091,983

Lithium Chloride	1 -31 oz.
Lithium Bromide	99–69 oz.

Gas Warning Odorant

U. S. Patent 2,068,614

Mercaptan	0.5 lb.
Alkylnitrosoamine	0.1 lb.
Sudan III Dye	0.75 lb.
Gasoline	1 gal.

The above solution will odorize 500,000 cu. ft. of gas.

Carbon Dioxide Absorbent

British Patent 473,913

Slaked Lime	10 kg.
Sodium Acetate (125 g./l.)	4 l.

Mix together & granulate. Dry at 110° C. and calcine in a rotary furnace at 350–380° C. for 1½–2 hr. Then moisten granules with 1 l. aqueous caustic soda (d. 1.33).

Preventing Spontaneous Explosion of Ether

Ether should be kept in an amber bottle with a piece of copper wire (#20 gage) extending to surface of liquid to prevent formation of explosive ether peroxides. The copper does not dissolve.

"Gettering" Vacuum Tubes

British Patent 471,636

Barium vapor is produced in vacuum tubes to remove harmful gases, by electrically heating to 1200° C. a tungsten wire coated with an equimolecular mixture of barium and strontium oxides.

Fire Extinguisher

Formula No. 1

An excellent fire-extinguishing powder can be made by incorporating 1–2% iodine crystals with bicarbonate of soda.

No. 2

U. S. Patent 2,010,729

Sodium Bicarbonate	32 oz.
Potassium Acid Tartrate	3 oz.
Boron Oxide	8 oz.
Borax	1 oz.

The above are finely powdered and mixed together.

Fireproofing Composition

Canadian Patent 368,886

Ammonium Sulphate	14 oz.
Borax	2 oz.
Boric Acid	½ oz.
Water	100 oz.

Fingerprinting Method

Make print of cleaned finger on white cardboard and dust a basic dye (e.g. Victoria Blue BS) over the print. To fix dye hold card for a few minutes over 30% boiling acetic acid to obtain a positive which can be photographed.

For photographing prints on colored objects the same method is used with a suitable shade of any basic dye.

Finger Prints, Developing Latent

Latent fingerprints can be rendered visible by applying iodine to the suspected surface and then making an impression upon a specially coated white paper. The iodine can be applied by placing a petri dish containing a fused iodine crystal over the area under examination or by directing a current of air upon it from a wash bottle containing a few iodine crystals. The coating solution for the paper consists of 1 gram starch, 0.3 gram thymol and 2 grams potassium iodide dissolved in 20 cc. water. After the imprint has been made it can be protected against injury by coating with a 3 per cent solution of dammar resin in benzene.

Finger-Printing Powder

U. S. Patent 2,099,028

Hydroquinone	8 oz.
Gum Acacia, Powdered	1 oz.

Finger Prints on Metal

U. S. Patent 1,993,920

Gelatin	1.5 g.
Sodium Chloride	28.4 g.
Copper Sulphate	35.5 g.
Water	113.6cc.

Loosening Glass Stoppers

Formula No. 1

When glass stoppers in bottles are stuck, they can often be loosened by letting a few drops of glycerin soak down the inside edges.

No. 2

Glass stoppers which have become fixed can easily be loosened without heat by allowing a few drops of the following solution to soak in between the neck of the bottle and the stopper:

Chloral Hydrate	10 g.
Glycerin	5 g.
Water	5 g.
Hydrochloric Acid (25 per cent)	3 g.

No. 3

Quickly heat the neck of the bottle so that it expands before the heat reaches the stopper.

Chemical "Barometer"

A glass tube, 10 in. long and 1 in. in diameter, is sealed at one end, the other end being drawn to a fine neck about 8 in. from the sealed end. For this the quantities required are:—

Camphor .	½ oz.
Nitre (Powdered)	¼ oz.
Sal Ammoniac (Powdered)	¼ oz.
Rectified Spirits, or Commercial Alcohol	4 oz.

The equipment required includes a small double saucepan, a Fahrenheit thermometer, a glass funnel, a 12-oz. glass bottle, glass wool, a cork to fit the barometer tube and carrying a bent glass tube of sufficient length to reach the bottom of the bottle, a Bunsen burner, and a mouth blow-pipe.

The nitre and sal ammoniac are placed in the saucepan, and ½ oz. of water added. By direct heat and stirring as complete a solution as possible is obtained, and the saucepan is then placed in its water jacket, which must contain water at 110° F. The camphor, crushed, is then added, and the temperature of the mixture brought to approximately 100° F. The alcohol is gradually added, with stirring, until a complete solution is obtained at 100° F. Great care should be exercised not to add excess alcohol, and to keep the bath gently heated at the required temperature. The funnel, containing a wad of glass wool, is warmed, and the solution filtered into the warm bottle, the temperature being carefully maintained, as crystallisation during this operation must be avoided.

The bottle is then corked and placed in hot water. The tube of the barometer is now warmed until just bearable to the hand, and a small quantity of the prepared solution coaxed into it through the narrow neck. The fitted cork is then inserted in the mouth of the tube, and the narrow tube inserted in the bottle of solution. By boiling the alcoholic solution in the tube, all the air can be expelled, and on cooling the stock liquid is drawn into the tube. Surplus liquid is removed from the top portion of the wide tube, and the latter sealed by means of the Bunsen flame and blowpipe. A small air space at the top of the tube is of no great consequence. The finished tube may be mounted in a perpendicular position in a wooden frame, and a scale, dividing the length of the tube into three, and marked "Fair," "Change" and "Storm" may be affixed, "Fair," of course, being the lowest division.

The reactions of the barometer are merely a function of temperature. The tube being hermetically sealed, neither atmospheric pressure nor humidity can have any effect, nor can electrical conditions affect precipitation in any marked degree. Temperature changes, however, are definitely related to other conditions of the weather. Anti-cyclonic conditions during the summer are generally accompanied by settled periods of high temperature and clear skies, and in such circumstances the tube shows a precipitate level in the "Fair" section and a clear liquid above. On the approach of cyclonic conditions the usual warm "front" of the disturbance is reflected in the fall of the separation line, while the arrival of the colder "centre" causes a rapid precipitation with clouding of the liquid, and a rise of the dividing line into the "Storm" section forecasting the windy weather associated with the passage of a depression. In winter the "glass" usually prophesies "Change."

Solution for Blowing Strong Soap Bubbles

Any convenient weight of triethanolamine is thoroughly stirred with a little less than twice its weight of oleic acid in a flask (no heating necessary). The flask is stoppered and set aside for twenty-four hours.

A thirty-gram portion of the resulting soap is mixed with about a liter of distilled water, in which it slowly dissolves. Solution is hastened by occasional shaking. Finally, it is allowed to settle for twenty-four hours. (It becomes translucent but never clear.) The lower, light-gray layer is siphoned off and mixed well with three-tenths of its volume of glycerin. The solution is stored in the dark, and the bottle in which it is kept is well-stoppered to protect it from the air. After aging for twenty-four hours it is ready for use.

Foam Inhibitors
U. S. Patent 2,074,380

The addition of ½–1% of triamylamine or other liquid, substantially water insoluble amine reduces or eliminates foam formation.

Frost Formation Preventer

Salt	1 oz.
Glycerin	16 oz.
Water	8 oz.

If the windshield is wiped occasionally with the cloth prepared as directed below the glass will not fog.

Water	5 qt.
Glycerin	1 oz.
Sodium Oleate	1 oz.

Boil together for five minutes, then immerse the cloth (usually flannel) in the boiling solution for ten minutes.

Mist- & Rainproofing Windshields

Apply the following lightly but thoroughly:

Glycerine	100 g.
Glycol Bori-borate	40 g.
Water	10 g.

Anti-fogging Composition for Glass Windows
U. S. Patent 2,107,361

Glycerin	1	gal.
Camphor	4	oz.
Turpentine	½	pt.
Potassium Oxalate	1	lb.
Oxalic Acid	4	oz.

Eye-Glass Mist Preventer Pencil

a.	Glycerin-Soap	65 g.
b.	Glycerin	30 g.
	Turpentine	5 g.
c.	White Bole	to desired consistency

Melt the soap on a water-bath, add the glycerin and turpentine, and work in enough of the bole to form a moldable material. Make pencils while hot.

Non-Cracking Ice

There are many processes on the market designed to prevent cracking, checking, and shattering of ice frozen from raw-water at low temperatures. All are based upon lowering the pH. Ammonium chloride, used 5 gms. per 300 lb. cake, will buffer the pH down to the proper value, regardless of initial pH, within any reasonable limits. Cracking in *distilled-water* ice, is usually due to too low pH values, and can be remedied by raising pH to 7–7.2.

Refrigerating Medium
U. S. Patent 2,058,924

A hold-over brine or cold accumulator fluid consists of

Propyl Alcohol	17 –25 lb.
Water	83 –75 lb.
Sodium Chromate	0.1– 0.2 lb.

Freezing Mixtures

Formula No. 1

Ammonium Chloride	1 oz.
Potassium Nitrate	1 oz.
Water	3 oz.

Reduction of temperature about 40° F.

No. 2

Ammonium Nitrate	1 oz.
Sodium Carbonate	1 oz.
Water	1 oz.

Reduction of temperature about 50° F.

Artificial Ice for Skating Rink

Formula No. 1

British Patent 466,908

Carnauba Wax	100 lb.
Naphthalene	70– 90 lb.
Montan Wax	20 lb.

Melt together and apply hot. Spread with heated rollers. When cool coat glycerin with or without a small amount of soap solution as a lubricant.

No. 2

U. S. Patent 2,057,906

IG Wax (Esterified Montan Wax)	100 lb.
Naphthalene	40–100 lb.

Melt together; mix well and pour on an even surface. After this composition has hardened it is made smooth by scraping and hot irons. For reducing friction, the surface is moistened with glycerin.

Any of the IG waxes may be used in the above with or without carnauba wax.

Permanent Aqueous Microscopic Slide Mount

Lanolin Anhydrous	80 g.
Rosin	20 g.

Melt together and stir until uniform. Dry the slide and cover glass before application and apply melted.

Removing Cover Glasses of Microscope Slides

It is often necessary in cytological work to remove the cover glass of a slide, in order to replace a broken cover glass or restain the sections underneath. For this purpose most workers use xylene. It has been found, however, that a mixture of 90 parts of xylene and 10 parts of n-butyl alcohol acts much more rapidly. The hard and brittle balsam or damar of old slides, which would require an immersion of several days in pure xylene, is usually dissolved by this mixture in a few hours. This time difference is probably due to the presence—especially in old slides—of a small amount of moisture in the mounting medium around the margin of the cover glass. Such moisture would offer a barrier to the penetration of pure xylene, but not to xylene containing n-butyl alcohol; for the latter is miscible with small amounts of water, as well as with xylene, balsam and damar. It should be remembered that butyl alcohol is a solvent of the aniline dyes, and so material stained with these substances will be destained in this xylene-butyl alcohol mixture.

Removing Flesh From Skulls

Unfleshed skulls of small animals, kept overnight in a screened bait box containing a dozen or more crawfish, will be cleaned of every particle of flesh. The voracious crawfish devour the tissues, leaving the skull odorless and snowy white, in excellent condition to be stored indefinitely. The usual method of boiling the skulls has a tendency to soften the jaw hinges, making it necessary to wire the lower jaw to the skull. Crawfish are unable to loosen the jaws from their sockets because the tough gristle forming the hinges is located beyond reach.

Low Cost Giemsa Stain

Azur II—Eosin	3.0 g.
Azur II	0.8 g.
Glycerin (C.P.)	250.0 g.
Methyl Alcohol, Absolute (Neutral), Acetone Free	250.0 g.

Dissolve the Azur II and Azur II—eosin in the methyl alcohol in an Erlenmeyer flask. Shake well for fifteen minutes, add the glycerin, shake for ten minutes and filter through a moderately fine grade of filter paper. Collect the filtered stain in a bottle and discard the undissolved residue.

There is generally quite a bit of stain that does not dissolve. This, however, seems to make very little difference in the character of the resultant stained blood films. Results have been equally satisfactory with human blood and avian blood. Malarial parasites are brought out sharply, with distinct differentiation of chromatin and cytoplasm.

Algae Growing Food

Potassium nitrate, 1g., calcium sulphate, 0.5 g., magnesium sulphate, 0.5 g., ferrous phosphate, 0.10 g., tricalcium phosphate, 0.25 g., distilled water 1,000 cc.

Fish Bait

U. S. Patent 2,102,052

1. A method of making artificial fish bait includes cutting a piece from a slab of pork rind and forming it to a shape suitable for artificial bait, washing it in warm water to remove impurities, impregnating it with a sodium alkyl sulphate, dehydrating it with a polyhydric alcohol maintained at a concentration in excess of 50% by weight, and mechanically kneading it to render it pliable.

Decorative Spangles

Starch	10 oz.
Sodium Perborate	0.5 oz.
Sodium Salicylate	2.5 oz.
Water	87 oz.

The sodium perborate is dissolved in the water and then the starch added. This mixture is then heated in a water jacket with continued stirring to the bursting of the starch granules, and heating continued until the mass is clarified. The sodium salicylate is mixed in a small amount of water and added to the mixture thoroughly stirring the same. A smooth highly polished metallic surface is coated with a very thin film of oil or wax and the above solution spread out upon this surface in a thin layer. It is then dried in an oven at about 180° F., after which it is easily removed from this surface with a knife or razor blade. These flakes can be crushed in a mortar to the desired fineness. They scintillate like mica. If the starch plastic is colored with water soluble dyes, or colored pigments added including powdered aluminum or bronze, very attractive and varied novelty effects are obtained. If a sign, or design is made on any surface with an adhesive drying material, and while same is still tacky the above flakes are dusted on same, a very decorative effect is produced.

Removing Silver From Mirror

Muriatic Acid	1 oz.
Nitric Acid	1 oz.
Water	5 oz.

Dip the screened mirror in this solution for about three to five seconds and the silvering and copper back will be completely removed. Next rinse glass in an acid-neutralizing bath of cyanide of potassium (10% solution). Then rinse with running water and dry.

"Sweeping Aid"

Wood Meal, Dry, Sifted	40 lb.
Sand, White, Fine	30 lb.
Rock-Salt in Small Crystals	20 lb.
Mineral or Spindle Oil (3–4° Engler/20° C.)	10 lb.
Oil-Soluble Green Dye	to suit
Pine Needle Oil, etc.	to suit

Pouring Small Amounts

A discarded lens from a hand flashlight is excellent for use on a bottle when pouring solution. By moving the lens, as much or as little solution as you desire will be released.

Imitation Iced Tea Display

Fill a glass three quarters full with water, colored with a little water soluble brown dye. Crumple some clear "Cellophane" and stuff in top of glass. It will look like ice.

Denicotinized Tobacco Products

U. S. Patent 2,048,624

A process of producing *denicotinized tobacco,* consists in moistening the tobacco, then subjecting the moistened tobacco to the action of an organic nicotine solvent, (e.g. formaldehyde and carbon tetrachloride), then treating the tobacco with warm air for the purpose of removing the solvent, again moistening the tobacco, again subjecting the tobacco to treatment with warm air, and finally heating the tobacco to remove the remaining moisture.

Denicotinizing Cigarette Smoke

Put some cotton wool in the mouthpiece of the cigarette or cigarette holder. This will absorb 93% of the nicotine in the smoke.

Glycerin Substitute

a.	Magnesium Chloride, Crystallized	4 kg.
	Water	1.5 kg.
b.	Glucose	4 kg.
	Water	3.5 kg.

Prepare solutions *a* and *b,* mix. Settle, or filter if necessary. Adjust to a specific gravity of 1.23 (28° Bé).

Preparation of Zein

U. S. Patent 2,044,769

Gluten meal (from corn) is extracted with a 4:1 mixture of alcohol and water. Adjust pH to 6.5–12 and add 2 volumes of water below 37° C. This is added first slowly, with stirring, then rapidly.

Wash precipitate with water below 49° C. and dry below 65° C.

Heavy Petroleum Drilling Mud

Galena	35 lb.
Hematite	35 lb.
Bentonite	1.2 lb.
Water	28.8 lb.

All materials should be ground to 325 mesh.

Revivifying Spent Oil-Decolorizing Clay
U. S. Patent 2,118,310

Heat clay to at least 1600° F. for 4–5 seconds.

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Practical Druggist
Practical Everyday Chemistry
Printing Industry
Prob. Edelmetalle
Process Engr. Mo.
Proc. World Petroleum Congress

Rayon & Mell. Tex. Monthly
Refiner & Nat. Gas Mfr.
Rev. Aluminum
Rev. Amer. Electro Society
Rock Products

Science
Sharpless Solvents Corp.
Shoe and Leather Journal
Soap
Soap Gazette & Perfumer
Solvent News
Sovet-Sakhar
Spirits
Steel
Synthetic & Applied Finishes

Textile Colorist
Textile Mfr.
Textile Recorder

Univ. Nebr. Agric. Coll. Bull.
U. S. Department of Agriculture
U. S. Bureau of Mines
U. S. Bureau of Standards

Veneers and Plywood

Z. Elektrochem.
Zeit. Unters. Lebensm.

TRADE NAMED CHEMICALS

During the past few years, the practice of marketing raw materials, under names which in themselves are not descriptive chemically of the products they represent, has become very prevalent. No modern book of formulae could justify its claims either to completeness or modernity without numerous formulae containing these so-called "Trade Names."

Without wishing to enter into any discussion regarding the justification of "Trade Names," the Editors recognize the tremendous service rendered to commercial chemistry by manufacturers of "Trade Name" products, both in the physical data supplied and the formulation suggested.

Deprived of the protection afforded their products by this system of nomenclature, these manufacturers would have been forced to stand helplessly by while the fruits of their labor were being filched from them by competitors who, unhampered by expenses of research, experimentation and promotion, would be able to produce something "just as good" at prices far below those of the original producers.

That these competitive products were "just as good" solely in the minds of the imitators would only be evidenced in costly experimental work on the part of the purchaser and, in the meantime irreparable damage would have been done, to the truly ethical product. It is obvious, of course, that under these circumstances, there would be no incentive for manufacturers to develop new materials.

Because of this, and also because the "Chemical Formulary" is primarily concerned with the physical results of compounding rather than with the chemistry involved, the Editors felt that the inclusion of formulae containing various trade name products would be of definite value to the producer of finished chemical materials. If they had been left out many ideas and processes would have been automatically eliminated.

As a further service a list of the better known "trade name" products is appended together with the suppliers of these materials. The number after each trade name refers to the supplier given below with the corresponding number.

TRADE NAME CHEMICALS

SUPPLIERS OF TRADE NAME CHEMICALS

1. Acetate Products Corp., London, England
2. Acheson Graphite Corp., Niagara Falls, N. Y.
3. Advance Solvents & Chem. Corp., New York City
4. American Aniline Products, Inc., New York City
5. American Catalin Corp., New York City
6. American Cellulose Co., Indianapolis, Ind.
7. American Chemical Paint Co., Rochester, N. Y.
8. American Chemical Products Co., Rochester, N. Y.
9. American Colloid Co., Chicago, Ill.
10. American Cyanamid & Chem. Co., New York City
11. American Insulator Corp., New Freedom, Pa.
12. American Plastics Corp., New York City
13. Anchor Chemical Co., Manchester, England
14. Anderson Prichard Oil Corp., Oklahoma City, Okla.
15. Ansbacher-Siegle Corp., Rosebank, N. Y.
16. Archer-Daniels-Midland Co., Minneapolis, Minn.
17. Arkansas Co., New York City
18. Atlantic Refining Co., Philadelphia, Pa.
19. Augsburger, Kunst Fabrik, Augsburg, Germany
20. Autoxygen, Inc., New York City
21. Bakelite Corp., New York City
22. Baker & Co., Inc., Newark, N. J.
23. Baker Castor Oil Co., Jersey City, N. J.
24. Baker, J. T. Chem. Co., Philipsburg, N. J.
25. Barber Asphalt Co., Philadelphia, Pa.
26. Barrett Co., New York City
27. Beck, Koller & Co., Detroit, Mich.
28. Bick & Co., Inc., Reading, Pa.
29. Bilhuber-Knoll Corp., New York City
30. Binney & Smith, New York City
31. Bohme A. G., H. Th., Chemnitz, Germany
32. British Drug Houses, Ltd., London, England
33. British Xylonite Co., London, England
34. Bud Aromatic Chemical Co., Inc., New York City
35. Buromin Corp., Pittsburgh, Pa.
36. Bush, W. J. & Co., Inc., New York City
37. Cabot, Godfrey L., Inc., Boston, Mass.
38. Calco Chemical Co., Bound Brook, N. J.
39. Campbell, John & Co., New York, N. Y.
40. Campbell, Rex & Co., London, England
41. Carbic Color & Chemical Co., New York City
42. Carbide & Carbon Chemical Corp., New York City
43. Carbogen Chemical Co., Garwood, N. J.
44. Carborundum Co., Niagara Falls, N. Y.
45. Casein Mfg. Co., New York City
46. Cellonwerke, Charlottenburg, Germany
47. Celluloid Corp., Newark, N. J.
48. Century Stearic Acid & Candle Works, New York City
49. Champion Fibre Co., Canton, N. Car.
50. Chaplin-Bibbo, New York City
51. Chemical & Pigment Co., Baltimore, Md.
52. Chemical & Pigment Co., Inc., Scranton, Pa.
53. Chemical Solvents, Inc., New York City
54. Cheeseborough Mfg. Co., New York City
55. Ciba Co., Inc., New York City

56. Cinelin Co., Indianapolis, Ind.
57. Colgate-Palmolive-Peet Co., Jersey City, N. J.
58. Colledge, E. W., Inc., Cleveland, Ohio
59. Columbia Alkali Corp., New York City
60. Commercial Solvents Corp., Terre Haute, Ind.
61. Commonwealth Color & Chem. Co., Brooklyn, N. Y.
62. Conewango Refining Co., Warren, Pa.
63. Continental Diamond Fibre Co., Bridgeport, Pa.
64. Corn Products Refining Co., New York City
65. Darco Sales Corp., New York City
66. Deep Rock Oil Corp., Chicago, Ill.
67. Dewey & Almy Chem. Co., Boston, Mass.
68. Dodge & Olcott Co., New York City
69. Dow Chemical Co., Midland, Mich.
70. Ducas, B. P. Co., New York City
71. DuPont, E. I., de Nemours & Co., Wilmington, Del.
72. Dynamit A. G., Troisdorf, Germany
73. Eastman Kodak Co., Rochester, N. Y.
74. Economic Materials Co., Chicago, Ill.
75. Eff Laboratories, Inc., Cleveland, Ohio
76. Emery Industries, Inc., Cincinnati, Ohio
77. Felton Chemical Co., Brooklyn, N. Y.
78. Fezandié & Sperrlé, Inc., New York City
79. Fiberloid Corp., Indian Orchard, Mass.
80. Filtrol Co., Los Angeles, Calif.
81. Formica Insulation Co., Cincinnati, Ohio
82. Fougera, E. & Co., New York City
83. Franco-American Chemical Works, Carlstadt, N. J.
84. Fries Bros., New York City
85. Fritzchie Bros., New York City
86. Geigy Co., Inc., New York City
87. General Atlas Carbon Co., New York City
88. General Chemical Co., New York City
89. General Drug Co., New York City
90. General Dyestuffs Corp., New York City
91. General Electric Co., Pittsfield, Mass.
92. General Electric Co., Schenectady, N. Y.
93. General Naval Stores Co., New York City
94. General Plastics Corp., London, England
95. General Plastics, Inc., No. Tonawanda, N. Y.
96. Girdler Corp., Louisville, Ky.
97. Givaudan-Delawanna, Inc., New York City
98. Glidden Co., Cleveland, Ohio
99. Glyco Products Co., Inc., New York City
100. Goldschmidt, A. G., Th., Essen, Ruhr
101. Goldschmidt Corp., New York City
102. Goodyear Tire & Rubber Co., Akron, Ohio
103. Grasselli Chemical Co., Cleveland, Ohio
104. Greef, R. W. & Co., New York City
105. Griffith Laboratories, Chicago, Ill.
106. Hall, C. P. & Co., Akron, Ohio
107. Halowax Corp., New York City
108. Hammond, W. A., Yellow Springs, Ohio
109. Harshaw Chemical Co., Cleveland, Ohio
110. Haskelite Mfg. Corp., Chicago, Ill.
111. Haveg Corp., Newark, Del.
112. Heine & Co., New York City
113. Hercules Powder Co., Wilmington, Del.
114. Heveatex Corp., Melrose, Mass.
115. Heyden Chemical Works, New York City
116. Hooker Electro-Chemical Co., New York City
117. Hopkins, J. L. & Co., New York City
118. Horn, Jefferys & Co., Burbank, Calif.

119. I. G. Farbenindustrie, Frankfurt, Germany
120. Imperial Chemical Industries, Ltd., London, Eng.
121. Industrial Chemical Sales Co., New York City
122. Innis, Speiden & Co., New York City
123. International Pulp Corp., New York City
124. Johns-Manville Corp., New York City
125. Jungmann & Co., New York City
126. Kali Mfg. Co., Philadelphia, Pa.
127. Kalle & Co., Wiesbaden-Bierich, Germany
128. Kay-Fries Chemicals, Inc., New York City
129. Kessler Chemical Corp., New York City
130. Kinetic Chemicals, Inc., Wilmington, Del.
131. Koppers Products Co., Pittsburgh, Pa.
132. Krebs Pigment & Color Corp., Newark, N. J.
133. Kuhlman, Etabls., Paris, France
134. Kurt, Albert G. M. B. H, Amöneburg, Germany
135. Lehn & Fink Corp., New York City
136. Lewis, John D., Inc., Providence, R. I.
137. Liquid Carbonic Corp., Chicago, Ill.
138. Lucidol Corp., Buffalo, N. Y.
139. Magnetic Pigment Co., New York City
140. Magnus, Mabee & Reynard, Inc., New York City
141. Makalot Corp., Boston, Mass.
142. Mallinckrodt Chemical Works, St. Louis, Mo.
143. Malt Diastase Co., New York City
144. Manchester Oxide Co., Manchester, England
145. Martin, Dennis Co., Newark, N. J.
146. Mathieson Alkali Co., New York City
147. McCormick & Co., Baltimore, Md.
148. Merck & Co., New York City
149. Metro-Nite Co., Milwaukee, Wis.
150. Mica Insulator Co., New York City
151. Monsanto Chemical Works, St. Louis, Mo.
152. Moore-Munger, New York City
153. Mutual Chemical Co. of America, Newark, N. J.
154. National Aluminate Corp., Chicago, Ill.
155. National Aniline & Chemical Co., Buffalo, N. Y.
156. National Oil Products Co., Harrison, N. J.
157. National Rosin Oil & Size Co., New York City
158. Naugatuck Chemical Co., New York City
159. Neville Co., Pittsburgh, Pa.
160. New Jersey Zinc Sales Co., New York City
161. Niacet Chemical Corp., Niagara Falls, N. Y.
162. Nulomoline Co., New York City
163. Nuodex Products, Inc., Newark, N. J.
164. Onyx Oil & Chemical Co., Passaic, N. J.
165. Papermakers Chemical Corp., Wilmington, Del.
166. Paramet Chemical Corp., Long Island City, N. Y.
167. Penick, S. B. & Co., New York City
168. Penn. Alcohol Corp., Philadelphia, Pa.
169. Penn. Salt Mfg. Co., Philadelphia, Pa.
170. Pfaltz & Bauer, Inc., New York City
171. Philadelphia Quartz Co., Philadelphia, Pa.
172. Pittsburgh Plate Glass Co., Milwaukee, Wis.
173. Plaskon Corp., Toledo, Ohio
174. Plymouth Organic Labs., New York City
175. Pollopas, Ltd., London, England
176. Procter & Gamble, Cincinnati, Ohio
177. Pure Calcium Products Co., Gainesville, Ohio
178. Pylam Products Co., New York City
179. Rauh, Robert, Inc., Newark, N. J.
180. Reilly Tar & Chemical Corp., Indianapolis, Ind.
181. Resinous Products & Chemical Co., Philadelphia, Pa.

182. Resinox Corp., New York City
183. Revertex Corp., New York City
184. Rhone-Poulenc, Soc., Paris, France
185. Richards Chemical Work, Jersey City, N. J.
186. Robeson Process Co., New York City
187. Rohm-Hass Chemical Co., Philadelphia, Pa.
188. Ross-Rowe, Inc., New York City
189. Royce Chemical Co., Carlton Hills, N. J.
190. Rubber Service Labs. Co., Akron, Ohio
191. Russia Cement Co., Gloucester, Mass.
192. Salomon, L. A. & Bro., New York City
193. Samuelson & Co., P., London, England
194. Sandoz Chemical Works, New York City
195. Scholler Bros., Inc., Philadelphia, Pa.
196. Schliemann Co., Inc., New York City
197. Scott, Bader & Co., London, England
198. Seeley & Co., New York City
199. Sharples Solvents Corp., Philadelphia, Pa.
200. Shawinigan, Ltd., New York City
201. Sherwood Petroleum Co., Brooklyn, N. Y.
202. Siemon Co., Bridgeport, Conn.
203. Silver, Geo., Import Co., New York City
204. Sonneborn, L. Sons, New York City
205. Southwark Mfg. Co., Camden, N. J.
206. Spencer-Kellogg Co., New York City
207. Stamford Rubber Supply Co., Stamford, Conn.
208. Stanco Distributors, Bayway, N. J.
209. Stanco, Inc., New York City
210. Standard Brands, Inc., New York City
211. Standard Oil Co. of Calif., San Francisco, Calif.
212. Standard Oil Co. of Indiana, Chicago, Ill.
213. Standard Oil Co. of N. J., New York City
214. Stauffer Chemical Co., New York City
215. Stein-Hall & Co., Inc., New York City
216. Stokes & Smith Co., Philadelphia, Pa.
217. Sun Oil Co., Philadelphia, Pa.
218. Swann Chemical Corp., Birmingham, Ala.
219. Synfleur Scientific Labs., Monticello, N. Y.
220. Synthane Corp., Oaks, Pa.
221. Tannin Corp., New York City
222. Tennessee Eastman Corp., Kingsport, Tenn.
223. Texas Mining & Smelting Co., Laredo, Texas
224. Thomas, Arthur H., Co., Philadelphia, Pa.
225. Titanium Pigments Co., New York City
226. Uhlich, Paul Co., New York City
227. United Color & Pigment Co., Inc., Newark, N. J.
228. United States Gypsum Co., Chicago, Ill.
229. United States Industrial Chemical Co., Inc., New York City
230. U. S. Rubber Products, Inc., New York City
231. Van-Ameringen Haebler, Inc., New York City
232. Vanderbilt, R. T. Co., Inc., New York City
233. Van Schaack Bros. Chemical Co., Chicago, Ill.
234. Varcum Chemical Corp., Niagara Falls, N. Y.
235. Verley, Albert & Co., Chicago, Ill.
236. Victor Chemical Works, Chicago, Ill.
237. Virginia Smelting Co., W. Norfolk, Va.
238. Vultex Corp. of America, Cambridge, Mass.
239. Wallerstein Co., Inc., New York City
240. Welch, Holme & Clark Co., Inc., New York City
241. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
242. Whittaker, Clark & Daniels, Inc., New York City
243. Wiffen & Co. Sons, Ltd., London, England
244. Will & Baumer Candle Co., New York City

245. Wishnick-Tumpeer, Inc., New York City
246. Woburn Degreasing Co. of N. J., Harrison, N. J.
247. Wolf, Jacques & Co., Passaic, N. J.
248. Wyodak Chemical Co., Cleveland, Ohio
249. Young, J. S., Baltimore, Md.
250. Young, J. S. & Co., Hanover, Pa.

WHERE TO BUY CHEMICALS

Abietic Acid
Hercules Powder Co., New York, N. Y.
Accelerators, Vulcanization
Rubber Service Labs., Inc., Akron, O.
Acetamide
Amer. Chemical Products Co., Rochester, N. Y.
Acetic Acid
The Cleveland-Cliffs Iron Co., Cleveland, Ohio
Acetic Anhydride
American-British Chemical Supplies, Inc., New York, N. Y.
Acetone
W. S. Gray Co., New York, N. Y.
Acetphenetidin
Merck & Co., Inc., Rahway, N. J.
Acetyl Salicylic Acid
Monsanto Chemical Co., St. Louis, Mo.
Acids, Fatty
Arthur C. Trask Co., Chicago, Ill.
Acriflavine
Abbott Laboratories, North Chicago, Ill.
Agar
American Agar Co., Inc., San Diego, Calif.
Albumen
Stein, Hall & Co., Inc., New York, N. Y.
Alcohol, Denatured
Rogers & McClellan, Boston, Mass.
L. R. Van Allen & Co., Chicago, Ill.
Alcohol, Pure
U. S. Industrial Alcohol Co., New York, N. Y.
Alkalies
Columbia Alkali Corp., New York, N. Y.
Alkaloids
Merck & Co., Inc., Rahway, N. J.
Alkanet
J. L. Hopkins & Co., New York, N. Y.
Almond Oil
Magnus, Mabee & Reynard, Inc., New York, N. Y.
Aloes
Peck & Velsor, New York, N. Y.
Alpha Naphthol
Hord Color Products, Sandusky, O.
Alumina
Aluminum Co. of America, Pittsburgh, Pa.
Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Aluminum Hydrate
Ceramic Color & Chem. Mfg. Co., New Brighton, Pa.
Alums
The Grasselli Chemical Co., Cleveland, O.
Aluminum Acetate
Niacet Chemicals Corp., Niagara Falls, N. Y.
Aluminum Bronze Powder
U. S. Bronze Powder Works, Inc., New York, N. Y.
Aluminum Chloride (Solution, Crystals and Anhydrous)
The Calco Chemical Co., Bound Brook, N. J.
Aluminum Stearate
Franks Chemical Products Co., Inc., Brooklyn, N. Y.

Aminostearin
Glyco Products Co., Inc., New York, N. Y.
Ammonia
Nat'l Ammonia Co., Inc., Philadelphia, Pa.
Ammonium Bifluoride
The Harshaw Chemical Co., Cleveland, O.
Ammonium Carbonate
Wishnick-Tumpeer, Inc., New York, N. Y.
Ammonium Chloride
Pennsylvania Salt Mfg. Co., Inc., Philadelphia, Pa.
Ammonium Linoleate
Glyco Products Co., Inc., New York, N. Y.
Ammonium Nitrate
Garrigues, Stewart & Davies, Inc., New York, N. Y.
Ammonium Oleate
Glyco Products Co., Inc., New York, N. Y.
Ammonium Persulphate
Buffalo Electro Chemical Co., Inc., Buffalo, N. Y.
Ammonium Phosphate
Swann Chemical Co., New York, N. Y.
Ammonium Sulphate
H. J. Baker & Bro., New York, N. Y.
Ammonium Stearate
Glyco Products Co., Inc., New York, N. Y.
Amyl Acetate
Chemical Solvents, Inc., New York, N. Y.
Aniline Dyes
Experimenter's Supply Co., New York, N. Y.
Aniline Oil
Dow Chemical Co., Midland, Michigan
Antimony
C. Tennant & Sons Co. of N. Y., New York, N. Y.
Antimony Chloride
Seldner & Enequist, Inc., Brooklyn, N. Y.
Antimony Oxide
O. Hommel Co., Pittsburgh, Pa.
Antimony Sulphide
Foote Mineral Co., Philadelphia, Pa.
Anti-Oxidants
Givaudan-Delawanna, Inc., New York, N. Y.
Arsenic
Amer. Smelting & Refining Co., New York, N. Y.
Asbestos
Powhatan Mining Corp., Woodlawn, Baltimore, Md.
Asphalt
The Barber Asphalt Co., Philadelphia, Pa.
Asphaltum
Allied Asphalt & Mineral Corp., New York, N. Y.
Balsams
James B. Horner, Inc., New York, N. Y.
Barium Carbonate
Barium Reduction Corp., Charleston, W. Va.
Barium Nitrate
C. W. Campbell Co., Inc., New York, N. Y.
Barium Peroxide
Barium Reduction Corp., Charleston, W. Va.
Barium Sulphide
C. P. De Lore Co., St. Louis, Mo.
Barium Sulphide
Chicago Copper & Chemical Co., Blue Island, Ill.
Barytes
Bradley & Baker, New York, N. Y.
Nat'l Pigments & Chemical Co., St. Louis, Mo.

Basic Colors
Amer. Aniline Products, Inc., New York, N. Y.

Bayberry Wax
The W. H. Bowdlear Co., Syracuse, N. Y.

Beeswax
A. C. Drury & Co., Inc., Chicago, Ill.
Theodor Leonhard Wax Co., Inc., Haledon, Paterson, N. J.

Bentonite
Amer. Colloid Co., Chicago, Ill.
Silica Products Co., Kansas City, Mo.
The Wyodak Chemical Co., Cleveland, Ohio

Benzaldehyde
Heyden Chem. Corp., New York, N. Y.

Benzidine
General Aniline Works, Inc., New York, N. Y.

Benzine
Amer. Mineral Spirits Co., New York, N. Y.

Benzocaine
Abbott Laboratories, No. Chicago, Ill.

Benzoic Acid
Carus Chemical Co., Inc., La Salle, Ill.

Benzol
The Barrett Co., New York, N. Y.

Benzoyl Peroxide
Lucidol Corp., Buffalo, N. Y.

Benzyl Cellulose
Advance Solvents & Chem. Corp., New York, N. Y.

Bergamot Oil
Orbis Products Corp., New York, N. Y.

Beryllium
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.

Beryllium and Its Salts
Beryllium Corp. of America, New York, N. Y.

Beta Naphthol
The Calco Chemical Co., Bound Brook, N. J.

Bismuth
Cerro de Pasco Copper Corp., New York, N. Y.

Bismuth Subnitrate
The New York Quinine & Chemical Wks., Inc., Brooklyn, N. Y.

Blanc Fixe
Adolph Hurst & Co., Inc., New York, N. Y.

Bleaching Powder
Electro Bleaching Gas Co., New York, N. Y.

Blood Albumen
Morningstar, Nicol, Inc., New York, N. Y.

Bone Ash
Denver Fire Clay Co., Denver, Colorado

Bone Black
Siemon Colors, Inc., Newark, N. J.

Bone Glue
Darling & Co., Chicago, Ill.

Bone Oil
Texas Chemical Co., Houston, Texas

Borax
American Potash & Chem. Corp., New York, N. Y.

Bordeaux Mixture
Mechling Bros. Chem. Co., Camden, N. J.

Boric Acid
Borax Union, Inc., San Francisco, Calif.

Botanical Products
S. B. Penick & Co., New York, N. Y.

Bromine
J. Q. Dickinson & Co., Malden, W. Va.

Bromo-Fluorescein
Glyco Products Co., Inc., New York, N. Y.
Bronze Powder
B. K. Drakenfeld & Co., New York, N. Y.
Burgundy Pitch
Geo. H. Lincks, New York, N. Y.
Butyl Acetate
Commercial Solvents Corp., New York, N. Y.
Publicker, Inc., Philadelphia, Pa.
Butyl Aldehyde
Commercial Solvents Corp., Terre Haute, Ind.
Butyl Alcohol (Normal)
Publicker, Inc., Philadelphia, Pa.
Butyl Propionate
C. P. Chemical Solvents, Inc., New York, N. Y.
Butyric Ether
The Northwestern Chemical Co., Wauwatosa, Wisconsin
Butyl Stearate
Kessler Chem. Corp., New York, N. Y.
Cadmium
U. S. Smelting, Refining & Mining Co., New York, N. Y.
Cajuput Oil
D. W. Hutchinson & Co., New York, N. Y.
Calcium Arsenate
Bowker Chemical Corp., New York, N. Y.
Chipman Chemical Co., Inc., Bound Brook, N. J.
Calcium Carbonate
Limestone Products Corp. of Amer., Newton, N. J.
Calcium Carbonate (Precipitated)
Merck & Co., Inc., Rahway, N. J.
Calcium Chloride
Michigan Alkali Co., New York, N. Y.
Saginaw Salt Products Co., Saginaw, Mich.
Calcium Chloride (Anhydrous)
Fales Chemical Co., Inc., Cornwall Landing, N. Y.
Calcium Phosphate
Provident Chemical Wks., St. Louis, Mo.
Calcium Sulphide (Luminous)
Amer. Luminous Products Co., Huntington Park, Calif.
Calcium Stearate
The Synthetic Products Co., Cleveland, Ohio
Camphor
E. J. Barry, New York, N. Y.
Camphor Oil
Magnus, Mabee & Reynard, Inc., New York, N. Y.
Candelilla Wax
Innis, Speiden & Co., Inc., New York, N. Y.
Caramel Color
Alex Fries & Bro., Cincinnati, Ohio
Caraway Oil
Geo. Lueders & Co., New York, N. Y.
Carbolic Oil
Reilly Tar & Chemical Corp., New York, N. Y.
Carbon, Activated
The Jennison-Wright Co., Toledo, Ohio
Carbon Bisulphide
J. T. Baker Chemical Co., Phillipsburg, N. J.
Carbon Black
United Carbon Co., Charleston, W. Va.
Binney & Smith, New York, N. Y.
Carbon, Decolorizing
Darco Sales Corp., New York, N. Y.

Carbon Tetrachloride
Niagara Smelting Corp., Niagara Falls, N. Y.
Cardamom Seed
Newmann-Buslee & Wolfe, Inc., Chicago, Ill.
Carnauba Wax
Frank B. Ross Co., Inc., New York, N. Y.
Casein
The Casein Mfg. Co. of America, Inc., New York, N. Y.
Castile Soap
Conti Products Corp., New York, N. Y.
Castor Oil
The Baker Castor Oil Co., New York, N. Y.
Castor Oil, Sulphonated
Jacques Wolf & Co., Passaic, N. J.
Celluloid
Celluloid Corp., New York, N. Y.
Celluloid Scrap
Moses Serinsky Co., Indianapolis, Ind.
Cellulose Acetate
Celanese Corp. of America, New York, N. Y.
Cellulose Nitrate
Merrimac Chemical Co., Everett, Mass.
Ceresin Wax
Sherwood Petroleum Co., Inc., Brooklyn, N. Y.
Cetyl Alcohol
Hummel Chemical Co., Inc., 90 West St., New York, N. Y.
Chalk, Precipitated
Charles B. Chrystal Co., Inc., New York, N. Y.
Charcoal
Chas. L. Read & Co., Inc., New York, N. Y.
Western Charcoal Co., Chicago, Ill.
China Clay
Taintor Trading Co., New York, N. Y.
China Wood Oil
Balfour, Guthrie & Co., Ltd., New York, N. Y.
Chloramine
Abbott Laboratories, No. Chicago, Ill.
Chlorine (Liquid)
Electro Bleaching Gas Co., 9 E. 41st St., New York, N. Y.
Chloroform
The Dow Chemical Co., Midland, Michigan
Chlorophyll
Amer. Chlorophyll, Inc., New York, N. Y.
Pylam Products Co., New York, N. Y.
Cholesterin
Digestive Ferments Co., Detroit, Michigan
Merck & Co., Inc., Rahway, N. J.
Chrome Green
Kentucky Color & Chem. Co., Louisville, Ky.
Chrome Yellow
Ansbacher-Siegle Corp., Rosebank, N. Y.
Chromic Acid
Mutual Chemical Co. of America, New York, N. Y.
Chromium Oxide
O. Hommel Co., Inc., Pittsburgh, Pa.
Citral
Givaudan-Delawanna, Inc., New York, N. Y.
Citric Acid
Chas. Pfizer & Co., Inc., New York, N. Y.
Citronella Oil
H. C. Ryland, Inc., New York, N. Y.
Clay
Kentucky Clay Mining Co., Mayfield, Ky.
Olive Branch Minerals Co., Cairo, Ill.

Coal Tar
Crowley Tar Products Co., New York, N. Y.
Coal Tar Colors
H. Kohnstamm & Co., New York, N. Y.
Cobalt Acetate
Fred L. Brooke Co., Chicago, Ill.
Cobalt Driers
The McGean Chemical Co., Cleveland, Ohio
Cobalt Linoleate
The McGean Chemical Co., Cleveland, Ohio
Cocoa Butter
Alpha Lux Co., Inc., New York, N. Y.
Thomas J. Shields Co., New York, N. Y.
Coconut Butter
Procter & Gamble Co., Cincinnati, Ohio
Coconut Oil
Franklin Baker Co., Hoboken, N. J.
Coconut Oil Fatty Acid
Acme Oil Corp., Chicago, Ill.
Cod Liver Oil
H. H. Rosenthal & Co., Inc., New York, N. Y.
Collodion
Charles Cooper & Co., New York, N. Y.
Colors, Dry
Holland Aniline Dye Co., Holland, Mich.
Colors, Oil Soluble
Commonwealth Color & Chem. Co., Brooklyn, N. Y.
Copper Carbonate
Chas. Copper & Co., New York, N. Y.
Jungmann & Co., Inc., New York, N. Y.
Copper Cyanide
Charles Hardy, Inc., New York, N. Y.
Copper Oxides
The O. Hommel Co., Inc., 209 Fourth Ave., Pittsburgh, Pa.
Copper Sulphate
Barada & Page, Inc., Kansas City, Mo.
Corn Oil
American Maize Products Co., New York, N. Y.
Corn Sugar
Staley Sales Corp., Decatur, Ill.
Corn Syrup
Clinton Co., Clinton, Ia.
Corn Products Refining Co., New York, N. Y.
Cottonseed Oil (Crude)
Battleboro Oil Co., Battleboro, N. C.
Welch, Holme & Clark Co., New York, N. Y.
Coumarin
Maywood Chem. Works, Maywood, N. J.
Coumarone Resin
Barrett Co., New York, N. Y.
Neville Co., Pittsburgh, Pa.
Cream of Tartar
The Harshaw Chemical Co., Cleveland, Ohio
Creosote
Koppers Products Co., Pittsburgh, Pa.
Cresols
Coopers Creek Chem. Co., W. Conshohocken, Pa.
Reilly Tar & Chemical Corp., New York, N. Y.
Cresylic Acid
The Barrett Co., New York, N. Y.
Cryolite
Vitro Mfg. Co., Pittsburgh, Pa.
Cyclohexanol
E. I. Du Pont de Nemours Co., Wilmington, Del.

Damar Gum
Geo. H. Lincks, New York, N. Y.
Degras
Amer. Lanolin Corp., Lawrence, Mass.
Derris Extract
Seacoast Laboratories, New York, N. Y.
Derris Root
W. Benkert & Co., Inc., New York, N. Y.
Dextrins
Morningstar, Nicol, Inc., New York, N. Y.
Diastase
Takamine Laboratory, Inc., Clifton, N. J.
Diatomaceous Earth
Dicalite Co., New York, N. Y.
Dibutylphthalate
The Kessler Chemical Corp., New York, N. Y.
Dichlorbenzol
Hooker Electro Chemical Co., New York, N. Y.
Diethyleneglycol
Carbide & Carbon Chemicals Corp., New York, N. Y.
Diethylphthalate
Van Dyk & Co., Inc., Jersey City, N. J.
Diglycol Oleate
Glyco Products Co., Inc., New York, N. Y.
Diglycol Laurate
Glyco Products Co., Inc., New York, N. Y.
Diglycol Stearate
Glyco Products Co., Inc., New York, N. Y.
Dioxan
Carbide & Carbon Chem. Corp., New York, N. Y.
Dipentene
Hercules Powder Co., Wilmington, Del.
Diphenyl
Swann Chemical Co., New York, N. Y.
Drop Black
Wilckes-Martin-Wilckes Co., New York, N. Y.
Dyestuffs
National Aniline & Chemical Co., Inc., New York, N. Y.
Egg, Dried
W. P. Pray, New York, N. Y.
Egg Yolk
Stein, Hall & Co., New York, N. Y.
Ephedrine
Abbott Laboratories, No. Chicago, Ill.
Epsom Salt
General Chemical Co., New York, N. Y.
Essential Oils
Compagnie Duval, New York, N. Y.
Ester Gum
John D. Lewis, Inc., Providence, R. I.
Paramet Chemical Corp., Long Island City, N. Y.
Ether
Carbide & Carbon Chemicals Corp., New York, N. Y.
Ethyl Acetate
Merrimac Chemical Co., Boston, Mass.
Ethyl Cellulose
Advance Solvents & Chem. Corp., New York, N. Y.
Ethylamine
F. C. Bersworth Labs., Framingham, Mass.
Ethyl Lactate
American Cyanamid & Chemical Corp., New York, N. Y.
Ethylene Diamine
F. C. Bersworth Labs., Framingham, Mass.

Ethylene Dichloride
Dow Chemical Co., Midland, Mich.
Ethyleneglycol
Carbide & Carbon Chemicals Corp., New York, N. Y.
Eucalyptus Oil
Chas. Fishbeck Co., New York, N. Y.
Feldspar
Consolidated Feldspar Corp., Trenton, N. J.
Fillers
C. K. Williams & Co., Easton, Pa.
Film Scrap
Horn-Jefferys & Co., Burbank, Calif.
Fish Glue
C. B. Hewitt & Bro., New York, N. Y.
Fish Oil
Falk & Co., Pittsburgh, Pa.
Flaxseed
Bisbee Linseed Co., Philadelphia, Pa.
Fluorspar
Hillside Fluor Spar Mines, Chicago, Ill.
Formic Acid
Victor Chem. Works, Chicago, Ill.
Formaldehyde
Heyden Chemical Corp., New York, N. Y.
Fuller's Earth
L. A. Salmon & Bro., New York, N. Y.
Sinclair Refining Co., Olmstead, Ill.
Fusel Oil
Empire Distilling Corp., New York, N. Y.
Gallic Acid
Eastman Kodak Co., Rochester, N. Y.
Gamboge
Frank B. Ross Co., New York, N. Y.
Gelatin
Atlantic Gelatine Co., Woburn, Mass.
Geraniol
Kay-Fries Chem., Inc., New York, N. Y.
Geranium Lake
Interstate Color Co., Inc., New York, N. Y.
R. F. Revson Co., New York, N. Y.
Geranium Oil
Schimmel & Co., New York, N. Y.
Gilsonite
George H. Lincks, New York, N. Y.
Utah Gilsonite Co., St. Louis, Mo.
Ginseng
C. H. Lewis & Co., New York, N. Y.
Glandular Products
The Wilson Laboratories, Chicago, Ill.
Glauber Salt
Iowa Soda Products Co., Council Bluffs, Ia.
Glue
Cudahy Packing Co., Chicago, Ill.
Glycerin
Colgate-Palmolive-Peet Co., Chicago, Ill.
Glyceryl Mono Stearate
Glyco Products Co., Inc., New York, N. Y.
Glyceryl Phthalate
Glyco Products Co., Inc., New York, N. Y.
Glyceryl Stearate
Glyco Products Co., Inc., New York, N. Y.
Glycol Oleate
Glyco Products Co., Inc., New York, N. Y.

Glycol Phthalate
Glyco Products Co., Inc., New York, N. Y.
Glycol Stearate
Glyco Products Co., Inc., New York, N. Y.
Gold Chloride
Mallinckrodt Chemical Works, St. Louis, Mo.
Graphite
Adolphe Hurst & Co., Inc., New York, N. Y.
Asbury Graphite Mills, Asbury Park, N. J.
Gum Arabic
T. M. Duche & Sons, New York, N. Y.
Gum Benzoin
Peek & Velsor, Inc., New York, N. Y.
Gum Copal
George H. Lincks, New York, N. Y.
Gum Damar
Thurston & Braidich, New York, N. Y.
Gum Karaya
Frank-Vliet Co., Inc., New York, N. Y.
Gum, Locust Bean
Innis, Speiden Co., New York, N. Y.
Gum Manila
Stroock & Wittenberg Corp., New York, N. Y.
Gum Tragacanth
E. Meer & Co., Inc., New York, N. Y.
J. L. Hopkins & Co., New York, N. Y.
Gypsum
U. S. Phosphoric Prod. Corp., New York, N. Y.
Hemlock Bark
Tanners Supply Co., Grand Rapids, Mich.
Henna Leaves
S. B. Penick & Co., New York, N. Y.
Herbs
John Clarke & Co., New York, N. Y.
Hexamethylenetetramine
Heyden Chemical Corp., New York, N. Y.
Hydrochloric Acid
General Chemical Co., New York, N. Y.
Hydrogen Peroxide
The Warner Chemical Co., New York, N. Y.
Hydroquinone
Eastman Kodak Co., Rochester, N. Y.
Ichthyol
Merck & Co., Rahway, N. J.
Indigo
L. E. Ransom Co., New York, N. Y.
Indium
Belmont Smelting & Refining Works, Brooklyn, N. Y.
Invert Sugar
Nulomoline Co., New York, N. Y.
Iodine
New York Quinine & Chemical Wks., Inc., Brooklyn, N. Y.
Iridium
Baker & Co., Inc., Newark, N. J.
Irish Moss
S. B. Penick & Co., New York, N. Y.
Iron Ammonium Citrate
Schuykill Chem. Co., Philadelphia, Pa.
Iron Chloride
Chicago Copper & Chem. Co., Blue Island, Ill.
Iron Oxide
Binney & Smith Co., New York, N. Y.
Isopropyl Acetate
A. K. Hamilton, New York, N. Y.

Isopropyl Alcohol
Carbide & Carbon Chemicals Corp., New York, N. Y.
Insect Wax, Chinese
Frank B. Ross Co., Inc., New York, N. Y.
Ivory Black
Binney & Smith Co., New York, N. Y.
Japan Wax
Smith & Nichols, Inc., New York, N. Y.
Kerosene
Colonial Beacon Oil Co., Everett, Mass.
Kerosene, Deodorized
Sherwood Petroleum Co., Brooklyn, N. Y.
Laboratory Equipment
Central Scientific Co., Chicago, Ill.
Chemical Publ. Co. of N. Y., Inc., New York, N. Y.
Chicago Apparatus Co., Chicago, Ill.
Eimer & Amend, New York, N. Y.
Experimenter's Supply Co., New York, N. Y.
Fisher Scientific Co., Pittsburgh, Pa.
N. J. Laboratory Supply Co., Newark, N. J.
Scientific Glass Apparatus Co., Bloomfield, N. J.
Lacquers
Maas & Waldstein, Newark, N. J.
Lactic Acid
Apex Chemical Co., Inc., New York, N. Y.
Lamp Black
Binney & Smith Co., New York, N. Y.
L. Martin Co., New York, N. Y.
Lanolin
American Lanolin Corp., Lawrence, Mass.
Merck & Co., Inc., Rahway, N. J.
Pfaltz & Bauer, New York, N .Y.
Lard Oil
Enterprise Animal Oil Co., Philadelphia, Pa.
Lauryl Alcohol and Sulphonate
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Lavender Oil
Van Ameringen-Haebler, Inc., New York, N. Y.
Lead Acetate
National Lead Co., New York, N. Y.
Lead Arsenate
Barada & Page, Inc., Kansas City, Mo.
General Chemical Co., New York, N. Y.
Lead and Its Oxides
The Eagle-Picher Sales Co., Cincinnati, Ohio
Lecithin
American Lecithin Corp., New York, N. Y.
Lemon Juice, Concentrated
Mutual Citrus Products Co., Anaheim, Calif.
Lemon Oil
D. W. Hutchinson & Co., Inc., New York, N. Y.
Licorice
MacAndrews & Forbes Co., New York, N. Y.
Lime
J. E. Baker Co., York, Pa.
Chazy Marble Lime Co., Inc., Chazy, N. Y.
Limestone
F. E. Schundler & Co., Joliet, Ill.
Linoleic Acid
Glyco Products Co., Inc., New York, N. Y.
Linseed Oil
Bisbee Linseed Co., Philadelphia, Pa.
Litharge
The Eagle-Picher Lead Co., Cincinnati, Ohio

Lithopone
Krebs Pigment & Color Corp., Newark, N. J.
Marshall Dill Co., San Francisco, Calif.
Locust Bean Powder
T. M. Duche & Sons, New York, N. Y.
Logwood Extract
American Dyewood Co., New York, N. Y.
Lycopodium
McKesson & Robbins, Inc., New York, N. Y.
Magnesia
Philip Carey Co., Lockland, O.
Magnesite
General Magnesite & Magnesia Co., Philadelphia, Pa.
Magnesium Carbonate
Merck & Co., Inc., Rahway, N. J.
Magnesium Chloride
Wishnick-Tumpeer, Inc., New York, N. Y.
Magnesium Powder
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.
Maleic Acid
Nat'l Aniline & Chem. Wks., New York, N. Y.
Manganese
Ajax Metal Co., Philadelphia, Pa.
Marble Dust
Hammil & Gillespie, Inc., New York, N. Y.
Manganese Dioxide
B. F. Drakenfeld & Co., New York, N. Y.
Menhaden Oil
Robert Badcock & Co., New York, N. Y.
Menthol
Chas L. Huisking & Co., Inc., New York, N. Y.
Mercury
Chas. L. Huisking & Co., Inc., New York, N. Y.
George Uhe Co., New York, N. Y.
Methanol
Wm. S. Gray & Co., New York, N. Y.
Methyl Acetate
Carbide & Carbon Chem. Corp., New York, N. Y.
Methyl Acetone
Delta Chem. & Iron Co., Wells, Mich.
Methyl Anthranilate
Florasynth Laboratories, New York, N. Y.
Methyl p-Hydroxybenzoate
Heyden Chemical Corp., New York, N. Y.
Methyl Salicylate
Dow Chemical Co., Midland, Michigan
Mica
Southern Mica Co., Franklin, N. C.
Milk Sugar
Mallinckrodt Chemical Wks., St. Louis, Mo.
Mineral Rubber
Barber Asphalt Co., Philadelphia, Pa.
Mineral Spirits
Amer. Mineral Spirit Co., New York, N. Y.
Montan Wax
Strahl & Pitsch, New York, N. Y.
Naphtha
Deep Rock Oil Corp., Chicago, Ill.
Naphthalene
The Barrett Co., New York, N. Y.
Napthenic Acid
Glyco Products Co., Inc., New York, N. Y.
Neatsfoot Oil
National Oil Products Co., Harrison, N. J.

Nickel Chloride
Chas. Cooper & Co., New York, N. Y.
Nickel Sulphate
The Harshaw Chemical Co., Cleveland, O.
Nicotine
Tobacco By-Products & Chemical Corp., Louisville, Ky.
Nicotine Sulphate
Lattimer-Goodwin Chemical Co., Grand Junction, Colo.
Nitre Cake
Trojan Powder Co., Allentown, Pa.
Nitric Acid
Monsanto Chemical Co., St. Louis, Mo.
Nitrobenzol
Calco Chem. Co., Bound Brook, N. J.
Nitrocellulose
E. I. Du Pont de Nemours & Co., Inc., Parlin, N. J.
Ochres
Smith Chemical & Color Co., Brooklyn, N. Y.
Oil, Citronella
D. W. Hutchinson & Co., Inc., New York, N. Y.
Oil, Mineral
Standard Oil Co. of California, San Francisco, Calif.
Oil, Olive
Leghorn Trading Co., Inc., New York, N. Y.
Oiticica Oil
L. N. Jackson & Co., New York, N. Y.
Olein
Century Stearic Acid Wks., New York, N. Y.
Oleoresins
Seeley & Co., New York, N. Y.
Olive Oil, Sulphonated
Royce Chem. Co., Carlton Hill, N. J.
Orange Oil
Dodge & Olcott Co., New York, N. Y.
Ortho Dichlorbenzene
Hooker Electrochemical Co., New York, N. Y.
Oxalic Acid
Mutual Chemical Co. of America, New York, N. Y.
Oxgall
Wilson Labs., Chicago, Ill.
Oxygen
Cheney Chemical Co., Cleveland, O.
Oxyguinoline Sulphate
Benzol Products Co., Newark, N. J.
Ozokerite Wax
Strohmeyer & Arpe Co., New York, N. Y.
Palm Kernel Oil
Franklin Baker Co., Hoboken, N. J.
Palm Oil
Wishnick-Tumpeer, Inc., New York, N. Y.
Paraffin Oils
S. Schwabacher & Co., Inc., New York, N. Y.
Paraffin Wax
Oil States Petroleum Co., New York, N. Y.
Paraldehyde
Heyden Chem. Corp., New York, N. Y.
Para Aminophenol
Verona Chem. Co., Newark, N. J.
Para-Phenylenediamine
Amido Products Co., New York, N. Y.
Paris White
Southwark Mfg. Co., Camden, N. J.
Peanut Oil
Elbert & Co., New York, N. Y.

Pearl Essence
Mearl Corp., New York, N. Y.
Pectin
Calif. Fruit Growers' Exchange, Ontario, Calif.
Peppermint Oil
Magnus, Mabee & Reynard, Inc., New York, N. Y.
The Sparhawk Co., Sparkhill, N. Y.
Perilla Oil
S. L. Jones & Co., San Francisco, Calif.
Petrolatum
Pennsylvania Refining Co., Butler, Pa.
Petroleum Jelly
L. Sonneborn Sons, Inc., New York, N. Y.
Petroleum Spirits
Sun Oil Co., Philadelphia, Pa.
Phenol
American-British Chemical Supplies, Inc., New York, N. Y.
Phenol-Formaldehyde Resins
Durite Plastics, Philadelphia, Pa.
Phosphoric Acid
Victor Chemical Works, Chicago, Ill.
Phorphorus
International Selling Corp., New York, N. Y.
Phthalic Anhydride
Monsanto Chem. Co., St. Louis, Mo.
Pine Oil
General Naval Stores Co., Inc., New York, N. Y.
Pine Tar
Southern Pine Chem. Co., Jacksonville, Fla.
Pitch
Robert Rauh, Inc., Newark, N. J.
Plaster of Paris
Whittaker, Clark & Daniels, Inc., New York, N. Y.
Potash, Caustic
Niagara Alkali Co., New York, N. Y.
Potassium Carbonate
Joseph Turner & Co., New York, N. Y.
Potassium Chlorate
Joseph Turner & Co., New York, N. Y.
Potassium Hydroxide
Merck & Co., Inc., Rahway, N. J.
Potassium Iodide
New York Quinine & Chemical Wks., Inc., Brooklyn, N. Y.
Potassium Oleate
Glyco Products Co., Inc., New York, N. Y.
Carl F. Miller & Co., Seattle, Washington
Potassium Permanganate
Carus Chemical Co., Inc., La Salle, Ill.
Potassium Silicate
Philadelphia Quartz Co., Philadelphia, Pa.
Prussian Blue
Kentucky Color & Chem. Co., Louisville, Ky.
Pumice
Charles B. Crystal Co., New York, N. Y.
Psyllium Seeds
Laxseed Co., New York, N. Y.
Pyrethrum Extract
McLaughlin, Gormley, King & Co., Minneapolis, Minn.
Pyrethrum
S. B. Penick & Co., New York, N. Y.
Pyrogallic Acid
Zinsser & Co., Inc., Hastings-on-Hudson, N. Y.
Pyroxylin Solutions
Egyptian Lacquer, Kearney, N. J.

Quince Seed
J. L. Hopkins & Co., New York, N. Y.
Quinine Bisulphate
R. W. Greef & Co., Inc., New York, N. Y.
Rapeseed Oil
Balfour, Guthries & Co., Ltd., New York, N. Y.
Red Oil
Century Stearic Acid Candle Wks., New York, N. Y.
Resins, Synthetic
Beck, Koller & Co., Inc., Detroit, Mich.
Marshall Dill, San Francisco, Calif.
Resorcin
Penn. Coal Products Co., Petrolia, Pa.
Rhodium
Baker & Co., Inc., Newark, N. J.
Rochelle Salts
Chas. Pfizer & Co., Inc., New York, N. Y.
Rose Water
Geo. Lueders & Co., New York, N. Y.
Rosin
General Naval Stores Co., Inc., New York, N. Y.
Rosin Oil
National Rosin Oil & Size Co., New York, N. Y.
Rotenone
Thorocide, Inc., St. Louis, Mo.
Rubber
Earle Bros., New York, N. Y.
Rubber Latex
Littlejohn & Co., Inc., New York, N. Y.
Saccharine
Heyden Chemical Corp., New York, N. Y.
Salicylic Acid
The Dow Chemical Co., Midland, Mich.
Sal Soda
Church & Dwight Co., Inc., New York, N. Y.
Salt
Morton Salt Co., Chicago, Ill.
Salt Cake
Amer. Cyanamid & Chem. Corp., New York, N. Y.
Saltpetre
Croton Chem. Corp., Brooklyn, N. Y.
Saponin
Experimenters Supply Co., New York, N. Y.
Jungmann & Co., New York, N. Y.
Selenium
Amer. Metal Co., New York, N. Y.
Shellac
Wm. Zinsser & Co., New York, N. Y.
Shellac Wax
Adolphe Hurst & Co., New York, N. Y.
Siennas
Fezandie & Sperrie, Inc., New York, N. Y.
Silica
Barnsdall Tripoli Corp., Seneca, Mo.
Silver
Handy & Harman, New York, N. Y.
Silver Cyanide
Chas. Cooper & Co., New York, N. Y.
Silver Nitrate
Eastman Kodak Co., Rochester, N. Y.
Soda Ash
Diamond Alkali Co., Pittsburgh, Pa.
Soda, Caustic
Mathieson Alkali Works, Inc., New York, N. Y.

Soda, Sal
Consolidated Chem. Sales Corp., Newark, N. J.
Sodium Aluminate
National Aluminate Corp., Chicago, Ill.
Sodium Arsenite
Harrison Mfg. Co., Rahway, N. J.
Sodium Benzoate
Hooker Electrochemical Co., New York, N. Y.
Sodium Bicarbonate
Church & Dwight Co., Inc., New York, N. Y.
Sodium Bichromate
Prior Chem. Corp., New York, N. Y.
Sodium Bisulphite
The Grasselli Chemical Co., Cleveland, Ohio
Sodium Carbonate
Solvay Sales Corporation, New York, N. Y.
Sodium Choleate
Difco Laboratories, Inc., Detroit, Mich.
Sodium Cyanide
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Sodium Fluoride
American Cyanamid & Chemical Corp., New York, N. Y.
Sodium Hydrosulphite
Royce Chemical Co., Carlton Hill, N. J.
Sodium Hydroxide
Merck & Co., Inc., Rahway, N. J.
Sodium Hypochlorite
Delta Chemical Mfg. Co., Baltimore, Md.
Mathieson Alkali Wks., Inc., New York, N. Y.
Sodium Hypochlorite Liquid
Riverside Chemical Co., No. Tonawanda, N. Y.
Sodium Hyposulphite
The Grasselli Chemical Co., Cleveland, Ohio
Sodium Metaphosphate
Buromin Co., Pittsburgh, Pa.
Sodium Metasilicate
Philadelphia Quartz Co., Philadelphia, Pa.
Sodium Nitrate
Battelle & Renwick, New York, N. Y.
Sodium Nitrite
Solvay Sales Corp., New York, N. Y.
Sodium Perborate
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Sodium Phosphate
Swann Chemical Co., New York, N. Y.
Sodium Resinate
Paper Makers Chem. Corp., Wilmington, Del.
Sodium Silicate
Mechling Bros. Chemical Co., Camden, N. J.
Philadelphia Quartz Co., Philadelphia, Pa.
Standard Silicate Co., Pittsburgh, Pa.
Sodium Silico Fluoride
The Grasselli Co., Cleveland, Ohio
Sodium Sulphate
General Chem. Co., New York, N. Y.
Sodium Stannate
Harshaw Chem. Co., Cleveland, Ohio
Sodium Sulphite
Mechling Bros. Chemical Co., Camden, N. J.
Sodium Tungstate
J. T. Baker Chem. Co., Phillipsburgh, N. J.
Solvent Naphtha
Barrett Co., New York, N. Y.

Sorbitol
Atlas Powder Co., Wilmington, Del.
Soybean Oil
Spencer Kellog & Sons Sales Corp., Buffalo, N. Y.
Arthur C. Trask Co., Chicago, Ill.
Sperm Oil
Cook Swan Co., Inc., New York, N. Y.
Spermaceti
Strahl & Pitsch, New York, N. Y.
Squill
S. B. Penick & Co., New York, N. Y.
Starch
Starch Products Co., New York, N. Y.
Stearic Acid
Century Stearic Acid Candle Wks., New York, N. Y.
Stearin
M. Werk Co., Cincinnati, Ohio
Stearin Pitch
A. Gross & Co., New York, N. Y.
Strontium Nitrate
Grasselli Chem. Co., Cleveland, Ohio
Strychnine
Chas. Pfizer & Co., New York, N. Y.
Sulphonated Castor Oil
Burkard-Schier Chem. Co., Chattanooga, Tenn.
Sulphonated Olive Oil
Jacques Wolf & Co., Passaic, N. J.
Sulphur
Stauffer Chemical Co. of Texas, Freeport, Tex.
Sulphur Dioxide
Virginia Smelting Co., Boston, Mass.
Sulphuric Acid
Merrimac Chemical Co., Everett Sta., Boston, Mass.
Talc
Charles B. Crystal Co., Inc., New York, N. Y.
Tallow
Welch, Holme & Clark Co., Inc., New York, N. Y.
Tartaric Acid
R. W. Greeff & Co., Inc., New York, N. Y.
Tar Acid Oil
Barrett Co., New York, N. Y.
Tartar Emetic
Apex Chem. Co., New York, N. Y.
Tea Seed Oil
Lundt & Co., New York, N. Y.
Terpineol
D. W. Hutchinson & Co., New York, N. Y.
Tetrachlorethane
Dow Chemical Co., Midland, Mich.
Tetrachlorethylene
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Thallium Sulphate
Jungmann & Co., Inc., New York, N. Y.
Thiocarbamilid
Monsanto Chemical Co., St. Louis, Mo.
Thiourea
Jungmann & Co., New York, N. Y.
Thymol
Sherka Chemical Co., Inc., Bloomfield, N. J.
Tin
Union Smelting & Refining Co., Inc., Newark, N. J.
Tin Chloride
Seldner & Enequist, Inc., Brooklyn, N. Y.

Tin Oxide
The McGean Chemical Co., Cleveland, Ohio
Tinctures
Parke, Davis & Co., Detroit, Mich.
Titanium Dioxide
Marshall Dill, San Francisco, Calif.
R. T. Vanderbilt Co., New York, N. Y.
Toluol
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Triacetin
Niacet Chemicals Corp., Niagara Falls, N. Y.
Tricresyl Phosphate
R. W. Greeff & Co., Inc., New York, N. Y.
Triethanolamine
Experimenter's Supply Co. (small lots), New York, N. Y.
Carbide & Carbon Chem. Co. (large lots), New York, N. Y.
Triethanolamine Oleate
Glyco Products Co., Inc., New York, N. Y.
Marshall Dill Co., San Francisco, Calif.
Triethanolamine Stearate
Glyco Products Co., Inc., New York, N. Y.
Carl F. Miller & Co., Seattle, Washington
Triphenylguanidine
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Triphenylphosphate
Monsanto Chemical Co., St. Louis, Mo.
Tripoli
Tamms Silica Co., Chicago, Ill.
Tungsten
Fansteel Products Co., No. Chicago, Ill.
Turkey Red Oil
National Oil Products Co., Inc., Harrison, N. J.
Turpentine
Antwerp Naval Stores Co., Inc., Boston, Mass.
General Naval Stores Co., New York, N. Y.
Turpentine Substitute
Anderson-Prichard Oil Corp., Oklahoma City, Okla.
Turpentine (Venice)
National Rosin Oil & Size Co., New York, N. Y.
Turtle Oil
Edwin Seebach Co., New York, N. Y.
Ultramarine Blue
Standard Ultramarine Co., Huntington, W. Va.
Umbers
Fezandié & Sperrlé, Inc., New York, N. Y.
Uranium Nitrate
Harshaw Chemical Co., Cleveland, Ohio
Urea
Sherka Chemical Co., Inc., Bloomfield, N. J.
Vanilla Beans
Thurston & Braidich, New York, N. Y.
Vanillin
Seeley & Co., Inc., New York, N. Y.
Van Ameringen-Haebler, Inc., New York, N. Y.
Varnish Gums and Resins
Amer. Cyanamid & Chem. Corp., New York, N. Y.
Vat Colors
Amer. Aniline Products, Inc., New York, N. Y.
Vegetable Colors
L. E. Ransom Co., New York, N. Y.
Vermiculite
Hill Bros. Chem. Co., Los Angeles, Calif.
Vermilion
Fezandié & Sperrlé, Inc., New York, N. Y.

Vinyl Acetate
Niagara Chemicals Corp., Niagara Falls, N. Y.
Vinyl Chloride
Carbide & Carbon Chem. Corp., New York, N. Y.
Wax, Synthetic
Glyco Products Co., Inc., New York, N. Y.
Wetting Out Agents
Glyco Products Co., Inc., New York, N. Y.
Whiting
Columbia Alkali Corp., New York, N. Y.
Limestone Products Corp. of America, Newton, N. J.
Witch Hazel Extract
E. E. Dickinson Co., Essex, Conn.
White Arsenic
H. H. Rosenthal Co., New York, N. Y.
White Lead
National Lead Co., New York, N. Y.
Wood Flour
D. H. Litter Co., New York, N. Y.
Wood Flour, Inc., Manchester, N. H.
Xylol
The Barrett Co., New York, N. Y.
Yeast
Standard Brands, Inc., New York, N. Y.
Zinc
Hegeler Zinc Co., Danville, Ill.
Zinc Carbonate
Wishnick-Tumpeer, Inc., New York, N. Y.
Zinc Chloride
Wishnick-Tumpeer, Inc., New York, N. Y.
Zinc Chromate
E. M. & F. Waldo, Inc., Muirkirk, Md.
Zinc Oxide
Merck & Co., Inc., Rahway, N. J.
N. J. Zinc Co., New York, N. Y.
Zinc Stearate
Merck & Co., Inc., Rahway, N. J.
Wishnick-Tumpeer, Inc., New York, N. Y.
Zinc Sulphate
W. R. Russell & Co., New York, N. Y.
Virginia Smelting Co., West Norfolk, Va.
Zirconium Oxide
Foote Mineral Co., Philadelphia, Pa.

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