MANUFACTURERS' PRACTICAL RECIPES

DRY COLOURS
PIGMENTS
PAINTS
PAINT OILS & MEDIUMS
PUTTY, &C. &C.

MANUFACTURERS' PRACTICAL RECIPES

VOLUME I.

COMPRISING

PIGMENTS AND DRY COLOURS, PASTE AND MIXED PAINTS, PAINT OILS, VEHICLES, AND MEDIUMS, DISTEMPERS, AND SUNDRY PAINT MATERIALS.

BY

LEWIS JAMESON

Assisted by Leading English and Foreign Trade Experts, Works Managers, and Skilled Mechanics.

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IMPORTANT NOTICE.

Although the greatest care has been exercised in the selection of recipes, formulæ, and processes, and in the revision of the proof sheets, and it is therefore confidently believed that errors in the text are neither numerous nor of serious importance, this volume of Manufacturers' Practical Recipes is offered on the distinct understanding that neither the Author nor the Publishers nor any other person concerned is to be held liable for any inaccuracies or errors, or for any loss or damage arising from any cause whatsoever in the working of any recipe or process herein described.

So much depends upon proper manipulation, suitable qualities of chemicals and materials, and correct working conditions (temperature, arrangement of plant, etc.), that it is absolutely essential that all recipes and processes be first tried experimentally on the smallest possible scale, and a satisfactory sample obtained before the operator attempts the preparation of a large batch.

It is proposed to embody any corrections, revisions, or additions that may be necessary in an ***Appendix,*** a copy of which will be presented to every purchaser of the present volume, and the Publishers will welcome suggestions from subscribers on matters relevant to the same.

LEWIS JAMESON and Co.

London, April 4th, 1902.

PREFACE TO VOL. I.

The very flattering reception accorded to "THE MANUFACTURERS' PRACTICAL UP-TO-DATE RECIPE BOOK" which was published in 1897, and the many convincing proofs of the utility and convenience of that work, are among the chief reasons that have induced the Author to prepare a revised, extended, and largely re-written edition.

The growth of the Oil, Colour, Paint, Varnish, and allied trades during the last few years has been so enormous, and new methods and processes of manufacture have been introduced to such an extent, that a book of Practical Trade Recipes, which was thoroughly up-to-date five or even three years ago, does not by any means represent the state of the manufacturing trade at the present moment. For this reason, the present edition of Manufacturers' Practical Recipes contains numerous Formulæ, Recipes, Processes, and Methods of Manufacture which are of quite recent introduction, and which are not to be found in the earlier edition.

The Table of Contents indicates with sufficient clearness the wide field covered by the present volume, and also gives some idea of the minuteness with which the various subjects embraced within that field are dealt with. In a word, there is now offered to the Trade a veritable Compendium of practical information, every item of which is capable of being turned into money, and which, in point of scope, accuracy, and general utility, has never been approached, much less equalled, either in England, America, or the Continent.

In the preparation of the present volume, the Author has kept steadily in view the aim and purpose expressed in the preface to the 1897 edition. This is to provide, at merely nominal cost, a reliable and practical directory, by the aid of which Manufacturers, Merchants, Traders, Works Managers, Foremen, Overseers, and others may manufacture or prepare a given article in the most approved manner, at the lowest possible cost, and without having to undertake a tedious and often expensive process of experimentation.

Many of the most valuable recipes detailed in the following pages can be worked on the manufacturing scale with the simplest plant, a fact which in itself frequently involves an immense saving. Some products, however, can be prepared only by the agency of specially adapted machinery, and in such cases the construction of the latter is indicated.

How often does a manufacturer find that he is largely dependent on his servants—his foremen, or his workmen, for information regarding some special product of his trade! The possession of the "MANUFACTURERS' PRACTICAL RECIPES" will place such a manufacturer beyond the need of advice from his employés. But it will do more. It will enable him to discriminate between a good recipe and a bad one, between a practical method and a method which is unworkable, because the recipes given are carefully selected, and have been tested in practice. Lastly, it will enable the reader to see the exact position, to-day, of the manufacturing industry in which he is interested, so that he is in a position to utilise the trials of his predecessors for his own benefit.

No time, trouble, or expense has been spared in the compilation of this work. In particular, the *arrangement* of the topics dealt with has been a matter of careful consideration. In this respect the present edition will, it is hoped, be found of much greater service than that of 1897, the contents of which were not divided into sections and chapters. This has been done in the present instance, and the result cannot fail to enhance the value of the work as a quick, accurate, and complete Book of Reference in the particular field it is designed to cover.

The Index has been compiled with great care, and contains abundant cross references, so that a particular subject may be turned up easily and quickly.

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MANUFACTURERS' PRACTICAL RECIPES.

PART I.

PIGMENTS AND DRY COLOURS.

CHAPTER I.

NATURAL COLOURS AND THEIR DERIVATIVES.

In numerous portions of the globe there are immense deposits of earth or clay, stained with varying proportions of ferric oxide or hydrated ferric oxide. To such materials the general term ochre is usually applied, and it includes not only those members which possess a more or less pronounced yellow colour, and whose colouring principle is usually hydrated ferric oxide, but also the red varieties, to which the names red ochre, light oxide, etc., are often applied, and which depend for their colour on ferric oxide. The natural stained clays are chiefly of interest, because from them are derived the whole of the yellow ochres so widely used in the colour industry, and which will be referred to again.

When the natural deposits of stained ochre earths contain a high percentage of hydrated ferric oxide, as well as a proportion of organic matter, and the colour is of a rather dark dull yellow, the material is usually considered a sienna earth. Hence the important group of the siennas are to be considered as natural colours.

If, in addition to hydrated oxide of iron, the native earth contains manganese and a still higher proportion of organic matter, it is an umber.

Finally, if the deposit is bituminous in nature, and contains only traces of metallic ingredients, a Vandyke brown is the result.

The dry colours which are derived from the above will be dealt with in due course, but we have first of all to consider the true oxide of iron pigments, whose source is somewhat different.

The iron reds, purple browns, and other oxide pigments so largely used by the paint manufacturer are found native, but most of the deposits have been formed by the gradual oxidation of the native sulphide of iron or iron pyrites, so that in place of the material consisting, like the red and yellow ochres, of clay or other base, stained by oxide of iron, the whole mass consists of colour which has to be prepared by mechanical means to render it fit for the manufacturer's use.

Two main processes are adopted in the preparation of oxide of iron colours. One is *burning*, whereby the shade can be altered, the other is *grinding and levigating*, whereby impurities are eliminated, and the pigment becomes brighter, stronger, and richer.

There are three special points to be looked for in the crude product, viz., the colour, staining power, and the quantity of sand or gritty matter. The preparation of the finished pigment is, in nearly all cases, conducted on the spot where the crude material is found, or at least within a small radius of the mines. Thus it comes about that there are certain districts in which the manufacture of these colours is a special industry, as it does not pay to transport the raw material any distance.

As already stated, burning and levigating are the chief operations to which these crude colours are subjected. When burning is resorted to, it produces a molecular change; thus an ochre, by being burnt, turns into a reddish brown, umber into a richer and deeper colour. There is considerable loss in weight during this process, but, of course, the price obtained is, or should be, in accordance with this loss. There are two methods of levigation, viz., grinding the crude material in water under heavy mill-stones until thoroughly fine, say three times through the stones, or, what is better, through three sets of stones consecutively, thus making one regular process of it. The resultant pulp is then dried and dry powdered, and is ready for the paint grinder. With colours containing a small percentage of sand, this process is to be recommended, as what little sand there is, is ground with the colour. But where there is a large percentage of sand, the following system should be followed, the sand being by this means separated. A large pan is used, in which revolve heavy stone runners. This pan is fed from time to time with the crude colour, and a continual steady stream of water is provided to carry off the fine portions of the colour as they rise in the water on account of the disintegrating action of the runners. This water is carried off by gravitation to a series of tanks or pits. The coarser particles settle in the first pit, and so on until, in the last pit, superfine colour is deposited, and the water runs off clear, various intermediate grades of fine colour being in the successive pits.

It is recommended that the product of the first pit be thrown into the pan again to be ground finer. The bulk of the sand is left in the pan, which should be periodically cleaned out.

Native Red Oxide of Iron.

(Red Hematic or Spathic Ore.)

This material, which is a crude oxide or carbonate of iron, is most useful to the colour manufacturer. It is not used largely by itself, but is mixed with other colours, forming a most useful series of derivatives. Spathose ore possesses good drying and wearing qualities, which enable it to render useful service as a base. In Cumberland, Lancashire, Isle of Man, Glamorganshire, Devon, and Cornwall, occur the principal deposits of this useful mineral. It must not be considered as an adulterant, but may be used in reducing in cases where barytes, terra alba, or whiting could not be safely used. To prepare the mineral for use, it should be crushed, and then levigated and dried. When burnt in a reverberatory furnace a rich brown is produced. The following are the principal methods of treatment :—

SPATHOSE YELLOW.

	cwt.	qrs.	lbs.
Prepared Spathose Ore.......	1	0	0
Hydrochloric Acid	0	0	$2\frac{1}{2}$

Process.—The ore and the acid are ground to a paste in water, and spread out where it is exposed to the influence of the weather. It should be kept damp and turned frequently. In time it will turn to a good dark yellow, which, when washed and dried, will be found very useful in reducing yellow ochres. The longer it is exposed the darker it gets.

SPATHOSE RED.

	cwt.	qrs.	lbs.
Prepared Spathose Ore	1	0	0

Sulphuric Acid, 2 to 14 lbs.

Process.—The ore and acid are ground to a stiff paste in water, and the mixture exposed to the weather for a few days, with continual turning. Dry and charge into retorts, and burn from one to five hours. The more acid used and the longer the burning, the more it will oxidise, and the more valuable the red produced. This is very useful to mix with bad drying oxides or red ochres, to assist them in that respect.

SPATHOSE PURPLE.

	cwt.	qrs.	lbs.
Prepared Spathose Ore	1	0	0
Green Copperas	0	0	12

Process.—Grind the ore and copperas to a paste, dry and charge into retorts, and burn from three to six hours at a cherry red heat. Allow to cool; dry, grind and sift. Increasing the quantity of copperas yields a more valuable product. A good useful brown for mixing with purple browns.

SPATHOSE BROWN.

(IMITATION VANDYKE BROWN.)

	cwt.	qrs.	lbs.
Prepared Spathose Ore	1	0	0
Sulphate of Manganese	0	0	3

Process.—Grind the ore and sulphate of manganese to a stiff paste with water, dry and charge into retorts, burn two to four hours. Rake out, and when cool grind and sift. This is a good drier, and is useful for cheapening Vandyke browns.

SPATHOSE GREEN.

	cwt.	qrs.	lbs.
Prepared Spathose Ore	1	0	0
Hydrochloric Acid	0	0	3
Yellow Prussiate of Potash	0	0	1½

Process.—Grind ore and acid to a paste in water. Allow to stand some time, then add the prussiate of potash dissolved in water. A little green copperas solution will help to develop the colour, which will be a dull green. A good base for other greens, and can be mixed with Brunswick greens when much barytes would be objected to.

SPATHOSE BLACK.

	cwt.	qrs.	lbs.
Prepared Spathose Ore	1	0	0
Gas Tar	0	0	6
Sulphate of Manganese	0	0	3

Process.—Mix well together and charge into retorts, burn two to four hours. Draw into iron drums, and seal with clay until cold. Then grind and sift. This yields a good black which dries well.

The retorts used in these processes are gas retorts. Special care must be exercised in opening retorts containing Spathose ore, as, when white hot, it is apt to run out of the retort. Therefore a vessel should be placed close to the retort mouth to catch it, and the door opened with a long hook.

The retorts should be charged well back and left empty in front.

Light Oxide.

Any natural oxide of iron may be used, the higher the percentage of Iron Oxide the better for this purpose. No burning is required, but simply the mechanical processes of crushing, levigating, and drying. It is then ready for sale. Many grades of this material are referred to as Venetian red and Spanish brown, but both the latter are usually considered to be burnt products.

Purple Oxides.

Sulphide of iron, or, as it is commonly called, iron pyrites, is one of the chief sources of sulphuric acid. After the sulphur has been extracted, there is left a fairly pure and rich iron oxide. This is termed purple ore, or popularly, 'Blue Billy.' This material after the following process yields the Middle Oxide and Purple Oxide of commerce.

Process.—For middle and purple the process is the same. The ore is charged into a reverberatory furnace, and burnt until all traces of sulphur are removed. The length of burning would vary, but six to eight hours is about the usual time. Ore required for purple oxide is burnt at a much greater heat than that for middle shades. When burnt sufficiently the charge is drawn and, when cool, washed with water, or what is better lime water. It is then ready for levigating. The longer it is exposed to the action of the atmosphere between burning and levigation the richer the colour.

A richer purple oxide may be made by calcining certain proportions of Blue Billy ore and green copperas, together with whiting and magnesia, forming a mixture of purple oxide and Indian red. In fact these mixtures can often be sold as Indian red.

The following furnish a most useful range of these colours:—

No. 1.

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	2	0	0
Whiting	1	0	0
Magnesia	0	1	0

No. 2.

	cwt.	qrs.	lbs.
Green Copperas	1	3	14
Blue Billy Ore	2	0	0
Whiting	1	0	0
Magnesia	0	1	0

No. 3. 503

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	2	0	0
Whiting	1	2	0
Magnesia	0	1	0

No. 4. 504

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	2	0	0
Whiting	1	3	0
Magnesia	0	1	0

Crocus.

This pigment is not very extensively used in the manufacture of paint, but it has other uses, *e.g.*, metal polish. The mode of preparation is as follows :—Iron shale is obtained from any large ironworks, and exposed to the action of the atmosphere as long as is convenient, the longer the better. It is then calcined in a reverberatory furnace for from six to eight hours, and finally levigated and dried. It is then ready for sale. It is a very deep, almost a black, oxide of iron. 2

Indian Red.

The designation Indian red is applied to a variety of colours, and numerous Indian reds are native oxides which have undergone a refining process. The best, however, of these valuable colours are oxides of iron artificially made by the calcination of green copperas. They are much superior to the native oxides. An ordinary reverberatory furnace can be used in the manufacture of Indian red, but it is advisable to use a specially constructed kiln, with apparatus to receive the sulphur generated and retain it in the form of sulphuric acid. In a thickly populated neighbourhood, the sulphur given off constitutes a nuisance, and the authorities would compel the manufacturer to have plant laid down to retain the sulphur. The sulphuric acid thus formed should be utilised by treating it with old scrap iron, and thus forming sulphate of iron or green copperas, which can, in its turn, be calcined, so that there is no waste. It is not necessary to mix anything with the copperas previous to calcining, but most large makers find it best to mix it with various salts. Whiting, carbonate of soda, Epsom salts and Blue Billy ore are principally used to mix with the green copperas previous to calcining. There is no doubt, however, that the purest and best reds are made from the green copperas alone. Should green copperas alone be used, no preparation is necessary previous to charging the kiln or furnace, but a saving in fuel is effected if the copperas is previously partially dried. This is most economically done by utilising the heat passing from the furnace or kiln as the case may be.

Where whiting, Epsom salts, etc., are used, all should be ground together dry under edge runners before charging. The retorts, furnaces, or kilns, as the case may be, should not be tightly closed up for an hour after charging; this is to facilitate all moisture being driven off.

Firing should be carefully attended to, and one regular heat kept up.

The firing may be conducted either in kilns or in retorts, or in reverberatory furnaces.

If a kiln is used in the manufacture the various shades, light, middle, deep, and extra deep, are formed in one operation in the following manner :—The copperas is placed in earthen pots, which are stacked in the kiln and fired from underneath. The usual length of time occupied in firing a charge would be eight to ten hours. The lower pots having undergone the greatest heat would produce deep and extra deep shades. Then would appear a stratum of middle, and lastly the light at the top. Where a retort or reverberatory furnace is used, the shades are obtained according to the duration of calcination.

To obtain light shades of Indian red, calcine 7 to 8 hours.
,, ,, middle ,, ,, ,, ,, about 9 ,,
,, ,, deep and extra deep ,, ,, ,, 10 to 11 hours.

The following formulæ will be a guide to the manufacturer where it is desirable to manufacture from other than the copperas alone :—

PALE INDIAN RED. 601

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	0	0	21
Whiting	0	2	0

MIDDLE INDIAN RED. 602

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	0	1	0
Whiting	0	2	0

DEEP INDIAN RED. 603

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	1	0	0
Whiting	0	3	0
Magnesia	0	0	7

EXTRA DEEP INDIAN RED. 604

	cwt.	qrs.	lbs.
Green Copperas	2	0	0
Blue Billy Ore	1	1	0
Whiting	0	3	0
Magnesia	0	0	14

Colcothar.

This name is given to a rather bright shade of oxide of iron pigment.

No. 1. 605

To a hot solution of green copperas add a hot solution of bicarbonate of soda till precipitation ceases. Drain the precipitate and expose to air for a few days. Then wash, dry, and calcine at a red heat.

Darker shades may be made by mixing cheap lampblack with the precipitate previous to calcination.

No. 2. 606

To a solution of green copperas add milk of lime till precipitation ceases. Drain dry and calcine at a red heat. The product is a bright or dark red, according to the heat employed, being darker the greater the heat. The lime is transformed during the calcination into plaster of Paris, which makes the colcothar set hard when made into paint.

This may be remedied to a great extent by wetting the colcothar, drying it, and recalcining at a gentle heat.

As in No. 1, so in No. 2 can various shades be produced by the introduction of lampblack in various quantities previous to calcination.

Fine sawdust, peat dust, starch refuse, spoiled flour fibre refuse, or any vegetable matter free from grit or dirt, may be used instead of lampblack to form the purple shades of colcothar.

These substances form carbon on combustion, and should be mixed with the precipitate from the iron solution while in paste.

Turkey Red.

A very fine bright red oxide of iron is usually sold under this title. It should be carefully levigated, and freed from all silica, etc. The red chosen should possess good staining power, but must not be of a deep colour.

Venetian Red.

This is one of the most widely used pigments in the colour trade, and all grades and qualities are met with.

The usual method of preparing it is to reduce one of the fine bright native oxides of iron, Turkey red or an Indian red, by the addition of terra alba, or some other convenient reducing material. Many reds are found which can be used as Venetian red without any admixture. The following mixtures form a useful series :—

No. 1.

	cwt.	qrs.	lbs.
Pure Red Oxide	2	0	0
Terra Alba	4	0	0

No. 2.

	cwt.	qrs.	lbs.
Pure Red Oxide	1	0	0
Terra Alba	2	0	0
Common Barytes	2	0	0

No. 3.

	cwt.	qrs.	lbs.
Pure Red Oxide	0	2	0
Terra Alba	1	1	0
Common Barytes	1	2	0

1,200,010

No. 4.

	cwt.	qrs.	lbs.
Pure Red Oxide	0	2	0
Terra Alba	1	2	0
Common Barytes	1	2	0

1,500,011

No. 5.

Very suitable for distemper colours.

	cwt.	qrs.	lbs.
Pure Red Oxide	0	2	0
Terra Alba	2	0	0
Whiting	0	3	0

600,010

Silicated Oxide of Iron

May be profitably made from iron scale, slag cinders, clinkers, furnace scale, etc. Take one or other of these materials, or a mixture of them, which are compounds of silica and oxide of iron fused into a hard glass. Break small in a stone crusher or under stamps. Pass through a disintegrator, and sift through a sieve with a medium mesh. Mix the sifted material to a stiff paste with a mixture of weak sulphuric acid and water. Expose to the action of air for a few days, turning the mass occasionally. Dry and calcine at a cherry red heat until all sulphuric acid is driven off. It should be tested from time to time by drawing a sample and wetting it, and applying litmus paper. When burnt sufficiently, draw the charge, then levigate and dry in the usual manner.

The product may be mixed with rich red ochres, or may be used in many ways to make a cheap and useful oxide paint. It makes by itself a genuine iron paint, but is deficient in covering power. It shows a good percentage of ferric oxide, and is therefore very useful for cheapening oxide paints where barytes would be inadmissible. The colour varies according to the length of time allowed for oxidising, and it is none the worse if exposed for a whole winter.

Ochres.

RED.

The origin and composition of these substances have already been alluded to. They are principally composed of various double silicates, or clays, the colour of which is due to the presence of oxide of iron. Strictly, there is no dividing line between red ochres and native oxides. It is principally a question of the quantity of oxide of iron contained. All native oxides contain a percentage of the silicates, so that it seems a matter to be decided by the predominance of the oxides of iron or of the silicates, as the case may be. The reds, when treated, become the *Spanish browns*, the *raddles* and the *tibers* and *red chalk* of commerce. A highly oxidised ochre, of good colour, may be disposed of as a *Venetian red*.

The following are grades of Spanish brown usually met with :

Ordinary Spanish Brown (native powdered red ochre).
Washed Spanish Brown (the same levigated).
Super Spanish Brown (selected red ochre or oxide).
Super Washed Spanish Brown (the same carefully levigated).

The better qualities of Spanish brown make good paints, and possess a rather pleasing metallic appearance. Many low grade Venetian reds, or dirty samples, are sold as Spanish brown.

YELLOW.

As in the case of the red ochres, these colours are composed essentially of clay stained with oxide of iron, but in this case it is the hydrated oxide. A great variety of shades and qualities is found. Some ochres possess extraordinary staining powers, and as such are very useful. The finest of the English ochres is undoubtedly that found in Oxfordshire. Of the foreign ochres, Italian takes the lead. A most useful range of ochres, however, are the Devonshire and Cornwall ochres. In Gloucestershire and

Derbyshire, also, are found ochres of good quality. The French ochres, comprising what are generally known as the J.C., J.F.L., etc., class, are very useful to the paint grinder.

When calcined in reverberatory furnaces, yellow ochres turn to a reddish brown. This process is, however, not carried on to any large extent, although burnt or brown ochre has a limited use.

After undergoing the usual levigating process, the crude ochre should be thoroughly, but carefully, dried. Particular attention should be paid to the drying of the yellow, as, if subjected to the action of great heat, the colour would be turned from a bright yellow to a dingy brown.

BLACK OCHRE.

A very useful black is made by calcining yellow ochre with gas-tar in the following proportions :—

	cwt.	qrs.	lbs.
Dry Crude Yellow Ochre	1	0	0
Gas-Tar	0	0	10

Process.—Well mix together, charge in a gas retort, and burn for four hours. The tar should then be all burnt out. If this were not done, the colour produced will dry badly, and be deficient in blackness. Draw the charge into iron drums, and seal with clay to keep air-tight until cold. Dry, grind and powder.

Terra di Sienna.

This valuable earth derives its name from Sienna, in Tuscany, the original source of the material. In common with the ochres, it owes its colour to oxide of iron. It is used both raw and burnt.

RAW SIENNA.

The crude earth is levigated, dried, and powdered ; it is then ready for sale. In colour it is yellow, with a slight green tinge.

BURNT SIENNA.

The crude raw Sienna is first dried and then calcined in a reverberatory furnace till a dark reddish brown is produced. The period of burning is usually from six to eight hours ; the resulting product is then levigated, dried, and powdered, or dry ground through a disintegrator. The burnt modification is more largely used than the raw Sienna. The loss during calcination may be taken on an average at from 30% to 50%, but this varies with every parcel, and depends on various circumstances.

Umbers.

This earth is a compound of silicates of iron and manganese; the name is derived from the province of Umbria, in Italy, where it was originally found. The chief umbers in use in this country are the native, and, as it is generally termed, English umber, and the so-called Turkey umber, of which the island of Cyprus is the chief source of supply. A large quantity of Italian umber is also imported. The Turkey and Italian umbers are superior in every respect to the English umbers.

RAW UMBER.

The crude umber is taken as mined, and levigated, dried, and powdered, and is then ready for the market.

BURNT UMBER.

The crude umber is dried, and then calcined in a reverberatory furnace for from six to eight hours, according to shade required, then levigated, dried, and powdered, or dry ground through a disintegrator. The loss through burning, on an average, is from 30% to 40%.

Vandyke Brown.

The original pigment of this name was a bituminous natural earth, derived from certain districts on the Continent. The treatment of the raw material resembles that of the other earth colours.

Much of the Vandyke brown now used is manufactured differently, and the following are some of the principle methods :—

No. 1.

Cork bark and cuttings and soft wood chips or sawdust are calcined in a closed vessel. The resulting brownish-black carbon is mixed with lamp black and a little red oxide to the desired shade.

No. 2.

Lamp Black	100	parts.
Chocolate Coloured Oxide	100	parts.

No. 3.

Lamp Black	30	parts.
Middle Purple Oxide	50	,,
Yellow Ochre	20	,,

CHAPTER II.

CHEMICAL COLOURS—YELLOWS.

If we except the colours which consist of, or are based on, oxide of iron, by far the larger proportion of pigments are produced as the result of chemical processes. It is impossible, in dealing with manufacturing processes which depend on definite chemical principles, to avoid altogether the use of technical language, but it has been the aim in the present volume to express the details connected with the various recipes as simply as possible consistently with accuracy.

Most of the chemical processes by which colours are manufactured are conducted in the wet way. That is, solutions of various chemicals are used. These, when mixed in the correct proportions and with due regard to the essential details, produce, by precipitation, the desired pigment. Filtering, drying, and sometimes powdering, are the remaining processes through which the pigment has to pass in order to prepare it for the market. It will thus be seen that the production of chemical colours is not attended with insuperable difficulty, and expensive plant is rarely required—except, of course, on the very large scale, when such plant as filter presses, etc., will become necessary.

The success of the operations, however, will depend very much on the attention given to the details of the various processes, such as the purity of the chemicals used, the concentration of the solutions, the temperature at which the precipitation is conducted, and the scale on which the process is carried out. This last is a most important point, and it should always be remembered that an experiment that works well with small quantities may require some modifications to enable successful results to be obtained on the larger scale.

It has appeared most convenient to classify the various pigments according to colour, and along with the colours prepared in the wet way are described those which depend on combustion processes. These latter are sometimes considered as constituting a class by themselves, but it is most convenient to refer to them as occasion requires, along with other pigments of similar shade.

Yellow Chromes.

The base of the chrome colours, which are met with in commerce in various shades and under various names, such as lemon chrome, scarlet chrome, Derby red, Persian red, Chinese red, etc., is chromate of lead in one or other of its modifications. Of these there are several, acid, normal, and basic, but the two latter varieties only are of any interest to the colour-maker. The normal chromate is obtained as an orange-yellow precipitate on adding a solution of potassium bichromate to one of a soluble lead salt.

The manufacture of chrome yellow is very simple in theory, but in practice difficulties occur which, in some cases, are very curious, and not a little difficult to account for. Chrome yellow seems to be a very sensitive compound, whose colour and molecular structure appear to largely depend upon the peculiar conditions under which it is made. Thus an excess of bichromate will alter the shade of the product from a lemon yellow to an orange yellow. Leaving the colour too long in contact with the wash water will alter the shade and will render the product pulpy; and the quantity of water used in dissolving the re-agent will affect the product somewhat; so that to make a good chrome requires an experienced hand. The general method of making chrome yellow is to precipitate the solution of lead nitrate or acetate with a solution of bichromate of potash or soda. Formerly, the potash salt was solely used, but the soda salt is equally good, and by some is considered preferable, on account of its greater solubility. The method of making chromes by boiling white lead and a solution of the bichromate together is not recommended, as the product is apt to be sandy in texture.

Another method in somewhat frequent use is to boil sulphate of lead with bichromate of potash or soda. In principle, this is wrong, as chromic acid, being a weaker acid than sulphuric acid, is not able to decompose the lead sulphate. The process is only moderately successful when the pulpy sulphate of lead obtained in making dyers' acetate of aluminium has been used. This pulp frequently contains acetate of lead, and it is really this that is the efficient agent, and not the sulphate of lead. Another method is to make it from the lead by first treating it with nitric acid and then adding the bichromate solution.

CHROME YELLOW (USUAL PROCESS).

Chrome yellow is made in various shades, many makers producing ten to twelve different gradations. They are invariably produced by simple precipitation. The process is conducted thus :—

The salt of lead (either the nitrate or the acetate) is dissolved in cold water in a tank. If the lead salt is not very clean, as sometimes happens, and a good pure yellow is required, the solution must be filtered before it is run into the tank.

Dissolve the bichromate of potash or soda and sulphate of soda or soda crystals. This solution should be filtered, if necessary, before running into the tank. Steam may be used to facilitate solution, but the solution must be allowed to get thoroughly cold before running into the second tank or vat, as if used hot, the shade of the resulting colour is materially affected, being rendered more orange in hue, instead of the light greenish shade which is required. Bichromate of soda may be used instead of the bichromate of potash. On the whole it is to be preferred as it is more soluble and cheaper than the potash salt. The weaker the solutions are made the finer will be the resulting colour. On no account should soda crystals or any form of carbonate or caustic soda be used in making chrome yellows, as it turns them of an orange shade. Having made the solutions in the two vats, the chromate solution is run slowly into that of the lead, with constant stirring. When all is run in, the contents are allowed to settle, and when the yellow has subsided, which it will do in two or three hours, the clean top liquor is run off by decantation as much as possible, and clean water run in, stirring the contents all the while. They are then allowed to settle as before, and the running off and the washing repeated three times. Care should be taken not to allow the wash-water, especially the first one, to remain too long in contact with the colour, as doing so has a tendency to cause the colour to become pulpy. The cause of this is somewhat obscure. After washing the precipitated colour thoroughly, it is transferred to earthenware drying pans, and put into the drying stoves, where it is dried at a low temperature, say at about 150° to 180° F. Too high a temperature has a tendency to cause the colour to turn greyish. It is necessary to have an excess of lead over and above the theoretical proportion required. Excess of bichromate of potash causes the colour to turn dark, either during the process of precipitation or in drying. Theory indicates that 100 parts of acetate require 38·9 of bichromate of potash. Practically, there should never be more than 35 parts present if a good result is required. In the following recipes the lead is always kept in excess.

PURE LEMON CHROME.

	qrs.	lbs.
Lead Acetate or Nitrate	3	16
Bichromate of Potash or Soda	0	25
Glauber's Salt	1	7

PURE MIDDLE CHROME.

	qrs.	lbs.
Lead Acetate or Nitrate	3	16
Bichromate of Potash or Soda	1	2
Glauber's Salt	0	21

PURE ORANGE CHROME.

	qrs.	lbs.
Lead Acetate or Nitrate	3	16
Bichromate of Potash or Soda	1	7

By varying the proportion of bichromate and Glauber's salt many intermediate shades can be produced. If the bichromate is increased, the Glauber's salt must be reduced, and vice versa.

In making chromes, it is a good rule to keep the quantity of lead salts at one constant figure in all recipes, producing the various shades by varying the proportions of the other ingredients, as in the above recipes. For altering the proportion of bichromate and Glauber's salts, the following rule will be found useful: 1 lb. of Glauber's salts is equal to 0·4 lbs. of bichromate of potash or soda. 1 lb. of potash or soda is equal to 2½ lbs. of Glauber's salts. Sulphuric acid is used by some makers instead of Glauber's salts, but its use is not to be recommended, especially when nitrate of lead is used. 3½ lbs. ordinary commercial acid are equal to 10 lbs. of Glauber's salts. Some makers use white lead in making their chromes, that is to say, they make their own nitrate of lead from the ordinary commercial dry carbonate of lead. The following recipes will serve as a guide in such cases:—

CHROME YELLOWS (WHITE LEAD METHOD).

PURE LEMON CHROME.

	cwt.	qrs.	lbs.
Dry White Lead	2	2	20
Nitric Acid	0	1	12
Bichromate of Potash or Soda	0	1	7

PURE MIDDLE CHROME.

	cwt.	qrs.	lbs.
Dry White Lead	1	3	4
Nitric Acid	0	1	12
Bichromate of Potash or Soda	0	1	7

PURE ORANGE CHROME.

The addition of a little milk of lime to the preceding middle chrome while in pulp would give an orange shade, great care being exercised during this operation, as very little suffices.

ORANGE CHROMES.

It has already been pointed out that when chromate of lead is boiled with caustic alkali it undergoes decomposition, a red basic chromate of lead and chromate of the alkali being formed. If only a portion of the chromate of lead be thus decomposed, the resulting red chromate mixing with the excess of yellow chromate forms an orange chrome. Upon these principles are based the various processes of manufacturing the orange and red coloured modifications of chrome yellow.

These pigments are either made pure or mixed with barytes or other white bases. It is less difficult to make orange chromes than to make the yellow chromes, the conditions of working being more favourable to the presence of alkali. They are made in the same way as chrome yellows, but while in the latter case it was necessary to work in the cold to ensure a yellow being produced, now the operation is conducted at the boiling point of water, and as this much facilitates the solution of the chemicals used, the operations are carried on much quicker than in making chrome yellows.

Spoiled batches of light or middle chrome or any odds and ends of chrome liquor can always be utilised for the production of the orange shades. All that is necessary is to boil up the chrome with a little caustic soda (a very small quantity is sufficient), and the orange chrome will be produced.

COMMON CHROMES.

These are made by mixing barytes, China clay, or gypsum, with the lead solutions before precipitating, and then proceeding in the manner already detailed. The amount of such additions can be regulated to any extent to suit requirements, and does not need detailing here.

By varying the proportion of adulterant, the colour is made lighter or deeper. Constant stirring is required while the bichromate solution is being run in. The rest of the operation is carried on as before.

Instead of barytes, China clay may be used, and less of the latter will be required—1 lb. of China clay will go as far as $2\frac{1}{2}$ lbs. to 3 lbs. of barytes. Gypsum or terra alba may also be used, but it is not so good as either China clay or barytes, as there occurs a double decomposition between the gypsum and the lead salts, which prevents an excess of the latter in the liquors, as there should be. This action of gypsum is more noticeable when nitrate of lead is used instead of acetate. Whiting can be use for the cheaper middle shades of yellow, but not for the pale shades, as it gives them a dirty appearance. Some samples of whiting show a tendency to turn the yellow to an orange. This is owing to the fact that in drying the whiting has been heated too strongly, and a little of it has been converted into caustic lime, which reacts on the yellow in the way already mentioned. When barytes, China clay, whiting, gypsum, or white lead are used, they ought to be ground into a paste with water, to ensure that they are in fine state of division, before adding them to the precipitating vat. (See also Reduced Chromes, page 30.)

PURE CHROMES (Another Series).

The following recipes for pure chromes give exceedingly good results, and to these all preceding remarks apply. Where there are differences of detail in working, they are plainly shown.

PURE PRIMROSE CHROME.

No. 1.

	cwt.	qrs.	lbs.
Grey Acetate of Lead	1	2	21
Sulphate of Lead	0	1	14
Bichromate of Potash	0	1	11
Potash Alum	0	1	24
Soda Crystals	1	2	20
Produce	1	3	0

Process.—1. Dissolve the sugar of lead in 250 gallons of water in the striking vat, wash the sulphate of lead into the acetate solution through a sieve, using for this about 20 gallons of water.

2. Dissolve the bichromate of potash and the alum together in 60 gallons of water.

3. Dissolve the soda crystals in 60 gallons of water. When all are quite cold, run No. 2 into No. 1, and then run in No. 3, stirring well all the time. Allow to settle for 10 minutes, fill vat up with water, wash well previous to pressing and drying.

PURE PRIMROSE CHROME.

No. 2.

	cwt.	qrs.	lbs.
Nitrate of Lead	0	3	24
Bichromate of Potash	0	0	22
Potash Alum	0	1	4
Soda Crystals	0	2	4
Produce	1	0	0

1. Dissolve the nitrate of lead in 130 gallons of cold water in the striking vat.

2. Dissolve the bichromate of potash and the alum together in 40 gallons of cold water.

3. Dissolve the soda crystals in 40 gallons of cold water.

Run No. 2 into No. 1, then add No. 3, wash at once and until clean. Filter, press, and dry.

PURE PRIMROSE CHROME.

No. 3.

	cwt.	qrs.	lbs.
Nitrate of Lead	0	1	12
Sulphate of Lead	0	2	24
Bichromate of Soda	0	0	10
Glauber's Salt	0	0	10
Potash Alum	0	0	10
Soda Crystals	0	0	20
Produce	1	0	0

1. Dissolve the nitrate of lead in 50 gallons of cold water in the striking vat, then add the sulphate of lead by washing through a moderately fine sieve, using 20 gallons of cold water.

2. Dissolve the bichromate of soda, the Glauber's salt, and 10 lbs. of the soda crystals in 40 gallons of cold water.

3. Dissolve the potash alum in 15 gallons of water.

4. Dissolve the remaining 10 lbs. of soda crystals in 10 gallons of cold water.

Run No. 2 into No. 1, then add No. 3 and then No. 4, stirring all the time. Wash at once and until clean, then filter, press, and dry.

PURE PRIMROSE CHROME.

No. 4.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	0
White Lead	0	3	7
Bichromate of Soda	0	3	0
Sulphuric Acid	0	2	0
Produce	2	1	0

1. Dissolve the nitrate of lead in 120 gallons of cold water in the striking vat, then wash the white lead through a sieve into the nitrate solution, using six gallons of cold water.

2. Dissolve the bichromate of soda in 100 gallons of cold water, add the acid to the bichromate solution.

Run No. 2 into No. 1, stirring well all the time. Wash at once and until clean. Filter, press, and dry.

PURE LEMON CHROME (ACID METHOD).

No. 1.

	cwt.	qrs.	lbs.
Nitrate of Lead	2	2	0
White Lead	1	2	14
Bichromate of Potash	1	1	4
Sulphuric Acid	1	0	0
Produce	4	0	0

1. Dissolve the nitrate of lead in the striking vat with 300 gallons of cold water, then add the white lead by washing through a moderately fine sieve, using 12 gallons of water.

2. Dissolve the bichromate of potash in 150 gallons of cold water, then add the sulphuric acid to the bichromate solution.

Run No. 2 into No. 1, stirring well. Wash at once and until clean, filter, press, and dry.

PURE LEMON CHROME (ACID METHOD).

No. 2.

	cwt.	qrs.	lbs.
White Lead	1	2	14
Nitrate of Lead	2	2	0
Bichromate of Soda	1	2	0
Sulphuric Acid	0	2	0
Produce	4	0	0

Process as in 1.

PURE LEMON CHROME.

No. 3.

	cwt.	qrs.	lbs.
Nitrate of Lead	2	0	0
Bichromate of Soda	0	1	8
Glauber's Salt	0	1	8
Soda Crystals	0	1	8
Produce	1	3	0

1. Dissolve the nitrate of lead in the striking vat with 250 gallons of cold water.

2. Dissolve the bichromate of soda, Glauber's salt, and soda crystals together in 300 gallons of cold water.

3. Run No. 2 into No. 1, stirring well. Wash at once, and until clean. Filter, press and dry.

PURE LEMON CHROME.

No. 4.

	cwt.	qrs.	lbs.
Nitrate of Lead	0	3	16
White Lead	0	1	0
Bichromate of Potash	0	1	0
Soda Crystals	0	1	7
Epsom Salts	0	1	14
Produce	1	1	0

1. Dissolve the nitrate of lead in the striking vat with 120 gallons of cold water, then wash the white lead through a sieve, using 1 gallon of water.

2. Dissolve the bichromate of potash, soda crystals, and Epsom salts together in 120 gallons of water.

3. Run No. 2 into No. 1, stirring well. Wash at once and until clean, filter, press and dry.

PURE LEMON CHROME (ACID METHOD).

No. 5.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	4
White Lead	0	3	7
Bichromate of Potash	0	3	7
Sulphuric Acid	0	2	0
Produce	2	0	0

Process same as in 3.

It will be found that two great factors in the production of the palest shades are (1) the concentration of the solutions and (2) the temperature. Dilute solutions and a low temperature favour the production of pale shades.

PURE MIDDLE CHROME.

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Lead	1	1	0
Bichromate of Soda	0	1	12
Sugar of Lead	0	0	11
Lead Liquor—73 gallons	–	–	–
Produce	1	3	0

Process for making lead liquor.—Boil by open steam 60 gallons of water in a wood vat, then add 76 pounds of sugar of lead (white or grey). When dissolved, add 67 pounds of flake litharge. Boil for one hour, shut off steam, and make up to 120 gallons by adding cold water, stirring all the time. When cold the liquor is ready for use.

Process for chrome.—Wash the sulphate of lead through a sieve into the striking vat, using 20 gallons of cold water.

Dissolve the bichromate of soda in 34 gallons of cold water.

Dissolve the sugar of lead in 11 gallons of distilled water, and add 73 gallons of the lead liquor.

Run bichromate of soda solution into the lead mixture, add the sugar of lead solution, stirring all the time, wash at once and until clean, filter, press and dry.

PURE MIDDLE CHROME.

No. 2.

	cwt.	qrs.	lbs.
Nitrate of Lead	2	2	0
White Lead	1	2	14
Bichromate of Soda	1	2	0
Produce	4	0	0

PURE MIDDLE CHROME.

No. 3.

	cwt.	qrs.	lbs.
White Lead	0	1	0
Nitrate of Lead	1	1	4
Bichromate of Potash	0	1	24
Soda Crystals	0	0	14
Produce	1	2	0

PURE MIDDLE CHROME.

No. 4.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	4
Bichromate of Soda	0	2	0
Soda Crystals	0	2	0
Produce	1	1	0

Process for Nos. 2, 3, and 4, as for Lemon Shades.

The designation Primrose Chrome is often applied to some of the Middle Chromes. The purity of the chemicals used has a great influence on the beauty of the resulting colour, whether lemon or yellow.

PURE ORANGE CHROME.

This is made by either of the following processes :—

No. 1.

Dissolve in separate quantities of water the following ingredients :—

	cwt.	qrs.	lbs.
Lead Acetate or Nitrate	0	3	16
Bichromate of Potash	0	1	7
Caustic Soda, 77%	0	0	9
Produce	0	3	14

Either this strong soda, which is practically pure, can be used, or a proportionately larger quantity of a weaker caustic. 10 lbs. of caustic soda 77% are equal to 11¼ lbs. of 68%, or 13 lbs. of 60%. Run the lead solution into a precipitating tank, add the bichromate solution, allow the precipitated lead chromate to settle. Run off the top liquor, and run in the caustic solution. Boil up for 30 to 60 minutes, stirring the mixture the whole time to develop the shade, then allow to settle. Run off the top liquor, add fresh water, stir well, and allow to settle. Run off the clear liquor and repeat the washings until the clear liquor is no longer coloured yellow. Then, after allowing the colour to settle, run off as much of the top liquor as possible. Transfer the pigment to a filter, and finally put into earthenware pans to dry.

PURE ORANGE CHROME.

No. 2.

	cwt.	qrs.	lbs.
Lead Acetate or Nitrate	0	3	16
Bichromate of Potash	0	1	2
Glauber's Salt	0	0	21
Quick Lime	0	0	10
Produce	0	3	14

Dissolve lead salts in one tank, and bichromate and Glauber's salt in another tank. When dissolved mix the two as before. In another vessel slake the quick lime, mixing it with water to a thin cream, and then add this to the precipitate formed above. Boil for one hour, stirring continuously; allow to settle, run off top liquor, and proceed as before.

PURE ORANGE CHROME.

No. 3.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	0
White Lead	0	3	7
Bichromate of Potash	0	3	0
Quick Lime	0	2	0
Produce	2	0	0

PURE ORANGE CHROME.

No. 4.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	0
White Lead	0	3	7
Bichromate of Soda	0	3	0
Quick Lime	0	0	14
Produce	2	0	0

PURE ORANGE CHROME.

No. 5.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	20
Bichromate of Soda	0	1	14
Soda Crystals	0	1	14
Quick Lime	0	0	9
Produce	1	1	0

Process for Nos. 3, 4, and 5, as for No. 2.

The notes which accompany the foregoing recipes contain all the essential information in regard to the preparation of the various shades of chrome. A few further general remarks may, however, be of use to the intending manufacturer. To obtain a nice bright lemon chrome it is necessary to strictly adhere to the following maxims, viz.:—

Dissolve the chemicals in cold water and plenty of it. It will be noticed that in most cases a certain quantity of water is mentioned. This is intended as a guide, and need not be strictly adhered to, but the tendency should be to increase and certainly not to decrease the amount of water stated.

With regard to middle chromes, it will be noticed that the formulæ differ from those of lemon chromes in the absence of either sulphuric acid or a sulphate salt. The manufacture of middle chrome is facilitated by the use of steam heat in assisting the solution of the chemicals in their various waters. By striking the colour when the temperature of the solutions has dropped to 120° F. a nice shade of middle chrome is produced. Should a deeper shade be required, it may be obtained by boiling with open steam, or striking at a higher temperature. This is a matter that depends to such an extent on the requirements of the manufacturer for his particular business that it is impossible to lay down a hard and fast rule.

To obtain a good orange chrome a bright middle shade should first be made. The quick lime, after being slaked with boiling water, should be added through a moderately fine sieve to the middle shade while it is in a pulp. During the second washing is the best time to do this. The lime should be run in slowly, and great attention should be paid to the changes of colour. When the desired colour is hit off the addition of the lime should be stopped, and the washing proceeded with.

Reduced Chromes.

Such terms as Super, Fine, No. 1, No. 2, No. 3, etc., applied to chromes, indicate a colour which contains a proportion (of varying extent) of added adulterant. In many of the recipes for pure chrome, sulphate of lead is precipitated with the chrome, especially in the pale and lemon shades. This cannot be called an adulterant, as the presence of the lead sulphate is often necessary in order to obtain the light tint.

SUPER CHROME.

	cwt.	qrs.	lbs.
Barytes, China Clay, or Terra Alba ..	2	0	0
Pure Chrome..............	As per preceding formulæ		

NO. 1 CHROME.

	cwt.	qrs.	lbs.
Barytes, China Clay, or Terra Alba ..	4	0	0
Pure Chrome	As per preceding formulæ		

NO. 2 CHROME.

	cwt.	qrs.	lbs.
Barytes, China Clay, or Terra Alba ..	8	0	0
Pure Chrome	As per preceding formulæ.		

Very little absolutely pure chrome is sold in the ordinary way of business. The above quantities of terra alba, etc., added to the preceding formulæ give chromes of the usual qualities. Commoner qualities may be made to any extent at the discretion of the manufacturer. (See also page 21.)

Imperial Yellow.

This is a considerably reduced chrome, probably of about No. 2 quality, and is sent out in a powder, instead of the round or square cakes in which chrome is usually sold. For a pale Imperial Yellow a lemon chrome should be used; for a deep Imperial Yellow a middle chrome should be used. It is a useful article in paint grinding.

Naples Yellow.

In ordinary commercial practice this is practically the same as Imperial yellow, but should be of distinctly better quality. The original Naples yellow is seldom made, at any rate in Britain. It is a compound of lead and antimony salts, and is really antimoniate of lead.

It can be made in the following way :—

Tartar Emetic	1	part.
Lead Nitrate	2	parts.
Common Salt	4	,,

Are melted in a crucible for some time. The mass is allowed to cool, extracted with water, the soluble portion drained away, when the yellow pigment remains.

Cologne Yellow.

As in the case of Naples yellow, a chrome yellow is generally sent out under this name. The original article, however, was obtained by the decomposition of sulphate of lime and chromate of lead with a soda salt. A good quality lemon chrome is most suitable.

Golden Ochre.

This is really a very cheap chrome of a dull or drab shade.

No. 1.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	0
Bichromate of Soda	0	1	14
Soda Crystals	0	1	14
Quick Lime	0	0	12
Common Barytes	15	0	0
Produce	16	0	0

No. 2.

	cwt.	qrs.	lbs.
Nitrate of Lead	1	1	0
Bichromate of Soda	0	1	14
Soda Crystals	0	1	14
Quick Lime	0	0	12
Common Barytes	12	2	0
Terra Alba	12	2	0
Produce	26	0	0

Process.—As for *orange chrome.* Wash three times, the barytes and terra alba being added during second washing.

Small quantities of lemon or middle chrome are often added to grinding ochre, with the object of imparting to it a rich, golden hue. It is usually mixed dry.

Mars Yellow.

This is hydrated oxide of iron prepared by a special precipitation process. It is a very permanent pigment, and can be prepared in comparatively light and bright shades if care be taken in the precipitation.

Process.—Take equal weights of ferrous sulphate (green copperas) and potash alum, dissolve in cold water, making a very weak solution (not over 2% strength); add a little sulphuric acid, then add a solution of carbonate of potash till *slightly* alkaline. Wash, press, and dry at a low temperature.

Another method is to add solution of green copperas to a solution of bleaching powder, keeping the latter always in excess.

MARS YELLOW (ANOTHER METHOD).

	cwt.	qrs.	lbs.
Green Copperas	1	0	0
Quick Lime	1	0	0

Process.—Dissolve the copperas in abundance of water. Reduce the quick lime to milk of lime with water and strain through coarse sieve. Mix the two together, wash and collect the green precipitate, expose to the air and dry. It turns yellow on exposure.

MARS YELLOW (ANOTHER METHOD).

	cwt.	qrs.	lbs.
Green Copperas	1	0	0
Alum	1	0	0

Process.—Dissolve the copperas and alum each in an abundance of water, and mix the two solutions together. Add a solution of American potash until no acid is discernible by litmus paper. Stir well, allow to settle, and run off the clear liquor. Wash and dry the product, which is a very fine iron lake of a rich golden yellow. The colour may be made paler or deeper as the quantity of alum is varied. It is a safe colour both in oil and water.

The following are derivatives of Mars yellow:

MARS ORANGE.

Take the Mars yellow obtained by one of the above processes, and calcine gently to an orange or golden brown tint Draw the charge and grind fine. This is a safe colour in oil or water

MARS RED.

Calcine the preceding yellow at a higher degree of heat than required for the orange, and a red will be produced.

MARS VIOLET.

Take the preceding yellow and mix with lampblack, and calcine at a medium temperature. Carefully watch the process, drawing samples from time to time. A rich violet pigment will result ; a beautiful and permanent colour in oil or water. Different shades will be produced according to the quantity of lampblack, and the time and heat of calcination ; hence the need for careful watching.

Cadmium Yellow.

The best commercial method for preparing the cadmium yellow is as follows :—The paler shades are precipitated from 10% solutions of sulphate or chloride of cadmium by means of sulphuretted hydrogen. The alkaline sulphides, although more convenient than the gas, yield pigments which from their instability are quite useless for painters. The stream of gas must be stopped when half the cadmium has been thrown down, and the precipitating vessel must be so arranged as to bring the sulphide into contact with the sulphuretted hydrogen as little as possible. For dark shades the whole of the cadmium is thrown down, the liquor being kept warm, and the precipitate constantly stirred up. The orange shades are made by passing sulphuretted hydrogen into a boiling 2% solution of cadmium chloride to which 5% of hydrochloric acid has been added, the whole being constantly stirred. Lemon yellows may be prepared from the hydrate, carbonate, or oxalate of cadmium. These are not so good as the sulphide pigments.

Strontia Yellow.

	cwt.	qrs.	lbs.
Nitrate of Strontium	1	0	4
Bichromate of Soda	0	1	22
Soda Crystals	0	1	4
Caustic Soda	0	1	26
Produce	1	0	0

Process.—Dissolve the nitrate of strontium, bichromate of soda, and soda crystals together by open steam in 40 gallons of water. Then add the caustic soda dissolved in 10 gallons of water. Stir well, wash at least three times, filter, press and dry.

Zinc Chromes.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	3	16
Bichromate of Potash	0	1	17
Sulphuric Acid	0	3	23
Produce	0	3	26

No. 2.

	cwt.	qrs.	lbs.
Zinc White	0	3	16
Bichromate of Potash	0	1	17
Sulphuric Acid	0	3	23
Best Barytes	1	0	0
Produce	1	3	26

Process.—Open out the zinc white through a very fine sieve with water to a thin cream, then add the sulphuric acid diluted with 5 gallons of water, stirring well the whole time, then add the bichromate of potash, dissolved in as little water as possible, slowly,—*this must be carefully attended to.* When all is in, wash once in at least 300 gallons of water, filter and dry at a low temperature. If No. 2 is being made, add the barytes while washing.

ANOTHER METHOD.

No. 3.

	cwt.	qrs.	lbs.
Sulphate of Zinc	1	0	0
Bichromate of Potash	0	2	0
Soda Crystals	0	2	0
Quick Lime	0	0	14

ANOTHER METHOD.

No. 4.

	cwt.	qrs.	lbs.
Sulphate of Zinc	1	0	0
Bichromate of Potash	0	2	0
Soda Crystals	0	2	0
Quick Lime	0	0	14
Terra Alba	1	0	0

Process for 3 and 4.—Slake the lime and wash into vat through a fine sieve. Then run in the bichromate in solution as cold as possible, stirring all the time. Then add the sulphate of zinc solution, and lastly, the soda crystals in solution. Stir every hour for one day, wash three times, filter, and dry. Add the terra alba in the second washing.

ANOTHER METHOD.

No. 5.

	cwt.	qrs.	lbs.
Sulphate of Zinc	1	0	11
Soda Crystals (a varying quantity)			
Bichromate of Soda	0	1	25

ANOTHER METHOD.

No. 6.

	cwt.	qrs.	lbs.
Sulphate of Zinc	1	0	11
Soda Crystals (a varying quantity)			
Bichromate of Soda	0	1	25
Terra Alba	1	0	0

Process for 5 and 6.—Dissolve the sulphate of zinc in as small a quantity of water as possible, and carefully neutralise the solution with the soda crystals. Test from time to time with litmus paper. Boil up, and then add the bichromate of soda previously bissolved in as little water as possible, and neutralise as in the case of the zinc solution. Great attention must be paid to the neutralisation of both solutions. Continue boiling for one hour after all is in, then wash and dry at a low temperature. Add the terra alba (if any) during washing

LEMON SHADE.

	qrs.	lbs.
Chloride of Zinc (a variable quantity), say..	2	14
Bichromate of Potash	0	20
Caustic Soda	2	0

Process.—In the manufacture of zinc chrome by the above method, a stock solution of chloride of zinc must be kept in a wooden vat ready for use.

Dissolve the caustic soda in 700 gallons of cold water, then run in the chloride of zinc till the mass shows an acid reaction. Test from time to time with litmus paper. Boil for one hour with continual stirring and allow to stand till quite cold.

Dissolve the bichromate of potash in cold water and add to the above when cold. Stir till thoroughly amalgamated and allow to settle. Draw off top liquor, and filter and dry. No washing is required. Dry at a very low heat.

GOLDEN YELLOW SHADE.

	cwt.	qrs.	lbs.
Chloride of Zinc (a variable quantity), say		2	14
Bichromate of Potash	0	0	24
Caustic Soda	1	0	0

Dissolve the caustic soda in 700 gallons of cold water. Then run in chloride of zinc solution, as for lemon, until the mass shows an acid reaction. Test with litmus paper. Keep well stirred, then boil for an hour by steam. While boiling, add the bichromate of potash dissolved in hot water. After the bichromate is in and all amalgamated, turn off steam, allow to stand until quite cold. Run off the top liquor, filter, and dry. No washing required. Dry at as low heat as possible, in fact, a warm air draught is best.

Barium Chrome.

Chromate of barium is a colour which is used to a considerable extent in paper-staining, but hardly at all in the paint industry.

It is obtained by precipitating neutral solutions of a soluble barium salt with bichromate of potash.

No acid should be present, and for the palest shades the precipitation should be conducted in the cold, and the bichrome should be neutralised with alkali before precipitation.

Lithographers' Chromes.

Large quantities of these are now used in connection with lithographic printing. It will be noticed that they are struck on a white lead base, which gives great density to the pigment.

PURE LEMON.

No. 1.

	cwt.	qrs.	lbs.
Dry White Lead	1	0	5
Sugar of Lead	0	2	19
Sulphate of Alumina	0	2	19
Bichromate of Soda	0	1	9

PURE PALE.

No. 2.

	qrs.	lbs.
Dry White Lead	3	18
Sugar of Lead	2	15
Sulphate of Alumina	3	9
Bichromate of Soda	1	10

PURE MIDDLE.

	qrs.	lbs.
Dry White Lead	3	18
Sugar of Lead	2	0
Sulphate of Alumina	2	18
Bichromate of Soda	1	12

PURE DEEP.

	cwt.	qrs.	lbs.
Dry White Lead	1	0	15
Sugar of Lead	0	2	19
Bichromate of Soda	0	2	0

PURE ORANGE.

	cwt.	qrs.	lbs.
Dry White Lead	1	0	15
Sugar of Lead	0	2	19
Bichromate of Soda	0	2	0
Quick Lime	0	0	8

PURE RED.

	cwt.	qrs.	lbs.
Dry White Lead	1	0	15
Sugar of Lead	0	2	19
Bichromate of Soda	0	2	0
Quick Lime	0	0	10

PURE EXTRA RED.

	cwt.	qrs.	lbs.
Dry White Lead	1	0	15
Sugar of Lead	0	2	19
Bichromate of Soda	0	2	0
Quick Lime	0	0	15

Process.—Lemon, pale, and middle shades.

Dissolve the bichromate of soda and sulphate of alumina together in an abundance of cold water (80 gallons to the cwt. of crystals).

Dissolve the sugar of lead in a small quantity of hot water, and add cold water, 40 gallons to the cwt.

Wash the white lead through a sieve into the striking vat with cold water, 80 gallons to the cwt., add the sugar of lead solution to the white lead, and run in the bichromate and sulphate of alumina solution very slowly, stirring all the time and for 10 minutes after all is in. Wash four times, filter, press, and dry.

Process.—Deep shades. As for lemon, etc., the sulphate of alumina not being added.

Process.—Orange and red shades. Slake the lime, and during the second washing, add it through a sieve very steadily.

Dutch Pink.

This pigment is a lake whose colouring principle is derived from the bark of the quercitron tree. The process is as under :—

	cwt.	qrs.	lbs.
Quercitron Bark	2	0	0
Lime	0	2	0
Alum	0	2	0
Whiting	1	0	0
Terra Alba	2	0	0
White Sugar of Lead	0	0	10
Produce	3	2	0

Put the quercitron bark into a tub with cold water ; slack the lime, and add the water to the wood ; this draws all the colour out of the wood ; dissolve the alum in water, and run it into the bark liquor, the alum solution being just warm ; dissolve the sugar of lead, and add it to the above ; then add the terra alba and whiting. The whole mass is now in a pulp, which must be cast in drops and dried as required. A darker shade may be made by adding 7 lbs. pearlash and 7 lbs. bichromate of soda to the bark liquoı

LIGHT DUTCH PINK.

No. 1.

	cwt.	qrs.	lbs.
Quercitron Bark	2	0	0
Alum	0	1	22
Terra Alba	0	3	0
Whiting	1	2	0
Produce	3	3	0

DARK DUTCH PINK.

No. 1.

	cwt.	qrs.	lbs.
Quercitron Bark	2	0	0
Alum	0	1	22
Pearlash	0	0	3
Bichromate of Soda	0	0	3
Terra Alba	0	3	0
Whiting	1	2	0
Produce	3	3	0

Process.—Boil the bark three times, each time in 300 gallons of water. If a dark shade is required, add the pearlash and bichromate of soda in the first boiling. First boiling, $1\frac{1}{2}$ hours ; second and third boiling, 1 hour each. Run all the water together into a large vat, add the alum dissolved in boiling water. Well stir and allow to stand till the following day. Then wash in the terra alba and whiting through a fine sieve, stirring well all the time, and for half-an-hour after the terra alba and whiting are in. Next day, run off the clear water and wash twice, filter, drop, and dry.

LIGHT DUTCH PINK.

No. 2.

	cwt.	qrs.	lbs.
Quercitron Bark	2	2	0
Alum	0	1	8
Sugar of Lead	0	0	1
Terra Alba	1	1	0
Whiting	2	2	0
Produce	5	2	0

Process.—As before, the sugar of lead being added last, dissolved in one gallon of cold water.

DARK DUTCH PINK.

No. 2.

	cwt.	qrs.	lbs.
Quercitron Bark	2	0	0
Soda Crystals	0	0	8
Alum	0	1	2
Terra Alba	0	3	16
Whiting	2	0	14
Produce	4	2	0

Process.—Boil the quercitron bark as before, adding the soda crystals in the first water. When cool, wash the terra alba and whiting through a sieve into the liquor, and add 20 lbs. of powdered alum. Stir well, say five minutes every hour for three hours. Then add the remaining 10 lbs. of alum. Stir well; when settled, run the clear liquor off, filter, press, and drop.

English Pink.

	cwt.	qrs.	lbs.
Quercitron Bark	2	0	0
Lime	0	1	0
Whiting	2	0	0
Terra Alba	3	0	0
Sugar of Lead	0	0	7
Alum	0	1	0
Produce	1	2	0

This is the same as Dutch pink, only of poorer quality. Put the bark into a vat, slack the lime in another vat, and add the clear lime-water to wash the bark, repeat this three times; let the bark stand in each water 24 hours; run the liquor into the vat below, then add the terra alba and whiting; wash well in top vat, and run into the liquor below through a hair sieve, stir well up; dissolve the sugar of lead in warm water and pour gently into the vat while stirring; dissolve the alum, and run in the batch while stirring, filter, press slightly, and drop, then dry as required.

CHAPTER III.

CHEMICAL COLOURS *(continued)*.

BLUES.

The preparation of blue pigments is an exceedingly important branch of the colour-maker's art. From the commercial point of view, blue colours divide themselves naturally into two main groups.

(1) Blues made by precipitation processes. This class comprises the Prussian, Chinese, Saxon, Bronze, Brunswick, and Celestial blue.

(2) Blues made by furnace processes comprising the Ultramarines, Lime Blues and Smalts. With these two groups we shall deal in the order stated.

One of the most sought after shades is that known as *bronze blue*. When a lump of the pigment is broken the fracture should show a bronze lustre.

The following are formulæ :—

Bronze Blue.

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas) ..	1	0	8
Yellow Prussiate of Potash	1	0	0
Sulphuric Acid	0	2	4
Nitrous Acid	0	1	20
Produce (Pure Blue)........	1	3	14

Process.—(1) Dissolve the copperas in 60 gallons of boiling water.

(2) Dissolve the prussiate of potash in 60 gallons of boiling water.

Add 1 and 2 together, and make up to 140 gallons with cold water.

When cold, filter: the residual thick paste is to be put back to the boiling vat; turn on steam, heat up to 209° F., keep at this heat for half-an-hour. Remove steam pipe, and cover up tightly, leaving a small hole in top of cover. Through this aperture add the sulphuric, and then the nitrous acids. Keep covered for an hour. Stir well. Stir again after an interval of four hours. Leave it for 12 hours, stir well, run down into washing vat. Wash in four waters, filter and press, and dry quickly at a temperature of 150° F.

BRONZE BLUE.

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	18
Yellow Prussiate of Potash	1	2	0
Sulphuric Acid	1	2	0
Muriatic Acid	1	0	8
Bichromate of Soda	0	0	18
Produce (Pure Blue)	1	0	0

Dissolve the copperas in 100 gallons of water.

Dissolve the prussiate of potash separately in an equal quantity of water.

Stand till cool, then run the above two solutions into a lead lined vat. Add sulphuric and muriatic acid, boil for three hours, then add the bichromate of soda. Fill vat with water. Run into washing vat and well wash, filter and press, and dry.

NOTE.—In all formulæ and recipes relating to these and similar blues the iron salt is to be added to the yellow prussiate solution, unless otherwise stated.

Chinese Blue.

The term Chinese blue is usually reserved for pure blues, while Prussian blue is an elastic term indicating a blue which may be pure or may not.

For fine Chinese and Prussian blues, the chemicals used should be very pure, otherwise the brilliancy of the product will be impaired.

CHINESE BLUE.

No. 1.

	qrs.	lbs.
Sulphate of Iron (green copperas)	2	7
Yellow Prussiate of Potash.................	2	0
Sulphuric Acid........................... ...	1	2
Bichromate of Potash......................	0	8
Produce (Pure Blue)	1	14

Process.—Dissolve the copperas in 100 gallons of boiling water.

Dissolve the prussiate of potash separately in an equal quantity of boiling water.

Add the iron solution to prussiate of potash solution, and boil for $1\frac{1}{2}$ hours, shut off steam, add very slowly the acid, then add the bichromate of potash in the form of crystals. Stir very gently for ten minutes, wash at once and repeat washing at least three times, filter, press and dry.

DEEP CHINESE BLUE.

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	1	0
Yellow Prussiate of Potash...........	1	1	0
Sulphuric Acid	1	1	0
Bichromate of Soda	0	0	14
Produce (Pure Blue)	1	0	4

DEEP CHINESE BLUE.

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	1	0
Yellow Prussiate of Potash	1	1	0
Bichromate of Soda...................	0	0	14
Muriatic Acid	1	3	14
Produce (Pure Blue)	1	0	14

The following are slightly varied formulæ for Chinese blue—

CHINESE BLUE.
No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	2
Yellow Prussiate of Potash	1	0	0
Sulphuric Acid	0	3	0
Bichromate of Potash	0	0	16
Produce (Pure Blue)	0	3	14

CHINESE BLUE.
No. 3.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	2
Yellow Prussiate of Potash	1	0	0
Sulphuric Acid	0	3	0
Chlorate of Potash	0	0	10
Produce (Pure Blue)	0	3	14

CHINESE BLUE.
No. 4.

	qrs.	lbs.
Starch (dry)	1	0
Pulp Blue	1 batch as above.	

Thin the starch with water, and add to the pulp blue.

The process for each of above blues is the same, but care should be taken to have plenty of water in proportion as the weight of the chemicals is increased.

This formula differs somewhat from the others.

CHINESE BLUE.
No. 5.

	qrs.	lbs.
Sulphate of Iron (green copperas)	1	8
Yellow Prussiate of Potash	1	8
Sulphuric Acid	0	5
Chloride of Lime	0	7
Muriatic Acid	0	$0\frac{1}{2}$
Produce (Pure Blue)	1	0

Process.—Dissolve the sulphate of iron in 30 gallons of water by steam, in a vat; when dissolved, add 30 gallons cold water. In another vat dissolve the prussiate of potash in 40 gallons of water, by steam, and add it hot to the iron sulphate solution. Stir well, then add the sulphuric acid diluted with a little cold water. Allow this mixture to stand two days, and then run off all the clear water.

Now mix the lime in five gallons of cold water, and add it to above by passing it through a fine sieve (care being taken that no sediment gets in). Stir well, and add the muriatic acid. Now stir all up well together and let it stand a few days until settled down. Run off the clear water and wash at least twice again. Filter, press, and dry in the usual manner.

Prussian Blue.

Prussian blues always contain a certain proportion of alum. The effect of this during the striking is to cause the colour to be precipitated more slowly, so that the particles are finer and the shade paler. The following formula gives one of the purest Prussian blues that can be made:—

PURE PRUSSIAN BLUE.

(1) Sulphate of Iron (green copperas) .... 100 lbs.
Dissolved in five times its weight of cold water.

(2) Potash Alum .... 200 lbs.
Dissolved in five times its weight of cold water.

Nos. 1 and 2 are mixed together, and the mixture run into a solution of

Yellow Prussiate of Potash .... 100 lbs.

Previously dissolved in 10 times its weight of cold water. Allow to settle, wash, and filter.

It will be noticed that very dilute solutions are used, also that cold solutions are used. This is important in dissolving the iron salt, as any heat precipitates oxide of iron, which spoils the shade. The final process may be conducted hot or cold, according to the precise shade desired.

In preparing pure Prussian blue by the above method, 1,112 parts of iron salt yield 860 parts of dry blue, or 1,184 parts of blue, including chemically combined water.

The following are formulæ for reduced Prussian blues.

PRUSSIAN BLUE.

No. 1.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	1	0	0
Sulphate of Iron (green copperas)	1	0	3
Bichromate of Potash	0	0	16
Sulphuric Acid	0	3	0
Soda Crystals	0	1	0
Alum	0	1	0
Best Barytes	0	1	0
Best Terra Alba	0	1	0
Produce	1	1	21

PRUSSIAN BLUE.

No. 2.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	1	0	0
Sulphate of Iron (green copperas)	1	0	3
Bichromate of Potash	0	0	16
Sulphuric Acid	0	3	0
Soda Crystals	0	2	0
Alum	0	2	0
Best Terra Alba	1	0	0
	2	0	14

PRUSSIAN BLUE.

No. 3.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	1	0	0
Sulphate of Iron (green copperas)	1	0	3
Bichromate of Potash	0	0	16
Sulphuric Acid	0	3	0
Soda Crystals	0	2	0
Alum	0	2	0
Best Terra Alba	2	0	0
	3	0	14

Some recipes are more economical than others in respect of quantity of blue produced from given weights of ingredients, as the following show.

PRUSSIAN BLUE, PURE, OF VERY FINE QUALITY.

No. 1

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas) . . .	1	0	3
Yellow Prussiate of Potash	1	0	0
Chlorate of Potash	0	0	10
Sulphuric Acid	0	3	0
Alum	0	1	0
Soda Crystals	0	1	0
Produce	0	3	21

PRUSSIAN BLUE, AN ALTERNATIVE FORMULA.

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	3
Yellow Prussiate of Potash	1	0	0
Bichromate of Potash	0	0	16
Sulphuric Acid	0	3	0
Alum	0	1	0
Soda Crystals	0	1	0
Produce	0	3	21

PRUSSIAN BLUE (RATHER CHEAPER).

No. 3.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	3
Yellow Prussiate of Potash	1	0	0
Chlorate of Potash	0	0	10
Sulphuric Acid	0	3	0
Alum	0	2	0
Soda Crystals	0	2	0
Produce	1	0	7

PRUSSIAN BLUE (AN ALTERNATIVE FORMULA).

No. 4.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	3
Yellow Prussiate of Potash	1	0	0
Bichromate of Potash	0	0	16
Sulphuric Acid	0	3	0
Alum	0	2	0
Soda Crystals	0	2	0
Produce	1	0	7

PRUSSIAN BLUE (STILL CHEAPER).

No. 5.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	3
Yellow Prussiate of Potash	1	0	0
Chlorate of Potash	0	0	10
Sulphuric Acid	0	3	0
Alum	0	3	0
Soda Crystals	0	3	0
Produce	1	0	21

PRUSSIAN BLUE (AN ALTERNATIVE FORMULA).

No. 6.

	cwt.	qrs.	lbs.
Sulphate of Iron (green copperas)	1	0	3
Yellow Prussiate of Potash	1	0	0
Bichromate of Potash	0	0	16
Sulphuric Acid	0	3	0
Alum	0	3	0
Soda Crystals	0	3	0
Produce	1	0	21

Process for Prussian Blues as above.—This is precisely the same as the method adopted in the manufacture of Chinese blue, up to the addition of the alum and soda crystals and terra alba or barytes, which is carried out as follows:—

This addition is made during the second washing. Where soda crystals and alum are used, the following is the process: Boil the soda and alum together in water until all effervescence ceases. The residue which settles out is added to the blue. Trade terms for this white pulp, which is really hydrate of alumina, are *satinette*, *satinite*, and *satin white*. The same material is largely used in making lakes (see later).

PRUSSIAN BLUE SOLUBLE IN WATER.

Dissolve 2 qrs. 7 lbs. of oxalic acid in boiling water, and, when cool, add to one of the batches of Prussian blue, as above, while in pulp. Then filter, press, and dry in the usual manner. 27

Pulp Blues for Paper Stainers.

BRONZE BLUE.

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Iron	1	1	10
Yellow Prussiate of Potash............	1	1	6
Sulphuric Acid	0	2	6

19

Mix above as usual, and allow to stand till the following day.

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron	0	3	16
Nitrous Acid	0	1	8
With 70% Water, Produce	2	0	0

20

Mix 1 and 2 separately in stoneware vessels and allow to stand till the following day. Then run No. 2 into No. 1, and fill vat up with water. Stir well for one hour, and wash well in the usual manner.

BRONZE BLUE.

(Another Method.)

1

	cwt.	qrs.	lbs.
Sulphate of Iron	2	1	0
Yellow Prussiate of Potash............	1	1	4
Nitric Acid	0	1	8
Sulphuric Acid	0	2	4
With 70% Water, Produce	3	1	0

Mix iron and prussiate solutions in the usual manner. Add the sulphuric acid, and allow to stand till next day. Then add the nitric acid. Wash clean in the usual manner.

CHINESE BLUE.

Any of the dry Chinese Blue formulæ may be used, the only difference being that in this case the blue is not dried.

PRUSSIAN BLUE.

3

Any of the dry Prussian blue formulæ may be used, and terra alba added according to quality.

DAMP, OR PASTE BLUE.

No. 1.

4

	cwt.	qrs.	lbs.
Sulphate of Iron	1	0	18
Yellow Prussiate of Potash..........	1	0	14
Bichromate of Potash	0	1	7
Glauber's Salts	3	0	0
Alum	6	0	0
Soda Crystals	6	0	0
With 20% Water, Produce	3	0	0

DAMP, OR PASTE BLUE.

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron	1	0	18
Yellow Prussiate of Potash	1	0	14
Chlorate of Potash	0	1	0
Glauber's Salts	3	0	0
Alum	6	0	0
Soda Crystals	6	0	0
With 20% Water, Produce	3	0	0

5

Boil the sulphate of iron and prussiate of potash in the usual manner, add the bichromate or chlorate of potash, then the Glauber's salts. Wash the product thoroughly.

Dissolve soda and alum together and wash thoroughly, and then add to above, for which process both of the mixtures must be cold. Terra alba may be added according to quality.

PASTE PRUSSIAN BLUE.

No. 1.

6

	cwt.	qrs.	lbs.
Sulphate of Iron	1	0	0
Yellow Prussiate of Potash	1	0	18
Alum	0	1	22
Bichromate of Soda	0	0	16
20 % Water, Produce	1	0	7

Dissolve the alum and sulphate of iron in 120 gallons of water, and run, while hot, into striking vat.

Dissolve the prussiate of potash in 120 gallons of water, and run, while hot, into the alum and sulphate solution, well stirring all the time. Now dissolve the bichromate of soda in 40 gallons of water, and run into above mixture, well stirring all the time; fill vat up with cold water, allow the blue to settle, wash at least three times. The blue is usually left in the paste state, but it may be dried and sold for staining paper pulp.

PASTE PRUSSIAN BLUE.

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Iron	1	1	6
Yellow Prussiate of Potash	1	1	0
Alum	1	1	14
Chloride of Lime	0	1	12
20 % Water, Produce	1	1	25

Dissolve the alum and sulphate in 150 gallons of water, and run, while hot, into the striking vat. Dissolve the prussiate of potash in 150 gallons of water, and run, while hot, into the alum and sulphate solution, stirring well all the time.

Now dissolve the chloride of lime in 30 gallons of boiling water, add 10 gallons of cold water, let it settle four hours, and run the clear liquid into above mixture, well stir, and leave for three hours. Then fill up the vat with cold water, well stir, allow the blue to settle, wash at least three times.

NOTE.—These paste blues are usually sold in damp paste for use by calico printers, paper stainers, etc., but they may be dried if desired.

Brunswick and Celestial Blues.

To any of the preceding Chinese Blues, while in pulp, add best white barytes in the following quantities :—

	cwt.	qrs.	lbs.
Add for Brunswick Blue	10	0	0
,, Celestial Blue	20	0	0
,, Pale Celestial Blue	30	0	0

It is advisable to add the barytes during the second washing. The usual manner of doing this is to wash it through a moderately fine sieve with cold water. It is essential that the barytes be a very finely ground quality.

The above quantities of barytes are arbitrary, and are intended merely as a guide ; it is solely a matter for the manufacturer himself as to the quantity to be added, this depending on price and special requirements.

Terra alba may be used in place of barytes, and is often preferred.

Azure Blue

(A GOOD SANITARY OR LIME BLUE).

This is really a lake pigment, and is a useful colour.

	cwt.	qrs.	lbs.
Potash Alum	1	2	0
Soda Crystals	1	2	0
Best White Barytes	1	2	0
Patent Blue Aniline	0	1	7
Chloride of Barium	0	0	6
Produce	2	1	14

Process.—The alum and soda crystals are dissolved separately in 50 gallons of water, at 150° F., added together, and the precipitate washed twice.

The precipitate and the barytes are mixed together, with water sufficient to form a thin paste.

The blue dye, dissolved in $1\frac{1}{2}$ gallons of water at 100° F., is added to this paste. Then add the chloride of barium dissolved in 2 gallons of water at 120° F. Run the clear liquor off, filter, and press and dry. No washing required.

The above blue is used as a lime or sanitary blue, and, when mixed with chrome, makes good lime or sanitary greens.

Ultramarine Blue.

This unique pigment is found native as the Lapis Luzuli, but the supply from this source is extremely limited. Ultramarine is produced on the commercial scale by a furnace process. The details are somewhat complicated, and require careful attention to obtain even moderately successful results. Its base is silicate of alumina, better known as China clay, and sulphur is an essential element in its composition. The following is the process expressed in general terms :—

China Clay	100 parts.
Sulphate of Soda	41 ,,
Carbonate of Soda	41 ,,
Carbon	17 ,,
Sulphur	13 ,,
Sulphide of Soda	26 ,,

All the above must be pure, and, in particular, the China clay must contain no iron.

Grind the ingredients very fine for a long time, heat them in a muffle furnace in pots, and white ultramarine is produced. This, exposed to air, produces ultramarine green. The latter is mixed with 4 % of sulphur and roasted in shallow pans, with constant stirring. The blue shade is gradually developed.

Excess of silica gives a reddish tone. Less soda gives a paler and greener blue.

Lime Blue.

This is either a low grade of ultramarine or is obtained from the latter by mixing with it varying quantities of powdered silica, ground glass, or terra alba.

The following are also derivatives of ultramarine blue :—

ORIENTAL BLUE.

No. 1.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	2	0
China Clay	0	0	7
Soda Crystals	0	0	14
Alum	0	0	14
Produce	0	2	14

No. 2.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	2	0
Starch	0	0	7
Soda Crystals	0	0	14
Alum	0	0	14
Produce	0	2	14

No. 3.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	2	0
Starch	0	0	10
China Clay	0	0	7
Soda Crystals	0	0	14
Alum	0	0	14
Produce	0	3	0

No. 4.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	2	0
Starch	0	0	7
China Clay	0	0	14
Soda Crystals	0	0	14
Alum	0	0	14
Produce	0	2	21

Process.—Thoroughly mix the ultramarine blue and China clay and starch in 70 gallons of cold water. Dissolve the soda crystals and alum separately, each in 14 gallons of water, at 130° F. Run the soda solution into the blue and then run in the alum solution, with continual stirring, wash at least twice, filter, and press.

IMITATION HERONDALE BLUE.

	cwt.	qrs.	lbs.
Pale Ultramarine Blue................	1	0	0
Indian Red..........................	0	0	16

Mixed dry.

INDIA RUBBER BLUE

No. 1.

	cwt.	qrs.	lbs.
Pale Ultramarine Blue	0	2	0
Blue Black	0	2	7

No. 2.

	cwt.	qrs.	lbs.
Pale Ultramarine Blue	0	1	14
Blue Black	0	2	7

No. 3.

	cwt.	qrs.	lbs.
Pale Ultramarine Blue	0	1	0
Blue Black	0	1	14
Zinc White	0	0	21

All the above are mixed dry.

CHAPTER IV.

CHEMICAL COLOURS *(Continued)*.

GREENS.

The greens are among the most numerous and important of the dry colours. At one time nearly all green pigments of importance were copper derivatives, and their preparation was an exceedingly delicate operation. With the introduction, however, of improved methods of preparing compound greens containing yellow chrome and Prussian blue, a great change has been effected, and now the great bulk of the green colours of commerce belong to the Brunswick class—a name which is now restricted to the compound greens referred to. The modern Brunswick greens include several qualities and modifications, to which special names are usually given. Thus, there are *Royal greens*, *coachmakers' greens*, *emerald-tinted Brunswick greens*, *Victoria greens*, *Albert greens*, *chrome greens*, etc.

The general principles followed in the manufacture of all these are identical, and consist in blending, by a wet process, suitable proportions of Chinese or Prussian blue and chrome yellow, with or without the addition of cheapening agents, such as barytes, terra-alba, or whiting.

Full practical details of the process will now be given, and, as the method is really a combination of the methods by which Chinese or Prussian blue, and chrome yellow are respectively prepared, the rules already given with reference to these pigments should be carefully studied.

Greens of the class now under consideration can also be prepared in the dry way by grinding together suitable proportions of blue, chrome, and (if desired) barytes under the edge-runners. The pigments obtained by the dry process, however, lack the brightness and fine appearance of the struck greens, and their use is confined to very low qualities, which can be treated more economically in the dry state.

Brunswick Greens

(WET PROCESS).

As already stated, the principle underlying the manufacture of these greens lies in obtaining a mixture of Chinese blue and chrome yellow. If the following directions are carefully followed, the formulæ given will be found to yield splendid greens of bright colour and good staining and covering power. The lower qualities are obtained by the admixture of barytes, terra-alba, whiting, etc. Barytes is, however, most generally used.

A good Chinese blue is first obtained, for which see "Chinese Blue," and is thoroughly washed and run into the striking vat. The barytes, if any, is then added to the blue with plenty of water, and the whole thoroughly incorporated together. At the same time have ready the two solutions which go to make a "Lemon Chrome," and run them steadily on to the blue in the striking vat. Stir well during the running in of the chrome solution, and for some time afterwards. The green soon precipitates, and requires washing at least three times previous to filtering, and pressing and drying. It is essential that all solutions should be cold during the striking of greens, and the more water the chemicals have been dissolved in the better will the result be. All remarks that have been made under the headings of Chinese blue and lemon chrome apply to the manufacture of Brunswick greens. It must be borne in mind that the paler the chrome the better the green. While it is necessary to use steam heat for the manufacture of the blue, the use of heat should be avoided in the solutions for the chrome if possible. The differences between Brunswick, Royal, and emerald-tint green are in detail only, and do not need any special remarks. These greens are very seldom sent out absolutely pure. As in other colours, certain quantities of barytes are given as a guide to the manufacture of the cheaper grades. By varying the proportions of the blue and yellow, and reducing material, an almost endless variety of shades and qualities may be produced.

Several alternative formulæ are given.

PURE BRUNSWICK GREEN (LIGHT SHADE).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Bichromate of Potash	0	0	4
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	0	0

PURE BRUNSWICK GREEN (MIDDLE SHADE).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	8
	Sulphuric Acid	0	1	14
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	2	0

PURE BRUNSWICK GREEN (DEEP SHADE).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	3	0

PURE BRUNSWICK GREEN (LIGHT SHADE).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	10
	Sulphate of Iron	0	0	10
	Bichromate of Potash	0	0	1½
	Sulphuric Acid	0	0	3
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Glauber's Salts	0	3	4
	Produce	2	0	0

PURE BRUNSWICK GREEN (MIDDLE SHADE).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	7
	Sulphuric Acid	0	0	10
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	0	2	21
	Bichromate of Potash	0	3	0
	Glauber's Salts	0	2	0
	Produce	1	3	0

PURE BRUNSWICK GREEN (DEEP SHADE).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	2
	Bichromate of Potash	0	0	12
	Carbonate of Potash	0	0	0¼
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	0	2	21
	Bichromate of Potash	0	3	0
	Glauber's Salts	0	1	0
	Sulphuric Acid	0	0	14
	Produce	2	1	0

PURE BRUNSWICK GREEN (LIGHT SHADE).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Nitric Acid	0	0	6
	Sulphuric Acid	0	0	9
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	0	14

PURE BRUNSWICK GREEN (MIDDLE SHADE).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Chlorate of Potash	0	0	$2\frac{1}{2}$
	Nitric Acid	0	0	10
	Sulphuric Acid	0	0	14
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	1	0

PURE BRUNSWICK GREEN (DEEP SHADE).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	14
	Sulphate of Iron	0	1	14
	Chlorate of Potash	0	0	4
	Nitric Acid	0	0	15
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	1	14

PURE BRUNSWICK GREEN (LIGHT SHADE).

No. 4.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	4
	Sulphate of Iron	0	0	4
	Chlorate of Potash	0	0	$0\frac{1}{2}$
	Sulphuric Acid	0	0	4
Yellow	Brown Sugar of Lead	1	0	0
	Bichromate of Potash	0	1	4
	Produce	1	0	0

PURE BRUNSWICK GREEN (MIDDLE SHADE).

No. 4.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	15
	Sulphate of Iron	0	0	15
	Chlorate of Potash	0	0	1¾
	Sulphuric Acid	0	0	15
Yellow	Brown Sugar of Lead	0	3	0
	Bichromate of Potash	0	0	24
	Produce	0	3	7

PURE BRUNSWICK GREEN (DEEP SHADE).

No. 4.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	2
	Sulphate of Iron	0	0	22
	Chlorate of Potash	0	0	3
	Sulphuric Acid	0	0	22
Yellow	Brown Sugar of Lead	0	2	0
	Bichromate of Potash	0	0	21
	Produce	0	2	21

We will now give four formulæ for different shades of green, which may be used when, instead of a pure green like the preceding, it is desired to make a reduced pigment.

One solution process for Brunswick Green for reduced grades.

LIGHT.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	0	0	5
Sulphate of Iron	0	0	5
Sugar of Lead	0	2	10
Bichromate of Potash	0	0	20
Best Barytes	5	0	0
Produce	5	2	0

MIDDLE.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	0	0	7
Sulphate of Iron	0	0	7
Sugar of Lead	0	2	12
Bichromate of Potash	0	0	21
Best Barytes	5	0	0
Produce	5	2	7

DEEP.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	0	0	10
Sulphate of Iron	0	0	10
Sugar of Lead	0	2	14
Bichromate of Potash	0	0	22
Best Barytes	5	0	0
Produce	5	2	14

EXTRA DEEP.

	cwt.	qrs.	lbs.
Yellow Prussiate of Potash	0	0	20
Sulphate of Iron	0	0	20
Sugar of Lead	0	2	24
Bichromate of Potash	0	0	25
Best Barytes	5	0	0
Produce	5	2	21

Process.—Dissolve the prussiate of potash and bichromate of potash together in cold water. The sulphate of iron and sugar of lead are each dissolved separately. Have the barytes well mixed with an abundance of water in the striking vat. Run the iron on to the barytes, next add the lead. Then run the combined potash solutions in with continual stirring. The green forms very quickly, and should be well washed, filtered and pressed, and dry as usual.

The following recipes are for various grades of green usually designated No. 1, No. 2, No. 3, etc., by the double solution process already described in connection with the pure qualities.

BRUNSWICK GREEN.

No. 1.—LIGHT (1).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Bichromate of Potash	0	0	4
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—MIDDLE (1).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	8
	Sulphuric Acid	0	1	14
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP (1).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash........	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

BRUNSWICK GREEN.

No. 1.—LIGHT (2).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	10
	Sulphate of Iron	0	0	10
	Bichromate of Potash	0	0	$1\frac{1}{2}$
	Sulphuric Acid	0	0	3
Yellow	Nitrate of Lead	1	1	0
	Dry White Lead	0	3	7
	Bichromate of Potash	0	3	0
	Glauber's Salts	0	3	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—MIDDLE (2).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	7
	Sulphuric Acid	0	0	10
Yellow	Nitrate of Lead	1	0	2
	Dry White Lead	0	2	21
	Bichromate of Potash	0	3	0
	Glauber's Salts	0	2	0
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP (2).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	0	2	21
	Bichromate of Potash	0	3	0
	Glauber's Salts	0	1	0
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above Best Barytes	20	0	0
	For No. 3. add (in place of above Best Barytes	30	0	0

BRUNSWICK GREEN.

No. 1.—LIGHT (3).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	4
	Sulphate of Iron	0	0	4
	Chlorate of Potash	0	0	0½
	Sulphuric Acid	0	0	4
Yellow	Brown Sugar of Lead	1	0	0
	Bichromate of Potash	0	1	4
	Best Barytes	5	0	0
	For No. 2. add (in place of above) Best Barytes	10	0	0
	For No. 3. add (in place of above) Best Barytes	15	0	0

No. 1.—MIDDLE (3).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	15
	Sulphate of Iron	0	0	15
	Chlorate of Potash	0	0	1¾
	Sulphuric Acid	0	0	15
Yellow	Brown Sugar of Lead	0	3	0
	Bichromate of Potash	0	0	24
	Best Barytes	4	0	0
	For No. 2. add (in place of above) Best Barytes	8	0	0
	For No. 3. add (in place of above) Best Barytes	12	0	0

No. 1.—DEEP (3).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	22
	Sulphate of Iron	0	0	22
	Chlorate of Potash	0	0	3
	Sulphuric Acid	0	0	22
Yellow	Brown Sugar of Lead	0	2	0
	Bichromate of Potash	0	0	21
	Best Barytes	2	2	0
	For No. 2. add (in place of above) Best Barytes	5	0	0
	For No. 3. add (in place of above) Best Barytes	7	2	0

Royal Greens.

These are made in the same way as the preceding, but all the materials should be pure, and the various operations conducted carefully, so that full bright shades may be obtained. White lead is not admissible in the pure grades.

PURE ROYAL GREEN (LIGHT).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Bichromate of Potash	0	0	4
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	2	21

PURE ROYAL GREEN (MIDDLE).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	8
	Sulphuric Acid	0	1	14
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	3	21

PURE ROYAL GREEN (DEEP).

No. 1.

		cwt.	qrs.	lbs
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	3	0	21

PURE ROYAL GREEN (LIGHT).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	10
	Sulphate of Iron	0	0	12
	Bichromate of Potash	0	0	1½
	Sulphuric Acid	0	0	5
Yellow	Nitrate of Lead	1	2	14
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Produce	1	2	7

PURE ROYAL GREEN (MIDDLE).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	20
	Sulphate of Iron	0	0	22
	Bichromate of Potash	0	0	3
	Sulphuric Acid	0	0	10
Yellow	Nitrate of Lead	1	2	14
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	1	2	0
	Produce	1	3	0

PURE ROYAL GREEN (DEEP).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	18
	Sulphate of Iron	0	1	22
	Bichromate of Potash	0	0	7
	Sulphuric Acid	0	0	23
Yellow	Nitrate of Lead	1	2	14
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Produce	1	3	21

PURE ROYAL GREEN (LIGHT).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Sulphuric Acid	0	0	12
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Produce	2	2	14

PURE ROYAL GREEN (MIDDLE).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	12
	Sulphate of Iron	0	1	12
	Chlorate of Potash	0	0	2½
	Sulphuric Acid	0	1	0
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Produce	2	3	0

PURE ROYAL GREEN (DEEP).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Chlorate of Potash	0	0	4
	Sulphuric Acid	0	1	12
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Produce	3	0	0

The following are formulæ for reduced greens of the same class:—

No. 1.—LIGHT ROYAL GREEN.

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Bichromate of Potash	0	0	4
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

NOTE.—In this and similar recipes, the terms No. 1, No. 2, etc., *placed on the same line* as the designation Light Royal Green, etc., indicates the quality. The number *below* the name is the number of the recipe for the particular shade.

No. 1.—MIDDLE ROYAL GREEN.

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	8
	Sulphuric Acid	0	1	14
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes........................	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP ROYAL GREEN.

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—LIGHT ROYAL GREEN.

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	10
	Sulphate of Iron	0	0	12
	Bichromate of Potash	0	0	1½
	Sulphuric Acid	0	0	5
Yellow	Nitrate of Lead	1	2	14
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Best Barytes	6	0	0
	For No. 2. add (in place of above) Best Barytes	12	0	0
	For No. 3. add (in place of above) Best Barytes	18	0	0

No. 1.—MIDDLE ROYAL GREEN.

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	20
	Sulphate of Iron	0	0	22
	Bichromate of Potash	0	0	3
	Sulphuric Acid	0	0	10
Yellow	Nitrate of Lead	1	2	14
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Best Barytes	6	0	0
	For No. 2. add (in place of above) Best Barytes	12	0	0
	For No. 3. add (in place of above) Best Barytes	18	0	0

No. 1.—DEEP ROYAL GREEN.

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	18
	Sulphate of Iron	0	1	22
	Bichromate of Potash	0	0	7
	Sulphuric Acid	0	0	23
Yellow	Nitrate of Lead	1	2	14
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Best Barytes	6	0	0
	For No. 2. add (in place of above) Best Barytes	12	0	0
	For No. 3. add (in place of above) Best Barytes	18	0	0

No. 1.—LIGHT ROYAL GREEN.

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Sulphuric Acid	0	0	12
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	11
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—MIDDLE ROYAL GREEN.

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	12
	Sulphate of Iron	0	1	12
	Chlorate of Potash	0	0	2½
	Sulphuric Acid	0	1	0
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP ROYAL GREEN.

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Chlorate of Potash	0	0	4
	Sulphuric Acid	0	1	12
Yellow	Nitrate of Lead	2	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

Emerald Tint Brunswick Greens.

An important modification of the Brunswick green class is that of the Emerald Tinted Brunswick greens. The name explains itself, and these pigments must possess a very clean, pure shade, as near as possible to that of emerald green.

PURE EMERALD TINT GREEN (LIGHT).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Bichromate of Potash	0	0	4
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	0	21

PURE EMERALD TINT GREEN (MIDDLE).

No. 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	8
	Sulphuric Acid	0	1	14
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	2	0

PURE EMERALD TINT GREEN (DEEP).

No 1.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Produce	2	3	0

PURE EMERALD TINT GREEN (LIGHT).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Sulphuric Acid	0	0	9
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	2	0	0
	Bichromate of Potash	0	3	4
	Sulphuric Acid	0	2	4
	Produce	3	0	14

PURE EMERALD TINT GREEN (MIDDLE).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	12
	Sulphate of Iron	0	1	12
	Chlorate of Potash	0	0	3½
	Sulphuric Acid	0	0	20
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	2	0	0
	Bichromate of Potash	0	3	4
	Sulphuric Acid	0	2	4
	Produce	3	1	0

PURE EMERALD TINT GREEN (DEEP).

No. 2.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Chlorate of Potash	0	0	4
	Sulphuric Acid	0	0	24
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	2	0	0
	Bichromate of Potash	0	3	4
	Sulphuric Acid	0	2	4
	Produce	3	2	0

PURE EMERALD TINT GREEN (LIGHT).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	10
	Sulphate of Iron	0	0	12
	Bichromate of Potash	0	0	1½
	Sulphuric Acid	0	0	5
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	0	0
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Produce	1	2	7

PURE EMERALD TINT GREEN (MIDDLE).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	20
	Sulphate of Iron	0	0	22
	Bichromate of Potash	0	0	3
	Sulphuric Acid	0	0	10
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	0	0
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Produce	1	2	14

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PURE EMERALD TINT GREEN (DEEP).

No. 3.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	18
	Sulphate of Iron	0	1	22
	Bichromate of Potash	0	0	7
	Sulphuric Acid	0	0	23
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	0	0
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Produce	1	2	14

PURE EMERALD TINT GREEN (LIGHT).

No. 4.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Sulphuric Acid	0	0	12
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	1	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Produce	2	2	14

PURE EMERALD TINT GREEN (MIDDLE).

No. 4.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	12
	Sulphate of Iron	0	1	12
	Chlorate of Potash	0	0	2½
	Sulphuric Acid	0	1	0
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	1	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Produce	2	3	7

PURE EMERALD TINT GREEN (DEEP).

No. 4.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Chlorate of Potash	0	0	4
	Sulphuric Acid	0	1	12
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	1	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Produce	3	0	0

EMERALD TINT GREEN (REDUCED GRADES).

No. 1.—LIGHT (1).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	0
	Sulphate of Iron	0	1	0
	Bichromate of Potash	0	0	4
	Sulphuric Acid	0	0	21
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

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No. 1.—MIDDLE (1).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Bichromate of Potash	0	0	8
	Sulphuric Acid	0	1	14
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP (1).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	3	0
	Sulphate of Iron	0	3	0
	Bichromate of Potash	0	0	12
	Sulphuric Acid	0	2	7
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	2	0
	Bichromate of Potash	0	3	0
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—LIGHT (2).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Sulphuric Acid	0	0	9
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	2	0	0
	Bichromate of Potash	0	3	4
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—MIDDLE (2).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	12
	Sulphate of Iron	0	1	12
	Chlorate of Potash	0	0	3½
	Sulphuric Acid	0	0	20
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	2	0	0
	Bichromate of Potash	0	3	4
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP (2).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Chlorate of Potash	0	0	4
	Sulphuric Acid	0	0	24
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	2	0	0
	Bichromate of Potash	0	3	4
	Sulphuric Acid	0	2	4
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

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No. 1.—LIGHT (3).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	10
	Sulphate of Iron	0	0	12
	Bichromate of Potash	0	0	$1\frac{1}{2}$
	Sulphuric Acid	0	0	5
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	0	0
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Best Barytes	6	0	0
	For No. 2. add (in place of above) Best Barytes	12	0	0
	For No. 3. add (in place of above) Best Barytes	18	0	0

No. 1.—MIDDLE (3).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	20
	Sulphate of Iron	0	0	22
	Bichromate of Potash	0	0	3
	Sulphuric Acid	0	0	10
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	0	0
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Best Barytes	6	0	0
	For No. 2. add (in place of above) Best Barytes	12	0	0
	For No. 3. add (in place of above) Best Barytes	18	0	0

No. 1.—DEEP (3).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	18
	Sulphate of Iron	0	1	22
	Bichromate of Potash	0	0	7
	Sulphuric Acid	0	0	23
Yellow	Nitrate of Lead	0	2	0
	Dry White Lead	1	0	0
	Bichromate of Potash	0	1	0
	Soda Crystals	0	1	0
	Glauber's Salts	0	2	0
	Best Barytes	6	0	0
	For No. 2. add (in place of above) Best Barytes	12	0	0
	For No. 3. add (in place of above) Best Barytes	18	0	0

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No. 1.—LIGHT (4).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	0	18
	Sulphate of Iron	0	0	18
	Chlorate of Potash	0	0	1½
	Sulphuric Acid	0	0	12
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	1	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—MIDDLE (4).

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	1	12
	Sulphate of Iron	0	1	12
	Chlorate of Potash	0	0	2½
	Sulphuric Acid	0	1	0
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	1	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

No. 1.—DEEP.

		cwt.	qrs.	lbs.
Blue	Yellow Prussiate of Potash	0	2	0
	Sulphate of Iron	0	2	0
	Chlorate of Potash	0	0	4
	Sulphuric Acid	0	1	12
Yellow	Nitrate of Lead	1	0	0
	Dry White Lead	1	2	0
	Bichromate of Soda	0	3	0
	Glauber's Salts	0	2	14
	Sulphuric Acid	0	0	14
	Best Barytes	10	0	0
	For No. 2. add (in place of above) Best Barytes	20	0	0
	For No. 3. add (in place of above) Best Barytes	30	0	0

Dry Mixed Greens.

Attention has already been directed to these, and special shades are often required, which can most conveniently be prepared by dry mixing. The mixing may be conducted in stone edge-runner mills, or in one of the various forms of dry mixing plant. A combined mixer and sieving machine is very convenient, as it turns the colour out in a nice powdery condition. The following are the chief dry mixed greens, but endless variations are possible :—

DRY MIXED BRUNSWICK GREEN.

LIGHT.

	cwt.	qrs.	lbs.
Celestial Blue	0	1	16
Lemon Chrome	0	3	0
Best Barytes	2	0	0

MIDDLE.

	cwt.	qrs.	lbs.
Celestial Blue	0	2	24
Lemon Chrome	0	3	0
Best Barytes	1	2	0

DEEP.

	cwt.	qrs.	lbs.
Brunswick Blue	0	2	10
Lemon Chrome	0	3	0
Best Barytes	1	2	0

SANITARY EMERALD TINT GREEN.

These greens are suitable for distemper work.

LIGHT.

	cwt.	qrs.	lbs.
Azure Blue	0	3	8
Primrose Chrome	0	3	6
Sulphate of Lead	0	0	12
Best Barytes	0	1	14

MIDDLE.

	cwt.	qrs.	lbs.
Azure Blue	0	3	8
Primrose Chrome	0	1	14
Sulphate of Lead	0	0	7
Best Barytes	0	2	14

DEEP.

	cwt.	qrs.	lbs.
Azure Blue	1	0	14
Primrose Chrome	0	1	18
Sulphate of Lead	0	0	10
Best Barytes	0	1	14

VICTORIA GREEN.

LIGHT.

	cwt.	qrs.	lbs.
Celestial Blue	0	2	0
Pure Lemon Chrome	0	1	16
Best Barytes	0	3	0

MIDDLE.

	cwt.	qrs.	lbs.
Celestial Blue	1	2	0
Pure Lemon Chrome	0	2	10
Best Barytes	0	2	0

DEEP.

	cwt.	qrs.	lbs.
Brunswick Blue	1	2	0
Pure Lemon Chrome	0	2	10
Best Barytes	0	2	0

ALBERT GREEN.

LIGHT.

	cwt.	qrs.	lbs.
Celestial Blue	0	1	16
Lemon Chrome	0	3	0
Best Barytes	0	2	7

MIDDLE.

	cwt.	qrs.	lbs.
Celestial Blue	0	2	24
Lemon Chrome	0	3	0
Best Barytes	0	1	14

DEEP.

	cwt.	qrs.	lbs.
Brunswick Blue	0	2	10
Lemon Chrome	0	3	0
Best Barytes	0	1	14

Bronze Greens.

This is an important group. The following formulæ may be varied according to the exact shade desired. They are usually mixed dry, and a combined mixing and sieving machine is best.

LIGHT.

	cwt.	qrs.	lbs.
Celestial Blue	0	3	14
Lemon Chrome	0	3	7
Orange Chrome	0	3	0
Burnt Umber	0	1	0
Common Barytes	0	3	14

MIDDLE.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
Lemon Chrome	0	3	0
Orange Chrome	0	3	14
Burnt Umber	0	1	7
Common Barytes	1	0	0

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DEEP.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
Lemon Chrome	0	2	0
Orange Chrome	1	0	0
Burnt Umber	0	1	14
Common Barytes	1	0	0

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Or Brunswick green may be taken as the base and tinted as under :—

BRONZE GREENS.

LIGHT.

	cwt.	qrs.	lbs.
Lemon Chrome	1	0	0
Middle Brunswick Green	0	1	0
Ivory Black	0	1	0

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MIDDLE.

	cwt.	qrs.	lbs.
Lemon Chrome	1	0	0
Middle Brunswick Green	0	1	10
Ivory Black	1	1	0

DEEP.

	cwt.	qrs.	lbs.
Lemon Chrome	1	0	0
Middle Brunswick Green	0	2	0
Ivory Black	2	0	0

Quaker Greens.

Greens of this class are of a dull yellow tone. It is an effective decorating colour, and is getting very popular.

LIGHT.

	cwt.	qrs.	lbs.
Imperial Yellow (or Middle Chrome)	0	3	0
Deep Brunswick Green	0	0	14
Mineral Black	0	0	14

MIDDLE.

	cwt.	qrs.	lbs.
Imperial Yellow (or Middle Chrome)	0	2	14
Deep Brunswick Green	0	1	0
Mineral Black	0	0	14

DEEP.

	cwt.	qrs.	lbs.
Imperial Yellow (or Middle Chrome)	0	2	0
Deep Brunswick Green	0	1	0
Mineral Black	0	1	0

Olive Green.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	0	2	0
Deep Brunswick Green	0	2	0
Ivory Black	0	1	14

Sage, Moss, Cypress, Myrtle, and Invisible Greens are made by tinting in the same way. Sage and moss greens are rather pale yellow shades with a little umber in them; cypress is a middle shade, rather blue in tone; the last two are dark, invisible green being a green black.

Chrome Green.

A Brunswick green of a yellowish shade is usually sent out under the name of Chrome green. The most suitable grades of Brunswick greens for this purpose are made from sugar of lead, for which see under Brunswick Greens.

The original chrome green was an oxide (or occasionally a phosphate) of chromium. The oxide Cr_2O_3 was the most common composition, and the pigment was a very stable one, and made a splendid water colour.

Process.—Bichromate of ammonia is carefully heated, gradually raising the temperature. The action is a somewhat violent one, and results in the oxide of chromium being left on a dark dull green powder in the crucible.

Guignet's Green.

This is a pigment of somewhat similar composition to the above. It is prepared by heating bichromate of potash along with boracic acid. The fused mass is thrown into water, and the borate of potash is dissolved out, leaving the insoluble green behind.

At the present time there are indications that this colour will regain its popularity.

This green is proof against the action of acid.

It may also be used in calico-printing by adopting the following process :—Grind fine, mix with 1 part albumen and 2 parts water, print the colour on the goods and steam.

Green Colours with Copper Base.

The colours belonging to this group are entirely different from those already described. The older colour makers, as a general rule, used copper derivatives in their green pigments, and arsenic was also a frequent ingredient. The poisonous nature of these materials was in itself a strong reason why other methods should be worked out, and thus it happens that the copper-arsenic greens are much less frequently met with now than formerly.

One pigment, however, of this class still commands special attention, inasmuch as nothing has yet been discovered which possesses the same properties of brightness and transparency. We refer to emerald green. Owing to the poisonous nature of its constituents, as well as to the dusty character of the colour when dry, great care must be exercised in the manipulation.

Emerald Green.

Four distinct sets of formulæ are given, marked respectively A, B, C, D, and E. They are all working recipes. A description of the alternative process will be found on page 102.

EMERALD GREEN (A).

PURE.

	cwt.	qrs.	lbs.
Sulphate of Copper	1	2	0
Caustic Soda	0	1	0
Arsenic	1	3	14
Acetate of Soda	1	2	8
Produce	1	2	0

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Copper	1	2	0
Caustic Soda	0	1	0
Arsenic	1	3	14
Acetate of Soda	1	2	8
Best Barytes	0	2	0
Produce	2	0	0

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Copper	1	2	0
Caustic Soda	0	1	0
Arsenic	1	3	14
Acetate of Soda	1	2	8
Best Barytes	1	0	0
Produce	2	2	0

EMERALD GREEN (B).

(The alkali is carbonate of soda in place of caustic soda as in A.)

PURE.

	cwt.	qrs.	lbs.
Sulphate of Copper	1	2	0
Soda Crystals	0	2	10
Arsenic	1	0	17
Acetate of Soda	1	0	7
Produce	1	2	0

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Copper	1	2	0
Soda Crystals	0	2	10
Arsenic	1	0	17
Acetate of Soda	1	0	7
Best Barytes	0	2	0
Produce	2	0	0

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Copper	1	2	0
Soda Crystals	0	2	10
Arsenic	1	0	17
Acetate of Soda	1	0	7
Best Barytes	1	0	0
Produce	2	2	0

EMERALD GREEN (C).

(In this series a mixture of caustic soda and soda crystals is used.)

PURE.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	1	0
Caustic Soda Lye (80° Twaddell) ...	0	0	14
Soda Crystals	1	0	14
Arsenic	1	3	14
Acetate of Soda	1	2	10
Produce	2	1	0

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	1	0
Caustic Soda Lye (80° Twaddell)	0	0	14
Soda Crystals	1	0	14
Arsenic	1	3	14
Acetate of Soda	1	2	10
Best Barytes	0	2	0
Produce	2	3	0

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	1	0
Caustic Soda Lye (80° Twaddell)	0	0	14
Soda Crystals	1	0	14
Arsenic	1	3	14
Acetate of Soda	1	2	10
Best Barytes	0	3	0
Produce	3	0	0

No. 3.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	1	0
Caustic Soda (80° Twaddell)	0	0	14
Soda Crystals	1	0	14
Arsenic	1	3	14
Acetate of Soda	1	2	10
Best Terra Alba	1	0	0
Best Barytes	0	3	0
Produce	4	0	0

EMERALD GREEN (D).

(In this series acetic acid is used.)

PURE.

	cwt.	qrs.	lbs.
Sulphate of Copper	4	0	0
Soda Crystals	4	0	0
Arsenic	2	2	10
Acetic Acid—12 gallons			
Produce	4	0	0

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Copper	4	0	0
Soda Crystals	4	0	0
Arsenic	2	2	10
Acetic Acid—12 gallons			
Best Terra Alba	0	3	0
Best Barytes	0	3	0
Produce	5	2	0

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Copper	4	0	0
Soda Crystals	4	0	0
Arsenic	2	2	10
Acetic Acid—12 gallons			
Best Terra Alba	1	0	0
Best Barytes	1	0	0
Produce	6	0	0

No. 3.

	cwt.	qrs.	lbs.
Sulphate of Copper	4	0	0
Soda Crystals	4	0	0
Arsenic	2	2	10
Acetic Acid—12 gallons			
Best Terra Alba	1	1	0
Best Barytes	1	1	0
Produce	6	2	0

EMERALD GREEN (E).

Here both acetic acid and acetate of soda are used, the alkali being carbonate of soda.

PURE.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	0	0
Soda Crystals	0	2	10
Acetic Acid—12 gallons			
Arsenic	1	0	10
Soda Crystals	0	3	20
Acetate of Soda	0	0	14
Produce	2	0	0

No. 1.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	0	0
Soda Crystals	0	2	10
Acetic Acid—12 gallons			
Arsenic	1	0	10
Soda Crystals	0	3	20
Acetate of Soda	0	0	14
Best Barytes	0	2	0
Produce	2	2	0

No. 2.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	0	0
Soda Crystals	0	2	10
Acetic Acid—12 gallons			
Arsenic	1	0	10
Soda Crystals	0	3	20
Acetate of Soda	0	0	14
Best Barytes	1	0	0
Produce	3	0	0

No. 3.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	0	0
Soda Crystals	0	2	10
Acetic Acid—12 gallons			
Arsenic	1	0	10
Soda Crystals	0	3	20
Acetate of Soda	0	0	14
Best Barytes	2	0	0
Produce	4	0	0

VARIOUS PROCESSES FOR STRIKING EMERALD GREEN.

I.—Dissolve the sulphate of copper in the striking vat, and run into it very steadily the boiling solution of the alkali and arsenic, and acetate of soda made in the following manner.

First add the alkali (*i.e.*, the soda crystals, or the caustic soda as the case may be) to boiling water; keep boiling and very steadily add the arsenic; when the arsenic is all dissolved add the acetate of soda.

As soon as the colour is struck, cover up the vat tightly till the next morning, then wash the green well and filter; press and dry at 90°F.

II.—Dissolve by the aid of heat in the striking vat the alkali, arsenic, and acetate of soda in an abundance of water, as in I. Keep the steam on till all are dissolved. The sulphate of copper is dissolved in boiling water, say 10 gallons to one cwt. of copper salt, and when at 120°F., run as quickly as possible into the alkali and arsenic solution. Cover up till next day; then wash at least three times, filter, press and dry.

III.—In cases where acetic acid is given in the formulæ, there are two methods of working. 1st. Add the acetic acid to the copper solution with about half of the alkali, and then proceed as before. 2nd. After the colour prepared as in I. or II. has been covered up all night in striking vat, add the acetic acid, and stir occasionally during day, and leave till next day; then wash, filter, press and dry.

The object of the acetic acid is to brighten the colour.

Imitation Emerald Green.

	cwt.	qrs.	lbs.
Barytes	4	0	0
Soda Crystals	1	0	0
Alum	1	0	0
Diamond Green Aniline	0	0	6
Naphthol Yellow	0	0	1½
Produce	4	0	7

Process.—Thoroughly mix the barytes with about 100 gallons of cold water. Dissolve the soda crystals and alum together in boiling water, and add the barytes. Add the diamond green dissolved in cold water, then the naphthol yellow dissolved in hot water. Stir well, wash once and filter, press and dry at a temperature not exceeding 120°F.

Imitation emerald greens made on this principle are useful cheapeners for the genuine article, to sell dry, or for export.

Mineral Green.

Among the remaining copper colours, one of the best known is mineral green.

MINERAL GREEN (A).

	cwt.	qrs.	lbs.
Sulphate of Copper	1	1	0
Caustic Soda	0	1	7
Arsenic	0	0	7
Tartaric Acid	0	0	8
Produce	1	0	14

Process.—Dissolve the caustic soda in 100 gallons of boiling water; add the arsenic, and boil by open steam for 20 minutes, and allow to cool.

Dissolve the sulphate of copper in 100 gallons of cold water, and run into soda and arsenic solution, stirring all the time, and add the tartaric acid dissolved in lukewarm water; wash twice, press, filter and dry.

MINERAL GREEN (B).

	cwt.	qrs.	lbs.
Sulphate of Copper	1	0	14
Caustic Potash	0	3	0
Quick Lime	0	0	12
Arsenic	0	0	7
Cream of Tartar	0	0	5
Produce	1	0	0

Process.—Dissolve the sulphate of copper in 150 gallons of cold water.

Dissolve the caustic potash in 150 gallons of hot water, then add the lime slaked with about 20 gallons of cold water, stir thoroughly and allow to settle. Take 20 gallons of the clear liquor and boil the arsenic in it, and add the mixture to the bulk of the clear liquor, which should previously have been run off into a lead-lined vat; add the cream of tartar, then run in the copper solution, stirring well all the time; wash well, filter, press and dry.

Imitation Mineral Green.

The following is a useful green lake pigment, which bears the same relation to the mineral greens just described, that the imitation emerald does to the pure emerald.

Put into a stone edge-runner, and mix the following:—

	cwt.	qrs.	lbs.
Ground Whiting	1	0	0
No. 2. Barytes	1	0	0

Take 3 lbs. dry aniline green, dissolve in warm water, and add the solution to the mixture in the pan mill, and mix the whole together.

After this is done, dissolve 2 lbs. of tannic acid in boiling water, and add it to the mixture; this strikes the colour. After mixing all together, put into bags and place them in a press. When well pressed dry at a low temperature, and powder.

Green Verditer.

The verditers are made in several shades, varying from nearly yellow to a bright blue green. The most characteristic are of a pale bright tint. *Apple green* is a term sometimes applied to them.

Although considerable quantities of these pigments are manufactured, only a small proportion is used in oil.

No. 1.—Blue Tint.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	1	14
Caustic Soda	0	1	0
Arsenic	0	0	12
Quick Lime	0	2	0
Produce	2	1	0

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No. 2.—Blue Tint.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	1	14
Caustic Soda	0	1	0
Arsenic	0	0	12
Quick Lime	0	2	0
Terra Alba	2	0	0
Produce	4	1	0

No. 1.—Yellow Tint.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	0	0
Caustic Soda	0	1	0
Arsenic	0	0	18
Quick Lime...................	0	2	0
Produce	2	0	0

No. 2.—Yellow Tint.

	cwt.	qrs.	lbs.
Sulphate of Copper	2	0	0
Caustic Soda.........................	0	1	0
Arsenic	0	0	18
Quick Lime...................	0	2	0
Terra Alba	2	0	0
Produce	4	0	0

Process.—Dissolve the sulphate of copper in an abundance of cold water.

Dissolve the caustic soda in water by open steam, add the arsenic and boil for 20 minutes. Let this stand until cold, then slake the lime in cold water and run in through a sieve. Stir well, and run in the copper solution very gently. Allow to settle, draw off the clear water, filter, press and dry at once, no washing being required for this.

Among the more uncommon copper greens which still find a place among artists' colours are the following :—

Casselman's Green.

This is a basic acetate of copper.

(1) Sulphate of Copper ..	30 parts	in 300 parts	Water.
(2) Acetate of Soda	40 ,,	,, 40 ,,	,,

Dissolve separately in the cold ; add (2) to (1).

Heat up gradually with open steam, and the precipitated acetate of copper becomes basic, which gives the pigment.

It is a dull green ; hence arsenic was introduced as in the preparation of emerald green.

Scheele's Green.

Mix separately three parts copper sulphate in 36 parts water, and one part arsenic with three parts carbonate of potash in four parts water.

Heat the copper solution, and add the arsenic solution to it. Wash the precipitate with boiling water and dry.

Terre Verte or Verona Earth is a natural green earth, whose tint is due to double silicate of iron and aluminium, etc.

CHAPTER V.

CHEMICAL COLOURS *(continued)*.

REDS.

In Chapter I. there have been described the numerous iron reds which belong to the class of natural colours. There still remain, however, a considerable number of important and commonly occurring pigments, whose preparation is due to chemical processes. Thus we have such colours as red lead, vermilion, imitation vermilion, etc. The group of the true lakes, of which many of the leading members are red, will be discussed separately in Chapter VI.

Red Lead

is a highly important pigment, whose preparation is conducted by a roasting process. Pig lead is melted in a suitable furnace, with admission of air or oxygen during the melting. A scum of the oxide Pb_3O_4 collects on the surface and is raked off. This process is such a special one that it cannot with advantage be conducted except in specially designed and adapted plant.

Orange Lead

is produced in a similar manner, but the metallic lead is mixed with a certain proportion of white lead.

The ordinary colour manufacturer usually purchases these two pigments from the lead manufacturer, and uses them as a base for numerous important and very saleable colours.

Imitation Red Lead.

The high price of genuine red lead necessitates the addition in many cases of cheapening material. One of the imitation red leads now described will be found exceedingly useful for this purpose, as the colour of the product is not injured to an appreciable extent.

No. 1.

6 19

	cwt.	qrs.	lbs.
Orange (Aniline	0	0	11
Barytes	7	0	0
Sugar of Lead	0	0	11
Produce	7	0	0

Process.—Dissolve the aniline orange in 11 gallons boiling water, also dissolve the sugar of lead separately in two gallons boiling water. Put the barytes in mixer, 1 cwt. at a time, and add 1½ gallons orange liquor, and one quarter of a gallon sugar of lead solution to every cwt. of barytes until the whole seven cwt. is in, then mix well for half to three quarters of an hour, and draw out on trays to dry.

The approximate cost of the above production is as follows :—

	cwt.	qrs.	lbs.			s.	d.
Barytes....	7	0	0	at 2/– per cwt.		14	0
Orange	0	0	11	at 1/2 per lb.		12	10
Sugar Lead	0	0	11	at 24/– per cwt.		2	4
	7	0	22		£1	9	2

Cost 4s. per cwt. (nearly).

The following is another formula, the method of working which is similar to No. 1.

6 20

	cwt.	qrs.	lbs.
Best Barytes	1	0	0
Orange (Aniline)	0	0	5
Barium Chloride	0	0	8
Produce	1	0	0

Reduced Red Lead.

Originally it was customary to reduce genuine red lead with cullet or ground glass similar to that used in the manufacture of glass paper. The transparent nature of this material enabled it to be added in considerable quantity to red lead, without the colour of the latter being injured. The great objection was the gritty texture of the adulterant. Barytes is objectionable because, except in small quantity, it is apt to give the red lead a bleached appearance. Hence, nowadays, the cheaper grades of red lead are almost universally blends of pure red lead and one of the imitation red lead already described. Some makers prefer to use a mixture of barytes and imitation red lead for blending, and by doing so it is often possible to obtain a mixture which, in appearance, might readily be taken for the genuine article.

It may be added that anything down to 50% reduction is quite safe to use for the ordinary purposes for which red lead is usually wanted.

The following are some typical blends, which can be varied at will. The numbers refer to average commercial qualities.

	cwt.	qrs.	lbs.
No. 1.			
Genuine Red Lead	4	0	0
Imitation Red Lead	1	0	0
No. 1.			
Genuine Red Lead	4	0	0
Common Barytes	1	0	0
No. 2.			
Genuine Red Lead	4	0	0
Imitation Red Lead	1	1	7
No. 2.			
Genuine Red Lead	4	0	0
Common Barytes	1	1	7
No. 3.			
Genuine Red Lead	4	0	0
Imitation Red Lead	2	0	0

No. 3.

	cwts.	qrs.	lbs.
Genuine Red Lead	4	0	0
Common Barytes	2	0	0

No. 4.

Genuine Red Lead	4	0	0
Imitation Red Lead	3	0	0

No. 4.

Genuine Red Lead	4	0	0
Common Barytes	3	0	0

Scarlet and Red Chromes.

In addition to the numerous chromes already described in Chapter II., there are several red pigments of similar composition, which are extensively used.

We shall now proceed to give working methods for their preparation.

PURE SCARLET CHROME.

	cwt.	qrs.	lbs.
Lead Acetate or Nitrate	0	3	16
Bichromate of Potash	0	1	7
Caustic Soda 77%	0	0	14
Produce	0	3	14

Process.—Dissolve the lead acetate or nitrate and the bichromate and the caustic soda separately in water. Add the bichromate solution to the lead solution; allow the precipitate that forms to settle; pour off the top liquor, then add to the pulpy mass of colour the caustic soda, and boil for one hour, stirring continuously, or until the desired scarlet shade is obtained. Allow the colour to settle, run off the top liquor, and then wash the colour thoroughly with water. Afterwards transfer to filter to drain, and then to drying pans.

CHROME RED.

This body, which is sold under the following names, Derby red, Persian red, chrome red, and probably others, consists almost entirely of the basic chromate of lead. It is made as follows :

PALE PERSIAN RED.

No. 1.

	cwt.	qrs.	lbs.	
White Lead	1	2	14	
Bichromate of Potash	0	2	0	6 – 3
Sulphuric Acid	0	0	7	
Produce	1	1	7	

PALE PERSIAN RED.

No. 2.

	cwt.	qrs.	lbs.	
White Lead	1	2	14	
Bichromate of Potash	0	2	0	
Sulphuric Acid	0	0	7	6 – 3
Barytes	0	2	0	
Produce	1	3	7	

Process.—Boil lead and the bichromate in a copper until it is dark red; wash three times, and in the last washing add gently the sulphuric acid; filter and press, and dry on chalk as quickly as possible. Add the barytes during second washing.

PALE PERSIAN RED.

No. 3.

	cwt.	qrs.	lbs.	
White Lead	1	2	0	
Bichromate of Potash	0	2	0	
Soda Crystals	0	0	7	6 3
Sugar of Lead	0	0	7	
Sulphuric Acid	0	0	7	
Produce	1	1	7	

Process.—Same as preceding formula, the soda being added first, then the bichromate, sugar of lead, and acid.

DEEP PERSIAN RED.

No. 1.

6 3

	cwt.	qrs.	lbs.
White Lead	1	2	14
Bichromate of Potash	0	2	0
Soda Crystals	0	0	7
Sulphuric Acid	0	0	5
Produce	1	1	7

Process.—Mix white lead with about 180 gallons of water in the copper, dissolve soda in one gallon hot water, and add to lead. Heat up the mixture, and as soon as it is warm add the bichrome. Turn on the steam, and boil up as quickly as possible; boil, say, one hour. After being washed twice, add the acid (dilute), and fill the pan up with water. Filter and dry on chalk as quickly as possible.

DEEP PERSIAN RED.

No. 2.

6 3

	cwt.	qrs.	lbs.
White Lead	2	2	0
Bichromate of Potash	0	3	0
Sulphuric Acid	0	0	8
Produce	2	0	0

DEEP PERSIAN RED.

No. 3.

6 3

	cwt.	qrs.	lbs.
White Lead	1	2	14
Bichromate of Potash	0	2	0
Sulphuric Acid	0	0	5
Barytes	0	2	0
Produce	1	3	7

Process.—As for pale Persian reds.

CHINESE REDS.

As a rule, these are not so bright in hue as the Persian reds.

No. 1.

	cwt.	qrs.	lbs.	
White Lead	0	2	14	6 3
Bichromate of Potash	0	0	15	

Process.—Proceed as for Persian red, and boil up until colour develops.

For Persian red, add one lb. sulphuric acid, and further boil in copper vessel.

No. 2.

	cwt.	qrs.	lbs.	
White Lead	1	2	0	
Soda Crystals	0	0	7	
Bichromate of Potash	0	2	0	6 3
Sugar of Lead	0	0	7	
Produce	1	1	0	

No. 3.

	cwt.	qrs.	lbs.	
White Lead	1	2	0	
Bichromate of Potash	0	2	0	6 3
Produce	1	1	0	

Process.—As for Persian reds.

DERBY RED.

A cheaper Chinese red is often sold as Derby red. This is effected by the addition of barytes in varying quantities. An alizarin lake of a very permanent character is also known as Derby Red. 6 40

Partial Lakes.

In the reds about to be described a metallic pigmentary base, such as red lead or orange lead, is employed. This is mixed in the form of a pulp with a solution of an aniline dye—eosine being the one usually selected. A precipitating solution or mordant is then added, and the precipitated dye attaches itself to the particles of the red or orange lead base, producing a pigment which possesses the body of the base and the brightness of the aniline dye.

These colours are not true lakes, inasmuch as the whole substance is not precipitated. It is convenient, therefore, to refer to them as *partial lakes*.

The base, as already stated, is usually red or orange lead, the latter being used if a yellow product is desired; the former, if a certain amount of blueness is desirable. Other cheaper materials are often added to the lead base, according to the quality aimed at. Thus, barytes, China clay, starch, and sulphate of alumina may severally be used in the preparation of the base.

The eosine can be bought in numerous shades. As a rule it is advisable to procure as yellow a shade as possible, because the pigments made by this process are usually too blue. It is good policy to buy a good quality eosine, as then much less will be required.

The fixing or mordanting solution is usually prepared from either acetate (sugar) of lead, nitrate of lead, barium chloride, tin crystals, or alum.

After precipitation the colour should be rapidly filtered, without washing, and dried at a low temperature.

The chief colours prepared by the method described above are imitation carmines or carminettes, imitation vermilion or vermilionettes, royal reds, signal reds, some so-called permanent reds, and others.

The following are rather blue or crimson shades obtained by using a good quality base. Good prices can be obtained for them. Nitrate of lead should be used to precipitate. A little tin salts gives a brighter shade, but paler and yellower.

IMITATION CARMINE.

No. 1.

	cwt.	qrs.	lbs.
Orange Lead	1	1	0
Eosine	0	0	8
Soda Crystals	0	0	16
Nitrate of Lead	0	0	24
Tin Salts	0	0	8

No. 2.

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	2
Rose of Bengal	0	0	6
Lead Acetate	0	0	15
Alum	0	0	5

6 oz. 4.

No. 3.

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	7
Nitrate of Lead	0	0	7

6 - 4.

The loss of material in working the above formulæ will be about five per cent.

Vermilionettes, or Royal Reds.

These two names are, as a rule, applied to colours prepared on the same general plan, but of varying depth and tone of colour. As a rule a yellower shade is sought for than in the preceding group, and endless variations can be produced by the alteration of the proportion of the mordant, and by similar means.

Although in most of the following formulæ red or orange lead is given as the base, cheapening agents can be introduced at will—good white barytes, terra alba, or China clay being the best. Starch, also, is used in the cheaper grades.

PROCESS FOR CHEAP VERMILIONETTES.

A mixture of starch and China clay is made into a cream with water, and the solution of eosine added to it. 2% of eosine on the weight of the dry base will give a pale red; more is required for deep shades. The colour is precipitated by means of a solution of alum. For lighter shades add an excess of alum, and precipitate the latter with caustic soda. The shade varies from vermilion to light pink, according to the strength of the solution. Yellower shades are obtained by using sulphate of magnesia or sulphate of zinc as precipitants.

IMITATION VERMILION.

The base is red lead or a rich red chrome. Digest it with a solution of eosine (2% dye on weight of lead or chrome), and precipitate with sugar of lead.

It is always essential to test by experiment exactly how much sugar of lead or other mordant is required for a definite weight of a particular sample of eosine. It will be seen that the formulæ given herewith offer great divergence in this particular. This is due to various grades of eosine being in common use.

The following is an imitation vermilion prepared on the lines just mentioned :—

Red Lead	50 lbs.
Eosine R.	4 lbs.
Sugar of Lead	16 lbs.

Make the red lead into a pulp by running through a sieve, dissolve the eosine separately, then add to the red lead. Mix thoroughly together by stirring, then gently add sugar of lead solution, which precipitates the eosine on to the red lead base.

The shade is varied by using various brands of eosine, and the product is cheapened by the addition of barytes.

DEEP VERMILIONETTE.

PERMANENT.

Red Lead	1½ cwt.
Terra Alba	1 cwt.

Boil in water, then add—

O.O.B. Orange (Aniline)	4¾ lbs.
Eosine	3¾ lbs.
Sugar of Lead	7 lbs.

The following is a complete series of formulæ for vermilionettes of the most modern kind.

VERMILIONETTE.

No. 1.

PALE.

	cwt.	qrs.	lbs.	
Orange Lead	1	0	0	
Eosine	0	0	3	4
Acetate of Lead	0	0	3	
Produce	1	0	3	

MIDDLE.

	cwt.	qrs.	lbs.	
Orange Lead	1	0	0	
Eosine	0	0	4 6	4
Acetate of Lead	0	0	4	
Produce	1	0	4	

DEEP.

	cwt.	qrs.	lbs.	
Orange Lead	1	0	0 6	4
Eosine	0	0	6	
Acetate of Lead	0	0	6	
Produce	1	0	6	

No. 2.

PALE.

	cwt.	qrs.	lbs.	
Orange Lead	1	0	0 6	4
Eosine	0	0	3	
Lead Nitrate	0	0	3	
Produce	1	0	3	

MIDDLE.

6 5

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	4
Lead Nitrate	0	0	4
Produce	1	0	4

DEEP.

6 5

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	6
Lead Nitrate	0	0	6
Produce	1	0	6

No. 3.

PALE.

6 5

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Barytes	0	2	0
Eosine	0	0	3
Lead Acetate or Nitrate	0	0	3
Produce	1	2	0

MIDDLE.

6 5

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Barytes	0	2	0
Eosine	0	0	4
Lead Acetate or Nitrate	0	0	4
Produce	1	2	0

DEEP.

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Barytes	0	2	0
Eosine	0	0	6
Lead Acetate or Nitrate	0	0	6
Produce	1	2	0

600, 05L

No. 4.

VERMILIONETTE (BLUISH SHADE).

NOTE.—The introduction of barytes always makes the shade bluer.

	cwt.	qrs.	lbs.
Red Lead	1	0	0
White Lead	0	0	14
Barytes	2	0	0
Eosine	0	0	6
Fast Pink (Aniline)	0	0	6
Lead Acetate	0	0	12
Produce	3	1	0

6. 5

No. 5.

VERMILIONETTE.

	cwt.	qrs.	lbs.
Orange Lead	0	2	0
Red Lead	1	0	0
Barytes	1	3	0
Eosine	0	0	6
Lead Acetate	0	0	6
Produce	3	2	0

600 5

VERMILIONETTES.

The following are cheaper grades :—

No. 1.

PALE.

6 5

	cwt.	qrs.	lbs.
Orange Lead	0	1	7
Barytes	1	0	0
Eosine	0	0	2
Lead Acetate	0	0	4
Produce	1	1	7

MIDDLE.

6 5

	cwt.	qrs.	lbs.
Orange Lead	0	1	7
Barytes	1	0	0
Eosine	0	0	4
Lead Acetate	0	0	8
Produce	1	1	7

DEEP.

6 5

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Barytes	0	1	7
Eosine	0	0	6
Lead Acetate	0	0	12
Produce	1	1	7

EXTRA DEEP.

6 6

	cwt.	qrs.	lbs,
Orange Lead	1	0	0
Barytes	0	1	7
Eosine	0	0	8
Lead Acetate	0	0	14
Produce	1	1	7

No. 2.

PALE.

	cwt.	qrs.	lbs.
Barytes	0	2	0
Terra Alba	0	2	0
Eosine	0	0	3
Lead Acetate	0	0	$4\frac{1}{2}$
Produce	1	0	3

MIDDLE.

	cwt.	qrs.	lbs.
Barytes	0	2	0
Terra Alba	0	2	0
Eosine	0	0	$4\frac{1}{2}$
Lead Acetate	0	0	9
Produce	1	0	4

DEEP.

	cwt.	qrs.	lbs.
Orange Lead	0	2	0
Terra Alba	0	2	0
Eosine	0	0	6
Lead Acetate	0	0	$9\frac{1}{2}$
Produce	1	0	6

Permanent Reds.

A considerable number of permanent reds are prepared on the same principle as the vermilionettes. They cannot be considered so stable as some of the alizarin reds.

No. 1.

	cwt.	qrs.	lbs.
Orange Lead	1	2	0
Starch	0	1	0
Eosine	0	0	12
Tannic Acid	0	0	12
Tartar Emetic	0	0	12
Produce	1	3	14

No. 2.

	cwt.	qrs.	lbs.
Orange Lead	1	2	0
Starch	0	0	16
Eosine	0	0	10
Tannic Acid	0	0	10
Tartar Emetic	0	0	10
Produce	1	3	0

No. 3.

	cwt.	qrs.	lbs.
Orange Lead	1	2	0
Starch	0	0	12
Eosine	0	0	6
Tannic Acid	0	0	6
Tartar Emetic	0	0	6
Produce	1	2	14

No. 4.

	cwt.	qrs.	lbs.
Orange Lead	1	2	0
Starch	0	0	5
Eosine	0	0	5
Tannic Acid	0	0	5
Tartar Emetic	0	0	5
Produce	1	2	7

The process for permanent reds is similar to that described under vermilionette. The starch and lead are worked into a thin pulp together, the eosine added, then the tartar emetic in 12 gallons of water, finishing off with the tannic acid in 12 gallons of water.

Specific Scarlet.

This is a cheap colour, similar in composition to those described under cheap vermilionettes.

No. 1.

	cwt.	qrs.	lbs.
Orange Lead	0	0	12
Barytes	1	1	20
Barium Chloride	0	3	0
Orange (Aniline)	0	0	3
Eosine	0	0	3
Lead Acetate	0	0	16
Alum	0	0	10
Produce	1	3	0

6 6

No. 2.

	cwt.	qrs.	lbs.
Orange Lead	0	1	0
Barytes	1	1	0
Terra Alba	1	0	0
Orange (Aniline)	0	0	2
Eosine	0	0	14
Lead Acetate	0	0	11
Alum	0	0	3
Produce	2	2	0

6 6

No. 3.

	cwt.	qrs.	lbs.
Orange Lead	0	1	0
Barytes	1	1	0
Terra Alba	2	0	0
Orange (Aniline)	0	0	2
Eosine	0	0	4
Lead Acetate	0	0	11
Alum	0	0	3
Produce	3	2	7

6 7

No. 4.

6 7

	cwt.	qrs.	lbs.
Barytes	1	0	0
Scarlet (Aniline)	0	0	3
Barium Chloride	0	0	10
Glauber's Salt	0	0	9
Produce	1	0	7

Victoria Red.

The following reds are also fairly permanent, and their manufacture is conducted in precisely the same manner as in the foregoing recipes.

No. 1.

6 7

	cwt.	qrs.	lbs.
Barytes	1	0	0
Rose Bengal (Aniline)	0	0	5
Acetate of Lead	0	0	15
Produce	1	0	7

No. 2.

6 7

	cwt.	qrs.	lbs.
Barytes	1	1	0
Rose of Bengal (Aniline)	0	0	5
Acetate of Lead	0	0	10
Alum	0	0	5
Produce	1	1	7

Royal Reds.

These reds are very similar to the vermilionettes, but are usually sold as best grades, vermilionettes constituting the cheaper qualities.

No. I.

PALE.

	cwt.	qrs.	lbs.	
Red Lead	1	0	0	600, 7
Eosine	0	0	2	
Hydrochloric Acid	0	0	1	
Water	0	0	3	
Produce	1	0	0	

MIDDLE.

	cwt.	qrs.	lbs.	
Red Lead	1	0	0	
Eosine	0	0	3	6 7
Hydrochloric Acid	0	0	1½	
Water	0	0	4½	
Produce	1	0	0	

DEEP.

	cwt.	qrs.	lbs.	
Red Lead	1	0	0	
Eosine	0	0	5	6 7
Hydrochloric Acid	0	0	2	
Water	0	0	6	
Produce	1	0	0	

EXTRA DEEP.

	cwt.	qrs.	lbs.	
Red Lead	0	3	0	
White Lead	0	1	0	6 7
Eosine	0	0	7	
Hydrochloric Acid	0	0	5	
Water	0	0	10	
Produce	1	0	7	

No. 2.

PALE.

6 7

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	4
Acetate of Lead	0	0	7
Nitrate of Lead	0	0	1
Alum	0	0	$0\frac{3}{4}$
Produce	1	0	7

MIDDLE.

6 7

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	7
Acetate of Lead	0	0	12
Nitrate of Lead	0	0	$0\frac{3}{4}$
Produce	1	0	14

DEEP.

6 8

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Eosine	0	0	8
Acetate of Lead	0	0	14
Alum	0	0	$3\frac{1}{2}$
Produce	1	0	14

In the following formulæ the base is varied to suit varying requirements :—

ROYAL RED.

6 5

	cwt.	qrs.	lbs.
White Lead	1	0	0
Eosine	0	0	6
Hydrochloric Acid	0	0	3
Water	0	0	9
Produce	1	0	7

ROYAL RED.

	cwt.	qrs.	lbs.
White Lead	1	0	0
Barytes	0	2	0
Eosine	0	0	6
Hydrochloric Acid	0	0	3
Water	0	0	9
Produce	1	2	7

ROYAL RED.

	cwt.	qrs.	lbs.
White Lead	1	0	0
Barytes	1	0	0
Eosine	0	0	6
Hydrochloric Acid	0	0	3
Water	0	0	9
Produce	2	0	7

ROYAL RED.

	cwt.	qrs.	lbs.
Litharge (Red Shade)	1	0	0
Barytes	0	2	0
Eosine	0	0	8
Hydrochloric Acid	0	0	4
Water	0	0	12
Produce	1	2	14

ROYAL RED.

	cwt.	qrs.	lbs.
Litharge	0	2	0
Barytes	1	0	0
Eosine	0	0	8
Hydrochloric Acid	0	0	4
Water	0	0	12
Produce	1	2	14

ROYAL RED.

No. 1.

	cwt.	qrs.	lbs.
Orange Lead	0	2	0
Sulphate of Lead	0	2	0
Eosine	0	0	$2\frac{1}{4}$
Nitrate of Lead	0	0	4
Produce	1	0	0

ROYAL RED.

	cwt.	qrs.	lbs.
Orange Lead	0	3	0
Sulphate of Lead	0	1	14
Eosine	0	0	$2\frac{1}{4}$
Nitrate of Lead	0	0	4
Produce	1	0	14

ROYAL RED.

	cwt.	qrs.	lbs.
Orange Lead	1	0	0
Sulphate of Lead	0	1	0
Eosine	0	0	$2\frac{1}{4}$
Nitrate of Lead	0	0	4
Produce	1	1	0

Signal Red.

Should a dry signal red be required, any of the cheaper of the preceding royal reds would do.

Antimony Vermilion.

An excellent substitute in many cases for the true vermilion is the sulphide of antimony Sb_2S_3, which is a strong, bright, and permanent pigment.

When sulphuretted hydrogen gas is passed into an acid solution of antimony salt the sulphide is precipitated as a bright orange precipitate.

The cheapest method, however, is to use the native black sulphide of antimony as the source of the H_2S gas by adding hydrochloric acid to it. Lead the gas that is evolved into the hydrochloric acid solution left from a previous treatment, and so regenerate the Sb_2S_3. Therefore, the only cost is the loss of hydrochloric acid.

By arranging a series of carboys with three exit tubes to each, loss of H_2S can be prevented. Light shades are got by using strong solutions. Wash in clean, warm water, and dry slowly. This is the exact opposite of the chromes.

The pigment obtained by the above method is an orange or orange red substance. If it is desired to prepare a vermilion substitute, the following method may be adopted :—

SCARLET SULPHIDE OF ANTIMONY.

(1) Hyposulphite of Soda , 40° Twaddell.. $7\frac{1}{2}$ gallons.
(2) Antimony Solution, 40° Twaddell .. 3 gallons.

Add (2) to (1).

A black precipitate is formed, which, on warming up, turns red, and, at 140° F. becomes a bright scarlet.

Dry Mixed Reds.

A few special red colours are obtained by the blending in the dry state of two or more components. Iron red is usually the base, and is tinted with lake or some other colour. Tuscan red, special shades of Indian red, and a few combination reds and purples are prepared in this way.

TUSCAN RED.

LIGHT.

No. 1.

	cwt.	qrs.	lbs.
Light Indian Red	1	0	0
Rose Pink	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Light Oxide of Iron	1	0	0
Rose Pink	0	0	14

MIDDLE.

No. 1.

	cwt.	qrs.	lbs.
Middle Indian Red	1	0	0
Rose Pink	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	1	0	0
Rose Pink	0	0	14

DEEP.

No. 1.

	cwt.	qrs.	lbs.
Deep Indian Red	1	0	0
Rose Pink	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Deep Oxide of Iron	1	0	0
Rose Pink	0	0	14

CHAPTER VI.

LAKE PIGMENTS.

In no department of colour-making are advances so constantly being made as in the manufacture of lakes. Although the old madder and cochineal lakes still are used, and still command high prices, there is an ever-increasing demand for lake colours which are suitable for printing inks, enamel and paint-making, and which combine the property of permanence with moderate cost.

Of late years great advances have been made in this direction many of the most beautiful coal tar products, and aniline and anthracene dyes being now made to furnish equally beautiful and useful lake pigments. On the Continent, in particular, great strides have been made.

We have been at great pains and no little expense in rendering this part of our recipe book absolutely up to date, and the following collection of recipes and processes is, we believe, absolutely unique.

Madder Lakes.

No. 1.

From the Root.

A. Finest Qualities.

The ground madder root is steeped in water at a temperature of 80°—100° F. for 24 hours. Then add a solution of potash alum, the quantity of alum being about the same as that of madder. Heat up to 140°—160° F. Filter off the alum extract of the colouring matter, and precipitate the lake with sodium carbonate.

The reason of using a moderate heat in the alum extraction is that higher temperatures extract other materials as well as the desired colouring matter, and the product suffers in hue.

B. ORDINARY QUALITIES.

	cwt.	qrs.	lbs.
Madder	1	0	0
Alum	1	0	0
Pearl Ash	0	3	0

Process.—The madder is placed in a linen bag of fine texture and digested in a tub with 250 gallons of water, which is added a little at a time until all the colouring matter is extracted. Filter off and boil the liquor, and gradually pour into a boiling solution of the alum in 150 gallons of water. The carbonate of potash dissolved in 56 gallons of water is then gradually added with constant stirring. Stand for 12 hours, wash and filter, make into drops, and dry at a moderate heat.

By using selected materials and carefully watching the temperature of the extraction, the finest lakes can be produced as in A.

No. 2.

FROM GARANCINE.

The use of garancine in the manufacture of madder lakes is preferable to the use of the root. It is an extract of madder prepared by steeping madder root in a solution of sulphate of soda, and washing.

	cwt.	qrs.	lbs.
Garancine	1	0	0
Alum	1	0	0
Chloride of Tin	0	0	$1\frac{3}{4}$
Soda Crystals	0	3	0

Process.—Boil the garancine in 250 gallons of water for three hours, add the alum dissolved in water, and boil for two hours; filter through flannel while warm. To the liquor add the chloride of tin dissolved in water. Dissolve the soda crystals in water, and add sufficient of the solution to precipitate the alum. Filter through flannel, and well wash. Make into drops, and dry at a moderate heat.

CHEAP MADDER LAKES.

No. 1.

In lower-priced lakes, when the best madder has not been used in the extraction, a brilliant colour can be obtained by following the process already described, but varying it by employing, to precipitate the alum solution, not soda crystals or pearl ash, but a solution of cochineal-carmine in ammonia. This communicates a brilliant and attractive colour to the precipitated lake.

No. 2.

A mixture of madder and Brazil wood is extracted with a solution of soda crystals and precipitated with alum or tin crystals.

No. 3.

Madder lake diluted with sulphate of barium.

TEST FOR GENUINE MADDER LAKE.

The pure lake is wholly (or nearly so) soluble in caustic soda or potash, but is insoluble in dilute ammonia. Cochineal carmine is soluble in the latter reagent.

Cochineal Lakes.

Carmine and the numerous derivatives of that substance are cochineal lakes. The better class of crimson, scarlet, carnation, purple, violet, and often cochineal carmine lakes are derived thus, though now, with the introduction of newer methods, these colours can be produced otherwise.

PURE COCHINEAL CARMINE.

	cwt.	qrs.	lbs.
Best Cochineal	0	3	0
Citric Acid	0	0	6
Gelatine	0	0	7
Powdered Borax	0	0	12
Powdered Alum (perfectly free from iron)	0	0	7

Process.—Boil 120 gallons of water in a copper pan, with closed copper worm. Add the citric acid, boil for two minutues, then add the cochineal in a fine powder, and boil for five minutes; add the gelatine dissolved in 10 gallons of hot water, and boil all together for ten minutes. Strain through a moderately fine copper sieve, and allow to stand for four hours. Return to copper (which must, in the meantime, have been thoroughly cleaned), straining through flannel; boil up, and skim off anything that may rise to the surface, continue boiling until all scum has been removed, then add the borax and alum in fine powder together; boil for a quarter of an hour; run off into a clean vat, allow to subside, draw off liquor, filter the precipitate, and dry in warm air draught. The yield of carmine depends entirely on the quality of cochineal used. On no account must iron come in contact during any part of the process, nor is the least trace permissible in any of the ingredients.

CARMINE LAKE.

	cwt.	qrs.	lbs.
Cochineal	0	1	4
Citric Acid	0	0	2
Alum	0	0	3
Borax	0	0	4
Lake White .... 1 batch.			

(For Lake White see p. 139).

Process.—Boil the cochineal and citric acid together for 20 minutes, then add two gallons of new milk, allow to settle for three hours, draw off the top liquid, add the borax and alum dissolved in water, then boil for a quarter of an hour, add the lake white, and allow to settle; make into drops, and dry at a moderate heat.

CARNATION LAKE.

	cwt.	qrs.	lbs.
Cochineal	0	3	0
Salts of Tartar	0	0	10½
Potash Alum (Perfectly free from iron)	0	0	5½

Process.—Boil the cochineal in 120 gallons of water in copper pan, with close steam, for a quarter of an hour. Turn off the steam, add the salts of tartar, then the alum very slowly. If it should not rise, turn on steam until it does. Then pass through a moderately fine sieve into settling vat. Allow to stand 48 hours, then carefully add small quantities of nitro-muriate of tin until precipitation ceases. Draw off the clear liquor, filter, and dry in warm air draught. The best method of ascertaining when precipitation ceases is to take a sample from vat and drop it on to blotting paper; if there is a colourless ring round a spot of colour, the process is finished. As in carmine, no iron must come in contact during process.

PALE CARMINE.

	cwt.	qrs.	lbs.
Cochineal (Insects)	0	0	40

Process.—Put 60 gallons of water in vat, bring up to boiling point, then add cochineal. Now continue the boiling for about 10 minutes, then turn off steam and shake in gently 5 lbs. of cream (or salts) of tartar. Then turn on steam for another five minutes, and add gently powdered alum, 3 lbs. Now allow to settle for about five minutes, then run into bottom vat, and add another 10 lbs. of cream of tartar. Let stand and run liquor off, and add white base as follows:—

	cwt.	qrs.	lbs.
Potash Alum	0	3	0
Liquid Ammonia 80%	0	1	22

MEDIUM CARMINE.

ALSO SOLD AS GERANIUM LAKE.

Same process as for pale carmine, but a 60 lb. boiling of cochineal instead of 40 to one batch of base as above.

DEEP GERANIUM LAKE.

70 lbs. boiling of cochineal to half above proportion of base, but double the proportion of salts of tartar and alum.

CRIMSON LAKE.

No. 1.

	cwt.	qrs.	lbs.
Cochineal	0	0	12
Salts of Tartar	0	0	$0\frac{1}{2}$
Alum	0	0	$0\frac{5}{8}$
Cream of Tartar	0	0	$2\frac{1}{2}$
Lake White ....1 batch.			

Process.—Boil the cochineal with the salts of tartar, alum, and cream of tartar in an abundance of water, add the base, run off the clear liquor, make into drops, and dry at a moderate heat.

CRIMSON LAKE.

No. 2.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Lake White .... 2 batches.			

CRIMSON LAKE.

No. 3.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Lake White .... 4 batches.			

CRIMSON LAKE.

No. 4.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Lake White .... 6 batches.			

Process.—Have boiling in a copper pan 300 gallons of water, add the salts of tartar, and boil for two minutes, add the cochineal coarsely powdered, boil ten minutes, turn off the steam, and shake in alum in powder. Strain through a moderately fine sieve into a large vat, allow to stand for three hours, and then draw off the clear liquor into another vat. Then, when cooled to 134° F., add the cream of tartar in small quantities at a time, stirring well until frothing has ceased. Allow to stand all night, draw off the upper liquor, and add the lake white, stirring well in. Make into drops, and dry at a moderate heat.

CRIMSON LAKE.

No. 5.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Sulphate of Alumina	1	0	0

CRIMSON LAKE.

No. 6.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Sulphate of Alumina	2	0	0

CRIMSON LAKE.

No. 7.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Sulphate of Alumina	3	0	0

Process as before.

SCARLET LAKE.

The addition of Vermilion is the distinctive characteristic of this cochineal lake.

No. 1.

	cwt.	qrs.	lbs.
Cochineal	0	1	12
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Pale Vermilion	0	1	0
Sulphate of Alumina	1	0	0

SCARLET LAKE.

No. 2.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Pale Vermilion	0	1	0
Sulphate of Alumina	2	0	0

SCARLET LAKE.

No. 3.

	cwt.	qrs.	lbs.
Cochineal	0	1	21
Salts of Tartar	0	0	12
Alum	0	0	4
Cream of Tartar	0	0	18
Pale Vermilion	0	0	21
Sulphate of Alumina	3	0	0

Process.—As for crimson, adding the vermilion with the sulphate of alumina.

VIOLET LAKE.

This may be prepared from cochineal by mixing with the cochineal extract, previous to precipitation, either sulphate or carbonate of lime, or zinc oxide.

Lake White.

This has been referred to as an ingredient in certain of the cochineal lakes. It is a useful, all-round base or diluent for lakes, and is prepared as follows :—

	cwt.	qrs.	lbs.
Carbonate Ammonia	0	0	14
Potash Alum	0	1	14

Process.—Into a perfectly clean 300-gallon vat put the carbonate ammonia, add 30 gallons of boiling water, then add the alum dissolved in about 20 gallons of boiling water, stir well together, wash twice, and draw off to volume of 60 gallons. It is then ready for use.

Satin White.

Largely used in lake manufacture.

	cwt.	qrs.	lbs.
Powdered Alum	1	2	21
Quick Lime	0	2	14
Ultramarine Blue	0	0	$0\frac{1}{4}$

Process.—Slake the lime with 32 gallons of water, allow to stand a night. Next day, thin up with 48 gallons more of water, and place in a pug mill with the alum ; let the mill run four hours ; wash the white through a fine sieve and add the blue. This is used and sold in a state of pulp.

SATIN WHITE.

Another process, used as above :—

	cwt.	qrs.	lbs.
Alum	1	0	0
Soda crystals	1	0	0

Process.—Boil together in water till effervescence ceases, wash the result, and precipitate, and it is ready for use.

Imitation Cochineal Carmine Lake.

Ground Starch	30 lbs.
Powdered Chalk	10 lbs.
Sulphate of Lime	1 lb.

Process.—Stir the whole of the above with a decoction of Brazil wood.

Add ground alum 1 lb., stir up for several hours, and allow to settle. Pour off the clear liquor, and proceed as before, adding a fresh portion of wood extract and another pound of alum each time. The mixture of starch, etc., under this treatment, gradually absorbs the colouring matter, and assumes the appearance of a lake. The colour, however, is not yet bright enough to pass muster as a cochineal lake, and, accordingly, it is brightened by the addition of arsenite of soda.

Wood Lakes.

A large number of the cheaper lakes in every-day use are obtained from dyewoods. Thus, Brazil wood yields brown, red, or reddish-brown lakes; Sapan wood, Lima wood, and log wood produce red or purple lakes; Persian berries and quercitron yield yellow lakes. The following are the lakes of commercial interest so prepared.

YELLOW LAKE.

	cwt.	qrs.	lbs.
Quercitron Bark	1	0	0
Sugar of Lead	0	0	9
Potash Alum	1	2	21
Pearl Ash	0	3	0

Process.—Boil the bark for four hours in 300 gallons of water, strain into a large vat through a moderately fine sieve, add the sugar of lead dissolved in hot water, stir well together, allow to stand eight hours, draw off the clear liquor into a large vat; add the alum dissolved in as little water as possible. Stand for four hours, add the pearl ash dissolved in 40 gallons of water, stir well, fill up vat with water, filter, make into drops, and dry at a moderate heat.

Iron must not come into contact with this in any part of the process. Indeed, the presence of iron in the preparation of any of the wood lakes will seriously alter the colour.

RICH YELLOW LAKE.

		cwt.	qrs.	lbs.
	Persian Berries	0	2	15
	Cream of Tartar	0	2	0
Base	Potash Alum	0	1	0
	Carbonate of Soda	0	1	0

FINE YELLOW LAKE.

	cwt.	qrs.	lbs.
Persian Berries	0	2	0
Cream of Tartar	0	1	20
Potash Alum	0	0	0
Carbonate of Soda	0	1	20
Paris White	0	0	14

Process.—Boil up berries in top vat with 60 gallons of water. When at boiling point, add cream of tartar gradually. Have base already made in bottom vat at about 80° F. Then pass top liquor through 100-mesh strainer into base, stirring gently all time. Fill up vat with water, allow to settle, press lightly, and dry at 100° F.

DUTCH PINK.

The quercitron yellow lake already described is really a Dutch pink, although the quantities may be altered slightly to suit special circumstances.

The method may be adopted which was described under imitation cochineal lake, in this case a decoction of quercitron bark, containing alum, being precipitated with chalk.

For bright shades of yellow the bark extract should be cleared with a little gelatine, the use of which is to remove traces of tannin. Dutch pink may also be obtained by using Persian berries as described under Italian pink.

BROWN PINK.

	cwt.	qrs.	lbs.
Quercitron Bark	1	0	0
Salts of Tartar	0	0	2
Pearl Ash	0	0	10
Alum	0	1	14
Green Copperas	0	0	2

Process.—Boil the bark with the salts of tartar in 300 gallons of water for two hours, draw off the liquor and allow to stand for 24 hours. Then add pearl ash and stir till dissolved. Add the alum dissolved in water, stir for one hour, wash twice, and in the second washing add the copperas. Stir well, allow to settle (this may take a week), filter and dry at a moderate heat.

ITALIAN PINK.

	cwt.	qrs.	lbs.
Persian Berries	0	0	12
Pearl Ash	0	0	3
Potash Alum	0	0	6
Lake White (1 batch)	(see p.139)		

Process.—Boil the berries in 50 gallons of water for four hours, strain into a large vat, add the alum dissolved in two gallons of water, then the pearl ash dissolved in two gallons of water, stir for ten minutes, add the lake white, fill up vat with water, allow to settle, draw off clear liquor, filter, make into drops, and dry at a moderate heat.

MAROON LAKE.

No. 1.

	cwt.	qrs.	lbs.
Lima Wood	1	2	14
Sapan Wood	0	2	14
Lime	0	0	12
Satin White (see p.139)	0	1	14

Process.—Boil the barks with the lime in water for four hours, draw off the clear liquor, and, when cold, add the satin white; stir well together, allow to settle, filter, make in drops, and dry at a moderate heat.

MAROON LAKE.

No. 2.

	cwt.	qrs.	lbs.
Lima Wood	1	3	0
Quercitron Bark	0	1	0
Lime	0	0	12
Satin White	0	1	14
Alum	0	2	0

Process.—As before, adding the alum last.

ALBERT LAKE.

	cwt.	qrs.	lbs.
Lima Wood	2	0	0
Quercitron Bark	0	0	7
Lime	0	0	12
Satin White	0	1	14

Process.—As before.

BROWN LAKE.

	cwt.	qrs.	lbs.
Lima Wood	2	0	0
Lime	0	0	12
Best Barytes	0	0	14
Fine Whiting	0	0	14
Powdered Alum	0	0	7
Quercitron Bark	0	0	14
Soda Crystals	0	0	7
Sulphate of Alumina	0	0	7
Sulphate of Copper	0	0	1

Process.—Boil the Lima wood with the lime in water, and to the clear liquor add the barytes and whiting by open vat through a fine sieve with water, then add the alum.

Separately boil the quercitron bark, add to the clear liquor, add the soda crystals and stir till dissolved, then add the sulphate of alumina dissolved in three gallons of water, stir well, wash twice, allow to settle, and add the precipitate to the red. Add to the bulk the sulphate of copper dissolved in water, stir well, allow to settle, filter and dry at a moderate heat.

ROSE PINK

is a cheap lake prepared from a decoction of Brazil wood chips, which are boiled and allowed to stand for several days to completely extract the colouring matter. This solution is filtered, and the colouring matter precipitated on gypsum or any other base, by alumina. Brazil wood should be tested for strength, so as to give the operator an idea as to the quantity of gypsum to use. A poor solution, naturally, would not take as much adulterant as a strong one.

The method described under imitation cochineal lake will answer well for the above if care be taken that no iron is present and that the colour does not degenerate to a brown.

The following, however, are preferable methods for rose pink.

ROSE PINK.

NO. 1.
LIGHT.

	cwt.	qrs.	lbs.
Sapan Wood	1	0	0
Lima Wood	1	0	0
Whiting	2	0	0
Alum	0	2	10
Produce	3	3	0

ROSE PINK.

NO. 2.
DEEP.

	cwt.	qrs.	lbs.
Sapan Wood	3	0	0
Lima Wood	3	0	0
Terra Alba	4	0	0
Whiting	1	2	0
Lime	0	0	12
Alum	2	0	0
Produce	10	1	0

ROSE PINK.

No. 3.

	cwt.	qrs.	lbs.
Sapan Wood	2	0	0
Alum	1	0	14
Whiting	1	2	4
Produce	4	1	0

Wash in the whiting and terra alba through a hair sieve; then run in the alum. If a deep colour is required, slack the lime and run it in at the last through a hair sieve (let the alum be just warm or it will show in the pink); let it stand for a day, run off the water, strain, and dry on the chalks.

ROSE PINK.

No. 4.

	cwt.	qrs.	lbs.
Sapan Wood	1	0	0
Lima Wood	1	0	0
Quercitron Bark	0	0	7
Whiting	1	2	0
Alum	1	0	8
Produce	4	1	0

ROSE PINK.

No. 5.

	cwt.	qrs.	lbs.
Sapan Wood	1	2	0
Lima Wood	1	2	0
Whiting	0	3	10
Alum	0	1	5
Lime	0	0	6
Produce	3	1	0

Process as before.

ANILINE ROSE PINK.

No. 1.

	cwt.	qrs.	lbs.
Barytes	2	0	0
Magenta (An line)	0	0	4
Tannic Acid	0	0	2
Tartar Emetic	0	0	3
Produce	2	0	0

Process.—Digest the barytes with the magenta solution at a moderate temperature, add the tannic acid and precipitate with the tartar emetic solution.

ANILINE ROSE PINK.

No. 2.

	cwt.	qrs.	lbs.
Barytes	1	0	0
Whiting	0	1	10
Magenta (Aniline)	0	0	$1\frac{1}{2}$
Scarlet	0	0	3
Acid Maroon (Aniline)	0	0	4
Barium Chloride	0	0	10
Produce	1	1	14

Process as above, using barium salt to fix.

Aniline Lakes.

The pigments produced by fixing the various numerous soluble aniline dyes by means of a mordant on an inert base, such as alumina, are not lakes in the sense in which the true madder and cochineal pigments are lakes. The theory of the preparation of these aniline lakes is this. A base is chosen which exerts a powerful attraction to all colouring matter. When the colouring matter dissolved in water is brought into contact with such a base, it stains or dyes the latter, and the addition of a suitable fixing agent, mordant or precipitant, enables the attraction between the dye and the base to be still stronger. Thus a great deal depends on the base, and it has to be selected with care, and prepared according to rule. We have already, in dealing with eosine pigments (vermilionettes and royal reds), used the term *partial lakes.* The same term might appropriately be applied to the group now under consideration.

Of the suitable bases only a few are used to any extent. The chief are sulphate of lime, oxide of tin, and hydrate of alumina, and the latter is the one which is now used to the greatest extent. Various fanciful and trade names are given to it, such as lake white, etc. (see p. 139). In the following exhaustive list of aniline lakes the base is of the same composition in every case, and is referred to as *alumina paste.*

It is prepared as follows :—

ALUMINA PASTE (BASE FOR ANILINE LAKES).

Sulphate of Alumina (as free as possible from Iron) .... 300 lbs.

Dissolved in 360 gallons of water, precipitated at a temperature of 86° F. with

Soda Ash .... 135 lbs.

Dissolved in 120 gallons of hot water.

Wash the precipitate three times with cold water. Squeeze out the water till the paste from the above weighs 780 lbs. This is the alumina paste used in the formulæ that follow.

The process is practically identical in each case, the solution of the dye being left in contact with the base till the colour is absorbed. The mordant is then added. This may be chloride of barium, alum, sulphate of zinc, tin crystals, tartar emetic, acetate of soda, etc., etc. Frequently the alteration of the mordant will enable the maker to produce another shade.

As a rule it is best to use moderately dilute solutions.

The working temperature when given should be closely adhered to.

The names of the dyes are the ordinary trade terms as supplied by the leading dye manufacturers in England and Germany.

LAKE COLOURS (FROM ANILINE DYES).

BLUES.

No. 1.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Alkali Blue B	0	0	5
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	16

Precipitate cold.

No. 2.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Alkali Blue B	0	0	5
Tin Crystals	0	0	3
Produce (Dry Lake)	0	0	19½

Precipitate cold.

No. 3.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Alkali Blue B	0	0	5
Chloride of Barium	0	0	6
Produce (Dry Lake)	0	0	20

Precipitate cold.

No. 4.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Methyl Blue	0	0	1
Tannic Acid	0	0	1½
Tartar Emetic	0	0	1
Produce (Dry Lake)	0	0	14½

Precipitate at 100° F.

No. 5.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Capri Blue B.B.	0	0	1
Tannic Acid	0	0	1½
Tartar Emetic	0	0	1
Produce (Dry Lake)	0	0	17

Precipitate at 100° F.

No. 6.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Capri Blue G.O.	0	0	5
Tannic Acid	0	0	3
Produce (Dry Lake)	0	0	17

Precipitate at 100° F.

No. 7.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Induline Blue G.O.N.	0	0	5
Chloride of Barium	0	0	7
Glauber's Salts......................	0	0	2
Produce (Dry Lake)	0	0	19

Precipitate cold.

No. 8.

(GREEN SHADE.)

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Induline Blue (Green Shade)	0	0	5
Chloride of Barium	0	0	8
Sulphate of Alumina	0	0	2
Produce (Dry Lake)	0	0	19½

Precipitate cold.

No. 9.

Soluble Blue.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Soluble Blue G.S.	0	0	5
Tin Crystals	0	0	3
Produce (Dry Lake)	0	0	16½

No. 10.

Soluble Blue (Green Shade).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Soluble Blue (Green Shade)	0	0	5
Tin Crystals	0	0	3
Produce (Dry Lake)	0	0	15½

Precipitate at 85° F.

No. 11.

Soluble Blue (Red Shade).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Soluble Blue (Red Shade)	0	0	5
Tin Crystals	0	0	3
Produce (Dry Lake)	0	0	16

Precipitate at 85° F.

No. 12.

Cotton Blue (R).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Cotton Blue R........................	0	0	5
Tin Crystals	0	0	7
Produce (Dry Lake)	0	0	17½

Precipitate at 85° F.

No. 13.

COTTON BLUE (2R).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Cotton Blue R.R.	0	0	5
Tin Crystals	0	0	7
Produce (Dry Lake)	0	0	17½

Precipitate at 85° F.

No. 14.

COTTON BLUE (VI).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Cotton Blue VI	0	0	5
Tin Crystals	0	0	6
Produce (Dry Lake)	0	0	16

Precipitate at 85° F.

No. 15.

PEACOCK BLUE.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Peacock Blue	0	0	5
Tannic Acid	0	0	6
Tartar Emetic	0	0	2
Produce (Dry Lake)	0	0	23

Precipitate at 100° F.

No. 16.

CARMINE BLUE (B).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Carmine Blue B	0	0	5
Chloride of Barium	0	0	8
Sulphate of Alumina	0	0	2
Produce (Dry Lake)	0	0	18½

Precipitate at 95°

No. 17.

NAVY BLUE.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Navy Blue	0	0	5
Chloride of Barium	0	0	8
Sulphate of Alumina	0	0	1
Produce (Dry Lake)	0	0	17½

Precipitate cold.

No. 18.

METHYL BLUE.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Methyl Blue	0	0	5
Chloride of Barium	0	0	5
Sulphate of Alumina	0	0	4
Produce (Dry Lake)	0	0	19

Precipitate at 100° F.

No. 19.

FAST BLUE (GREEN SHADE).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Fast Blue (Green Shade)	0	0	5
Chloride of Barium	0	0	8
Sulphate of Alumina	0	0	1
Produce (Dry Lake)	0	0	17

Precipitate cold.

VICTORIA BLUE.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
New Victoria Blue	0	0	5
Tannic Acid	0	0	3
Acetic Acid	0	0	2
Acetate of Soda	0	0	3
Produce (Dry Lake)	0	0	16

Precipitate at 100° F.

ORANGE SHADES.

No. 1.

	cwt.	qrs.	lbs.
Alumina Paste	0	2	20
Orange (No. 2)	0	0	6
Chloride of Barium	0	0	9
Produce (Dry Lake)	0	0	17

Precipitate at 115° F.

No. 2.

ORANGE (R.X.).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	6
Orange R.X.	0	0	5
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	18

Precipitate at 115° F.

No. 3.

CROCEINE ORANGE (R.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	20
Croceine Orange R.	0	0	6
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	16½

Precipitate at 115° F.

No. 4.

CROCEINE ORANGE (G.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	20
Croceine Orange G.	0	0	6
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	16½

Precipitate at 115° F.

REDS AND SCARLETS.

No. 1.

CROCEINE SCARLET.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Croceine Scarlet R.	0	0	8
Chloride of Barium	0	0	8
Produce (Dry Lake)	0	0	21

Precipitate cold.

No. 2.

CROCEINE SCARLET.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Croceine Scarlet B. 1	0	0	8
Chloride of Barium	0	0	15
Sulphate of Alumina	0	0	5
Produce (Dry Lake)	0	0	29

Precipitate cold.

No. 3.

CROCEINE SCARLET (B. 2).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Croceine Scarlet	0	1	2
Chloride of Barium	0	2	16
Sulphate of Alumina	0	1	6
Soda Ash	0	0	14
Produce (Dry Lake)	0	1	24

Precipitate cold.

No. 4.

CROCEINE SCARLET (B. 3).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Croceine Scarlet B. 3	0	0	8
Chloride of Barium	0	0	15
Sulphate of Alumina	0	0	5
Produce (Dry Lake)	0	0	28

Precipitate cold.

ANTHRACENE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Anthracene Red	0	0	10
Produce (Dry Lake)	0	0	13

Precipitate boiling.

RHODAMINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Rhodamine B.	0	0	6
Tannic Acid	0	0	9
Tartar Emetic	0	0	4
Produce (Dry Lake)	0	0	26

Precipitate at 100° F.

RHODAMINE RED (S.).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Rhodamine S.	0	0	2
Tannic Acid	0	0	3
Sulphate of Zinc	0	0	3
Produce (Dry Lake)	0	0	18

Precipitate cold.

RHODAMINE RED (G.).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Rhodamine G.	0	0	6
Tannic Acid	0	0	6
Sulphate of Zinc	0	0	6
Produce (Dry Lake)	0	0	27

Precipitate cold.

ORSELLINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Orselline B.B.	0	0	6
Chloride of Lime	0	0	8
Sulphate of Alumina	0	0	2
Soda Ash	0	0	1
Produce (Dry Lake)	0	0	10½

Precipitate cold.

AZO EOSINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Azo Eosine	0	0	5
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	15

Precipitate cold.

SCARLET (R.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Scarlet R.	0	0	6
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	15½

Precipitate at 100° F.

SCARLET (3 B.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Scarlet 3 B.	0	0	6
Sulphate of Alumina	0	0	8
Soda Ash	0	0	2
Produce (Dry Lake)	0	0	16

Precipitate cold.

CLOTH RED (B.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Cloth Red B.	0	0	6
Chloride of Barium	0	0	5
Produce (Dry Lake)	0	0	15½

Precipitate at 120° F.

CLOTH RED (3 B.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Cloth Red 3 B.	0	0	6
Chloride of Barium	0	0	5
Produce (Dry Lake)	0	0	15½

Precipitate at 120° F.

FAST RED.

No. 1.

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Fast Red B.T.	0	0	6
Chloride of Barium	0	0	7
Produce (Dry Lake)	0	0	16

Precipitate at 85° F.

FAST RED.

No. 2.

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Fast Red	0	0	6
Chloride of Barium	0	0	9
Sulphate of Alumina	0	0	4
Soda Ash	0	0	1
Produce (Dry Lake	0	0	18

Precipitate at 100° F.

BORDEAUX RED.

	cwt.	qrs	lbs.
Alumina Paste	0	3	14
Bordeaux Red Extra	0	0	8
Chloride of Barium	0	0	9
Produce (Dry Lake)	0	0	23

600, 16.5

Precipitate at 100° F.

BORDEAUX RED (Bx.).

	cwt.	qrs.	lbs.
Alumina Paste	0	2	14
Bordeaux Red Bx....................	0	2	6
Chloride of Barium	0	0	5
Produce (Dry Lake)	0	0	14

Precipitate at 100° F.

GERANINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Geranine Red G.	0	0	16
Sulphate of Alumina	0	0	35
Soda Ash	0	0	14
Produce (Dry Lake)	0	0	31

Precipitate at 85° F.

GERANINE RED (B.B.).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Geranine Red B.B.	0	1	2
Chloride of Barium	0	2	12
Sulphate of Alumina	0	1	16
Soda Ash	0	0	14
Produce (Dry Lake)	0	0	80

Precipitate at 85° F.

BRILLIANT GERANINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Brilliant Geranine Red B 3	0	1	2
Chloride of Barium	0	1	22
Sulphate of Alumina	0	1	2
Soda Ash	0	0	10
Produce (Dry Lake)	0	0	64

Precipitate at 95° F.

EOSINE RED (BLUE SHADE).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Eosine (Blue Shade conctd.)	0	0	15
Nitrate of Lead	0	0	11
Produce (Dry Lake)	0	0	27

Precipitate at 85° F.

EOSINE RED (YELLOW SHADE).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Eosine (Yellow Shade conctd.)	0	0	15
Nitrate of Lead	0	0	10
Produce (Dry Lake)	0	0	27

Precipitate at 85° F.

CARDINAL RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Cardinal Red B 4	0	0	6
Tannic Acid	0	0	8
Tartar Emetic	0	0	3
Produce (Dry Lake)	0	0	20

Precipitate at 100° F.

PYRONINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Pyronine Red G.	0	0	6
Tannic Acid	0	0	2
Tartar Emetic	0	0	1
Produce (Dry Lake)	0	0	20

Precipitate at 100° F.

CRIMSON.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Crimson	0	0	6
Tannic Acid	0	0	8
Tartar Emetic	0	0	2
Produce (Dry Lake)	0	0	22

Precipitate at 115° F.

RUBINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Rubine Crystals	0	0	6
Tannic Acid	0	0	10
Tartar Emetic	0	0	4
Produce (Dry Lake)	0	0	24

Precipitate at 115° F.

DIAMOND RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Diamond Fuchsine	0	0	6
Tannic Acid	0	0	9
Tartar Emetic	0	0	4
Produce (Dry Lake)	0	0	22

Precipitate at 100° F.

SAFFRANINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Saffranine F.F.	0	0	6
Tannic Acid	0	0	9
Tartar Emetic	0	0	4
Produce (Dry Lake)	0	0	22

Precipitate at 100° F.

SAFFRANINE RED (B.B.).

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Saffranine B.B.	0	0	6
Tannic Acid	0	0	6
Tartar Emetic	0	0	3
Produce (Dry Lake)	0	0	21

Precipitate at 100° F.

RHODULINE RED.

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Rhoduline G.	0	0	6
Tannic Acid	0	0	9
Tartar Emetic	0	0	1½
Produce (Dry Lake)	0	0	25

Precipitate at 100° F.

RHODULINE RED (B.)

	cwt.	qrs.	lbs.
Alumina Paste	0	3	14
Rhoduline B.	0	0	6
Tannic Acid	0	0	9
Tartar Emetic	0	0	1½
Produce (Dry Lake)	0	0	25

Precipitate at 100° F.

Analine and Alizarin Lakes

(ANOTHER SERIES).

We now proceed to give a very full list of various lake colours prepared from soluble dyes, and comprising every colour which the colour-maker is likely to be called upon to produce.

In this series are described aniline lakes similar to those given in the last series, and also alizarin lakes, which are now of great interest and importance, as many valuable and permanent pigments can be prepared from the alizarin colouring matters.

The great utility of having all the recipes that constitute a series like the present worked out on one basis, and arranged so that similar solutions can be used in every case, is obvious to everyone who has to handle such recipes. We have, therefore, gone very fully into the preparation of the various solutions, both of colouring matter and of mordant, and all the formulæ have been reduced as nearly as possible to a uniform standard of weights. Several of the formulæ will be found to be practically the same as those given in the preceding series, but the convenience in having all the colours calculated out uniformly is so apparent that no apology is offered for the inclusion of the few referred to.

PASTE BASES USED IN THE LAKES.

I. ALUMINA PASTE.—We have already given on p. 147 the method (with quantities) for the preparation of the base used in the ordinary lakes. This formula may be used for the production of the paste required in the following series. The following is the same formula, using the metric or decimal system of weights, which is very convenient, and the use of which is extending.

Process.—Dissolve three kilos. sulphate of alumina in 36 litres of hot water, and precipitate at 86° F. with a solution of one kilo. 350 grammes soda ash, in 12 litres of hot water. Wash three times with cold water. Squeeze out the water until the weight of the paste is seven kilos. 800 grammes.

II. In the alizarin lakes, and also in some of the more delicate aniline lakes, it is essential that none of the materials should contain the least trace of iron, otherwise the resulting colour will be seriously affected, the alizarin reds turning purple or brown, and so on.

The paste, therefore, for use with these colours must be free from iron, and as sulphate of alumina is usually contaminated with this substance, potash alum is usually chosen as the source of the alumina paste. The following is the method of preparation :—

Process.—Dissolve one kilo. of alum in 10 litres of hot water, and precipitate at 86° F. with a solution of 335 grammes soda ash in $3\frac{1}{2}$ litres hot water. After washing it three times with cold water, squeeze out until the weight of the lake or paste is two kilos. 300 grammes.

III. Still another base is used in some of the lakes. It is hydrate of chromium, which is prepared in the following manner:—

Process.—Dissolve one kilo. chrome alum in 10 litres of hot water, and precipitate at 95° F. with 320 grammes soda ash, which has been dissolved in three litres of water.

Production : Two kilos. 140 grammes paste.

When making lakes in quantity, the quantity of alumina given in the recipes is best precipitated direct from the corresponding quantity of sulphate of alumina (or alum) and soda ash, and squeezed out, because the lakes so prepared, which are sold in lump form, show a regular surface when broken, and no white spots of dried alumina which have not been dyed, which is apt to occur if the dye is mixed with the paste.

GENERAL METHOD OF PRECIPITATION.

As a guide to the best reagent to use to effect the precipitation of a given dyestuff, the following tables may be consulted. In them the commoner dyestuffs are classified according to the reagent that will most easily and with the best results precipitate them.

CLASS No. 1.

ACID AND DYESTUFF SUBSTANTIVE COLOURS WHICH PRECIPITATE WITH CHLORIDE OF BARIUM.

Alkali Blues.
Anthracene Red.
Bordeaux Extra B.X.
Brilliant Yellow.
Chloramine Brown.
Chloramine Yellow.

Chloramine Orange.
Chrysamine G. & R.
Cloth Red B.G.G. Extra,
3 G. Extra, 3 B. Extra.
Croceine Orange G. & R.
Croceine Scarlet R.
Curcumine S. & W.
Fast Green Extra.
Fast Red B.T.
Fast Violet, Bluish.
Fast Red, Reddish.
Indian Yellow.
Induline.
Jet Black G. & R.
Jute Scarlet 3 B.H.
Metanil Yellow.
New Yellow, Extra Concentrated.
New Victoria Black.
Nigrosine G.B.R. & 2 R.
Orange II. B., G.T., R.X.
Paper Blue R.P.
Quinoline Yellow.
Scarlet R.
Thiuzole Yellow.
Wood Ponceau R., 2 R., 3 R.

EXAMPLE.

Eight parts wood ponceau R. are dissolved in 1,000 parts of hot water, sieved with 100 parts of alumina paste, and precipitated at a temperature of 95°—100° F., with 12 parts chloride of barium dissolved in ten times the quantity of water. After once washing, filter and dry.

If opaque lakes are required from the colours mentioned above, Glauber's salt and chloride of barium in adjusted proportions are added, or the colours are precipitated according to the method given under class No. 2.

CLASS No. 2.

ACID AND SUBSTANTIVE COLOURS.

The following are colours which can be precipitated most easily if sulphate of alumina, and sometimes soda, which has been added subsequently, are present.

Acid Green B.B. Extra.
Acid Green B.B.N.
Acid Green G.B. Extra.
Acid Green G. Extra.
Acid Green G.G. Extra.
Acid Violet 4 B. Extra.
Acid Violet 5 B.
Acid Violet 6 B.
Alkali Violet.
Azo Eosine, almost precipitated.
Bismarck Acid Brown.
Bordeaux Extra.
Brilliant Yellow.
Brilliant Geranine B. & 3 B.
Carmine Blue B. & G.
Chloramine Yellow.
Chrysophenine.
Croceine Scarlet B. & 2 B., 3 B., 7 B., 8 B., 10 B.
Dark Acid Brown.
Diamond Yellow.
Fast Brown.
Fast Light Green (not entirely).
Both not quite precipitated. { Fast Green Extra Bluish.
Fast Green Bluish.
Fast Acid Blue B. Extra (not entirely).
Geranine G. & B.B.
Hessian Yellow.
Navy Blue 115.
Naphthol Yellow S.
Metyhl Blue.
Naphthylamine Yellow.

EXAMPLE.

ACID GREEN G.B. EXTRA.

Mix 15 parts sulphate of alumina in 10 times its weight of water with a solution of 10 parts acid green dissolved in 10 times its weight of water, and precipitate at 70° F., with 32 parts of chloride of barium in 10 times its weight of water, and complete the precipitation by a further addition of $6\frac{1}{2}$ parts of soda ash dissolved in 10 times its weight of water, which causes a further precipitation of alumina. If such lakes are to be less opaque, alumina paste is added before precipitation.

CLASS NO. 3.

ACID AND SUFSTANTIVE COLOURS PRECIPITATED WITH TIN CRYSTALS.

Alkali Blues, clearer lake than if precipitated with Chloride of Barium.
Cotton Blues.
Fast Brown.
New Victoria Black.
New Victoria Black Blue.
Night Blue, Extra Greenish.
Nigrosine.
Silk Blues.
Soluble Blues.

EXAMPLE.

SOLU LE BLUE (GREENISH SHADE).

Five parts of dyestuff are dissolved in 100 times the quantity of water, and sieved with 90 parts of alumina paste, and precipitated at 100° F. with three parts tin crystals.

Dissolve tin crystals in three parts of water, wash, squeeze off, and dry.

CLASS NO. 4.

EOSINES PRECIPITATED WITH SUGAR OR NITRATE OF LEAD.

EXAMPLE.

Sieve 100 parts of alumina paste with 15 parts eosine (yellow shade concentrated No. 9,212), dissolved in 100 times the quantity of water, and precipitated by 10 parts nitrate of lead or 12 parts of sugar of lead.

Lead salts only are used for the precipitation of eosines. Eosine lakes which have been precipitated on alumina are sold as *geranium lakes*. *Imitation vermilions* are eosine lakes which have been obtained by precipitation of eosines or ponceaux on red leads. (These have been fully described. See p. 113 *et seq.*).

CLASS No. 5.

Precipitation with tannic acid and tartar emetic, or tannic acid and acetate of soda, or tannic acid and chloride of iron.

Auramine.
Bismarck Brown F.
Brilliant Green Crystals.
Capri Blues.
Cardinal 4 B.
China Green Crystals, concentrated.
Chrysoidine.
Crimson Blue Shade.
Crimson Yellow Shade.
Diamond Fuchsine.
Emerald Green Crystals.
Imperial Green.
Jute Black.
Methyline Blue B.B.
Methyl Violet.
New Blue R. Extra.
New Fast Blue F. & H.
New Victoria Blue B.
Peacock Blues.
Pyronine G.
Rhoduline G. & B. Extra.
Rhoduline Red B. & G.
Rhoduline Violet.
Rubeine Crystals.
Saffranine B.B. & F.F. Extra.
Turquoise Blue B. & G.

EXAMPLE.

Eight parts brilliant green crystals in 100 times the quantity of water. 150 parts of alumina paste, 10 parts tannic acid, 10 times the quantity of water. Five parts tartar emetic (one in 20 of water), or 10 parts acetate of soda (one in 10 of water).

In order to obtain a deeper shade, five parts of chloride of iron (one in 10 of water) in place of tartar emetic should be added. Wash, squeeze off, and dry as usual.

CLASS NO. 6.

NOTE.—The sign (:) between two numbers indicates that the number of parts of dye or chemical expressed by the first number are to be dissolved in the number of parts of water indicated by the second number. Thus, turquoise blue (1:500) means that the strength of the solution is 1 of dye to 500 of water.

BASIC DYESTUFFS PRECIPITATED WITH MOLYBDINATE OF AMMONIA.

EXAMPLE.

1 part Turquoise Blue B.B. (1:500),
30 parts Glauber's Salt (1:10),

add at temperature of 100° F.,

54 parts Chloride of Barium (1:10),
3 parts Molybdinate of Ammonia (1:10).

Wash, squeeze off, and dry.

Production, 48 parts Dry Lake.

Turquoise blue B.B. and G., as well as rhoduline violet, produce, if precipitated with molybdinate of ammonia, clearer shades than with tannic acid.

Turquoise blue lakes, with molybdinate of ammonia, are much bluer than tannic acid lakes. The lakes can also be struck on blanc fixe with molybdinate of ammonia.

CLASS NO. 7.

ALIZARINE AND CHROME COLOURS.

Boil the colour solutions with alumina and Turkey red oil, with an addition of chloride of barium, if required, or of tin crystals or hydrate of chrome.

Alizarine Blue R. Double.
Alizarine Blue G.W. Double.
Alizarine Blue G.G. Double.
Alizarine Cyanine, G. Extra.
Alizarine Cyanine, R. Extra.
Alizarine Cyanine, 3 R. Extra.
Alizarine Cyanine, G.G. Extra.
Alizarine Cyanine Black.
Alizarine Bordeaux B.
Alizarine, X.G.
  R.A. New, S.X. Extra New.
  2 A.G., 2 A.B., 1 Extra.
Alizarine Cardinal.
Alizarine Purpine.
Anthracine Brown, R. & G.G.
Anthracine Yellow.
Anthracine Red.
Azo Green.
Brilliant Alizarine Blue, G. & R.

EXAMPLE.

A.

10	parts Cyanine 3 R. Powder,
1,000	parts Water,
100	parts Alumina Paste.
5½	parts Turkey Red Oil.

Boil for half an hour, wash after it gets cold, squeeze off, and dry.

Production, 24½ parts Dry Lake.

B.

50	parts Chrome Orange Paste, in
1,000	parts Water,
2	parts Turkey Red Oil, 50%,
150	parts Alumina Paste.

Boil for half an hour, then add five parts chloride of barium.

Production, 25½ parts Dry Lake.

C.

5 parts Cœruleine Powder,
1,000 parts Water,
90 parts Alumina Paste.

Boil for half an hour, then add 2½ parts tin crystals (1:1), wash, squeeze off, and dry. Production, 13½ parts Dry.

D.

20 parts Azo Green Paste,
150 parts Alumina Paste,
60 parts Hydrate of Chrome Paste, 6½%.

Wash, squeeze off, and dry.

SPECIAL.

RHODAMINE S. EXTRA.

Rhodamine S. Extra is precipitated in the following manner:-

Two parts rhodamine S. extra are dissolved in 1,000 parts water, sieved with 100 parts alumina paste. Precipitate cold, with three parts sulphate of zinc (1:10) and three parts tannic acid (1:10).

Production, 18·2 parts Dry.

GENERAL WORKING DETAILS.

All lakes produced with acid and basic colours are washed once, then squeezed off and dried.

Lakes of mordant colours are washed twice. The concentration of the solutions used is as follows:—

Chloride of Barium	20%
Soda Ash	10%
Glauber's Salts	10%
Sulphate of Alumina	20%
Tannic Acid	10%
Tartar Emetic	5%
Tin Crystals	50%
Acetate of Soda	10%
Molybdinate of Ammonia	10%
Sulphate of Zinc	10%
Chloride of Iron	10%
Bichloride of Tin	10%
Nitrate of Lead	10%

BRILLIANT CHROME RED.

50 parts Brilliant Chrome Red (1:20),
150 parts Alumina Paste,
2 parts Turkey Red Oil.

Boil for half an hour, then add :—

8 parts Chloride of Barium.

Wash twice.
Production, 27 parts Dry Lake.

CHROME BORDEAUX 6 B.

50 parts Chrome Bordeaux 6 B. double (1:12),
150 parts Alumina Paste,
2 parts Turkey Red Oil.

Boil for half an hour, then add :—

10 parts Chloride of Barium.

Production, 33 parts Dry Lake.

ALIZARINE BORDEAUX B.

10 parts Alizarine Bordeaux B. Powdered (1:100).
150 parts Alumina Paste.
3 parts Turkey Red Oil.

Boil half an hour. Production, 25·4 parts Dry Lake.

ALIZARINE 2 H.B. PASTE.

60 parts Alizarine 2 H.B. Paste (1:20).
200 parts Alumina Paste from Alum.
10 parts Turkey Red Oil.

Boil half an hour. Production, 36½ parts Dry Lake.

ALIZARINE R.A.

30 parts Alizarine New Paste 20% (1:30).
110 parts Alumina Paste from Alum.
10 parts Turkey Red Oil 50%.

Boil half an hour, and wash twice at 85° F. Production, 20 parts Dry Lake.

ALIZARINE S.X. EXTRA NEW.

Method same as R.A. Production, 18·3 parts Dry Lake.

ALIZARINE 1 EXTRA PASTE.

Method same as R.A. Production, 24·1 parts Dry Lake.

ALIZARINE 2 A.G. PASTE.

Method same as R.A. Production, 22·4 parts Dry Lake.

ALIZARINE X.G. PASTE.

Method same as R.A. Production, 21 parts Dry Lake.

All lakes must be washed once, whilst the alizarine lakes have to be washed twice.

NAPHTHOL YELLOW S.

	100	parts Alumina Paste.
	16	parts Sulphate Alumina.
100° F.	12	parts Naphthol Yellow S. (1:100).
	34	parts Chloride of Barium.
	7½	parts Soda Ash.

Production, 156 parts Lake.

QUINOLINE YELLOW.

	12	parts Quinoline Yellow. (1:100.)
	100	parts Alumina Paste.
100° F.	20	parts Glauber's Salt.
	52	parts Chloride of Barium.

Production, 135 parts of Lake.

ORANGE H.B.

	12	parts Orange H.B. (1:100).
	100	parts Alumina Paste.
70° F.	15	parts Sulphate of Alumina.
	40	parts Chloride of Barium.

Production, 135 parts Lake.

CROCEINE ORANGE G.

12 parts Croceine Orange G. (1:100).
100 parts Alumina Paste.
100° F. 15 parts Glauber's Salt.
40 parts Chloride of Barium.

Production, 140 parts Lake.

SCARLET R.

16 parts Scarlet R.
100° F. 200 parts Alumina Paste.
18 parts Chloride of Barium.

Production, 200 parts Lake.

CROCEINE SCARLET 2 B.

20 parts Croceine Scarlet 2 B. (1:100).
100 parts Alumina Paste.
15 parts Sulphate of Alumina.
44 parts Chloride of Barium.
6 parts Soda Ash.

Precipitate Cold. Production, 160 parts Lake.

CROCEINE SCARLET 8 B.

As Croceine Scarlet 2 B. Production, 175 parts Lake.

BORDEAUX B.X.

16 parts Bordeaux. (1:100).
100° F. 200 parts Alumina Paste.
12 parts Chloride of Barium. (1:10).

Production, 190 parts Lake.

ALKALI BLUE 4 B.

No. 1.

16 parts Alkali Blue 4 B. (1:100).
100° F. 200 parts Alumina Paste.
10 parts Chloride of Barium. (1:10).

Production, 225 parts Lake.

ALKALI BLUE 4 B.

No. 2.

	20	parts Alkali Blue 4 B. (1:100).
	150	parts Alumina Paste.
100° F.	15	parts Glauber's Salt.
	38	parts Chloride of Barium.

Production, 295 parts Lake.

200, 063

NAVY BLUE, 115.

	20	parts Navy Blue. (1:100).
100° F.	200	parts Alumina Paste.
	10	parts Chloride of Barium.

Production, 150 parts Lake.

ACID GREEN G.B. EXTRA.

15	parts Acid Green G.B. Extra. (1:100).
100	parts Alumina Paste.
15	parts Sulphate of Alumina.
40	parts Chloride of Barium.
6½	parts Soda Ash.

500, 130

Precipitate cold.
Production, 152 parts Lake.

ACID GREEN S.G. EXTRA. COMBINED WITH QUINOLINE YELLOW.

100	parts Acid Green G.B. Extra. (1:100).
5	parts Quinoline Yellow 1:100.
15	parts Sulphate of Alumina.
40	parts Chloride of Barium.
6	parts Soda Ash.

Precipitate cold.
Production, 140 parts Lake.

ACID VIOLET 5 B.

20 parts Acid Violet 5 B. (1:100).
100 parts Alumina Paste.
15 parts Sulphate of Alumina.
44 parts Chloride of Barium.
6 parts Soda Ash.

Precipitate cold. Production, 150 parts.

FAST VIOLET, BLUE SHADE.

16 parts Fast Violet, Blue Shade. (1:100).
100° F. 200 parts Alumina Paste.
15 parts Chloride of Barium. (1:10).

Production, 330 parts Lake.

METHYL VIOLET 5 R.

No. 1.

2 parts Methyl Violet. (1:500).
90 parts Alumina Paste.
100° F. $3\frac{1}{2}$ parts Tannic Acid.
$1\frac{3}{4}$ parts Tartar Emetic.
or
$3\frac{1}{2}$ parts Acetate of Soda.

Production, 18 parts Dry Lake.

METHYL VIOLET B.

No. 2.

2 parts Methyl Violet. (1:500).
9 parts Alumina Paste.
100° F. $2\frac{1}{2}$ parts Tannic Acid.
$1\frac{1}{4}$ parts Tartar Emetic.

Production, 16 parts Dry Lake.

METHYL VIOLET B.

No. 3.

2 parts Methyl Violet B. (1:500).
90 parts Alumina Paste.
100° F. 3 parts Tannic Acid.
$1\frac{1}{2}$ parts Tartar Emetic.
Production, 18 parts Dry Lake.

ALKALI VIOLET SOLUBLE WITH DIFFICULTY.

10 parts Alkali Violet (1:150).
150 parts Alumina Paste.
86° F. 20 parts Chloride of Barium.
7 parts Sulphate of Alumina.
2 parts Soda Ash.
Production, 43·8 parts Dry Lake.

RHODULINE VIOLET.

No. 1.

5 parts Rhoduline Violet (1:250).
150 parts Alumina Paste.
100° F. $8\frac{1}{2}$ parts Tannic Acid.
2 parts Tartar Emetic.
Production, 29·1 parts Dry Lake.

RHODULINE VIOLET

No. 2.

3 parts Rhoduline Violet (1:250).
100° F. 150 parts Alumina Paste.
6 parts Molybdinate of Ammonia.
Production, 21·4 parts Dry Lake.

FAST VIOLET, BLUE SHADE.

No. 1.

5 parts Violet Blue Shade.
86° F. 90 parts Alumina Paste.
$6\frac{1}{2}$ parts Chloride of Barium.
Production, 18·4 parts Dry Lake.

FAST VIOLET, RED SHADE. No. 2.

12 parts Fast Violet R.S. (1:150).
86° F. 100 parts Alumina Paste.
15 parts Glauber's Salt.
36 parts Chloride of Barium.

Production, 48·8 parts Dry Lake.

ACID VIOLET 5 B.

12 parts Acid Violet (1:150).
50 parts Alumina Paste.
15 parts Sulphate of Alumina.
34 parts Chloride of Barium.
6½ parts Soda Ash.

Precipitate cold.
Production, 46·1 parts Dry Lake.

ACID VIOLET 6 B. (N.R. 1).

5 parts Acid Violet (1:200).
90 parts Alumina Paste.
8 parts Chloride of Barium.
2 parts Sulphate of Alumina.

Precipitate cold.
Production, 18·6 parts Dry Lake.

ACID GREEN B.B. EXTRA (M.R. 5).

10 parts Acid Green (1:150).
15 parts Sulphate of Alumina.
33 parts Chloride of Barium.
6½ parts Soda Ash.

Precipitate cold.
Production, 35·3 parts Dry Lake.

ACID GREEN B.B.N. EXTRA.

10 parts Acid Green (1:150).
15 parts Sulphate of Alumina.
35 parts Chloride of Barium.
6½ parts Soda Ash.

Precipitate cold.
Production, 34·4 parts Dry Lake.

ACID GREEN (6B).

Precipitate at B.B. Extra.

Production, 32·5 parts Dry Lake.

ACID GREEN, G.B. EXTRA.

Precipitate as B.B.N. Extra.

Production, 34·2 parts Dry Lake.

ACID GREEN AND NAPHTHOL YELLOW.

8 parts Acid Green G.G. Extra (1:150).
2 parts Naphthol Yellow S. (1:200).
15 parts Sulphate of Alumina.
34 parts Chloride of Barium.
6½ parts Soda Ash.

Precipitate cold.

Production, 32 parts Dry Lake.

FAST GREEN EXTRA.

12 parts Fast Green Extra (1:150).
150 parts Alumina Paste.
20 parts Chloride of Barium.
4 parts Sulphate of Alumina.

Precipitate cold.

Production, 35 parts Dry Lake.

FAST GREEN, BLUISH.

12 parts Fast Green, Bluish (1:150).
150 parts Alumina Paste.
22 parts Chloride of Barium.
5 parts Sulphate of Alumina.

Precipitate cold.

Production, 42·2 parts Dry Lake.

BRILLIANT GREEN.

8 parts Brilliant Green Crystals (1:100).
100° F. 150 parts Alumina Paste.
10 parts Tannic Acid.

Production, 34 parts Dry Lake.

BRILLIANT GREEN.

15 parts Sulphate of Alumina.
7 parts Soda Ash.
20 parts Chloride of Barium.
100° F. 8 parts Brilliant Green Crystals (1:100).
12 parts Tannic Acid.
5 parts Tartar Emetic.

Production, 38·4 parts Dry Lake.

BRILLIANT GREEN.

8 parts Green Crystals (1:100).
100° F. 150 parts Alumina Paste.
12 parts Tannic Acid.
5 parts Chloride of Iron.

Production, 34 parts Dry Lake.

FAST GREEN EXTRA BLUISH.

12 parts Fast Green Extra Bluish (1:150).
150 parts Alumina Paste.
18 parts Chloride of Barium.
5 parts Tin Crystals.

Precipitate cold.
Production, 35·4 parts Dry Lake.

FAST LIGHT GREEN.

5 parts Fast Light Green (1:150).
90 parts Alumina Paste.
9 parts Chloride of Barium.
4 parts Sulphate of Alumina.

Precipitate cold.
Production, 21·2 parts Dry Lake.

BRILLIANT GREEN AND NAPHTHOL YELLOW (S.)

75 parts Sulphate of Alumina.
35 parts Soda Ash.
5 parts Naphthol Yellow S. (1:200).
100° F. 104 parts Chloride of Barium.
5 parts Brilliant Green Crystals (1:150).
5 parts Tannic Acid.
2½ parts Tartar Emetic.

Production, 121 parts Dry Lake.

IMPERIAL GREEN.

8 parts Imperial Green Crystals (1:150).
150 parts Alumina Paste.
100° F. 10 parts Tannic Acid.
5 parts Tartar Emetic.

Production, 35·9 parts Dry Lake.

CHINA GREEN.

2 parts China Green (1:150).
90 parts Alumina Paste.
100° F. 3 parts Tannic Acid.
1½ parts Tartar Emetic.

Production, 16·8 parts Dry Lake.

EMERALD GREEN.

8 parts Emerald Green (1:150).
150 parts Alumina Paste.
100° F. 6 parts Tannic Acid (1:10).
2½ parts Tartar Emetic (1:20).

COERULEINE.

5 parts Coeruleine (1:150).
9 parts Alumina Paste.
2½ parts Tin Crystals.

Boil for half an hour.

Production, 13·5 parts Dry Lake.

CHROME GREEN.

10 parts Chrome Green Paste (1:100)
150 parts Alumina Paste.
5 parts Turkey Red Oil.
120 parts Hydrate of Chrome Paste.

Boil for half an hour.

Production, 31·4 parts Dry Lake.

AZO GREEN.

No. 1.

10 parts Azo Green Paste (1:150).
90 parts Alumina Paste.

Boil for half an hour.

Production, 10·4 parts Dry Lake.

AZO GREEN.

No. 2.

20 parts Azo Green Paste (1:150).
150 parts Alumina Paste.
60 parts Hydrate of Chrome Paste.

Boil for half an hour.

Production, 23·2 parts Dry Lake.

ENGLISH GREEN.

No. 1.

4 parts Acid Green G.G. Extra.
3 parts Quinoline Yellow (1:150).
40 parts Sulphate of Barytes.
90 parts Alumina Paste.
15 parts Chloride of Barium.
2 parts Sulphate of Zinc.

Precipitate cold.

Production, 16·3 parts Dry Lake.

ENGLISH GREEN.

No. 2.

4 parts Acid Green G.G. Extra.
3 parts Naphthol Yellow, S.

Further as No. 3. Precipitate cold.
Production, 61·2 parts Dry Lake.

ENGLISH GREEN.

No. 3.

4 parts Acid Green G.G. Extra.
2½ parts Quinoline Yellow (1:150)
90 parts Alumina Paste.
60 parts Sulphate of Barytes.
12 parts Chloride of Barium.
3 parts Sulphate of Zinc.

Precipitate cold.
Production, 88·2 parts Dry Lake.

YELLOW AURANINE (O.).

2 parts Auranine O. (1:250).
90 parts Alumina Paste.
4 parts Tannnic Acid.
2 parts Tartar Emetic.

Production, 16·8 parts Dry Lake.
Precipitate cold.

ANTHRACENE YELLOW.

50 parts Anthracene Yellow Paste.
150 parts Alumina Paste.
2 parts Turkey Red Oil.

Boil for half an hour at 195° F.
Production, 18·2 parts Dry Lake.

NAPHTHOL YELLOW (S.).

5 parts Naphthol Yellow S. (1:200).
15 parts Sulphate of Alumina.
7 parts Soda Ash.
24 parts Chloride of Barium.

Precipitate cold.
Production, 24·7 parts Dry Lake.

CHRYSOPHENINE.

5 parts Chrysophenine (1:200).
90 parts Alumina Paste.
5 parts Chloride of Barium.

Production, $15\frac{1}{2}$ parts Dry Lake.
Precipitate at 140° F.

CHLORAMINE YELLOW.

5 parts Chloramine Yellow (1:200).
15 parts Sulphate Alumina.
86° F. 5 parts Soda Ash.
24 parts Chloride of Barium.

Production, 25·4 parts Dry Lake.

DIAMOND YELLOW.

15 parts Diamond Yellow (1:100).
90 parts Alumina Paste.
86° F. $4\frac{1}{2}$ parts Chrome Alum.
2 parts Soda Ash.
3 parts Chloride of Barium.

Production, 19·1 parts Dry Lake.

GOLDEN YELLOW.

5 parts Golden Yellow (1:200).
90 parts Alumina Paste.
86° F. 8 parts Chloride of Barium.
1 part Sugar of Lead.

Production, 17·8 parts Dry Lake.

NEW YELLOW.

5 parts New Yellow Extra Concentrated (1:200).
86° F. 90 parts Alumina Paste.
6 parts Chloride of Barium.

Production, 16·2 parts Dry Lake.

METANIL YELLOW.

5 parts Metanil Yellow (1:200).
86° F. 90 parts Alumina Paste.
8 parts Chloride of Barium.

Production, 18·7 parts Dry Lake.

INDIAN YELLOW.

5 parts Indian Yellow (1:100).
86° F. 90 parts Alumina.
4 parts Chloride of Barium.

Production, 15½ parts Dry Lake.

THIUZOLE YELLOW.

5 parts Thiuzole Yellow (1:100).
86° F. 90 parts Alumina Paste.
7 parts Chloride of Barium.

Production, 17½ parts Dry Lake.

QUINOLINE YELLOW.

5 parts Quinoline Yellow.
86° F. 90 parts Alumina Paste.
7 parts Chloride of Barium.

Production, 19 parts Dry Lake.

ALIZARINE YELLOW R.

150 parts Alumina Paste.
50 parts Alizarine Yellow R. Paste (1:20).
2 parts Turkey Red Oil.

Boil for half an hour.

Production, 27·7 parts Dry Lake.

FAST BROWN.

No. 1.

10 parts Fast Brown (1:50).
120 parts Alumina Paste.
6 parts Tin Crystals.

Production, 28·2 parts Dry Lake.

FAST BROWN.

No. 2.

12 parts Fast Brown (1:50).
50 parts Alumina Paste.
15 parts Sulphate of Alumina.
34 parts Chloride of Barium.
6½ parts Soda Ash.

Production, 36·8 parts Dry Lake.

DARK ACID BROWN.

12 parts Dark Acid Brown (1:30).
50 parts Alumina Paste.
15 parts Sulphate of Alumina.

Production, 39·4 parts Dry Lake.

ANTHRACENE BROWN (R.)

150 parts Alumina Paste.
12 parts Anthracene Brown (1:100).
3 parts Turkey Red Oil.
7 parts Chloride of Barium.

Boil for half an hour at 195° F. Production, 29·4 parts Dry Lake.

ANTHRACENE BROWN G.G.

100 parts Alumina Paste.
30 parts Anthracene Brown G.G. Paste (1:25).

Production, 17 parts Dry Lake. Boil for half an hour.

BISMARCK BROWN (F).

8 parts Bismarck Brown F.
150 parts Alumina Paste. 300,010
100° F. 10 parts Tannic Acid.
5 parts Tartar Emetic.

Production, 41·4 parts Dry Lake.

ALIZARINE CYANINE BLACK.

20 parts Alizarine Cyanine Black Paste (1:50).
20 parts Frankfort Black.

Boil for half an hour. Production, 20 parts Dry Lake

JUTE BLACK.

5 parts Jute Black (1:100).
20 parts Frankfort Black.
3 parts Tannic Acid.
1½ parts Chloride of Iron.

Precipitate cold. Production, 22·9 parts Dry Lake.

NIGROSINE BLACK (G).

5 parts Nigrosine G. (1:100).
100° F. 20 parts Frankfort Black.
3½ parts Tin Crystals.

Production, 22·2 parts Dry Lake.

NIGROSINE (B.).

100° F., the same as Nigrosine G. Production, 22·4 parts Dry Lake.

NIGROSINE 2 R.

5 parts Nigrosine 2 R. (1:100).
100° F. 20 parts Frankfort Black.
3 parts Tin Crystals.

Production, 23 parts Dry Lake.

The above-mentioned Frankfort black, or German black, can be bought ready prepared. Before adding the colour solution to the Frankfort black, the latter is well wetted with hot water, and the lake precipitated on it after thorough mixing.

BRILLIANT ALIZARINE BLUE (R.).

100 parts Alumina Paste.
4 parts Brilliant Alizarine R. (1:250).
$5\frac{1}{2}$ parts Turkey Red Oil 50%.

Production, 15·3 parts Dry Lake. Boil for half an hour.

BRILLIANT ALIZARINE BLUE (G.).

100 parts Alumina Paste.
4 parts Brilliant Alizarine G. (1:250).
$5\frac{1}{2}$ parts Turkey Red Oil.
$1\frac{1}{2}$ parts Tin Crystals (1:1).

Production, 18 parts Dry Lake. Boil for half an hour.

ALIZARINE CYANINE (G.).

150 parts Alumina Paste.
12 parts Alizarine Cyanine G. Extra Powdered (1:100).
5 parts Turkey Red Oil.

Production, 25·1 parts Dry Lake. Boil for half an hour.

ALIZARINE CYANINE (R.).

No. 1.

12 parts Alizarine Cyanine R. Powder (1:100).
150 parts Alumina Paste.
5 parts Turkey Red Oil.

Production, 3.. 6 parts Dry Lake. Boil for half an hour.

ALIZARINE CYANINE (3 R.).

No. 2.

5 parts Alizarine Cyanine 3 R. Double (1:100.)
100 parts Alumina Paste.

Production, $13\frac{1}{2}$ parts Dry Lake. Boil for half an hour.

ALIZARINE CYANINE (3 R.) POWDER.

No. 3.

10 parts Alizarine Cyanine 3 R. (1:100).
150 parts Alumina Paste.
5 parts Turkey Red Oil.

Production, 24·3 parts Dry Lake. Boil for half an hour.

ALIZARINE CYANINE (G.G.).

No. 4.

10 parts Alizarine Cyanine G.G. Powder (1:100).
100 parts Alumina Paste.
2 parts Turkey Red Oil.

Production, 18·3 parts Dry Lake. Boil for half an hour

ALIZARINE BLUE (R.).

13 parts Alizarine Blue R. Double (1:30).
100 parts Alumina Paste.
2 parts Turkey Red Oil.

Production, 18·7 parts Dry Lake. Boil for half an hour.

TURQUOISE BLUE (G.).

No. 1.

15 parts Turquoise Blue (1:100).
300 parts Alumina Paste.
100° F. 12 parts Tannic Acid.
6 parts Tartar Emetic.

Production, 62·2 parts Dry Lake.

TURQUOISE BLUE (G.).

No. 2.

1 part Turquoise Blue (1:150).
30 parts Glauber's Salts.
54 parts Barium Chloride.
3 parts Molybdinate of Ammonia.

Production, 49·1 parts Dry Lake.

LAKES MADE FROM BRILLIANT ANILINES.

The concentration of the various solutions is given on p. 171.

ALKALI BLUE.

90 parts Alumina Paste.
5 parts Alkali Blue B. (1:20).
7 parts Chloride of Barium.

Precipitate cold. Production, 16 parts Dry Lake.

ALKALI BLUE (4 B.).

5 parts Alkali Blue (1:200).
100 parts Alumina Paste.
3 parts Tin Crystals.

Precipitate cold. Production, 19·3 parts Dry Lake.

ALKALI BLUE (6 B.).

5 parts Alkali Blue (1:200).
100 parts Alumina Paste.
6 parts Chloride of Barium.

Production, 20·3 parts Dry Lake. Precipitate cold.

ALKALI BLUE (6 R. EXTRA.)

5 parts Alkali Blue (1:200).
90 parts Alumina Paste.
7 parts Chloride of Barium.

Precipitate cold. Production, 16½ parts Dry Lake.

METHYLATED BLUE (B.B.).

No. 1.

1 part Methylated Blue (1:500).
100 parts Alumina Paste.
100° F. 1½ parts Tannic Acid.
1 part Tartar Emetic.

Production, 14·7 parts Dry Lake.

METHYLATED BLUE (B.B.).

No. 2.

	5	parts Methylated Blue B.B.
	9	parts Alumina Paste.
100° F.	5	parts Tannic Acid.
	2½	parts Tartar Emetic.

Production, 21·3 parts Dry Lake.

COPRI BLUE (G.O.).

No. 1.

	1	part Copri Blue G.O.
	100	parts Alumina Paste.
100° F.	1½	parts Tannic Acid.
	1	part Tartar Emetic.

Production, 17·4 parts Dry Lake.

COPRI BLUE (G.O.M.).

No. 2.

	5	parts Copri Blue G.O.M. (1:200)
100° F.	90	parts Alumina Paste.
	3	parts Tannic Acid.

Production, 16·8 parts Dry Lake.

INDULINE (B.).

No. 1.

5	parts Induline B. (1:200).
90	parts Alumina Paste.
2	parts Glauber's Salt.
7	parts Chloride of Barium.

Precipitate cold.

Production, 19·5 parts Dry Lake.

INDULINE (6 B.).

No. 2.

Precipitate as B.

Production, 19·5 parts Dry Lake.

INDULINE (GREEN SHADE).

No. 3.

5 parts Induline G.S. (1:200).
90 parts Alumina Paste.
8 parts Chloride of Barium.
2 parts Sulphate of Alumina.

Precipitate cold.

Production, 19·8 parts Dry Lake.

SOLUBLE BLUE GREEN SHADE.

5 parts Soluble Blue G.S. (1:200).
85° F. 90 parts Alumina Paste.
3 parts Tin Crystals.

Production, 15·2 parts Dry Lake.

SOLUBLE BLUE RED SHADE.

Precipitate as Soluble Blue Green Shade.

Production, 16 parts Dry Lake.

SOLUBLE BLUE (3 B. EXTRA G.S.).

5 parts Soluble Blue 3 B. Extra G.S.
85° F. 90 parts Alumina Paste.
3½ parts Tin Crystals.

Production, 15·2 parts Dry Lake.

SOLUBLE BLUE (T.R.).

5 parts Soluble Blue T.R.
85° F. 90 parts Alumina Paste.
3 parts Tin Crystals.

Production, 16·8 parts Dry Lake.

COTTON BLUE (R.).

5 parts Cotton Blue R. (1:200).
85° F. 90 parts Alumina Paste.
6½ parts Tin Crystals.

Production, 17·5 parts Dry Lake.

COTTON BLUE (2 R.).

	5	parts Cotton Blue R.R. (1:200).
85° F.	90	parts Alumina Paste.
	6½	parts Tin Crystals.

Production, 17·5 parts Dry Lake.

COTTON BLUE.

	5	parts Cotton Blue VI. (1:200).
85° F.	90	parts Alumina Paste.
	6	parts Tin Crystals.

Production, 16 parts Dry Lake.

PEACOCK BLUE (G.).

	5	parts Peacock Blue G. (1:200).
	90	parts Alumina Paste.
100° F.	5½	parts Tannic Acid,
	2	parts Tartar Emetic.

Production, 23·7 parts Dry Lake.

CARMINE BLUE (B.).

	5	parts Carmine Blue B. (1:200).
	90	parts Alumina Paste.
95° F.	8	parts Chloride of Barium.
	2	parts Sulphate of Alumina.

Production, 18·5 parts Dry Lake.

NAVY BLUE, 115.

5	parts Navy Blue (1:200).
90	parts Alumina Paste.
7½	parts Chloride of Barium.
1	part Sulphate of Alumina.

Precipitate cold.

Production, 17·5 parts Dry Lake.

NIGHT BLUE, EXTRA GREEN SHADE.

5 parts N.B.E.G. Shade (1:200).
90 parts Alumina Paste.
3 parts Tin Crystals.

Precipitate cold.

Production, 13·5 parts Dry Lake.

METHYL BLUE.

5 parts Methyl Blue (1:200).
90 parts Alumina Paste.
100° F. 4 parts Sulphate Alumina.
5 parts Barium of Chloride.

Production, 19 parts Dry Lake.

FAST BLUE, GREEN SHADE.

5 parts Fast Blue, Green Shade. (1:200).
90 parts Alumina Paste.
8 parts Chloride of Barium.
1 part Sulphate of Alumina.

Precipitate cold.

Production, 17·2 parts Dry Lake.

NEW VICTORIA BLUE (B.).

5 parts N.V. Blue B. (1:200).
2 parts Acetic Acid.
100° F. 90 parts Alumina Paste.
3 parts Tannic Acid.
2½ parts Acetate of Soda.

Production, 16·3 parts Dry Lake.

ORANGE (H.B.).

12 parts Orange H.B. (1:100).
115° F. 150 parts Alumina Paste.
18 parts Chloride of Barium.

Production, 33 parts Dry Lake.

ORANGE (R.X.).

5 parts Orange R.X. (1:200).
115° F. 100 parts Alumina Paste.
6·25 parts Barium Chloride.

Production, 18 parts Dry Lake.

CROCEINE ORANGE (R.).

12 parts Croceine Orange R. (1:100).
115° F. 150 parts Alumina Paste.
14 parts Chloride of Barium.

Production, 32·8 parts Dry Lake.

CROCEINE ORANGE (G.).

12 parts Croceine Orange G. (1:100).
115° F. 150 parts Alumina Paste.
14 parts Chloride of Barium.

Production, 33·7 parts Dry Lake.

CHROME ORANGE PASTE.

50 parts Chrome Orange Paste (1:20).
150 parts Alumina Paste.
2 parts Turkey Red Oil.

Boil half an hour; then add five parts of Chloride of Barium (1:10).

Production, 25·4 parts Dry Lake.

CROCEINE SCARLET (R.).

8 parts Croceine Scarlet R. (1:100).
100 parts Alumina Paste.
8 parts Chloride of Barium.

Precipitate cold.

Production, 21·8 parts Dry Lake.

CROCEINE SCARLET (1 B.).

8 parts Croceine Scarlet B. (1:100)
100 parts Alumina Paste.
5 parts Sulphate of Alumina.
15 parts Chloride of Barium.

Precipitate cold.

Production, 20 parts Dry Lake.

CROCEINE SCARLET (2 B.).

15 parts Croceine Scarlet 2 B. (1:10).
50 parts Alumina Paste.
17 parts Sulphate of Alumina.
36 parts Chloride of Barium.
6½ parts Soda Ash.

Precipitate cold.

Production, 52 parts Dry Lake.

CROCEINE SCARLET (3 B.).

100 parts Alumina Paste.
8 parts Croceine Scarlet (1:100).
5 parts Sulphate of Alumina.
15 parts Chloride of Barium.

Precipitate cold.

Production, 28·4 parts Dry Lake.

CROCEINE SCARLET (7 B.).

8 parts Croceine Scarlet 7 B. (1:100).
100 parts Alumina Paste.
10 parts Chloride of Barium.
1½ parts Chloride of Tin.

Precipitate cold.

Production, 18 parts Dry Lake.

CROCEINE SCARLET (8 B.).

12 parts Croceine Scarlet 8 B. (1:100).
15 parts Sulphate of Alumina (1:10).
33 parts Chloride of Barium. (1:10).
6 parts Soda Ash (1:10).

Precipitate cold.

Production, 34·4 parts Dry Lake.

If the Lake is wanted to be less opaque, Alumina is added before precipitating.

CROCEINE SCARLET (10 B.).

8 parts Croceine Scarlet 10 B: (1:100).
100 parts Alumina Paste.
5 parts Sulphate of Alumina (1:10).
16 parts Chloride of Barium (1:10).

Precipitate cold.

Production, 28·7 parts Dry Lake.

ANTHRACENE RED.

10 parts Anthracene Red (1:150).

Boil for half an hour, and add to 100 parts of Alumina Paste.

Production, 13 parts Dry Lake.

RHODAMINE (B. EXTRA).

6 parts Rhodamine B. Extra (1:150).
110 parts Alumina Paste.
100 F. 9 parts Tannic Acid.
4 parts Tartar Emetic.

Production, 26·8 parts Dry Lake.

RHODAMINE (S. EXTRA).

2	parts	Rhodamine S. Extra (1:150).
100	parts	Alumina Paste.
3	parts	Sulphate of Zinc.
3	parts	Tannic Acid.

Precipitate cold.

Production, 18·2 parts Dry Lake.

ORSELLINE (B.B.).

12	parts	Orselline B.B. (1:100).
150	parts	Alumina Paste.
17	parts	Chloride of Calcium (1:10).
3	parts	Sulphate of Alumina.
1	part	Soda Ash.

Precipitate cold.

Production, 21·9 parts Dry Lake.

AZO EOSINE.

5	parts	Azo Eosine (1:100).
100	parts	Alumina Paste.
6·25	parts	Chloride of Barium.

Precipitate cold.

Production, 15·6 parts Dry Lake.

SCARLET (R.).

12	parts	Scarlet (1:100).
100° F. 150	parts	Alumina Paste.
14	parts	Chloride of Barium.

Production, 31·1 parts Dry Lake.

SCARLET (3 B.).

6 parts Scarlet 3 B. (1:100).
75 parts Alumina.
2 parts Soda Ash.
8 parts Sulphate of Alumina.

Precipitate cold.

Production, 16·3 parts Dry Lake.

WOOD PONCEAU (R.).

8 parts Wood Ponceau (1:100).
95° F. 100 parts Alumina Paste.
12 parts Chloride of Barium.

Production, 26·3 parts Dry Lake.

WOOD PONCEAU (2 R.).

Precipitate as R.

Production, 23 parts Dry Lake.

WOOD PONCEAU (3 R.).

12 parts Wood Ponceau 3 R. (1:100).
95° F. 150 parts Alumina Paste.
17 parts Chloride of Barium.

Production, 33·3 parts Dry Lake.

CLOTH RED (B.).

12 parts Cloth Red B. (1:10).
120° F. 150 parts Alumina Paste.
10 parts Chloride of Barium.

Production, 31·5 parts Dry Lake.

CLOTH RED (3 B. EXTRA).

Precipitate as Cloth Red B.

Production, 31·5 parts Dry Lake.

FAST RED (B.T.).

	12	parts Fast Red B.T. (1:100).
85° F.	150	parts Alumina Paste.
	14	parts Chloride of Barium.

Production, 32·3 parts Dry Lake.

FAST RED (N.S.).

	12	parts Fast Red N.S. 1:100).
	150	parts Alumina Paste.
100° F.	18	parts Chloride of Barium.
	8	parts Sulphate of Alumina.
	2½	parts Soda Ash.

Production, 37 parts Dry Lake.

AZO EOSINE (S.L. EXTRA).

4	parts Azo Eosine S.L. Extra.
70	parts Alumina Paste.
10	parts Nitrate of Lead.

BORDEAUX EXTRA.

	8	parts Bordeaux Extra (1:100).
100° F.	100	parts Alumina Paste.
	9	parts Chloride of Barium.

Production, 23·1 parts Dry Lake.

BORDEAUX (B.X.).

	12	parts Bordeaux B.X. (1:100).
100° F.	150	parts Alumina Paste.
	10	parts Chloride of Barium.

Production, 28·8 parts Dry Lake.

GERANINE (G.).

	16	parts Geranine B.B. (1:100).
	100	parts Alumina Paste.
85° F.	35	parts Sulphate of Alumina.
	13	parts Soda Ash.

Production, 31·3 parts Dry Lake.

GERANINE (B.B.).

	15	parts Geranine B.B. (1:100).
	50	parts Alumina Paste.
85° F.	17	parts Sulphate of Alumina.
	34	parts Chloride of Barium (1:10).
	$6\frac{1}{2}$	parts Soda Ash.

Production, 41·6 parts Dry Lake.

BRILLIANT GERANINE (3 B.).

	15	parts Brilliant Geranine 3 B.
	50	parts Alumina Paste.
95° F.	15	parts Sulphate of Alumina.
	25	parts Chloride of Barium.
	5	parts Soda Ash.

Production, 32·3 parts Dry Lake.

EOSINE BLUE SHADE CONCENTRATED.

	15	parts Eosine B.S. Concentrated (No. 9,213), (1:15).
85° F.	100	parts Alumina Paste.
	11	parts Nitrate of Lead.

Production, 27 parts Dry Lake.

EOSINE YELLOW SHADE CONCENTRATED.

	15	parts Eosine Y.S. Concentrated (No. 9,212).
85° F.	100	parts Alumina Paste.
	10	parts Nitrate of Lead.

Production, 27 parts Dry Lake.

ARTIFICIAL VERMILION.

	50	parts Red Lead.
85° F.	8	parts Eosine Yellow S. (1:50).
	13	parts Nitrate of Lead.

Production, 62 parts Dry Lake.

CARDINAL.

	9	parts Cardinal 4 B. (1:100).
	150	parts Alumina Paste.
100° F.	12	parts Tannic Acid.
	5	parts Tartar Emetic.

Production, 40 parts Dry Lake.

PYRONINE.

	8	parts Pyronine G. (1:100).
	150	parts Alumina Paste.
100° F.	3	parts Tannic Acid.
	$1\frac{1}{2}$	parts Tartar Emetic.

Production, 31 parts Dry Lake.

CRIMSON YELLOW SHADE.

	8	parts Crimson Yellow Shade (1:100).
	150	parts Alumina Paste.
115° F.	10	parts Tannic Acid (1:10).
	$2\frac{1}{2}$	parts Tartar Emetic (1:20).

Production, 32·3 parts Dry Lake.

RUBINE.

	8	parts Rubine Crystals (1:100).
	150	parts Alumina Paste.
115° F.	$14\frac{1}{2}$	parts Tannic Acid (1:10).
	$6\frac{1}{2}$	parts Tartar Emetic (1:20).

Production, 35·7 parts Dry Lake.

DIAMOND FUCHSINE

	8	parts Diamond Fuchsine.
	150	parts Alumina Paste.
100° F.	13	parts Tannic Acid (1:10).
	6	parts Tartar Emetic.

Production, 33·9 parts Dry Lake.

SAFFRANINE (F.F. EXTRA).

As Diamond Fuchsine.

Production, 35·2 parts Dry Lake.

SAFFRANINE (B.B. EXTRA).

	8	parts Saffranine B.B.E. (1:100).
	150	parts Alumina Paste.
100° F.	8	parts Tannic Acid (1:10).
	4	parts Tartar Emetic (1:20).

Production, 32·1 parts Dry Lake.

RHODULINE RED.

	8	parts Rhoduline G. (1:100).
	150	parts Alumina Paste.
100° F.	13	parts Tannic Acid (1:10).
	3	parts Tartar Emetic (1:20).

Production, 38 parts Dry Lake.

RHODULINE RED (B.).

Precipitate as Rhoduline Red G. Wash once.

Production, 38 parts Dry Lake.

CHAPTER VII.

WHITE AND BLACK PIGMENTS.

In the preceding chapters we have dealt with the various classes of coloured pigments. There still remain, however, those important substances used as pigments, bases or adulterants, and which are, for the most part, white or nearly so, as well as those carbonaceous substances which do not fall under any of the groups already treated of.

It is noteworthy that both white and black pigments are usually the result of special processes and industries, so that the colour maker who is concerned in the preparation of the coloured pigments, does not as a rule manufacture either white or black pigments. It is none the less important, however, that he should possess a knowledge of their composition and general mode of preparation, and with this end in view they have been included here.

White Pigments.

White Lead.—Used as the basis of many paints, and also in the manufacture of various dry colours, *e.g.*, chromes, lakes, etc. Manufactured (1) by the old Dutch or stack process, in which plates of metallic lead are exposed to the action of acetic acid vapour in the presence of carbonic acid gas generated by the decomposition of tan bark. The white lead forms as a crust of hydrated carbonate on the plates, from which it is after the lapse of time removed, ground in water, dried and sold as commercial white lead. (2) Newer methods of manufacture are based on precipitation processes, and numerous modifications are adopted. The product sought for is always the hydrated carbonate, both the pure hydrate and the pure carbonate being useless for painting purposes.

SULPHATE OF LEAD, also called new or non-poisonous white lead and Glasgow lead, is a frequent substitute for true white lead, being much cheaper. It is produced by a furnace process which requires special plant. Being a somewhat crystalline substance, sulphate of lead is a useful base in many processes of colour making. It may be usefully employed in chrome and Brunswick green making as well as in the making of lakes and partial lakes. It has a considerable affinity for dyestuffs, so that for aniline lakes it is sometimes valuable.

OXIDE OF ZINC is wholly imported. The best grades come from the continent, and carefully selected zinc is used in the making. America now supplies large quantities. Besides its use in paints, enamels, anti-fouling compositions, etc., it is very useful in colour making, as it usually imparts brilliancy and beauty of tint to pigments in which it is used as a base. Lakes often contain oxide of zinc, but its tendency is to produce violet or blue tones.

SULPHIDE OF ZINC, LITHOPONE, NEW WHITE, CHARLTON WHITE are all names for practically the same article, which consists essentially of true sulphide of zinc struck on a base of sulphate of barium. None of the ordinary grades contain more than 30–33% pure sulphide, and many of them much less. The pigment has good body, and is a cheapener of oxide of zinc in paint.

PRECIPITATED SULPHATE OF BARIUM, OR BLANC FIXE is used in certain precipitated colours, and in lakes.

BARYTES, SULPHATE OF BARYTES, or ENAMEL WHITE, is of the same chemical composition as the precipitated sulphate, but differs in its physical properties. It is mined in the native state, sometimes very pure and of a splendid white colour, sometimes stained with iron, and contaminated with silica, etc. The best grades are used in paint making for reducing white lead and zinc paints; the second and third grades are used in the various coloured paints.

WHITING OR PARIS WHITE is the native chalk or carbonate of lime. When dry ground it forms ordinary whiting. The whiter and finest ground portions are sold as Paris white. Putty, driers and paint are the chief directions in which it is used. In dry colour making its use is not recommended except in special cases, its yellowish colour and tendency to alkalinity being bad features.

SULPHATE OF LIME, GYPSUM, OR TERRA ALBA is found native, and can also be precipitated by the addition of sulphuric acid or soluble sulphates to solutions of lime salts. It is greatly used in colour making on account of its fine texture, good colour, and affinity for colouring matter.

CHINA CLAY is a curiously inert substance. It is a natural silicate of alumina, and after being mined undergoes a process of grinding in water, and floating to purify it. In common with other compounds of alumina, it possesses a marked affinity for colouring matter, which feature renders it a useful base for many lakes and partial lakes.

Black Pigments.

Numerous chemically-prepared blacks have already been referred to. There still fall to be mentioned the black pigments whose colour base is carbon.

LAMP OR VEGETABLE BLACK is produced by the imperfect combustion of waste fat, grease, coal tar, oil refuse, etc. The smoky fumes are collected in sacking, and the black collects in flakes. The finer sorts are usually called vegetable black.

GAS OR CARBON BLACK is the result of burning natural oil gas in America. It is a very strong staining black.

MINERAL BLACK varies in quality. It is a carbonaceous schist, and when powdered is of use as an ingredient of black paint, as a cheapener or as an adulterant of lamp black. It possesses poor staining properties, however, and can only be regarded as a convenient cheapening agent for the better blacks.

BLUE BLACK is a mixture of mineral black with whiting. The two are roughly ground together damp, and then dried.

IVORY OR BONE BLACK.—The bones used by the ivory black manufacturer may be in the raw state (*green* as it is termed in the trade), or they may previously have been treated to extract the grease. If the fat has not been extracted they should be boiled in water by steam heat, and the resulting fat can be used in the manufacture of soaps, greases, etc. If already extracted no treatment is necessary previous to being calcined, with the exception of being sorted into lots of which the bones in each are roughly of the same size. This applies to both classes of bones. If this were not done the small bones would be overburned before the large ones were sufficiently burned, and would cause brown spots of hard uncarbonised bones, which would injure the colour and render proper grinding difficult. The bones, after sorting, are charged into gas retorts and calcined for about four hours or more, according to the size of the bones. When sufficiently burned, rake into iron drums and seal with clay till cool. When cool grind dry through a disintegrator ; mill and sift, or what is better, levigate and dry on slabs or sheets of iron or glass in the well-known form of drops. The best qualities of this black are made, as the term "Ivory" would imply, from ivory waste. This is a material not easily obtainable, and most of the ivory black of to-day is simply the better bone black.

CHAPTER VIII.

VARIOUS DRY COLOURS AND SUNDRIES.

In this chapter are given formulæ and practical directions for the preparation of the various dry materials which do not come within the scope of previous chapters, but which are of the nature of pigments.

Bronze Powders.

Gold.

Melt two lbs. of pure tin in a crucible, and add under constant stirring one lb. of mercury previously heated in an iron ladle until it begins to emit fumes. When cold this alloy is powdered and mixed with one lb. each of sal ammoniac and sublimed sulphur. Enclose the whole in a retort and immerse in a sand bath. Apply heat to the sand bath and maintain it until the sand becomes red hot, and it is certain that vapours are no longer evolved from the retort. Allow to cool.

The gold bronze is found at the lower part of the retort as a shining gold-coloured mass, which must be reduced to powder. The upper layer consists of sal ammoniac and sulphide of mercury.

Silver.

Melt together one lb. each of tin and bismuth, and then add $1\frac{1}{4}$ lbs of mercury, and when cold reduce to an impalpable powder. It must be borne in mind that when tin is heated above melting point, 442° F., with free access of air, it oxidises and becomes a yellowish white powder, and that it volatilises at white heat.

RED.

Mix together two lbs. sulphate of copper and one lb. one oz. of soda crystals. Heat until fused. When cold, powder, and add five ozs. of copper filings, mix together, and apply heat. Keep the compound at a white heat for twenty minutes; when cold, reduce to a fine powder, wash and dry.

Filling-up Powders.

These preparations are largely used in the coach-making, painting, furniture, blind-making, and other trades, in which woodwork has to be painted or varnished. The object of the filling is to make the surface uniform, and to fill up the minute lines and cracks which all wood surfaces contain. In the case of the better woods which are used for the natural beauty of their grain, the filling-up powder assists in bringing this out.

There are two classes of filling-up powders, the composition of which varies according to the purpose for which the powder is required.

(1) WOOD FILLERS FOR VARNISHED OR POLISHED SURFACES. —In these the object is to fill the pores with a transparent or semi-transparent substance which answers the double purpose of rendering the whole surface perfectly smooth and of bringing out the grain of the wood. This class of filler is greatly used in America. The following are suitable mixtures for this purpose:—

FOR PLAIN VARNISHED BLIND LATHS.

J.F.L.S. French Ochre............	2	parts.
Powdered Pumice	1	part.

FOR HARD NATURAL WOOD.

Finely ground Silica...............	2	parts.
Finely ground Pumice	2	parts.
J.F.L.S. Ochre (to colour if desired)	$\frac{1}{2}$ to 1	part.

It is usual now to prepare these fillers by grinding the powder in turps and pale goldsize.

(2) FILLERS FOR SURFACES WHICH HAVE TO BE PAINTED.— In these transparency is no object, and a powder is required which covers well, and will stop suction.

The following are several leading grades :—

COACHMAKERS'.

	cwt.	qrs.	lbs.
Whiting	1	0	0
Mineral Black	0	0	21
Powdered Litharge	0	0	7

GREY.

Whiting	1	0	0
Mineral Black	0	0	14
Powdered Litharge	0	0	7

YELLOW.

Whiting	1	0	0
English Ochre	1	0	0
Powdered Litharge	0	0	14

PINK.

Whiting	1	0	0
Venetian Red	0	0	14
Powdered Litharge	0	0	7

METAL-FILLER, OR ANTI-CORROSION PAINT POWDER.

This powder may be rubbed well into the metal, and is a good preparation for painting.

½ cwt. Powdered Glass.
½ cwt. Dry Lead Sulphate
¼ cwt. Dry Terra Alba.

Mix ingredients on edge runners or conical mill. This can be tinted up to any shade by the addition of the necessary pigment.

Mixed Dry Colours.

Dry colours may be mixed in any proportion in order to produce definite shades, or to procure a desired cost. In blending different pigments, it must be remembered that some pigments react on each other, one or both of a mixture of two being in many cases ultimately destroyed.

Thus, chrome yellow and Prussian blue sooner or later destroy one another.

Ivory or bone black will bleach pigments of organic origin, such as lakes.

Pigments containing sulphur as sulphide are liable to blacken lead compounds.

Iron pigments must not be mixed with quercitron lakes, or with pigments containing tannin.

The following list contains some typical mixtures which are mostly used as coachmakers' colours. Numerous others will suggest themselves.

BLUE COACH COLOUR.

	Parts.
Prussian Blue	5
Zinc Oxide	5

MAROON COACH COLOUR.

	Parts.
Rose Pink	7
Vermilionette	3

DARK COACH RED.

	Parts.
Indian Red	5
Vermilionette	5

BLUISH BUFF COACH COLOUR.

	Parts.
Zinc Oxide	9
Venetian Red	2
Ultra Blue	1
Raw Sienna	18

LIGHT RED COACH COLOUR.

	Parts.
Indian Red	3
Venetian Red	2
Vermilionette	7

DARK PURPLE LAKE COACH COLOUR.

	Parts.
Rose Lake	4
Rose Pink	3
Prussian Blue	trace

Powdered Dryers (or Driers).

Under the names of French, powdered, zinc, and zumatic dryers are included various mixtures of borate or sulphate of manganese, with a white base, such as terra alba. The proportions can be varied at pleasure to suit the price. The following are typical mixtures.

No. 1.

	cwt.	qrs.	lbs.
Terra Alba	2	1	0
Borate of Manganese	0	1	14

No. 2.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Best Barytes	3	0	0
Borate of Manganese	0	3	0

No. 3.

	cwt.	qrs.	lbs.
Zinc White	2	0	0
Sulphate of Manganese	0	0	2
Acetate of Manganese	0	0	2
Sulphate of Zinc	0	0	2

No. 4.

	cwt.	qrs.	lbs.
Zinc White	1	0	0
Whiting	2	0	0
Borate of Manganese	0	0	14
Sulphate of Manganese	0	0	14
Pale Powdered Resin	0	0	14

SUGAR OF LEAD DRIERS.

	cwt.	qrs.	lbs.
Dried White Sugar of Lead	2	0	0
Zinc Oxide	0	2	0
Terra Alba	0	2	0

Dry Wood Stains.

Many of the aniline dyes are excellent stains for wood in their ordinary state; other dyes, however, may require some preparation. A well known series of dry wood stains is made as follows:—

DRY STAINS (SOLUBLE IN WATER OR VARNISH).

WALNUT.

Vandyke Brown (soluble)	8 lbs.
Ammonia	3 pints.

Dissolve Vandyke brown in water to stiff paste, mix in the ammonia, boil, dry, and crush.

MAHOGANY.

4	lbs.	Walnut	Sol. aniline dye.
$2\frac{1}{2}$	lbs.	Crimson Crystals	Sol. aniline dye.
2	lbs.	Red	Sol. aniline dye.
2	lbs.	Sugar.	

OAK STAIN.

6	lbs.	Walnut	Sol. aniline dye.
1	lb.	Oak	Sol. aniline dye.
4	lbs.	Sugar.	
4	oz.	Picric Acid.	

EBONY.

6	lbs.	Sugar	
$1\frac{1}{2}$	lbs.	Water Black	Sol. aniline dye.
$\frac{1}{2}$	lb.	Aniline Black	Sol. aniline dye.
$1\frac{1}{4}$	lbs.	Walnut.	

SATINWOOD.

7 lbs. Sugar
6 lbs. Picric Acid
2 lbs. Walnut (sol. aniline dye).

Wood Stains in Water, or Liquid Stains.

A selection of typical liquid stains may be included here, and any of the dry stains already described may be turned into liquid stains by dissolving in water.

Bottled stains frequently constitute a profitable line in the way of painters' sundries.

MAHOGANY.

4 oz. Mahogany Dry Stain
4 oz. Ammonia
1 gallon Water.

WALNUT STAIN.

Water	1 quart.
Soda	$1\frac{1}{2}$ ozs.
Vandyke Brown	$2\frac{1}{2}$ ozs.
Bichromate of Potash	$\frac{1}{4}$ oz.

Boil for 10 minutes.

WALNUT OR DARK OAK.

Two parts permanganate of potash dissolved in 30 parts hot water.

CHERRYWOOD.

$\frac{1}{2}$ lb. Madder
2 oz. Logwood Chips.

Boiled in 1 gallon water.

WALNUT.

24 lbs. Soluble Vandyke Brown.
16 gallons Boiling Water.
1 quart Ammonia.

SATINWOOD.

3 gallons Water.
6 lbs. Picric Acid.
1 pint Ammonia.

OAK.

½ of Walnut. 1237

½ of Satinwood.

This gives a yellowish oak colour, called light oak, or American oak.

OAK (A WARM DARK TONE).

6 gallons Water.
4 lbs. Prepared Vandyke.
½ gallon Ammonia.

MAHOGANY.

5 lbs. Red (Water).
3 oz. Crimson Crystals.
8 gallons Boiling Water.
8 gallons Walnut Stain.

ROSEWOOD.

3 quarts Mahogany.
1 quart Walnut.

EBONY.

3 lbs. Black (Water).
5 lbs. Sol. Vandyke Brown.
8 gallons Boiling Water.
1 quart Ammonia.

WOOD STAINS (ANOTHER METHOD).

To a solution of 50 parts of commercial alizarin in 1,000 parts water, is added ammonia, drop by drop, until a perceptible ammonia odour is developed. The solution will give to fir and oak a yellow-brown colour, to maple a red-brown. If the wood is then treated 1242 with a 1 per cent. aqueous solution barium chloride, the fir or pine becomes brown and the oak a dark brown. If crystallised calcium chloride be used instead of barium chloride, the fir becomes brown, the oak red-brown, and maple dark brown. If a 2 per cent. aqueous solution of magnesium sulphate be used, the fir and oak become dark brown, and the maple a dark violet-brown. Alum and aluminium sulphate produce on fir a high red, on oak and maple blood-red. Chrome-alum colours maple and fir reddish-brown, and oak Havana brown. Manganese sulphate renders fir and maple dark violet-brown, and oak walnut-brown.

Dry Distempers.

The simplest formula for these is a base of whiting tinted with a suitable colour (preferably oxide of iron or earth colour, ultramarine, and mineral black), and containing powdered glue or size powder to bind them.

SERIES NO. 1.

WHITE.

Whiting	1	cwt.
Ultramarine Blue	5	oz.
Dry Powdered Size	10	lbs.

Blend the whole together; crush and sieve through a hair sieve.

LAVENDER.

Whiting	1	cwt.
Vermilionette	8	lbs.
Blue Ultra	4	lbs.
Dry Size	13	lbs.

Same process as above.

SILVER GREY.

Whiting	1	cwt.
Vegetable Black	½	lb.
Ultramarine Blue	3	lbs.
Dry Size	11½	lbs.

LIGHT BUFF.

Whiting	1	cwt.
Oxford Ochre	9	lbs.
Venetian Red	1	lb.
Dry Size	12¼	lbs.

LIGHT BLUE.

No. 1.

Whiting	1	cwt.
Ultramarine Blue	7	lbs.
Dry Size	12	lbs.

No. 2.

Whiting	1	cwt.
Prussian Blue	3	lbs.
Dry Size	11	lbs.

FRENCH GREY.

Whiting	1	cwt.
Ultramarine Blue	4	lbs. 6 oz
Venetian Red	4	lbs.
Dry Size	12	lbs.

PRIMROSE.

Whiting	1	cwt.
Lemon Chrome	4	lbs.
Dry Size	10	lbs.

SALMON.

Whiting	1	cwt.
Venetian Red	$4\frac{1}{2}$	lbs.
Yellow Ochre	$2\frac{1}{4}$	lbs.
Dry Size	$13\frac{1}{2}$	lbs.

ROSE PINK.

Whiting	1	cwt.
Vermilionette	9	lbs.
Dry Size	13	lbs.

INDIAN RED.

Indian Red	30	lbs.
Whiting	70	lbs.
Dry Size	18	lbs.

TERRA COTTA.

Venetian Red	25	lbs.
Yellow Ochre	18	lbs.
Whiting	1	cwt.
Dry Size	20	lbs.

PEA GREEN.

Whiting	1	cwt.
Light Brunswick Green	20	lbs.
Prussian Blue	2	lbs.
Dry Size	12½	lbs.

SAGE GREEN.

Whiting	1	cwt.
Dark Brunswick Green	18	lbs.
Yellow Ochre	3	lbs
Dry Size	14	lbs.

OLIVE GREEN.

Dark Brunswick Green	56	lbs.
Whiting	56	lbs.
Prussian Blue	2¼	lbs.
Dry Size	12½	lbs.

EMERALD GREEN.

Lime Green	90	lbs.
Whiting	20¾	lbs.
Dry Size	11	lbs.

EAU DE NIL.

Whiting	112	lbs.
Dark Brunswick Green	18	lbs.
Yellow Ochre	6	lbs.
Dry Size	14	lbs.

TURQUOISE.

Whiting	1	cwt.
Prussian Blue	5	lbs.
Lime Green	2	lbs.
Dry Size	13½	lbs.

CANARY.

Whiting	1	cwt.
Middle Chrome	8	lbs.
Ochre	1	lb.
Dry Size	11¼	lbs.

LIGHT STONE.

Whiting	1	cwt.
Yellow Ochre	$2\frac{1}{4}$	lb.
Raw Umber	$\frac{1}{2}$	lb.
Dry Size	$12\frac{1}{2}$	lbs.

DARK STONE.

Whiting	1	cwt.
Ochre	5	lbs.
Raw Umber	$\frac{3}{4}$	lb.
Dry Size	13	lbs.

PORTLAND STONE.

Whiting	1	cwt.
Vegetable Black	1	lb.
Venetian Red	$\frac{1}{2}$	lb.
Ultramarine Blue	1	lb.
Ochre	1	lb.

IVORY WHITE.

Whiting	1	cwt.
Ochre	$\frac{1}{2}$	lb.
Dry Size	$10\frac{1}{4}$	lbs.

NUT BROWN.

Purple Brown	56	lbs.
Whiting	56	lbs.
Ochre	7	lbs.
Raw Umber	7	lbs.
Dry Size	20	lbs.

ELECTRIC GREEN.

Whiting	1	cwt.
Deep Brunswick Green	13	lbs.
Lemon Chrome	1	lb.
Dry Size	$11\frac{1}{2}$	lbs.

CHOCOLATE.

Purple Brown	70	lbs.
Whiting	30	lbs.
Venetian Red	2	lbs.
Vegetable Black	3	lbs
Dry Size	22	lbs

CORAL.

Whiting	1	cwt.
Venetian Red	11	lbs.
Ochre	6	lbs.
Dry Size	17	lbs.

MAIZE.

Whiting	1	cwt.
Ochre	12	lbs.
Lemon Chrome	2	lbs.
Dry Size	13	lbs.

SERIES No. 2.

Reduce the whiting by 10 lbs. and add 10 lbs. of dry white lead and three lbs. of white sugar, and 1 lb. alum. The same colour quantities, as the difference in the base is not material to shades.

Both 1 and 2 are washable, especially No. 2. They require to every cwt. 13 to 14 gallons of warm or hot water. Are easy of application, and colours do not fade, as only stable pigments are included.

SERIES No. 3.

WASHABLE DISTEMPER POWDERS.

This series is in many respects similar to the preceding, but, owing to the presence of white zinc, better tints can be obtained. They may also be sent out in 7 lb. packets, which make about one gallon of distemper by the addition of boiling water. It can be prepared for use by soaking in cold water, but better effects are obtained by boiling it, and allowing it to cool to a jelly, when it works with great freedom.

Process.—Dissolve the glue in hot water, add the alum and then the soap powder previously dissolved in hot water. A large vessel is necessary for this process, as there is a large amount of froth in the admixture of the glue, alum and soap liquor. Thoroughly incorporate with various pigments and strain through a coarse sieve. Pour into shallow trays and dry in a colour stove at a heat not exceeding 200° F. Thoroughly dry it, but care must be taken that it does not bake. Then it should be reduced to a coarse or granular powder. It is then ready for packing.

WHITE.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	1	2
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
Blue Black		2 oz.	

GREY.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	0	25
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
Ultramarine Blue	0	0	4
Mineral Black	0	0	2

LIGHT BLUE.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	0	14
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
Ultramarine Blue	0	0	7

DARK BLUE.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	0	14
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
Ultramarine Blue	0	0	14

LIGHT YELLOW.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	0	25
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
No. 2 Lemon Chrome	0	0	7
Italian Ochre	0	0	7

DEEP YELLOW.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	0	25
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
No. 2 Middle Chrome	0	0	14
Italian Ochre	0	0	14

HARVEST OR CORN YELLOW.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	0	14
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	$0\frac{1}{4}$
No. 2 Middle Chrome	0	0	3
Italian Ochre	0	0	7

LIGHT STONE COLOUR.

	cwt.	qrs.	lbs.
Whiting	0	3	0
Zinc White	0	0	5
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼
English Ochre	0	0	4

DARK STONE.

	cwt.	qrs.	lbs.
Whiting	0	3	0
Zinc White	0	0	5
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼
English Ochre	0	0	7

RED.

	cwt.	qrs.	lbs.
Whiting	0	0	20
Venetian Red	0	3	0
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

TERRA COTTA.

	cwt.	qrs.	lbs.
Whiting	0	3	0
Venetian Red	0	0	20
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

ROSE PINK.

600,22

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	1	2
Derby Red	0	0	10
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

PINK.

601,2.

	cwt.	qrs.	lbs.
Whiting	0	2	14
Zinc White	0	1	2
Middle Indian Red	0	0	5
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

LIGHT GREEN

	cwt.	qrs.	lbs.
Whiting	0	2	0
Zinc White	0	0	14
Lime Green	0	1	0
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

DARK GREEN.

	cwt.	qrs.	lbs.
Whiting	0	2	0
Zinc White	0	0	14
Lime Green	0	1	0
Ultramarine Blue	0	0	7
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

CITRON GREEN.

	cwt.	qrs.	lbs.
Whiting	0	2	0
Zinc White	0	0	14
Italian Ochre	0	0	20
Dark Brunswick Green	0	0	10
Glue	0	0	12
Mottled Soap	0	0	1
Alum	0	0	0¼

The foregoing shades form a useful selection ; others can be made on similar lines if desired.

SERIES No. 4.

WASHABLE DISTEMPER IN DRY POWDER.

TO BE MIXED FOR USE WITH HOT WATER.

This is a cheap line similar to Series 1. The base varies somewhat, and powdered glue is the binding material.

WHITE BASE.

	cwt.	qrs.	lbs.	
Fine Whiting	0	2	0	700.
Best Barytes	0	1	0	
Plaster of Paris	0	1	0	
Powdered Glue	0	0	10	

Grind thoroughly together.

May be tinted to any of the usual distemper colours, of which the following are a selection.

LIGHT BLUE.

	cwt.	qrs.	lbs.
White Base	1	0	0
Ultramarine Blue	0	0	4

MIDDLE BLUE.

	cwt.	qrs.	lbs.
White Base	1	0	0
Ultramarine Blue	0	0	10

Deep Blue.

	cwt.	qrs.	lbs.
White Base	1	0	0
Ultramarine Blue	0	0	14

Lemon Chrome.

	cwt.	qrs.	lbs.
White Base	1	0	0
No. 1 Lemon Chrome	0	0	10
Yellow Ochre	0	0	1

Orange Chrome.

	cwt.	qrs.	lbs.
White Base	1	0	0
No. 1 Orange Chrome	0	0	10
Spanish Brown	0	0	0½

Light Stone.

	cwt.	qrs.	lbs.
White Base	1	0	0
Yellow Ochre	0	0	6
Umber	0	0	2

Dark Stone.

	cwt.	qrs.	lbs.
White Base	1	0	0
Umber	0	0	6
Yellow Ochre	0	0	2

Fawn.

	cwt.	qrs.	lbs.
White Base	1	0	0
Yellow Ochre	0	0	21
Umber	0	0	3
Spanish Brown	0	0	4

Light Green.

	cwt.	qrs.	lbs.
White Base	1	0	0
Ultramarine Green	0	0	14

DARK GREEN.

	cwt.	qrs.	lbs.
White Base	1	0	0
Ultramarine Green	0	0	14
Ultramarine Blue	0	0	7

BLUSH TINT.

	cwt.	qrs.	lbs.
White Base	1	0	0
Yellow Ochre	0	0	6
Spanish Brown	0	0	3

PALE ROSE.

	cwt.	qrs.	lbs.
White Base	1	0	0
Spanish Brown	0	0	10

BRICK RED.

	cwt.	qrs.	lbs.
White Base	1	0	0
Spanish Brown	0	1	2
Mineral Black	0	0	7

BRIGHT RED.

	cwt.	qrs.	lbs.
White Base	1	0	0
Light Red Oxide	0	1	14
Vermilionette	0	0	7

DARK SLATE.

	cwt.	qrs.	lbs.
White Base	1	0	0
Mineral Black	0	0	8

BROWN.

	cwt.	qrs.	lbs.
White Base	1	0	0
Umber	0	1	14
Purple Brown	0	0	14
Mineral Black	0	0	14

HARDENING SOLUTION FOR USE WITH THE FOREGOING.

	cwt.	qrs.	lbs.
Sugar	1	0	0
Water	10 gallons.		
Raw Linseed Oil	10 gallons.		

Mix the sugar with the water, and add to the linseed oil. To render the distemper harder and more washable add three pints to each one cwt. of distemper.

KALSOMINES AND CALCARIUMS.

No. 1.

For the Binding Medium use:—

1 lb. 9 ozs. Soda Crystals.
5 lbs. Shellac (Powdered).

Dissolve the soda in water, and add the powdered shellac; then heat up until thoroughly emulsified and of a uniform consistency. Let dry by exposure to the air, then pulverise very fine.

TAKE—

3 lbs. of Dry Base (Whiting, Zinc, etc., may be used according to price required.)
1 lb. of Binding Medium as above.

Use tinting colours as required.
In the following no special binding medium is required.

No. 2.

112 lbs. Dry Slaked Lime.
140 lbs. Whiting (Dry).
28 lbs. Raw Linseed Oil.
30 lbs. Alum.
14 lbs. Glucose.
28 lbs. Dry Concentrated Blue.

Colour to shade required.

Process.—Grind all together and pulverise; then thin out with water for use.

No. 3.

112 lbs. Whiting.
20 lbs. Dry Slaked Lime.
5 lbs. Casein.
10 lbs. Powdered Concentrated Glue.
2 lbs. Soda.
5 lbs. Silicate of Soda.

Process.—Grind altogether and pulverise, and colour to shade required.

No. 4.

56 lbs. Whiting.
6 lbs. Alum.
28 lbs. Terra Alba.
10 lbs. Powdered Concentrated Glue.
28 lbs. Linseed Oil.

Colour to shade required.

Process.—Grind all together, and thin down for use with water.

No. 5.

Whiting	56 lbs.
Dry Slaked Lime	28 lbs.
Barytes	56 lbs.
Powdered Glue	10 lbs.
Silicate of Soda	15 lbs.

Colour to shade required.

Grind all together and well pulverise, then mix with water to consistency for use.

ENCAUSTIC DISTEMPER POWDERS.

This class contains, besides the usual binding agent (size or glue), a self-hardening substance of a cement nature, the base of which is often plaster of Paris. The powders are often put up in 7 lb. packets, which, with the addition of boiling water, make about a gallon of distemper. More or less water may be used, according to special requirements. It is an improvement if the powder is boiled with the water. First coat applied warm, second and third coats cold, and of the consistency of jelly. It is damp, proof and washable, and may be painted over, but is not so suitable for varnishing. May be used as a filler for rough walls, to make a smooth surface for painting or papering.

WHITE.

	cwt.	qrs.	lbs.
Best Quality Keene's Cement	0	3	14
Zinc White	0	3	14
Concentrated Size Powder	0	0	20
Dry Soap Extract	0	0	10

GREY.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
Zinc White	0	3	14
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10
Ultramarine Blue	0	0	4
Mineral Black	0	0	3

STONE COLOUR.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
Zinc White	0	3	14
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10

Oxford Ochre, 4 to 20 lbs., according to shade.

DRAB.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
Zinc White	0	3	14
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10
Middle Chrome	0	0	10
Manganese Black	0	0	7

RED.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
Red Oxide of Iron	0	2	4
Purple Oxide of Iron	0	1	12
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10

OAK COLOUR.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
English Ochre	0	2	4
Red Oxide of Iron	0	0	10
Burnt Umber	0	1	2
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10

PURPLE TINT.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
Zinc White	0	3	14
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10
Purple Oxide	0	0	10

IVORY COLOUR.

	cwt.	qrs.	lbs.
Keene's Cement	0	3	14
Zinc White	0	3	14
Concentrated Size Powder	0	1	2
Dry Soap Extract	0	0	10
Raw Umber	0	0	4

The above is the most useful range of colours to make the encaustic powder, but many more may be made as desired on the same lines, using freshly prepared Plaster of Paris, or other similar self-hardening material, as the base.

PART II.

OILS, PAINT MEDIUMS, AND VEHICLES.

CHAPTER IX.

RAW AND BOILED LINSEED OILS.

Linseed oil as it reaches the consumer after being expressed from the seed is a yellow limpid oil, possessing a greater or less degree of colour according to the source of the seed. The colour of the oil is an important point, and furnishes a guide to the origin of the seed. Most of the oil now expressed in this country is obtained from one or other of three kinds of seed. (1 East Indian or Calcutta seed, (2 Russian or Baltic seed, and (3) South American or La Plata seed. There are two varieties of East Indian seed, summer and winter, and the oil expressed varies in quality according to the time of year during which the seed ripened, as well as on account of other local circumstances. The composition also of the seed varies greatly. Some samples contain much mucilage and albuminous matter, which separates out from the oil as a flocculent deposit or "foots." Moist or musty seed also furnishes inferior oil. The colour of the oil, although an important feature for certain purposes, such as varnish making, is not a criterion of the intrinsic value of the oil or of its drying properties. Many dark-coloured oils make capital boiled oil if they are suitable in other ways.

Attention is directed to these points because if the oil is to be used for special purposes, such as varnish making, or for the fabrication of special drying compositions great care must be bestowed on its selection.

TESTING LINSEED OIL.—A tube of the oil should be stood in a cool place to see whether any foots are deposited.

Another portion should be heated to 220° F. to see whether foots are precipitated on boiling.

Drying qualities may be tested by exposing films of the oil on sheet lead and glass respectively, and observing the time of drying, and the nature of the varnish film produced.

The taste should be mild and characteristic.

The sp. gr. should be on an average ·934 at 60° F. Any great departure from this figure suggests probable adulteration. The introduction of cotton oil will lower the sp. gr. Rape oil lowers it still more. Rosin oil raises it. Therefore, the proper sp. gr. may be maintained by introducing a mixture of a lighter oil, like cotton or rape, and a heavier one like rosin oil.

The following rule is useful if the temperature at which the sp. gr. is taken is not 60° F. :—

For every five degrees in temperature above 60° add 2 to the last figure of the gravity ; for every five degrees below 60 deduct 2 from the reading. Thus, suppose the temperature is 65° F., and the hydrometer shows a gravity of ·933, then add ·002 = ·935, sp. gr. at 60°. If the temperature is 57·5° F. (= $2\frac{1}{2}$° below 60°) and the hydrometer reads ·935, then the sp. gr. at 60° will be ·001 less, or ·934.

All good quality linseed oil, whether it is to be used raw or is to be boiled, should be tanked before use, so that all the albuminous matter may be deposited. Oil boiled from untanked oil is difficult to boil, is apt to froth, and does not clear so well afterwards as well racked oil, and further, the drying properties of the product are injured.

Raw Paint Oils.

This term is often applied to reduced linseed oil, which has to be supplied to meet competition or the requirements of foreign or colonial buyers.

As a rule the base is genuine raw linseed oil, and the cheapening agent is a mineral oil. The later may be either a light mineral oil—such as the American blending or neutral oils—or it may be pale refined rosin oil. If it is desired to keep the gravity right a mixture of the two should be used. As a rule the light Russian oils are rather strong-smelling for using to reduce linseed oil.

Very often the mineral oil is treated with nitro-naphthalene to destroy its bloom, and the resulting bloomless oils are much used to mix with linseed oils. The chemical in them, however, has the property of causing the oil to turn cloudy sooner or later, so that it is often questionable whether it is good policy to use them.

The following are proportions in which linseed oil is blended for varying requirements:—

LINSEED OIL, OR RAW PAINT OIL.

No. 1.

	Genuine R.L.O.	2	parts.
971 A	Pale Mineral Oil	½	part.
	Pale Refined Rosin Oil	½	part.

No. 2.

	Genuine R.L.O.	3	parts.
972 A	Pale Mineral Oil	1	part.
	Pale Refined Rosin Oil	1	part.

No. 3.

	Genuine R.L.O.	1	part.
973 A	Pale Mineral Oil	½	part.
	Pale Refined Rosin Oil	½	part.

No. 4.

	Genuine R.L.O.	1	part.
974 A	Pale Mineral Oil	1	part.
	Pale Refined Rosin Oil	1	part.

No. 5.

	Genuine R.L.O.	1	part.
975 A	Pale Mineral Oil	2	parts.
	Pale Refined Rosin Oil	2	parts.

Any intermediate qualities can be blended similarly.

Boiled Linseed Oil.

At one time all linseed oil was boiled by direct fire heat ; now steam heat is almost universally used, at any rate in the case of oils to be used for ordinary painting purposes, and the aid of air-blowing is nearly always sought, as the latter both increases the drying properties of the oil and thickens it.

STEAM BOILED LINSEED OIL.—In a large cylindrical tank or vat is fitted a steam coil capable of receiving steam at a pressure of from two to three atmospheres. A pipe is also introduced circularly at the bottom, which is connected with an air-pump or blower. This pipe is perforated with a number of small holes so that the air as it is forced in escapes in numerous fine streams through the oil. The size of the vat should be such that when the full charge of oil is in it is not more than two-thirds full. This is to allow for frothing. Any quantity of oil may be treated, from one ton (six barrels) to 10 tons being the usual limits. Five tons make a convenient batch. The quantities given herewith refer to batches of one ton.

Sometimes, in place of the vat with steam coil, a steam jacketed pan is used. In some ways this is preferable ; there is less loss of heat, and cleaning out is easier.

Process.—The raw oil is pumped into the boiler, steam turned into the coil, and the heat gradually brought up to 220—240° F. This may take from one and a half to two hours. The driers, whether ordinary metallic, such as litharge, etc., or resinate, are meanwhile mixed with a small quantity of the oil by the aid of heat, forming a uniform solution or mixture, and are now added to the bulk of oil. The air-blower is then turned on, and the boiling continued till the oil has acquired the proper colour and body. The temperature should be maintained at 260°—280° F. for from four to six hours after the driers are in, and the air-blowing may be continued all the time or not according as the oil is required dark or rather pale. For double-boiled oil plenty of boiling and air-blowing are necessary.

DRIERS FOR STEAM BOILED OILS.—Recipes will be given at a later stage for oils made from the older-fashioned lead driers. Among the most convenient form of soluble driers are the resinate driers, which are now very generally used. They consist for the most part of resinate of manganese, with which is sometimes associated resinate of lead. These resinates may be purchased ready made from most of the chemical and colour brokers, or they may be made by the oil boiler himself in the following manner:—

Process for Resinate of Manganese.—The rosin should be fairly pale, certainly not darker than G grade. It is crushed fine previous to being used. Every 112 lbs. rosin requires about 15 lbs. caustic soda of 80% strength, but the actual quantity must be accurately determined by a saponification experiment. 765A
A quantity of water is taken, equal to the weight of rosin to be treated, and in it is dissolved the caustic soda. The rosin is then added, and the whole heated up either by open steam or in a jacket pan. In this way is produced a solution of rosin soap. The previously prepared solution of sulphate of manganese is now slowly added to the rosin solution, with constant stirring, till the precipitation is complete. The precipitate consists of resinate of manganese. This is washed and dried, and is then mixed with a small proportion of rosin, and fused gently. It can then be cast into cakes or moulds, and broken up as required.

About 2% to 3% of this will make linseed oil dry well, and 4% to 5% will make a good siccative rosin oil.

STEAM DOUBLE BOILED LINSEED OIL WITH RESINATE DRIER.

10,

Raw L.O.	6 brls.	
Resinate Drier	2 qrs. 7 lbs.	977A

The drier should be melted with five gallons of the oil, and added when the temperature is about 200° F.

DO. (CHEAPER DRIER).

R.L.O.	6 brls.	
Resinate Drier	1 qr. 7 lbs.	
G. Rosin	2 qrs.	973 A

SINGLE-BOILED OILS are prepared by using less drier and boiling for a shorter time. Oil boiled with resinate driers should not be mixed with raw oil, otherwise it is apt to turn cloudy.

Dark Steam Boiled Oils

WITH SOLID DRIERS.

The process of manufacture is similar to that already described, except that the temperature should be raised as high as possible, say to 300° F.

The quantities given are sufficient to make a drier for one ton of oil.

No. 1.

	lbs.
Litharge	10
Red Lead	15
Sulphate of Manganese	3

No. 2.

	lbs.
Litharge	9
Red Lead	12
Sulphate of Manganese	2

No. 3.

	lbs.
Litharge	7
Red Lead	10
Sulphate of Manganese	2½

No. 4.

	lbs.
Litharge	8
Red Lead	5
Sulphate of Manganese	2½

No. 5.

	lbs.
Litharge	6
Red Lead	9
Manganese Dioxide	2½

No. 6.

	lbs.
Litharge	4
Red Lead	6
Manganese Dioxide	1

335

BOILED OIL DRIERS (SPECIAL).

Common Soda	28 lbs. 10

Boil in 15 gallons water.

Sulphate of Manganese	15 lbs.

Boil in 8 gallons water.

Acetic Acid	8 gallons.

Mix the soda solution and the manganese solution, then add the acetic acid slowly. To every ton of oil use four gallons of above liquor.

Get oil to 180°, put in the driers liquor, bring it up to 220° 985 A
for pale boiled oil, and 260° for dark boiled oil.

SPECIAL BOILED LINSEED OIL.

	gals.
Best Baltic Linseed Oil	120
	lbs.
Flake Litharge	21 986 A
Dried Red Lead	7
Dried Umber	21

Measure the oil into a 150-gallon enamelled iron pan, and put in the umber, which should be suspended just under the oil, in a wire cage. For the first three hours slowly heat up the oil to 350°—380° F., and during the next hour add the lead and litharge, a little at a time, with constant stirring. The temperature should now be raised to 420° F., and kept at this at least six hours, stirring well every half-hour, and then leave until next day. Next morning heat up to 400°—420° F., and continue boiling at this temperature eight hours longer; strain and tank for use. It should be kept at least one month before using, but it is better to keep it three months, if possible.

SPECIAL BOILED LINSEED OIL (ANOTHER RECIPE).

	gals.
Baltic Linseed Oil	500
	lbs.
Umber	42 987 A
Powdered Litharge	72
Red Lead	72

Process.—Heat the oil to 320° F., then add the umber, raise heat to 340° F. and add the litharge, then raise heat to 360° F. and add the red lead, and continue heat to 400° F. to finish.

Reduced Linseed Oils or Paint Oils.

Just as raw linseed has to be cheapened, so genuine boiled oil must sometimes be reduced. The most suitable reducing agent is one of the specially prepared siccative rosin oils. These can now be obtained so sweet and free from odour and bloom that it is hard to distinguish them from boiled linseed oil.

If the rosin oil is distilled over quicklime to get rid of traces of acetic acid a better oil will be obtained. To make the best reduced paint oil, the rosin oil (also called vegetable or pine oil) should be well refined and free from added mineral oil. It should be mixed in the desired proportion with the raw oil and boiled along with the latter with a good resinate drier, and with plenty of blowing. Good-drying, bright, attractive oils can be prepared in this way, containing 50% of rosin oil.

CHAPTER X.

PALE BOILED LINSEED OILS.

Pale Boiled Oils are increasing considerably in popularity, and painters and decorators are finding them useful in mixing zinc and lead substitute paints. The following recipes are therefore of great current interest.

The quantities given in the following formulæ are sufficient to make one ton of pale boiled oil.

To make the liquid drier, measure five gallons of raw linseed oil into a copper furnace, and apply heat. Commence sprinkling the driers in at 250° F., and keep stirring continuously to prevent them settling and burning. Increase heat to 500° F., and boil three hours.

The chemicals should be previously dried, and it is a good plan to grind them with a little raw oil in a hand mill and then add the mass to the contents of the pan. Any tendency to boil over may be stopped by pouring in a little raw oil.

To make the pale boiled oil, pump up one ton of raw linseed oil into a steam-jacketed tank, and turn on steam. At 170° F. put on air pump or blower for two hours. At 250° F. pour in the liquid drier by degrees, keeping up a thorough agitation. When all is in, continue blowing four or five hours longer, or until sufficient body is obtained.

LIQUID DRIERS FOR 1 TON OF OIL.

No. 1.

	lbs.
Borate of Manganese	5
White Sugar of Lead	10
Sulphate of Zinc	5

R

No. 2.

	lbs.
Borate of Manganese	7
Sugar of Lead	5
Sulphate of Zinc	7

No. 3.

	lbs.
Borate of Manganese	$7\frac{1}{2}$
Sulphate of Manganese	$7\frac{1}{2}$
Sugar of Lead	5

No. 4.

	lbs.
Borate of Manganese	6
Sulphate of Zinc	4
Acetate of Lime	$1\frac{1}{2}$

No. 5.

	lbs.
Borate of Manganese	8

NOTE.—The borate must be free from iron.

No. 6.

	lbs.
Peroxide of Manganese (washed and dried)	3
Sugar of Lead	1
Borax	$\frac{1}{2}$
Sulphate of Zinc	$\frac{1}{2}$

SPECIAL PALE BOILED OIL.

	Ton	cwt.	qrs.	lbs.
Linseed Oil	1	0	0	0
Sulphate of Manganese	0	0	0	3
Sugar of Lead	0	0	0	7

Dissolve the manganese in one gallon of boiling water and digest the sugar of lead in two gallons of warm oil overnight. Mix or grind together for the liquid drier.

Heat the oil in a jacketed tank to 180° F. and put on air pump or blower. Add the liquid drier by degrees, and raise temperature to 260° F. or 300° F. if possible. Blowing and agitation must be kept up without intermission, and it is a good plan for a rotary pump fixed against the tank to continuously withdraw oil from the bottom and discharge it on top. By a simple arrangement of the pipes and cocks, the same pump can be used for charging the boiling tank and pumping the finished oil into storage tanks.

The oil will assume a pale reddish tinge, and should be finished about two hours after attaining the maximum temperature. Steam should then be shut off, but the air pump may be kept on longer, according to requirements.

No. 2.

	Ton	cwt.	qrs.	lbs.
Linseed oil	1	0	0	0
Sulphate of Manganese	0	0	0	$2\frac{1}{2}$
Sugar of Lead	0	0	0	4
Acetate of Lime	0	0	0	3

995 F

Dissolve the lime and manganese separately in one gallon of boiling water each; cool, strain and mix together. Settle and decant the clear solution of acetate of manganese.

Dissolve the sugar of lead in another gallon of water.

Heat the oil to 180° F., put on air pump, and stir in the acetate of manganese liquor. Then add the lead solution, keeping up a vigorous agitation as previously described, and raise the heat to 300° F. Continue two to four hours.

No. 3.

	Ton	cwt.	qrs.	lbs.
Linseed Oil	1	0	0	0
1. Sulphate of Manganese	0	0	0	15
2. Sugar of Lead	0	0	0	10
3. Litharge	0	0	0	30
4. Sulphate of Zinc	0	0	0	3

996 F

Dissolve 1 and 2 separately in hot water and add the zinc and litharge. Keep stirring till all is well mixed, and then grind with linseed oil.

Heat the oil to 190° F., put on air pump, and carefully add the liquid drier, keeping up a vigorous agitation. Gradually raise the temperature to 240° F. and continue steam, and stir three or four hours.

PALE BOILED OIL (ANOTHER RECIPE).

17	tons	Linseed Oil
1	cwt.	Powdered Litharge
20	lbs.	Sulphate of Manganese.

Heat to 220° for pale boiled oil. Blow in air according to colour required. Work litharge in gradually when temperature is about 180°.

For ordinary boiled oil the temperature may be raised to 260° F., and to 280° for double boiled oil.

The boiling should be continued for from six to eight hours.

TO CHEAPEN PALE BOILED OIL.

	cwt.	qrs.	lbs.
·885 Mineral Oil	2	2	20
Rosin	0	1	12
Nitro Naphthalene	0	0	3
Liquid Driers	0	0	6

Boil to 130° ; keep simmering three hours ; heat the oil, then add resin and dissolve, then add nitro naphthalene.

TO CHEAPEN PALE BOILED OIL.

	cwt.	qrs.	lbs.
Mineral Oil ·885	2	2	20
Amber Resin	0	1	12
Nitro Naphthalene	0	0	3
Liquid Driers	0	0	6

Boil to 130°. Keep at that three hours.

First heat the oil, then add resin ; when dissolved, add the other stuff.

Use above in 6 cwt. of boiled oil ; it reduces the cost nearly 50s.

CHAPTER XI.

OILS FOR SPECIAL PURPOSES.

Most of these are modifications of the oils already described, details in the composition or process being altered to suit the particular purpose for which the oil is to be used.

Special Boiled Oil for Zinc Paints.

Well racked linseed oil is boiled for six or eight hours, and to every 100 lbs. of oil are added 5 lbs. of powdered manganese oxide, which may be kept suspended in a bag like litharge; then 250-F
boil and stir for five or six hours more, and then cool and filter. This drying oil is employed in the proportion of 5 to 10 lbs. per cwt. of the zinc white.

Zinc Drying Oils.

FIRE BOILED.

Baltic Linseed Oil	120 gals.
White Copperas (Dried)	15 lbs.
Litharge	15 lbs.

251-B

Measure the oil into an iron pan and heat up to 400° F. Add the driers and continue boiling one hour, stirring well. The copperas must be quite dry, or it will boil over.

No. 2.

Linseed Oil	120 gals.
White Copperas (Dried)	60 lbs.

252-F

Boil half an hour and allow to stand till bright.

No. 3.

1. Linseed Oil	120	gals.
2. White Copperas (Dried)	120	lbs.
3. Calcined Sugar of Lead	50	lbs.
4. Black Oxide of Manganese (Dried)	2	lbs.

Measure the oil into a pan and boil up. Dissolve 2 and 3 in a small copper with a few gallons of hot oil and gradually pour the solution into the boiling oil, stirring well. When it is taken up, add the manganese and boil till all is dissolved.

STEAM BOILED.

Linseed Oil	120	gals.
White Copperas	12	lbs.
Sulphate of Manganese	40	lbs.
Water	4	gals.

Dissolve the manganese in the four gallons boiling water, grind the zinc with a few gallons of the oil in a hand mill, add to the bulk, and heat in a steam pan to 180° F. Start blower, pour in manganese liquor, and increase heat to 250° or 300° F. Use air freely, and shut off air and steam when the oil has acquired a nice red tinge. Cool to 200° F., strain and tank.

Special Quick-Drying Oils.

No. 1.

	lbs.
Litharge	7
Sugar of Lead	7
Borate of Manganese	7

Heat 1 cwt. linseed oil to 500° F. and gradually sprinkle in above driers (finely ground, dried and mixed together), and blow in air five or six hours until the oil is thick and will dry on glass in one hour.

No. 2.

Heat any of the stout terebine driers (without turps.), and thin down with hot boiled linseed oil, if necessary, blowing in air.

10,028

TO DRY STILL MORE QUICKLY.

No. 1.

Heat 1 cwt. linseed oil to 500° F., blowing in air when the temperature reaches 250° F. At 400° F. gradually sprinkle in the following driers, all finely ground, dried in stove, and mixed together.

	lbs.
Litharge	10
Red Lead	10
Sulphate of Manganese	5
Sulphate of Zinc	5

Keep up the heat till all is dissolved and continue air for six hours.

No. 2.

	lbs.
Litharge	10
Sugar of Lead	5
Borate of Manganese	7

Heat 1 cwt. linseed oil to 500° F. and gradually sprinkle in above driers (finely ground, dried, and mixed together), and blow in air five or six hours until the oil is thick and will dry on glass in one hour or less.

No. 3.

Heat the stoutest of the terebine driers (without turps.), and thin down with hot boiled linseed oil, blowing in air.

New Paint Oil.

This can be made any colour from a shade as pale as raw oil to very dark. Melt 400 lbs. resin; a good clear E. or F. grade resin will do very well for the purpose. Just before the resin is quite melted begin to add powdered sulphur, stirring it in as fast as it is absorbed, till 80 lbs. are put in. Keep the temperature down to 225°, or not over 250° F. Keep at that temperature till the moisture has evaporated. When the foam has subsided (you need not wait till it is all off), begin to run in slowly paraffin oil. Stir well while oil is running in, say about 125 gallons in all. Pump up into settling tanks, and it will very soon clear. This oil, if mixed with common dry colours, such as Venetian red, etc., can be readily spread, and will dry with a good glossy surface on wood or metal. In good, sunny weather it will dry in a few hours, say six to eight. It needs the addition of no drier or linseed oil. A large proportion of the sulphur will settle out in the tanks, and can be used over again, so that the amount of 80 lbs. to 400 lbs. of resin is not maintained in subsequent batches. After the process is well started, there is always the settled sulphur, to which a small amount of fresh can be added. The higher the temperature given to the resin and sulphur the darker the resulting oil will be. If the resin is hardened and neutralised by any of the standard processes before being treated by the sulphur, the resulting oil will be better, and will mix with white lead without curdling. For instance, melt the resin and then sift into it $2\frac{1}{2}$ lbs. fresh lime, and cook it out, then add the sulphur, and you will have an oil that will mix with white lead very readily.

Elastic or Non-Cracking Oils.

For exposed iron or other surfaces subject to expansion and contraction.

To manufacture these, a solution of Para rubber in linseed oil and turps. is first made and used as a base to be thinned down according to the formulæ given below.

CAOUTCHOUC OIL.

Best Baltic Linseed Oil	10	gals.
Best Para Rubber	50	ozs.

Finely shred the rubber and steep in the oil, kept at 90° F. for a week or two, stirring daily; then increase the heat in the jacket-pan to a maximum of 190° F. Stir well until all is dissolved, and strain. Store in a warm place protected from dust.

No. 2.

Para Rubber	50	ozs.
Turpentine	8	gals.
Boiled Oil	2	gals.

Dissolve the rubber in the turps in a jacket-pan, with gentle heat, stirring well. When solution is complete add the boiled oil, (previously warmed), and mix intimately, keeping temperature about 100° F. Strain while warm, and store as directed before. This is a quicker process than the previous one, and either may be used for the purposes indicated.

ASPHALTE OIL.

Egyptian Asphaltum	7	lbs.
Black Oxide of Manganese	1	lb.
Red Lead	1	lb.
Linseed Oil	3	gals.
Turpentine	7	gals.

Boil the oil and the manganese for one hour, add the lead, and boil another hour. Introduce the asphaltum by degrees, stirring well, and boil an hour at not over 300° F. Cool down to 150° F. and add the turps. (warmed to about 120° F.), mix well together and strain. Store in a warm place protected from dust

To make elastic oils from the above bases proceed as follows:—

PALE.

Best Baltic Linseed Oil	85	gals.
Sulphate of Manganese	8	lbs.

Make a good drying oil from the above by any of the methods previously described, keeping the product as pale as possible. By careful management and continuous stirring to prevent the driers settling and burning, the oil may be brought to 300° F. without fear of discoloration. When the boiling is finished, cool down a little, say to 250° F., and throw in 2 ozs. solid paraffin wax. Now mix together cold

Raw Linseed Oil	10	gals.
Caoutchouc Oil	5	gals.

and gradually pour into the hot boiled oil and mix thoroughly. Run off through strainer into storage tank, two of which, at least, should be employed in order to have one always settled and ready for use.

Paints mixed with the oil require no driers, unless for exceptional purposes, when a little terebine may be added.

DARK.

Best Baltic Linseed Oil	75	gals.
Black Oxide of Manganese	10	lbs.

Make a good fire-boiled oil from the above, using air pump. 865 B A temperature of 600° F. may be reached. Remove from fire and cool down to 250° F. Mix together

Manganese Oil	15	gals.
Caoutchouc Oil	5	gals.
Asphalte Oil	5	gals.

Gradually pour into the hot boiled oil and stir thoroughly together. Run off into storage tank as directed for pale.

These oils should be stored in a warm place.

Quick-Drying Oils.

Boil into a quantity of rosin black oxide of manganese (all it will take , cool down.

866 B Take rosin oil and boil it with the manganese rosin prepared as above, say 2 lbs. to a gallon, or enough to make it dry, and thin with benzine.

Instead of using rosin oil, kerosene can be used, when a little Virgin turps or coal tar can be added.

Drying Kerosene.

Make a cheap soap and boil a little of it with rosin, or boil into rosin a solution of caustic soda or soda crystals. When the rosin has boiled clear, add kerosene to extent of body required. 867 B When boiling, put in some *common beans* and boil ; they impart an odour like flax.

Dilute linseed oil with the above. This has been sold as a linseed substitute.

American Paint Thinner.

AMERICAN THIN DRIERS OF THE "LIGHTNING DRIER" TYPE.

These driers are very extensively used in America, especially for the cheaper class of work. Cases have been known of a drier of this type being sold to the consumer at 75 cents per gallon.

Usually, the consumer pays about 35 cents to 45 cents for it. These goods cost wholesale (for dark) 15 cents to 23 cents, (light) 14 to 20 cents.

Process.—Put in kettle any amount of rosin, and when melted add about 12% oxide of manganese—about 12 lbs. to the 100 of rosin. This is put in slowly and with thorough stirring, heat 1006A kept to 250 to 275 or 300° F. When the rosin begins to thicken and turn very dark in colour begin to work naphtha into it as fast as possible. The kettle should be drawn from the fire; if a set kettle, draw the fire from the kettle when you are ready to put in the naphtha. The amount of naphtha is quite optional; usually the goods are made very thin, indeed "water thin." When thinned run into tank for storage. Goods can be made thick and heavy if wished for.

Now place an equal amount of rosin in kettle and heat to, say, 250° F., then sift in 5 lbs. to each 100 of rosin of freshly-slaked quicklime. Stir rapidly and thoroughly till all is well mixed; then let kettle rest. When it begins to skin over and large clear bubbles appear, cut off the fire and run in naphtha till of same thinness as previous batch; then pump into same tank and mix.

This will give the cheapest and best cheap drier made in America. It will dry raw linseed in eight hours, when added in the proportion of one pint drier to one gallon of oil. In some factories the manganese is well worked into the rosin, and when that is done $2\frac{1}{2}$ lbs. of freshly-prepared slaked lime to each 100 lbs. of rosin is stirred in, and the naphtha then put on; this covers the two operations in one. The only trouble is that the resinate is liable to "freeze" upon your hands before the naphtha can be got in, so thoroughly is the rosin oxidised. The cheap light driers are made by taking the second part of the first process; that is, it is the resinate of lime thinned down with naphtha, only in making that we use $2\frac{1}{2}$ lbs. of rosin to the 100 lbs. of lime; more lime adds to the strength of the drier; over 5 lbs. to the 100 of rosin will be hard to work when well worked. Very frequently turpentine driers are made on just this same plan, except that a portion of the thinner used is turps.—just enough to give the drier the odour of turpentine.

NOTE.—The foregoing process should be compared with the wet method of preparing resinate described on p. 237.

Boiled Drying Rosin Oil.

The plant required for making the above consists of a tank fitted with a steam (3in.) coil, and also a 2in. air ring, with holes perforated at intervals for blowing air through the oil.

The rosin oil to be boiled should be a crude oil, as pale as can be procured. A good oil for the purpose is a French rosin oil that is imported, costing £5 per ton, but there are also many oils made by English firms that are used.

When the oil is pumped into the tank, turn on steam and raise temperature up to 120° to 150° F., then put on blower and thoroughly agitate for six to eight hours until the air passing through the warm oil has sweetened it sufficiently to admit of the driers solution being added. Now raise the temperature to 200° F., *but not above this*, and then pour in the driers.

To each one ton rosin oil allow four gallons driers made in the manner described below. Keep well agitated while putting in driers and still blow in air. The force of air must keep oil in violent agitation. Now keep up temperature and raise gradually to 300° F., still blowing. In about four hours the driers will be absorbed. The oil should be then of a *rich ruby colour*, and on a small portion being allowed to cool in a test tube, it should remain quite bright. If on cooling it goes muddy or cloudy, it proves that moisture is present, so that the drier has not been taken up, and more blowing is wanted; continue therefore until the process is complete.

Temperature should not exceed 300° F., as it tends to make the oil thick.

DRIERS FOR OIL DESCRIBED ABOVE.

No. 1.

		cwt.	qrs.	lbs.
(*a*) Acetate	Acetic Acid	0	2	19
of Lime	Carb. Lime (Whiting)	0	0	25

Product costs, say, 10s. per cwt.

		cwt.	qrs.	lbs.	
(b	Sulph. Manganese	0	2	0	at, say, 22s. per cwt.
	Water	2	0	0	

Product costs, say, 4s. 0d. per cwt.

Make (a) and (b) separately, and mix, diluting if desired.

No. 2.

	cwt.	qrs.	lbs.
Acetate	1	0	0
Manganese	1	0	0
Water .... as required			

Product costs, say, 1s. 2d. per gallon.

	£	s.	d.
5 tons Rosin Oil at £5	25	0	0
20 gallons Driers, either (1) or (2), at 1s. 2d. per gallon	1	3	4

Cost per ton, boiled, £5 5s. 0d. or more, according to dilution of driers solution.

No. 2 QUALITY OIL.

Take one ton of yellow resin oil. Heat by close steam to 220° F. to clear it of any moisture it may contain; then add the driers as under, and put on air for four to six hours.

DRIERS FOR No. 2.

Heat in a small pan six gallons of linseed oil to 500° F., and add—

Borate of Manganese	6	lbs.
Sulphate of Zinc	6	lbs.
Sugar of Lead	5	lbs.

Keep on heat until all is thoroughly dissolved.

Melt in another pan 2 cwt. of resin, and add the above driers, or the resin can be crushed and added to the boiled driers. If the former process is adopted, great care is required that it should not boil over, and the hot driers must be gradually stirred into the melted resin. When all is complete add it to the hot resin oil, and blow in air until the oil dries as required.

For dark resin oil take the blue oil (crude), and when heated to 220° F. add a few pounds of mirbane (about 6 lbs. to the ton) to debloom. Then for the driers, use with 6 gals. of oil:—

Red Lead (genuine)	11	lbs.
Litharge	9	lbs.
Sulphate of Manganese	3	lbs.

And 2 cwts. of resin to the ton, same as above.

NO. 3 QUALITY.

For 2 tons of resin oil—

Resin	4	cwt.
Black Oxide of Manganese	20	lbs.

Process.—Melt the resin (220° to 230° F.), add the manganese, and keep on the heat for one hour until dissolved. In another pan heat the two tons of resin oil to 220° F., and add the two together, keeping up the heat and blowing in the air for three hours.

Drying Rosin Oils.

When properly prepared these may be used along with linseed oil in paints, and even alone in the grinding of cheap white lead or colours.

BLOWING PROCESS (A.).

A good pale neutral rosin oil is placed in an oil boiler and air blown in for several hours at a temperature of about 180° to 200° F. Have ready a mixture of borate of manganese in linseed oil prepared by heating the oil to 260°, and adding as much borate as it will dissolve. Add the oil-borate solution to the rosin oil in such a quantity that the product shall contain 3% to 5% of borate. Continue the heat and blowing till oil is clear and thick enough for the purpose for which it is required.

SODA PROCESS (B.).

Place 100 gallons rosin oil in the pan and heat up slowly. Add two gallons of a caustic soda solution of strength 15° B. The oil will become cloudy. Boil till clear and add another gallon of soda solution. Again boil clear, and proceed thus till the body is right. As a rule, about $3\frac{1}{2}$ to 4 gallons solution are sufficient for 100 gallons of oil. Oil that requires more is not so suitable. A small quantity should always be experimented with first, or a whole batch may be spoiled. If the oil in the pan begins to jelly add more oil at once.

The boiled product may be thinned, if desired, with benzine.

Boil at as low a temperature as possible so as to keep colour pale, and let stand a day or two to clarify.

Boiled Linseed Oil Substitute.

(Without foots, and equal to the best drying oil in the market.)

PREPARATION OF THE DRIERS.—Best prepared the day before using. Put into pan for every five tons of oil to be boiled—

Nice Amber Rosin	3	cwt.
Sugar of Lead (White for Pale Oil ; Brown for Ordinary)	$\frac{3}{4}$	cwt.
Black Oxide of Manganese	18	lbs.

10,04
872

First melt the rosin until all the froth goes down, indicating that it is clear of water. Then sprinkle in the black oxide of manganese, then the sugar of lead, stirring vigorously meanwhile. (It is best to put the sugar of lead in a strong bag and powder it well up with a wooden mallet.)

The secret of success with the oil is to boil the driers well. They will be very black at first, but by continued boiling and stirring they will come a nice amber colour. When you think they are nearly ready, keep putting a little on a piece of glass to see if they are a nice rich amber colour, clear and bright. Last thing add two or three barrels of your raw oil (out of your five tons), and you will then be able to pump them up. To boil, run your oil up to 180° F., and then blow vigorously for one hour, then add the driers and blow pretty freely at first and then moderate for five hours until the oil is thoroughly bright, and when cold enough it can be filled into casks and sent away. This is undoubtedly the finest oil in the market, and can with confidence be compared with the "Finest Double Boiled Baltic Linseed Oil" by tarpaulin, oilskin, and waterproof manufacturers, and all the most particular users of boiled linseed oil. For painters and ordinary users proceed as above, and when the oil is cooled down a bit next day, pump up from 12 to 15 cwt. debloomed min. oil (T. and B.'s, ·885, (·865 can be used if blown a little harder so as to get extra body.

For hardening drying oil use $\frac{1}{4}$ cwt. sulphate of zinc (white copperas acetate instead of $\frac{3}{4}$ cwt. sugar of lead.

BOILED LINSEED OIL SUBSTITUTE.

Another method.

For 1 ton Oil use for Driers :—

Rosin	56 lbs.
Sugar of Lead	17 lbs.
Black Oxide of Manganese	$3\frac{1}{2}$ lbs.

Jacketed pan will not do to make these driers, as you could not get heat enough. If you cannot empty the driers direct into the oil, and if you have to pump them up, add about three parts of a barrel of your oil to them; they will then pump easily.

Be sure that the driers are boiled until they are perfectly bright.

Dry Linseed Oil Substitute

(SOLD IN POWDER.

Boil together till thoroughly homogeneous, and then evaporate 1 lb. shellac, 1 lb. rosin, and 3 oz. of sal soda in small quantity of water in water bath. When evaporated to dryness, powder and sell.

To use, put powder in two quarts water, shake, and let stand till dissolved; then mix in linseed oil, and use the mixture as linseed oil.

Process for Drying Petroleum Oil.

There are various ways of making petroleum dry well and free from any greasiness. Herein are given the best and most up-to-date, all of which admit of variation.

A.

Melt 100 lbs. of rosin (the grade known as F. is very good), and add one gallon of cottonseed oil, and one to two gallons solution of sal soda of strength 25° B. Boil till all water has passed off, and the solution or gum is clear; then add (while still hot) 50 10,046
gallons of kerosene, more or less, according to the required body of the oil. Stir in till the gum begins to unite with the oil, then 1501 B
the process is complete. When cooled off there will be found an oil that will dry well and free from any greasiness, and an excellent substitute or cheapener for linseed.

B.

Place 100 lbs. of rosin in the kettle, add $1\frac{1}{2}$ gallons of soda solution, half to be of caustic soda and half to be of sal soda solution, each of strength 25° B. Then add kerosene 50 gallons, and 10,047
one gallon of cottonseed oil; turn on the heat and boil out. 1502 B
When it becomes clear (try sample of oil occasionally in small bottle, holding it to the light) it is done.

C.

10 lbs. of cottonseed oil, 10 lbs. of cocoanut oil (such as is used by soapmakers), 10 lbs. of rosin; melt, and add 10 lbs. of caustic soda in solution of strength 8° B. Work these thoroughly 10,048
together, and put the resulting soap aside.

Now melt 100 lbs. of rosin, and add to it slowly 10 to 15 lbs. 1503 B
sulphate of zinc (white vitriol), and then add 15 lbs. of above-made soap. When boiled out add the mineral oil, as in A and B.

NOTES ON ABOVE PROCESSES.

Do not let the temperature get above about 220° F.; all that is needed is to let it get to 212° F., to boil out the water. Pure raw linseed oil can be used to better advantage than any other oil in the mixing with rosin and soda. Neutral oils can be used in the same way, and in some respects are better; so, also, may kerosene. An oil (neutral) of 32 gravity T., when treated in this way, adding 2 lbs. of gum to the gallon of oil, or, say, 800 lbs. gum to 400 gallons of oil, comes out of the kettle at about gravity 25 T., sometimes down to 23 T. The quicker the oil is taken out of the kettle the lighter the colour, and the longer it is boiled the darker the colour. Likewise, the sooner it leaves the kettle the sweeter the oil. Always use a sweet neutral, and better results are obtained.

When working on the large scale a kettle may be used holding 1,000 gallons. Quick working and a low temperature are conducive to a nice pale colour. When everything is prepared ready to hand, a batch may be mixed, and boiled, and pumped out well within an hour.

Linseed Oil Substitutes.

FOR PAINTS, ETC., AND LINO MANUFACTURE.

No. 1.

Chinese Wood Oil	20	gallons.
Resin Spirit	18	gallons.

Process.—Mix with gentle heating.

This dries fairly quickly, and is very satisfactory for the purpose, even though it be different in formulæ from the usual substitutes. It is a splendid thing for lino paints.

No. 2.

Maize or Corn Oil Linseed Oil ..	In proportions, according to quality.

No. 3.

Bloomless Oil ·885/7	12	gallons.
Good Boiled Oil	2	gallons.
Hardened Resin	33	lbs.
Shellac Crumbs	7	lbs.

Process.—Melt the shellac, then add boiled oil (hot). Then run down the resin, pour B.O. and shellac in this, then boil up carefully with the mineral oil until all are dissolved and mixed. The drying qualities may be improved by boiling up with a little sulphate of zinc. This mixes well with No. 1, and a fine blended oil may be produced by mixing these according to any particular requirements.

No. 4.

Water	10	gallons.
Powdered Resin	80	lbs.
Caustic Soda, 30%	16	lbs.
Sweet Resin Oil	2	gallons.
Wood Oil	2	gallons.
Mineral Oil	4	gallons.

10,052 877 B

Process.—Boil soda in the water until dissolved, then add resin, continuing boiling until all liquefies, stirring well, then pour in the resin oil and mineral oil, and heat up until very hot. Finally, cool down, and add the tung oil (wood oil). Then strain.

No. 5.

VERY CHEAP.

Filtered Tar Oil (Creosote	10	gallons.
Raw Linseed Oil	2	gallons.
Oxidised Resin	28	lbs.
Turps.	½	gallon.
Resinate of Manganese	½	lb.
Nitro Benzol	½	lb.

10,053 878 B

Process.—Heat tar and linseed oils together, melting resin in a separate pan. Then mix; meantime have the turps. warming up; in this dissolve the resinate; mix all together, and strain. Properly made, this will dry in from three to five hours.

No. 6.

Resin Spirit (Unfiltered)	5	cwt.
Resin Oil	4½	cwt.
Boiled Oil	½	cwt.
Wood Oil	½	cwt.
Water	20	gallons.
Caustic Soda, 60%	32	lbs.

10,054 879 B

Process.—Boil caustic soda in the water until dissolved, run in the resin oil, mixing well, settle and pour off the water that separates out. Then heat up the resin oil with boiled oil and resin spirit to about 180° F., stirring to mix.

Lastly, when cooled down, pour in the wood oil. Stand and strain.

No. 7.

COLD PROCESS.

Wood Oil	$1\frac{1}{4}$ cwt.
Mineral Naphtha, 760/65	1 cwt.
Rosin Oil Varnish	$\frac{1}{4}$ cwt.

Process.—Dissolve the wood oil in the mineral naphtha (or benzole would do), then add the rosin oil varnish.

No. 8.

EXTRA PALE.

Debloomed Mineral Oil ·885/7	3 cwt.
Pale Ground Resin	1 cwt.
Sweet Resin Oil	1 cwt.
Boiled Oil	$\frac{1}{2}$ cwt.
Powdered Slaked Lime	$\frac{1}{4}$ cwt.
Magnesium Hydro-silicate	$\frac{1}{4}$ cwt.
Water	2 gallons.
Zinc Sulphate	3 lbs.

Process.—Melt the resin in the resin oil, and make a cream with the lime and water. Then pour this into the former; stir well and keep well heated for 30 minutes. Then settle, and syphon off the clear into another pan with the mineral and boiled oils and zinc sulphate. Heat up as high as it is possible without danger of the whole firing, stirring well. Then let down the heat, add the aluminium magnesium hydro-silicate, stir very thoroughly, keeping at about 180° F. for one hour. Then cool and filter. The hydro-silicate clay material may be used again if the oil is removed therefrom.

BOILED LINSEED OIL CHEAPENER.

Pale ·885 or ·903 American Mineral Oil	25 gallons.
Nitro Naphthaline	$1\frac{1}{2}$ lbs.
Powdered Resin	18 lbs.

Heat at 120° F.

For adulterating boiled oil, 10 gallons to one barrel of boiled oil.

To Kill Bloom in Rosin Oil.

Take—

Rosin Oil	1	ton.
Borate of Manganese Liquor	27	lbs.

10,058
333 B

Bring to 220° F., let it be at that one hour, then blow in wet steam.

Cheapeners for Paints.

The following are used as cheapeners in thinning ready-mixed paints.

No. 1.

Hard Rosin	1	cwt.
Turpentine	3	gallons.
Benzine	2	gallons.
Shale Spirit	1	gallon.

334 B

Process.—Sweat the rosin for about four hours to evaporate all moisture, then cool to about 150° F. (take away from all fire), and thin down with the spirits mixed together cold.

In making the thinnings for paints use—

Linseed Oil	2	parts.
Turpentine	1	part.
No. 1 as above	3	parts.

For cheaper quality use—

Linseed Oil	2	parts.
Turpentine	1	part.
No. 1 as above	6	parts.

336 B

All mixed together cold.

No. 2.

Rosin	500	lbs.
Lump Umber	$7\frac{1}{2}$	lbs.
Black Oxide of Manganese	$2\frac{1}{2}$	lbs.
Brown Sugar of Lead	$1\frac{3}{4}$	lbs.
Kerosene	10	gallons.
Benzine	60	gallons.

337 B

Process.—Melt the rosin. Mix the sugar of lead and manganese, and boil one hour in the rosin, well stirring all the time Crush the umber in a bag and suspend in the pan, well shaking it, and boil until the manganese is thoroughly incorporated, remove from all fire, cool to about 180° F., and thin with the kerosene, and, lastly, add the benzine. The above can be used as a cheapener for thinning genuine oil paints; or for better quality cheapener use—

Linseed Oil	2	parts.
Turpentine	1	part.
No. 2, as above, or less, according to price required	6	parts.

No. 3.

Boiled Linseed Oil with Litharge or Manganese Driers	12	gallons.
Turpentine	10	gallons.
Benzine	38	gallons.

Process.—Warm the boiled linseed oil to about 180° F., and add the turpentine and benzine mixed together cold.

No. 4.

Boiled Linseed Oil with Litharge and Manganese Driers	12	gallons.
Benzine	40	gallons.

No. 5.

Boiled Linseed Oil with Litharge and Manganese Driers	12	gallons.
Benzine	24	gallons.
Shale Spirits	12	gallons.

Process for Nos. 4 and 5, same as for No. 3.

For use take—

Linseed Oil	2	parts.
Turpentine	1	part.
Nos. 3, 4, or 5 (or greater percentage of genuine Linseed Oil and Turps. can be added if price permits)	3	parts.

No. 6.

Rosin	100	parts.
Boiled Linseed Oil	25	parts.
Turpentine	75	parts.
Benzine	30	parts.
Shale Spirit	15	parts.

Process.—Sweat the rosin for about four hours, then remove from all fire, cool to about 180° to 200° F. and thin with the turpentine, benzine, and shale spirit mixed together cold.

No. 7.

For better quality use—

Rosin	200	parts.
Boiled Linseed Oil	70	parts.
Turpentine	120	parts.

For use take—

Linseed Oil	2	parts.
Turpentine	1	part.
Nos. 6 or 7	3	parts.

MIXING OIL FOR REDUCING LINSEED OIL.

600 lbs. of rosin; if pale oil is desired use G or H rosin, if ordinary use F rosin. Melt to 220° F., and then add slowly 10 gallons strong, heavy whitewash. Keep up the heat, and, when the water has mostly boiled out, add 100 gallons of light-coloured bloomless neutral oil, of specific gravity about ·885. Boil out the balance of the water and see that sample drawn out is clear; it 899B should have a bright, live colour, after it has been out long enough to get cold. Then add 200 gallons more of the oil, and heat till colour is satisfactory, and oil in sample bottle taken from the kettle is perfectly clear and bright. Then draw off at once to storage tanks. This oil should rest, say, two days to four days before shipping.

GLOSS OIL TO MIX WITH LEADS, &c.

Melt rosin oil in pan, and pour in caustic soda solution 15° B., 1623 just enough so that the oil boils out clear and bright, and add benzine.

10,563

GLOSS OIL FOR PAINTS.

Rosin	500	lbs.
Lump Umber	$7\frac{1}{2}$	lbs.
Black Oxide Manganese	$2\frac{1}{2}$	lbs.
Bro. Sugar of Lead	$1\frac{3}{4}$	lbs.
Kerosene	10	gallons
Benzine	60	gallons

CHAPTER XII.

TURPENTINE AND TURPENTINE SUBSTITUTES.

American Turpentine.

By far the larger proportion of the turpentine used in the paint and varnish industries is of American origin. Its preparation is entirely carried out on the spot where it is obtained from the pine forests. No other turpentine can compete with it for purposes such as varnish making, although, for many ordinary uses, one of the other natural turpentines or a well made turpentine substitute will often give satisfaction.

The other natural turpentines are French turpentine and Russian turpentine. The strong odour possessed by these substances has prevented their use extending. It has often been attempted to refine Russian turps sufficiently to enable it to be widely used, but with only partial success. It may, indeed, be used in Brunswick blacks, or cheap gold-size, or terebine, but for high-class articles it has not superseded the American variety, in spite of the difference in price.

In the following recipes where turpentine is referred to, American spirits are meant.

Substitutes for Turpentines.

No. 1.

1 part Best Refined Rosin Spirit
1 part Heavy Benzoline
2 parts Turpentine.

No. 2.

1 part Naphtha (Coal Tar)
2 parts Petroleum Spirit, Sp. Gr. 0·790 1503 B
1 part Turpentine.

No. 3.

1 part Turpentine
1 part Petroleum Spirit, Sp. Gr. 0·790
1 part Rosin Spirit
1 part Coal Tar Naphtha.

No. 4.

2 parts Petroleum Spirit, Sp. Gr. 0·790 1505 B
1 part Rosin Spirit
1 part Coal Tar Naphtha.

These may be added to turpentine in any proportion, according to price required.

No. 5.

Mix together

5 gallons Water White Petroleum 1506 B
$\frac{1}{4}$ gallon Rosin Spirit
$2\frac{1}{2}$ gallons Benzine.

Add above to

10 gallons Turpentine.

NOTE.—The quantities of turpentine or cheapeners as per above can be varied according to price required.

No. 6.

45 parts Benzine
45 parts Water White Petroleum
10 parts Spirits of Turpentine.

No. 7.

20 gallons Benzine
$12\frac{1}{2}$ gallons Water White Petroleum
$7\frac{1}{2}$ gallons Turps.

Process.—Mix together cold, and add to genuine turps in any percentage required, according to price.

No. 8.

1 part Turpentine
1 part Rosin Spirit
1 part Petroleum oil
1 part Coal Tar Naphtha.

No. 9.

2 parts Petroleum Spirit
1 part Rosin Spirit
1 part Coal Tar Naphtha
4 parts Turpentine.

No. 10.

1 part Rosin Spirit
1 part Coal Tar Naphtha
1 part Shale Naphtha
1 part Petroleum Oil
5 parts Turpentine.

No. 11.

2 parts Water White Petroleum
2 parts Rosin Spirit
4 parts Turpentine.

No. 12.

1 part Benzine
3 parts Rosin Spirit
1 part Water White Petroleum
1 part Coal Tar Naphtha
6 parts Turpentine.

No. 13.

2 parts Benzine
2 parts Rosin Spirit
2 parts Turpentine.

No. 14.

10 parts Turpentine
5 parts Rosin Spirit
$2\frac{1}{2}$ parts Coal Tar Naphtha
$2\frac{1}{2}$ parts Water White Petroleum
2 parts Benzine.

No. 15.

2 parts Turpentine
1 part Coal Tar Naphtha
1 part Rosin Spirit
2 parts Water White Petroleum.

No. 16.

1 part Rosin Spirit
1 part Benzine
1 part Coal Tar Naphtha
1 part Water White Petroleum
1 part Heavy Benzoline
5 parts Turpentine.

Process.—All above are blended together cold.

NOTE.—The above can be varied in any proportion and added to genuine turpentine, according to price of production desired.

REDUCED TURPENTINE.

In reducing American turps to meet the demand for cheap lines, as for export, the usual cheapening agent is water white petroleum. Care should be taken to use as water-white a sample as possible. Only good brands, such as White Rose, should be used.

The use of a good, pale Russian petroleum is to be recommended, as its odour, though stronger than the American petroleum, blends better with the turps. Rosin spirit, which is often used in small quantity to mask the odour of American petroleum, need not be used with Russian petroleum.

For some foreign markets, *e.g.*, India, it is quite usual to send out turpentine reduced as much as 75%.

TURPENTINE SUBSTITUTES.

Put virgin turpentine into metal tank, and cover with deodorised benzine or turps, or a mixture of the two, and keep the tank about 100/115° F. till all is dissolved. Draw off through cloth strainer. In another tank have the deodorised benzine—(see next page). To about four gallons benzine add one gallon turps (dissolved).

DEODORISING BENZINE OR PETROLEUM. 3c

Remove the bung from a barrel and put in a tablespoonful or so of sharp chloride of lime and a like amount of vinegar or acetic acid. Shake the barrel occasionally, and in 36 hours or so the contents are well deodorised. 1520

DEODORISED BENZINE.

Benzine	7 gallons
Fusel Oil	3 gallons

Shake and set on one side.

This becomes milky, but clears in a day or so.

To each barrel of benzine put a tablespoonful of powdered fresh chloride of lime, and shake the barrel gently. Now add :— 1521

Acetic Acid	1 oz.
Water	1 oz.

Mix together.

Roll barrel. Next day add two quarts of benzine and fusel oil mixture.

ANOTHER METHOD. 3c

Place in each barrel of benzine four ounces of oil of birch, and agitate well. A mysterious, unrecognisable odour is generated which effectually masks the benzine smell. 1522 B

POWDER FOR DEODORISING ALCOHOL. 3c

Powdered Quicklime	$\frac{1}{2}$ oz.
Powdered Alum	2 ozs.
Purified Wood Charcoal	1 oz.

1523 A

Mix together. Above quantities are sufficient for one gallon of alcohol.

Process.—Add to the alcohol, allow to stand a few days, and filter.

DEODORISED PETROLEUM.

Under this name may be included a large number of so-called turpentine substitutes, many of which claim to be highly rectified benzine. They may be used in varnish making or in cases where cutting is necessary.

Process.—Take two ounces of fresh, dry chloride of lime and mix with one to two ounces (according to strength) of acetic acid. Stir well together and throw into a full barrel of the petroleum it is desired to deodorise. Shake it well up by rolling for a few minutes, and then leave with the bung out for 24 hours. It is best then to draw off the oil, as it will be clear, the lime and acid being at the bottom of the barrel. With the clear oil now mix four ounces of fusel oil, shake well up, allow to settle, and the oil will be found quite deodorised.

Where time is an object, the fusel oil may be added direct, without the lime treatment, but the above gives the best result.

PART III.

STIFF PAINTS AND PASTE COLOURS.

CHAPTER XIII.

WHITE PAINTS.

Genuine White Lead.

By far the largest proportion of the white paint produced consists of this article; its grinding, therefore, is an important branch of paint making.

VARIETIES OF WHITE LEAD.—At one time, all the white lead of commerce was made by the Stack or old Dutch process. Now, however, other makes are offered in large quantity. The following are the characteristics of the leading groups of white lead.

(1) English Stack-made white lead is very dense, of a yellowish white colour, possesses good body and excellent paint-forming properties.

(2) Continental Stack-made lead is, in general, like English, but not so well finished, as a rule. It often possesses a rather blue white or grey cast, due to artificial blueing, and some makes stiffen up very much when ground in oil.

(3) Precipitated or wet process white lead. Of varying colour, sometimes very good, sometimes inferior. Not so heavy as Stack-made, has less body, and requires more oil to grind it. When carefully selected, may be blended with other leads.

In grinding white lead it is a good plan to mix two, or even three, brands together, so that the peculiarities of each are balanced. Thus, for the best warranted Stack-made lead, a mixture of two of the best English (or American) makes may be expected to yield better results than if one only was used.

MACHINERY FOR MIXING WHITE LEAD.—In spite of the claims of makers of paint plant, nothing beats the old vertical pug-mill for mixing. The mixers should be placed in pairs, one pair to each grinding mill, and it saves labour if they deliver right into the rollers. For mashes of 20 cwt. the internal diameter should be 28 inches, and the depth 30 inches to 32 inches. There should be six horizontal knives, and these should rotate at a speed of 25 to 30 revolutions per minute.

The most suitable grinding mill is the triple-roller horizontal granite mill, by one of the good makers; either the 14 × 28 inch or the 15 × 30 inch size is best. Five and six roller mills are little used now.

OIL IN WHITE LEAD.—The best genuine refined linseed oil should be used in grinding good quality white lead; 7 to 8 per cent. of oil is the usual allowance, or, roughly, one gallon per cwt. of lead.

In making a mixing the dry lead and oil are added in alternate portions, keeping the whole rather stiff till all the dry lead is added. A little of the oil should always be kept in hand in case the lead drops after pugging.

Care must be taken that the mash does not become overheated during mixing, as a deal of friction is produced.

GENUINE GRD. WHITE LEAD FOR HOME TRADE.

	cwt.	qrs.	lbs.
Stack Lead	5	0	0
Stack Lead (Another Make)	5	0	0
Refined L. O.	0	2	21

100 A

Makes a stiff lead, suitable for best London trade.

GENUINE GRD. WHITE LEAD FOR HOME TRADE.

	cwt.	qrs.	lbs.
Stack Lead	5	0	0
Stack Lead (Another Make	5	0	0
Refined L. O.	0	3	0

101 A

Requires ageing to stiffen it.

GENUINE GRD. WHITE LEAD FOR HOME TRADE.

	cwt.	qrs.	lbs.
Stack Lead	7	2	0
Precipitated Lead	2	2	0
Refined L. O.	0	3	0

102 A

Makes a softer lead, as liked in Midlands and North.

WHITE LEAD FOR HOME TRADE.

BEST OR A QUALITY.

	cwt.	qrs.	lbs.
Stack Lead	8	0	14
Best White Barytes	3	3	14
Refined L. O.	0	3	0

103 A

WHITE LEAD FOR HOME TRADE.

2ND OR B QUALITY.

	cwt.	qrs.	lbs.
Stack Lead	6	0	0
Best Barytes	6	0	0
Refined L. O.	0	2	24

104 A

WHITE LEAD FOR HOME TRADE.

3RD SHIPS' STORE, OR C QUALITY.

	cwt.	qrs.	lbs.
Dry Lead	4	0	0
Best Barytes	6	0	0
Refined L. O.	0	2	16

105 A

Of course, the reduced qualities may be made to suit any desired price. In the export trade, the following proportions are often used :—

GENUINE.

	cwt.	qrs.	lbs.
Foreign Stack Lead	7	2	0
Foreign Precipitated	2	2	0
Refined Linseed Oil	0	3	6

No. 1.

	cwt.	qrs.	lbs.
Foreign Stack Lead	2	2	0
Foreign Precipitated	2	2	0
Best Barytes	1	2	0
Refined Linseed Oil	0	2	6

No. 2.

	cwt.	qrs.	lbs.
Lead as above	5	0	0
Best Barytes	2	2	0
Refined Linseed Oil	0	2	11

No. 3.

	cwt.	qrs.	lbs.
Lead as above	3	0	0
Best Barytes	2	0	0
Refined Linseed Oil	0	2	26

Sometimes a little blue is added to kill the yellow tone of the white lead : Thus in the following mixings :—

GENUINE WHITE LEAD BLUED.

	cwt.	qrs.	lbs.
White Lead	5	0	0
Ultramarine Blue .... 1 oz.			
Refined Linseed Oil .... 5 gallons			

GENUINE WHITE LEAD BLUED.

	cwt.	qrs.	lbs.
English White Lead	2	2	0
Foreign White Lead	2	2	0
Ultramarine Blue .... 1 oz.			
Refined Linseed Oil .... 5 gallons			

GRINDING LEAD NOT TO HARDEN WITH BARYTES.

Put the pigment with the barytes into a pan with chaser; pour in a few gallons of water. Start chaser and thoroughly wash the pigment with the water for 20 minutes and let it settle, draw as much water as possible, put in oil; the pigment goes to the oil and releases the balance of water, which is drawn off.

The following are further typical mixings:—

WHITE LEAD.

No. 1.

	cwt.	qrs.	lbs.
English White Lead	2	2	0
Foreign White Lead	2	2	0
Best Barytes	1	1	0

Ultramarine Blue .... 1 oz.

Refined Linseed Oil .... 6 gallons

7012

112A

WHITE LEAD (ALTERNATIVE).

No. 1.

	cwt.	qrs.	lbs.
English White Lead	2	2	0
Foreign White Lead	2	2	0
Best Barytes	0	2	14
China Clay	0	2	14

Ultramarine Blue .... $1\frac{1}{2}$ oz.

Refined Linseed Oil ...... 6 gallons

7013

113A

WHITE LEAD.

No. 2.

	cwt.	qrs.	lbs.
English White Lead	2	0	0
Foreign White Lead	2	0	0
Best Barytes	2	0	0

Ultramarine Blue .... $1\frac{1}{2}$ oz.

Refined Linseed Oil ...... 6 gallons

7014

114A

WHITE LEAD (ALTERNATIVE).

No. 2.

	cwt.	qrs.	lbs.
English White Lead	2	0	0
Foreign White Lead	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0

Ultramarine Blue .... 1½ oz.
Refined Linseed Oil ...... 6 gallons

WHITE LEAD.

No. 3.

	cwt.	qrs.	lbs.
English White Lead	1	2	0
Foreign White Lead	1	2	0
Best Barytes	3	0	0

Ultramarine Blue .... 1½ oz.
Refined Linseed Oil ...... 6 gallons

WHITE LEAD (ALTERNATIVE).

No. 3.

	cwt.	qrs.	lbs.
English White Lead	1	2	0
Foreign White Lead	1	2	0
Best Barytes	0	3	0
China Clay	0	3	0

Ultramarine Blue .... 1½ oz.
Refined Linseed Oil ...... 6 gallons

WHITE LEAD.

No. 4.

	cwt.	qrs.	lbs.
English White Lead	1	0	0
Foreign White Lead	1	0	0
Best Barytes	4	0	0

Ultramarine Blue .... 1½ oz.
Refined Linseed Oil ...... 6 gallons

WHITE LEAD (ALTERNATIVE).

No. 4.

	cwt.	qrs.	lbs.
English White Lead	1	0	0
Foreign White Lead	1	0	0
Best Barytes	2	0	0
China Clay	2	0	0
Ultramarine Blue	1½ oz.		
Refined Linseed Oil	6 gallons		

7019
119 A

JOINTING LEAD.

	cwt.	qrs.	lbs.
English White Lead	1	0	0
Best Barytes	3	0	0
Refined Linseed Oil	3 gallons		

7020
120 A

WHITE FOR CHEAP READY-MIXED PAINTS.

No. 1.

	cwt.	qrs.	lbs.
English White Lead	1	0	0
Foreign White Lead	1	0	0
Sulphide of Zinc	1	0	0
Best Barytes	6	0	0
Ultramarine Blue	2 oz.		
Refined Linseed Oil	9 gallons		

7021
121 A

No. 2.

	cwt.	qrs.	lbs.
English White Lead	0	2	0
Foreign White Lead	0	2	0
Sulphide of Zinc	0	2	0
Best Barytes	6	0	0
Ultramarine Blue	1½ oz.		
Refined Linseed Oil	7 gallons		

7022
122 A

The following are white lead bases for ready-mixed paints of good quality.

MIXINGS FOR WHITE LEAD READY-MIXED PAINTS.

	cwt.	qrs.	lbs.
Genuine White Lead	2	0	0
Refined Linseed Oil	0	0	18

(Glasgow lead is cheaper, and may be substituted, if desired).

2ND QUALITY WHITE LEAD.

	cwt.	qrs.	lbs.
Best White Barytes	1	0	0
Genuine White Lead	2	0	0
Refined Linseed Oil	0	1	0

3RD QUALITY.

	cwt.	qrs.	lbs.
Best White Barytes	1	2	0
Genuine White Lead	1	2	0
Refined Linseed Oil	0	0	24

4TH QUALITY.

	cwt.	qrs.	lbs.
Best White Barytes	2	0	0
Genuine Dry White Lead	1	0	0
Refined Linseed Oil	0	0	24

For genuine, mix in edge runners, and put through rollers three times.

Second quality, put through rollers twice.

Third and fourth, put through rollers once.

An excellent substitute for white lead in ready-mixed paints and even in ordinary stiff paint, is lithopone. Only the best brands should be used. These contain about 30% of real zinc sulphide.

The following make good paints :—

A.

	cwt.	qrs.	lbs.
Lithopone (Green or Red Seal)	3	2	0
Best Barytes	6	2	0
Refined Linseed Oil	0	3	7

B.

	cwt.	qrs.	lbs.
Lithopone	3	0	0
Best Barytes	7	0	0
Refined Linseed Oil	0	2	21

702
128A

C.

	cwt.	qrs.	lbs.
Lithopone	2	2	0
Best Barytes	7	2	0
Refined Linseed Oil	0	3	4

129A

Zinc White.

Next to lead, this is the most important white base in paints. Several brands are known, one of the best being that known as L.Z.O. Some of the red seal brands are good, and nothing lower should be used for really good white zinc paint.

Zinc oxide absorbs much more oil than white lead, about two gallons per cwt. being the usual proportion (say, 14%).

For genuine and good qualities double grinding is recommended.

For mixing zinc, the best form of plant is the iron pan-mill, and the latest and most satisfactory mill for this purpose is Follows and Bates' positive geared edge runner.

The following are typical mixings as used by large firms:—

GENUINE.

	cwt.	qrs.	lbs.
Green Seal Zinc Oxide	10	0	0
Refined Linseed Oil	1	1	21

130A

For the best or A qualities red seal zinc may be used and suitable proportions of barytes may be introduced, say, from 1 to 5 cwt. to the 10 of zinc.

B QUALITY.

	cwt.	qrs.	lbs.
Red Seal Zinc Oxide	5	0	0
Best Barytes	5	0	0
Refined Linseed Oil	1	0	14

131A

C QUALITY.

FOR EXPORT OR SHIP'S STORES.

132

	cwt.	qrs.	lbs.
Red Seal Zinc Oxide	4	0	0
Best Barytes	6	0	0
Refined Linseed Oil	1	0	2

D QUALITY.

FOR VERY CHEAP EXPORT, ETC.

133

	cwt.	qrs.	lbs.
Blue Seal Zinc Oxide	0	3	14
Best Barytes	4	0	14
Refined Linseed Oil	0	2	21

The following is another series of mixings in which the brand of zinc oxide known as X is used.

GENUINE ZINC WHITE.

134

	cwt.	qrs.	lbs.
Zinc White	5	0	0
Ultramarine Blue ½ oz.			
Refined Linseed Oil 10 gallons			

No. 1.

135

	cwt.	qrs.	lbs.
Zinc White	4	0	0
Best Barytes	0	2	0
China Clay	0	2	0
Ultramarine Blue ½ oz.			
Refined Linseed Oil 9 gallons			

No. 2.

136

	cwt.	qrs.	lbs.
Zinc White	4	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Ultramarine Blue ½ oz.			
Refined Linseed Oil 10 gallons			

No. 3.

	cwt.	qrs.	lbs.
Zinc White	2	0	0
Sulphide of Zinc	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Ultramarine Blue .... ½ oz.			
Refined Linseed Oil ...... 10 gallons			

137 A

No. 4.

	cwt.	qrs.	lbs.
Zinc White	1	0	0
Sulphide of Zinc	1	0	0
Best Barytes	2	0	0
China Clay	2	0	0
Ultramarine Blue .... ½ oz.			
Refined Linseed Oil ...... 10 gallons			

138 A

WHITE PAINT FOR INDIA.

No. 1.

	cwt.	qrs.	lbs.
Barytes	4	2	0
V.M.I. Zinc	1	3	14
(N. Zinc	0	1	14
Ultra. Blue .... 1½ oz.			
Refined Oil .... 9 gallons			

139 A

EXPORT WHITE (HOT CLIMATES).

140 A

	cwt.	qrs.	lbs.
Best Barytes	4	2	0
V.M.I. Zinc	1	2	0
Ultra. Blue .... 1 oz.			
Refined Oil .... 7½ gallons			

ZINC WHITE (ADMIRALTY BRAND).

Zinc White (Blue Seal)	1	cwt.
New White	1	cwt.
Linseed Oil, about	4	gallons.

141 A

ZINC WHITE (PEACOCK BRAND).

White Barytes	6	cwt.
Zinc White (Blue Seal)	15	lbs.

Ground in Best Refined Vegetable Oil.

Paints made after this model are mixed in the edge-runner, and are not ground. Calcutta is the market most of them go to.

SPECIAL ZINC WHITE.

Blue Seal Zinc Oxide	2	cwt.
Barium Sulphate (Burton)	1	cwt.
Barytes (O.H.)	1	cwt.

The following are also export qualities:—

WHITE ZINC IN OIL (BEST).

	cwt.	qrs.	lbs.
Best Barytes	4	2	0
L.Z.O. Green Seal Zinc	1	3	14
Red Seal do.	0	1	14
Ultramarine Blue .... $1\frac{1}{2}$ oz.			
Refined Linseed Oil .. 9 gallons			

ZINC WHITE IN OIL.

No. 1.

	cwt.	qrs.	lbs.
L.Z.O. Oxide Green Seal..............	4	2	0
V.M.I. Red Seal	0	2	0
Best Barytes	4	2	0
Ultramarine Blue .... $2\frac{1}{2}$ oz.			
Refined Linseed Oil .. $10\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
Red Seal Zinc	4	2	0
V.M.I. Yellow Seal Zinc	1	2	0
Best Barytes	5	2	0
Blue .... 2 oz.			
Refined Linseed Oil .. $12\frac{1}{2}$ gallons			

CHAPTER XIV.

PAINTS WHOSE BASE IS OXIDE OF IRON.

Oxide of iron in one or other of its very numerous forms forms the colouring principle in an immense number of paints. The quality of the oxide pigment varies very greatly; sometimes it may contain as much as 90% of ferric oxide, and sometimes not more than 20–25% of this substance may be present.

In the present chapter are included the usually-occurring oxide paints—Indian red, Venetian red, Turkey red, red oxide, purple oxide, purple brown, Spanish brown, magnetic oxide, spathic oxide, etc.

Indian Red Paints.

LIGHT INDIAN RED.

No. 1.

	cwt.	qrs.	lbs.
Light Indian Red	3	0	0
Common Barytes	0	1	0
Whiting	0	1	0
China Clay	0	0	14
Raw Linseed Oil .... 12 gallons			

350 A

No. 2.

	cwt.	qrs.	lbs.
Light Indian Red	3	0	0
Common Barytes	0	2	0
Whiting	0	2	0
China Clay	0	1	0
Raw Linseed Oil ...... 13 gallons			

351 A

No. 3.

		cwt.	qrs.	lbs.
Light Indian Red	....	3	0	0
Common Barytes	....	1	0	0
Whiting	....	1	0	0
China Clay	....	0	2	0
Raw Linseed Oil	...... 14 gallons			

MIDDLE INDIAN RED.

No. 1.

		cwt.	qrs.	lbs.
Middle Indian Red	....	3	0	0
Common Barytes	....	0	1	0
Whiting	....	0	1	0
China Clay	....	0	0	14
Raw Linseed Oil	.... 12 gallons			

No. 2.

		cwt.	qrs.	lbs.
Middle Indian Red	....	3	0	0
Common Barytes	....	0	2	0
Whiting	....	0	2	0
China Clay	....	0	1	0
Raw Linseed Oil	...... 13 gallons			

No. 3.

		cwt.	qrs.	lbs.
Middle Indian Red	....	3	0	0
Common Barytes	....	1	0	0
Whiting	....	1	0	0
China Clay	....	0	2	0
Raw Linseed Oil	...... 14 gallons			

DEEP INDIAN RED.

No. 1.

		cwt.	qrs.	lbs.
Deep Indian Red	....	3	0	0
Common Barytes	....	0	1	0
Whiting	....	0	1	0
China Clay	....	0	0	14
Raw Linseed Oil	...... 12 gallons			

No. 2.

	cwt.	qrs.	lbs.
Deep Indian Red	3	0	0
Common Barytes	0	2	0
Whiting	0	2	0
China Clay	0	1	0
Raw Linseed Oil ...... 13 gallons			

357 f

No. 3.

	cwt.	qrs.	lbs.
Deep Indian Red	3	0	0
Common Barytes	1	0	0
Whiting	1	0	0
China Clay	0	2	0
Raw Linseed Oil ...... 14 gallons			

Oxide Paints.

LIGHT OXIDE OF IRON (INDIAN RED TINT).

No. 1.

	cwt.	qrs.	lbs.
Light Oxide of Iron	4	0	0
Light Indian Red	0	2	0
Raw Linseed Oil ...... 6 gallons			

No. 2.

	cwt.	qrs.	lbs.
Light Oxide of Iron	4	0	0
Light Indian Red	0	2	0
Common Barytes	2	0	0
Raw Linseed Oil .... 8½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Light Oxide of Iron	4	0	0
Light Indian Red	0	1	0
Common Barytes	1	0	0
Raw Linseed Oil........ 10½ gallons			

MIDDLE OXIDE OF IRON (INDIAN RED TINT).

No. 1.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	4	0	0
Middle Indian Red	0	2	0
Raw Linseed Oil .... 5½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	4	0	0
Middle Indian Red	0	2	0
Common Barytes	2	0	0
Raw Linseed Oil .... 7½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	4	0	0
Middle Indian Red	0	2	0
Common Barytes	4	0	0
Raw Linseed Oil ...... 9½ gallons			

DEEP OXIDE OF IRON (INDIAN RED TINT).

No. 1.

	cwt.	qrs.	lbs.
Deep Oxide of Iron	4	0	0
Deep Indian Red	0	2	0
Raw Linseed Oil .... 5½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Deep Oxide of Iron	4	0	0
Deep Indian Red	0	2	0
Common Barytes	2	0	0
Raw Linseed Oil .... 7½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Deep Oxide of Iron	4	0	0
Deep Indian Red	0	2	0
Common Barytes	4	0	0
Raw Linseed Oil .... 9½ gallons			

367 A

LIGHT PURPLE BROWN.

The light oxide here referred to is a purple oxide, and is obtained in various qualities, the best being levigated and highly finished.

No. 1.

	cwt.	qrs.	lbs.
Light Oxide of Iron	4	0	0
Raw Linseed Oil .... 5½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Light Oxide of Iron	4	0	0
Common Barytes	2	0	0
Raw Linseed Oil.......... 8 gallons			

369 A

No. 3.

	cwt.	qrs.	lbs.
Light Oxide of Iron	4	0	0
Common Barytes	4	0	0
Raw Linseed Oil ...... 10 gallons			

MIDDLE PURPLE BROWN.

No. 1.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	4	0	0
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
Dry Purple Brown	2	0	0
Cheap Barytes	1	0	0
Linseed Oil	0	2	4
Thick Oil	0	0	4
	3	2	8

No. 2 (ANOTHER).

	cwt.	qrs.	lbs.
Middle Oxide of Iron	4	0	0
Common Barytes	2	0	0
Raw Linseed Oil .... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	4	0	0
Common Barytes	4	0	0
Raw Linseed Oil .... 9 gallons			

DEEP PURPLE BROWN.

No. 1.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	4	0	0
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	4	0	0
Common Barytes	2	0	0
Raw Linseed Oil .... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	4	0	0
377A Common Barytes	4	0	0
Raw Linseed Oil .... 9 gallons			

PURPLE BROWN PAINT (FOR OILMEN).

	cwt.	qrs.	lbs.
L.M. or D. Purple Brown (This must be a good strong article, costing about 15s. per cwt.	0	2	0
Paris White	0	2	0
43 Barytes	2	2	0
Boiled Oil Foots	0	0	21
Varnish Foots	0	0	7
Raw Linseed Oil	0	0	21

For a super quality use two qrs. more purple brown.

CHEAP EXPORT OXIDE OF IRON PAINTS.

LIGHT.

No. 1.

	cwt.	qrs.	lbs.
Light Oxide of Iron	2	0	0
Common Barytes	2	0	0
Whiting	2	0	0
Pine Oil ... 4 gallons			
Raw Linseed Oil ... 4 gallons			

379 A

No. 2.

	cwt.	qrs.	lbs.
Light Oxide of Iron	2	0	0
Common Barytes	2	0	0
Whiting	1	2	0
Terra Alba	2	0	0
Pine Oil ... 4½ gallons			
Raw Linseed Oil ... 4½ gallons			

380 A

No. 3.

	cwt.	qrs.	lbs.
Light Oxide of Iron	1	2	0
Common Barytes	1	2	0
Whiting	1	2	0
Terra Alba	3	0	0
Pine Oil ... 4½ gallons			
Raw Linseed Oil ... 4½ gallons			

381 A

No. 4.

	cwt.	qrs.	lbs.
Light Oxide of Iron	1	0	0
Common Barytes	2	0	0
Whiting	1	2	0
Terra Alba	2	2	0
Pine Oil ... 3½ gallons			
Raw Linseed Oil ... 3½ gallons			

382 A

MIDDLE.

No. 1.

		cwt.	qrs.	lbs.
Middle Oxide of Iron		2	0	0
Common Barytes		2	0	0
Whiting		2	0	0
Pine Oil	4 gallons			
Raw Linseed Oil	4 gallons			

No. 2.

		cwt.	qrs.	lbs.
Middle Oxide of Iron		2	0	0
Common Barytes		2	0	0
Whiting		1	2	0
Terra Alba		2	0	0
Pine Oil	$4\frac{1}{2}$ gallons			
Raw Linseed Oil	$4\frac{1}{2}$ gallons			

No. 3.

		cwt.	qrs.	lbs.
Middle Oxide of Iron		1	2	0
Common Barytes		1	2	0
Whiting		1	2	0
Terra Alba		3	0	0
Pine Oil	$4\frac{1}{2}$ gallons			
Raw Linseed Oil	$4\frac{1}{2}$ gallons			

No. 4.

		cwt.	qrs.	lbs.
Middle Oxide of Iron		1	0	0
Common Barytes		2	0	0
Whiting		1	2	0
Terra Alba		2	2	0
Pine Oil	$3\frac{1}{2}$ gallons			
Raw Linseed Oil	$3\frac{1}{2}$ gallons			

DEEP.

No. 1.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	2	0	0
Common Barytes	2	0	0
Whiting	2	0	0
Pine Oil ... 4 gallons			
Raw Linseed Oil ... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	2	0	0
Common Barytes	2	0	0
Whiting	1	2	0
Terra Alba	2	0	0
Pine Oil ... 4½ gallons			
Raw Linseed Oil ... 4½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	1	2	0
Common Barytes	1	2	0
Whiting	1	2	0
Terra Alba	3	0	0
Pine Oil ... 4½ gallons			
Raw Linseed Oil ... 4½ gallons			

No. 4.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	1	0	0
Common Barytes	2	0	0
Whiting	1	2	0
Terra Alba	2	2	0
Pine Oil ... 3½ gallons			
Raw Linseed Oil ... 3½ gallons			

390 A

Red Oxide of Iron Paints.

TURKEY RED PAINT.

	cwt.	qrs.	lbs.
Pure Bright Red Oxide	4	0	0
Raw Linseed Oil ....10 gallons			

A little varnish foots should also be used.

NOTE.—A Turkey red (dry) must be a very fine, bright, strong pigment, better than a super Venetian red.

BRIGHT RED PAINT.

No. 1.

	cwt.	qrs.	lbs.
Pure Bright Red Oxide	3	0	0
Common Barytes	1	0	0
China Clay	1	0	0
Whiting	1	0	0
Raw Linseed Oil .... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Pure Bright Red Oxide	2	0	0
Common Barytes	2	0	0
China Clay	2	0	0
Whiting	2	0	0
Raw Linseed Oil .... 9 gallons			

No. 3.

	cwt.	qrs.	lbs.
Pure Bright Red Oxide	1	0	0
Common Barytes	2	0	0
China Clay	2	0	0
Whiting	1	0	0
Raw Linseed Oil .... 7 gallons			

Red Oxide Paint.

	cwt.	qrs.	lbs.
Red Oxide	1	0	0
Cheap Barytes	2	0	0
Boiled Oil Foots	0	1	26
Thick Oil	0	0	4
	3	2	2

Venetian Red Paint.

No. 1.

	cwt.	qrs.	lbs.
Super Venetian Red	2	0	0
Common Barytes	2	0	0
Whiting	2	0	0
Boiled Linseed Oil .... 12 gallons			

No. 2.

	cwt.	qrs.	lbs.
Super Venetian Red	2	0	0
Common Barytes	3	0	0
Whiting	3	0	0
Boiled Linseed Oil .... 10 gallons			

No. 3.

	cwt.	qrs.	lbs.
Super Venetian Red	2	0	0
Common Barytes	4	0	0
Whiting	4	0	0
Boiled Linseed Oil ....14 gallons			

Venetian Red Paint for Oil-shop Trade.

	cwt.	qrs.	lbs.
Bright super Venetian Red. (A good pigment, costing about 18s. per cwt.)	0	1	20
Paris White	0	2	24
43 Barytes	3	2	8
Boiled Oil Foots	0	0	8
Varnish Foots	0	0	8
Raw Linseed Oil	0	2	0

SPANISH BROWN PAINT.

No. 1.

530

		cwt.	qrs.	lbs.
Washed Spanish Brown		2	0	0
Common Barytes		2	0	0
Whiting		2	0	0
Boiled Linseed Oil	10 gallons			

No. 2.

531

		cwt.	qrs.	lbs.
Washed Spanish Brown		2	0	0
Common Barytes		3	0	0
Whiting		3	0	0
Boiled Linseed Oil	12 gallons			

No. 3.

532

		cwt.	qrs.	lbs.
Washed Spanish Brown		2	0	0
Common Barytes		4	0	0
Whiting		4	0	0
Boiled Linseed Oil	14 gallons			

CHEAP EXPORT RED PAINT.

No. 1.

530 - R

		cwt.	qrs.	lbs.
Super Venetian Red		2	0	0
Common Barytes		2	0	0
Whiting		2	0	0
Pine Oil	5 gallons			
Boiled Linseed Oil	5 gallons			

No. 2.

531 - R

		cwt.	qrs.	lbs.
Super Venetian Red		2	0	0
Common Barytes		2	0	0
Whiting		1	0	0
Terra Alba		2	0	0
Pine Oil	$5\frac{1}{2}$ gallons			
Boiled Linseed Oil	$5\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Super Venetian Red	1	0	0
Washed Spanish Brown	1	0	0
Common Barytes	2	0	0
Whiting	1	0	0
Terra Alba	3	0	0
Pine Oil .... $6\frac{1}{2}$ gallons			
Boiled Linseed Oil .... $6\frac{1}{2}$ gallons			

302-P

No. 4.

	cwt.	qrs.	lbs.
Super Venetian Red	1	0	0
Washed Spanish Brown	1	0	0
Common Barytes	2	0	0
Whiting	1	0	0
Terra Alba	4	0	0
Pine Oil .... 7 gallons			
Boiled Linseed Oil .... 7 gallons			

303-P

Magnetic Oxide Paints.

CHEAP EXPORT BLACK METALLIC OXIDE PAINT. ALSO CALLED BLACK MAGNETIC OXIDE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Black Oxide of Iron	2	0	0
Lamp Black	0	0	14
Common Barytes	4	0	0
Pine Oil .... $3\frac{1}{2}$ gallons			
Boiled Linseed Oil .... $3\frac{1}{2}$ gallons			

775

No. 2.

	cwt.	qrs.	lbs.
Black Oxide of Iron	2	0	0
Lamp Black	0	0	14
Common Barytes	6	0	0
Pine Oil .... $4\frac{1}{2}$ gallons			
Boiled Linseed Oil .... $4\frac{1}{2}$ gallons			

776

No. 3.

	cwt.	qrs.	lbs.
Black Oxide of Iron	1	0	0
Lamp Black	0	0	7
Common Barytes	4	0	0
Pine Oil .... 3 gallons			
Boiled Linseed Oil .... 3 gallons			

MAGNETIC OXIDE PAINTS.

Magnetic oxide of iron, or iron minium, is also used as the base of coloured paints, chiefly anti-corrosive paints. Usually, brown or reddish-brown shades are offered, and the material may be ground pure or may be mixed with barytes and whiting. Boiled oil should be used in the grinding.

	cwt.	qrs.	lbs.
Red Iron Minium	3	0	0
Barytes	0	2	0
Whiting	0	2	0
Boiled Linseed Oil	0	2	14

BLACK MAGNETIC OXIDE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Black Oxide of Iron	4	0	0
Lamp Black	0	2	0
Common Barytes	2	0	0
Boiled Linseed Oil .... 8 gallons			

No. 2.

	cwt.	qrs.	lbs.
Black Oxide of Iron	4	0	0
Lamp Black	0	2	0
Common Barytes	4	0	0
Boiled Linseed Oil .... 10 gallons			

No. 3.

	cwt.	qrs.	lbs.
Black Oxide of Iron	2	0	0
Lamp Black	0	1	0
Common Barytes	4	0	0
Boiled Linseed Oil .... 7 gallons			

Paints from Spathic Iron Ore.

(SEE PART I.

NOTE.—As the base is spathose ore, the various colours are most conveniently included here.

LIGHT BLUE.

	cwt.	qrs.	lbs.
Zinc White	1	0	14
Prepared Spathose Ore	2	0	14
Ultramarine Blue	1	3	0
Raw Linseed Oil .... 9 gallons			

650

DARK BLUE.

	cwt.	qrs.	lbs.
Zinc White	1	0	14
Prepared Spathose Ore	2	0	14
Ultramarine Blue	3	2	0
Raw Linseed Oil .... 12 gallons			

651

YELLOW.

	cwt.	qrs.	lbs.
Yellow Ochre	3	2	0
Prepared Spathose Ore	1	2	0
Raw Linseed Oil ...... 10 gallons			

250

YELLOW TINT.

	cwt.	qrs.	lbs.
Zinc Oxide	4	0	0
Prepared Spathose Ore	1	0	0
No. 2 Middle Chrome	0	1	0
Raw Linseed Oil .... 10 gallons			

251

PRIMROSE.

	cwt.	qrs.	lbs.
Zinc Oxide	4	0	0
Prepared Spathose Ore	1	0	0
No. 2 Middle Chrome	0	0	21
Raw Linseed Oil ...... 10 gallons			

252

BATH STONE.

	cwt.	qrs.	lbs.
Zinc Oxide	1	2	0
Prepared Spathose Ore	3	0	0
Oxford Ochre	0	1	7
Raw Linseed Oil .... 9 gallons			

PORTLAND STONE.

	cwt.	qrs.	lbs.
Zinc Oxide	1	2	0
Prepared Spathose Ore	3	0	0
Ultramarine Blue	0	0	2
Raw Linseed Oil .... 9 gallons			

BRIGHT RED.

	cwt.	qrs.	lbs.
Middle Indian Red	0	2	0
305 P Venetian Red	1	2	0
Prepared Spathose Ore	3	0	0
Boiled Linseed Oil ...... 10 gallons			

CARRIAGE RED.

	cwt.	qrs.	lbs.
Bright Red Oxide	3	0	0
Prepared Spathose Ore	1	2	0
Boiled Linseed Oil ...... 9 gallons			

SALMON.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
Prepared Spathose Ore	3	0	0
Venetian Red	0	1	14
Yellow Ochre	0	0	21
Raw Linseed Oil .... 9 gallons			

PRIMING.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
Prepared Spathose Ore	3	0	0
307 P Venetian Red	0	0	21
Raw Linseed Oil .... 9 gallons			

HARD PRIMING.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
Prepared Spathose Ore	3	0	0
Red Lead	0	1	0
Raw Linseed Oil .... 9 gallons			

308 P.

BROWN.

	cwt.	qrs.	lbs.
Brown Ochre	2	2	0
Prepared Spathose Ore	2	2	0
Boiled Linseed Oil ...... 10 gallons			

533

PURPLE BROWN.

	cwt.	qrs.	lbs.
Middle Purple Brown	2	2	0
Prepared Spathose Ore	2	2	0
Boiled Linseed Oil ...... 9 gallons			

309 P.

LIGHT GREEN.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
No. 2 Light Emerald Tint Green	1	2	0
Ultramarine Blue	0	0	7
No. 2 Middle Chrome	0	0	2
Prepared Spathose Ore	1	2	0
Raw Linseed Oil .... 9 gallons			

450

MIDDLE GREEN.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
No. 2 Middle Emerald Tint Green	1	2	0
Ultramarine Blue	0	0	14
No. 2 Middle Chrome	0	0	2
Prepared Spathose Ore	1	2	0
Raw Linseed Oil ...... 9 gallons			

451

DEEP GREEN.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
No. 2 Deep Emerald Tint Green	1	2	0
Ultramarine Blue	0	0	21
No. 2 Middle Chrome	0	0	2
Prepared Spathose Ore	1	2	0
Raw Linseed Oil ...... 9 gallons			

NAVY GREEN.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
No. 2 Light Brunswick Green	0	3	0
No. 2 Emerald Green	0	3	0
Prepared Spathose Ore	1	2	0
Raw Linseed Oil ...... 9 gallons			

BRONZE GREEN.

	cwt.	qrs.	lbs.
No. 2 Dark Brunswick Green	1	1	0
Yellow Ochre	1	1	0
Mineral Black	0	0	7
Prepared Spathose Ore	2	2	0
Boiled Linseed Oil .... 10 gallons			

SILVER GREY.

	cwt.	qrs.	lbs.
Zinc White	4	2	0
Prepared Spathose Ore	0	2	0
Ultramarine Blue	0	0	21
Raw Linseed Oil ...... 9 gallons			

FRENCH GREY.

	cwt.	qrs.	lbs.
Zinc White	2	2	0
Prepared Spathose Ore	2	2	0
Ultramarine Blue	0	0	21
Raw Linseed Oil ...... 10 gallons			

SLATE.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
Prepared Spathose Ore	3	0	0
Mineral Black	0	1	14
Celestial Blue	0	0	14
Boiled Linseed Oil ...... 10 gallons			

LIGHT LEAD.

	cwt.	qrs.	lbs.
Zinc Oxide	2	2	0
Prepared Spathose Ore	2	2	0
Ultramarine Blue	0	2	0
Boiled Linseed Oil .... 10 gallons			

DARK LEAD.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
Prepared Spathose Ore	3	0	0
Mineral Black	0	1	0
Ultramarine Blue	0	1	0
Boiled Linseed Oil .... 10 gallons			

BLACK.

	cwt.	qrs.	lbs.
Mineral Black	1	2	0
Spathose Black	1	2	0
Prepared Spathose Ore	1	2	0
Boiled Linseed Oil ...... 10 gallons			

CHAPTER XV.

SIENNA, UMBER, AND VANDYKE BROWN PAINTS.

This group (along with the ochres which will be treated of in the next chapter) constitutes that of the earth staining colours. Oxide of iron is really the colouring matter in these pigments, but it is present in smaller quantity than in the true oxides.

All the members of the group require a large proportion of oil, and several grindings are necessary before they are fine enough.

Raw linseed oil gives better results than boiled, but a small proportion of varnish or varnish foots should be added to keep the paint stiff.

Siennas.

Raw Sienna in Oil.

Genuine.

		cwt.	qrs.	lbs.
534	Raw Sienna	2	0	0
	Raw Linseed Oil ...... 22 gallons			

No. 2.

		cwt.	qrs.	lbs.
535	Raw Sienna	2	0	0
	Terra Alba	1	0	0
	Raw Linseed Oil ...... 24 gallons			

No. 3.

		cwt.	qrs.	lbs.
536	Raw Sienna	2	0	0
	Terra Alba	2	0	0
	Raw Linseed Oil ...... 26 gallons			

BURNT SIENNA IN OIL.

GENUINE.

		cwt.	qrs.	lbs.
537	Burnt Sienna	2	0	0
	Raw Linseed Oil .... 24 gallons			

No. 2.

		cwt.	qrs.	lbs.
538	Burnt Sienna	2	0	0
	Common Barytes	1	0	0
	Raw Linseed Oil .... 25 gallons			

No. 3.

		cwt.	qrs.	lbs.
539	Burnt Sienna	2	0	0
	Common Barytes	2	0	0
	Raw Linseed Oil ...... 27 gallons			

Some paint makers prefer to use only terra alba in reducing burnt sienna, thus—

540 Genuine Burnt Sienna Paint ......mixture of two good brands (pure
541 No. 1 .. 3 parts Sienna and 1 part Terra Alba
542 No. 2 .. 2 parts Sienna and 1 part Terra Alba
543 No. 3 .. 1 part Sienna and 1 part Terra Alba

BURNT SIENNA IN OIL FOR OILSHOP TRADE.

		cwt.	qrs.	lbs.
	Pure Burnt Sienna	1	0	14
	Paris White	0	1	14
544	No. 2 Barytes	1	3	14
	Varnish Foots	0	0	21
	Boiled Oil Foots	0	1	0
	Raw Linseed Oil	0	2	32

Umbers.

RAW TURKEY UMBER IN OIL.

GENUINE.

		cwt.	qrs.	lbs.
545	Raw Turkey Umber	2	0	0
	Raw Linseed Oil ...... 16 gallons			

No. 2.

	cwt.	qrs.	lbs.
Raw Turkey Umber	2	0	0
Whiting	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil ...... 18 gallons			

No. 3.

	cwt.	qrs.	lbs.
Raw Turkey Umber	2	0	0
Whiting	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil ...... 19 gallons			

BURNT TURKEY UMBER IN OIL.

GENUINE.

	cwt.	qrs.	lbs.
Burnt Turkey Umber	2	0	0
Raw Linseed Oil .... 18 gallons			

No. 2.

	cwt.	qrs.	lbs.
Burnt Turkey Umber	2	0	0
Whiting	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil........ 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
Burnt Turkey Umber	2	0	0
Whiting	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil .... 21 gallons			

RAW ENGLISH UMBER.

English umber gives a special shade useful in staining.

GENUINE.

	cwt.	qrs.	lbs.
Raw English Umber	2	0	0
Raw Linseed Oil .... 8 gallons			

No. 2.

552

	cwt.	qrs.	lbs.
Raw English Umber	2	0	0
Whiting	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil .... 10 gallons			

No. 3.

553

	cwt.	qrs.	lbs.
Raw English Umber	2	0	0
Whiting	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil .... 11 gallons			

Burnt English Umber (Genuine).

554

	cwt.	qrs.	lbs.
Burnt English Umber	2	0	0
Raw Linseed Oil .... 8 gallons			

No. 2.

555

	cwt.	qrs.	lbs.
Burnt English Umber	2	0	0
Whiting	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil .... 10 gallons			

No. 3.

556

	cwt.	qrs.	lbs.
Burnt English Umber	2	0	0
Whiting	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil .... 11 gallons			

As the shade of burnt umber is apt to be injured if too much whiting or terra alba is mixed with it, barytes is sometimes preferred. The following is a series framed in this way :—

Genuine.

557

	cwt.	qrs.	lbs.
Burnt Turkey Umber	1	0	0
Genuine Boiled Oil ...... 10 gallons			

558

No. 2.

	cwt.	qrs.	lbs.
Umber	2	0	0
No. 2 Barytes	1	0	0
Genuine Boiled Oil...... 21½ gallons			

559

No. 3.

	cwt.	qrs.	lbs.
Umber	1	0	0
No. 2 Barytes	1	0	0
Oil .... 11½ gallons			

560

BURNT UMBER IN OIL, SUPER, OR A, FOR OILSHOP TRADE.

	cwt.	qrs.	lbs.
Burnt Turkey Umber	1	3	14
Paris White	0	1	14
No. 2 Barytes	0	2	7
Varnish Foots	0	1	11
Boiled Oil Foots	0	0	7
Raw Linseed Oil	1	0	18

561

BURNT UMBER IN OIL, No. 2, OR B, FOR OILSHOP TRADE.

	cwt.	qrs.	lbs.
Burnt Turkey Umber	1	2	0
Paris White	0	1	14
No. 2 Barytes	1	2	0
Varnish Foots	0	0	21
Boiled Oil Foots	0	0	10
Raw Linseed Oil	1	0	25

DARK ENGLISH UMBER PAINT.

This is a very fine dark greenish brown shade. A dark English Ashburton umber should be used.

562

	cwt.	qrs.	lbs.
Umber	2	0	0
English Ochre	2	0	0
Common Barytes	3	0	0
Varnish Foots	0	0	14
Raw Linseed Oil ...... 15 gallons			

To cheapen any of the foregoing earth staining colour paints, in place of using genuine raw or boiled linseed oil, a mixture of genuine oil wth 25%, 50%, or even more of refined rosin oil may be used. (See under Paint Oils, Part II.)

It should always be remembered that there are great variations in the quantity of oil required in grinding these colours. The quantities given herein are for average and typical samples.

Vandyke Browns.

Genuine.

562

		cwt.	qrs.	lbs.
Vandyke Brown		2	0	0
Raw Linseed Oil	22 gallons			

No. 2.

564

		cwt.	qrs.	lbs.
Vandyke Brown		2	0	0
Whiting		0	2	0
Terra Alba		0	2	0
Raw Linseed Oil	24 gallons			

No. 3.

565

		cwt.	qrs.	lbs.
Vandyke Brown		2	0	0
Whiting		1	0	0
Terra Alba		1	0	0
Raw Linseed Oil	25 gallons			

Vandyke in Oil (Another Quality).

Genuine.

566

		cwt.	qrs.	lbs.
Vandyke Brown		2	0	0
Linseed Oil	17 gallons	1	1	13
		3	1	13

VANDYKE BROWN PAINT FOR OILSHOP TRADE.

	cwt.	qrs.	lbs.
Vandyke Brown	1	0	14
Paris White	0	1	14
Boiled Oil Foots	0	1	14
Raw Linseed Oil	0	1	20

In all the above recipes the pure Vandyke earth brown is supposed to be used.

To make up a paint of the tint of Vandyke brown take as a base a chocolate-coloured oxide of iron and tint it with lamp black, reducing to any desired degree with common barytes. It is necessary that the oxide used for this has no purple tint; if it has it must be killed by adding yellow ochre.

CHAPTER XVI.

OCHRE AND YELLOW PAINTS.

Yellow Ochre Paints.

These are made for two entirely different purposes.

(1) As staining colours to be used in white lead or zinc to produce stone, buff, and other tinted yellows.

(2) As self colours either as grounding colours for graining work, or for other purposes.

Hence the dry ochre must be selected with reference to the particular kind of paint it is desired to produce, and if reducing agents are introduced these must be selected on the same basis.

The first grades of staining ochres are usually termed Oxford ochres, and if they are specially selected to produce good stone-colour tints they are often termed stone ochres. The latter term, however, is applied variously both to good and to common qualities.

NOTE.—The oil required by ochres varies greatly.

OXFORD OCHRE IN OIL.

GENUINE.

	cwt.	qrs.	lbs.	
Oxford Ochre	5	0	0	756
Raw Linseed Oil .... 8 to 10 gallons per cwt.				

No. 2.

	cwt.	qrs.	lbs.	
Oxford Ochre	2	0	0	
French Ochre	2	0	0	757
Common Barytes	2	0	0	
Raw Linseed Oil .... 34 gallons				

No. 3.

		cwt.	qrs.	lbs.
Oxford Ochre		1	2	0
French Ochre		1	2	0
Imperial Yellow		0	0	14
Common Barytes		3	0	0
Raw Linseed Oil	28 gallons			

NATIVE OXFORD OCHRE PAINT.

	cwt.	qrs.	lbs.
Pale Grinding Ochre	2	1	14
Deep Grinding Ochre	0	3	9
Barytes	0	3	9
Lemon Chrome	0	0	9
Raw Sienna	0	0	12
Raw Umber	0	0	$1\frac{1}{2}$
Linseed Oil	0	3	6
Thick Oil	0	0	20

OXFORD OCHRE PAINT.

		cwt.	qrs.	lbs.
Italian Ochre		1	0	0
Paris White		1	0	0
Barytes		1	3	20
Middle Chrome		0	1	0
Linseed Oil	$8\frac{1}{2}$ gallons	0	2	20
Varnish Bottoms		0	0	9
		4	3	1

No. 2 OXFORD OCHRE PAINT.

		cwt.	qrs.	lbs.
Italian Ochre		0	2	0
J.F.L.L. Ochre		1	0	0
Cheap Barytes		2	0	0
Middle Chrome		0	0	14
Soft Soap		0	0	2
Linseed Oil Foots	10 gallons			
Boiled Oil Foots	3 gallons			
Thick Oil	9 gallons			

SUPER NO. 1 OXFORD PAINT.

	cwt.	qrs.	lbs.
Italian Ochre	0	3	0
J.F.L.L. Ochre	2	1	14
Lemon Chrome	0	0	$7\frac{1}{2}$
Middle Chrome	0	0	$5\frac{1}{2}$
Raw Turkey Umber	0	0	2
Thick Oil ... 2 gallons			
Boiled Oil Foots ... 2 gallons			
Linseed Oil ... 9 gallons			

ENGLISH OCHRE PAINT.

This is a second quality of Oxford ochre.

GENUINE.

	cwt.	qrs.	lbs.
English Ochre	5	0	0
Raw Linseed Oil ... 8 to 10 gallons per cwt.			

NO. 2.

	cwt.	qrs.	lbs.
English Ochre	2	2	0
Common Barytes	2	2	0
Raw Linseed Oil ... 23 gallons			

NO. 3.

	cwt.	qrs.	lbs.
English Ochre	2	0	0
Common Barytes	3	0	0
Raw Linseed Oil ... 20 gallons			

IMITATION OXFORD OCHRE PAINT.

NO. 1.

	cwt.	qrs.	lbs.
Light Italian Ochre	1	0	0
Imperial Yellow	1	0	0
Whiting	2	0	0
China Clay	2	0	0
Raw Linseed Oil ... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Light Italian Ochre	1	0	0
Imperial Yellow	1	0	0
Whiting	4	0	0
China Clay	4	0	0
Raw Linseed Oil .... 24 gallons			

No. 3.

	cwt.	qrs.	lbs.
Light Italian Ochre	1	0	0
Imperial Yellow	1	0	0
Whiting	4	2	0
China Clay	4	2	0
Pale Pine Oil .... 12½ gallons			
Boiled Oil .... 12½ gallons			

ITALIAN OCHRE PAINT.

GENUINE.

	cwt.	qrs.	lbs.
Italian Ochre	5	0	0
Raw Linseed Oil ...... 10 to 12 gallons per cwt.			

No. 2.

	cwt.	qrs.	lbs.
Italian Ochre	2	0	0
French Ochre	2	0	0
Common Barytes	1	0	0
Whiting	1	0	0
Raw Linseed Oil ...... 40 gallons			

No. 3.

	cwt.	qrs.	lbs.
Italian Ochre	1	2	0
French Ochre	1	2	0
Common Barytes	1	2	0
Whiting	1	2	0
Imperial Yellow	0	0	14
Raw Linseed Oil ...... 31 gallons			

STONE OCHRE PAINT.

		cwt.	qrs.	lbs.
Italian Ochre		1	0	0
Paris White		1	0	0
Barytes		2	3	0
Linseed Oil	12½ gallons	1	0	0
Varnish Bottoms	2 gallons	0	0	18
		5	3	18

STONE OCHRE PAINT.

No. 2

		cwt.	qrs.	lbs.
J.F.L.L. Ochre		0	3	0
Welsh Ochre		0	2	0
Cheap White Barytes		1	3	0
Soft Soap		0	0	0½
Raw Linseed Oil	7 gallons			
Boiled Oil Foots	1½ gallons			

STONE OCHRE PAINT.

		cwt.	qrs.	lbs
J.F.L.L. Ochre		1	0	0
Oxford Ochre		1	0	0
Cheap White Barytes		1	2	0
Orange Chrome		0	0	7
Soft Soap		0	0	1½
Linseed Oil	12 gallons			
Boiled Oil Foots	2 gallons			

SUPER STONE OCHRE PAINT.

		cwt.	qrs.	lbs.
J.F.L.L. Ochre		2	2	0
Cheap Barytes		0	2	0
Soft Soap		0	0	1½
Raw Oil	16 gallons			
Boiled Foots	2½ gallons			

COMMON OCHRE PAINTS.

These are mostly used as self-colour paints.

No. 1.

	cwt.	qrs.	lbs.
French Ochre	4	0	0
Common Barytes	1	0	0
Whiting	1	0	0
Raw Linseed Oil ...... 10 gallons			

No. 2.

	cwt.	qrs.	lbs.
French Ochre	3	0	0
Common Barytes	1	2	0
Whiting	1	2	0
Raw Linseed Oil .... 10 gallons			

No. 3.

	cwt.	qrs.	lbs.
French Ochre	3	0	0
Common Barytes	1	3	0
Whiting	1	3	0
Imperial Yellow	0	1	0
Raw Linseed Oil ...... 10 gallons			

CHEAP EXPORT OCHRE PAINTS.

No. 1.

	cwt.	qrs.	lbs.
French Ochre	1	0	0
Common Barytes	2	0	0
Whiting	2	0	0
Pale Pine Oil .... 4 gallons			
Boiled Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
French Ochre	1	1	0
Common Barytes	2	2	0
Whiting	2	2	0
Pale Pine Oil .... $4\frac{1}{2}$ gallons			
Boiled Oil .... $4\frac{1}{2}$ gallons			

276

277

277

279

210

No. 3.

	cwt.	qrs.	lbs.
French Ochre	1	1	0
Common Barytes	2	3	0
Whiting	2	3	0
Pale Pine Oil .... $4\frac{1}{2}$ gallons			
Boiled Oil .... $4\frac{1}{2}$ gallons			

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No. 4.

	cwt.	qrs.	lbs.
French Ochre	1	1	0
Common Barytes	3	0	0
Whiting	3	0	0
Pale Pine Oil .... 5 gallons			
Boiled Oil .... 5 gallons			

BRIGHT YELLOW PAINT.

No. 1.

	cwt.	qrs.	lbs.
Common English Ochre	1	0	0
Common Middle Chrome	0	2	0
Common Barytes	1	2	0
Whiting	1	2	0
Boiled Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
Common English Ochre	1	0	0
Common Middle Chrome	0	2	0
Common Barytes	2	0	0
Whiting	2	0	0
Boiled Oil .... 6 gallons			

No. 3.

	cwt.	qrs.	lbs.
Common English Ochre	1	2	0
Common Middle Chrome	0	2	0
Barytes	2	2	0
Whiting	2	2	0
Boiled Oil .... 7 gallons			

BRIGHT YELLOW PAINT (RED SHADE).

No. 1.

	cwt.	qrs.	lbs.
Common English Ochre	1	0	0
Common Middle Chrome	0	2	0
Venetian Red	0	1	0
Barytes	1	2	0
Whiting	1	2	0
Boiled Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
Common English Ochre	1	0	0
Common Middle Chrome	0	2	0
Venetian Red	0	1	0
Common Barytes	2	0	0
Whiting	2	0	0
Boiled Oil .... 6½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Common English Ochre	1	0	0
Common Middle Chrome	0	2	0
Venetian Red	0	1	0
Common Barytes	2	2	0
Whiting	2	2	0
Boiled Oil .... 7½ gallons			

JAPANNER'S OCHRE.

	cwt.	qrs.	lbs.
White Lead	2	0	0
French Ochre	1	0	0
Venetian Red	0	0	3
Boiled Oil .... 4 gallons			

The following may be used as staining or tinting colours for R.M. paints.

BEST YELLOW OCHRE PAINT.

	cwt.	qrs.	lbs.
Best French Ochre	1	2	0
Lemon Chrome	0	0	14
Best Barytes	0	0	14
Dried Whiting	0	0	7
Linseed Oil	0	0	12
Pale Boiled	0	0	12

290

Put through rollers twice.

ORDINARY YELLOW OCHRE PAINT.

	cwt.	qrs.	lbs.
Lump Ochre	0	1	14
Best French Ochre	0	1	21
2nd Quality Barytes	0	3	0
Linseed or Pale Boiled Oil	0	0	16

291

Put once through rollers.

Chrome Yellow Paints.

Chrome yellow paints have only a limited use for special purposes — mostly decorative — where the characteristic shade of chrome is required.

Lemon and middle shades are perhaps more used than orange.

Excellent middle shades can be obtained by using one of the second quality chromes or Imperial yellow. The latter material is also a favourite in many foreign markets.

IMPERIAL YELLOW PAINT.

No. 1.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
Raw Linseed Oil	4 gallons		

292

No. 2.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
China Clay	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil ...... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
China Clay..........	1	0	0
Terra Alba...........	0	2	14
Raw Linseed Oil ....6 gallons			

CHEAP EXPORT IMPERIAL YELLOW PAINT.

No. 1.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
Best Barytes	0	2	0
China Clay	0	2	0
Pale Pine Oil..............2½ gallons			
Raw Linseed Oil .... 2½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Pale Pine Oil .... 3 gallons			
Raw Linseed Oil .... 3 gallons			

No. 3.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
Best Barytes.......	1	2	0
China Clay	1	2	0
Pale Pine Oil .... 3½ gallons			
Raw Linseed Oil .... 3½ gallons			

Lemon Chrome in Oil.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Lemon Chrome	2	0	0
Raw Linseed Oil ...... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Lemon Chrome	2	0	0
China Clay	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil .... 6 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Lemon Chrome	2	0	0
China Clay	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil .... 7 gallons			

Middle Chrome in Oil.

No. 1.

201A

	cwt.	qrs.	lbs.
No. 1 Middle Chrome	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 2.

202A

	cwt.	qrs.	lbs
No. 1 Middle Chrome	2	0	0
China Clay	0	2	0
Terra Alba	0	2	
Raw Linseed Oil .... 6 gallons			

No. 3.

203A

	cwt.	qrs.	lbs.
No. 1 Middle Chrome	2	0	0
China Clay	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil .... 7 gallons			

ORANGE CHROME IN OIL.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Orange Chrome	2	0	0
Raw Linseed Oil ...... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Orange Chrome	2	0	0
China Clay	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil .... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Orange Chrome	2	0	0
China Clay	1	0	0
Terra Alba	1	0	0
Raw Linseed Oil ...... 7 gallons			

CHEAP EXPORT CHROME PAINTS.

LEMON.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
Best Barytes	0	2	0
China Clay	0	2	0
Pale Pine Oil .... 3 gallons			
Raw Linseed Oil .... 3 gallons			

LEMON.

No. 2.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
Best Barytes	0	3	0
China Clay	0	3	0
Pale Pine Oil .... $3\frac{1}{4}$ gallons			
Raw Linseed Oil .... $3\frac{1}{4}$ gallons			

LEMON.

No. 3.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Pale Pine Oil .... $3\frac{1}{2}$ gallons			
Raw Linseed Oil .... $3\frac{1}{2}$ gallons			

MIDDLE.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Middle Chrome	2	0	0
Best Barytes	0	2	0
China Clay	0	2	0
Pale Pine Oil .... 3 gallons			
Raw Linseed Oil ...... 3 gallons			

MIDDLE.

No. 2.

	cwt.	qrs.	lbs.
No. 2 Middle Chrome	2	0	0
Best Barytes	0	3	0
China Clay	0	3	0
Pale Pine Oil .... $3\frac{1}{4}$ gallons			
Raw Linseed Oil .... $3\frac{1}{4}$ gallons			

MIDDLE.

No. 3.

	cwt.	qrs.	lbs.
No. 2 Middle Chrome	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Pale Pine Oil .... $3\frac{1}{2}$ gallons			
Raw Linseed Oil .... $3\frac{1}{2}$ gallons			

ORANGE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Orange Chrome		2	0	0
Best Barytes		2	0	0
China Clay		0	2	0
Pale Pine Oil	3 gallons			
Raw Linseed Oil	3 gallons			

ORANGE.

No. 2.

		cwt.	qrs.	lbs.
No. 2 Orange Chrome		2	0	0
Best Barytes		0	3	0
China Clay		0	3	0
Pale Pine Oil	3¼ gallons			
Raw Linseed Oil	3¼ gallons			

ORANGE.

No. 3.

		cwt.	qrs.	lbs.
No. 2 Orange Chrome		2	0	0
Best Barytes		1	0	0
China Clay		1	0	0
Pale Pine Oil	3½ gallons			
Raw Linseed Oil	3½ gallons			

Several more yellow paints will be found in the chapter devoted to tinted paints.

CHAPTER XVII.

BLACK PAINTS.

Black paints are characterised by great variety in their composition. The usual black staining materials are lamp or vegetable black, carbon black, and bone black. These may be associated with the commoner sorts of black, such as mineral black, blue black, or black oxide of iron, white barytes, whiting, or terra alba are usually present as cheapening agents.

All black pigments are poor dryers; therefore, boiled oil should be used in the grinding, and varnish foots are also an improvement.

For cheaper quality paints one of the reduced boiled paint oils may be advantageously substituted.

Black Paints for Staining or Tinting.

These are usually nearly pure lamp or vegetable black but often contain carbon black as well. The materials require repeated grinding in boiled oil.

FINEST STAINING BLACK PAINT.

	cwt.	qrs.	lbs.
Vegetable Black	1	0	0
Carbon Black	0	0	14
Boiled Linseed Oil	0	3	14

FINE STAINING BLACK PAINT.

	cwt.	qrs.	lbs.
Vegetable (or Lamp) Black	1	0	0
Carbon Black	0	0	14
Whiting	0	1	0
Boiled Linseed Oil	0	3	17

JET BLACK PAINT FOR TINTING.

	cwt.	qrs.	lbs.
Lamp Black	0	1	0
Carbon Black	0	0	7
Prussian Blue	0	0	7
Terra Alba	0	1	0
Boiled Linseed Oil	0	1	7

LAMP BLACK IN OIL

	cwt.	qrs.	lbs.
Lamp Black	1	0	13
Linseed Oil	0	3	15
	2	0	0

The following are paints with a vegetable black base :—

No. 1.

	cwt.	qrs.	lbs.
Vegetable Black	0	2	0
Paris White	1	0	0
Linseed Oil .... 20 gallons	1	2	12
Varnish Bottoms	0	0	18
	3	1	2
For Lower Grade, add Barytes	2	0	0
	5	1	2

No. 2.

	cwt.	qrs.	lbs
Vegetable Black	0	0	14
Paris White	1	0	0
Barytes	1	2	0
Varnish Bottoms ...... 2 gallons	0	0	18
Linseed Oil .... 6 gallons			

No. 3.

		cwt.	qrs.	lbs.
Vegetable Black		0	1	0
Barytes		1	2	0
Paris White		2	0	0
Varnish Bottoms		0	0	18
Linseed Oil	11 gallons	0	3	15
		4	3	5

No. 4.

	cwt.	qrs.	lbs.
Vegetable Black	0	0	12
Ivory Black	0	0	7
Whiting	1	1	0
Cheap Barytes	3	0	0
Dark Boiled Oil	0	0	24
Dark Oil Foots	0	0	22
Linseed Raw Oil	0	2	6
	5	1	15

Black Paints for Self Colours.

The following are examples of black paints tinted with carbon black, and suitable for self-colours.

No. 1

		cwt.	qrs.	lbs.
Carbon Black		1	0	0
Lamp Black		2	0	0
Common Barytes		1	0	0
Whiting		1	0	0
Litharge		0	1	0
Boiled Oil	9 gallons			

No. 2.

		cwt.	qrs.	lbs.
Carbon Black		1	0	0
Lamp Black		2	0	0
Common Barytes		1	2	0
Whiting		1	2	0
Litharge		0	1	0
Boiled Oil	10 gallons			

No. 3.

	cwt.	qrs.	lbs.
Carbon Black	1	0	0
Lamp Black	2	0	0
Common Barytes	2	0	0
Whiting	2	0	0
Litharge	0	1	0
Boiled Oil .... 11 gallons			

No. 4.

	cwt.	qrs.	lbs.
Carbon Black	1	0	0
Lamp Black	2	0	0
Common Barytes	2	2	0
Whiting	2	2	0
Litharge	0	1	0
Boiled Oil .... 12 gallons			

The litharge in the above is introduced to assist the drying. It may be omitted if desired

BLACK PAINTS CONTAINING MINERAL BLACK.

No. 1.

	cwt.	qrs.	lbs.
Carbon Black	0	1	0
Lamp Black	0	1	0
Mineral Black	3	0	0
Common Barytes	0	2	0
Whiting	0	2	0
Terebine.................... 3 gallons			
Boiled Linseed Oil ...... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
Carbon Black	0	1	0
Lamp Black	0	1	0
Mineral Black	3	0	0
Common Barytes	0	2	0
Whiting	0	2	0
China Clay	0	2	0
Litharge	0	1	0
Boiled Linseed Oil ...... 8 gallons			

BLACK PAINTS—VARIOUS (TINTED WITH BLUE.)

No. 1.

	cwt.	qrs.	lbs.
Carbon Black	0	1	0
Mineral Black	3	0	0
Celestial Blue	0	0	14
Common Barytes	0	2	0
Whiting	0	2	0
Patent Driers	0	2	0
Boiled Linseed Oil ...... 8 gallons			

No. 1.

	cwt.	qrs.	lbs.
Lamp Black	0	1	0
Mineral Black	3	0	0
Common Barytes	0	2	0
Whiting	0	2	0
China Clay	0	2	0
Litharge	0	1	0
Varnish Foots .... 2 gallons			
Boiled Linseed Oil ...... 8 gallons			

No. 2.

	cwt.	qrs.	lbs.
Carbon Black	0	0	14
Lamp Black	0	0	14
Mineral Black	3	0	0
Common Barytes	1	0	0
Whiting	1	0	0
Terebine .... 3 gallons			
Boiled Linseed Oil ...... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
Carbon Black	0	0	14
Lamp Black	0	0	14
Mineral Black	3	0	0
Common Barytes	0	3	0
Whiting	0	3	0
China Clay	0	3	0
Litharge	0	1	0
Boiled Linseed Oil ...... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Carbon Black	0	0	14
Mineral Black	3	0	0
Celestial Blue	0	0	14
Common Barytes	1	0	0
Whiting	1	0	0
Patent Driers	0	2	0
Boiled Linseed Oil ...... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Lamp Black	0	0	14
Mineral Black	3	0	0
Common Barytes	0	3	0
Whiting	0	3	0
China Clay	0	3	0
Litharge	0	1	0
Varnish Foots .... 2 gallons			
Boiled Linseed Oil ...... 9 gallons			

No. 3.

	cwt.	qrs.	lbs.
Carbon Black	0	0	7
Lamp Black	0	0	7
Mineral Black	3	0	0
Common Barytes	1	2	0
Whiting	1	2	0
Terebine ... 3 gallons			
Boiled Linseed Oil ... 6 gallons			

No. 3.

	cwt.	qrs.	lbs.
Carbon Black	0	0	7
Lamp Black	0	0	7
Mineral Black	3	0	0
Common Barytes	1	0	0
Whiting	1	0	0
China Clay	1	0	0
Litharge	0	1	0
Boiled Linseed Oil ... 10 gallons			

No. 3.

	cwt.	qrs.	lbs.
Carbon Black	0	0	7
Mineral Black	3	0	0
Celestial Blue	0	0	14
Common Barytes	1	2	0
Whiting	1	2	0
Patent Driers	0	2	0
Boiled Linseed Oil ... 10 gallons			

No. 3.

		cwt.	qrs.	lbs.
Lamp Black		0	0	7
Mineral Black		3	0	0
Common Barytes		1	0	0
Whiting		1	0	0
China Clay		1	0	0
Litharge		0	1	0
Varnish Foots	3 gallons			
Boiled Linseed Oil	10 gallons			

CHEAP EXPORT BLACK PAINTS.

No. 1.

		cwt.	qrs.	lbs.
Lamp Black		0	0	7
Mineral Black		3	0	0
Common Barytes		1	2	0
Whiting		1	2	0
Varnish Foots	2 gallons			
Pine Oil	4 gallons			
Boiled Linseed Oil	4 gallons			

No. 2.

		cwt.	qrs.	lbs.
Lamp Black		0	0	7
Mineral Black		3	0	0
Common Barytes		2	0	0
Whiting		2	0	0
Varnish Foots	2 gallons			
Pine Oil	$4\frac{1}{2}$ gallons			
Boiled Linseed Oil	$4\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Lamp Black	0	0	7
Mineral Black	3	0	0
Common Barytes	2	2	0
Whiting	2	2	0
Varnish Foots .... 3 gallons			
Pine Oil .... 5 gallons			
Boiled Linseed Oil ...... 5 gallons			

BLACK PAINT FOR READY-MIXED PAINTS.

Carbon black is the usual tinting material in this.

Carbon Black	2 lbs.
2nd Quality Barytes	1 cwt.
Dried Whiting	7 lbs.
Boiled Oil	12 lbs.

Any of the preceding Self-colouring Black Paints can be used for the same purpose, according to desired price. Excess of driers, however, is to be avoided.

VERY CHEAP BLACK PAINT FOR INDIA.

	cwt.	qrs.	lbs.
No. 2 Barytes	4	0	0
Whiting	1	0	0
Carbon Black	0	0	2
Celestial Blue	0	0	1
Soft Soap	0	0	4
Pale Pine Oil .... $4\frac{1}{2}$ gallons			
American ·885............ $4\frac{1}{2}$ gallons			

The materials are worked up in pan mill and filled into kegs, without being ground.

JET BLACK PAINTS FOR DECORATORS.

No. 1.

	cwt.	qrs.	lbs.
Ivory (or Bone) Black	0	2	21
Carbon Black	0	0	7
Celestial Blue	0	0	7
No. 2 Barytes	1	3	0
Whiting	1	3	0
Genuine Boiled Oil	1	1	14

No. 2.

	cwt.	qrs.	lbs.
Ivory (or Bone) Black	0	2	21
Celestial Blue	0	0	7
Carbon Black	0	0	7
No. 2 Barytes	2	1	0
Whiting	2	1	0
Genuine Boiled Oil	1	2	4

BLACK MAGNETIC OXIDE PAINT (BASE FOR QUICK-DRYING ANTI-CORROSIVE PAINT).

	cwt.	qrs.	lbs.
Black Magnetic Oxide of Iron	3	0	0
No. 2 Barytes	0	3	0
Zinc Oxide	0	1	0
Carbon Black	0	0	4
Genuine Boiled Oil .... 2 gallons			
Virgin Naphtha .... 2 gallons			

BLACK PAINTS CONTAINING WHITE LEAD.

These are used principally as protective paints on iron-work, the mixture of white lead and carbon being highly esteemed for this purpose. Naturally, no paint made on this principle is a dead black, but rather a grey of varying depth. As a rule, 10 lbs. of carbon black or 14 lbs. of vegetable black is required to convert 1 cwt. of white lead into a passably good black.

The following are typical mixings :—

No. 1.

	cwt.	qrs.	lbs.
Genuine White Lead	5	0	0
Mineral Black	0	2	0
Black Oxide of Iron	0	1	0
Carbon Black	0	1	7
Prussian Blue	0	0	7
Raw Linseed Oil .... 13 gallons			

No. 2.

	cwt.	qrs.	lbs.
Genuine White Lead	3	0	0
No. 3. Barytes	1	0	0
Mineral Black	1	0	0
Lamp Black	0	1	0
Carbon Black	0	1	0
Raw Linseed Oil .... 11 gallons			

CHAPTER XVIII.

RED PAINTS.

Most of the red paints which enjoy an extensive use fall under the heading of oxide paints, which have been already dealt with. Several chemical colours, however, are also used in paint making, and they are here enumerated.

Good white barytes will be found by far the best adulterant of such articles as vermilionette, as it is less likely to injure the colour than other cheapening agents.

Light Vermilionette Paint.

No. 1.

	cwt.	qrs.	lbs.
Light Vermilionette	2	0	0
Best Barytes	0	2	0
Raw Linseed Oil .... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Light Vermilionette	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... $3\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Light Vermilionette	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... $4\frac{1}{2}$ gallons			

MIDDLE VERMILIONETTE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Middle Vermilionette	2	0	0
Best Barytes	0	2	0
Raw Linseed Oil .... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Middle Vermilionette	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 3½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Middle Vermilionette	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 4½ gallons			

DEEP VERMILIONETTE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Deep Vermilionette	2	0	0
Best Barytes	0	2	0
Raw Linseed Oil .... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Deep Vermilionette	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil ....3½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Deep Vermilionette	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil ... . 4½ gallons			

LIGHT ROYAL RED PAINT.

No. 1.

	cwt.	qrs.	lbs.
Light Royal Red	2	0	0
Best Barytes	0	2	0
Raw Linseed Oil .... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Light Royal Red	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 3½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Light Royal Red	2	0	0
Best Barytes	2	2	0
Red Lead	0	0	14
Raw Linseed Oil .... 4½ gallons			

MIDDLE ROYAL RED PAINT.

No. 1.

	cwt.	qrs.	lbs.
Middle Royal Red	2	0	0
Best Barytes	0	2	0
Raw Linseed Oil .... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Middle Royal Red	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 3½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Middle Royal Red	2	0	0
Best Barytes	2	2	0
Red Lead	0	0	14
Raw Linseed Oil .... 4½ gallons			

DEEP ROYAL RED PAINT.

No. 1.

	cwt.	qrs	lbs
Deep Royal Red	2	0	0
Best Barytes	0	2	0
Raw Linseed Oil .... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Deep Royal Red	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 3½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Deep Royal Red	2	0	0
Best Barytes	2	2	0
Red Lead	0	0	14
Raw Linseed Oil ...... 4½ gallons			

SIGNAL RED PAINT.

No. 1.

	cwt.	qrs.	lbs.
Middle Royal Red	2	0	0
Red Lead	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 6 gallons			

No. 2.

	cwt.	qrs.	lbs.
Middle Royal Red	2	0	0
Red Lead	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 8 gallons			

No. 3.

	cwt.	qrs.	lbs.
Middle Royal Red	1	0	0
Red Lead	1	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 6 gallons			

CHEAP EXPORT SIGNAL RED PAINT.

No. 1.

		cwt.	qrs.	lbs.
Middle Royal Red		1	0	0
Red Lead		1	0	0
Common Barytes		4	0	0
Pale Pine Oil	3 gallons			
Boiled Oil	3 gallons			

No. 2.

		cwt.	qrs.	lbs.
Middle Royal Red		1	0	0
Red Lead		1	0	0
Common Barytes		5	0	0
Pale Pine Oil	$3\frac{1}{2}$ gallons			
Boiled Oil	$3\frac{1}{2}$ gallons			

No. 3.

		cwt.	qrs.	lbs.
Middle Royal Red		1	0	0
Red Lead		1	0	0
Common Barytes		5	2	0
Pale Pine Oil	$3\frac{1}{2}$ gallons			
Boiled Oil	4 gallons			

RED LEAD PAINT.

No. 1.

		cwt.	qrs.	lbs.
Red Lead		2	0	0
Common Barytes		1	0	0
Raw Linseed Oil	$3\frac{1}{2}$ gallons			

No. 2.

		cwt.	qrs.	lbs.
Red Lead		2	0	0
Common Barytes		2	0	0
Raw Linseed Oil	$4\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Red Lead	1	2	0
Common Barytes	3	0	0
Raw Linseed Oil .... 5 gallons			

WHEELWRIGHT'S RED PAINT.

No. 1.

	cwt.	qrs.	lbs.
Specific Scarlet or Fast Red..........	0	1	0
Red Lead	2	0	0
Common Barytes	2	0	0
Boiled Oil .... $4\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
Specific Scarlet or Fast Red	0	1	0
Red Lead	2	0	0
Common Barytes	3	0	0
Boiled Oil .... $5\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Specific Scarlet or Fast Red	0	1	0
Red Lead	2	0	0
Common Barytes	4	0	0
Boiled Oil .... $6\frac{1}{2}$ gallons			

CARMINETTE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Imitation Carmine	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... $3\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
Imitation Carmine..................	2	0	0
Best Barytes.........................	2	0	0
Raw Linseed Oil .... 4½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Imitation Carmine..................	1	2	0
Best Barytes	3	0	0
Raw Linseed Oil .... 5 gallons			

PERMANENT RED PAINT.

No. 1.

	cwt.	qrs.	lbs.
Permanent Red	2	0	0
Best Barytes	1	1	0
Raw Linseed Oil .... 3½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Permanent Red	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 4½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Permanent Red	1	2	0
Best Barytes	3	0	0
Raw Linseed Oil .... 5 gallons			

BRIGHT RED PAINT.

Bright red paints may be prepared in various ways. Thus, taking an oxide base and tinting with red chrome:—

No. 1.

	cwt.	qrs.	lbs.
Bright Red Oxide	1	0	0
Red Chrome	0	1	0
Barytes	1	0	0
Raw Linseed Oil .... $4\frac{1}{2}$ gallons			

Or, using only chemical or lake colours:—

No. 2.

	cwt.	qrs.	lbs.
Vermilionette	0	2	0
Strong Staining Red Lake	0	0	20
Barytes	2	0	0
Varnish	0	0	6
Raw Linseed Oil	0	1	12

POST OFFICE, OR ROYAL MAIL RED PAINT.

This name is applied to any of the vermilionette, Royal red, or signal red paints, which possess the correct shade. Any of the mixings for these will do.

CHINESE RED PAINT.

	cwt.	qrs.	lbs.
Chinese Red	1	2	0
Best Barytes	0	2	0
Raw Linseed Oil .... $2\frac{1}{2}$ gallons			

PERSIAN RED PAINT.

	cwt.	qrs.	lbs.
Persian Red	1	0	0
Whiting	0	1	0
No. 2 Barytes	0	1	0
Raw Linseed Oil .... 2 gallons			

MAROON COLOUR PAINT.

(The purple oxide chosen should be a rich middle shade.)

	cwt.	qrs.	lbs.
Purple Oxide	1	0	0
Rose Pink	0	2	0
Ultramarine	0	0	4
No. 2 Barytes	0	2	0
Raw Linseed Oil .... $3\frac{1}{2}$ gallons			

CHAPTER XIX.

BLUE PAINTS.

It may be said that it is for purely decorative purposes that most blue paints are used. This being the case it is advisable that these paints be of as good quality as possible, and carefully ground. A word as to the oil used in blue paints. Prussian blue has a peculiar action on linseed oil; therefore, unless the paint is to be used quickly, linseed oil should not be used, but one of the following oils substituted :—

OIL MEDIUM FOR USE IN PRUSSIAN BLUE PAINT.

No. 1.

Olive Oil	....	

No. 2.

Olive Oil	....	2 parts.
Whale Oil	....	1 part.

No. 3.

Whale Oil	....	2 parts.
Tallow Oil	....	1 part.

Nos. 1, 2, or 3, or intermediate mixtures, may be used according as the cost permits.

In reduced Prussian blue paints, as well as in Brunswick and Celestial blue, both raw and boiled linseed oil are frequently used, so, also, are the paint oils (reduced). In the following mixings, therefore, the oil will be simply called *oil*, and its composition will not be specified, so that the maker may select that which suits the particular case best.

The oil in ultramarine and lime blue paints is usually raw linseed oil, with a little varnish.

PRUSSIAN BLUE PAINT.

No. 1.

		cwt.	qrs.	lbs.
Prussian Blue		1	0	0
Oil	4 gallons			

No. 2.

		cwt.	qrs.	lbs.
Prussian Blue		1	0	0
Best Barytes		0	1	0
Oil	$4\frac{1}{4}$ gallons			

No. 3.

		cwt.	qrs.	lbs.
Prussian Blue		1	0	0
Best Barytes		0	2	0
Oil	$4\frac{1}{2}$ gallons			

No. 4.

		cwt.	qrs.	lbs.
Prussian Blue		1	0	0
Best Barytes		1	0	0
Oil	5 gallons			

BRUNSWICK BLUE PAINT.

No. 1.

		cwt.	qrs.	lbs.
Brunswick Blue		4	0	0
Oil	4 gallons			

No. 2.

		cwt.	qrs.	lbs.
Brunswick Blue		3	0	0
Best Barytes		1	0	0
Oil	4 gallons			

No. 3.

	cwt.	qrs.	lbs.
Brunswick Blue	2	0	0
Best Barytes	2	0	0
Oil .... 4 gallons			

CHEAP EXPORT BRUNSWICK BLUE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
Best Barytes	1	2	0
China Clay	1	2	0
Pine Oil .... 2 gallons			
Raw Linseed Oil .... 2 gallons			

No. 2.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
Best Barytes	1	2	0
China Clay	2	0	0
Pine Oil .... $2\frac{1}{2}$ gallons			
Raw Linseed Oil .... $2\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
Best Barytes	2	0	0
China Clay	2	0	0
Pine Oil .... $2\frac{1}{2}$ gallons			
Raw Linseed Oil .... $2\frac{1}{2}$ gallons			

No. 4.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
Best Barytes	2	2	0
China Clay	2	2	0
Pine Oil .... 3 gallons			
Raw Linseed Oil .... 3 gallons			

CELESTIAL BLUE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Brunswick Blue	2	0	0
Best Barytes	2	0	0
Oil ... 4 gallons			

No. 1 (another).

	cwt.	qrs.	lbs.
Celestial Blue	4	0	0
Oil ... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
Celestial Blue	3	0	0
Best Barytes	1	0	0
Oil ... 4 gallons			

No. 3.

	cwt.	qrs.	lbs.
Celestial Blue	2	0	0
Best Barytes	2	0	0
Oil ... 4 gallons			

CHEAP EXPORT CELESTIAL BLUE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
Best Barytes	1	2	0
China Clay	1	2	0
Pine Oil ... 2 gallons			
Oil ... 2 gallons			

No. 2.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
Best Barytes	1	2	0
China Clay	2	0	0
Pine Oil ... $2\frac{1}{2}$ gallons			
Raw Linseed Oil ... $2\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
Best Barytes	2	0	0
China Clay	2	0	0
Pine Oil .... $2\frac{1}{2}$ gallons			
Raw Linseed Oil .... $2\frac{1}{2}$ gallons			

No. 4.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
Best Barytes	2	2	0
China Clay	2	2	0
Pine Oil .... 3 gallons			
Raw Linseed Oil .... 3 gallons			

The following are tinted blues on a white lead or zinc base :—

LIGHT BLUE PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	4	0	0
Brunswick Blue	0	3	0
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Best Barytes	0	3	0
China Clay	0	3	0
Brunswick Blue	0	3	0
Raw Linseed Oil .... 6 gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Best Barytes	1	2	0
China Clay	1	2	0
Brunswick Blue	0	3	0
Raw Linseed Oil .... $6\frac{1}{2}$ gallons			

The darker shades of these tinted blues are called *azure blue*.

The only other blue pigment of importance in paint-making is ultramarine or (in its cheaper form) lime blue. It is a difficult colour to grind in oil, and a little varnish should be used.

ULTRAMARINE BLUE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Ultramarine	3	0	0
China Clay	0	2	0
Terra Alba	0	2	0
Raw Linseed Oil .... 6 gallons			

No. 2.

	cwt.	qrs.	lbs.
Ultramarine	3	0	0
China Clay	1	2	0
Terra Alba	1	2	0
Raw Linseed Oil .... 10 gallons			

No. 3.

	cwt.	qrs.	lbs.
Ultramarine	3	0	0
China Clay	2	0	0
Terra Alba	2	0	0
Raw Linseed Oil .... 12 gallons			

CHEAP EXPORT ULTRAMARINE BLUE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Ultramarine	3	0	0
China Clay	2	0	0
Terra Alba	2	0	0
Pine Oil .... 6 gallons			
Raw Linseed Oil .... 6 gallons			

No. 2.

		cwt.	qrs.	lbs.
Ultramarine		2	0	0
China Clay		2	0	0
Terra Alba		2	0	0
Pine Oil	5 gallons			
Raw Linseed Oil	5 gallons			

No. 3.

		cwt.	qrs.	lbs.
Ultramarine		2	0	0
China Clay		3	0	0
Terra Alba		3	0	0
Pine Oil	7 gallons			
Raw Linseed Oil	7 gallons			

LIME BLUE PAINT.

No. 1.

		cwt.	qrs.	lbs.
Lime Blue		3	0	0
China Clay		0	2	0
Terra Alba		0	2	0
Raw Linseed Oil	5 gallons			

No. 2.

		cwt.	qrs.	lbs.
Lime Blue		3	0	0
China Clay		1	2	0
Terra Alba		1	2	0
Raw Linseed Oil	10 gallons			

No. 3.

		cwt.	qrs.	lbs.
Lime Blue		3	0	0
China Clay		2	0	0
Terra Alba		2	0	0
Raw Linseed Oil	10 gallons			

CHEAP EXPORT LIME BLUE PAINT.

No. 1.

		cwt.	qrs.	lbs.
Lime Blue		3	0	0
China Clay		2	0	0
Terra Alba		2	0	0
Pine Oil	5 gallons			
Raw Linseed Oil	5 gallons			

No. 2.

		cwt.	qrs.	lbs.
Lime Blue		2	0	0
China Clay		2	0	0
Terra Alba		2	0	0
Pine Oil	4 gallons			
Raw Linseed Oil	4 gallons			

No. 3.

		cwt.	qrs.	lbs.
Lime Blue		2	0	0
China Clay		3	0	0
Terra Alba		3	0	0
Pine Oil	$4\frac{1}{2}$ gallons			
Raw Linseed Oil	$4\frac{1}{2}$ gallons			

TINTED BLUE PAINTS WITH ULTRAMARINE.

White lead should not be used with ultramarine (1) because it is too heavy, and (2) there is a chemical action between the two.

LIGHT BLUE.

No. 1.

		cwt.	qrs.	lbs.
Zinc White		2	0	0
Ultramarine		0	0	14
Raw Linseed Oil	3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Zinc White	2	0	0
China Clay	1	0	0
Terra Alba	1	0	0
Ultramarine Blue	0	0	14
Raw Linseed Oil .... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
Zinc White	2	0	0
China Clay	1	2	0
Terra Alba	1	2	0
Ultramarine Blue	0	0	21
Raw Linseed Oil .... 9 gallons			

CHAPTER XX.

GREEN PAINTS.

Brunswick green is the colouring base of the immense majority of green paints, and considering the great variety in shade and quality in which this pigment is offered, almost endless varieties of paint can be prepared from it. Thus the pure, or nearly pure, Royal and fine Brunswick green pigments are the base of the best qualities of green paint used by the painter, decorator, coachbuilder, etc.; for cheaper paints, and especially for export, lower grades are used. Very bright green paints can be produced from the emerald-tinted Brunswick greens—in short, by varying the particular grade of pigment used, and by paying strict regard to the adulterants (if any) with which it is associated, great variety of tone and quality can be secured.

In preparing reduced green paints it is always economical to buy the very strongest green dry colour that can be procured, as it will stand proportionately more reduction than the cheaper pigments.

The following mixings indicate how a strong-staining dry green may be reduced for different grades of paints:—

Brunswick Green Paint (Light, Middle, or Deep).

No. 1.

	cwt.	qrs.	lbs.
Dry Green	3	0	0
Barytes	0	3	0
Paris White	0	1	0

No. 2.

	cwt.	qrs.	lbs.
Dry Green	1	2	0
Barytes	1	0	14
Paris White	0	3	0

No. 3.

	cwt.	qrs.	lbs.
Dry Green	1	2	0
Barytes	1	3	14
Paris White	0	2	14

$6\frac{1}{2}$ gallons of linseed oil to each mixing.

We now give details of typical mixings of various green paints. Either terra alba or Paris white may be substituted for barytes as adulterants, but caustic whiting must not be used. Raw linseed oil, with a little good varnish foots, is the best medium in which to grind.

LIGHT BRUNSWICK GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Light Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Light Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Light Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

MIDDLE BRUNSWICK GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Middle Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Middle Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Middle Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

DEEP BRUNSWICK GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Deep Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Deep Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Deep Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

LIGHT ROYAL GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Light Royal Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Light Royal Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Light Royal Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

MIDDLE ROYAL GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Middle Royal Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Middle Royal Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Middle Royal Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

DEEP ROYAL GREEN PAINT

No. 1.

	cwt.	qrs.	lbs.
No. 1 Deep Royal Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Deep Royal Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Deep Royal Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

LIGHT EMERALD TINT GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Light Emerald Tint Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Light Emerald Tint Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Light Emerald Tint Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

MIDDLE EMERALD TINT GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Middle Emerald Tint Green ..	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Middle Emerald Tint Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Middle Emerald Tint Green ..	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

DEEP EMERALD TINT GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Deep Emerald Tint Green	2	0	0
Best Barytes	1	0	0
Raw Linseed Oil .... 4 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 1 Deep Emerald Tint Green	2	0	0
Best Barytes	2	0	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 Deep Emerald Tint Green	2	0	0
Best Barytes	4	0	0
Raw Linseed Oil .... 7 gallons			

CHEAP EXPORT GREEN PAINTS.

LIGHT.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Light Green		1	0	0
Best Barytes		1	0	0
China Clay		1	0	0
Terra Alba		1	0	0
Pine Oil	3 gallons			
Pale Boiled Linseed Oil	3 gallons			

No. 2.

		cwt.	qrs.	lbs.
No. 2 Light Green		1	0	0
Best Barytes		1	0	0
China Clay		1	0	0
Terra Alba		2	0	0
Pine Oil	$3\frac{1}{2}$ gallons			
Pale Boiled Linseed Oil	$3\frac{1}{2}$ gallons			

No. 3.

		cwt.	qrs.	lbs.
No. 2 Light Green		1	0	0
Best Barytes		1	2	0
China Clay		1	0	0
Terra Alba		2	2	0
Pine Oil	4 gallons			
Pale Boiled Linseed Oil	4 gallons			

No. 4.

		cwt.	qrs.	lbs.
No. 2 Light Green		1	0	0
Best Barytes		2	0	0
China Clay		1	0	0
Terra Alba		3	0	0
Pine Oil	$4\frac{1}{2}$ gallons			
Pale Boiled Oil	$4\frac{1}{2}$ gallons			

MIDDLE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Middle Green		1	0	0
Best Barytes		1	0	0
China Clay		1	0	0
Terra Alba		1	0	0
Pine Oil	3 gallons			
Pale Boiled Oil	3 gallons			

No. 2.

		cwt.	qrs.	lbs.
No. 2 Middle Green		1	0	0
Best Barytes		1	0	0
China Clay		1	0	0
Terra Alba		2	0	0
Pine Oil	$3\frac{1}{2}$ gallons			
Pale Boiled Oil	$3\frac{1}{2}$ gallons			

No. 3.

		cwt.	qrs.	lbs.
No. 2 Middle Green		1	0	0
Best Barytes		1	2	0
China Clay		1	0	0
Terra Alba		2	2	0
Pine Oil	4 gallons			
Pale Boiled Linseed Oil	4 gallons			

No. 4.

		cwt.	qrs.	lbs.
No. 2 Middle Green		1	0	0
Best Barytes		2	0	0
China Clay		1	0	0
Terra Alba		3	0	0
Pine Oil	$4\frac{1}{2}$ gallons			
Pale Boiled Linseed Oil	$4\frac{1}{2}$ gallons			

DEEP.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Deep Green	1	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Terra Alba	1	0	0
Pine Oil ... 3 gallons			
Pale Boiled Oil ... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 2 Deep Green	1	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Terra Alba	2	0	0
Pine Oil ... $3\frac{1}{2}$ gallons			
Pale Boiled Linseed Oil ... $3\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 2 Deep Green	1	0	0
Best Barytes	1	2	0
China Clay	1	0	0
Terra Alba	2	2	0
Pine Oil ... 4 gallons			
Pale Boiled Linseed Oil ... 4 gallons			

No. 4.

	cwt.	qrs.	lbs.
No. 2 Deep Green	1	0	0
Best Barytes	2	0	0
China Clay	1	0	0
Terra Alba	3	0	0
Pine Oil ... $4\frac{1}{2}$ gallons			
Pale Boiled Linseed Oil ... $4\frac{1}{2}$ gallons			

Bronze Green Paints.

Dry bronze green is really a Brunswick green tinted with umber, etc., In grinding it, therefore, more oil is usually required than in the preceding paints.

LIGHT.

No. 1.

	cwt.	qrs.	lbs.
Light Bronze Green	2	0	0
Common Barytes	0	1	0
China Clay	0	1	0
Terra Alba	0	1	0
Boiled Linseed Oil .... 8 gallons			

No. 1.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
No. 2 Middle Brunswick Green	0	2	0
Ivory Black	0	2	0
Common Barytes	1	0	0
Boiled Linseed Oil .... $5\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
Celestial Blue	0	3	14
No. 2 Lemon Chrome	0	3	7
No. 2 Orange Chrome	0	3	0
Burnt Umber	0	1	0
Common Barytes	1	1	7
Boiled Linseed Oil .... $7\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
Light Bronze Green	2	0	0
Common Barytes	0	1	14
China Clay	0	1	14
Terra Alba	0	1	14
Boiled Linseed Oil .... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Celestial Blue	0	3	14
No. 2 Lemon Chrome	0	3	7
No. 2 Orange Chrome	0	3	0
Burnt Umber	0	1	0
Common Barytes	1	3	21
Boiled Linseed Oil .... 8 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
No. 2 Middle Brunswick Green	0	2	0
Ivory Black	0	2	0
Common Barytes	1	2	0
Boiled Linseed Oil .... 6 gallons			

MIDDLE.

No. 1.

	cwt.	qrs.	lbs.
Middle Bronze Green	2	0	0
Common Barytes	0	1	0
China Clay	0	1	0
Terra Alba	0	1	0
Boiled Linseed Oil .... 8 gallons			

No. 1.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
No. 2 Lemon Chrome	0	3	0
No. 2 Orange Chrome	0	3	14
Burnt Umber	0	1	7
Common Barytes	1	1	21
Boiled Linseed Oil .... 8 gallons			

No. 1.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
No. 2 Middle Brunswick Green	0	2	21
Ivory Black	2	2	0
Common Barytes	2	0	0
Boiled Linseed Oil .... 12 gallons			

No. 2.

	cwt.	qrs.	lbs.
Middle Bronze Green	2	0	0
Common Barytes	0	1	14
China Clay	0	1	14
Terra Alba	0	1	14
Boiled Linseed Oil .... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Celestial Blue	1	0	0
No. 2 Lemon Chrome	0	3	0
No. 2 Orange Chrome	0	3	14
Burnt Umber	0	1	7
Common Barytes	2	0	0
Boiled Linseed Oil .... 8 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	2	0	0
No. 2 Middle Brunswick Green	0	2	21
Ivory Black	2	2	0
Common Barytes	3	0	0
Boiled Linseed Oil .... 13 gallons			

DEEP.

No. 1.

	cwt.	qrs.	lbs.
Deep Bronze Green	2	0	0
Common Barytes	0	1	0
China Clay	0	1	0
Terra Alba	0	1	0
Boiled Linseed Oil .... 8 gallons			

No. 1.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
No. 2 Lemon Chrome	0	2	0
No. 2 Orange Chrome	1	0	0
Burnt Umber	0	1	14
Common Barytes	1	1	21
Boiled Linseed Oil .... 9 gallons			

No. 1.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	1	0	0
No. 2 Middle Brunswick Green	0	2	0
Ivory Black	2	0	0
Common Barytes	1	3	0
Boiled Linseed Oil .... 8 gallons			

	cwt.	qrs.	lbs.
Deep Bronze Green	2	0	0
Common Barytes	0	1	14
China Clay	0	1	14
Terra Alba	0	1	14
Boiled Linseed Oil .... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Brunswick Blue	1	0	0
No. 2 Lemon Chrome	0	2	0
No. 2 Orange Chrome	1	0	0
Burnt Umber	0	1	14
Common Barytes	2	0	0
Boiled Linseed Oil .... 10 gallons			

No. 2.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome	1	0	0
No. 2 Middle Brunswick Green	0	2	0
Ivory Black	2	0	0
Common Barytes	2	2	0
Boiled Linseed Oil .... 9 gallons			

LIGHT QUAKER GREEN PAINT.

The quaker shade is very characteristic and should not be confused with the bronze greens.

No. 1.

	cwt.	qrs.	lbs.
Imperial Yellow	3	0	0
No. 2 Deep Brunswick Green	0	2	0
Mineral Black	0	2	0
Common Barytes	0	2	0
China Clay	0	2	0
Boiled Linseed Oil .... 7 gallons			

No. 2.

	cwt.	qrs.	lbs.
Imperial Yellow	3	0	0
No. 2 Deep Brunswick Green	0	2	0
Mineral Black	0	2	0
Common Barytes	0	3	0
China Clay	0	3	0
Boiled Linseed Oil .... 8 gallons			

MIDDLE QUAKER GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
Imperial Yellow	2	2	0
No. 2 Deep Brunswick Green	1	0	0
Mineral Black	0	2	0
Common Barytes	0	3	0
China Clay	0	3	0
Boiled Linseed Oil .... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
No. 2 Deep Brunswick Green	1	0	0
Mineral Black	0	2	0
Common Barytes	1	0	0
China Clay	1	0	0
Boiled Linseed Oil .... 10 gallons			

DEEP QUAKER GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
No. 2 Deep Brunswick Green	1	0	0
Mineral Black	1	0	0
Common Barytes	0	3	0
China Clay	0	3	0
Boiled Linseed Oil .... 9 gallons			

No. 2.

	cwt.	qrs.	lbs.
Imperial Yellow	2	0	0
No. 2 Deep Brunswick Green	1	0	0
Mineral Black	1	0	0
Common Barytes	1	0	0
China Clay	1	0	0
Boiled Linseed Oil .... 10 gallons			

OLIVE GREEN PAINT.

No. 1.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	2	0	0
No. 2 Deep Brunswick Green	2	0	0
Ivory Black	1	1	0
Common Barytes	0	3	0
China Clay	0	3	0
Boiled Linseed Oil .... 10 gallons			

No. 2.

	cwt.	qrs.	lbs.
Middle Oxide of Iron	2	0	0
No. 2 Deep Brunswick Green	2	0	0
Ivory Black	1	1	0
Common Barytes	1	0	0
China Clay	1	0	0
Boiled Linseed Oil .... 11 gallons			

Verdigris Paint.

Copper green paints are usually associated with anti-fouling compositions which are varnish products; occasionally, however, copper green or verdigris is the base of an oil paint.

No. 1.

	cwt.	qrs.	lbs.
Powdered Verdigris	2	0	0
Raw Linseed Oil .... 7 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Verdigris	2	0	0
Best Barytes	0	2	0
China Clay	0	2	0
Raw Linseed Oil .... 8 gallons			

No. 3.

	cwt.	qrs.	lbs.
Powdered Verdigris	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Raw Linseed Oil .... 9 gallons			

Emerald Green Paint.

In grinding this substance, too much pressure must not be used, or it will turn white. Mix well with the oil and grind lightly. Be very careful of dust, as it is a deadly poison.

No. 1.

	cwt.	qrs.	lbs.
Emerald Green	2	0	0
Pale Boiled Linseed Oil .... 6 gallons			

No. 2.

	cwt.	qrs.	lbs.
Emerald Green	2	0	0
Best Barytes	0	2	0
China Clay	0	2	0
Pale Boiled Linseed Oil .... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
Emerald Green	2	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Pale Boiled Linseed Oil .... 8 gallons			

The reduced grades should contain a little emerald-tinted Brunswick green, as a better colour is thereby obtained. Pure emerald green is a bad stainer.

CHEAP EXPORT EMERALD GREEN PAINT.

These are made on the lines just indicated.

No. 1.

	cwt.	qrs.	lbs.
Emerald Green	1	0	0
Imitation Emerald Green	1	0	0
Best Barytes	1	0	0
China Clay	1	0	0
Pale Boiled Linseed Oil ....6½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Emerald Green	1	0	0
Imitation Emerald Green	1	0	0
Best Barytes	1	1	0
China Clay	1	1	0
Pale Boiled Linseed Oil .... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
Emerald Green	1	0	0
Imitation Emerald Green	1	0	0
Best Barytes	1	2	0
China Clay	1	2	0
Pale Boiled Linseed Oil ... 8 gallons			

Imperial Green Paint.

This name is given to a very vivid green, which has a large sale in certain foreign markets.

No. 1.

	cwt.	qrs.	lbs.
Steel Blue	0	0	2
Zinc Chrome	0	2	0
Best Barytes	3	0	0
Raw Linseed Oil .... 4½ gallons			

No. 2.

	cwt.	qrs.	lbs.
Steel Blue	0	0	2
Zinc Chrome	0	2	0
Best Barytes	3	2	0
Raw Linseed Oil .... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
Steel Blue	0	0	2
Zinc Chrome	0	2	0
Best Barytes	4	0	0
Raw Linseed Oil .... 5½ gallons			

The following are green paints used for special purposes, and, therefore, made of specially shaded materials.

GREEN SILICATE PAINT (LIGHT SHADE).

	cwt.	qrs.	lbs.
O. H. Barytes	2	3	10
Whiting	0	3	0
Silica	0	3	0
G. W. Green	0	3	0
Raw Linseed Oil	0	3	0
	6	0	0

DEEP CROME GREEN IN OIL.

	cwt.	qrs.	lbs.
Deep Brunswick Chrome Green	0	0	21
Barytes	1	0	0
Linseed Oil	0	0	22
Thick Oil	0	0	4
	1	0	19

MINERAL GREEN PAINT.

	cwt.	qrs.	lbs.
Mineral Green	1	0	0
Barytes	4	0	0
Pale Boiled Oil .... 7 gallons			

GREEN PAINT WITH WHITE LEAD BASE.

	cwt.	qrs.	lbs.
Strong Brunswick Green, Light or Middle Shade	0	1	0
White Lead	1	0	0
Barytes (as desired)			
Raw Linseed Oil .... 2 gallons			

If deep Brunswick is used, a little orange chrome must be added to correct the blue tone.

CHAPTER XXI.

TINTED PAINTS.

This term is appropriately applied to paints the base of which is white lead, white zinc, whiting, barytes, or some other suitable white base, tinted to a required shade with suitable stainers. There is great scope, both in the selection of bases and of stainers, and both the cost and the resulting shade are largely influenced by variations in these particulars.

In preparing a batch of paint to match a particular tint, trials should be first made with small quantities, otherwise large quantities of material may be spoiled.

The bases commonly used, along with their leading characteristics, are as follows :—

(1) White lead, where a dense, durable paint is required of good body.

(2) White zinc, where clean, delicate, or metallic shades are required.

(3) Lithopone, as a substitute for the above, and possessing many of the good points of both.

(4) Whiting, or Paris white, as an adulterant of white lead. Except in dark or dull tints it should not be used with (2) or (3).

(5) Barytes, of varying colour according to shade of paint, as an adulterant of any of the above.

(6) China clay and terra alba have little use in paints of this description.

The following list indicates the tints produced by some ordinary pigments :—

Yellow Ochre	Cream and Light Stone.
Yellow Chrome	Warm Yellow Stone and Buff.
Raw Sienna, Raw Umber	Drab.
Ochre and Burnt Sienna	Warm Dark Stone.
Ultramarine Blue	Grey Blue.
Prussian Blue	Sky and Azure Blue.
Carbon Black	Grey.
Vegetable Black	Blue Grey.

We now give in detail a number of typical mixings indicating the composition of a large number of the tinted paints usually met with. By varying the stainers, many others can be produced.

LIGHT BATH STONE COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
Yellow Ochre	0	0	7
Raw Linseed Oil .... $4\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
Yellow Ochre	0	0	7
Raw Linseed Oil .... 6 gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
Yellow Ochre	0	0	7
Raw Linseed Oil .... 5 gallons			

MIDDLE BATH STONE COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
Yellow Ochre	0	0	14
Raw Linseed Oil .... 4½ gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
Yellow Ochre	0	0	14
Raw Linseed Oil .... 6 gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
Yellow Ochre	0	0	14
Raw Linseed Oil .... 5 gallons			

DEEP BATH STONE COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
Yellow Ochre	0	0	21
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
Yellow Ochre	0	0	21
Raw Linseed Oil .... 6½ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
Yellow Ochre	0	0	21
Raw Linseed Oil .... 5½ gallons			

LIGHT PORTLAND STONE COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
English Umber	0	0	7
Raw Linseed Oil .... 4½ gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
English Umber	0	0	7
Raw Linseed Oil .... 6½ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
English Umber	0	0	7
Raw Linseed Oil .... 5 gallons			

MIDDLE PORTLAND STONE COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
English Umber	0	0	14
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
English Umber	0	0	14
Raw Linseed Oil .... 6½ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
English Umber	0	0	14
Raw Linseed Oil .... 5 gallons			

DEEP PORTLAND STONE COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
English Umber	0	0	21
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
English Umber	0	0	12
Raw Linseed Oil .... 6½ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
English Umber	0	0	21
Raw Linseed Oil .... 5½ gallons			

PRIMING PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	2	0
Genuine Red Lead	0	0	14
Raw Linseed Oil .... 5 gallons			

No. 2.

	cwt.	qrs.	lbs
White Lead	3	0	0
Barytes	2	0	0
China Clay	1	0	0
Genuine Red Lead	0	0	12
Raw Linseed Oil .... 6½ gallons			

No. 3.

	cwt.	qrs.	lbs
White Lead	1	2	0
Barytes	2	0	0
China Clay	1	0	0
Genuine Red Lead	0	0	10
Raw Linseed Oil .... 5 gallons			

CHOCOLATE PAINT.

No. 1.

	cwt.	qrs.	lbs
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	1	0	0
Whiting	1	0	0
Boiled Linseed Oil ...... 3½ gallons			

No. 2.

	cwt.	qrs.	lbs
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	1	2	0
Whiting	1	2	0
Boiled Linseed Oil ...... 4½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	2	0	0
Whiting	2	0	0
Boiled Linseed Oil ...... 5½ gallons			

CHOCOLATE PAINT (ANOTHER METHOD).

	cwt.	qrs.	lbs.
Barytes	2	0	0
Ochre	0	2	0
Burnt Turkey Umber	0	0	14
Bone Black	0	0	14
Lamp Black	0	0	7
Raw Linseed Oil .... 7 gallons			

CHEAP EXPORT CHOCOLATE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	2	0	0
Whiting	2	0	0
Pine Oil .... 2½ gallons			
Boiled Linseed Oil ...... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	2	2	0
Whiting	2	2	0
Pine Oil .... 3 gallons			
Boiled Linseed Oil ...... 3½ gallons			

No. 3.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	3	0	0
Whiting	3	0	0
Pine Oil .... 3½ gallons			
Boiled Linseed Oil ...... 4 gallons			

No. 4.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Mineral Black	0	1	7
Common Barytes	3	2	0
Whiting	3	2	0
Pine Oil ... 4 gallons			
Boiled Linseed Oil ... 4½ gallons			

YORK BROWN PAINT.

No. 1.

	cwt.	qrs.	lbs.
York Brown	2	0	0
Boiled Oil ... 6 gallons			

No. 2.

	cwts.	qrs.	lbs.
York Brown	1	0	0
Raw Sienna	0	2	0
Oxford Ochre	0	1	0
Venetian Red	0	0	14
Whiting	0	2	0
Terra Alba	0	2	0
Boiled Linseed Oil ... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
York Brown	1	0	0
Raw Sienna	0	2	0
Oxford Ochre	0	1	0
Venetian Red	0	0	14
Whiting	1	0	0
Terra Alba	1	0	0
Boiled Linseed Oil ... 8 gallons			

TORBAY BROWN COLOUR PAINT.

	cwt.	qrs.	lbs.
Yellow Ochre	0	2	0
Barytes	2	0	0
Whiting	1	0	0
English Umber	0	0	14
Burnt Sienna	0	0	4
Bright Red Oxide	0	0	4
Middle Chrome	0	0	14
Raw Linseed Oil .... 5 gallons			

MEDIUM OAK COLOUR PAINT.

	cwt.	qrs.	lbs.
White Lead	1	0	0
Barytes	1	0	0
Whiting	0	2	0
Burnt Sienna	0	0	4
Raw Sienna	0	0	4
English Umber	0	0	4
Raw Linseed Oil .... 3 gallons			

LEAD COLOUR PAINT.

LIGHT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
Carbon Black	0	0	1
Ultramarine Blue	0	0	1
Raw Linseed Oil .... $4\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
Carbon Black	0	0	1
Ultramarine Blue	0	0	1
Raw Linseed Oil .... $6\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
Carbon Black	0	0	1
Ultramarine Blue	0	0	1
Raw Linseed Oil .... 5 gallons			

LEAD COLOUR PAINT.

MIDDLE.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
Carbon Black	0	0	$1\frac{1}{2}$
Ultramarine Blue	0	0	2
Raw Linseed Oil .... $4\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
Carbon Black	0	0	$1\frac{1}{2}$
Ultramarine Blue	0	0	$1\frac{1}{2}$
Raw Linseed Oil .... $6\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
Carbon Black	0	0	$1\frac{1}{2}$
Ultramarine Blue	0	0	$1\frac{1}{2}$
Raw Linseed Oil .... 5 gallons			

LEAD COLOUR PAINT.

DARK.

No. 1.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	1	0	0
China Clay	0	1	0
Whiting	0	1	0
Carbon Black	0	0	2
Ultramarine Blue	0	0	2
Raw Linseed Oil .... $4\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	3	0	0
Barytes	2	0	0
China Clay	0	2	0
Whiting	0	2	0
Carbon Black	0	0	2
Ultramarine Blue	0	0	2
Raw Linseed Oil .... $6\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
White Lead	1	2	0
Barytes	1	2	0
China Clay	0	3	0
Whiting	0	3	0
Carbon Black	0	0	2
Ultramarine Blue	0	0	2
Raw Linseed Oil .... 5 gallons			

SLATE COLOUR PAINT.

The lead colour mixings may be used, increasing or varying the proportion of stains as may be thought desirable.

TEAK COLOUR.

Strong burnt Turkey umber, with a little yellow ochre and a mere trace of Venetian red, will give this colour. The following will do.

	cwt.	qrs.	lbs.
White Lead	1	0	0
Whiting	1	0	0
Barytes	0	2	0
Burnt Turkey Umber	0	1	14
Yellow Ochre	0	0	14
Venetian Red	0	0	4
Raw Linseed Oil .... 4 gallons			

MAST COLOUR PAINT.

No. 1.

	cwt.	qrs.	lbs.
White Lead	2	0	0
Sulphide of Zinc	1	0	0
Common Barytes	2	0	0
Oxford Ochre	1	2	0
Venetian Red	0	1	0
Raw Linseed Oil .... 10 gallons			

No. 2.

	cwt.	qrs.	lbs.
White Lead	2	0	0
Sulphide of Zinc	1	0	0
Common Barytes	3	0	0
Oxford Ochre	1	2	0
Venetian Red	0	1	0
Raw Linseed Oil .... 11 gallons			

CHAPTER XXII.

COLOURS IN TURPS., COLOURS IN WATER.

The grinding of colours in turpentine demands care and attention to details. The mills used for the purpose are now, as a rule, cone mills of iron or American flat-stone mills.

Where cone mills are used, three should be arranged, one feeding into the other. Very little attention is then required. Loss through evaporation is often considerable, therefore means should be adopted to check this as much as possible, and the grinding should be conducted in a cool place.

Certain colours, such as drop black and Prussian blue, are hard to grind, others, such as zinc white and chrome, are comparatively easy.

Colours in Turps.

DROP BLACK IN TURPS.

	cwt.	qrs.	lbs.
Drop Black	2	0	0
Turps., 13 gallons	0	3	26
Linseed Oil, 6 gallons	0	1	26
	3	1	24

Loss by evaporation, say, 10 lbs.

REDUCED DROP BLACK IN TURPS. FOR CHEAP TRADE.

	cwt.	qrs.	lbs.
Drop Black	1	0	0
Terra Alba	1	0	0
Carbon Black	0	0	3
Brunswick Blue	0	0	1
Linseed Oil	0	0	14
Turps.	0	2	14

PRUSSIAN BLUE IN TURPS.

	cwt.	qrs.	lbs.
Prussian Blue	0	0	28
Olive Oil	0	0	7
Turps.	0	0	14

CHROME IN TURPS.

	cwt.	qrs.	lbs.
Chrome	0	0	28
Raw Linseed Oil	0	0	4
Turps.	0	0	10

INDIAN RED IN TURPS.

	cwt.	qrs.	lbs.
Indian Red	0	0	28
Goldsize	0	0	4
Turps.	0	0	10

ZINC OXIDE IN TURPS.

	cwt.	qrs.	lbs.
Oxide of Zinc	0	0	28
Turps.	0	0	14
Refined Linseed Oil	0	0	2
Pale Terebine	0	0	1

PRIMROSE CHROME IN TURPS.

	cwt.	qrs.	lbs.
Primrose Chrome	0	2	26
Dry White Lead	0	0	20
Refined Oil	0	0	6
Turps.	0	0	6
	1	0	2

For grinding colours which are to be used as stainers for flatting paint the following mixing may be used:—

	cwt.	qrs.	lbs.
American Turps.	0	0	15
Crystal Varnish	0	0	1

Grind under edge runners and then through cone mill.

The colours so treated are mostly raw and burnt sienna, Vandyke brown, drop black, and umber.

Colours in Water.

The same general principles govern the grinding of colours in water, only, as water is less volatile than turps. and is, in addition, of no account in regard to cost, more use may be made of the edge runner of flat-stone mill.

Raw and burnt sienna and Vandyke brown are the chief colours which are ground in water, although, on occasion, almost any colour may be asked for, just as in the case of turpentine colours. To prevent evaporation of the water, grind in a mixture of 1 part glycerine and 10 parts water, and cover the ground pulp with a film of glycerine.

RAW SIENNA IN WATER.

No. 1.

	cwt.	qrs.	lbs.
Sienna	1	1	14
Water	1	1	0

No. 2.

	cwt.	qrs.	lbs.
Sienna	2	1	14
Water	1	1	0

The sienna being commoner and heavier absorbs less water (in 2).

BURNT SIENNA IN WATER.

	cwt.	qrs.	lbs.
Sienna	1	0	0
Water	0	3	24

VANDYKE BROWN IN WATER.

	cwt.	qrs.	lbs.
Vandyke Brown	1	3	0
Water	1	1	12

A very fine Vandyke brown may take its own weight of water. The powder should be steeped in the water for 12 hours before grinding, and if it does not bind well with the water add 4 ozs. of carbonate of soda to every cwt. of dry colour, or 1 fluid oz. of strong ammonia to the same quantity. This makes it more soluble.

CHAPTER XXIII.

STIFF PAINTS FOR SPECIAL PURPOSES.

The exact classification of paints is a difficult, we may almost say an impossible, matter. If we make *colour* or hue the basis of the classification the result will be that we shall have in one group paints of entirely different composition and suited for divers purposes. Again, if the general composition of the paint is used as the basis of classification we may have paints collected in one group whose uses are entirely different. The method least open to objection, therefore, seems to be to collect in one chapter those paints whose uses are in any way different to ordinary painters' and decorators' colours. In the present chapter, therefore, will be found numerous recipes and formulæ used in the fabrication of paints and compositions used on special surfaces, as well as of those materials which cannot strictly be designated oil paints.

Artists' Tube Colours.

The purpose for which these are used demands that only the finest materials should be used in the making of them. Both the pigment and the oil should be of the finest quality, and the mixing and grinding must be of the most perfect description. The following list indicates some of the more usual colours and the oil required by each, the consistency being thinner than in the case of painters' colours.

100 parts White Lead	15 parts Oil
100 parts Zinc White	17 parts Oil
100 parts Chrome Yellow	32 parts Oil
100 parts Yellow Ochre	75 parts Oil
100 parts Raw Sienna	180 parts Oil
100 parts Vermilion	20 parts Oil
100 parts Prussian Blue	75 parts Oil
100 parts Ultramarine	37 parts Oil
100 parts Raw Umber	100 parts Oil
100 parts Burnt Umber	90 parts Oil
100 parts Burnt Sienna	195 parts Oil
100 parts Bone Black	110 parts Oil

Silicate Paints.

When this term is applied to oil paints, it indicates an ordinary oil paint of the nature of those described in the preceding chapters, but containing a definite quantity of powdered calcined flint or silica; finely powdered flint glass is a convenient source of silica.

The quantity added should be equal in weight to half the barytes or other adulterant used, no alteration of quantities need be made, as the flint does not deteriorate the shade of colour.

The following are given as typical examples.

WHITE SILICATE PAINT.

	cwt.	qrs.	lbs.
Zinc Oxide	1	0	0
Barytes	4	2	0
Zinc Sulphide	3	0	0
China Clay	0	1	0
Silica	0	1	0
Refined Oil	0	3	24
	9	3	24

LIGHT GREEN SILICATE PAINT.

	cwt.	qrs.	lbs.
Grey Barytes	3	0	12
Whiting	0	3	13
Silica	0	3	0
Green	0	1	14
Azure Blue	0	0	9
Lemon Chrome	0	0	$1\frac{1}{2}$
Raw Linseed Oil	0	3	6
Thick Oil	0	0	3
	6	0	$1\frac{1}{2}$

The following list of stiff oil paints comprises both tinted and self-coloured paints. They are all given together at this point, as they form a series of similar composition and quality, and are particularly suitable for ship work or for use on iron or metal work. The oil medium is open to some alteration, according to the particular purpose for which the paint is wished. Thus, for quick-drying hard paints, boiled oil and a little goldsize may be substituted. If a flat quick paint is wanted use turpentine and raw linseed, half and half, and add some goldsize.

Paints for Ships' Stores, Ironwork, etc.

MAST COLOUR PAINT.

	cwt.	qrs.	lbs.
Foreign White Lead	1	2	0
No. 2 Barytes	2	0	0
Yellow	0	0	18
Venetian Red	0	0	10
Linseed Oil .... 6 gallons			

BOOT TOPPING PAINT.

	cwt.	qrs.	lbs.
Foreign White Lead	1	0	0
No. 2 Barytes	3	0	0
Yellow Ochre	0	0	0
Venetian Red	0	0	20
Linseed Oil .... 7 gallons			

CHOCOLATE PAINT.

	cwt.	qrs.	lbs.
Purple Oxide of Iron	1	0	0
No. 2 Barytes	1	0	0
Linseed Oil .... 3½ gallons			

TEAK COLOUR PAINT.

	cwt.	qrs.	lbs.
Foreign White Lead	2	0	0
No. 2 Barytes	3	0	0
Purple Brown	0	1	7
Yellow Ochre	0	0	4
Venetian Red	0	0	8
Linseed Oil .... 8 gallons			

GREY PAINT.

	cwt.	qrs.	lbs.
No. 2 Barytes	2	0	0
Foreign White Lead	2	0	0
Brunswick Blue	0	0	6
Lamp Black	0	0	2½

STONE COLOUR PAINT.

	cwt.	qrs.	lbs.
Foreign White Lead	2	0	0
No. 2 Barytes	3	0	0
Yellow Ochre	0	0	8½
Venetian Red	0	0	1
Raw Linseed Oil .... 7 gallons			

BURNT TURKEY UMBER PAINT.

	cwt.	qrs.	lbs.
Burnt Turkey Umber	2	0	0
No. 2 Barytes	2	0	0
Linseed Oil .... 9 gallons			

LIGHT GREEN PAINT.

	cwt.	qrs.	lbs.
No. 2 Barytes	4	0	0
Light Green	3	0	0
Linseed Oil .... 8 gallons			

MIDDLE GREEN PAINT.

	cwt.	qrs.	lbs.
No. 2 Barytes	4	0	0
Middle Green	3	0	0
Linseed Oil .... 8 gallons			

DARK GREEN PAINT.

	cwt.	qrs.	lbs.
Dark Green	3	0	0
No. 2 Barytes	4	0	0
Linseed Oil .... 8 gallons			

CELESTIAL BLUE PAINT.

	cwt.	qrs.	lbs.
Celestial Blue	2	0	0
No. 2 Barytes	3	0	0
Linseed Oil .... 6 gallons			

BRONZE GREEN PAINT.

	cwt.	qrs.	lbs.
No. 2 Barytes	3	0	0
Dark Brunswick Green	1	0	0
Vandyke Brown	0	0	15
Lemon Chrome	0	0	9
Linseed Oil .... 6 gallons			

FERRIC OXIDE.

	cwt.	qrs.	lbs.
Indian Red	1	0	0
No. 2 Barytes	2	2	0
Linseed Oil .... 6¼ gallons			

BLACK PAINT.

	cwt.	qrs.	lbs.
Vegetable Black	0	1	0
No. 2 Barytes	2	0	0
Linseed Oil .... 4 gallons			

VENETIAN RED PAINT.

	cwt.	qrs.	lbs.
No. 2 Barytes	3	0	0
Venetian Red	0	0	36
Linseed Oil .... 4½ gallons			

ZINC WHITE PAINT.

No. 1.

	cwt.	qrs.	lbs.
Oxide of Zinc	6	0	0
White Barytes	2	0	0
Refined Linseed Oil ...... 15 gallons			

No. 2.

	cwt.	qrs.	lbs.
Zinc White	4	0	0
No. 1 White Barytes	4	0	0
Refined Linseed Oil ...... 12 gallons			

No. 3.

	cwt.	qrs.	lbs.
No. 1 White Barytes	5	0	0
Oxide of Zinc	3	0	0

Grind in { ½ Pale Boiled Oil.
½ Mineral Colza.

WHITE LEAD.

No. 1.

	cwt.	qrs.	lbs.
White Lead	4	0	0
No. 1 White Barytes	4	0	0
Refined Linseed Oil .... 8 gallons			

WHITE LEAD.

No. 2.

	cwt.	qrs.	lbs.
No. 1 White Barytes	5	0	0
White Lead	3	0	0

FILLING UP PAINT.

		cwt.	qrs.	lbs.
No. 2 Barytes		0	1	0
White Lead		0	1	0
Gold Size	112 gallons			
Boiled Oil	½ gallon			
Vegetable Black	1 lb.			

Funnel Paints.

The white or tinted paints in the series just given may be converted into funnel paints by taking as base zinc white, adding suitable stainers, and thinning with a strong binding oil. Raw linseed and gold size make a good medium.

The following are additional formulæ for the same class of paints :—

No. 1.

	cwt.	qrs.	lbs.
Whiting	3	2	0
Barytes	3	0	0
J.F.L.S. French Ochre	0	2	14
Red Chrome	0	1	21
Red Oxide	0	0	14
Linseed Oil	1	1	7
	9	0	0

No. 2.

	cwt.	qrs.	lbs.
J.F.L.S. French Ochre	0	1	14
Strong Grinding Yellow	0	0	7
Super Deep Chrome	0	0	10
Red Oxide	0	0	7
Barytes	3	2	14
Whiting	3	2	0
Linseed Oil	1	2	4
	9	1	0

No. 3.

	cwt.	qrs.	lbs.
Imperial Yellow	0	1	14
Red Lead	0	0	14
Barytes	1	0	0
Whiting	1	0	0
Linseed Oil.........................	0	3	14
	3	1	14

No. 4.

	cwt.	qrs.	lbs.
J.F.L.S. French Ochre	1	1	0
Oxford Ochre	0	1	0
Barytes	0	2	0
Whiting	0	2	0
Bright Red Oxide	0	0	7
Linseed Oil	0	2	14
	3	0	21

RED FUNNEL COLOUR.

	cwt.	qrs.	lbs.
Bright Red	0	3	14
Whiting	4	2	0
Barytes	3	0	0
Linseed Oil	1	3	0
	10	0	14

In all the above the oil, varnish, etc., may be varied as already indicated.

Stiff Paint Bases for R.M. Paints.

It is very desirable in making ready-mixed paints that the various tints are of the same quality, because if not the paint will fill the tins differently in the case of different colours. If, then, dry pigments are selected which will stand (approximately) the same reduction, the following proportions may be found useful :—

Venetian red, pale, middle, and deep Brunswick, chrome, and emerald greens, Brunswick blues, light and deep Indian reds, purple and red oxides, primrose, lemon, pale, middle and deep chromes in oil (paste).

For best, second, and third qualities, as follows :—

BEST QUALITY.

	cwt.	qrs.	lbs.
Colour	0	3	0
Best Barytes	0	1	0
Dried Whiting	0	0	7
Linseed Oil	0	0	9
Boiled Linseed Oil	0	0	2
Litho Oil	0	0	1

SECOND QUALITY.

	cwt.	qrs.	lbs.
Colour	0	2	0
Best Barytes	0	2	0
Dried Whiting	0	0	14
Linseed Oil	0	0	9
Boiled Oil	0	0	2

THIRD QUALITY.

	cwt.	qrs.	lbs.
Colour	0	1	0
Best Barytes	0	3	0
Dried Whiting	0	0	21
Linseed Oil	0	0	10
Or, Linseed Oil Foots	0	0	12

The first quality should be put through the rollers twice. Second, third, and lower qualities once. The third quality can be cheapened by using boiled oil substitute. The colours used in the above mixings should be the best.

American Specialities.

The following series of valuable recipes will be found to contain many American specialities, such as coloured glazes or enamel paints suitable for many purposes. A little experimentation with different sorts of mixing or grinding varnish will enable one to select the recipe which yields the best results with the pigments and dry colours at disposal.

SAND PAPER GLAZE.

White Lead	$62\frac{1}{2}$ lbs.
Gilders' Whiting	125 lbs.
Lamp Black	$2\frac{1}{2}$ lbs.
Grinding Japan	$2\frac{3}{4}$ gallons
Grinding Varnish	$2\frac{3}{4}$ gallons

Thin with a half gallon turpentine.

STANDARD GLAZE.

White Lead	100 lbs.
Whiting	100 lbs.
Muncey Filler	100 lbs.
Silica	50 lbs.
Lamp Black	5 lbs.
Turpentine Kauri Mixing Varnish ..	2 gallons
Grinding Japan	7 gallons

Thin with 2 gallons of turpentine.

The above should be ground *very* fine indeed. These are sometimes called glazes, but more commonly "rough stuffs."

STANDARD FREIGHT CAR PAINT.

Wetherell's No. 123 Oxide of Iron ..	260 lbs.
Whiting	10 lbs.
Water	$1\frac{1}{2}$ gallons
Raw Linseed Oil	25 gallons
Boiled Linseed Oil	10 gallons
Grinding Japan	$3\frac{1}{2}$ gallons
Turpentine	$1\frac{1}{2}$ gallons

ELASTIC FLOOR PAINT.

Wetherell's Indian Red No. 17	$93\frac{3}{4}$ lbs.
Double Boiled Oil	5 gallons
Grinding Japan	6 gallons

Thin with turpentine $4\frac{1}{2}$ gallons, and mixing varnish 30 gallons.

REFRIGERATOR CAR PAINT.

White Lead	93	lbs.
White Zinc	37	lbs.
Gypsum	50	lbs.
Colour as Required		
Raw Linseed Oil	$3\frac{3}{4}$	gallons
Water	$\frac{3}{8}$	gallon

LOCOMOTIVE FINISHING BLACK.

Carbon Black	4	ozs.
Drop Black	14	lbs.
Grinding Japan	3	gallons
Grinding Varnish	10	gallons
Turpentine	2	gallons

LOCOMOTIVE FINISH (GREEN STANDARD).

Carbon Black	9	lbs.
Peerless Green	$7\frac{1}{2}$	lbs.
Grinding Japan	$3\frac{3}{4}$	gallons
Grinding Varnish	42	gallons
Turpentine	$7\frac{1}{2}$	gallons

LOCOMOTIVE FINISH.

Carbon Black	$7\frac{1}{2}$	lbs.
Peerless Green	$6\frac{1}{4}$	lbs.
Boiled Oil	$3\frac{1}{2}$	gallons
Grinding Japan	$3\frac{1}{8}$	gallons
Grinding Varnish	35	gallons
Turpentine	$6\frac{1}{4}$	gallons

INSIDE LOCOMOTIVE FINISH (GREEN).

Peerless Green	6	lbs.
China Clay	2	lbs.
Peerless Green, Light	3	lbs.
Grinding Japan	3	gallons
Grinding Varnish	15	gallons
Turpentine	3	gallons

CARBON BLACK PAINT.

Litharge	150	lbs.
Charcoal	15	lbs.
Lamp Black	15	lbs.
Borax	6	ozs.
Water	3	gallons
Asbestine Pulp	30	lbs.
Double Boiled Linseed Oil	120	gallons

INSIDE CAB COLOUR (A REDDISH YELLOW).

White Lead	240	lbs.
Zinc White	80	lbs.
Ochre	23	lbs.
Victoria Venetian Red	6	lbs.
Turpentine	$\frac{3}{4}$	gallon
Raw Linseed Oil	$\frac{3}{4}$	gallon
Grinding Japan	7	gallons

GREEN.

Wood's Special M. Green	100	lbs.
Zinc White	20	lbs.
Grinding Japan	5	gallons

INDIAN RED.

Indian Red	56	lbs.
Whiting	20	lbs.
Grinding Japan	$1\frac{1}{2}$	gallons

STANDARD TRUCK COLOUR.

Crown Point Drab	300	lbs.
Ochre	210	lbs.
Zinc White	$7\frac{1}{2}$	lbs.
Carbon Black	7	lbs.
Ex. Chrome Green L.	45	lbs.
Ex. Chrome Green M.	21	lbs.
Chrome Yellow M.	6	lbs.
Victoria Venetian Red	13	lbs.
Grinding Japan	25	gallons
Boiled Linseed Oil	5	gallons
Turpentine	$1\frac{1}{2}$	gallons

CABOOSE COLOUR.

English Vermilion, Pale	75	lbs.
Ordinary Turkey Red	75	lbs.
China Clay	75	lbs.
Grinding Japan	$5\frac{3}{4}$	gallons
Boiled Linseed Oil	$3\frac{1}{4}$	gallons
Turpentine	10	gallons

STANDARD CAB VERMILION.

China Clay	50	lbs.
Ordinary Turkey Red	50	lbs.
English Vermilion	50	lbs.
Grinding Japan	4	gallons
Turpentine	$\frac{1}{4}$	gallon
Raw Linseed Oil	$\frac{1}{4}$	gallon

BLACK MACHINE PAINT.

Barytes	50	lbs.
Whiting	50	lbs.
Lamp Black	10	lbs.
Grinding Japan	2	gallons
Double Boiled Linseed Oil	2	gallons
Benzine Japan	2	gallons

IRON FILLER.

Muncey Filler	50	lbs.
Zinc White	5	lbs.
Crown Point Drab	1	lb.
Silica	2	lbs.
Barytes	$12\frac{1}{2}$	lbs.
Lamp Black	$\frac{1}{2}$	lb.
Grinding Japan	2	gallons
Benzine Japan	$\frac{3}{8}$	gallon
Varnish "Bottoms" (settlings from varnish tanks)	$\frac{3}{8}$	gallon

MACHINE PAINT.

Muncey Filler	93	lbs.
Zinc White	105	lbs.
Whiting	56	lbs.
Barytes	250	lbs.
Boiled Oil	4	gallons
Grinding Japan	4	gallons
Benzine Japan	4	gallons
Varnish Bottoms	4	gallons

DEEP MAROON FOR BRASS.

Rose Pink	$4\frac{3}{8}$	lbs.
Tuscan Red	$1\frac{1}{4}$	lbs.
Grinding Japan	$\frac{1}{2}$	gallon
Turpentine	$\frac{5}{8}$	gallon
Kauri Mixing Varnish	$3\frac{3}{4}$	gallons

INSIDE FLAT WHITE HOUSE PAINT.

White Lead	$62\frac{1}{2}$	lbs.
Zinc White	100	lbs.
China Clay	$6\frac{1}{2}$	lbs.
Refined Linseed Oil	$12\frac{1}{4}$	gallons
Price's Pale Japan	$1\frac{1}{4}$	gallons
Turpentine	$6\frac{1}{4}$	gallons

WHITE BARREL PAINT.

Zinc White	200	lbs.
Whiting	400	lbs.
Kerosene	4	gallons
Gloss Oil	30	gallons

For recipe for gloss oil see Part II.

RED BARREL PAINT.

Venetian Red	250	lbs.
Whiting	230	lbs.
Kerosene	5	gallons
Gloss Oil	30	gallons

BLUE BARREL PAINT.

Ultramarine Blue	40	lbs.
Whiting	450	lbs.
Zinc White	50	lbs.
Kerosene	5	gallons
Gloss Oil	30	gallons

GREEN BARREL PAINT.

Chrome Green D.	150	lbs.
Whiting	400	lbs.
Kerosene	4	gallons
Rosin Oil	27	gallons

STONE COLOUR FLOOR PAINT.

Zinc White	140	lbs.
Ochre	50	lbs.
Lamp Black	1	lb.
Boiled Linseed Oil	17½	gallons
Coach Japan	5	gallons
Benzine Japan	5	gallons
Rosin Varnish	40	gallons

PRIMING OCHRE.

French Ochre	100	lbs.
Barytes	600	lbs.
China Clay	200	lbs.
Raw Linseed Oil	17	gallons

LIQUID BASE FOR READY MIXED PAINTS.

Zinc White	100	lbs.
White Lead	87½	lbs.
Asbestine Pulp	12½	lbs.
China Clay	5	lbs.
Water	1	gallon
Benzine Japan	1	gallon
Turpentine Japan	1	gallon
Boiled Linseed Oil	21½	gallons

FLAT WHITE PAINT.

White Lead	$62\frac{1}{2}$	lbs.
Zinc White	100	lbs.
China Clay	$6\frac{1}{2}$	lbs.
Bleached Linseed Oil	$2\frac{1}{4}$	gallons
Turpentine	$6\frac{1}{4}$	gallons
Pale Japan	$1\frac{1}{4}$	gallons

IRON METAL COLOUR.

White Lead	24	lbs.
Zinc White	6	lbs.
Whiting	4	lbs.
Lamp Black		
Coach Japan	$1\frac{1}{4}$	gallons
Boiled Linseed Oil	$\frac{1}{4}$	gallon

BASE FOR TINNED PAINTS FOR DOMESTIC USE.

Zinc White	100	lbs.
China Clay	25	lbs.
Boiled Linseed Oil	10	gallons
Turps. Japan	1	gallon
Benzine Japan	3	gallons
Water	$\frac{1}{2}$	gallon
Rosin Varnish	$2\frac{1}{2}$	gallons

BEST COACH BLACK IN VARNISH.

Best Drop Black	50	lbs.
Grinding Japan	8	gallons
Turps.	1	gallon

MARINE BLACK.

Lamp Black	75	lbs.
Carbon Black	15	lbs.
Double Boiled Linseed Oil	43	gallons
Turps. Japan	2	gallons

TURKEY RED.

Rose Pink	15	lbs.
Bright Red	4½	lbs.
Vermilion	7½	lbs.
Boiled Linseed Oil	1¼	gallons

FLOOR PAINT, ORANGE.

Ordinary Turkey Red	17	lbs.
American Ochre	100	lbs.
Chrome Yellow	10	lbs.
Boiled Linseed Oil	7½	gallons
Turps. Japan	5	gallons
Turpentine	11	gallons
Rosin Varnish	20	gallons

GREEN ENAMEL PAINT.

Chrome Green	55	lbs.
China Clay	10	lbs.
Double Boiled Linseed Oil	10	gallons
Turps. Japan	1½	gallons
Benzine Japan	1	gallon
Rosin Varnish	3	gallons

COACH BODY COLOUR.

Tuscan Red L.	25	lbs.
Tuscan Red D.	30	lbs.
Indian Red L.	10	lbs.
Boiled Linseed Oil	½	gallon
Grinding Japan	1½	gallons
Turpentine	⅛	gallon

COACH BODY COLOUR.

Ochre	30	lbs.
Chrome Yellow M.	1½	lbs.
Indian Red D.	12	lbs.
Lamp Black	2	lbs.
Grinding Japan	3	gallons

CLARET COLOUR CARRIAGE ENAMEL PAINT.

Tuscan Red L.	12	lbs.
Rose Pink	32	lbs.
Boiled Linseed Oil	½	gallon
Grinding Japan	3	gallons
Turpentine	1⅛	gallons
Kauri Mixing Varnish	12	gallons

BLACK CARRIAGE ENAMEL PAINT.

Drop Black	14	lbs.
Carbon Black	½	lb.
Boiled Linseed Oil	½	gallon
Grinding Japan	2	gallons
Turpentine	½	gallon
Kauri Mixing Varnish	12	gallons

ENGINE LETTERING COLOUR.

White Lead	88	lbs.
Chrome Yellow M.	6	lbs.
Ochre	14	lbs.
Turpentine Japan	2	gallons

ENGINE OR CAB WALL YELLOW DRAB COLOUR.

Zinc White	150	lbs.
White Lead	75	lbs.
Ochre	20	lbs.
Burnt Umber	3½	lbs.
Venetian Red	2	lbs.
Turp. Japan	7½	gallons

CHAIR COLOUR.

Burnt Sienna	25	lbs.
Deep Chrome Yellow	50	lbs.
Zinc White	4	lbs.
Vermilion	45	lbs.
China Clay	20	lbs.
Barytes	15	lbs.
Raw Linseed Oil	2	gallons
Turpentine	½	gallon

Turp. Japan, as required.

ROOF COLOUR.

Venetian Red	50	lbs.
Indian Red	50	lbs.
China Clay	5	lbs.
Boiled Linseed Oil	4	gallons
Benzine Drier	4	gallons
Turpentine	2½	gallons
Rosin Varnish	6	gallons

STANDARD WINE COLOUR.

Rose Pink	70	lbs.
Tuscan Red D.	25	lbs.
Grinding Japan	5	gallons

CARRIAGE CARMINE.

Peerless Lake	24	lbs.
Dark Vermilion	2	lbs.
Tuscan Red	1	lb.
Boiled Linseed Oil	½	gallon
Turps.	2	gallons
Kauri Mixing Varnish	12	gallons

CARRIAGE TUSCAN.

Tuscan Red	48	lbs.
Boiled Linseed Oil	1	gallon
Turps.	2¼	gallons
Grinding Japan	3	gallons
Kauri Mixing Varnish	16	gallons

Caboose Ceiling

White Lead	50	lbs.
Zinc White	50	lbs.
Chrome Green	15	lbs.
Boiled Linseed Oil	1½	gallons
Turp. Japan	5½	gallons
Turps.	2½	gallons

Tuscan Red for Tin.

Tuscan Red	45	lbs.
China Clay	25	lbs.
Boiled Linseed Oil	10	gallons
Benzine Drier	½	gallon
Turps.	½	gallon
Varnish Bottoms	½	gallon

Caboose Red.

English Vermilion	40	lbs.
Tuscan Red	40	lbs.
China Clay	10	lbs.
Turp. Japan	24	gallons

Lead Colour.

White Lead	587	lbs.
Zinc White	562	lbs.
Asbestine Pulp	42	lbs.
China Clay	11	lbs.
Boiled Linseed Oil	4½	gallons
Bleached Oil	4½	gallons
Turp. Japan	1¾	gallons
Water	1½	gallons
Pale Japan	5	gallons

LIGHT WOOD FILLER.

Silica	25	lbs.
China Clay	4	lbs.
Raw Linseed Oil	¾	gallon
Turp. Japan	¾	gallon

TRUCK COLOUR.

Ochre	42	lbs.
Burnt Umber	5	lbs.
Chrome Yellow M.	3½	lbs.
Venetian Red	½	lb.
Chrome Yellow L.	5	lbs.
Lamp Black	¼	lb.

Grinding Japan, as required.

GOLDEN OCHRE IN JAPAN.

French Ochre	40	lbs.
China Clay	20	lbs.
Chrome Yellow	20	lbs.
Boiled Linseed Oil	1	gallon
Turp. Japan	3	gallons
Turps.	½	gallon

TRUCK COLOUR.

Ochre	320	lbs.
Zinc White	185	lbs.
Burnt Umber	60	lbs.
Chrome Yellow	6	lbs.
Venetian Red	2	lbs.
Turp. Japan	30	gallons

CHOCOLATE PULLMAN COLOUR.

Ochre	40	lbs.
Chrome Yellow Orange	15	lbs.
Drop Black	42	lbs.
Burnt Sienna	21	lbs.

Turp. Japan, as required.

CABOOSE COLOUR.

Ochre	30	lbs.
Chrome Yellow O.	10	lbs.
Chrome Yellow M.	10	lbs.
Turp. Japan	$2\frac{1}{2}$	gallons
Raw Linseed Oil	$\frac{1}{4}$	gallon

FREIGHT CAR PAINT.

Prince's Mineral	250	lbs.
Asbestine Pulp	25	lbs.
Boiled Linseed Oil	35	gallons
Benzine Drier	5	gallons
Turp. Drier	2	gallons

DARK YELLOW PULLMAN COLOUR.

Drop Black	15	lbs.
Ochre	32	lbs.
Chrome Yellow	2	lbs.
Indian Red	$2\frac{1}{2}$	lbs.

Grinding Japan, as required.

LIQUID VERMILION.

"Lucasin Vermilion"	50	lbs.
China Clay	15	lbs.
Asbestine Pulp	5	lbs.
Boiled Linseed Oil	5	gallons
Turp. Japan	$\frac{1}{8}$	gallon
Turps.	$\frac{1}{3}$	gallon
Rosin Varnish	$\frac{2}{3}$	gallon

BODY COLOUR.

Ochre	65	lbs.
Indian Red	6	lbs.
Chrome Yellow	9	lbs.
Drop Black	44	lbs.
Venetian Red	5	lbs.
Turp. Japan	8	gallons
Turps.	$\frac{3}{4}$	gallon

FLAT BRICK RED PASTE.

Venetian Red	15	lbs.
Ordinary Turkey Red	$3\frac{1}{2}$	lbs.
Whiting	$12\frac{1}{2}$	lbs.
Boiled Linseed Oil	$\frac{3}{4}$	gallon
Turp. Japan	$\frac{1}{16}$	gallon
Turps.	$\frac{1}{16}$	gallon

Then grind and thin with turps. or benzine.

TRUCK COLOUR.

Ochre	70	lbs.
Zinc White	18	lbs.
Prince's Mineral	10	lbs.
Chrome Yellow	$3\frac{1}{2}$	lbs.
Lamp Black	$\frac{1}{2}$	lb.

Turp. Japan, as required.

TRUCK COLOUR.

Ochre	20	lbs.
Lamp Black	$\frac{1}{4}$	lb.
Venetian Red	3	lbs.
Turp. Japan	$1\frac{1}{2}$	gallons

DRAB PULLMAN COLOUR.

Drop Black	180	lbs.
Chrome Yellow O.	180	lbs.
Burnt Umber	60	lbs.
Chrome Yellow M.	7	lbs.
Indian Red L.	68	lbs.
Turp. Japan	30	gallons
Turps.	2	gallons
Boiled Linseed Oil	3	gallons

CABOOSE RED.

Pale English Vermilion	75	lbs.
Ordinary Turkey Red	75	lbs.
China Clay	75	lbs.
Turp. Japan	$5\frac{3}{4}$	gallons
Boiled Linseed Oil	$3\frac{1}{4}$	gallons
Turpentine	10	gallons

INSIDE CABOOSE WALL.

White Lead	240	lbs.
Zinc White	80	lbs.
Turp. Japan	40	gallons
Turps.	4	gallons

BODY COLOUR.

Drop Black	12	lbs.
Ochre	14	lbs.
Chrome Yellow O.	$3\frac{1}{2}$	lbs.
Indian Red	$1\frac{1}{2}$	lbs.
Turp. Japan	2	gallons

BRUNSWICK GREEN.

Drop Black	200	lbs.
Chrome Green M.	80	lbs.
Turp. Japan	35	gallons
Turps.	$3\frac{1}{2}$	gallons

LIGHT LIQUID FILLER.

Asbestine Pulp	60	lbs.
China Clay	15	lbs.
Boiled Linseed Oil	$7\frac{1}{2}$	gallons
Turpentine	$7\frac{1}{2}$	gallons
Rosin Varnish	15	gallons

CABOOSE WALL LIQUID.

White Lead	46	lbs.
Zinc White	41	lbs.
Ochre	13	lbs.
Venetian Red	$2\frac{1}{2}$	lbs.
Burnt Umber	$2\frac{1}{2}$	lbs.
Boiled Linseed Oil	$1\frac{5}{8}$	gallons
Turp. Japan	$4\frac{1}{2}$	gallons
Turpentine	$2\frac{1}{8}$	gallons

WHITE ROUGH STUFF.

White Lead	$12\frac{1}{2}$	lbs.
Zinc White	$\frac{1}{4}$	lb.
Silica	5	lbs.
Turp. Japan	1	part
Kauri Mixing Varnish	1	part
Turps.	$\frac{1}{8}$	part

HARD LEAD GLAZE.

White Lead	40	parts
Whiting	4	parts
Lamp Black	$\frac{1}{16}$	part
Turp. Japan	4	parts
Best Grinding Varnish	5	parts
Turps.	$1\frac{1}{2}$	parts

FLOOR PAINT.

Zinc White	35	lbs.
Crown Point Drab	15	lbs.
Indian Red	2½	lbs.
Double Boiled Linseed Oil	2½	gallons
Turps.	2½	gallons
Turps. Japan	5½	gallons
Rosin Varnish	18	gallons

OUTSIDE FLOOR PAINT.

White Lead	12½	lbs.
Zinc White	12½	lbs.
Litharge	12½	lbs.
Ochre	10	lbs.
Lampblack	¼	lb.
Graphite	6	lbs.
Asbestine Pulp	1	lb.
Boiled Linseed Oil	6	gallons
Turp. Japan	1	gallon
Turps.	½	gallon

CABOOSE PRIMING.

Zinc White	45	lbs.
Whiting	18	lbs.
Venetian Red	18	lbs.
Chrome Yellow O.	4½	lbs.
Raw Linseed Oil	3½	gallons

BEST WHITE ENAMEL.

White Zinc	16	lbs.
Best Grinding Varnish	½	gallon
Turps.	¾	gallon
Best Dammar Varnish	4	gallons

FLOOR PASTE.

Ochre	95	lbs.
Prince's Mineral	35	lbs.
Venetian Red	5	lbs.
Raw Linseed Oil	$2\frac{1}{2}$	gallons
Turp. Japan	3	gallons
Turps.	$\frac{1}{2}$	gallon

PULLMAN COLOUR.

Drop Black	30	lbs.
Ochre	35	lbs.
Chrome Yellow O.	8	lbs.
Indian Red D.	8	lbs.
Turp. Japan	7	gallons
Turps.	$\frac{1}{2}$	gallon

CARRIAGE GREEN.

Peerless Chrome Green	20	lbs.
Carbon Black	4	lbs.
Boiled Linseed Oil	1	gallon
Turp. Japan	6	gallons
Turps.	$2\frac{1}{4}$	gallons
Kauri Mixing Varnish	24	gallons

OUTSIDE WHITE PAINT.

White Lead	600	lbs.
Zinc White	250	lbs.
China Clay	30	lbs.
Asbestine Pulp	20	lbs.
Boiled Linseed Oil	8	gallons
Water	3	gallons
Turp. Japan	3	gallons
Turps.	5	gallons
Bleached Linseed Oil	40	gallons

BODY COLOUR.

Ochre	360	lbs.
Chrome Yellow M.	64	lbs.
Chrome Yellow O.	24	lbs.
Zinc	100	lbs.
China Clay	72	lbs.
Raw Linseed Oil	16	gallons

FREIGHT CAR PAINT.

Purple Metallic Oxide	468	lbs.
China Clay	178	lbs.
Asbestine Pulp	39	lbs.
Boiled Linseed Oil	25	gallons
Benzine Drier	7½	gallons

CAB COLOUR.

Pale English Vermilion	63	lbs.
Ordinary Turkey Red	63	lbs.
Whiting	37	lbs.
Boiled Linseed Oil	5½	gallons

WINE COLOUR.

Rose Pink	160	lbs.
Indian Red	16	lbs.
China Clay	40	lbs.
Boiled Linseed Oil	24	gallons
Rosin Varnish	8	gallons
Turps.	6	gallons

FREIGHT CAR PAINT.

Prince's Mineral	312	lbs.
Whiting	60	lbs.
Asbestine Pulp	20	lbs.
Boiled Linseed Oil	13	gallons
Benzine Drier	3½	gallons

Thin with paint oil till of correct consistency.

CAR ROOF COLOUR.

Muncey Filler	55	lbs.
Ochre	20	lbs.
Brandon Brown	3	lbs.
Barytes	10	lbs.
Boiled Linseed Oil	4½	gallons

TRUCK COLOUR.

Ochre	62½	lbs.
Prince's Mineral	25	lbs.
Chrome Yellow M.	25	lbs.
Lamp Black	8	lbs.
Turp. Japan	7	gallons
Boiled Linseed Oil	¾	gallon
Turps.	¼	gallon

RAILWAY OCHRE.

Ochre	150	lbs.
Whiting	50	lbs.
Barytes	125	lbs.
Boiled Linseed Oil	12	gallons
Turpentine	1	gallon

PRIMER OR PRIMING.

Ochre	400	lbs.
Whiting	200	lbs.
Zinc White	40	lbs.
Raw Linseed Oil	28	gallons

CARRIAGE VERMILION.

Lucasine Vermilion	75	lbs.
China Clay	25	lbs.
Boiled Linseed Oil	½	gallon
Turp. Japan	1½	gallons
Turpentine	3	gallons
Kauri Mixing Varnish	12	gallons

PASSENGER CAR BODY.

Drop Black	15	lbs
Tuscan Red	18½	lbs.
Burnt Sienna	8	lbs.
Turp. Japan	3⅓	gallons

BARN PAINT.

Venetian Red	300	lbs.
Whiting	100	lbs.
Boiled Linseed Oil	35	gallons
Benzine Drier	20	gallons
Water	3	gallons

FREIGHT CAR PAINT.

Venetian Red	300	lbs.
Whiting	25	lbs.
Asbestine Pulp	25	lbs.
Boiled Linseed Oil	32	gallons
Double Boiled Linseed Oil	3	gallons

FREIGHT CAR PAINT.

Prince's Mineral	300	lbs.
China Clay	30	lbs.
Asbestine Pulp	8	lbs.
Boiled Linseed Oil	34	gallons
Turps. Japan	3	gallons
Water	1	gallon

FREIGHT CAR PAINT.

Prince's Mineral	375	lbs.
Ochre	106	lbs.
Lamp Black	7	lbs.
Boiled Linseed Oil	12½	gallons
Double Boiled Linseed Oil	12½	gallons
Turps. Japan	6	gallons
Benzine Japan	6	gallons
Water	1	gallon

MACHINE PAINT.

Muncey Filler	375	lbs.
Zinc White	20	lbs.
Lamp Black	20	lbs.
Whiting	75	lbs.
Ultramarine Blue	9	lbs.
Barytes	150	lbs.
Boiled Linseed Oil	8¾	gallons
Benzine Drier	8¾	gallons

BARN AND ROOF YELLOW PAINT.

Ochre	200	lbs.
China Clay	50	lbs.
Asbestine Pulp	25	lbs.
Boiled Linseed Oil	30	gallons
Benzine Drier	10	gallons

REGULAR RED.

Eatna Mineral	450	lbs.
China Clay	150	lbs.
Asbestine Pulp	25	lbs.
Boiled Linseed Oil	75	gallons
Turp. Japan	3	gallons
Turpentine	7	gallons
Water	½	gallon

Among the foregoing American recipes and formulæ will be found those usually employed in the making of coach and carriage colours, as well as railway and engine paints.

Disinfecting Paints.

Disinfecting paints contain carbolic acid, boric or salicylic acid, from 1 to 2 per cent. One such composition contains felspar, shellac, linseed oil, red lead, carbolic acid, and turpentine.

COMPO BLUE FOR CARBON PAPER.

	cwt.	qrs.	lbs.
Chinese Blue	0	1	17
Colza Oil, 9 gallons	0	2	25
	1	0	14

Water Paints.

The convenience, comparative cheapness, and utility for many purposes of paints whose fluid medium is water, have rendered them essential parts of the average paint maker's production. The leading classes of these paints are therefore indicated here, and typical formulæ given.

WATERPROOF WATER PAINT.

A waterproof paint may be made by dissolving in 2 quarts of water 1 lb. brown soap, and then adding 6 quarts boiled oil and 1 oz. vitriol. After removing from the fire, add 2 quarts turpentine with any colour it is desired to mix with it. Strain well and thin with turpentine.

RED WATERPROOF PAINT.

	cwt.	qrs.	lbs.
Paris White	1	0	0
Barytes	0	0	24
Middle Purple Brown	0	0	20
Azure Blue	0	0	2
Boiled Oil	0	0	20
Varnish	0	0	4
Water	0	1	8
Soft Soap	0	0	6
	2	0	0

BLACK WATERPROOF PAINT.

Carbon Black	10 lbs.
Paris White	90 lbs.
Barytes	60 lbs.
Litharge	21 lbs.
White Lead	21 lbs.
Soft Soap	17 lbs.
Boiled Oil	10 lbs.
Raw Linseed Oil	10 lbs.
Water	100 lbs.

May also contain varnish.

WHITE WATERPROOF PAINT.

Zinc Oxide	112 lbs.
Genuine White Lead (Ground in Oil)	112 lbs.
Barytes	122 lbs.
Paris White	336 lbs.
Linseed Oil	88 lbs.
Soft Soap (Potash)	56 lbs.
Water (26 gallons)	260 lbs.

Also $1\frac{1}{2}$ gallons Extra Pale Copal Varnish.

PRIMING.

Soft Soap	25 lbs.
Water	19 gallons
Dark Oak Varnish	5 gallons

The above waterproof paints may also be used as funnel paints, and are of the nature of the well-known Aquol paints.

Non-inflammable Paint.

To a gallon of a mixture of equal parts of lime water and vinegar add $\frac{1}{2}$ lb. salt, $\frac{1}{4}$ lb. alum, $\frac{1}{4}$ lb. white vitriol, each in the form of powder. The mixture is then boiled, one gallon of linseed or other drying oil is added, and the boiling repeated. After the addition of 1 gallon of crude petroleum, the mixture is once more heated to the boiling point, and is then ready for use.

A solution of silicate of soda used with ordinary distemper will render it fireproof.

Encaustic Paints.

The base of these is a specially prepared medium, which is made as under :—

ENCAUSTIC JELLY.

	cwt.	qrs.	lbs.
Medal Glue	0	2	7
Soap	0	0	10
Alum	0	0	10
Pink Carbolic Powder	0	0	1
Water .... 12 gallons			

Process.—Dissolve the glue in 9 gallons of water and the soap in 2 gallons of water, using heat. When both are dissolved, mix thoroughly together. Dissolve the alum in $\frac{1}{2}$ gallon of water and the carbolic powder in the remaining $\frac{1}{2}$ gallon of water. Mix all well together and strain while hot, and keep for use.

When cold, it will form a strong jelly.

Take any dry colours and mix with the encaustic jelly to form a thin paste, while hot. When thoroughly mixed, and while still hot, strain through a fine sieve. Fill into three-pint tins, and direct to be mixed with boiling water sufficient to make one gallon. The encaustic jelly is also packed in the same sized tins, and is used to dilute the encaustics or for first coats.

Washable Paste Distempers (Stiff).

WHITE.

Whiting	1	cwt.
China Clay	4	cwt.
Glue	20	lbs.
Pine Oil	3	gallons
Boiled Oil	12	gallons
Varnish (Cheap Oak	3	gallons
Glycerine	1	lb.
Water to mix	10	gallons
Ultramarine Blue	5	ozs.

Mix the whiting and clay into a paste with water, melt the glue, pour the glue in while the mixer is going round, and put the oils in at once; grind, and put into kegs or casks. When cold, it will form a stiff paste. It requires warm water to dissolve, 3 gallons to 1 cwt., and is perfectly washable and easy of application. Dries with a dead, smooth surface.

For shades to the last recipe add as follows, to every cwt. of pigment :—

LIGHT STONE.

Yellow Ochre	2½	lbs.
Raw Umber	½	lb.

DARK STONE.

Ochre	6	lbs.
Raw Umber	¾	lb.

PORTLAND STONE.

Vegetable Black	1	lb.
Ochre	1	lb.
Raw Umber	¼	lb.

DRAB.

Vegetable Black	½	lb.
Ochre	1½	lbs.

MIDDLE STONE.

Yellow Ochre	4	lbs.
Raw Umber	¾	lbs.

LIGHT BUFF.

Ochre	8	lbs.
Lemon Chrome	½	lb.

MAIZE.

Ochre	6	lbs.
Middle Chrome	2	lbs.

CANARY.

Lemon Chrome	2	lbs.
Ochre	1	lb.

WASHABLE DISTEMPER PAINTS (STIFF).

ANOTHER METHOD.

WHITE NO. 1 (BASE).

		cwt.	qrs.	lbs.
Chalk Lime	8 bushels			
Alum		0	2	8
Glucose		0	1	0

WHITE NO. 2 (BASE).

		cwt.	qrs.	lbs.
Whiting		1	2	0
Plaster of Paris		1	0	0
Chalk Lime		1	0	0
Alum		0	0	7
Glue		0	1	0
Linseed Oil	6 gallons			

WHITE NO. 3 (BASE).

	cwt.	qrs.	lbs.
Whiting	1	0	0
Plaster of Paris	0	2	0
Best Barytes	0	2	0
Glue	0	1	0

Process.—Slake the lime, add the glucose, alum or glue dissolved in hot water, and grind with water to the consistency of stiff paints. For use mix with hot water to the consistency of ready-mixed paint.

If required extra hard, add half-a-gallon of hardening solution to every cwt. of the distemper.

HARDENING SOLUTION.

		cwt.	qrs.	lbs.
Sugar crystals		2	0	0
Linseed Oil	20 gallons			
Water	20 gallons			

Dissolve the sugar in the water, and add the oil.

A great variety of tints can be prepared, as indicated below.

LIGHT BLUE.

	cwt.	qrs.	lbs.
Base (as above)	1	0	0
Ultramarine Blue	0	0	4

DARK BLUE.

	cwt.	qrs.	lbs.
Base	1	0	0
Ultramarine Blue	0	0	8

MAUVE.

	cwt.	qrs.	lbs.
Base	1	0	0
Ultramarine Blue	0	0	4
Middle Royal Red	0	0	2

LEMON CHROME.

	cwt.	qrs.	lbs.
Base	1	0	0
No. 2 Lemon Chrome	0	0	7
English Ochre	0	0	4

MIDDLE CHROME.

	cwt.	qrs.	lbs.
Base	1	0	0
No. 2 Middle Chrome	0	0	7
English Ochre	0	0	4

ORANGE CHROME.

	cwt.	qrs.	lbs.
Base	1	0	0
No. 2 Orange Chrome	0	0	7
English Ochre	0	0	4

CREAM COLOUR.

	cwt.	qrs.	lbs.
Base	1	0	0
English Ochre	0	0	3

LIGHT STONE COLOUR.

	cwt.	qrs.	lbs.
Base	1	0	0
English Ochre	0	0	7

MIDDLE STONE COLOUR.

	cwt.	qrs.	lbs.
Base	1	0	0
English Ochre	0	0	10

DARK STONE COLOUR.

	cwt.	qrs.	lbs.
Base	1	0	0
English Ochre	0	0	14

LIGHT BUFF.

	cwt.	qrs.	lbs.
Base	1	0	0
English Ochre	0	0	4
Venetian Red	0	0	1

DARK BUFF.

	cwt.	qrs.	lbs.
Base	1	0	0
English Ochre	0	0	7
Venetian Red	0	0	2

VERMILION TINT.

	cwt.	qrs.	lbs.
Base	1	0	0
Middle Royal Red	0	0	7

SALMON PINK.

	cwt.	qrs.	lbs.
Base	1	0	0
Venetian Red	0	0	7

PALE ROSE TINT.

	cwt.	qrs.	lbs.
Base	1	0	0
Middle Royal Red	0	0	4
Venetian Red	0	0	2

FRENCH GREY.

	cwt.	qrs.	lbs.
Base	1	0	0
Middle Oxide of Iron	0	0	4

BRICK RED.

	cwt.	qrs.	lbs.
Base	1	0	0
Spanish Brown	0	0	14

MAHOGANY.

	cwt.	qrs.	lbs.
Base	1	0	0
Venetian Red	0	0	5
English Ochre	0	0	4

LIGHT OAK.

	cwt.	qrs.	lbs.
Base	1	0	0
Burnt Umber	0	0	6
English Ochre	0	0	6

DARK OAK.

	cwt.	qrs.	lbs.
Base	1	0	0
Burnt Umber	0	0	10
English Ochre	0	0	10

LIGHT CEMENT.

	cwt.	qrs.	lbs.
Base	1	0	0
English Umber	0	0	4
Mineral Black	0	0	1

DARK CEMENT.

	cwt.	qrs.	lbs.
Base	1	0	0
English Umber	0	0	4
Mineral Black	0	0	3

LIGHT GREEN.

	cwt.	qrs	lbs.
Base	1	0	0
Lime Green	0	0	7

MIDDLE GREEN.

	cwt.	qrs.	lbs.
Base	1	0	0
Lime Green	0	0	14

DARK GREEN.

	cwt.	qrs.	lbs.
Base	1	0	0
Lime Green	0	0	21
Ultramarine Blue	0	0	4

CHAPTER XXIV.

PUTTY.

Putty, which is principally used for stopping and glazing, is composed essentially of whiting and raw linseed oil. For fine glaziers' putty, genuine oil should be used, and the whiting should be of good colour, and free from grit. It should not be alkaline because if so the putty will very likely go hard after being made.

Whiting for putty-making should be bone dry, and should therefore be stored in a dry place. A dry airy place is better than a badly-ventilated warm stove.

Various forms of plant are used in putty-making. Sometimes the ordinary edge-runner mill is used, and this gives good results, but is slow. A very poor method is to pug the materials in a vertical pug-mill, turn the putty on to a floor to sweat for a week, and then pug up again. The putty thus made is seldom reliable. Some people go to the trouble of grinding their putty through the rollers, but this is not necessary if the operation of mixing is well-performed. The best and most up-to-date method is to use the positive-driven edge-runner, which mixes very quickly, and partly grinds as well.

BEST GLAZIERS' PUTTY.

	cwt.	qrs.	lbs.
Good Selected Whiting	20	0	0
Raw Linseed Oil	4	0	0

SECOND QUALITY PUTTY FOR CHEAP OILSHOP TRADE.

	cwt.	qrs.	lbs.
Whiting	12	0	0
No. 2 Barytes	3	0	0
Raw Linseed Oil	3	0	0

Although barytes is dearer than whiting it is often introduced into putty, as it enables a great saving to be effected in the oil, which is the expensive ingredient in putty-making.

As much as 33% of barytes is sometimes introduced, but in general 25% (as in above recipe) should be the limit.

Linseed oil foots are much used in place of bright linseed oil. Other cheapeners are cottonseed oil or cotton foots; other seed oils, fish oil and various mineral oils.

SECOND QUALITY PUTTY WITH CHEAPENED OIL.

	cwt.	qrs.	lbs.
Whiting	5	0	0
No. 2 Barytes	1	0	0
Raw Linseed Oil Foots	0	2	4
Cotton Oil	0	2	4

The following are further recipes for cheap grades :—

No. 1.

	cwt.	qrs.	lbs.
Whiting	4	2	0
Brown Barytes	1	0	0
Linseed Oil	0	1	0
Linseed Foots	0	1	0
Rosin Oil	0	1	0
	6	1	0

No. 2.

	cwt.	qrs.	lbs.
Whiting	3	0	0
Linseed Oil .... 3 gallons	0	0	27
Barytes	1	0	0
Mineral Oil (9d.)	0	0	27

No. 3.

	cwt.	qrs.	lbs.
Whiting	4	0	14
Barytes	0	1	14
Linseed Foots	0	0	20
Mineral Oil	0	0	18
Raw Linseed Oil	0	0	47

SPECIAL CHEAP PUTTY.

Take 25 lbs. carb. zinc, 25 lbs. raw linseed oil, 2 lbs. borate of manganese; mix and well grind. The whole or part of this must then be reduced to the consistency of raw linseed oil, with Russian petroleum. Crush broken whiting, dry it, and pass through a sieve 45 holes to the square inch. Then, for every 100 lbs. of whiting add 20 lbs of paraffin thinning medium.

The following is a complete series of different qualities, as made by one maker :—

PUTTY.

EXTRA QUALITY.

	cwt.	qrs.	lbs.
Finely Powdered Dried Whiting	4	2	0
Dry White Lead	0	2	0
Raw Linseed Oil .... 9 gallons			

SOFT LINSEED OIL PUTTY.

	cwt.	qrs.	lbs.
Finely Powdered Dried Whiting	5	0	0
Raw Linseed Oil .... 9 gallons			

CHEAP.

No. 1.

	cwt.	qrs.	lbs.
Air Dried Whiting	5	0	0
Raw Linseed Oil .... 6 gallons			
Heavy Mineral Oil ...... 3 gallons			
Sweet Cod Oil .... 1 gallon			

No. 2.

		cwt.	qrs.	lbs.
Air Dried Whiting	....	5	0	0
Raw Linseed Oil	.... 7 gallons			
·885 Mineral Oil	.... 2 gallons			

No. 3.

		cwt.	qrs.	lbs.
Air Dried Whiting	....	2	2	0
Whiting Sand	....	2	2	0
Raw Linseed Oil	.... 7 gallons			
·885 Mineral Oil	.... 2 gallons			

All linseed oil substitutes may be used in addition to above for making putty, but are not recommended.

LINSEED OIL SUBSTITUTE FOR CHEAP PUTTY.

The heavy charge on putty is the high price of linseed oil. In order to reduce the cost, and at the same time make a putty that will work easily and dry hard, the following has been adopted and found successful :—

		cwt.	qrs.	lbs.
Silicate of Soda, s.g. 1,300 or 60° T.		0	0	3
Soft Soap	....	0	0	10
Water	.... 4 gallons	0	1	12
		0	1	25

Equal to five gallons.

Make the above hot, and add one gallon to each one gallon of linseed oil when making the putty. Use at once.

COST OF THIS MIXTURE.

	cwt.	qrs.	lbs.		£.	s.	d.
Silicate Soda	0	0	3	at 10s. 6d. per cwt.	0	0	$3\frac{1}{4}$
Soft Soap ..	0	0	10	at 20s. 0d. per cwt.	0	1	$9\frac{1}{4}$
Water	0	1	12				
	0	1	25		0	2	$0\frac{1}{2}$

Cost per cwt., 4s. 6d.

PUTTY.

	cwt.	qrs.	lbs.
Dry Whiting	20	0	0
Mixture $\frac{1}{2}$ Oil and $\frac{1}{2}$ above, 15 lbs. to 1 cwt.	2	3	0
	22	3	0

Mix under edge-runners.

AQUARIUM PUTTY.

No. 1.

	cwt.	qrs.	lbs.
Litharge	1	0	0
Dry White Lead	0	2	0
Boiled Linseed Oil ...... $1\frac{1}{2}$ gallons			

No. 2.

	cwt.	qrs	lbs.
Slaked Lime	0	2	0
Brickdust	1	0	0
Boiled Linseed Oil ...... 1 gallon			

RED LEAD PUTTY.

	cwt.	qrs.	lbs.
Linseed Oil Putty	1	0	0
Genuine Red Lead	0	2	0
Raw Linseed Oil	0	0	5

CHEAP JOINTING PUTTY.

	cwt.	qrs.	lbs.
Linseed Oil Putty	1	0	0
Genuine Red Lead	0	0	7
Venetian Red	0	1	0
Raw Linseed Oil	0	0	5

CHAPTER XXV.

DRIERS.

Driers, or, as the word is sometimes written, dryers, are compositions consisting of a powerful drying body, such as litharge, sulphate or borate of manganese, diluted with an inert base, such as whiting or barytes, and ground to the form of a paste with linseed oil or some substitute for the latter.

There is great variety in the methods of preparing these paste driers, or patent driers, as they are often called. Thus the drying materials may be added in the form of dry powder, and ground along with the linseed oil and barytes, etc., as in the case of ordinary paint. Now-a-days, however, a solution is usually prepared which contains the drying agent dissolved in it. Salts of manganese are usually chosen, and of these the sulphate is the most important. A common ingredient of the cheaper, dark-coloured solutions is acetate of lime.

The following recipes and formulæ include every method of preparing paste or patent driers which can be regarded as typical. By combining two or more recipes, according to the special requirements of each case, endless variations can be obtained.

Patent Driers.

LIQUOR No. 1.

	cwt.	qrs.	lbs.
Sulphate of Manganese	0	1	14
Water .... 40 gallons			

LIQUOR NO. 2.

		cwt.	qrs.	lbs.
Gray Acetate of Lime		0	1	14
Water	10 gallons			

Dissolve No. 1 and 2 separately in the waters by boiling, and strain. Keep in wooden or stone vessels.

PATENT DRIERS.

No. 1.

		cwt.	qrs.	lbs.
Best Barytes		3	0	0
Whiting		0	1	0
Zinc White		0	0	7
Sugar of Lead		0	0	7
Dry White Lead		0	0	7
Refined Linseed Oil	5 gallons			
No. 1 Liquor	2 gallons			
No. 2 Liquor	2 gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Barytes		3	0	0
Whiting		0	0	21
Zinc White		0	0	4
Sugar of Lead		0	0	4
Dry White Lead		0	0	4
Refined Linseed Oil	5 gallons			
No. 1 Liquor	2 gallons			
No. 2 Liquor	2 gallons			

No. 3.

		cwt.	qrs.	lbs.
Common Barytes		3	0	0
Whiting		0	3	0
Sugar of Lead		0	0	4
Dry White Lead		0	0	4
Refined Linseed Oil	5 gallons			
No. 1 Liquor	2 gallons			
No. 2 Liquor	2 gallons			

Process.—First grind, dry, under edge runners the white lead, sugar of lead, and oxide of zinc for a few minutes, then put in the whiting and let the mill run five minutes longer, and add barytes ; let all run five minutes, and then add the oil. When this is mixed well up with the other ingredients add the liquors. When making the best and second qualities, they are put through the rolls when the mixing is completed, but the common or third quality may be allowed to run about 15 minutes under the edge runners, and need not be put through the rolls.

SUGAR OF LEAD DRIERS.

First grind :—

	cwt.	qrs.	lbs.
Dried White Sugar of Lead	2	0	0
Zinc White	0	2	0
Whiting	0	2	0
Refined Linseed Oil ...... 5 gallons			

No. 1.

	cwt.	qrs.	lbs.
Best Barytes	1	2	0
Whiting	1	2	0
Sugar of Lead Drier as above	0	0	7
No. 1 Liquor .... 2 gallons			
No. 2 Liquor .... 2 gallons			
Pale Boiled Linseed Oil ... 3 gallons			

No. 2.

	cwt.	qrs.	lbs.
Best Barytes	1	2	0
Whiting	1	2	0
Sugar of Lead Drier as above	0	0	4
No. 1 Liquor .... 1 gallon			
No. 2 Liquor .... 1 gallon			
Boiled Linseed Oil .... 3 gallons			

STRONG BLEACHED PATENT DRIERS (SPECIALITY).

ACETATE OF LIME SOLUTION.

Whiting	6 lbs.
Acetic Acid	26 lbs.
Water (1 gallon)	10 lbs.

Mix the acetic acid with the water in a wooden or earthenware vessel, and slowly add lime until all is in and carbonic acid gas ceases to evolve, then allow to settle, and syphon off the clear liquor.

MANGANESE SOLUTION.

	cwt.	qrs.	lbs.
Sulphate of Manganese..............	0	0	18
Water (8 gallons)	0	2	24

Dissolve the above. Now mix together

	cwt.	qrs.	lbs.
Lime Solution (as above)	0	0	13
Manganese Solution (as above)	0	0	14
Acetic Acid	0	0	1

For the Driers,

	cwt.	qrs.	lbs.
Whiting	3	0	14
Best Barytes	3	0	14
Dry White Lead	0	0	14
Mixed Solutions (as above)	0	1	0
Sugar of Lead	0	0	6
Boiled Linseed Oil	0	3	0

Put half the quantity of whiting and barytes in a paint-mixer, and sufficient oil to form a stiff paste, then add the mixed solutions, with the white lead and sugar of lead, then mix well, and add the remainder of ingredients and oil.

PATENT DRIERS.

DRIERS LIQUID—A.

	cwt.	qrs.	lbs.
Grey Acetate of Lime	0	1	2
Sulphate of Manganese	0	1	0
Acetic Acid 33%	0	0	20

Dissolve the acetate of lime in 25 gallons of boiling water.

Dissolve the sulphate of manganese in 20 gallons of boiling water.

Mix the two solutions together, and allow to cool, and add the acetic acid. When settled, draw off the clear liquor.

DRIERS LIQUID—B.

	cwt.	qrs.	lbs.
Dried Sugar of Lead	0	2	0
Raw Linseed Oil ... 6 gallons			

Grind together.

No. 1.

	cwt.	qrs.	lbs.
Dry White Lead	0	1	0
Best Barytes	1	3	0
Whiting	1	3	0
A. Liquid	0	0	21
B. Liquid	0	0	6
Boiled Linseed Oil ... 6 gallons			

No. 2.

	cwt.	qrs.	lbs.
Dry White Lead	0	0	14
Best Barytes	2	0	0
Whiting	1	3	0
A. Liquid	0	0	21
B. Liquid	0	0	3
Boiled Linseed Oil ... $6\frac{1}{2}$ gallons			

No. 3.

	cwt.	qrs.	lbs.
Best Barytes	2	0	0
Whiting	1	3	0
A. Liquid	0	0	14
B. Liquid	0	0	2
Boiled Linseed Oil .... 6 gallons			

No. 4.

	cwt.	qrs.	lbs.
Common Barytes	2	1	0
Whiting	1	2	0
A. Liquid	0	0	14
B. Liquid	0	0	2
Boiled Linseed Oil .... $6\frac{1}{2}$ gallons			

PATENT DRIERS.

LIQUOR.

	cwt.	qrs.	lbs.
White Sugar of Lead	0	1	0
Chloride of Barium	1	0	0
Soda Crystals	0	1	0

Dissolve the sugar of lead in 3 gallons of boiling water.

Dissolve the chloride of barium in 8 gallons of boiling water.

Dissolve the soda crystals in 6 gallons of boiling water.

Mix the sugar of lead and chloride of barium solutions together, then add the soda solutions, stir well and filter.

When cool, the liquor is ready for use.

No. 1.

	cwt.	qrs.	lbs.
Dry White Lead	0	2	0
Best Barytes	1	2	0
Whiting	1	2	0
Liquor as above .... 3 gallons			
Boiled Linseed Oil .... 2 gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Barytes		1	2	0
Whiting		1	2	0
Liquor as above	2 gallons			
Boiled Linseed Oil	2 gallons			

PATENT DRIERS.

DRIERS MIXTURE.

		cwt.	qrs.	lbs.
Sulphate of Manganese		0	2	0
Powdered Litharge		0	2	0
Water	5 gallons			
Boiled Linseed Oil	6 gallons			

Grind together.

No. 1.

		cwt.	qrs.	lbs.
Dry White Lead		0	2	0
Best Barytes		0	2	0
Whiting		2	0	0
Driers Mixture as above		0	1	0
Boiled Linseed Oil	8 gallons			

No. 2.

		cwt.	qrs.	lbs.
Dry White Lead		0	1	0
Best Barytes		1	1	0
Whiting		2	2	0
Driers Mixture as above		0	1	0
Boiled Linseed Oil	8 gallons			

PATENT DRIERS.

No. 1.

			cwt.	qrs.	lbs.
Composition	Sulphate of Manganese		0	0	7
	Powdered Litharge		0	0	14
	Water	2 gallons			
	Boiled Linseed Oil	1 gallon			

Grind together and add to

	cwt.	qrs.	lbs.
Dry White Lead............	0	3	14
Best Barytes................	0	2	14
Whiting	1	3	21
Boiled Linseed Oil 4 gallons			

No. 2.

		cwt.	qrs.	lbs.
Composition	Sulphate of Manganese	0	0	4
	Powdered Litharge	0	0	7
	Water .... ½ gallon			
	Boiled Oil ......¼ gallon			

Grind together and add to

	cwt.	qrs.	lbs.
Best Barytes................	1	0	0
Whiting	2	0	0
Terra Alba..................	0	2	0
Boiled Linseed Oil..4 gallons			

SUGAR OF LEAD DRIERS.

	cwt.	qrs.	lbs.
Dried Sugar of Lead	1	2	0
Dry White Lead	0	2	0
Whiting	1	0	0
Pale Boiled Oil .... 5 gallons			

LITHARGE DRIERS.

	cwt.	qrs.	lbs.
Dry White Lead	0	2	0
Best Barytes	1	0	0
Whiting	1	2	0
Dried Sugar of Lead	0	2	0
Litharge	0	2	0
Sulphate of Zinc	0	3	0
Refined Linseed Oil ...... 7 gallons			

ZINC DRIERS.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	2	2	0
Terra Alba	2	0	0
Whiting	1	0	0
Borate of Manganese	0	0	7
Sulphate of Manganese	0	0	7
Pale Boiled Linseed Oil ... 6 gallons			

No. 2.

	cwt.	qrs.	lbs.
Zinc White	1	1	0
Terra Alba	2	0	0
Whiting	1	0	0
Borate of Manganese	0	0	2
Sulphate of Manganese	0	0	2
Sulphate of Zinc	0	0	2
Pale Boiled Linseed Oil ... 4½ gallons			

SPECIAL PATENT DRIERS.

No. 1.

	cwt.	qrs.	lbs.
Whiting	2	0	0
Best Barytes	2	0	0
Dry White Lead	0	2	0
Driers Liquor ... 4 gallons			
Resinate of Lime	0	0	10
Pine Oil ... 1 gallon			
Boiled Linseed Oil ... 2 gallons			

No. 2.

		cwt.	qrs.	lbs.
Whiting		2	0	0
Best Barytes		2	0	0
Driers Liquor	3 gallons			
Resinate of Lime		0	0	8
Pine Oil	2 gallons			
Boiled Linseed Oil	1 gallon			

Process.—Dissolve the resinate of lime in the boiled oil by heat, mix well with the pine oil, and grind with the rest of the ingredients.

PATENT BLEACHED DRIERS.

No. 1 SOLUTION.

	cwt.	qrs.	lbs.
Carbonate of Lime	0	0	6
Acetic Acid	0	0	26
Water, 1 gallon	0	0	10
	0	1	14

Mix acetic acid and water in a wood or earthenware vessel, and slowly add lime until all is in and carbonic acid gas ceases to evolve. Then allow to settle, and syphon off clear liquor.

Whiting is the most convenient form of carbonate lime to use.

No. 2 SOLUTION.

	cwt.	qrs.	lbs.
Sulphate Manganese	0	0	18
Water, 8 gallons	0	2	24
	0	3	14

Dissolve above.

The mixture for each batch of driers is as under :—

Lime Solution	1 part
Manganese Solution	1 part
Acetic Acid ....sufficient to acidify	

Above to be mixed in proportions given and added to the dry material as hereafter stated.

PATENT DRIERS.

	cwt.	qrs.	lbs.
Whiting	3	0	14
Barytes	3	0	14
Zinc White	0	0	14
Mixed Solutions	0	1	0
White Copperas	0	0	6
Linseed Oil	0	3	0
	7	1	20

Process.—Put half the quantity of whiting and barytes in a paint-mixer, and sufficient oil to form a stiff paste. Then add the 28 lbs. of liquor with white zinc and copperas, and, when well mixed, put in the balance of the ingredients and the oil.

SPECIAL PALE DRIERS.

	cwt.	qrs.	lbs.
White Sugar of Lead	0	0	14
Copperas	0	0	14
Powdered Litharge	0	0	5
Dry White Lead	0	0	5
Paris White	0	2	0
Paris White	0	2	0
White Barytes	1	2	0
Boiled Oil .... $3\frac{1}{2}$ gallons			

DRIER FOR FINE COLOURS.

Carbonate of Zinc	9 lbs.
Borate of Manganese	1 lb.
Boiled Linseed Oil	9 lbs.

BEST QUALITY PATENT DRIERS FOR PAINTS.

Paris White	112 lbs.
White Lead	50 lbs.
Sulphate of Zinc	15 lbs.
Sugar of Lead	4 lbs.
Litharge	7 lbs.

Grind in boiled oil (pale), $6\frac{1}{4}$ gallons.

LEADLESS DRIERS.

	cwt.	qrs.	lbs.
White Barytes	3	0	0
Whiting	3	0	0
Aceto-Borate of Manganese $\frac{1}{2}$ gallon			

Ground once through rollers.

CHEAP DRIERS.

SUGAR OF LEAD LIQUOR.

Sugar of Lead	10 lbs.
Water	10 lbs.

Boil together.

DRIERS.

No. 1.

	cwt.	qrs.	lbs.
Barytes	4	0	0
Paris White	1	0	0
White Lead	0	2	0
Sugar of Lead as above	0	0	6
Boiled Oil .... $8\frac{1}{2}$ gallons	0	2	20
Manganese Liquid	0	0	15
	6	1	13

DRIERS.

No. 2.

	cwt.	qrs.	lbs.
Barytes	4	0	0
Paris White	1	2	0
Sugar of Lead as above	0	0	4
Linseed Oil	0	2	25
Borate of Manganese	0	0	4

PATENT DRIERS.

Zinc Sulphate	8 lbs.
Litharge	$3\frac{1}{2}$ lbs.
Lead Acetate	2 lbs.
Boiled Oil	2 lbs.

Ground and added to—

White Lead	25 lbs.
Paris White	50 lbs.
Boiled Oil	15 lbs.

PATENT DRIERS.

		cwt.	qrs.	lbs.
Paris White		2	3	0
Barytes		2	3	0
Manganese Liquor	$3\frac{1}{2}$ gallons			
Boiled Oil and Raw Oil	$8\frac{1}{2}$ gallons			
Sugar of Lead Liquor	1 gallon			

MANGANESE LIQUOR FOR ABOVE.

Acetate of Lime	48 lbs.
Sulphate of Manganese	32 lbs.

Add 8 gallons water to each, boil separately, then strain together. For the sugar of lead liquor take one gallon of above liquor and add 7 lbs. sugar of lead.

PATENT DRIERS.

		cwt.	qrs.	lbs.
No. 2 Barytes		1	0	0
Whiting		1	0	0
Boiled Oil	4 gallons			
Liquor	2½ gallons			
Sugar of Lead	4 lbs.			

LIQUOR FOR PATENT DRIERS.

Dissolve ½ cwt. acetate of lime in 36 gallons water, strain and put in cask. Dissolve ½ cwt. sulphate of manganese in 16 gallons of water, then add 16 gallons of lime liquor, and boil with steam.

TUBE DRIERS FOR ARTISTS.

Special driers for artists and coach painters are put up in collapsible tubes, and must be ground exceedingly fine.

The following are various varieties :—

No. 1.

LITHARGE DRIERS.

Litharge ground in linseed or nut oil to an impalpable paste by repeated grindings.

No. 2.

SUGAR OF LEAD DRIERS.

White sugar of lead, ground as above.

No. 3.

SULPHATE OF MANGANESE DRIERS.

Sulphate of manganese ground as above.

No. 4.

SULPHATE OF ZINC DRIERS.

Sulphate of zinc, ground as above.

PART IV.

THINNED PAINTS, SPECIALITIES, AND SUNDRIES.

CHAPTER XXVI.

READY-MIXED PAINTS FOR GENERAL USE.

The preparation of thinned or ready mixed paints is frequently the ultimate stage of the manufacturing process. Most of the stiff paints or bases of such paints have been already described, although a few may be referred to specially in the following chapters.

The thinnings or fluid vehicles with which the stiff paints are mixed to bring them to a condition suitable for working, exert, as may be imagined, a great influence on the result. The thinning therefore should not be conducted haphazard, but the proper composition of the thinnings should be determined by experiment, and the correct proportions, when found, should be adhered to.

The chief vehicles, or thinners, are :—

(1) Raw linseed oil (refined linseed oil in the case of very delicate colours).—Where exceptional drying properties are not required, this is the ideal thinner, as it promotes ease in working, and good wearing properties.

(2) Boiled linseed oil (pale boiled oil in the case of zinc or delicate colours).—Promotes drying, and communicates gloss and body in the case of open paints.

(3) Turpentine used along with oil to promote drying and to act as a binder; it also eases the paint in working. In excess causes the paint to dry dead.

(4) Varnish or similar substance. Usually introduced for some special purpose, such as to harden enamel paints or to communicate elasticity or wearing properties to certain special paints.

As may be well understood, substitutes and cheapeners for the above thinners are often used. Several of these have been alluded to in Part II., others will be referred to later.

Process of Making Ready Mixed Paints.

Several forms of ready mixed paint mixers are in use. One of the quickest and best for small quantities consists of a pan held in a frame, which is caused to rotate rapidly. A set of vertical knives, which can be thrown out of gear at will, revolve at a high speed in the pan in an opposite direction to that in which the latter is moving. Rapid and effective mixing is the result, and as soon as one batch is ready, the pan can be disconnected and lifted out of the frame, and another pan substituted. This is called the "rapid mixer," and is made both in England and in America.

Whatever form of mixer is adopted, the thinnings should be added gradually, and the turpentine last. All ready mixed paints of good quality should be sieved before being sent out.

The proportion of thinnings required to reduce stiff paint to ready mixed paint varies greatly, and depends partly on the thinnings selected and partly on the composition and texture of the stiff paint.

A well-known brand of ready mixed paint used for canned paints in England has the following composition :—

	cwt.	qrs.	lbs.
Stiff Paint	14	1	15
Driers	2	2	22
Linseed Oil ($\frac{1}{2}$ Raw, $\frac{1}{2}$ Boiled)	2	1	0
Turpentine	0	2	19
Ready Mixed Paint	20	0	0

The following is a full list of ready mixed paints made on a fixed standard. The composition of the stiff paints may be determined by referring to Part III.

WHITE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Zinc White Paint		1	0	0
Powdered French Driers		0	0	7
Refined Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Zinc White Paint		1	0	0
Powdered French Driers		0	0	7
Refined Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

DARK BLUE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Brunswick Blue Paint........		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3. Brunswick Blue Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

LIGHT BLUE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Light Blue Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Light Blue Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

ULTRAMARINE BLUE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Ultramarine Blue Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Ultramarine Blue Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

AZURE BLUE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Zinc White Paint		0	3	0
No. 2 Ultramarine Blue		0	1	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 2 White Lead Paint	0	3	0
No. 2 Ultramarine Blue	0	1	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

LEMON CHROME.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Lemon Chrome Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Lemon Chrome Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

MIDDLE CHROME.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Middle Chrome Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs
No. 3 Middle Chrome Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

ORANGE CHROME.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Orange Chrome Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Orange Chrome Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

IMPERIAL YELLOW.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Imperial Yellow Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Imperial Yellow Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Oil	1½ gallons			
Turpentine	½ gallon			

PRIMROSE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Zinc White Paint		0	1	0
No. 2 Lemon Chrome Paint		0	3	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Zinc White Paint	0	1	0
No. 3 Lemon Chrome Paint	0	3	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

STRAW COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Zinc White Paint	0	3	14
No. 2 Imperial Yellow Paint	0	0	14
Patent Driers	0	0	12
Pale Boiled Linseed Oil.... $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Zinc White Paint	0	3	14
No. 3 Imperial Yellow Paint	0	0	14
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

YELLOW.

No. 1.

	cwt.	qrs.	lbs.
No. 2 English Ochre Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 English Ochre Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. $1\frac{1}{4}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

LIGHT BATH STONE COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Light Bath Stone Colour Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Light Bath Stone Colour Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

MIDDLE BATH STONE COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Middle Bath Stone Colour Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Middle Bath Stone Colour Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

DARK BATH STONE COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Dark Bath Stone Colour Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 2 Dark Bath Stone Colour Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Oil	1½ gallons			
Turpentine	½ gallon			

BUFF.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Ground White Lead		0	3	14
No. 2 English Ochre Paint		0	0	14
No. 2 Venetian Red Paint		0	0	2
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Ground White Lead		0	3	14
No. 3 English Ochre Paint		0	0	14
No. 3 Venetian Red Paint		0	0	2
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

VERMILIONETTE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Vermilionette Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Vermilionette Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil ..	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

SIGNAL RED.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Signal Red Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Signal Red Paint		1	0	0
Patent Driers		0	0	12
Pale Boiled Linseed Oil ..	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

BRIGHT RED.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Bright Red Oxide Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Bright Red Oxide Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

INDIAN RED.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Middle Indian Red Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Middle Indian Red Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

LIGHT PURPLE BROWN.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Light Purple Brown Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Light Purple Brown Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

MIDDLE PURPLE BROWN.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Middle Purple Brown Paint ..		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Middle Purple Brown Paint ..		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

DEEP PURPLE BROWN.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Deep Purple Brown Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Deep Purple Brown Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil........	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

CHOCOLATE.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Chocolate Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Chocolate Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

LIGHT BROWN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Raw English Umber Paint ..	1	0	0
No. 2 Venetian Red Paint	0	0	14
Patent Driers	0	0	12
Boiled Linseed Oil .... 2 gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Raw English Umber Paint	1	0	0
No. 3 Venetian Red Paint	0	0	14
Patent Driers	0	0	12
Boiled Linseed Oil ...... 2 gallons			
Turpentine .... ½ gallon			

RAW ENGLISH UMBER.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Raw English Umber Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Raw English Umber Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

BURNT ENGLISH UMBER.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Burnt English Umber Paint ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Burnt English Umber Paint ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

RAW TURKEY UMBER.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Raw Turkey Umber Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Raw Turkey Umber Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

BURNT TURKEY UMBER.

No. 1.

	cwt.	qrs	lbs.
No. 2 Burnt Turkey Umber Paint .	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Burnt Turkey Umber Paint ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil........ 1½ gallons			
Turpentine .... ½ gallon			

LIGHT OAK.

No. 1.

	cwt.	qrs.	lbs.
No. 2 English Ochre Paint	0	3	0
No. 2 Raw English Umber Paint	0	1	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 English Ochre Paint	0	3	0
No. 3 Raw English Umber Paint	0	1	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

DARK OAK.

No. 1.

	cwt.	qrs.	lbs.
No. 2 English Ochre Paint	0	3	0
No. 2 Raw English Umber Paint	0	1	14
Patent Driers	0	0	12
Boiled Linseed Oil .... 2 gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 English Ochre Paint	0	3	0
No. 3 Raw English Umber Paint	0	1	14
Patent Driers	0	0	12
Boiled Linseed Oil ...... 2 gallons			
Turpentine .... ½ gallon			

LIGHT DRAB.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Light Drab Paint (Lead Base)	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Light Drab Paint (Lead Base)	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

DARK DRAB.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Dark Drab Paint (Lead Base) ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Dark Drab Paint (Lead Base) ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil........ 1½ gallons			
Turpentine .... ½ gallon			

LIGHT BRUNSWICK GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Light Green Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Light Green Paint	1	0	9
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine . ... ½ gallon			

MIDDLE BRUNSWICK GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Middle Green Paint.	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Middle Green Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil.. 1½ gallons			
Turpentine .... ½ gallon			

DEEP BRUNSWICK GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Deep Green Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Deep Green Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

LIGHT BRONZE GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Light Bronze Green Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Light Bronze Green Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

MIDDLE BRONZE GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Middle Bronze Green Paint ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Middle Bronze Green Paint ..	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

DEEP BRONZE GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Deep Bronze Green Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil........ 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Deep Bronze Green Paint	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... 1½ gallons			
Turpentine .... ½ gallon			

EMERALD GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Emerald Green Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Emerald Green Paint	1	0	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

NAVY GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Emerald Green Paint	0	2	0
No. 2 Light Brunswick Green Paint .	0	2	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

No. 2.

	cwt.	qrs.	lbs
No. 3 Emerald Green Paint	0	2	0
No. 3 Light Brunswick Green Paint .	0	2	0
Patent Driers	0	0	12
Pale Boiled Linseed Oil .. 1½ gallons			
Turpentine .... ½ gallon			

BLACK.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Black Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	1½ gallons			
Terebine	½ gallon			
Turpentine	½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Black Paint		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	1½ gallons			
Terebine	½ gallon			
Turpentine	½ gallon			

LIGHT LEAD COLOUR.

No. 1.

		cwt.	qrs.	lbs.
No. 2 Light Lead Colour Paint (Lead Base)		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 Light Lead Colour Paint (Lead Base)		1	0	0
Patent Driers		0	0	12
Boiled Linseed Oil	1½ gallons			
Turpentine	½ gallon			

MIDDLE LEAD COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Middle Lead Colour Paint (Lead Base)	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

DEEP LEAD COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 Deep Lead Colour Paint (Lead Base)	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

No. 2.

	cwt.	qrs.	lbs.
No. 3 Deep Lead Colour Paint (Lead Base)	1	0	0
Patent Driers	0	0	12
Boiled Linseed Oil ...... $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

SLATE COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 2 White Paint	1	0	0
No. 2 Black Paint	0	0	7
Patent Driers	0	0	12
Boiled Linseed Oil .... $1\frac{1}{2}$ gallons			
Turpentine .... $\frac{1}{2}$ gallon			

No. 2.

		cwt.	qrs.	lbs.
No. 3 White Paint		1	0	0
No. 3 Black Paint		0	0	7
Patent Driers		0	0	12
Boiled Linseed Oil	$1\frac{1}{2}$ gallons			
Turpentine	$\frac{1}{2}$ gallon			

American Thinned Paints.

In America, where thinned paints are much more largely used by professional users than in Europe, the stiff paint is often ground with part of the oil, and at once passed on to the mixing plant, where it is worked up with the rest of the thinners and the driers. The following series of recipes is framed from large mixings which may be worked in this way.

The quality, it will be observed, is first-rate, and the introduction of suitable mixing varnish will enable an excellent enamel paint to be prepared.

WHITE.

Linseed Oil	1	gallon
Turps.	$\frac{1}{4}$	gallon
White Lead	13	lbs.
Driers	7	lbs.
Barytes	25	lbs.

LIGHT STONE.

Linseed Oil	1	gallon
Turps.	$\frac{1}{4}$	gallon
White Lead	$12\frac{1}{2}$	lbs.
Yellow Ochre	$\frac{1}{2}$	lb.
Driers	7	lbs.
Barytes	25	lbs.

MIDDLE STONE.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	12	lbs.
Yellow Ochre	1	lb.
Driers	7	lbs.
Barytes	25	lbs.

DARK STONE.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	11	lbs.
Driers	7	lbs.
Barytes	25	lbs.

LIGHT GREEN.

Boiled Oil	1	gallon
Turps.	¼	gallon
Light Brunswick Green	13	lbs.
Driers	7	lbs.
Barytes	25	lbs.

MIDDLE GREEN.

Boiled Oil	1	gallon
Turps.	¼	gallon
Driers	7	lbs.
Middle Brunswick Green	13	lbs.
Barytes	25	lbs.

DARK GREEN.

Boiled Oil	1	gallon
Turps.	¼	gallon
Dark Brunswick Green	13	lbs.
Driers	7	lbs.
Barytes	25	lbs.

LIGHT DRAB.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	12½	lbs.
Raw Umber	½	lb.
Driers	7	lbs.
Barytes	25	lbs.

MIDDLE DRAB.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	12	lbs.
Driers	7	lbs.
Barytes	25	lbs.

DARK DRAB.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	11	lbs.
Raw Umber	2	lbs.
Driers	7	lbs.
Barytes	25	lbs.

LIGHT PURPLE BROWN.

Boiled Oil	1	gallon
Turps.	¼	gallon
Red Oxide	13	lbs.
Driers	7	lbs.
Barytes	25	lbs.

FRENCH GREY.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	12	lbs.
Bone Black	1	lb.
Driers	7	lbs.
Barytes	25	lbs.

MIDDLE PURPLE BROWN.

Boiled Oil	1	gallon
Turps.	¼	gallon
Red Oxide	6	lbs.
Dark Purple Brown	7	lbs.
Driers	7	lbs.
Barytes	25	lbs.

DARK PURPLE BROWN.

Boiled Oil	1	gallon
Turps.	¼	gallon
Driers	7	lbs.
Barytes	25	lbs.
Dark Purple Brown	13	lbs.

LEAD COLOUR.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	11	lbs.
Bone Black	2	lbs.
Driers	7	lbs.
Barytes	25	lbs.

BLACK.

Boiled Oil	1	gallon
Turps.	½	gallon
Bone Black	3½	lbs.
Barytes	32½	lbs.
Driers	7	lbs.

CHOCOLATE.

Boiled Oil	1	gallon
Turps.	½	gallon
Red Oxide	10	lbs.
Bone Black	3	lbs.
Driers	7	lbs.
Barytes	25	lbs.

EMERALD TINT GREEN.

Light Brunswick-tinted Emerald Green	16	lbs.
White Lead	13	lbs.
Barytes	38	lbs.
Boiled Oil	2	gallons
Turps.	½	gallon

PINK.

Linseed Oil	1	gallon
Turps.	¼	gallon
White Lead	12	lbs.
Venetian Red	1	lb.
Barytes	25	lbs.

ROYAL BLUE.

Boiled Oil	1	gallon
Turps.	½	gallon
Driers	7	lbs.
Barytes	32½	lbs.
Ultramarine	3½	lbs.

PURPLE BROWN (BEST).

Purple Brown	15	lbs.
Driers	4	lbs.
Boiled Oil	¾	gallon
Turps.	¼	gallon

Ready Mixed Liquid Paints.

Here follows a series based on a fixed standard base, which, by varying the thinners, can be made suitable for various sorts of paints or enamel paints.

PASTE FOR WHITE.

	cwt.	qrs.	lbs.
Oxide of Zinc	0	2	0
White Barytes	1	2	0
Refined Linseed Oil	0	0	21
add, when ground,			
Patent Driers	0	0	7
Terebine	0	0	2

Thin with refined linseed oil.

FOR IVORY.

Add 2 ozs. French ochre in oil.

SKY BLUE.

	cwt.	qrs.	lbs.
Paste for White	2	0	0
Brunswick Blue in Oil	0	0	14
Patent Driers	0	0	28

Thinned down with half linseed oil and half boiled oil substitute.

FRENCH GREY.

	cwt.	qrs.	lbs.
Paste for White	2	0	0
Patent Driers	0	1	0
Black in Oil	0	0	2
Brunswick Blue in Oil	0	0	2

Thin with half linseed oil and half boiled oil substitute.

SILVER GREY.

	cwt.	qrs.	lbs.
White Paste	2	0	0
Patent Driers	0	1	0
Black in Oil	0	0	4
Brunswick Blue	0	0	1

Thin down with boiled oil substitute.

LEMON CHROME.

	cwt.	qrs.	lbs.
White Paste	2	0	0
Patent Driers	0	1	0
Pale Chrome in Oil	0	0	14

Thin down with boiled oil substitute.

MIDDLE CHROME.

	cwt.	qrs.	lbs.
White Paste	2	0	0
Patent Driers	0	1	0
Deep Chrome in Oil	0	0	14

Thin down with boiled oil substitute.

ROSE PINK.

	cwt.	qrs.	lbs.
White Paste	2	0	0
Patent Driers	0	1	0
Ordinary Vermilionette in Oil	0	0	7

Thin down with half linseed oil and half boiled oil substitute. The above are delicate tints; for darker tints use the following:

PASTE FOR MEDIUM SHADES.

	cwt.	qrs.	lbs.
White Lead	0	0	14
Whiting	0	0	21
2nd Barytes	1	0	0
Boiled Oil Substitute	0	0	18

LIGHT DRAB.

	cwt.	qrs.	lbs.
Medium Paste	2	0	0
Patent Driers	0	1	0
Burnt Turkey Umber in Oil	0	0	3

Thin down with 1 part linseed oil and 3 parts boiled oil substitute.

MIDDLE SHADE DRAB.

Use same, with 6 lbs. burnt Turkey umber in oil. Same thinnings.

DEEP SHADE DRAB.

Same as above, with 10 lbs. burnt Turkey umber in oil.

BLACK.

	cwt.	qrs.	lbs.
2nd Barytes	1	0	0
Vegetable Black	0	0	4
Boiled Oil Substitute	0	0	10
Gold Size	0	0	2

Add to 1 cwt. of black paste, 14 lbs. patent driers. Thin with boiled linseed oil 1 part, boiled oil substitute 3 parts.

SLATE.

	cwt.	qrs.	lbs.
Medium Paste	1	3	0
Black Paste	0	1	0
Patent Driers	0	1	0

Thin with 1 part linseed oil, 3 parts boiled oil substitute.

LIGHT STONE.

	cwt.	qrs.	lbs.
Medium Paste	2	0	0
Patent Driers	0	1	0
Ochre in Oil	0	0	2
English Umber in Oil	0	0	2

Thin down with 1 part linseed oil and 3 parts boiled oil substitute.

MIDDLE STONE.

Add to Paste—

Ochre in Oil	3 lbs.
English Umber in Oil	$2\frac{1}{2}$ lbs.

DEEP STONE.

Add to Paste—

Ochre in Oil	5	lbs.
English Umber in Oil	5	lbs.

SIGNAL RED.

	cwt.	qrs.	lbs.
Best Barytes	1	2	0
Bright Venetian Red	0	0	14
Deep Vermilionette	0	0	14
Boiled Linseed Oil	0	0	9
Boiled Oil Substitute	0	0	9

To 1 cwt. of paste add 14 lbs. patent driers, and thin with boiled oil substitute.

For Venetian red, Indian red, blue, light, middle, and deep Brunswick greens, purple, brown, ochre, deep chrome, emerald-tinted, and chrome greens, use for the paste as follows, the same quantity of any of the above colours :—

PASTE.

	cwt.	qrs.	lbs.
2nd Barytes	2	0	0
Dried Whiting	0	2	0
Colour	0	1	0
Boiled Oil Substitute	0	1	0

To every 1 cwt. of paste add 14 lbs. patent driers, and thin down (just sufficient to cover) with 1 part linseed oil to 3 parts of boiled oil substitute.

Paste should be ground out through rolls.

Enamel Paints.

The following make good enamels.

DARK BLUE.

Celestial Blue	3	lbs.
Best Hard Church Oak Varnish	8	lbs.

GO LIN BLUE.

Oxide of Zinc	3	lbs.
Pale Emerald Tint Green	2	ozs.
Ultramarine Blue	2	ozs.
Hard Church Oak Varnish	8	lbs.

PRIMROSE.

Oxide of Zinc	3	lbs.
Pale Lemon Chrome	2	ozs.
Enamel Varnish	8	lbs.

AZURE BLUE.

Oxide of Zinc	3	lbs.
Ultramarine Blue	4	ozs.
Enamel Varnish	8	lbs.

CANARY.

Oxide of Zinc	3	lbs.
Pale Lemon Chrome	4	ozs.
Enamel Varnish	8	lbs.

OLD GOLD.

Orange Chrome	2	lbs.
Raw Sienna	½	lb.
Hard Church Oak Varnish	9	lbs.

WHITE.

Oxide of Zinc	3	lbs.
Enamel Varnish	8	lbs.

IVORY.

Zinc White	3	lbs.
French Ochre	½	lb.
Enamel Varnish	8	lbs.

SEA GREEN.

Oxide of Zinc	3	lbs
Lime Blue	4	ozs.
Emerald Tinted Green	4	ozs.
Enamel Varnish	8	lbs.

GRASS GREEN.

Pale Chrome Green ...	2	lbs.
Pale Brunswick Green	1	lb.
Enamel Varnish	9	lbs.

SIGNAL RED.

Deep Ordinary Vermilionette	3	lbs.
Ultramarine Blue	2	ozs.
Hard Church Oak Varnish	8	lbs.

POST OFFICE RED.

Deep Ordinary Vermilionette	2	lbs.
Best Vermilionette	1	lb
Hard Church Oak Varnish	8	lbs.

SALMON PINK, PALE.

Oxide of Zinc	3	lbs.
Special Best Vermilionette	1	oz.
Enamel Varnish	8	lbs.

FOR DARK SHADE USE

Best Vermilionette	2	ozs.

STRAW COLOUR.

Oxide of Zinc	3	lbs.
Orange Chrome	1	oz.
Enamel Varnish	8	lbs.

PALE TERRA COTTA.

Oxide of Zinc	3	lbs.
Venetian Red	1	oz.
Enamel Varnish	8	lbs.

FOR DEEP SHADE USE

Venetian Red	2	ozs.

STONE COLOUR.

Oxide of Zinc	3	lbs.
Burnt Turkey Umber	1	oz.
Oxford Ochre	1	oz.
Enamel Varnish	8	lbs.

FLESH COLOUR.

Oxide of Zinc	3	lbs.
Special Vermilionette	½	oz.
Venetian Red	½	oz.
Enamel Varnish	8	lbs.

ELECTRIC BLUE.

Oxide of Zinc	3	lbs.
Emerald Tinted Green	1	oz.
Lime Blue	1	oz.
Enamel Varnish	8	lbs.

HELIOTROPE.

Oxide of Zinc	3	lbs.
Mauve Lake	4	ozs.
American Turps.	1	lb.
Enamel Varnish	7	lbs.

APRICOT.

Oxide of Zinc	3	lbs.
Venetian Red	1	oz.
Orange Chrome	½	oz.
Enamel Varnish	8	lbs.

EAU DE NIL.

Oxide of Zinc	4	lbs.
Pale Chrome Green	2	ozs.
Enamel Varnish	8	lbs.

LIGHT DRAB.

Oxide of Zinc	3	lbs.
French Grey	2	ozs.
Enamel Varnish	8	lbs.

MIDDLE DRAB.

French Grey	4	ozs.

DEEP DRAB.

French Grey	8	ozs.

PALE PINK.

Oxide of Zinc	3	lbs.
Geranium Lake	1	oz.
Enamel Varnish	8	lbs.

DEEP PINK.

Oxide of Zinc	3	lbs.
Geranium Lake	2	ozs.
Enamel Varnish	8	lbs.

FRENCH GREY.

Oxide of Zinc	3	lbs.
Ultramarine	1	oz.
Vegetable Black	$\frac{1}{2}$	oz.
Enamel Varnish	8	lbs.

SILVER GREY.

Oxide of Zinc	3	lbs.
Vegetable Black	1	oz.
Lime Blue	$\frac{1}{2}$	oz.

SKY BLUE.

Oxide of Zinc	3	lbs.
Ultramarine Blue	2	ozs.
Enamel Varnish	8	lbs.

For all ordinary dark shades of greens, blues, reds, chromes, black, &c., use 3 lbs. of the colour to 9 lbs. of the varnish (hard church oak varnish), and, if ground in a mill, it should be run through at least twice.

The enamel varnish is three parts best crystal varnish and one part cabinet makers' varnish mixed together, and oxide of zinc should not be of lower grade than red seal.

Methods of Cheapening Ready Mixed Paints.

Two methods may be suggested. The first is to cheapen the base or stiff paint, and, up to a certain point, this is all very well. After a limit has been reached, this method of cheapening, however, can only be continued at the sacrifice of the colour and body of the thinned paint. The other method is to substitute wholly or partly for the thinnings of oil and turps substances which are less expensive than these ingredients. For raw and boiled oil substitutes the reader is referred to Part II., and a further recipe is appended.

PAINT EXTENDER OR CHEAPENER.

Place in a kettle, over a fire, 100 lbs. rosin, melt, and stir in 5 lbs. freshly slaked quick lime, cook for about a quarter of an hour, and add 75 lbs. soda crystals, when melted together, add slowly 80 gallons of water, and cook the whole to a uniform consistency.

NOTE.—The amount of water to be added is regulated according to the consistency required, which should be that of a thick varnish.

For cheapening the genuine oil paint mix the composition obtained as above, in any proportion, with genuine oil paint, after the driers and thinners have been added, in any proportion required according to price desired, the usual percentage being up to about 60%, and thoroughly stir together.

Flatted or Dull Oil Paints.

To produce flatted or dead surface paints it is necessary to thin the oil paints with less raw linseed oil and more turpentine or other spirit; therefore, instead of thinning the oil paint with 2 parts linseed oil and 1 part turpentine, use as follows, viz.:—

THINNINGS FOR FLATTED OIL PAINTS.

No. 1.

Raw Linseed Oil	1 part
Turpentine	2 parts

No. 2.

Raw Linseed Oil	1 part
Turpentine	3 parts

No. 3.

For very flat or dull paint, thin with turpentine only.

In this case, some binding material, such as gold-size, must be added, otherwise the paint will flake.

No. 4.

(Very Cheap Thinning.)

Raw Linseed Oil	3 parts
Turpentine	1 part
Benzine	2 parts
Shale Spirit	1 part

In making up paints with flat thinnings, trials should always be made, so as to see what is the most economical method of getting a flat paint, as pigments vary very much.

DEAD FLAT WHITE PAINT.

White Lead	14 lbs.
Zinc Oxide	7 lbs.
Refined Linseed Oil	2 lbs.
Turps.	5 lbs.
Palest Terebine	3 lbs.

Thin, if necessary, with turps. only.

DEAD FLAT CHOCOLATE PAINT.

Deep Purple Oxide	84 lbs.
Yellow Ochre	28 lbs.
Celestial Blue	1 lb.
Turps.	15 lbs.
Linseed Oil	7 lbs.
Dark Terebine	1 lb.

CHAPTER XXVII.

THINNED PAINTS FOR SPECIAL PURPOSES.

Anti-Corrosive Paints.

The discussion of these paints has been reserved for this place instead of being dealt with under stiff paints, because it is preferable that they should be thinned ready for use by the manufacturer rather than by the user. It is clear that a paint which is to be used for a definite and special purpose should, if possible, be placed in the hands of the user ready for use, otherwise, through want of knowledge, he is liable to injure its specific properties in the thinning of it.

Anti-corrosive paints may be applied on metallic surfaces to prevent rusting or corroding from within. Thus, it is well-known that an oxide paint applied on iron will protect the surface (for some time at any rate) from external influences, but will not prevent rust forming under the paint. Therefore, oxide paints are not true anti-corrosive paints under all conditions. Anti-corrosive paints of another class are those which, when applied on a suitably-primed and prepared surface, protect the same from external influences.

(1) Raw linseed oil applied hot on new castings or ironwork permeates the pores and makes a splendid priming for oil paint.

(2) Red lead ground in Brunswick black and thinned with hot raw linseed oil may be used for the same purpose.

3. White lead 3 parts, barytes 1 part, lamp black 1 part, ground in oil and thinned with raw linseed oil and a little turps. is a good priming for wood or non-porous metals.

4. One of the best bases for a priming anti-corrosive paint is red lead and zinc white ground in raw linseed in equal parts.

5. Sulphide of zinc or lithopone is a good anti-corrosive under certain conditions.

6. Carefully-selected oxides of iron and especially the iron miniums are specially adapted for anti-corrosive paints if applied over proper priming.

The following series of paints gives numerous shades on an approved base.

It may be noted here that although it is necessary to produce anti-corrosives in all shades, the less extraneous tinting the better.

WHITE BASE FOR ANTI-CORROSIVE COLOURS.

No. 1.

	cwt.	qrs.	lbs.
White Lead	1	0	$22\frac{1}{2}$
Sulphide of Zinc	0	1	17
Powdered Flint	0	2	19
Powdered Glass	0	0	24
White Sugar of Lead	0	0	$7\frac{1}{2}$
Sulphate of Zinc	0	0	15
Ultramarine Blue ... 1 oz.			

No. 2.

	cwt.	qrs.	lbs.
White Lead	0	2	0
Powdered Litharge	0	0	14
Calcined Flint	1	0	0
Powdered Glass	0	1	14

These paints can be ground dry with the colours, or ground as stiff paints with linseed oil, or sent out as ready-mixed paints which is the preferable way.

Put the base and the dry colour or stiff paint into a mixer with 1 to 1½ gallons boiled linseed oil with each cwt. of base or paint and pass through rollers. Thin for use with any suitable thinnings, by preference genuine boiled oil and as little turps. as possible.

The bases just described are the foundation of the following tints:—

LIGHT BLUE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Celestial Blue	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Celestial Blue	0	2	0

DARK BLUE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Brunswick Blue	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Brunswick Blue	0	2	0

BRIGHT YELLOW.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
No. 2 Lemon Chrome	0	1	0
English Ochre	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
No. 2 Lemon Chrome	0	0	14
English Ochre	0	2	0

BRIGHT RED.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Bright Red Oxide	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2. Base	1	0	0
Bright Red Oxide	0	2	0

COPPER.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Bright Red Oxide	0	0	7
Rose Pink	0	0	7

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Bright Red Oxide	0	0	4
Rose Pink	0	0	4

PURPLE BROWN.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Middle Purple Brown	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Middle Purple Brown	0	2	0

CHOCOLATE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Spanish Brown	1	0	0
Mineral Black	0	2	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Spanish Brown	0	2	0
Mineral Black	0	1	0

LIGHT OAK.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
French Ochre	1	0	0
English Umber	0	2	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
French Ochre	0	2	0
English Umber	0	1	0

LIGHT GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
No. 2 Light Green	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
No. 2 Light Green	0	2	0

MIDDLE GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
No. 2 Middle Green	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
No. 2 Middle Green	0	2	0

DEEP GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
No. 2 Deep Green	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
No. 2 Deep Green	0	2	0

INVISIBLE GREEN

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
No. 2 Deep Green	1	0	0
Mineral Black	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
No. 2 Deep Green	0	2	0
Mineral Balck	0	2	0

LIGHT BATH STONE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
English Ochre	0	0	7

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
English Ochre	0	0	4

DARK BATH STONE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
English Ochre	0	0	14

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
English Ochre	0	0	7

LIGHT PORTLAND STONE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
English Umber	0	0	7

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
English Umber	0	0	4

DARK PORTLAND STONE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
English Umber	0	0	14

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
English Umber	0	0	7

BLACK.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Mineral Black	1	0	0
Litharge	0	0	14

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Mineral Black	0	2	0
Litharge	0	0	7

LIGHT LEAD COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Mineral Black	0	0	7
Celestial Blue	0	0	7

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Mineral Black	0	0	4
Celestial Blue	0	0	4

DARK LEAD COLOUR.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Base	1	0	0
Mineral Black	0	0	14
Celestial Blue	0	0	14

No. 2.

	cwt.	qrs.	lbs.
No. 2 Base	1	0	0
Mineral Black	0	0	7
Celestial Blue	0	0	7

Funnel Paints.

WHITE FOR YACHTS.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	3	14
China Clay	0	3	14
Ultramarine Blue	0	0	0½
Pale Resin Oil .... 2 gallons			
Silicate of Soda .... 20 gallons			

Process.—Mix well together and strain.

This may be used independently, or with good effects over a previous coat of No. 3 white funnel paint, as the lime will prevent the zinc from discolouring.

No. 2.

		cwt.	qrs.	lbs.
China Clay		0	0	10
Permanent White (Precipitated Barytes		1	2	21
Ultramarine Blue		0	0	0½
Pale Resin Oil	2 gallons			
Silicate of Soda	16 gallons			

Process.—As above.

No. 3.

		cwt.	qrs.	lbs.
White Chalk Lime		0	3	0
Whiting		0	3	14
Pale Resin Oil	4 gallons			
Silicate of Soda	16 gallons			

Process.—Slake the lime with water, add the resin oil while hot, then add the silicate and whiting, thoroughly mixing all together. Thin with water for use.

BLUE FUNNEL PAINT.

		cwt.	qrs.	lbs.
China Clay		1	2	21
Ultramarine Blue		0	1	2
Pale Resin Oil	4 gallons			
Silicate of Soda	18 gallons			

Process.—As before.

CREAM FUNNEL PAINT.

		cwt.	qrs.	lbs.
White Chalk Lime		0	3	0
Whiting		0	1	12
Powdered Litharge		1	3	0
Pale Resin Oil	4 gallons			
Silicate of Soda	20 gallons			

Process.—As before; add the litharge last, mixed with a little water.

BRIGHT RED FUNNEL PAINT.

		cwt.	qrs.	lbs.
White Chalk Lime		0	3	0
Whiting		0	1	12
Red Lead		1	3	0
Pale Resin Oil	4 gallons			
Silicate of Soda	20 gallons			

Process.—As before. Should the mixture turn hard on the addition of the red lead, add more resin oil and stir well in.

BLACK FUNNEL PAINT.

		cwt.	qrs.	lbs.
Oxide of Manganese		1	0	7
Bone Black		0	2	14
Black Lead		0	0	10
Resin Oil	4 gallons			
Silicate of Soda	20 gallons			

Process.—As before.

All require grinding, and when using should be constantly stirred.

ANOTHER WHITE FUNNEL PAINT.

	cwt.	qrs.	lbs.
Zinc Oxide	0	2	0
White Lead	0	2	0

Mix with water to a paste, and add ½ gallon glycerine. Melt 4 lbs. glue in 1 gallon water; put in the paste, and add 4 gallons of boiled oil and 1 gallon of turps.

FOR FUNNEL BLUE.

Add to above—

	cwt.	qrs.	lbs.
Prussian Blue	0	0	10
Ochre	0	0	3

FUNNEL RED.

Use Venetian red instead of white lead and zinc.

Paints for Engines.

ENGINE GREEN (LIGHT, MIDDLE, OR DEEP).

No. 1.

	cwt.	qrs.	lbs.
Brunswick Green	3	0	0
Barytes	0	3	0
Paris White	0	1	0
Boiled Oil ... 7 gallons			

No. 2.

	cwt.	qrs.	lbs
Brunswick Green	1	2	0
Barytes	1	0	14
Paris White	0	3	0
Boiled Oil ... 7 gallons			

No. 3.

	cwt.	qrs.	lbs.
Green	1	2	0
Barytes	1	3	14
Paris White	0	2	14
Boiled Oil ... 7 gallons			

To make ready for use thin with each 1 cwt. of paint

Boiled Oil	3	gallons
Turps.	1	gallon
Gold Size	1	gallon
Patent Driers	14	lbs.

For olive green add to dark green—

Vegetable Black ... 3 lbs.

For emerald green shade—

Use Zinc Green instead of Brunswick Green.

Bases for cheap engine paints may be prepared as under :—

STONE.

		cwt.	qrs.	lbs.
Whiting		4	0	0
White Barytes		3	2	0
Zinc Oxide (Yellow Seal)		1	2	0
Linseed Oil	$11\frac{1}{2}$ gallons			
Boiled Oil Foots	3 gallons			
Ochre		0	1	18

WHITE.

		cwt.	qrs.	lbs.
Zinc Oxide		2	0	0
White Barytes		3	2	0
Paris White		0	2	14
Refined Oil	10 gallons			
Water	1 gallon			

WHITE.

		cwt.	qrs.	lbs.
Zinc Oxide		2	0	0
Zinc Sulphide		0	2	0
White Barytes		4	1	14
Refined Oil	$12\frac{1}{4}$ gallons			
Soft Soap	3 lbs.			
Water	1 gallon			

Paints for Boilers, Engines, Bridges, &c.

No. 1.

	cwt.	qrs.	lbs.
Green Verdigris	0	1	0
Barytes	0	1	0
Whiting	0	2	0
Boiled Linseed Oil	0	1	0

Thinned with 2 parts of boiled oil and 1 of turps., mixed together. 3 gallons to the cwt.

No. 2.

	cwt.	qrs.	lbs.
Emerald Green	0	2	0
Barytes	2	0	0
Whiting	2	0	0
China Clay	0	0	14
Boiled Linseed Oil	1	0	0

Thinned with boiled oil and turps., as above.

No. 3.

	cwt.	qrs.	lbs.
Indian Red	0	2	0
Barytes	0	2	14
Whiting	0	1	14
China Clay	0	0	14
Boiled Oil	0	2	7

Thinned with boiled oil and turps., as above.

No. 4.

	cwt.	qrs.	lbs.
Middle Purple Brown	0	2	0
Barytes	0	1	0
Whiting	0	1	0
China Clay	0	0	7
Boiled Oil	0	2	0

Thinned with boiled oil and turps., as above.

NOTE.—For a cheaper thinning use 2 parts benzine and 1 part shale spirit.

Locomotive Paints.

GREEN.

Bright Green	9	lbs.
China Clay	2	lbs.
Grinding Japan	3	gallons
Grinding Varnish	15	gallons
Turpentine	3	gallons

No. 2.

Bright Green	$7\frac{1}{2}$ lbs.
Carbon Black	9 lbs.
Grinding Japan	$3\frac{3}{4}$ gallons
Grinding Varnish	42 gallons
Turpentine	$7\frac{1}{2}$ gallons

Any colours can be used.

Tar Paint for Ironwork.

	cwt.	qrs.	lbs.
Tar	0	3	7
Sulphur	0	0	7
Red Lead	0	0	7
White Lead	0	0	7

Process.—Boil together until reduced in bulk one half.

Can Paints.

1ST COATING.

White Lead	28 lbs.
Turps.	$1\frac{1}{2}$ pints
Gold Size	1 pint

2ND COATING.

White Lead	28 lbs.
Church Oak Varnish	1 quart
Gold Size	$1\frac{1}{2}$ pints
Linseed Oil	$\frac{1}{2}$ pint

JAPANNER'S BLACK FOR IRON.

	cwt.	qrs.	lbs.
Ivory Drop Black	0	2	0
Gold Size	3 gallons		
Turps.	1 pint		

Marine Paint for Metals Exposed to Salt Water.

Red Lead	55 parts
Quicksilver	30 parts
Turpentine (thick)	7 parts

Mix with boiled linseed oil to the proper consistency. The quicksilver must be properly amalgamated with the turpentine by grinding and rubbing, and this mixture must be ground with the red lead and boiled linseed oil, as little oil as is necessary to make the paint spread well must be used. To make this paint adhere more firmly, a previous coat of oxide of iron may be used.

Heat Indicating Paints.

No. 1.

	cwt.	qrs.	lbs.
Red Mercuric Oxide	0	0	5
Vermilion	0	0	1

No. 2.

	cwt.	qrs.	lbs.
Red Mercuric Oxide	0	0	5
Vermilionette	0	0	1

Process.—Make into paint in the usual manner, using linseed oil and turps. as thinnings.

FOR USE.—If bearings and other parts of machinery are painted with either of the above paints, it will be an easy task to ascertain if cool or overheated. These compounds will become dark at 150° F., and will fade back to their normal colour on cooling. If desired, they may be varnished.

Quick and Hard Drying Enamel Paint.

	cwt.	qrs.	lbs.
Indian Red	0	1	14
Venetian Red	1	2	0
Zinc Oxide	1	0	0
Whiting	0	1	0
Boiled Oil ... 9 gallons			

and, after grinding, add 18 gallons of brilliant mixing varnish.

QUICK HARD DRYING BLACK ENAMEL PAINT.

Carbon Black	3 lbs.
Refined Linseed Oil	3 gallons
Gold Size	10 gallons
Hard Church Oak Varnish	6 gallons
Turps.	3 gallons

Result, 22¼ gallons.

Gasometer Paints.

SPECIALITY RED OXIDE PAINT FOR GASOMETERS, &c.

	cwt.	qrs.	lbs.
Red Oxide	3	2	0
Barytes	7	0	0
Whiting	0	3	0
Boiled Linseed Oil	1	0	0
Raw Oil	2	0	0
Varnish Bottoms	0	2	2
Turps.	0	1	14
Driers	2	0	0

No. 2.

	cwt.	qrs.	lbs.
Fine Copperas Red	0	1	14
Chocolate Oxide	1	2	0
Zinc Oxide	1	0	0
Whiting	0	1	0
Boiled Linseed Oil .... 9 gallons			

Grind together and add—

Hard Mixing Varnish to required consistency.

RED OXIDE READY MIXED PAINT FOR GASOMETERS.

	cwt.	qrs.	lbs.
Red Oxide	3	2	0
Barytes	7	0	0
Whiting	0	3	0
Boiled Oil	1	0	0
Raw Oil	2	0	0
Varnish Bottoms	0	2	2
Turps.	0	1	14
Driers	2	0	0

ZINC WHITE READY MIXED FOR GAS WORKS.

	cwt.	qrs.	lbs.
Dry Zinc	1	3	0
Barytes	3	0	0
Refined Oil	1	1	8
Turps.	0	1	17
Manganese	0	0	2
Dammar Varnish	0	0	9

Floor Paints.

MAROON OR INDIAN RED.

	cwt.	qrs.	lbs.
Indian Red	0	2	0
Red Oxide	0	1	0
Zinc White	0	0	14
Whiting	1	0	0

Ground in linseed oil, 4 gallons, and thinned to consistency with preparation as under :—

THINNING PREPARATION.

	cwt.	qrs.	lbs.
Gloss Oil	0	0	10
Raw Linseed Oil	0	0	4
Turpentine Japan	0	0	2
Benzine Japan	0	0	$1\frac{1}{2}$
Turpentine	0	0	2
Benzine	0	0	2

GLOSS OIL.

		cwt.	qrs.	lbs.	
Resin		1	0	0	Boil 1 hour
Linseed Oil	3 gallons				
Add Benzine	4 gallons				
Add Shale Spirits	2 gallons				

LIGHT BROWN.

	cwt.	qrs.	lbs.
Yellow Ochre	0	2	0
Whiting	0	2	14
Middle Purple Brown	0	0	7
Zinc White	0	0	14
Venetian Red	0	0	3
Linseed Oil $2\frac{1}{2}$ gallons			

and thinned with the thinning preparation as above.

BUFF.

	cwt.	qrs.	lbs.
Yellow Ochre	0	3	0
Whiting	0	1	0
Zinc White	0	0	14
Terra Alba	0	0	14
Linseed Oil ... 2 gallons			

Thinned with the thinning preparation as before

DUST COLOUR.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
White Lead	0	0	14
Whiting	0	1	0
Lamp Black	0	0	1
Linseed Oil ... $2\frac{1}{2}$ gallons			

Thinned with the thinning preparation as before.

LEAD COLOUR.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
White Lead	0	0	14
Whiting	0	1	0
Lamp Black	0	0	5
Yellow Ochre	0	0	3
Linseed Oil ... 3 gallons			

Thinned with the thinning preparation as before.

TERRA COTTA.

	cwt.	qrs.	lbs.
Yellow Ochre	0	2	7
Venetian Red	0	0	7
Zinc White	0	0	14
Whiting	0	2	0
Linseed Oil ... $2\frac{1}{4}$ gallons			

Thinned with the thinning preparation as before.

The following is another series of floor paints :—

FLOOR PAINTS.

STONE COLOUR.

	cwt.	qrs.	lbs.
White Lead	1	0	0
Barytes	0	3	0
Whiting	1	0	0
Ochre	0	0	26
Raw Umber	0	0	3
Dark Boiled Linseed Oil .. 8 gallons			
Varnish (Hard Oak) ..... 4 gallons			

Mix together, grind, and thin with

Turps. .... 5 gallons
Mixing Varnish .... 4 gallons
Dark Boiled Linseed Oil .. 5 gallons

with the addition of $1\frac{1}{2}$ cwt. of driers, and 2 lbs. of borax.

BUFF FLOOR PAINT.

To last quantities add 14 lbs. Oxford ochre and 7 lbs. middle chrome, and leave out raw umber.

MAHOGANY.

	cwt.	qrs.	lbs.
Venetian Red	2	0	0
Burnt Umber	0	1	0
Oxford Ochre	0	0	14
Dark Boiled Oil .... 9 gallons			
Hard Church Oak Varnish . 5 gallons			

Mix and grind.

Thin with

Turps. .... 5 gallons
Dark Boiled Oil .... 3 gallons

with the addition of 1 cwt. of patent driers.

WALNUT.

		cwt.	qrs.	lbs.
Burnt English Umber		1	0	0
Venetian Red		0	0	14
Grinding Ochre		0	0	7
Cheap Barytes		1	3	14
Whiting		0	2	0
Dark Boiled Oil	15 gallons			
Varnish Bottoms	7 gallons			
Borax		0	0	6

Thin with

Turps.	4 gallons	
Boiled Oil	5 gallons	
Mixing Varnish	$4\frac{1}{2}$ gallons	

and add $2\frac{1}{2}$ cwt. of patent driers.

MAPLE.

		cwt.	qrs.	lbs.
Raw Sienna		1	0	0
Burnt Sienna		0	0	7
White Barytes		0	3	14
Whiting		0	3	14
Boiled Oil	13 gallons			
Church Oak Varnish	7 gallons			
Borax		0	0	8

Thin with

		cwt.	qrs.	lbs.
Turps.	5 gallons			
Mixing Varnish	7 gallons			
Patent Driers		3	0	0

OAK.

To Maple add

		cwt.	qrs.	lbs.
Burnt Umber		1	0	0
Boiled Oil	4 gallons			
Varnish, Extra	4 gallons			
also				
Barytes		0	2	0
Whiting		0	1	14

These recipes are for a high-class or No. 1 quality. To cheapen, reduce the staining colours by one-half, and increase the barytes and whiting 50%.

For No. 3 or cheap quality, use all boiled oil and no varnish, and increase barytes and whiting 100%.

Flexible Paints.

PAINTS FOR CANVAS SAILS, &C.

These must combine flexibility with good wearing properties, and absence of any tendency to crack or blister.

Boiled Oil	10 gallons
Patent Driers	19 lbs.
Chrome or any other Colour	14 lbs.

Mix well together and strain through muslin.

CANVAS PAINTS.

BEST OR NO. 1 QUALITY, FOR LINOLEUM AND OIL CLOTH, ETC.

WHITE.

	cwt.	qrs.	lbs.
White Lead	2	0	0
Refined Linseed Oil	0	0	15
Soft Soap	0	0	7

LIGHT STONE.

To above add

Yellow Ochre	7 lbs.
Raw Umber	½ lb.

DARK STONE.

To Light Stone add extra

Ochre	14 lbs.
Umber	1 lb.

BUFF.

To Light Stone add

Ochre	20 lbs.
Lemon Chrome	3 lbs.
Extra Oil	½ gallon

DRAB.

To Dark Stone add

Burnt Umber	14 lbs.
Extra Oil	½ gallon

AZURE BLUE.

To White add

Prussian Blue	14 lbs.

FRENCH GREY.

To White add

Ultramarine Blue	28 lbs.
Venetian Red	3 lbs.
Extra Oil	½ gallon

PEA GREEN.

To White add

Imitation Emerald Green	28 lbs.
Deep Brunswick Green	4 lbs.
Extra Oil	½ gallon

DARK RED.

	cwt.	qrs.	lbs.
Red Oxide	1	0	0
Whiting	0	1	14
Barytes	0	2	0
½ Boiled Oil, ½ Raw Oil	7 gallons		
Soft Soap	0	0	8

INDIAN RED.

	cwt.	qrs.	lbs.
Indian Red, Dry	1	0	0
Whiting	0	2	0
Barytes	0	2	7
½ Boiled Oil, ½ Raw Oil	6 gallons		
Soft Soap	0	0	7

LIGHT PURPLE BROWN.

	cwt.	qrs.	lbs.
Light Purple Brown	1	0	0
Whiting	0	1	0
Barytes	0	2	14
½ Boiled Oil, ½ Raw Oil	6 gallons		
Soft Soap	0	0	7

MIDDLE AND DEEP PURPLE BROWN.

Use middle and deep purple brown instead of light.

LIGHT GREEN.

	cwt.	qrs.	lbs.
Light Brunswick Green	1	0	0
Barytes	0	1	0
Whiting	0	2	7
½ Boiled Oil, ½ Raw Oil	4 gallons		
Soft Soap	0	0	3½

For middle and dark green, use middle Brunswick and dark Brunswick green respectively.

LIGHT BLUE.

	cwt.	qrs.	lbs.
Prussian Blue	0	2	0
Whiting	1	0	0
Barytes	1	0	0
½ Boiled Oil, ½ Raw Oil ... 6 gallons			
Soft Soap	0	0	9

DARK BLUE.

	cwt.	qrs.	lbs.
Prussian Blue	0	2	7
Whiting	0	2	14
Barytes	0	3	20
½ Boiled Oil, ½ Raw Oil ... 6 gallons			
Soft Soap	0	0	9

SAIL CLOTH PAINTS.

DRAB.

	cwt.	qrs.	lbs.
Dark Boiled Oil ... 4 gallons			
Burnt Umber	0	1	7
Patent Driers	0	2	7
White Lead	0	2	0
Raw Linseed Oil ... 2½ gallons			
Turps. ... 2 gallons			
Soft Soap	0	0	3
Glycerine ... 1 pint			

STONE BUFF.

		cwt.	qrs.	lbs.
White Lead		0	2	0
Yellow Ochre		0	1	14
Orange Chrome		0	0	7
Boiled Oil	$4\frac{1}{4}$ gallons			
Raw Oil	$1\frac{1}{2}$ gallons			
Patent Driers		0	2	7
Soft Soap		0	0	$3\frac{1}{2}$
Glycerine	1 pint			

TRAVELLING TRUNK PAINT (QUICK-DRYING).

BUFF.

Brown Hard Varnish	1	gallon
Lemon Chrome	2	lbs.
Sulphide of Zinc	1	lb.
Ochre	$\frac{1}{2}$	lb.
Methylated Spirit	1	pint

BLACK.

Brown Hard Varnish	1	gallon
Mineral Black	$\frac{1}{2}$	lb.
Zinc Sulphide	1	lb.
Methylated Spirit	1	pint

TRAVELLING TRUNK PAINT (SLOW-DRYING).

LIGHT STONE (DULL).

		cwt.	qrs.	lbs.
White Lead (Dry)		0	1	0
Turps.	$\frac{1}{2}$ gallon			
Boiled Oil	$\frac{1}{2}$ gallon			
Ochre		0	0	1
Patent Driers		0	0	14

BUFF (DULL).

		cwt.	qrs.	lbs.
White Lead		0	2	0
Ochre		0	0	5
Turps.	1 gallon			
Boiled Oil	½ gallon			
Patent Driers		0	0	14½
Middle Chrome		0	0	1

LIGHT STONE (FLAT).

		cwt.	qrs.	lbs.
White Lead		0	2	0
Gold Size	1½ gallons			
Turps.	½ gallon			
Ochre		0	0	1

BUFF.

		cwt.	qrs.	lbs.
Ochre		0	0	6
White Lead		0	2	0
Gold Size	1¾ gallons			
Turps.	1½ gallons			

FLEXIBLE PAINT.

Oxford Ochre in Boiled Oil	7 lbs.
Cheap Driers	2 lbs.
Soft Soap	1½ ozs.
Boiled Oil	½ lb.
Turps.	¼ lb.

To make any paint flexible, put in ½ pint glycerine to each ½ cwt. of paint, and use very little turps.

BLACK PAINTS FOR TARPAULINS.

Lamp Black	30	lbs.
Double Boiled Oil	24¾	gallons
Driers	½	cwt.
Sugar of Lead	7	lbs.

Use 4 gallons of oil to the black and mix with sugar of lead. Grind; then add the other ingredients.

CHEAP BLACK COMPO FOR TARPAULINS.

Black	3	cwt.
Boiled Oil	6	gallons
Shale Spirit	2	gallons

No. 2.

Black Oil Paint	1	cwt.
Burnt Brunswick Black	20	gallons

Make up to 40 gallons with rosin varnish.

BLACK TRUNK PAINTS.

No. 1.

	cwt.	qrs.	lbs.
Barytes	2	1	0
Whiting	0	1	0
Mineral Black	0	2	0
Carbon Black	0	0	3
Acetate of Lead	0	0	3
Boiled Linseed Oil	0	2	7
Varnish Bottoms	0	0	6
	3	2	24

No. 2.

Carbon Black	3	lbs.
Linseed Oil	3	gallons
Gold Size	10	gallons
Hard Church Oak Varnish	6	gallons
Turps.	3	gallons
	22¼	gallons

FLEXIBLE TRUNK PAINT.

	cwt.	qrs.	lbs.
Ground White Lead	1	0	0

Stained with burnt sienna, raw sienna, burnt Turkey umber, raw Turkey umber, Oxford or Italian ochre, Prussian blue, or any colour required; and thinned with pale oil boiled, 2 gallons; turps., 1 gallon; 7 pounds patent driers to the cwt.

For a quick-drying paint use thinnings as follows:—

Dissolve in a pan 1 cwt. resin and thin with 4 gallons benzine and 2 gallons shale spirit.

Use $3\frac{1}{4}$ gallons to the cwt. paint, as above.

FLEXIBLE PAINT.

Yellow Soap (in slices)	$1\frac{1}{2}$ lbs.
Boiling Water	1 gallon

When dissolved and hot mix in

Oil Paint (ready-mixed) Any Shade ..	$1\frac{1}{4}$ cwt.

ELASTIC WATERPROOF PAINTS.

There are a large number of mixtures used as bases for these paints, but it depends really upon the ultimate or special use of the paint when deciding upon a medium. The following make suitable applications for horse, rick and sail cloths, tents, shop blinds, etc., etc. They will dry fairly quickly, and the coating will prove efficient for quite a considerable period, but two or even three coats should be laid on, and then the resistance to wet will endure as long as the fabric of the sheet itself. The three colours given are the only ones in request, but any others would be produced by substituting the pigment desired for those in the recipes.

BLACK.

Boiled Oil	5	gallons
Turps.	4	gallons
Bone Black	17	lbs.
Yellow Soap	$2\frac{1}{2}$	lbs.
Chinese Blue	1	lb.

Process.— Cut up the soap, then boil in the oil, stirring frequently, then stir the blue in, and when dissolved mix and grind with black and turps.

The addition of a portion of varnish foots or thick stuff will impart more body and give a more glossy coating.

Another type of black paint is as follows :—

Boiled Oil	10	gallons
Resin Spirit	8	gallons
Resin Soap	$\frac{3}{4}$	gallon
Crushed Asphaltum	40	lbs.
Prussian Blue	8	ozs.

Process.—Melt the asphaltum, steadily heating for a few hours to drive off the moisture, then turn the oil in, mixing well ; then add the liquid resin soap. After heating a little longer and mixing well, add the blue, cool down, and thin with resin spirit.

The resin soap for the above will be made by dissolving 4 lbs. of carbonate of soda in $2\frac{1}{2}$ gallons of water by boiling, then add 18 lbs. of crushed resin and continue heating until all is dissolved. In addition to being satisfactory, these paints must be cheap, therefore, such things as shellac, rubber, etc., that would answer the purpose very well, are not admissible on account of their price, but alumina soap may be advantageously substituted for the ordinary soap specified, if a little extra cost is not objected to.

The following is a third way for turning out a black colour :—

Rosin Oil Varnish	5	gallons
Vegetable Black	22	lbs.
Chinese Blue	6	ozs.

Process.—Dissolve the blue in the varnish by heating carefully —then mix well or grind with the black.

The rosin oil varnishes vary in consistency, and it may be necessary to thin the paint a little when it is ground.

No soap is required in the above to make it elastic, nor is any drier necessary, as the varnish being a compound of soap and containing manganese and turps., supplies these in a ready and correctly combined form. (See siccative rosin oil, Part II.)

GREEN (EAU DE NIL).

Rosin Oil Varnish	2	gallons
Boiled Oil	2	gallons
Turps.	2	gallons
Mid. Brunswick Green	10	lbs.

Process.—Mix liquids and grind with pigment, then strain.

BUFF.

Boiled Oil	5	gallons
Resin Spirit	5	gallons
Thick Rosin Oil Varnish	2	gallons
Yellow Ochre in Oil	56	lbs.

Process.—Mix, grind, then strain. This is the ordinary yellowish or khaki colour much favoured as van covers.

CHAPTER XXVIII.

SILICATE, WATER, AND DISTEMPER PAINTS.

So far the ready-mixed paints described have been those in which the vehicle is linseed oil or a combination of that substance with turpentine. Many thinned paints are made, however, in which water or some watery fluid takes the place of the ordinary oil thinnings. The important varieties of such paints are dealt with in this chapter.

Fireproof Paints.

These paints dry with a hard enamel-like surface, which is fire and water proof, and gets harder by exposure to water and weather. A cheap and effective paint for large surfaces of plastic stucco cement, house fronts, etc. They are also adapted for factories, theatres, stores, etc., as a protection from fire. They may be tinted with the ordinary staining colours, but Prussian and Brunswick blues and greens, or any colour affected by alkalies, must not be used.

WHITE.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
White Lead	0	3	0
Sulphate of Zinc	0	0	20
Magnesia White	0	3	6
Silicate of Soda	0	1	2
Refined Linseed Oil ... 10 gallons			

Process.—Mix the dry materials well, and mix the oil with the silicate of soda. Mix all together in pug mill, not too full, as the mixture swells a little at first, and then grind well. The mixture may be thinned for use with silicate of soda and oil mixture, or with linseed oil and turps. in the usual manner, no driers being required.

WHITE FIREPROOF PAINT.

(ANOTHER METHOD.)

	cwt.	qrs.	lbs.
White Lead	0	2	0
Zinc White	0	0	14
Whiting	1	0	0
Silicate of Soda	0	0	60
Barytes	0	1	14

Mix the lead, zinc, and whiting, etc. in water to a stiff paste add the silicate, then thin down to the consistency of paint ready for use.

RED FIREPROOF PAINT.

No. 1.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Whiting	0	2	0
Barytes	1	0	0
Silicate ... 100 lbs.			
Water ... 10 gallons			

Process.—As above.

No. 2.

	cwt.	qrs.	lbs.
Venetian Red	1	2	0
Barytes	1	2	0
Silicate of Soda	1	1	0
Water	1	3	0

This is ready for use.

BUFF FIREPROOF PAINT.

	cwt.	qrs.	lbs.
Barytes	0	3	0
China Clay	1	0	0
White Lead	0	2	19
Yellow Ochre J.F.L.S.	0	1	13
Venetian Red	0	0	5
Silicate of Soda .... 71 lbs.			
Water .... 5 gallons			

BLACK FIREPROOF PAINT.

	cwt.	qrs.	lbs.
Vegetable Black	0	1	14
Mineral Black	0	1	14
Whiting	0	1	14
Barytes	1	1	0
Silicate of Soda .... 72 lbs.			
Water .... 9 gallons			

As above process.

BLUE FIREPROOF PAINT.

	cwt.	qrs.	lbs.
Lime Blue	1	0	0
China Clay	0	2	14
Barytes	1	0	0
Silicate of Soda .... 68 lbs.			
Water .... 11 gallons			

GREEN FIREPROOF PAINT.

	cwt.	qrs.	lbs.
Oxford Ochre	0	2	17
Lime Blue	0	1	19
Barytes	0	3	14
China Clay	0	1	0
Silicate of Soda .... 49 lbs.			
Water .... 7 gallons			

Washable Paints.

Herewith we give a complete series of the chief washable paints. This term is often reserved for water paints, as oil paints are naturally understood to be washable, but the following are oil and varnish mixings, which are inserted at this point for convenience and ready comparison with water and silicate paints.

FOR PAPER.

	cwt.	qrs.	lbs.
Fine Whiting	1	0	0
Common Oak Varnish	0	1	7

Process.—Cover the whiting with water and allow to stand 5 or 6 hours, then remove the water not absorbed by the whiting and beat the pulpy mass to the consistency of batter, add the varnish, and mix well till of a creamy consistency. Stain to shade required by using colours ground in boiled linseed oil.

FOR WOODWORK.

	cwt.	qrs.	lbs.
Fine Whiting	1	0	0
Boiled Linseed Oil	0	1	7

Process.—Treat the whiting as before, add the boiled linseed oil, stir well together, and stain as before. A small quantity of patent driers may be added if desired. Thin with turps. and raw linseed oil in equal quantities.

FOR BRICKWORK OR PLASTER.

	cwt.	qrs.	lbs.
Fine Whiting	1	0	0
Boiled Linseed Oil	0	1	7

Process.—As before. No driers required. May be thinned with paraffin oil.

FOR DISTEMPER WORK.

	cwt.	qrs.	lbs.
Fine Whiting	1	0	0
Boiled Linseed Oil	0	1	7

Process.—As before. No driers required. Thin with hot size and apply while warm.

In the event of any of above requiring a second coat, add a small quantity of white lead.

SILICATE OF SODA WATER PAINT.

The following process will yield good results and will give a paint which may be used as a water or oil paint by thinning with water, or in the ordinary manner by the use of linseed or boiled oil, or it may be mixed ready for use by the addition of the silicate oil substitute. With the exception of blues of the Prussian class, Brunswick greens, and, to some extent, chromes, all colours may be ground with this oil substitute.

LIQUID.

No. 1.

	cwt.	qrs.	lbs.
Silicate of Soda, 45 Beaumé	1	0	0
Pale Resin	0	1	0
Water .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Silicate of Soda, 45 Beaumé	1	0	0
Black Resin	0	1	0
Water .... 20 gallons			

Process.—Boil the water and silicate of soda together, and, while boiling, sift in the resin, which should be coarsely powdered, stirring all the while. Boil till the resin is all dissolved, then strain through coarse canvas. Mix with Oil in the following proportions :—

OIL SUBSTITUTE.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Liquid	1	0	0
Raw Linseed Oil	1	0	0

No. 2.

	cwt.	qrs.	lbs.
No. 2 Liquid	1	0	0
Boiled Linseed Oil	1	0	0

These oils dry well, and with a moderate gloss, and harden with exposure.

WHITE.

	cwt.	qrs.	lbs.
Zinc White	1	2	0
Best Barytes	0	1	14
No. 1 Oil Substitute.... 10 gallons			

LIGHT BLUE.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	0	14
Best Barytes	1	2	0
No. 1 Oil Substitute .... 6 gallons			

DARK BLUE.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	0	21
Best Barytes	1	2	0
No. 1 Oil Substitute ...... 6 gallons			

YELLOW.

	cwt.	qrs.	lbs.
English Ochre	1	1	0
Common Barytes	1	0	0
No. 2 Oil Substitute .. 10 gallons			

RED.

	cwt.	qrs.	lbs.
Venetian Red	1	1	0
Common Barytes	1	0	0
No. 2 Oil Substitute .. 10 gallons			

GREEN.

	cwt.	qrs.	lbs.
Lime Green	1	0	0
Best Barytes	1	0	0
No. 1 Oil Substitute .... 10 gallons			

BLACK.

	cwt.	qrs.	lbs.
Mineral Black	1	1	0
Common Barytes	1	0	0
No. 2 Oil Substitute .... 10 gallons			

CHEAP SILICATE WATER PAINTS.

Cheap silicate paints may be made as follows:—

	cwt.	qrs.	lbs.
Fresh Burnt Lime	0	0	5
Pine Oil ... . 5 gallons			
Silicate of Soda, 40 Beaumé 10 gallons			

Slake the lime with water, and half the silicate of soda, stir in the oil and when saponified add the remainder of the silicate. Mix with linseed oil and use as in preceding formulæ.

No. 1.

	cwt.	qrs.	lbs.
Silicate Liquid	1	0	0
Raw Linseed Oil	1	0	0

No. 2.

	cwt.	qrs.	lbs.
Silicate Liquid	1	0	0
Boiled Linseed Oil	1	0	0

The main point in the preparation of any water paint is the selection of a suitable binder—that is, a substance or mixture of substances which will enable the paint to bind together and stand exposure to weather (if outside) or washing (if inside). The choice of a binder will depend to a great extent on the nature of the other ingredients. Various typical binders are here given.

Binders for Water Colours to make them Washable.

FOR PASTE DISTEMPERS.

No. 1.

To every cwt. of dry colour used add 4 lbs. melted glue in 1 gallon of water ; also :—

Boiled Oil	1½	gallons
Cheap Varnish	½	gallon
Pine Oil	1	gallon

No. 2.

SPECIALLY FOR LIME DISTEMPERS—CALCARIUM STYLE.

Soft Soap	7	lbs.
Linseed Oil	5	gallons
Oil of Eucalyptus	1	quart
Moist Sugar	28	lbs.
Alum	7	lbs.

Use 35 lbs. to every cwt. of dry colour.

No. 3.

Shellac	28	lbs.
Borax	1	lb.
Water	1	gallon

Heat the water, add shellac and borax, bring to boiling till dissolved.

The best distempers have 1 quart of glycerine added, to prevent chipping and running.

FOR DRY DISTEMPERS.

Dry Size	28	lbs.
Soap Powder	7	lbs.
Alum	7	lbs.

Mix 28 lbs. to every cwt. of dry colour.

The best is mixed with buttermilk and then dried. After it is dried it is used in the proportions indicated as before.

CASEIN BINDER.

Casein obtained from acidulated milk or buttermilk is the binder in the latest American water paints.

Water Paint.

(ANOTHER METHOD).

Slake any quantity of stone lime by putting it in a tub and covering up to keep in the steam. When slaked pass through a fine sieve, and to each 6 quarts of lime add 1 quart of rock salt in powder and 1 gallon of water. Boil all together and skim clean. To each 5 gallons of this liquid add

Powdered Alum	1	lb.
Powdered Green Copperas	$\frac{1}{2}$	lb.
Add very slowly Powdered Caustic Potash	$\frac{3}{4}$	lb.
Fine Sand	4	lbs.

Thoroughly mix together and apply with a brush. When dry is as durable as slate, and if used on brick or stone walls will render the latter impervious to wet.

For BUFF.—Use 1 lb. of Oxford Ochre to 1 gallon of Liquid.

For STONE.—Use $\frac{1}{4}$ lb. of Ochre to 1 gallon of Liquid.

Silicate Water Paints.

These paints are thinned with hot or cold water, work like distemper, adhering firmly and resisting washing when dry. They may be used inside or outside for all purposes instead of distemper, and in many cases may be used instead of oil paint. It is not advisable to use them over old paint, as owing to their caustic nature they may bring off the paint. They make a splendid surface for ceilings and walls, and may be left as the brush leaves them, or may be stippled, which greatly improves the appearance. One to three coats may be applied, according to the state of the work treated. The first coat may be applied thin and warm to penetrate the work and stop suction, but the succeeding coats are best applied cold. The paint has then a better consistency and will stipple nicely. Wash up all spots and smears before it dries, as it is impossible to do so afterwards.

LIQUID.

	cwt.	qrs.	lbs.
Good Yellow Soap	0	0	5
Alum	0	0	5
Pale Glue	0	1	2
Concentrated Silicate of Soda 4 gallons			
Carbolic Acid	0	0	0½
China Clay	0	0	4
Raw Linseed Oil .... 2 gallons			
Water .... 20 gallons			

Process.—Dissolve the glue in 10 gallons of the water; dissolve the alum and the soap in 1 gallon of hot water each. Mix the soap solution thoroughly with the glue and gradually add the alum, stirring continually. Soak the china clay in a gallon of water, and add to the silicate of soda. Mix the oil with the silicate of soda, and, while still warm, mix the whole together, adding the remainder of the water with the carbolic acid last. Stir well, and strain to remove all grit.

WHITE.

	cwt.	qrs.	lbs.
Whiting	1	0	7
China Clay	0	1	12
Zinc White	0	1	12
Ultramarine Blue .... 2 oz.			

Liquid sufficient to form a thin paste.

Process.—Wet the ultra blue with a little hot water, and thoroughly mix with some of the china clay. Warm the liquid and mix the whole of the ingredients together to form a thin paste, which fill into kegs while warm. It will turn to a stiff jelly when cold. For use, thin with hot water to suit requirements.

BLUE.

	cwt.	qrs.	lbs.
Whiting	1	0	7
China Clay	0	1	12
Ultramarine Blue	0	0	14

Liquid as before.

Process as before.

STONE COLOUR.

	cwt.	qrs.	lbs.
Whiting	1	0	7
China Clay	0	1	12
English Ochre	0	0	14

Liquid as before

Process as before.

SALMON COLOUR.

	cwt.	qrs.	lbs.
Whiting	1	0	7
China Clay	0	1	12
Venetian Red	0	0	14

Liquid as before

Process as before.

GREEN.

	cwt.	qrs.	lbs.
Whiting	1	0	7
China Clay	0	1	12
Mineral or Lime Green	0	1	12
Liquid as before			

Process as before.

The above are the usual tints; others may be made as required on same line.

Silicate Enamel.

To any quantity of pure dry zinc white or good quality pulp colour add sufficient silicate of soda diluted with water to render it of a consistency capable of being easily worked with a brush. One coat will show well, but if a second is applied after the first is thoroughly dry, the result will be much superior. If it be used on articles the size of which will allow of their being stoved at a temperature of 175° F., a surface like porcelain will be the result. It will be found to equal any enamel of the kind in present use.

Emulsion Waterproof Paints.

No. 1.

Dry White Lead	450	lbs.
Oxide of Zinc	1200	lbs.
Raw Linseed Oil	200	gallons
Benzine	100	gallons
Strong Liquid Driers	15	gallons
Silicate of Soda Solution	60	gallons

Process.—Grind in part of oil and add the balance of the thinnings.

No. 2.

Oxide of Zinc	400	lbs.
Dry White Lead	700	lbs.
China Clay	50	lbs.
Boiled Linseed Oil	24	gallons
Turpentine Japan	3	gallons
Water	5	gallons

Process.—Grind together and thin with

Raw Linseed Oil	70	gallons

No. 3.

CHEAP QUALITY.

For the solution

Hide Glue	10	lbs.
Water	10	gallons

Heat until dissolved, then add

Borax	12	lbs.
Soda Crystals	12	lbs.
Water to make up 50 gallons		

Grind together.

Oxide of Zinc	240	lbs.
Barytes	360	lbs.
Raw Linseed Oil	32	gallons

Then thin down with

Raw Linseed Oil	10	gallons
Benzine	5	gallons
Solution (as above)	20	gallons

No. 4.

For the solution

Borax	3	lbs.
Soda Crystals	3	lbs.
Hot Water	4	gallons

Dissolve, and, when quite cold, add

Cold Water	2	gallons
Silicate of Soda	6	lbs.

Stir together very carefully, and when all is perfectly dissolved, add water to make up 50 gallons. Grind genuine oil paint with above solution to consistency.

EMULSION WATERPROOF PAINT.

Ochre	96	lbs.
Lamp Black	16	lbs.
Boiled Linseed Oil	42	lbs.

This quantity of boiled oil must be decreased or increased if the resulting consistency is not satisfactory when mixed. It depends upon the absorptive properties of the ochre and lamp black.

Then add

Yellow Soap	2	lbs.

dissolved in

Water (Hot)	1	gallon

and reduce, if necessary, to the consistency of thick varnish with more boiled oil.

Any colour can be obtained by using the usual pigments.

EMULSION PAINTS.

(ANOTHER METHOD).

Potash (American)	50	lbs.
Boiled Oil	22	gallons
Water (Hot)	5	gallons

Dissolve the potash in the water and add the oil.

Any colours can be made by mixing with the above to consistency.

THINNINGS (LIGHT).

Emulsion (as above)	100	lbs.
Refined Linseed Oil	$5\frac{1}{2}$	gallons
Water	$1\frac{1}{2}$	gallons

THINNINGS (DARK).

Emulsion (as above)	100	lbs.
Refined Oil	$3\frac{1}{2}$	gallons
Varnish Foots	4	gallons
Water	$1\frac{1}{2}$	gallons

EMULSION MIXTURE.

	cwt.	qrs.	lbs.
American Potash	0	2	0
Hot Water	0	1	0

Dissolved and mixed with 22 gallons boiled oil.

WHITE.

	cwt.	qrs.	lbs.
Dry Zinc	0	2	0
White Lead	0	2	0
Whiting	0	3	0
Barytes	0	1	0
Emulsion Mixture (as above)	0	3	0

Thinned with

Emulsion (as above)	100	lbs.
Raw Linseed Oil	$5\frac{1}{2}$	gallons
Water	$1\frac{1}{2}$	gallons

Take of this about 3 gallons to the cwt.

BLACK.

	cwt.	qrs.	lbs.
Whiting	1	0	0
Carbon Black	0	0	7
Barytes	0	2	0
Emulsion Mixture (as before	0	2	0

Thinned as for the white.

GREEN.

	cwt.	qrs.	lbs.
Brunswick Green	0	2	0
Barytes ½, Whiting ½	1	0	0
China Clay	0	0	14
Emulsion Mixture (as before)	0	2	7

Thinned as for white.

The following recipes for waterproof paint are conveniently included here, although they are not strictly water paints.

WATERPROOF PAINT.

No. 1.

Slaked Whiting	2	cwt.
White Lead ground in Oil	56	lbs.

Colour to shade required, ground in boiled linseed oil.

Oak Varnish	1½	gallons
Boiled Linseed Oil	3	gallons
Dry Concentrated Size	4	lbs.

Process.—Pug the white lead with the slaked whiting, then add the colour, boiled oil, and varnish, and, lastly, add the concentrated size, and pug the whole together; or the boiled oil can be added to the slaked whiting; then colour, add the varnish, then the size, and pug the whole together.

Thin with turps. if required, or, for cheap thinning, use:—

Turps.	3	parts
Benzine	2	parts
Shale Naphtha	1	part

No. 2.

Take equal portions of waterproof paint as in No. 1 recipe and genuine oil paint, and grind together, then thin to consistency required, as per recipe No. 1.

PROCESS FOR SLAKING THE WHITING.

Slake the whiting (ball whiting preferred) with cold water for 6 to 12 hours, then draw off the supernatent water and beat up or thoroughly stir the slaked whiting to consistency of batter.

No. 3.

Whiting	112	lbs.
Boiled Linseed Oil	30	lbs.
White Lead Ground in Oil............	56	lbs.
Genuine Oil Paint	168	lbs.

Colour to shade.

Process.—Slake the whiting with water as above, and grind together with the boiled linseed oil and white lead, colour to shade required, and then grind together with the genuine oil paint to consistency.

No. 4.

Genuine White Lead Ground in Oil	3	lbs.
Chrome Yellow or other Colour to Shade (about 6 lbs.		
White Hard Spirit Varnish	1	gallon
French Polish	2	gallons

Mixed together.

No. 5.

Yellow Soap (Best)	20	lbs.
Hot Water ....about	10	gallons
Boiled Linseed Oil	30	gallons
Raw Linseed Oil	10	gallons
Turps.	10	gallons

Colour to shade required.

Process.—Cut the soap in shavings and dissolve in the hot water, well stirring together to thick consistency; then add the boiled oil, raw oil, and turps.; mix well together and grind in paint mill.

No. 6.

FLEXIBLE.

Yellow Soap (Best)	3	lbs.
Boiling Water	2	gallons

Cut the soap in shavings and dissolve in the boiling water, then mix while hot with—

Oil Paint	$2\frac{1}{4}$	cwt.

Kalsomine, or Distemper Paint.

A waterproof and washable water paint.

Gum Shellac	5	lbs.	
Soda Crystals	1	lb.	9 ozs.

Process.—Dissolve the soda in water, add the shellac and boil all together till thorough emulsion takes place. Then remove to a sand bath and evaporate quite dry. When thoroughly dry the resultant gum is very finely powdered. This constitutes the waterproof binder.

Take 3 lbs. of any pigment and mix it with one lb. of the binder and sufficient hot water to make a paint of consistency required. Apply in the usual way.

FIRE-RESISTING KALSOMINE.

Heat 10 gallons water and add 3 lbs. glue of medium quality. When this is dissolved, add 20 lbs. common salt little by little as it dissolves. Let the fire go down and add 60 lbs. of good whiting. This will not separate from the glue, and will stand solidifying without spoiling. Wood covered with this composition will not ignite. Two coats should be applied. Any colour usually used in water paints may be added.

Fire-Resisting Paint.

Place in pan 400 lbs. of common rosin and melt. Dissolve 50 lbs. of soda in 10 gallons water, and add to the melted resin, and proceed to boil out the water. As the water boils out add common salt to the extent of 50 lbs. When the water is boiled out and the salt has dissolved add 15 to 20 gallons of raw linseed oil (this is optional) and thin with benzine. If 15 gallons of raw linseed oil are added there will be required about 60 gallons benzine to bring to proper consistency. The above produces the oil medium for the fire resisting paint. To make the paint run into the mixer say equal portions of raw linseed oil and the above oil medium, and the dry colour as required; thin, as desired, with any thinner; benzine is very good. Before thinning it is an improvement to put in an additional 25 lbs. of salt to the barrel of paint. If a cheaper paint is required, leave out part of the raw linseed oil and use more of the oil medium. This makes a really good fire-resisting paint, and at a wonderfully low cost.

CHAPTER XXIX.

SUNDRY SPECIAL PAINTS AND COMPOSITIONS.

In this chapter are described a number of special products which could not conveniently be grouped in the preceding chapters. Many of the recipes here given form the base of high priced specialities which show good profits to the makers.

Mica Lustre Paint. 1337

	cwt.	qrs.	lbs.
Clean Mica Powder	0	3	0
Pale Boiled Oil .... 14 gallons			

The above paint is nearly transparent and is intended to be applied over other paint to produce a peculiar silvery or scaly glittering appearance, varying in different lights, and is very effective on certain classes of work, such as woodwork in refreshment rooms, bars, etc. Small quantities of colour may be introduced, but the best effects are obtained by its use over other colours.

Preparing Mica for Use in Above. 1336

Place in crucibles or retorts and make red hot, and draw into water, or boil in dilute muriatic acid.

After either of the above processes it has to be ground in water, and dried and powdered.

It is fireproof, and will rival asbestos as a fireproof paint, but possesses no opacity, so that its use is purely decorative.

Asbestos Paints.

Asbestos is usually introduced into paints with the object of making them fireproof. Asbestos paints have not so much body as the ordinary oil paints, but as they are made with a special object this fact is not of primary importance.

PREPARED ASBESTOS. 12

Asbestos, carefully selected for white or light colours, is placed in a gas retort. Heat well to burn out all organic matter. Draw out into cold water, wash and grind in water under heavy stones. Float, dry, and sift. It is then ready to mix with the paint. If, owing to the presence of oxide of iron, it is then discoloured, it must be boiled by steam with hydrochloric acid or sulphuric acid, or a mixture of the two acids diluted.

ASBESTOS WHITE. 1334

		cwt.	qrs.	lbs.
Prepared Asbestos		0	3	14
Zinc White		0	3	14
Zinc Sulphide		0	0	24
Refined Linseed Oil	2 gallons			
Turpentine	$\frac{1}{4}$ gallon			

ASBESTOS WHITE LEAD. 12

		cwt.	qrs.	lbs.
Prepared Asbestos		0	3	14
Sulphate of Lead		0	2	14
Zinc White		0	1	0
Refined Linseed Oil	3 gallons			

ASBESTOS BLUE. 1332

		cwt.	qrs.	lbs.
Prepared Asbestos		0	3	14
Ultramarine Blue		0	3	14
Raw Linseed Oil	4 gallons			

ASBESTOS YELLOW. 1331

	cwt.	qrs.	lbs.
Prepared Asbestos	0	3	14
Oxford Ochre	0	3	14
Raw Linseed Oil ...... 3½ gallons			

ASBESTOS RED. 1330

	cwt.	qrs.	lbs.
Prepared Asbestos	0	3	14
Venetian Red	0	3	14
Boiled Linseed Oil .... 3½ gallons			

ASBESTOS PURPLE. 1329

	cwt.	qrs.	lbs.
Prepared Asbestos	0	3	14
Purple Oxide	0	3	14
Boiled Linseed Oil .... 4 gallons			

ASBESTOS STONE COLOUR. 1328

	cwt.	qrs.	lbs.
Prepared Asbestos	0	3	14
Zinc White	0	3	14
Zinc Sulphide	0	0	24
Raw Umber	0	0	6
Boiled Linseed Oil .... 4 gallons			
Turpentine .... ½ gallon			

ASBESTOS GREEN. 1327

	cwt.	qrs.	lbs.
Prepared Asbestos	0	3	14
Middle Brunswick Green	0	3	14
Boiled Linseed Oil ...... 3½ gallons			

ASBESTOS BLACK. 1326

	cwt.	qrs.	lbs.
Prepared Asbestos	0	3	14
Black Oxide of Manganese	0	3	14
Carbon Black	0	0	1
Boiled Linseed Oil ...... 3½ gallons			

Any other colours may be made as desired. For use, thin with linseed oil and turps. in equal proportions. A large quantity of turps. in the thinnings enhances the fireproof qualities of the paint, as it evaporates in the drying, leaving the coat of paint freer from oil.

Fireproof Silicate Paints.

In these paints silica in the form of slag wool is used. It is incombustible and possesses great heat-resisting properties. The slag as obtained from furnaces requires to be finely ground as directed for asbestos. Blast furnace slag may be ground and used for dark-coloured paints. Both this and slag wool are compound silicates of lime and iron, and make fire-resisting paints of good quality.

SILICATE NO. 1.

Finely Ground Slag Wool. 1325

SILICATE NO. 2.

Finely Ground Blast Furnace Slag. 1324

Use these in the manufacture of paints as directed for asbestos paints, and in the same proportions with less oil. They require thoroughly grinding in order to have a paint of nice appearance. They are quite as good as asbestos paints, at less cost.

Elastic Roof Paint.

The following formula yields a paint which is water and weather proof, suitable for wood or metal, and very lasting.

Gum Shellac	½ lb.
Soft Water	1 gallon
Common Soda	1 oz.

Place on fire, keep hot but do not boil. When all is dissolved (say in 1 to 2 hours), remove, and put in cans.

For preparing a good oil paint, add 1 gallon of above to 1 gallon paint. It will neither thicken nor thin the paint, nor decrease covering power.

For old metal or other roofs, which leak at seams, etc., add solution till it begins to body up the paint; neither ice, snow, nor standing water affects it.

BLACK AMERICAN ROOF PAINT.

Take 1 gallon coal tar, and add as much lime water as possible, and allow to stand If it is desired to increase the lustre, add a little good asphaltum varnish. If required brown, add strong Venetian red.

BLACK ELASTIC ROOF PAINT.

Heat in a kettle 100 gallons of refined gas tar till it begins to fume (just before it begins to boil), then add 25 lbs. of crushed sal soda; this should be added slowly, and kettle stirred well, so that it does not foam over. When it is in, add as follows:—25 gallons of stale oil; work well in and then add 15 gallons of lime whitewash; this last must be very thoroughly stirred, and worked in so that it does not rise to the top when kettle is allowed to stand a few minutes. When the water is well in there can be added 100 to 115 gallons of thin asphaltum varnish.

This must be added slowly and with constant stirring, the stirring to be kept up for half an hour to an hour after all the asphaltum is in. Thorough mixing the goods is very important and cannot be overdone.

This formula admits of very many variations, but all based on the same general ingredients, for example:—

100 lbs. of rosin; melt, and add 100 lbs. of tar pitch; melt together and add 10 gallons of stale oil, and when well worked in add thin asphaltum varnish till reduced to the body desired. Water may, or may not, be added, as desired.

A grade may be made without tar and substituting gum rubber, and using tar pitch instead of tar, as set forth in the last formulæ. To the asphaltum varnish is added 1 gallon of rubber solution, stirring it well in; then add the varnish to the mass in kettle. In all such cases draw the fire when it is time to add the asphaltum varnish, there is then heat enough to carry the process to a finish.

When these goods are ready to remove from the kettles have them pumped out to settling tanks. In these tanks the pipe from the mixing kettle goes to within say 6 inches of the bottom of the tanks, so that in this way, when you pump up a new batch, it goes to the bottom, and, as it is hot, slowly rises to the top, mixing well with all that is in the tank.

The paint dries with a glossy finish, will not crack, blister, nor chip off.

Quick-Drying Ironwork Paints.

QUICK DRYING RED COMPO.

For deck holds and bunkers, iron sheds, and any ironwork, etc.

Put into a mixer and mix, and, when thoroughly mixed, grind.

		cwt.	qrs.	lbs.
Indian Red, Dry		5	0	0
Grey Seal Zinc		1	0	0
Chalk, Dry		1	0	0
No. 2 Barytes, Dry		1	0	0
Linseed Oil	10 gallons	0	0	90

Varnish thinnings should be used to thin down the above when ground; when thin enough put into casks or drums and bung tight.

QUICK DRYING ZINC COMPO. FOR SAME PURPOSES AS RED. 1322

Put into a mixer, and mix together, and, when mixed, grind.

		cwt.	qrs.	lbs
Dry Zinc White		4	0	0
Chalk		1	1	0
Lime Blue		0	0	1
Linseed Oil	8 gallons	0	0	72

Thin down with varnish thinnings.

ZINC AND TALLOW COMPO. 1321

Take 4 cwt. quick drying zinc compo. that has been ground and thinned down as stated above, and add 1 cwt. of tallow that has been boiled, and stir well, and put into casks or drums. This is ready for use, and does not require further boiling before being applied to ships' bottoms.

ANTI-CORROSIVE COMPOSITION FOR SHIPS' BOTTOMS (ONE COATING). 1320

Put into a mixer and mix the following, then grind :—

		cwt.	qrs.	lbs.
Grey Seal Zinc		4	0	0
Ground Chalk		1	0	0
Ferric Oxide		0	1	0
Oak Varnish	3 gallons			
Raw Oil	3 gallons			

And thin down with varnish thinnings.

ANTI-FOULING COMPOSITION.

	cwt.	qrs.	lbs.
Chalk	1	0	0
Indian Red	4	0	0
Arsenic	0	1	0
Red Oxide of Mercury	0	0	25
Oak Varnish	6 gallons		
Raw Oil	6 gallons		

And thin down with 4 cwt. varnish thinnings.

Anti-fouling compos. being varnish derivatives will be fully treated in the volume devoted to these products (Vol. II.).

Luminous Paint.

No. 1.

Best White Lead	28 lbs.
Best Church Oak Varnish	$\frac{1}{4}$ gallon
Pale Gold Size	$1\frac{1}{2}$ pints
Best Raw Linseed Oil	$\frac{1}{2}$ pint

Process.—Put in mixer and mix well together until the whole is of a creamy consistency, then, to every 28 lbs. of the white paint as above, add 1 to $1\frac{1}{4}$ lbs. calcium sulphide, according to brilliancy desired.

No. 2.

	cwt.	qrs.	lbs.
White Lead	1	0	14
Zinc White	0	1	0
Refined Linseed Oil	0	0	$10\frac{1}{2}$
Gold Size	0	0	7
Turps.	0	0	$3\frac{1}{2}$
Driers	0	1	0

To every 28 lbs. of above, add 1 to $1\frac{1}{4}$ lbs. calcium sulphide as per above.

NOTE.—Any kind of best white paint can be used as a base.

Metallic Aluminium Paints.

1316

Aluminium, when reduced to fine powder, and mixed with a solution of gum lac in water, gives a metallic paint which covers well, and may be tinted with aniline colours dissolved in water. The solution of lac is made by bringing to boiling point and continuing till lac dissolves 1 gallon of water, 8 ozs. of soda and borax, and 2 lbs. of lac. If this solution comes too thick, more water and borax (1 oz. to 1 pint) must be added to thin it. To this solution aluminium finely-powdered must be added in sufficient quantity to produce a paint sufficiently fluid to apply with a brush. Colour with aniline as desired (1 oz. to 1 gallon), well stirred.

This colour is brilliant and durable, and is suitable for wood, metals, paper, and cloths. If required to spread easily add 1 oz. glycerine to every gallon.

CHAPTER XXX.

SUNDRY COMPOSITIONS AND PREPARATIONS FOR SPECIAL PURPOSES.

A large number of special preparations are in every-day use among painters, engineers, and others, who use or handle paint, which, though not in themselves strictly describable as paints, are so inseparably connected with the latter that some notice must be bestowed upon them in a volume like the present.

The chief of these are damp-proofing preparations, wood fillers, and paint removers. These will now be described in order, and a section on cements has been added also.

Damp Proof Preparations. 121.5

Damp Proof Composition (Colourless).

	cwt.	qrs.	lbs.
Lime, Slaked	0	2	0
Sugar	0	0	14
Alum	0	0	3
Boiled Oil ... 2 gallons			
Oil of Eucalyptus .. ½ gallon, 1 pint			
Water, Warm ... 9 gallons			

Dissolve the lot together, and add more water as required to whatever consistency desired.

White. 12.16

Use zinc oxide, about 3 lbs. to 1 gallon of above.

STONE. 1313

Use zinc oxide, 3 lbs. ; Oxford ochre, ¼ lb.

BUFF. 1312

Use zinc oxide, 1 lb. to gallon, and Oxford ochre, 1½ lbs.

DRAB. 1311

Use zinc 2 lbs., Oxford ochre 1 lb., and raw Turkey umber ¼ lb.

GREEN. 1310

Use lime blue, 1 lb., and Oxford ochre, ½ lb. to 1 gallon of liquid.

BLUE. 1309

Use 1 lb. of lime ultramarine blue to 1 gallon of liquid.

DAMP PROOF COMPOSITION (ANOTHER METHOD). 1308

Shellac	28	lbs.
Water	14	gallons
Borax	7	lbs.

Heat the water and put in the shellac ; when soft, add the borax and 1 gallon of boiled oil.

FOR RED.—Red oxide, ½ lb. to 1 gallon of above liquid.

FOR GREEN.—Use 2½ lbs. of middle Brunswick green to every gallon of liquid.

FOR BLUE.—Use lime ultramarine blue, 1 lb. to gallon.

PETRIFYING LIQUID. 1307

Powdered Pumice Stone	4	cwt.
Glue	16	lbs.
Pine Oil	3	gallons
Boiled Oil	10	gallons
Varnish Bottoms	3	gallons

Melt the glue ; mix the pumice-stone into a stiff paste with cold water, about 11 gallons will do. As soon as the glue is melted have the oils ready. Pour the glue in and put the oils in at once, let it mix ; when the oil is gone into the stuff, grind it through a mill ; add 70 gallons of water to it in a large tub. Sti well and let it settle for a day; then the liquid is ready. After all the liquid is taken off, the same pumice-stone that has settled is used (for about a dozen times) with the same quantities of glue and oils, and carried off.

It stops dampness in walls, basements, etc., and is a good groundwork for distempers to be applied on, as it stops the porosity of the bricks, etc.

WATER GLASS.

Nine cwt. 50% carbonate of soda (soda ash); 11 cwt. of clean, fine sand, or, if it can be conveniently procured from the chalk pits, 11 cwt. of clean flint; the addition of 1 cwt. to the ton of wood charcoal is an improvement, and makes the fusing go on much quicker.

Mix the above materials together and throw them on the bed of a reverberatory furnace—6 feet by 10 feet—and fuse four or five hours. When properly fused, draw out into iron pots or barrows to cool. When cold, break the glass up, and put it into a tank with a perforated diaphragm or false bottom situated at least a foot from the bottom of the tank.

Run water (boiling hot) on the glass, and when all is dissolved and settled draw off into evaporating pans and concentrate it down to 1·450 sp. gr., when, on cooling, it becomes viscous. If carbonate of potash instead of soda is used, take equal parts of the two ingredients, potash and sand.

FOR COATING ROUGH STONE WALLS.

Mix one part of water glass with 3 parts of rain-water. The solution of water glass is decomposed by the lime in the wall. The calcium carbonate is converted into silicate by this decomposition, whereby the surface acquires a glossy appearance of a darker hue, becomes solid and hard, and resists the action of the weather. By painting white-washed walls with water glass the coat becomes very durable, does not rub off, and can be washed. If the white colour is to be preserved, some fat lime may be added to the glass. Zinc white, with an addition of $\frac{1}{4}$ to $\frac{1}{2}$ of white barytes and ground in water glass, gives a beautiful white colour. Water glass, either by itself or mixed with paints, is especially well adapted for painting articles of iron, zinc, brass, etc., exposed to the action of the air and of the moisture; it also prevents rust. A coat of a mixture of elutriated manganese and water glass applied to iron will stand a red heat; not only so, but the coat will become more beautiful. This is a useful paint for stove pipes. Wood, painted with water glass, is protected against the action of fire, the atmosphere, and moisture, and is also rendered very durable. The water glass must be applied cold, not too concentrated, nor too thick. A proper solution is obtained by diluting one part of water glass with five parts of rain water. Apply several coats of this to the wood, allowing each coat to dry thoroughly before laying on the next.

WATER GLASS CEMENTS. 1818

By combining water glass with cement or quicklime a double silicate, hard as stone and resisting chemical agents, is formed in a short time.

TRANSPARENT DAMP-PROOF LIQUID. 1306
No. 1.

Calcium Chloride	30	lbs.
Water	10	gallons

Dissolve, settle, and strain. Should be o sp. gr. 20 B. This is used in conjunction with No. 2.

TRANSPARENT DAMP PROOF LIQUID.
No. 2. 1303

Concentrated Silicate of Soda	5	gallons
Hot Water	5	gallons

Mix well together and strain. When cold, the sp. gr. should be 20° Beaumé; if heavier, add water; if lighter, add a little more silicate. Pack in carboys or jars.

For use after an application of No. 1 on damp inside walls where water exudes or efflorescence takes place, or on new plaster which is required to dry quickly for painting, papering, or distempering.

Directions.—If an old wall, clean off all paper, paste, size, distemper, etc., with hot water, so as to have a clean surface. Apply a coat of No. 1, follow immediately with a coat of No. 2;

if not dry in a few hours give another coat of No. 2, which will result in a dry surface, which can be worked on as desired. If the wall is new and clean no washing is necessary, but apply the solution as directed.

The preceding liquids are intended principally for inside work on plaster walls or ceilings, and may be used for stucco or brick interiors, as in warehouses, etc., for the purpose of preventing damp coming through, and may be afterwards whitewashed or coloured, or left plain. They may be used to prepare patches on outside walls for painting, but it must be borne in mind that No. 1 is of no use unless followed by the application of No. 2.

LIME KILLER. 1302

	cwt.	qrs.	lbs.
Sulphate of Zinc	0	1	0
Terra Alba	0	0	$1\frac{1}{2}$
Hot Water .... 5 gallons			

Process.—Dissolve the sulphate of zinc in the water and add the terra alba, and strain through a coarse sieve.

For use, dilute with hot or cold water, and brush over the spots of new lime two or three times until they dry. Used for new patches in walls or ceilings where lime putty has been used. Can be painted, papered, or distempered over, and will keep dry.

FIREPROOF COMPO. 1301

Slake stone lime by putting it in a tub, cover to keep in the steam. When slaked, pass through a fine sieve, and to each 6 quarts of lime add 1 quart of rock salt in powder, and water 1 gallon. Boil, and skim clean. To each 5 gallons of this add slowly powdered alum 1 lb., powdered copperas $\frac{1}{2}$ lb., powdered potash $\frac{3}{4}$ lb., fine sandal wood ashes 4 lbs. As durable as slate. Prevents moss, and renders brick impervious to wet.

Fillers. 304 - L

LIQUID WOOD FILLER.

Grind together 4 lbs. of china clay, 4 lbs. of corn starch, and 4 pints of raw linseed oil; add 4 pints of turpentine, 4 pints of hard oil, and 1 pint of Japan. The hard oil is a description of varnish sold under that name by American manufacturers, and is generally supposed to be nothing more or less than a resin varnish ; in default of anything else a cheap oak varnish will do.

The following recipe is given as emanating from one of the best wood finishers in the Western States :—

Take gum shellac, 48 parts ; Venice turpentine, 19 parts ; and Balsam of Peru, 1 part. Melt them together at a gentle heat, and allow the mixture to solidify, when it may be powdered and dissolved in alcohol. It is necessary to heat the alcohol to about 97° F. in order to dissolve the balsam of Peru. After dissolving, it should stand a couple of days before using. It can also be made by adding the alcohol before it solidifies, but this way, it is claimed, is not so good.

LIQUID FILLER.

303-L

ANOTHER METHOD).

Soapstone	4	cwt.
Farina	5	cwt.
Linseed Oil	50	gallons
Turps.	51	gallons
Turpentine Varnish or Bright Resin Varnish	50	gallons
Gold Size (Pale)	19	gallons

LIQUID FILLER.

302-L

(ANOTHER METHOD).

Dextrine Solution	½	gallon
Silicate of Soda	¼	gallon

A dash of either glycerine or raw linseed oil.

Process.—Mix together. If used as a wall size, omit the raw linseed oil and glycerine and add a little more dextrine.

The following are based on varnishes :— 301-L

LIQUID FILLER (HOT PROCESS).

Rosin, melt	135	lbs.
Turps. (part Benzine)	199	gallons
Coach Japan	7½	gallons
Boiled Whiting	120	lbs.

LIQUID FILLER (COLD PROCESS).

Rosin	8	lbs.

Put it in—

Benzine	2	gallons

And let stand till dissolved, then add—

Raw Linseed Oil	1	gallon
Benzine	1	gallon
Neatsfoot Oil	¼	pint
Kerosene	1	gallon
Japan	1	quart

PASTE FILLER.

Silicate of Alumina	100	lbs.
French Chalk	35	lbs.
Raw Linseed Oil	2½	gallons
Grinding Japan	½	gallon
Terebene	3	gallons

Colour as desired.

PASTE FILLER.

Prepared China Clay	100	lbs.
Soapstone	35	lbs.
Raw Linseed Oil	2½	gallons
Grinding Japan	½	gallon
Good Thin Drier	3	gallons

For Colour—

Burnt Sienna	1½	lbs.
Burnt Umber	2¼	lbs.

IRON FILLER.

Fine whiting is mixed with equal parts boiled linseed oil and coach japan to the consistency of treacle. To 2 parts of above add 1 part of cold boiled flour paste of about similar consistency. Cover with water to keep in stock. Colour to suit requirements.

RIVET HEAD COMPO. 1300

This is used to rub over the heads of rivets to keep the damp from leaking in and corroding the rivet. The best is red lead and whiting, equal parts, ground in boiled oil and gold size, equal parts of each. Cheaper qualities are made by using whiting and Venetian red, and grinding in turpentine and gold size, or turps. and cheap varnish. It should dry hard and quickly, with a flat surface.

Paint Remover. 1400

Caustic Soda	1	cwt.
Water	12	gallons

Dissolve the caustic soda in the water. Then take 24 lbs. whiting and 10 lbs. of starch, and add 3 gallons of the caustic solution to it and put in a tablespoonful of essence of citronella. It will form a stiff paste, which should be applied with an old brush. Leave it on the paint or varnish for about half an hour ; then wash off with water, when all the paint, etc., will come off clean.

PAINT REMOVER. 1401

Caustic Soda 98%	7	lbs.
Water	15	lbs.

Mix and allow to cool.

Starch	1	lb.
China Clay	1	lb.
Water	15	lbs.

Mix the latter and add to the caustic, when a thick smooth paste is formed. Apply freely to the paint or varnish surface and allow to remain on some time ; then wash off with warm water. Paint, varnish, wall-paper, can be removed in this way.

For *Cleaning* the surface of paints, etc., use a weak solution of the Remover.

1402

PAINT REMOVER.

Water	1½	gallons
Ground Black Rosin	16	lbs.
Commercial Caustic Soda	4	lbs.

Sufficient water to make up to strength required.

Sufficient crude carbolic acid (30%).

Process.—Dissolve soda in the water, add resin, boiling until dissolved; then pour in more water to make the quantity up to 6 gallons. When this boils, add about 2 gallons of the crude acid, and stir well.

It simplifies matters to make this mixing in a copper or pan of 8 gallons capacity. As a paint remover, this acts as a charm—the chemical action is to saponify the oil in the paint, and this is easily rubbed off. In the above form, without dilution, it will make strong stuff, and may be diluted with water at will to produce weak stuff. Painters know these terms well, and it is far superior to sugar soap, which some of them now use. In the diluted form, it neither burns the wood nor the painter's hands, nor yet injures the brushes or cans; in fact, it is an exceedingly useful article.

Sailors use this for washing and whitening ship and yacht decks.

1603

PAINT REMOVER.

Fusel Oil	7	parts
Turps.	1	part

This also removes varnish and all gummy materials.

Cements.

STEAM BOILER CEMENTS. PF-1800

No. 1.

Mix two parts of finely-powdered litharge with 1 part of fine sand, and 1 part of air-slaked lime. This may be kept a great time without deterioration. To use it, mix a portion to a paste with boiled linseed oil, and use quickly.

No. 2.

Dried and powdered clay 6 lbs., iron filings 1 lb., made into a paste with boiled linseed oil. Use for stopping leaks in boilers, stoves, etc., etc.

No. 3.

Good oil varnish, ground with equal weights of white lead, pipe clay, and black oxide of manganese.

No. 4. 1803

Powdered clay 1 part, clean fine iron filings 2 parts. Acetic acid enough to make a paste.

No. 5. 1804

Dry powdered clay 8 parts to 10 parts, iron filings free from rust 4 parts, peroxide of manganese 2 parts, sea salt 1 part, powdered borax 1 part; water enough to make paste.

No. 6. 805

Make a stiff paste of two parts sal ammoniac, and 35 parts of fine iron filings or borings, 1 part sulphur, and mix with water. Drive this into the seams with a chisel or other instrument.

No. 7. 1806

Two parts sal ammoniac, 1 part of sulphur, and 60 parts of iron filings; mix with water and add $\frac{1}{6}$ part of vinegar, or, in its stead, a little sulphuric acid.

No. 8. 1807

100 parts iron filings, and 1 part sal ammoniac moistened with urine, force into the cracks or seams. It will stand the action of fire.

No. 9. 1808

Sulphate of barytes 1 part, clay 2 parts, made up with solutions of silicate of potash and borax. Said to resist a very high temperature.

No. 10. 1809

Iron filings free from rust 50 parts, powdered sulphur 2 parts, pulverised chloride of ammonia 1 part. These are mixed with water or urine to make a homogeneous paste, which is used in joints of steam pipes and boilers. The lute swells, becomes very solid, and perfectly closes the openings.

No. 11. 810

Iron filings 4 parts, loam 2 parts, powdered sandstone 1 part, made to a paste with salt water. Becomes very hard after setting.

No. 12. 811

Thick paste made with silicate of soda and iron filings, or for the latter may be substituted equal parts of oxide of zinc and peroxide of manganese.

No. 13.

Sand	84	parts
Portland Stone, Powdered	166	parts
Litharge	18	parts
Pulverised Glass	$\frac{9}{10}$	part
Red Lead	45	parts
Sub Oxide of Lead	$\frac{9}{10}$	part

All to be rubbed up in linseed oil.

OIL CEMENT FOR STEAM PIPES.

Powdered barytes 8 parts, graphite 6 parts, slaked lime 3 parts, linseed oil 3 parts.

CEMENT FOR STEAM LEAK.

Fine iron borings or filings, powdered, 1 lb., sal ammoniac in powder, 2 ozs., powdered sulphur 1 oz., mix dry.

For use, mix 1 part of the above with 20 parts of iron filings or borings; mix with water till the consistency of mortar, and use immediately.

STOPPING FOR ROOFS, ETC. 1315

The best and cheapest of cements for roof work, stopping leaks, etc., in tin or iron roofs, is made by boiling up paint skins—as called paint refuse—bucket scrapings, etc., etc., in a kettle with raw linseed oil. Should be boiled till all skins are dissolved and the mass is *perfectly* smooth and homogeneous.

IRON PUTTY FOR STEAM JOINTS. 1316

Two parts of good metallic paint, and 1 part of fine litharge 3 parts fine iron borings, and mix to a putty with linseed oil. Make the putty as stiff as well can.

LIME PUTTY FOR WOOD. 1317

Slaked lime 5 parts, rye flour 10 parts, linseed oil varnish 5 parts; colour to suit.

NOTE.—Attention is directed to the IMFORTANT NCTICE facing page 1 of this volume.

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END OF VOL. I.

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