Paints and painting

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Paint plays an important part in modern life. From the eyelets of your shoes to the vast bulk of a bulldozer, from an egg-whisk to the soaring facade of a skyscraper, there are millions of surfaces finished with paints or varnishes. There is hardly a country under the sun that does not contribute some pigment, dye, chemical, oil or spirit used in paint-making—an industry which has achieved tremendous importance throughout the world.

As preservatives that protect wood, metal, and many other materials from deterioration, paints and varnishes effect tremendous savings far outweighing their cost. The damaging effects of rust and corrosion, the ravages of insects and fungi, the deterioration caused by scorching suns and wet weather, may be minimised by keeping the surfaces painted with good materials.

Paint beautifies while it protects and thus makes a tremendous contribution to the pleasure of living. We are all sensitive to colour and are influenced—to a far greater extent than most of us realise—by the eye-appeal of the articles we use and the surroundings among which we live.

The farmer should know and understand paints and painting, for the wise use of paints and varnishes can enhance the appearance of his buildings and equipment and prolong their useful life. As the services of experienced painters are seldom available in country districts, it is hoped that these notes will provide the answers to some of the problems confronting the amateur.

**THE COMPOSITION OF PAINT**

An understanding of the ingredients which are blended to produce a modern general-service paint will help the amateur painter to obtain good results.

Paint consists of pigments to give the required colours, to give opacity or “hiding” properties and to combine with the liquid portions to produce a durable protective finish.

The liquid constituents are designed to serve as a “vehicle” for the pigments and to carry the pigment particles in such a way that the mass is fluid until and during the process of application. After this, the liquids must be capable of hardening...
and acting as a binder to hold the pigment intact on the surface which has been painted. The liquid gives “life” to the paint and if correctly blended will give an elastic vehicle capable of withstanding the vagaries of the atmosphere for long periods.

**SOME COMMON PIGMENTS**

**White Lead** is the oldest of the white pigments and has been used since the days of the Phoenicians. It is obtained by submitting metallic lead to the corrosive action of acetic acid. It has good obliterator powers when used in paint and does not crack. On the other hand it is not a good “spreader” and has a tendency to oxidise the oil with which it is ground. This renders white lead paint liable to “chalking.” This is a disadvantage but has a saving grace, in that a “chalked” surface is more adaptable to repainting than one on which the paint has cracked.

**Zinc Oxide** is another white pigment that is softer and superior in colour to white lead. It is a combination of one atom of metallic zinc with one atom of oxygen. It is bulkier than white lead and requires more oil to grind it into paint. It is unaffected in colour by any gases present in the atmosphere, may be mixed with other pigments and is non-poisonous. It is liable to harden the paint film causing it to “crocodile,” crack and peel, therefore repainting may be difficult and costly owing to the need for burning off the old paint.

**Lithopone** is a white pigment of good colour and soft texture. It has good opacity and is slightly less bulky than zinc oxide. It is a mixture of zinc sulphide and blanc fixe chemically combined in special furnaces. Lithopone is mainly used for interior flat wall paints.

**Titanium Dioxide** is made from a black sand called ilmenite found in various parts of the world and subjected to a complicated process of chemical reactions, washing and heating to high temperatures. It is the whitest of pigments, soft in texture with excellent opacity or hiding power. It is very widely used in modern paints since one of its faults—a tendency to “chalking”—has been overcome.

There are other white pigments which have their purposes in paint mixture, but the four mentioned are the most important. Reference has been made to the various deficiencies or faults of these pigments, and research by paint chemists has consequently determined the correct combination of these pigments to produce the ideal paint—a paint that will be durable, retain a gloss, will not crack or peel necessitating costly repainting, but will slowly weather by controlled chalking to a smooth film that is ready for repainting after four or five years.

**Colour Pigments:** A large number of colour pigments are employed in the production of the many shades in which modern paints are made. These pigments may be roughly classified into two groups—natural and artificial. The former includes all mineral and earth pigments such as ochres, siennas, oxides, umbers and many pigments which are not extensively used. Under the heading of artificial pigments are included chemical colours such as lead chromates, Prussian blues, lake colours, etc.
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Linseed Oil: This is a vegetable oil which has been found and proved by ages of actual use to possess more of the elements essential to making good oil paint than any other oil which has been tried. The oil is extracted from matured seed of the flax or linseed plant.

Fig. 4.—Peeling

Turpentine is a thinner, commonly known as Spirits of Turpentine. It is produced in various parts of the world, but a large proportion of the turpentine sold is taken from the sap of the long-leaf pine which is common in various parts of the southern states of the United States of America. Incisions are made in the trees and the sap which exudes is collected and put through a process of distillation which causes the thin fluid or turpentine to separate from the mass. A large proportion of the remaining part of the sap, after the turpentine has been distilled off, is vegetable acid in solid form which we know as resin. Turpentine is a splendid solvent, is almost completely volatile, has wonderful penetration and imparts free working of the paint or enamel under the brush.

During the last decade, petroleum refiners have advanced their techniques to such a degree that high-quality mineral turpentine is quite the equal of the original vegetable turpentine and is now widely used in paint manufacture.

Driers: For drying oil paints it has been found that the most satisfactory drier is made by cooking certain metallic drying salts, such as some forms of lead or manganese, in oil, until the oil has taken up the metallic salts. A drier is necessary in order that the paint may be dried sufficiently to withstand harmful influences within a comparatively short time. The drier, when added to paint, simply hastens the natural tendency of linseed oil to absorb oxygen from the air. When the oil takes up oxygen it becomes modified or transformed into a solid—and we say that the paint has dried.

CONCERNING VARNISH

Varnish consists of gum or resin melted in oil and then thinned with solvents so that the gum is held in solution. When applied to any surface, the solvent evaporates and a smooth, lustrous film is left. This film may be purely decorative or it may contain both protective and decorative features.

Varnish may be roughly divided into two types—those which contain more oil than resin and those which contain more resin than oil. They are known as long-oil and short-oil varnishes respectively.

The long-oil varnishes are designed for work where an elastic, tough, long-wearing film is necessary. The spar varnish used on ships and small boats is a typical long-oil varnish able to withstand outside exposure, rain, wind, sun, salt spray, etc. It must be able to keep its gloss, not show white spots even after being constantly submerged, and must not chip easily or peel. Such long-oil varnishes dry more slowly than the short-oil types.

In recent years the old-type varnishes have been very largely superseded by synthetic products which are available in matt to full gloss finishes, and give excellent results.

The four main constituents of the oil varnishes are the oils themselves, resins, driers and thinners.

The oils impart flexibility, toughness, adhesion, durability and relative waterproofing qualities. The resins impart hardness, waterproofness and gloss. Hard resins accelerate drying. The driers have as their main function the acceleration of the drying time. The thinners have as a primary function, the reduction of viscosity or the increasing of fluidity so as to permit easy application of the varnish coating.

Linseed oil has been used in varnish manufacture since the fifteenth century and more linseed oil is used in varnish making than all other oils combined.
Tung or China wood oil ranks next to linseed oil in importance. It is quicker drying and faster bodying than linseed oil and has better resistance to water. Tung oil is used extensively in the quicker drying four-hour varnishes. Fish oils are used as drying oils and dehydrated castor oil is also a good partial substitute for tung oil and is being used in increasing quantities. The use of soya bean oil is also likely to increase in the paint industry as further research work is undertaken.

Resins are divided into two main groups—natural and synthetic. The natural resins of most importance in the varnish industry were dammar, kauri copal, congo copal, east india gum and shellac. Since the introduction of ester gum, the first synthetic resin of practical importance, in 1900 great strides have been made in varnishing making. With the use of synthetic resins a great advance was made as varnishes were improved in outside durability, toughness, gloss retention, colourless properties and water resistance.

Driers consist of certain metals such as lead, cobalt and manganese chemically combined in a compound that is oil-soluble and thus they are able to exercise their peculiar function of converting liquid drying oils to solid oxidised films which are tough, water-resisting and durable. This is achieved by accelerating the rate at which the oil absorbs oxygen from the atmosphere. Modern driers are so efficient in this respect that a very small addition to linseed oil produces a dry film in a matter of hours instead of days. Terebene is an example of this type of drier.

MIXING PAINTS

We have given a brief description of some of the ingredients of paints and varnishes. It is by no means a complete list, but it covers the substances in common use.

The preparation and blending of these substances in the proportions best designed to give smooth application, good covering qualities, beauty, durability and all the other attributes of a good paint, is a task for the experts.

In these days, even the large-scale users of paints seldom find it worth while to mix their own. They are content to leave it to the manufacturer who maintains staffs of skilled technicians and a factory operating on a high plane of mechanical efficiency with special machinery for grinding and blending.

The farmer therefore who wishes to carry out a painting job will be well advised to purchase ready-mixed paints bearing the brand of a reputable firm—and to use the paint according to the instructions issued by the manufacturer.

We live in an era of keen commercial competition and the manufacturer is jealous of the reputation of his products. He can be depended upon to use the best materials available and his recommendations for the use of the paint are designed to produce the most satisfactory results. A satisfied user is a potential customer for the future.

PAINT FAULTS

Before discussing the best methods of applying paint, let us take a glance at some common paint faults. An understanding of their causes may assist in avoiding such failures in the future.

Excessive “Chalking.”—Obviously a paint cannot last forever. It must deteriorate in course of time, and gradual “chalking” is actually desirable and much to be preferred to flaking, cracking or peeling as the surface is left in a good condition for repainting.

Chalking is just what the name suggests—the surface of the film becomes chalky or powdery so that it rubs off leaving a matt surface. Briefly, chalking is caused by the oxidisation of the oil and if it occurs
gradually over a period of say four to five years it is an indication of a good quality paint.

Excessive chalking shortens the life of the paint film and leaves the material unprotected. It is caused very largely by faulty application.

One-coat painting is liable to chalk quickly as the paint film is thin and the weathered surface robs the paint of its binder. Too much oil added to the finishing coat promotes rapid chalking too, as the pigment particles are spread too far apart, permitting the sun to penetrate and break down the film.

Cracking and Scaling.—Cracking starts with fine, scarcely visible, breaks in the paint film. The cracks widen and the paint flakes off. There are several causes.

(a) The paint becomes brittle as it ages. As the wood or metal beneath it expands and contracts, the paint film cracks through lack of elasticity.

(b) The previous coats have become lifeless, with poor adhesion, so that the strong new coat pulls them loose on drying.

(c) Excessive quantities of zinc oxide will cause the paint film to harden and crack or "crocodile."

FIG. 6.—Wrinkling

Complete removal of the old paint by blowlamp, scraper or sandpaper is the only certain preventive of this trouble.

"Crocodiling" or "Alligatoring."—This is an extreme form of the cracking described above. The surface coat cracks into a bold pattern resembling that of a crocodile-skin.

This fault is most marked when a hard, quick-drying paint is applied over a slow-drying or insufficiently-dried undercoat.

The use of an inferior undercoat made with slow-drying oils will cause crocodiling. Allow ample time for even a good undercoat to dry before applying another layer of paint.

Blistering.—Moisture behind the paint film causes blistering. Wet weather painting, the painting of green wood, and moisture seeping on to the wood from rain percolation or faulty plumbing are frequent causes of this trouble, which usually occurs when the paint film is new and very elastic. Windows and doors exposed to the weather are often insufficiently sealed by painting. Failure to paint the tops of doors and windows allows moisture to soak into the end grain of the wood. Shrunken putty in a window sash allows water to get into the wood, and leaky gutters and downpipes are other common sources of moisture in woodwork.

Running and Sagging.—This may be caused by using a paint with too much oil and applying it too thickly. Drying takes place too slowly and the paint sags. A sudden drop in temperature will delay drying and give the same effect.

Wrinkling.—A less extreme form of sagging, in which the paint forms a number of small surface wrinkles. Failure to brush out the paint to a thin even coat, the use of boiled linseed oil in house paint, too heavy a coat, and fog or frost on a newly-applied paint film are all common causes of wrinkling.

Loss of Gloss.—Premature or uneven loss of gloss is commonly caused by adding oil to the finishing coat of a ready-mixed paint. This practice slows down the drying and allows the paint to accumulate dust and dirt. It also lowers pigment concentration and causes early chalking because of penetration by the sun.

PREPARING THE SURFACE

For satisfactory painting, the surface to be covered must be dry, and free from grease, dust, smoke deposits, loose scaly paint from previous treatments, or any other material likely to interfere with the application, and subsequent retention by the surface, of a smooth even paint film.
The use of a wire brush and scraper will assist in removing loose material; sandpaper may often be used to advantage, and a rub-down with a cloth dipped in turpentine or petrol may be necessary to remove grease.

Where a thick coat of cracked and hardened paint mars the surface, use a blowlamp and shave hook then rub down the surface with sandpaper.

Badly smoke-stained surfaces are often encountered in rooms where wood-burning stoves or badly constructed open fire-places are used. Before re-painting, such surfaces should be washed down with lime-water made by dissolving 6 oz. hydrated lime in a gallon of water.

Apply lavishly and allow to dry, then dust down thoroughly before painting. In the case of very persistent smoke-stains, the lime-water treatment may need to be repeated two or three times before the paint is applied.

**PREPARING THE PAINT**

When a tin of ready-mixed paint is opened, it will usually be found that the oil and other liquid constituents are on top with the heavier pigments deposited in lower portion of the container.

It is a good idea to pour off the liquid into a clean container, then mix the thick pigments thoroughly with a flat paddle until they form a smooth paste. Gradually add the liquid, stirring all the time, and finish by pouring the mixed paint from one clean container to another back and forth several times to complete the process.

Where the paint is to be thinned down by adding extra oil, turpentine or driers (according to the manufacturer’s instructions) these are best stirred into the liquid before it is added to the thick pigment.

**PRIMERS AND UNDERCOATS**

Although many amateurs are content to use thinned-down ordinary paint for the primer or first coat, it is advisable to use the recommended primers and undercoats specially compounded by the manufacturers.

Various primers and undercoats are now available in ready-mixed form and it is no longer necessary to thin them down with oil or turpentine.
The primer is usually a full oil mixture which has marked penetrative powers, especially when used on bare wood.

**Puttying.**

After the primer has been applied, nailholes, cracks and joints should be filled in with linseed oil putty. Do not apply putty to the bare wood. It adheres much better to a primed surface.

The primer fills in the pores of the “hungry” dry material and forms a bond for the succeeding coats.

The undercoat provides “body” and dries with a semi-flat surface which makes an ideal base for the finishing coats.

**USE GOOD BRUSHES**

The price of a good paintbrush in these days will give the average man a severe “pain in the pocket,” but don’t let this tempt you into buying the cheaper grades.

Buy a good brush and—as it represents a sizeable investment—take care of it.

Never let the paint dry on the brush. If you merely have to suspend painting operations for a few hours and wish to avoid washing the brush out with turpentine or other cleaners, immerse the bristles in water.

The best method of achieving this is to drill a hole through the handle of the brush, large enough to take a piece of stout wire about six inches long. Hang the brush in a tin or jar so that the wire rests on the rim and holds the bristles clear of the bottom of the vessel. Pour in sufficient cold water to cover the bristles and your brush will remain in good condition until needed again.

When ready to re-commence painting remove the wire and a few sharp flicks will shake off most of the water. A few strokes of the brush on a piece of waste wood will remove the remainder—and the brush is ready for work again.

When painting is concluded, wash the brush thoroughly in turpentine, petrol, kerosene or similar substances and then in warm soapy water until all traces of paint are removed. Allow to dry, and then wrap the brush in paper to exclude dust, and store in a dry place.

Old neglected brushes may often be reclaimed by treating with one of the proprietary cleaners sold by paint stores, but the conscientious worker will never let his brushes reach this stage.

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**USE LONG SWEEPING STROKES**

In applying paint, hold the brush well up from the bristles in such a manner that the wrist and fingers can flex easily.

Do not dip the brush deeply into the paint—a third or less of the length of the bristles is sufficient. Surplus paint should then be removed by slapping the brush lightly against the inside of the container or drawing it in a wiping motion across the edge of the tin.

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*Fig. 9.—Hold the brush so that the wrist and fingers can flex easily.*

Apply the paint in long sweeping strokes and try to bring the brush lightly against the surface when commencing the strokes—increasing the pressure towards the centre and then lifting the brush gradually towards the end of the strokes.

Stir the paint at intervals as the pigments are liable to settle.

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