PAINT for EVERY PLACE and PURPOSE

By R. S. MADDOCK

PART I

This is the fifth article in the series of comprehensive building articles—which are really little building manuals in themselves—by authoritative authors, which have been added to COUNTRY LIFE *each month. In this series we have endeavored to make an exhaustive research into the subject under consideration and to give our readers the latest and most complete information of practical value about that subject. Thus the first article in our April issue took up the roof and discussed it from every possible angle. In the May issue we treated of stone walls and their construction, in June the various methods of heating the house, in July, windows, in August, mantels and fireplaces, and this month paint. Other articles to come will include "Stairs and Stairways," "Floors and Flooring," "Doors and Doorways," etc.*—THE EDITORS.

THIS article has to deal particularly with paints so constructed that they may be used to beautify and protect the structural materials that are used in the building of a residence, and it is our desire to present the subject in such a way that a better and more intimate understanding will be had, both of the making of paint and of its proper use.

The simplest form of oil paint consists of a single pigment mixed with linseed oil to the consistency of thick cream, this mixture being combined by hand with a stick. A small percentage of volatile thinner such as turpentine, is added until the paint is of good brushing consistency. Opposed to this simple mixture of paint are the scientific machine-made paints, the composition of which has been determined by painstaking study and research. It is a proven fact that a worthy machine-made paint will outlive the very best hand-mixed lead-and-oil paint by at least a year, and some even by a full two years. Not less than an average of four years will be the life of a job painted with the properly made machine paint, and more often the life will be extended to five or six years.

On the other hand, experience has determined the life of a job done with the best hand-made paints to be from two to three years at most. It has been found in the instances where hand-made lead-and-oil paints have been used that chalking (surface becoming powdery) takes place often in the second season, but we will assume that the chalking does not take place until the third season. Think of what this difference in length of life means in the cost of paint and re-painting over a period of twelve years.

You will find, after careful study, that the factor of labor cost as it relates to the durability of the paint is so important that you, as the owner, cannot afford to use any but the very best paints available. This is such an important factor that we will explain just what we mean by a fair and representative example of the painting of two identical houses, each with a surface of about 3,600 square feet, to be covered with two coats of paint. In other words, each house had 7,200 square feet of surface to be painted. These two houses were painted several years ago and in order to have them painted with present costs in mind, the figures now existing for labor and for paint are employed.

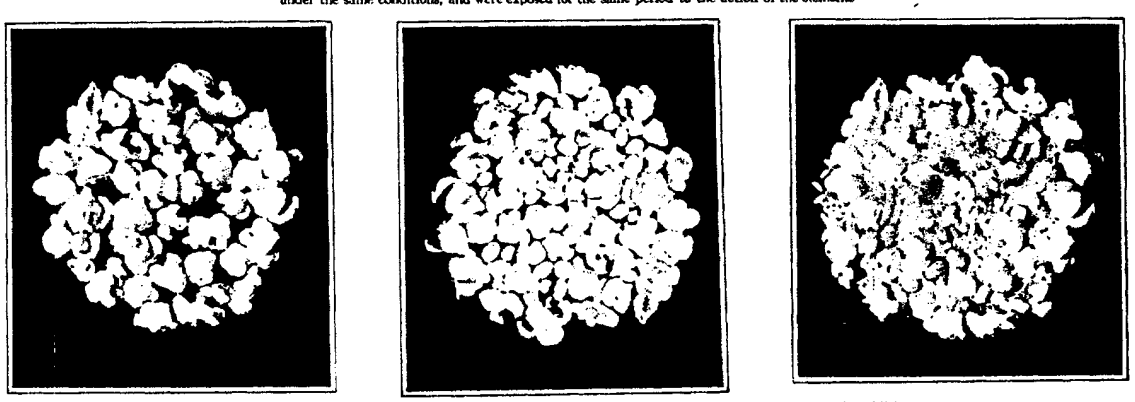
A paint skin of three layers of paint. It is like a sheet of rubber when dry, and from 1-1,000th and 1-500th of an inch thick. Thin as it is, this coating when properly made of the right materials, gives complete protection—but only when so made

	HOUSE PAINTED WITH MACHINE-MADE PAINT		HOUSE PAINTED WITH HAND-MADE PAINT	
12 gallons machine-made paint (two coats) at $3.75 per gal.	$ 45.00			
17 gallons lead-and-oil paint (two coats) at $3 per gal.				$ 51.00
Labor cost at $8 per day	(20 days)	160.00	(27 days)	216.00 (longer time required—same rate per day)
Total cost to owner for two coats of paint		$205.00		$267.00
Life of the job before repainting was necessary	4 years		3 years	
—which would mean an annual cost to the owner of		$ 51.25		$ 89.00

This would mean that over a period of twelve years, on the basis of the four-year cycle, the cost for the house painted with the machine-made paint would be $615. On the basis of the three-year cycle, the cost to the owner for the house painted with the hand-made paint would be $1,068—a difference of $453 lost to the owner on painting, within a period of twelve years, with the added disadvantage of piling paint upon paint too often.

It will be noted that twelve gallons of the machine-made paint covered the house with two coats of paint that lasted four years, and it was still in a receptive condition to assimilate more paint. On the other hand, it required seventeen gallons of hand-made lead-and-oil paint to cover a like house, and it was necessary to repaint within the third year

On the left a surface painted with machine-made paint; on the right one painted with lead and oil paint made by the stick-mixed method. Both paints were applied at the same time and under the same conditions, and were exposed for the same period to the action of the elements



Illustrating by means of popped corn in the first figure, popped corn and beans in the second, and the addition of rice to these two in the third, how the voids between particles in paint are filled up by the various ingredients

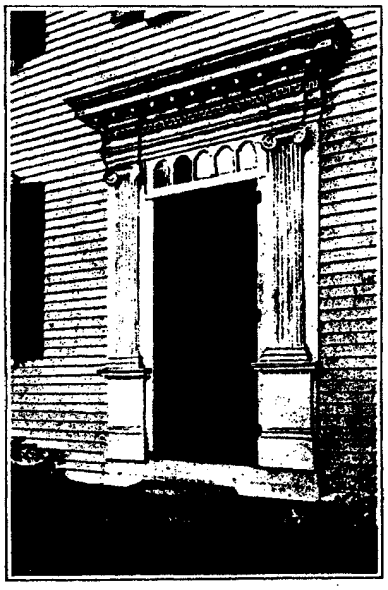
The old Joseph Stebbins house at Deerfield, Mass., is a monument to the preservative power of paint

order to apply the new paint on the old paint ile it was still in a receptive condition for re-inting. It required seven days longer to ply the hand-made mixture due to the fact that ire brushing was necessary to obtain an even face throughout.

The whole secret of this difference is in the int making. It makes no difference whether be Professional Painter or Mr. Average Paint er. A good paint cannot be made by hand it compares in value and service to the good int made with machinery. The reputable man-icturer realized years ago that in manufacturing ood paint it was and always would be necessary keep well in mind what is expected of paint, first essential being determined as its ability weather-proof the surface to which it is ap-ed. Paint must be so constructed that it will ver the surface completely and keep out mois-e. It must also have density or hiding power, iformity and even covering, spreading capacity, e of application, drying ability within a sonable time, and durability.

The paint maker, through painstaking effort, s determined that all materials necessary in composition of paint have weaknesses, and s come to the belief that a perfect paint is im-ssible. In fact, it is well established that if an lestructible binder or oil could be found, it uld matter little what sort of pigments were ed, so long as they gave the necessary hiding wer and the desired color effect.

It is safe to state that a layer of dried linseed (linoxyn) is probably more resistant to atmos-eric influences chemically (not mechanical ar) than any known paint, yet it is not water oof. It is claimed upon good authority that a llon of linseed oil spread upon 100 square feet surface will outwear a gallon of the best paint ade spread upon the same area of a similar rface—but it will be noted that it will require out three times as many coatings of the oil use up a gallon as it will of the paint to use it . Thus it is apparent that pigments must be refully selected; not only do they supply the cessary covering or hiding properties, and the sired color effect, but also they must thicken e paint and reinforce the paint film.



Detail of doorway of the Stebbins house. Although more than 150 years old, every piece of the architectural detail is preserved perfectly. Yet the stone used as a step has been gradually destroyed by the elements until it was necessary to place a small stone on top of the original

Linseed oil is the life of the paint. Oil in the paint is the binder that grips the wood and holds the selected pigments on. It follows, therefore, that when the binder is dissipated, the pigment powders or chalks off. For this reason great care must be given to the selection of the oil used. In the well-organized paint factory the chemist determines the value of each batch of oil received. It should be absolutely pure and of certain designated grade. In other words, a so-called pure linseed oil does not necessarily mean that it is a good linseed oil for use in the making of paint.

One manufacturer of a very high-grade paint says that a praiseworthy linseed oil "is of pale yellow color—brilliant, limpid, drying well, with a rich lustre, and having a pleasant nutty taste." A fair linseed oil "is a yellowish oil with a brown hue—clear, drying fairly, not very pleasant to the taste but somewhat bitter." An unsatisfactory linseed oil "is of a greenish or dark color—uncertain taste, cloudy, and drying poorly."

The linseed oil in a good paint should absorb a certain given amount of oxygen by weight. It is an established fact that it continues to take in oxygen over a period of three or four weeks after it is dry, and probably does so during the life of the paint.

At this point we want to emphasize the fact that the pigments and oils other than linseed oil which enter into the making of paint, either increase or decrease the life of the linseed oil. The scientific paintmakers' exact knowledge of pigments and oils has been the means of extending or increasing the life of the linseed oil in paint, and is the definite reason why a properly machine-made, well-balanced linseed oil paint will wear or live longer than a hand-made paint.

Other liquids should be used in the making of a good linseed oil paint, especially if the paint is made for use on wood surfaces. For instance, turpentine, or a good turpentine substitute, added in correct amounts, aids the paint in brushing out farther over the surface, making it possible to obtain an even thickness of film throughout. Turpentine also aids in carrying the linseed oil into the pores of the wood (in the case of new wood) and through previous coats of paint in its use on a previously painted surface.

We mentioned that a good turpentine substitute might be used, but we advise against the indiscriminate buying of turpentine substitutes, because it is vitally necessary to use only those that are safe. There are many on the market that are not at all safe to use.

Genuine turpentine can be easily found at all good paint stores and should be used whenever

thinner is required. Turpentine does not retard the natural drying of linseed oil. In fact, it rather has a tendency to quicken the drying of an oil paint film, but it does not quicken the drying of this film at the expense of the life of the linseed oil. We want to make a point of this characteristic, since we find that the addition of some of the so-called thinners or turpentine substitutes will retard the drying of the paint, and in some cases even prevent the paint from drying hard enough to give good service.

The manufacturer has found it advisable to add a carefully made drier to some oil paints in order that the film of paint will dry free of dust within a reasonable period. In other words, the manufacturer, in order to obtain some shades of linseed oil paint, finds it is necessary to use pigments which have a tendency to retard the normal drying period of linseed oil; and whenever pigments of this nature are used, the necessary amount of dryer is added to counteract the action of the pigment. As a rule no additional drier need be added by the user.

We said before that all materials used in paint have weaknesses. This statement especially applies to the pigment portion of the paints. Each and every pigment lacks or is below par in some one or more of the qualities of the ideal pigment, but it may possess one or more other desirable qualities in a marked degree. One of the most important basic white pigments used by the manufacturer in making a good white paint is white lead. The defect of white lead, however, is its alkaline nature, causing gradual and progressive attack upon the linseed oil and other materials of the paint coating. If the chemical activity of each particle be supported by close contact of the other lead particles, then there occurs an undesirable chemical action of the mass. The addition of a proper amount of reinforcing inert pigments is a great aid in separating the lead particles, and is of decided assistance in lessening the chemical activity.

It may further be said that no one pigment is complete in itself, and the manufacturer, with his exact knowledge of how to make the virtues of one offset the deficiencies of the other, can secure balance in the relation of pigments to the paint mixture. For instance, lead pigments are soft, but hide the surface well. The zinc pigments are hard but do not hide the surface well. By the addition of zinc and inert materials it is possible to obtain all the required characteristics necessary in a well-built pigment body.

Illustration of painted surface in complete disintegration. The surface was allowed to remain too long before repainting was done, and it was no longer in a receptive condition to assimilate more paint

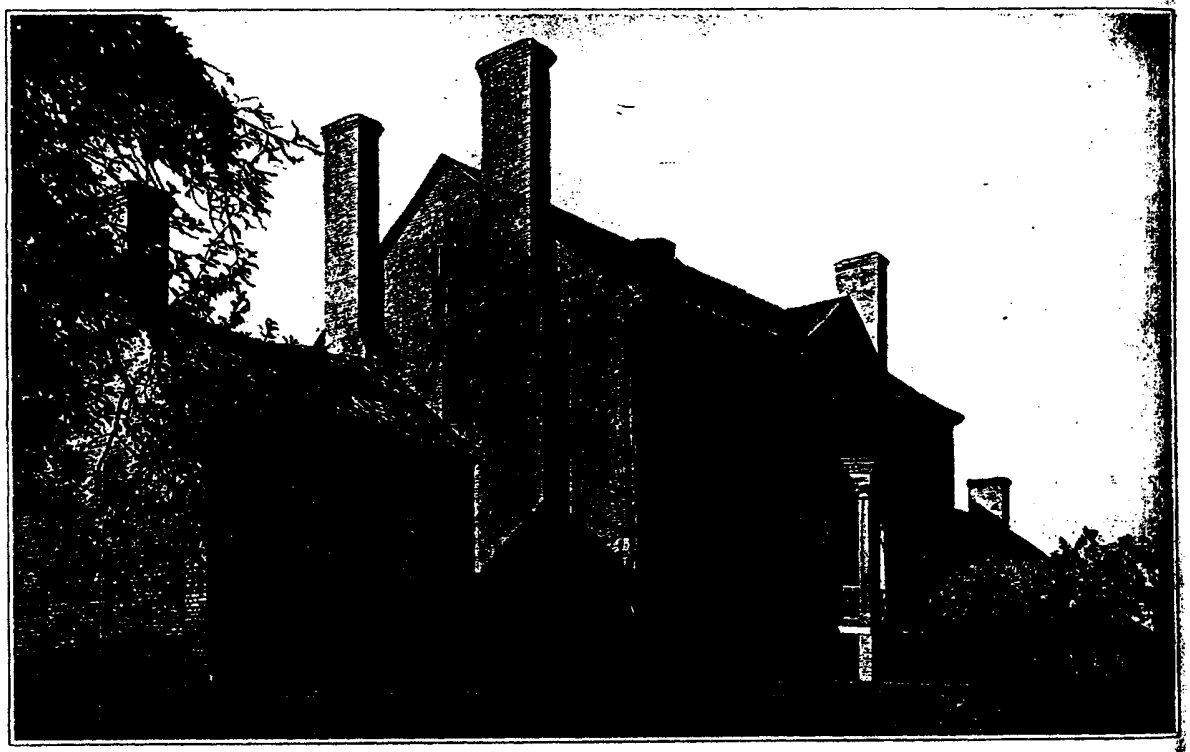
The most important basic pigments used by the manufacturer in making a good white paint are, in their order of importance, white lead, zinc oxide, sublimated white lead, and lithophone, this last named pigment being used chiefly, if not entirely, in paints made for interior use only.

The principal reinforcing pigments or inert pigments are barytes, silex, asbestine, and china clay.

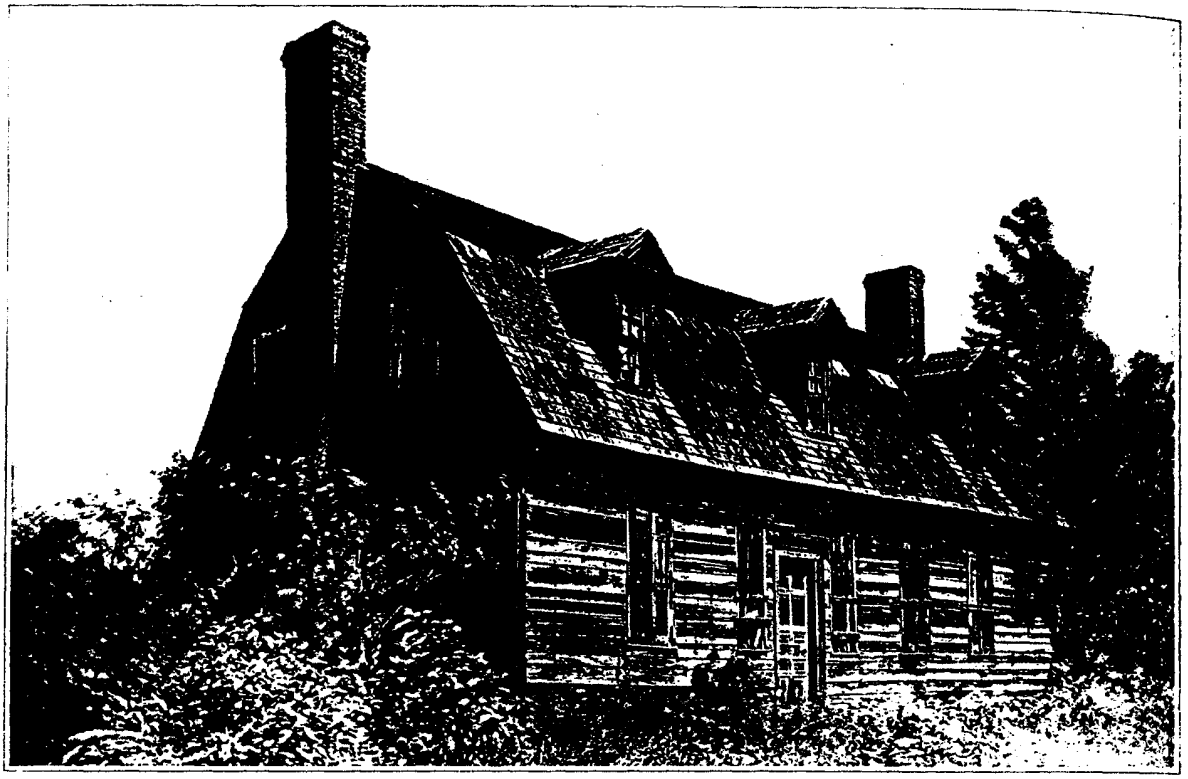
Most of our attention should be given to the white pigments because they not only dominate the white paint but at the same time are the controlling factors in the pigment combination of the tints and light colors of most desirable paints. The balancing of the pigment body in the making of the paint might be better understood by comparing it to the alloy of metals. It is well understood that pure gold is too soft a metal for commercial use. It must be reinforced or made hard by making an alloy of gold with copper. It is also well understood that the amount of copper added to pure gold determines its carat value.

All good paints are made on the alloy principle. It is true that the high-grade paints are made upon a lead base, but there should be added a direct proportion of zinc and other reinforcing pigments, all so united that the strength of one ingredient serves to offset the weakness of the others. The result is that the pigments in the well-balanced machine-made paints have little, if any, chemical action on the oil, but rather serve to protect and prolong its life, insuring gradual wear and leaving an excellent surface for repainting.

Some of the pigments used in the manufacture of a high-grade paint group themselves in particles that are quite large, as seen under a microscope. Other pigments group themselves in particles that are quite small, and these particle groups are not of the same shape or character physically. If it were possible to lay these pigments side by side and they could be examined



An old Southern Colonial mansion built about 1760 which proper painting would have preserved in as good condition as the Stebbins house at Deerfield, Mass.



An ancient Maryland farmhouse whose warped and decaying siding is eloquent of neglect to paint and to keep painting

through a powerful lens it would be seen that voids existed—in other words, that spaces were not closed in a thin layer of these pigments. White lead groups itself in particles that are not unlike in appearance to popped corn (see illustration). Oxide of zinc groups itself in particles that are not unlike in appearance to navy beans. A second illustration shows, placed together, the popped corn with navy beans used to close the voids. We find, however, upon close examination, that voids still exist. We will say that the inert pigments, such as barytes and silex, would gather themselves in pigment particles that would closely resemble in appearance grains of rice. The third illustration shows that by addition of rice to the popped corn and navy beans it has been possible to close all voids and to have a perfect covering of the surface upon which this combination of grains has been spread. It has also been possible to level up the thickness of the pigment layer.

The same principle is applied in the making of paints, and it explains why, from a strictly physical standpoint, different characters of pigments should be used in the making of good paint.

UNIFORMITY of product is obtained by the proper understanding of each ingredient used and the best manner of incorporating these into one mass, coupled with the thorough incorporation of the ingredients by powerful grinding and mixing machinery. In other words, the high-grade paint, as now being made by the reputable manufacturers is the culmination of carefully selected oils and pigments, combined with an exact knowledge of paint-making, together with care used at every step of the process.

Cracked and peeling paint. Conditions of this sort can be avoided by care in applying the priming coat

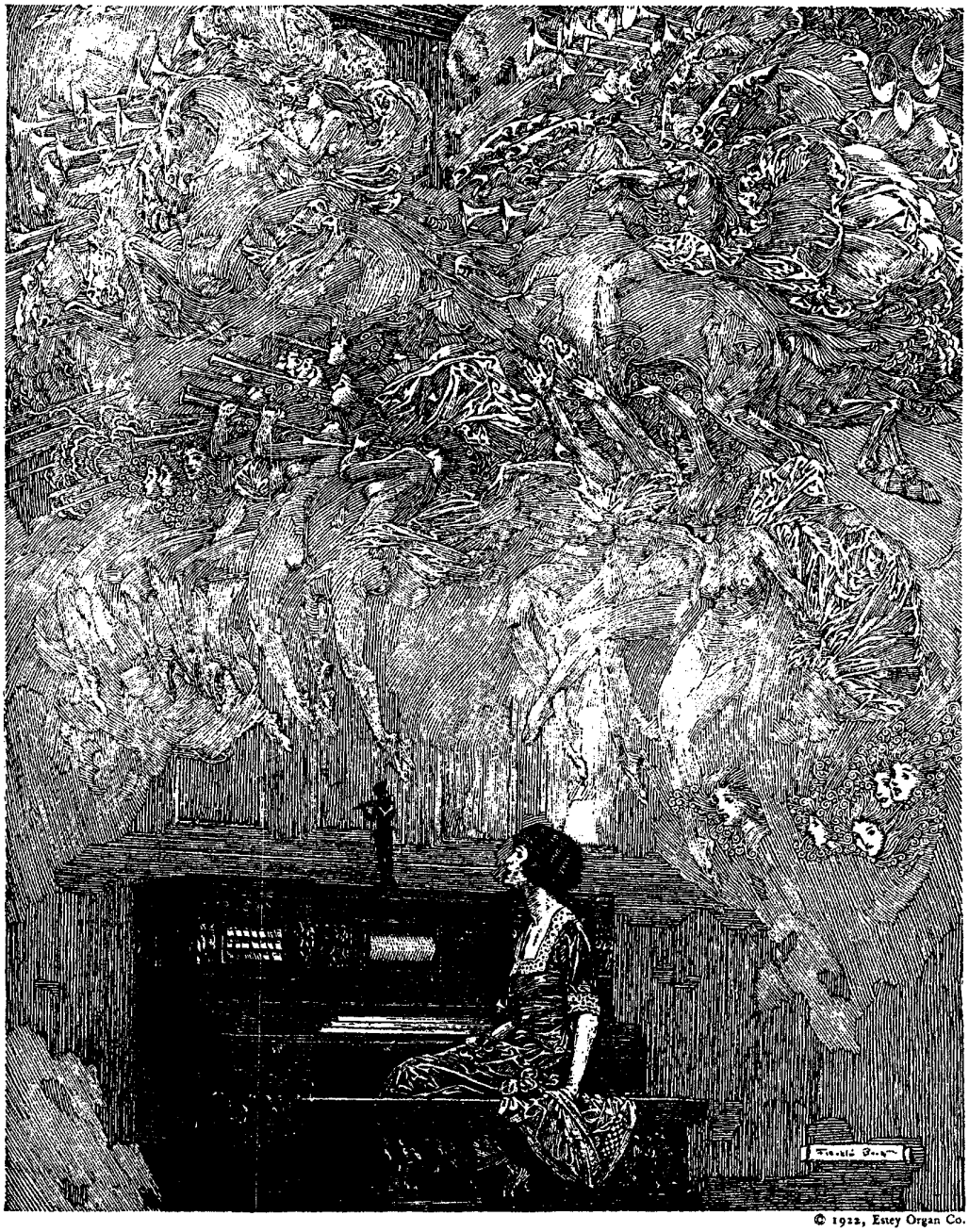
The paint manufacturer who is building paint with a conscience begins with the white lead ground in oil. This white lead is either received by the manufacturer already ground in oil or he proceeds to grind the lead in oil before it is mulled together with other pigments. He adds to the base lead the other pigments and the necessary oils which are required in the first mixing or mulling of these pigment particles together. When this mixture has been thoroughly mulled together, it is lowered to another mixer (usually on the floor below) and is here further mixed and ground through a series of grinding stones, until the pigment particles are thoroughly broken up into units as small as is practically possible. To illustrate this point, let us suppose that we have a given amount (in weight) of lead shot that is about the size of a small pea. A given weight of this shot, spread on a surface side by side, does not cover nearly so large an area as the same quantity (in weight) of shot of very much smaller size would cover.

This thorough grinding, in other words, is the reason why the machine-made paint will spread so much farther and at the same time hide the surface so much better than will the hand-made lead-and-oil mixture. A further advantage of this thorough grinding is that the finely divided pigment particles become thoroughly surrounded by oil.

It will be remembered that one of the most exacting requirements made of a good paint is its ability to seal completely the surface of the article to which it is applied. Fineness of grinding is one of the essentials necessary to accomplish this.

Mixing, double grinding, plus more mixing, plus an exact knowledge of proper pigments, oils, and thinners, equals a high quality paint—the quality of paint which assures service to the user. The reputable manufacturer for years made a special effort, through national advertising and direct sales literature, to prove that his particular product was a pure paint by virtue of the fact that its principal pigment content was carbonate white lead combined with a vehicle or oil of pure linseed. A little later he carefully admitted the necessity for adding a varying quantity of zinc oxide to harden the paint film, thus increasing the life of the paint. As time went on, chemists and physicists, through painstaking effort and research, proved that by the addition of inert pigments in very limited quantities (considered in relation to the total pigment content of lead and zinc) the life of the paint film or coating could be made to last much longer, to have a better appearance throughout the period of wear, and to leave the surface in a better condition to receive paint when repainting became necessary.

After all these years it surely must be hard for the average paint user to understand just why the conscientious paint manufacturer has so



THE ESTEY RESIDENCE PIPE ORGAN

WHILE the Estey has been and is being incorporated with distinguished success in homes already built, it offers great possibilities for new houses that are now being planned. Architects are designing music rooms with organ screen and console in harmony that make a dignified and appropriate setting for the Estey Organ. But a room devoted to music is not necessary. The living-room or hall can be used with equally good effect, both musically and architecturally. All our experience is at the service of any architect planning such a feature. The Estey Organ is so flexible that the pipes can be placed anywhere, at any distance from the console.

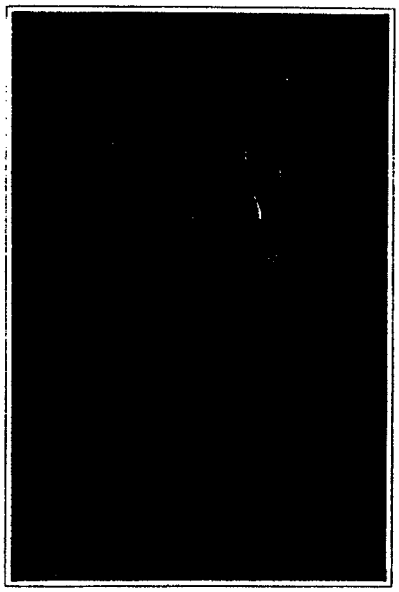
ESTEY ORGAN COMPANY, *Brattleboro, Vermont*

enlarged upon the virtues of the white lead pigment content in his paint, when its defects have given him his greatest problem. With the facts before us, however, it is not to be wondered at that the manufacturer has hesitated to confide in the consumer.

Paint manufacturers can be safely said to be in three groups: the first group is made up of the large national manufacturers and distributors of the best scientific, machine-made paint, and it can be safely stated that these concerns rather hesitated to undertake the enormous expense of teaching the public that to make the best paints groups of reinforcing pigments must be used, when it was understood that these very same materials, used in excess, were used for adulteration, and if used ignorantly, gave poor results. This lack of frankness is to be deplored.

The second group consists of the smaller manufacturers who make paint for local distribution. Their factories are small and they do not employ expensive chemists—in fact, it is rare to find in them a testing laboratory, and their methods must be largely rule-of-thumb. It must be stated, in all fairness, however, that the smaller manufacturers in many instances produce some of the best paint manufactured in this country, but this group also includes those who through ignorance or intent, overweight their vehicle and impair necessary pigment quality with an excess of inert pigments.

In the third group we find a class of manufacturers who are known in the trade as makers of "dope" paint. In a "dope" factory the subordinate pigments (inerts), because they are cheap, are used far in excess of the percentage required to offset the effects of the more opaque pigments; also far in excess of the percentage that will add strength and give new life to the film of oil. Without question they add this excessive adulterant that they may cut the market price of high-grade paints and impose upon the public, thus bringing discredit on the industry. In addition to having an excess of inert pigments (usually over 30 per cent.) you will find that the



An illustration of "flatting," caused by absorption by the wood

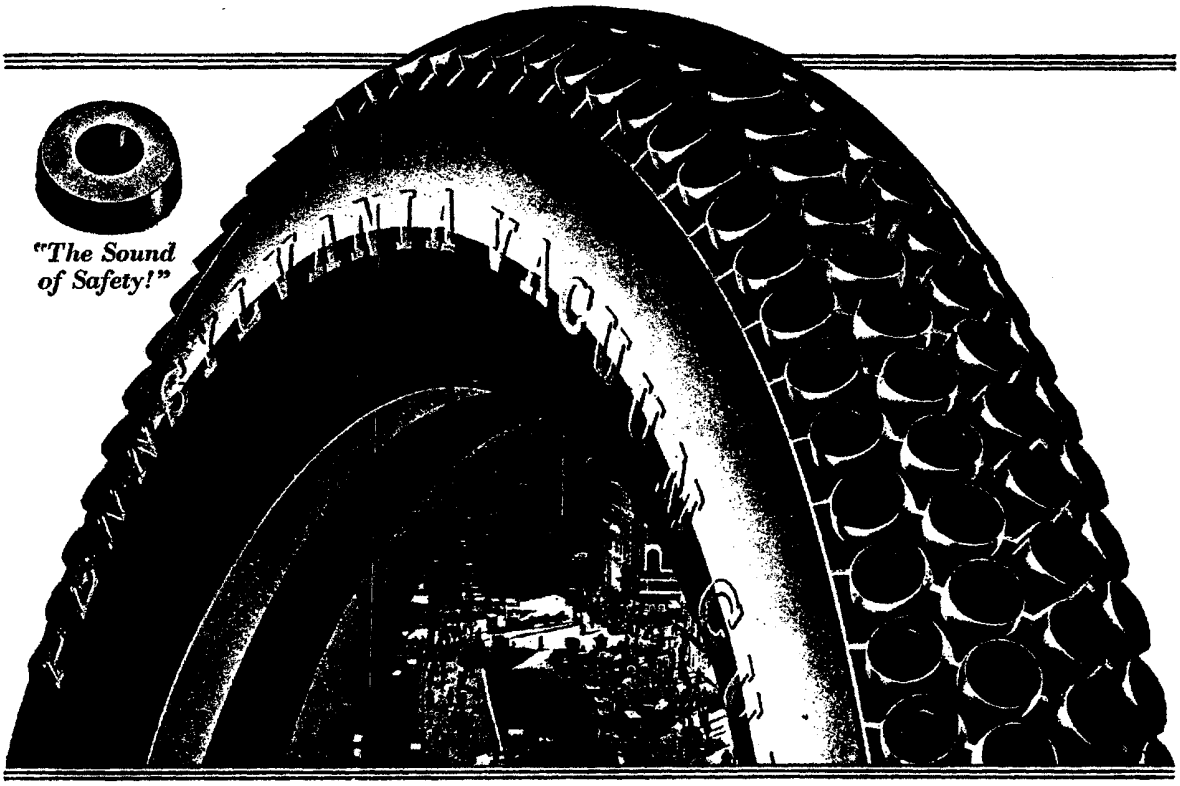
formulas of their paint show adulteration of the vehicle by adulterating the linseed oil. Oftentimes the addition of a large percentage of water in the paint can be found.

Another factor that enters into the situation and is a contributing reason why the more important paint manufacturers have hesitated to talk "out loud" about their paint is the fear of offending the painter. The master painter for years has opposed the use of the machine-made paints. The reason for this opposition we believe is well understood by all to-day, and does not need to be enlarged upon. We will say, however, that this fear of the painter on the part of the manufacturer is just another big bugaboo. With the coming of the perfected, highly scientific, machine-made paint, we have seen the passing of the old-school painter. In fact, there are but few practical painters who really can be depended upon for reliable painting methods and practices—the average town of to-day will not boast of more than one, or possibly two. Those who are schooled enough in the art of painting to know their work as they should are frank to admit that they cannot make a paint which equals that now made by the reliable manufacturer.

But there is a great class of self-styled painters who are not even good brush workers. It seems that men who have failed to be a success in other trades drift to the field of painting as a last resort; and as soon as they learn to apply paint with a brush without dropping more of it on the ground than they put on the siding they consider themselves painters. Every effort should be made to refuse this class of workman an opportunity to continue the costly destruction of your house. If you cannot employ a competent painter to do your work, you might better do it yourself, following carefully the advice that all of the best manufacturers of paint can and do freely offer you through their service departments. With a little practice in the use of the brush, you will find the brushing on of paint comparatively easy, and it will be found that you can produce a good and satisfactory job with a good paint, if you use care.

Successful painting depends as much upon building material, dry weather, absence of frost, and the methods of application as upon the quality of paint. It must be always remembered that the durability of paint will be affected by hurry. Allow at least three days or, better still, a week—according to the circumstances—for the drying of each coat of paint. Never add driers to a good paint to hasten the drying.

Unseasoned lumber and all cedar and yellow



"The Sound of Safety!"

THAT rigid adherence to traffic regulations which protects the cautious motorist at congested intersections is completed by full equipment of Vacuum Cup Tires.

The deep-purring "Sound of Safety" of the Vacuum Cup Tread means the cups are exercising their famous *grip-hold-letgo* principle of suction on wet, slippery pavements, generating *safety* every inch of the way.

The Vacuum Cup Tread means *extra service.* It is built of hundreds of sturdy Vacuum Cups over an already extra heavy, extra ply foundation, giving *safety* and *service* far beyond the limitations of *ordinary* makes of tires, though the purchase price is no more.

Rough country roads or smooth city streets —they serve as well on one as on the other

PENNSYLVANIA RUBBER COMPANY OF AMERICA, INC.,
JEANNETTE, PENNSYLVANIA
Branches and Service Agencies Throughout the World

VACUUM CUP CORD TIRES *NOW COST NO MORE* THAN ORDINARY MAKES

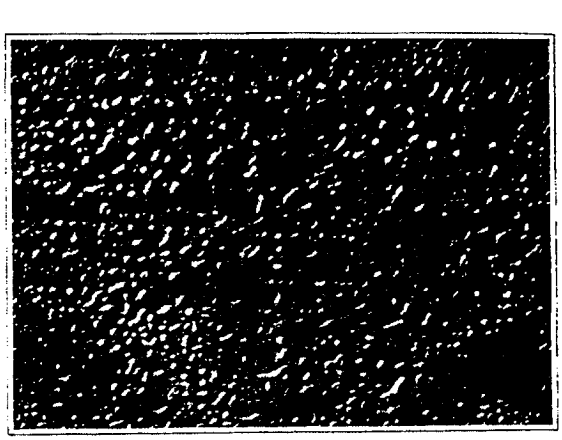
pine at any time require that the priming coat be given at least three weeks to dry, and a longer time would be better before the second coat is applied. In fact, it is often better to allow these woods to stand in the weather for several weeks before applying the priming coat.

The season of the year affects the consistency that paint should be for the right sort of painting. Paint that is right for warm weather may be wrong for cold, and an absorbent surface needs a different paint from that required by a hard surface. In this respect judgment must be exercised, as there can be no absolute rule given. Reliable machine-made paint is made to meet average conditions, and in large measure it will save you much time and trouble in having it right and ready for use.

ONE of the first essentials to good painting is the use of a proper brush for the work being done. Your dealer can aid you in the selection of this brush.

It is also very important that each coat of paint, and especially the priming coat, be well brushed out over the surface—and in fact into it in the case of its use on new wood. There is always existing on the surface of anything to be painted a thin layer of air, and this must be removed by firmly brushing the paint on to it. If this is not done, this thin film of air will come up and through the paint film, as it dries, causing minute holes to exist in the film.

For new work not less than three coats of paint should be used. The recommendations for the use of each coat—that is the first or priming coat on new wood, the second or intermediate coat, and the third or exposed coat—will be found in the color card of the manufacturer whose paint you are using. The most important coat is the priming coat, and for this it will generally be found that the paint will need some thinning. As a rule, if the lumber you are painting is rather sappy, the addition of



Showing blistering caused by heat. The heat may be from without or from within, but the result is the same

a small amount of turpentine—say a pint to a gallon of prepared paint—in addition to some linseed oil would be advisable. If the lumber is not sappy, but is rather dry and soft, the addition of linseed oil should be made to the first coat. The amount could be anywhere from a quart to a half gallon of oil to the gallon of well-made paint.

The second coat as a rule should have a very slight amount of turpentine added to it, and unless the wood which is being painted is very soft, the further addition of linseed oil to the paint as it is found in the can will not be necessary. The condition of the surface as it exists after the first or priming coat has been applied will determine in large measure what is best to do in this regard. This might be said, however: if the first or priming coat has a tendency to gloss, even slightly, additional oil will not be required. If it penetrated the wood and is absolutely dead flat when thoroughly dry and hard, the addition of oil as well as turpentine in the second coat might be advisable.

The third or last coat as a rule should be applied as it is found in the can. And let me again repeat that great care should be taken with every coat to brush out each brushful of paint as far as it will go and still leave a good appearance on the surface.

On old work, as a rule, two coats of a well-made paint will prove satisfactory. It is first necessary to remove all blistered or peeling paint; the surface to be painted should be thoroughly gone over with a wire brush or a hand scraper, removing all the loose paint possible. If the old paint coating is inclined to be powdery, it is advisable to add at least a quart of good linseed oil to the gallon of paint for the first coat. Oftentimes a greater amount of oil added to the first coat would be better.

If the surface to be painted is hard and brittle, the opposite of powdery, the addition of from a half pint to a pint of turpentine to the average well-made paint would be safe.

*[In the second instalment of this article, which will appear in the October number, the author will discuss in detail painting both indoors and out.—*THE EDITORS.*]*