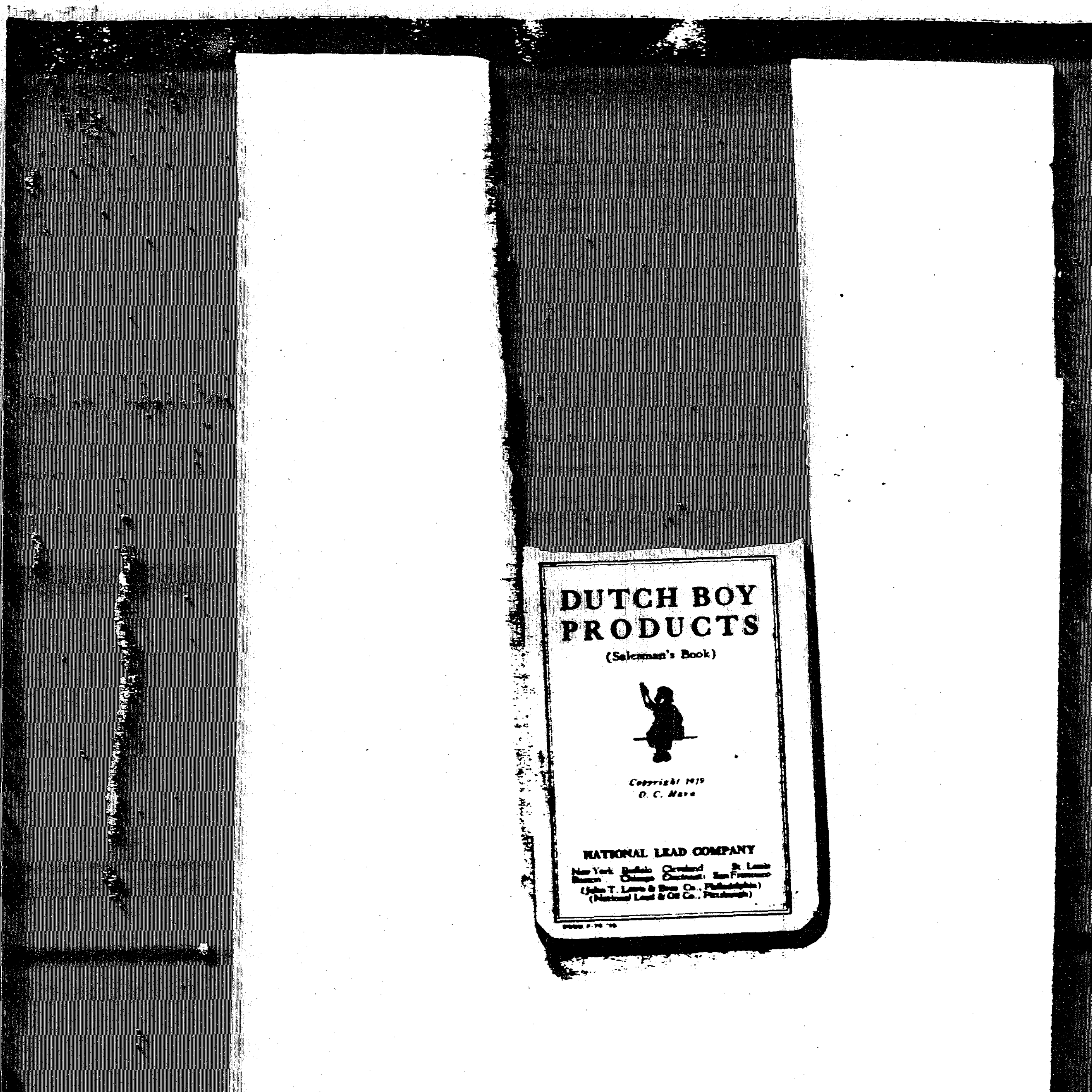
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PRODUCTS
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DUTCH BOY

## WHITE-LEAD

White-lead is pure, refined, ... (O), and Hydrogen (H).

... "Old Dutch Process."

### *Old Dutch Process*

ing compartment. Rows of earthenware pots, shaped somewhat like crucibles, are placed thereon close together. In the bottom of each pot is poured about one-half pint of weak acetic acid (practically vinegar). The pots are filled with waffle-like perforated discs of extremely pure lead.

These lead discs are called "buckles." Each buckle is about six inches in diameter and three-sixteenths of an inch thick. The buckles are piled flat and rest on a shoulder near the bottom of the pot, which prevents the metal from coming into direct contact with the acid. From ten to fourteen buckles are put in each pot.

Over the filled pots is laid a floor of planks. On these planks is spread another layer of tan bark. A second layer of pots is then arranged as before and alternating layers of pots and tan bark are built up until about ten tiers, or a "stack," are in place.

Fermentation of the tan bark soon sets in. The heat thus generated, the temperature of which ranges between 160 and 180 degrees Fahrenheit, causes the acetic acid to volatilize. Its fumes attack the lead, changing the metal on the surface to a thin film of acetate of lead. Carbonic acid gas, liberated by the decomposing tan bark, acts on this film of acetate





of lead, converting it into carbonate of lead. The action of the carbonic acid gas on the acetate of lead frees acetic acid in the latter and this freed acid attacks the metallic lead just below the first thin film of white-lead and changes more lead to acetate of lead, which in turn is changed by the process described to carbonate of lead.* Continuous attacks of acetic acid and carbonic acid gas continue in this way until all the lead clear down to the center is corroded into white-lead.

At the end of about four months, the stack is taken down or "stripped." The buckles of lead, which were blue, are found to be white, except for a core of metallic lead which sometimes remains in the imperfectly corroded buckles. This white powder is hydrated carbonate of lead, or white-lead.

From the stack, the corroded buckles are conveyed to a separating machine. Here they are broken up by tumbling about in a revolving screen and all uncorroded portions of lead are separated from the white-lead.

The white-lead is then mixed with water and g

* White-lead is indefinitely spoken of as carbonate of lead; this is conventionally correct but not strictly accurate, for, as has already been explained, white-lead contains both carbonate of lead and hydrated oxide of lead.

ground again and again between heavy, rapidly revolving mill-stones until it is fine enough to float in water through a long, oblong box called a "drag-box." The coarse particles of white-lead sink to the bottom of the drag-box and are automatically returned to the mills for regrinding.

The white-lead that is fine enough to float through the drag-box enters a series of four large tubs in which the water is agitated constantly by revolving rakes. These tubs are known as "rake-tubs." In the rake-tubs, the white-lead is washed free of traces of acid and other impurities; also here any coarse particles that got by the drag-box settle to the bottom of the rake-tubs.

After floating through a series of rake-tubs, the white-lead (still floating in water) flows on to a screen of silk bolting cloth containing about 27,000 microscopic meshes to the square inch. Only white-lead which is fine enough to flow through this screen is considered fine enough to become Dutch Boy white-lead. White-lead which will not pass through is rejected and reground.

The white-lead which passes through the bolting cloth is pumped into large settling tubs. There it settles to the bottom as wet pulp, the surplus water being drawn off from the top.





The wet pulp white-lead is then pumped upon drying pans where the moisture in it is evaporated by means of steam surrounding the pans. From the drying pans, the dried white-lead is conveyed to mixers, known as "chasers," where it is mixed with linseed oil, then to stone mills for final grinding.

Another way of incorporating white-lead with linseed oil is by pulp-mixing it. The white-lead mixed with water, known as pulp, instead of going to drying pans, is pumped into a box where the exact amount of linseed oil to be mixed with it is determined by its weight. The contents and sufficient oil are then pumped into an upright mixer. Owing to the greater affinity of the oil for the white-lead, the oil, during mixing, drives the water out. As the water rises to the top it is drawn off, leaving a paste made of white-lead and linseed oil instead of a [illegible]-and-white-lead paste.

Eight pounds of linseed oil to ninety-two pounds of white-lead is the usual mixture. Whether white-lead paste is made directly from pulp white-lead or from dried white-lead, its value in a paint is the same.

### Quick Processes

Methods of manufacturing white-lead other than the Dutch process just described are known as quick processes. Many quick processes have been invented and patented but, with few exceptions, they have not met with success in commercial practice. Two notable exceptions are the Carter and the Matheson processes.

The principle underlying both these methods is the same as that on which the old Dutch process is based. In each instance the lead is first changed to acetate of lead and then converted into hydrated carbonate of lead.

The Carter process takes about 12 days to turn lead into white-lead. The rapidity of the process is due to the fineness of the metallic lead with which it starts. By this method, granulated lead, resembling gun powder, is sprayed with acetic acid in a great revolving wooden cylinder. Thus acetate of lead is formed. Purified gas from coal is then introduced. This gas contains carbonic acid gas which changes the acetate to white-lead.

In the Matheson process, the lead is first "feathered," or made to resemble a sponge in structure, by running molten lead into water. It is then dissolved in acetic acid and, by contact with carbonic acid gas, precipitated, that is, thrown down in the form of a white powder which is carbonate of lead, or white-lead.

Character and Qualities.—Dry white-lead, i. e., white-lead before it is incorporated with lin-





seed oil into a paste, is a white, exceedingly fine powder. It is insoluble in water. It is fairly permanent as to color when exposed to strong light, remaining unaffected for a long time.

"Nature's true paint pigment" is what white-lead is often called. It is the only white pigment which, when mixed alone with the right proportion of pure linseed oil, yields a paint generally suitable for commercial work.

White-lead possesses a strong, natural attraction for linseed oil. The two combine in intimate union. Affinity in the same degree is not evident when linseed oil is mixed with any other pigment.

The natural attraction that white-lead has for linseed oil is proved by the pulp process of making white-lead paste, described under the manufacture of white-lead. It is also easily demonstrable by a simple experiment: Take a small quantity of dry white-lead. Mix it thoroughly with water. Add a little linseed oil and stir. Observe that the water rises to the top; the linseed oil and white-lead have combined, forcing the water out.

In order to make satisfactory paint, white-lead should be very pure, extremely fine and exceedingly opaque. A good degree of whiteness is also desirable.

### Purity

Strictly pure white-lead by itself produces the most serviceable protective and decorative paint. Its life is shortened and its other good properties are impaired by the presence of impurities or the addition of adulterants.

The impurities may be foreign substances accompanying the lead in its original state or allowed to creep in during the course of manufacture. The adulterants may be barytes, chalk and other "extenders" whose only mission is to cheapen.

Ordinary adulteration of white-lead cannot be detected by the eye or any other organ of sense. A simple and infallible test, however, if the adulteration is appreciable, is known as the blow-pipe test.

### *Blow-Pipe Test*

Place a small amount of the white-lead to be tested, say the size of a small pea, in a hollow scooped out of a piece of charcoal. Direct the flame of a gas or alcohol lamp, or a candle, upon the white-lead by means of a blow-pipe. The heat will reduce the white-lead in a few moments to globules of metallic *lead* if no adulteration is present. If there is adulteration, the reduction will not take place or will be incomplete.





Dutch Boy white-lead readily reduces to metallic lead under the blow-pipe. It is strictly pure.

### Fineness

To make good paint, white-lead should be so fine that, with an excess of oil, it will not feel hard and gritty when rubbed with the finger on a piece of glass or a smooth slate. If the pigment particles are not sufficiently fine, the spreading power of white-lead will be poor, it will not [illegible] properly, it will not [illegible], it will not work well under the brush and the film of paint will not be even and [illegible].

The white-lead used in the Dutch Boy [illegible] is exceedingly fine. [illegible]

### Opacity

White-lead is a very opaque pigment and that white-lead which gives the greatest opacity, other things being equal, is to be desired because it requires less coats to cover or hide a given surface.

Opacity is a scientific term and refers to the power of preventing the transmission of light under standard conditions. In the case of paints it is preferable to speak of its hiding power rather than its opacity, as hiding power better expresses what is meant so far as the practical use of paint is concerned.

The opacity or hiding power of a paint depends upon three factors—first, the refractive index of the pigment; second, the fineness of the pigment; third, the amount of pigment present.

Refractive index means the power of one material to bend or change the direction of a ray of light as compared to the similar power of some other substance taken as a standard. Thus, air, which transmits light practically without bending or refracting the ray at all, is taken as unity.

All pigments have refractive indices greater than the vehicles in which they are used. That is, the pigments bend the rays of light more, as compared with rays coming through the air only. If the pigment in a paint had the same refractive index as the vehicle, the paint would be transparent.

White-lead has a refractive index of something over two, which is higher than that of any white pigment in commercial use. It therefore has the greatest opacity, other things being equal.

Fineness has its influence on opacity because





the finer the pigment, the greater the aggregate surfaces there are to refract the light.

Of course a thin coat of paint is not so opaque as a thick coat of paint, other things being equal, but the thin coat of paint made from white-lead may have a much greater opacity or hiding power than a thick coat of paint containing pigments having lower refractive [illegible]

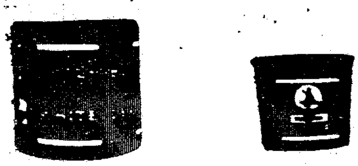

Whiteness

[illegible] white-lead insures [illegible] ciple to produ[illegible] by pressure [illegible] may be slightly whiter than [illegible] white-lead in the pail. The [illegible] of extreme whiteness can be over-emphasized, however, especially in connection with outside work, for any good white-lead of standard whiteness will match even extra white samples after exposure for a few days to the light.

On the other hand, white-leads of any process which have not the advantage of our great laboratory check sometimes fall short of the illustrator's fair demands as to color. Dutch Boy White-lead is always of good color. Complete corrosion and thorough washing keep it so.

Packages—Dutch Boy white-lead is sold in 12½, 25 and 50 pound pails and 100 pound kegs. All the packages are made of steel. The three smaller sizes are equipped with bails for carrying.

The packages are distinctive in design and have great advertising value. The labels are lithographed right on the steel. As shown below, at the top and bottom of the packages



are two broad orange stripes which go clear around. Between, also in orange, is the name of the product with the Dutch Boy trademark and guaranty label. The background is solid black.

How to Open Kegs—Opening the smaller sizes, 12½, 25 and 50-pound kegs, is very simple. First, pry the lugs of the lid outward with a screw-driver until clear of the reinforcing wire





of the rim. Second, tap the straightened lugs outward with a hammer and the lid will come off. (The process is easier if the pail is turned upside down first).

The 100-pound keg has six crimps which are pressed in the edge of the cover under the wire which reinforces the chime, thus locking it very securely on the inside. These crimps are drawn back by striking the cover sharply. Instead of letting the hammer strike the head [illegible], let it strike somewhat on its edge so that the blow will draw the crimped edge [illegible] rather than merely drive it downward. The outer edge of the cover which ends downward over the reinforced edge of the keg is held there by friction. This friction is overcome by tapping the projecting edges on the upper side after the crimps are drawn back. Ten seconds is sufficient to open the keg if done properly.

Mixing of "Lead-and-Oil"—Paint made from pure white-lead and pure linseed oil is popularly known as lead-and-oil.

Lead-and-oil is either used straight, i.e., containing no coloring matter, and is white paint; or it is tinted with colors-in-oil. In either case, the painter, at his discretion, adds turpentine to the paint, to induce greater penetration, and drier, to facilitate drying.

For generations lead-and-oil has been the skilled painter's standby. Its virtues, which have caused it to be thus favored, are: durability, beauty, adaptability, elasticity, adhesion, workability, opacity and economy.

*Durability*

The tough, elastic, water-proof film produced by lead-and-oil has no competitor in wearing and protective qualities. Lead-and-oil outlasts any other paint of white pigment base and withstands, without crack, blotch or blister, the attacks of rain, hail, sleet, snow, and trying changes between heat and cold.

A job properly done with lead-and-oil, under average conditions, can be relied upon to last at least four years. Not infrequently work is reported as still in good condition after ten, fifteen, twenty or more years' exposure to the elements. Such cases are interesting as proving the great wearing qualities of lead-and-oil, but cannot be cited as examples of good painting practice. Good appearance requires more frequent painting.

*Beauty*

A more beautiful, decorative finish cannot be secured than that obtainable with lead-and-oil. Not only is the paint smooth and free from brush marks when dry, but the range of pleas-





ing color combinations available is limited only by the desires of the house-owner and the ingenuity of the painter in blending colors.

*Adaptability*

White-lead possesses many points of adaptability which make it preferred by trained, discriminating painters. The paint can be varied to suit all conditions of surface, season, locality and exposure. It can be mixed thick or thin as required. Any desired tint, no matter how delicate, can be made easily, quickly and accurately. Also it can be made to produce a dead flat or various degrees of gloss, simply by varying the vehicle used.

*Elasticity*

The film made by lead-and-oil is remarkably elastic. It stretches and shrinks with the expansion and contraction of surfaces due to temperature changes. There is no cracking and scaling as is the case when a hard, brittle, unyielding paint is used.

*Adhesion*

When rightly brushed in and left, lead-and-oil is anchored so fast that it appears to be part of the surface to which it is applied. To pry the film loose is a physical impossibility.

In a large measure, this wonderful adhesion of lead-and-oil is due to the natural attraction existing between the pigment and the vehicle. So closely are the white-lead and the linseed oil united, they penetrate the surface pores as a compound. There the lead-and-oil compound dries, with the result that the film left on the surface, as well as succeeding coats, is virtually riveted fast by countless tiny tentacles or hooks of tough paint.

*Workability*

A peculiar characteristic of lead-and-oil is its tendency to become apparently more fluid the more it is brushed. Owing to its easy-working nature the maximum surface can be covered with it in a day. The smooth-flowing character of lead-and-oil also improves its penetration and increases its spread.

*Spread*

The spreading rate of a paint depends largely on its consistency, condition of the surface on which it is spread and whether it is laid on thickly or thinly, but, with a given set of conditions, lead-and-oil can hardly be equalled for spreading power. Its freedom from grit and hard particles, its opacity, making a very thin film practicable, and the naturalness of its union with linseed oil, are all conducive to good spread.





Three hundred square feet of surface to the gallon, two coats, is a fair average spreading rate for lead-and-oil.

*Hiding Power or Opacity*

The infinite variety in size of the microscopic particles of white-lead, together with their extreme fineness, makes a film of lead-and-oil exceedingly opaque. This is popularly known as hiding power. Sometimes hiding power is referred to as covering power, but the latter expression is objectionable, as it may be confused with spreading power.

*Washableness*

For interior decoration the remarkable washableness of a white-leaded surface is a distinct advantage. This one point alone frequently influences the choice of white-lead rather than a so-called flat paint. The superiority of white-lead in this respect is due to its fineness and consequent smoothness. That is, there are no projecting particles to catch the dirt as there are in films made of coarse pigments.

*Economy*

Whether viewed from the standpoint of the home-owner or the painter, white-lead paint, all things considered, is extremely economical. Usually it costs anywhere from twenty-five to thirty per cent. less per gallon than the better grade of mixed paints and only a little more than the cheaper and worthless ones. Its superior spreading power and durability combine to reduce its ultimate or real cost to a point far below those materials which might seem to be more economical. Moreover, when repainting time does come, no preparation beyond a dusting off is necessary, because lead-and-oil wears down smooth, leaving just enough "tooth," as painters say, to give the fresh paint a firm anchorage. This still further reduces its ultimate cost, and is a point many property-owners lose sight of entirely.

**White-Lead in Gallons.**—One hundred pounds of white-lead ground in oil, i. e., white-lead paste, occupies a space of about 2.8 gallons. To find out how much paint one hundred pounds of white-lead paste will make, simply add this 2.8 gallons to the amount of oil turpentine and drier used, expressed in gallons.

**Example:**

| | |
|---|---|
| 100 lbs. white-lead | = 2.800 gals. |
| 4 gals. linseed oil | = 4.000 " |
| 1 pint turpentine | = .125 " |
| 1 pint turpentine drier | = .125 " |
| Total Paint | = 7.05 " |
| | (Practically 7 gals.) |





**How to Mix Paint.**—First. Take the proper amount of white-lead called for by a formula. "Break up" or soften it in a large pail with just enough oil to bring it to a workable paste. Use a wooden paddle to stir.

Second. Add tinting color if the paint is to be tinted, mixing thoroughly with the white-lead.

Third. Put in drier. Stir thoroughly.

Fourth. Add the remainder of the oil required by the formula. Stir thoroughly.

Fifth. Put in the turpentine.

Stir until the whole mass is thoroughly mixed.

**How Much Paint?**—Following is a quick method of calculating approximately amount of material needed to paint a house.

1. *Quantity of Paint for Body of House*

First measure girth of house in feet and multiply by height in feet to eaves. If there is a gable, multiply width of gable in widest place by half the height of gable in highest place. Add the quantities and divide the result by 600 (approximately the number of square feet one gallon of white-lead paint will cover).

This gives the number of gallons of paint needed for the body of the house, one coat.

Multiply the number of gallons thus found by the number of coats to be applied.

The result is the total gallons of body color needed.

For every gallon of paint, the following quantities of ingredients will be needed:

| | |
|---|---|
| Dutch Boy white-lead.......... | 14½ pounds |
| Pure raw linseed oil.......... | 6¼ pints |
| Pure turpentine .......... | ⅛ pint |
| Drier free from rosin.......... | ⅛ pint |

*Quantity of Trimming Color*

If a house has only medium trim (window frames 4 inches wide or less, cornice about 9 inches extension, porch posts rather slender) count 2/5 gallon or 3 1/5 pints of paint for every 100 feet of trim. If trimming is of more massive style (say window frames 6 inches), heavy veranda pillars (30 inches in circumference) figure 3/5 gallons or 4 4/5 pints to every 100 feet.

To find the quantities of ingredients necessary proceed as explained above, multiplying by the number of coats required and using the same formula.

Number of Coats.—Three coats should always be applied to a surface which has never before been painted—a thin priming coat and two thicker coats. Two coats are sufficient for re-



Repainting Old Wood Outside

[illegible]

the gallon).

# FORMULAS FOR OUTSIDE PAINTING

### Table A—(New, Unpainted Wood Outside)

| INGREDIENTS | PRIMING COAT | SECOND COAT | THIRD COAT |
|---|---|---|---|
| Dutch Boy white-lead | 100 pounds | 100 pounds | 100 pounds |
| Pure raw linseed oil | 4 gallons | 1½ gallons | 3½–4½ gallons |
| Pure turpentine | 2 gallons | 1½ gallons | 1 pint |
| Drier free from rosin | 1 pint | 1 pint | 1 pint |
| How much paint it makes | 9 gallons | 6 gallons | 6½–7½ gallons |
| Square feet it will cover | 5,175 sq. ft. | 3,600 sq. ft. | 3,900–4,500 sq. ft. |

### Table B—(For Repainting Old Wood Outside)

| INGREDIENTS | FIRST COAT | SECOND COAT |
|---|---|---|
| Dutch Boy white-lead | [illegible] pounds | 100 pounds |
| Pure raw linseed oil | 2 gallons | 3½–4½ gallons |
| Pure turpentine | 2 gallons | 1 pint |
| Drier free from rosin | 1 pint | 1 pint |
| How much paint it makes | 7 gallons | 6½–7½ gallons |
| Square feet it will cover | [illegible] sq. ft. | [illegible] sq. ft. |

### Table C—Quantities of Each Material Required for Mixing One Gallon of Paint

(NEW WORK [WOOD] OUTSIDE)

| INGREDIENTS | PRIMING COAT | SECOND COAT | THIRD COAT |
|---|---|---|---|
| Dutch Boy white-lead | 11 pounds | 16⅔ pounds | 14¼ pounds |
| Pure raw linseed oil | 4 pints | 2 pints | 4½ pints |
| Pure turpentine | 1⅞ pints | 2 pints | ⅛ pint |
| Drier free from rosin | 1/9 pint | 1/5 pint | ⅛ pint |
| Square feet it will cover | 575 sq. ft. | 600 sq. ft. | [illegible] sq. ft. |

(OLD WORK [WOOD] OUTSIDE)

| INGREDIENTS | FIRST COAT | SECOND COAT |
|---|---|---|
| Dutch Boy white-lead | 14¼ pounds | 14¼ pounds |
| Pure raw linseed oil | [illegible] pints | 4½ pints |
| Pure turpentine | [illegible] pints | [illegible] pint |
| Drier free from rosin | [illegible] pint | [illegible] pint |
| Square feet it will cover | [illegible] sq. ft. | [illegible] sq. ft. |

painting old work. (See Table of Formulas on preceding page). Two coats are sometimes used on new work for the sake of economy, but it is not true economy. A third coat costs only one-third more and makes the job last twice as long.

## LINSEED OIL

Source of Supply.—Linseed oil is obtained by crushing the seed of the flax plant. Technically, domestic seed is usually known as flaxseed, and the imported seed as linseed. The flax plant is grown for either its fibre or its oil; but, apparently, it cannot be grown for both at the same time. If grown for seed, the fibre is of small value; if grown for fibre, the seed is immature. It is remarkable for the range of climate it can grow in—North Dakota, Northern Russia, the Argentine Republic, Southern Russia and India. Flax has the reputation of poisoning the soil where it has been grown, but recent research has proved that this is due not to the flax but to bacteria. If the bacteria are killed before the seed is sown the soil is not harmed. The plant grows about two feet tall and bears a cluster of beautiful, delicate blue flowers.

One ton of seed on the average gives about [illegible] gallons of oil (counting 7.5 lbs. of oil to the gallon).

**Why It Excels.**—The reason for the supremacy of linseed oil as a paint vehicle, especially where severe exposure subjects the paint to great stress, is its property of gradually hardening into an insoluble, tough, elastic film when exposed to the air. Linseed oil also has a natural affinity for white-lead, commingling with the fine white-lead particles in so intimate a union that a compound is formed which penetrates into the pores of wood, *not as oil* but as lead-and-oil, a new substance, which dries tough and elastic. It is the gripping quality and the toughness and elasticity of the lead-and-oil combined which prevent cracking and scaling.

No other oil, animal, vegetable or mineral so perfectly answers the purpose of a paint vehicle except, perhaps, poppy oil, but poppy oil cannot compete because it is more expensive.

**How Made.**—Linseed oil is produced to-day in three different ways:

1st Method. This is called the *Old Method* and is the one used by National Lead Co. The seed is ground and heated, then pressed by hydraulic pressure. The residue is known as linseed oil cake. If the ground seed or meal is run cold, "cold-pressed linseed oil" is produced. Ordinarily the meal is heated before pressing. The heat may be as high as 180° F.,





but in ordinary practice it is something over [illegible]0° F. The oil cake usually has from 5.5% to 6.5% of oil left in it.

2nd Method. The *Anderson Expeller Mill.* In this process the meal is heated only slightly and is forced by a screw through a conical grating. The oil comes through the grating, and the meal, formed into scales resembling cocoanut shells, comes out at the end of the expeller. The oil left in the scales or shells sometimes exceeds 8%.

3rd Method. The *Extraction Process.* In this method, the ground seed is leached with light petroleum naphtha which dissolves the oil, leaving a meal containing usually less than 3% of oil. The naphtha extract is distilled, the naphtha recovered and used over again and the linseed oil obtained as a residue from this distillation.

All three processes give commercially pure raw linseed oil of practically equal value.

**Character and Qualities.**—Linseed oil is a saponifiable oil, that is to say, it contains acids in combination with glycerine, which, under the influence of alkali are decomposed, the glycerine is liberated, and soap is formed. The fatty acids in linseed oil are mostly "unsaturated," that is, they are capable of absorbing oxygen from the air and becoming hard. They then lose their greasy and oily character, although they can still be saponified. It is convenient to consider the product which results when linseed oil is oxidised under the single name "linoxyn," although, strictly speaking, it is not composed of one constituent only, nor is it ever constant in its composition. This dried linseed oil, "linoxyn," is tough and elastic and is the principal constituent, in volume, of almost all dried paint.

Linseed oil should be unadulterated, clear, well filtered, free from foots. (Foots is the jelly-like matter which is natural to linseed oil and which gradually settles out upon standing. It consists of about 50% gelatinous organic matter and 80% of calcium and magnesium phosphates.) Not more than 4%, by volume, of foots should be obtained from raw linseed oil after it has stood two weeks at a temperature of between 60° and 80°. This does not mean 4% of actual suspended matter, as probably 75% of the foots is oil.

Many substitutes for linseed oil are offered (vegetable, animal and mineral oils), but they all fall short in some respect. The principal ones are soy bean oil, China wood oil, rosin and rosin oil, fish oil, corn oil and petroleum oils. As a rule, however, substitutes appear in the form of linseed oil adulterated with one or





another of the named materials. Adulteration of linseed oil is usually made surreptitiously, but sometimes it is done openly under pretense of improving it. Naturally both sorts of adulteration are more noticeable at times of high linseed oil prices. Adulteration of linseed oil prevents the paint from drying properly and the film never becomes tough. (For characteristics of substitutes mentioned see sections on those materials.)

Adulteration is difficult to detect, there being no simple and absolute test. The presence of fish oil, and generally rosin, can be detected by the rank odor; for pure linseed oil when rubbed briskly between the hands has the pleasant aroma of flaxseed. Corn oil, at times a frequent adulterant, while possessing a characteristic odor, cannot always be detected unless a large quantity has been used. If a few drops of linseed oil be placed upon a black painted surface, and a bluish or iridescent tinge or cast appears about the edge, such as kerosene exhibits, the presence of petroleum is indicated.

The iodine absorption test is the most reliable linseed oil test, but needs laboratory equipment. By the amount of iodine absorbed it is ascertained if the proper fatty acids are present. Pure linseed oil takes up 180% of its own weight of iodine.

## DUTCH BOY LINSEED OIL

**What It Is.**—Our pure and excellent linseed oil in handy, original, sealed cans bearing the Dutch Boy Painter on the seal and front. Raw oil, boiled oil and refined oil are sold in this form.

**Its Novelty.**—The cans containing the oil are designed to travel unbroken from manufacturer to consumer.

**Its Advantages.**—1.—The linseed oil can be identified as ours because our trademark appears on the cans. This means that where a paint user wants less than a barrel he can get pure, clear, superior, bright, well-settled, carefully filtered linseed oil by simply making sure that the Dutch Boy Painter is on the cans and that the seal is unbroken. Our trademark is a safeguard against substitution, too.

2.—There is no waste from foots or leakage. Besides, wooden barrels absorb oil; tin cans do not. In the sealed cans the dealer sells every drop of oil he buys.

3.—Sealed oil protects the honest painter from unscrupulous competition of irresponsible men who take the job away from him by promising to use good materials and then use cheaper stuff. The linseed oil as well as the white-lead can be brought to the job for inspection.





4.—The sealed cans are handy and clean.

5.—They can be attractively displayed.

6.—Possible adulteration or contamination from dirt getting into open measures used for other purposes is eliminated.

**A Bigger Profit.**—Aside from ridding himself of the muss of handling bulk oil, the dealer is assured of a larger profit in selling sealed oil. With bulk oil he loses at least 11½ cents on every 25 cents, due to shrinkage; with sealed oil he makes the whole 25 cents, as he sells every drop of oil he buys. It figures out this way: Bulk oil is bought on the basis of 7¾ pounds to the gallon and sold by gallon measure of 7½ pounds—a definite loss at the very outset of ¼ pound or 1/30 of the purchase, which, when oil costs $1.65, amounts to 5½ cents per gallon. To this loss is added the loss from leakage, absorption and foots, which inquiry among a large number of dealers places at two gallons per barrel of oil or 6 cents per gallon. Adding the two losses together shows a definite total loss of 11½ cents per gallon, not to mention the more or less indefinite, but none the less evident, loss on cans.

Thus when the dealer buys bulk oil at $1.65 and sells it at $1.90 per gallon, he is not making 25 cents per gallon profit but a profit of 25 cents less 11½ cents, or only 23½ cents actual profit.

On the other hand, when he buys sealed oil at $1.75 (the 10 cents additional being for can) and sells it at $2.10 per gallon, the whole 35 cents is profit.

Extra Cost of Can.—Dutch Boy linseed oil is sold to the consumer at 10 or 15 cents per gallon additional (according to size) to cover the cost of the can. The question sometimes is raised that consumers will not pay this extra cost per gallon, but no fair-minded person will hesitate in buying sealed oil if he is shown that the few extra cents are for insurance.

Viewed from the following angles, the additional cost shrinks to an insignificant item:

1.—It amounts to only 6c more per gallon of paint. Scarcely any consumer will hesitate to pay a little more per gallon for paint which he knows is better. Scarcely any dealer will hesitate to handle a high-grade paint at a little more per gallon in spite of the fact that he could get any number of brands for less.

2.—The total increase on all of the oil used in doing a $100 job would not be more than 50c, or only one-half cent on each dollar to insure getting genuine oil.





3.—This extra 50c would only amount to 12½ cents a year if the job lasts four years, as Dutch Boy white-lead and Dutch Boy linseed oil will on the average. An uncertain oil might give out in less than a year, entailing the loss of the cost of the labor as well as of the paint. The insurance of getting pure linseed oil, and through it increasing one's chance of getting a good durable job, is easily worth the slight expenditure, no matter in which of the above ways it is viewed.

Packages.—One and five gallon tin cans, sealed at the spout. The full-measured gallon basis or 7½ lbs. to the gallon is used. The one gallon cans are packed six in a wooden case and the five gallon cans one in the case.

## BOILED LINSEED OIL

What It Is.—Boiled linseed oil is linseed oil that has been heated, usually in combination with manganese and some form of lead. Strictly speaking, linseed oil cannot be "boiled," for that implies an evaporation point. What really happens is a kind of chemical decomposition.

Character and Qualities.—Boiled linseed oil is more viscous (thicker), heavier and darker than raw oil. It should have a specific gravity of about 0.940 to 0.945 as compared with the specific gravity for raw oil of from 0.932 to 0.936.

Boiled oil dries with more gloss than raw oil and offers better resistance to water.

There is a tendency in boiled oil for the lead and manganese soaps to separate. This makes the oil at times cloudy, but does not necessarily injure its quality. In fact, clear oil is no proof of quality, because adulterants may have been added to keep it clear. Stirring before removal from container will make the oil uniform throughout.

How Made.—Boiled oil is made by a number of different methods, usually one of the following:

1.—Small amounts of manganese and oxides of lead or salts of lead are added to linseed oil





in the process of heating or boiling, during which they are slowly dissolved. The product is old-fashioned boiled oil.

2.—The same oxides or salts are dissolved in a small quantity of raw oil, which is then added to the remainder of the oil, after which the entire mixture is heated to the desired point. The result is a product practically the same as old-fashioned boiled oil.

3.—Sometimes driers are added to raw oil without heating, the resulting product being offered as boiled oil. This, of course, is not boiled oil at all. From the fact that this imitation product is sometimes prepared in a small way through the bung-hole of the barrel, it is known in the trade as "bung-boiled" oil. It is an inferior substitute for kettle-boiled oil and users should be cautioned against it.

The driers contained in boiled oil should be about 0.2 per cent. lead (as PbO) and manganese about 0.05 per cent. (MnO). We believe no other constituents than those mentioned are justified. Rosin is sometimes added to make the oil clear, but we consider it inadvisable.

Uses and Advantages.—A generation ago boiled linseed oil was commonly used as the sole paint vehicle with white-lead, but nowadays, and particularly in this country, it is less often used on wood, except as a drier with raw oil.



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As a drier, boiled oil is superior to ordinary driers in a number of ways. In the first place, there is no loss by evaporation. In the second place, the majority of driers contain rosin. Rosin is an undesirable constituent in paint and its use can be avoided by using pure boiled oil as a drier. Again, the bulk of most liquid driers is benzine. We do not recommend the use of benzine in exterior paint. If a thinner is needed, it is better to use turpentine.

For outside work, a combination of two-thirds raw oil and one-third boiled oil is very popular. Of course, the proportions vary somewhat according to the nature of the work to be done but, ordinarily, the proportions stated produce a vehicle that will absorb a sufficient amount of pigment, and that will be thin enough to thoroughly penetrate the pores of the wood. For outside work on wood, a higher percentage of boiled oil than above referred to can be used if turpentine is added for thinning.

Especially in the spring and fall of the year, when changes of temperature at the end of the day are sudden, boiled oil as a drier is particularly valuable, for it will cause the paint to set quickly and thus protect it from injury due to the sudden dropping of the temperature.





In painting roofs, particularly of tin, a high percentage of boiled oil is valuable, because of its toughness and great power of resistance to the weather, and inasmuch as there are no pores to be filled, its heaviness is no disadvantage in this case.

For white work, too high a percentage of boiled oil is objectionable because of its dark color, although in exterior work it will bleach out gradually after application.

For the first coat on brick or plaster, whether inside or outside, boiled oil is frequently used as the sole vehicle. On such work a thinner vehicle tends to penetrate the pores to such a degree that the resultant film lacks sufficient binding quality. By using boiled oil as the sole vehicle, this tendency is overcome and the result is a heavy elastic film that affords an excellent foundation for the following coats. Moreover, boiled oil is less liable to be acted upon by alkali in the plaster.

Packages—Pure and boiled linseed oil is sold in one and five gallon tin cans and in half barrels and barrels. The one gallon cans are packed six in a wooden case and the five gallon cans one and two to the case.

## LINSEED OIL SUBSTITUTES

Soy Bean Oil.—No perfect and all-around substitute for linseed oil has yet been found. Soy bean oil, however, is the nearest approach to such an oil and great possibilities are predicted for it. The chief objection to its use is that it does not dry to the same semi-solid, elastic film that linseed oil does when exposed to the air.

Soy bean oil is a vegetable oil. It is extracted from the bean of the soy plant, which flourishes in Japan and China. The plant is also cultivated now quite extensively in the United States.

Two general methods of extraction are employed: First, the naphtha process, in which the beans are ground and dissolved in naphtha. The naphtha solution is then distilled and the oil is drawn off. Second, the expression method in which the oil is hydraulically pressed from the beans.

The soy plant will thrive under almost any conditions, is good for the soil and yields a cake which is used for cattle food. The oil has an iodine absorption number of [illegible] and is sweet-smelling, clear and bright in color. It does not become rancid and foul-smelling as fish oils do. But with all these things in its





favor soy bean oil lacks the most important qualification of a perfect paint vehicle—it does not dry tough and elastic.

China Wood Oil.—China wood oil or tung oil is obtained from the nuts of a tree much resembling our chestnut tree, though smaller, which grows chiefly in China. Attempts are being made to cultivate these trees in our Southern States. To extract the oil the nuts are ground in a rude mill, steamed and pressed. Like linseed oil, China wood oil is classified as a drying oil, drying by taking oxygen from the air. In fact, excepting linseed oil, it is the only true "drying oil" in considerable use. In China, wood oil is used either alone or as a paint oil on wood surfaces, especially boats. In this country it is rarely used by itself in paint. It is used quite extensively in varnishes, especially resin varnishes, where it has a much greater drying power than linseed oil. China wood oil's chief use, however, is in making the cheaper grades of resin varnishes which form the liquid portion of inside flat, white, wall paints. These varnishes seem to lack penetrating power as compared with linseed oil varnishes, adhering to the surface without taking firm hold which results in bad cases of flaking.

China wood oil costs more than linseed oil. It has a disagreeable odor and dries without gloss. It appears to be more waterproof than linseed oil and dries more quickly. With the present knowledge of it, however, there exists always an uncertainty as to its action. This disadvantage, together with its high price and scarcity, prohibits the more general use of China wood oil.

Corn Oil.—Corn oil, as the name indicates, is obtained from corn, being a by-product in the manufacture of glucose. It has an agreeable odor and when carefully made from selected corn and properly refined is a valuable food oil.

Corn oil is used chiefly in the manufacture of soap and in compounds made by varnish-makers for special technical purposes. It is not a drying oil and is very little used in paint because it stays greasy and does not dry hard.

Cotton Oil.—Cotton oil or cottonseed oil is made from the seed of the cotton plant. It is used to some extent as a soap oil, but its most important use is as a food material. After proper treatment it makes a substitute for lard. The finest quality of oil, expressed from selected seed and carefully filtered, is probably the best substitute for olive oil as a table or salad oil.

Cottonseed oil is not a drying oil and is seldom, if ever, used alone as a paint vehicle.





Fairly good results, however, have been obtained by mixing a small proportion with linseed oil, due to the fact that the latter oil's good qualities overshadow the poor qualities of the adulterant. The addition of cottonseed oil to linseed oil is for no reason other than to cheapen.

Fish Oil.—So far as can be determined, the only fish oil employed in the paint business is menhaden oil, made from fish of that name by steaming and pressing.

Menhaden oil is about the color and body of linseed oil and while not a true drying oil responds to driers to some degree. It is mixed in the proportion of twenty to twenty-five per cent. with eighty or seventy-five per cent. of linseed oil for roof and smoke-stack paint, where its lack of drying power and its offensive odor are not considered objectionable.

Rosin Oil.—Rosin oil is made by distilling rosin as follows: A quantity of rosin is heated, decomposing it. A condensed vapor is caused by the distillation, consisting of rosin spirits, a volatile fluid, and rosin oil, a thick liquid-like syrup. The oils made this way vary in color and quality, the poorer grades being almost black and the better grades being yellow and sometimes almost colorless, depending on the color and quality of the rosin used.

## Linseed Oil Substitutes

Rosin oil is used principally in making printing ink. Linseed oil also is used for this purpose. Its use in paint is not to be commended because it has a tendency to dry slowly and stay sticky, gradually becoming dirty from the absorption of dust. Alligatoring is almost sure to follow the use of rosin oil in paint.

Petroleum Oils.—Petroleum is refined by distilling. The most volatile portion is gasoline; then come several sorts of benzine, the most important being varnish-maker's and painter's and the mineral turpentine or turpentine substitutes; then comes kerosene and between kerosene and the heavy lubricating oils are several grades of oil which are called "neutral oil" or very light lubricating oils. Oils of this latter class are rather extensively used to adulterate linseed oil. They have no permanent binding power, however, for when spread out in a film and exposed to the air they are not entirely volatile and weaken the paint film. They tend to make paint turn yellow in outside work.

The cheapness of petroleum oils accounts for their too promiscuous use to adulterate linseed oil. Kerosene, too, is oftentimes used. Such practice, no matter by what motive it is prompted, should be condemned.



## Driers

### DRIERS

What They Are.—Driers are agents, usually liquids, added to paint to hasten the oxidation and the hardening of the film.

White-lead and linseed oil will dry without artificial aid in about three days, but the prevalence of dust and insects makes it generally desirable for paint to harden in eight to ten hours. A drier is therefore necessary. It is not harmful if good and not used in excess of one quart to four gallons of oil. If too much is used, the paint dries on the surface and leaves the under part soft. Also wrinkling of the surface of the paint is apt to follow excessive use of drier.

How Made.—Driers are compounds of lead and manganese. Litharge (or red-lead) or manganese dioxide or both, are put into raw linseed oil and heated. The oxides combine chemically with some of the oil and dissolve. If only a small quantity of oxides is used we simply get boiled linseed oil, but if a much larger proportion of oxides is added the compound becomes thick. Add still more oxides and the compound will, when cooled, be a hard cake. The cake is then dissolved in turpentine or similar solvents and is known as liquid drier. Drier thus made is known as a non-self-drier (because if spread out into a film by itself it will remain greasy and will not dry. If added to oil in small quantities it gives the maximum of quick drying, but if an excess is used the drying is retarded.

Japan Driers.—Driers are sometimes made by dissolving gum shellac in hot linseed oil and adding a large quantity of lead and manganese oxides. These are true Japan driers. The resulting compound is dissolved in turpentine. The latter fact gives rise to the term "turpentine Japan drier." Many driers are called Japan driers improperly.

## TURPENTINE

What It Is.—Turpentine is a thin, colorless volatile, highly inflammable liquid with a characteristic, pungent odor. Its chief functions in paint are to induce better penetration, to hasten drying, to improve the working quality of paint by increasing its fluidity and to produce a flat finish with white-lead.

Test for Purity.—It is not uncommon to adulterate turpentine with benzine, kerosene, coal-tar naphtha, rosin spirits and similar fluids. Adulteration of this nature can readily be detected by moistening a piece of white paper with the sample to be tested. If pure, the turpentine will evaporate without leaving a residue. If impure, an oily residue will remain.



How Made.—Pure turpentine spirit is obtained in two ways. One way is by distilling the resinous sap which exudes from incisions made in the trunks of various species of pine trees. The refining is done in an ordinary copper still. At a temperature of about [illegible]° Fahrenheit the turpentine passes off leaving rosin as a residue.

The other way of producing turpentine is by reducing the stumps and the heart wood of dead pines to chips and distilling in a current of steam. Steam-distilled turpentine is considered equal in every way to the gum spirits. The only noticeable difference is in odor.

Mineral Turpentine.—Mineral turpentine is really not turpentine at all, but a heavy benzine. It is one of the distillates obtained in refining petroleum. For some painting purposes, mineral turpentine is considered equally as good as real turpentine. It compares favorably in weight and evaporates as slowly, but does not possess the powerful solvent qualities of real turpentine.

## WHITE BASIC LEAD SULPHATE

What It Is.—White basic lead sulphate is a white pigment closely resembling carbonate of lead (white-lead) in appearance, but differing in certain physical characteristics as well as

## Basic Lead Sulphate

in chemical composition. As commercially used, white basic lead sulphate analyzes about as follows:

75 to 80 per cent. lead sulphate
20 to 15 per cent. lead oxide
5 per cent. zinc oxide

It is sometimes known as "Sublimed Lead" and "Sublimed White-Lead." These are proprietary names for it used by one of the manufacturers.

How Made.—White basic lead sulphate is made from mineral or lead ore that is composed of galena and blende, the former ore being greatly in excess. Galena, when pure, averages about 86.6 per cent. lead and 13.4 per cent. sulphur. Blende, known also as sphalerite and "jack," contains 67 per cent. zinc and 33 per cent. sulphur.

In making white basic lead sulphate, the lead ore as mined, is first crushed, washed and separated from associated rock by a gravity or jigging process termed "concentrating." The concentrates thus obtained are shipped to the works. There they are subjected to a furnace treatment. Volatilization takes place. The volatilized portion of the concentrates becomes oxidized. The result is a white fume which is carried away by a draft of air and collected in bags.

## Basic Lead Sulphate

Some metal is obtained in the process. It is drawn off from the bottom of the furnace.

Character and Qualities.—White basic lead sulphate contains nearly 70 per cent. of metallic lead when of average composition. Under the blow-pipe it is reduced to metallic lead with much more difficulty than corroded white-lead. It is insoluble in water, possesses a high degree of opacity and, being a fume product, is extremely fine.

Mixed with linseed oil, white basic lead sulphate forms a smooth paste, works easily under the brush, and has great spreading properties. A paste made of white basic lead sulphate and linseed oil shows a tendency to get lumpy and hard, especially around the edges.

White basic lead sulphate paints dry to a tough, elastic film that is only slightly affected by sulphur fumes and other destructive [illegible].

In time white basic lead sulphate paint films tend to chalk excessively.

How Used.—Very little white basic lead sulphate is used alone as paint. Almost always it is combined with some other white pigment. Paint grinders consume a large part of the production. Practically all of the remainder is used in the rubber industry for tubing, hose, automobile tires and molded articles.

## BLUE BASIC LEAD SULPHATE

What It Is.—Blue basic lead sulphate is essentially a white basic lead sulphate colored with lampblack accidentally in the process of sublimation. Other names by which it is known are "blue lead," "blue fume," and "fume lead." The pigment is of variable composition. A characteristic analysis follows:

- 62.52 per cent. lead sulphate
- 27.46 per cent. lead oxide
- 2.35 per cent. carbon
- 3 to 4 per cent. zinc oxide
- 1 to 1½ per cent. lead sulphide.

How Made.—Blue basic lead sulphate is a by-product collected in the manufacture of white basic lead sulphate. The lampblack which colors it is an accidental ingredient resulting from incomplete combustion of carbon fuel in the blast furnaces.

Character and Qualities.—Notwithstanding its variable composition, blue basic lead sulphate has many commendable properties and probably deserves more attention than it has had, but for structural steel, especially on contact places, red-lead must still be regarded as supreme.

Blue lead is as high in lead content as any other lead pigment. It is blue-gray in color, fine, smooth, opaque, durable and remains in





suspension indefinitely. Being a "fume" product the spreading power of blue basic lead sulphate is high. Like white basic lead sulphate, it is practically unaffected by sulphur fumes and other atmospheric gases. It is variable in color and hence is not popular for finishing coats.

How Used.—Part of the output of blue basic lead sulphate is utilized as paint for metal. The rest, probably the biggest portion, is used in the manufacture of rubber products.

## LEAD OXIDES

Kinds.—Lead oxides are chemical compounds of lead and oxygen. There are supposed to be five kinds, viz: (1) Lead Monoxide (or Litharge) ($PbO$); (2) Lead Suboxide ($Pb_2O$); (3) Lead Dioxide (or Peroxide) ($PbO_2$); (4) Lead Sesquioxide ($Pb_2O_3$); (5) Lead Tetroxide (Red-Lead and Orange Mineral) ($Pb_3O_4$). Lead suboxide and lead sesquioxide are compounds of doubtful existence. Lead dioxide or peroxide has been used for safety matches; also to a limited extent for electrical purposes and in chemical compounds. We do not handle it.

The lead oxides that we are interested in are litharge, red-lead and orange mineral. The principal difference between them is in the amount of oxygen that they contain.

## RED-LEAD

**What It Is.**—Red-lead ($Pb_3O_4$) is a chemical compound of two parts litharge ($PbO$) and one part peroxide ($PbO_2$). It is a brilliant, scarlet red in color.

There are a number of grades of red-lead. As in the case of litharge, the uses to which the different grades are put give names to them. There are the following red-leads: Dutch Boy red-lead, painters' dry red-lead, glassmakers' red-lead, varnishmakers' red-lead, accumulator red-lead and orange mineral.

**How Made.**—Red-lead is made by heating litharge to a suitable temperature after the litharge has been cooled, ground and purified. The heating is done in a reverberatory furnace, a furnace with arched roof which "reverberates" or reflects the heat down upon the litharge. At about 900° Fahrenheit, the buff-colored, powdered litharge takes on more oxygen, changing in color to a brilliant red. This is red-lead. The conversion of litharge into red-lead takes about forty-eight hours.

A remarkable phenomenon is that, if the temperature is raised to 1180° Fahrenheit, and higher, the red-lead loses oxygen and goes back to litharge.

**Character and Qualities.**—Red-lead is more or





less crystalline in texture. It contains about 90 per cent. lead and 10 per cent. oxygen.

More detailed information as to the character and qualities of red-lead will be found under "How Used."

**How Used.**—The various kinds of red-lead differ principally in purity, fineness and proportions of litharge and true red-lead in their composition. Depth of color and brilliancy of tone also determine to some extent the use to which red-lead is put.

### *Painters' Dry Red-Lead*

Painters' dry red-lead is mixed with pure linseed oil into paint. As a paint for metal, red-lead has no peer in wearing and preserving qualities. It is excellent also for brick, cement and troublesome wood jobs.

Paint made from red-lead and linseed oil covers remarkably well and dries to a tough, hard, tenacious film. It is insoluble in water, is an excellent insulator, does not check and alligator, has a distinctive color and is unaffected by ordinary atmospheric influences.

The only fault ever found with dry red-lead as a paint is its tendency to harden if allowed to stand, due to high litharge content. This difficulty is entirely obviated in Dutch Boy red-lead, which is a highly-oxidized red-lead from which most of the drying agent, litharge, has been removed. (Refer to next page for further information about paste red-lead.)

Dry red-lead for painting purposes should be finely ground, uniform and of good color. A pigment that contains over [illegible] per cent. true red-lead ($Pb_3O_4$) and less than 7 per cent. litharge is about the right composition to give satisfactory results generally.

### *Glassmakers' Red-Lead*

Glassmakers' red-lead is used in the same way as glassmakers' litharge, but is often preferred to litharge because of higher oxygen content. Oxygen helps burn up the impurities in the mix. Glassmakers' red-lead should be moderately fine and exceedingly pure. It should contain not less than 60 to 70 per cent. true red-lead.

### *Colormakers' Red-Lead*

Colormakers' red-lead is used in making vermilion. The color must be clear and bright. Fineness of pigment and depth of color vary according to the character of the vermilion to be made.

### *Varnishmakers' Red-Lead*

Varnishmakers' red-lead is boiled with oil in the making of varnish to give drying qualities.





It is preferred by some manufacturers to litharge on account of the higher percentage of oxygen. Better results in drying are obtained with red-lead. For varnish red-lead should be a little finer than for glass but it should be equally pure.

### *Accumulator Red-Lead*

Accumulator red-lead is used as explained under "Accumulator Litharge." A very pure red-lead is required and it should have a bulk that corresponds to from [illegible] to [illegible] apparent density by Scott's volumeter test. Good pasting qualities are especially essential.

Packages.—Red-lead is sold in 12½, 25, 50 and 100-pound kegs; also in 250 and 500-pound [illegible]. Our red-lead has a nation-wide reputation for purity, uniformity, fineness, high oxidation and color.

### "DUTCH BOY" RED-LEAD

What It Is.—Pure red-lead very highly oxidized. (Litharge content not more than 3% and frequently less.) Ground exceedingly fine and mixed by means of powerful machinery, with pure linseed oil, then passed through special mills to insure perfect incorporation of pigment and oil. There is nothing added either to pigment or to oil to keep it soft. The elimination to such a large degree of litharge, and the fine grinding which breaks up the particles which contain the litharge core, are the reasons for the non-hardening of Dutch Boy red-lead. Old style red-lead contains a large percentage of comparatively coarse particles with litharge cores, making the litharge content run as high as 2 to 15 per cent.

Its Novelty.—Its ability to stay soft and workable indefinitely. We have samples still soft which have been mixed a year.

Its Advantages.—1.—There is no waste. It does not harden when mixed with oil and what is not used at once can be safely saved for later use. Dutch Boy red-lead remains workable indefinitely. Also in mixing there is no dry powder to be spilled and wasted. There are thus two chances of saving by using Dutch Boy red-lead.

2.—Time is saved in mixing. Any paste pigment is more quickly reduced to painting consistency than a dry pigment.

3.—Enough paint for the whole job may be mixed at one time when Dutch Boy red-lead is used. It will not harden.

4.—Being very fine, exceedingly pure, highly oxidized, and ground with oil in a mill it spreads exceedingly well and the minimum of paint is therefore required for a given surface.





5.—In spite of the fact that it spreads farther than ordinary paint, the film is better because of a more uniform thickness. This is due to the machine-grinding of the paste.

6.—It saves in labor cost for two reasons: (a) It spreads so easily that a workman can cover more surface in a day. (b) It works as easily as white-lead and no special skill is required for its application.

7.—It is sanitary. No dry pigment to fly about in the form of dust and get in the lungs.

Compared With Old Style.—You may encounter the objection, prompted by manufacturers of old-style red-lead, that in eliminating litharge we have lessened the value of the red-lead. We have no desire to attack ordinary commercial red-lead. We still make it. But there is no foundation for the claim that litharge is the valuable constituent of red-lead. One of the red-leads which stood in the highest class in the Havre de Grace bridge tests was a very highly oxidized product, and the other was by no means a low grade red-lead. This is the best answer to contrary theories.

If in any particular case litharge would be a valuable constituent, it would be much better to add the required amount of litharge to Dutch Boy red-lead because then we would have finely ground red-lead and finely ground litharge mixed together in an effective way, while in low grade red-lead the litharge is present simply as the cores of comparatively coarse particles of red-lead.

Directions for Mixing.—Break up the Dutch Boy red-lead paste in the same manner as pure white-lead paste is broken up, adding pure linseed oil, a little at a time, and stirring it in thoroughly.

Formulas.—100 lbs. Dutch Boy red-lead paste measures 2.124 gallons. 1 gallon Dutch Boy red-lead weighs 47.08 lbs.

### FORMULA No. 1

To prepare paint equivalent to 33 lbs. dry red-lead to the gallon of oil, use either of the following formulas:

| FORMULA No. 1-A | | FORMULA No. 1-B | |
|---|---|---|---|
| Dutch Boy Paste Red-Lead | 100 lbs. | Linseed Oil (Measured) | 1 gal. |
| Linseed Oil (Items 1 and 2) | 1.88 gals. | Dutch Boy Red-Lead Paste | 30 lbs. |
| Quantity paint | 4.11 gals. | Quantity paint | 2.40 gals. |

One gallon of this paint contains 24.29 lbs. Dutch Boy paste red-lead and .48 gals. linseed oil (.5 commercial gals.)

### FORMULA No. 2

To prepare paint equivalent to 28 lbs. of dry red-lead to the gallon of oil, use either of the following formulas:





DRY REDOMPOSITION OF PAINT
Dutch Boy Red-Lead as Dutch Boy Paste Red-Lead

| Pounds of Dry Red-Lead to One Gallon of Linseed Oil | Weight of each Gallon in Pounds | Quantity of Linseed Oil in Each Gallon | Approximate Quantity of Linseed Oil to Each Gallon |
|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] |

One gallon of this paint contains 18.71 lbs.

HANDY TABLE OF RED-LEAD DATA. Based on Dry Red-Lead Formulas with Dutch Boy Paste Red-Lead Equivalents. 

| DRY RED-LEAD FORMULAS | | DRY RED-LEAD BASED ON 100 POUND KEG | | Dutch Boy Paste Red-Lead Equivalent FORMULAS BASED ON 100 LB. KEG | | COMPOSITION OF PAINT MADE FROM EITHER DRY RED-LEAD OR DUTCH BOY PASTE RED-LEAD | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pounds of Dry Red-Lead to One Gallon of Linseed Oil | Gallons of Paint Resulting | Gallons of Linseed Oil to 100 Pounds of Dry Red-Lead | Gallons of Paint Resulting | Gallons of Linseed Oil to 100 Pounds of Dutch Boy Paste Red-Lead | Gallons of Paint Resulting | Pounds Dry Red-Lead in Each Gallon | Weight of Each Gallon Pounds | Quantity of Linseed Oil in Each Gallon (GALLONS) | Approximate Quantity of Linseed Oil in Each Gallon (PINTS) |
| 40 | 1.56 | 2.50 | 3.87 | 1.496 | 3.616 | [illegible] | [illegible] | [illegible] | [illegible] |
| 35 | 1.48 | 2.86 | 4.23 | 1.824 | 3.948 | [illegible] | [illegible] | [illegible] | [illegible] |
| 33 | 1.46 | 3.03 | 4.40 | 1.985 | 4.112 | 23.7 | 28.1 | [illegible] | [illegible] |
| 32 | 1.44 | 3.125 | 4.49 | 2.076 | 4.200 | [illegible] | [illegible] | [illegible] | [illegible] |
| 31 | 1.43 | 3.23 | 4.60 | 2.171 | 4.296 | [illegible] | [illegible] | [illegible] | [illegible] |
| 30 | 1.41 | 3.33 | 4.70 | 2.271 | 4.396 | 21.3 | [illegible] | .71 | [illegible] |
| 29 | 1.40 | 3.45 | 4.82 | 2.379 | [illegible] | [illegible] | [illegible] | .71 | [illegible] |
| 28 | 1.38 | 3.57 | 4.94 | 2.494 | 4.618 | [illegible] | [illegible] | [illegible] | [illegible] |
| 27 | 1.37 | 3.70 | 5.07 | 2.617 | 4.741 | 19.7 | [illegible] | [illegible] | [illegible] |
| 26 | 1.36 | 3.85 | 5.22 | 2.750 | 4.874 | 19.2 | [illegible] | [illegible] | [illegible] |
| 25 | 1.34 | 4.00 | 5.37 | [illegible] | 5.018 | 18.6 | [illegible] | .74 | [illegible] |
| 24 | 1.33 | 4.17 | 5.54 | [illegible] | 5.174 | 18.1 | [illegible] | .74 | [illegible] |
| 23 | 1.32 | 4.35 | 5.72 | 3.219 | 5.343 | 17.6 | 23.4 | [illegible] | [illegible] |
| 22 | 1.30 | 4.55 | 5.92 | 3.404 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 21 | 1.29 | 4.76 | 6.13 | 3.606 | 5.730 | [illegible] | [illegible] | [illegible] | [illegible] |
| 20 | 1.27 | 5.00 | 6.37 | [illegible] | [illegible] | 15.7 | [illegible] | [illegible] | [illegible] |
| 19 | 1.26 | 5.26 | 6.62 | 4.075 | [illegible] | 15.1 | [illegible] | [illegible] | [illegible] |
| 18 | 1.25 | 5.56 | 6.92 | 4.345 | 6.471 | 14.4 | 20.7 | .81 | [illegible] |
| 17 | 1.23 | 5.88 | 7.25 | 4.644 | 6.778 | 13.8 | 20.1 | .81 | [illegible] |
| 16 | 1.22 | 6.25 | 7.62 | 5.006 | 7.126 | 13.1 | [illegible] | [illegible] | [illegible] |
| 15 | 1.21 | 6.67 | 8.04 | 5.387 | 7.511 | 12.4 | [illegible] | [illegible] | [illegible] |

Weight of one gallon of Dry Red-Lead—75 pounds. Weight of one gallon of Dutch Boy Paste Red-Lead—[illegible] pounds.

One gallon of this paint contains [illegible]

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litharge mixed together in an effective way, while in low grade red-lead the litharge is present simply as the cores of comparatively coarse particles of red-lead.

Directions for Mixing.—Break up the Dutch Boy red-lead paste in the same manner as pure white-lead paste is broken up, adding pure linseed oil, a little at a time, and stirring it in thoroughly.

Formulas.—100 lbs. Dutch Boy red-lead paste measures 2.124 gallons. 1 gallon Dutch Boy red-lead weighs 47.08 lbs.

FORMULA No. 1

To prepare paint equivalent to 33 lbs. dry red-lead to the gallon of oil, use either of the following formulas:

| FORMULA No. 1-A | | FORMULA No. 1-B | |
|---|---|---|---|
| Dutch Boy Paste Red-Lead | 100 lbs. | Linseed Oil (Measured) | 1 gal. |
| Linseed Oil (Notes 1 and 2) | [illegible] gals. | Dutch Boy Red-Lead Paste | 50 lbs. |
| Quantity paint | 4.11 gals. | Quantity paint | [illegible] gals. |

One gallon of this paint contains 24.29 lbs. Dutch Boy paste red-lead and .48 gals. linseed oil (.5 commercial gals.)

FORMULA No. 2

To prepare paint equivalent to 28 lbs. of dry red-lead to the gallon of oil, use either of the following formulas:





| FORMULA No. 2-A | | FORMULA No. 2-B | |
|---|---|---|---|
| Dutch Boy Paste Red-Lead | 100 lbs. | Linseed Oil (Measured) | 1 gal. |
| Linseed Oil (Notes 1 and 2) | 2.5 gals. | Dutch Boy Red-Lead Paste | [illegible] lbs. |
| Quantity paint | 4.6 gals. | Quantity paint | [illegible] gals. |

One gallon of this paint contains 21.85 lbs. Dutch boy paste red-lead and .54 gals. linseed oil (.56 commercial gals.)

FORMULA No. 3

To prepare paint equivalent to [illegible] lbs. of dry red-lead to the gallon of oil, use either of the following formulas:

| FORMULA No. 3-A | | FORMULA No. 3-B | |
|---|---|---|---|
| Dutch Boy Paste Red-Lead | [illegible] lbs. | Linseed Oil (Measured) | 1 gal. |
| Linseed Oil (Notes 1 and 2) | [illegible] gals. | Dutch Boy Red-Lead Paste | [illegible] lbs. |
| Quantity paint | [illegible] gals. | Quantity paint | [illegible] gals. |

One gallon of this paint contains [illegible] lbs. Dutch Boy paste red-lead and .54 gals. linseed oil ([illegible] commercial gals.)

FORMULA No. 4

To prepare paint equivalent to [illegible] lbs. of dry red-lead to the gallon of oil, use either of the following formulas:

| FORMULA No. 4-A | | FORMULA No. 4-B | |
|---|---|---|---|
| Dutch Boy Paste Red-Lead | [illegible] lbs. | Linseed Oil (Measured) | 1 gal. |
| Linseed Oil (Notes 1 and 2) | [illegible] gals. | Dutch Boy Red-Lead Paste | [illegible] lbs. |
| Quantity paint | [illegible] gals. | Quantity paint | [illegible] gals. |

One gallon of this paint contains 18.71 lbs.

Dutch Boy paste red-lead and 5 gals. linseed oil (.62 commercial gals.)

NOTE 1. If genuine boiled linseed oil is available, such as our own Dutch Boy boiled oil, we advise the use of one-third boiled oil to two-thirds raw oil. If raw oil is used add one-half pint turpentine Japan drier to every gallon of paint.

NOTE 2. This is the full measured gallon, not the 7½-pound gallon which is always understood in the oil trade as a commercial gallon. To figure your paint in terms of the short commercial gallon substitute the following figures for the oil given: Formula No. 1, 5.66 gals. Formula No. 2, 2.67 gals. Formula No. 3, 3 gals. Formula No. 4, 3 1/3 gals.

Drier Needed.—Until the painting public becomes thoroughly familiar with this product do not let any occasion pass to call attention to the necessity of *using a drier* with Dutch Boy red-lead. It sets like white-lead and needs just about the same quantity of drier.

Field.—The big field of course is that of skyscrapers, bridges, steel vessels, railroad maintenance work, etc. But there is a lot of minor metal construction to be painted also. Some of this can be reached through the general painter. Some may be reached when calling on buyers in factories, for machinery often needs paint.



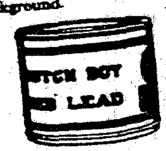


The farm trade can be reached through the dealer.

Selling Points.—The best selling points for Dutch Boy red-lead are to be found under "Its Advantages." There are one or two considerations, however, about these advantages which should be specially kept in mind. The engineer and architect have long been favorable to red-lead and the obstacles to its larger use have been chiefly two, namely, its cost and a belief that it was hard to use. But these objections are met in Dutch Boy red-lead. The salesman should at once familiarize himself (by demonstration if possible) with the various features enumerated which bear on its economy, viz., the elimination of waste, the saving of time both in mixing and spreading, the greater spreading capacity and finally the great durability. (The latter point is available as against other pigments, not against old style red-lead.) With many the sanitary feature will make a powerful appeal.

When selling to painters and trade generally the strong point is the transformation of this excellent pigment from an infrequently employed material into an easily-used, general-utility paint. It is as easily and conveniently used now as white-lead-in-oil, and painters will find it not only absolutely the best paint for that coats on iron fences, gallies, tin cornices, spouting, awning supports and all other miscellaneous metal work, but the solution also of many a problem in connection with wood and brick, if he will prime with it, either pure or mixed with white-lead. Advi- them especially to use it on pitchy woods, such as yellow pine and cypress. It will prevent the resinous substance from striking through. For occasional use in factory and on farm Dutch Boy red-lead will prove handy because it can be kept standing around ready to use.

Packages.—12½, 25, 50 and 100 lb. steel kegs, same as white-lead packages, only shorter, as Dutch Boy red-lead is less bulky. No oak packages are used, owing to absorption of oil. All packages net weight. The present container is red-lead in color with decorations in black. The head contains the special Dutch Boy red-lead brand (see cut) printed in black on the red-lead color background.




[illegible] IN A GALLON OF PAINT, IN DOLLARS

Measured Gallon. Add [illegible] to the Barrel Price

[illegible]

[illegible] but there is not much oxidation until the temperature is raised considerably. It is often

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Table showing the COST OF PURE RED-LEAD PAINT per gallon, of any specified mixture of red-lead and linseed oil as indicated by continuous horizontal lines; with current prices in the vertical lines. The cost of a gallon of paint is obtained by adding the cost of pigment in a gallon to the cost of oil in a gallon.

| Pounds of DRY PIGMENT in a Gallon of Paint | Pounds of PASTE RED-LEAD in a Gallon of Paint | Pounds of LINSEED OIL in a Gallon of Paint | WEIGHT of Paint, per Gallon | Pounds of DRY RED-LEAD in a Gallon of Oil | COST OF PIGMENT IN A GALLON OF PAINT, IN DOLLARS — Red-Lead Price per Pound, in Cents: 6c | 7c | 8c | 9c | 10c | 11c | 12c | 13c | 14c | Fraction of a Gallon of Oil in a Gallon of Paint | COST OF VEHICLE (OIL) IN A GALLON OF PAINT, IN DOLLARS — Linseed Oil Price per Measured Gallon. Add 3 1-3% to the Barrel Price: [illegible] | [illegible] | [illegible] | 70c | [illegible] | [illegible] | $1.00 | $1.10 | $1.20 | $1.30 | $1.40 | $1.50 | $1.60 | $1.70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

## LITHARGE

What It Is.—Litharge is a buff-colored pigment occurring both in granular and flake form. It is a monoxide of lead (PbO).

There are a number of grades of litharge. As a general thing, the uses to which the different grades are put have given rise to the names by which they are commercially known, thus: Glassmakers' Litharge, Colormakers' Litharge, Rubbermakers' Litharge, Varnishmakers' Litharge, Enamelers' Litharge, Potters' Litharge and Accumulator Litharge.

How Made.—Most of the production of litharge is made by calcining or roasting pig lead in specially constructed furnaces. The furnaces are called reverberatory furnaces because the heat is reverberated or thrown down from an arched roof upon the material being treated. The hearth or space where the oxidation takes place is about ten feet square. Fire boxes are at the sides. The arch is two-and-one-half to three feet above the hearth.

The process of manufacturing litharge is essentially as follows: About one-and-a-half to three tons of pig lead are placed in a furnace. At 621° Fahrenheit, the lead commences to melt but there is not much oxidation until the temperature is raised considerably. It is often

as high as 1800° Fahrenheit before oxidation
is complete.
While the lead is molten, it is constantly
stirred or rabbled with iron-handled hoes in
order to expose all parts of the lead to the
oxidizing action of the air. Gradually the con-
molten mass becomes granular and, with con-
tinued heat, all the lead is converted into
oxide. If the heat has been sufficiently intense
to render the oxide pasty, it will, when cool
and removed from the furnace, break down
into small, reddish-yellow flakes, known as flake
litharge.

The litharge, as drawn from the furnace, is
pulverized water-floated to free it from me-
tallic particles, and dried. During pulveriza-
tion, the litharge assumes a buff color.

The process of transforming metallic lead into
litharge requires from 24 to 36 hours. In that
time, with the temperature at from 1100° to
1800° Fahrenheit, the lead takes up all the
oxygen that it will hold in its present condition.
(See Red-Lead—How Made.)

Character and Qualities.—Litharge can be had
in either powder or flake form. It contains
approximately 93 per cent. lead and 7 per cent.
oxygen. Iron, copper, silver, silica and me-
tallic lead are sometimes present in small
amounts in litharge as it is sold commercially.





If the heat in the process of manufacture has not been properly regulated, litharge will also contain quite a little red-lead.

Under "How Used" will be found more detailed information as to the character and qualities of litharge.

How Used.—The various kinds of litharge differ principally in purity and fineness. Some uses require a pure and fine product. A poorer grade serves equally well for others.

*Glassmakers' Litharge*

Glassmakers' litharge is melted with silica and potash to make glass. It is used in flake form and must be exceptionally free from unoxidized metal.

*Colormakers' Litharge*

Colormakers' litharge (powdered) is dissolved in diluted acetic acid to form soluble salts. The salts are used in producing chrome yellow and chrome green. Litharge for colormaking must be of moderate fineness (extreme fineness not objectionable) and must give a nearly clear, clean solution when dissolved in acids.

Colormakers' litharge (flake) is used in the same manner as powdered litharge. It is preferred by some colormakers, but is not in great demand.

*Rubbermakers' Litharge*

Rubbermakers' litharge is used as an accelerator and controller in the vulcanization of rubber. It should be extremely fine and free from red-lead. In any considerable quantity rubbermakers' litharge cannot be employed for light-colored rubber.

*Varnishmakers' Litharge*

Varnishmakers' litharge (flake) is boiled with oil in the manufacture of varnish to give drying properties. Its flake formation permits of quick settling and easy clarification of the varnish. Soluble lead soaps are formed when flake litharge is dissolved in oil.

Varnishmakers' litharge (powdered) is used in the same way as flake litharge. In quality it should be about similar to colormakers' litharge, but a little finer.

*Potters' Litharge*

Potters' litharge is used for making a glaze for pottery. Briefly, the process is as follows: In its first stages, pottery is known as biscuit ware and is nothing more or less than burnt, formed clay. Biscuit ware is dipped in water-pulp made of litharge, clay, whiting and zinc oxide. A deposit is left on the surface of the pottery which, when fired, melts and forms a glaze. Litharge for potters should be exceed-





ingly pure. Iron and copper are the most injurious impurities. Because of its better suspension qualities, white-lead is more extensively used than litharge for glazing pottery.

*Enamelers' Litharge*

Enamelers' litharge is identical with potters' litharge both in character and use.

*Accumulator Litharge*

Accumulator litharge is used in the manufacture of storage batteries. With red-lead and diluted sulphuric acid, it forms a paste which is filled into metallic gratings, called "grids," and allowed to dry. After the paste becomes hard, the grids are placed in sulphuric acid and charged by electric currents, making positive and negative plates. Litharge for storage battery plates should be in powder form. It should be very pure and particularly free from copper and iron.

*Oil Refiners' Litharge*

Litharge is also used by oil refiners. Petroleum oil is refined with it in the following manner: The crude oil is run into large tanks, where it is treated with diluted sulphuric acid. It is then washed with water to remove the acid and other soluble impurities. Caustic soda solution in which litharge has been dissolved is agitated with the oil to remove sulphur. The sulphur combines with the lead, forming lead sulphide, which is removed by settling.

**Packages.**—Litharge is sold in 12½, 25, 50 and 100-pound kegs; also in 250 and 500-pound casks. Our litharge, powder and flake, is of the highest grade in every particular and can be relied upon to serve admirably the purpose for which it is intended.

## ORANGE MINERAL

**What It Is.**—Orange mineral is identical in composition with red-lead, but is rather paler in color, finer in texture, and lighter in weight.

**How Made.**—Orange mineral is made in the same way as litharge and red-lead except that the process starts with white-lead instead of pig lead. White-lead is calcined or roasted in a furnace and turns to orange mineral as it takes in oxygen and releases carbon and hydrogen.

**Character and Qualities.**—Orange mineral is similar in character to red-lead and has similar properties. It is finer than ordinary grades of red-lead, but the special grinding given to Dutch Boy red-lead makes it practically equal to orange mineral.

**How Used.**—Orange mineral is used chiefly in the manufacture of vermilions, printing ink and dipping paint. Its fineness, fluffiness and



high degree of oxidation make it especially desirable for these purposes.

**Packages.**—Orange mineral is sold usually in 500-pound barrels, in 200 to 300-pound casks and in 1,000-pound casks. Smaller quantities can be supplied if desired. Our orange mineral can be guaranteed to be as good as, if not better than, any orange mineral on the market.

## DUTCH BOY FLATTING-OIL

**What It Is.**—Dutch Boy flatting-oil is a vehicle specially prepared for use with white-lead to produce durable and artistic flat effects, particularly for interiors. It is the result of much careful study, both from a scientific and practical standpoint. It is not a "turpentine substitute." It is a combination of pure vegetable [illegible] oils, to which turpentine and high-grade [illegible] oils have been added as volatile thinners. It contains no wax, [illegible], rosin, or [illegible] substances. When fresh the oil is pale yellow in color, but after standing a while it assumes a greenish tint, which is desirable because it tends to give a whiter tone to the paint.

**What It Does.**—Mixed in right proportions with white-lead, Dutch Boy flatting-oil makes an oil paint which really flats and which is soft in finish, silken in texture, and truly washable.

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It is also extremely workable, flowing out smoothly and easily, and giving a finish free from brushmarks, laps, joints, or streaks.

Why It Excels—1.—Soft Finish—The finish produced by Dutch Boy flatting-oil is a soft, dull flat with a depth of tone which most flat paints lack.

2.—Tenacity—Dutch Boy flatting-oil has a double value, for it flats white-lead better than turpentine does yet binds with the tenacity of linseed oil.

3.—Truly Washable—The surface produced is truly washable. It washes as well after a year's service as it does when first applied. This cannot be said of the ordinary flat wall paint, which may wash fairly well when new, but streaks when old, due to chemical changes in the pigment. White-lead does not change and therefore does not streak when washed.

4.—Any Desirable Tint—Paint made of white-lead and Dutch Boy flatting-oil is white, but any color desired can be matched exactly by the addition of tinting matter in the same way that paint made of white-lead and linseed oil is tinted. Every popular finish, from dead flat to egg-shell gloss, can be had simply by adding linseed oil.

5.—Stippling—The paint lends itself naturally to stippling.



with Dutch Boy flatting-oil than with other thinners.

COMPARATIVE COSTS PER SQUARE FOOT OF FLAT WALL PAINTS

(Figures based on white-lead at $13.00 to $10.00 per 100 pounds and flatting-oil at $1.[illegible] per gallon.)

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| Cost of white-lead per 100 Lbs. | Cost of flatting-oil per Gal. | Formula No. 1: Cost of Paint per Gal. | Formula No. 1: Cov. Cap. in Sq. Ft. per Gal. | Formula No. 1: Cost per 100 Sq. Ft. | Formula No. 2: Cost of Paint per Gal. | Formula No. 2: Cov. Cap. in Sq. Ft. per Gal. | Formula No. 2: Cost per 100 Sq. Ft. | Formula No. 3: Cost of Paint per Gal. | Formula No. 3: Cov. Cap. in Sq. Ft. per Gal. | Formula No. 3: Cost per 100 Sq. Ft. | Formula No. 4: Cost of Paint per Gal. | Formula No. 4: Cov. Cap. in Sq. Ft. per Gal. | Formula No. 4: Cost per 100 Sq. Ft. | Formula No. 5: Cost of Paint per Gal. | Formula No. 5: Cov. Cap. in Sq. Ft. per Gal. | Formula No. 5: Cost per 100 Sq. Ft. | Other Flat Wall Paints: Cost per Gal. | Other Flat Wall Paints: Cov. Cap. in Sq. Ft. per Gal. | Other Flat Wall Paints: Cost per 100 Sq. Ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $13.00 | $1.[illegible] | $3.[illegible] | 750 | $.[illegible] | $3.[illegible] | 750 | $.[illegible] | $3.1111 | 750 | $.3[illegible] | $2.[illegible] | 800 | $.3419 | $2.7164 | 850 | $.3[illegible] | $[illegible] | 400 | $.[illegible] |
| 12.75 | 1.[illegible] | 3.[illegible] | 750 | .4[illegible] | 3.0704 | 750 | .3[illegible] | 2.9640 | 750 | .3873 | 2.7639 | 800 | .3419 | 3.0790 | 850 | .3600 | [illegible] | 400 | [illegible] |
| 12.50 | 1.[illegible] | 3.[illegible] | 750 | .4107 | 2.9978 | 750 | .3900 | 2.9168 | 750 | .3813 | 2.7166 | 800 | .3364 | 3.0004 | 850 | .3100 | [illegible] | 400 | [illegible] |
| 12.25 | 1.[illegible] | 3.[illegible] | 750 | .4118 | 2.9[illegible] | 750 | .3897 | 2.7730 | 750 | .3664 | 2.6743 | 800 | .3310 | [illegible] | 850 | .3100 | [illegible] | 400 | [illegible] |
| 12.00 | 1.[illegible] | 2.9[illegible] | 750 | .40[illegible] | 2.[illegible] | 750 | .3742 | 2.7300 | 750 | .3496 | 2.6011 | 800 | .3196 | [illegible] | 850 | .3[illegible] | [illegible] | 400 | [illegible] |
| 11.75 | 1.[illegible] | 2.[illegible] | 750 | .3972 | 2.7[illegible] | 750 | .3667 | 2.6790 | 750 | .3460 | 2.5574 | 800 | .3205 | 2.8001 | 850 | .3[illegible] | [illegible] | 400 | [illegible] |
| 11.50 | 1.[illegible] | 2.8[illegible] | 750 | .3[illegible] | 2.7[illegible] | 750 | .3601 | 2.6636 | 750 | .3376 | 2.5437 | 800 | .3146 | 2.6077 | 850 | .3[illegible] | [illegible] | 400 | [illegible] |
| 11.25 | 1.[illegible] | 2.7730 | 750 | .3[illegible] | 2.6617 | 750 | .3566 | 2.5870 | 750 | .3317 | 2.[illegible] | 800 | .3094 | [illegible] | 850 | .3[illegible] | [illegible] | 400 | [illegible] |
| 11.00 | 1.[illegible] | 2.7[illegible] | 750 | .3707 | 2.[illegible] | 750 | .3501 | 2.5407 | 750 | .3257 | 2.4548 | 800 | .3040 | 2.6947 | 850 | .3[illegible] | [illegible] | 400 | [illegible] |
| 10.75 | 1.[illegible] | 2.6710 | 750 | .3[illegible] | 2.[illegible] | 750 | .3436 | 2.4944 | 750 | .3196 | 2.4136 | 800 | .2986 | 2.6400 | 850 | .3[illegible] | [illegible] | 400 | [illegible] |
| 10.50 | 1.[illegible] | 2.[illegible] | 750 | .3615 | 2.[illegible] | 750 | .3370 | 2.4481 | 750 | .3136 | 2.3[illegible] | 800 | .2932 | 2.5913 | 850 | .2700 | [illegible] | 400 | [illegible] |
| 10.25 | 1.[illegible] | 2.[illegible] | 750 | .3542 | 2.4[illegible] | 750 | .3306 | 2.4019 | 750 | .3070 | 2.3[illegible] | 800 | .2878 | 2.5354 | 850 | .2704 | [illegible] | 400 | [illegible] |
| 10.00 | 1.[illegible] | 2.[illegible] | 750 | .3478 | 2.4[illegible] | 750 | .3250 | 2.3556 | 750 | .3000 | 2.2815 | 800 | .2824 | 2.5100 | 850 | .2654 | [illegible] | 400 | .5000 |

[illegible]



[illegible]—Economical from Every Viewpoint—The paint is cheaper than the ordinary flat paint, not only in final cost but in first cost as well. Fewer gallons of paint are needed and the painter can cover more surface per day. (See table of comparative costs on page 64A.)

[illegible]—Sets Slowly—The paint sets slowly so that the painter is able to work on large areas. He does not have to rush the work down the wall in order to avoid laps. In painting a door or paneled woodwork, where formerly the painter was compelled to cut in panels, mouldings and stiles separately, he can now carry all the work along. As the paint does not dry [illegible] same time, the painter can clean off any [illegible] on the woodwork without any loss of [illegible].

[illegible]—Dries Hard—The paint dries to a hard [illegible], ready for the application of a second coat within a reasonable length of time—24 to 48 hours.

[illegible]—Inoffensive Odor—The odor of the paint is not offensive and the painter is able to work in a closed room, if obliged to, without discomfort.

[illegible]—Superior Undercoating—A better surface for subsequent gloss coats can be produced with Dutch Boy flatting-oil than with other thinners.

### Brick

Brick varies greatly in its porosity and presents much the same problem as plaster. The best practice is to paint first with boiled linseed oil and white-lead paint properly tinted and thinned to some extent with turpentine to get proper penetration.

### Stone

Stone is ordinarily only slightly porous, and is readily painted. An undercoating of boiled linseed oil and white-lead, thinned with turpentine, is usually satisfactory.

Formulas.—The formulas which follow are designed to meet average conditions. Plenty of time should be allowed for each coat to dry. At least twenty-four hours should be allowed between coats and forty-eight hours will make a better job.

### *New Plaster Walls (Inside)*

Priming Coat

100 pounds (2.81 gals.) Dutch Boy White-Lead
7 gallons pure kettle-boiled linseed oil
1 gallon pure turpentine
(or)
100 pounds (2.81 gals.) Dutch Boy White-Lead
7 gallons pure raw linseed oil





1 gallon pure turpentine
[illegible] pints drier

(These formulas make about 11 gallons of paint and will cover about [illegible] square feet one coat.)

How far any paint will spread depends, of course, a good deal on the condition of the surface and also on the workman. This figure and those which follow are at best, therefore, only approximate, but as all the estimates are based on practical tests, they will be found to be a fair average.

In dealing with porous or "hot" walls, it is oftentimes desirable to modify the priming coat formula by replacing some of the linseed oil with varnish.

When an impervious varnish or sizing coat has been used, no priming coat is required.

If the priming coat does not properly fill and seal the wall surface, the body coat formula should be altered by replacing some of the flatting-oil with raw linseed oil and adding enough drier to dry the linseed oil.

Body Coat

100 pounds (2.81 gals.) Dutch Boy White-Lead
2 to 3 gallons Dutch Boy Flatting-Oil
(This formula makes from 5 to 6 gallons of

paint and will cover from 3,800 to 4,800 square feet, one coat.)

### Finishing Coat—Flat

100 pounds (2.81 gals.) Dutch Boy White-Lead
2 to 3 gallons Dutch Boy Flatting-Oil
(This formula makes from 5 to 6 gallons of paint and will cover from 3,800 to 4,800 square feet, one coat.)

### Finishing Coat—Eggshell Gloss

100 pounds (2.81 gals.) Dutch Boy White-Lead
¼ gallon light enamel varnish
1½ to 2 gallons Dutch Boy Flatting-Oil
(This formula makes from 5 to 5½ gallons of paint and will cover from 3,800 to 4,800 square feet, one coat.)

### *Two-Coat Work*

Three-coat work is recommended for all interior painting. It happens not infrequently nowadays, however, that a two-coat job is desired. In such cases it will be found that good results can be obtained by using simply the priming and finishing coats given above, omitting the body coat. To make two coats cover properly, the first coat should be made a little darker than the second coat.





### *Special Finishes for Wood (Inside)*

#### White (Flat or Eggshell Gloss)

For flat or eggshell gloss finish over a suitable undercoating on woodwork, use proper formula for finishing coat as given under "New Plaster Walls (Inside)."

#### Ivory Finish

For ivory finish, tint last coat with suitable colors-in-oil to give desired shade.

### *Flat Finishes for Brick (Outside)*

#### Milwaukee Finish

For flat Milwaukee finish for outside brick, stucco, or stone over a suitable undercoating, the formula for Finishing Coat—Flat, given under "New Plaster Walls (Inside)," makes a paint which is superior to a turpentine flat [illegible]. The paint is improved by the addition of a suitable quantity of raw linseed oil and the necessary drier.

#### Brick-Red Finish

For flat brick-red finish for outside brick over a suitable undercoating, the color thinned with Dutch Boy flatting-oil makes a better paint [illegible] when thinned with turpentine.

### *Repainting Plaster Walls (Inside)*

Before repainting, walls should be carefully cleaned and repaired. If the work is to be done over old paint having a high gloss, the surface should first be roughened with sand-paper.

No priming coat is necessary in repainting. For body and finishing coats, use formulas as for "New Plaster Walls (Inside)."

Tinting.—In making paint from white-lead and Dutch Boy flatting-oil, the same practice is followed as in making paint from white-lead and linseed oil. The oil is added a little at a time, the paint being stirred constantly. Tinting should be done only with high-grade colors-in-oil or the best Japan colors, all colors being thinned to spreading consistency, before adding, with Dutch Boy flatting-oil. If the colors used are rich in oil and a large amount of colors is required, some of the oil should be drawn off before the colors are added to the paint. Drier is sometimes needed where colors rich in oil are used.

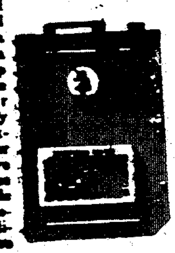
Care of Oil.—Dutch Boy flatting-oil contains oil varnish, so that if this flatting-oil is exposed to the air it tends to absorb oxygen and the oil varnish contained in it may, if the exposure is long enough, become insoluble in the volatile thinner present. It is therefore important to keep air away from Dutch Boy flatting-oil. In other words, the containers in which it is kept should at all times be kept





tightly stoppered and sealed. A certain amount of oxidation can take place without impairment of the oil, but if the oxidation goes too far the oil becomes worthless.

Packages.—Dutch Boy flatting-oil is sold in 1 and 5-gallon cans and in barrels holding about 50 gallons. The cans are similar in shape to our Dutch Boy linseed oil packages. The label is printed in orange on a black background with a band stripe at the top and bottom and the Dutch Boy Painter trademark prominently displayed. The packages are attractive for store display and have great advertising value in that they resemble our Dutch Boy white-lead kegs. Complete directions for use are printed on each label.



## GENERAL PAINTING INFORMATION

How Far Should Paint Spread?—A gallon contains 231 cubic inches. If a gallon of paint were to be laid on an inch thick, it would obviously cover a surface of 231 square inches (about 1-2/3 square feet). Also obviously, if it were laid on one-half inch thick, it would cover twice that area or 462 square inches (about 3.2 square feet). This process carried out upon a practical painting basis, gives the results shown in the following table:

| Average thickness of coating | | Spreading rate in square feet per gallon |
|---|---|---|
| 1/100 inch | | [illegible] |
| 1/200 " | | [illegible] |
| 1/300 " | | [illegible] |
| [illegible] " | | [illegible] |
| [illegible] " | | [illegible] |
| [illegible] " | | [illegible] |
| 1/700 " | | [illegible] |
| 1/800 " | | [illegible] |
| [illegible] " | | [illegible] |
| [illegible] " | " | 900. |
| [illegible] " | " | 1200. |
| [illegible] | | |

It is difficult to say how thick a coat of paint should be. For protective purposes the total film should not be less than 1/300 of an inch. This would mean three coats of not less than 1/900 inch each.

Referring to the foregoing table, we find a gallon of paint will spread over [illegible] square feet with a thickness of 1/900 of an inch. This calculation is based upon the supposition of





perfect conditions. In practice, due to the inequalities of the surface and the workmanship, the ridges and valleys formed by the brush marks, the absorption into the cracks, etc., the actual spreading rate will be reduced about one-half—perhaps to 400 square feet.

Provided a thinner coat than 1/900 of an inch, with a consequent greater spread, would give sufficient hiding power, would it be desirable? No, for it would not give sufficient protection. Every paint contains a certain quantity of volatile matter; for instance, turpentine drier. Suppose a gallon of paint containing a quart of volatile thinner is spread so as to cover 400 square feet. Reference to our table shows that the coat would be 1/[illegible] of an inch thick, but after the volatile matter had evaporated, the volume and therefore the thickness would be reduced by 25 per cent. Then we would have a coat only 1/[illegible] of an inch thick.

From this it will be seen that paint must be spread heavy enough to leave a sufficiently thick coat after the volatile matter has evaporated.

The late Dr. Dudley, a well-known authority, believed that a paint coat, after evaporation of volatile substances, should consist of one volume of pigment to two volumes of vehicle. One gallon of dry white-lead mixed with two gallons of oil would be a durable formula, but would give too thick a paint to spread properly. For practical use it must be thinned out (say with a gallon of turpentine), but in spreading it should be borne in mind that the volatile thinner would then comprise one-quarter the volume and that the paint coat should be thick enough to allow for that 25 per cent. evaporation without injury.

**Proper Proportions of Pigment and Vehicle.**—It cannot be questioned that some painters use too high a percentage of linseed oil as compared with the amount of pigment. At 12½ cents a pound, a gallon of average white-lead paste will cost about $4.38. With linseed oil at, say $1.20 a gallon, naturally, the more oil, the cheaper the paint. But if a painter is willing to lessen the value of his paint by mixing in too much vehicle, why not carry the process to the logical conclusion and mix in adulterants that are even cheaper than linseed oil? If a painter is really anxious to get the best possible results, it is probable that the dried film, after the volatile substances have evaporated, should contain one part pigment to two parts vehicle, as Dr. Dudley, mentioned above, prescribed.

We believe that the life of the paint is in neither the white-lead nor the linseed oil, but rather in securing the proper proportion of the





two. The farther away from this proper proportion the painter gets, the less protection he will give to the painted surface.

**TABLE OF COMPARISONS**

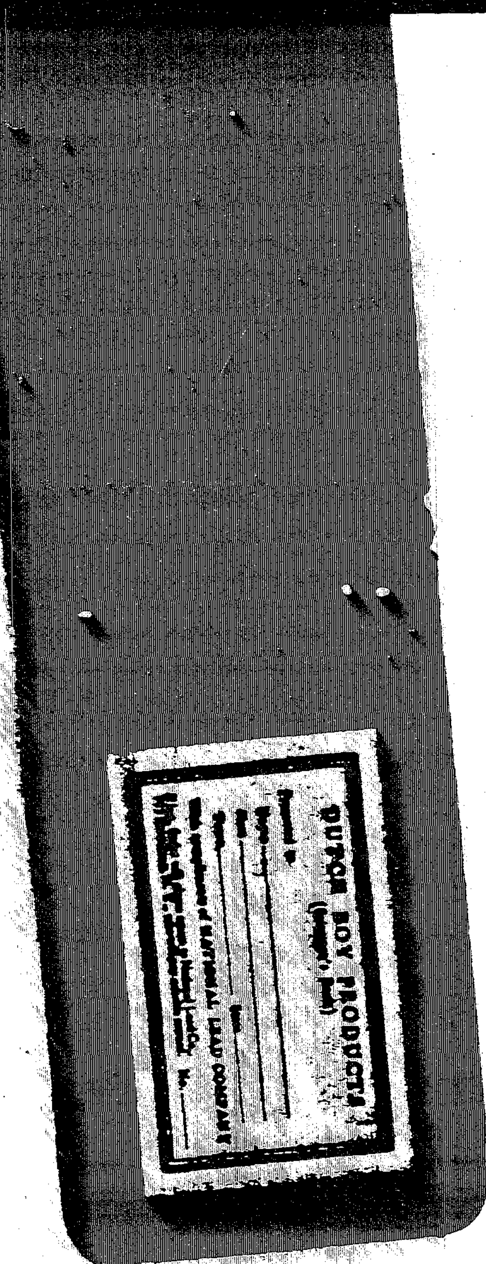
(All pigments dry unless paste is specified)

| Pounds | Of Average | Equals |
|---|---|---|
| [illegible] | White-lead | 1 gallon |
| [illegible] | White-Lead Paste | " |
| [illegible] | Basic Lead Sulphate | " |
| [illegible] | Red-lead | " |
| [illegible] | Zinc-oxide | " |
| [illegible] | Lithopone | " |
| [illegible] | Barytes | " |
| [illegible] | Calcium Carbonate | " |
| [illegible] | [illegible] | " |
| [illegible] | China Clay | " |
| [illegible] | [illegible] | " |
| [illegible] | Chrome Yellow—[illegible] | " |
| [illegible] | Chrome Yellow—[illegible] | " |
| [illegible] | Chrome Yellow—Medium | " |
| [illegible] | [illegible] | " |
| [illegible] | Chrome Green—Dark | " |
| [illegible] | Chrome Green—Light | " |
| [illegible] | [illegible] | " |
| [illegible] | [illegible] | " |
| [illegible] | [illegible] Ochre | " |
| [illegible] | [illegible] | " |
| [illegible] | [illegible] | " |
| [illegible] | [illegible] | " |
| [illegible] | [illegible] | " |
| [illegible] | [illegible] Black | " |
| [illegible] | [illegible] | " |
| [illegible] | Linseed Oil | " |

## General Data

**Weights and Measures.**—Paint and paint vehicles are usually referred to in terms of gallons. Pigments are referred to in terms of pounds. Consequently, the foregoing table of comparison should be useful.

The volume of any paint is equal to the aggregate volume of its components. Many persons think that loss of volume takes place in mixing, but this is not true, so far as concerns any of the ingredients which are used in paint. It is true, of course, in cases where evaporation, leakage and spilling occur.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