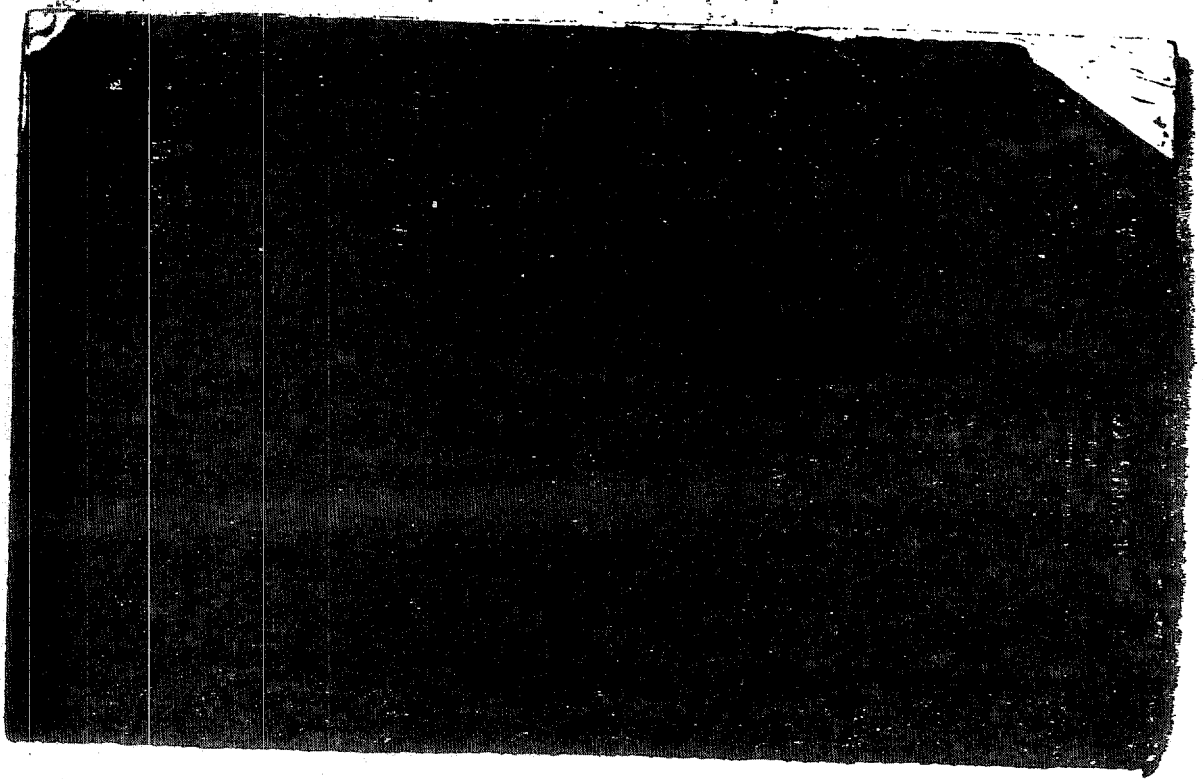




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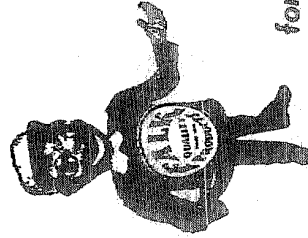
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FOR

Many technical authorities of the materials and services rendered by the Scientific Varnish & Lacquer Assoc.

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THE PAINT SECTION

What is paint?

A mixture of opaque or semi-opaque substances (pigments, or finely divided metals, commonly known as "bronze powders") with liquids, suitable for application to surfaces by means of a brush or a spray painting machine or by "dipping," "roller-coating" and solidifying ("drying") to form an adherent protective and/or decorative coating thereon.

What is the purpose of paint?

To protect or to decorate surfaces, or to improve chemical resistance and for many other purposes.

What additional services does paint render?

It is a sanitary agency and a preventive of decay and corrosion. In white or light tints, it reflects and diffuses light, thus reducing the cost of interior illumination and eliminating eye strain. As traffic paint it reduces accidents.

What is House Paint?

Paint designed to protect and beautify the surfaces of materials used in the construction of buildings—especially of dwellings.

What is the best House Paint?

That which best and longest protects and beautifies the surfaces to which it is applied.

What materials are used in making House Paints?

Pigments, drying and semi-drying oils, volatile "thinners" and solvents, driers ("japans") and varnishes.

How may such pigments be classified?

As white "bases," inert or "extender" pigments, natural earth colors, chemical colors or dyes, lake colors, etc.

What are the white colors?

White lead: the basic (several varieties), basic lead, zinc oxide ("American Process"), leaded zinc (of lead sulphate, 5% there are four types), titanium combined with a definite antimony oxide or coated

What is Basic Carbonate White?

A compound of lead, composition of basic carbonate considered to be $2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$ of present knowledge a modern scientific instrument to be a mixture of the following:

- (1) $4\text{PbCO}_3 \cdot 2\text{Pb(OH)}_2$
- (2) $2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$
- (3) PbCO_3

The process of manufacture hence the name "Old Dutch."

The American procedure Lead is melted and cast into "buckles." The buckles, diameter, are placed in one pint of dilute 3% acid are placed in rooms holding to 1000 pots each. The and layers of tanbark rooms, technically called ing a period of about 1 acid generated by ferments with the acid vapors, convert a basic carbonate white lead.

This, after it is crushed water, and dried, forms is sold in the dry state to or ground in linseed oil purposes.

What is "Carter" Process?

In this process melted by a jet of air or super lead is charged into la

wooden cylinders, and subjected during 10 to 12 days to the action of air and purified carbon dioxide gas from burning coal. The white lead produced by this process is finer in particle, and somewhat whiter and more uniform than Dutch Process white lead.

What is Electrolytic White Lead?

Lead plates—Anodes—suspended in a solution of Sodium Acetate containing a trace of Sodium Carbonate, and iron plates—cathodes—suspended in a solution of Sodium Carbonate, and the two solutions separated by a fabric diaphragm, form an electrolytic cell. On application of the electric current the lead dissolves as lead acetate at the anode and is precipitated immediately in the anolyte as basic lead carbonate. It is then carried in suspension by the flow of anolyte through the cell to a "settler." The clear anolyte returns to the cell. The settled white lead is filtered, washed and dried. The carbonate ions that are removed from the catholyte, by migration through the diaphragm, to precipitate the white lead, are replaced by carbonation of the catholyte external to the cell.

The product is a very pure, brilliantly white and finely divided pigment.

What is Euston White Lead?

Euston White Lead is made by a unique chemical process. Basic lead acetate solution is first prepared by dissolving lead oxide, formed on the surface of highly purified, feathered lead through the action of air, in normal lead acetate solution.

This basic solution is clarified and treated with CO_2 whereby the basic portion is precipitated as white lead. The white lead is separated from the normal lead acetate solution remaining and washed, dried, pulverized and packed dry or ground in oil.

The strict control possible is responsible for the exceptional purity and clean white color of Euston White Lead.

What are the characteristics of Basic Carbonate White Lead?

It is a reactive white pigment which disperses readily in linseed oil and other "drying oils" and stimulates their drying. It works easily under the brush to form an opaque white film having excellent durability and water

resistance. Being a reactive white lead reacts with the vehicle in the film to form lead carbonate which stabilizes the film and increases its life. The lead soaps are flexible mesh like fibers in cloth, films containing white lead

What is Thompson-Stewart Process?

This is a precipitated white lead of very fine particle size produced by the Thompson-Stewart process.

A mixture of finely divided lead, formed by agitating lead in a furnace, is charged into a tank where it forms a slurry. A small portion of the batch is removed after which the batch is agitated, and basic carbonate white lead is produced.

The white lead produced by this process is the most basic in commercial production and is very flexible and can produce a white lead within the formula $4\text{PbCO}_3 \cdot 2\text{Pb(OH)}_2 \cdot \text{PbO}$.

The outstanding characteristics of this process are extremely hiding power, and desirable

What is Pulp Ground White Lead?

Basic carbonate white lead is settled in tanks, and the residue is called "pulp lead." The pulp is dried by heat. Later the pulp for oil was utilized to disperse the pigment in oil. The moist pigment is then mixed in a type mixer, and the dispersion process is more economical and results in a more uniform product.

What is Basic Silicate White Lead?

Basic Silicate White Lead is a development of the National Lead Company's new pigment containing silicate.

By means of a dry process, lead sulfate is reacted with silicate to form a pigment comprising a silicate

and monobasic lead sulfate firmly bonded to a silica core. The resulting pigment has a reactive surface with the same ability to form lead soaps as basic carbonate white lead. The bulking value of basic silicate white lead 45X offers a distinct advantage compared with other reactive pigments. A solid gallon of basic silicate white lead 45X weighs 33.3 lb. compared with basic carbonate white lead's 56.0 lb. per gallon.

What is Red Lead and Orange Mineral?

An orange-red pigment composed principally of Pb_3O_4 . It is made by heating litharge as metallic lead in a special furnace at 900-950° F.

Orange mineral is a special grade of red lead produced by calcining basic carbonate white lead.

The usual grades of red lead used in paint are classified as 85%, 95%, 97%, and 98% red lead; the remainder is mainly PbO (Lead Oxide).

Red Lead produces an excellent rust inhibitive, metal protective coating, widely used for painting iron and steel.

What is "Sublimed" or Basic Sulphate White Lead?

This product is so named because it is obtained by a sublimation process or 'fume' process from lead sulphide (galenite or 'galena') ores by a process analogous to that used to produce American zinc oxide and leaded zincs. The product is obtained directly as a very fine, impalpable white powder, without grinding. Chemically, it is different from ordinary white lead, being apparently a basic sulphate of lead and . . . has approximately the following constitution:

Lead sulphate	77%
Lead oxide	15%
Zinc oxide	8%

It exceeds in the fineness of the particles the basic carbonate grades of white lead, and is at least equal to them in whiteness, body, covering power and wearing qualities. It differs from basic carbonate white leads in being less poisonous, and resists the blackening action of the sulphur compounds of sewer gas and of fuel gas to a much greater degree.

The lead sulphate and lead oxide are chemically combined in sublimed white lead, forming the true basic sulphate (approximately $Pb_3 S_2 O_9$). This chemical

combination of the sulphur compound explains the high pigment possesses. Its physical properties are far superior to that of pigment obtained from the normal lead carbonate, because it is crystalline. The zinc oxide present in small amount of zinc sulphate used in its manufacture.

What are the characteristics of sublimed lead?

Like all pigments produced by sublimation, sublimed lead possesses properties far superior to that of pigments produced by other means. On account of the extreme fineness of the particles, it does not settle out of liquid media, it resists the discoloring action of other harmful gases in the atmosphere, and it is more stable than any other lead pigment.

It reacts less strongly with the "drying oils." When used in more freely than corrode the metal, manufacturers to introduce counteract the tendency.

What is Sublimed Blue Lead?

A sublimation product of lead, the process of manufacture and what different compositions are used in its analysis follows:

Lead sulphate	
Lead oxide	
*Carbon	
Zinc oxide	
Lead sulphite	
*The carbon comes from	

What are the characteristics of sublimed blue lead?

Bring a "fume" process, it is high (more than twice) in covering power, is as high as that of other pigments in suspension and brush application, and more than most lead pigments in linseed oil and is not attacked by Official tests place it in the class of "inhibitors."

What is Zinc Oxide?

Zinc oxide (ZnO) is a compound of zinc and oxygen available in commercial form as an extremely fine white powder. One of the principal uses of zinc oxide is as a pigment in protective coatings. Pigment zinc oxide is manufactured by burning the vapors of metallic zinc in a suitable combustion chamber, cooling the resultant white fume in a system of flues and filtering through fabric bags which collect the zinc oxide and permit the combustion gases to escape to the atmosphere. The metallic zinc vapors are provided by two well-known processes. In the French Process, metallic zinc vapors are obtained by distilling the zinc in suitable retorts. In the American Process, a mixture of calcined zinc ore and fuel, usually anthracite coal or coke, is burned in a suitable furnace in which the zinc is volatilized and burned directly to zinc oxide. The flexibility of these processes has enabled manufacturers to develop a wide variety of grades of zinc oxide to meet the many needs of the paint industry. (N. J. Zn. Co.).

What are the characteristics of Zinc Oxide?

In particle size, it is one of the finest of all pigments, ranging from 0.1 to 0.5 microns in diameter. The particle shape of zinc oxide as viewed under a high-powered microscope varies over a wide range from round or nodular shapes to acicular or needle-like shapes. Zinc oxide is one of the whitest pigments. It is opaque to ultra-violet light and when incorporated in a paint, protects the film from the destructive action of the ultra-violet rays in sunlight. While zinc oxide contributes to the hiding power of paint, other properties are of more importance. It is not discolored by the sulphur gases in the atmosphere and is, therefore, considered as a fume-proof pigment. It is also non-poisonous. Zinc oxide is used as a preventive for mildewing, yellowing and also contributes to the hardness of paint films. Zinc oxide is a very valuable pigment in controlling the checking, chalking and dirt retention of exterior paint films, and is used in moderate amounts in many other types of coatings: in metal protective paints, for rust inhibition . . . in enamels, for minimum yellowing . . . in alkyl flats, for greater scrub resistance. (N. J. Zn. Co.).

What are Lead Zinc Oxides?

Lead zinc oxides are made from zinc ore and lead sulphide. When the lead and zinc are fused together in this manner, the result is a co-fused lead zinc oxide, present as basic lead sulphate and white lead. Lead zinc oxide is a basic sulphate white lead, a 35% lead zinc oxide produced by blending zinc oxide and white lead, both of which have been used in zinc oxide is primarily used in white paints.

What are the characteristics of Lead Zinc Oxides?

They are widely used in white paints not only provide a covering power, but also zinc oxide and white lead, and weathering properties.

Their hiding power and exterior house paints and similar mixtures of white.

What is Zinc Sulfide?

The chemical formula is ZnS . The most readily produced by passing a solution of zinc sulfate solution with a solution of sodium sulfide, washing and calcining the product. It is a constituent of lithopone, and has a good hiding power.

What are the characteristics of Zinc Sulfide?

This pigment finds special use in white paints for its hiding power and dense covering. It also imparts resistance to fading and retention and resistance to fading.

What is "Lithopone"?

Normal lithopone, a white pigment, is produced by precipitation of zinc sulfide and zinc sulfate. The

strongly calcined to develop optimum pigment properties.

A modification of this pigment is "titanated" lithopone—a blend of about 15% TiO_2 and 85% normal lithopone.

What are the characteristics of Lithopone?

Lithopone, first made in this country around the turn of the century, is used in large tonnages by the paint industry—not only for its good hiding power but also for the special properties it adds to finishes.

In wall coatings based on latex, resin-emulsions or casein, lithopone is widely used because it imparts can stability, more freedom from lap marks and color floating, and greater resistance to washing. In oleoresinous primer-sealers and flats, that pigment gives added density, enamel holdout and scrub resistance.

It is the principal pigment in many metal primer-surfacers for automobiles and the like, in which good sanding properties are essential. Its firm bonding with vehicles likewise adds to the wear resistance of traffic paints and porch-and-deck enamels. In the latter, lithopone also provides excellent tint retention and marked resistance to color floating. Lithopone is still used in large tonnages.

What are the Titanium Pigments?

Primarily titanium dioxide (TiO_2). The pure oxide is obtained chiefly from ilmenite, a mineral containing approximately 47 per cent iron and 53 per cent titanium dioxide. While deposits are found in various parts of the United States and in Canada, the chief commercial sources of supply are Travancore Beach, India, and Norway. Domestically, there are large deposits in New York State and in Florida. By chemical treatment the iron is removed and the pure dioxide precipitated. This pure oxide is marketed under various trade names. "Reduced" grades (usually designated as "C") containing calcium sulphate, are also consumed in large quantities.

The pure or unreduced Titanium Dioxide is manufactured in two crystal types—Anatase and Rutile. The Anatase pigment is lower in specific gravity, somewhat bluer in color, and less chalk resistant than Rutile. The

Rutile types range from moderate to high specific gravity depending on the treatments and in their manufacture. They are bluish than Anatase, higher in opacity and tinctorial strength, more suitable for exterior finishes, more resistant to weathering, and more resistant to chalk resistance and tint retention.

What are the characteristics of

Extreme fineness of particle (—4.25), brilliant whiteness and alkali resistance, inertness in lacquer ingredients. They are used in industrial finishes, lithographic cellulose lacquers, enamels, etc.

What is an "Inert" or "Reinforcing"

Properly speaking any pigment which is chemically inert with any of the "non-reactive pigments." In carbon black, lamp black, graphite, "chrome green", etc., are "inert," however, is usually colorless natural "extenders" to paints for various technical purposes. They provide the solid base on which the chemical lake colors and active pigments in the paint are based. Percentages of magnesium silicate may be added to white lead to give it excessive spreading rate (thickening the paint film) or to give it resistance to alkali (magnesium silicate or silicate bases). It will be noted that the inert pigments are colorless themselves.

Note: The inert pigments are often used intensively to adulterate the

What Inert Pigments are in

Barium sulphate ("baryte white") silica (silica, diatomaceous earth, silicate (asbestine, "nytal") tated alumina, kaolin, alu-

phate (gypsum, terra alba, "burnt gypsum" or "anhydrite,") calcium carbonate (ground limestone), Paris white, whiting, etc. In the calcium carbonate group a "coated" precipitated type has recently been introduced which increases lustre and flow and eliminates brush marks at high pigment concentration in paints and enamels. In addition it reduces absorption by porous surfaces.

What is Barium Sulphate or Barytes?

Chemically, one atom of barium combined with one molecule of sulphuric acid (BaSO_4) in which the barium replaces the two atoms of hydrogen in the acid (H_2SO_4). It is a widely distributed mineral. The principal American sources are Missouri, Arkansas, Tennessee, North Carolina and Virginia. Preparation consists essentially in grinding, removing impurities in an acid bath, thorough washing and bolting or sedimentation. *Blanc fixe* is produced by precipitation from solution of a soluble barium salt by means of a soluble sulphate. The process is similar to that for lithopone. In the preparation of some of the more permanent lakes barium sulphate is precipitated simultaneously with the "striking" of the color. The union of "base" and "stainer" is thus more intimate, forming what is known as a "lake color." The best chemical "chrome greens" are thus produced.

What are the characteristics of Barium Sulphate?

Extreme chemical stability. As a pigment it is, in the full sense of the term, inert. Being practically colorless in oil it has no modifying effect on the color of other pigments. It is therefore an excellent means for diluting highly colored pigments without modifying their tone; for diluting chemically active pigments and thus prolonging the life of the paint film; for modifying the spreading rate of the finely divided pigments, thereby increasing film thickness. Used in moderate percentages with white lead or zinc oxide it is held by many authorities to increase durability. The heavy weight of these pigments has a tendency to cause hard settling upon storage.

What is Silica or Silox?

It is an oxide of the metalloid, Silicon, containing one

atom of the latter and two of oxygen. It is one of the most abundant "crust," existing in many forms: crystal, amethyst, quartz or opal, etc. It also occurs in extraneous earth—"kieselguhr"—skeletons of microscopic algae, etc. The solid forms are called "silica." The sudden quenching, grinding, etc., floating." Diatomaceous earth is a fine particle size.

What is "Dicalite" Inert Extender?

Diatoms, microscopic aquatic organisms, skeleton in the form of soft, crumbles, is the source for dicalite.

What are its uses in Paint?

This product is used extensively as extender pigments. Being colorless, its bulk value is high and it is very resistant. They extend the life of the paint film and increase the strength of the film. It tends to reduce or prevent the film from becoming porous, thus making the film more durable. Brushing and leveling is also improved.

What is Magnesium Silicate?

A complex combination of magnesium and water. It is a true talc or "soapstone," from the varieties usually found in nature. It can be shaded into one another, but its physical properties which are of great value in the paint industry.

What are the characteristics of Magnesium Silicate?

"Inertness," fineness, uniformity (under 3), and a physical property which keep it in suspension. It is a "smoother" paint than other inerts. The "asbestine") are generally

film materially. Magnesium silicates are believed to be of special value in fire-retardant roof paints.

What is "Alumina"?

Aluminum Oxide (Al_2O_3). Its most familiar forms are corundum, emery, ruby, sapphire. Aluminum sulphate ("alum") under certain circumstances, precipitates aluminum trihydrate (aluminum hydroxide, "hydrated alumina"), which is used as a mordant in dyeing and as a base in the manufacture of chemical colors and lakes. The silicates of aluminum—china clay, kaolin, feldspar, etc.—are commonly, though incorrectly, called "Alumina," and therefore are included here under that heading. They are complex hydrated silicates. One of these is china clay, which is decomposed feldspar. For use it is washed and "floated."

Another type, Pyrophyllite ($Al_2O_3 \cdot 4SiO_2 \cdot H_2O$) is also a well-known "inert."

What are the characteristics of Aluminum Silicate?

"Inertness" and practical absence of color—though in this the clays are inferior to magnesium silicate and calcium carbonate—impalpable fineness in the case of kaolin and appreciable "tooth" in the case of feldspar; microtubular and crypto-acicular form in the case of pyrophyllite. Otherwise the pigment is comparable in its properties to magnesium silicate.

Being one of the cheapest of the "inerts" it is specified in station paints, freight car paints, etc. by some large consumers.

What is Aluminum Silicate Pigment? (ASP)

An inert extender pigment which results from processing domestic china clay so as to remove grit, mica, sand, hard particles, water soluble salts and other impurities found naturally in clay. Aluminum Silicate Pigments differ from ordinary clays in that the specialized processing also permits specific particle size fractionation, especially in the fine particle range of $\frac{1}{2}$ micron average and $3\frac{1}{2}$ microns maximum. This processing further assures a controlled moisture content of $1\frac{1}{4}$ maximum in contrast with china clays which are known to vary widely. The Aluminum Silicate Pigment is a flat hexagonal plate and is used in paints for the following reasons:

1. Helps to disperse hard to grind pigments.
2. Imparts ease of brushing and spreading—gives paint a "slip."
3. Shows unusual suspending power.
4. Speeds up factory production.
5. Produce smooth looking film or sandiness.
6. Provide an excellent means of freedom from ropiness.
7. Certain Aluminum Silicate ASP (1100) show remarkable color retention. Processed aluminum silicate color.
8. Chemical inertness and 4.4 - 5.5 and free of lime effect lime-sensitive color body due to chemical reaction.
9. Excellent durability.

ASP 1100 is coated with st grades are not coated.

What is Calcium Sulphate?

The hydrated sulphate of the calcium ($CaSO_4 \cdot 2H_2O$). Familiar as "gypsum," of Paris (the latter dehydrated with water it rehydrates and "set"). Enon is familiar in Portland cement. Hydrated, however, it loses this inert pigment it is carefully ground consequent dehydration, and becomes "Dead burnt" calcium sulphate which all the water has been removed. Preferred extender pigment for Dioxide and is used in large ton

What are the characteristics of Calcium Sulphate?

Inertness, medium softness, manipulation. Its solubility in water impairs its value in some forms. It is comparable to other "inerts" such as that of the Pennsylvania R. Co.

What is Calcium Carbonate?

One atom of calcium combines with one atom of the carbonic acid radical ($CaCO_3$).

as limestone, marble, Mexican onyx, crystalline calcite, satin spar, stalactite, Paris white, chalk, etc. The most familiar commercial form is "whiting," the best of which is known as "Paris white," "cliffstone Paris white" and "bolted whiting." It is formed through long ages, similarly to diatomaceous earth, from the shells of minute foraminifera inhabiting prehistoric oceans. The best varieties are obtained from the chalk cliffs on the east coast of England—hence the name "cliffstone." The chalk is coarsely ground in water with "edge-runner" mills, then with flat stone mills, floated in water, thoroughly dried, and carefully reground to avoid heating. Finely ground marble dust, etc., is often offered for sale as "whiting."

Calcium carbonate is also a synthetic pigment made by one of two methods, the precipitated product of the synthesis of lime water and carbon dioxide or the precipitated product of the mixture of sodium carbonate and lime.

What are the characteristics of Calcium Carbonate?

Each of the various forms has its definite properties. Whiting, partly because of its peculiar structure, tends to hold pigments in suspension and will neutralize any traces of free mineral acid in oil or pigments. It "spreads" well and is regarded as especially useful to neutralize acid residues in the chemical iron oxides, bleached barytes, etc.

Another type, known as "white mineral primer," is made from marble dust, calcite etc., finely ground and water floated. It has a crystalline structure and is comparable in properties to other inerts of similar structure.

The most recent type of calcium carbonate pigment, already mentioned, is described as "treated calcium carbonate," ("Surflex") and apparently has polar properties which differentiate it from other forms.

Regarding calcium carbonate in general it is worthy of note that "old time putty" made of linseed oil and whiting alone has been known to endure, without apparent deterioration, for half a century.

What are Iron Oxide Pigments?

Iron oxide pigments are divided into two major groups: natural oxides or earth colors, and synthetic or pure oxides. Each group is further divided into four

colors: red (ferric oxide, Fe_2O_3); black (ferrous oxide, $\text{Fe}_3\text{O}_4 \cdot x\text{H}_2\text{O}$); black (ferrous oxide, $\text{Fe}_3\text{O}_4 \cdot x\text{H}_2\text{O}$); and brown (mixtures of the two). The natural oxides range in iron oxide content and contain varying amounts of mineral matter, etc. which influence strength, and physical properties. They analyze from 95 to 99% iron and contain some impurities.

Natural oxides are manufactured in five basic types: hematite, a red oxide; limonite, a yellow or brown oxide; hydrated ferric oxide; siderite, a white oxide; and calcined pyrites, a black oxide; and calcined pyrites, a black oxide. Ores suitable for pigment are only a small fraction of the total. They must be carefully selected not only for color but for such properties as color fastness, etc. The natural oxides most commonly used and their source are: Spanish hematite; Persian Gullite ore imported from Persia; iron oxides with a high manganese content; raw and burnt siennas from domestic limonite ores; metallic iron oxides; calcined limonite and siderite from domestic hematite and black oxide from magnetite ore.

The principal basic material for the synthesis of synthetic oxides is copperas ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$). Pure yellow iron oxide is obtained by precipitating colloidal iron hydrate by proceeding with a precipitation of copperas, scrap iron and carbon.

Pure black iron oxide is prepared by using an iron salt and an alkali.

Pure red iron oxides are prepared by methods (1) calcination of iron oxides, (2) calcination of pure black oxide, (3) calcination of copperas with the oxidation to Fe_2O_3 . A complete range of colors from salmon red to deep purple red

Light red shades are known in the industry as pure light red oxides and dark shades as pure Indian reds.

Another group of synthetic red oxides, named Venetian reds, is made by calcining lime and copperas to give a product analyzing 40% Fe_2O_3 and 60% CaSO_4 .

Iron oxides are permanent in color, non-bleeding, resistant to acids, alkalis, and heat, opaque to ultraviolet light, have excellent covering power, and are normally chemically inert. The choice of type depends on the requirements of end-use.

What are "Chemical Colors"?

The first broad classification of chemical pigment colors can be made by placing them in groups of organic pigments and inorganic pigments and this classification has some significance because all the pigments in each group will have certain properties in common.

Most organic pigments are made from dyestuffs or chemical compounds known as intermediates, that are derived from coal tar. Generally speaking, pigments of this type lack the lightfastness, particularly in tints, of the organic pigments and there are but few exceptions. Also the organic pigments as a class are more likely to be somewhat soluble or to "bleed" in oils, solvents, thinners and soap solutions than the inorganic pigments. Whenever reference is made to bleeding, the particular type of bleeding should be stated, since some pigments that are non-bleeding in one material may bleed in others.

The organic colors are not necessarily composed entirely of organic matter and in many cases metallic salts are combined to form toners and lakes. Metallic salts that are commonly used include those of barium, calcium, aluminum, tungsten, molybdenum, lead, tin and strontium. Examples of organic pigments are Toluidine Reds, Para Reds, Lithol Reds, Hansa Yellows and Yellow Lakes, as well as the Phospho-Tungstic and Molybdic Lakes prepared from such dyestuffs as Victoria Blue, Methyl Violet, Brilliant Green, Malachite Green and Rhodamine Reds.

The inorganic color pigments are composed of metallic compounds of iron, lead, zinc, tin, chromium, aluminum and many others. Pigment colors in the inorganic group include the Lead Chromatic Yellows and Oranges, Iron Oxide Yellows, Cadmium Yellows and Reds, and Red Oxides. Zinc Yellow, Iron Blues, Chrome Greens,

Chromium Oxide, Hydrated Chromium Oxide, and Marine Blue are also included.

These chemical colors are produced under controlled conditions which produce a uniform color not only from the standpoint of composition but also shade, strength, and fineness of grinding. The precipitated pigments are solutions of chemicals which form precipitates that precipitate or separate.

Fire process pigments are produced by burning a mixture of materials. Marine Blue, Hydrated Chromium Oxide, and Marine Blue are examples of pigments produced by the precipitation process. The Cadmium pigments are produced in a furnace in order to develop the color. Various burning processes are used for the important black pigments, Lampblack and Bone Black, and to the presence of carbon.

In the manufacture of some pigments, the equipment generally consists of a tank in which the contents can drain by gravity. The tank in which the precipitation process is carried out is equipped with mechanical agitators to agitate the chemicals more easily and so that during the strike there is no settling of the precipitating solution. The solutions, the concentration, the temperature at which the precipitation is carried out, the agitation of the solutions, influence the precise shade of color that is formed. The next step in the process is to remove objectionable matter from the solution. This is accomplished by adding water and then allowing the solution to settle, and the clear liquid is then siphoned off. The settled pigment is then agitated and the pigment is washed. This washing process is repeated until the salts are removed. Sometimes the pigment is carried out in filter presses for the purpose. The thin water slurry of pigment is pumped to filter

pigment from the excess water and at this stage the pigment is said to be in "pulp" form. The pulp color is then loaded on trays and placed in drying ovens where it is dried at temperatures ranging from 140° F. to 190° F. depending upon the particular color. After drying, the pigment is in the form of large lumps which are ground on a pulverizer to a very fine powder and then packed for shipment.

REDS

The more important types of inorganic reds are the Iron Oxide Reds and the Cadmium Reds. English Vermilion might be mentioned but its use is relatively limited in the paint industry. There are many different types of organic reds and in this brief review it is only possible to touch upon the more important ones, which include Lithol Reds, Para Reds, Toluidine Reds, Chlorinated Para Red and Alizarine Red Lakes.

Iron Oxide Reds—Iron Oxide Reds may be divided into two types; one being the natural occurring oxides and the other, the synthetic or manufactured products. The manufactured Iron Oxides cover a wide range of shades varying from a light red to a comparatively deep red or maroon. They are essentially pure Iron Oxides that are made by roasting iron sulphate, a by-product of the iron pickling industry, or a ferric hydrate, in a kiln or furnace. Iron Oxide Reds are very permanent and opaque and comparatively low in cost, but they lack the rich, bright hues of the organic reds. Their principal use is for railway finishes, marine paints, house and barn paints and for floor enamels and many types of metal primers.

Cadmium Reds—Cadmium Reds are precipitated pigments, the chemical composition being cadmium sulphide in combination with some selenium, and the types in most common use in this country are co-precipitated products containing barium sulphate. They are furnace treated after precipitation and they will therefore withstand high baking temperatures and they are available in a range of shades from a very light red to a deep red or maroon. They have good brilliancy, being considerably brighter than the Iron Oxide Reds but less brilliant than the organic red toners. They have a low oil absorption and have good gloss in enamels and are non-bleeding in all solvents. Cadmium Reds are sometimes used in automotive finishes.

English Vermilion—English Vermilion is a mercury sulphide pigment, the color being a light, bright Vermilion shade. In paints and enamels it tends to bleed in oils and lacquers. Because of its high cost its use is limited.

Lithol Reds—Lithol Reds are intermediate between the Iron Oxide Reds and the Cadmium Reds. They are available as Sodium Toners and Lakes; the Sodium is what may be termed a Calcium Lithol. They are deep reds and are the lowest in cost of the organic reds. They are used in enamels where maximum lightfastness is required. They are non-bleeding in lacquer solvents and badly in oil. They are used to quite an extent in exterior paints but do not have the lightfastness of Para Reds and therefore are not generally used in bulletins or bulletin paints. They find use in toy enamels, novelty enamels, etc. Lithol Reds contain a metallic resinate which makes them brighter in mass tone and cleaner in appearance. The opacity of the non-resinated Lithol Reds is poor in enamels.

Para Reds—Para Reds are produced by the reaction of Paranitraniline and Barium Sulphate. They are available in light and deep shades and have good brilliancy and very good lightfastness. They are used in enamels and have very good resistance for exterior use. One disadvantage of Para Red for certain applications is its tendency to bleed in oils. It also has poor resistance to alkalis. Lithol Reds or Toluidine Reds are used in baking enamels that are cured over 200° F.

Toluidine Reds—Toluidine Reds are organic reds that have excellent lightfastness and are non-bleeding in oils. In organic reds they should not be used where lightfastness is important. Toluidine Reds are used in bulletin paints, automotive finishes, etc. They are used in bulletin paints where maximum lightfastness is required.

Chlorinated Para—Chlorinated Para Red is a deep red pigment, the color being a deep red shade. It is used in bulletin paints where maximum lightfastness is required.

of Para Red that contains some Chlorine in the molecule. It is a very light red, being much lighter than Paras or Toluidines, and has excellent brilliancy. Its properties are similar to those just mentioned for Toluidines with the exception that it has poorer heat resistance. It is used principally in exterior finishes where it is desirable to employ a red of this approximate shade with maximum lightfastness.

Madder Lakes—Madder Lakes are produced from a dyestuff known as Alizarine Red and take the place of the coloring matter that was made many years ago from the madder plant. It is a bluish shade red that is comparatively transparent, and its use in the paint industry is largely confined to stains where a permanent red pigment is desired, and it is used in making mahogany shades. It has very good permanency and is non-bleeding in oil and lacquer solvents. Madder Lake is also used for artists' oil colors.

ORANGES

The inorganic orange pigments in most common use are C.P. Chrome Oranges, Molybdate Orange, Orange Mineral, and a so-called orange shade of Hydrated Iron Oxide Yellow. The organic oranges include Dinitraniline Orange, Orthonitraniline Orange and Orange Lakes.

C.P. Chrome Oranges—C.P. Chrome Oranges are basic lead chromates made by the precipitation process from lead acetate or lead nitrate and sodium bichromate. By varying the conditions, particularly the alkalinity, it is possible to produce a range of colors from a very light orange to a very reddish orange. Chrome Oranges have very good lightfastness and they show less tendency to darken on severe exposure to light than is characteristic of Molybdate Oranges and the lighter shades of Lead Chromate Yellows. Because of low cost and permanency they are used where an orange pigment is desired, unless it is necessary for some special use to employ a different type to obtain better brilliancy, alkali fastness, non-bleeding properties or to avoid the use of a lead pigment. The darker shades find application in the manufacture of rust-inhibitive paints, and are generally referred to as Basic Lead Chromates.

Molybdate Oranges—Molybdate Oranges are precipitated lead chromate pigments, the composition of which

is mainly normal lead chromate, with lead molybdate and lead sulphate. They are brighter and have many times the opacity of the Chrome Orange. Because of opacity they are more economical to use despite the fact that they are more expensive than Chrome Orange. They tend to have excellent gloss in enamels and are used in combination with dark reds to give a range of shades having excellent brilliancy at low cost where maximum permanency is desired. In comparison with the older type of orange pigments, much improved products with respect to resistance to darkening, are now available and find extensive use in farm machinery.

Orange Mineral—Orange Mineral is a pigment made in a furnace by roasting sublimed litharge; it is a very bright orange having good tinting strength. It is not all that is the standpoint of permanency as on exposure to light a white chalkiness occurs on the surface, probably due to the formation of the carbonate. It has very good opacity, is non-bleeding and is sometimes employed as a substitute for Vermilion Reds. Orange Mineral is used in enamels to any very great extent and in primers for metal surfaces.

Orthonitraniline Orange—Orthonitraniline Orange is produced from the intermediates C and Beta Naphthol. It is a very bright, orange having good lightfastness when used in enamels. It is used for awning paints and is a comparatively good alkali fastness pigment in the manufacture of casein paints. One of its disadvantages is that Orthonitraniline Orange bleeds badly in solvents.

Dinitraniline Orange—Dinitraniline Orange is produced from Dinitraniline and Beta Naphthol. It is a shade of orange that has excellent lightfastness and has better resistance to bleeding than the orthonitraniline type, and is used for awning paints. It is suitable for trim and it matches the Federal shade known as Orange. It has comparatively poor resistance to darkening and is therefore not generally employed where it is to be baked.

Orange Lakes—Orange Lakes are made by precipitating an orange dyestuff on a base, usually of aluminum hydrate. They are transparent and vary from poor to fair with respect to lightfastness, depending upon the particular dyestuff used. Their principal use is in the production of transparent metal coatings for cans, bottle caps, etc. They are non-bleeding in oil and withstand the high temperatures at which finishes of this type are usually baked. They are not sufficiently lightfast for sign coatings that are to be subjected to exterior exposure. When used in combination with the transparent Yellow Lakes a "gold" effect is produced.

YELLOWS

Inorganic Yellow pigments include C.P. Chrome Yellows, Hydrated Iron Oxide Yellows, Zinc Yellow and Cadmium Yellows. The more common organic yellow pigments are the Hansa Yellows and Yellow Lakes. Quite recently the Benzidine type of yellow has been introduced.

Chrome Yellows—Chrome Yellows are available in a wide range of shades from a very light or greenish yellow known as Primrose Yellow down through the Lemon or Light shades to what is called a Medium Yellow. These are lead chromate pigments and a Medium Yellow is about a normal lead chromate, containing 95 per cent or more lead chromate. The lighter hues contain varying amounts of co-precipitated lead chromate and lead sulphate. Chrome Yellows are very bright yellows and considerable progress has been made in recent years in improving their lightfastness, although even the best Chrome Yellows darken to some degree on exposure to light. The Primrose Chrome Yellows are the more objectionable in this respect. The Chrome Yellows are considerably brighter and are available in a much greater range of shades than the Hydrated Iron Oxide Yellows. Chrome Yellows are not alkali fast and they will not withstand extremely high baking temperatures without discoloration. Chrome Yellows are used in paints and enamels, also kalsomine, but not in casein paints or finishes that are to be applied to surfaces that are alkaline, such as cement or stucco. Being lead pigments, Chrome Yellows will blacken in the presence of sulphides.

Iron Oxide Yellows—Iron Oxide Yellows are pre-

cipitated pigments of much finer particle size than the greater tinctorial strength than the iron oxides such as ochre. They are very useful for producing cream and white finishes where the brightness of Chrome Yellows is not required. They have excellent lightfastness and are sensitive to high temperatures, becoming redder at temperatures in excess of 400°C.

Zinc Yellow—Zinc Yellow is a pigment of comparatively low tinting strength, reacting a solution of potassium bichromate. Its principal use is in the production of inhibitive paints and particularly primers being used by the aircraft industry. It is partially water soluble and while making green trim paints in combination with chromium oxide, it should not be used where chromates may be objectionable. It is used for yellow enamels since on severe weathering it turns greenish and less brilliant. It is occasionally used as an artists' color.

Cadmium Yellows—Cadmium Yellow is a sulphide pigment and the types in this class are co-precipitated pigments containing varying amounts of cadmium sulphide. Cadmium Yellows are available in a range of shades from a greenish or Primrose Yellow to a golden shade, and they have excellent lightfastness and do not darken on exposure to light in the presence of sulphide fumes. In this respect they are permanent on weathering as the "out"; this is particularly evident when used in combinations of Cadmium Yellow with a blue or bluish green. The Cadmium Yellows have excellent heat resistance which is why they are furnace treated pigment used in enamels and also casein paints.

Hansa Yellow—Hansa Yellow is a group of organic azo pigments that have excellent lightfastness and alkali resistance. It is about four times that of a good yellow of approximately the same shade. Hansa Yellow is comparatively poor opacity in enamels and is seldom used except where a non-bleeding pigment is required, prohibiting the use of a yellow. The heat resistance of

particularly good, and it therefore is not well adapted for use in baking enamels.

Yellow Lakes—Yellow Lakes are made by precipitating soluble dyes, such as Chinoline Yellow and Tartrazine, on an aluminum hydrate base. The Yellow Lakes are transparent in oil and lacquer vehicles and are used for metal decorating finishes, such as can bottle caps, novelties, etc. They withstand the customary baking schedules for finishes of this type and in combination with Orange Lakes, produce gold shades. Aluminum hydrate has the desirable property of being transparent in oil and varnish vehicles, but unfortunately it also is reactive with some vehicles and care must be taken to be sure that the vehicle used is compatible with pigments containing aluminum hydrate. The Yellow Lakes do not have sufficient permanency for finishes that are to receive severe exterior exposure.

Benzidine Yellow—Benzidine Yellow is a class name for a group of organic azo pigments that have a very high tinting strength, moderately good light fastness and alkali resistance. These pigments are based on dichlor-benzidine and vary in color and tint over a wide range from light yellow to orange depending upon the intermediate with which the dichlor-benzidine is coupled.

The Benzidine Yellows, as a class, are less light fast than Hansa Yellow, but are much more higher in tinting strength. They are not recommended for exterior finishes, but like Hansa Yellows, are not sensitive to alkalis, sulfides, and other common industrial or atmospheric gases.

GREENS
Inorganic Greens are Chrome Greens, Chromium Oxide and Hydrated Chromium Oxide. The organic Greens include the Phospho-Tungstic pigments made from basic dyes and also Phthalocyanine Green.

Chrome Greens—Chrome Greens consist of the mixed precipitates of a Lead Chromate Yellow and Iron Blue. By varying the proportions of yellow and blue a wide range of hues is produced. Chrome Greens have excellent lightfastness and good opacity and they are used extensively for most all types of paints and enamels. They cannot be used where an alkaline condition is present either in paint or on the surface to which a finish is applied. This is due to the sensitivity of both the yellow and the blue to alkali. Chrome Greens are produced in what are termed the C.P. and Reduced grades.

The "C.P." indicates commercially pure, free from extenders such as barytes, etc., while the Reduced Greens contain a combination of barytes and clay, the clay aid the suspension properties of the Greens have the disadvantage of not being stable for color retention in the package. Oil paints and enamels, due to the presence of an oil that dries by oxidation, are partially deoxidized which means that the color or strength because of this is lost. Thus, an aged Chrome Green paint, when made, but after it has been applied and the demand for oxygen again satisfied, will generally revert back to nearly its original color. Chrome Greens are widely used because of their opacity, lightfastness, excellent color, and low cost.

Chromium Oxide—Chromium Oxide is made by burning a mixture of sodium chromate and a reducing material which converts the chromate to the Chromic Oxide. Chromium Oxide is a permanent and indestructible pigment, resistant to strong alkali and acids. It is inferiorly and much less brilliant than Chrome Greens and for tinting purposes it is more opaque. It has very good opacity and has low oil absorption to quite an extent in specification paint. It is possible to vary the hue of Chromium Oxide by controlling conditions during its manufacture, but the range of shades obtainable is extremely limited. Chromium Oxide is an abrasive pigment and wears on roller mills. Although the particle is hard, the aggregates are so fine that a very small amount of grinding. Because of its lightfastness Chromium Oxide is used in paints and finishes that are to be applied to exterior surfaces.

Hydrated Chromium Oxide—Hydrated Chromium Oxide is made by an entirely different process from Chromium Oxide, but it is a fire proof pigment produced by burning a mixture of iron sulfate and boric acid. This is a very clear pigment that has excellent lightfastness.

and is used in considerable quantities in green enamels. It has poor opacity and fairly high oil absorption and is never used by itself but usually in combination with a suitable opaque white, and yellow is added when necessary to modify the shade. It is much more expensive on a tinting basis than Chrome Green but it is used where package stability is desired and also for brighter and cleaner green tints than can be produced with Chrome Greens.

Phospho-Tungstic Greens—Phospho-Tungstic Greens are manufactured by precipitating basic dyestuffs with a solution of phospho-tungstic acid and in some cases phospho-molybdic acid. These pigments are comparatively transparent and therefore not suitable for making opaque coatings except in tints where the opacity is imparted by the opaque white. They produce much cleaner tints than Chrome Greens. They have fair lightfastness for interior use, and are used for toy finishes, novelties and kitchen furnishings, but they do not have sufficient permanency for exterior enamels. The phospho-tungstic pigments as a class are fairly sensitive to alkali so pigments of an alkaline nature should never be used with greens of this type as fading will occur on storage of the enamels in the container. Alkali also impairs the lightfastness. It is advisable not to use zinc oxide or white lead or extenders such as whiting, as the slightly basic nature of these pigments will, on long standing, cause fading of weak tints in the package.

Phthalocyanine Green—Phthalocyanine Green is a highly chlorinated copper Phthalocyanine of a fairly bluish green hue that has very good lightfastness and alkali resistance and is non-bleeding in oils and lacquer vehicles. It produces very brilliant green tints but it is very high in price. Phthalocyanine Green is stable in solvents and retains its color very well in green tints. Being not very opaque it is used almost always in combination with opaque white for finishes with good hiding power.

Blues

The inorganic blues in general use are Iron Blue, Ultramarine Blue and Cobalt Blue, the latter being used in relatively small quantities because of its comparatively high cost. The organic blues used by the paint and varnish industry include the phospho-tungstic precipita-

tions of basic dyes and Phthalocyanine Blues.

Iron Blues—Iron Blues are produced by dissolving a solution of a soluble ferric salt, such as ferric phosphate, thereby forming a ferric phosphate, which is then oxidized to a ferric salt. A ferric salt is used with sodium hydroxide to make a satisfactory pigment proper for the names of Prussian Blue, etc., but these names have as far as describing any produce Iron Blues that and others with a decided tones range from a clear, jet, dark blue. They are fast and are used by very permanent finishes trim paints. Iron Blues should not be used with surfaces where alkali material is very strong tinctorial necessary to formulate color and vehicle in order to

Ultramarine Blue—Ultramarine Blue is a blue with a reddish hue and enamels and compounds because of its very bright color. It is the shade of Ultramarine pigments. One desirable is its very good resistance. Ultramarine does not ret exposure although when fading of the pigment disintegrates and the appearance of the pigment powder, and naturally appear to have faded. blue shades but here a Blues, the durability is white and amount that that is used.

Ultramarine Blue is should not be used with into contact with acids or oxidation or exposure cond

What are Lake Colors (or Color Lakes)?

What are Carbon Blacks?

Other carbon containing blacks include *Graphite*—mined or made synthetically by heating selected carbon

What are the Characteristics
Chemically, Carbon Black
carbon with varying amounts
and oxygen, and have a
0.5%. Physically, they
spherical particles, quasi-
colloidal dimensions. The
Black is valued in industry
its fine state of subdivision
diameters of 50-5,000 Å.
ent grades covering this
Blacks contain from 5-15%
oxygen; furnace and the
less than 1% of similar
ness, high hiding power.
Carbon Blacks render
and plastics. The furnace
traditional lampblacks
ordinarily much stronger

The **Lampblacks** and **Blacks** by lower oil absorption and lower surface areas. The **Blacks** color blacks. The blue color blacks are popular for tinting and coloring. Lampblacks have pH values. The color blacks range from 7 to 10. **Acetylene Black** is very fine particle size. This is used in Graphite among the carbon blacks.

due to its unctuous quality, familiar in stove polished, lead pencils and dry lubrication. It comes in several forms—"Flake"—amorphous and specially ground or "micronized." It is a permanent carbon and used chiefly in protective paints or electrically conducting films and in combination with carbon blacks, pigments or extenders.

Bone Blacks are characteristically very black in color despite the large particle diameter (grinding process). They possess low oil absorption values, low tinting strength relative to the carbon, lamp or furnace blacks. They are used mostly for tints, artist colors and artificial leather coatings. In the latter case it also acts as a filler in conjunction with the high color values. Bulk of this pigment are the calcium phosphates, the ash ranges from approximately 78 to 85 per cent. It has an alkaline pH, usually around 8 to 9.

Vegetable Blacks are carbonaceous pigments usually high in ash ranging from 10 to 50 per cent. They are occasionally used as fillers. The tinctorial value is low as well as the blackness.

Mineral Blacks—These pigments are mostly used as fillers, are ground to pigment fineness and in themselves are low in tinctorial value and relatively low in color. In most cases they are useful not only as extenders (black) but also for flattening properties due to their low oil absorption values. They are high in silicious matter.

Iron Oxide Blacks—The synthetic type is the more useful and occupies an important position in the paint industry. They are precipitated pigments and have a small particle diameter. They are low in oil absorption, stable, easy to disperse and are useful for shading or tinting, for primers and for coatings of many types. They also have many other specialized uses.

Carbon and lampblacks are amorphous though certain types of the former ("Spectra Blacks") show micro-reflecting facets. The spreading rate of a pure carbon black paint is extraordinary, consequently it is usually reduced by admixture with an inert pigment. These paints are also proverbially durable—lampblack lettering on old signs, in many instances has stood out in relief after the wood surrounding it has been deeply eroded by "weathering."

What are Drying Oils?

Oils (usually vegetable or animal) which, by absorp-

tion of oxygen, harden stimulated by the catalytic salts of certain metals. In order of importance: tung or "Chinese" Alcurites Fordii (Hemp), but now grown in India; fish oils, (from menhaden), oil (from a small genus *Colaus*—Wenster), especially useful in coating heat—smoke-stacks, but certain "semi-drying" importance—Soya bean Manchuria, but now grown in cheap paints, colors which have little to recommend.

Of this list soya bean both in paint and varnish cultivation of which has large experimental success considerable usefulness.

Dehydrated Castor oil that bodies rapidly dries rapidly to yield water resistance. (2) durability. (3) pale retention. No other possesses this unique paint and varnish oil technical study than now obtainable in nature.

NOTE. Linseed oil paint and varnish oil technical study than now obtainable in nature.

What are Driers?

Driers are metallic catalyze the oxidation of The metals commonly zinc, calcium and organic acids such as etc., to provide the resin may be formed in reacting litharge, manganic resin acids, but driers allowing flexibility in

Modern driers are concentrated solutions (e.g. 24% lead, 6% cobalt) of the metallic soaps of either naphthenic acids, 2-ethyl hexoic acid, or tall oil. Naphthenic acids are derived from petroleum, are quite resistant to oxidation, and have been used for over twenty years to produce perfectly satisfactory driers. 2-ethyl hexoic acid, a synthetic material, has been used commercially relatively recently to produce premium priced driers of somewhat lower viscosity, paler color, and less odor than the naphthenates. Tall oil is substantially a mixture of rosin and fatty acids and although acceptable driers can be made from it, they exhibit somewhat poorer stability because of the unsaturation of the component acids.

The type of coating, its application, and drying requirements govern the choice of the metals required and the amounts needed.

Why are Drying Oils used in paint?

The primary purposes are to provide a means to allow uniform application to the surface, hold the pigments to the surface by forming a firm, adhesive, flexible bond, and to contribute to the ultimate durability of the paint.

Are the same proportions of Drier used in all Paints?

No. The pigments, the oil type, and even climatic conditions govern the amounts and types of drier used. The lead pigments generally act as mild driers, whereas pigments such as carbon black and many organic colors require higher amounts of drier than normally used. Raw oils respond well to lead-manganese driers, whereas bodied oils usually require a small amount of cobalt. In high humidities lead-cobalt is used regardless of oil type used. For "fume-proof" paints, calcium replaces lead as a drier.

For what purpose are Driers added to paints?

Without driers, oil paints require days to reach a condition where they will not become rain-spotted, pick up dust and insects, and can be repainted. With proper driers, this condition can be reached in a small fraction of the time.

Do Driers prolong the life of paint?

This is a moot question. Without driers, the oil may be greatly absorbed by the wood leaving an "oil-poor" film to combat the elements. Also, a film that is fluid

for a long time would be spots by dirt and insects. (It is commonly thought of as oil films decompose by chain might be assumed that driers No conclusive studies have investigated this. It is, of course, a minimum amount of drier to

OCTOATES

The use of metallic soaps in the Protective Coatings Industry. The earliest forms were the ground into the vehicle or were made by reacting the derivatives and also with lin were developed a need was of drier and this need resulted thenates. In the never-ending and better materials to work work on Octoates. The (Reuter) OCTOATES are the

OCTOATES are the metallic Acid. Historically they are The first ones were produced cost of raw materials was so were not of commercial interest the acid has been reduced tion and the resultant OCTO the Naphthenate driers.

OCTOATES being the homogeneous acid are, by a pure, chemical compound. qualities of the synthetic fatty exhibit certain unusual and properties are of great interest Industry in its search for in The theoretical discussion of the scope of this article, and ing discussion to its practical

SOLUBILITY

OCTOATES show in all cases are superior of the same metal and c

SMP 006731

EFFICIENCY

OCTOATES exhibit a greater drying activity than Naphthenates. In all experimental work done, 10% less metal as OCTOATES gave a better or equal drying than the comparable Naphthenates.

STABILITY

OCTOATES are more stable as a concentrate or in naphtha solution, as well as in the various paint and varnish vehicles in common use today.

MISCIBILITY

OCTOATES have proven to be more easily miscible with the various paint oils, alkyd resin solutions, and oleo-resinous vehicles than either naphthenates or tallates.

ODOR

OCTOATES being made from an odorless synthetic fatty acid and specially selected solvents are for all practical purposes odorless. There has been a large interest in odorless paints in recent years and ESSAR OCTOATES are by far the most suitable driers for this type of material.

STAINING

OCTOATES are made from a water white acid. Thus the only staining which can be noticed is from the metal itself. Generally the OCTOATES are lighter in color and will remain lighter in color than the corresponding Naphthenates. 6% COBALT OCTOATE is a good example as it shows a clear, true cobalt color which has minimum staining effect and does not show up as a dark stain in white paints and enamels.

SPECIFICATIONS

In conclusion, "ESSAR" OCTOATES are made from a technically pure, water white and odorless synthetic fatty acid. The resultant metallic soaps are a definite improvement over all preceding types of soluble paint driers. The metallic portion of the "ESSAR" OCTOATES is also very closely controlled as to purity, and the result is a carefully made, accurately controlled chemical compound.

For the utmost in drying quality . . . specify OCTO-

ATES for all of your dry

	% Metal*	Solids (Max.)	Viscosity (Max.)
Lead	24%	60%	A
Cobalt	8%	40%	A
Zinc	8%	50%	A
Manganese	6%	43%	A
Calcium	5%	50%	A

* Note:
Metal $\pm$ 0.25%
Wt./Gal. $\pm$ 0.20 Lb.

What is "Kettle Bodied Oil"?

A term used to designate oil which has been heated at an elevated temperature.

What is a "Boiled" Oil?

A Boiled Oil is one which has been heated to a "boiled" does not mean

What are Volatile "Thinners"?

Certain liquids which are used in paints, but on evaporation more or less completely. "Turpentine" — "wood turpentine" — alcohol (methylated) ("V. M. and P. naphtha") allied coal tar distillates more generally in varnishes, etc., than in paints.

What are the Characteristics of "Wood" Turpentine?

Of those commonly used in paints, "Wood" Turpentine is a distillate from the residual product being refined. It is distilled from pine by two processes—one "Turpentine," with water retorts. There is no impurity and "Wood" Turpentine is more uniform in composition type, recovered from the finds little application in

"V. M. and P. Naphtha" the lighter distillates from the "fractions" are point, distillation range

"fractions" used in the paint industry range from 0.703 to 0.808 in specific gravity.

"Mineral Spirits" are petroleum fractions of higher boiling point, therefore evaporating more slowly. The variety available for specific uses covers a wide range.

Benzol or, properly, *Benzene*, is a distillate from coal tar. There are several "fractions" in the series (benzene, "solvent naphtha," toluol, xylol, etc.) of which "Benzol," and "Solvent Naphtha," are the only two ordinarily found in paint. The first is that fraction which boils at 82° C. (180° F.); the second that boiling between 130° C. (298° F.) and 160° C. (262° F.). It is sometimes called "160 degree benzol."

What are the Uses of "Benzol," "Solvent Naphtha," etc.?

They are powerful solvents, but as benzol vapors are injurious, its general use is restricted. They are used in some varnish removers and more generally in oil stains. Their use is also recommended by painting authorities in first coats for resinous or "greasy" woods, such as yellow pine and cypress, to assist adhesion.

What is "Lustrex"?

Lustrex* 601-2: A freeze-thaw stable unplasticized styrene emulsion.

Lustrex* 820: An alkali-soluble copolymer of styrene. When used jointly with Monsanto plasticizers like Santicizer 160 or HB40, the Lustrex products are useful as styrene emulsion paint vehicles.

What are some of the newer Grinding Aids and Vehicles?

The following products made by Advance Solvents and Chemical Corporation are typical of this class of product:

VISKOPLUS

An aluminum soap useful in formulating paints and enamels. It is distinguished from the more familiar aluminum stearate in both physical form and its behavior in use.

It is amber-colored tough solid, which, when properly incorporated into paints and enamels, produces results which are both interesting and desirable.

Body or viscosity is increased appreciably. The actual increase depends on

* A product of Monsanto Chemical Co.

1. the amount of the heavier
 2. acid number
 3. method of oil gives higher
- Short chunky g
stearate, nor w
out.

Lustre and drying material causes no flat it slow up drying o cheesiness or tende characteristics are stearate's behavior.

Pigment wetting plus in grinding li directions have beha

1. less oil is re ment—incre the paste gr
2. grinding tin compared w

Many find the characteristics to greater mill

Penetration into architectural enamel Viskoplus. In clear nounced.

Flowing and lev elusion of small an oil vehicles which ing, effects a great causes the paint to effect is not accom dency to sag or cur

Pigment suspensi grinding vehicles p to incipient gel str

Since Viskoplus solvents or oils, it i of heat. One typic

liquids, suggested procedure follows:

A stock solution of Viskoplus in linseed oil should be prepared by incorporating one half pound of Viskoplus in one gallon of linseed oil. This may be done as follows:

When used in grinding liquids, it is suggested that the enamel or paint vehicle contain one pound of Viskoplus to every ten gallons of oil. In other words, instead of using ten gallons of straight oil, use eight gallons of straight oil plus two gallons of the Viskoplus solution.

The use of such mixtures should show most of the advantages enumerated at the beginning of this description, that is, increased body, greater wetting power, shortened grinding time, easier brushing, better flow, and less pigment settling.

ADVAMIX

A specially compounded wetting agent for pigment paste systems. It is an outgrowth of investigations to perfect a product of greater efficiency than that of Soligen Zinc Naphthenate, which has been widely used for the same applications.

It is produced to the following specifications:

Specific Gravity	0.994
Non-Volatile	59%
Color (Gardner)	11+
Flash Point	125°F
Viscosity	A

It produces the following benefits in paint manufacture:

- Faster pigment paste mixing time.
- Greater pigment to vehicles ratios, resulting in greater mill output.
- Improved final grind.
- Finer grinds with fewer mill passes.

It is compatible in the broadest sense with virtually all oleoresinous and synthetic finishing vehicles.

It shows its greatest efficiency when utilized in the range of 1% to 3% maximum on the total paste weight. We recommend that the formulator test the efficacy of this product by first using 3 parts per 100, and then cutting down as his experiments show that lesser amounts will serve with equally satisfactory results.

ANTI-FLO

This is a synthetic product found beneficial in helping of chrome greens and some iron oxides. In addition, it contributes an additional ination of sagging in the submerged portion.

Flooding and floating on the top of a film of pigments, which differ in the submerged portion, is tested by a uniform color film. Flooding is characterized by a uniform color.

An agent, such as ADVAMIX, preventing these conditions. Among the principal causes of poor wetting and poor stabilization effect, has been the use of some films.

It is recommended that blues, carbon blacks, and produce flooding or dosage, as a starting point (0.5%) AAFA, based on the weight of the pigment.

PHYSICAL

Color	
Viscosity	
Specific Gravity	
Pounds per gallon	

ANTI-LIV

This is a pale color used in problems involving liv. It is unique in that it and usually requires a small amount.

PHYSICAL

Acid Number	
Non-Volatile	
Active Ingredient	
Color	
Weight per gallon	

SHIP 006734

cosity of paints where gloss oil, lined tall oil, or other similar vehicles have been used. It works well also with most alkyds and long oil varnishes.

It is compatible with most conventional paint vehicles and solvents. The bodying effect is almost immediate, and not progressive on aging. The increased viscosity may permit additional thinning, resulting in lower finished cost.

PHYSICAL CONSTANTS

Color (Hellige)	6 - 8
Viscosity (Gardner)	A
Specific Gravity	0.98
Weight per gallon	8.15
Solids	18%

Application: The viscosity increase usually results in ease of brushing and longer lap time.

Recommended dosage: $\frac{1}{4}$ - 2% by volume, based on total volume of the paint, will generally produce the desired results.

CALCIUM PULP

This is an outstanding product for use in putty to prevent oil-pigment separation, and in paint to aid suspension and ease of brushing.

It shows improved package stability and ease of handling as compared to the calcium pulps usually offered to the trade.

The material is available for prompt shipment.

PHYSICAL PROPERTIES

Volatile	62.5%
Alkalinity on solids	7.9
Ash on non-volatile	6.7%
Acid No. on non-volatile	4.5

Dosage: In Putty — $\frac{1}{2}$ % to 3 %
In Paint — $\frac{1}{2}$ % aids suspension
2% to 10% in flat wall paints
helps brushing qualities

All dosages are based on the oil content.

What is Superior Lecithin?

A commercial soyabean lecithin consisting of natural soyabean phosphatides with soyabean oil as solvent or carrier. Although it has been demonstrated that lecithin

is only one of a number of commercial soyabean products, is generally called Superior lecithin, regardless of the grade, is approximately 65% soyabean phosphatides. The grades differ in viscosity. The phosphatides are attracted by the oil, and they contain phosphorus constituents of simple fatty acid structures are attracted by oils. This makes it a very effective agent with the ability to penetrate materials containing oil. Lecithin is an active anti-

What is Defoamer No. 37?

A multipurpose defoamer for use in emulsion paints, and latexes, in suppressing foam during the formation of bubbles of air. Several antifoaming agents are available, but Defoamer No. 37 carries a stock of several grades. No. 37 is diluted with water for best results.

What is Dispersaid 117A?

An anionic dispersing agent of the condensation type that acts as a wetting agent for water and oil, and shows good pigment dispersing characteristics. Upon drying, it is non-rewettable. Further, it is also non-foaming.

What is Emulsion Freezer?

The general name for a product which are designed to prevent the separation, or similar type of

stabilize these systems under freezing conditions. Unlike other low temperature stabilizers, most of which merely lower the freezing point and have to be used in fairly large amounts, the Emulsion Freeze Stabilizers are designed to be used in small amounts as an additive, often less than 1% being required. It acts as a stabilizer rather than a freezing point depressant inasmuch as material containing it are frozen solid, the effects being reversible at room temperature.

What is Latex Paint Stabilizers (Modified Casein Solutions)?

Sold to paint manufacturers to be incorporated, generally in the range of about 7%, into latex paint systems. These stabilizers are used to impart controlled viscosity and to supply easy working and brushing properties and to help stabilize the latex itself. Different types are available based on ammonia or sodium salt.

What is "Creosote Oil"?

Strictly speaking, that distillate from coal tar which is heavier than water. Its largest use is as a wood preservative. Because of this property it also finds extensive use in shingle stains.

What are "Gum Varnishes"?

As used in paint manufacture they are solutions of natural resins or of fossil gums in drying oils, with added volatile thinners and dryers; or of the newer "synthetic resin" varnishes, or of varnishes prepared from China wood oil and esterized rosin—the latter being a chemical compound of resin acids with glycerine. They are used chiefly as the principal vehicle of enamels, quick drying floor paints and "synthetic house paints."

What are Quick Drying Floor Paints or Enamels?

These are often called "four hour enamels," etc. The principal vehicle is usually a varnish of the modified phenolic or of the ester gum type.

What are Quick-Drying House Paints?

Paints which harden within a few hours after application, permitting the application of a second coat. In these, as in the "Four Hour Enamels," the phenolic type resins generally play an important part in conjunction with specially treated drying oils.

What Service Should Be Expected from Properly Prepared House Paint?

From three to five years, under normal conditions, the surface, the conditions of the environment.

How does Paint "Fail"?

By chalking, peeling, "alligatoring," or normal wear.

"Chalking": progressive chalking, probably due to the loss of component oil. **"Chalking":** minute cracking.

"Peeling": indicates moisture in the surface. Any paint applied to a surface usually "peels." The moisture back of the paint film causes the peeling methods are chiefly related to the moisture.

"Alligatoring": an incoherent paint cracks into large segments which break away from the surface. It is usually due to the application of new coats over old coats, or a hard coat over an elastic one.

"Scaling and Flaking": large or small segments of paint which peel, or elastic paint would peel, according to the degree of elasticity.

"Normal Wear": gradual deterioration and removal by abrasion.

What is the Most Desirable Method of Paint Application?

Obviously by "normal" methods. The chief objects of the home painter are intelligent paint technology and meet this requirement.

How is this Accomplished?

First, by careful selection of materials, by remitting laboratory chemical and physical and chemical research for materials by experience with large

under intensified natural conditions—such, for instance, as exposure in hot, humid or dry climates, and the "accelerated weathering machine." Paint manufacture is one of those industries which, within a few years, has developed from routine traditional practice to a highly specialized technical industry and is still in process of rapid development.

What is the Cause of Blistering?

Heat vaporizing moisture under a paint film. Only comparatively new and inflexible films are subject to this defect. Incompletely dried lumber, poor construction or sidewall condensation would appear to be the chief causes. The blister may disappear, but the film remains brittle and permanently detached.

What is Flat Wall Paint?

That type of interior paint designed to produce a lustreless washable finish on interior surfaces—especially on plaster, etc. The vehicle is usually a specially prepared varnish, oil or alkyd, with rather high volatile content. However, chlorinated rubber vehicles are receiving increasing consideration. Pigment content is comparatively high. The pigments principally used are Titanium Calcium or Lithopone, with Magnesium Silicate and Calcium Carbonate as extenders. Zinc oxide is sometimes used for puffing.

What are the Merits of these Finishes?

These finishes are most desirable due to their resistance to stains, smudging and greater decorating possibilities.

Being washable, they are more sanitary than wall paper and, being more durable, are, in the end, more economical.

What are Casein Paints?

Improved types of the products formerly known as "water paints." The "binder" in these products is casein (from milk) with a non-toxic preservative. The pigments, varying according to intended use, may be pure "cliff-stone Paris white" (whiting), or other white "inert" pigments, with zinc oxide, zinc sulphide, lithopone, titanium pigment, etc. They are furnished as a dry powder to which the user adds water; as a paste to which additional water is added by the user; or as a Plastic Paint intended for decorative relief effects. In the case of these

latter, the vehicle is designed to be more plastic than a fluid product. They are available in various combinations for various uses in white or tints.

What are the Uses of Casein Paints?

Largely for interior wall surfaces (especially in hospitals, public buildings, etc.) under a plaster especially) under an opaque coat between the finish and oil paints, etc. Some types are used for illumination of industrial buildings. Some types are used principally for

What are "Mill Whites"?

White paints of the enamel type for wall surfaces of industrial buildings, etc., to augment illumination, promoting physical illumination. They include the first to level the surface and second to insure reflection. They are usually offered in three grades: "semi-flat" and "flat." Some measured quantities of a vehicle of which will pigments used are selected: lithopone, zinc oxide, zinc sulphide, titanium dioxide, sublimate, inert pigment. The vehicle is wood oil varnish.

What is Cement Paint?

The name is applied to paints used to decorate cement, concrete, etc., containing Portland Cement and may be safely applied to other surfaces. Based paints are finding wide use because of their high chemical resistance.

How may cement or plaster be prepared for application of Oil Paints?

By preliminary treatment in the proportion of eight parts of cement to one part of oil. By chemical action of the

(calcium oxide or hydroxide) the lime is transformed to calcium sulphate (gypsum) and the zinc salt into zinc hydroxide, neither of which reacts with the oil acids. Surfaces should be allowed to dry thoroughly, and excess salt crystals removed by brushing before painting.

What are Sealers?

Coatings devised to fill the pores of unduly absorbent surfaces, in preparation for painting. By preventing the absorption of oil from the paint they not only reduce the number of coats required, but insure a stronger film. In some cases a sealer is also used to protect the finished coat from attack by chemicals in the surface to be coated; such as a primer for fresh plaster.

What are "Hot" Plaster Sealers.

Coatings devised to not only fill the pores of plaster and prevent penetration but also to protect the finished coat from attack by alkalis or chemicals in the plaster. When a "hot" plaster sealer such as one based on Pliolite is used, no preliminary treatment of the surface is required.

What are Pliolite Paints?

Pliolite resin solutions or Pliolite Latex water emulsions that have been pigmented. Pliolite paints are based on a styrene-butadiene resin or latex, are noted for their alkali resistance and other desirable properties, and are popularly termed as "rubber-based" paints.

Paints based on the resin are recommended for concrete floors; exterior stucco, concrete, masonry and cement-asbestos shingles; "hot" plaster; chemical resistance; traffic marking; and industrial maintenance.

Paints based on the latex are recommended for interior walls, ceilings and trim work.

What is Aluminum Paint?

Aluminum pigment consisting of finely divided aluminum particles in flake form suspended in a suitable vehicle, usually of the long oil varnish type. Its chief uses are in painting structural steel such as bridges and tanks, interiors of industrial buildings and as a priming coat and finishing coat for wood. The aluminum pigment is obtainable either in the paste or powder form. Aluminum paints, owing to the shape of the metal particles,

have the unique property of "leaving" plates rising to the surface of the paint, there a practically complete metallic surface.

What are Ship Bottom Paints?

Special coatings designed to protect the bottom areas of ships from corrosion, and to prevent the attachment of marine organisms, are known as ship bottom paints.

Ship bottom paints are divided into three classes:

- (1) Primers—Either Red Lead or Zinc-rich primers.
- (2) Anti-Corrosive Paint—Applied under the Anti-Fouling, or the bare metal, or preferred primer.
- (3) Anti-Fouling Paint—A top coat containing toxic substances such as copper compounds and formulated to release the poisons at a controlled rate with the fouling organisms such as barnacles and algae.
- (4) Boottop Paint—A paint for the area between the keel and the gunwale which is alternately submerged in water and exposed to the atmosphere.

During the past ten years the quality of ship bottom paints has undergone a marked improvement about through continued scientific research.

New raw materials, such as plastic resins and organic poisons, are contributing to the development of bottom paints.

What is Zinc Dust?

Metallic zinc is finely powdered by a special process a slight film of zinc oxide on the surface of each particle. Mixed with special vehicles, and as a priming coat on metal surfaces, it has proved equally efficient in preventing corrosion and scaling due to rapid changes in temperature.

What are "Industrial Paints"?

Coatings designed for use in the industrial field.

of industry. The range is very wide—from automobile to agricultural machinery and implements—and in each case the paint is designed for its specific purpose, usually under specifications of test requirements.

What are Resin Emulsion Paints?

Improved types of water-thinnable paint products, supplied in paste form to which the consumer adds sufficient water to produce a product suitable for application. The binder is usually an oil modified synthetic resin vehicle, either of the alkyd type or the oleo-resinous variety, and made water-thinnable by the use of suitable emulsifying agents and protective colloid.

The prime white pigments used include lithopone and titanium dioxide, and extenders such as clay, talc, mica, etc. are used in addition. These paints are furnished in a wide variety of colors as well as white. The chief advantage of the resin emulsion paints over casein types is the fact that they possess moderately good washability after proper curing.

What are the Uses of Resin Emulsion Paints?

Interior types are used for wall surfaces in private dwellings, public buildings, factories, etc., and are applied over wallboard, plaster, previously painted surfaces, as well as for priming in preparation for finish coats of other types.

Exterior types employing alkyd resin in emulsified form provide excellent durability on properly prepared surfaces such as concrete, masonry, brick, cement block, etc.

What are Synthetic Latex Paints?

The latest improvement in water-based type paints. Supplied in ready-to-use form these paints have as a binder a synthetic latex in emulsified form. The copolymer, styrene-butadiene is most commonly used. Titanium dioxide, lithopone, and selected extenders usually supply pigmentation. Finishes varying from nearly flat to a good degree of gloss are possible, depending upon formulation. They are available in a wide range of tints and in deep solid colors as well as white.

What are the Uses of Synthetic Latex Paints?

For interior application to walls, ceilings and trim work, providing a soft and decorative finish which is

easy to apply, dries of real washability. of resistance to alkali

What are "Synthetic Rub

Paints containing as a major ingredient same materials as sy solvent system, forms greater alkali and ac for exterior use. Ter same raw materials interior masonry-type are the main uses.

In View of all the Foreg True Test of Paint Value

Service. The cond nical, governing the are so numerous an anyone but an exper House paint is desig tions and the better average conditions w the many competing record of success r paints that the cons There is always a rea —why a certain pai fails to meet the r usually obscure and range of common k matic that no paint on the basis of subs and nothing could t of a given paint in stration of its valu practical demonstrati and durability which paint to expand fr industry in the late present day.

WHITE LEAD

LENGTHENS THE LIFE OF
HOUSE PAINTS

BECAUSE:

IT STABILIZES

Neutralizes acidic compounds resulting from the decomposition of the vehicle—prevents the film from becoming soft or liquefying.

IT PLASTICIZES

Forms lead soaps which increase film flexibility.

IT STRENGTHENS

Flexible, spiny crystals in lead soaps mechanically reinforce the film and increase elastic strength.

IT RESISTS WATER

Paint films with an optimum lead pigment content absorb only a small fraction as much water as they otherwise would.

IT LIMITS OIL PENETRATION

More of the vehicle remains in the film where it is needed; less is absorbed in the substrate.

IT IMPROVES APPEARANCE

By controlling chalking and inhibiting mildew.

For detailed information on the most effective use
of white lead in your paints . . . write to

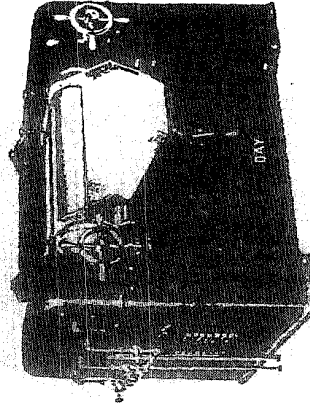
LEAD INDUSTRIES ASSOCIATION

420 LEXINGTON AVENUE
NEW YORK 17, N. Y.



DAY type "B" THREE ROLL MILL

HIGH
SPEED



FOR DISPERSION OF
Paints, Enamels, Lacquers
Colors in Varnish
Synthetics, etc.

3 SIZES

14" x 30"
10" x 22"
5" x 12"

THE J. H. DAY COMPANY
INCORPORATED
CINCINNATI 22, OHIO

SUMMARY

The inescapable conclusion from all that has preceded is that paint manufacturing is a progressive industry, dependent upon the knowledge and skill at the command of the manufacturer. At the time when the first edition of this "Catechism" was published, in 1907, manufacturing practice was based largely on tradition, modern technical science having not yet been born. During the period intervening the subject has received intensive study from trained specialists and the use of a multitude of devices for the measurement and evaluation of raw materials and finished products has become almost universal. The measurement of such cryptic properties as surface tension, electric charges, catalytic action, absorption and adsorption, reflective and refractive indices, have become routine practice with all advanced manufacturers—especially raw material manufacturers, whose technical salesmen disseminate technical information throughout the entire industry. As a result the industry has largely "cut loose" from ancient tradition, involving the classic method of "trial and error."

As the paint of today is radically different from the paint of yesterday, so the paint of tomorrow will differ from that of today. Those who have the responsibility for the selection and application of these therefore owe it to themselves as well as to their clients to keep themselves in touch with this development—it is a responsibility inherent in the service they offer. The scientist is abroad in the land and in his eyes nothing is valid that cannot be proved—he is no respecter of trade traditions, no matter what their age or ancestry.

"Try all things. Hold fast to that which is good"—until something better displaces it!

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