DEVOE & RAYNOLDS CO., INC.

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Good paint is not a luxury, but an absolute necessity. It is not an expense but a saving. These two truths should be impressed upon every owner of property and furniture. It should be the constant endeavor of every painter and every paint seller to convince the neglectful, that good painting is an economy.

Why is paint a necessity? Why, an economy? When exposed to the attack of the elements, wood rots, and metal rusts. This attack, is first on the surface of the wood and the metal, and if no resistance is offered, the attack is progressive and finally disentegrates the entire structure.

When subjected to the wear and tear of usage as on floors, furniture and other surfaces, friction-wear will attack the surface and gradually work its ruin, through progressive abrasion. Where surfaces have been gnawed into by weather-wear or friction-wear they become rough and uneven, collect dirt, become unsanitary and difficult to clean, neglect, thus shortens the possible life of expensive structures and furnishings, compelling their re-placement at high cost.

Economic reasons demand that the lower expense of painting make unnecessary this much higher expense of replacement. Last but not least, is thenquestion of decoration. We owe it to ourselves and to the community in which we live, not to appear shabby. We owe it to ourselves to make the interior of our houses, real homes, by the use of sanitary coatings permitting of harmonious color arrangements.

When we consider all we save and gain by the judicious and timely use of paint and varnish, we must admit that they represent an insurance against deterioration, purchased at a very small annual premium.

As we have seen, the attack is first on the surface, and the slogan adopted by the paint craft "Save the Surface and You Save All" is a self-evident truth. How then shall we save the surface? By the application of a surface coating, that will resist the attacks and protect the surface, while but slowly sacrificing its own life in doing so.

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Wood and metal, under the influence of varying temperatures expand and contract. Therefore we must apply surface coatings that have a like ability to expand and contract, and so accomodate themselves to the surfaces to which they are attached. When these surface coatings do not do this, they must necessarily tear apart, forming cracks through which the elements enter, and perform their work of destruction.

In short, these surface coatings, mustbe water-repellent, sufficiently elastic to expand with heat and contract with cold and hard and tough enough to withstand friction wear. It is our purpose to study the composition of such protective coatings, and to know the reasons why certain materials are better adapted to this end than are others.

Paints differ in their composition, in accordance with the specific purpose for which they are employed. We can best define its general composition by saying, Paint consists of a solid material known as the Pigment, which is held in suspension as a substantially insoluble material in a drying liquid, known as the Vehicle.

The pigments, of whose derivation and manufacture we will read later, are the solid materials which do the hiding of the surface assisti in protecting and gives us the required color for ornamentation.

The Vehicles are the liquid part of the paint, and must furnish the necessary binding quality to hold the pigments in place, and give us our water repelling ability.

It is a common saying that "Oil is the Life of Paint," but we come nearer the truth, when we realize that the right pigments are just as important. Good pigment and good oil enhance each other's value. Both are equally important.

As we proceed we will learn that vehicles are of various kinds for differing purposes; and that proper additions of other liquids, called volatile thinners and dryers, are made in the preparation of paint coatings.

VEHICLES

Let us study, Vehicles and the liquid portion of our paint first. The vehicle best adapted for exterior painting is Pure Raw Linseed Oil. We are all of us rather familiar with a number of oils of both vegetable and animal origin. These oils can be divided into two general classes. Some when exposed to the air in a thin film, undergo but little or no change, others gradually dry into a tough rubbery skin.

The first class, known as non-drying oils, are of course unfit for paint making, and are used largely for lubricating purposes and food oils. They would remain wet or sticky, and collect insects and dirt.

The second class, are called drying oils, for when exposed as in a paint coating they absorb oxygen and solidify, imprisoning the particles of pigment, holding them in place and clothing the surface with a tough water shedding coat.

The oils which possess these desired qualities sufficiently to deserve consideration are Linseed Oil, Poppy seed oil, Soya Bean Oil, Perilla Oil and China Wood Oil. A few others like Corn Oil, Cotton Seed Oil and Menhaden Oil have weak drying qualities and their use along with rosin oil, is restricted to cheap paints.

Up to the present time, Raw Linseed Oil has proven itself the best Vehicle for general painting purposes.

LINSEED OIL

Raw Linseed Oil, is produced by crushing flaxseed. The flax plant grows best in a cold or temperate climate. It is grown in Russia, India, Argentine Republic, North Dakota and parts of Canada. The seed is small, of a flat oval shape, pointed at one end, glossy and of a pale brown color. The plant which grows about 2 feet high, blooms in clusters of delicate blue flowers.

When raised for fibre, instead of seed, the fibre is spun and woven into linen. There are three methods for extracting the oil from the seed, but the one known as the Old Method is most generally in use. By this method, the seed is ground and heated to between 160 and 180oF, and subjected to hydraulic pressure. The residue called oil cake, containing usually from 5-1/2 to 6-1/2% oil, is sold for cattle feeding.

The oil obtained is cloudy and must be filtered. If permitted to stand in tanks for a time, there is a deposit of sediment which is known as oil "foots". This contains albuminous and mucilaginous matter from the crushed vegetable matter of the seeds, and is soluble in water. If not removed, it detracts from the moisture repelling qualities of the oil, and the paint made with such oil may wash off.

The oil is sometimes refined and made lighter in color, by agitating it with sulphuric acid, but this treatment impairs the wearing quality of the oil. Sun bleaching of oil, is of course impossible on a large commercial scale, It is best to use the oil in its natural color, and its exposure to sun light in the paint coating will bleach out the color. A high grade white paint, made with unbleached linseed oil will look yellowish in the can, and when first applied, but in a few days will become snow white.

Adulteration of linseed oil, is practiced to quite an extent, by the addition of fish oil, rosin oil, corn oil, cotton seed oil and petroleum oil. Rub a little oil briskly between the hands, Pure Linseed oil has a sweet aroma, while fish oil and rosin oil have a rank smell. Corn oil is more difficult to detect. Kerosene will show in a bluish tinge about the edge, if a few drops of the suspected oil are placed on a black painted surface. A laboratory test with iodine is the best test, and pure linseed oil, absorbs about 180% of its own weight of iodine.

Buy your oil from reliable dealers only, as an adulterated oil, when used to thin down your paste pigments and prepared paints, may prevent proper drying, a loss of gloss, and even cause the paint coating to dissolve in rain storms and wash off rapidly.

Raw Linseed Oil of good quality, is a slow dryer, requiring when spread in a thin application, on a non-absorbent surface, about four to six days to dry. In order therefore to save the job from dust and rains, we add to the oil, a preparation known as drier, which hastens the oxidation of the oil. Of these driers we shall hear more later on, under the heading of Driers-their Use and Abuse.

Boiled Linseed Oil, is not really boiled, but was formerly heated to a temperature between 400 and 500°F for a few hours, when the oil begins a quiet ebullition wrongly called boiling. Boiled oil of to-day is generally raw oil, heated to about 240°F during which time there is added a very powerful dryer known as **crushers** dryer.

Frequently we find unreliable dealers selling, what may be called "Bung-hole" boiled oil. That is oil that has not been heated, but five or ten gallons of oil are removed from a barrel of raw oil, and a like quantity of cheap benzine-rosin drier are added and mixed in. This is a treacherous concoction

and often the ruination of the paint coatings.

RAW OIL versus BOILED OIL

The writer remembers when Boiled Oil was very much in demand, and the favorite oil of painters who had learned their craft in Europe. Present day American practice, calls for Raw Oil, and even European painters are adopting its use.

Linseed Oil films are acted on by the oxygen on the surface, and the oxidation, proceeds from the surface in.

Raw Oil, drying slowly remains fluid long enough to permit of penetrating the pores of the wood deep enough to get the needed anchorage, and the oil dries slowly throughout the film, from top to bottom.

Boiled Oil, being heavier in body and setting up quickly does not penetrate well, and is entirely unfit for priming or first coat.

Dr. I. W. Drummond, a prominent paint chemist and manufacturer, says that boiled oil should not be used in any coat for exterior painting.

Another bad fault of boiled oil it skins quickly over the surface, excludes oxygen, keeps the lower part of the film from drying. This often causes cracking, through an uneven expansion and contraction in the paint film.

Again, boiled oil drying with a high gloss, creates a poor holding surface for the succeeding coat of paint. It is the concencus of opinion among the leading paint makers, that raw linseed oil, assisted by a correct proportion of dryers is preferable to boiled oil.

OTHER DRYING OILS

Soya Bean Oil is an oil extracted from the Soy bean, which is grown largely in China and Japan and in our southern states. The oil is extracted by methods similar to those used in producing linseed oil. It has a sweet odor, is of a clear bright color, and absorbs about 136% of its weight of iodine Unfortunately it dries too slow, leaves too soft a film, and lacks the toughness and elasticity of linseed oil. It is likely some day to find increased use in combination with linseed oil, and a larger percentage of dryer.

Poppy Oil, is produced in France, from the seeds of the Poppy plant. It is paler in color, than raw linseed oil, but much slower in drying. In our country, it is used mainly for Artists colors. Some of the imported highest grade French Zinc Whites, are ground in Poppy Oil, but the American grinding in refined linseed oil, answers every purpose of the artisan.

Perilla Oil, is an oil extracted from seeds, grown in China and Japan. Tests made with it are very promising, but as yet have not been conclusive enough to warrant its general use. It is believed by some authorities, that Perilla Oil, may develop into a rival of linseed oil.

Cotton Seed Oil, which is often used as an addition to linseed oil, does not oxidize fast enough. When so used, it must be considered a cheapening adulteration.

Corn Oil, is a by-product obtained in the manufacture of glucose from corn. As a paint oil it has no real value, because it does not dry hard, and remains greasy.

Menhaden or Fish Oil, made from Menhaden fish by a process of steaming and pressing. It is a very poor dryer. When mixed with linseed oil for general painting it must be considered deliberate adulteration. For the painting of roofs and smokestacks, where there is no friction wear, and great elasticity is required, an addition of 20 to 25% to linseed oil is not objectionable.

Rosin Oil, is one of the products produced in the distillation of Rosin. It is a liquid of the consistency of thick syrup, and the better grades are yellow, and often quite colorless. It drys slowly and is apt to remain tacky, and collects dirt very easily. Paint films in which rosin oil has been used, are likely to alligator.

Petroleum Oils distilled from crude Petroleum are often used to cheapen the cost of Linseed Oil. Kerosene and "neutral oils", have no binding quality, and while they evaporate quite freely, yet they leave a portion of non-drying oil, which weaken the paint coating. The addition of petroleum oils to linseed oil, especially for exterior house painting is one of the most contemptible adulterations practiced.

China Wood or Tung Oil has come into prominence in the last few years, but is employed principally as a varnish makers oil. The oil is extracted from the fruit of the Tung tree, and the fruit is about the size of a small orange. It contains five divisions, each holding a small kernel, about as large as a nutmeg. The fruit is collected, dried, the kernels removed, ground in a crude mill, steamed and pressed. The oil has a decided odor of hog fat, and thickens up rapidly when exposed to the air. When spread on a non-absorbent surface like glass, it dries in its raw state, with a rough "flat" surface, and an opaque wax like film. The varnish maker heats the oil to a temperature not exceeding 360F. for if heated higher it forms a jelly like substance, and cannot be brought back to a liquid state. China Wood Oil dries quicker than linseed oil, and seems to set up quickly throughout the film. It is more water repellent, but unfortunately lacks the elasticity of linseed oil. It therefore does not expand and contract as well under changing temperatures, and disintegrates more rapidly on exterior exposure.

The reader will see from our study of vehicles, that pure raw linseed oil is the best. But let us keep an open mind. Good paint makers, are constantly studying and testing out possible paint ingredients and Soy Bean Oil or Perilla Oil, may in the near future, prove valuable additions to our paint vehicles.

VOLATILE THINNERS

What are volatile thinners and what purpose do they serve in paint? We learn from our previous reading that our linseed oil, dried by absorption of oxygen, and thus change from a liquid to a solid form remained in the dried paint coating as a necessary binder. Volatile Thinners do not oxidize but dry off by evaporation. Whatever quantity of volatile thinner is added to paint or varnish acts simply as a temporary expedient to thin the oil or varnish, and then passes off completely into the air.

By adding volatile thinners to the paint, we thin the oil and the paint penetrates better into the pores of the wood. The addition of the volatile thinners, also makes it possible to spread a given quantity of oil paint over a larger area. As the thinner removes itself by evaporation, it leaves the oil paint spread out over this larger area.

in a thinner layer. This thinner layer of oil, with more surface exposure to the action of oxygen in the air, will necessarily dry or solidify faster. This explains why paint containing turpentine dries quicker, although turpentine is not really a dryer. Volatile Thinners are used also to take the place of oil, in making paints that are to dry flat or without gloss. Oil produces gloss, and therefore only enough oil is used to give thr required binding quality to the paint. The balance of our liquid is Volatile Thinner, which in evaporating leaves a small amount of oil so thin and distributed, that no gloss is produced. Remember that an excess of volatile thinners reduces and even destroys the binding and wearing qualities of paint and varnish.

The principal Volatile paint thinners in use today, are: pure spirits of turpentine, wood turpentine and petroleum spirits, benzine, naptha, and kerosene.

SPIRITS OF TURPENTINE

Spirits of Turpentine as most of us know, is a water white thin liquid. It is inflamable and has a bungent, but not unpleasant odor. It is frequently adulterated by the addition of benzine, naptha, kerosene and petroleum spirits. A simple test, is to put a little turpentine on a piece of white paper, if pure it will evaporate completely, leaving no residue on paper. If adulteration an oily residue will remain.

Spirits of Turpentine or just Turps as the painter calls it, is produced by a process of distillation from the sap of several species of pine trees. A cavity is cut into the side of the tree and the surface above the cavity is scarrified or wounded so as to cause a bleeding out of the sap. Another method, now generally employed, is to use glazed earthen ware cups, instead of the cavities to collect the sap. The sap is put in an ordinary capstill, and at a temperature of about 300 Fahrenheit, the turpentine passes over and leaves a residue, which is known and sold as rosin. In each characteristic american fashion we have been very wastful in producing turpentine, and in some sections of the South, the industry has been killed. As a result turpentine is not as plentiful as it formerly was, the price has risen considerably, and the temptation to adulterate is very strong. For house painters use, Turpentine is the best volatile thinner, because its evaporation is fairly slow.

Quick evaporators, pass off into the air, before they have performed their intended duty of causing better penetration or greater spreading power.

WOOD TURPENTINE

Wood turpentine, briefly is distilled in a current of steam. It is produced from the stumps and heart wood of dead pine trees, reduced to chips. It has a very pungent disagreeable odor, and is not as uniform in quality as Pure Spirits of Turpentine.

PETROLEUM or MINERAL SPIRITS

Mineral Spirits are distilled from Texas petroleum having an asphalt base. They have excellent solvent properties, and evaporate slower than turpentine. For this reason, mineral spirits are better adapted than turpentine as thinners in the flat paints that are so popular to-day for interior decoration. They retard the too quick setting of these flat paints, in which the volatile thinners are necessarily so large a part of the liquid content, and so give us ease of application, and greater spreading capacity of the paint.

BENZINE - NAPTHA and GASOLINE

These are very light distillations of petroleum. They evaporate too quickly, and set up the paint too fast by killing the fluidity of the oil. The sole reason for their employment is cheapness in price.

KEROSENE

Kerosene, another petroleum product, is about 85% volatile, the balance being a non-drying oil. It should not be used as a thinner, as it interferes with proper drying. It issometimes added in small quantity to varnish enamels and other varnish paints to increase their flowing quality and to make application easier, but is likely to rob them of the snappy gloss, and make them look "sleepy".

BENZOLE

Benzole, is a benzene made from coal-tar. It has powerful solvent properties, and evaporates very quickly. It is used considerably in replacing part of the turps in priming coats.

of paint used on resinous woods like yellow pine, as it cuts the resin and permits the paint to penetrate better. It is also employed as a solvent for oil anilines in aniline stains, and is one of the important ingredients of most paint removers. It should never be used in any coats of paint, except priming coat, as it would cut the undercoats.

In conclusion, let the painter be warned to use volatile thinners judiciously. In excessive quantities, or in the wrong place they will do as much harm, as will the wrong use of dryers. Do not abuse the binding quality of your linseed oil. You know that paint on your hands can be removed by washing them in turps. Why? Because the turps cuts the oil. This same action takes place, of course, when volatile thinners are poured into a can of oil paint. The writer has seen many a job of painting ruined by too much pure turps.

DRYERS

In studying the properties of drying oils, and especially of linseed oil, we found that they dried or solidified by the absorption of oxygen from the air. But this natural process of drying requires about four to six days, and our paint coating may suffer from rain or dust, before it becomes dry. It is necessary therefore to hasten the oxidation by adding a judicious quantity of an oxygen carrier that will impart a quicker drying quality to the oil. We call these oxygen carriers Dryers.

There are a number of dryers made by manufacturers, and they differ considerably from each other in ingredients, in quality and even in name.

Liquid Dryer, as it is generally known among leading makers, is made from raw linseed oil. The oil is heated, and varying proportions of oxides of lead, that is litharge and red lead, and also oxide of manganese are dissolved in the oil. This heating continues until the liquid becomes the consistency of a syrup. It is then drawn from the fire, cooled down and thinned with turpentine. Cheaper grades of liquid dryers, are often thinned with petroleum spirits or benzine, and the thinning is frequently excessive in order to cheapen the cost.

Liquid Dryers, are often sold under the proprietary names or brands of the maker, and are sold sometimes under the name of oil dryer.

Brown Japan Dryer, is also a dryer in liquid form, and is made practically the same as regular liquid dryers, with one radical difference. The maker adds a melted varnish gum. This gum, if of good quality, helps to set the paint faster, and adds a binding quality. All dryers, contain considerable volatile thinner which cuts the oil, and the gum counteracts this action. Cheap grades of Japan Dryer are made with rosin instead of the more expensive gum, and as rosin is brittle its addition to paint will tend to make the coating brittle. Dryers thinned too liberally with benzine, which is done to cheapen the cost, will if used in excess destroy the binding properties of the oil, and cause an otherwise good paint to wash off in rainy weather, and chalk off in dry weather.

White Japan Dryer, used less frequently now, than it was in former days is not a true dryer. It is of a thin varnish character, is light in color, and helps to set the paint a little faster. As a dryer it is very weak.

Japan Gold Size, is practically a Brown Japan Dryer, but paler in color and stronger as a dryer. It is used as such to some extent in carriage painting shops, but its chief purpose now, is as an adhesive for holding gold leaf. When put on glass or some non-absorbent surface, it should dry with a slight tack in about twenty to thirty minutes.

Coach Painters Japan, is a very strong dryer, made much the same as Brown Japan Dryer. In this case the maker omits the varnish gum, and in its place adds melted gum shellac, Coach Painters Japan, to be good, must be not only a strong dryer, but a quick hardening powerful binder. It is used as the vehicle in Coach Japan Colors, and often as the binder in Paste Wood Filler, Rough Stuff and Iron Filler.

Patent Dryer, is a paste form of dryer, of a cream white color, formerly used extensively, but almost displaced by the modern liquid dryers. It is made of acetate of lead, conbined generally with a weakening addition like zinc oxide, and ground in linseed oil. It is very apt to harden in sealed packages. In use, the painter thinned it, with about a pint of turps to the pound, and used it as a liquid dryer.

One cannot be too careful in the selection of dryers, and only those of reliable make should be used. Brown Japan

Dryer, when of the proper strength is the best for house painters use. Five per cent relative to the quantity of oil is sufficient. In cold or damp weather, this proportion can be increased a little, but a half-pint to each gallon of raw linseed oil should be enough.

In buying dryers, get sealed cans bearing the names of a reliable manufacturer. Reliable retail stores, frequently carry in barrels and drawn off, as called for, a cheap grade of dryer loaded with rosin and benzine. These are often used in proportion as high as twenty to twenty-five per cent relative to oil. Let me emphasize, that the best of white lead or prepared paints can be destroyed by the use of cheap dryer, or by the excessive use of good dryer.

An excess of good dryers, retards rather than accelerates the drying of oil, and is likely to leave the paint coat spongy.