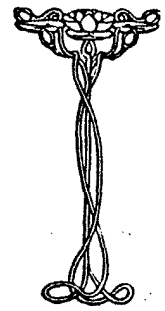
TP935
.P5
3- 7228

The Paint and Varnish Making Industry in Philadelphia



ISSUED BY
THE EDUCATIONAL COMMITTEE
OF THE
PHILADELPHIA CHAMBER OF COMMERCE

N40018

PRESENTED TO THE
SCHOOLS OF PHILADELPHIA
BY
THE PHILADELPHIA PAINT CLUB

Educational Pamphlet No. 13, issued by the Educational Committee of the Philadelphia Chamber of Commerce.

Copyright, 1917, Philadelphia Chamber of Commerce.

THE Paint and Varnish Making Industry in Philadelphia

By ERNEST T. TRIGG

GENERAL DIVISIONS OF INDUSTRY

THE PAINT AND VARNISH INDUSTRY may be roughly divided into two general divisions, namely: (1) so-called oil paints, which are used on the outside and inside of dwellings, factories, public and other buildings; and (2) such products as varnishes, stains and enamels, used largely on interior surfaces of various kinds, together with special materials for technical purposes and for manufacturing trades which are used very largely in the construction of, and on the various products of, our mills and factories.

(1) There are two general classes of materials which come under the first division, namely: (a) paint which is mixed together by the painter from various ingredients, which usually consist of white lead, linseed oil, coloring matter to tint to the shade desired, and a sufficient percentage of dryer to make the paint dry properly. The tinting colors used consist of a large number of pigments, ranging all the way from earth colors to those which are made by complicated chemical processes. These colors are supplied in paste form in original containers, to the painter, for the purpose stated above.

The other class (b) is prepared, or mixed paint, as it is generally called, which consists of the various necessary ingredients ground together and thoroughly incorporated by the use of heavy machinery. Such paints, produced in a variety of shades, go to the trade in sealed packages, being practically ready for use, it being necessary only to thin or temper the first coats, depending upon the condition of the surface over which they are applied.

(2) The second division includes a wide range and variety of products, covering the field from the small packages of varnishes, etc., used by the home owner, to special technical paints used in large quantities to prevent rust, for protection against electrolytic action, etc. The products in this group are generally made and supplied to the trade in prepared form, being ready for use, or practically so.

Varnishes are, of course, always supplied in liquid form, including products especially made to produce the most satisfactory

IMPORTANCE OF INDUSTRY

The paint and varnish industry is one of the staple and rapidly growing industries of the United States. It provides one of the most essential of all building materials, for the reason that it protects, preserves, and serves to decorate and beautify the surfaces over which it is applied.

It is only within comparatively recent years that the public generally have begun properly to understand and take an intelligent interest in this important part of the investment and up-keep of property. There was a time when paint and varnish products were considered almost wholly, if not entirely, as serving to satisfy pride, in the sense that their sole object was that of decoration. The following interesting quotation indicates the thought on this subject in pre-Revolutionary days:

> "The simple habits of the early settlers, their poverty and struggles for subsistence, prohibited the use of paint for decorative purposes, while the abundance of timber rendered it unnecessary to be at any great expense to protect the wood from the destructive action of the elements; so the use of paint was not only discouraged as extravagance, but history reports that 'the Rev. Thomas Allen of Charlestown, near Boston, was called to account in 1739 for having paint on his dwelling.' It was considered 'that by so doing, he was encouraging the tendency to showy, aristocratic ways of living that would endanger the morals of the community.'"

There is no longer any question in the minds of thinking persons as to the importance of the use of paint and paint materials with sufficient frequency to protect and preserve buildings and structures of all kinds from decay, rot, and final destruction. Professor H. H. King, of the State Agricultural College of Kansas, in a letter written April 17, 1916, makes this significant statement:

> "The losses ensuing in this State through lack of paint are much greater than the losses sustained by fire. Paint serves more than the mere purpose of decorating. Its principal value lies in the fact that it prolongs the life of the surface that is painted. Wood and iron exposed to air undergo a slow process of oxidation, which just as surely destroys them as though they were set on fire, the difference being the speed at which the reaction comes."

The paint industry is doing a large part toward "stemming the tide" of a great, annual, economic waste, through its forceful education of the public on this subject. It is now planning a nation-wide publicity campaign to carry this education into every home in the country, which it is confidently expected will have a far-reaching and permanent effect. Not only will such an education of the public tend to accomplish the purpose of creating a much greater demand for and consumption of paint and paint materials; but it will, at the same time, effect a great economic saving by way of conserving all building materials, and it will, too, tend to make better citizens in many communities because of the civic pride aroused, and the greater degree of respectability brought to such communities.

This campaign is being developed by the Paint Manufacturers' Association of the United States, which organization has been in existence since 1899, and has been a most potent factor in the development of the industry along both commercial and scientific lines. From the early days of the existence of this Association, Philadelphia manufacturers have been active in its affairs. Four times has our city been honored by having one of its manufacturers made president of this organization.

Philadelphia's active co-operation and influence have been potent factors in the activities of the organization through its various committees. The Educational Bureau of the Paint Manufacturers' Association has been in existence since 1904, and there has always been at last one Philadelphia manufacturer, and as many as three at a time, acting as members of this bureau.

The general work of the bureau is divided into two sections—known as Educational and Scientific. The Scientific Section has devoted itself for years to the scientific development of the paint business. Through means of this scientific work, methods of manufacture have been improved, the raw material market has been widened and manufacturers have obtained a better and more dependable knowledge of many of the raw materials in common use.

Through the activities of this section, too, the public have been educated to more intelligent use of paint and its requirements. Contrary to the conception of some persons—paint is made to-day in a most thorough and scientific manner. Its manufacture has long since passed the "rule of thumb" stage. Formulas on which paint is made are the result of a thorough knowledge of:

First: The requirement;

Second: Of each raw material, whether it be pigment or liquid, which goes into its composition;

Third: The proper balance of each pigment and liquid with the others which are used;

Last: A knowledge based upon years of experience in the proper grinding and incorporation of the pigments with the liquids.

In a modern paint plant there are no chances taken in the production of a given formula. The modern paint factory has as its center of control a completely equipped chemical laboratory, which is invariably "manned" by the best graduate chemists to be obtained. An absolute control is exercised over all raw materials of every nature in the laboratory. No materials are allowed to enter any of the manufacturing departments before they are approved, both chemically and physically, by the laboratory. Both of these examinations and approvals are necessary to insure finished products absolutely up to the standard. The chemical or analytical approval alone, without the physical approval, would serve only a partial purpose, for the reason that many products used in a paint factory analyze the same chemically, but are very different in their physical properties.

A notable example of this is zinc oxide. The average paint plant uses a zinc oxide, which is made from American ore, on a so-called American process. It also uses zinc oxide made from American ore, on a so-called French process. Chemically both zinc oxides would analyze practically the same; but there is a considerable difference in their physical properties, fineness, whiteness, etc. This difference is sufficient to cause the manufacturer to pay twice as much for the French process zinc oxide for use in certain products. This same condition applies to many other raw materials. The example is cited to show the necessity for actual control over the physical aspects or properties as well as the chemical composition.

After the raw materials are approved in the laboratory they are conveyed to the various manufacturing departments as required, where they are converted into finished products, based on formulas which are, in most cases, the result of years of study and experimentation. Experienced men are invariably in charge of each different manufacturing department, and every conceivable check for accuracy is thrown around the manufacture of the various products through the complete process.

As one example of the checks for accuracy—reference is made to the measure and weight check before filling out into cans, to be sealed and shipped. This consists of a careful determination, when a formula which is sold by liquid measure, for instance, is established, of its net weight per gallon. It has been accurately determined, for example,

that a certain mixed paint product should weigh 15 pounds 10½ ounces to the gallon. So long as this formula is in use every gallon of paint (231 cubic inches) made on it must, when filled out and ready for sealing and shipment, weigh exactly 15 pounds 10½ ounces. If, for any reason, there is a variation in this final test between the measure and the weight, then the batch is held up, and an investigation made.

Samples are drawn from every batch made which are tested by experts for trueness of color and tone, as well as for hiding properties, covering capacity and drying. These samples when approved are retained for a period of time (varying in different factories) for possible comparisons later on.

WHAT ARE CHEMICAL DRY COLORS AND HOW ARE THEY MADE?

Chemical dry colors are those colors or compounds which are produced through chemical reactions, chiefly of the elements lead (Pb), chromium (Cr), iron (Fe), potassium (K), and sodium (Na). Some are made from organic compounds or substances, hydrocarbons, aniline, etc., in combination with potassium or sodium.

Chrome green is probably the most widely known among the group of commercial pigments known as dry colors. It is composed of two basic colors namely, blue and yellow. The combination of these colors which produces green is largely mechanical. It is the blending together of these colors to produce a number of shades of green. These shades run from the palest yellow-toned to the deepest blue-toned greens.

The union of the two colors can be accomplished in a mechanical way by mixing the two colors in the dry state, but it is more scientifically done by what is known as the "wet process." Here we have a combination of the two colors, chrome yellow (lead chromate), and Prussian blue (ferricferrocyanide) compounds obtained from the metals chromium, lead, iron, potassium or sodium. Chrome yellow, as made from metallic lead, is a lemon shade with a greenish tone. It enters into perfect harmony with the iron blue to produce greens, which can be manipulated to produce any shade of green desired.

The principal use of chrome green is in the manufacture of paints of various kinds, and it is very popular for such use because of its pleasing contrasts and because it is, when properly reinforced, very durable and fast to light. It is also largely employed in the manufacture of oil cloths, linoleums and printing inks.

A detailed explanation of how a chrome green is made involves a detailed explanation of how both a chome yellow and a Prussian blue are made. The following is the process of manufacturing a medium shade chrome green:

Making the Yellow.

Two hundred and twenty-five pounds of litharge are dissolved in 215 pounds of acetic acid, with enough water to form a clear solution. The solution is made in a large wooden tub or tank under either hand or power agitation. Simultaneously, in a separate wooden tub or tank, 150 pounds of bichromate of potassium are dissolved in water by similar agitation, and then, when both solutions are ready, they are brought together in a separate and larger wooden tub or tank known as the striking tank, which for convenience is set just below the dissolving tanks. When the two solutions come together a chemical reaction takes place—the combining of the lead acetate (lead solution) and bichromate solution forms a chemical compound which gradually precipitates to the bottom of the striking tank and which is the desired lead chromate or chrome yellow. If it were to be finished as a chrome yellow it would then be washed by decantation until free from acid or soluble salts, filtered, dried and powdered as we later wash, filter, dry and powder the green. However, as it is to be used for making a green, the washing is deferred at this stage and the blue is introduced immediately.

Making the Blue.

Sixty-five pounds of prussiate of potash are dissolved in water in one wooden tub or tank and 65 pounds of sulphate of iron (copperas) are dissolved in water in another wooden tub or tank. These two solutions are brought together in a larger striking tank in precisely the same manner as described for the yellow. The chemical product which forms as a precipitate is ferricferrocyanide. It appears as a whitish precipitate, and is, in the striking tank, oxidized with a combination of 50 pounds of sulphuric acid and 5 pounds of chloride of lime, separately dissolved in water or stirred in mechanically. When thus oxidized the precipitate is a very dark shade of blue. In the striking tank the blue is washed up with fresh water by repeated decantation until it is free from acid or soluble salts and tests neutral—(neither acid nor alkaline). At this stage it is liquid blue, such as is used in combination with the yellow to make greens. If it were to be finished as a Prussian blue it would be filtered, dried and powdered.

Making the Green.

The liquid blue is next added to the yellow in the yellow striking tank (properly the green striking tank) under constant agitation, and the combination produces the medium shade of green desired. As soon as the chrome green has been formed it is allowed to precipitate, and it is then washed up with fresh water by decantation until it is free from acid or soluble salts. It is then pulp green. The next step is to remove as much of the water as possible mechanically. This is done with what is known as a filter press. The press consists of a number of cells or chambers into which the pulp color is pumped or forced by air pressure. Each cell or chamber collects the pigment between filter cloths, while a large part of the water is forced through the cloths and runs out of a special drain attached to the bottom of each cell or chamber. The next step is to take the cells or chambers apart and remove the pasty cakes from the frames which form the cells or chambers. This is done by laying them flat on a tray and running a wide blade or knife around the edges. The cake drops out on the tray and the trays are then loaded on a portable truck to be dried.

The drying is done by wheeling the trucks holding the trays with the color cakes into a kiln or stove, which is steam heated and which is provided with a forced draft to circulate the heat thoroughly and to drive off, through suitable vents, the moisture as it evaporates from the cakes. Such a green as we have made will require drying for 36 hours at a temperature of 140 degrees Fahr. At the end of that time the kiln or stove is opened and the thoroughly dry cakes of color are removed and ground up impalpably fine in specially designed mills. The color is then either packed in barrels and other packages or stored in bins for use.

WHAT KINDS OF PAINT ARE MADE, AND HOW ARE THEY MADE?

While it would be impossible to enumerate the many different kinds of paint which are made, it is possible to classify the different kinds and group them in such a way as to indicate, in a general way, the purpose for which each class is intended, viz:

Ready Mixed Paints:

Oil paints, such as house paints—sometimes put up as domestic, prepared, family and household paints, in small untility cans, with removable caps.

Varnish paints, really enamels, as they dry with an enamel or bright varnish gloss. As there are flat drying varnishes, so there are

Paste Paints:

Paste or semi-paste paints. These are usually oil paints which have not been thinned down for use or which have been only partly thinned down for use.

Oil colors. These are colored pigments of all kinds which have been ground in oil, usually linseed oil, to a stiff paste consistency, so that they can be added to paints for tinting, or so that they, like paste or semi-paste paints, can be thinned down for use.

Japan or coach colors. Same as oil colors, except that a quick drying, coach Japan varnish is used instead of oil in grinding them. They require thinning with turpentine and dry flat. Subsequent coats of varnish are required to complete work done with them.

Distemper colors. Same as oil colors, except that water and a water soluble siccative or drier is used instead of oil or linseed oil. They require thinning with water for use and dry flat. They are used almost exclusively by artists.

Stains:

There are many kinds of stains. The principal kinds which are classed with paints are: Oil stains, spirit stains, varnish stains and shingle stains.

All stains only partly obscure the surface to which they are applied.

The list would not be complete without adding that class of paints which are partly oil paints and partly varnish paints, in which class are:

Floor and Deck Paints:

In addition to the foregoing, there is a great variety of products used by painters, which, although not paint at all, are invariably considered as such.

Some of these are: Paste wood fillers, crack and crevice fillers, putties and cements (liquids or paste).

HOW PAINTS ARE MADE.

Oil paints are made from pigments and linseed oil, with just enough drier added to insure that the paint will dry in a reasonable length of time.

Varnish paints are made from pigments and varnish and enough volatile thinner to make them work easily under the brush. They are rapid drying as compared with oil paints.

Paste paints are partly made oil paints, pigments of various kinds and colors, including black and white, ground to paste or semi-paste form in one vehicle, or a combination of vehicles, such as oil, varnish, Japan or water. It is necessary to thin them down with more vehicle, according to the kind of work for which they are intended, before they can be applied. Some of these pastes are used only for tinting or shading oil and varnish paints.

Stains are the same as oil or varnish paints, except that instead of being made to completely obscure the grain of wood, or whatever surface they are applied on, sufficient of the pigment is withheld to make them but partly obscure the grain. Perfectly clear solutions of color, varnish or oil which do not obscure the surface at all are classed as colored lacquers (see Varnishes).

Floor and deck paints are oil paints, to which enough hard drying varnish has been added to insure a quick and hard drying paint, that will withstand the wear of feet.

It will interest the reader to know just how one of these classes of paint is made in detail, and, as oil paints are those mostly used and as the methods for making all the others are very similar, we give the details for making a silver gray oil or house paint of the very best quality. Space will not permit of a discussion of the merits of the various raw materials used.

The paint is made first as a base. This base is then thinned down and tinted as desired.

Making the Base.

Into a large mixer, consisting of an iron or steel drum with stationary mixing blades, or of a large iron portable pan which can be set on a revolving base into which mixing blades can be lowered and revolved in the opposite direction to that on which the pan revolves, 135 pounds of linseed oil are first placed Then, with the mixing blades in motion, 150 pounds of basic lead carbonate (Old Dutch process white lead) are gradually fed in with scoops or shovels. When this is well worked into the oil 125 pounds of basic lead sulphate are worked gradually into the mixture. When this has been done 235 pounds of pure zinc oxide are similarly worked in. To complete the mix 90 pounds of silicate of magnesia (asbestine) are finally worked in. During the foregoing mixing 60 additional pounds of linseed oil are worked in a little at a time. When the mix is complete it therefore consists of the following:

195 pounds of linseed oil,
275 pounds of white lead,
235 pounds of zinc oxide,
90 pounds of asbestine.

The mix is allowed to remain in the mixer under constant stirring until it is uniform throughout and free from lumps. It is then drawn from the mixer through an automatic gate at the bottom of the mixer, or, if it has been mixed in a pan, the pan is removed from the mixing machine.

Grinding the Base.

The next step is to grind the base until it is perfectly smooth. This is done in large, water-cooled grinding mills, in each of which there are two large, flat stones, one above the other, and one of which revolves. They are set on a spindle so that one can be raised or lowered. This is called the "set" of the mill. The surface of the stones is cut in long, narrow grooves, in such a manner that, when the faces of the stones come together, the grooves in one stone cross the grooves in the other stone at a sharp angle. The stones are hollowed on the inside so that a constant stream of water circulates in them when they are in motion. This is to prevent heating and burning the product from the heat generated by the friction of the stones. Above each mill is a receiving hopper or pan, into which the mix described is run or ladeled. This hopper has a revolving blade which forces the mix gradually through a small gate at its bottom into the eye or opening of the grinding mill. As the mix drops into the mill it feeds down between the stones, starting at the center, and works between the stones as one revolves on the other, until it comes out around the outer edges where a fixed scraper scrapes it off from the skirt of the mill (a narrow ledge around the bottom stone) into whatever kind of container it is desired to have the new thoroughly ground base. This is usually a cooling pan or tub, for, despite the water cooling of the mill, the paste comes out either warm or hot, and it is necessary that it shall be thoroughly cooled before it is used.

As the base is to be used in making a mixed paint, it is next moved to a pumping station and there pumped to a storage tank set above the liquid mixing department, so that it can be drawn into the reducing tanks, as wanted, by gravity.

Reducing the Base to Liquid Consistency.

Twelve hundred and fifty pounds of the above base are, as described, next drawn from the storage tank into a portable mixing tub or tank set on wheels and resting on a large platform scale, level with the scale. Over the reducing tank is set a portable stirring blade, which lowers into the reducing tank. This is then lowered into the tank and 405 pounds of raw linseed oil added. The mass is then stirred

by the mechanical power-driven mixing blades and 60 pounds of pure oil drier added. When the batch is of uniform consistency 43 pounds of pure turpentine are added, and this completes the mix ready for tinting.

To tint to the required shade, three pounds of lampblack and one pound of medium chrome yellow, both in paste form, are added and thoroughly stirred in. Samples of the same color, drawn from each of the last three batches of the same color, are compared with the resulting paint to make sure that it is a perfect match. It is also compared with a dry-painted slat or panel of the same color. When the tinter is satisfied that he has made a perfect match he sends a sample of the paint to the chief tester, who repeats the comparisons with both wet and dry standards. If any exception is taken to the match he notifies the tinter what change is necessary and it is made. These variations seldom occur with an expert tinter, but are always caught when they do occur. When the chief tester approves a batch he paints out a small section on a file panel for the color, by which means it is possible to keep an actual test for color, gloss and drying of 16 batches, each marked, for possible future reference.

Proving Up the Consistency.

It is necessary that the paint shall be uniform in consistency, otherwise some batches would be thinner than others. When the batch is completed and approved and is ready to pour out in packages, but before it is taken off the scales, a standard United States gallon measure (231 cubic inches) is dipped out and weighed to compare with what the color is known to weigh. As the batch has been put up by weight and not by measure variations in the weight are trivial, yet these variations are corrected. If the batch is over or under weight per gallon more base or more reducer in the proper proportions is added to bring the weight per gallon to the correct figure.

Filling the Paint into Packages

The batch of silver gray paint, now proved for color and consistency, is removed from the scales and wheeled over large storage tanks, into one of which, properly cleaned for its reception, it is poured. This storage tank is fitted with stirring blades. When the tank is filled with repeated batches of the color the whole mass is stirred until a sample drawn from the tank again checks to the correct weight per gallon. To guard against possible change in color, this sample is again tested by the chief tester for color. The paint is then, while under constant agitation, filled into the cans or other packages by weight; for in-

stance, if this paint weighs 15½ pounds per gallon, and the gallon can into which it is filled weighs 14 ounces, a scale is set to 16 pounds 6 ounces, the can placed on same and the paint run into it until it tips the scale. The cans thus filled are removed to the soldering benches where the caps are soldered on. When filled into smaller than half-gallon cans utility friction top cans are used, and these are removed to separate benches where the caps or plugs are pressed in. It is customary to stamp the cap or plug of each can with identification marks of the color and batch for reference, and also to determine the age of the goods after they have been put into stock.

SOURCE OF MATERIALS.

The paint manufacturer draws his supplies of raw materials from the four quarters of the earth. An ordinary can of paint contains products not only from America, but from Europe, Asia, Australia, Africa and the islands of the Pacific. The increase in the price of paint since the beginning of the European war is due to our dependence on the principal countries at war for both raw and finished material, and this is especially true in the case of Germany. Para and toluidine, used in the manufacture of reds, and potash and soda products for blues and yellows, formerly came from Germany.

Another ingredient of paint is linseed oil. It comes principally from Russia, India and Canada; a considerable quantity also comes from the Argentine. Oxide of manganese comes from the Caucasian Mountains, Russia and Brazil, and for varnish we are indebted to the fossil gums of New Zealand, Dutch West Indies, East Africa and India. Chinese wood oil, which comes from the interior of China, is of great value in the manufacture of varnish.

From this it can be seen that the paint business is dependent on the markets of the world for many of its raw materials.

WHAT ARE VARNISHES AND HOW ARE THEY MADE?

Varnishes are transparent fluids or liquids which, when spread on a surface, dry or oxidize, forming a colorless or slightly colored film or coating. A good varnish when applied will dry quickly and form a thin, elastic film or coating that will neither break nor crack.

Sometimes varnishes are purposely colored or dyed, and when so treated are usually called colored lacquers. Some varnishes are purposely made to dry dull or flat to imitate the effect that a glossy varnish will show when the glossy surface has been cut or rubbed away with powdered pumice stone.

Kinds of Varnishes.

Varnishes are divided into many classes, the principal of which are enumerated below:

Carriage varnishes are rich in oil, so that they will withstand outdoor exposure well.

Furniture varnishes are rich in hard gums that will produce a very bright and durable lustre, although the cheap grades carry cheap gums or substitutes for gums, which also produce a very bright lustre, but are soft and therefore not durable, and which turn white easily in dampness or when knocked or scratched. There are many varieties of these varnishes. Each variety is intended for some particular kind of work. Each is so made that it is known in advance just how long it will require to dry.

Spar varnishes are similar to carriage varnishes, but contain even more oil and less gum.

Shellac varnishes dry very quickly and impart a very brilliant gloss. They contain no oil and when dry are very brittle. For this reason they have very little durability and are seldom used for a finishing coat. They are used mostly for undercoats, which are applied on indoor work before the finishing coat of varnish is applied. Their brittle nature permits of their being cut down with sandpaper to a very smooth, dull surface, which makes a desirable surface over which to spread a high-grade furniture varnish.

Asphaltum varnishes are usually black. They always dry with a brilliant lustre and are mostly used for decorating metal surfaces. Like furniture varnishes, they may be of very durable quality or very cheap quality; cheapening in asphaltum varnishes is usually an indication of cheap oil or none at all.

Copal varnish is either an outside or an inside varnish made from copal gum (fossil gum) and linseed oil. A good copal varnish is excellent for general use, if properly selected.

Hard oil finish is a furniture varnish, and, like other furniture varnishes, may be either good or bad, according to how it is made and of what it is made.

Dammar varnishes are very white, but never dry thoroughly hard. They soften easily under heat. They are used mostly for coating pictures and for making white enamels.

Gloss oil is a trade name for a very cheap mixture which will dry with a good gloss, but which, being almost totally devoid of durability, is used only for mixing very cheap paints to give them gloss, for adulterating good varnishes, or to produce a cheap, temporary finish, as on barrels, etc.

Raw Materials of Varnishes.

The *RAW MATERIALS* used in making varnishes can be divided into the following classes:

Non-Volatile Oils:

These include linseed oil, china wood oil, soya bean oil, poppyseed oil and numerous other seed oils.

Volatile Liquids:

These include turpentine, mineral spirits, such as benzine or naphtha, asphaltum spirits or turpentine substitute, alcohol, benzol and acetone.

Gums and Waxes:

Most varnish gums are of vegetable origin, although at least one is of mineral origin. The vegetable gums are divided into several classes:

The hard varnish resins are those that produce the best grades of varnish, because of their durable character.

Zanzibar copal, dug out of the ground on the east coast of Africa, is the hardest of the commercially available varnish gums. Other grades of varying hardness are Kauri, Manila, Congo, Pontianac, East India. These hard gums are the saps of prehistoric trees which are dug from the ground where they have lain for many ages.

Dammar is a soft gum regularly cultivated in the East Indies. It is obtained from incisions cut into the trunks of the trees from which it exudes. Shellac flows from the branches of other East Indian trees which have been injured by a species of insect. When bleached with chloride of lime it is white.

The hard and semi-hard gums are used exclusively for making oil varnishes. The soft gums, including dammar and shellac, are used exclusively for making spirit varnishes or lacquers.

Rosin is that part of the sap of pine trees which remains after the turpentine has been distilled off. The color of rosin depends on the age of the tree from which the sap is taken. The sap from very young or virgin trees yields a very light or white rosin, while the sap from old

trees yields a dark brown or nearly black rosin. Rosin is used as an adulterant of both oil and spirit varnishes, as it readily dissolves in either oil or spirits.

The principal waxes are paraffin, beeswax, carnauba and cerusine.

Pigments:

These are of a soluble character and are used for coloring or staining only. Insoluble colors produce enamels and not transparent or translucent varnishes or lacquers.

Chemical Products or Driers:

Compounds of lead, such as litharge, red lead, orange mineral, sugar of lead; compounds of manganese, such as borate of manganese and oxide of manganese; compounds of zinc, such as zinc oxide and zinc zulphate; compounds of cobalt, such as cobalt acetate, are used for imparting to oils an increased or accelerated drying quality.

In making varnishes raw materials are used in about the following general manner:

For making a light colored oil varnish:

Linseed oil (refined).
Light colored hard gum.
Chemical drier that will not discolor the oil—borate of manganese or zinc sulphate, for instance.
Turpentine or benzine.

If this varnish is for inside use it is necessary to have it dry quickly; therefore, more chemical drier is used than for outside purposes. Driers tend to make varnishes brittle. Outside varnishes must be very elastic to withstand the expansion and contraction due to radical temperature changes, and so are made with as little drier as possible. Gum in any varnish is not as durable as the oil; therefore, more of it could be used in the varnish for inside use than for outside use. Varnishes with plenty of hard gum will also have brighter gloss and will polish better than varnishes that have little gum and a preponderance of oil. Generally speaking, varnishes that have a maximum of oil and a minimum of gum are called long oil varnishes and are best for outside uses, while varnishes that have a maximum of gum and a minimum of oil are called short oil varnishes and are best for all inside uses.

If varnish is to work freely under the brush the volatile thinner should be turpentine, as it evaporates more slowly than benzine, and therefore allows more time to work the varnish out over a large surface.

A dark colored oil varnish can be equal in quality to a light col-

ored varnish. It can be made in exactly the same manner and from exactly the same materials, except that a dark colored, hard gum would be substituted for the light colored, hard gum.

Grades of cheapness in oil varnishes are obtained by substituting soft and cheaper gums and some rosin for the hard gums, benzine or other mineral spirits for the turpentine.

For making spirit varnishes:

Alcohol (wood or denatured).
Shellac or other gum which will dissolve in the cold alcohol. Shellac is usually either orange color or white.
OR Turpentine.
Dammar gum which dissolves in the cold turpentine.

Either of these can be cheapened with rosin, which is soluble in either cold alcohol or turpentine. The dammar varnish can be made from benzine or other mineral spirits at reduced cost.

PROCESS OF MAKING VARNISH.

Varnish making, it will be seen, is really a science on which volumes have been written, and as this is intended only as a very general explanation of what varnishes are, what they are made of and how they are made, we are concluding with a detailed explanation of how a high-grade exterior oil varnish of medium color, such as is used on the best class of automobile or carriage work, is made.

Preparing the Oil:

One hundred gallons of refined linseed oil are put into a large kettle which rests on a portable truck and is wheeled over an open coke fire in what is called the varnish stackhouse. It is heated to 510 degrees Fahr., at which heat it is held for six hours continuously. During the time the oil is thus being heated six pounds of borate of manganese are gradually sprinkled and stirred in. At the end of the six hours the oil is withdrawn from the fire and stored for settling and future use.

Melting the Gum:

Four hundred pounds of copal gum, clean and broken into small pieces, are put into a large copper kettle, which rests on a portable truck and is wheeled over the open coke fire in the varnish stackhouse. It is heated to 650 degrees Fahr., at which temperature the gum is perfectly melted or fused and is ready for immediate use.

Mixing the Oil and Gum:

While the gum is being melted the 100 gallons of oil previously treated are again put over the fire and reheated to 400 degrees Fahr. The oil is then withdrawn from the fire and is gradually added to the melted gum, which has just previously been withdrawn from the fire and allowed to drop from 650 to 600 degrees Fahr. It is added with constant agitation. The mixture is then put back on the fire and cooked four and one-half hours at 510 degrees Fahr.

Thinning the Mixture:

When the oil and gum mixture has been properly cooked it is withdrawn from the fire and allowed to cool to 375 degrees Fahr., and is then gradually thinned with 130 gallons of turpentine. The turpentine is stirred into the mixture slowly. This completes the making of the varnish, the batch yielding 230 gallons. It remains only to run it through a filter press to remove dirt or other foreign matter, and to store for a period of months to age before using.

Making an Average Grade Light Hard Oil Finish:

This is a China wood oil varnish of a somewhat modern type.

Melt 125 pounds of "H" rosin in the melting kettle, and when the rosin is between 475 and 500 degrees Fahr. add five pounds of lime. Now raise the heat to 525 degrees Fahr., stirring well. Add to this melted rosin, over the fire, 12 gallons of untreated varnish oil (refined linseed oil). This will lower the temperature, so raise it again to 475 degrees Fahr., and then gradually sprinkle and stir in 15 pounds of flake litharge. Raise the temperature to 510 degrees Fahr. and add 24 gallons of raw China wood oil. Again raise the temperature to 560 degrees Fahr., remove from the fire, and, after standing one-half hour, sprinkle and stir in two pounds of borate of manganese. Cool to 375 degrees Fahr. and thin with 70 gallons of benzine. The yield will be 106 gallons. Filter and store for use.

HISTORY OF THE PAINT INDUSTRY IN PHILADELPHIA.

Philadelphia is one of the most important paint and varnish centers in the United States. This is due, to an extent, to the aggressiveness of Philadelphia manufacturers, whose products are shipped all over the world; but is due more than anything else to the quality of the material manufactured. It is to the credit of Philadelphia manufacturing industries generally that Philadelphia-made goods are known not only in the domestic market, but in foreign fields as well, to be of the highest quality, and most dependable and serviceable at all times.

White lead was the first paint product manufactured in the United States. This material is made from the metal lead, by a process of corrosion, in which the metal is finally converted into a basic carbonate of lead, which is pure white in color. After this basic carbonate has been thoroughly pulverized it is ready for use in the manufacture of paint. It is used both in the production of prepared paints, and is also ground with a small percentage of linseed oil to a paste consistency, in which form it is sold to the painter, and mixed by him with other ingredients to make a prepared paint in the manner previously described.

The first white lead factory in the United States was built in 1804 by Samuel Wetherill & Sons, at the corner of Broad and Chestnut streets, so that Philadelphia has the credit of being the first city to start this important industry in this country.

The business of Samuel Wetherill & Sons was continued against rather great odds in its early days, due to every possible means being used by English competition to embarrass that company and force it out of business. The determination of Mr. Wetherill and his son, however, enabled them eventually to succeed, and the business still exists.

In 1809 Mr. John Harrison, originator of the business, which is still in existence, established the Kensington Laboratories, which eventually became the Western White Lead Company. This laboratory was begun by the erection of a small chamber for the manufacture of sulphuric acid, with an expenditure of $5,000. Soon after the establishment of this laboratory, white lead, red lead, litharge and orange mineral were added, probably between 1810 and 1812.

As an indication of the difficulties under which manufacturers operated in those days, and as indicating the determination and foresight of the men of those times, as well as the part Philadelphia merchants played in the affairs of the nation, and to show to the present generation that some of our national problems of today confronted the nation over a hundred years ago, the letter printed in the appendix, written by John Harrison (when he was in the business of manufacturing chemicals) to President Thomas Jefferson, under date of November 1, 1808, is interesting, and of historical value.

The white lead business of John T. Lewis & Brothers antedates all others in America, although as manufacturers of lead this company seems to have followed closely the start of the other two businesses referred to. The Lewis importing business was originally established in 1752. As an interesting bit of history—an old ledger, now in existence shows an account with Benjamin Franklin in February, 1753. An account was opened by this company with the Bank of North America in 1782, nine days after the Bank had been chartered by an act of Congress. This account has run continuously to the present time, and is doubtless the oldest bank account in the United States.

The lamp black business in the United States was initiated in Philadelphia. There have been many discussions as to who first made this material, but it is generally conceded that Fox, in 1775, was the originator in his factory at Germantown, located at the corner of Indian Queen Lane and Main Street. He called his blacks after the name of the town, namely, Germantown Black, which brand is known all over the country.

Just a word about the method of manufacturing lamp black. Originally, the various materials were burned in kettles, and later on, in pans. The accumulated soot was gathered in large chambers especially constructed for the purpose. In the early days, on account of its bulkiness, there was no means of packing it, except by hand, and after being carefully sorted and graded, it was put into barrels and burlap bags. This was very difficult on account of the lightness of the material. Modern machinery has since been invented which takes the air out of the black, and packs it without much handling; so that at the present time, while a large force is necessary to clear the soot out of the chambers, handling the barrels, marking them, taking care of the oils and different mixtures which are used to produce the different grades, the black itself is largely disposed of by mechanical processes. Lamp black is a necessary pigment in a paint plant, and is also used in the manufacture of rubber clothing, etc.

Wetherill Peterson, of Philadelphia, was the first to make Venetian red in America. The English process for making this material was not available, because bituminous coal was the fuel there, and anthracite coal the fuel here. One day the idea struck him to burn a piece of copperas in their office stove at 47 North Front Street. The green chemical came out of the fire bright red paint. This would not have happened in England, as the smut from the bituminous coal used there would have darkened it, and therefore spoiled the color of the paint. This was a real discovery, and is responsible for the business of making Venetian reds and other grades of oxide of iron in this country.

The oldest varnish manufacturing concern in the United States is C. Schrack and Company, of Philadelphia. The business was established in 1815 by Christian Schrack on Second Street above Noble. A few years ago they moved to the present site of their store, which is now No. 150 to No. 154 North Fourth Street. Their present buildings were the first five-story buildings in Philadelphia. Practically all the varnish used in this country prior to 1815 was imported from England, and when this Company first attempted to make varnish, it did so on the open lots in the vicinity of the store, in a primitive way.

Following the establishment of the concerns mentioned—a number of other businesses and factories were established in Philadelphia. Those who have been in business in this city for fifty years or more, are, in their chronological order as manufacturers (including those mentioned) as nearly as can be determined, the following:

Wetherill and Brother,
Harrison Brothers and Company, Inc.,
John T. Lewis and Brothers Company,
George D. Wetherill and Company,
G. Schrack and Company,
Robert Shoemaker and Company,
Samuel H. French and Company,
John Lucas and Company, Inc.,
William Waterall and Company,
Felton, Sibley and Company, Inc.,

The volume of paint and varnish production in the so-called "Philadelphia District" as published by the Department of Commerce, Bureau of Census, for 1914, was $11,310,000. There are no census figures available since those of 1914. That being a year of business depression, particularly the latter half of the year (owing to the start of the European War in August, 1914), it is quite likely that the figure stated above is less than normal, and that the two succeeding years, that is, 1915 and 1916, would show a much greater total, if the information was available.

The following is quoted from a statement appearing in a souvenir presented by John Lucas and Company to the Master House Painters' Association, at the time of their convention in Philadelphia in 1886:

> "Painters in business 40 years ago will remember the 'discovery' or alkali secret of their early days. This was revived during the sixties, and as dealers we had inquiries for a certain brand of 'Chemical' paint. We gave the matter our attention about 1870, and easily made an improved paint, made from pure pigments and linseed oil, which, after testing some two and one-half years, we put on the market, without water, benzine, or chemicals. In fact, it was the only paint representing the old style hand-mixed goods. We call this the original Pure Oil Liquid Paint, and which we believe (as experience proved it to be) equal to anything in the way of paint that could be put together. We have always maintained that the purchase of a can of mixed paint did not, by some mesmeric influence, convert the purchaser into a painter; hence we have always cautioned the buyer that if good results were expected, a practical painter only could be relied upon to produce them."

This seems to establish 1870 as approximately the date of the first manufacture and sale in Philadelphia, and probably in the United States, of a meritorious mixed paint product. The so-called chemical compounds, sold as mixed paints, were previously made; but such products were not successful because they did not possess quality. The mixed paint business has probably grown during the past two generations more rapidly than any other part of the paint business. The mixed paint industry is firmly established because of its advantages of economy, utility and quality.

One of the early interests in America was the crushing of oil from the seed of the flax plant, which is known as linseed oil. In producing this oil, the seed is first ground and then heated or cooked in order that the oil may be separated more readily. It is then placed in powerful hydraulic presses, which remove the oil, and leaves a hard residue known as cake, which is largely used as a cattle food.

In the early part of the last century, there were many linseed oil mills in the State of Pennsylvania, flaxseed being one of the important crops at that time of the States of Pennsylvania, New Jersey and New York. As late as 1860, the center of the flax production of this country was in Ohio. The growth of it has gradually worked west and north, until to-day the Dakotas and Montana are the largest flax producing States.

The Tariff Act of 1872, providing a degree of protection to American initiative, provided a great stimulation to the paint and varnish industry in this country, and a new impetus seems to have been given to the manufacture of paint and varnish products from that time forward.

Great credit is due to George T. Lewis, of the firm of John T. Lewis & Bros., for his foresight and courage to start new industries in the paint and chemical business. In Joplin, Mo., Mr. Lewis started the Lone Elm Lead Co., for the manufacture of "Lone Elm Lead," afterwards called "Sublimed Lead" by Mr. S. P. Wetherill, of Philadelphia. Mr. Lewis brought from the south and pressed at the factory in Kensington the first load of cotton seed oil ever produced in quantity. He took Mr. Charles Pratt to Natrona and from there to the oil regions and with Mr. Pratt made some of the first kerosene ever produced. Mr. Pratt subsequently took up the work and became associated with the Standard Oil Company.

Mr. Lewis was previously one of the organizers of the Lehigh Zinc Co., which succeeded Wetherill and Gilbert in the operation of the great mine at Friedensville, and the furnace at Bethlehem, Pa. The Wetherill of this concern was Colonel Samuel Wetherill, a native

Philadelphian, who invented the furnace which solved the problem of making American process oxide of zinc, without which there would really be no mixed paint industry.

Colonel Wetherill was an inventor and original thinker of the first order, but his work was done outside of Philadelphia. This is mentioned in order to show that many of the industries which are now located in other places originated in the minds of Philadelphians. We naturally could not make oxide of zinc in Philadelphia, profitably, if the ore was at Friedensville; or sublimed lead (basic sulphate—white lead), if the ore was at Joplin, Mo. But we could and did furnish the inspiration, the concrete directions, and the finances for carrying the operations to success.

It is entirely due to Mr. August Heckscher, S. P. Wetherill, and the latter's brother, the late John Price Wetherill, all of Philadelphia, that the manufacture of French process oxide of zinc was brought to the United States and started at Freemansburg, Pa.

In conclusion—mention must be made of the benefits which the paint and varnish industry in Philadelphia has derived from the unselfish and faithful efforts of some of the leaders in the industry, which efforts have resulted in co-operation between manufacturers located here, tending to improve conditions generally. The Philadelphia Paint Club has been a medium through which the manufacturer and related interests have been brought together, and as an organization it has done excellent work for the trade.

Mr. William Waterall, as President for 30 years, and Mr. Howard B. French, as Chairman of the Executive Committee for the same length of time, are especially entitled to the thanks and highest appreciation of the paint and varnish trade in Philadelphia for the work and thought which they have given so unselfishly and generously to the affairs of the Philadelphia Paint Club, and for the influence which they have constantly exerted as individuals for the betterment of the industry generally. It can be said, without fear of contradiction, that the influence of the Philadelphia Paint Club, under the guidance of these men and their associates, has gone far beyond the confines of the Philadelphia District.

The writer desires to acknowledge the assistance given to him in the preparation of the foregoing by the "History of Samuel Wetherill" by Mrs. S. P. Wetherill, and by the following gentlemen:

Mr. William H. Wetherill, Mr. Thomas Skelton Harrison, Mr. Edwin H. Stulb, Mr. William Waterall, Mr. Howard B. French, Mr. Edward F. Beale, Mr. Henry C. Stewart, Mr. Luther Martin, Jr., and others.

APPENDIX

Copy of Letter from John Harrison to Pres. Thomas Jefferson*

PHILADELPHIA, November 1, 1808.

Resp. Friend—As the period is approaching when the Great National Council is to assemble for the purpose of deliberating upon the affairs of our country, I trust I shall not be considered as intruding improperly on your time and patience, or of interfering officiously with the Government of my country by selecting you as the proper person to whom I ought to communicate such facts and reasonings relative to the subject of this communication as in detail would be too desultory for a memorial to Congress, and I do it with the more freedom because it appears to me that you are the constitutional organ through whom Congress are from time to time to receive information.

The present is a crisis which most especially [?] invites our attention to every subject, however minute, that will have a tendency to lessen our dependence upon foreign nations and consequently decrease their influence in our country; manufactures embracing not only articles of luxury, but most of those which are necessary to our comfort and convenience we have been in the habit of receiving from abroad; this habit has become so familiar to us from the facility of exchanging our own native productions, for the productions of their arts, that we seem not to have discovered there is a sufficiency of genuine talent, energy and capital in our country to supply those wants, but believing as I do we possess these requisite qualifications to the fullest extent, in what are we deficient except the mere modus operandi? and how soon is this to be acquired in the fostering hand of Government? Europe is dependent upon us for many of the raw materials necessary to their manufactures; we are dependent upon Europe for many of the raw materials that would be essential to our manufactures were we extensively engaged in them; one part of Europe is dependent upon another for any change of raw materials; in this there is fair reciprocity. Let us obtain from them their native productions in exchange for ours, and we shall find the balance of trade greatly in our favor.

Manufactures of every kind require a long time and assiduous application aided by a knowledge of the particular branch and a sufficiency of capital to bring them to perfection. The question then is, Does the citizen, who, uniting their various means, and who, through his individual exercises, has brought to perfection an important manufacture, deserve the support and countenance of his Government?

Anticipating your answer, I shall proceed to a statement of facts relating to the manufacture in which I am engaged. After mentioning that I presented a

*Latin terms used in this letter, from Century Encyclopedia: Modus Operandi—a plan or mode of working. Caput Mortuum—literally, a dead head.

a—A fanciful term used by the old chemists to denote the residuum of chemicals when all their volatile matters had escaped; specifically, oxid of iron, which is the residue left when sulphate of iron is distilled at a red heat. Hence—

b—Anything from which all that rendered it valuable has been taken away

memorial to Congress on this subject at their last session, accompanied by a number of documents relating to the quantity of the different articles which was referred to the Committee of Commerce and Manufacturing, but has not since been acted upon, this may have been occasioned by the peculiar situation of our country, exciting at that time, an uncommon feeling for the wrongs that had been done us, I am anxious and solicitous to obtain suitable reparation for the insult offered to our national honor and independence; but it appears to me there is an improper association of duties in that committee, for hitherto the commercial and manufacturing interests have been at variance and must remain so until manufactures are more generally established, and the course of trade so far changed as to affect our merchants' other means of obtaining sale [?] for their exports. I, therefore, think it would be an act of equal justice to separate these objects, giving to each description of citizens the same opportunity of being heard and attended, and what is of as much importance, as an act [?] of policy, the separation of them at this point [?] would show to foreign governments our determination to learn to do without them; permit me with the same freedm to suggest to you the propriety of noticing the subject of manufactures in your message to Congress at the opening of the session, with the view of fixing [?] their attention specially to that object.

In the years 1793-94 I commenced a series of experiments for the preparation of sulphuric, nitric and muriatic acids on a small [?] trial scale. In this attempt I succeeded so far as to prepare them to the utmost perfection, but the high price of the crude materials (sulphur and saltpetre), the want of sufficient demand and the easy intercourse with Great Britain, from whence we obtained our supplies, occasioned me to abandon the undertaking, though at considerable loss, and from that time until 1804 I continued in my profession as a druggist, content with preparing such of them as were necessary for the supply of my immediate customers. At this period, believing the consumption of the United States to be sufficient for the support of such an undertaking, I relinquished my business and devoted the whole of my attention to this important subject. In order to perform it with effect both capital and enterprise were requisite. I employed $5,000 in the construction of apparatus alone, which had I failed in my endeavors would not have produced me $2,000, but I succeeded. It, of course, became necessary the works should be increased for the purpose of doing business upon a large scale, because I could not expect the support of the venders or consumers of these articles unless I could give them assurances of my ability to supply all their wants. I consequently enlarged them to such an extent as I believe to be fully equal to the supply of the whole United States, as I have never yet had demand for more than one-fourth of the quantity I am capable of producing. I have since added to my establishment the different preparations of mercury, antimony, copper and many other articles of lesser consequence, and have employed as a capital about $40,000.

In my memorial to Congress, presented at last session, I asked a protecting duty on those articles only which are at present *free*, viz.: oil of vitriol, muriatic acid, nitrous acid and blue vitriol, and I did it with the more confidence because I knew I could supply the whole demands at prices as low as the imported, provided there was no unfair means employed to destroy my undertaking, and because *the crude [?] materials were at that time subject to duty* then, viz.: sulphur, saltpetre and unmanufactured copper, are by a late law exempt from duty, but derive no benefit from this since those articles have nearly doubled

in cost, while I am compelled to adhere by my original prices in consequence of the market being constantly supplied with them from Britain, in most instances of late date, by great additions to the orders, or by shipments made without order, evidently occasioned by their knowledge of my establishment and their determination to effect its destruction in its infancy.

It must be evident to you that the country will sustain great loss, should there be any discouragement of local talent and enterprise at this time, or should there appear on the part of the Government an indisposition to give suitable protection after the experience we have had of the necessity of a complete independence of manufactures. I shall, therefore, not dwell on this subject, confident that in you it will meet with the consideration due to its great importance, but I beg leave to notice that those articles before enumerated were exempt from duty in consequence of their great importance to other manufactures, but since a complete and ample supply can be had here lower than imported on a fair competition, the necessity of this exemption appears to me to cease.

It now remains for me to show the causes which have occasioned the establishment so long to remain unproductive, from which I trust it will be seen that I have a fair and honorable claim upon the interference of government in favor of a manufacture which as a collateral branch is important to the country, and which without this aid must inevitably be suspended. How soon another might rise upon its ruins is not for me to say, but as numerous unsuccessful attempts have been made, should this fail, I fear the want of those articles would be sensibly felt. The means employed to outrage or destroy attempts at manufacturing in this country may be classed under two general heads—first, foreign; second, domestic. The first consists in the perfection to which every special manufacturer has been brought in Europe arising [?] in part from the great consumption by [?] which they are enabled to make a judicious arrangement of the various parts—and from cheapness occasioned by one manufacturer aiding another, not only in the real product of the manufacture, but in many of their off materials a *caput mortuums*, large quantities of which are collected and worked over again to advantage or employed as auxiliaries in other branches —but the aid which the governments afford may be considered not the least important, for in Britain, from whence we import the greatest variety of goods and for whom we are the best customers, drawbacks or bounties are allowed on almost every article of export, the manufacture of which they deem important to preserve to themselves, and of so much consequence do they consider it that wherever attempts have been made to establish them in other countries, they have always been found ready to assist their subjects in their endeavors to crush them—even oil of vitriol from my establishment has become entitled to a bounty of seven shillings six pence per cwt., notwithstanding it pays a duty in this country on export. I cannot conceive that the mere protection of that article can be considered of so much consequence, because in its preparation it consumes no product of their own isle and employs but poor [?] hands, nor does it yield anything to the Government itself; 'tis true the East India company are benefited by the consumption of the saltpetre employed, and their ships obtain ballast from the Mediterranean by bringing sulphur instead of stones—but the secret is [?] that every important and useful manufacture, particularly in clothing, such as bleaching, dyeing, callic printing, hatting and in papermaking and working in metals, is eminently promoted, if not absolutely dependent on this article for their excellence, and, as that country has almost exclusively

made it for export and so cheap as to answer those great national purposes, it is considered an object by the Government to keep it in their own hands. The manufacturer, then, aided by the Government with greater security, increases his exports, and by a combination of numbers and consequently of capital, is enabled to overstock our markets, while the American manufacturer has the mortification to brood over the unproductive result [?] of his labor, his talent and his capital and for what [?] is [?] needed [?] to nurture foreign manufacturers, for so soon as we are protrated their productions advance in a ratio that soon repays them for the first sacrifice; many examples of this might be mentioned, but I shall content myself with noticing one which came more immediately under my own observation. Christopher and Charles Marshall, about the year 1787, established upon a very extensive scale works for the preparation of sal amoniac, Glaubers salts and spirits of hartshorne. They succeeded perfectly. So soon as this became known in England Glaubers salts, a very principal article, was sent out in considerable quantity and interfered materially with their sales. This induced them to apply to Congress for a protecting duty, which was granted, and, instead of an adequate ad valorem duty, a specific duty of two dollars per cwt. was imposed. No sooner was this known to the powerful manufacturers, for so soon as we are prostrated their productions advance in a ratio being ordered in immense quantities at a price reduced from 32 shillings, Sterling, to 10 shillings per cwt., with liberty to the consignee, if the quantity was greater than they wished, to sell it at auction for the benefit of the shippers. By this means the country became overstocked and the Marshalls gave up the business, after having sunk a large sum of money, and as soon as the stock became reduced the article rose in England to 40 shillings per cwt. Glaubers salts is now made here to the exclusion of Britain. Their operator is now following the trade of chemist [?] in one of the western counties of this State. I may also add that since I have been engaged in manufactures many of the articles have been reduced in price in England, so far as affects their shipments to this country, and oil of vitriol has been sent out in much larger quantities than ordered, and in some instances without order, on the plea of a considerable reduction in price, while we know that sulphur and nitre, the materials employed in its manufacture, had advanced, from whence we may fairly infer the reduction in price so, was the result [?] of a plan formed for the destruciton of similar manufacture here.

The obstacles which present themselves to an American manufacturer from *domestic* causes appears to me to consist of prejudices in favor of foreign goods arising from our intimate acquaintance with the nature and quality of them, the certainty of always obtaining them in sufficient quantities to answer our purposes at prices that had become familiar to us, the influence of fashion in articles of dress and the *fact* that American productions would not prove equal to those we had been accustomed to, there having been few opportunities of making a fair comparison; but there is another and more powerful operative against them—the American Importer may be considered as the medium thro' which the American consumer is supplied with foreign productions; to him it is unimportant what those articles cost so long as they are procured from a foreign market, because his profits arise from a percentage charged on that cost, and the higher the charge the greater quantum of profits results on a given quantity, hence the indifference, and in too many instances the hostility of those intermediate agents or venders to the introduction of manufactures among

ouselves, for say they wherever a manufacture is established equal to the supply of our wants the consumers can go to the fountain head and we lose our profits. This is also aided by the residence among us of agents of foreign manufacturing houses whose influence is created by their apparent liberality in the extension of credit, where occasions prevent showing [?] some prospective advantages or where the urgency of the importer requiring such indulgence feels the necessity of sacrificing his independence to his circumstances.

Some of the observations in this you will perceive have a general application, while others apply particularly to my own concerns. I will not deny that my own interests [?] had a prepondering influence, tho' I can assure you with the utmost truth that I always considered the more general introduction of manufactures as essential to our happiness and that this consideration was my principle inducement for engaging in my present undertaking.

With best wishes for your present and future happiness I am respectfully

Your frd

JOHN HARRISON.

EDUCATIONAL PAMPHLETS
ISSUED BY THE
PHILADELPHIA CHAMBER OF COMMERCE

PURPOSE:—To make Philadelphia's life, industry, history and government known, understood, and appreciated by all its citizens.

No. 1 Thrift—a short text-book
No. 2 The Trust Companies of Philadelphia
No. 3 The Rug and Carpet Industry of Philadelphia
No. 4 The Locomotive Industry in Philadelphia
No. 5 Truck Farming in Philadelphia County
No. 6 Candy Making in Philadelphia
No. 7 The Leather and Glazed Kid Industry in Philadelphia
No. 8 Milk and Its Distribution in Philadelphia
No. 9 Telephone, Telegraph and Wireless Systems in Philadelphia
No. 10 The Manufacture, Distribution and Use of Gas in Philadelphia
No. 11 Department Stores of Philadelphia
No. 12 Commercial Banking in Philadelphia
No. 13 The Paint and Varnish Making Industry in Philadelphia

Other pamphlets in course of preparation

Date Due

DEC 1 8	1948		

Library Bureau Cat. no. 1137