LEATHER, TOY, AND REFRIGERATOR INDUSTRIES

To better enable our representatives to successfully approach these three important manufacturers a thorough research of the finishing methods and materials employed by these three industries was recently made at considerable expense to the company, and represents months of specialized study and effort.

Every representative who has any leather, toy, or refrigerator accounts in his territory can digest this data to very good advantage, as it outlines not only the finishing schedules employed by the larger manufacturers of these products in the leading industrial centers but definitely provides the products in our line that have proven to meet the requirements of these particular classifications of trade. You can recommend these schedules and rexes with confidence, as these systems are based upon successful use in actual production and furthermore carry the approval of our manufacturing and technical departments. Slight modifications may be necessary to meet individual requirements or certain local conditions, but other than a possible exception here and there these schedules represent the best finishing practice for toy, refrigerator, and leather fabricators.

It is our aim and intention to concentrate on these three types of manufacture this year with all the force of our sales organization. We expect unusual activity in the close cultivation of such accounts. Arrangements for tests of our products should be made immediately and then followed up personally so that the introductory work is quickly completed so that the maximum sales can be credited to the individual territories for the current fiscal year. Every toy, leather, and refrigerator manufacturer, large or small, should be aggressively solicited on every territory, not only for their finishing material requirements but their maintenance and up-keep paints as well.

Changing conditions in industry demand greater specialization coupled with standardization. We feel we are keeping pace, or possibly a step ahead, by making a specialized study of the leading manufacturers in standardizing schedules developed to meet the requirements of one class of trade only. Our success in the development of Opex Automotive Lacquer sales can be credited to simplification and standardization. Further industrial surveys of this character will be carried out, dependent upon the response and performance of the sales department to this foundation, covering what we consider the three largest industrial consumers of lacquer finishes the present market presents.

So as not to handicap the small manufacturers nor penalize the large consumers we are not establishing any book prices on the new products incorporated in this data. Special prices will be authorized dependent upon the potential consumption of each manufacturer. Application for selling prices should be made to the district Mfrs. Sales Manager, who in turn will take this up with either the Chemical and Technical Products Department, or the General Lacquer Sales Department at Cleveland. Each and every request must provide the following information for individual analysis:

1. Customer's name and address.
2. Rex number of material.
3. Type of product manufactured.
4. The size of package, as to 1's, 5's, or drums.
5. F. O. B. Chicago or delivered price.
6. What material we have sold the manufacturer in the past.
7. Name and type of product they are using at the present time.
8. Amount they will order at one time.
9. Estimated annual consumption.

The General Lacquer Sales Department will also welcome detailed correspondence concerning the finishing operations each representative encounters in his search for new business in these three fields. We will be particularly interested in the following information, so that careful analysis can be made of each individual problem:

1. How is surface prepared?
2. Type and nature of surface.
3. Type of primer or sealer used.
4. Type of surfacer or filler used.
5. Type of finishing coats used.
6. How many coats in all?
7. Is the material air dried or baked and how long?
8. Is the material sprayed, brushed, or dipped?
9. The type of finishing equipment employed.
10. Any sanding or rubbing?
11. What tests are made?

Should tests of regularly established rexes prove the necessity of a slight change in formulation, follow out the instructions covered under "Special," on page 302 of the Opex Industrial Price List.

LEATHER FINISHING

1. Classification.
2. Synopsis of treatment from raw hide or skin to finished product.
3. Description of most important machines used for finishing leather.
4. Application of lacquer.
5. Types of lacquer used.
6. Advantages gained by use of lacquer.
7. Finishing schedule for calf skin.
8. Finishing schedule for kid.
9. Tests and definition of terms used by the leather manufacturer.
10. Shoe finishing.

CLASSIFICATION

LEATHER MADE FROM:

Hides

Pelts from large, full grown animals—cow, horse, etc. Use—Heavy leather for shoes, belting, and harness. When cut into splits used for uppers, bags, upholstering, etc. Characteristics—stiffness, strength.

Kips

Skins of under-sized cows, horses, etc.

Skins

Obtained from small animals such as calves, goats, and sheep. Uses—Uppers for shoes, pocket-books, bookbinding, gloves, and fancy leather.

Characteristics—Light and pliable.

SYNOPSIS OF TREATMENT FROM RAW HIDE OR SKIN TO FINISHED PRODUCT

Soaking

The hides or skins as they come from the packer are salted to keep them from putrefying. When received at the tannery they are first soaked to wash off the salt.

Liming

The hair is removed by immersing in a tank of lime water. This both loosens the hair and swells the hide.

Originally the hair was removed by scraping with a blunt knife but this same operation is now mechanically performed by an unhairing machine.

Deliming or Bateing

This removes excess lime which is detrimental to tanning.

Tanning

The hides, after being washed, are now ready for tanning. This keeps the skin in a stable condition, and without this tanning the skin would soon become stiff and disintegrate.

There are two general methods of tanning—vegetable and chrome. Most leather made for soles, heels, or belting is vegetable or a combination vegetable and chrome tanned. Shoe uppers, glove leather and fancy leather are generally chrome tanned because this gives a more pliable leather.

The essential material used in vegetable tanning is tannic acid, which occurs in various barks, woods, nuts, leaves, etc.

In chrome tanning Chromium salts are used.

Dyeing

The next operation is the application of the dye. This is a study in itself. The application and type of dye varies considerably, depending on the skin and use to which it is put.

Fat Liquoring

No matter how well tanned the hides or skin may be if they are not properly fat liquored they dry out stiff and lack that well nourished feel that is essential.

Fat liquor is an emulsion of soap, oil, etc., which should be absorbed entirely by the leather. If there is any excess on the surface, the subsequent finishing with lacquer is spoiled as it is impossible for lacquer to adhere to a greasy surface.

Drying

The leather is now dried out and then lightly dampened again to get it in a softened condition prior to staking or softening.

Staking

This is accomplished by the use of a machine comparable to the Glazing Machine, which is described later. It has a movable arm and dull knife in place of the glass cylinder. This stretches the leather. When dry it is ready for the application of lacquer.

DESCRIPTION OF MOST IMPORTANT MACHINES USED FOR FINISHING LEATHER

Glazing

This operation imparts a high gloss finish to the leather. The machine used consists of an arm provided with a glass or agate cylinder held stationary while the arm runs forward and back over the base of the machine on which the skin to be treated is placed but only touches it on the backward motion. The friction caused by this action gives a polish while at the same time smoothing out the skin.

Rolling

When a semi-gloss finish is required this method is used. The machine is the same as used in glazing with the exception that a steel roll replaces the glass cylinder. This smooths out the skin. On account of there being less friction the gloss or polish is not as high.

Smooth Plating

This operation leaves the skin smoothed out but with a dull finish. The leather is placed between the plates of an embossing machine, which is fitted with smooth plates. This machine is capable of great pressure and steam heat is applied at the same time which makes the pressure more effective.

Embossing

When an artificial grain is required the skin is inserted in an embossing machine, the same as is used in smooth plating but with an engraved top plate used in place of a smooth plate.

Ironing

In place of smooth plating, some tanneries iron the leather. A plate heated to 150 degrees is laid over the leather and ironed with a gas heated iron, similar to the type used by a clothes presser. This leaves a dull finish and is not as severe as smooth plating when used on light weight skins.

APPLICATION OF LACQUER

The application of lacquer to leather is quite standardized. A regulation spray booth is used and has inserted a wooden rectangular frame on which is tacked a wide meshed screen. This is slanted backwards about 20 degrees from vertical. The skin is thrown on the screen and held in position by nails which protrude in such a position that the four corners of the skins are held in place.

A better method is the use of toggles or snaps which are attached to the screen and snapped on to the skin. The draft created by the fan also tends to hold it in place.

The lacquer is reduced 200%.

Quality and durability depend to a great extent on the application and the same material can either be driven right through the skin or laid on the surface giving widely different results. The oil type finishes being very slow drying have a chance to penetrate right into the skin. Lacquer, if thinned down and sprayed on wet also has a chance to penetrate. However, if an extremely thin coat is applied with less thinner it dries as soon as it hits the surface and lays right on top.

TYPES OF LACQUER USED

There are three main types of lacquers used on leather:

1. Lacquer Enamels.
2. Lacquer Stains.
3. Clear Lacquer.

Lacquer Enamels

If a heavy coat is required to get proper covering there are distinct disadvantages. In the first place a heavy film produces an excessive break in the finished leather. Secondly, it will have less adherence than a thin film. Opex Leather Lacquer is properly balanced to meet these conditions.

The rezes of our latest developments are as follows:

Red	CE 1033
White	CE 1037
Black	CE 1036
Yellow	CE 1035
Light Blue	CE 1034
Blue	CE 1031
Brown	CE 1042
Light Yellow	CE 1164
Green	CE 1032

APPLICATION OF LACQUER—Continued

Lacquer Stains

This one operation stains and lacquers the surface. While water-proof in the sense that it will not spot with water a dampened rag will show color when rubbed over the surface. By applying a coat of Clear, 04609, on top this is overcome.

The rexes on the Leather Lacquer Stains are as follows:

Red	CL 292
Blue	CL 293
Green	CL 294
Brown	CL 295
Yellow	CL 296
Black	CL 297

Leather may be stained also with regular water soluble stain first, and finished with 04609. As water soluble stains are faster to light the color is more permanent in this method.

Where a satisfactory adhesion cannot be obtained by using the lacquer enamels as a first coat, Opex Clear Leather Lacquer, on account of the absence of pigment, serves as an excellent priming coat. It is also used as a finish coat where the highest possible gloss is required.

The rex on this clear lacquer is as follows:

Clear.....04609

ADVANTAGES GAINED BY THE USE OF LACQUER

The advantages to be obtained by the adoption of lacquer in the finishing of leather varies somewhat according to the skin in question.

Side Leather

1. Particularly in the light colors the shoe manufacturer has to go to quite heavy expense and trouble in order to keep the shoes clean in the process of fabrication, because the finishing materials are not water or grease proof. Some factories go to the expense of using linen to protect the surface of the shoes from the workman's hands. With a lacquer finish all that is necessary is to wipe them clean with a dampened cloth.

2. Leather is graded according to its degree of perfection and on this grading depends the price which the tanner receives for his products. Naturally the problem with which they are continually wrestling is to have as much of their output as possible in the top grades. With the pigment finishes it is very difficult to control the uniformity of the finish, but Opex Leather Lacquers are overcoming this trouble.

3. Our latest development for this type of leather has more flexibility and twice the covering power of our earlier developments thus allowing a lighter coat to be applied.

Sole Leather

Chrome tanned sole leather when coated with Opex Leather Lacquer Enamels is made to look like a vegetable tanned piece of goods. As the sales value depends largely on how the leather looks, and as lacquers have improved the appearance resulting in increased value, tanners are very much interested in this development. It also protects the leather from water and oil stains and these can be easily wiped off from a side coated with lacquer, where ordinarily they left a permanent mark.

Patent or Semi-Patent Finish

1. The durability of this type of leather has never been all that could be desired. Cracking or "piping" occurring after the shoes have been worn for some time. Patent leather produced from lacquer will stand five times the number of bends that the oil finishes stand.

2. The time consumed for oil finishes to dry, space taken up, labor in putting the skins out in the sun and taking them in has been a costly procedure. The speed of drying in the lacquer finishes is just as important here as in any other production job.

3. The highest possible gloss is required in this type of leather and lacquer gives a higher lustre than is possible by the use of the oil finishes.

Bag and Fancy Leather

1. When a woman pays a big price for a fancy bag and this is permanently spotted when rained upon, she is naturally disappointed. With the use of lacquer a waterproof finish is obtained which makes the ultimate product more satisfactory and is a sales aid to tanner, manufacturer, and retailer.

FINISHING SCHEDULE OF CALF SKIN

Calf Skin—its uses—shoes, bags, belts, etc.

Finishing Schedule

1. Apply by air brush—40 lbs. pressure. One light coat of Opex Leather Lacquer Enamel, reduced 200%.
2. Apply at right angles to the first coat a second light coat at the same pressure and reduction.
3. The skin is then plated, glazed or ironed.
4. One coat of Opex Clear Leather Lacquer, 04609, reduced 200%.
5. The skin is again plated, glazed, or ironed. This gives a very soft, flexible and high lustre finish that is exceedingly durable.

FINISHING KID

While we have tests being made on our materials for finishing kid, at the present time we are not in a position to give definite recommendations.

TESTS AND DEFINITIONS OF TERMS USED BY LEATHER MANUFACTURERS

Waterproof

A big advantage gained by the adoption of lacquer as a leather finish is its waterproofing qualities. The finish is tested for this property by wiping a dampened rag over the surface and seeing if it removes any of the color.

Adherence

As the first lacquers did not adhere very well, naturally the present day lacquers are tested very carefully for this property. The severity of the test depends upon the subsequent use to which the leather is to be put.

As shoe leather is formed over the last and some women's shoes are turned inside out in the process of manufacture, leather for this purpose must stand extreme stretching. If the adherence is poor the finish crystallizes or flakes under very little stretching. While this might be termed a "knock down" test, it nevertheless gives a good idea of the various degrees of adherence of the different lacquers.

Break

When a skin is folded with the finished grain side on the inside, the finish should break in the same places as the grain of the material. The break of the skin should not be increased after finish is applied.

Feel

When the skin is folded loosely with the finished grain side on the outside and the fingers drawn over it, the leather should have a soft pliable feel.

Topping

On embossed leather the top is often given a coat of a different color than the ground coat and this is applied lightly to the surface of the skin.

SHOE FINISHING

A successful Leather Lacquer must satisfactorily meet the requirements of not only the tanner, but the shoe manufacturer and the ultimate consumer—the wearer of the shoes. In the same manner that we in the marketing of our product studied the requirements of the tanner, the tanner in turn must keep in mind and study the requirements of the shoe manufacturer. The tests he puts his finished leather to should be designed in such a way as to tell him whether the leather will be able to withstand the abuse to which it is put in the fabrication of foot-wear. As it is necessary to have an intelligent understanding of the complete manufacturing process from the raw skin to the finished shoe we are briefly outlining the operations encountered in the manufacturing of the leather into shoes.

Cutting

The various pieces of leather that go to make up the shoe are cut out from the stock by a series of dies.

Skiveing

The tops are skived to a proper thickness so they can be folded. A hard or brittle finish would crack or tear during this operation.

Fitting of Shoe

The various pieces must be properly and carefully fitted so that the finished shoe will not be out of line.

SHOE FINISHING—Continued

Pulling the Shoe

The fitted shoe is pulled down tight to the last. A brittle or hard finish would not stretch with the leather and would crack or powder off.

Lasting the Shoe

Side lasting is where all the stretch is taken out of the leather.

Toe Lasting

The leather is formed over the toe of the last. This operation puts a very great strain on the leather and it is this operation that causes many finishes to fail.

Seaming

Filling

The bottom of the shoe is filled with cork.

Laying of the Sole

Stitching the Sole Fast to the Welt

Trimming

Sole trimmed to proper shape.

Heeling

If the precautions and methods which have been previously indicated have been carefully followed no trouble will be encountered in the making of shoes from leather finished with Opex Leather Lacquer.

TOY FINISHING

1. Advantages of a Lacquer Finish.
2. Types of Toys Manufactured.
3. Different Surfaces Encountered.
4. Finishing Methods for Different Surfaces.

ADVANTAGES OF A LACQUER FINISH

Lacquer, being a quick drying finishing material, is exceptionally well adapted for use in all production shops.

As most toys are assembled after the separate pieces have been finished, great care has to be exercised in transporting parts from one operation to another, and in actual assembly where the oil type of enamels are used.

There is scarcely a group of manufactured articles that have to stand the abuse to which toys are put. The toughness and durability of lacquers fill these requirements.

On interviewing some of the larger toy jobbers in New York City they agreed unanimously that the quality of the finish had more to do with the salability of toys than any other factor.

TYPES OF TOYS MANUFACTURED

The variety of toys manufactured is almost numberless but they can be grouped into several divisions according to the kind of toy.

Automobiles—Baby Carriages—Baby Walkers—Jumpers—Banks—Boats—Children's Vehicles—Composition Toys—Construction Toys—Dolls—Engineering Toys—Furniture—Iron Toys—Kitchen Sets—Mechanical Toys.

DIFFERENT SURFACES ENCOUNTERED

In view of the wide variety of toys, practically every surface which is encountered in industry as a whole is found in this business. From a standpoint of the finishing foreman, it is not so much the kind of toy manufactured that he is interested in, as the piece of wood or metal, the size and shape and the use to which it is put. Taking this as a basis for classification, we find the following:

A—WOODEN
1. Small Turnings.
2. Large Turnings.
3. Angular or Irregular Wooden Pieces.

B—METAL
1. Sheet Metal.
   (a) Black Iron.
   (b) Tin.
   (c) Hot Rolled Sheet Steel.
   (d) Cold Rolled Sheet Steel.
2. Cast Metal.
   (a) Iron.

C—RUBBER COMPOSITION.

D—SAWDUST COMPOSITION.

FINISHING METHODS FOR DIFFERENT SURFACES

A—1. First Coat Wooded Turnings (Small) *Oil Type Primary Coat*

The most economical way to apply the first coat to small wooden turnings is by tumbling. There are many shops who could cut the costs in this operation considerably if the tumbling method were adopted. Lacquers, on account of their quick drying properties, cannot be applied by this method. Our Lustral Enamels, when properly reduced, have proven very successful for tumbling.

The equipment involved is comparable in principle to the agitator tanks used in reducing paints. In tumbling, however, the drum itself revolves rather than the agitator. A stationary shaft attached to the center of the bottom protrudes about half-way up the middle of the drum. It is fitted with a cap on the end. When the pieces fall on the cap, they are spread to the outside, giving a circulation of the articles being coated. The tank is set at an angle of about 60 degrees from horizontal which facilitates the circulation.

Another type of tumbling machine is composed of a cylinder which revolves on its horizontal axis, similarly to the ball mill types of paint mixer. In both cases the most important factors to set and control are the body of the paint and the speed of the mixer. The paint should be thin to allow as perfect an intermingling as possible between the articles and coating material. The speed must be fast enough to prevent the pieces sticking together.

By forced drying of the first coat to 200 degrees F. for an hour, the disfigurement of the surface, due to the formation of bubbles where the subsequent coat is dipped, is overcome.

Second Coat—Dipped

As this process is more likely to raise the first coat than spraying, care must be taken to have it thoroughly dried.

The pieces are dipped singly, in groups, or by machine. Only special toys which are not made in a production way are dipped singly. The next best method is to dip in groups. Where it is feasible a hole is punched in the end of the turning so that it can be stuck on a rack fitted with nails. In this way a number of pieces may be dipped at once. This operation is done by hand. The dip tank should have as small an opening as possible in order that evaporation of the lacquer solvents may be reduced to a minimum. The maintenance of uniform viscosity or body is essential in dipping. When the proper body has been ascertained by trial, this can be readily maintained by the use of a hydrometer. The tank should be tested at frequent intervals and as it bodies up more thinner should be added to make up for the loss in evaporation.

If the wood is very absorptive the material which drains off will have a greater percentage of pigment and be shorter than the original lacquer enamel. If the pigment particles seem to stick together leaving a rough finish this may be overcome by adding a small portion of clear lacquer and mixing it in well.

The speed of dipping plays a more important part in securing a good job when using lacquer than it does with oil enamels. Because lacquer sets up rapidly, if the piece is withdrawn quickly, a heavy coating is deposited as it dries before it has a chance to flow off. A bothersome feature is the formation of a tip due to the accumulation of excess material at the bottom. If the articles are turned upside down after draining for a carefully determined length of time, this will flow out. If this is done too soon, the lacquer will flow back, particularly on the sides, and runs occur. If too late, the tip will have set up and will not flow out.

By dipping slowly the lacquer has a chance to flow down as the article is being removed and a thinner film is applied and the danger of runs is minimized. While some articles are dipped satisfactorily by hand, modern production methods call for special automatic machinery. This machine is designed for the purpose of automatically dipping all kinds of small wooden and metal items at the least possible cost. They have a capacity of finishing from 2500 to 100,000 small items per day depending upon the size and shape of the article being dipped, the operator, and the quality of finish desired. A flat can be dipped faster than a glass. The cost of these machines runs between $500 and $600. The manufacturers of these machines will develop the proper rate of dip and will also correctly finish the first batch of samples in Opex to any purchaser we refer to the manufacturers of the dipping machine. Full information as to the source of supply of this equipment will be furnished you by your district MSD manager. The rate of dip is dependent upon the size and shape of the product being dipped—generally it averages five inches per minute—small wooden baubles are usually withdrawn from the lacquer tanks at the rate of one to four inches per minute. A perfect dipping operation covers solid with no runs or sags.

In most cases these two operations are the complete finishing schedule although where an extremely high gloss is required, a third coat of clear lacquer is dipped.

A—2. First Coat Wooden Turnings (Large)

Tumbling cannot be used to advantage when the turning is more than 8 inches at its longest dimension. For the first coat the lacquer primer is dipped. The method of application is by dipping and in some cases by spraying. Opex White Filler, 28601, is the most satisfactory first coater for either dipping or spraying wooden turnings.

If forced drying is used, the finishing time can be reduced. Many plants which had installed ovens for baking enamels, are using these to advantage in the application of lacquer. The temperature should not be in excess of 175 degrees for forced drying lacquer.

FINISHING METHODS FOR DIFFERENT SURFACES

Continued

Second Coat

Method of application of the second coat depends upon the size of the article. Over 18 inches they are usually sprayed. As dipping is cheaper, it is used wherever feasible. If the dipping process is used a standard body should be maintained by the use of a hydrometer. Specify Opex Industrial Enamels, in grade and color desired by customer.

A-3. Angular or Irregular Wooden Pieces

There are so many grades used that no definite rule for application can be layed down. Whether the dip or spray method is used depends on the size and shape of the article.

B—Metal

The preparation of the metal surface is of extreme importance. No matter what quality finishing materials are used most unsatisfactory results will be obtained unless the utmost care is taken in the treatment of the metal surface.

B—1. Sheet Metal

(a) BLACK IRON

Due to the speed with which rust forms on this metal it is at best dangerous to use. Great care should be taken in cleaning and after handling, and not more than a few hours allowed between cleaning and finishing. An oil primer, such as No. 36, should be used rather than a lacquer primer, followed by one or two coats of Opex Industrial Lacquer Enamel. In most cases the finish is applied by spray, but if the shape permits dipping is a cheaper method.

(b) TIN

This has fallen into disuse by the toy manufacturers. Because of its very smooth surface the difficulty of getting the finish to adhere properly is very great. Train tracks are made of this metal and the switches are often painted for this purpose with long oil enamel, such as Old Dutch.

(c) HOT ROLLED SHEET STEEL

When delivered this metal is covered with grease and often rusted in spots. There are many methods used for its cleansing. The old method was with a caustic solution, but this has in many cases been replaced by processes, of which the Oakite Process is a good example. The equipment consists of three baths; the first is filled with a hot Oakite solution into which the sheets are dipped, the second bath is cold running water, and the third contains boiling water. After being removed from the third the sheets are dried in an oven. These should not be left more than overnight before coating. They are generally finished by spraying as follows:

1. One coat Oil Baking Primer No. 36.
2. One coat Opex Industrial Enamel.

An alternative method is using lacquer primer, which is satisfactory provided great care is taken in removing every trace of rust and grease from the surface. Opex Lacquer Primer No. 64 gives excellent results.

(d) COLD ROLLED SHEET STEEL

This is smoother than the hot rolled steel, which makes a better finish possible, but with which it is harder to get the proper adherence. The same method for cleaning and finishing that is used for hot rolled sheet steel is used here.

B—2. Cast Metal

(a) IRON

Cast iron engines, automobiles, and similar irregularly shaped articles provide the bulk of this classification. They are generally cleaned by dumping them into a mesh basket and then dipping them into a cleaning solution. Up to the present time color varnishes give the best results as it is generally necessary in one coat to provide a smooth, well covered finish that does not leave any drain at the bottom when dipped.

C—Rubber Composition

Some boats, for example, are made from molded hard rubber composition. The only precaution necessary for finishing this material is to give it a light sand. Often some portions of the surface will have quite a glaze and it is this part, in particular, that should be given a tooth for the succeeding coats. When this precaution has been taken, lacquer enamel can be quite successfully applied direct without the use of a primer. As most of these boats are made in two-tone effects they generally make shields, which are on hinges, divided in the center into which the boat fits up to the desired level. Specify Opex Industrial Lacquers.

FINISHING METHODS FOR DIFFERENT SURFACES
Continued

D—Sawdust Composition—Doll Heads—Arms

They are molded from a mixture of sawdust, starch and glue, which is baked, leaving a very porous brittle surface.

First Coat

The head is dipped into a sealer of the following approximate formula:

100 lbs. glue—30 lbs. zinc oxide—20 lbs. glycerine.

This is reduced to the proper consistency with water.

Second Coat

The cheeks and tip of chin are spotted with an analine dye solution.

Third Coat

One coat of Opex Flesh Colored Lacquer Enamel, Rex CE 1125. The solvents in the enamel dissolve the analine dye which bleeds up through the top coat, giving the natural bloom of the cheek. The requirements of such an enamel are that it cover solid in one coat, have a velvet finish, and natural flesh color. Then as the doll heads are exposed in store windows it should also hold its color without showing traces of "sun-burn" when exposed to the sun. CE 1125 meets all these requirements satisfactorily.

Fourth Coat

Opex Tan Enamel, CE 1124, is sprayed on the top of the head to represent the hair. For the eye-brows stencil masks are made and the eye-brows sprayed on, using CE 1172.

REFRIGERATOR INDUSTRY

In the past few years, due to the introduction of domestic electric refrigeration, great changes have taken place within this industry. Some of the leading manufacturers of electric refrigerators were unknown as far as this trade is concerned, a short while ago, although in most cases they are powerful corporations in other industries. The extensive advertising carried on of late has opened up an increased market.

Color, which has been playing an ever increasing part in the finishing of most manufactured products, is now creeping into this industry as well.

Up until a few years ago the great majority of boxes were finished in a conservative golden oak stain. Then came the demand for white enamel, and this caused a lot of worry and loss to the manufacturer, retailer, and consumer alike in its first stages. At this time practically all the boxes were of wood and even today there are very few manufacturers who will finish wooden boxes in either oil or lacquer enamel. In transportation cracks almost invariably develop and in use the finish will often peel off because no matter how well the inner surface is sealed some moisture gets through and forces the finish off.

The next development was the use of sheet metal attached to a wooden framework. Black sheet iron, galvanized iron, Galvaneel, sheet steel, and lead-coated sheet steel are all used with varying degrees of success. Due to the improper treatment of the metal prior to the finishing, many really good finishing materials have been outcast.

Types of Refrigerators

1—METAL REFRIGERATORS

1—(A) Sheet Metal

The sheet metal is assembled on a wooden frame which is dipped in Spar Varnish, rex 02191, or Reduced Ebonol.

The metals used are black iron, galvanized iron, Galvaneel, automobile or furniture type sheet steel, and lead-coated sheet steel. To obtain a satisfactory finished job the proper pre-treatment of the metal is absolutely essential and each variety of metal presents its special problems.

1. BLACK SHEET IRON

This is perhaps the most dangerous one to use due to the extremely rapid rusting which takes place. As practically every manufacturer who used this material has discarded it, it need not be discussed very fully here, except to say that where it is used unless the surface has been extremely well cleaned and then coated within a few hours trouble will be experienced.

REFRIGERATOR INDUSTRY—Continued

2. GALVANIZED IRON

While the galvanizing process overcomes the danger of rusting, the grease and acid which remain on the surface are the worst of enemies to any subsequent finishing coat.

(a) The surface is carefully washed with Benzine.

(b) The surface is washed with dilute Acetic Acid about the strength of Vinegar.

(c) A rag dampened with alcohol should be used to give the final wipe-off.

There are of course many variations to be used in the cleaning of this metal. In some places a saturated copper sulphate solution replaces the Acetic Acid.

3. GALVANEEL

This metal is a recent refinement of galvanized iron, the development of which was caused by the dangerous finishing surface the regular galvanizing process left. It does not have the smooth, scaly appearance but is dull and has a somewhat porous surface. Concerns using this material are limiting their treatment to washing with naphtha and are obtaining good results. While its surface is less dangerous to coat over, its porous nature makes it more difficult to obtain a smooth finish. In some cases a surfacer coat is used.

4. AUTOMOBILE or FURNITURE TYPE SHEET STEEL

The most fool-proof method is sand blasting. This leaves a bright, clean, almost fool-proof surface. As this method is costly it is not as generally used as some other methods.

The ordinary method for cleaning this metal is the alkali bath, although safer methods are taking its place, of which the Oakite and Wyandotte methods are good examples. In these methods sheets are successively dipped into three tanks and finally dried. The first tank consists of a boiling chemical solution, the second tank is filled with cold running water, and the third is filled with boiling water. Sheets are then dried and finished with the oil primer, not more than four hours after cleaning.

5. LEAD-COATED SHEET STEEL

This seems to be a desirable metal for use in refrigerators. It has a smooth surface and does not rust. It is cleaned by the following method:

(a) Washing with Naphtha.
(b) Wet sanded.
(c) Washing with Vinegar.
(d) Dry sanded.
(e) Wiped with a rag wetted with alcohol.

Due to the lead coating the baking temperatures are limited to about 180-200 degrees F.

Priming

Wherever possible the priming coat is applied before assembling. While the usual method of application is spray, in some cases where conditions make it possible it is dipped. The best results are obtained by the use of a light coat. Primer should be flexible and yet adhere strongly to the surface. It should present a smooth surface to eliminate surfacer, particularly where the original sheet metal is smooth, as in many cases the finishing coat of lacquer enamel is applied directly over the primer. It should be non-porous in order to hold out the lacquer. Y7511 is extremely long in oil, giving a tough elastic film, which properties are retained after the application of the lacquer coats. It may be applied by dip or spray. At 310° F it is dry in 1 ½ hours or at 250° F in 2 ½ hours. This is our best recommendation. Y7099 is a dip primer. It bakes in 1 hour at 300° F or 1 ½ hours at 250° F. Y8027 is the same quality as Y7099 but is better for spraying as it has less tendency to run. These rates should be recommended where conditions do not allow the time taken by Y7511 to bake. The longer the primer the more durable the finish so that every advantage as to increased temperature or longer baking should be taken advantage of.

Surfacing

Surfacer is not necessary when the metal is smooth. When it is used, on account of file marks or imperfections, it should be well sanded, only remaining in the places which it was intended to fill. At best, because of the shortness of the material, it weakens the film and as the proportion of pigment to vehicle is greater than the primer coat it does not hold out the finishing coats as well as the primer. Whether to use lacquer or oil surfacers depends on the conditions existing in the individual plant. If they have baking equipment, oil surfacers should be specified, but if air drying then recommend the use of lacquer surfacers. The same applies to the choice between lacquer and oil putties.

REFRIGERATOR INDUSTRY—Continued

Finish Coat

The quick drying nature of lacquer, as well as its toughness and durability, has been capitalized upon by this industry. Rex CE 1122 should be recommended where a sharp blue-white color is required, and CE 877 where a cream-white is wanted. They are both reduced approximately 75 per cent for spraying.

Requirements of the Finish

As there has been considerable loss due to the lack of durability in the finish used naturally the manufacturers are using very severe tests to determine the quality of the finish obtained by any schedule recommended. They lay the greatest stress on the humidity test. The refrigerator is filled with ice, or, in the case of the iceless type it is put into operation, and placed in a room in which the temperature is controlled at around 120 degrees; moisture is condensed on the surface and the box "sweats." It is left here for about 15 days and there must be no softening of the finish, or discoloration either by yellowing or staining from rust. Both the primer and lacquer must retain perfect adhesion to the metal. The requirements of a refrigerator lacquer, which are met by Opex refrigerator lacquers, are as follows:

1. Satisfactory condition in the package to eliminate grit caused by stirring up settled pigment.
2. It should take good reduction—at least 50 per cent.
3. It should spray well without excessive spray dust, "orange peel," or a tendency to sag.
4. It must cover well—solid over light gray primer in three double coats without sanding between coats.
5. It must dry quickly without blushing and with a full gloss.

Cleaning the Metal

This is such an important step that we are stressing it again because no finish is any better than its adherence to the surface. It is the most important operation where a permanent finish is expected. The primer will adhere properly when the metal is clean, but when the metal is not properly cleaned no primer, or any other finishing coat, can be expected to adhere.

There are several different systems of cleaning metal employed, these being more or less dependent upon the type of metal used in the fabrication of the refrigerator. If gasoline is used it should be high test gasoline to insure against leaving an oily film.

Opex Cleaner and Remover, although more expensive, is more effective than High Test gasoline because there is no possibility of leaving behind any residue. Sandblasting is the surest way to clean metal, not only because it does not leave any foreign substance but because it roughens the metal and thus gives the primer a better tooth to bite on. Dioxydine is a mixture of alcohol and phosphoric acid. This is used to prevent rust forming but the primer must be applied within 8 to 10 hours after Dioxydine is used. Dioxydine is particularly recommended for black sheet iron and other metals that have a tendency to rust quickly before the priming coat can be applied.

Dioxydine, however, is not recommended as a cleaner or remover for greasy, oily surfaces. Where the problem is particularly one of removing a greasy, oily surface the Oakite or Wyandotte processes are generally employed for most efficient results. Wyandotte cleaner is a mixture of caustic soda, soda ash and soap. It removes grease by forming an emulsion which should then be removed with hot water. The bath should be changed frequently as the oil content increases to a point where grease is not removed but is merely transferred from the cleaning solution to the surface that is being cleaned. The Copper Sulphate solution recommended for galvanising iron is a 5 per cent to 10 per cent solution which is generally used by wiping over the surface with a rag saturated with this solution. The sheet is then washed in a hot water bath and wiped dry with clean cloths or dried in an oven.

2. Wooden Refrigerators

(A) GOLDEN OAK STAIN FINISH

Still the most popular finish in this class of box is the Golden Oak Stain Finish. Perhaps the most popular wood used is Northern Ash. A tested satisfactory finishing schedule is as follows:

1. INSIDE
   (a) One coat of White Oil Bond Coat, Rex 23266. This air dries over night to a very light gray—dull finish. Reduced 25 per cent with Naptha.
   (b) One coat of White Enamel (Oil) Rex 22301. The above is a high gloss. For a dull finish use 22320.
2. INSIDE

   An alternative method for the cheapest grade of box is one coat of White Enamel. While this method is not to be recommended nevertheless there is a real demand for this type of material, and we have developed Rex-6017 which air dries in 1 ½ hours with a rich high gloss.

REFRIGERATOR INDUSTRY—Continued

OUTSIDE

(a) One coat Paste Wood Filler, Golden Oak, Rex No. 5. This is reduced 50-100 per cent with Turpentine or mineral spirits.

(b) One or two coats of Varnish, Rex 01865, sprayed.

(B) GRAY STAIN FINISH

One company making wooden boxes ran into trouble in finishing in white enamel, and wishing to replace it with something other than Golden Oak Stain they sent out to their agents a few sample boxes with the following finish, which has become so popular that it now represents 40 per cent of their production, although only started one year ago.

1. A stiff wire brush is generally used to open up the pores of the wood.
2. One coat of Gray Handcraft Stain, Rex 14521.
3. One coat of Oil Filler, such as Flat-Tone White, Rex 15185, is brushed on and rubbed off with a rag filling the pores white.
4. One coat Opex Flat Lacquer, Rex-04595. This is sprayed without reduction. Two coats over a well filled box will give satisfactory results.

Interior Finish

We do not recommend Opex for the finishing of the interior of refrigerators, as in our opinion there cannot be an absolutely odorless lacquer. Previous experience has proven that although a lacquer may have no residual odor, when confined within a cold damp refrigerator interior, perishable food is subject to contamination where lacquer has been used for finishing the inside of the refrigerator.