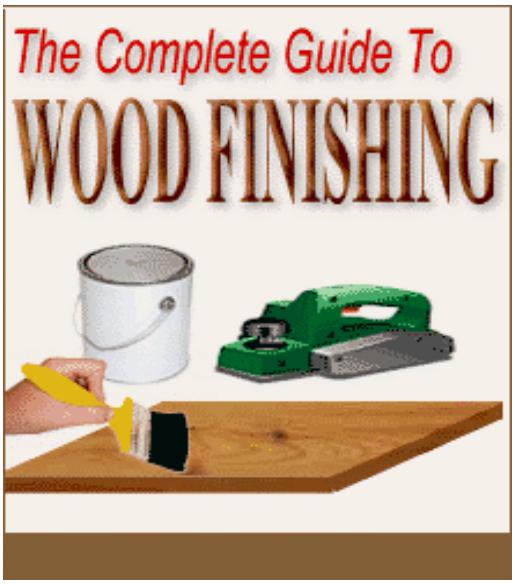

PREFACE

WOOD finishing today is a commercial art. With the greater appreciation of interior decoration by the great middle classes has come the realization that interior wood trim constitutes the frame of the picture, so to speak. Consequently the selection of color and texture of the finish for wood trim is being done with the same care that is exercised by the artist who chooses a frame for his painting.

The tendency to consider the wood finishing in homes and public buildings simply as one element of a decorative scheme, along with the several others, such as walls, floor, furniture, drapes, rugs and accessories, is a wholesome development which is making interiors truly beautiful.

The wood finisher, whether he be house painter and decorator, furniture worker or arts and crafts artisan, is confronted with an array of finishes calculated to confuse even the most experienced unless his working methods are based upon a sound knowledge of the most modern stains, fillers, varnishes and other materials. Then there has been a steady change in the kinds and grades of woods used for buildings, cabinets and furniture, calling for complete knowledge of the characteristics of present day woods.

And to make the wood finisher's task even more difficult the specifications by architects and customers change constantly to keep pace with styles in furniture and decorations of standard, period and novel designs. The wish is always for something new and different.

So the wood finisher must keep up with the procession in pursuit of style and vogue.

The matter of cost of producing finishes is usually the controlling factor, especially when surfaces to be finished are very large or are many times repeated, as when made up of hundreds of rooms in large office, hotel or similar structures. Then the cost of an extra coat or an extra sanding of the surface, for instance, may mean the difference between profit or loss on the job.

In this book the author has aimed to discard the old and obsolete materials and methods which are too costly in labor to be practical in this day of high wage scales. Only such materials and methods have been cited as are equal to present day demands for both practical and

artistic finishes.

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CHAPTER I

WOOD FINISHING IN GENERAL

THE wood finisher's ideal must necessarily be simply that of making the most of what he has to work with, producing the maximum of beauty and serviceability under the circumstances. For no two jobs are alike in all respects and he is seldom consulted in the selection of the wood before erection.

In undertaking a job of interior wood finishing there are four factors which must be considered: the kind of wood, the color decorative plan for the room, the durability of the finish expected^ and the cost or investment of money to be made.

The kind of wood to be finished determines broadly the character of the finish to be employed. We may say that in common practice woods are finished as indicated by these groups:

Stain Natural

Mahogany Gumwood

Hickory Redwood

Chestnut Cedar

OakMahogany

Ash Walnut, American Holly Walnut, American Walnut, Circassian Bass
,

Paint or Enamel Pine, white Pine, yellow Pine, Oregon Fir Spruce

Butternut Oak, white, red Cottonwood Rosewood Cherry Cypress Cherry Rosewood Gumwood Birch, select Chestnut Birch Gumwood Ebony Redwood Cypress Satinwood Fir, select Cedar Redwood

In addition to the kind of wood, the grade has much to do with the selection of the finish. The cheaper grades, and even the better grades which have not been selected for grain, figure and color by the mill, often leave one with no choice of finish except as between paint and

enamel.

Trim lumber which is not selected is apt to show great differences in color, contrast and size of the grain and figure. To finish such surfaces in natural or stained color to have anything like a uniform color tone is quite impractical, because of the cost of bleaching, touching-up and blending off-colored boards. So it pays to have the trim lumber carefully selected and matched at the mill. The increased cost there is less than to have the wood finisher do the matching.

The color scheme or decorative plan for a room must be considered by the wood finisher if he is to make the most .of his opportunity. It is his function to enhance by his finishing methods the natural color shadings and grain figure of the wood, to subdue too much contrast and harshness of coarse grain and figure of some woods, to carry out the color scheme by coloring the trim wood to become part of the background of the room, to make it match or harmonize with the furniture,to so finish it that the surface will be enduring,and finally, the finish must protect both the color and the wood from moisture and gases which discolor, crack and warp the wood.

Wood trim ought never to be finished with color or grain figure so strong as to call attention to itself. It is really part of the background, with the walls, ceiling and floor,the background for the furnishings of the room and not the focal point of interest in the picture. The display of strong, fantastic grain figure in either cheap or expensive woods, except for special novelty finishes, is evidence of poor taste as a rule. The beauty of the natural grain and of the color of wood or stain ought not to be obscured by finishes which lack transparency but woods finished to subdue strong contrasts of grain color and to reveal only simple, graceful contours of figure are pleasing to behold,and as one lives with them day after day they sustain interest and grow in appreciation of all who love the beauty of harmony and simplicity.

Durability of Finish.

The use to which the wood is put absolutely determines what constitutes a serviceable, durable finish. Wood trim which is never touched by human hands, never rubbed with elbows, never sat upon, scuffed with feet or ground by heels is often durably finished by no more treatment than stain, filler and wax or oil coats. Under other conditions of service stain, shellac and wax are quite enough. But when it comes to floors nothing short of stain, filler, shellac and three coats of varnish, waxed to finish, can be considered really durable and

economically finished, and this in spite of common practice to the contrary which puts on only two coats of varnish. The durability of finish must include not only the preservation of color but also the preservation of the wood from damage by moisture.

In the matter of cost the wood finisher is in position to and does give customers just what they pay for. By cutting down the number of finishing operations and coats he cuts down the cost. In the excitement of price competition, however, he ought not to lose sight of the technical limitations, of the fact that a certain number of operations are necessary to produce clear colors, brilliancy and durability. Then the protective coatings of varnish, wax, paint or enamel on top of the color and surfacing coats cannot protect the color from fading or abrasion and the wood from moisture unless adequate in number and quality of material.

To express this thought in another way, we may say that a schedule of working operations which reads, stain, fill and wax, cannot possibly be as durable on some surfaces as one which reads, " stain, fill, shellac, varnish and wax." But the first schedule is much cheaper and may be adequate for a surface which is well protected and which is not subject to wear by abrasion, washing, etc. It all comes down to a question of what is the minimum number of coats and operations for the purpose of decoration and of durability for the particular kind of wood trim at hand.

Nature has woven into the fibre of each kind of wood a richness and variety of coloring which are ever pleasing to the eye. And in the exquisite grain and figure of woods she has traced patterns far beyond the ability and the dreams of the artist. Each wood has its own peculiar grain texture and figure. The best finishing is that which preserves to view these natural beauties and enhances them with color. There are but few woods which lack beauty of structure when the finisher knows how to make the most of them.

A stain or natural finish which hides any of the natural beauty evident in the wood before finishing is not the best kind of finish, but we must sometimes sacrifice something to gain durability by using varnish coatings which are not completely transparent. And, of course, on cheaper grades of work the price will not permit the use of the high class finishing methods which make the most of the grain and color. In very cheap work we even must go to the point of mixing stain to partly obscure the imperfections of poor wood, knots, resinous streaks, etc.

Considering the close relation between furniture finishes and wood trim finishes in buildings it is well to note that just as automobile painting represents the highest art in metal painting, so also does furniture finishing represent the highest art in wood finishing. Consequently any methods, tools and materials about which the house finisher can learn from the furniture finisher are often well worth study when within the limitations of cost. The furniture finisher can do many things which the house finisher cannot because his surfaces are smaller, his woods finer and his cost not so limited, but there is much in common between these two craftsmen. As a matter of fact the demand for natural and stained house trim came as a result of furniture finishes and a desire to harmonize the two elements of decoration in a room.

Furniture manufacturers have spared no time or expense in creating and reproducing fine finishes on wood. They have sent their expert finishers all over the world to study first hand the authentic period furniture and interior room designs of- the so-called golden periods of decoration which are rich in the artistic works of master craftsmen. These experts have reproduced color, texture and finish of furniture and interior wood trim in ancient baronial halls, castles, cathedrals and other structures built during the rich historic periods of design and decoration.

So, good furniture of modern manufacture offers a remarkably fine field for study for the finisher whose work is that of finishing wood trim of buildings.

CHAPTER II

PREPARATION OF NEW AND OLD SURFACES

GETTING a surface ready for finishing is work which should be done with the utmost care when the finish is to be the finest possible and even for ordinary jobs. Unfortunately the price received for many jobs of finishing: is so low that it is quite impossible to do more than the most rapid cleaning and sandpapering,so that is where the responsibility must be placed for many muddy, cloudy natural and stained finishes.

New Surfaces.

Wood to be finished in natural or stained color is especially deserving of most thorough work in preparing it for the finishing process. It should first be dusted off with a duster brush or a broom in the case of floors. Then all spots of plaster, dirt or grease ought to be removed. Usually such spots will come off with a washing over with benzine, using a putty knife to scrape off as much as possible. If the wood is oak, walnut or other open-grain variety, be particular to remove dirt, lime and grease from the pores of the wood. When such spots are not properly cleaned, stain does not take hold and penetrate and the finish is thus spotty in appearance.

New surfaces which are to be finished with paint and enamel ought to be cleaned well, but there is no need to be so particular about light stains. All loose particles on the surface should, however, be removed.

New surfaces which show dark stains from rust or other substances should be bleached out in such spots before being finished in natural or stained colors. The bleaching methods will be found later on in this chapter.

New surfaces after cleaning should next be sandpapered if the finish is to be natural or stain colors. This is not necessary for paint or enamel finishes. If water stain is to be used many finishers prefer to brush or sponge on a water coating before sandpapering. The water stain will raise the grain of the wood, making little wood fibres stick up all over. If the surface is wet in this way before staining, the water stain does not raise the grain so much and the second sandpapering is very light.

If the water wetting is nqt done before staining with water stain the sandpapering operation on some woods must be done so heavily that some of the stain color will be cut off the wood. This sandpapering operation on new wood before or after wetting should be done with No. 0 and No. 00 paper, depending upon the roughness of the wood. Sometimes it is well to go over the wood first with a No. 1 paper and finish up with a finer grade.

The cleaning necessary after sandpapering should be well done with a duster brush on ordinary jobs. On fine furniture and cabinets more effort should be spent to remove every particle of dust. In furniture factories the dust from sanding is blown out of the pores with compressed air.

Woods to be finished in natural color as light as possible, maple, birch, etc., are often bleached before any finishing coats of filler, varnish or shellac are put on. The bleaching raises the grain of the wood and a thorough job of sandpapering must be done after that process. The bleaching methods will be found later in this chapter.

New surfaces to be finished in natural or stain colors and which show cracks and holes should be filled to remedy these defects. Plaster of Paris soaked in water is preferred by many finishers for this filling because it will absorb stain and also will take on the coloring given by filler. Other putty does not absorb color. On stained finishes as a rule the putty is put into the cracks and holes after the stain is dry.

After putty is dry it should be sandpapered down smooth and clean. Then the surface should be cleaned up around the repairs.

Old Surfaces.

Preparing an old painted surface for repainting or for an enamel finish simply calls for sandpapering to remove dirt, grease and roughness, assuming that the old paint is firmly attached to the surface. If it shows any tendency to crack and scale or alligator it should be removed entirely from the surface with sandpaper or liquid paint remover.

Old enamel surfaces which are to be refinished call for sandpapering just enough to cut the old gloss and clean up the surface. Defects such as holes, bruises and cracks should, of course, be filled with good putty.

Old varnish to be refinished with varnish, paint or enamel should be rubbed down clean and smooth with No. 1 sandpaper just enough to remove the gloss, dirt and grease, assuming that the old varnish has not crazed or alligatored. If it shows indications of an infirm hold on the wood, better take off all of the varnish with liquid or paste varnish remover. After sandpapering to remove high gloss some finishers prefer to wash down a varnished surface with benzole or with warm water and soda to make it absolutely safe to paint or enamel. The soda bites into the varnish a little.

Old varnished surfaces which are to be refinished with stain call for stripping off all of the varnish, using liquid or paste varnish remover. A thorough job must be done. If any of the varnish is allowed to remain on the surface, even in a very thin coat, it will prevent new stain from penetrating into the wood. A penetrating stain is then needed to do an even coloring of the wood. After stripping off the varnish a most thorough washing should be done to remove any wax left on the surface by the remover. Wash up with benzole, preferably. Benzine, naphtha or turpentine will also do this clean-up work.

On low-priced work, restaining is sometimes done without removing the old varnish. The old varnish is rubbed down with No. 1 sandpaper to remove the gloss and clean up any dirt or grease on it. Then it is washed down with benzole brushed on to cut the old varnish a little,or is washed down with hot water in which soda has been dissolved to do the cutting of the old varnish. The stain used for such work is a oil stain which must be brushed on very deftly with as few strokes of the brush as possible to avoid raising or lifting the old varnish. Brush this stain only in one direction. For very cheap work a good brush hand can coat the surface with shellac to which a little pigment has been added to make a stain. These processes simply color the wood and supply a gloss. They do not pretend to enhance the beauty of the wood. In this sort of work it is sometimes necessary to touch-up bare, worn-through spots with a coat of thin oil stain before staining the whole surface, this is to make the worn places match the whole surface in color.

Old stained or natural varnished surfaces from which the old finish has been stripped off with varnish remover are often too dark in color to produce a nice finish with the new stain. Then it is necessary to bleach out the old color before restaining. The bleaching methods are presented later in this chapter.

Putty Mixing and Use.

Plaster of Paris Putty is used by some finishers on new wood to be finished in the natural color or stained. This putty will absorb stain and the color given by fillers. The plaster of Paris putty is made by simply submerging a handful of dry plaster of Paris in water. As long as it remains below the surface of the water it will not set, A small amount should be lifted with the putty knife and kneaded with the fingers.

Press it into place and clean off the surface around it. Be sure to fill the cracks and holes full and level with the surrounding surface.

Cabinet Makers' Putty is made of fine wood sawdust from the kind of wood to be filled. The dry sawdust is mixed with a glue made from 1 ounce of good quality glue and 16 ounces of water. A little water color or dry pigment tinting color is added if needed to make the putty match the surface. When this putty is well made and used it is practically impossible to detect the fillings, even in fine woods like mahogany and walnut

The wood finisher has occasion to use bleaching solutions for the purpose of removing stains from woods to be finished or refinished, such as rust stains, water and weather stains. He also needs a bleaching solution occasionally to bleach large surfaces of maple, birch, oak, walnut and other woods which are to be finished in as light a color as possible, for instance, oak, which is to be finished with one of the popular light gray, two-tone finishes with white filler, and walnut or gum, which are to be finished with the very light brown French walnut color. Then again when old stained and varnished surfaces are stripped off, removing all the old finish possible the wood is sometimes found to be too dark to take the new stain of light color and make a nice job. Then bleaching is resorted to.

The bleaching processes use water solutions and they raise the grain of the wood. So after the bleaching and neutralizing washes, the surface is permitted to dry and is then sandpapered to cut off the raised wood fibres. Sometimes a very thin coat of white shellac is brushed on to make the wood fibres stiff so they can be clipped off easily with the sandpaper.

After bleaching the surface may contain a bit of the chemicals and it is well therefore to wash up immediately with clean water, using a sponge. Then a coat of ordinary table vinegar without dilution will neutralize any alkaline traces left on the surface and make it safe for finishing coats. The surface should be allowed to dry at least twelve hours before the finishing coats are put on.

There are many chemical solutions used for bleaching. Some are most effective on one wood while others succeed best for other woods. The oxalic acid solutions are probably used most by wood finishers in the house building industry.

Before using any bleaching solution it is best to thoroughly clean and scrub a surface, using hot water to which soap and a little sal soda have been added. Use a wad of No. 2 or No. 3 steel wool for the scrubbing, then wash up well with clean water, using a sponge for the purpose.

Oxalic Acid Bleach. Oxalic acid can be secured from any drug store and from paint store stocks in dry crystal form. Usually a saturated solution is made by dissolving as much of the acid crystals in a gallon of water as the water will take up. Hot water is best and the solution is more effective when put on to the surface to be bleached while it is very hot. Use a old flat wall brush to apply the solution and let it dry on the surface. For bleaching weather stains and also dark sap streaks in wood, 8 ounces of oxalic acid in two quarts of water is about right. If the first application of bleach does not remove the discolorations or make the whole surface as light as you want it, apply the same solution hot a second time or repeat several times.

When sap streaks or whole surfaces to be bleached are greasy, wipe them off by rubbing with denatured alcohol and let dry before the bleaching solution is put on.

Chlorine Bleach makes an effective bleach, especially if followed by a solution of hydrogen peroxide .

Use this bleaching solution hot and brush on with an old flat wall brush; let dry; wash up with clear water.

Hydrogen Peroxide Bleach. This chemical is a positive acting bleach when freshly made. It is a little expensive when large quantities are needed for large areas of surface. For small stains on patches and spots it is entirely practical. Brush on and allow to dry. Wash up with clear water.

PAINT AND VARNISH REMOVERS

There are certain liquids which a finisher can use to remove paint and varnish, such liquids as benzole, wood alcohol, caustic soda and water

solutions, ammonia, etc., but as a general proposition it will be found that it is most economical to use the factory prepared patented liquid and paste removers. The cost may seem high, but it also costs money to fuss around with mixing solutions with which you are not entirely familiar and which seldom work as effectively as the patented removers. In these days of high-wage scales time must be reckoned as money.

There are two or more grades of patented removers on the market. They are made in thin liquid form for flat surfaces and in thin paste form for vertical surfaces. The cheaper grades of removers depend upon wood alcohol and benzole largely as the solvents for action, while the more expensive and better removers use acetone as the principal solvent. Most of the removers sold now are made under the same license patents which cover the use of wax in the removers to prevent the very volatile solvents from evaporating too rapidly and before they have dissolved the old varnish or paint.

It pays to buy the best quality of patented removers as a rule. When they work too fast on large surfaces to permit scraping off the old varnish before it gets hard again, add more wax to the remover. Place the can of remover in a pail of boiling hot water and when the liquid is hot shave into it a few ounces of paraffine wax. Then it will remain wet longer and permit you to do a cleaner job. Also it is well to coat not so large a surface at a time when the remover permits the varnish to get hard again.

Removing Shellac. To remove shellac from floors and other wood brush on denatured or wood alcohol and scrape up the soft gum as rapidly as possible. Then wash over the whole surface with the alcohol as a final clean up. The denatured alcohol is cheaper than wood alcohol as a rule. Benzine will not do for the final wash-up. Turpentine does not dissolve shellac. Repeated applications of the alcohol may be necessary to remove all of the shellac. When the patented varnish removers are used to remove shellac be sure to wash up well with benzine or benzole later to remove any wax left on the surface from the remover.

Removing Wax from Varnish. Before a waxed surface can be successfully revarnished or painted the wax must be removed. The new coats do not dry when spread on over wax. The wax must all be removed including what has lodged in the seams, cracks and pores of the wood.

The waxes usually used on floors and trim are soluble in benzine, benzole, turpentine and denatured alcohol. If you want to remove wax without injury to the varnish or shellac under it do not use alcohol; the benzine used freely will probably take off all of the wax if you scrub hard enough with it and sandpaper the surface well.

CHAPTER III

STAINS IN GENERAL

The day has passed when a finisher can profitably spend his time making stains in the old way from the cooking of dye woods, minerals and other substances. When he counts his time cost at prevailing wages no further argument is needed. Convenience and time saving are much in favor of using the best of manufactured ready-prepared stains.

Stains are usually named after the liquid in which the coloring matter is soluble.

Each of the various classes of stains is possessed of certain advantages and some disadvantages. Various kinds of wood take a single stain with different color effect. The difference may be only a lighter or darker shade of the same color or it may be a similar color with a different hue. The brown stain, for instance, which will give you an excellent walnut color on gum will produce only a light brownish yellow on birch and maple.

The wood finisher must know intimately the characteristics of each class of stain, their advantages and disadvantages, penetration, brushing peculiarities, tendency to hold their color or fade soon, etc. Without such knowledge he cannot follow specifications and match samples of colors in a permanent way. Then there are other considerations such as variations in kinds of lumber used on one job and on different jobs, variations in grades of lumber, select and not select as to color and grain figure and variations in ideas of colors described by standard names. A color sample given to a finisher to match may show the color wanted, but the sample may be birch while the wood to be finished is gum, cypress or pine. Birch and cherry have a natural pinkish hue while some gum when stained has a greenish tone. The finisher must not only know these characteristics but how to treat the woods to make them match the other woods in color.

CHAPTER IV

FACTORY PREPARED STAINS

MOST of the stain used today in the building trade is of the factory-prepared type. Oil stains probably are used to a greater extent than water stains, although the latter are greatly preferred for very high class work. The oil stains are not pigment stains but rather are made with many coloring substances in addition to the oil-soluble aniline and other coal tar dyes.

A busy wood finisher finds considerable advantage in using the factory-prepared stain. He usually uses several brands until he finds a line which suits his needs well and then confines himself to those stains. He secures finished wood panel samples from the manufacturers and soon becomes familiar with the working qualities of these stains and learns how to vary them to get different effects on all the commonly used woods.

When he is given a color to match and a specification which is very different from the ordinary standard finishes he finds the manufacturer's service department willing to make up special stain for the purpose, or to direct his mixing of standard colors to produce the match needed.

With a set of wood sample panels showing all of the common or standard colors on the various kinds of woods the finisher is in position to expedite his customers' selection greatly. Then if he has pasted a label on the back of each sample showing the name or number of the stain used, the kind of wood, the finishing method as to filler, gloss, polish, rubbed, flat varnish or wax, he loses no time dealing with customers or giving out his shop orders when a large amount of work is being done.

When a finisher selects a brand of stains made by one of the larger and long-established manufacturers he finds much advantage in the fact that the colors are standardized in shade and working qualities. The fact that these characteristics remain unchanged year after year saves time for the finisher when matching colors, mixing and tempering his stains and in the brushing and wiping qualities.

In other words, when his stain for walnut, for instance, is always the same color exactly and always the same strength, he has eliminated two variables and he has less trouble in matching samples. He soon learns exactly what that stain will do on each kind of wood. Then to change the color he adds other colors or more liquid to it, or he may in some cases spread one stain over another to gain the final color wanted.

The variety of stains offered by manufacturers is ample for all practical needs.

CHAPTER V

WATER STAINS

For the finest kind of finishing on interior wood trim of buildings, cabinets and furniture, water stains are easily the best type, particularly the aniline and coal tar dye group which comes in convenient dry and liquid form. When a finisher is anxious to build up a reputation he will be wise to use water stain as a rule and get a price which will cover the little extra labor of sandpapering the raised wood grain caused by the use of water on it.

The particular virtue of water stains is that they are far clearer, more transparent, more brilliant in color hue and more permanent against the fading effects of strong light. These stains show up and enhance the natural color shadings and grain figure of beautiful woods to greater advantage than other stains. Fine finishing calls for coloring the wood fibre, not covering or obscuring the natural beauty of the wood, and water stain has no equal in this respect.

The permanency of water stains is far greater than oil and may be considered absolutely permanent for all practical purposes.

In the matter of available colors the water stains are far greater in number than all others; they are numbered by the hundreds.

In the matter of penetration of the wood water colors are also superior. Wood in its natural state, in trees, is composed of numerous little cells in the live tree which are filled with water. When the tree is cut down and the wood dried these cells are filled with air. Dry wood absorbs water more evenly than oil or spirit liquids, and the water, being a natural element to the tree, penetrates more deeply into the wood. The water evaporates more slowly than alcohol and other spirits, leaving a more even distribution of the stain on the surface. It is interesting to note, too, that wood at a temperature of about 90 degrees absorbs water better than at lower temperatures, hence water stain penetrates deeper at that temperature.

Water stains are cheaper than oil stains. And even taking into consideration the extra labor and cost of sanding the raised grain of the wood many finishers consider water stain cheaper, Water stain

spreads over and colors more surface per gallon than other stains.

There are certain surfaces like show windows, window sills, frames and casings, sun parlor wood trim, etc,, which are subjected to very strong light, often the direct rays of the sun, which can only be finished permanently as to color when water stain is used. This is especially true of the mahogany reds and browns and the green stains. Oil stains fade too quickly on such surfaces to be practical.

Water stains are just as permanent and effective generally for light colors as for dark colors. They are necessary for such light stain finishes as the grays, light greens, cherry, Circassian walnut and French walnut. The oil stains are good only for dark colors, used in light colors they fade too rapidly.

Now as to the disadvantages of water stains. The superior finishes which are produced with water stains are not gained without some extra effort and cost. These stains raise the grain of the wood and the rough surface so produced must be sandpapered down smooth to cut off the wood fibres so raised by the water. This raising of the grain of the wood is most evident on gumwood, fir, cypress, bass, poplar and white pine.

The machine finishing of lumber and machine sanding cuts off wood fibres to make the wood smooth, it is true, but these operations also press wood fibres into the open cells, closing them against the entrance of the filler. Sponging the wood with water or the use of water stain surely does open the wood grain and make it possible to fill the surface properly. Due credit should be given this fact when the disadvantage of sandpapering the raised grain to smooth the surface again is cited as an objection to water stains.

Some finishers on fine work prefer to sponge the wood with water before staining. When dry the raised grain is sandpapered. When the water stain is then put on it does not raise the grain again so much. When the water coat is not used first it is sometimes necessary to do so much sanding on certain woods on top of the stain that the beauty of the finish is impaired a little by cutting through the stain.

When two coats of water stain are to be used there is no need to sponge the wood with water first. Sandpaper after the first coat of stain.

Water stain is a little more difficult than oil stain to brush on to avoid

having laps and joints show. A careful workman has no difficulty, however, in producing a good job, using a large brush for the application of the stain. When a surface is particularly difficult to coat with stain without showing laps and joints a coat of water may be brushed on just ahead of the stain. The stain should follow immediately before the water dries.

When water stain appears too dark after brushing it on the wood it can be made lighter in color by wiping it while dry or wet rather deftly with a sponge wet with water. You must be careful, however, not to wipe it lighter in some places unless you are trying to produce an antique or high-lighted effect as when wiping out the center of panels to make them lighter, leaving the corners, mouldings, etc., dark.

In the application of water stain use the brush rather dry, that is, don't load it too much with stain. Use a wide brush, a four or four-and-one-half-inch wall brush.

On very thin veneer and delicate wood structures water stain is not practical. It swells the wood and raises the grain too much. On such surfaces oil stains are best.

The application of water stain is best done with two or more thin, light coats rather than one strong, dark coat. Light coats are easier to brush on without showing laps and joints or streaks. Allow each coat to dry before putting on the next. Then you can judge the color already gained better than when wet. The surface should not be flooded with the stain. That might have a tendency to loosen up veneer on doors and of course the more water you put on the more the grain will be raised.

Hot water stain penetrates hard woods better than cold water stain and it is best to use any water stain hot, or at least warm, never ice cold. Soft water makes the best stain.

Some finishers use a sponge to apply water stain, but a large brush is better. The sponge carries more stain and the rubbing with it is likely to raise the grain fuzz more than a brush will do.

A gallon of water stain will cover from 400 to 500 square feet on soft woods. It will cover about 700 square feet on hard woods, one coat. used for water stains are secured from the coal tar dye sources.

Stain is simply a mixture of coloring matter in a liquid. There is a limit

to the amount of coloring matter each liquid will dissolve per gallon. When that limit is reached the stain solution becomes cloudy, or may precipitate coloring matter which settles to the bottom of the pot, or it may do both. So when a clear, color-saturated stain does not produce a color on wood which is dark enough in one or two applications, allowing each to dry, don't overload the liquid with more coloring matter. It is better to find some other stain to do the job alone or as a first coat over which the other stain is used. Often two or more stains mixed together will give the color wanted. If it is convenient to use a stain quite hot it is satisfactory to make a supersaturated solution without having a cloudy stain or one from which the coloring matter crystalizes and precipitates to the bottom of the container.

In manufacturing processes where large quantities of small articles like toys are stained by dipping them, into a super-saturated solution of stain the stain is kept hot to the boiling point by a steam jet or coil in the tanks.

Where hot water is not available on the job it is better to buy the stain in liquid form of standard colors. The dry form costs less per gallon, however, and permits the mixing and blending of colors to suit the needs in matching.

The dry stain powders are often composed of fine and coarse particles. The finer particles settle to the bottom when the packages are subject to vibration or jarring. Care should be taken to see that the dry powder in a package is well mixed before using. The stain will not work right otherwise. It is also important to keep dry stain powders in a dry place and sealed up tightly in the cans. They will absorb moisture from a damp atmosphere. Deterioration will result.

In the furniture industry considerable effort has been exerted to standardize colors of finishes to be used under certain names. Much progress has been made in this direction. For instance, standard formulas are now in use generally for Standard American Walnut, Standard American Mahogany, Standard Brown Mahogany, Standard Jacobean and Standard Fumed Oak. Definite formulas and colors are in use under these names. Many other names in use, however, designate finish colors quite similar but with some variation as made by different manufacturers.

The wood trim in houses and public buildings has always been finished to a considerable extent, at least, to accord with the furniture finishes.

Individual preferences for color effects will always demand something a bit different than the standard, but if there is a standard to work by it will always be easier to produce the special color effects wanted. The success of any formula depends absolutely upon the use of color ingredients which are of the same coloring strength as those used in producing the formulas used. When using the aniline and other coal tar dye stains little difficulty will be experienced in getting color matches true to name and formula, because such colors have been pretty well standardized as to character and strength, although some differences do exist between brands of the same colors put out by different manufacturers. The cheaper grades do not, of course, possess the same color value or tinting strength as the higher quality stains. Formulas are usually based on high quality stains.

It is not difficult to check colors, however, since one usually has a pretty fair idea of the color he ought to get before staining is done. He usually knows, for instance, that it is a brown with a certain hue and other characteristics which should be produced under a certain name. If not, the finisher had better get a finished wood panel sample showing the color from stain manufacturers. Or, he may study the finish by the name wanted as produced upon correct period furniture made of the kind of wood for which the finish was originally designed.

To illustrate this point further, if you are not certain just what kind of a brown, is correct for fumed oak color, study that color as produced by the real fuming process, not by stain, and on oak. Fumed oak color finish is done on many kinds of wood. All such colors resemble the original finish by the fuming process on real oak, but there are some differences. Better start right by making a study of the real thing on fine furniture.

CHAPTER VI

STAIN BRUSHING AND PROCEDURE

Many things influence the color of a stained wood surface. Various boards of the same kind of wood, and even from the same tree, may finish up a slightly different color hue when using the same stain. And again you may have a stain which gives exactly the color wanted on birch, but put it on pine, gum or maple and quite another color hue may result on each kind of wood. So, to mix stain to match a sample you must spread it on the same kind of wood of which the sample consists. All of which simply goes to demonstrate the necessity for a finisher learning the exact characteristics of various stains on the many common woods. A good finisher can usually mix or temper a stain to make it match closely enough on two or more kinds of wood. By adding other colors or mixing two or more liquid stains of the same group or class and by wiping skillfully a finisher has complete control of results and can usually, but not always, produce the color wanted on any kind of wood. In a room trimmed with two or more kinds of wood it often is necessary to have two or more cans of stain tempered to fit each wood. Then, too, the preliminary treatment of the wood with oil or sizes to make the suction of the wood more uniform increases control of results.

The rougher the surface, naturally or from rough sandpapering with coarse paper, the darker the color produced by a stain. Rough surfaces soak up more stain. And smooth surfaces,naturally hard, close-grain, and those made smooth with fine sandpapering take the stain with a lighter color.

To preserve and enhance the naturally beautiful characteristics of wood, the stain substance or coloring matter dissolved in liquids should be completely soluble in the liquid used, that is, no coloring matter should remain in suspension, nor should any precipitate on to the bottom of the can. In the finishing of interior wood trim and cabinets of ordinary work the pigment oil or water stains sometimes used fail to meet this ideal because very little of the pigment coloring matter is really soluble in the liquids, they constitute merely a mechanical mixture of fine pigment with the liquid, the pigments remain in suspension. So when a pigment stain is being used the can should be stirred often to maintain a uniform mixture. Otherwise the

coloring pigment will settle to the bottom and the color imparted to the wood will gradually become lighter.

A good stain will remain clear at ordinary temperatures down to about 40 degrees. If at freezing temperature these stains show a settlement of coloring matter they should be heated, allowed to cool to 70 degrees and then they ought to be strained before using. If used while cold, strain them also or the color imparted to the wood will not be uniform. If you begin to spread such stains while warm do not allow them to drop to low temperatures or the color will get lighter as the stain gets colder. When you start a job one day with stain at a temperature of about 70 degrees, allow the stain to get very cold over night and begin using it next morning without warming, the color of the wood stained the second day will be lighter.

CHAPTER VII

PREPARING WOOD TO TAKE STAIN WITH EVEN COLOR EFFECT

The wood trim and cabinet work of the average building is stained without much thought about preparing the wood to take the color evenly, but there is no doubt about the better results to be gained by more attention to this detail. Some finishers, it is true, coat very soft, porous woods with a very thin shellac before staining and that has the effect of stopping the suction in the very porous streaks, when oil or water stains are used. Some prefer to brush on a coat of oil, about one-fourth boiled linseed oil and three-fourths turpentine, before the staining is done. The oil should dry before the application of the stain. Sometimes the whole surface is treated with the shellac or oil size and sometimes only the excessively porous boards.

Before the application of water stains the wood is sponged over with water and allowed to dry. This to raise the grain of the wood as the water stain would do anyway. The wood is then sandpapered and. cleaned up before the water stain is applied. The object of this procedure is to avoid the sandpapering on top of the stain color because that necessarily removes some of the color. On some woods, the grain of which is' raised excessively by water, it is also necessary to sandpaper after staining, even though a sponge coat of water was put on, but this sanding on top of the color is very lightly done and so does not remove color.

A water sponge coat is also used to make a water stain color the surface more evenly when there are great variations in the absorbing characteristics of the wood surface. In that case the water is sponged on and before it dries the stain is brushed on.

The end grain on table tops, cabinets, etc., also the porous knots where they show end grain, are touched up by the furniture finisher before staining. He uses a very thin glue size made with the best cabinet glue and warm water. This must be done carefully. If too much glue is used a water stain will not take, will not penetrate through it. This glue size treatment serves for water, oil and spirit stains alike,

Resinous knots and streaks of sap wood do not take stain sometime,, or they take the color very much lighter than the balance of the wood.

Sap streaks, knots, etc,, in wood to be finished with oil stains are treated before staining by some finishers with a mixture of turpentine, benzine and japan drier. Turpentine and benzole (99 degree or 160 degree solvent naphtha) are preferred by others, to be used in equal parts.

brush, for the application of stains on large surfaces. Smaller brushes are, of course, suitable for smaller surfaces, but better have the brush too large than too small.

Speed is necessary in spreading any stain to distribute it evenly, especially on oak, chestnut and ash which have large open cells which soak up much stain making too dark a color in places. There is not so much danger on veneered wood in this respect,the stain can penetrate only as far as the glue. But on solid wood more stain may go deep into the wood, if you flood the surface by working too slowly, than can dry in the time allowed. Then when you seal up this wet stain with filler, shellac and varnish trouble may follow. Sometimes the wet stain generates gas and forces itself to the surface pushing filler and varnish ahead of it and a disfigured surface results.

In your brushing to avoid laps, which are the result of piling up a double coat of stain at the joints, take advantage of the natural breaks of the surface. On cabinets, wall panels, furniture, doors, etc., do one whole panel or board at a time, letting the brush sweep the full length of the panel or board without a stop if possible. At any rate, make your stopping places at the natural limits of the surface whenever possible,at the corners, ends, mouldings, seams, etc. Then if there is a little lapping of a wet stain coating over a partly dry stain coating it will not show up.

It is correct to brush from the dry wood toward the stain coated finished wood. When working on floors, coat in about ten boards at a time and carry the stretch the full length across the room. Then the break between the partly dry stain and the new wet stain of the next stretch will come at the crack or seam and will not show1 darker.

In brushing stain on to panels and large boards the finisher sometimes has difficulty on refinishing old surfaces which had been varnished and filled because after putting the stain on it wipes off again with the finishing touches of the brush strokes, especially if a slow-drying stain

is used. To avoid this it is necessary to wipe the brush fairly free from stain on the final touches and then brush up toward the top and down toward the bottom very lightly and deftly so the point of beginning with your brush will not show in the middle of the panel. This difficulty of having the brush drag the stain off of the surface is more likely to happen when flowing a full coat.

Soft porous woods are more difficult to coat with stain to avoid lapping or piling up of the stain color at the beginning and end of the strokes. Use a large brush, as has been said before, load it with stain so it will be full but not so any will drip out. If overloaded the brush will blot like a pen too full of ink. Then an excess of stain and a darker spot will appear on the surface. On soft woods especially the brush strokes must be strong and decisive, beginning at one end and running the full length of a panel or board at one sweep. If you break the stroke in the middle or let it stop short, the stain will pile up and be darker at the joint where you begin again.

On open-grain woods with large pores the stain sometimes bridges over the open cells filled with air. A stiff brush is needed to apply the stain and rub it into these cells. With slow drying stains it is a good plan to have a short bristled large brush, like a shoe brush, handy to rub in the stain after spreading it with the regular flat wall brush.

To get an even coloring on end wood, the boards cut across the grain you must use a fairly dry brush. This end grain soaks up stain rapidly and will dry a darker color than the balance of the wood if a full brush load of stain is used on them. The same is true of porous sap streaks and rough knots. When these parts are treated as described earlier in this chapter the stain can usually be flowed on full the same as on the balance of the surface.

As a rule two medium thin coats of stain are better than one heavy coat on close-grain wood for darker effects. Penetration is slow on these woods and it is well to apply the stain warm, when the water stains are used. On these woods one standing is usually enough to smooth down the grain raised by two coats.

On any raw new wood the stain must be applied more freely than on a treated or sized wood.

When you start to use a full brush load of stain on a surface try to take up the same amount of stain every time you dip the brush.

The brushing and wiping of water stains require more skill than the application of oil stains. This is especially true when working on soft, porous woods like white pine, bass, poplar, fir and gum. These are more absorbent than woods like maple, birch and cypress.

Water stains penetrate more deeply and oil stains more quickly, leaving dark spots where each brush load of stain is first put in contact with the wood. So after dipping the brush be sure it is not overloaded to the point where it may drip and blot the soft porous surface. Then apply the stain with light, long and rapid sweeps and lay the color off, distribute it evenly, with as few strokes as possible in order to gain a uniform color. It is safer to mis the stain very thin and apply two coats on these woods to gain a darker effect. If a water stain appears too dark after application some of the color can be removed if wiped over evenly with a wet cloth (water). A spirit stain should be wiped to lighten it, with a cloth dampened with benzine. Care must be taken in any case, however, to avoid wiping harder in some places than in others, or a light streaked surface or mottled effect will result.

Oil stains are easy to apply because the finisher has plenty of time to brush them on evenly and they do not show laps and joints. Such stains do not penetrate as deeply as water stains, although when they contain benzole they penetrate deeply enough for all practical purposes. The oil stains may be spread and allowed to stand a quarter or half hour and can then be wiped off to remove any excess stain not absorbed by the wood.

If the color is too light a second coat may be put on after the first is dry. If too dark some of the color can be removed by wiping with a dry cloth and more of it will come off if the cloth is dampened with benzine or turpentine. Care must be taken, however, to avoid wiping off in spots or streaks. The oil stains are especially good for soft porous woods in the brown colors, but do not give such dark colors on maple, birch and other close grained, hard woods.

The cleaning of brushes used in stains ought to be done as soon as the job is finished, laying the brushes flat to dry with the bristles straight. A brush should be cleaned with the same thinner liquid as was used in the stain or in a solvent of that liquid. Brushes used in oil stains should be cleaned with benzine, naphtha or benzole. Brushes used in water stains should be cleaned with water.

PROCEDURE IN STAINING

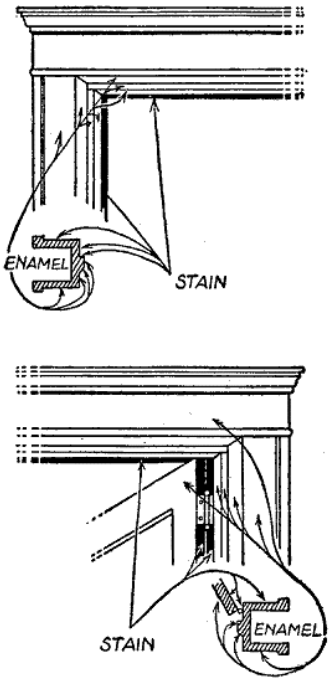
Success in staining a surface beautifully and with the even color usually desired depends largely upon your procedure, upon which part of the surface is colored first and how you follow through to the conclusion. This subject has been touched upon earlier in this chapter and here are a few more points which will help the new wood finisher to develop his working methods.

When painting a wall panel or the panels of cabinets or furniture many finishers coat in the mouldings around the panels first and then follow up by coating-in the center of the panels all around. That method is not correct when staining with rapid setting stains. Don't brush the stain around the moulding edges of a panel, four sides, and then come back to coat-in the center.

Working that way you will have to keep four edges wet and it can't be done on fairly large panels. It is better to start the first brushful of stain on one side, covering the moulding and part of the panel center. Then the second brushful should be laid right alongside of the first, repeating until the panel has been completely stained. In that way only one edge must be kept wet and there is much less likelihood that there will be dark streaks where a new brushful of stain is run alongside of a brushful that has become partly dry.

The finishing of a paneled door with stain must be carefully done to gain a uniform color, taking advantage of the natural breaks in the surface.

When it comes to staining the casings, jamb, stops, etc., of an inside doorway between two rooms there is a question in the minds of new wood finishers as to where to stop, that is when one room has a stained finish and the other is painted, enameled or stained a different color.



Staining Door Trim and Doors Which are Between Two Rooms Finished Differently Puzzles the Inexperienced as to Where to Stop. Ahove Shows the Correct Handling When One Room is Stained and the Other Enameled.

CHAPTER VIII

THE USE OF WOOD FILLERS

WOOD fillers are needed for the purpose of filling the open cells or tiny crevices in open-grain woods such as oak, ash, chestnut, butternut, elm, mahogany, walnut, etc. All woods are composed of fibres and cells. While growing these cells are filled with water, sap or resin. When the wood is seasoned and dried the cells are filled with air. The surface cells are littles holes or pores. In the open-grain woods listed above they are fairly large. In close-grain woods like maple, birch, bass, beech, cherry, cypress, fir, pine, gum, poplar, redwood, spruce, sycamore and holly, the cells are very small, the fibre being closely woven together.

Fillers are of two kinds, paste and liquid. Paste fillers usually are semi-transparent but sometimes are opaque. Liquid fillers are transparent. The paste fillers are used on open-grain wood, while the liquid fillers are used usually on close-grain wood.

The purpose served by fillers is that of leveling, by filling, the cells of the wood. They are used to build up the tiny depressions in the wood, in other words, and thus prevent the varnish finish from sinking in and from giving a pitted or rippled effect. This effect is apt to remain even though several coats of varnish are put on, unless the under coats of varnish are rubbed down a great deal, when they act as a filler. It is cheaper and quicker to fill the surface before varnishing. The filler, however, should be as transparent as possible in order to preserve the natural color beauty of the wood. Although in some cases, like the two-tone finishes, the filler is purposely made opaque to gain a special effect.

The close-grain woods are often finished without the use of any filler. And also the open-grain woods are finished without any filler to gain the correct effect for such finishes as weathered oak, fumed oak, Flemish oak, Flanders oak, antique oak, ebony, Jacobean.

In the best classes of work the filler is put on after the stain, but in certain special cases and for cheaper work where it is desirable to save the labor of putting on a separate stain coat, the filler and stain are put on in one coat. The stain does not penetrate so deeply when combined with the filler coat but satisfactory results can be secured, especially if about 20% of the thinner liquid for the filler is composed

of benzole, 90 degree, or solvent naphtha, 160 degree. When oil stains are to be used some finishers prefer to put the filler on first because filler containing oil put on over an oil stain is apt to lift the stain, mix it with the filler and produce a muddy, cloudy finish. The best practice, however, is to put on even the oil stain first, let dry and then seal it up with a very thin coat of shellacabout a 2-pound cutbefore the filler is spread on the wood. A thick coat of shellac which is not cut. down by considerable rubbing makes a poor foundation for a finish. When it is rubbed enough to cut off all shellac except tnat which is lodged in the pores of the wood it makes an excellent filler.

One pound of paste filler will fill about forty square feet of surface. One gallon of liquid filler will fill from 200 to 400 square feet, depending upon its composition.

The importance of proper filling of Wood is indicated by the fact that the expert furniture finishers inspect a filled surface after it is dry with a magnifying glass.

If he finds numerous pinholes in the filled surface, indicating that the filler bridged-over the open pores rather than entered and filled them, he brushes on a second coat of filler of thinner consistency, lets it dry hard, sandpapers down to the bare wood, then, removing all except what is lodged in the pores.

FACTORY-MADE WOOD FILLERS

Much of the filler used today is ground and mixed in the paint factories. It comes in paste form which is quite thick and is ready for use after being thinned with turpentine, mineral spirits or benzine.

The colors commonly listed by paint supply houses are: Transparent or Natural; Walnut; Mahogany, light; Mahogany, dark; Golden Oak; Ebony; Special White.

These paste fillers are sold in cans of the following sizes: 1, 5, 10 and 25 pounds each.

The chief advantages gained by using these fillers are that the quality is good, the fillers adhere firmly to the wood and the colors are standard. You can mix batch after batch of the same color, securing a match. The working qualities are also standardized. Success in filling depends largely upon tempering the filler just right with the thinner liquids. So when the factory-made fillers are always made the same

way and you become accustomed to working with a particular brand, time is saved by knowing exactly how the filler will work every time.

Of the factory-made liquid fillers it must be said that some are good and some are not. Those which are made with good varnishes are very good, while those made with the cheap varnishes are not to be depended upon. In this class of goods it is unwise to buy any but the best brands of reputable manufacturers and pay the price of good material.

Good filler must not shrink or expand, must not attract moisture and should be heavy enough to avoid carrying air cells into the pores of the wood. Silica filler when properly mixed sinks into the pores of the wood and does not expand, shrink, bulge or bleach out in the wood grain. These stable qualities make it an ideal pigment for this purpose.

Some of the other pigments used for mixing fillers are whiting, china clay and cornstarch. Each is good for special purposes, but it is doubtful if any equals silica for general use.

MIXING, BRUSHING AND WIPING PASTE FILLERS

Mix and color the filler, if it is to be colored rather than used in the natural color, as indicated in the preceding pages of this chapter.

Thin the heavy paste with benzine until it brushes freely and yet is fairly thick. Tempering the mixture to have it just right is very important. Try out the mixture on some out-of-the-way place or on a sample of the wood you are going to finish. The filler should be used thinner for walnut, gum and similar woods than for oak, chestnut, ash, elm etc.,the latter woods have larger pores or cells to be filled.

Coat the surface freely with the filler using a stiff brush to rub the filler well into the wood. Brush the filler on with the grain, lengthwise of the boards, but lay it off to finish brushing across the wood grain. Wood pores are filled with air-which forms a cushion. The filler will not sink in to the bottom of the cells unless thoroughly brushed. When the filler mixture is just right it will fill the wood pores and set up with a dead flat surface in from two to five minutes, depending upon the amount of ventilation and the temperature of the room.

If the filler settles quickly into the pores of the wood, leaving the liquid on top, too much benzine has been used.

Filler used by the house painter is usually tempered to save time. It contains very little oil and it sets flat ready for wiping in from two to five minutes, as has been said. It sets so hard in half an hour, usually, that it cannot be wiped off. The furniture finisher takes more time. He likes to temper the filler so it sets ready for wiping to begin in about 15 to 20 minutes, and yet so it can be wiped any time up to an hour or two after brushing. It will dry hard in twenty-four hours and will thoroughly mature and harden in forty-eight hours.

When the filler has been brushed on to a small area of surface and has set flat it is ready to wipe. A handful of burlap may be used. The wiping must be done across the grain of the wood and in such a way as will not lift the filler out of the cells but will cut it off sharp and level with the top of the wood fibres.

The object of wiping is to remove all filler which is not lodged in the wood cells. If any is allowed to remain on the surface of the wood it will cloud the finish and give a muddy appearance. After wiping over a small area with the excelsior or other coarse material to remove most of the filler wipe over it again with clean cotton rags, but use no rags which leave lint. The cleaner the job of wiping the less sandpapering you will have to do when the filler is dry. Do not wait to begin wiping until the whole area coated in has turned flat; begin wiping the first filler brushed on as soon as flat spots appear, being careful to rub the filler into the wood cells as you wipe. In other words note carefully how the filler is coming off before you wipe too much.

If your filler has been mixed and tempered correctly it will roll up under the burlap wad and come off easily. If it seems tough and hard to remove you have waited too long before wiping. You may have to wash the surface with benzine, let it dry and start over again to brush on the filler and try a second time to wipe it at just the right time.

If the filler lifts out of the pores when wiping after it has set flat, too little binder has been used.

When a filler has too much oil in it it will not roll up as it should, like putty, when wiping. It will be sticky and will pull out of the wood grain and cracks.

When the filler after being mixed correctly sets too rapidly and becomes dry before wiping, stop part of the ventilation and coat in smaller areas of surface so you can get back soon enough to wipe

before the set is too dry. It may also be necessary to add a few drops of linseed oil to the filler to slow up the setting. Be very careful, however, not to use too much oil. A surprisingly small amount of oil is needed and too little is better than too much. Oil makes the filler tough and prevents it from wiping off clean and level.

Filler which is mixed too stiff, not enough benzine, will take an excess of labor to brush it on and it will roll out of the cells of the wood while wiping.

When for any reason filler sets so hard that you cannot wipe it, brush on some benzine, let it set again and wipe when just right, or wash off the filler first coat and take a fresh start.

Don't coat a large area of any surface with filler until you try a small area to test out the brushing, wiping and filling qualities of the mixture. By following that suggestion you will save yourself much time and labor. As a matter of fact many finishers work much harder on filling jobs than they need to if they would only use their heads more and their muscles less. Learn how to temper the filler just right by experimenting and then it will wipe off easily, fill the cells well and do a clean job. If filler is permitted to dry hard before being wiped a great deal of labor is needed to remove it with scrapers and sandpaper.

An examination of the filler after it has been wiped and is dry will show whether the mixture was tempered correctly and properly brushed and wiped. Pinholes in the filler result from using too thin a mixture or from too little brushing. When the pores are not well filled, the filler was mixed too stiff, not enough benzine in it, or it was wiped off too soon. When the grain figure is clouded and muddy in appearance, the wiping was not done well enough to clean up thoroughly or the wiping was delayed too long.

While brushing on paste filler it should be stirred every three or four minutes. If not, the filler used off the top of the can will contain too much oil and what is used from the bottom later will contain too little oil. The pigment settles rapidly unless cornstarch or asbestine have been added to it.

If a filler containing too much oil is used on woods having an excess of oil naturally, like rosewood and cypress the excess of oil will ruin the varnish finish. The same is true when the surface has been shellaced before filling. And when filler containing too little oil or japan is used on mahogany, walnut, gum, etc,, the filler will turn gray in the pores

and so a clouded finish will result, giving somewhat the same appearance as the use of white shellac on dark stained finishes, instead of orange shellac.

Narrow mouldings, edges of cabinets, table tops and similar surfaces are more difficult to cover with a uniform thickness of filler than flat surfaces. It is necessary sometimes to put two coats on these. Let the first coat set flat before brushing on the second and then wipe both coats when the second is flat. Delicate carvings are never filled with paste filler. One or several coats of shellac are best, because the filler fills up the depressions and rounds off the sharp edges too much.

When filling and staining in one coat it is best to add about 20% benzole to the filler in place of some of the benzine. It will then penetrate and color the surface more deeply.

Where oil stains are used it is desirable to precede the filling with a very thin wash coat of shellac, as there is some danger that the filler with its linseed oil content might soften and wipe up the stain. Thus a muddy, cloudy color effect will result.

Where it is necessary to use paste filler on large surfaces, as on floors, wall panels, etc., reduce only enough of the thick paste with benzine for a day 7s work. When the filler which has been finally thinned is allowed to stand over night the pigment not only settles to the bottom but some of the solvents evaporate and a thick mixture which will not work as it did the first day results. If you add more benzine by guess to take the place of that which has departed you cut the oil too much and the filler may dry out powdery. It is really better to add a little more linseed oil, but too much oil will make the filler tough and it will then require more labor to wipe it off clean.

Paste filler should not be mixed too far in advance of your needs. It is better two days after mixing and up to about two weeks after mixing than it was the first day, if kept covered up so the volatile liquids cannot get away.

After being wiped clean paste filler should dry not less than 12 hours and a longer time is much better. Some finishers put on a second and thinner coat of filler, wipe and let it dry. This is to avoid all risk of having the varnish coats sink into unfilled cells and dry with a pitted effect.

When the filler is bone dry, sandpaper the surface with No. 2 paper

and wipe the surface up clean with a cloth dampened with benzine. That clears up the wood grain considerably, making a finer finish. Of course, if the wiping of the filler has not been well done it will be necessary to sandpaper more. Use, then, No. 1 for the first time over and finish with No. 00 or finer paper.

LIQUID FILLERS OR SURFACERS

Close-grain woods like maple and birch, and those which are halfway between these and the large open-grain woods like oak, chestnut, ash and elm, call for a filler of a liquid rather than thick paste consistency.

For example mahogany, walnut and rosewood are considered open-grain woods and yet they have not the large open cells of a size found in oak.

Some finishers use paste filler thinned considerably as a liquid filler. Some use one or two coats of shellac as a liquid filler, rubbing each down to the bare wood fibre so as to remove all shellac gum except what is lodged in the pores of the wood. Others use one of the many factory-made liquid fillers which are transparent. They are sold in quart, half-gallon and gallon cans. These materials when made of first-class varnish by one of the well known manufacturers are excellent.

Liquid fillers composed of gloss oil, hard oil or other cheap varnishes are not dependable materials. Some of the cheap fillers bleach out white in time and make a mottled cloudy appearance under the varnish. Some are too brittle and so crack.

Shellac makes a good filler. The white bleached shellac should be used for natural and light colored finishes while the orange shellac must be used for dark colors. White and orange are mixed for finishes which are medium dark. When white shellac is used on dark mahogany or other dark finishes it sometimes gives the finish a white cloudy effect in time. Shellac should always be used thin as a filler. One or two thin coats (a 2- or 3-pound cut) are best, letting each dry and sandpapering well to remove all sbellac except what is in the wood cells. Shellac does not adhere to the surface or to subsequent coats of varnish any too well and for that reason a complete film of shellac makes a poor foundation. When used to fill the pores or cells only, however, it is excellent. Shellac, also acts as a sealer over oil stains, preventing the oil from affiliating with the varnish. Varnish in direct contact with oil sometimes remains soft and tacky for a long time. The shellac coats over stains, especially over reds in the oil or water form

often prevents these stains from bleeding.
After brushing on a thin liquid filler allow it to set a few minutes and then wipe off all filler not lodged in the wood cells and cracks. If not wiped off clean it will bleach out white in time and show white clouds or a muddy appearance under the varnish. This is especially true if too much pigment has been mixed in with the filler liquids.

Liquid filler is used to stop the suction of the wood principally, and is not good for woods having large open pores. Some liquid fillers are made to be brushed on and not to be wiped clean, but when any pigment is used in a liquid filler it is safer to wipe off all except what is lodged in the wood grain, otherwise the final finish may not be as clear and transparent as it should be. Liquid fillers are used by some on oak and other open-grain wood after a paste filler to make a more perfect surface.

CHAPTER IX

VARNISH AND SHELLAC

THE purposes served by the use of varnish are quite obvious. First, it is needed to protect surfaces from moisture which will warp, swell and raise the grain of the wood and from gases ever present in the air which discolor wood not protected. Varnish also protects stained colors from light and air which fade them, especially the oil and spirit anilines which must be covered immediately if they are to hold their color a reasonable length of time. Varnish protects wood from wear by surface abrasion to some extent.

Decoration produced by varnishes is just as important a purpose served as the protection of the wood, decoration in the form of beautiful polished gloss or the alluring charm of the dull lustre finishes. Varnish increases and enhances the brilliance of colors as well as to preserve them from fading.

What varnish is may well be considered for a paragraph or so. The word has taken on a broad meaning with its years of use. It does not mean any one definite composition, but rather includes many compositions within its meaning. A general definition may state that varnish is any liquid, containing no pigment, which is used for protection and decoration of surfaces, one that can be spread in a thin, homogeneous film and which will dry to a hard, transparent or semi-transparent coating. A chemist would describe varnish something like this,a liquid which usually is transparent, but sometimes translucent, one which when spread in a thin film on a surface dries by oxidation and by evaporation of its volatile fluid content. It may dry with a high gloss or with a dull lustre.

As with other materials, varnishes of many grades are made. The high quality and more expensive grades are more transparent and more serviceable. There are medium grades and cheap grades made for cheap jobs. It is easy enough to test the quality of these oil varnishes. Simply coat a board with the varnish, about two coats are needed for a fair test. Let the varnish dry thoroughly. Then soak a sponge in water, squeeze out some of the water and place the sponge on top of the varnished board over night. If the varnish is of high quality it will be clear, bright and glossy in the morning ; such varnish is durable and a good representative of its class. But if the varnish turns white it means that it has absorbed the water from the sponge and if it remains white

the water has dissolved part of the varnish. Varnish of this kind is not good enough for use on interior wood trim of buildings or on furniture.

All-Purpose Varnish.The question of all-purpose varnishes is one which the finisher encounters. Is it possible for one varnish to serve ail purposes equally well as each kind of varnish made for a special purpose? Will the so-called all-purpose varnish rub to as high a polish as a fine polishing varnish? Will it rub as clean, as easily and produce as fine a surface as good rubbing varnish ? Will it prove equally durable used on exterior as on interior surfaces? No! is probably the best answer to those questions. There probably is not a long-oil varnish that is suitable for exterior exposure which is capable of being1 rubbed to a smooth and fine high-polished surface. A good interior, or under-coat varnish, has got to be rubbed and to hold up succeeding coats. It cannot be hard enough to rub and to hold up the finishing coats if it contains enough oil to be elastic and durable on exterior surfaces. It takes more time to rub long-oil varnishes than to rub short-oil varnishes.

It is important to observe the selecting the right varnish for each purpose. Each surface and the conditions of service expected should be fully known. Then when you also know the essential characteristics of each of the more common varnishes you are in position to select the right varnish for each job. The following brief descriptions of each kind of varnish will be helpful. And the wise finisher will also establish a friendly business contact with a reliable varnish manufacturer who will gladly act as technical adviser on unusual problems and also help any sincere and ambitious mechanic to learn more about varnishes.

Spar Varnish.All surfaces exposed to the sun should be covered with spar varnish if they are to be varnished rather than painted. And no filler should be used. The filler decomposes and crumbles under the action of the sun and temperature extremes. Build up the surface with several coats of varnish, sand each lightly, clean up and flow on the last coat freely.

As the name indicates this varnish was first made to protect the spars of ships by keeping out the moisture, and of course it had to be a varnish which would resist both moisture and the salt air at sea. Today spar varnish includes all long-oil varnishes of a similar type and for similar purposes. The name spar is also used to designate a group of very tough and elastic interior varnishes.

As has been said spar is a long-oil varnish, which means that it

contains a much larger proportion of oil to its gum resin content than other varnishes. Spar is dark in color, does not dry rapidly, is very elastic and retains this quality for a very long time, has only a moderate gloss and is very durable. Spar is still used largely on ships, but also on many exterior surfaces wherever a tough, elastic weather and water resistant varnish is needed especially for wood surfaces, but also on metals.

Floor Varnish. A medium-oil varnish which has many of the qualities of spar varnish. It must be elastic and tough to withstand the very severe abrasion of feet, grinding heels, furniture scraping, etc. It must dry more rapidly than spar varnish, however, as the revarnishing of floors in use constitutes a very large part of the consumption of this product. It must dry moderately hard over night and ready for use in about 48 hours. These varnishes must resist a moderate use of cleaning water and they must be able to carry the weight load of heavy pieces of furniture as no brittle varnish will do. Floor varnish is, of course, used principally for floors, but it is also suitable for interior trim generally when the color is not too dark for the finish wanted. It makes the very best kind of wall size when thinned down with turpentine and when a little of the paint is mixed in with it.

Architectural Varnishes.This is a class name which refers to all varnishes which are used for interior building purposes, such as floor varnish, cabinet, coach, interior spar, etc.

Flat Varnish. An interior varnish which dries with a dull lustre, rather than high gloss as usual, resembling the appearance of a hand-rubbed gloss varnish. The effect is not exactly the same, but it is beautiful and for a great many jobs the flat varnish serves the purpose fully and at less cost, because the flat is gained without the labor cost of rubbing.

Flatting varnishes are made on many formulas, most of which include the use of wax of one kind or another. China wood oil (tung oil) is also used. In the raw state this oil dries naturally flat, so its use in flatting varnish simply requires that it be not cooked to the point where it loses this flat-drying characteristic. There is also a flat-drying spirit varnish made usually with shellac? glycerine, etc. It is not much used.

The best of flat varnishes are made without wax, because wax put on to a surface in varnish or otherwise makes a very poor foundation for future coats of varnish, paint or enamel when it comes time to refinish. To be safe every trace of wax on a surface to be re-finished must be removed with turpentine, benzole, sanding, etc. Wax never

really'dries, though it sets fairly hard when rubbed with weighted brushes. No varnish or paint will adhere to it for long. The flat varnish finishes are very effective over open-grain, unfilled oak and walnut.

Finishing Varnish. Usually refers to furniture varnish. Any varnish used for the final coat or coats, and which is tough and more elastic than the undercoats of varnish. Usually finishing varnish is able to withstand light rubbing with pumice stone and oil and polishing with rotten stone for a high gloss effect. Piano polishing varnishes are of this class varnish. They are of the medium-oil content class, having more oil in proportion to the amount of gums contained than the short-oil class, but less oil than the long-oil spar and exterior varnishes.

Polishing Varnish. Finishing varnishes, as described above, capable of taking on a much greater gloss after rubbing with pumice and oil and polishing with lotten stone on the bare hand palm. Usually refers to fine piano and furniture varnishes.

Waterproof Varnishes. China wood (tung) oil has very great water resisting ability. In fact the raw oil is used in China for coating boat bottoms and for many similar purposes where the surface is subjected to water. Therefore the varnishes which are made to resist contact with moisture are often made with a considerable China wood oil content.

SHELLAC AND ITS USE

Shellac is not an exudation of tree gum as are many of the other resins used for varnish making, although it is collected from trees. It is a resinous incrustation found on certain species of trees in the jungles of India, Siam, Ceylon and other far Eastern countries. It is deposited on the bark, branches and twigs of these trees by swarms of tiny insects known as the Lac insect (coccus Lacca). These twigs are broken off and in that form are called stick lac. They are collected in June and September of each year by the natives and are crushed and ground in primitive stone mills to separate the gum from the wood. Then it is sifted to free it from bark., twigs, etc. Next it is placed in large tubs of warm water to free it from lac dye coloring matter which the insects have deposited. In this form it is known as seedlac.

When the seedlac is dry it is placed in cotton bags and held over charcoal fire by two men, one at each end, who twist the bag when, the seedlac melts, thus forcing the melted gum through the weave of

the cloth from where it is scraped and spread in a thin sheet over the outside of a hollow cylinder filled with hot water, or on flat surfaces. When the gum has congealed on this cylinder surface it is scraped off and broken into flakes with a knife and forms the dry shellac which comes to the finisher and painter.

The natural color of shellac is bright orange. White shellac is prepared by bleaching orange shellac by a chemical process. The best grades of shellac are those which are most nearly free from impurities. Since most impurities are dark in color it follows that the lighter colored shellacs are apt to be the best.

The dry gum shellac is soluble in alcohol (wood, denatured or grain) and in alkali water solutions, but not in turpentine, oil or benzine. Denatured alcohol is most commonly used for making shellac varnish by dissolving shellac gum in it. Wood alcohol is more expensive, usually, and is very poisonous. The fumes from it are injurious to the finisher's health and it is more difficult to brush shellac mixed with wood alcohol than that mixed with denatured alcohol.

Shellac is greatly used as a liquid filler for furniture and interior trim. It is an excellent filler if used in thin coats and if sandpapered enough to remove all shellac except what has lodged in and filled the wood . cells. It penetrates the pores of the wood, dries quickly enough to save much time because it permits varnishing the same day as the shellac is put on and it seals up any stain coats or filler coats which might be lifted by subsequent coats of varnish or which might bleed through the finish.

While shellac is very valuable for many purposes, it is entirely unsuited for others. It will not withstand moisture without turning white. It does not make a really tough and hard surface. The orange shellac is translucent, while bleached or white shellac is transparent. Shellac gum absorbs moisture readily from the air in damp rooms and is then difficult to cut with alcohol.

One or two coats of shellac on trim or furniture do not produce a really durable finish, but several coats, as in the French polishing process, with oil coats too, make one of the most durable finishes known. Pure shellac doesn't scratch nor mar; it is an elastic finish. Finishes built up with water stain, several coats of thin shellac and wax are durable and do not take on a white cloudy effect when moderately exposed to moisture, as is sometimes noted on finishes where varnish is put on over shellac.

Flat and dull lustre finishes are very popular now for walls, trim and furniture. Shellac is one of the best materials to use for finishing furniture to avoid the new, shiny look and to make it fit into the color scheme better. Shellac makes a very fine finish but not a low cost job. Eight coats are needed where shellac alone is used for the finish, and a handsome as well as a durable one results. Apply two coats of pure shellac the first day six hours apart. Allow two days for drying. Then apply six more coats, allowing two days for each to dry in a well ventilated and dry room. Rub the fourth and eighth coats only.

It is not wise to apply shellac over stain, not even over water stain, the same day that the stain is put on. And do not apply more than two coats of shellac in one day, except in the French polishing process where shellac is used as thin as water.

Rub shellac with pumice stone and oil or with very fine sandpaper, never with pumice stone and water, or a white clouded surface will result.

Orange shellac from which the natural orange color has been extracted to make white or bleached shellac sometimes proves difficult to keep in good condition. Not all of the bleaching chemicals have been extracted and the action continues. Strain white shellac often and if you find undissolved pieces of gum don't use the shellac, especially do not use it on mahogany finish as it is likely to make a cloudy white effect under the varnish.

Bleached white shellac takes on moisture and should not be used in a humid room. A hot, muggy atmosphere may give a cloudy appearance to the finish as is sometimes noted on furniture and store fixtures put into new cement buildings before the steam heat is turned on for a month or two. Humid hot climates experience considerable difficulty in this respect unless furniture and fixtures are finished especially to meet this condition. The white cloudy effect often disappears when the building becomes bone dry.

The use of white bleached shellac on dark finishes, especially on mahogany is not wise. In time the shellac will cause a cloudy white film to appear under the varnish. Orange shellac is needed for such surfaces.

Shellac is not suitable for any outside surfaces, not even when covered with varnish. It must not be used on damp surfaces or upon surfaces

which are likely to become damp later.

When using shellac to touch up bare spots on old varnish floors, mix orange and white bleached in varying proportions to get the color wanted.

Some finishers add a little glycerine thinned with a little alcohol to shellac to slow up its rapid setting and make it easier to brush on without showing laps and joints. Some use 10% by weight of turpentine for the same purpose, but the practice, while successful in accomplishing these purposes, is of doubtful merit unless used with skill and extreme caution and in wood alcohol cut shellac which sets very rapidly.

Do not use shellac on surfaces which are hot.

Brushes used for the application of shellac should be the largest possible for the size of the surface, this in order to make it unnecessary to use many strokes to cover the surface. For large areas a four-inch flat brush is about as large as can be handled while for smaller surface the three and two-inch varnish brushes are about right.

Shellac must be brushed on rapidly and in one direction. Very little rebrushing can be done because shellac sets so rapidly. This material brushes " short" and cannot be stretched out like paint or varnish. Be careful not to skip places,they can only be avoided by getting the right light on the work. It is especially difficult to brush shellac dissolved in wood alcohol which causes it to set quickly, yet dry hard more slowly than grain and denatured alcohol.

CHAPTER X

VARNISHING, RUBBING, POLISHING

GENERALLY speaking the varnishes of today are far superior to any supplied to finishers of other times. They are as nearly fool proof as science and remarkable manufacturing facilities can make them. They will produce remarkably beautiful finishes and durable finishes if used skillfully and under reasonable conditions of service. The wonder is that they behave so well and prove so satisfactory when used as they are under adverse circumstances in the building field. The ftTrni-ture finisher and automobile painter have learned the reasonableness of, and necessity for, providing correct surfaces and surroundings fit for varnishing. It is easier for them to do so than for the finisher in the building field, because they have the work brought to their shops, whereas the house finisher must take his shop to the work. That is probably the fundamental reason why the finishing 4one an furniture and vehicles has always been far superior to any other. And still the house finisher is to be congratulated upon producing as fine finishes as he does, considering the adverse conditions under which he must work, The best he can do is to keep in mind what the perfect conditions for varnishing are and then do the best he can to approach them.

Conditions Suitable for Varnishing. Temperature is, perhaps, the most important consideration. The surface to be varnished should be, preferably, between 70 and 80 degrees and surely not below 60 degrees. Heat is needed to make the varnish brush and flow properly. The varnish itself should be warm too, as nearly the same temperature as the wood as possible. If the varnish has been chilled in transportation or storage, never use it until the temperature has been raised by placing the can in a pail of hot water, about 110 degrees F. is best, or by letting the can stand near, not on, a hot radiator a day or two if possible. If the "varnish has been subjected to zero temperatures for days, or even hours, there is some likelihood that some of the gums or driers have solidified. Then the varnish should be warmed up and put through a double thickness of cheese cloth before using. Otherwise you may have a case of seedy, sandy or specky varnish when it is brushed on to the surface.

Moisture in the air in excess of normal may cause trouble with varnish. Hot, humid days: and cold, misty, muggy days are very hard on

varnished surfaces. Keep the windows closed in a room which has been freshly varnished if the weather changes to excessive humidity. Most varnishes are made to perform perfectly under normal humidity. There are varnishes made which will do equally well in very moist atmospheres and they should be secured for use under those conditions.

Ventilation is very important to have because varnish dries by evaporation of the volatile thinners used in it and by taking on oxygen from the air. The air in a room soon becomes loaded with the fumes given off by the varnish and the oxygen in the room is soon exhausted. Therefore the more frequently you can change the air by ventilation of the proper kind the more rapidly the varnish will dry hard. Ventilation should be secured without having drafts blow directly upon the fresh varnish, however, if trouble is to be avoided by having the varnish dry flat or do many other undesirable tricks.

It is a good plan to apply your varnish, in buildings where many people are at work, the last hour or two during the day when there is less likelihood of vibration caused by others walking through the room or building, raising dust or causing it to drop from ceiling or walls.

Storage and Handling of Varnish. Since varnish works best at a temperature of about 70 degrees it is well to keep your supply in storage at about that temperature. The top shelf in the shop is often just the right place for it.

All cans in which varnish is kept for any length of time should be full of varnish. Partly filled cans, obviously, have considerable air at the top and that is sufficient to cause a skin to form over the varnish, especially, if the top is removed often so as to renew the supply of air. It is evident, also, that all cans containing varnish must be kept covered tightly all the time. Varnish which has been allowed to skin over should be strained through silk or fine muslin and placed in new clean cans. A double thickness of cheese cloth, silk or other finer cloth make good strainers.

Getting Clean Work. High quality varnish is absolutely clean when it leaves the factory, and it leaves in clean cans. It is not really difficult to produce varnished surfaces which are completely free from grit, dust, skins and other imperfections, if the finisher will train himself to do many little tasks well. He must be a "crank" about perfection in cleanliness. He may have the job and tools ninety-nine per cent clean and that one per cent dirty will ruin the whole job. For instance, the

finisher accustomed to working in buildings doesn't often give a thought to cracks, corners and crevices as places which conceal loose dirt which will be dragged out upon a clean surface by a clean varnish brush when applying the varnish, yet the automobile painter searches out every possible hiding place for grit before he flows on a coat of finish. Every crack, hole and crevice around hardware and elsewhere is sealed up tight with a small brush and a coating of shellac. If there is any dust in such places, any grit from sandpaper or pumice stone rubbing he makes sure that it stays there by sealing it up with shellac because he cannot completely remove it, can't even see it as a rule.

Before beginning the application of varnish the first step is to see that the surface is clean, not nearly clean but perfectly free from all loose particles, and the final cleaning should be done but a few minutes before the brushing of the varnish begins. A surprising amount of grit can settle on a surface in a quarter of an hour, especially if there are people moving around in the room or if the windows and doors are open. How to clean the surface varies with jobs. After sanding a good brushing with a clean duster brush makes a good start. And for ordinary work a final wiping over with a cloth or chamois skin dampened with benzine, turpentine or benzole will remove the grit. The automobile finisher uses what he calls a "tack rag", a cloth dipped into a mixture of varnish and turpentine and allowed to dry until it is a bit sticky and until none of the varnish would come off on the surface. The varnish is squeezed out of the rag after dipping, of course and before it is allowed to set. Wiping over the surface with the tack rag picks up all loose grit.

With a surface that is known to be perfectly clean the next place to look to for grit which may ruin the job is the brush to be used. It is hopeless to try to produce clean varnishing with a brush which has been used for paint, shellac or any other material than varnish. It is difficult to do clean work with a new varnish brush, so a new brush should be shaken and worked with the fingers until all dust and loose bristles have been worked out. That will take a few minutes time. Then such a brush had best be used a few times for application of varnish under coats, not for finishing coats. Then if it is made perfectly clean after using by washing in at least two pots of turpentine, or a pot of benzine first and a pot of clean turpentine next, it will be in good shape to do a clean job of finishing varnish. Brushes which have been kept in a bath of brush-keeper varnish should be carefully worked free of such varnish by wiping it on the edge of the keeper tank. Then brush out as much more of the varnish as you can on a dry, clean board. Then work it well into the varnish you are going to use, but be

dead sure that there is no dried varnish skin clinging to the upper ends of the bristles nor on the metal ferrule sides.
The varnish should now be considered. If good quality varnish which has been sealed up in the original can is used and if it has never been subjected to freezing or zero temperatures it is safe to assume that it is perfectly clean and free from solid, gritty bits of gum or drier. Otherwise, if in doubt strain the varnish into a clean can. And remember that a can may be clean and shining and still have grit in the side or bottom seams.

Surfaces Fit to Varnish. Before one can reasonably expect success in varnishing the surf ace, old or new, paint, varnish filler or any other should be free from moisture,, both in the surface and on top of it. The varnish defects resulting from varnishing over moisture or sap in green wood are many, blistering being the most common result. Surfaces to be varnished must be free from oil and from grease of every nature, including the greasy film left by human hands and fingers. The surface,, if varnish, paint, filler, etc., should be equally as elastic as the varnish to be applied or a little less elastic, never more elastic than the last coat, if trouble would be avoided. Surfaces composed of varnish, paint, filler, stain, etc., must be bone dry and hard, each and every coat of it and one at a time, before a new coat of varnish is spread on. It is foolish to take a chance on violation of this principle. It is not a good gamble to cut the time of drying short because you never have a chance from the beginning; the result is a certainty, a failure in durability or appearance. Crazing, cracking, flaking, etc., are among the fruits of applying varnish over surfaces which are not hard dry.

Surfaces having considerable gloss should be sandpapered or rubbed with pumice stone and water enough to remove the gloss before applying varnish, enamel or paint.

The secret of success in obtaining smooth, first class work is contained to a great extent in the preparation of the wood, and unless a little care is exercised on the initial stages of the job, the final coat will not show up well. Where a perfectly smooth and level surface is desired the woodwork must be sandpapered down well with No. 00 sandpaper and all traces of dust removed with a hair duster.

Wherever it is possible, and that is in most places, it is a good rule to sprinkle the floor with water or wet sawdust in order to keep down the dust. Beautiful workmanship is often finally marred by floating dust settling on the surface of the work.

To avoid trouble, old surfaces to be varnished should be well washed with water in which has been dissolved a little soda or any good washing power. Care must be taken to see that the solution of soap is not strong enoxigh to injure the surface of the varnish. Do not attempt to wash too large a surface at one time as this gives the solution a chance to dry up and thus injure the surface. In washing doors and other upright surfaces lay the soapy water on with a soft brush, starting from the bottom of the surface and working up to the top in order to avoid little streams of water which will trickle down and mark the unwashed surface below. Work the surface well over with the brush, then rinse off all traces of the solution with a liberal supply of warm water which is clean, starting at the top and washing down. After drying the Water with a chamois skin, the surface is ready for sandpapering, dusting and revarnishing.

Where wax has been used on old surfaces it is necessary, before varnishing, to wipe off all traces of wax with a rag soaked in benzole, benzine or turpentine. Unless every trace of wax is removed the new varnish coat will crawl and will not dry. In most cases after cleaning with benzine or other wax solvent liquid it is well to apply a very thin coat of shellac before the varnish coat is applied. The alcohol in the shellac will penetrate any traces of Wax film on the surface and gain anchorage better than varnish. Wax left on a surface by the use of liquid varnish removers must also be removed by wasUng in the same way.

Mixing and Thinning Varnishes. The varnish manufacturer advises that you do not thin varnish in any way, that as it comes in the can, it is ready for the brush. That is good advice and could be literally followed to the advantage of all concerned, if a new can of varnish were opened for every job, was completely used on that job and if the thickness of varnish was suitable for every coat on every job. There are very few occasions, however, which justify the thinning of varnish. Varnish in its original condition should never be thinned for second, third and fourth coats. For the first coat, however, on hard woods like oak, maple and birch, a better job will surely result from thinning the varnish about 25% with pure turpentine. This makes a much better first coat than shellac if it is mixed from the same kind of varnish that is to follow it in subsequent coats. This thin varnish sinks into and fills the wood cells or pores and attaches itself more firmly to the wood than if the first coat were thick enough to bridge over the cells.

In this matter of thinning varnish the furniture finisher has the right idea. He takes a pint of the heavy varnish to be thinned, adds to it a

quart of pure turpentine, making sure the temperature of both is 70 or 80 degrees F. He mixes this varnish with the turpentine in a most thorough manner and lets it stand over night or longer. Then he uses this thin varnish to reduce the thick varnish of the same, not a different kind. Oil should never be used for thinning varnish. Varnishes which have become thick from improper exposure with the top off or loose must be thinned and strained in the same way.

It is not wise to mix two or more kinds of varnish together, even if made by the same manufacturer, nor different brands of the same kind of varnish, unless you know each varnish thoroughly well and have acquired skill in this sort of thing. If mixed the varnishes should be warm and should be allowed to stand a day or two after mixing to make sure that you have not formed chemical combinations which have bad reactions, such as livering or separation of some of the gums or liquids. It is much wiser to use varnishes for the purposes for which they are made. If you need varnish for a special purpose, consult the manufacturers and get technical advice which is correct. It will cost nothing and may save you considerable money.

Brush-Keeping and Cleaning. Starting with a new varnish brush of good quality, the first thing to do is to carefully work out any dust and loose bristles with the fingers. Jar the brush by pounding it in the palm of the hand, but never on a board which will ruin the setting. When you have worked out as much of the loose material as possible, wash the brush thoroughly with benzine, working the fingers through the bristles while they are submerged in a pot of the liquid. Never put a brush in water for any reason. The bristles are little hollow tubes and if you fill them with water they will become soft and flabby, and you will lose the very much-prized spring of the brush, its elasticity. When the brush is as clean as you can make it dip it into clean varnish and work the varnish into the bristles by repeatedly dipping and wiping it out on the side of the pot. It is best to break a new brush in by using it for application of varnish under coats, before using it for finishing varnish coats. Never use it in paint, or in shellac, if you would avoid having it become "lousy" and worthless for varnishing. Little particles of shellac or paint work their way up into the root ends of the bristle, become dry skins, and you will have a time of it trying to get them out.

When you have finished using a varnish brush and when you stop for lunch or any other reason do not lay a varnish brush down flat. It is sticky and will pick up grit. Hang it so the bristles will be submerged in the can of varnish and let the varnish completely cover the bristles up to the metal ferrule. To keep varnish brushes when not in use never

use an oil bath, which is good for paint brushes. The brushes should be suspended in a bath of varnish so the bristles do not touch the bottom and so the bristles are completely covered. The kind of varnish should preferably be what is called brush-keeper varnish. It is a long-oil varnish made without driers so it will keep its liquid form for a long time without skinning over on top or drying on the varnish ferrules. Next to brush-keeper varnish good quality long-oil spar exterior varnish is best. The brush-keeper tank should be covered up as tightly as possible to keep dust out and to prevent undue drying of the varnish supply.

When no brush-keeper is at hand to take care of varnish brushes the only course left is to wipe out as much of the varnish as possible on the side of the varnish can, then wipe as much as you can out on a board and finally wash the brush in a can of benzine, working your fingers through the bristles submerged in the benzine, and finally, wash in a can of turpentine. Shake out the liquid and lay the brush flat to dry. If the varnish is permitted to dry until it is sticky use alcohol to clean it.

Varnish brushes which have been neglected until the varnish is hard dry in the bristles are ruined for further application of varnish.

The Brushing of Varnish. To one who has not tried it the brushing of varnish, particularly finishing coats which are flowed on rather full, is accomplished merely by dipping the brush into the varnish and spreading it around on the surface, much as we spread oil paint. But one attempt to varnish a fairly large surface and get a clean, perfect gloss will suffice to teach anyone that there is considerable skill, understanding and experience yet to be acquired.

The first consideration in the application of varnish is the brush. Needless to say that a perfectly clean, well broken in varnish brush is essential, quite as essential as good varnish and the proper method of application. No matter whether you prefer a flat varnish brush or an oval, it must be good, clean and well used to do perfect finishing.

The successful brushing of varnish merely requires that you work methodically, that you work out a system of brushing .which will properly distribute the varnish over the entire surface to an even thickness. That means first, look over the surface to note the best place to begin and to finish so as to take advantage of the natural breaks in the surface, mouldings, edges, joints. carvings, etc.

It is not wise to pour out the last inch or so of varnish in a can because it may contain settlements of grit or crystalized gum or drier. The can should not be shaken unnecessarily and when pouring varnish from it let the stream hit against the side of the pot which has been tilted over a little, this so you will not fill the varnish in the pot with air bubbles which are likely to make your brushing more difficult.

Dip your brush into the varnish deep enough to take a full load, but not so large a load as will drip off the brush. Do not scrape out the varnish on the side of the pot any more than you have to, because that fills the varnish with air bubbles which may make your brushing more difficult when laying-off the coating to finish. A clean wire stretched across the center of the varnish pot is better than wiping on the sides of the pot, if any wiping at all is necessary. It really is better to dip the brush just enough to load it and so require no wiping.

Carry the loaded brush to the surface, the center of a small panel or not too near one end or edge, and with quick strokes moving the length of the wood grain distribute the varnish roughly as far as it will go without too much stretching. Then with the empty brush begin cross-brushing this load, across the grain of the wood. Now the varnish is pretty well distributed, so lay it off to finish by rubbing again with the grain of the wood, using the tip ends of the brush bristles.

Take up your second brush load of varnish and distribute it in the same way, repeating the operation until a fairly large area has been coated in and laid off to finish. Now after the varnish has had a little time to set, the time from the first brushful until the last, you can tell pretty well whether too much has been put on and whether there are going to be any runs, sags or wrinkles. It is well to take your varnish brush when empty, wipe it out more on the pot and with it go over the entire surface to pick up any excess of varnish which may be in evidence in the form of folds, runs or sags near mouldings, corners, etc., brushing with the grain of the wood. Long, light strokes are best for this final brushing, and be very careful not to do this work too late, after the varnish has set so much as to become sticky. Let your brush strokes run up to and over the edges of boards, panels, cabinet tops, etc. Inspect the surface against the light reflections to find any skipped placed, " holidays" as the finishers call them.

The first coat of varnish should always be brushed out thinner than later coats. Put on less varnish and brush it out until a thinner film is distributed than is wanted for the finishing coat. But on any varnish coat it is better to brush it out too thin than to leave it too thick. If too

thin it will dry perfectly, as long as you have not skipped any places, and if greater depth of varnish is wanted another coat or two can be put on. But if too thick a coat is spread it is likely to develop such defects as runs, sags and wrinkles which will mar the beauty of the finish. Heavy-bodied varnish should be thinned about 25% with pure turpentine for the first coat only. Then it will sink into the wood cells better, dry harder and more quickly and make a fine foundation, firmly attached, for the future coats.

Allow plenty of time for the first coats of varnish to dry hard. Time cut short on the drying of the undercoats must be added to the drying of succeeding coats and a poorer finish results, too. Each coat of varnish spread stops the drying of the varnish or other coatings under it. On jobs which have as many as four coats of varnish it is well to let the first two coats dry bone hard. The third coat should dry hard enough to rub safely, but not so dry as the first two. Then the last coat will fuse into the varnish body below it and fill up any abrasions where the rubbing might have cut through a little. If the third coat is bone dry and very hard any rubbed through places may show up in the finish. Of course, it is far better to do the rubbing so carefully that there will be no rubbed through places.

When brushing panels it is well to deposit your first brushful in the center near one end. Then coat-in the corners and across the ends, following up by filling in the centers. That method prevents laying on an excess of varnish on the edges and in the corners,"fatty runners'' as they are called. When it comes to laying-off with the final strokes with the grain of the wood, brush the whole panel first with the length of the grain, then across the grain and finally with the grain again. These final, light, long strokes should start in the center of the panel and work both ways toward the ends. They should not start at the ends and finish in the middle as is sometimes done. That method often drags the varnish from the ends and piles it up in the center where it will run, sag and wrinkle.

Finishing coats of varnish are as a rule flowed on a little thicker than the undercoats, but as has been said, if there is any doubt about how thick to flow the varnish, put it on too thin rather than too thick. And when flowing any coat of varnish do not take small brush loads and spread them on small areas. In that way the varnish will set before you can get enough on the surface to cover it and distribute it evenly. Take full loads in your brush, spread it out vigorously and decisively, aiming to get enough varnish on the surface quickly and then you will have more time to distribute it evenly and lay it off to a fine finish.

Varnish must not be rubbed-in but applied with a firm stroke.

When varnishing table and cabinet tops or any projecting surfaces be very careful to run your brush up to the edge, but not over the edge. When you scrape the brush over the edge an excess of varnish is left on those places and that excess will run or form a fat edge.

It is well to keep close watch on any varnished surface for a few minutes after the brushing has been completed. Often you can catch up runs, sags and wrinkles with the brush before the final setting and so prevent a disfigured surface. This must, however, be done very deftly to avoid roughing-up the partly dry varnish about the runs.

Runs in varnish after the varnish is dry can sometimes be made less conspicuous in this way, wet a cloth, rub it on a piece of hard soap and then rub the varnish run which is dry and hard. Then take up a bit of pumice stone on the same cloth and gently rub the defective spot. The soap enables you to rub down the excess of varnish without having the pumice stone lodge in the varnish film.

RUBBING The preference for highly polished surfaces of a few years ago has given place to a popular liking for dull lustre and flat finishes on walls, wood trim and furniture. The dull effects take away the new appearance of furniture and trim, making them take their place more modestly in the general decorative scheme.

Some woods, like mahogany and walnut present a far richer effect as wall panels, when finished with a dull lustre and the hand-rubbed surface is much to be preferred on such woods. On these woods and upon oak dull finish is historically correct. A high gloss causes reflections which prevent one from seeing the full beauty of the wood. Next to the hand-rubbed finish the flat varnish finish is preferred. Some believe that finish is decidedly out of place on walnut and mahogany, but is very appropriate on oak.

The surfaces commonly rubbed dull are gloss varnish, gloss enamel and shellac for the cheaper work. The means of producing a dull finish are several hand rubbings with pumice stone and oil or water, coating a surface with varnish or enamel which dry with a dull lustre instead of a gloss, waxing a gloss surface, rubbing a gloss surface with sandpaper and oil, or waterproof sandpaper and water, rubbing a gloss surface with steel wool or with an electric rubbing machine which uses pumice stone and oil or water.

Nearly any kind of varnish, shellac or enamel can be rubbed to a dull finish if it is hard dry, but more work is called for on all except the varnishes which are made especially for rubbing. The rubbing varnishes are short-oil and medium-oil varnishes which dry hard and more rapidly than others. If you rub a long-oil varnish or enamel too soon it will gum up the paper badly and rupture the coating to the point of disfiguring it. Of course, if you rub any coating before it is dry the same thing will happen.

Pumice Stone and Water Rubting. The finest kind of rubbed and polished surface is produced by this method of rubbing the under coats and with the final rub on the finishing coat done with pumice stone and on.

The pumice stone used for this rubbing is a fine grain, hard abrasive which comes in many grades. The grades are designated as F for a fine grade and FF for a very fine grade. Others grade pumice stone and list it as follows:

Extra Extra Fine, powdered

Extra Fine

Fine

No. 0 Usual,

No. 1 Coarse,

The FF grade of pumice is commonly used for rubbing varnish. The tools used for rubbing with pumice stone are simply a piece of felt pad which is fairly soft for fine rubbing and hard for coarse rubbing. The felt is purchased in sheets from 4 to 1 inch thick by the pound and can be cut to suit the job. Some use pieces cut from old felt hats, but it is too thin for good work. The felt is cut about 3 by 5 inches and tacked at two ends on a block 3 by 4 inches. The felt is turned up at the two ends and tacked on the ends so the heads of the tacks will not come in contact with the surface being rubbed. There are various kinds: of patented rubbing pads on the market which are excellent for the work. Other things are used for rubbing, such as burlap, but all have their faults and none are as good as felt for the purpose.

The procedure to follow in rubbing with pumice and water is as follows: Make sure that the varnish or enamel is bone dry and hard

before any rubbing is done. Then place the dry pumice stone in a cigar box or any dish which is handy. Soak the felt pad in water and soak the surface to be rubbed in water.

Whenever possible place the surface to be rubbed flat on a bench or on saw horses at a height from the floor which will enable you to rub without leaning over too much. Take the wet felt and dip it into the pumice stone so as to put a thin coating of the dry powder on the pad and begin rubbing the surface with a light pressure first, gradually increasing it to the degree of pressure which you can maintain comfortably for a long time over the whole surface. Bub only with and never across the wood grain, that is, rub in the direction in which the wood fibres extend. If you rub across grain you will scratch the surface so that it will be difficult to remove the marks. Rub in fairly long, straight strokes, never in a circular manner.

Success in rubbing depends upon doing the work methodically., that is, you must cover every inch of the surface with the same pressure and with about the same number of strokes. No need to count the strokes, but a little practice will teach you to quit rubbing when the gloss has been cut off and the grit or dirt disappear. There is no advantage in rubbing beyond that point. No need to cut off any more of the varnish body than you have to to get a dull, smooth surface.

When it comes to rubbing panels where it is not possible to rub the ends without rubbing across grain, rub them first and across grain but do not rub any more than you have to to take off the gloss. Then when rubbing the balance of the panel with the grain you will have to rub out the scratches put in the ends by cross rubbing.

Rubbing is strenuous labor at best, but many finishers work much harder at it than is necessary. If they would use their heads more and their muscles less a better job would result with less work.

The finisher must be especially alert to avoid cutting through the finish at the corners of mouldings, carvings and edges of all overhanging boards. It takes but a stroke or two to cut through at these places so keep away from them with the pad while rubbing the surface generally and go back to them later with a smaller felt and rub them with unusual care. If you do cut through at such places, they should *be touched up with shellac colored to match after the surface has been completely rubbed and before the next coat of varnish or enamel is put on.

Another point which must be carefully guarded against is that of rubbing too long in one place. That will heat the varnish enough by friction to burn and ruin it. Burning may also result from rubbing without-sufficient water. The rubbing should be started in one place and should proceed progressively, always in a forward motion. In other words, rnb back and forth a few strokes in one place and then move on to the position next to it and so on.

Add more water to the surface from time to time to keep it wet but it is a good plan not to add more pumice stone to a board or panel being rubbed. Take enough pumice onto the panel when you start rubbing to finish rubbing that panel. The point is that after you have rubbed a little with the pumice it becomes finer as the surface becomes smoother. If you add more pumice stone it will cut faster than the partly worn stone on your pad and it will scratch the fine surface already produced.

Two-coat work will not stand close rubbing, if rubbed at all it should be rubbed lightly. From six to eight strokes in each place will usually be enough to remove the gloss and dirt nlbs. For really fine work from four to six coats of varnish are needed.

The rubbing is a very important part of the work of finishing. It makes or breaks the job since expert rubbing adds lustre or depth to the finish.

Keep a sharp lookout for a caking or gumming up of the felt pad. If the varnish or enamel cut off gums or cakes the pad the surface is likely to be scratched. To avoid that wash the pad off in clean water occasionally. If it becomes necessary to add more pumice to a panel or board to finish it use a finer grade than that with which you started so you will not scratch the surface already produced and so make the polishing difficult. Varnish which is not dry will cake up easily and some varnishes will cause caking no matter how dry.

When a varnish or enamel is so dirty or rough that conisderable coarse rubbing is necessary that cuts off what is equivalent to one or one and a half coats of varnish. So it is evident that very little rubbing can be done on anything less than a four-coat job and it also makes clear the desirability of doing clean varnishing work to save rubbing time and labor cost.

The first rubbing done on a job is called coarse rubbing and is done with pumice stone which is not so fine as that used for fine rubbing

and it is done with a felt which is only medium hard and from 1/2 to 2 inches thick.
Carvings are rubbed with a brush rather than a felt pad which will not of course reach into the depressions.

Pumice Stone and Oil Rubbing. This is called fine rubbing because the object of it, on fine furniture and cabinet work at least, is to remove the fine scratches produced by coarse rubbing. The fine rubbing is often done first with very finest of pumice stone and oil and then after a wash-tip the surface is finished with rot-tenstone which is very fine, sifted and bolted, and oil.

Oil rubbing should never be done on under coats only on the last coat of any finish. If done on under coats the next coat of varnish or enamel may crawl or behave even worse.

Fine rubbing is done with a fine-grained, thin hard felt, and it may be done with either water or oil. As a rule the flow coat, or finishing and polishing coat, of varnish is clean and smooth, the very nature of the varnish makes it so if the application is made under anything like favorable conditions. The rubbing should under no circumstances cut through this coat or the finish will be ruined. This rubbing should not take place until the varnish is hard dry beyond any doubt,at least not until forty-eight hours after application and longer, time for drying is much better.

The oil used for fine rubbing may be any one of several. Raw linseed oil was used in years that have passed. So also was sweet oil in favor. Of late years the non-drying mineral oils have been favored, such as light motor oil thinned a little with benzine, or sewing machine oil. Then there are special rubbing oils put out by all of the large oil refineries which are very good for this purpose. Paraffine oil is liked by some for the work.

When rubbing with oil do not flood the surface, simply dip the pad into the oil and then pick up a thin coating of pumice stone on it. Repeat as often as is necessary to transfer to the panel or board enough pumice to finish rubbing that area. Some finishers prefer to mix the oil with the pumice stone. The rubbing method with oil is identical wjth that used for water rubbing. There is not, however, as much danger of cutting through or burning the surface and for that reason oil rubbing is a little safer for the new hand at it.

After rubbing with oil wipe the surface as clean as possible with cloths

and then wash! absolutely clean with benzine.

Allow a fine rubbed surface to dry at least twenty-four hours before polishing. Otherwise the polish may not be durable. A longer time for drying and to allow the surface to " sweat" is much better.

Brush Rubbing.For quick and cheaper results in the way of rubbing gloss varnish or shellac a brush is used. For large flat or vertical plain surfaces a short bristled brush like a shoe brush is used, while for general trim and mouldings an old short stub flat wall brush or oval varnish brush is used. The pumice stone is mixed with the oil into a "soup", as the finishers call it. The brush is dipped into the soup and the surface rubbed rapidly. Such rubbing, of course, does no more than to remove the gloss from the surface, but it does very well for some jobs.

Sandpaper and Oil Rubbing. On some of the cheaper work fine sandpaper of the ordinary grades is used after dipping it in one of the oils listed in the pages preceding for pumice stone and oil rubbing. This is a practice which should be extended until it entirely supersedes the practice of sandpapering paint, enamel, etc., dry, a dangerous habit. Breathing the dust from dry sandpapering is perhaps the only real health hazard of the trade today. The paper cuts just as well or better when used with oil. When it clogs up it can be washed with benzine and used again. It leaves no grit on the surface to be cleaned up. The greatest objection to it is that on new woods which are to be finished in as light a natural color as possible, or in gray stains, the oil is apt to darken the wood color. For dark stains, however, the oil has a beneficial effect, since what is absorbed by the wood will seal up the excessively porous places and make the stain take with a more uniform color.

Waterproof Sand and Grit Papers. In recent years these specially made papers covered with sand, glass, emery and other grits of a very fine and uniform nature have made great progress in the favor of furniture, automobile and house finishers. They are used for a great many jobs where pumice stone and water or oil were used in the past. They do just as fine finishing and do it much faster. The cost is much greater for material, but considering the time and labor cost saved they are really cheaper in the end.

To use these papers soak a sheet in water, wet the surface and rub as usual. It is best to place the paper on a sandpaper block. Any wood block will do but the patented kinds are very handy. Wash the

sandpaper out every few minutes with water to remove the accumulation and keep the surface wet. Wash the wood surface off with a sponge and water after finishing the rubbing. A felt rubbing pad on a block of wood makes a good tool over which to stretch the sandpaper. Some finishers stretch the piece of canvas over the felt before putting the sandpaper in place.

These papers are made so fine in grain and so uniform as to composition that they cannot scratch the surface and they do not leave any grit on the surface.

The fineness or coarseness of sandpaper is rated as FF, P, 3/0 (or 000), 2/0 (or 00), 0, 1/2, 1, 1%, 2, 2 1/2, 3, 31/2 4, 4 1/2. No. FF is the finest and No. 4 1/2 the coarsest.

Most of the sandpaper used by the house painter comes in sheets 9x11 inches or thereabouts.

Steel Wool and Oil.This abrasive is used extensively by the house painter especially and serves the purpose well. It is used both dry and with one of the rubbing oils to keep down the dust and protect the health of the finisher. It is made in the following grades from fine to coarse:

No. 00,equal to FP pumice stone

No. 0, equal to F pumice stone

No. 1, equal to No. 0 sandpaper

No. 2, equal to No. 1/2 sandpaper

No. 3 equal to Nos. 1 and 2 sandpaper

POLISHING Wood finishers doing the ordinary run and even the better class of finishing in homes and public buildings are seldom called upon to do any polishing beyond a careful clean up and rubbing with soft cloths after varnished surfaces have been coarse and fine rubbed. The piano polish, however, is often inquired about and occasionally a fine piece of furniture or cabinet work calls for polishing to a high lustre after the rubbing.

The rather dull lustre of hand rubbed wood trim and cabinets is generally considered much more artistic than a high piano polish, surely it harmonizes with flat finished walls and dull finished furniture so much in use better than an extremely high gloss.

There is no possibility of producing a highly polished surface unless the wood has been well filled, is level and hard dry. A surface with a ripple effect caused by insufficient filler, or no filler, little or no rubbing cannot be polished. Then, too, polishing must be done on the right kind of varnish. The varnishes intended for polishing are short-oil, very hard drying kinds. You cannot produce a high polish on the long-oil, elastic varnishes which are made to be very elastic and to withstand exterior exposure. And, further, you cannot polish or rub any varnishes which have not been allowed to become bone dry. If you can dent a varnish coat with your finger nail it is too soft to rub and polish.

Having a properly filled, varnished and rubbed surface the polishing is done by one of three methods,a quick polishing, a slow polishing or French polishing. The latter method is never used except on furniture and while it produces a very beautiful and durable finish its cost is too great in labor and time to be considered for any except furniture pieces.

Using the quick polishing method you begin after the varnish has been coarse-rubbed and fine-rubbed and cleaned up very thoroughly. The polishing is done with fine, dry rottenstone and rubbing oil. This oil may be a mixture of half sweet oil and half denatured alcohol. Fresh cottonseed oil was used in years past, too. Also you can purchase what is called rubbing oil now made especially for this purpose.

Some finishers prefer a soft piece of felt about 3x5 inches, some a wad of cotton batting and some a clean, soft piece of cotton waste. Whichever is used, it should be dipped into the rubbing oil and squeezed out dry. Then the surface may be rubbed with it until coated with oil and then the very fine rottenstone may be sprinkled on to the oily surface. Some prefer to dip the rubbing pad in the dry rotten stone. The rubbing should be done in a circular manner and should proceed over the surface until a good polish has been gained by even pressure and an equal amount of rubbing on all areas.

It takes time to produce this polish. When the polish has been completed wipe off the oil as clean as possible with a soft cloth or cotton waste. Then dampen the chamois skin with benzine and wipe off the surface. Then to remove every trace of oil, dry cornstarch or

dry bran can be sprinkled on the surface and rubbed over it. After that polish the surface with a clean, soft cloth to a high lustre.

A slower method of polishing is done with an extra coat of flowing or polishing, finishing varnish put on after the surface has had the usual rub with pumice stone and water and has been thoroughly cleaned up. Let this extra coat of varnish dry hard and then rub it fine with the finest pumice stone you can secure, FF grade, and water, using a soft felt pad. When a smooth and evenly dull surface has been secured, clean up by a thorough washing. Then wet the surface with water, wet the palm of the hand and pick up on it some dry and fine rotten stone. Rub the surface well and evenly with your hand, keeping the surface wet and using a circular motion. Decrease the amount of rotten stone gradually until you are rubbing with the hand and water alone. When finished let the surface dry and then with your hand clean and dry wipe off the rotten stone white powder which remains, cleaning your hand after each stroke. Polish with a soft piece of silk or a dry, soft chamois skin. This slower method produces better results than the oil polish described. The oil rub, however, always cuts faster than a water rub.

CHAPTER XI

VARNISH DEFECTS AND THEIR CAUSES

WE see about us remarkably beautiful jobs of varnishing on furniture and automobiles. In our homes and business buildings we like to expect equally beautiful varnishing to be done on wood trim, floors and cabinet work. None but those who know the exacting requirements to which the furniture finisher and the automobile painter hold themselves can appreciate the inconsistency evident in the expectations of those who want the finest type of finishing done on wood trim in buildings under the working conditions found.

The furniture finisher and the automobile painter are tireless in their vigilance to keep out dust from their work rooms, to regulate the ventilation and to control the humidity of the air. In the factories of most modern design huge sums of money are spent in providing apparatus for the control of heat, air and moisture for the finisher.

Is it any wonder, then, that the finisher who must do his work in new buildings and old, where he must accept conditions as they are, encounters varnish troubles? Even though the quality of the products used be beyond question, surface and working conditions are Sometimes such that a high class job is simply impossible of production.

But adverse working conditions for varnishing can be greatly improved if the finisher but has a knowledge of the causes of the more common varnish failures.

Some such failures are so complicated that it is sometimes impossible to diagnose the case because of lack of facts concerning what was done. The more common failures, however, repeat themselves so regularly when conditions are duplicated that there is little difficulty in pointing out the cause and remedy. The use of cheap varnishes, poor tools, improper under coats, application of varnishes on wet, dirty, cold and greasy surfaces account for a very large part of the troubles encountered.

Crawling Varnish. This condition can readily be recognized by the fact that the varnish acts like oil on a wet surface. The varnish fails to

attach itself to the surface in places and crawls or wrinkles or puckers up in tiny waves or folds.

The cause of crawling is the application of varnish over surfaces which are wet, or greasy, or cold, or which have too high a gloss. Crawling may also occur when new varnish is put on over previous coats which are sweaty, which are not hard and dry. Dirty and sweaty finger marks on the surface before varnishing will cause crawling, the perspiration really is a greasy film. A film of soap left from washing without thorough rinsing with clean water will cause crawling.

The addition of drier to varnish may cause crawling by making it dry too rapidly and before it has attached itself firmly to the surface. The practice of adding drier to varnish is a vicious habit and ruins good material. The manufacturer puts in the right kind and amount of drier when he makes the varnish and it is unwise for the finisher to add drier in his ignorance of the chemical actions involved. When two or more kinds of varnish are mixed together the finisher is inviting the appearance of crawling varnish. And when a can of varnish is allowed to remain uncorked until it becomes thick it may cause crawling if it is thinned with benzine instead of pure turpentine. Too much benzine will ruin any except the cheap rosin varnishes.

Even the best of linseed oil ought not to be mixed with varnish, it may cause crawling. The use of an oil-soaked brush may cause it. Quick changes of temperature from warm ta cold and of weather from dry to cold, foggy air, cold drafts, etc., are sometimes sufficient to cause crawling of varnish. Oil in the wood surface may cause crawling. Cypress contains a little natural oil on the surface and some finishers oil-coat wood to even up the suction, a good practice, before staining. But if these oily surfaces are not bone dry before varnishing the coat may crawl. The cypress surface can be wiped free from surface oil with a turpentine or benzole soaked cloth. When the surface is cold and the varnish is cold, either below 70 degrees, crawling is apt to occur. Poor workmanship in the brushing of varnish will cause the coating to crawl because it is a thick and thin job, that is, the varnish is not distributed evenly over the surfaces. In the places where the varnish is put on too thick it will crawl, wrinkle or pucker up. A thin film of wax on a surface left by the use of liquid varnish removers will cause crawling, fitting and cracking. The wax should be washed off with benzole or alcohol.

A varnish having excessive body, too thick, may crawl, especially on a surface with a high gloss.

Running, Sagging and Wrinkling. The causes for these troubles are substantially the same as for crawling. If the surface is vertical and considerable varnish is flowed on it is apt to run, sag and wrinkle as well as to crawl.

The word curtaining is used to indicate the sagging effect of varnish when it sags in long ridges like the draping of curtains. This is apt to occur also near mouldings, carvings, etc., about which more varnish is likely to have been brushed than upon the open places. Varnish which is too new, which is unfinished or not aged enough will cause this festooning, but the trouble is more often faulty application of the varnish in the form of cold, wet, greasy surface or brushing on the coating in a film of uneven thickness. Slow-drying, elastic and durable varnishes containing more oil than the quick, hard-drying varnishes require more brushing and laying-off and are more likely to run, sag, wrinkle, etc., if not properly brushed to distribute the varnish in an even film.

The wrinkling of varnish is caused by flowing on too much varnish. The outside surface absorbs oxygen and dries faster than the under side of the varnish coat, forming a skin. The under part of the varnish film gives up part of its volatile thinners by evaporation and thus loses part of its bulk. The outside skin taking on oxygen soon becomes too large for the mass of soft varnish under it and so it draws up into wrinkles or ridges.

Silking or Enameling of Varnish. When varnish in drying takes on a texture of a grainy and fibrous appearance it is called by some "silky" because it has a textile fibre appearance. It is called ''enameling" by others because it looks like the grain of enameled leather. The cause is usually the spreading of varnish in an unheated room,cold surface and cold varnish. One cannot brush such varnish enough to keep it in place before it sets in the condition described. The temperature of a room in which varnish is being spread should be kept between 70 and 80 degrees and both the surface coated and the varnish should be of the same temperature.

When varnish is spread over tinder coats of varnish or paint which are not completely dry silking is likely to occur. Cold drafts may cause silking. Mixing turpentine with some varnishes will cause silking and if a varnish is brushed too long brush marks may remain which give the same appearance.

Seedy, Sandy or Specky Varnish. This defect looks like a surface over

which some fine sand or other gritty substance had been sprinkled while the varnish is wet. These particles will not be in evidence at first but after the coating has been drying from half to one and one-half hours the seedy effect appears.

As to the cause of this trouble. Look first at the varnish used. Varnish which has been recently made, has not aged enough and is not ripe may dry with a seedy surface.

Allowing varnish to become chilled in winter is one cause of the appearance of a sandy finish of varnish. After varnish has been brushed on, if the surface becomes chilled, it may become covered with a multitude of tiny specks and when the coating is dry the specks are even more in evidence. The cause is the chilling of the oil and the reaction of the driers. The remedy is, of course, the proper heating of the room and the varnish to 70 or 80 degrees. The seedy, or sandy particles are congealed bits of gum resins or oils or driers. Crystalized particles of drier are usually the cause.

When varnishes are exposed to zero temperatures or nearly so during transportation from factory to finisher the sandy, seedy surface may appear when the varnish is spread. Such varnish should be warmed thoroughly before being used. Place the varnish can in a pail of hot water for half an hour or more. About 110 degrees is the correct temperature of the water for this purpose.

Age does not cause varnish to become sandy or seedy, but with age, when the can has stood around for years, varnish will deposit some settlings in the bottom of the can. For that reason a careful finisher will never use the varnish from the bottom of old cans without first straining it. As a rule the last quarter inch in the bottom of any can, old or new, will not be used for finishing by a careful man. Such varnish is set aside for rough work.

When varnish is allowed to stand around uncovered it will skin over the top and when this skin is broken it is sure to become mixed with the clear varnish and a seedy or specky surface will result, unless the varnish is strained before using.

Pumice stone or other grit, like that from sandpaper or steel wool, on the surface will give the specky, seedy appearance to the finished varnish coating. Dust from ceilings or other surfaces which cast it off into the air will give the seedy appearance to varnish. Likewise the use of brushes which are full of dust or the dried varnish or paint skins

from previous work will cause the gritty, sandy, seedy finish on varnish.

Pitting, Pinholing, Pocking and Blotching. The causes of these defects are similar and each of these difficulties denote relative degrees of the same general trouble.

Pinholing is the condition of varnished surfaces which show disfiguring by innumerable small holes resembling pin-holes.

Pitting is the same pin-hole effect but the holes are larger.

Pocking or Blotching describes the same condition but the indentations are still larger, taking on the effect of large scars.

The causes which are usually found in such cases as are called pitting, pinholing, etc., are these: The mixing of two or more varnishes of different kinds or different brands together; change in the air from dry to damp; spreading the varnish in rooms which are excessively hot or excessively cold; brushing varnish over varnish or color which has not become bone dry or which is sweaty; varnishing in a room with a floor which is very wet or cold; placing cold varnish on warm panels^ or warm varnish on cold panels; lack of proper ventilation and a uniform temperature of from 70 to 80 degrees.

In the summer time a sudden drop of temperature may cause the pin-hole or pitting of varnish if the air in the room is quite damp. The excessive moisture in the hot air is condensed on the surface when the temperature drops suddenly. The drops of water oa the surface prevent the varnish from taking hold and the pin-holes result. It is just like rain on the surface. If it occurs after the varnish is brushed on and before it sets, the same action takes place,the water sinks in and attaches to the surface while the varnish recedes from the water just as water and grease separate.

When brushes are kept in oil and not made perfectly clean before loading them with varnish they may place enough oil on the surface to cause pin-holing. Varnish 1 brushes, for that reason, ought not to be kept in oil but in varnish, preferably in the special brush-keeper varnishes made for the purpose.

The defect called blotching may be caused by thinning varnish with turpentine or benzine. It may result from the presence of turpentine or benzine in the varnish brush which has not been thoroughly cleaned.

Varnish brushes kept in oil and not cleaned perfectly are a fruitful cause of blotching. Varnish is very particular about what it associates with. It takes only a little of some liquid of other kind to start trouble. And the strange part of it is that the varnish contains oil and turpentine usually, but incorporated under heat and in correct ways.

Improper or careless filling of wood is largely responsible for pin-hole defects. And on close-grain woods where no filler is used a first coat of varnish which is too thick will cause pin-holes to appear. The thick varnish fails to penetrate into the wood cells. The first coat of varnish should be thinned with about 25% of pure turpentine for first coat only.

Sweating Varnish. Gloss varnish which has been rubbed to a dull finish will sometimes change back to a greasy gloss and that is called sweating. The most common cause of this defect is the application of varnish over under coats which are not sufficiently dry and hard. Sweating may occur over varnish under coats or over color and paint coats which are not dry. In some cases varnish will sweat, even when applied to properly dry and hard under coats, if it is rubbed too soon and before it is hard and dry. The long-oil varnishes, those which contain a large proportion of oil, are much more likely to sweat than the short-oil, hard-drying varnishes. The long-oil varnishes are, of course, the most durable type but are not intended for much rubbing. When they are rubbed they should be bone dry and hard. The very best quality finishing varnish is likely to sweat if rubbed as soon as a week or two after application. A much longer time must be allowed before rubbing such varnish with safety.

When it becomes necessary to rub finishing varnish of the long-oil type the job should be cleaned up after rubbing and be allowed to stand five or six hours in Summer^ or over night in Winter, before another coat of varnish is applied. Usually if sweating is going to occur it will show up in that time. And when sweating does occur allow the job to stand just as long as possible before 'brushing on the next coat. Also rub it again lightly with very fine pumice or an old pumice rag before application of the next coat of varnish. When a job is so handled that sweating may occur it is well to use another precaution, that of applying the rubbing coats as carefully as finishing coats are put on, as to brushing, and rub as lightly as possible, using plenty of water. In this way the under coats are not cut deeply by the rubbing and a deeper lustre will finish on the job. If this procediire is not followed or if the job is finished too soon the finished surface may be specky or full of brush marks.

Green varnish, that which has not aged enough, is often the cause of sweating, but when using high quality standard brands of varnish this is a very remote possibility and the cause of sweating is more likely to be one of those suggested above or rubbing too long and too hard in one place which heats up the varnish even though it was hard and dry enough to begin with.

Sinking-in. When an open-pored wood like oak is not sufficiently or properly filled, when the paste filler is wiped too soon or incorrectly so as to drag or lift the filler from the wood cells, the varnish coats sink in. It is not possible to produce a really high polish on such a foundation which has a rippled effect. Sinking-in is also a term used to describe deadening, flatting or loss of gloss.

Deadening, Withering, Saddening Varnish, This condition is really the loss of gloss, giving the varnish a withered, dead appearance. The cause usually may be traced to insufficient or defective under coats, improper filling or insufficient filling of the wood. The cause may be traced to under coats which have not been permitted to dry hard, causing the finishing coat to be absorbed in part by the under coats. This trouble is very common and occurs sometimes even in the best of shops.

Some of the other causes for this defect are the spreading of varnish on unseasoned lumber, on composition panel surfaces which are very absorbent or upon paint under coats which are not perfectly dry. This latter is a very fruitful cause of the loss of gloss on the varnish. If the paint is not dry the varnish most certainly will sink in and go dead; the gloss is not there. There are no exceptions to the principle in painting, varnishing, shellacing, staining, enameling, etc., that each and every coat must be bone dry before another coat is put on. When a finisher violates that law he is in for trouble and he has it coming to him. The customer can hurry the finisher, but the finisher cannot hurry the coatings, beyond certain limits, without paying the price either in the appearance of defects or in the loss of durability. Certain chemical reactions must take place in all these coatings before they become dry and hard.

Spreading varnish over porous, absorbent under coats of paint or enamel undercoaters results in the varnish sinking in and the loss of gloss. The spreading of polishes and waxes of certain compositions on top of gloss varnish will cause the loss of gloss^ even when the under coats and the varnish are correctly applied and dried. When too many

coats of material making up the surfacing and coloring of the job are put on in one day deadening or sinking-in is an inevitable result. The addition of an elastic binder like varnish to japan color is apt to cause both deadening and checking of varnish. Japan color comes to the finisher with sufficient binder in it and any more added is detrimental.

Tacky, Sticky, Slow-Drying Varnish.Varnishes are made to work perfectly within certain limits. Perfect results come only when varnishes are applied under perfect conditions. The requirements are a temperature of from 70 to 80 degrees, good ventilation, without drafts, light and not too much humidity. Extremes in weather, very hot, very cold and very humid, damp days interfere with getting perfect results. Varnishes are made which will do good work under each of these imperfect conditions, but special Tarnishes should be used under special conditions.

Tacky, slow-drying or non-drying of varnish is most often encountered in churches, halls and other places as on pews and seats. The cause of the trouble is poor air, poor or no ventilation, air loaded with ammonia and other gases and moisture. If the old wood is greasy before varnishing, not thoroughly cleaned of perspiration, finger marks and the usual dirt accumulation on furniture, the varnish may fail to dry or remain tacky. Or it may dry and soften up again under the heat of the human body when on chairs or pews. Painted or grained surfaces containing too much oil will prevent the varnish from drying hard and tackiness may result. A minimum of oil ought to be used in all under coats for varnish. The remedy is to remove the varnish and refinish with hard-drying pew varnish. In some cases a coat of thin shellac will eliminate the trouble. Tackiness is often the result of using the wrong kind of varnish for the job. Any good interior spar, coach or cabinet varnish will serve satisfactorily if the surface and under coats are correct.

Crazing of Varnish. This defect is the appearance of fine interlacing cracks which seem to be in the under side of the varnish film, not on the outer surface. It is much'the same effect as is noted on old china dishes. Automobile bodies are especially subject to crazing, even on the finest of finishes. The.cause of this defect is often sudden changes of temperature. An automobile, for instance, may be stored over night in a garage with a temperature of 50 or 60 degrees; It is suddenly driven out into freezing or even zero temperatures. The metal surface contracts rapidly; if the varnish and whole body of finish does not contract in the same degree, crazing, or worse, may result. Then when the engine warms up there is heat on the inside of the surface and

extreme cold on the outside. No wonder crazing is common with such extreme conditions. Crazing may result also from the use of excessively hard gums in the varnish and from the use of varnish which is not elastic enough for the job at hand, in other words, an unwise selection of varnish for the purpose.

Cracking and Checking. A common defect which is pretty well described by the terms "cracking" and "checking''. The varnish breaks up much like a mirror. There are many causes of the defect. Severe changes in temperature when the varnish is not thoroughly dry and hard and the use of cheap, inelastic varnish in thick coats are common causes. Under coats which are not dry when the finishing coats are put on and the use of under coats which are too thick are fruitful causes.

If slow-drying varnish is applied over quick-drying varnish, the finish is likely to crack. The safe method on all surfaces is to use the same quality of varnish from the start to the finish of the job.

The use of two varnishes having entirely different degrees of drying on the same surface is unwise. The use of a cheap first coat varnish and an elastic good quality finishing coat of long-oil varnish invites trouble from cracking and checking or worse.

Some finishers will not use shellac for varnish under coats, even when absolutely pure, on the theory that it is very brittle and prevents the varnish from taking hold of the surface and anchoring firmly. This is open to argument, obviously, since shellac is very widely used, and, when spread on in thin coats and rubbed down considerably, none of it remains except what is lodged in the wood pores as a filler.

The best and only safe method for finishing is one which puts on an elastic priming coat next to the wood or metal. Then from the primer to flat color coats the elasticity should decrease. From the flat color to the finishing coats the elasticity should increase by degrees. Any other method is likely to result in cracking. This, of course, has special reference to automobile and similar finishing, but the principle is the same for enameling.

Varnish films which are exposed to unusual amounts of ammonia fumes, coal gas, alkalies, etc., are likely to crack.

Varnish which has cracked can seldom be refinished to eliminate the cracks, except temporarily, unless the varnish is stripped off far enough to cut out the cracks, and then refinish.

Chipping, Flaking, Scaling, Peeling Varnish. These defects are such as show a separation of one varnish coat from another, or of varnish from coats of paint or other color ground. These terms are used to describe different degrees of the same defect,thus, chipping means that the varnish film is coming off in small pieces; flaking means that the varnish film is coming off in larger pieces; peeling1 and scaling refer to still larger pieces of varnish coming off.

These failures often follow cracking and are due sometimes to the same causes. The most common cause is the spreading of a hard, inelastic varnish over an elastic one, lack of uniformity of elasticity in the various coats of the finish. It all comes back to the principle which has no exceptions in varnishing, that from the surfacer to the finishing coats the elasticity of each coat should be increased progressively. And it takes a good finisher to know how to do this. The truth, of the principle, however, is easy to prove by simply reversing the method, by placing the long-oil elastic varnish on first and the short-oil, hard-drying varnish on top as a finishing coat. You can wager anything on the result as being chipping, flaking, scaling, cracking, etc. The only way to work strictly in accordance with the correct principle is to study the varnish you are using. Learn just what it is and what to expect from it. The manufacturer will be glad to advise you on these technical points. Various brands of varnish, even those sold under the same general names such as spar, cabinet, coach, etc., vary considerably in elasticity.

A common cause of flaking is the use of japan color or oil ground color which contains too much binder under varnish. When a greasy surface is varnished without thoroughly cleaning off every trace of grease you may expect one of these difficulties. And when old varnish has been stripped off with liquid remover containing wax, the surface must be thoroughly washed with benzole, alcohol or turpentine to remove the wax film, if you would avoid flaking of the new varnish. And when lye, potash or caustic soda removers are used they are likely to leave some alkali on the surface. If not removed by washing well with clean water the varnish is very likely to flake off. The flaking, scaling, etc., of varnish in some cases is the result of using cheap liquid fillers and not wiping them off clean from the surface. They prevent the varnish coats from gaining a good anchorage on the wood fibre.

Milky, Cloudy, Foggy, Blooming Varnish and Shellac. As the descriptive terms imply, this defect amounts to a clouding1 of the varnish transparency. In spots the varnish takes on irregular, mottled

opalescent effects. The cause is nearly always the presence of moisture from damp air, spilled water, hot dishes on table-tops and in shellac varnish, which is very easily discolored by moisture. The rubbing of the coat with pumice and water instead of pumice and oil will turn it white in places.

A common cause of this trouble is foggy, misty weather which produces moisture-laden atmosphere in rooms where varnishing is done. During such weather windows must be closed during and after the varnish is spread and until the varnish is hard dry, if these defects are to be avoided. They are much more likely to happen to short-oil, quick-drying varnishes than to others because they do not contain sufficient oil to repel the moisture which is absorbed by the varnish gum.

The lack of ventilation in rooms where varnishing is being done invites blooming, clouding, etc., especially in new buildings where there is an excess of moisture which collects on the surface.

By increasing the ventilation and rubbing the dry varnish with a soft cloth or chamois skin to clean and warm it up, the blooming will often be removed. Sometimes if the surface is rubbed with a soft cloth which has been wet with denatured alcohol and squeezed and shaken out dry it will help remove the discolorations.

When shellac finished surfaces turn white the milky clouds are due to moisture absorption. Brush on a coat of denatured alcohol with a light touch. Let it dry. That will redissolve the shellac and eliminate the white clouds as a rule. Next brush on a thin coat of boiled linseed oil and wipe off gently immediately. Let it dry and put on a coat or two of varnish of good quality.

Varnishes in which the oils and gums are not perfectly fused together are apt to show a bloom in humid atmospheres.

Blistering of Varnish. This defect is familiar to all, the swelling out of the varnish film in places after it is dry into bubbles or blisters. The cause of blistering is the action of heat, usually the sun, drawing out of the wood moisture or sap which has been sealed in by the varnish. Moisture in the under coats of paint, enamel, etc., and grease on a surface varnished are also fruitful causes of this trouble. Non-drying oil in the wood varnished will cause blistering. The action of the sun or heat from other source is that of heating1 and expanding the liquid under the varnish. The expanding necessarily tears the varnish loose

to make room for the increasing volume of the liquid. The better the quality of the varnish the more elastic it is, and the more elastic the varnish the more likely it is to blister when subjected to these unfavorable conditions. Newly varnished surfaces should be protected from the concentrated rays of the sun or other heat source until hard and dry. There are on record cases where varnished surfaces have been blistered by the action of a bubble imperfection in a window glass. The bubble concentrated the sun's rays upon the varnish in the same manner as a burning or magnifying glass works.

Shellac, especially, will not withstand heat. When used for under coats it may cause blistering when heated, even though no moisture is under it.

Blistering is more troublesome, perhaps, on doors of residences, stores and public buildings which have south exposure. Some cases persist in spite of repeated refinishing. Stubborn cases are usually cured by stripping off all of the old finish down to the bare wood, using liquid paint and varnish remover or a blow torch, and then refinishing this way: For a stained and varnish finish, use a water stain, allowing at least six hours to dry and follow with from two to four coats of first-class exterior spar varnish. If a high polish is wanted, necessitating a well-filled, level surface, do not use filler but rather allow the first coat of varnish to dry two or three weeks and rub it down level with pumice stone and water. Clean up thoroughly. This will make the first varnish coat serve as a filler and it may be necessary to rub the second coat a little too, but be sure it is dry. If you rub long-oil, exterior spar too soon it will sweat and it will gum up and destroy itself. Be sure to use the same brand and kind of varnish for all coats, from the same can if possible.

For refinishing such a job with paint or enamel, use the least possible oil from the start to the finish. The first coat may contain not more than ten to twenty-five per cent of oil and the balance turpentine. The under coats to follow should be thinned entirely with turpentine, making sure that each and every one is bone dry before applying the next. A first class enamel under coater may next be used or a coat of half lead and half zinc ground in oil and thinned with turpentine. The finishing coat should be first class white enamel of the kind that is made for exterior exposure, meaning a long-oil enamel must be used. Or, for the last coat mix with high class spar varnish a little of the lead

zinc under coater, just enough, to kill the brown color of the varnish, and use that as the enamel coat. If it is to be colored be sure to use

colors ground in japan, not oil colors.

Alligatoring of Varnish. This trouble is noted most often on doors and window frames, sills, casings, etc., which have been grained or painted. The cause is the use of too much oil in the painted or grained under coats. The paint is more elastic than the varnish, so the varnish film breaks to let the paint expand more when heated by the sun or otherwise. Paste fillers mixed with too much oil and used on woods which do not absorb much oil, or when not allowed to dry hard before varnishing will sometimes cause alligatoring. The alligatoring of varnish is caused by the use of quick-drying, short-oil, hard varnishes over long-oil elastic varnishes. Alligatoring, of course, is that condition which causes the varnish to break up into cracks which look like an alligator's back.

Powdering, Crumbling, Perishing Varnish. All of these terms and a few others are used to describe varnish which first loses its gloss and then gradually becomes lifeless, powdery and crumbles away to complete destruction.

The causes of this destruction are several and they destroy even good varnish prematurely. Exposure to coal gas, ammonia fumes and other gases are common causes of this trouble. Washing varnish with excessively hot water is destructive in this manner. Exposure to sudden and great changes in temperature while the varnish is drying will sometimes cause it to be destroyed in this way. The crumbling of varnish to dust may be due to the use of the improper kind of varnish for the purpose,for instance, the use of short-oil, hard, inelastic varnish for exterior surfaces where a long-oil elastic varnish is needed. One of the greatest causes of premature perishing of varnish on furniture and vehicles is the use of so-called renovators, soaps and polishes. Such compounds as a rule do not remove dirt and grit from surfaces but grind it into the varnish and also they tend to keep the varnish in a soft condition which is injurious. Where soaps are necessary the neutral soaps containing little free alkali should be used. Linseed oil soap is good. Cleaning with clear cool water is best.

Brush-Marked Varnish. Varnish sets soon after being spread on a surface. It can be brushed and re-brushed safely if done quickly and immediately after spreading, but when brushed too much, or too long, or too late the brush marks remain. For a few minutes after spreading varnish and enamel flow out and level up the brush marks, but when they have taken a set by the evaporation of some of the volatile liquids it is harmful to do more brushing, it roughs-up the coating and leaves

brush marks. The use of rubbing varnish having excessive body, producing heavy coats, causes much brushing and the brush marks may show. The varnish sets before it can be brushed out evenly. Chilling of Varnish. Varnish should be stored and used in a temperature of from 70 to 80 degrees. When the temperature is allowed to drop to low levels some of the gum or driers or oils in the varnish solidify, they drop out of solution. These may or may not be redis-solved when the varnish is again warmed up by placing the can in a pail of hot water. If the solid portions do not redissolve, little specks will appear on the finished surfaces causing what is called seedy, sandy, specky varnish. Such varnish should be very thoroughly strained after heating and before using.

Brittleness of Varnish. One of the greatest problems of the varnish maker has always been to produce varnish which will dry hard, rub smoothly and clean and be sufficiently elastic, in other words,, to secure these qualities without making the varnish brittle. Brittleness is a matter of degree. Some are more brittle than others. Interior short-oil varnishes and rubbing varnishes necessarily are more brittle as a class than exterior, long-oil varnishes which must be very elastic to withstand exterior exposure.

Excessive brittleness of varnish is an inherent defect which is due to an excess of drier, lack of oil, adulterated gums or improper cooking. When a varnish crumbles and powders white under friction from the finger nail, when it scratches white easily that varnish is of poor qualify. Brittle varnish has no value except, perhaps, as a temporary coating on barrels, etc. It should not be used on surfaces as under coats on the theory that it will be protected by the good quality, elastic finishing coats. The brittle varnish will then rob the finishing coats of its tough, elastic character upon which it is dependent for durability.

Livering Varnish. When varnish coagulates into a thick mass like liver you have the condition described by this term. It also occurs with paint when it is mixed with cheap varnishes which contain considerable rosin. Livering of varnish occurs when it is mixed with certain lands of paints and certain other varnishes. The cause usually is separation of some of the varnish constituents and the formation of new chemical combinations. In other words it is not always safe to mix varnishes and paints indiscriminately in large batches until small trial mixes have been made first to determine what reactions may be expected. Not all varnishes are good mixing varnishes. The special mixing varnishes are made with a view to overcoming any bad reactions when it is mixed with the common materials in use. Occasionally varnish which has

been subjected to extremely cold weather for some time and those which are not completely sealed in the can will liver, due to separation of the varnish constituents and chemical reactions when the varnish is again warmed up.

Skinning of Varnish. This term is used to describe that condition which results when the cover of a varnish can is not put in tightly or not at all. The top varnish in the can oxidizes, forming a tough skin. This exposure also permits the evaporation, of some of the volatile solvents of the varnish and is decidedly detrimental to the quality of the varnish. The storage of varnish should always aim to keep it corked tightly and to keep it in cans which are full. An air space at the top of the can permits skinning. Large cans which have been partly emptied should not be kept half full, or with any air space at the top. Pour the contents into smaller cans which will be filled by the varnish.

Varnish Spotting. Flat and discolored spots on new varnish may appear due to cold blasts of air hitting the fresh varnish while drying, to the splashing of liquids like gasoline, benzine, etc., on to the wet varnish. Such accidents may cause the varnish constituents to separate and flat or discolored spots may result. Splashes of water or contact with a stream of humid air will cause the varnish to become cloudy in spots.

Fire Cracks in Varnish. These are very fine, delicately woven cracks in the underside of the varnish or surface coats. The cause is the same as for cracking and crazing as described elsewhere in this chapter. One or two extra coats of rubbing varnish will often eliminate fire cracks.

Discoloration of Shellac. Shellac which is kept in tin cans too long will turn black or greenish black, due to the action of the alcohol in the shellac on the metal. Shellac should be stored in glass or earthen vessels and in the dark and, of course, must be corked up tightly.

Shellac which has discolored this way is a loss. Nothing can be done to restore its color.

Varnish Fails to Flow. When varnish is permitted to get very cold it will not flow properly and should not be applied until it has been placed in a pail of hot water and warmed through to the temperature of the surface to be coated. When a can of varnish has been allowed to remain uncorked for some time, or when a little varnish is kept in a large can with much air space at the top it becomes thick and will not flow freely or evenly. It should be warmed, thinned with pure turpentine and strained. Allow it to stand a few days then before

using.

CHAPTER XII

LACQUERS

THERE has been a much needed change in the use of the word lacquer of late to describe transparent coatings. It has been used in such a general way for years that one had little idea of the composition of any product called lacquer. The Chinese and Japanese lacquers are simply varnishes made of oils and gums peculiar to those countries. In the United States the word lacquer has been used to describe certain varnish coatings of a highly transparent nature which produce a dull lustre on metals and other surfaces. Some were used for decoration and some simply to exclude the air from brass, copper and other polished surfaces to preserve their brilliance. Some were air-drying and some baking varnishes.

Today the word lacquer is rapidly being accepted as a designation for the cellulose pyroxylin coatings and it will be well if it is used in the future exclusively to designate these materials. All others really are varnishes and should be so described and referred to.

The word lacquer is derived from lac, a gum resin produced by lac insects which feed upon the sap of certain trees in India. Shellac varnish is a solution of this gum in alcohol. When refined and purified it makes a nearly colorless coating and one which is quite transparent. In this form it has been long used, as stated before, for preserving the lustre on highly polished metals like brass, copper, etc. The shellac gum is also colored with aniline and other coal tar colors, the spirit-solubles, and is then called lacquer. It has been greatly used on furniture and art objects and when many coats are applied thin, remarkably durable finishes result. When these lacquers are baked at temperatures between 100 and 200 degrees the gum is fused, the lacquer is made to adhere more firmly to the surface and is a more durable finish.

The Chinese and Japanese lacquers are not like the shellac lacquers. They are made from the juice of trees which grow in those countries, trees which are related to the sumac and dogwood known to America. After collecting this juice which looks like that which one squeezes from milkweed, it is purified and worked through many operations to

make varnish. It is used in its natural white, transparent state and also is colored with various pigments and metallic substances which make it resemble enamels. These lacquers are used on woods and metals and for the finest work about three dozen operations are required to bring the job along to the finish of a perfect character. Such lacquer is not baked but, strange as it may seem, dries best in cold, damp and dark closets. The most valuable pieces of this lacquerware, boxes, trays, vases, et^,, required from five to twenty years to complete the work.

Pyroxylin Nitro-Cellulose Lacquers.The lacquers in which we are so much interested today as they are used on furniture are not products of very recent inventions as is commonly thought, but are the result of perfecting a lacquer which has been used over a dozen years. The first lacquers of this type made and used a few years ago were thin, so very thin that to secure a body of finish equal to oil and gum varnishes from fourteen to twenty coats of lacquer were required. The trouble was that at that time a very limited amount of the solid matter could be used in each, gallon of liquid. When enough of the solid matter (nitrated cotton) was put into a gallon to make a thick film when dry, it was so thick and sticky that it could not be sprayed upon the surface. These early lacquers were transparent and white. A little later a small amount of color could be added, but not enough to make the beautiful lacquer enamels we now have. The early lacquers also had no gloss. The reason for the great progress in the use of lacquers in the last year or two is the fact that the chemists have learned how to overcome the disadvantages of the old-time cellulose lacquers by producing what is called low viscosity cotton which can be added in sufficient amount to each gallon of liquid to make a thick, transparent film on the surface coated when dry. They have also given us lacquers which will carry, not only sufficient color pigments to produce the brilliant colors noted on automobiles and all manner of merchandise, but also lacquers which will carry opaque pigments; thus we have lacquer enamels. They do not carry as much of the opaque pigments as the oil and gum varnish white enamels, but sufficient for the purpose.

It should be noted that pyroxylin, nitre-cellulose lacquers are not related in any way to the other kinds of lacquers which have been used for a great many years, for centuries in the case of the Chinese and Japanese lacquers. These latter lacquers are varnish and shellac compositions of gums, resins and oils, while the pyroxylin lacquers are of entirely different composition; and although they do contain a little of the gum resins used in oil varnishes, as an incidental means of

increasing elasticity, they can be made entirely without these gums.

A brief outline of the manufacture of pyroxylin lacquers is interesting. The word cellulose is the chemist's name for all vegetable fibre. Ordinary cotton and wood are the chief forms of cellulose. Paper is simply a physical combination of cotton and wood vegetable fibres, and waste paper is, therefore, used as well as cotton in the making of lacquers.

The first step in the making of lacquer is the treatment of cotton with a mixture of sulphuric acid and nitric acid. The short-fibre cotton which remains after long-fibre cotton is stripped from the plants is the grade used; it is called linters cotton, and after washing, cleaning and bleaching; it is ready for the acid treatment when it is dry. The cotton takes up the nitric acid and is then called cellulose nitrate, nitro-ceilulose or nitro-cotton. This nitro-cellulose is washed thoroughly with water and some soda to remove the acid, leaving the nitrogen in the cotton, and then the water is taken out. The water is displaced with alcohol and the nitrocellulose is then called pyroxylin, or soluble cotton. It is shipped in the wet state, containing about 30% of alcohol by weight. The alcohol materially reduces the fire hazard. Pyroxylin is the raw material from which the lacquer manufacturer makes his product. It is also called collodion and is used in surgery for coating wounds.

Nitro-cellulose which contains a great amount of nitrogen, up to 13.5%, is the base of smokeless powder. That which contains more nitrogen is the base for making gun-cotton explosives. The nitro-cellulose used for lacquers, that which makes pyroxylin, is nitrated to an intermediate degree, from 11.8% to 12.5% of nitrogen, and as long as it is kept wet with alcohol there is little or no risk of fire or explosion.

Pyroxylin used as the base for lacquers looks very much like ordinary cotton. It is white, rather solid and the fibres are more brittle. To make lacquer this pyroxylin is dissolved in solvent liquids like ethyl, butyl and amyl acetates, acetone and methyl alcohol. These solvents are, of course, very volatile. Combinations of denatured alcohol and camphor and of alcohol and ether are also used as solvents of pyroxylin. Alone these substances are not solvents, but in the combinations they are.

Then other thinners are added which are volatile but are not solvents of the pyroxylin. They are used simply to make the lacquer more fluid so it can be sprayed on to a surface more easily, or so it will distribute

itself better when articles of merchandise are dipped into it. The volatile, non-solvent liquids used in lacquers to make them more fluid, help control the rate of drying and to help decrease the cost are: denatured alcohol, butyl alcohol, fusel oil, benzol, toluol and xylol.

Pyroxylin dissolved in the solvents mentioned and diluted with the non-solvent volatile liquids makes an exceedingly tough and transparent coating, but one which is too brittle and which does not adhere as firmly as is desired to under coats. Therefore to that solution is added what are called plasticisers, or softeners, which remain in the lacquer when dry and increase the elasticity. Castor oil, rape oil, camphor and a group of liquids called esters are used as plasticisers. In order to increase adhesion and the gloss of the lacquer, gum resins, such as are used in making oleo-resinous varnishes of the old type, are added to the solution.

Lacquers made of the materials so far mentioned are very transparent and very light in color, as well as exceedingly tough and resistant to wear of all kinds. In order to make lacquer enamels, color pigments and also opaque pigments are added to the clear lacquer.

The drying of lacquers requires from ten minutes to an hour, depending upon the composition which is within the control of the manufacturers. It dries by the evaporation of the solvent and non-solvent volatile liquids until nothing is left on the surface except the cellulose in the hard, solid form, plus the plasticisers and the gums incorporated.

The application of lacquers is made by use of the spray gun and by dipping. Lacquers which can be applied with the brush have also appeared on the market for use on a great many kinds of surfaces, particularly household articles like furniture, etc. It is offered for use also on floors and general wood trim and will dry hard enough to walk on in half an hour.

The cellulose lacquers made years ago were little used except upon metals as a bronzing liquid with metal bronzes and as a very thin, transparent coating over polished metals, brass, copper, bronze, etc. They were used largely for the same purposes as the shellac and varnish lacquers.

In modern manufacture of merchandise and in the arts and crafts the clear lacquers and lacquer enamels in innumerable colors are used on merchandise and decorations very extensively. The thin, light colored

and tough transparent lacquers find great usefulness in coating metals such as silverware, electric light fixtures, building hardware, all manner of metal spinning and stamping products like art and novelty pieces and jewelry. The clear lacquers are used both as bronzing liquids with which bronzes are mixed and as coatings for bronze-coated surfaces and enameled surfaces. The furniture industry employs both the clear and colored lacquers extensively and more and more each year. The colored lacquers^ enamels, are also very widely used on automobiles, machinery of many kinds^ electric light fixtures, furniture, fixtures, toys and novelties.

The use of lacquers, in short, is growing very rapidly to include not alone the automobile industry, but also railway equipment, furniture of every kind and the house building industry. In the development of any product which promises so much in durability and general service there are bound to be some set-backs, due to too much speed and inexperience in the making and the application of lacquer, but the great research work being done, combined with the experience which craftsmen are getting in the application of lacquer, is bound to overcome the difficulties which cause the low percentage of failures which is evident.

CHAPTER XIII

WAX FINISHES AND OIL-RUBBED FINISHES

THE wax-finished surface has a beauty all its own, although it cannot really be said that it reproduces the effect of a hand-rubbed varnish finish. Like most fin-fishes, it has its advantages and some disadvantages. To make the most of this finish, therefore, the finisher should acquaint himself with the characteristics of this material and its actions under common circumstances.

Wax is a fatty, solid substance of animal, vegetable or mineral origin. It sets rather quickly as commonly used, will take a hard finish or polish by friction, but never gets really dry like varnish and paint. A number of waxes are in common use in the paint and varnish industry and each has its own characteristics. Some dry with a harder, tougher surface than others and some are light in color, while others are quite dark. The most common waxes are beeswax, light and dark, paraffine wax, carnauba, ceresine and spermaceti. Beeswax is most used because it is abundant and is not very expensive. Paraffine or para wax is a petroleum product which is also abundant and moderate in cost, but it is a bit too soft. Its white color, however^ makes it very valuable for light gray wax finishes upon which other waxes could not be used without discoloring the finish. Carnauba is a much better wax than either of those, but it is not generally carried in stock by paint supply houses. It is largely used by manufacturers. It has a higher melting point (185 degrees) and is more expensive than beeswax and paraffine. Carnauba wax is also called Brazil wax because it is a product of the Brazilian wax-palm tree. It is hard and white in color. Japanese wax is sometimes called ozocerite and is obtained from the fruit of a tree. It is used for making candles in Japan. Chinese wax is very similar and is secured from the twigs of the Chinese ash tree upon which it is secreted by an insect.

Concerning the merits of the wax finish as compared with other finishes it must be noted that, while it makes an artistic finish which harmonizes well with other surfaces in an interior decorative scheme, it is not really a durable finish. This very fact is considered an advantage, however, since it can readily be renewed without stripping

off the old finish. When a waxed surface is properly built up it is a fairly durable one if anything like regular attention is given to its upkeep. Consider the waxed floor, for instance. It is very durable or not durable at all depending upon how it is done. If the floor is filled and stained in one operation and then waxed, it will not be a satisfactory finish unless rewaxed very often and unless it is in a family where the traffic is not heavy. If, however, the floor is first stained, using a penetrating water stain, is then filled and waxed with at least two good coats, each one allowed to dry two days and polished to a hard finish a durable surface is gained. And if two or three coats of varnish are put on before the wax and on top of the filler a very durable finish is secured.

When regular waxing is done every week or two or three, depending upon the amount of traffic, some prefer the job without varnish because the floor is not so slippery and if the finish is worn through near the doors it is easy to build it up to the original finish and match these spots perfectly. The penetrating stain holds the color in the wood.

If a varnished floor is neglected to the point where the traffic wears through the varnish to the bare wood it takes a skLQful finisher, indeed, to coat with blended, colored shellacs to make a touch-up match. If there was no stain coat before the filler it is very difficult to match up bare spots which are worn and discolored.

Wax will not withstand water. Hence a damp floor or one which is washed with water is no place for a wax finish. A waxed floor can, however, be wiped up with a damp cloth which will not turn the wax white like an excess of water, Waxed floors should be cleaned with a dry dust mop or one slightly moistened with paraffine oil or liquid wax, never linseed oil,

A floor which is warm from being over a furnace or boiler is no place for wax because it remains fairly soft and picks up dirt. To give good service from the standpoint of cleaning and appearance as well, wax must be polished by friction to a high gloss and that can only be, done when it is not warmer than the normal 70 degrees.

Wax makes an impossible foundation on a surface that is to be painted, enameled or varnished. No materials like these will remain long if even a trace of a wax film remains on the surface. Therefore surfaces to be finished with these materials, especially waxed floors which are to be revarrdshed, should be cleaned thoroughly first by

scrubbing with warm water containing sal soda or any good washing powder. Then it ought to be sandpapered, cleaned up free from dust and washed with benzole, benzine or turpentine.

Some object to varnishing a floor which is to be finished with wax on the theory that the varnish makes the polished wax more slippery than if the finish consists of nothing but stain, filler and wax. There is some truth in this, but when the two finishes are highly polished one is about as slippery as the other.

On standing wood trim one coat of wax is commonly considered enough, but there is no doubt that two coats give a deeper lustre and more beautiful finish.

Wax should be applied with a soft cloth or with one of the soft mops made especially for that purpose. Then it may be rubbed over with a dry, soft cloth to polish, or a short-bristled, weighted brush will do the polishing much more easily. The electric polishing machines with revolving brushes are wonderful labor savers and they produce a harder finish, which means a more durable one, than can be done by hand polishing. Note Plate 21, One pound of paste wax of the ordinary consistency will cover about 125 square feet, one coat.

Wax may be colored to suit, especially paraffine wax, by adding to it colors ground in japan and thinned with turpentine. Color ground in oil, if used, should first be thinned with benzine and allowed to stand over night to let the oil come to the top. Pour off the oil and mix the color pigment with turpentine before adding to the wax.

Factory-Prepared Waxes. Because the manufacturer has at his command a greater number of waxes, has the chemical knowledge and experience to handle them and the manufacturing skill and equipment at his command he is able to make better wax pastes, for floors especially, than the finisher can mix from available materials. The factory-prepared waxes are mixed and tempered to work properly and yet to give a much harder wearing surface and a higher polish than any that can be mixed by the finisher.

OIL-RUBBED FINISHES The first use of oak for interior trim in the English feudal castles and baronial halls included no attempt to finish the wood. It was allowed to age and color from the greases and gases liberated by the cooking over open fires In time beautiful and colorful finishes resulted naturally. Later to produce the mellowed and aged effects on these old surfaces without waiting for the passage of time,

new oak was treated with oils; probably animal fats, linseed oil and others. Coat after coat was rubbed in and renewed from time to time.

There is no more serviceable finish today than that produced by coat after coat of hot linseed oil. The great durability and beauty of French polished woods is due largely to the oil coats rubbed in, each being allowed to dry.

On table tops or any surfaces which are subject to hot dishes there is no better finish than that produced by brushing on a coat of half boiled linseed oil and half turpentine; let it dry an hour or so and wipe off any excess remaining on the surface. In a day or two coat again with the oil, wipe off and let dry. When the oil is put on hot it penetrates more deeply and so makes a more serviceable finish. Three or four coats of oil makes a good finish, and if the process is continued by adding a coat of hot oil occasionally, the finish is very satisfactory and decidedly appropriate for oak, especially. It will not spot white from hot dishes and may be washed as often as necessary to keep it clean. Such a finish is, therefore, very practical for restaurant tables.

CHAPTER XIV

SCHEDULES OF WORKING OPERATIONS

NATURAL FINISH ON HARD AND SOFT WOODS; STAINED FINISH ON HARD AND SOFT WOODS; CABINET AND FURNITURE FINISHES; EXTRA FINE CABINET AND FURNITURE FINISHES

FOR quick and ready reference it is thought that the following working schedules will be of considerable help to those who want to learn quickly just what constitutes the common practice for each of the various kinds of jobs. After all there is no difference between a high class, costly finish and a less costly one except that in the former many coats and operations are included which are not a part of the quicker, less costly job. As a general proposition when a craftsman has spent the years necessary to become possessed of expert skill it is difficult, if not quite impossible for him to do more than one kind of work, so what he does on a low cost job is usually done just as well as those operations can be done on the better jobs, but of course, he simply omits some coats and operations for the cheaper jobs.

NATURAL FINISH: NEW INTERIOR HARD WOOD TRIM, OAK, ASH, CHESTNUT, CHERRY, WALNUT, GUM, BIRCH AND MAPLE

Operation 1: Clean up the wood with your duster brush and putty knife. Sandpaper the rough places.

Operation 2: Bleach. Maple, Birch and any wood which is to be finished with the lightest possible color should be bleached as per the directions given in Chapter II. Then a coat of bleached white shellac, very thin, should be put on after the surface is dry and has been sandpapered to smooth the raised grain caused by the bleaching with water solutions. Or the sandpapering may be done after the shellac coat, as preferred by some. The shellac coat will seal up the wood against discoloration from the oil in filler coats or varnish coats to come.

Operation 3: Filler. Open-grain woods such as oak, ash, chestnut,

walnut, etc., require filling usually, but not always, with a paste filler. Some finishes like Jacobean and Missions call for unfilled wood cells, the open-grain effect is correct. Birch, maple and cherry and gum, close-grain woods are usually filled sufficiently with a coat of shellac which is rubbed close. Paste filler is used on these woods by some finishers after mixing it very thin. Let the filler dry at least 12 hours; then clean up the wood grain by wiping over it with a cloth dampened with benzine. For mixing methods and use of fillers see Chapter XII. No color is used in the filler for natural finishes. Be sure to wipe off all putty marks from around the fillings or it will cloud the beauty of the finish. Let the putty dry over night if possible and sandpaper the filled places. Clean up the whole surface with a duster brush and wipe over with a damp chamois skin.

Operation 5: Shellac. A thin coat of shellac of the white or bleached kind is next applied. About a three-pound cut, that is, three pounds of shellac gum dissolved in 1 gallon of denatured alcohol. Let it dry hard, requiring about an hour or so if the shellac is pure. Then lightly sandpaper the surface with No. y2 paper or steel wool. Dust off the surface and wipe down with the damp chamois skin. Some finishers prefer to omit this shellac coat, but it is really a benefit on either open or close grain woods, since it acts as a liquid filler, when sandpapered close as it should be, and puts on the finishing touches in leveling up and sealing the surface porous places.

Operation 6: Varnish. Apply from one to four coats of first class interior varnish. When more than one coat is used each undercoat must be sandpapered enough with No. 1/2 or No. 00 sandpaper to remove the gloss. Then clean up the surface, cracks and corners with your duster and chamois skin before brushing on the next coat. Be sure the varnish coat is bone dry, however, before any sandpapering is attempted. Thin the first coat only of varnish 25% with pure turpentine.

Operation 7: Rub Dull. If a dull, flat finish is wanted rub the last coat also when dry after two or three days, with FF, pumice stone and oil or water on a felt pad. Wash up with benzine after an oil rub and polish the surface dry.

Operation 8: Wax. A wax coating may be applied immediately after Operation 4, but a much more serviceable job results from waxing over a coat or two of varnish. After applying the wax, let it dry fairly hard and polish. Then let it dry two days before applying a second coat. Polish the second coat to a hard surface with the usual weighted

brush or rotary electric machine polisher.

NATURAL FINISH: NEW INTERIOR SOFT WOOD TRIM, WHITE PINE, YELLOW PINE, POPLAR AND CYPRESS

Operation 1: Clean up the surface with a duster brush and putty knife. Sandpaper any rough places, remove grease, dirt, etc.

Operation 2: Shellac. One thin coat of white shellac. Use about a three-pound cut, 3 pounds of shellac gum to 1 gallon of denatured alcohol.

Operation 3: Putty. Fill holes, bruises and cracks: with putty mixed from white lead in oil, dry whiting and a little japan drier. Tint the putty to match the surface with dry colors. Let dry and sandpaper, then clean up thoroughly.

Operation 4: Varnish. Apply two coats of first class interior varnish. Eub down the first coat with No. 00 sandpaper, rubbing just enough to remove the gloss and dirt nlbs. Flow the second coat of varnish on a bit more freely than the first, but brush it enough to distribute the coating evenly and to avoid runs, sags and wrinkles. Rebrush, any defects with an empty brush before the varnish sets. Thin the first coat only of varnish with about 25 per cent of pure turpentine.

Operation 5: Rub Dull. If a dull finish is wanted, rub the last coat lightly with grade FF pumice stone and oil or water. Two coats of varnish will stand very little rubbing, and each coat must be bone dry.

Operation 6: Color Tone. To change slightly the objectionable natural color of some woods, without staining, and to make a more uniform color over all, add to the first coat of varnish a touch of tinting color ground in japan. Such colors as raw and burnt sienna, raw and burnt umber are commonly used. Colors ground in oil and thinned with turpentine slightly can be used but the japan colors are better.

STAINED FINISH: NEW INTERIOR HARD WOODS,OAK, ASH, CHESTNUT., CHERRY, WALNUT, GUM, BIRCH AND MAPLE

Operation 1: Clean up the wood with duster brush and putty knife, making sure all dirt and grease are removed. Sandpaper any rough places.

Operation 2: Stain. Use an oil, spirit or water stain. Let it dry and if the

grain of the wood has been raised by the water or spirit stain sandpaper it down smooth, using No. 1/2 paper. Let the stain dry twelve hours or more before sandpapering. Then clean up after the sanding operation.

Operation 3: Putty. Fill all holes, braises and cracks with lead putty made from white lead ground in oil, dry whiting and a little japan drier. Add dry colors to make the putty match the stained wood, making the putty a trifle darker because the wood will get darker with age and when the finishing coats are added.

Operation 4: Filler. Open-grain woods like oak, ash, chestnut, walnut, etc., require filling usually, but not always, with a paste filler. Some finishes call for unfilled grain. r Birch, maple and cherry are close-grain woods and usually are filled enough with a coat of shellac which is rubbed close, removing all shellac except what remains in the pores of the wood. The shellac is used very thin, about a two-pound cut. Care should be taken not to use a white bleached shellac on dark stained woods. It will in time show up in a white cloud under the varnish. This has occurred often when white shellac has been used on mahogany. Use white only on light colored finishes, a mixture of white and orange on medium dark finishes and orange or brown on dark finishes. Some finishers use paste filler on birch, maple, cherry, walnut and gum after making it quite thin. Usually, but not always, the filler is colored to match the stain. But the filler for gray stains is usually white or light gray, while the filler for mahogany is usually very dark brown, nearly black. Allow any filler, except shellac, to dry at least twelve hours. Sandpaper lightly and clean up with a cloth dampened with benzine to clear up the grain.

Operation5: Shellac. Brush on one thin coat of shellac. Let it dry, sandpaper and dust off the surface clean. This will seal up the stain against rubbing up or bleeding1 when the varnish coats are put on.

Operation 6: Varnish. Apply one to four coats of first class interior varnish. Let each coat dry hard before another is put on. And if more than one coat of varnish is used each undercoat should be rubbed lightly, but enough to remove the gloss and dirt nlbs with No. 00 sandpaper or steel wool. Then clean up the surface, cracks and corners before brushing on another coat. Use a duster brush and a damp chamois skin for the clean up work. Thin the first coat only of varnish about 25% with pure turpentine.

Operation 7: Rub dull. If a dull finish is wanted rub the last coat of

varnish with grade FF pumice stone and oil or water on a felt pad. Then wash up with benzine and rub the surface to a dull lustre. Or use a flat-drying varnish on the last coat and no rubbing is necessary.

Operation 8: Wax, The wax may be applied immediately after Operation 4 or 5, or over one or more coats of varnish. Apply the wax, let it dry fairly hard and polish with a weighted brush or. electric polishing machine. Let the first coat dry two days and wax and polish again to a hard surface. (Note: When a finish with open pores, like Jacobean oak or mission oak is wanted, omit the filler and add one more coat of shellac, which with one or two very thin coats of varnish is sufficient.)

STAINED FINISH: NEW INTERIOR SOFT WOODS,YELLOW PINE, WHITE PINE, POPLAR AND CYPKESS.

Operation 1: Clean up the surface with duster brush and putty knife. Sandpaper to remove dirt and rough places. Remove grease, oil, etc,, because stain cannot penetrate such substances and leaves a light spot in the finish if not removed.

Operation 2: Oil Coat. Brush on a coat composed of % linseed oil and %, turpentine to even up the suction and fill the soft, open-grain spots in the wood. This enables you to gain a more uniform coloring of the wood with the stain coat. Let the oil coat dry over night. It should be brushed on and any excess of oil not absorbed should be wiped off. with a cloth after half an hour. A coat of thin shellac is preferred by some finishers for this purpose of sealing up the wood porous places and sappy, pitchy streaks. The shellac coat also enables you to gain a more even coloring of the wood.

Operation 3: Stain. Any oil stain or spirit stain may now be brushed on, and wiped off if needed to remove excess of stain, or to make the color lighter. Water stain may be used on these woods orer a shellac first coat as indicated.

Operation 4: Putty. Holes, bruises and cracks should be filled with putty as soon as the stain has set. No need to wait until the stain is dry. Mix the putty from white lead in oil, dry whiting and a few drops of japan drier. Add dry tinting colors to make it match the wood and be a little darker, if anything, because the wood will get darker with age. Allow the putty and stain at least 12 hours to dry. Then very lightly sand the surface with No. 00 paper and clean off any putty marks, dust, etc., using a duster and a damp chamois skin.

Operation 5: Varnish. Brush on two coats of first class interior varnish, thinning the first coat only with about 25% of pure turpentine. Allow the first coat to dry hard and then rub it very lightly with No. 00 sandpaper to remove the gloss and dirt nlbs. Clean up well and apply the second coat of varnish freely, but brush out enough to avoid runs, sags and wrinkles. Go over the coat with an empty brush after laying it off and that will pick up any excess of varnish which you may have put on the surface.

Operation 6: Rub dull. If a flat, dull lustre is wanted the second coat can be rubbed a little and lightly with FP pumice stone and oil or water on a felt pad. Clean up well after the rubbing with benzine and polish with a dry cloth. Two coats of varnish will not stand hard or close rubbing without cutting through and spoiling the finish. Three coats at least are needed. A fiat drying varnish may be used to save the rubbing, but select a flat varnish which contains no wax. Wax makes a poor foundation for future finishing.

REFINISHING OLD WOOD TRIM

Old natural finished wood trim of either hard or soft woods can be refinished in the natural or a stained color. If the old natural finish is in good shape it may need no more than sandpapering and revarnishing. If marred, bruised and scratched it will require stripping off the old finish, bleaching and revarnishing or staining.

Old stained wood which has been stained and varnished or waxed may be restained within certain limitations with new stain colors. The same color or a darker color of similar kind is easily used, after stripping off the old varnish, wax and as much of the stain as can be washed off with benzole, turpentine, benzine or alcohol. A brown stain over an old red stain will usually succeed, and the reverse is often true. It usually is not practical within the limitations of expense to change from browns and reds to greens and grays, unless the old surface is completely stripped off and bleached thoroughly. Of course, varnish stains can be used no matter what the old color. Whatever stain is used the new finish will usually be as dark as or darker than, the old.

Operation 1: Strip-off the old varnish with liquid varnish remover. Wash up the surface with benzole, benzine or turpentine to remove the wax film left by the remover. Sandpaper the surface thoroughly with No. 1/2 or No. 1 paper or steel wool. Clean up with duster brush.

Operation 2: Bleach. If the surface is dark and uneven in color it should be bleached, using one of the bleaching methods described earlier. Usually oxalic acid bleaches will serve the purpose. After bleaching let the surface dry well.

Operation 3: Sandpaper the surface well with No. 1/2 paper to remove the raised grain caused by the water bleaching solution. Clean up well with a duster brush, being certain to get the dust out of the pores, corners, mouldings, etc.

Operation 4: Refinish the same as new wood, using a penetrating oil stain, spirit stain or water stain.

CABINET AND FURNITURE FINISH:STAIN ON NEW WOODS, OAK, ASH, CHESTNUT, MAHOGANY, CHERRY, WALNUT, MAPLE, HOLLY AND SATINWOOD

Operation 1: Clean up the wood with duster and putty knife. Sandpaper rough places and see that all dust, dirt and grease are completely removed.

Operation 2: Water Coat. For oak and all woods upon which water stain is to be used it is best to sponge the wood with warm water and let it dry. Water stains, and spirit stains to a lesser degree, raise the grain of the wood. It is better to raise the grain before staining and then to cut down the rough wood fibres with sandpaper than to stain and sandpaper after. So much rubbing is needed in some cases that the sandpaper cuts away part of the color beauty if done after the staining. After a water coat a water stain raises the grain but little and so little and light sandpapering only is needed.

Operation 3: Sandpaper. All woods require perfect preparation with fine sandpaper., No. 1/2 and No. 00 to finish. Then the dust must be removed from the wood cells. In the furniture factories compressed air is used to blow it out.

Operation 4: Stain. Use a high grade water stain, Brush it on uniformly and let dry at least 12 hours. If you anticipate any difficulty in brushing the stain uniformly sponge the wood with water immediately before staining and brush on the stain while the water is there. That will slow up the penetration of the stain a little and enable you to distribute it evenly and avoid an uneven coloring. After the stain is dry sandpaper it lightly with No. 00 sandpaper and clean up the dust thoroughly with duster brush and damp chamois skin.

Operation 5: Putty. Fill holes, bruises and cracks with putty, colored to match or a little darker than the stained wood. Wipe off all putty marks around the fillings to avoid clouding the finish in such places.

Operation 6: Filler. Paste wood filler of fine texture and colored to match the stain, or darker than the stain, as the correct finish may call for should be brushed on and wiped off with great care.

Operation 7: Shellac. One coat of thin pure shellac should be brushed on. Let it dry half an hour or longer and sandpaper it to make a fine textured surface. That will remove most of the shellac except what is lodged in the pores of the wood and places not filled by the paste filler. Clean up thoroughly with duster brush and damp chamois skin.

Operation 8: Varnish. When a polished varnish is wanted, apply three or more coats of first class polishing varnish. The first coat should be thinned about 25% with pure turpentine so it will not bridge over any open pores and will sink into the surface and attach itself well. A pale, transparent quality of varnish is needed to enhance the beauty of the stained wood. Under coats to be pale rubbing varnish and the last coat pale finishing, polishing varnish. Let each coat dry not less than 48 hours. Then rub each under coat with FF pumice stone and water on a felt pad. Rub just enough to remove the gloss and dirt nlbs and then wash up well with water and dry with a chamois skin. Be sure to remove all pumice stone and dirt from corners, mouldings, etc. The last coat should be first class cabinet finishing, polishing varnish. Flow it on full, but not so freely as to cause running, sagging and wrinkling. After laying it off brush over it lightly with the empty brush, using the tip ends of the bristles only. That will pick up any excess of varnish and avoid trouble. When this coat is bone dry, so you cannot dent it with your finger nail, after two or three days, rub it fine with FF pumice stone and water or oil on a felt pad. Clean up with benzine. Then polish as directed in that chapter. When only two varnish coats are put on the rubbing must never be close. A light rub is permissible if carefully done. A high polish requires a solid, firm and level surface. That cannot be secured in less than four coats of varnish.

Operation 9: Wax. Two coats of good quality, hard-drying wax may be put on after Operation 7 or after one or two coats of varnish have been applied. Apply the wax. Let each coat dry after polishing for at least two days and then polish to a hard surface with a weighted brush or a power driven rotary brush. Nothing but friction will put the hard glaze on wax which makes it durable. On small surfaces, of course, this

polishing can be done with a sheeps wool pad or soft cloths or brushes.

Operation 10: Dead Flat. When a dead flat, lustreless finish is wanted omit the filler and shellac coats, placing the wax directly upon the stain. It is better, however, to put on the coat of shellac and accept the slight lustre which comes with it. Or apply a good flat varnish before or after Operation 7 and omit waxing. That is not a real durable finish, but it is used for open grain finishes like oak where the rough, open pores of the wood break up the varnish effect. In such finishing the window sills and sash should be coated with good gloss varnish which can be rubbed to a dull finish with pumice stone and oil. Flat varnish will not withstand exposure well on such surfaces.

Operation 11: Open-Grain Effects. When open pores are wanted, as in the ease of Jacobean, mission and weathered oaks, omit the paste filler and add an extra coat of shellac mixed thin. It is very important that all shellac coats on this finish be very thin and that they be uniformly spread to an even thickness to avoid filling up the pores too much and having laps and joints show.

EXTRA PINE FURNITURE AND CABINET FINISH

WHITE MAPLE, SATINWOOD,ITALIAN WALNUT,BIRDSEYE MAPLE MAHOGANY, FRENCH WALNUT, WALNUT

These fine cabinet and furniture woods are usually finished in their natural colors and to retain as light a color as possible in order to preserve and enhance the natural coloring and shading of the grain figures. No oil is used because it darkens the color. No filler and little or no stain are used. A good working schedule to follow, for the finest class of finishing is:

Operation 1: Sandpaper the wood to make it smooth and to start with the finest possible surface. Sandpaper with No.1/2 and finish No. 00.

Operation 2: Clean up thoroughly to remove dust from the pores of the wood and all grit, particularly from mouldings, cracks, etc. A good stiff duster brush will do the work and it should be followed with a clean up using a damp chamois skin.

Operation 3: Shellac. Two thin coats of pure white shellac, cut about 2 pounds of shellac gum to 1 gallon of alcohol. Brush on thin and evenly.

Let dry half an hour or more and sandpaper with No. 00 paper to remove all shellac except what is lodged in the wood cells. Use orange shellac for dark woods and white for light woods.

Operation 4: Putty. Fill holes, cracks and bruises with putty. Color the putty to match the surface or a little darker as may be called for to make the most of the wood you are finishing. Wipe all putty marks off of the surface around the fillings so it will not cloud the finish. Let the putty dry hard.

Operation 5: Sandpaper the surface lightly with No. 00 paper. Clean up with duster brush and chamois skin damp.

Operation 6: Varnish. Four coats of extra pale cabinet or furniture varnish are needed. The first coat should be thinned about 25% with pure turpentine so it will sink and fill any pores in the surface and not bridge over as thick varnish may do. Each coat of varnish must be allowed to dry at least 24 hours and longer is much better. Each coat should be rubbed to remove the gloss and dirt nlbs, using FF pumice stone and water on a felt pad. The last coat of varnish should be fine rubbed and polished with rotten stone as noted in that chapter also.

Operation 7: Waxing. As a rule these fine woods are completely finished with the first six operations. If a wax finish is wanted the wax may be put on after Operation 5 or 8, omitting all following operations. Two coats of wax are needed. Let thefirst coat dry and polish. Let it stand two days and apply the second coat and polish it with a pad, or a bristle brush to a hard lustrous surface. Such a finish costs less, looks well but is not very durable unless put on over a varnish finish.

Operation 8: Stain. These woods are sometimes stained. A good quality water stain is best because it is most transparent and penetrates deepest. Apply the stain after Operation 2 and putty before Operation 3. When dark stains are used apply orange shellac, never white. The latter will bleach out in time and cause a white cloud under the varnish.

FINISHING CARVED DECORATIONS

One of the first things that a skilled finisher learns is that one should never use several coats of gloss varnish or filler on carved surfaces, and don't rub such surfaces in the usual way. Filler and thick varnish coats fill up the depressions and round off the sharp edges of carved decorations. Rubbing also cuts off the sharp projections. Clean cutting

and sharp projections are marks of great skill possessed by the carvers, and so good carving should not be ruined by the finisher, rather enhanced and preserved. It is well to finish carvings by this schedule:

Operation 1: Clean up with duster and soft sharp wood sticks.

Operation 2: Stain to match other wood trim about it. There is some likelihood that the edge grain of the carvings may take the stain darker than the other surface, so be very careful until you find out. It may be necessary to thin the stain considerably. It may be necessary to give the carvings a very thin coat of shellac first to seal up the porous edge grain and prevent it from absorbing too much stain.

Operation 3: Shellac. After staining apply two thin coats of shellac, white or orange, as needed to match the stain.

Operation 4: Wax. Two thin coats. Apply and rub to a hard finish with a stiff bristle brush, a sash tool is good.

Operation 5: Flat Varnish. In place of wax one fairly thin coat of fiat varnish may be used.

A TROPICAL FINISH

To meet the unusual conditions which a furniture and cabinet finish must withstand in hot, humid climates, the following is a quick and satisfactory finish for oak and other woods. It is particularly appropriate for finishing open-pore woods like oak, ash and chestnut, also for gumwood, and is equally satisfactory for the general wood trim as for furniture and cabinets.

Operation 1: Clean up the wood with duster brush, putty knife and finally with a damp chamois skin or cloth. Be sure to remove all grease and dirt.

Operation 2: Stain, using a water or spirit stain, preferably, but oil stain will do. If water stain is used the wood should be sandpapered after the stain is dry to smooth down the raised grain of the wood.

Operation 3: Shellac. Apply one thin coat5 mixed about 2 pounds of shellac gum with 1 gallon of denatured alcohol. In about an hour sandpaper the shellac with No. 00 paper and clean up the surface.

Operation 4: Brush on at least four coats of banana oil (amyl acetate). This spirit dries very rapidly. Put it on with the least possible brushing. It flows out and you need not fear brush marks, laps and joints. Just brush enough to quickly spread it over the surface. Too much brushing will cause this oil to lift the shellac and stain coats,it is a powerful solvent. This oil will dry without any gloss. If you want the finish to have a little lustre add about one pound more of shellac gum to the shellac coat Operation 3. If the banana oil gets too thick reduce it with alcohol.

Operation 5: Let this finish dry hard, allowing an hour or more between coats of the oil, and when all are dry rub with a soft cloth to a dull lustre.

CHAPTER XV

WOODS AND DESCRIPTIONS OF CHARACTERISTICS

THERE is a great deal of knowledge about the characteristics of woods commonly used for interior trim, cabinets and furniture which helps the wood finisher to do his work more effectively, both as to beauty of the finishes he produces and their durability.

One of the very first considerations is whether the trim in a building or the wood used in a cabinet or piece of furniture is sufficiently uniform as to color, grain and figure to make it practical to finish it in the natural or a stained color, whether it might not be better to finish with paint or enamel. A skillful finisher can always bleach dark boards and stain light boards to tone in with the general appearance of the other wood, but it costs money and time to remedy defects.

Then again it may be that the wood has too many defects in the way of knots, end grain, cross grain, etc., to make suitable natural or stained finish. First class natural and stained finishes are transparent, the whole plan in finishing is aimed to bring out the beauty of the wood, not to obscure defects. It sometimes helps to darken the stain and to touch up defects, but the facts remains that wood to be finished in the natural color or with stains should be selected by the mill to match as to grain, figure and color. That saves money in the end, even though selected lumber costs more than the general run.

Nature has not produced two woods which are exactly alike. Each kind differs as to hardness or softness, fine or coarse texture, open or close grain, light and dark colors. Then there are medium degrees of all of these characteristics. It is often difficult to say whether a certain wood belongs in one class or another. Some woods have characteristics which would put them in two or more classes. So it is much better to classify woods as open or close grain, rather than soft or hard. The kind of grain is a more important consideration when it comes to the finishing method to be employed.

Then there are some woods which have a beautiful grain figure and color shadings while others are rather uninteresting. Some of the former group have very large, outstanding figures which make them suitable for large rooms, while some of the same group are beautiful because of fine, small and subdued grain and figure. Because of the natural color of some woods, like Circassian walnut, redwood and some others, they are far more beautiful when finished in their natural color than when stained. But staining, on the other hand, adds beauty to the natural grain of some woods.

In the matter of finishes it may be said that generally the woods like white pine, poplar, cottonwood and bass are better finished with paint or enamel.

A logical classification of woods as to open-grain and close-grain is as follows:

OPEN-GRAIN WOODS

Oak (hard) Elm (hard)

Ash (very hard) Mahogany (soft)

Chestnut (medium hard) Walnut (medium hard)

Butternut (medium hard) Rosewood (hard)

Bass (soft) Georgia Pine (hard)

Beech (soft) Southern Pine (hard)

Birch (hard) Norway Pine (hard)

Cedar (soft) Yellow Pine (hard)

Cherry (hard) White Pine (soft)

Cypress (soft) Sugar Pine (soft)

Fir, Oregon Pine (soft) Poplar, whitewood (soft)

Gum (medium hard) Redwood (soft)

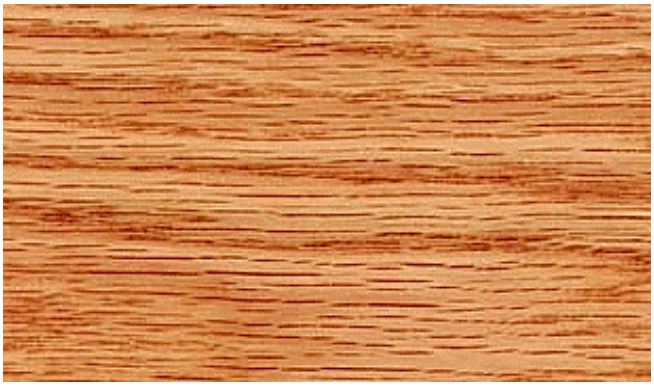
Hemlock (soft) Spruce (soft)

Holly (soft) Sycamore (soft) Maple (very hard)

The manner in which wood is sawed makes a difference, of course, in the grain figure, as plain sawed, quarter sawed, edge grain, slash grain, etc. When the trim of a room includes wood of the same kind but sawed by two different methods it will be difficult to finish them to match up exactly as to color. Then again we have wood from the same tree which is different in color,the sapwood is light in color while the heart-wood is dark. This is especially noticeable in gum wood and cypress. Quarter-sawing of wood is done with many varieities and has been done for hundreds of years. It is considered somewhat wasteful of wood, but it gives greater uniformity of surface and greater strength. The beauty of the grain and figure and color shadings is greater, the wood resists wear by abrasion better when quarter-sawed and is less likely to warp, shrink or swell.

OAK

White Oak



Red Oak

The characteristics and the sterling merit of oak are so well known to

all that it would seem like a waste of time to describe it. Since the very earliest records of man, oak has played an important part in life. Its fruit, acorns, has fed man and beast and its wood has served every conceivable purpose from that of forming humble huts to stately castles and mansions, from shrines and churches to battleships.

The qualities of oak are truly remarkable. It is hard, open grain, heavy, tough and strong. It is durable even in contact with moisture beyond all common belief, especially white oak.

There are about 295 kinds of oaks found in the world, of which about 50 are found in the United States. More than one-third of all hardwood produced in the United States is oak. Of all the kinds of oak found they may be generally divided into two groups, red and white oaks. The white oak is more durable, less porous, finer textured, has better color than red oak; it is considered better for furniture and cabinet work. But on the other hand, red oak is greatly used and is considered just as good as white for a great many purposes. The color of red oak will usually enable anyone to identify it,it has a reddish tinge, especially near the knots. The most reliable way to distinguish between red and white oak, however, is by noting the grain of the woods. Red oak is invariably a coarser wood and white oak has a more prominent figure.

There are differences between oaks of the same kind according to where they were grown. Oaks which grow slowly and evenly on high, well drained land make lumber of the finest grain, easiest to work with tools and least likely to shrink or swell in humid atmospheres. Oaks grown in low, warm, humid lands which are flooded occasionally are coarse in structure, though very hard and tough.

Considerable oak is imported from Europe and is considered superior to American oak. English oak is harder on the surface, although more difficult to work, and is preferred by some for furniture. Slavonian or Austrian oak is imported, too. It is softer to work and has a very straight grain. It also has a small grain figure which is especially interesting and is very easily stained and finished like antique oak.

Pollard oak is a cultivated variety grown in sections of Europe for its peculiar figure of grain. The small limbs of this tree are cut into rounded heads close to the tree and as the tree grows larger the stunted heads are included in the wood growth. Then when the tree is cut up for lumber these heads produce burls or knots which form very unusual grain figures.

Oak is prepared in two ways with the saw, straight or plain sawed and quarter-sawed. It is peculiar in the fact that there are strips of special tissue radiating from the center of the logs, like spokes in a wheel, called medullary rays. When these are cut through by quarter-sawing the logs the boards show flakes of smooth wood with which all are familiar. Quarter-sawed is much preferred for many purposes, yet plain or straight-sawed oak is greatly used for carving and for the finest of furniture, cabinets and general trim lumber. It is especially not desirable to use quarter-sawed lumber with large flakes when the boards are narrow or small in both directions,casings around windows, small panels and delicately designed furniture and cabinets are especially not the place for prominently flaked quarter-sawed oak.

Oak being open grained to a great extent offers a greater opportunity than any other wood for novelty finishes by using two-tone finishes which are produced by using a stain of one color and a filler of a different and contrasting color. By developing the flake of quarter-sawed oaks, by sanding and picking out the pores, after treating with a water sponge coat to raise the grain of the wood, and by the use of various filler colors a great number of interesting special finishes are produced. Such finishes are welcome relief and afford variety for tea rooms, clubs, shops, store fixtures, window trims, furniture, etc. When the grain is raised with water in one or more applications a stiff bristle or fine steel wire picking brush can be used to open up the pores more and to remove the dust resulting from sandpapering. Then the filler will show up better because there is more of it left in the wood cells. A penetrating stain should be used and white shellac and wax or white paraffine wax alone constitute the finishing materials.

To Offset the Color of Red Oak. Some kinds of red oak are so red that it is not possible to produce very
light gray finishes on it unless the red color is killed. Brush on a light green stain first and let it dry; the wood will be toned to take a gray or a brown stain with a much more satisfactory effect. This toning is needed quite as much for light brown oak stains as for gray.

The whole tradition, sturdy quality and dignity of oak seem to forbid that it be stained red to imitate mahogany. Don't do it. Gum, cypress and birch, on the other hand, make very fine finishes to represent mahogany when selected for grain and suitable figure.

BIRCH

Because of its very desirable qualities, birch is one of the most versatile of woods, being used for innumerable purposes in addition to its many uses in the building and furniture fields.

Birch is a hard, close-grain, fine-textured wood. It is tough, strong and heavy. The heartwood is reddish yellow and the sapwood is yellow. The grain figure of birch shows great variety ranging from very plain, inconspicuous growth to the strong figures and the very ornate curly birch. When well seasoned, birch does not warp, twist, split or swell. Its very hard surface makes the wood withstand much abuse in the way of mars, bruises, scratches and knocks without showing ill effects. And, again, its very hard nature makes it possible to give birch an unusually high polish without a great number of surfacing coats. Birch is suitable for finishing in the natural color, for any stained color and for enamel finishes.

The grades of birch are, unselected, red birch and curly birch. Unselected birch is a mixture of the reddish heartwood and yellow sapwood and a mixture of grain figures. It is suitable for stained finishes in dark colors and for painted and enameled finishes. Red birch is all reddish heartwood and is much used for trim, cabinets and floors. It is suitable for dark stained finishes, for painted and enameled finishes. When used for gray or other very light finishes a toner of light

green aniline water stain should be spread on the wood first and allowed to dry. That will neutralize the reddish tone of the wood, making better grays and light browns from stains.

Curly birch has a beautiful wavy grain figure which looks like watered silk. It is rather scarce because only an occasional tree is found to produce this peculiar grain. It is much used for furniture, cabinets, doors and panels. It costs more than the other grades, of course. Curly birch gives an impression of delicacy and is used on furniture which is to have the feminine appeal.

White birch is the heartwood of the tree. It is generally light in color, but because it has a reddish tone also it is called red birch.

For producing silver gray and other similar gray finishes, birch and white oak divide honors, especially if these woods are bleached do they make perfect finishes of this kind. Some object, however, to the yellowish tone which comes through the gray from the birch and prefer maple for grays.

The stained finishes most commonly produced on birch are mahogany, red and brown, walnut, antique mahogany, fumed browns, produced with tannic acid washes and bichromate of potash solutions, and it also makes a close representation of cherry. In producing a cherry finish with birch take care not to allow a reddish tone to occur which real cherry doesn't have. The stain must be absolutely clear,no sediment or undissolved coloring matter should be permitted. It is best to use a strong, water stain very thin.

Birch is a wood which sandpapers well and finishes up after sanding with a velvety lustre much admired. It has one peculiarity which is apt to give trouble to the inexperienced, however. The wood seems to grow in both directions at the same time,it has many areas where the end grain crops up. End grain takes stain darker than the balance of the surface unless the stain is very thin or unless the end grain is coated with very thin shellac or glue size before staining. Sometimes when looking at the finished birch from one end it looks uniform in color, but from the other end it looks darker. Uniformity of color is, of course, very desirable and more so for furniture and fine cabinet work than for the average run of wood trim. In the furniture factory uniformity of finish begins with the proper selection of each board as to color and grain and the way the wood is laid out to be glued and joined together. If a board which is too light accidentally gets into a piece of furniture that board is stained first to make it match up with

the balance of the wood before the whole surface is stained. If the board is too dark it is bleached out before the staining is done.

Birch is a close-grain wood, as has been said, and some finishers object to the use of a filler on it, claiming that it will muddy up or cloud the finish. That surely is true if a poor filler is used and especially if the stain is not wiped off clean, but if good fine filler is used, is properly tempered and made thinner than for oak and is wiped at the right time and wiped clean the beauty of the finish is enhanced by the filler. This is especially true when a dark or black filler is used to contrast with the stain color, as is true in producing mahogany. The wood cells or open parts of birch grain are very small, to be sure, but they offer some opportunity for the filler to lodge and so improve the finish. It is quite out of the question to produce the best kind of finish in isilver gray without the use of pure white filler. Of course white paraffine wax can be used as a finish for silver gray and it will serve the purpose of the white filler to some extent.

Those who object to using a paste filler on birch use one or two thin coats of shellac and rub each coat close, which practically removes all of the shellac except that which is lodged in the pores of the wood. These same finishers object to the use of filler on wall panels which are constructed with mahogany veneer center panels and birch stiles and mouldings. Their method of finishing such surfaces is to stain the mahogany and the birch with the first coat of stain. Then to fill the mahogany only and brush on a second coat of stain to the birch only to make it dark enough to match the mahogany. If the stain fails to take, to penetrate the birch, as it sometimes will, add 1 ounce of acetic acid, or more of strong table vinegar, to a quart of water stain. That will increase penetration of the stain.

The weight of the argument, however, is in favor of using a dark paste filler, thinned more than for oak, in order to bring out the grain of the wood more effectively and make the open pores contrast with the stain color of the fibres.

GUMWOOD

Gum

Gumwoocl has been used a great many years for fine cabinet construction and furniture. For a long time it was not known in the finished wood by its rightful name American Gumwood but was called satin-walnut, hazelwood, etc., because in the hands of skillful finishers it was made to resemble other woods so closely that very few could distinguish it from those other woods. In Europe, especially, it has been used under other names and was recognized for its good qualities long before it became so popular in America, Today it is known as red gum, sap gum and sweet gum. It enjoys very extensive use for furniture, building trim, cabinet work and for many other purposes.

Gumwood is a very close-grain, close-knit wood of fine texture. It is commonly called a soft wood, but is designated as a hard wood by its manufacturers. It is harder than white pine but not so hard as maple, oak and birch, so it may well be called a medium hard wood.
This wood is plain or straight-sawed and also quarter-sawed, but to account for the wonderfully interesting grain figure is beyond the ability of most men today. That is one of Nature's riddles. The formation of figure in gumwood obeys no laws, apparently; it ramifies throughout the logs at random. Some trees have pronounced grain figure in the wood, some have much and some little. Soil conditions and location of individual trees affect in some mysterious way the structure of the wood. Each gumwood log produces boards of somewhat different grain figure; one will be rather subdued while another may be strong, while still another will be intricate and quite ornate.

As to color, the sapwood of the gum tree makes a rather light colored wood with occasional dark brown streaks. The heartwood produces boards of a medium light brown with a reddish tinge. The lumber from the sapwood is called sap gum and the lumber from the heartwood is

called red gum.

Red gumwood is graded or selected to supply plain or figured wood. For fine panels and furniture the wood is veneered and when matched as to pattern produces wood which is very similar to Circassian walnut. The plain sawed gumwood finished natural or with a very light brown stain is much appreciated for interior wood trim because it produces walls of soft., subdued quality that is very rich for a background of a decorative scheme. The quarter-sawed plain gumwood, not selected for decorative figures, is also much used for the same purpose.

Gumwood is beautiful in its own right and there is no need to place its value according to what woods it will represent well when properly finished. It is, nevertheless, prized because in the hands of skillful finishers the grain figure can be selected and patterns matched so well as to make finishes which are fully as beautiful as Circassian walnut. Then properly finished gum resembles black and other walnut woods closely, so much so that when used in the same panels or piece of furniture with other woods it takes an expert to tell the difference between the two woods.

Gumwood finishes very much like mahogany, too, when the wood is selected for grain figure of similar nature, Finished in its natural light brown color gumwood is much liked by some, while others like it better after a very light, thin brown stain has been used on it to slightly darken the color. For enamel jobs gumwood makes an excellent base. Its uniformity of cell structure, its uniform density does not permit the wood to absorb paint, stain or enamel coats unevenly, and there are no pockets or streaks of resin to come through the finish.

For stained finishes water stains raise the grain of gum a bit more than it does on other woods, but it penetrates deeply and its very transparent nature produces a far more beautiful finish than other stains, and the sapwood really needs a water stain to make a uniform color and clear tone because of the very light streaks of wood. It is well to use a very thin stain coat on light wood streaks which appear along side of dark wood; coat these light streaks before staining the whole surface.

Gumwood is most beautiful when finished in dull lustre. The hand rubbed, varnished surface, the flat varnish surface and the shellaced and waxed surface are all preferred to the high gloss, polished surface for interior trim, especially.

When gumwood is used for the stiles and mouldings of wall panels with mahogany or walnut veneer for the panel centers the gumwood should be coated with a toner before staining. For a toner a weak solution of chloride of iron, or sulphate of iron (copperas), is suitable. Dissolve this chemical in water and brush it on to the gumwood and let it dry. That will subdue the sharp contrast between sap streaks and give a more uniform effect. Follow this toner with water stain or oil stain.

Gumwood being very close-grain does not require a filler, at least not a paste filler or varnish liquid filler. It is good practice to brush on a thin coat of raw linseed oil, or a mixture of raw linseed oil and turpentine first. Let it set a few minutes and then wipe off. Let it dry at least twelve hours before staining with water or oil stain. The oil fills the very fine wood pores and makes a more uniform suction which helps to stain the wood a uniform color.

Gumwood is often finished with a stain, two or more coats of white shellac and wax, or the shellac is rubbed dull and no wax is used. Then again the furniture finisher likes to apply one very thin coat of white shellac and when dry rub it close which removes all shellac except what is lodged in the fine wood cells and which acts as a filler. The shellac goes on after the stain,

MAPLE

Maple

When we think of maple the first use to which the wood is put is the only one which occurs to us. The extremely hard, tough surface of maple which takes on a higher polish as it is subjected to wear has made it a remarkable material for floors. But maple is also very good

for wood trim which is to be finished in the lightest possible natural wood color. The grade known as white maple, when finished with white shellac alone or with white wax, makes a truly beautiful finish which cannot be duplicated by any other wood. Sometimes it is bleached before finishing to make it even whiter. And maple, of course, is much used for furniture, especially the curly and the bird's-eye maples. For floors which are subject to much traffic, maple has no equal,schools, dance floors, kitchens, bedrooms, halls, etc.

Maple is a close-grain, very hard, fine-textured, tough and strong wood. The sapwood is very light in color, while the heartwood is a light brown. The grain figure is subdued but beautiful and quite uniform and interesting as well.

All maple is light in color, but the white, clear grade is especially light. It is the sapwood from the outside of the log, winter-sawed and end piled in sheds to prevent staining. It is ivory white and the finest grade of maple flooring and lumber produced. Birch floors and trim give an airy, cheerful color to a room which reminds one of the northern forests where the best maple trees grow.

Maple is what is called a single-growth wood, meaning that when the present supply is exhausted there will be no more to take its place. Then it will become as costly as walnut and similar rare woods because the rate of growth is very slow and reforestation is not equal to producing a growth equal to the natural and original stand of timber.

The growth of maple is common to England, Central Europe and America. Curly maple is the wood which results from trees which have made a twisted growth and which peculiarity has been preserved by special methods of cutting the lumber. It has a curly, mottled figure quite similar to satinwood. Bird's-eye maple is sugar maple. The peculiar bird's-eye knots are presumed to be the result of buds or shoots which formed in the wood but were unable to penetrate the hard, tough bark and thus come out to form branches. Sugar maple when newly cut is a creamy white in color, but it darkens to a golden yellow with age. In finishing this bird's-eye maple the best practice is 'to put on a toner in the form of a water solution of tannic acid. This brings out the little eyes or knots interestingly. The toner is followed with a weak water stain.

The heartwood of maple is rather too dark a brown to be finished in light gray stains and it cannot be bleached enough to make it suitable. It, however, makes finishes which are quite as beautiful and similar to

mahogany, brown, red or antique. The white maple, or sapwood of the tree, produces the finest kind of silver gray, also driftwood and Kaiser grays by correct staining methods. A select grade of maple which has a red tone is sometimes used to represent cherry and when finished by skillful men it makes a wonderfully fine appearance.

Maple makes a first class foundation for enamel finishes because of its even, close grain texture and uniform color and absorption.

Maple floors are, of course, often oiled when the traffic is very heavy, as in schools. That makes a finish which is easy to keep clean and a uniform color, but of course it darkens the color of the wood.

PINE AND FIR

Pine

White Pine. In the memory of the older building craftsmen white pine has a glorious past. Its very extensive employment for all manner of building exteriors acquainted all of those men with its great strength and fine working qualities.

White pine is a soft wood with a close, even and uniform grain texture. It is light in weight but very strong. Its color is pale, light yellow with few markings, none of which are very strong. The surface of white pine is smooth and without raised grain. It is a durable wood which holds its shape exceptionally well, showing no warping, swelling, shrinking, checking or splitting.

Considering the finishes which are best for white pine first mention should be made of painted and enameled finishes. White pine has no superior when it comes to forming a permanent and satisfactory foundation for paint and enamel. Its soft, fine texture and its habit of staying where you put it, avoiding warping, swelling opening of joints, etc., gives it first place for these finishes. Then its subdued grain and figure, the absence of strongly contrasting streaky make it possible, to cover and hide this light colored wood with fewer coats of paint than is possible with other pine woods.

For stained finishes white pine is not interesting unless selected and matched for figure. Then it makes an interesting finish in the browns. Selected grains of white pine finish well with mahogany stains. And selected grains with many small knots are popular for finishing in the natural color when used for library and dining room panels which are a reproduction of early English and American colonial architecture of pine and deal wood. The wood is yellowed with ammonia washes before finishing to give an antique or aged appearance. The finish then is thin white shellac and wax or white was alone.

Before staining white pine it is best to brush on an oil coat first, mixing about one-half raw linseed oil and one-half turpentine. Brush this coat on, wipe off any excess after a few minutes and let it dry. Then finish with oil stain, preferably, but water and spirit stains can be used. Some prefer to use a thin coat of shellac instead of the oil first coat to seal up the suction places.

Sugar Pine. This wood is a true white pine, botan-ically, and has practically all of the characteristics of white pine. It is used for all interior and exterior building construction as well as for tanks, silos, boat decking, pattern making, organ pipes, piano keys, etc.

Deal (Pine). The wood finisher occasionally gets a specification which calls for finishing pine like English deal wood paneled interiors. The pine used for this work in America is usually white and has been selected for having many small knots of dark color. The wood is simply sandpapered and brush coated once or twice with strong ammonia to give it a yellow color similar to the aged or antique appearance of the real deal wood after long exposure. The finish is then simply waxing with white wax or it is shellaced with white bleached shellac used thin and waxed or rubbed dull. Deal is a pine tree of the northern group which grows in Europe and North Asia. It is known as yellow deal and red deal. Russia, Poland, Sweden and Norway export deal lumber. It has been used for hundreds of years for interior house trim and as the

core stock or solid parts of furniture and cabinet work over which veneers of finer finishing woods were glued. White deal (spruce) wood is used for cheap furniture in England.

Southern Pine. It is true that there is more confusion in the minds of finishers and building mechanics in general about names for the various pine lumbers than about any other class of woods. The uncertainty about names has made it a bit difficult to specify finishes and for two people to discuss finishes and be sure they are talking about the same kind of wood.

All of the Southern pine lumbers belong to the yellow pine group. The white pines come from the Northern states,from Eastern states first, then from the states about the Great Lakes and today from California.

Seven trees of the coastal plains of the South furnish the commercial cut of southern or yellow pine. These trees are: longleaf, shortleaf, loblolly, Cuban, pond, spruce and sand pine. The lumber produced from all of these trees is similar as to qualities and so only three kinds of Southern yellow pine are generally recognized, namely, longleaf, shortleaf and loblolly pine.

The confusion of thought has been added to greatly by the use of many local names for these three kinds of pine lumber. We have all heard and read about hard, pitch, fat, Georgia, Florida, North Carolina, turpentine and Norway pine. All have been used indiscriminately to describe longleaf, shortleaf and loblolly pines.

To distinguish each of these three kinds of pine lumber is not at all difficult. In longleaf pine the growth rings are narrow, uniform in width and outline and number from eight to twelve rings per inch, Io6king at a log cut off across the length. The wood of this long-leaf pine is heavy, hard and full of resin or pitch. The color of the wood is reddish yellow or reddish brown. The ring of sap wood on the outside next to the bark is thin or narrow, the tree is mostly heartwood. The leaves of the tree are very long, from 9 to 15 inches.

In shortleaf pine the growth rings are of medium width and number from six to eight per inch. The wood is fairly hard and fairly heavy but not to the same degree as longleaf. Shortleaf contains less resin than longleaf. The color of the wood is from whitish brown to reddish brown. The width of the sapwood ring on the outside of the log next to the bark is greater than that on the longleaf, it is, in fact, rather thick.

In loblolly pine the growth rings are usually very broad and there are but from four to six rings to the inch showing on the face of a cut-off log. The wood varies considerably in texture from hard, strong and compact to light, coarse and brashy. The color is subject to variation, too, from yellowish to reddish orango brown. The sapwood ring about the outside of the log is very thick.

The Southern pines are cut straight or plain sawed (flat or slash grain) for most interior trim and exterior purposes. Some of it is quarter or rift-sawed and that method produces what we know as edge-grain pine commonly used for flooring. The edge-grain sawing makes a much harder, tougher wood to resist wear by abrasion.

The uses to which Southern pine is put are innumerable for all exterior and interior building purposes.

Interior trim and cabinets as well as some furniture of the kitchen type are made from it.

Pine is generally classed as a soft wood, but some of it is very hard. It is for the most part a close grained wood with alternate hard and soft streaks. It is tough and very strong for the most part

Considering Southern pine from the standpoint of finishing, it makes an attractive appearance when finished in brown stains, dark red, green and weathered effects. It is rather a difficult wood to stain gray because of the very strong yellow grain figures. Silver gray stains for use on this wood should have a rather strong violet hue to neutralize the yellow as much as possible. To succeed with gray stains considerable white filler should be retained in the pores of the wood and pine is so close grained that it does not offer much open-grain to permit the white paste filler to lodge and remain on the surface. A wash of strong muriatic (hydrochloric) acid makes an interesting gray stain on Southern pine.

On Southern pine stains take or soak into the soft streaks considerably and do not penetrate the hard resin-filled streaks much. Light colored stains as a rule are not so good on soft woods; dark stains are better.. An even coloring is desirable on all staining jobs so any wood like this which takes stains spotty should be treated before staining so as to gain an even tone. Some finishers wash over the wood with benzole first to remove any surface pitch or resin and give the stain a chance to penetrate the hard resin-filled places. Benzole is a powerful solvent of resin. Alcohol will also serve this purpose. Then to overcome the

excessive suction of the soft wood streaks some finishers brush on a thin coat of raw linseed oil, that is, half oil and half turpentine, wipe it off and let it dry overnight. Some prefer a thin coat of shellac to stop suction and even up the absorbing ability of the wood.

Water stains, raise the grain of pine and do not penetrate the resinous streaks much. After the stain the wood must be sandpapered to smooth it again. Oil stains may be used-effectively and on this wood is one place where oil stains show considerable advantage. They cover up part of the strong grain figure and fill up the excessively porous places, thus making an even color tone more easily than the more transparent water stains.

As to enamel finishes on Southern pine, much has been written against the use of enamel on this wood because some trouble has been experienced. When the character of the wood is considered by the finisher and when he fits his finishing methods to the surface as he should, no trouble will be experienced and this pine will give good service as a foundation for paint and enamel. The only real objection to the wood is that its strong grain figure contrasts so much with the soft, light-colored parts of the wood that it takes an extra coat of paint to hide the figure and make a uniform color in white and light tints. The first step before painting Southern pine should be to wash down the wood with benzole or alcohol so as to open up the pores of the wood in the resin, sap-filled streaks. That will give the paint a chance to penetrate a bit as it must in order to gain a firm hold on the wood. The benzole or alcohol wash, will also remove any excess of resin on the surface which may bleed through the paint and discolor the finish later, especially in the presence of heat.

Douglas Fir (Oregon Pine). This wood is cut from giant trees which furnish lumber for many purposes such as common boards, sheathing, framing timbers, finishing lumber, flooring, etc. The grain figure of fir is interesting and some of it in the veneer form is selected and matched to make very fine appearances. The color of the wood is a pinkish yellow or brownish red and it may be distinguished from Southern pine which has a decided yellow color. The grain figure of the straight or plain-sawed fir is very similar to Southern yellow pine but a bit more angular and sharp.

Fir is a light weight, strong, soft and close-grain wood. Its absorption of oil and stain is rather uniform and it makes an excellent foundation for paint and enamel finishes. It seasons well, resists weather excellently and shrinks moderately.

Fir should be finished as soon after erection as possible because ordinary moisture in the air will raise the grain of the wood into ridges which cannot be cut down level again by sanding. For this reason water should not be used on fir except for the novel effects which are sometimes wanted when the wood is sponged with water to raise the ridge as much as possible before the application of acid solutions as toners or special fillers, etc. Oil stains are best for coloring fir.

White Fir. This is a very light colored, grayish white wood of light weight. It has a close grain and a moderately soft, uniform texture. The grain figure is much subdued like white pine. It is strong lumber as is indicated by the fact that it is classed by forestry experts with Sitka spruce which is the official airplane construction lumber of many governments. White fir is used for cutting into common boards, sheathing, framing timbers, heavy timbers, finishing lumber and many other purposes. It takes paint and enamel finishes wonderfully well because of its uniform structure as to density and absorbing quality. Its grain figure is rather too much subdued to hold a great deal of interest, but it can be stained effectively like soft and white pine.
CYPRESS

A most enduring wood and one which is being used rather extensively for clapboard siding on building exteriors, for sash, doors, floors and many other purposes where the ability to stand up against moisture and the weather generally is especially desired. It is only the brown heartwood which shows remarkable durability when subjected to conditions favoring decay. Cypress is a close, straight grained, soft wood, although its winter growth wood is quite hard. The texture of grain is rather fine. Not a strong wood. It does not swell or shrink, once well seasoned. The heartwood of the tree is rather a dark brown, while the sapwood is a yellowish white.

This tree grows in swamps and when the wood is green and before seasoning it is very heavy, being filled with water and an oily sap. When correctly seasoned cypress is very light in weight. A very durable wood even in service where it is damp and where conditions are right to promote decay in other woods. It has no resin ducts and is not resinous or pitchy like hard yellow pine. It does contain considerable oily sap which is a compound having antiseptic properties and which imparts a waxy feel to the finished lumber. It is this sap which no doubt resists decay in the wood when subjected to moisture. This oil should be wiped off before painting or staining or varnishing cypress. A cloth soaked with benzine or benzole will remove the

surface oil. Wipe it immediately before painting or staining. The oil will rise to the surface again.

Cypress weatherboards, clapboard siding and similar cuts show great contrasts of color, When used for interior trim or for any purpose requiring a fairly uniform color in natural finish, cypress must be selected to gain some uniformity of color, the variations of color between the nearly white sapwood and dark brown heartwood are great. Penetrating stains will even up the color differences, as a rule, however. Oil stains should contain about two parts linseed oil, one part turpentine and one part benzole.

In dry kilns cypress acts badly and so most of it is seasoned by air drying. When well seasoned it doesn't shrink abnormally, nor does it swell and warp in the presence of moisture.
The painting of cypress while not difficult requires a bit of special knowledge and understanding of the nature of the wood. Because of the oily sap which permeates the wood, oil paint doesn't penetrate and gain sufficient anchorage unless mixed properly.

Cypress makes a good foundation for enamel and interior paint finishes, having strong grain figures in places and strong contrasts between sap and heartwood requires an extra coat of white and colored paints to hide the dark surface. Also the grain growth is of a circling nature in places; it seems to curl up and sometimes requires more coats of paint to give a smooth level finish. Much of this roughness can be removed by sandpapering.

In the stained finishes penetrating oil stain is much used. Water stain may be used with excellent results, especially when used hot and with some alcohol in it to help secure penetration.

Selected and matched grain woods of cypress make very fine finishes to represent mahogany in red and brown; likewise it makes good walnut and takes all brown stains beautifully. It is practically impossible to produce a gray stain on cypress with oil stains and, in fact, any stain is quite ineffective in producing gray on this wood because of its naturally dark color.

When selected for grain figure cypress finishes up beautifully in its natural reddish brown color. It requires no filler. Simply wipe off the oil, make the surface smooth and clean and then shellac, varnish and rub or wax, or use flat varnish.

The lacy grain of cypress finishes up with a remarkable effect in what is called the Sugied Cypress. The wood is burned over some with the flame of a blow torch which burns the soft parts but not the hard. A soft wire brush is then used to remove the charcoal resulting between the hard streaks of wood. When clean the wood is given a filler or toner coat which lodges in the depressions burned out and gives a contrast to the darker ridges of grain figure. White shellac and wax or flat varnish are then used to finish the surface. This interesting finish cannot be duplicated with any other wood.

WALNUT

Walnut

American Black Walnut. The remarkable strength, hardness, variety of grain, figure and coloring of this wood have made it so popular for furniture construction, most people have carried the idea that the supply of American walnut is exhausted. The great popularity of American walnut for interior trim and furniture a number of years ago was eclipsed by the popular craze for golden oak, because of a too somber use of walnut in dark, straight grain effects. Today this walnut has returned to popularity, is being used in the select and decorative patterns and in somewhat lighter colors for the finishing. It is even being used for floors in the finer homes as well as for trim and furniture. The desire for lighter, brighter colors in furniture is being

satisfied with painted pieces and wicker furniture.

American black walnut is a hard wood with open-grain and fine texture. In color it is a dark, tawny brown for the heartwood, while the sapwood is very light, grayish white. The wood has exceptional strength and is so hard that it does not bruise, mar or scratch easily. When it is damaged the defect doesn't show up much because of the dark color of the wood and its dense texture. In strength it is superior to English, Italian and French walnuts.

American black walnut is native in North and Central America. It is closely related to butternut, which it resembles in color and grain formations. It is also related to English, French, Italian and Circassian or Turkish walnuts.

Burl walnut is veneer cut from the root growths of American black walnut. The stumps from which it is cut are very large, weighing from one to two tons. The veneer is, of course, very carefully matched into patterns of very fantastic and decorative forms when artistically handled. Burl veneer is also cut from knotty formations, called burls, which form on the roots and larger limbs of the trees. The veneer walnut is not, of course, suitable for interior trim except for panels on walls, doors, etc.

Curly walnut, the wood which has a wavy, curly grain formation, is very popular. It is cut from certain trees which have grown in a twisted shape because of soil conditions or the stress and strains to which they have been subjected.

Because of its interesting variety of grain and figures when cut by different methods, and because of its variety in color shadings, walnut is usually finished in its natural rich, brown color. Sometimes it is bleached to make lighter effects. It is never painted or enameled today, although in some of the older houses it was painted. In many of those houses the paint, enamel f and even graining is being stripped off today to reclaim the natural beauty of the walnut.
The filler used for walnut is of the paste kind and it is usually colored very dark brown, nearly black, for the classic, conventional finishes. Light colored, gray fillers are used for some of the novelty walnut finishes.

The finish on walnut should be polished gloss varnish or hand-rubbed gloss varnish.

For a while the American furniture market offered very light, yellowish brown walnut finishes which were produced by much selecting and bleaching of the expensive veneer walnut required. It was not a staining but a bleaching process which proved very expensive and rather uncertain. Popular preference then returned part way toward the darker finishes, medium dark, not the very dull dark walnuts.

To retain and enhance the beauty of walnut when a stain is used it should be a water stain, because these are the most transparent of stains. What is called Italian walnut finish is produced by the use of a gray water stain, white shellac, gray paste filler and a final coating of white shellac, white wax or clear lacquer.

English, French and Italian Walnuts.The English walnut is not much used for wood trim or furniture, being difficult to obtain. It is most valuable for its fruit, the English walnut of commerce. It is related to American black walnut but is inferior in strength and beauty of grain figure.

French walnut is closely related to the others mentioned and is used only in a limited way for trim and furniture. It is not equal to American black walnut in either figure, coloring or strength and hardness. See

Italian walnut is like American black walnut. It is very fine in texture with a close, dense grain figure of much beauty. Delicate carvings and antiques made of it have nearly the quality of bronze statuary. The grain figure of Italian walnut is not so pronounced as English and French walnuts and is more beautiful. It grows in the southern European regions and is much used for fine furniture.

Circassian and Turkish Walnut.These walnuts are of the same species as the others, but because they grow in rather barren soils and because of other influences of environment, the trees are much twisted, knotted, gnarled and the growth is stunted. The trees, therefore, when cut up produce wood which is quite similar to the burl and curly grain figures of American black walnut. It is employed only for cutting veneers and is much prized because of the extremely fantastic grain figures which may or may not be used artistically by the craftsmen to construct furniture and panels for interior building trim. The trees grow on the slopes of the Caucasus mountains in Russia.

MAHOGANY

Mahogony

The history of mahogany is long and fascinating, too much so to be more than touched upon in the limited space of this chapter. In 1597 Sir Walter Raleigh returned to England after one of his wandering voyages at sea. In the decks of his ships were reddish brown planks which had been used to make repairs to the ships after long weeks of battle with the sea. The repairs were made in the West Indies where Raleigh had made a stop for rest and repairs. The natives had suggested the use of this wood which was strange to the civilized world. On visiting these ships when they returned to England, Queen Elizabeth commented upon the strange brown wood in the decks of the ships, whereupon Raleigh had the planks removed, and sent to skilled furniture craftsmen who made a table from them. The table was presented to the Queen. Its great beauty and royal patronage soon placed mahogany in a preferential position as a fine cabinet wood, where it has remained ever since. It has always been associated with quality of furniture and, of course, has always been imitated in every conceivable way. A great many of the finest pieces of furniture made by such master designers and cabinet craftsmen as Chippendale, Heppelwhite, Sheraton and others were made of mahogany and these masters worked almost entirely with mahogany because of its sound qualities in construction and its great beauty.

A small number of mahogany trees grow in the United States, in the Florida everglades, but they are not accessible. Genuine mahogany grows in tropical sections. The wood is imported from Mexico, Honduras, Guatemala, Nicaragua and other Central American States. It comes, too, from South America, the Nigerian, Gold and Ivory coasts of West Africa. The West Indies, principally Cuba and Santo Domingo supply some of the best mahogany.

Prima Vera is another wood called mahogany, or white mahogany. It comes from Mexico and Central America. It is very similar in grain and

figure to genuine mahogany. Its color is a light, golden yellow. It, too, is open-grain and makes a beautiful finish in stains.

Spanish cedar from Mexico, Cuba and the West Indies is called mahogany. It resembles mahogany in grain and figure but is more porous of texture. This wood is much used for cigar boxes because of its porous structure which assists the seasoning process supposed to improve cigars. It is sold for and used as mahogany in furniture and wood trim.

Butternut, called white walnut, is another wood which resembles genuine mahogany in many respects when stained. It is not difficult for one who is familiar with real mahogany to detect the difference, however.

Because mahogany has always been associated with quality and richness of surroundings it is generally considered a very expensive wood, yet the actual figures of cost when using it for interior wood trim of the better buildings shows that it costs but a few dollars more than oak, birch and some other woods.

In characteristics mahogany ranges from soft to very hard. The Cuban mahogany is the heaviest and hardest, but produces the richest grain and figure beauties. Mahogany is an open-grain wood of great strength. It does not shrink and warp and for that reason was so quickly favored by cabinet workers. In color it is varied from light pinkish browns to dark browns. Its surface takes a polish with a depth of lustre which is unequalled and with age it takes on a marvelous color depth and quality which is illusive to describe in words, being like the deep red of old wine with yellow light showing through it. The red commonly associated with mahogany is not the natural color of the wood, but a stained color which has been superceded lately by brown stain. Natural finished mahogany, called toona mahogany, is light pinkish brown in color.

The grain character and figure of mahogany is not due to various ways of sawing the wood, as is true with oak and others. It comes in two grades called plain and figured. An explanation of the figure is well presented by the Mahogany Association, Inc., New York, N. Y., as follows:

" Considerable confusion exists as to what is meant by the word Figure. Figure has nothing to do with grain. The grain of wood is produced, partially, by the size and character of its pores and fibres,

but more by the lines of demarcation between periods of growth, known in temperate zone woods as annular growth rings. While mahogany is a tropical tree and grows practically continuously, it has these latter grain markings to some extent. Furthermore, they show on both plain and figured surfaces.
Figure, on the other hand, is produced in mahogany by the interlocking and interlacing of the wood fibres. In other words, the fibres of the tree twist and curl sc that, when manufactured into lumber or veneers, some are seen from one angle and some from another, producing that play of light and shade known as figure. It can readily be seen that these growth convolutions which, by the way, usually extend through several periods of growth^could never be twice alike and, therefore, that every piece of figured mahogany is individual.

Notwithstanding this diversity there are certain characteristics of figure that enable those in the trade to establish types, or names under which figured mahogany is sold. These number over twenty, of which a few typical examples will be described.

"Plain" has no surface markings except those produced by the tree's growth and known as grainas above explained.

"Stripy Figure" means that the surface is broken into ribbon-like stripes of fairly uniform width, lengthwise with the grain.

"Broken Stripe" means that the irregular stripes twist and tumble, come to the surface and disappear, in a play of light and shade that produces a satisfying individuality.

"Mottle" in its various forms, means that the surface of the wood looks as though the tree had met with some cataclysm of nature that boldly forced the fibres into great confusion, pushing them sidewise and producing countless splashes of light and shade that mingle in a kaleidoscopic riot of figure effect.

"Rain-drop" in some ways is similar to a combination of Mottle and Broken Stripe. The interruptions in the Broken Stripe figure are sudden and positive, giving the effect of rain splashes driven by a high wind.

"Fiddle-back" is named from the fine, curly, rippling figure seen on the backs of rare, old violins. It is like the effect of a gentle summer breeze on a placid pond where one tiny wavelet follows another in a procession of ripples. Fiddleback is a typical, well-named and

distinctive variety of figured mahogany.

"Crotch" High up in the air, in the trunk of a mahogany tree, a silent but intense struggle takes place among the fibres in the attempt of each to follow its own inclination in determining to which of the great branches overhead it shall pledge its allegiance and support. Consequently the fibres cross, twist and tumble in a "swirl that, when manufactured into veneer, produces the most highly figured mahogany of allthe "Crotch" figure so well known and so long used."

It was not until about one hundred and fifty years after Sir Walter Raleigh introduced mahogany into England that it became a product of commerce. It was used much at first for building ships and still is used for the smaller pleasure craft because of its enduring and strong qualities. From the beginning it has been used both in solid and veneered forms for the construction of furniture and cabinets. Today its greatest use is for furniture, cabinets and panels for interior walls and doors.

In the matter of finish mahogany has had an eventful career. The early masters of furniture design and construction knew that the least possible finish and the most transparent finish was best for this wood. Many of the pieces were finished simply by rubbing into the wood coat after coat of oil, wiping it and letting it dry before the next coat. The most beautiful and durable French polish finishes amounted to about the same thing, using oil and very thin shellac, much time and much labor. When first finished these fine old pieces which are worth fabulous sums of money today were quite light in color, but as the play of sunlight and the natural aging of the wood progressed the finishes developed marvelous depths of color variety and richness. Noting these beauties people who devote their lives to pretending they are or have something of great value were not satisfied with the genuine mahogany finish when new. They ordered the furniture craftsmen to doctor the finishes to make them look like the artistic beauties of the mellowed-with-age pieces of mahogany furniture. So no matter how it went against the artistic natures of craftsmen who worked for bread they were compelled to stain the new mahogany to look like the old. They succeeded well, but their imitators soon produced stains and finishes which had none of the transparent nature of the masters finishes. The red color which the average person calls mahogany soon developed, devoid of any depth of finish and beauty such as is possessed by the aged mahogany. From this point it was only a step or two down to the practice of staining other woods with the same red color and calling it mahogany, purposely making the stain with a lack

of transparency so that the real character of the wood would be obscured.

Real mahogany finish is neither a flaring red nor a nearly black brown, but a color in between which is too illusive to describe. It is well that today there is a well-defined movement on foot to stop obscuring the natural beauty of mahogany, walnut and in fact all woods with finishing coats which are too thick and which lack the transparency of quality finishes. Each of the cabinet woods has beauties all its own. Nature has not made two woods alike and those which are fit for finishing in their natural color and with really transparent stains which simply preserve and enhance the wood grain should be finished for their own value, not as imitations of something they are not. Pretensions are of no value among woods any more than they are among people. Many of the troubles with fine finished woods, such as murky, cloudy, mottled defects which develope in use are afflictions which have been thrust upon the wood by the use of finishes which are not artistic and not practical for the service to which the furniture and trim woods are put.

The open grain of mahogany is best filled for period and conventional finishes with silex filler of very fine and fairly thin character. It is usually colored very dark with drop black and Vandyke brown ground in oil tinting colors. The wiping of the stain must be done with exceptional care to avoid clouding the very fine grain.

For the finest of finishes no filler is used. The wood is carefully matched as to grain and figure and is filled with a coat or two of very thin orange shellac which is rubbed close, resulting in the removal of all shellac except what lodges in the pores of the wood. White shellac ought never to be used on mahogany because in time it clouds the finish with a white mottled effect. Sometimes white and orange shellac are mixed for this filling. The slow hand-rubbed oil and French polish finishes require no filler of the paste type. As a matter of fact about all these finishing methods do is to fill the grain of the wood with oil, shellac or both by thin coats; they saturate the wood to considerable depth and that is why they are both beautiful and very durable, while at the same time allowing the natural markings of the wood to remain unobscured.

The best stains for making mahogany darker are the water stains which are the most transparent. They simply dye the wood fibre and do not fill or obscure any of the natural color shadings and figure markings.

The final finish on most mahogany wood used for furniture and building panels and trim is pale gloss varnish which may be hand polished to a high lustre in the case of furniture and cabinets and dull rubbed by hand for wall panels and other large surfaces which do not look well with a high gloss.

REDWOOD

California redwood is a tree of such mammoth size that it is awesome. Specimens three hundred feet high and as much as twenty-five feet in diameter have been found. This wood grows only in California and the supply is estimated as sufficient for one hundred and forty years to come at the present rate of cutting. Some of the trees are two thousand years old.

In many characteristics and uses to which it is put redwood resembles cypress. It resists fire and moisture. It does not rot. It is a soft wood of close grain and straight figure of great uniformity. It is a wood which shows very few knots and some panels six feet and more, wide are common because the trees are so large in diameter. Properly seasoned redwood does not shrink, swell or warp. It is a strong wood and a medium light one. In color redwood ranges from the lightest cherry to darkest mahogany. The grain figures are varied, too, from straight and plain to the curly figure of the stumpwood and roots.

Redwood contains a natural preservative substance which prevents decay and which gives it natural seasoning qualities.

With durable qualities which apparently are equal to cypress for all special and common purposes it is probable that redwood will be with us for centuries after cypress has been depleted in supply. Redwood is used for all common building purposes and many special purposes for exteriors and for most interior purposes, except perhaps for floors to any great extent.

Redwood takes all finishes well. In painting it permits the coatings to penetrate well and good paint proves remarkably durable on it. It is commonly said that there is no need to paint redwood for protection, since it is not injured by moisture and does not rot from fungi. Care must be taken not to paint this wood while it is wet, however. It absorbs moisture rather easily. The grain is free from pitch or resin.

When painting and enameling redwood on interior trim it should be

handled in the ordinary way except that any shellacing of knots should be done after the priming coat of paint is on and dry, not before painting. The same is true of knots on exterior surfaces.

Redwood may be stained and takes a beautiful finish with the browns, greens, red and gray. Penetrating oil stains are used on this wood as well as water stains. Some very unusual color effects can be secured on redwood which are peculiar to it and are artistic, indeed. A large number of special formulas for water stains for use on redwood have been developed.

No filler is required for this close-grained wood. A coat of shellac will usually fill the fine grain sufficiently for succeeding coats of varnish or wax.

CHERRY

Cherry

This is the wood of the fruit tree and while it was used rather more extensively in former years it never has been extensively used except for novelty effects, parquetry, etc., on fine furniture. The wood is close-grain and of very fine texture. It is a hard wood of a pinkish white color.

CHESTNUT

This wood is so near to oak in the appearance of the grain figure that few can tell the difference. It is a light weight, coarse grained wood. It is open grained, of course, and is very durable. Chestnut is little used for exterior building construction and not to any great extent anywhere. Its open grain doesn't absorb paint as readily as might appear. The paint doesn't seem to penetrate. Mix paint thin with a liberal amount of turpentine and brush out each coat, allowing plenty of time to dry. Chestnut interior trim may be stained attractively and a filler is required when varnishing.

BASSWOOD

This wood is also called linn and linden. It is a straight, close-grain wood, soft and compact in structure. Light in color and in weight and only moderately strong. It is used to a limited extent for building construction. Rather too soft. The painting of basswood is easily accomplished. It absorbs paint well, affording good anchorage and penetration. Owing to the very light color and absence of prominent grain figure in this wood, it is easy to cover and hide with white paint.

POPLAR

Poplar

The other names for poplar are whitewood and yellow poplar. Poplar has had extensive use for clapboards or weatherboard siding on the sides of residences, but cypress is taking its place in some sections. It is a soft, clear, close and straight-grain wood which is not very elastic. It shrinks little on being seasoned, and while it is light in weight, it is strong enough for the purpose. One of the easiest of woods to paint, it

has the ability to absorb paint, offering excellent penetration and anchorage for the paint. Not extensively used for interior trim but it makes an excellent foundation for white enamel finishes. It takes stain wtll but its grain figure is not very attractive.

CEDAR WOODS

Cedar

Several kinds of cedar are used for various purposes in different localities. White cedar is used for exterior building construction rather extensively in some sections. A wood of light weight, soft, brittle, close-grain and compact character. And of course all cedars are durable woods. The sapwood of white cedar is light in color while the heartwood is brown. An easy wood to paint because it absorbs paint well and offers good penetration and anchorage. Considerable oil is needed to satisfy suction. Use thin coats. White cedar takes stains well.

California and Oregon cedars are similar and are used for exterior construction. These woods are light in weight, soft, strong and durable. They are close grain and absorb paint well, offering good penetration and anchorage. At least three thin coats are needed and four coats of paint are much better in order to supply enough oil.

Red cedar is used in a limited way for exterior lumber and extensively for making shingles,the very best lumber for this purpose. Lead pencils are made from this wood. A light-weight, soft, close, even-grained wood which is not very strong. The sapwood is white and the heartwood is red. Oil of cedar is made from this tree and that oil is a paint solvent. So unless the wood is well seasoned this oil will likely destroy the paint coatings. Bed cedar doesn't absorb paint readily nor does it offer good penetration and anchorage. Paint dries slowly on it.

Washington cedar is considered a soft wood, but the trees produce wood which is both soft and fairly hard. This wood is very close grained but is light in weight. It absorbs paint rather unevenly. Thin coats well brushed out and with a little more turpentine than usual are needed. Allow plenty of time for each coat to dry.

CHAPTER XVI

BRUSH GRAINING

On some jobs of remodeling the matter of cost must be kept down to the minimum and for that reason the old painted, grained or cheaply finished trim, fixtures and often the furniture must be given a brighter color note and fresh look without spending much money on the refinishing. A job of real graining done by capable craftsmen costs quite as much as any first class finish. So brush graining is often resorted to to meet the requirements in all respects. Brush graining is really a process of staining on top of prepared, opaque grounds. The finished effect is clean, bright and attractive, without any attempt to imitate the grain and figure of any wood in detail, although the general color tone of other finishes are closely followed.

Brush graining is easy and very simple. A working schedule for the average job is as follows:

Operation 1: Prepare the old painted, grained or varnished surface as you would for repainting. That is, sandpaper it to make it smooth, clean and to remove the gloss.

Operation 2: Mix and brush on a ground coat to dry flat and tinted a color to suit the final color wanted. The paint may be a flat wall paint. The color may be any color wanted for novelty finishes but for conventional colors ivory white, cream or tan is best. Use a pink for a mahogany ground. If the old surface is light in color one coat may serve, but usually two coats are needed. All holes, cracks and bruises should be filled with putty after the first coat has been spread and is dry.

Operation 3: Any of the semi-transparent colors may be used. Those most often used are raw and burnt umber, raw and burnt sienna, chrome green and to make black for a gray finish, mix raw umber and ultramarine blue for use over a light gray ground color. Apply this coat with the usual four inch flat wall brush and while it is wet proceed with the next operation.

Operation 4: Stipple the wet stain color using an ordinary brush. Hold the brush like a hammer and pound the surface with the flat side of the bristles. Start at the top of the door or other surface and draw the brush down while stippling with it all the time. Don't coat in too large a surface at a time, since the stain color, when water colors are used, sets in a few minutes so it can not be worked any longer. If you fail the first time wash off the stain color put on and start over again. It is not likely that you will be able to produce a nice even stipple the first time you try, but keep on washing it off and repeating until you have a fairly even grain effect.

Operation 5: Grain streaks may now be put in while the stain color is still wet by taking an ordinary whisk broom and drawing it down through the color from top to bottom. This will uncover the light colored ground coat and give a contrast with the stain color which the whisk broom piles up in streaks which resemble in a general way the grain of woods finished in stains. When drawing the whisk broom down don't try to keep it moving in a line that is straight, wiggle the brush a little so as to produce a wavy grain in places.

Operation 6: Varnish, shellac or wax. When water color has been used for the stain coat it will be dry in half an hour or an hour so that you can coat it over with shellac, varnish or wax to make a serviceable finish. If oil color has been used for the stain coat it can be finished in

the same way but it should dry at least 12 hours before any coating is put on top of it.

CHAPTER XVII

DECORATIVE WOOD FINISHES BY GLAZING AND HIGHLIGHTING

PAINTED and enameled wood trim is finished with very interesting, artistic effects by glazing it much in the same manner as walls are finished with the glazing, mottling and blending methods. The object of this treatment is sometimes to give a novelty finish in vivid color effects, but more often it is done to subdue the color of the wood trim and to make it harmonize in low tones with walls, furniture and the general furnishings of the room. The work is simple to do, yet it requires the use of good taste both in the selection of the glazing or stippling color and the strength of the pattern put on to the wood.

Streaked Glazing. This finish is done on both wood trim and plaster walls of the smooth type, as well as upon furniture. The working operation is very simple but some good taste must be exercised in selecting the colors. As a rule, but not always, the walls and wood trim

are painted the same color, a light tint, mixing the paint to dry flat or semi-flat. When the ground coats of paint are dry and when the color is even all over, showing that enough coats of paint have been spread to hide the surface completely, you are ready to apply the glaze streaks. The effect to be produced is that of a very fine grained wood in which no figure or pattern is seen, only the grain.

Tinting colors are used for this glazing. Choose a color of the same kind as is used for the ground coat, but a little darker. For instance, for an ivory white or cream color ground coat, mix your glazing color with raw sienna and burnt or raw umber. Mix this color quite thin. Brush the thin glazing color on to a stretch of the surface and while it is still wet take a clean, dry, soft cotton rag, crumple it up into a wad and you are ready to begin the streak glazing of the surface. Start at the top and draw the rag down over the surface, bearing down just heavy enough to leave an even streaked color on the wood. The rag should not get wet with color at any time or it will not do good work to match the first stretch done. Change rags often enough to be using a comparatively dry one all the time.

When the surface has been uniformly streaked allow it to dry, preferably over night before it is finished with flat varnish, shellac or wax. One of these finishes is essential on wood trim to protect the color from being rubbed off.

Brush Stipple Glazing. Rather novel and interesting shading is done by stippling a light colored surface with the stippling brush, using a color which usually is the same as the color of the ground coats but a little darker. For novelty effects contrasting colors can be used, one or more, for the stipple coat.

The wood is painted or enameled as usual and when dry the stipple may be put on. If the work is to be finished with flat varnish, wax or white shellac after the stipple glaze the color used must contain the least possible amount of oil.

Mix the color quite thin and brush out a little of it on a board or newspaper. Then with a clean, dry stippling brush pick up some of the color from the board and proceed to stipple the surface. In the case of doors and other paneled surfaces the stipple color is usually run along the borders of the panels, leaving the centers untouched. Casings and other plain surfaces may be stippled all over or only on both edges, leaving the center untouched by the stipple color. No wiping is done in this work, the color is put only where you want it. When the color is

dry it may be left in that condition as finished, but it is better to at least coat it with flat varnish, thin white shellac or wax in order to make it more serviceable. When the stipple glaze is done over enamel the enamel should be rubbed dull first with pumice stone and water.

Antique and Old Ivory Glazing. In any decorative scheme the appearance of brand new shiny surfaces are a jarring note. Surfaces of furniture, wood trim, etc., are more artistic and more comfortable to live with when they have been mellowed by age and toned down a little from the glaring new effect. To gain this mellowed-with-age effect glazing is resorted to on new painted and enameled surfaces. The surfaces may be smooth, hard and polished, fairly rough or very rough as may be preferred.

The color combinations used may be any which are in harmony with the surface and its surroundings, but raw umber and mixtures of raw and burnt umber and raw sienna are often used for antique effects. Only the colors which are semi-transparent are used.

The surface to be glazed is built up in the regular manner with paint and enamel, and when dry and clean the glaze color is brushed on with a flat wall brush; the surface ground should be flat, not glossy. Usually the glaze color is brushed on over the mouldings, at the edges of the panels, in the corners, on the carvings, etc. It is very thin. As a rule no glaze color is put on to the center of panels and other places which are to appear very light as the highlights of reflections.

Sometimes the color of an entire paneled wall surface, for instance, is about right as near as the mixing of colors can make it, but still there is a raw, sharp appearance to the work which mars its beauty. In such a case the glaze coat is spread over the entire surface and is immediately wiped off with clean cloths. Just enough of the glaze color remains in the pores of the surface to take away that raw, sharp, new look which is objectionable. Sometimes the same method is employed to change the color hue of a surface a trifle by using a different glaze color,for instance, a brown surface-which is a bit too cold may be warmed up with a burnt sienna or other red glaze, a green which is too yellow can be benefited by a clear blue glaze.

As a rule the glaze color is brushed on only to the surfaces which are to remain shaded and as soon as it has set a trifle it is wiped off rather deftly with clean cloths, wiping more near the center of panels and t boards and on high projections of mouldings, carvings, etc., than elsewhere, leaving the glaze color in the depressions untouched or

stippled lightly with the wad of cloth or a stippling brush.

To produce old ivory the ground coats of paint or enamel are tinted with raw sienna and a bit of burnt umber to a light ivory color. When dry the surface is glazed about the mouldings, carvings, etc., with a glazing color. The ground coats in this case are usually rubbed dull with pumice stone and water, or they are composed of semi-flat drying enamel or full gloss enamel. In the case of full gloss it may be necessary to wipe over the parts to be glazed with a cloth wet with benzine before applying the color, so the color will take hold. When the color is on and has set a little wipe it over with clean cloths to remove the color from the high projections like moulding tops, carving projections, etc, leaving the color dark in the depressions.

When glazing some new painted or enameled surfaces it will be found necessary to make the glazing color so thin that there seems to be no staining ability left. Sometimes a glaze of varnish, turpentine and a little linseed oil and no color is sufficient to color the surface the little needed.

Rough Stipple Glazes. In the case of painted, not enameled, surfaces the rough stippled surfaces make far more beautiful effects. The ground coats of paint in this case are stippled in the regular manner with a stippling brush before the paint becomes dry. That eliminates the brush marks, distributes the paint better and leaves a surface pitted with tiny pores. The coat should be mixed thicker than is used for finishing with a brush in the ordinary manner and it should be mixed to dry flat. If a much rougher surface is wanted mix the paint in that manner and then just before brushing it on throw a handful or two of dry plaster of Paris in the paint. Stir it in to mix it only fairly well. You don't want it completely soaked up and mixed with the paint. When such paint is brushed on it may be stippled to a far rougher and more beautiful finish, than plain stippling of ordinary paint alone. Then if a very tough surface is wanted mix into the paint a few handfuls of fine screened sand and stir it well to mix the sand in the paint.

When one of these rough surfaces is coated in part or all over with a glaze color and wiped off the effect is very interesting. The glaze color may be one which is closely related in hue to the ground color or it may be one which harmonizes by contrast. One or several glaze colors may be used. A common method is to pick out, that is, color, the mouldings a different color than the ground and different than the general color used to gain the antique shading, or aged effect in the corners and depressions of carvings, corners, etc.

CHAPTER XVIII

REPAIRING DAMAGED FINISHES

AFTER producing a nearly perfect job of finishing on wood trim, cabinets or furniture the finisher sometimes meets with the great disappointment of having some other workers around the job damage the surface before the customer has accepted the work, or after. What to do in such cases is exceedingly valuable knowledge and marks a finisher as a professional when he can meet the emergency with skill. Sometimes in refinishing old surfaces the damaged places consisting of bruises, deep scratches, splinters, cracks, etc., are too deep or extensive to be eliminated by the ordinary stripping off of the old finish and sandpapering the surface. Filling and patching must be done. The following will be of great help in these situations, but of course the principal requirement is experience and practice in the work. What follows will give you the tools, methods and some suggestions to make a start with.

Furniture Repair Kits. There are on the market boxes or kits of tools and materials needed to do this sort of repair work on furniture. They are made for furniture stores, factory finishers, etc. One of these should be in the hands of every finisher. An excellent kit of this kind can be assembled by any finisher and should consist of the following items:

1 small camel hair artist's brush.

1 larger camel hair brush.

8 stain colors, spirit-soluble; one ounce of each of the following, black, orange, yellow, Bismarck brown (red), walnut, golden oak, green and methylene blue.

1 quart denatured alcohol.

6 or more filler sticks of the best quality in such colors as,light, dark and medium oak, walnut, mahogany, ebony, natural transparent, etc.

1 electric soldering iron such as is used for radio work.

1 pocket knife.

1 old table knife.
6 sheets of fine sandpaper, No. 00.

1 ounce fine pumice stone, FF grade.

1/2 bar yellow soap.

1/2 pint pure white bleached shellac.

1/2 pint polishing wax.

1 pound cake of paraffine wax,

1 pint turpentine.

Clean wiping rags

Dents and Bruises on Unfinished Wood. These can be so perfectly repaired before finishing that they will never be found. . The first thing to do is to wet the dented or bruised spots with water. Let the water

soak in a bit. Then take the point of a sharp knife and heat it until it is red. Stick the hot knife into the wet spot about an eighth of an inch repeatedly but between different fibres of the wood each time. Be careful not to hold the hot blade in the wood so long as to burn the fibres. Don't get the blade too hot. The steam thus produced will swell the wood fibres until they level up with the surrounding surface. Let these repaired spots dry thoroughly, sandpaper and clean up and the surface is ready, for finishing in the usual manner,

Dents and Bruises on Finished Wood. When the finish has not been broken but the wood has been depressed it can often be raised again to a level by treating the spot with heat and cold repeatedly. If the finish is shellac the heat should not be raised above 100 degrees, but varnish will stand 120 degrees. A felt pad should be placed over the injured spot and a hot flat iron should be placed on it for ten or fifteen minutes. Then wrap some crushed ice in a cloth and place it on the spot for about the same time. A water bottle of rubber is best for the ice treatment. Repeat this heat and cold several times and it usually will cause the compressed fibres to raise back to their original level. If this fails there is nothing to do except to scrape off the finish and raise the wood with steam by placing a damp cloth on it with a hot flat iron on top. Then refinish as suggested elsewhere in this chapter for other repairs. Keep a close watch on the hot flat iron however it is used so it will not damage the surface around it.

Blisters of Veneer Wood. When the glue under veneer lets go and the thin plywood blisters up it can often be secured back in place by heating the old case knife blade and rubbing it over the blister repeatedly. If the blister is near the edge of a flat board lift it up and insert a thin coating of first class wood glue with a flat stick, knife or toothpick. Then clamp the veneer down or place a board on it with a heavy weight on top for at least 12 hours. The glue alone without the clamp or weight will not hold it.

Chipped Wood, Knot Holes, Deep Splits, etc. Sometimes these defects and others caused by nails and deep scratches must be repaired in old or new surfaces. The first step is to take a sharp knife and clean out the damaged space so as to remove all splinters and loose wood fibres. Such loose wood fibre will take a stain darker than solid wood and will prevent getting a perfect job if not removed. Have the hole clean and smooth coat it with a stain mixed to match the old or new finish to be put on in color but make the stain lighter than the new or old color. You can never strike it just right in color because the subsequent coats of shellac, wax or varnish will darken the color. So

make it too light and then you can darken the coats to follow and repeat them until a perfect color match has been made.

When staining use the camel hair brush. Put on a thin coating first and let it dry. If too light, apply another coat and repeat as often as is necessary, keeping the color lighter always than the finished surface. If the damaged place is shallow like scratches it can be built up by repeated coats, letting each one dry, until the surface is level.

When dry a repair made as above should be rubbed by coating it with a mixture of FF pumice stone and paraffine oil, sweet oil or light sewing machine oil. Use a soft piece of felt to rub with. Rub this repair in the same direction as the original rubbing was done on old finishes. Don't rub much. Wipe up the surface clean often to inspect it, For a final rub on a real dull finished surface use the oil alone on the palm of the hand. If a highly polished surface clean up after the rubbing with the oil and polish to a good gloss with a soft flannel cloth. In the case of large panels, cabinet and table tops it is well to rub the entire panel to make a better match.

In this sort of repair work on the weathered and mission finishes which are finished without filler and with open pores care must be taken to mark the filling coats with the knife so that it matches the surrounding surface. Only about half as much shellac can be used in the stain coat on these surfaces. The marking of the pores or grain may be done with a dull table knife or a small screw driver. At any rate don't make a solid, smooth filling in a surface which is broken up generally with pores. You have practically got to draw the pores and grain marks on the filling you put into scratches, especially those across the grain. After making a repair on such a surface, coat it with wax and rub to a hard luster to match the surrounding surface. Often it is well to rewax the whole panel or board.

Deep holes, chipped-out places and large cracks must be filled on new or old wood with filler sticks. Filler sticks are made in more than fifty colors and you can get color cards from the manufacturers showing just what is available. The cheaper grades do not work right. Good sticks will not gum up or soften when sandpapered, the cement can be rubbed and polished and it will not only remain tenaciously in the hole or crack but will not chip or crack.

To make this kind of a repair clean out the hole, removing all loose splinters as before. Then with the electric soldering iron melt the proper stick into the hole to completely fill it, but don't put in any more

than is necessary to level it with the surrounding surface. A second filling can be made and any excess put on can be cut off with a sharp chisel or knife. Also the filling can be finally smoothed and leveled with sandpaper. It is best to stain the hole and the wood around it before filling, using a stain of the same color as will be used for finishing the whole surface, but a little lighter. Let the stain dry before filling with cement. The cement filling will dry immediately but can be smoothed out with the hot blade of the table knife or a small spatula. The cutting down with a sharp chisel and with sandpaper must be done after the cement has set, of course.

After the repair filling has been put into place and finished as level and smooth as possible mix a stain for the whole surface and finish as usual if a new surface. If it is an old surface mix your stain, blending and matching colors and applying coat after coat until the exact match has been made with the old surface. Apply the stain deftly and a perfect job can be done.