

Notes on Finishing

Avoid the unseemly rush to glue up

by Ian Kirby

Compared to the paucity of attention given to the preparation stages of woodworking, a plethora of technical data is available about various wood finishes. Despite this, many otherwise fine pieces of work are spoiled at this final stage. Finishing problems seem to create as many problems at the end of a job as bad preparation of wood creates at the start.

Everybody seems to understand the need for extreme care and discipline when cutting joints and fitting pieces together. Yet when it comes to the finishing work, the time needed is usually underestimated. Then the urge to get the piece put together for the last time often overrides the need to assemble and finish in a considered sequence and under careful conditions. Ironically, an undignified rush to glue up before everything is absolutely ready inevitably requires substantially more time for finishing than would otherwise have been the case, and the result can only be less than acceptable.

This is not another article about wood finishes as such. It is an attempt to make a few points, which in my experience seem often to be forgotten at the finishing stage.

Cleaning up, applying a finish and assembly are all related parts of the finishing stage. The most common error is not to see them as such, especially where assembly is concerned. People glue together full or part assemblies and forget that it is far easier to clean up a piece of wood when it is separate from any other than to clean it up when it is glued into an assembly. Where two or more pieces come together at right angles to each other as in, say, a frame, it is virtually impossible to plane the inside surfaces or even to sand them properly without considerable frustration and sometimes taking the skin off the knuckles. Even when one is prepared to make this sacrifice, it remains impossible to reach right into the corners and a good crisp result simply cannot be achieved. It is also difficult to apply finish, at least by hand methods, to inside surfaces.

In general, it is best to prepare the surface for finishing with a minimum amount of sanding. The best finish comes from wood that is carefully smooth-planed, then sanded lightly (if at all) with 220-grit paper. This is particularly true when working ring-porous hardwoods, which may have considerable variation in density between earlywood and latewood. Excessive sanding cuts down the harder tissues in each growth ring, and depresses the soft tissues. As soon as the finish hits the wood, the compressed soft tissue springs back and the surface may become quite rough.

Once the piece is ready to go together, a sequence has to be worked out for each particular job, along the following lines: All inside and subsequently inaccessible surfaces should be planed with a very sharp smoothing plane and sanded lightly with fine garnet paper. Then they need to be dusted and given their full, final finish. Great care must be taken not to contaminate the surfaces to be glued during assembly, since the finish would prevent adhesion. Nevertheless it is neces-

sary to apply the finish right up to the part to be glued.

Doing it this way saves time and energy and ensures high quality. Other benefits also accrue. During assembly glue inevitably will squeeze out from the joints, leaving beads and dribbles on the work. If the surface of the wood is polished these can be, indeed should be, left strictly alone to cure. Resist the strong temptation to wash or scrape them off immediately. Once they have cured they will simply fly off when the edge of a chisel is eased gently under them, leaving no trace or mark. Had the work not been polished, the glue would have penetrated the wood. Even if an attempt had been made to wash it off immediately, some would have still entered the surface tissue of the wood, since washing only dilutes the glue and increases its rate of absorption. If the wood is cleaned up before assembly but not polished, the squeezed-out glue will have to be chiseled off. This can only result in damage to the surfaces, in precisely those places inaccessible to cleaning-up tools. Further, the residual glue on the surface of the wood forms a barrier to polish applied over it, and shows up as an unsightly mark about which little can be done.

These considerations don't matter with surfaces on the outside or accessible to planing after assembly, because they won't yet have been cleaned up. Indeed, it would be unwise to smooth-plane such surfaces before assembly, as they are often scuffed and dirtied while the piece is being put together.

Why finish?

Wood finishes have to cater to at least five requirements: 1) to keep dirt out of the wood; 2) to prevent degrade of the wood surface as a result of abrasion and heat; 3) to produce visual and tactile qualities; 4) to bring out the colors in the wood, and 5) to slow down moisture exchange with the air.

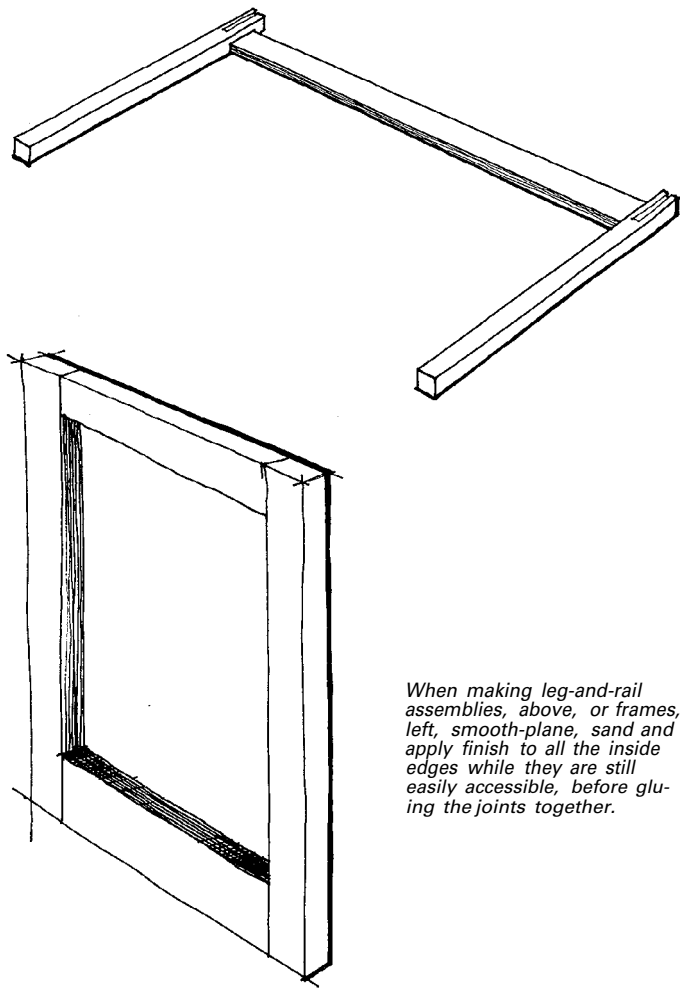
I don't intend to go into great detail about all the different finishes available nor to describe the merits or debilities of each, relative to these five requirements. Indeed, a full accounting would require a lengthy excursion into exotic chemical technology. The point I do want to emphasize is that no one finish can be regarded as best, separate from the specific requirements of the job at hand.

In all but the most stringently clean conditions, wood will be degraded through discoloration from dirt, unless the finish provides a barrier. If it were not for the fact that wood absorbs debris from the atmosphere and through direct contact, it would need no finish at all.

The second requirement, to prevent degrade of the surface, is related to the first. But here I have in mind potentially more harmful agents such as physical and chemical abrasion and wet and dry heat. The degree to which such degrade can be repaired is a factor to weigh against the longevity of any finish that is not easy to repair.

The available choices of visual and tactile qualities are determined primarily by whether the finish resides in the wood, such as waxes and oils, or on top of its surface, such as lacquers and varnishes. This is a decision about texture. Once this decision has been made, the maker must choose the degree of gloss the surface is to have. The range from gloss to matte is narrow with waxes and oils, but very broad with varnishes and lacquers, from totally matte to mirror glossy. However, the choice is determined by the manufacturer—there is little a maker can do to transform a glossy varnish into a matte finish, and vice versa.

It has to be stressed that in touching a piece that has been



lacquered or varnished, one is not in contact with the wood at all, but with the film lying over it. The number of coats of varnish or lacquer also affects visual and tactile qualities. Two light coats of varnish put directly onto the natural wood leave an open finish, in contrast to the full finish achieved by first filling the grain and then creating a build with a number of coats, each one being cut back before the next is applied, and the final one polished.

The fourth requirement, that of bringing out the colors in the wood, is often regarded more from an emotional point of view than from a practical one. For while some finishes do accentuate the visual characteristics, usually by differentiating light and dark features, others can discolor the wood far more than one might wish. Staining is a complete topic in itself, but it ought to be said that in the main it kills the visual qualities of wood, making it bland and lifeless. So much of the furniture one sees is adulterated in this way, and it's sad that so much beauty is stained away for spurious reasons.

The principal spurious reason for this state of affairs is usually given as economy. Manufacturers take wood randomly from the pile and cut whole sets of furniture "en suite," in whatever manner wastes the least, and then employ men to stain it all to uniformity. The public has come to expect walnut or maple always to have the same color it does in the furniture store. It probably would cost the industry less to employ a man to select the lumber at the start, as does a maker working alone, according to subtle variations in color

and figure. The saving in finishing materials would offset any additional waste in cutting. And despite industry's perception of the public's expectations, most people—once they are given the chance—quickly come to relish the juxtaposition of heartwood and sapwood on a surface, and the beauty of the wood in all its color and variety. Indeed, this is a part of what gives custom furniture its quality. I never use stains, except when matching new parts to old in repair work.

Generally speaking, the visual qualities and certainly the tactile qualities of the wood are best brought out by the finishes that reside in the surface. However some light woods such as maple and sycamore tend to turn yellow, and lacquer or varnish inhibit this better than wax does. It is always a question of weighing one factor against the other.

Finally, no finish will prevent wood from taking up or losing moisture as the humidity of the atmosphere varies with the seasons, nor as a consequence from shrinking and expanding. Finishes do, however, provide an effective barrier against sudden changes in relative humidity and in this respect varnish or lacquer offers the most protection. This is also why all wood surfaces, both visible and invisible, should be finished in top-quality work.

Varnish and lacquer

Most people are aware of the advantages of varnish or lacquer over oils and waxes when it comes to protecting horizontal surfaces against wet and dry heat, and chemical abrasion. The tendency is, however, to think of on-the-surface finishes as entirely appropriate in all other situations, irrespective of whether the work is likely ever to meet harsh conditions, and in spite of the fact that varnish and lacquer have disadvantages in other directions, when compared to wax and oil. Also, there is no reason that one must apply the same type of finish to every part of a piece. For instance, a vertical surface rarely needs to be highly resistant to the wet and dry heat or chemical abrasion that a horizontal surface is liable to encounter. The tabletop clearly needs protection, while the apron and legs usually do not. Also, because of the way light and shadow work, we rarely see the same effect from a horizontal surface as from a vertical surface. There is no reason why they shouldn't be finished differently, to capitalize on the combined advantages of a variety of finishes.

I have used the terms varnish and lacquer together to refer to on-the-surface films. This is because there is tremendous confusion about just what each word means, aggravated by advances in chemical technology over the last 50 years. A century ago, each town or locality had its own paint maker who mixed varnish according to his own secret recipe. Usually the base was boiled linseed oil, with the addition of various gums, resins and dryers. The same preparation became paint with the addition of whitening and pigment. Such preparations were soluble in oil, turpentine and mineral spirits. The original lacquer, on the other hand, was shellac, prepared from the resinous deposits of the lac insect and soluble in alcohol. But things changed soon after the turn of the century with the development of nitro-cellulose lacquer, and since then with the creation of a veritable flood of synthetic resins.

Manufacturers first introduced these synthetic resins into existing varnish and lacquer mixtures. But chemists quickly developed more sophisticated, and more highly reactive, preparations that required new formulations. Most began as two-can products which the user had to mix, but people are

notorious about experimenting with directions and the resulting disastrous finishes forced the chemists to devise single-can preparations that polymerized upon contact with oxygen or moisture in the atmosphere or by internal catalysis. The result today is a profusion of clear wood finishes, marketed under the familiar old names of varnish and lacquer, but containing few of the original ingredients of these materials.

This is a case where big is better, since the research that goes into a modern finish is extraordinarily expensive, and so is the factory required to produce it. Indeed, most synthetic resins are made by a few large firms and sold in bulk to smaller producers of paint and varnish. These resins are vastly better than the products they have replaced, but they ought to be applied according to the directions on the can. Many furniture makers begin with commercial varnishes and mix their own oil-varnish preparations, according to experiment and intuition. It's possible to achieve good results this way ("Oil/Varnish Mix," Spring '76, pp. 46-47), but I never do it. I don't think I can match the research facilities of DuPont or Farben, especially when the label usually doesn't even tell precisely what is inside the can.

Most lacquers and varnishes may be sprayed on, but they can be applied with a brush or rag. If they are being applied to a veneered surface where the veneer has been bonded with white or yellow glue, it is always best to apply the first coat sparingly with a rag to form a seal, because an excess of lacquer may seep through the veneer and attack the glue line, resulting in blisters. I don't mean to dilute the preparation, but to rub a little of it over a large area. Once the grain has been sealed by the first coat, which must be abraded to denib the surface, subsequent coats should be applied sparingly and quickly without too much brushing in. Each coat should be allowed to flow out and left to cure.

One hazard to a glossy lacquer or varnish finish is floating dust from the air. The best way to avoid the problem is to work in a dust-free finishing room. Without such a room, one can guard against dust fall-out only by scrupulous cleanliness. Clear all the tools and debris from your bench, sweep well, and cover the bench top with a piece of clean plywood. Have nothing on the bench but the tools and materials you need for finishing. Apply finish to the furniture parts and lay them out flat on the plywood, then block up another piece of plywood over the work, as an umbrella against falling dust. If despite these precautions you do get dust in the finish, then you will have to sand out the offending spots with fine, worn paper and refinish.

Many makers attempt to turn a gloss finish into a matte finish by sanding or rubbing with steel wool. This scatters the incident light by abrading the top surface of the finish. The scratches are large at first, but the more rubbing the finer the scratches and the glossier the surface becomes. A glossy finish dulled with steel wool or pumice and oil will soon become shiny again under the normal abrasion of routine household cleaning. If you want a matte finish, buy a matte varnish or lacquer. These products contain stearates in suspension, which scatter the incident light by their presence throughout the film.

Wax and shellac

A wax finish gives, in the main, excellent visual and tactile results. It protects well against knocks and physical abrasion and is very easy and fast to apply and repair. It is entirely suit-

able for vertical surfaces in most situations. The quickest and easiest way to achieve a good finish is with a coat of shellac to seal the wood, followed by wax, for polish. An equally good method is to finish with oil, or with oil followed by wax, although the speed of drying and ultimate curing is considerably longer than with wax and shellac.

While lacquers and varnishes are bought as prepared products with full data sheets and instructions, the best furniture wax is made up in the workshop from beeswax. Beeswax is the basis of most commercial furniture waxes, although it is often adulterated with paraffin wax and other substances. I use the word "adulterated" advisedly, for often the proportion of beeswax to other substances is very small in name brands. A good mix can be made quite easily from a block of pure beeswax grated with an ordinary household grater or pared with a wide chisel. Put the chips into a wide-necked container, that is, wide enough to get your hands in, such as a large mayonnaise or peanut-butter jar. Pack them loosely and add pure turpentine to half the depth taken up by the chips and set aside to dissolve. This will take about 24 hours. The final consistency should be that of soft butter just before it melts into oil. If it is too thin add more wax, or if too thick, more turpentine. When stirring, take care not to splash because, while it won't damage the skin, it can be very painful in the eyes.

Store the mix in the same wide-necked vessel with a lid, to prevent evaporation of the turpentine and hardening of the wax (although if it does harden, it can always be softened

again by the addition of a little more turpentine).

Additives can be used with this sort of preparation, but it is questionable whether it is worth it in the long run. Carnauba wax, which is added while heating the mix, results in a wax that finishes out harder than beeswax but becomes more difficult to use. Drying can be speeded by the addition of up to 25% gasoline, but the easiest and safest way is to use pure beeswax and pure turpentine. Incidentally, if you heat this wax up, you should use a hot water bath or double boiler.

Before waxing, apply an initial sealing coat of dilute shellac with a large, soft brush called a "mop" or with a "mouse" rubber. A mop is a round, squirrel-hair brush about 1½ in. in diameter, and it is best to keep it right in the shellac, suspended through a hole in the lid. The diagram shows how to make a mouse. Its advantage is that while it has a substantial reservoir of liquid, it allows fine flow control according to the amount of pressure exerted by the fingers. You can obtain a more even coat than with the brush. Only one application of shellac is necessary, to act as a barrier to inhibit the wax from penetrating the wood so deeply that it eventually disappears. If the ground of shellac were not there, it would take very much longer, and more wax, to finish the surface. The best is pure shellac dissolved in wood alcohol, rather than a commercial preparation that also contains polymerizing agents, rapid drying agents or gums. Shellac dries rapidly anyway, and you don't want to achieve a build.

Apply the wax with either a rag or brushes. The brushing method, all too infrequently used, is very similar to shining shoes or horse tack, in that two brushes are used, both of which need fairly soft bristles. Whether the brush or rag is used, apply the wax across the grain in circles to get an even, light spread, then make the final strokes with the grain.

A common mistake is to apply too much wax, leaving a deposit on the surface, on the false assumption that it will harden and disappear into the wood. The result is a sticky, uneven surface that is very difficult to level. Two or three light coats of wax are much better than one heavy one.

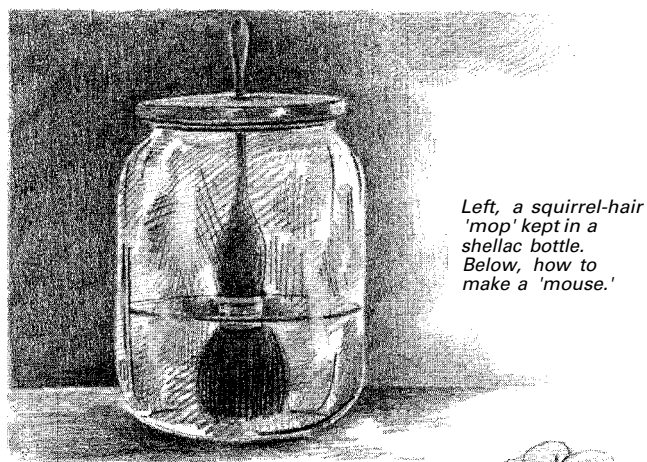
Oil finishes

Oil is also a sound finish in itself or as a base for subsequent waxing. Oils for furniture are usually based either on linseed oil to which polymerizing agents have been added, or on synthetic resins with hardeners added. These latter oils are often referred to as "teak" oils or "Danish" oils but this should not be taken to mean that they are used only on teak or by Danes. They can be used on any wood where the main concern is to protect and enhance the visual and tactile qualities.

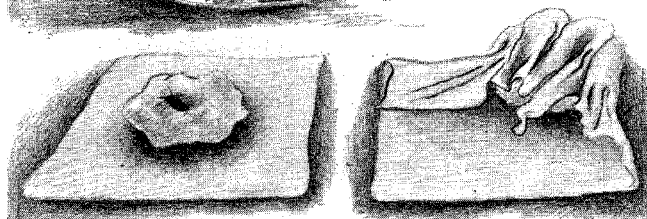
Oils do, however, present more problems at the pre-gluing stages because they are highly fugitive—it is easy to contaminate gluing surfaces with oily fingers or with a touch or drip from the rag. Great care must be taken to avoid the risk of poor adhesion due to oil contamination. Also, because of its volatile nature, oil tends to creep along the grain, which makes working up to joint lines more of a risk.

It is the maker's responsibility to advise customers about the finish, its expected performance and daily care. For your own protection and reputation, this should not be merely verbal. A printed sheet giving all the information necessary should accompany the delivered furniture. □

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Left, a squirrel-hair 'mop' kept in a shellac bottle. Below, how to make a 'mouse.'



A square of cotton cloth is wrapped around a wad of cotton batting a little smaller than a tennis ball. Finishing material is poured in, and the cloth is folded and twisted around. Hand pressure controls the flow onto the wood.

