

The
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THEIR USE AND



APPLICATION

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The Band Saw and Jig Saw

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**A
Comprehensive Handbook
on
Uses and Applications
of the
BAND SAW
and
JIG SAW**

*Containing over
100 photographic illustrations
and line drawings*

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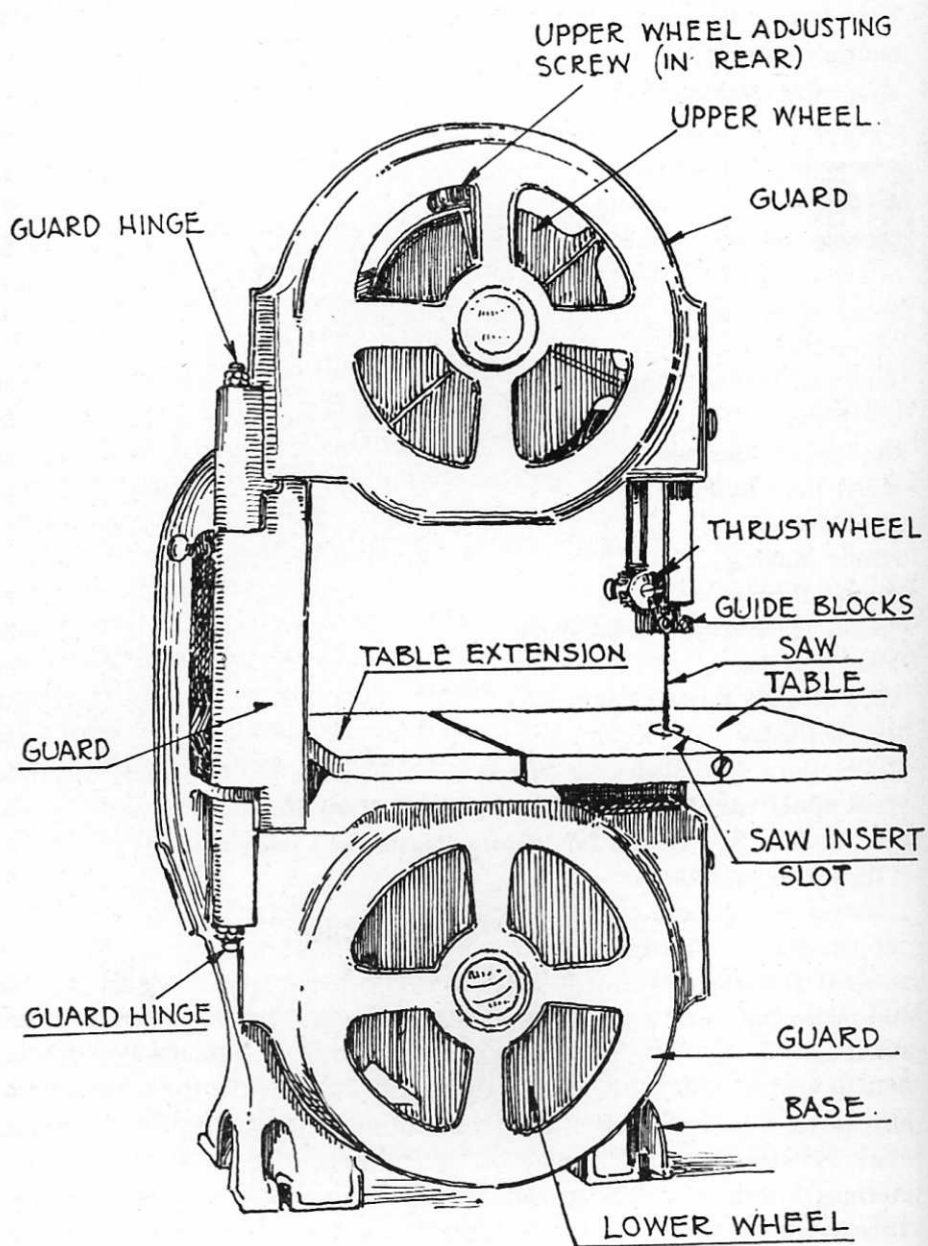
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BOOK ONE

The Band Saw



THE band saw, with its ability to cut all manner of curves from heavy lumber to thin plywood has always been one of the most essential machines in the woodworking shop. It is practically impossible to do the work that a band saw handles quickly and accurately with any other tool either hand or power operated. Only in the last few years has the small band saw been available for the home workshop enthusiast. At the present time there are several band saws available at unbelievably low cost, compared to the prices one had to pay a few years ago. For around twenty-five dollars one is able to purchase a machine that will not only stand up under hard, continuous usage but will do all the work that the more expensive machines of fifty to seventy-five dollars used to do. Not only have these modern machines been designed to insure ruggedness and long continued service, but the number of adjustments and the mechanism has been cut down to a minimum, so that a man need not be a thorough mechanic in order to adjust and operate one of them.



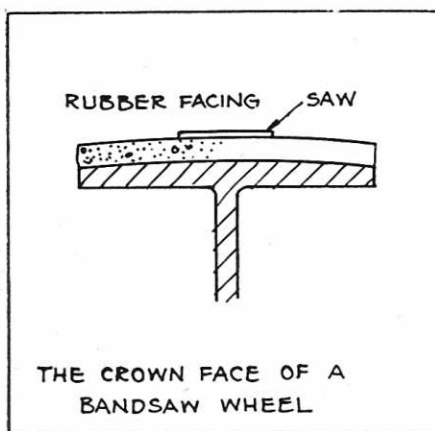
Points of Construction

The first requisite of a band saw is a heavy substantial frame that will not vibrate under continued running and cutting of either light or heavy wood. While vibration is not always detrimental to the machine, it is a decidedly aggravating feature and does not lend itself to accurate and smooth work. For this reason it is advisable for the prospective purchaser of a band saw to pay particular note to determine whether the table or the frame vibrates considerably, even though the machine may not be bolted down to the table.

Bolting the band saw rigidly to a substantial table or bench, helps greatly to eliminate vibration, yet in a properly designed machine, the table or frame should not vibrate under fairly heavy cuts, even though the machine is not bolted down.

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Design of Blade Tensioner is Important



Another point of importance is the type of device for adjusting the blade to run true on the two wheels. On most of the present day machines the wheels are balanced and centered properly, and arranged with a crowned face; that is, a face wherein the center of the rim of the wheel is higher than the outside edges. It is a well-known fact that a flat belt running over a wheel or pulley will creep

to the highest point on the surface of the rim. This same principle is utilized in the band saw. The crowned rims cause the endless blade to travel at the center of the wheel rims. Most band saw wheels are faced with rubber bands to prevent dulling of the saw which would occur were it to run directly on a metal surface.



Changing the Tracking of a Blade

To facilitate changing the tracking of the blade, the average machine is made with the upper wheel tiltable as well as adjustable up and down. Mechanical adjusting screws are usually included by which very close and accurate tilting of the wheel may be accomplished. Not the least in importance are the bearings on which the two wheels revolve. The ones most commonly used are the bronze sleeve and the ball-bearing types. Some of the latest models have ball-bearings of the sealed type. These bearings are lubricated when they leave the factory, and require little if any attention for a long period of time. The sleeve bearing machines ordinarily have grease cups or oil cups. Be sure to supply plenty of oil or grease at these points if you expect your machine to continue to run true and be free from vibration.

The next point of importance in a band saw is the method of guiding and supporting the blade both above and below the table, to insure its running true and at the same time to prevent it from twisting under the side pressure exerted when cutting around circles or attempting to follow a straight line. In following a

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straight line, particularly if the blade has become slightly dulled, it is almost impossible to prevent the blade from following the softer portions of a piece of wood and being deflected by the hard portions of the grain. This is especially true of the thinner gauge saw blades (of the sizes No. 26, 28, or 30 gauge). To direct the blade and keep it traveling on a line, guides are placed above and below the table. This guiding equipment on most modern band saws consists of a pair of block steel guiding pins which are arranged one on either side of the blade. They are adjustable and support the blade on both sides. In addition there is usually incorporated what is known as a thrust wheel which is set behind the back edge of the saw and is adjustable at the front or back to bring the saw to its proper depth between the block steel guides. Approximately the same type of support and thrust wheel arrangement is used underneath the table as above. The adjustment of both the guide and the thrust wheel is very important to prevent damage to the saw teeth and to insure accurate and smooth work. The upper guide assembly is adjustable up and down so that when sawing thin stock it may be lowered to a point just above the stock. It is raised when thicker stock is sawed. At all times the upper guide should be as close as possible to the stock being sawed.

The table should have a slight adjustment front and back to allow it to be properly leveled in relation to the saw. This latter adjustment is usually taken care of in the casting and mechanical assembly underneath the table, and by means of which the table itself is attached to the main casting. The tilt of the table to the left may be as little as 5° and is only for the purpose of trueing up the table with the saw blade. The tilting of the table to the right is usually arranged so as to allow up to 45° for certain types of band sawing which will be taken up later.



Installation

The band saw should be rigidly bolted to a substantial bench or stand and so arranged that the height of the band saw table is about 42" to 44" above the floor for the operator of average height. This distance will be altered, of course, to suit the requirements of taller or shorter operators. If the operator will stand in an upright position and bend his left arm at the elbow, and then measure from the under side of the elbow to the floor,

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he will arrive at a table height which he will find is the most convenient and least tiring.

The band saw should be so mounted that a plentiful supply of light will come either from behind the operator or along the side of the saw frame. Adequate light should be directed at the point where the saw is entering the wood.

The location of the machine in the shop is also important. Time will be saved if the band saw is installed somewhere near the left end of the cabinet work bench. When placed in this position it is one of the most convenient machines to have around the shop, since it will lend itself readily to cutting small blocks and trimming up pieces of wood, making small gauges and stop blocks as well as the regular work of cutting curved lines.



Operating Speeds

The speed of a band saw blade should be from 1500 to 2000 feet per minute. On a 12" band saw this would mean that the wheel itself should revolve at about 550 to 700 R.P.M. It is not advisable to run a machine faster than 700 R.P.M. since the increased friction and consequent heat at the guide blocks tends to burn the blade and cause undue blade breakage, not only at the point of brazing but at other points as well. On a 14" band saw, the wheel should revolve at from 500 to 650 R.P.M. with the most ideal speed at about 550 R.P.M. On a 10" band saw the revolutions per minute may be from 600 to 800 R.P.M., with the ideal speed at around 700 R.P.M. Theoretically, the speeding up of a band saw should speed up its cutting capacity, but due to the loss of power and the additional unnecessary friction caused at the guide, one finds that this is not so. If the ideal speed is maintained, the saw will not only cut as fast as desired but will also do very clean and creditable work.

The speed with which the stock can be fed depends on the sharpness of the saw, the thickness of the stock, and the skill of the operator. Ordinarily, the speed of the stock will be as fast as the saw can cut without undue pressure against the thrust wheel behind the saw. The exact adjustment and function of the thrust wheel will be described further on.

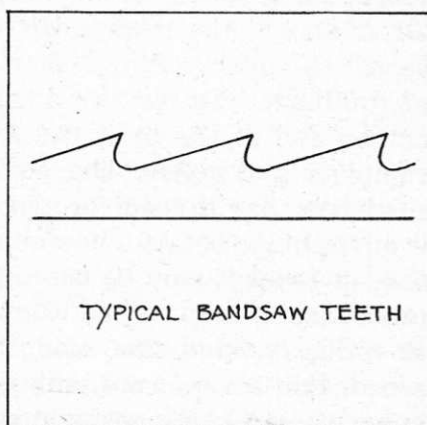
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Sharpening a New Blade

Because of the comparatively low price at which band saw blades may be purchased today it might seem inadvisable to cover the sharpening of them. Yet some operators find that even with a brand new blade, if one or two light strokes of a file are taken over each tooth, that the blade will cut much cleaner. Also that any tendency of the blade to creep to one side or to deviate from a straight line will be eliminated. The band saw is supposed to cut a straight line, and this line of cut should be parallel to the side of the table. Quite frequently the operator may find that the saw will cut a straight line but that this straight line is at an angle to the side of the table. The fault in this particular case is usually in the saw itself, indicating that it needs resharpening. When the ordinary band saw blade is manufactured, it is filed by machine and this filing is usually done in one direction only. This means that there will be a certain amount of wire edge projecting on one side of the saw. It is this wire edge which causes the saw to creep in the direction of its sharpest side. The only remedy in this case is resharpening of the saw, which, while it takes a little time, is not an arduous task.

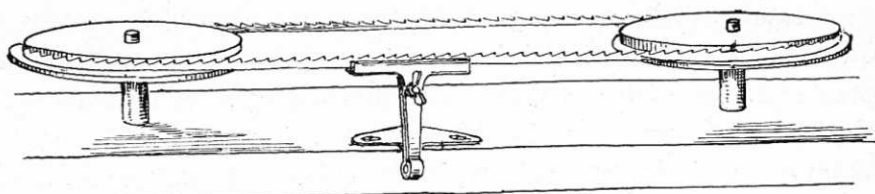
In the sketch is shown the shape of a tooth on the average band saw blade. Note that there is a slight undercut to the front of the tooth which is slightly different from the regulation rip saw tooth. Outside of this deviation it is a rip tooth pure and simple. On practically all of the standard band saw blades the teeth should be filed straight across the blade. For the average run of woodwork a blade of from eight to twelve teeth per

inch is usually chosen. In counting the number of teeth per inch, remember that there is always one more point than there are teeth. For instance on a 10-tooth blade, the distance between teeth will be one-tenth of an inch, but there will be eleven points to the inch.



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How to Make a Homemade Blade Sharpener



TYPICAL SET-UP FOR FILING BANDSAW BLADES

In the sketch is shown a home-made arrangement for sharpening band saw blades. Note that the whole outfit consists merely of a board on which to rest the balance of the blade while the portion that is in the clamp is being filed. An ordinary metal-worker's vise may be utilized for clamping the saw, providing the unclamped portion is supported in some way to hold it in a near horizontal position. Extreme care must be used in handling the blade to prevent its getting "kinks" from undue twisting strain.

While filing the blade it is clamped between the jaws of the vise in such a manner as to allow slightly more than the full tooth to project above the vise jaws. With an ordinary three-cornered saw file, take one or two strokes straight across the tooth, filing every other tooth all the way around the blade. After doing this, reverse the blade by turning it inside out and repeat the process filing every other tooth from the opposite side of the blade. You will find that it is only necessary to take one or two and at the most three strokes of the file in order to accomplish a complete sharpening. When a blade gets in such condition that it requires more than three or four file strokes it is advisable to obtain a new one. After a blade has been sharpened once or twice it may be necessary to reset the teeth. If the same procedure is followed as would be used for setting the teeth of an ordinary hand saw, using the same type of saw set, one can accomplish a very creditable job. There is this point to keep in mind when a blade needs sharpening: if you do not wish to do it yourself, you will find that the cost of having the job done by a regular mechanic is almost, if not as much as, the cost of a new blade. In fact the cost of new blades is so low that it hardly pays to have them resharpened. This is particularly true with the smaller types of machines, such as the 10" or 12".

The gauge, or thickness, of the metal in a band saw is im-

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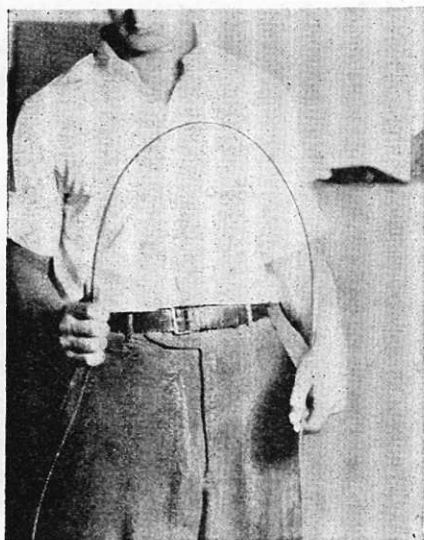
portant. For continuous, heavy work it is advisable to secure a blade of 23 or 24 gauge thickness, while for the average run of light work around the home workshop, a gauge of 26 or 28 is sufficient. In selecting a blade for a particular type of work the operator should use the widest saw that he can, and still be able to get around the smallest curve in the particular piece of work that he is cutting out. Remember that it is always easier to follow a straight line with a blade of $\frac{1}{2}$ " width than it is to keep on the same straight line with a blade only $\frac{1}{8}$ " in width. This is due to the fact that the $\frac{1}{2}$ " saw will have more bearing surface behind the teeth, against which the stock may be guided. Then again, it is unwise to use a $\frac{1}{2}$ " blade to cut circles having as small as a 2" radius since this causes considerable strain on the blade, trying to force it to go around such a small curve. Such manipulation is not only detrimental to the saw blade itself, but also throws undue wear on the saw guide, and unnecessary strain on the guide assembly. For the general run of work around a home workshop or small wood working shop a $\frac{3}{16}$ ", a $\frac{1}{4}$ " and a $\frac{5}{16}$ " or $\frac{3}{8}$ " blade will be found sufficient. For heavier types of work such as resawing boards to thinner dimensions and for sawing heavy lumber, a $\frac{1}{2}$ " band saw blade is recommended. When a band saw blade has been removed from the machine, it should be carefully coiled and hung up out of the way where it will not be injured by other metallic objects. It only requires a slight blow to throw some of the teeth out of alignment. A single tooth projecting beyond the others will not only cause the saw to deviate from a straight line, but will also cause a roughing of the edge being cut.



How to Coil a Blade

The coiling of a band saw blade is a rather tricky operation and hard to explain but it is hoped that through the medium of the photograph and the attendant explanation, that this trick may be readily learned. First grasp the blade in the left hand, with the teeth uppermost and the left hand thumb on the upper edge resting on the teeth. The right hand should be placed so that the thumb is on the underside of the blade or the back of the blade and in such a position that the thumb points toward you. The left thumb should point away from you. Now with a

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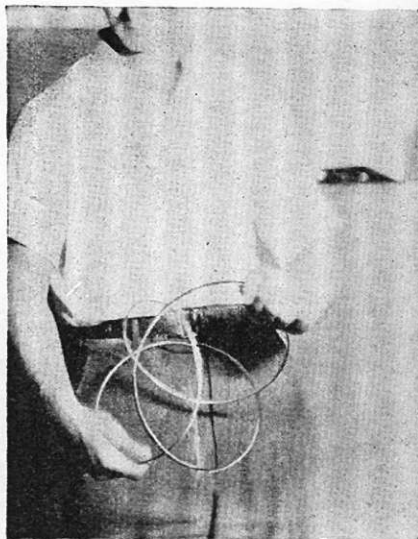


Grasp the blade thus—

slightly twisting motion, raise or turn the right hand so that the thumb points up. At the same time turn the left hand so that the thumb points up. This will form two half loops in the blade. Now continue turning the right hand until the thumb points toward you and the loops thus formed are turned over until they go through the loop formed by the left hand and are underneath the left hand. Continue twisting or turning the right hand until the back of it is toward you and you will note that the saw has a tendency to form three loops

and go together. With the index finger of the left hand, grasp the three loops and release the saw with the right hand.

Another method of coiling a blade is used in production shops where large blades are handled. The blade is rested on the floor and the toe of the right foot is placed over it to hold it down. Both the right hand and the left hand grasp the saw at points approximately opposite each other on the saw blade. Then both right and left hands are twisted toward each other at the same time. Under this action the portion of the blade that is close to the operator is forced down into a loop. The loops which are formed by the right and left hands are brought toward each other, the right hand loop being guided underneath the left hand loop, and both hands forced down toward the floor. At this point the three loops formed will nest together and may be grasped by either the right or left hand.



turn the hands to this position—

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—catch the loop with the index finger.

After a blade has been coiled it is good procedure to wrap a piece of soft iron wire around the coil at least at one place to prevent it from uncoiling accidentally. A blade falling from a hook or nail overhead and uncoiling as it falls can become rather dangerous. When coiling or uncoiling a saw blade, precaution must be taken to grip it firmly with both hands to prevent an accidental slipping of the blade during the operation. Care in handling will prevent the operator from a possible scratch or other injury.



The Blade Tension

The proper tension of a band saw blade for accurate and fast work is a very important matter and is not always understood and appreciated by the average operator. There is no absolute rule by which the tension of a blade may be measured as there is no hard and fast rule by which the operator may be guided. The general rule is to have the blade just tight enough to do its work and no tighter. It is not necessary to have the blade as tight as a fiddle string, nor is it wise to have the blade so loose that it may be easily twisted in going around small curves. While the blade is guided above and below the table to overcome this twisting tendency, the tension of the blade itself has a considerable influence on this twisting. While some band saws are equipped with so-called indicating or tensioning devices, the only real indicator is the operator himself. Experience, of course, can only come with continued operation. The safest procedure is to mount the blade and put only a slight tension on it, just enough tension to hold the blade in contact with the wheels while they revolve. If, with this much tension the operator finds that the blade has a tendency to twist when going around small curves,

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a little more tension may be applied and another trial made. Further adjustment should be made until the blade is under sufficient tension to prevent it from becoming twisted. Proper setting of the guide is essential before any adequate test of the tension of the blade can be made. While a band saw may be run with the blade under terrific tension, such operation is detrimental to the bearings of the saw, the blade, and also to the rubber facing with which the wheel is fitted. One point that must be kept in mind, in applying or adjusting the tension of a blade, is that a narrow blade of 1/8" or 3/16" requires less tension than a blade of 3/8" or 1/2". This is due to the fact that the lighter blade has less metal in it and will require less tension to hold it in line while work is being done.

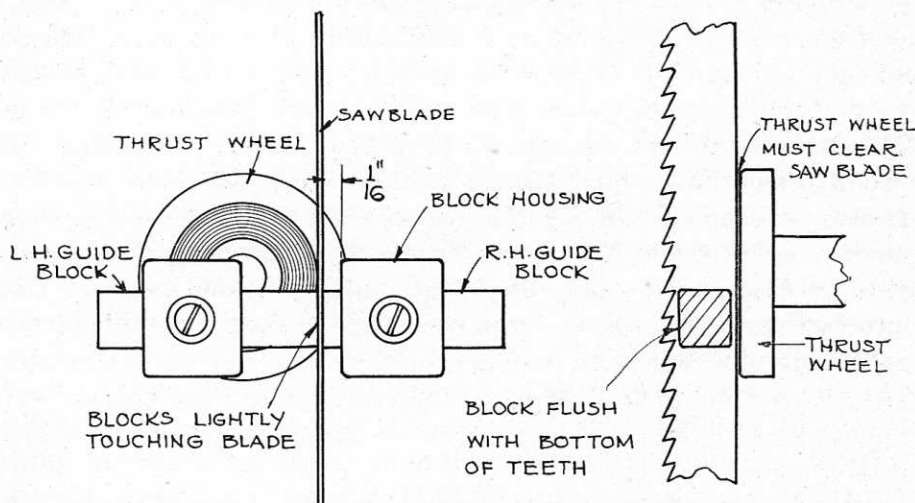
While it is wise from the standpoint of the life of the machine and of the saw blade to run the blade with as little tension as is necessary to insure good work, it is better from the standpoint of quality of work turned out to err on the side of too much tension rather than too little.



The Saw Guide and Thrust Wheel

Probably the most important point in the adjustment and operation of a band saw lies in the proper setting or adjustment of the guide blocks, and the thrust wheel located both on the guide assembly above the table and the guide assembly below the table. When a blade has been mounted on the band saw, the guides both above and below the table should be loosened by releasing the set screws or thumb nuts, which hold them in place. The thrust wheel should also be loosened and retracted until it does not touch the blade at all. The blade is then adjusted so that when revolving the wheel by hand, the saw will track in the exact center of the edge of the wheel. Only sufficient tension should be put on the blade to insure its running on the center of the rim without the help of either the guides or thrust wheels, either above or below the table. In other words, neither the guide nor the thrust wheel should be used to insure the blade remaining on the wheels or tracking in the center of them. After the adjustment for tracking of the saw has been properly made and not until then, should the adjustment of the guide and the thrust wheel be made.

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After the blade has been adjusted to track properly, the guide blocks are adjusted, first above and then below the table. The right hand guide block, or pin, is so set that it will project on the left hand side of its housing about $1/16''$ and is locked in that position. The entire housing is then adjusted so that it just bears lightly against the blade, but does not push the blade out of its vertical alignment. The left hand guide block is then adjusted so that it rests lightly against the saw blade and is locked in that position. Both blocks should rest against the blade but not with sufficient pressure to prevent the wheel being turned by hand. The entire guide block assembly is then put forward or moved back until the front edge or surface of the block is exactly even with the bottom of the teeth of the blade. In no case should the guide block project so far out toward the point of the teeth that a clicking noise will be heard as the teeth pass between the guide blocks. And by the same token, the guide blocks should never be so far to the rear of the saw blade as to allow it to twist from one side to another while cutting. This is particularly true when the wider widths of saw blades are used.

After both the upper and lower guide block assemblies have been properly adjusted to the blade, the thrust wheels may then be adjusted. These are adjusted forward until they just barely clear the back edge of the saw blade, but should not touch. While the blade is running free, it should not touch the thrust wheel or cause it to turn. As a matter of fact the thrust wheel should only come into use or be brought into play under the pressure of a heavy cut. At all other times the blade should run free

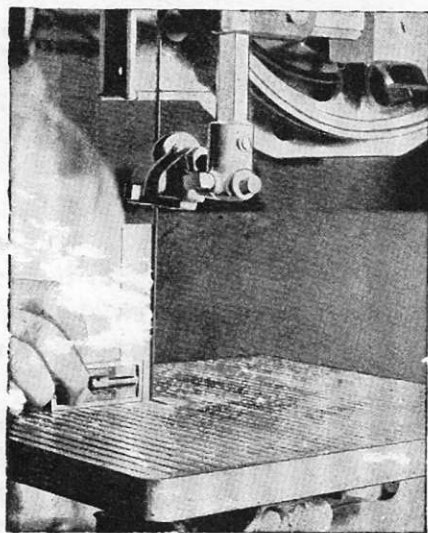
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enough and the feed by hand be kept light enough so that the blade will absorb all the thrust of feeding and cutting. If the thrust wheel is allowed to bear against the back of the saw blade all the time, it will soon crystallize and harden the back edge of the blade. Then it will be only a matter of a short time until the blade will break from the uneven strains that are set up within it. The friction caused by the saw sliding between the guide blocks is in no way detrimental if it is not excessive. Operating with excessive friction at the guide blocks is usually avoided more or less automatically because too much pressure between the guide blocks and blade will cause the machine to labor and in some cases stop altogether. After the blade is running it may be necessary to make some slight readjustment in the guide block pressure and in this case the adjustment is usually made with the left hand block only, the right block being left in its permanent position with a 1/16" projection.

These adjustments are graphically shown in the sketch. A careful study of this sketch will make clear all of the foregoing description.



Adjustment of the Table



Align the blade with a try square.

Most of the present day small band saws are made with the table mounted on a pair of trunnions or a quadrant providing adjustments to the right or to the left. The first adjustment necessary is setting the table absolutely at right angles to the saw blade. In doing this, the operator will find below the table, in the main casting, an adjustable stop screw which should be adjusted to bear against the under side of the table, so that the table may be returned at any time to its predetermined horizontal position. The next adjustment is to set the table at an exact angle of 45°, with the band saw blade, and then adjust the stop screw on the under side of the

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table provided for this purpose, so that the table may be tilted readily to 45° at any future time. At both the 90° and 45° positions the indicator on the segment which indicates the degree of tilt should be checked for accuracy.

After the foregoing adjustments and check-ups have been made, the machine may be considered ready for use.



General Operation

The operation of a band saw; that is, the cutting of wood, is a fairly simple operation. Almost anyone without previous experience on a band saw can shove a piece of wood through and make it cut. But to make the saw follow a given line, whether that line be curved or straight, is a different proposition and requires a little forethought and some experience. There are numerous little tricks to the operation of a band saw which, if followed, make the operation simple and more accurate.

For instance, in sawing through a straight line, if one edge of the piece being sawed is fairly straight, one hand is usually used as a guide, while the other hand feeds the work; that is, the left hand would probably rest stationary on the table and be used as the guiding member, while the right hand would grasp the stock and feed it to the saw. In following curved lines, either the right or the left hand may be used as the guide, while the other hand does the feeding and guiding of the wood.

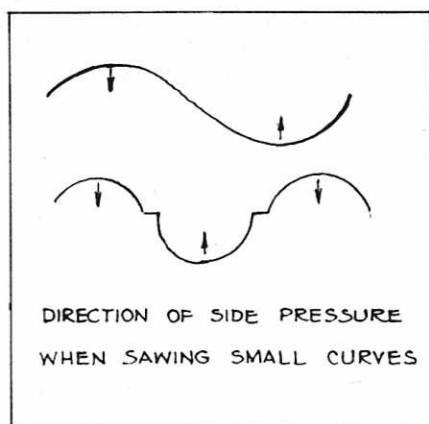
Where considerable straight line sawing is to be done, it is advisable to use a fairly wide blade of $\frac{3}{8}$ " or $\frac{1}{2}$ " width. This facilitates the following of a straight line.



Cutting Curves

In following or attempting to saw curved lines, there is a little trick of operation which not only facilitates the guiding of the saw around a curve, but also results in a cleaner cut surface. By exerting slight pressure of the stock against the side of the blade on the inside of the curve being cut grinding is greatly improved. If the operator attempts to cut free-hand, allowing the blade to cut without any guiding, a ragged edge instead of a smooth surface will result. The cutting of curves is facilitated to a great extent by using the proper width of saw. While it

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is possible for the operator to have the blade chew its way around a sharp curve, which is smaller than the real capacity of the blade, this is not a mark of good workmanship, and will not produce satisfactory work.

Experience indicates that a $\frac{1}{8}$ " band saw blade will cut circles as small as 1" in diameter, and $\frac{3}{16}$ " blade circles of about $1\frac{1}{2}$ ".



Saw Blades Vary with Size of Circle

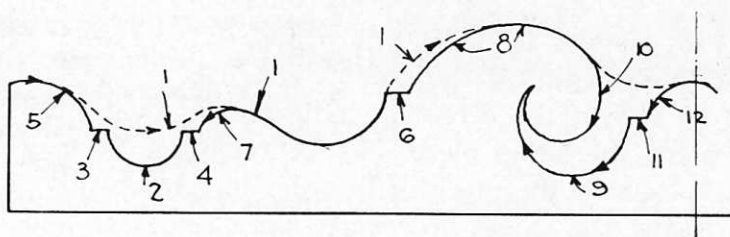
A $\frac{1}{4}$ " blade will cut around circles of about 2", while a $\frac{3}{8}$ " band saw blade will cut around a radius of about $2\frac{1}{2}$ ". These figures should not be taken as an accurate guide since a lot depends upon the set of the saw teeth, the degree of sharpness of the blade, and the adjustment of the guide and thrust wheel. There are so many items that enter into the proper manipulation of the saw blade and its cutting that it is almost unwise to give these figures. But they will serve as a rough guide so that the beginner will not attempt to force a $\frac{3}{8}$ " blade to go around a circle of only $1\frac{1}{2}$ " in diameter. If the operator will bear in mind that little trick of keeping one side of the cut being made against the side of the blade, he should experience no difficulty in following either a straight or a curved line.



Cutting Combination Curves

In cutting out combination curves; that is, curves that are formed by the junction of long sweeps with straight lines, or with other curves and the assembly for inclusion of small curves, straight lines and long sweeps in one design, the cutting may be facilitated and a more finished looking job turned out, if a little forethought is given to the cutting. To illustrate this point a sketch of a rather intricate design is shown and the order of

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ORDER OF OPERATIONS - CURVE BANDSAW WORK

procedure or the progressive order of cuts shown in numbered form. No. 1 is the first cut and No. 2 the second, and so on. The reader will note that following this procedure not only makes for easier work but also produces a cleaner cut job, leaving the corners square as they should be. The sketch described is along the line of a pediment or gallery for a cupboard, and is typical of the type of work which is readily handled by the band saw.

The first cut as indicated by the dotted line No. 1 is to remove most of the stock from around the pattern to facilitate future handling. No. 2 cut will be the sawing out of the cove or concave shape in either direction. The third and fourth cuts will be the straight shoulder which intersects cut No. 2. After making No. 2 and No. 4 cut, you will notice that it has been necessary to back the blade out of the cut. It is always wise to plan these cuts ahead where the saw has to be backed out, since this backing out is one of the most delicate parts of band saw operation, and must be exercised with great care. Then if the blade gets bound in the saw cut there is a liability of the blade being pulled out of the saw guide and running into either the saw guard or the table of the machine, in most instances ruining the blade. Cut No. 5 would be the cutting of the rounded member meeting with cut No. 3. Cut No. 6 should be the small shoulder indicated by that number. Cut No. 7 is started at its intersection with No. 6 and should be run in the direction indicated by the arrow and, of course, be stopped when the shoulder produced by cut No. 4 has been reached. Cut No. 8 is begun at the point indicated by the small line crossing it and should be run in the direction of the arrow to meet cut No. 6. Cut No. 9 is run as indicated by the arrow line, and should be stopped when the point of intersection with No. 10 has been reached. Here again great care must be exercised when taking the saw out of cut

THE BAND SAW

No. 9, to prevent it being pulled from the guide. The next cut, No. 10, is begun at the point where No. 8 was started and should be run in the direction indicated to meet cut No. 9 at which point the scrap piece may be removed. It may become necessary to stop the machine in order to remove this piece and that is really the safest procedure, since removing small pieces of wood with the band saw running, is a rather hazardous practice.

Cut No. 11 is the small shoulder which intersects cut No. 9 and cut No. 12 is the cutting of the round member in the direction indicated, beginning at the top of the curve and sawing both ways to meet shoulder No. 11 and shoulder No. 13 and so forth. Only one-half of the complete design has been shown since the order of procedure in cutting the other half would be identically the same as the first half.

In sawing out this pattern you will recall that at the beginning of cuts No. 8 and No. 9, particularly the latter, it was necessary to pick up the line as it is called. This consists of starting the actual cutting in the middle or some portion of a curve that has already been partially sawed. In order to do this without having any break in the line, it is first necessary to bring a portion of the curve behind the actual point of starting against the side of the saw blade near its back edge. If the piece of wood, as in this case, is on the left hand side of the saw blade, the wood is rested lightly against the side of the blade and then the end nearest the operator is slowly swung to the right until the saw blade begins to cut. The cutting may then be continued accurately and a perfectly smooth curve will be obtained.

The reader will see by the foregoing description that in order to pick up and continue a curve or a straight line it is necessary to have the saw blade at a tangent with that curve or straight line, as it begins to cut, so as to preserve an unbroken smooth line, either curved or straight.

In all broken curve work such as the piece just described, the general procedure is about the same. A little careful planning before the cutting is started will save considerable annoyance and produce much cleaner and better looking work. It is suggested that the beginner practice considerably in this type of work in order to obtain a certain degree of efficiency and skill before tackling any finished product. While there is nothing particularly hard about the operation of a band saw or the cutting

Its Use and Application

of complicated curves, experience and skill help tremendously, and can only be gained by continued cutting through a considerable period of time.



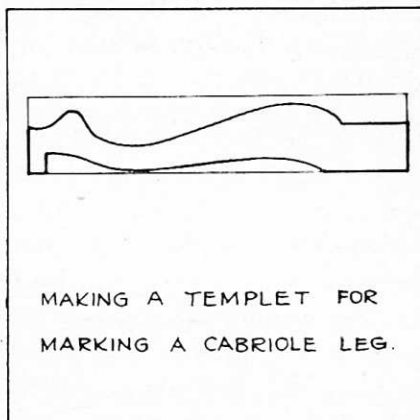
Compound Band Sawing

The cutting of such shapes as Queen Anne or cabriole legs, compound curves, aprons and rails and similar projects, come under the head of compound band sawing. In this type of work either two or four of the surfaces are band sawed, although the actual cutting is done from two sides only, as in the cabriole legs. This type of leg necessitates the cutting away of both the upper and lower surfaces of the block resting on the table of the band saw, and provision must be made to provide a level surface on which to rest the block for the second operation. In the following description the cabriole legs will be taken up step by step, and described.



Preparing a Templet

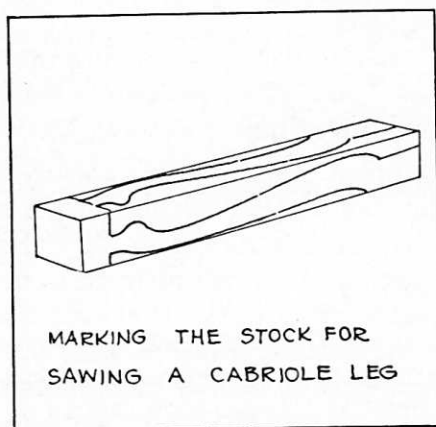
The first operation is the preparing of the templet or shape from which the leg will be marked and sawed. After preparing this templet the shape is marked on two adjacent sides of the block from which the legs will be cut as indicated in the sketch. Note that lines have been marked at right angles to the gauging edge with which to set the templet. In most cases the rear face of



the legs is used for this purpose. After carefully marking the outline of the leg on the two adjacent surfaces, the leg is ready for the band saw. It might be well to point out at this particular time that in the sawing of such shapes as we are describing, it should be borne in mind that a sufficient amount of excess stock ought to be provided, so that in cutting out the forms, the upper surface or remaining surface will not be destroyed entirely as far as the lines which are marked on it are concerned. This is clearly indicated in the sketch.

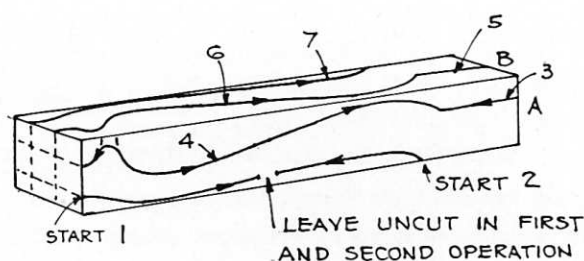
THE BAND SAW

Beginning the Cut



Now place the block on the table with the surface marked "A" uppermost, and begin the cut at the bottom end of the leg as indicated by the word "Start." Saw in along the line as far as the heavy line indicates, then very carefully withdraw the saw from this cut. Now turn the piece of wood around to the point indicated as the second start, and follow

along as indicated by the heavy line and then withdraw the work from this blade. A small portion of the line has been left untouched and preserves a smooth surface on which to rest the block for future cutting. If this entire section on the rear of the leg has been completely cut away there would be a discrepancy equal to the thickness of the saw cut in the surface which we wish to maintain. Therefore this surface would not be parallel to the opposite surface. Still keeping surface "A" uppermost, saw out the front line of the leg as indicated. In this particular case, the



ORDER OF OPERATIONS - CUTTING A CABRIOLE LEG

entire piece may be removed. Now turn the piece over on the table with the surface marked "B" uppermost. The same procedure is followed in sawing as you did with surface "A" uppermost, doing the rear of the leg first and then the front of the leg, holding the loose piece with surface "B" uppermost firmly in contact with the

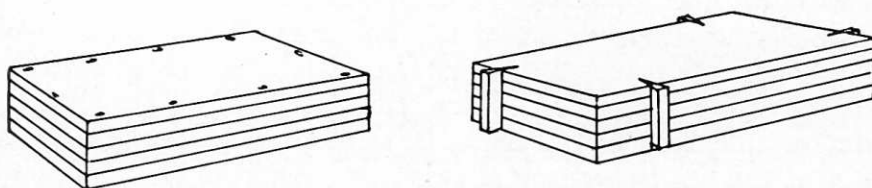
Its Use and Application

block, while doing the cutting. In order to facilitate holding, it is wise to drive one or two small thin wire brads in at some portion of the scrap wood to hold this loose piece.

After a few trials you will see that actually the sawing of a compound piece is no greater task than plain ordinary band sawing, requiring only a little planning and forethought to facilitate the cutting.



Group Cutting



METHODS OF PILING LAYERS OF LUMBER FOR SAWING

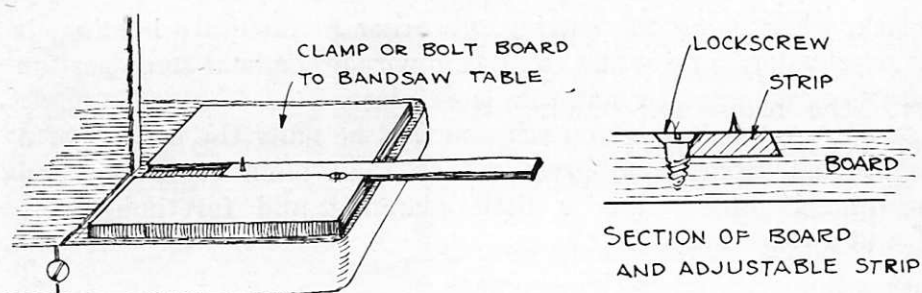
Where a number of pieces are to be piled one upon the other and a group of them cut at the same time, there are several ways of holding them in alignment while the sawing is taking place. One is to nail the pieces together, putting the nails in portions of the blocks which will be discarded or wasted. The second method is running a saw cut in along one or more edges and driving a wedge-shaped piece of wood in this saw cut. Another way is to make up a form in which the pieces to be cut are piled. These two methods are shown in the sketch.



Making a Circle-Cutting Jig

Where a number of pieces are to be sawed out to the form of a perfect circle, it is a wise precaution to provide oneself with a circle cutting gauge. The making of this jig is a fairly simple matter, consisting merely of a board in which a groove has been cut. In this groove place a strip of wood which may be slid back and forth. In one end of this strip of wood a nail is driven through from beneath and pointed to project about 1/16". The other end of the wood is arranged to be held immovable by a wood screw which is driven into the board alongside of the strip. The strip may be graduated by marking off certain distances on the board alongside of the groove in which the strip slides. This

THE BAND SAW



CIRCLE-CUTTING JIG FOR BANDSAW OR JIGSAW

board is clamped or screwed fast to the band saw table and so arranged that the position of the pin is exactly parallel to the cutting edge or tooth of the blade; that is, if a line were drawn parallel to the face of the blade, this line passing through the point of the band sawed piece, it would also pass through the point of the pin to be used as a center. Between the nail which will be the center of the circle, and the saw blade which will be the outside or circumference of the circle, determine the size of the circle that will be cut. In short, this distance will be the radius of the circle.

It sometimes happens that only segments of large circles are to be cut. In this case an extension of some sort must be attached to the band saw table, and a pin or nail driven in at the proper distance from the blade in order to provide the center of the radius desired.



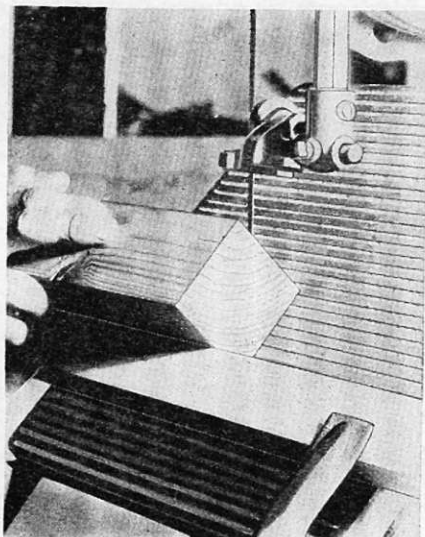
Sawing Octagon and Hexagon-Shaped Ornaments

In the band sawing of octagons or hexagon-shaped ornaments or members, it is necessary to employ the tilting table feature of the band saw. The first two cuts to follow would be with the table in a level position, after which the table for a hexagon piece would be tilted to an angle of 30° , while for the second cut on an octagon piece would require the table being at an angle of 45° . In the case of the hexagon there would be three remaining edges to be cut and in the case of the octagon there would be four remaining edges to be cut. The actual cutting with the table tilted is along the same general line of procedure as that with the table in a horizontal position. It is wise, however, to remember that whenever possible to do the sawing on the outer surface of the table; that is, on the portion of the table that is

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below the saw blade. This will prevent the material being drawn into the blade and binding it against the side of the slot in the band saw table, consequently dulling the saw.

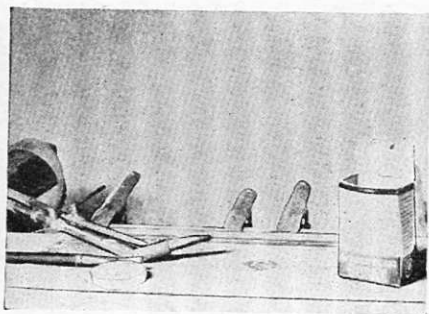
Through some accident or other cause a band saw blade may become broken. When this happens the blade must be rejoined together by the process known as brazing. The brazing of a band saw is not a hard or intricate task but does require a little careful work and several pieces of special equipment. The simplest method of brazing a band saw is through the medium of a pair of heated tongs. A blow torch or a special brazing lamp may be also used for heating the joints. Brass solder or filler may be substituted for the silver solder if the silver solder is not available. Ten cents worth of silver solder will be sufficient to braze about ten band saw blades since only a small piece is used. The flux used for brazing with silver solder is ordinary borax powder which may be secured at any drug store.



A supporting guide should be used with the table tilted.



Brazing a Broken Blade



Only simple equipment is needed to braze a saw blade.

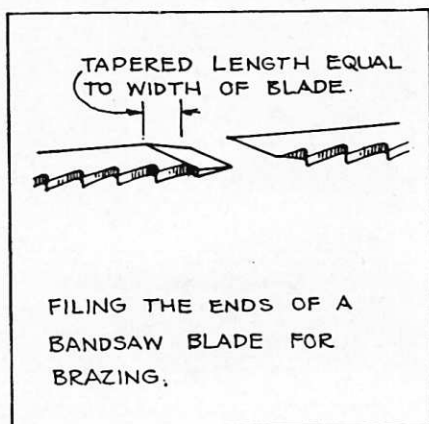
Some sort of a brazing jig or arrangement for holding the two ends of the saw in alignment should be provided in order to facilitate the work. The photograph shows clearly what a simple jig of this type looks like.

It is necessary to file the broken ends of the saw square across the blade and then these ends must be tapered to a wedge-

THE BAND SAW

like form as shown in the sketch. The saw is then laid in the jig so that the rear edge of the saw is held tightly against the straight-edge backing. The two wedge-shaped ends are then brought together so that a continuation of the usual thickness of the saw

will result. Some of the borax powder is then mixed with water to form a little paste which is then carefully smeared on the joint. A small piece of silver solder sheet large enough to cover the entire joint between the blades is then clipped and inserted in the joint. The joint is then heated to a red heat either through the medium of a pair of heavy tongs or with a blow torch, until the solder melts. Press the ends of the blade tightly together

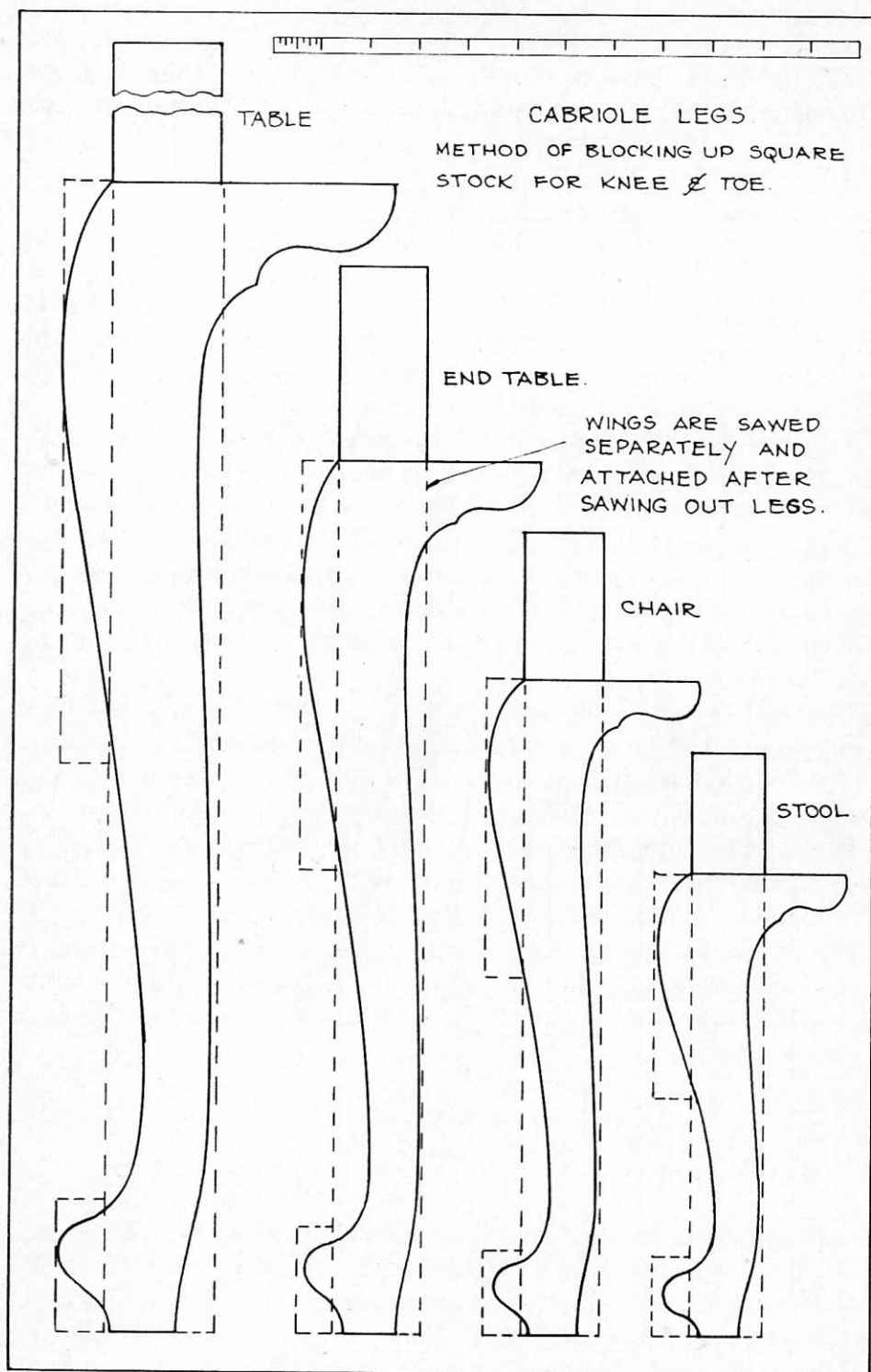


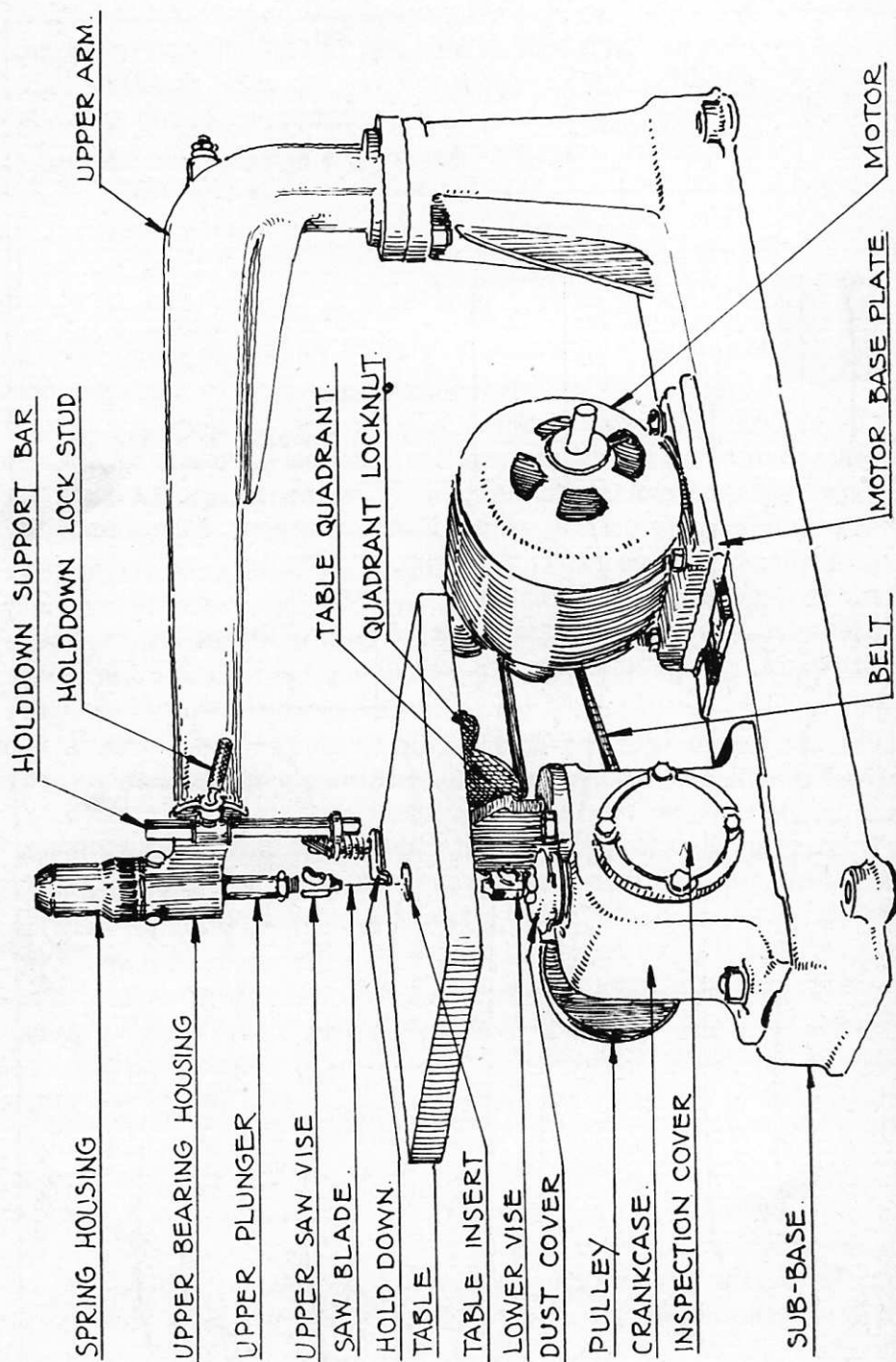
with an old center punch or a large nail, and hold them thus until the joint cools enough for the solder to "set." Leave the saw blade in the jig until cool.

Regardless of how carefully you work some solder will ooze out around the joint, and this must be cleaned up. Lay the saw blade on a flat surface, then lay a flat file on the joint, and move it back and forth until there is no "hump" left at the joint. This filing must be done on both sides of the blade. If you have a caliper or micrometer with which to measure the thickness, you can make sure that the blade is no thicker at the joint than elsewhere. This is important, since any great difference will prevent the joint from passing between the guide blocks.

The back edge of the blade must also be smoothed up to a continuous line.

Its Use and Application





BOOK TWO

The Jig Saw



IF anyone who wishes to start a home workshop asks an experienced craftsman which machine to purchase first the answer invariably will be "the jig saw." There are several reasons for this. It is the easiest machine to learn to operate expertly. And then it is used for so many things. With a jig saw innumerable articles of beauty and utility can be made in a surprisingly short time. Toys for the kiddies, a set of numbers for the house, models of all kinds, popular lawn ornaments, weathervanes, bird houses, puzzles and more serious projects such as bookends, inlays and overlays can be made with only one power tool—the jig saw. By selling its products the jig saw can provide income for purchasing other power tools. No other machine, in the hands of a novice, will begin to bring in returns as quickly.

During the recent depression thousands of authentic cases have been brought to light where a jig saw not only saved families from want, but in some instances increased a man's earning power above what he had been receiving in previous years.

The jig saw may be used to do some of the work usually done on the band saw. But, due to slower cutting speed, it must necessarily require a longer time. The capacity of a jig saw, as to thickness of material that may be cut, is also much less than that of a band saw. Then too, the band saw will not cut the fine delicate curves that the jig saw will. So the jig saw cannot completely replace the band saw, nor vice versa. Each has its more or less distinctive uses.

While the skillful operation of a jig saw may be learned in a short time, there are numerous other uses for a jig saw. It is the purpose of this treatise to describe, as well as the intelligent planning of work, these special uses of the jig saw, and their value to the home workshop, as well as in the commercial field.

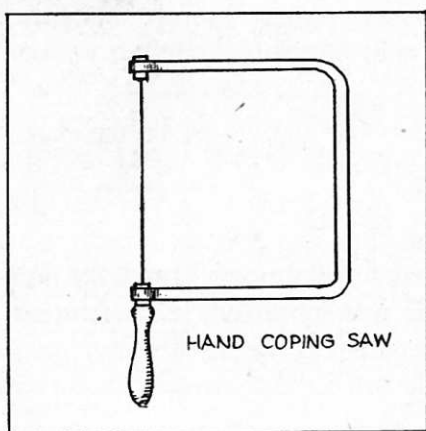
THE JIG SAW

The Development of the Modern Power Jig Saw

About thirty or forty years ago "fret work" enjoyed a tremendous wave of popularity. Each fret sawyer was his own designer to a great extent, but paper patterns could usually be purchased at almost any hardware or stationery store, together with thin "black walnut" panels, the then popular wood. Along with some of the furniture of the "gay nineties" many of these "knick-knacks" lacked attractiveness and would be considered "dust catchers" by the modern housewife. Jig saws of this period were all hand or foot operated.

From this period to about 1920, the jig saw lacked general popularity. Factories let them remain idle, because, compared to other machines, they were poor production machines. The marquetry manufacturers alone continued to depend on the jig saw as their major machine and still do.

About 1920 furniture designers began to use fret work overlays of rare woods to embellish furniture, and the jig saw started to come into its own again. In this age of speed, the hand "coping"



or "fret saw" was far too slow. The foot-power jig saw naturally came to replace it in the home and small workshop, since the available power jig saws were very expensive and heavy. All manner of makeshift power driven jig saws were developed by the ingenious workshop owners. Then, in 1928, a prominent manufacturer of light bench machinery developed a power driven jig saw that would really turn out creditable work, to sell for less

than \$5.00. Thousands upon thousands were quickly taken by enthusiastic men and boys.

The natural sequence of events caused the development of the present day power driven jig saw. The old "rocker arm" type has given way to the spring tension head, precision type machine which will operate continuously at high speeds. With these machines the speed of cutting has been brought up to about 70

Its Use and Application

per cent of that of a band saw. And further, other uses for these modern machines have been developed until the jig saw has become a really indispensable machine.



Driving Mechanism

The heart of a jig saw is the crosshead and crank pin, that part of the machine which converts rotary motion into reciprocal action. In no other part of the machine is close, precise fitting so important. Adequate provision for continuous and proper oiling of these parts must be provided to insure reasonable life to the machine. We know that an automobile crankshaft bearing must be taken up occasionally, due to wear. In the jig saw, with its relatively small parts, it is cheaper to replace worn parts than to provide for take-up on the bearings. Thousands of hours of service may be expected, however, before the crosshead or crank pin need be replaced. If the recommendations of the manufacturer concerning oiling are followed religiously the life of these parts are materially lengthened.



The Tension Head

High speeds meant a departure from the old moving arm type of jig saw. The spring tension head was a natural development. But it was not until the very fine blades, that were developed for puzzle work, were brought out that the extreme importance of the tension head was recognized and this part of the machine given real attention. With the fine blades which are only a few thousandths of an inch thick, and not much wider, the range of tension in the spring head was cut down to a dangerously narrow margin. It was only after considerable experimentation that a really adequate mechanism was developed. The operator may now change from a blade .025" x .035" to a blade of No. 26 gauge x 1/4" wide with perfect assurance, and run either of them at

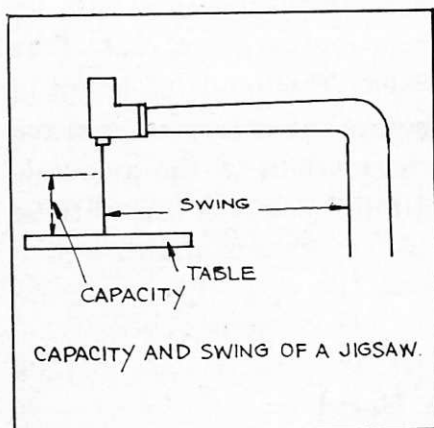
THE JIG SAW

a motor speed of 1750 R.P.M. Since the correct tension is more vital for fine blades than for heavy blades, the tension is usually determined for the fine blades and fixed that way, the same tension being adequate for the heavier blades. A slight variation of this tension is available by pulling the upper tension plunger or saw vise a little further down when fastening in the saw blade.

Care should be exercised, when depressing the upper plunger, to avoid getting too much tension on the blade as this will throw an extra load on the cross-head mechanism in the base and tend to set up vibration in the arm. Experience will dictate the best setting.



Capacity of a Jig Saw



The thickness of material that may be cut on a jig saw is regulated by the distance from the table to the under surface of the upper saw vise, where no hold down arm or bracket is located between, the upper vise being at the lowest end of its stroke. This capacity may be increased for special purposes by blocking up the head, or upper arm, in some machines, or as in

saber sawing, by removing the upper arm entirely. This latter phase of operation with its attendant applications will be dealt with in a later chapter.

The size or area of material which may be cut is regulated by the throat of the machine, which is the distance from the blade to the inside surface of the upright which supports the upper arm. If, therefore, the throat distance of a machine is 24", the capacity of the machine will be to the center of a 48" circle, or approximately to the center of a 36" square.

The area or lateral capacity of the machine may be increased by removing the upper arm and using a heavier blade. Here, the capacity is regulated only by the space around the machine.

Its Use and Application

Selecting a Jig Saw

The first requisite of a power jig saw should be its ability to stand up under continued service, without continuous replacement of parts. The less vibration it has the better. Smooth operation and longer service are synonymous. Of the better grade machines now on the market, one may select the one that appeals to him most with perfect assurance. Naturally it is advisable to purchase a jig saw made by a concern which has been in the business for several years, since experience gained in making and marketing these machines over a period of years is a valuable asset and should eliminate "speculation" from your purchase.



Installation of a Jig Saw

The jig saw is one of the few machines that may be installed with its back to the wall, unless particularly large panels are to be cut with the upper arm removed. It is a wise measure to mount the machine and motor on an individual stand so that it may be placed close to a wall and pulled out only when necessary to do extra capacity cutting with the upper arm removed.

There are several points to remember when setting up a jig saw. Mount it on a substantial base. A well made jig saw should run without excess vibration, even at high speeds. But the very nature of the action and return of the blade is bound to produce some vibration, particularly when cutting heavy stock. If you purchase a machine stand for the jig saw, get a heavy one. If you make the stand use three-by-threes for the legs and a piece of 2" x 10" for the top, well braced with one-by-sixes. Mount a light just above and to the left of the head so there will be no shadows cast by the head on the hold-down foot.

Set the machine on a stand so that the height of the table is about six inches above your waist-line. This is the least tiring height when operating the machine in a standing position. With a high stool to sit on, the machine is therefore convenient for both standing and sitting operation.

THE JIG SAW

Motor Requirements

Compared to other machines, the jig saw requires little power. A $\frac{1}{4}$ H.P. or $\frac{1}{3}$ H.P. motor is ample. The manufacturer will usually recommend a certain position for the motor and it is good policy to follow his recommendation. Most jig saws can be driven in either direction, with equal efficiency, so direction of rotation of the motor is of no importance.

Do not have the belt so tight that it throws side strain on the bearings, especially if they are of the bronze sleeve type. Follow instructions as to oiling and greasing, and you can expect long service.



Selecting Blades

For hard woods, a finer toothed blade may be used than for soft woods. Due to the fairly large grains of sawdust and the stringy character of most soft woods, the fine tooth blade soon clogs up and begins to burn the surface of the cut rather than make a clean cut.

Jig saw blades come in a great variety of teeth and numerous thicknesses and widths. Saws may be purchased that are only .010" thick by .015" wide, with teeth so fine they can hardly be distinguished with the naked eye. They are needed only on the finest of detail work on extremely delicate projects.

Jewelers' blades are available in even smaller sizes, but they are used only on the most delicate of pierced metal work on fairly soft metals, and are run at very low speeds. Other blades may be purchased, in graduated sizes with a varying number of teeth per inch up to blades of No. 20 gauge $\frac{1}{4}$ " wide, with 7 or 8 teeth to the inch. A blade $\frac{3}{16}$ " wide No. 26 gauge, with 11 teeth to the inch (which may be a length of broken band saw blade) is the ideal general purpose blade to keep in the machine, handy for the many little odd jobs which naturally come up often. This blade should be kept filed and set the same as a band saw blade, since it is only for rough heavy work. Needless to say, the machine should be equipped with vises which will accommodate a blade of this size, although the ends of the blade may be filed down if necessary to fit a smaller vise.

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Besides this blade you should have some $\frac{1}{8}$ " blades with 12 to 16 and 18 to 20 teeth to the inch of No. 30 to 36 gauge steel. Due to the process of manufacture these blades will probably have no set to the teeth. The saw kerf will therefore be little if any wider than the thickness of the blade itself, so that they should not be used on heavy wood unless absolutely necessary.

Then there are the fret saw blades. These range from No. 30 gauge x $\frac{1}{16}$ " wide to No. 48 gauge of the same width, with teeth ranging in size from 20 to the inch to 50 to the inch. An assortment of these should be kept handy for finer detail work than can be conveniently handled with the $\frac{1}{8}$ " saws.

Of the finer blades, which created considerable discussion during the recent "puzzle craze," a blade of .008" x .025" wide with from 16 to 48 teeth per inch proved ideal for most machines. It is interesting to note that long hours of experimentation during this period indicated that more depended on getting a proper combination of blade, machine and operator than anything else. Blades that were entirely satisfactory with one operator were unsatisfactory with another operator. Because of this personal element it was very difficult for the manufacturers to arrive at the ideal blade. When operating the jig saw be sure to use the correct type of blade for the kind of work you are doing.

The safest rule to follow in selecting a blade for the work to be done is to use the largest blade, with the coarsest teeth that will cut cleanly and permit cutting of the smallest curves on the pattern. The special purpose blades and other jig saw accessories are covered in more detail later on.



Speeds of Operation

There are no set rules by which one may be governed in the operation of a jig saw. Fine blades may be run at from 600 to 1750 R.P.M. (down and up constituting one stroke) while the coarsest blades may be run from 150 to 1300 strokes per minute. Obviously higher speeds give faster cutting, so that the main objective is to use a speed which will allow easy manipulation or guidance of the work without forcing or without compelling the operator to hurry to keep up with the cutting. These are two extremes. Select as fast a speed as you can conveniently handle.

THE JIG SAW

The Hold-Down Foot

While most of the power jig saws designed for small shop and home workshop use are equipped with a hold-down foot or bracket, very few of the larger and heavier commercial machines are so fitted. The hold-down foot is really one of the fine additions which have been added to assist the novice to attain a greater degree of skill in a shorter time. With its use he can disregard the effort and attention needed to hold the work down on the table, and confine his whole attention to following the curves and lines. The hold-down is of far greater value on heavy stock than on thin panels, since with the heavy stock there is a more decided "lift" to the up stroke, the saw blade dragging considerably on the thicker material. This drag is caused mainly by the absence of set on the teeth of jig saw blades. This is all the more reason why short lengths of band saw blade may be used to real advantage on very heavy stock.

When making small pierced panels, where it is necessary to change from one interstice to another every few moments the hold-down is more of a hindrance than a help. For this work it should be removed, and the work held down by pressure of the hands alone. You will find yourself dispensing with the help of the hold-down more and more as skill is acquired.

When adjusting the foot to the blade and the work, set it so that the blade is in the groove or slot, and see that the back edge of the blade just clears the back end of the slot, and **does not rub except when sawing**. Continued rubbing will cause the blade to crystallize and in time to break. It is wise, therefore, to eliminate as much of the rubbing as possible, and thus prolong the life of the blade.

Another point in connection with the location of the blade is the hold-down foot. The blade should not set deep enough in the slot to make the teeth rub on the side. Ruination of the blade will result.



The Operation of Sawing

Having made all the necessary adjustments and familiarizing yourself with the machine, you are ready to cut. Anyone can put a piece of wood on the jig saw table and cut it. That is simple. But to follow a line, either curved or straight, and have that line

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smooth and unbroken, is quite another matter. It requires practice to attain this skill—nothing but practice will suffice. There is no short “cut” but there are some little kinks that if borne in mind, will help materially toward gaining that degree of skill necessary in turning out a piece of creditable work.



Ornament Making

Probably the most common use to which the jig saw is put today is the making of small ornamental cutouts, such as lawn ornaments, novelties, weathervanes, etc. With this type of ornament the work consists mainly of sawing to outline. Here is a type of work to develop skill in following an outline, and gain proficiency in speed. We suggest running the machine at about 1100 R.P.M. at first, until proficiency has been acquired, when the machine may be sped up to about 1300 R.P.M. Bear in mind that the slower the machine is running, the easier it is to follow a line. Use the largest saw blade you can, while still being able to get around the smallest curve you will encounter.

When cutting an outline such as the rail (shown on page 21 for band saw work) follow the same procedure as in band sawing. Don't attempt to follow a line from one end to another. Pick out the most prominent curves or members of a pattern and cut those first, then go back and cut the smaller members. Sharp corners and smoother curves are the result.

There is not the same degree of danger in backing the jig saw blade out of a cut as there is with a band saw, since the blade is short and is held firmly in vises. However, considerable time may be lost by making long cuts and then backing the saw out of the cut. Plan a little way ahead, to avoid this backing out as much as possible. Besides losing time it roughens up the edges of the cut already made.

In ornamental sawing where part of the pattern is pierced, so that it is necessary to put the saw through a hole bored for the purpose, saw these openings first. Then cut the outline.

This method of procedure allows for the protection of any projections or scrolls around the outside edge of the work, and, at the same time, makes the piece more agreeable to handle.

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Making a Perforated Pattern

To make a perforated pattern, it is necessary only to perforate the pattern with a needle which has been stuck in the end of a piece of wood about the size of a pencil. Lay the paper to be perforated on a pad of cloth, and holding the needle in a vertical position jab it through the paper on a line. Follow the line with a series of jabs, spacing them close on small intricate portions of the pattern and spacing a little farther apart on larger portions. In making these holes the operator should always keep in mind the fact that if the distance between these perforations is too close there will be a likelihood of the pattern tearing, particularly if there is a great number of transfers to be made. You will be surprised how fast a pattern may be perforated with a little practice and by giving it a little reasonable care how long the pattern will last.

In commercial work such as marquetry manufacture, a perforating machine is used which consists of a flexible shaft or a pantograph arrangement, where a handpiece imparts a short up-and-down stroke to the needle. The operator needs only to give his attention to following the line.

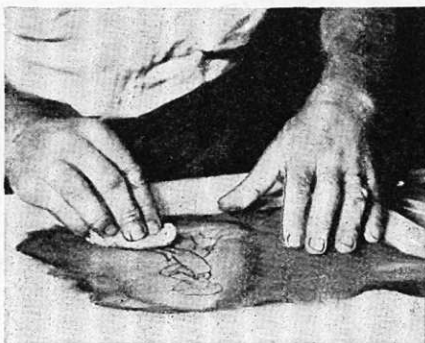


Transferring the Design to the Wood

The greatest bugaboo in connection with this type of work is transferring the design to the wood. Where only one piece is required, transferring the design with carbon paper is the simplest method. In instances where only half a pattern is given, you will find it advantageous to procure a piece of transparent tracing paper. Fold it once, then using the crease as a center line, trace the half pattern. Fold the paper and trace the other half. The tracing paper, being transparent, permits you to see what you are doing and allows for perfect matching of halves of pattern. The whole design may then be transferred to wood with carbon paper. Where a number of duplicates of the same pattern are required several methods of transferring the design may be used.

Its Use and Application

The carbon paper method consumes too much time. One method is to make a thin wooden pattern, and mark around it with a pencil. A far quicker method is to make a perforated pattern of tough paper, and transfer with a stain. The stain is thick asphaltum paint and is applied by dampening a sponge or cloth pad with gasoline or benzine. Apply a little asphaltum to the pad and with the pattern held firmly in position on the wood rub the pad or sponge over the perforated lines. Some of the stain will go through the holes onto the wood. With reasonable care, a perforated pattern on drawing paper or tough wrapping paper will last for hundreds of transfers. Transfer ink, such as is used on mimeograph machines may be used in place of the asphaltum, with equivalent results. This ink must be diluted with benzine. Vellum tracing paper has been found to give the best results.



Transferring with a perforated pattern.



Multiple Sawing

One method for making duplicate pieces, involves multiple sawing, where a number of pieces of wood are piled one on another, fastened together in one of several ways and then sawed as one piece. Several methods of fastening the "pile" together are available. Nailing is probably the most widely used. Putting saw cuts around the edges and driving small wedges in from the side is the second popular method.

A black and white line drawing of a young child standing in a wooded area. The child is wearing a long, light-colored dress and has their arms crossed. The drawing is annotated with various labels for different types of wood and plants, connected to the corresponding elements by lines. The labels include:

- MAPLE (top left, pointing to a tree branch)
- BLUE (top left, pointing to a tree trunk)
- BURL THUYA (top right, pointing to a tree branch)
- MAPLE (top right, pointing to a tree branch)
- FLESH HOLLY (top right, pointing to a tree branch)
- NAT. HOLLY (top right, pointing to a tree branch)
- BLUE HOLLY (center, pointing to a tree branch)
- MAHOGANY (left, pointing to a tree trunk)
- CURLY PEAR (left, pointing to a tree trunk)
- DARK BLUE (center, pointing to a tree branch)
- BLUE (center, pointing to a tree branch)
- RED (center, pointing to a tree branch)
- BLACK (center, pointing to a tree branch)
- CURLY PEAR (center, pointing to a tree branch)
- FLESH (center, pointing to a tree branch)
- BLACK (bottom right, pointing to a tree branch)
- FLESH (bottom right, pointing to a tree branch)
- GREEN SYCAMORE (bottom, pointing to a tree trunk)

Sooner or later the owner of a jig saw will want to try his hand at marquetry making. It is fascinating work and the results are very much worth while. Pictorial marquetry is enjoying quite a vogue and making it is certainly a pleasant pastime. Small pictures, done in fancy veneers, enjoy a ready sale at gift and art shops so that real returns may be obtained and a steady income provided.

Where one only of a pattern is to be made, the simplest method is to pile pieces of varied colored veneers on top of each other, each piece of veneer being large enough to cover the area needed, and this "pile" securely clinch-nailed between two cover pieces of thin plywood. (This plywood may be obtained from old packing boxes.) Then, using a fine blade (puzzle blade) all the lines are sawed. You will find that the different pieces of veneer will then fit together, forming the design or picture. Where the design is of a conventional form, you will have as many complete sets or finished patterns as the number of veneers used.

Its Use and Application

For single pieces of pictorial marquetry, considerable waste is involved, but this cannot be helped and on small pieces, is of no great importance. On large pictures, however, it is of considerable importance both from the cost standpoint and difficulties encountered. It would be foolish to lay a sheet of burl elm or burl maple a foot square on a piece where only a small piece, more than likely in the center would be cut out. So a sort of "segregated pile" method is utilized. To better illustrate the method, let us take an actual pictorial piece and go through the operations. An outline drawing of a simple picture is shown, with the different woods of which it will be composed marked, together with the direction of grain of each piece.

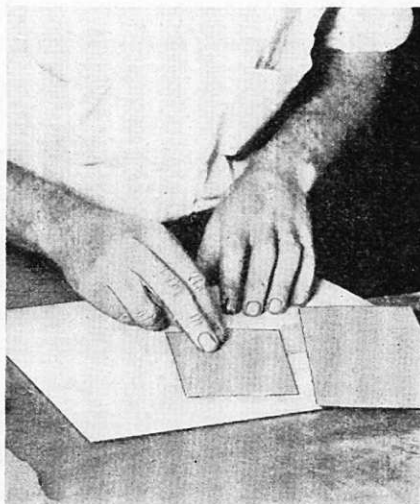
Transfer the complete outline of the picture to a piece of thin plywood.

First choose the veneers which cover the most area. In this case they will be the foreground and sky. Lay a piece, large enough to cover the sky area on the pattern and another to cover the foreground, letting both lap over surrounding areas. Fill in the space between them with scrap pieces of veneer (any kind will do). No veneer should overlap another.

Now, with different veneers specified, cover as many areas as possible, such as the face, hands and legs of the figure, the tree trunk, a bush, maybe part of the foliage, using pieces of veneer just large enough to completely cover the area for which it is intended. Then fill in, roughly, all uncovered areas with scrap pieces of veneer.

In no case should one piece of veneer of a layer, overlay another piece, since this would cause an uneven pile, and prevent the proper clamping of the piles. This must constantly be kept in mind while laying the veneers. Where a considerable number of small pieces are used to fill out a lay, some gummed paper may be used to hold them in position until the piles have been completed. (See photo.)

Repeat this procedure until all areas of different kinds of veneer have been taken care of. Then lay a piece of thin plywood



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on the top and clinch-nail the whole pile together. Transfer the pattern to the top plywood, in such manner as to make it "register," or line up accurately with the one on the bottom.

Choose a fine blade, such as a puzzle blade of .010" thickness.

It is seldom that a pile of veneers in landscape marquetry will be over $\frac{1}{2}$ " in thickness in this method, so that a blade of this size will stand up readily for the work. Too fine a blade will make the fitting of the pieces more difficult when assembling,

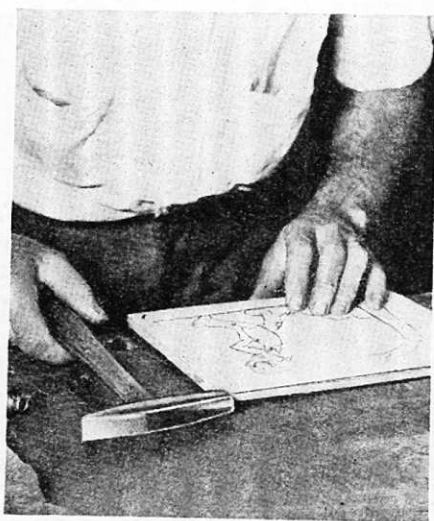
and is more liable to breakage. Then, too, a cut made with a very fine blade will not show up where the cut is used to indicate lines, such as the eye and mouth in the picture illustrated.

Start at one corner and saw out one part at a time and lay these pieces carefully to one side. Keep each group of pieces separate.

It is logical that pieces sawed from a pile in this way will fit perfectly into adjacent pieces. All you have done is remove material equal to the thickness of the saw blade.

This method has another advantage in addition to saving material. You can arrange the grain of the different veneers so as to help the marquetry picture pictorially.

The method of assembling the pieces will be described further on.



Clinch-nail the "pile" firmly together.



Marquetry in Quantity Production

For making marquetry in quantities, an entirely different method of cutting must be used.

An original drawing of the marquetry is first made in complete form, and the drawing then carefully perforated.

The number of different kinds of veneer to be used is then determined, and a number of duplicate patterns, on paper, are made to equal it; in other words, a complete paper pattern is necessary for each kind of wood to be used.

Veneers are then stacked usually about 20 to a pile, with the

Its Use and Application

grain of all the pieces running in the same direction. A piece of thin plywood is placed top and bottom and the whole pile securely clinch-nailed along the edges.

The paper patterns are then cut up, taking all the pieces that are to be of mahogany, for example, from one pattern, disregarding the remainder of the pattern. The pieces are cut out with a $\frac{1}{8}$ " margin around the edges of each piece.

These pieces of pattern are then pasted on the top of a mahogany "pile," arranging them carefully to conserve material, but placed so the grain of the pieces will be correct according to pattern.

Taking the same pictorial pattern as previously described, the photo shows clearly how this is done.

After a "pile" of each of the woods have been made up, and paper patterns pasted on them, sawing is begun. For this work a blade about $\frac{1}{8}$ " wide of 26 to 30 gauge is usually used. The blade must be kept absolutely sharp if good results are to be expected.

When sawing out the parts you must gauge your saw cuts so as to "leave the line" of the paper pattern. Saw just as close and accurately to the line of the pattern as you can, but without cutting away the line. This is a test of skill, if there ever was one, and it's a job that cannot be hurried. As a completely sawed piece is cut loose from the main pile, the pieces are placed in a shallow tray and laid to one side. Individual trays may be provided for each shape of each kind of veneer, or trays divided into compartments may be used, as long as the pieces of different shape and different veneer are kept separated.

After all the pieces have been cut, you are ready to assemble them into a complete picture.



Assembly of Marquetry

Do not attempt to fit the pieces together and glue them to their permanent backing at the same time. Trouble is almost certain to result. Even the finest operators, careful as they are, cannot cut the pieces perfectly, so that some trimming and fitting is always necessary.

Provide a maple board about a foot square, a steel straight edge, some straight wooden strips $\frac{1}{4}$ " x $\frac{3}{8}$ " x 12" and a very sharp knife. Regular veneer trimmer's knives may be purchased,

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Assemble the picture on wrapping paper to which the design has been transferred.

but a good paring knife will answer the purpose admirably, if the end is ground and sharpened to an angle of about 60° across the end, with the cutting edge in the form of an arc rather than straight. The cutting is done by rocking the cutting edge rather than drawing it across the surface. Trimming is only necessary when making marquetry by the production method.

The same knife that is used for trimming will also come in handy for cleaning out the corners of recesses into which inlay designs are to be placed.

Make some starch paste by dissolving two tablespoonsful of laundry starch in a pint of hot water.

Tack a piece of heavy wrapping paper on a flat board and nail two of the wooden strips on to form a 90° corner.

Start with the piece that goes in this corner, pasting it to the paper with the starch paste. Then fit and paste in all the pieces that are adjacent to the first piece. Continue working in this way until the completed picture has been fitted together. Do the trimming and fitting as you go.

Saw cuts that have been purposely put in to represent lines, and little discrepancies of fitting are now filled in. Commercially, a mixture of sawdust and glue is used, but the amateur will find that tinted or colored plastic wood or crack filler is easier to handle, using a small spatula or putty knife to apply it.

The wrapping paper to which the pieces have been pasted acts as a protection and a means of holding the pieces together.

When gluing the marquetry to a backing, or inseting it for an inlay, it is put on with the paper side up. After the glue has hardened, the paper is then scraped and sanded off, leaving the marquetry clean and smooth.

Colored or dyed veneers in all manner of shades may be obtained from veneer supply houses. But, the brownish toning along the edges of certain portions of a pattern, particularly in floral designs, is strictly a hand proposition.

Its Use and Application

Provide a pan of clean, fine sand (about two cupsful) and place it over a gas burner. When the sand becomes hot the pieces of veneer are held edgewise with a pair of tweezers, one by one, in the sand until the heat of the sand scorches the edge to the desired degree. Do not let the sand get hot enough to burn the veneer. A little experimenting will show how far you must thrust the piece into the sand and how long to leave it there, to get best effects.

This toning must naturally be done on the pieces after they have been cut out, and before they have been assembled.



Assembling with Borders

Where a picture or pattern is to be arranged within a fancy veneer border, first assemble the picture proper. Then trim the edges all around and fit the border. A very useful adjunct to the making of bordered panels is a trimming knife, such as the type used by photographers.



Letters and Sign Work

The making of cut-out letters, profiles and other aids to the profession of sign making has brought abundant returns to the owners of jig saws.

One type of sign that proves popular is a trademark. Cut from smooth faced building panels of the composition type, and then painted in attractive colors sometimes in gold or silver leaf.

There is opportunity here for the jig saw owner not only to exercise his ingenuity, but also to gain valuable experience in salesmanship.

Every department store and most other stores are prospective markets for novelty cut-outs for window displays. Cut-out numerals, in unique forms, and colored attractively, play an important part in window displays. They can readily be made in quantities on the jig saw and sold at a low figure on this account.

It is small wonder that the jig saw was the saving means for numerous families during the slump in business.

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Inlaying Metals

Inlaying monograms or initials in cigarette humidors, glove boxes, and similar articles calls for a slightly different procedure. By far, the easiest way is to veneer the surface in which the monogram will be set, and cut the monogram into this veneer, as follows:

Trace the design on the metal, using a piece just large enough to accommodate it. Then apply rubber cement to both the veneer and metal, allowing it to dry. Apply a second coat and press the metal into place on the veneer.

Tilt the saw table, if possible, slightly to the right, about one degree. Bore a small hole in a corner of the design, through which to insert the saw blade, which should be of the fine jeweler's type.

Keeping the design always to the right of the blade, saw out the design, making one continuous cut. The tilted table gives a slight angle to the edge of the metal and the veneer, making a much closer fit.

After the design is cut out, the rubber cement may be removed by rubbing it hard with the fingers. Use shellac to cement the metal in place permanently.

Pewter, brass, copper, silver, aluminum or other soft metals may be used. Celluloid in a variety of colors also provides excellent effects.

When doing this kind of work the operating speed of the machine should be reduced to a low speed, from 300 to 600 R.P.M. The work cannot be hurried, since jeweler's blades are hard tempered and do not permit a great deal of side pressure.



Metal Monograms

Beautiful monograms of metal may be readily cut on the jig saw and mounted on glove boxes, jewel boxes, and other wooden articles, either homemade or purchased. Monograms cut from metal and attached to leather articles such as handbags, purses or wallets, take on an added sentimental value to the recipient of such a gift.

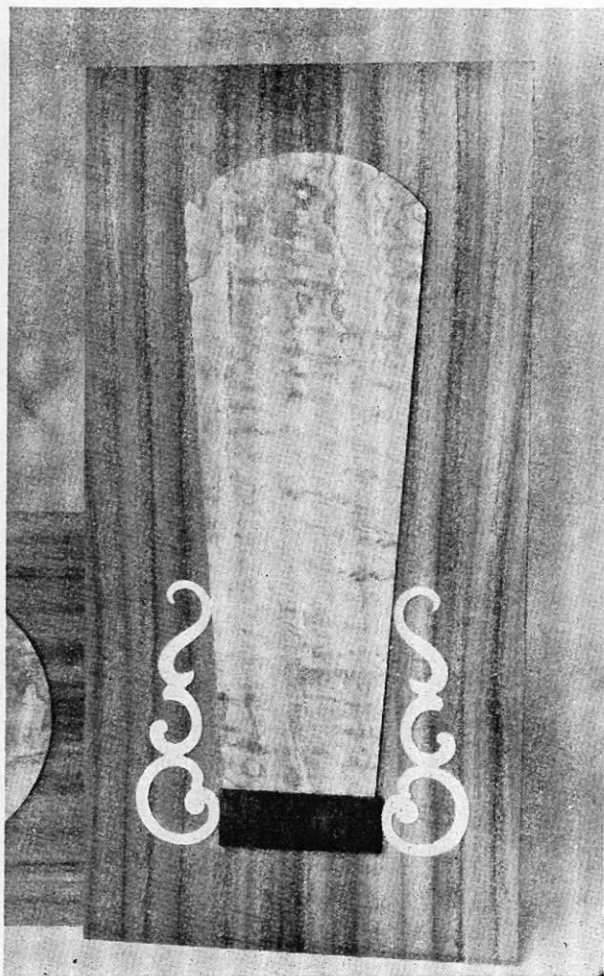
Its Use and Application

Overlaying

It is not always necessary, nor desirable, to inlay fancy woods to gain effects. Fret-sawed brackets and panels may be cut out and applied directly on the surface.

Delicate pierced mouldings are easily made and applied to boxes, cabinets and furniture, and contribute a lot in the way of tasteful decoration when not overdone. In this work there is ample opportunity for the jig saw operator to display his ingenuity.

Some of the things which may be handled in this way are illustrated. A tour through gift shops and department stores will offer numerous other suggestions along these lines.



A door of a telephone cabinet, overlaid with a panel of Tamo ash, a block of rosewood and two jigsawed scrolls of Holly makes a very decorative appearance.

Spun and Pierced Metal Work

Going a little further with the making of pierced metal work, we come to the sawing out of curved shapes, such as a silver cake platter. Sawing a piece of this kind is not as hard as it seems. The trick lies in preparing a jig or platform to support the object so that the point where the sawing is being done is parallel with the surface of the jig saw table. For this reason, a block must be fastened to the jig saw table, with the upper surface rounded somewhat, to fit into the contour of the dish or tray. A hole must be cut in this block for the saw to travel in, so the saw cuts only the metal.

Fretwork or pierced metal handles may be made for attaching to pitchers, porringers and similar pieces. The handles can be very successfully made from a piece of pewter sheet $3/32''$ thick. This is the procedure that was followed:

The sheets of $1/8''$ cold rolled steel were clamped together, with $3/32''$ strip steel around three sides, between them. The plates were then made warm, stood on edge and melted pewter scraps poured in the top. A very nice cast plate was the result.

One can also make pierced patterns of wood, mold them in jeweler's sand, and cast pewter, aluminum, zinc and if enough heat is available, brass, silver, and gold.

There is practically no end to the things that may be tastefully embellished through the medium of the jig saw.



Segments of zinc, pieced, and nailed to a turned wooden dish as illustrated on the left makes a very attractive and altogether useful dish for ornament or actual service.

Its Use and Application

Die Filing

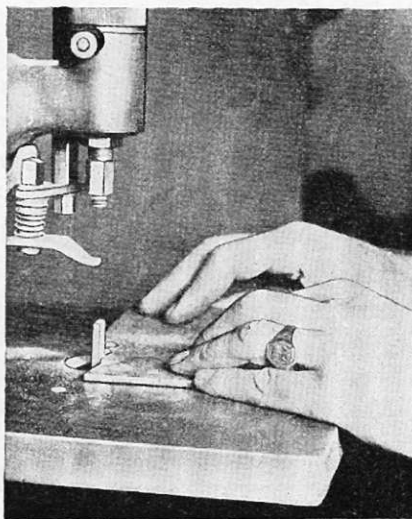
Jig sawing is not the only work which a machine of this type will perform. All the desirable elements of a fine filing machine are incorporated, and special die maker's files are available for just this purpose. These files come in a variety of sizes and shapes, but for the general run of work, a Three Square, Half Round, Round, Crochet, Pillar and Square file will be sufficient.

This is not a treatise on die design nor die making. Since a man who is making a die or a punch will probably have drawings and instructions to follow, or more than likely knows considerable about this profession, space need not be taken here to describe the methods. We wish merely to have him recognize the inherent accuracy and adaptability of the jig saw machine for this work.

The amateur can utilize the filing feature of the machine to facilitate the making of wood, fibre or metal templets, to be used for router work or router carving. (This work is described in one of the books in this series called "The Drill Press.") The jig saw then proves itself of immense value as an adjunct to other machines.

A number of very convenient sanding spindles, or pencils, of various diameters may easily be made and kept on hand for the purpose of cleaning up and sanding fretwork. Pieces of dowel stock, dipped into liquid glue and rolled in powdered or crystallized carborundum or emery dust will do very effective work. The emery or carborundum is available in a wide range of grits for fast cutting or fine finishing. In using them caution is necessary—run the machine at a low speed when sanding.

One of the greatest advantages of the jig saw for die filing is the ability to adjust the table of the machine to an angle to the file, both parallel to and at right angles to the operator. This assures the exactness of filing which is so essential in die work.



Filing a blank for a die.

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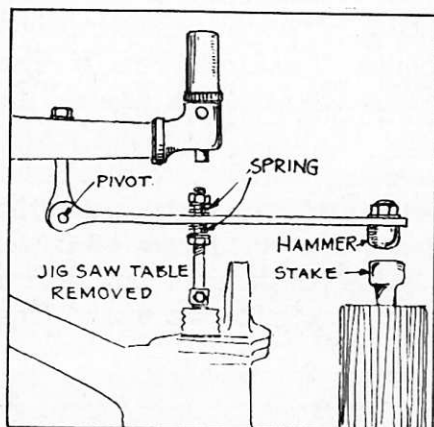
When filing or sanding either to get a square or an angular edge, the immeasurable value of the machine method is apparent. One only needs to give attention to filing to the line, since the angle is automatically maintained by the machine.

Men whose hobby lies in the making of model trains or other types of model work will find this machine filing indispensable.



Mechanical Hammer

Since the jig saw has all the essential elements of motion, it may be easily arranged to be used as a hammer for use in metal work, such as hammered vases, dishes, mugs, jewelry and like objects.

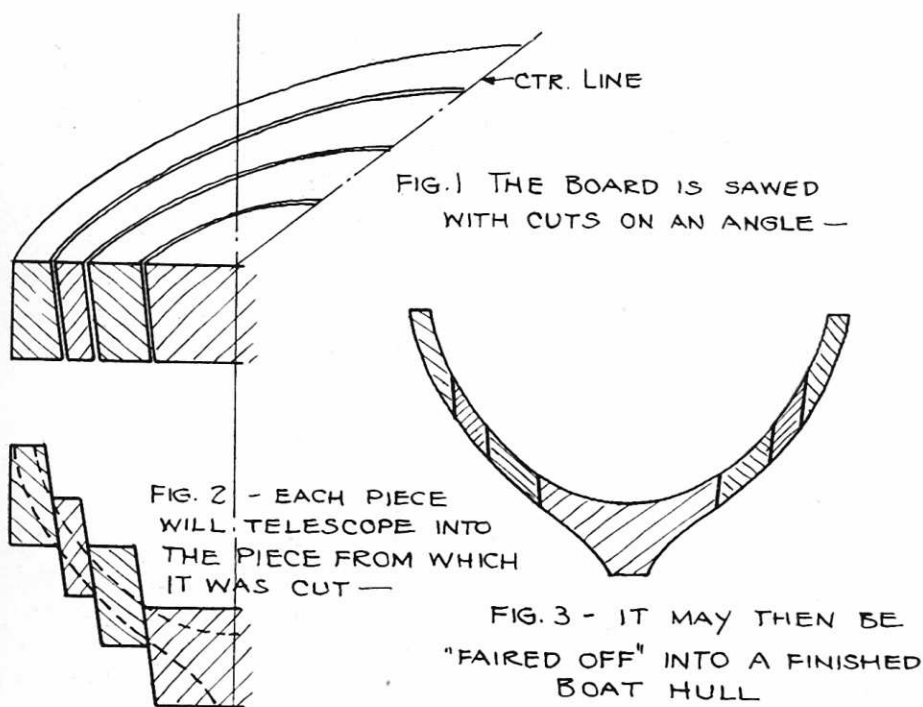


In the sketch is a typical conversion of a jig saw for hammer work. A piece of spring steel has been fastened to a pillar, which was rigidly attached to the upper arm. At the other end, hammers with different shaped faces are fastened by means of nut and spring washer. Midway between the pillar and hammer a stud is placed in the spring handle, and is fastened in the chuck of the

machine. If the stroke of the machine is one inch, the stroke of the hammer, using a 12" spring, with the stud at the middle, would be two inches. If the head of the hammer weighs about half a pound, a considerable blow may be obtained. In ornamental metal work heavy blows are not as necessary as blows of equal force, so that again the superiority of a machine over hand hammering is apparent.

The real value, however, lies in the saving of strain on the arm and hand, not to mention the greater progress that can be made in a given length of time. And last, but not least, it is the uniformity of a hammer blow, not uniformity of spacing, that gives the real charm to hammered metal work.

Its Use and Application



Model Boat Building

Utilizing the advantages of a tilting table on the jig saw in the making of boat hulls is not a new idea, having been developed several years ago, but the idea has not been as universally put to use as might be expected.

Now we know that if a section is cut from the interior area of a board, with the table tilted to an angle, that, due to the sloping sides of the piece cut out, it cannot be pushed all the way through the opening. (You will particularly notice this when sawing some heavier stock, if the table is not at exact right angles to the saw.) We can so gauge this occurrence that the sawed out piece will drop only a predetermined distance down in the original piece. By so laying out the lines or plans of the "lifts" or layers, a model boat hull is quickly formed in the rough, with an absolute minimum amount of waste. If properly planned, one board $\frac{3}{4}$ " thick may be so cut as to telescope into a model boat hull that is 6" deep amidships. When glued together in this position, a rigid and substantial hull will be the result. The "fairing" up of the lines and the smoothing of the hull is a hand work proposition, outside the province of this book.

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Sign Making

Recessed or "unfret" signs may be quickly made by utilizing the same method, just described for boat building. Letters cut out using the tilted table will only set in a short distance, so that a recessed or inset effect may be obtained.

Profiles, letters and figures cut out of plywood or other materials may be glued or nailed to a backing, while the original panels with the letters in the form of openings may be backed up with colored paper to form illuminated signs for night advertising. Considerable income may be derived by making such signs for local merchants.



Puzzle Making

The jig saw puzzle which attained such tremendous national interest a short time ago probably was the greatest recent factor in popularizing the power jig saw. Speeding blades turned out puzzles by the thousands. Lending libraries sprung up all over the country, and while the demand has dwindled somewhat, these libraries and individual enthusiasts still require substantial quantities. And there is always a market for unique and educational puzzles. For fifty years or more puzzles have had their ardent adherents numbering in the thousands.



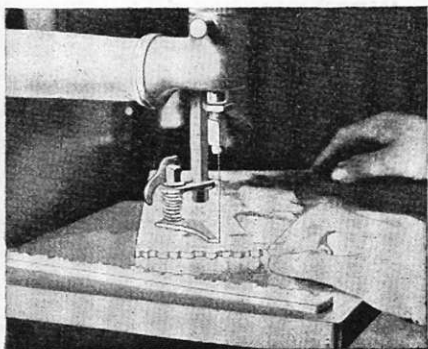
Picture Puzzles

By far, the most popular of puzzles is the picture puzzle. The picture is glued to a plywood backing and cut into small pieces, which are then packed in a disassembled form.

The demand is almost entirely for interlocking puzzles, where each separate piece has one or more key members which interlock with one or more adjacent pieces. After a puzzle of this type has been completely assembled, the entire puzzle may be held up by one corner without falling apart.

The type of plywood generally used for picture puzzle work is basswood, from $\frac{1}{8}$ " to $\frac{1}{4}$ " in thickness. This wood is soft and cuts easily, and is fairly cheap. Its softness is a disadvantage in one respect, in that the puzzle pieces will not stand a lot of

Its Use and Application

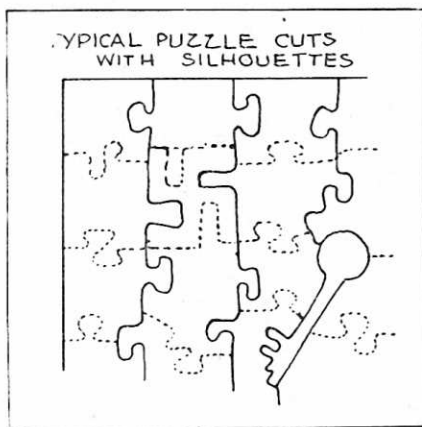
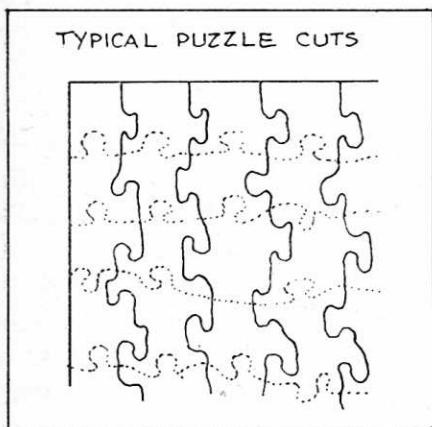


Using the hold-down foot for picture puzzle work.

abuse, and great care must be used in cutting so that no narrow projecting "keys" are cut, which would break off.

Maple, birch, apple, pear and sycamore ply woods make more substantial picture puzzles, but cost quite a bit more than the basswood.

If the hold-down foot is used in connection with the making of picture puzzles, particular attention must be paid to keeping the under side of it very smooth. Polishing it on a cloth buffing wheel with pumice stone will produce the desired surface. There will be no danger of scratching the face of the picture.



The common form of interlocking puzzle is cut as shown by the sectional outline illustrated at the left. This is cut freehand; that is, without any guiding lines marked, the easiest method being to cut the whole puzzles into strips approximately $\frac{5}{8}$ " wide. These strips are then cut into pieces about $\frac{5}{8}$ " long, or $\frac{5}{8}$ " squares. The strips are all made with interlocking key numbers at intervals of about $\frac{5}{8}$ " and the pieces cut from the strips are likewise interlocked into adjacent pieces.

Another popular variety of the interlocking puzzle incorporates silhouettes of all manner of objects, distributed among the pieces, as illustrated. One type uses letters of a name with a

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date, as an appropriate birthday or Christmas gift. Several methods of locating and cutting the silhouettes are in use, but of these the method of tracing the outlines of the different silhouettes on scraps of paper, and cementing them on the picture with rubber cement is probably the simplest. The papers are easily removed after completion.

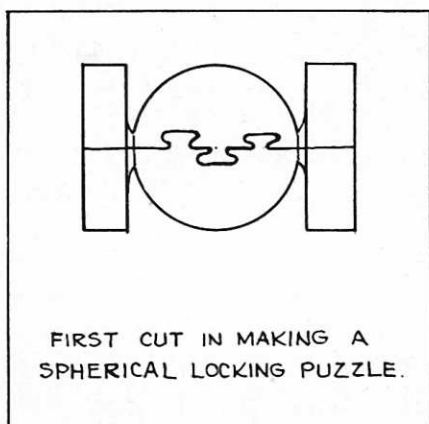


Speeds for Picture Puzzle Work

The speed at which to operate the machine for picture puzzle work depends entirely on the skill of the operator. For the beginner, a speed of about 1100 R.P.M. is recommended, which may be increased to 1300 R.P.M. as soon as the skill of the operator will permit, and later increased to 1750 R.P.M. Don't try to run the machine at such a high speed that you have to hurry to keep up with it.

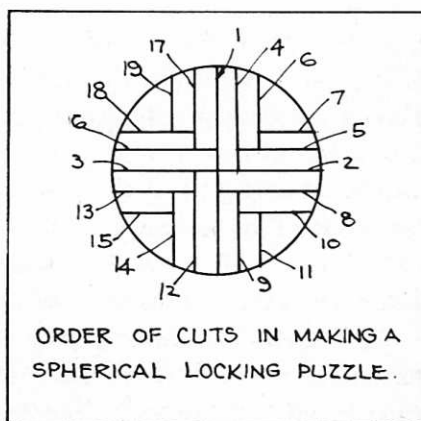


Other Puzzles



for the preliminary cut, as a support. Each cut thereafter is made with two key members, making the cuts in sequence as numbered in the sketch, with the rounded surface uppermost each time, and resting on a surface which has been previously cut.

Another type of interlocking puzzle which may be easily made on the jig saw is that of a square block, egg shaped block or sphere shape. The general method is about the same for any of the shapes. On rounded shapes, a square must be left at each end,



Its Use and Application

Art Titles for Moving Pictures

On the surface it would seem to be a far cry from photography to a jig saw but with the tremendous popularity of "home movie making" the jig saw fills a definite niche in the scheme. Titles cut from thin plywood, individual letters cut out and stood on edge for photographing, bits of scenery, back drops and miniature stages are handily prepared at very little cost and only a few hours of interesting work. One will find that the preparation of these "sets" is every bit as fascinating as the photography itself. Ingenuity plays a very important part, but a close study of regular motion picture procedure will be of great value in suggesting new ideas.

The owner of a jig saw who is looking for an outlet for his work can readily build up a nice business by making all sorts of "props" and renting them to photography enthusiasts.

We show on page 61 two different alphabets which, if cut from wood of $\frac{1}{8}$ " to $\frac{1}{4}$ " thickness are suitable for many unique effects in title photography. They may be temporarily mounted on paper, cardboard, building boards or wood panels by using rubber cement. Or, they may be stood on edge and photographed, with strong lighting effects, from different angles to obtain effective titles. Other alphabets may easily be worked out by tracing the outlines of letters from large type faces in magazines and newspapers.

It is not alone in the making of cut-out letters that the jig saw proves of great help, but also in the making of little stage settings, bits of scenery, back drops, puppets, prosceniums frames for titles and numerous other items that may be gleaned by careful study of such items in regular motion pictures. Jointed puppets, movable and jointed figures and objects provide an endless variety of combinations. Take the example shown in Fig. 1 on page 59. The title letters are cemented to a pane of glass, behind which is a whirling spiral or a continuously moving band on which a design has been drawn or mounted. (Strips of fancy paper serve the purpose admirably.) This provides a title with a moving background.

In Fig. 2 we have a framed pair of doors, which are opened slowly by a pair of concealed threads, revealing the title.

In Fig. 3, we have a scissors type of vignette, easily made from thin wood, with which fadeout titles are quickly made by interposing the vignette between the lens and the mounted title.

THE JIG SAW

The vignette should be set a short distance away from the lens.

In Fig. 4 is shown another type of setting commonly used, where the title is printed on a long sheet and is drawn up past the opening in the frame, causing the reading to disappear at the top and appear at the bottom. The decorations may be actual drapes in miniature.



Puzzle Blades

Special, fine jig saw blades have been developed for puzzles, after a great amount of experimental work. The requirements finally narrowed down to a blade .006" x .025" as being the ideal size to give a fine cut and still be rugged enough to stand up under continued high speed. The following charts give a rather complete list of blades, their thicknesses, etc.



Heavy Duty Saw Blades for Woods

Unset Thickness Width	Set Thickness Width	Teeth Per Inch
.022" x .060"	.026" x .060"	13
.022" x .081"	.028" x .081"	11
.024" x .099"	.037" x .099"	10
.028" x .157"	.040" x .157"	7
.029" x .250"	.041" x .250"	7

Hard Metal Saw Blades for Cutting Extra Hard Metals

Thickness and Width	Teeth Per Inch	Thickness and Width	Teeth Per Inch
.008" x .042"	60	.013" x .029"	36
.009" x .076"	48	.013" x .038"	27
.009" x .082"	48	.013" x .049"	20
.009" x .100"	48	.013" x .054"	18
.009" x .108"	48	.014" x .060"	17
.009" x .120"	48	.014" x .075"	15
.039" x .250"	26	.015" x .080"	13

Its Use and Application

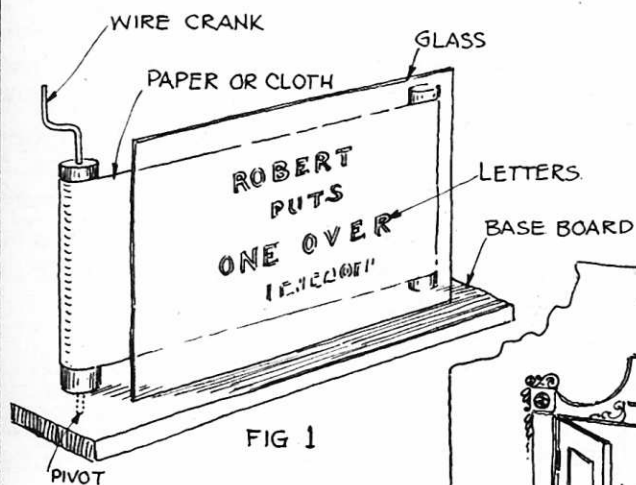


FIG. 1

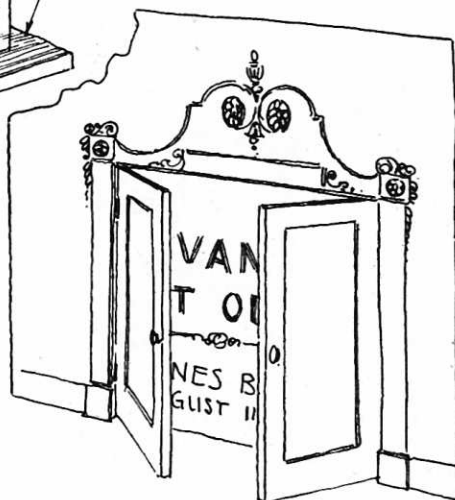


FIG. 2

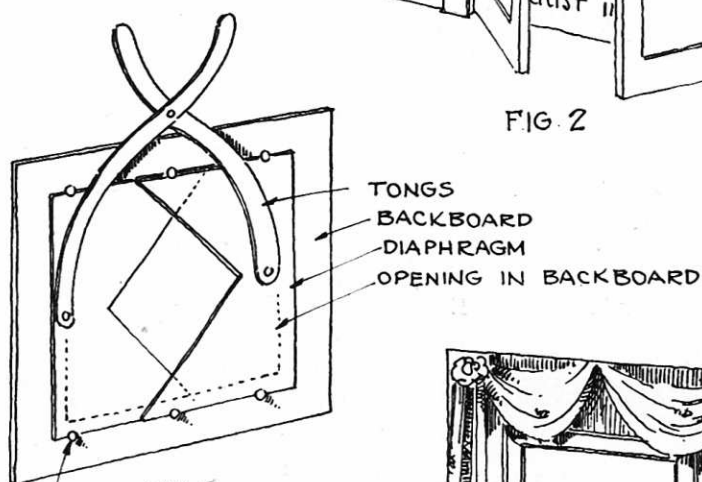


FIG. 3

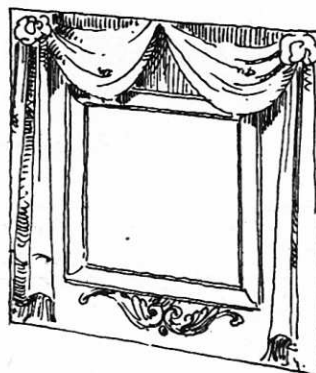


FIG. 4

Special Thin Saw Blades for Picture Puzzles and Inlaying

(Single Tooth Saws)

Thickness	Width	Teeth Per Inch
.007"	.028"	21
.008"	.028"	21
.010"	.035"	21

(Double Tooth Saws)

Thickness	Width	Teeth Per Inch
.008"	.028"	33
.008"	.028"	38

5 Inch Fret Saw Blades

(Single Tooth Saws)

Thickness	Width	Teeth Per Inch
.010"	.020"	32
.011"	.024"	26
.012"	.027"	26
.013"	.028"	23
.014"	.032"	21
.014"	.036"	19
.015"	.040"	17
.017"	.044"	16
.018"	.046"	15
.019"	.050"	15
.020"	.053"	14
.021"	.057"	13
.022"	.063"	13

(Double Tooth Saws)

Thickness	Width	Teeth Per Inch
.010"	.020"	36
.011"	.024"	34
.012"	.027"	28
.013"	.028"	28
.014"	.032"	26
.014"	.036"	22
.015"	.044"	18
.017"	.044"	18
.018"	.046"	18
.019"	.050"	17
.020"	.053"	16
.021"	.057"	16
.022"	.063"	16

Jewelers Metal Saws

Thickness	Width	Teeth Per Inch
.007"	.014"	74
.007"	.017"	72
.008"	.017"	70
.009"	.020"	64
.010"	.021"	60
.012"	.023"	56

Thickness	Width	Teeth Per Inch
.013"	.028"	48
.014"	.030"	44
.015"	.032"	40
.016"	.033"	36
.016"	.035"	32

A B C D E F G H I

J K L M N O P Q

R S T U V W X Y

Z & 1 2 3 4 5 6

7 8 9 - A B C D E

F G H I J K L M N

O P Q R S T U V X

W Y Z - 1 2 3 4

5 6 7 8 9

INFORMATION ON FINISHING

The term finish as applied to wood work means staining, filling, oiling, shellacing, varnishing, lacquering, waxing, painting, gilding and the like. The purpose of finishing is to bring out the natural beauty of the wood, to protect the surface from changes in temperature and from moisture and, at the same time to give the wood a wearing surface.

General Directions

Too much emphasis cannot be placed on the importance of properly preparing the surface of the wood before starting to apply the finish since no amount of skill, nor material applied will hide defects in cabinet work. On the contrary, they will serve to magnify such defects. The surface of the wood for all types of finish, must be absolutely smooth. By smooth is meant a surface free from any mill marks (machine marks), chipped or wavy indentations and even sandpaper scratches.

Sandpapering

While sanding machines and equipment are indispensable for reducing wood and trueing all surfaces, the final sanding usually should be done by hand, working down to the finest grade for a perfect surface. Where the work is in a rather poor condition, start with No. 11½ grade which cuts quickly but leaves quite large scratches. Follow this with No. 1, then No. ½ and No. 0 grades, each time making the scratches finer until finally they are invisible. If the surface is inclined to be wavy, sandpaper across diagonally with the grain. With this action the cutting and trueing up is more effective. Final sanding must be done **with the grain**. Use a sandpapering block to fold the paper over; this insures flat surfaces. A block made with cork linoleum glued on the bottom acts as a cushion for the sandpaper. Before staining,

however, give the entire piece of furniture a thorough rubbing with sandpaper held in the hand, and slightly round all corners with No. 00 and No. 000 grades of paper.

Staining

There are four different kinds of stain—water, acid, spirit, and oil. Oil stain is the easiest to apply and leaves the surface smooth but does not give as clear a color nor penetrate as deeply as the other stains. Water, acid and spirit stains give clear, lasting colors, with any degree of intensity, but are more difficult to apply evenly and have a tendency to raise the grain. The choice of stain rests primarily with the individual.

Stain should always be applied liberally by brushing on or better still by dipping so as to get a uniform depth of color. The surplus stain should be wiped off with an old rag to prevent wood darkening in spots. Allow at least twelve hours for stain to dry thoroughly. If the grain has been raised by the stain, apply a very thin coat of white shellac to stiffen these raised fibres. When dry, which will under good conditions be an hour or so, lightly rub with No. 00 sandpaper.

Filling

If the wood you are finishing is of a porous nature these pores must be filled with a paste wood filler. Use a shade to match the stain you have applied. The filler is put on in the consistency of a cream, allowed to set until it turns rather white and then rubbed off across the grain. Be sure to clean out all corners before the filler sets hard. Sometimes a second coat is desirable. Allow twelve hours to harden.

Shellacing

It is far better to apply many thin coats rather than one heavy coat of shellac. When applying, do not go over the surface any more than is necessary to avoid laps. Do the shellacing in a warm room, dry and free from draughts. Three or four coats give a good surface. Lightly rub between coats with No. 00 sandpaper, and the final coat with fine pumice stone powder and crude oil. Use a rubbing felt for this operation. The fine old furniture of our Grandfather's day was finished in shellac.

Wax Finishes

To bring out the values of either a stained or unstained natural wood finish and to give the finish depth, shellac and wax finishing are very satisfactory.

If the work has been stained, be sure it is thoroughly dry and then brush on a very thin coat of shellac. Give it four or five hours to dry, then go over it with No. 00 sandpaper, smoothing it down uniformly. Follow this with another coat of shellac and another sanding. With very soft wood you will probably need three coats of shellac, sanding after each one. Care must be taken that the shellac is not too thick, otherwise it will cause laps and waves in the finish which are very difficult to get out. Alcohol is the correct thinner to use. After the last coat of shellac sand it carefully, ready for the wax.

To apply wax, put it on a flannel cloth or place a lump of it in a pad of cheesecloth and rub the surface until it is completely covered. Then polish to a hard glaze with the sheepskin polishing pad attached to the flexible shaft, or by hand. The result will be a sort of dull satin finish which is very hard and durable. Increasing the applications of wax will give depth to the finish.

Antique Finish

The best woods for antique finishes are the open grain woods, as it is easier to make their pores look gray as with accumulated dust.

The stock should be stained first, given two coats of shellac and sanded down after each coat. Then mix two parts of paste wax with one part of rottenstone, rub this mixture well into the pores of the wood and polish.

Lacquering

Lacquers have many advantages for finishing. They are tough and durable, and most of them dry in ten or fifteen minutes, leaving a dust-free surface.

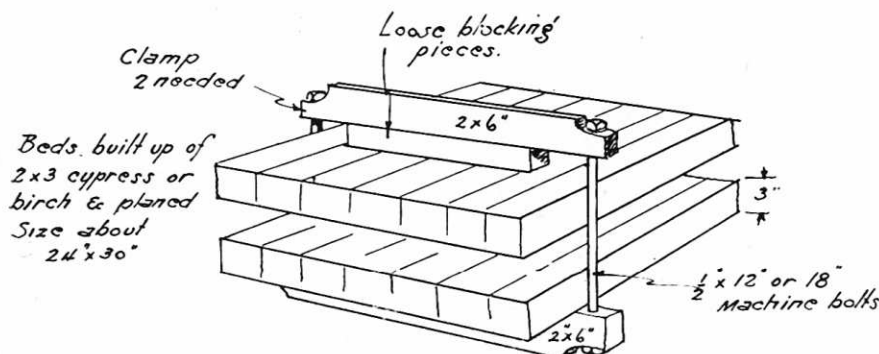
They can be either sprayed or brushed on. If applied with a brush, use one with long, soft bristles. Do not try to brush too long, or try to cover too large an area at one time. On previously finished surfaces in good condition, apply two or more coats, allowing about an hour between coats for drying. For surfaces

that are scratched, checked, or marred or on new unfinished surfaces, sand smooth and apply one or more coats of lacquer undercoat or sealer. Open grained woods should be filled with a suitable wood filler before lacquering. On bare metal or previously finished metal surfaces that are scarred apply one or more coats of metal surfacer and then lacquer.

If lacquer becomes thick it should be thinned with lacquer thinner which is also used for cleaning brushes.

Lacquer should never be applied over mahogany-stained work or recently varnished, painted, or enameled surfaces.

How to Make a Veneering Press



VENEERING PRESS

Veneering

Those experienced in furniture will invariably prefer veneered to solid stock, as there is much less cracking, checking and warping with veneered stock. One thing for the amateur to remember is that it is necessary to veneer both sides of the stock. Also, the veneer should not be applied directly to the base. In three-ply veneer stock the face and backing veneers are laid at right angles to the grain of the core. In five-ply veneer a crosslay veneer (usually poplar or gum) is glued both sides and laid at right angles to the core (one piece, each side) and on these the face and backing veneers are laid with the grain parallel to the core or at right angles to the crosslay veneer. Seven-ply veneer stock is usually made up by taking three pieces of 1/4" core stock glued together to form the core on which regular veneer is laid to form three- or five-ply stock. This form is usually used when building curved plywood.

WOODS COMMONLY USED

Hard Woods

Chestnut. Light in weight, of average strength, hardness and elasticity. Chestnut is sawed, planed, turned and shaped easily, although it splits readily and warps quite badly.

Maple. It is very hard, strong and elastic. Its close, crooked grain takes an excellent finish.

Oak. Used extensively for furniture and cabinet work. It is heavy, strong, hard and elastic. Very durable but warps and checks considerably.

Ash. Resembles oak somewhat, although ash is coarser grained and less attractive, but easier to work. Used for all kinds of furniture. Straight grained, heavy, hard, strong, stiff and tough, but becomes brittle with age.

Black Walnut. Because of its beautiful chocolate brown color, walnut is in popular demand for furniture, but rapidly becoming scarce. It is heavy, hard, strong, coarse grained and easily worked.

Birch. This wood is hard, tough, straight of grain and able to stand wear and tear. Widely used in cabinet making and for various kinds of furniture. An excellent wood for lathe turning.

Mahogany. There are several varieties, chief of which are Central American, African, Mexican and Philippine. They vary considerably in color, hardness and ease of working. Usual color is rich red. Very desirable if kept dry. Glues exceptionally well.

Soft Woods

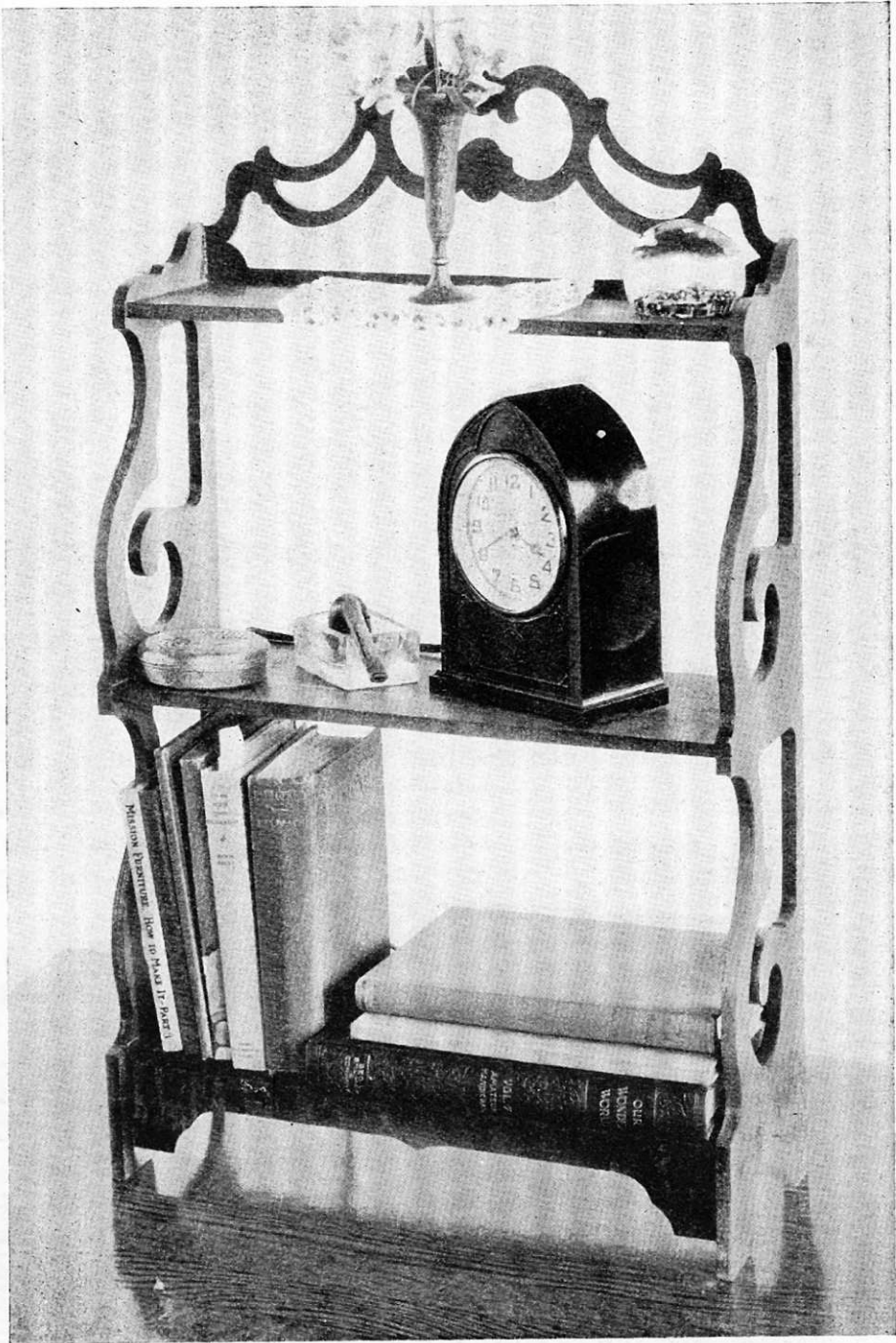
Poplar. An excellent wood to work. Light, soft and stiff but not strong. Its fine texture and exceptional working qualities make it very desirable for furniture.

Gum. It has an even texture, is comparatively easy to work, takes a beautiful finish, is an ideal wood for carving, and with a little care can be nailed well.

Cypress. A soft, easily worked wood that does not warp easily, but is likely to contain many fine checks. Nails well and is very durable. Color is reddish brown. It makes beautiful furniture.

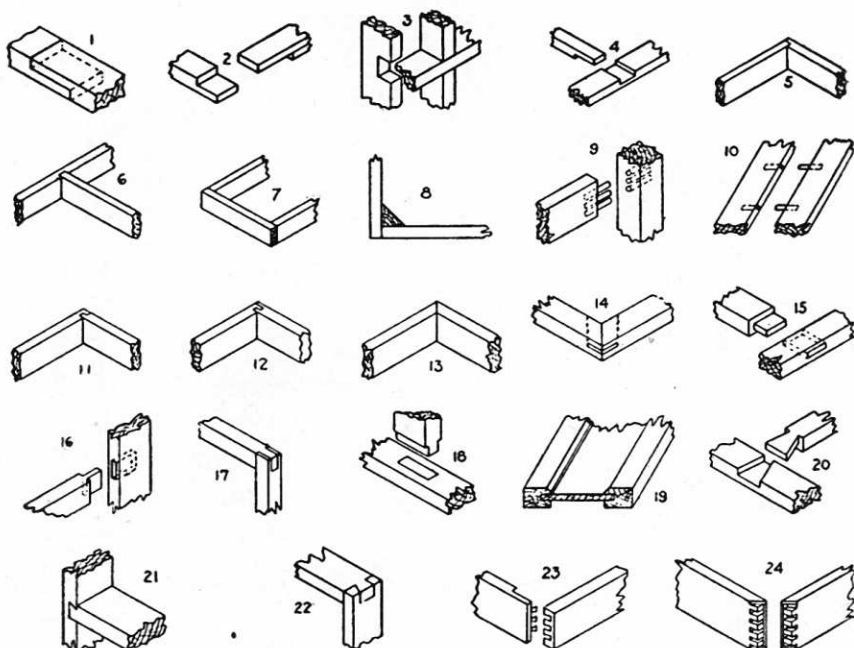
Basswood. A light, straight-grained wood which warps very little, is easily worked and nails well. Fairly durable but weak. Picture frames and mouldings are usually made from basswood.

White Pine. A very light wood of average strength and durability. It is used in large quantities for various carpentry purposes. Grain is straight and it is easily worked.



A good book magazine rack or bookshelf, made in a short time almost entirely on the jig saw.

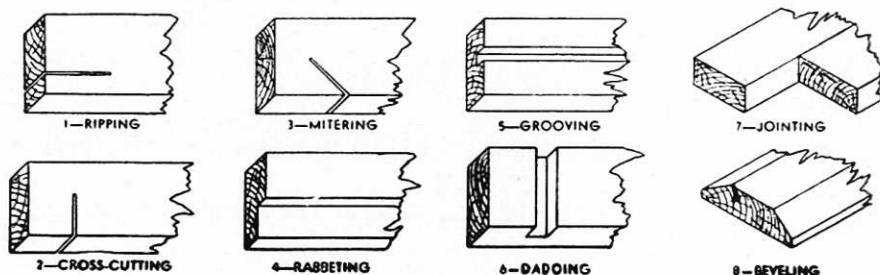
HOW JOINTS ARE MADE



- | | | |
|---------------------------------|-------------------------------------|--|
| 1. Spliced or Halved Joint | 11. End Dado or Box Joint | 18. Stub Mortise and Tenon Joint |
| 2. End Lap or Halved Joint | 12. Dado Tongue and Rabbet Joint | 19. Panel Construction |
| 3. Cross Lap Joint | 13. Miter Joint | 20. Half Lap Dovetail Joint |
| 4. Middle Lap Joint | 14. Miter with Spline | 21. Half Dovetail Dado Joint |
| 5. Rabbet Joint | 15. Through Mortise and Tenon Joint | 22. Through Single Dovetail Joint |
| 6. Dado Joint | 16. Blind Mortise and Tenon Joint | 23. Multiple End Dovetail Joint |
| 7. Butt Joint | 17. End Mortise and Tenon Joint | 24. Blind Miter or Secret Dovetail Joint |
| 8. Glued and Blocked Butt Joint | | |
| 9. Dowel Butt Joint | | |
| 10. Edge to Edge Dowel Joint | | |

Even though you fasten with nail or screw, reinforce every joint with Le Page's Glue

Explanation of Common Terms



No. 1. Spliced or Halved Joint—used where the ends of two pieces are to be joined together in a continuous line to obtain extra length.

No. 2. End Lap or Halved Joint—used where the end of one piece joins the end of another at an angle. Often used on window screens, frames, small doors or panel type of construction. Instead of being cut square across the joint can be made with a miter on one side. In this case it is called an "End Lap Miter Joint."

No. 3. Cross Lap Joint—used where two pieces having square edges intersect each other as in the case of making pigeon holes, divisions on an umbrella stand or the cross bars of a taboret, etc.

No. 4. Middle Lap Joint—used to connect two members at some intersecting point in the form of the letter T. Note: All of the four above joints are of the half lap group and are made in much the same way; that is, cutting away half of the wood on both members, making the top and bottom surfaces flush (even).

No. 5. Rabbet Joint—used extensively in drawer and cabinet construction where a plain butt joint would be objectionable on account of the end grains showing.

No. 6. Dado Joint—used in the back construction of drawers, the joining of the shelves to the sides, for book shelves, etc.

No. 7. Butt Joint—used a great deal in box construction. This joint is often simply nailed together.

No. 8. Glued and Blocked Butt Joint—used extensively in cabinet work. The strength depends on the quality of the glued joint and the reinforced blocking.

No. 9. Dowel Butt Joint—used in cabinet work in place of the mortise and tenon joint wherever the leg and rail type of construction is used.

No. 10. Edge to Edge Dowel Joint—used for joining together various boards as in the case of wide table tops, panels, etc. The dowels help to line up the one surface of all the different boards joined in this way.

Note: Dowel joints are simple and quick to make. Care must be exercised to accurately locate all holes and to bore them straight. Dowel pins must fit these holes. These joints are glued together.

No. 11. End Dado or Box Joint—(sometimes called dado and rabbet joint) used in box construction.

No. 12. Dado Tongue and Rabbet Joint—used in drawer construction. This type shows very little end grain and has a good gluing area.

No. 13. Miter Joint—used extensively in picture frame construction or running mouldings. A true miter is cut at 45° . This joint, however, may be made at any angle.

No. 14. Miter with Spline—used for the stronger and better type of miter construction. The grain of the spline must run at right angles to the miter cut.

No. 15. Through Mortise and Tenon Joint—used for all forms of frame or panel construction as in doors, blinds, screens, etc. The hole portion is known as the mortise and the other part fitting into it as the tenon.

No. 16. Blind Mortise and Tenon Joint—used extensively in all forms of leg and rail construction where the end of the tenon, as in the case of the through mortise and tenon joint, would be objectionable.

No. 17. End Mortise and Tenon Joint—a simplified type of mortise and tenon joint. Used for the making of screens, frames, etc.

No. 18. Stub Mortise and Tenon Joint—differs from the blind mortise and tenon joints in that the joint is made with a short tenon. Is used more extensively in carpentry work.

No. 19. Panel Construction—grooves are cut in the edges to receive the panels. This form has its value in allowing for expansion and contraction of the panel.

No. 20. Half Lap Dovetail Joint—used in place of the middle lap joint where there is to be a pulling strain on one member.

No. 21. Half Dovetail Dado Joint—a good joint, but difficult to make it fit well on wide surfaces—used in place of simple dado joint.

No. 22. Through Single Dovetail Joint—used in place of the end miter and tenon joint.

No. 23. Multiple End Dovetail Joint—used extensively in drawer construction.

No. 24. Blind Miter or Secret Dovetail Joint—a very difficult joint to make and used very little. For fine box construction. No joints show except the miter cut.

HINTS ON GLUING

(By Courtesy of LePage's)

The woodworker is concerned with three kinds of glue—animal, fish and casein. Animal glue, commonly known as "hot glue" is obtained from the hides, skin, bones and sinews of cattle. Fish glue, which we know as a ready-to-use, prepared liquid glue is made from a by-product of the salt fish industry. Casein glue, ordinarily called waterproof glue, is made from the curd of milk.

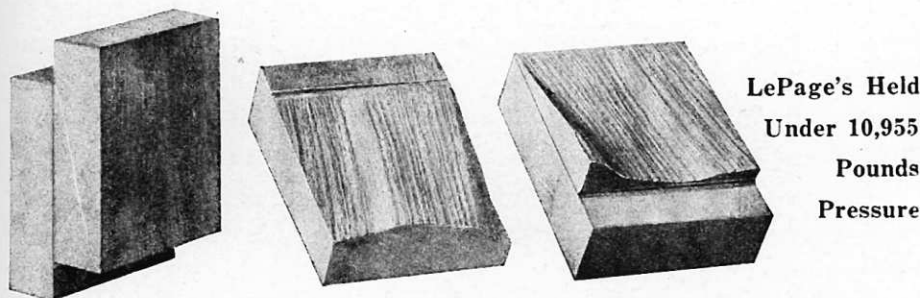
Good Joints Essential

No great skill is needed in using glue but there are a few important directions to follow regardless of what kind you use.

The most vital point is that the two pieces of wood to be joined together must be perfect joints and make perfect contact. The wood must be dry and free from grease, and the glue must be of the proper consistency, spread evenly—and be free from air bubbles. Use enough glue, do not starve the joints. The two pieces to be joined must be held together under pressure, while the glue sets. Always make a trial fitting without glue and mark the various pieces as they are to be put together as No. 1 and No. 1, No. 2 and No. 2, etc. Clean off the excess glue by throwing fine sawdust over that glue which has been squeezed out of the joint. This will facilitate its removal with a chisel.

If two pieces of wood are properly glued together, the glue will hold better than the wood itself. The illustration below clearly proves this.

No one kind of glue, whether animal, fish or casein, is the best for all uses. For average use, however, Le Page's Liquid Glue is highly recommended. It requires no soaking, heating or mixing to certain proportions. It is fool proof. It has the advantage of setting slowly, giving the worker ample time to arrange and rearrange the clamps, or to square up the different parts being glued. For many needs, the slow set is indispensable. Makes a joint stronger than the hardest wood.



The first illustration above shows the side view of one of the blocks of wood used in testing the strength of LePage's. The thin straight line indicates the lepaged joint. The irregular line indicates the line along which the wood finally gave way leaving the lepaged joint unbroken.

Under a pressure of 10,955 pounds, the block was finally broken. Note from the surface of the two halves that it was the wood itself which gave way under the strain and not the LePage's.

REINFORCE EVERY JOINT WITH LePAGE'S GLUE