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1938 Edition
1st Printing
A Comprehensive Handbook on Uses and Applications of the BENCH SAW JOINTER and SHAPER

Containing over 100 photographic illustrations and line drawings

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WHEN one looks at the very useful and ingenious power driven bench saws which are available today, and compares them with the somewhat "makeshift" affairs of only five or six years ago, it is small wonder that their popularity has increased so tremendously. With the many different types, most of them good, which are offered, one needs only to select the one that meets his particular fancy, or his pocket-book.

Bench saws, of course, are not all designed alike. One will carry its saw blade on a fixed arbor, with a table that raises and lowers. Another type will have a fixed table with a rising and falling arbor. Others will have some still different features intended to promote efficiency or practicability.

Since this treatise is not intended to deal with the merits of various power bench saws, but rather in their use and applications, the subject of design will not be discussed, other than to bring out the following points, which are important.

If the machine has an adjustable table or an adjustable arbor for regulating the depth of cut, assure yourself that the operation of adjusting the machine is not an arduous task, but may be accomplished with a minimum of exertion, and that such adjustment is accurate. The machine should be equipped with a gauge to show the extent of movement possible by such adjustment.

If the machine has a tilting table, the control of such tilting, in the larger and heavier machines, should be mechanical, preferably of the worm or screw operated type, which is positive and easy to operate. In the smaller machines this is not so necessary, due to the comparative lightness of the machine and the smaller sized table. It is rather unnecessary to have all kinds of "gadgets" on a small machine. If there is a gauge to indicate the angle to which the table is tilted, the indicating pin which is used in connection with the gauge should be slightly adjusted so that minor differences in position, when the blade is squared with the table (using a try square), can be corrected.
If the saw table has a metal insert, assure yourself that it fits flush with the table and may be easily removed.

Whether the saw arbor or the table rises and falls, make certain that provision has been made for adjusting the alignment of the saw with the table. Due to unusual strain, an accidental bump, or other cause, the saw may be knocked out of alignment and provision should be made to remedy it.

On a well designed saw, the arbor should not be threaded for a distance of at least \( \frac{3}{8} \)" from the collar to allow saws to ride on the arbor and not on the threads (dadoes excepted).

See that ample provision has been made for oiling the bearings, whether they be of the bronze sleeve type or of the ball bearing type. While most of the ball bearing types are dust-sealed, nevertheless, they will need oil or grease at some future date, and it is unwise to tear the machine apart to do so. If the machine is equipped with oil cups or grease cups a little injection of either can do no possible harm, no matter how frequently it is given.

See that the miter gauge and ripping guide are heavy enough to be in keeping with the rest of the machine, so as to maintain their accuracy.

---

Checking Up a New Bench Saw

After setting up your machine according to the instructions of the manufacturer, check it for these points. Regardless of what make machine you buy, or what price you pay for it, check it. Most machines are properly set and aligned when they leave the factory, but rough handling, climatic conditions and other uncontrollable causes are liable to change the alignment, so make these tests.

Check the alignment of the saw blade with the grooves in the table, in which the miter gauge is guided. To do this accurately, a simple "home grown" test is the best. Attach a piece of scrap lumber \( 1\frac{3}{4}" \times 1\frac{3}{4}" \times 10" \) to the miter gauge. The miter gauge should be set at 90°. Raise the saw to its greatest cutting capacity. Start the saw blade running and move the miter gauge away

[8]
from you toward the saw in the left hand groove, until the saw cuts half way through, on the under edge of the piece of wood. Now back the miter gauge away and lift it from the table. Place it on the rear end of the saw table and move it toward you, until the saw cuts the other half way through on the under side of the wood. Inspect the cuts made. If the two cuts meet exactly, the saw is lined up properly. Repeat the test in the right hand groove of the table. If the two grooves check up as being equidistant from the saw you can go to the next checking operation. If they don't, make adjustments of the saw arbor until they do, before attempting anything else. The miter gauge with one of the stop bars, may also be used to check the alignment of the saw with the slot.

Now, set the miter gauge at exactly 90°, and with a piece of wood at least 6" wide (8" is better) held tightly against the gauge, cut one end of it off, then check the squareness of the cut with an accurate try square. If it does not show up correct adjust the miter gauge slightly and make another cut, or yet another adjustment and cut until the cut is accurate. Then bend, file or adjust the indicating pointer to point to the 90° mark.

The next thing to check is the alignment of the ripping guide with the saw. Now, since the saw is correctly aligned with the slots in the table, it is only necessary to align the ripping guide with the slots. This alignment should be checked periodically.

Now adjust the saw table to 90° with the saw blade, then at 45° with the saw blade, and adjust the stop screws which are provided for this purpose. The table may then be quickly set to either of these oft-used angles without the
added labor of always getting these adjustments. See that the guard mechanism is properly adjusted so the guard will clear saw blade sufficiently. If saw is equipped with a splitter be sure that it is directly in line with the blade.

The machine may now be considered as being ready for use.

**Best Location in Shop**

When installing your saw, give its location in your shop serious consideration. The best possible place is in the exact center of the working space. The size of material you can cut is limited only by the size of the room. It is obvious, that if a saw is mounted in front of a wall, the distance from the saw blade to the wall is the longest piece you can cut. The practice of ripping half way through a piece of board, reversing it and completing the cut from the other end, is not good machine practice. Locate the machine so that other machines or benches are not in the way when ripping or cross-cutting large pieces. A little care in planning at installation saves considerable annoyance later, and it is also productive of better and more satisfying work.

**Speed, Power and Installation**

Technical handbooks give as the safe speeds at which circular saws for wood may be run, as follows:

- 7" diameter—5000 R.P.M.
- 8" diameter—4500 R.P.M.
- 10" diameter—3600 R.P.M.

Practically all present day bench saws are designed for lower speeds than these. Most saw manufacturers recommend speeds varying from 3000 to 4500 R.P.M. for any of the above.

To figure the size of pulleys necessary to obtain certain speeds the formula is

\[
\frac{\text{Speed of motor} \times \text{diameter of motor pulley}}{\text{diameter of saw arbor pulley}} = \text{or speed of saw required}
\]

[10]
Example. To obtain 3500 R.P.M. for the saw with a 1750 R.P.M. motor and a 4" pulley on the motor.

The formula then is stated as:

\[
\frac{1750 \text{ (speed of motor)} \times 4" \text{ (dia. of pulley)}}{3500 \text{ (speed of saw)}}
\]

which works out to \(\frac{7000}{3500}\) or 2 (which indicates that the other pulley should be 2" in diameter.)

If we know the speed of the motor and the size of both motor and saw arbor pulleys, the equation reads

\[
\frac{1750 \times 4}{2}\text{ or 3500 R.P.M.}
\]

Theoretically it takes less power to keep a saw running and doing the same work at 4000 R.P.M., than it does at 3000 R.P.M., but because of the comparatively small diameters of blades used in present day bench saws, this factor is of little account. A more important factor in the power of a saw, is the weight of the rotor in the motor, its power and speed, and the correctness of the belt tension.

It is usually good policy to follow the recommendations of the manufacturers of the machine as to what motor should be used with it. They are interested in your getting the greatest possible service from the machine.

In order for a motor to transmit its power to the saw, it must depend on friction. The modern "V" type endless belt has overcome most of the difficulties of the old style flat belt. But to get the greatest amount of service from "V" belts, they should be used on pulleys of ample diameter. Present day machines are too often equipped with pulleys that are too small, in an effort to gain "capacity of cut." An 8" saw that has 3" capacity, but will not cut over 1 1/2" without the belt slipping is not as serviceable as an 8" saw with 2 1/4" capacity that will cut 2 1/4". 
Motor Must Have Ample Power

The machine should be equipped with a motor powerful enough to cut wood as thick as the capacity of the saw will allow, and the saw blade should be at its greatest height at all times when sawing completely through any thickness of wood, since less power is needed than if the saw is adjusted to just a little higher than the thickness of the wood.

Of all the machines in the shop the circular saw requires relatively the greatest amount of power. This being a fact, serious consideration should be given the type of electric equipment to be used—the horsepower of the motor and whether or not the electric wiring is heavy enough to supply sufficient current.

Except for very light work, with a small diameter saw, no motor of less than ½ H.P. should be used. With 7” or 8” blades when material up to 2” thick is to be cut, best results will be obtained with a ½ H.P. motor. If driven from a line shaft, allowance must be made for power loss in the hanger bearings, by using a heavier motor. The ideal set-up is with an individual motor. 10” saws almost invariably require a ¾ H.P.

If Motor Does Not Pull Well
Check up on Your Wiring

The well-designed ½ H.P. motor will pull at least one and one half times its rated horsepower, which means that when pulling a capacity load with an 8” saw, the motor is drawing close to 10 amperes. If the motor is plugged in on a circuit already loaded with lamps or other appliances the line will not supply enough current for the additional load. The result is a drop in voltage and the motor, struggling to carry the load, becomes overheated. Very frequently perfect motors are condemned for not pulling properly when the trouble actually is in the house wiring.

If the shop is to be operated on the house circuit (it is always better to have a separate line direct from the meter) the line should be at least as large as No. 10 gauge wire.

Motor failures and loss of power due to motor defects are not at all common. If you think yours is defective have an electrician check your current with a volt meter, first with no load and then with a load. Without the load the reading should be approximately that shown on the motor plate. With a full load the line voltage should not fall more than 5%.
Individual Motor Bases

A recent development, the individual motor base, is very helpful in supplying full power to each machine. Extra mounting rods and brackets (part of the base illustrated) are mounted behind each machine and the motor with notched base moved from one machine to another as required. This prevents power loss caused by shafting and hangers.

Types of Saw Blades and Their Uses

The mainstays of the experienced machine saw operator are a good rip saw and a good cross-cut saw. For the operator who is alternately ripping, cross-cutting or mitering, one of the several good "combination" saws is satisfactory, since it saves considerable time, but it will neither rip as fast as a rip saw, nor cut as clean a cross grain as a cross-cut saw. There are also available, so called "planer saws," which are hollow ground to offset the teeth having no "set." This type of saw requires more power to operate than any of the other three types mentioned, but makes a very smooth cut that does not need "jointing" if the board is to be glued to another board. Using this saw, however, does not mean that it does away with the planing or jointing of the board for a finishing edge.

There are also available to the craftsman special "fast cut" saws, similar in action to the "combination" saw. It also is a good type of saw for the operator who is continually changing from one type of cut to another.

Then, there are also blades known as grooving saws and dado heads. Grooving saws form the two outside members of a dado, while the inside members or "chippers" are two tooth types, of different thicknesses, which may be added to make different widths of cut. These "chippers" are only used in conjunction with the grooving saws, never by themselves.
Among other special saws which have “specialized” uses, are lock-corner saws, and hollow-ground fine tooth miter saws, but since these are adapted to only the particular work for which they are designed, it is unwise for the craftsman to invest in them, unless he has considerable of the special work to do. For all general purposes, a good rip saw, a good cross-cut saw, and a good “combination” saw, together with a dado head that may be built up to 7/8” will give you a range that can handle practically all the work you may expect to do.

Mounting the Saw

When putting a saw blade on the machine, first wipe any sawdust from the arbor and collar. Then slide the saw on easily so as not to damage the threads. Teeth of the saw should point down at the point where they extend through the table (nearest the operator). Put on the retaining collar and nut and screw the nut up tight, so the saw will not come loose. Rotate the blade by hand to make certain that the saw clears the groove in the table.

Note—Before any sawing is done, take the time to attach to the ripping guide a piece of wood, at least 1/2” thick, about 3” wide and long enough to reach from the front of the table to the back edge of the saw blade. The ripping guides on some machines are provided with screw holes for this purpose. Should you accidentally run the ripping guide into the saw, no damage to the saw will result, while running a metal guide into the saw would result in ruining the blade.

Sharpening and Care of Saws

A dull saw is a constant source of annoyance, is hard on the machine and the motor. And it will not produce clean work.

The first operation in sharpening a circular saw, regardless of type, is to “joint” the saw. This is done by holding a hard emery stone, resting on the table, against the teeth and rotating the saw by hand, not by power, and rotating it backwards, until all the teeth have been “touched.” Then remove the saw from the machine.
Make for yourself a saw clamp as illustrated. On the top of the back board put three guide marks, one at 90° from the face of the saw and two at 45°, for guidance in filing.

On a rip saw the front edge of all teeth are filed straight across, while the top of the tooth has a very slight angle, about 2° instead of flat, every alternate tooth having the bevel opposite to the preceding adjacent tooth. This type of filing tends to make the saw cut cleaner and easier.

When filing a rip saw, go all the way around the saw, filing the front edge only lightly. Then file alternate teeth on the top, with the end of the file nearest you lower than the farthest end. Reverse the saw in the clamp and file the other teeth the same way.

On a cross-cut saw, the teeth are filed at an angle of 45°, every alternate tooth being opposite to the preceding adjacent tooth. First go all the way around the saw, taking every other tooth and make about three strokes to each tooth, no more. Then reverse the saw in the clamp and repeat the operation, but filing by the other 45° angle mark from the first. If the saw is not sharpened sufficiently, repeat the operation on both sides, this time making only two strokes. If necessary, repeat around the saw, making only one stroke per tooth, until all teeth have been filed down to remove the “flat” left by the “jointing.” By this method of filing a more satisfactory job will be obtained than if one attempted to file each tooth to the necessary depth to remove the “flat.”

If the saw has to be filed considerably to remove the “flat” it will be necessary to “set” the teeth. This should be done just before the last “touch up” filing is done, not after the saw has been sharpened. One of the numerous saw sets (which may also be used on hand saws) should be purchased for this purpose.
On a "novelty" or combination saw and on dado outside saws, the teeth are arranged in groups of four or five teeth each. The first tooth which is usually a "chipper" or "raker" tooth, is filed straight across the saw, and is 1/32" lower than the cross-cut teeth. File all the raker teeth first. Then file all the cross-cut teeth, following the same routine as on a cross-cut saw. On a dado head, all the chippers or rakers should be filed to the same cutting diameter. After filing a dado head, mount the complete head on the saw arbor and try it out on some scrap wood. If properly sharpened, it should make a groove like "A" in sketch. (This has been slightly exaggerated to make it clear.) If the cut looks something like "B," examine all the chipper teeth to find out which one or more are longer than the others and file it down slightly. Use this file-and-try method until the groove cut is smooth, with only four "scratch like" lines showing from the cross-cut teeth of the outside saws.

The same procedure is followed in sharpening a hollow ground "planer" saw, except that the teeth are not "set."

Ripping

The bench saw is probably used more for ripping wide boards into narrower pieces, than any other operation. It is the simplest of the operations and at the same time it relieves one of the tedious task of hand ripping.

The setting of the ripping guide by measurement of the distance from the saw blade to the ripping guide, or by setting the ripping guide to a graduated bar on the table, is a simple matter. Obviously, the graduated bar should be checked frequently for accuracy in its relation to the saw.

The height of the saw above the table in relation to the thickness of stock being cut is an important point in ripping. The saw should always be high enough to have several full teeth projecting above the wood at the point above the arbor. This is necessary for the blade to free itself of sawdust. Unless the teeth project through dust will not be able to get out, resulting in binding and overheating the blade. You will note that when ripping
without a saw guard, that the higher the saw is adjusted, the more sawdust it will throw up in your face. You will also find the higher the saw is adjusted, the more accurately the ripping guide must be aligned with the saw blade.

When ripping pieces where the distance between saw blade and ripping guide is less than 3", use a pusher stick, which should be a specially made one, hanging always convenient to hand, rather than a "pick-up" scrap of wood. The "scrap of wood" is not always there when needed and the dangerous practice of pushing narrow pieces through with the fingers is resorted to.

After ripping a piece of wood, examine the surface of the cut on both pieces. If one appears considerably rougher and shows deeper saw grooves than the other this may be traced to two causes. Either the ripping fence is not properly aligned with the saw, or the wood warps as it passes the blade. The answer to the former is obvious, while the answer to the latter is to install and use a splitter, if procurable. On the best present day saws the splitter is incorporated into the saw guard.

Resawing

Resawing, or the cutting of boards into thinner boards, comes under the heading of ripping. When the piece to be resawn is less in width than twice the capacity of the saw, the blade should be set to just a little over half the width of the board, rather than do most of the ripping from one edge, and only a little from the other. For example, we have a board 4" wide x 3/4" thick, which we desire to resaw into two boards 4" x 5/16". (Our blade will waste about an eighth of an inch.) The capacity of the saw is 2½", but we only set the blade to cut 2½". This leaves 1½" for the second cut, which is sufficient stock to prevent squeezing together and binding the blade with the result of cutting a groove
in the piece on the left side of the blade. Where the width of the board to be resawed is greater than twice the capacity of the machine, make cuts as deep as possible from each edge, then finish ripping by hand or by band saw. The important thing to remember when resawing is to keep the same surface of the board against the guide for both cuts; i.e., reverse the board end for end and not side for side.

The cutting of such items as tapered legs comes under the heading of ripping. If the operator will take the time to make for himself a taper cutting jig, this operation becomes as simple as ordinary ripping. The sketch shows such a jig and its construction.

In operation, the gauge block is set for the amount of the taper on one side of the leg. Two adjacent sides of each leg or piece to be cut are run through. The gauge block is then set for twice the amount it was first set, and all the pieces to be cut are run through, cutting the remaining two adjacent sides.

Ripping, with the table tilted to any desired angle, is accomplished just as easily as ordinary ripping.

Crosscutting

In cross-cutting, accuracy is dependent on several additional factors, not the least of which is the operator himself.

Since the miter gauge which is supplied with most bench saws does not exceed 7" in length, it is obvious that considerably more effort is required to hold a board several feet long against such a short surface with any degree of accuracy. One of the first things an operator should do, upon acquisition of a
bench saw, is to attach a straight piece of wood, preferably laminated to prevent warpage, to the miter gauge. (Shown in use.) This piece should be at least 18" x 3¼" x 2" high. Near the lower edge, to the left and right of the gauge, run a wood screw through, to project about 1/16", then file the end of the screw to a point. The edge of a board pressed against these points will not readily slip, and the small indentations they make are not objectionable, in most work.

To do accurate work in cross-cutting it is essential that the miter gauge be checked and set to cut a right angle accurately first, after which it will automatically cut other angles to which it may be set. The indicating pointer may be filed to offset any slight inaccuracy or with some saws, may be adjusted to a perfect accuracy.

When holding boards against the miter gauge for cross-cutting or mitering, the pressure of the left hand should be directly across the board from the pivot of the gauge and not near one end of the face strip, so that no tendency to spring the face strip would be present, causing an inaccurate cut.

If the board which is to be cut off is wider than the distance from the front of the saw to the front of the table, reverse the miter gauge in its slot, as the illustration shows.

The practice of holding a wide board against the gauge and letting its front edge come down on the saw is productive of pinched fingers and should be avoided. If the board is entirely too wide to be included in the capacity of the miter gauge, the ripping guide may be used, but do not under any circumstances, use the ripping guide as a gauge for cross-cutting narrow pieces, or for gauging the length of the piece cut off.
There are usually furnished with a miter gauge, several metal rods, which are used to regulate the length of pieces being cut off. When the miter gauge is used in the left hand table groove no part of these rods should extend past the miter gauge on the right. When the miter gauge is used in the right hand table groove, the reverse is true. The illustration at the right shows the correct way of using these gauge rods, when cutting off a number of pieces to a given length.

Mitering, or cutting boards across the grain, at an angle to the edge is cross-cutting, and is done in the same manner. The most used angle is $45^\circ$ to form a four-sided frame, $30^\circ$ to form a six-sided frame and $22\frac{1}{2}^\circ$ to form an eight-sided frame.

### Table Extensions

Table extensions for enlarging the working space on the saw table are now available for most machines. They attach to both sides of the standard table and some attachments are provided for the part of the table to increase the table area in front of the saw blade. Extensions are very helpful and usually well worth the small extra investment required.

### Moulding Making

The practice of making “makeshift” mouldings, by “forcing” a piece of wood diagonally across a circular saw blade, and “chewing” a section out of it, is not good circular saw practice. It is far better practice, if one is forced to make a moulding of this type, to remove as much stock as possible with successive cuts of a dado head and finish the shape with a hand moulding plane.

The use of moulding heads of the loose cutter type, in bench saws, unless the head is of a safety type approved by woodworking manufacturers, is not recommended. And again, the type of mouldings that would be beyond the capacity of a bench shaper,
necessitating their being made on a bench saw with a moulding head, come under the head of architectural mouldings and may be purchased for a small increase over the wood alone.

Further, a "coping head" or moulding head, for use on a bench saw must necessarily be at least 4" in diameter to be of any use and unless it is sufficiently heavy to withstand the strains imposed upon it, is more or less hazardous.

Dadoing and Rabbeting

First let us point out the fact that a bench saw is essentially a labor saving machine, and is not intended to produce finished work, as do the jointer and shaper. The very design of the cutting members or tools designed for use on the bench saw, such as dado heads and groovers show intention for rough work only; that is, there is no attempt made to eliminate tool cuts.

In a properly designed dado head, as explained in the chapter relating to the sharpening of saws, the cutting teeth (those shaped like cross-cut saw teeth) sever the fibers of the wood, and the chippers follow with a chisel-like action, chipping out the wood thus severed. If you will examine the illustration of the result of a correctly sharpened dado head, you will notice four distinct grooves, formed by the cutting teeth. These should always be present in a cut made by a dado head. If, on the other hand, there are other unevennesses present, they indicate incorrect sharpening of the dado head, and should be remedied. If the groove to be cut is on the outer surface of a piece of lumber, where it will show on the finished piece, don't use the dado, but do that work on a shaper. Dado heads usually include, in a set, two outside saws usually about 1/8" thick each. There is no set on any of the teeth on these saws, the idea being to make a smooth cut, with little or no tool marking on the sides of the cut. In some cases, these saws are hollow ground, particularly for deep grooving.

The inside chippers usually consist of one 1/4", two 1/8" and one 1/16", these dimensions indicating the thickness at the hub.
The actual cutting portion is widened out or "swaged" to a greater width, so as to lap over the adjacent cutter or saw. For this reason, the "swaged" portion of a chipper should always be so placed as to come in the "gullet" of the adjacent cutter or saw. Then too, the chipper teeth in a group should be staggered around the circumference, to distribute the cutting effort more evenly. This tends to give smoother running and cutting. The illustration of a correctly set up dado head shows clearly how this is done.

To set up a dado head on the bench saw, first clean off all sawdust that may have lodged itself on the saw arbor. In a dado head there is quite a mass of metal revolving at a good speed, and if it is not running true it can set up a terrific vibration.

Put on first an outside dado saw, then as many chippers as necessary, then the other outside saw to make the width of cut desired. Never use the chipper blades by themselves; always use the outside saws with the chippers between.

The regular stock dado head is usually furnished to cut a 13/16" width of cut, variable from 1/8" to 1/4" and then by sixteenths up to its capacity. Various widths of cuts are made by various combinations of saws and chippers. Example: to cut a 7/16" dado, the two outside saws—the 1/8" and 1/16" chippers would be used. Note that the thickness of a chipper is measured by that portion at the shaft—not the cutting edge.

If the total width of the finished cut is over 13/16" or beyond the capacity of the dado head, set up your dado head to a little more than half the total width, and make it in two cuts, lapping the cuts at the center. There is less tendency for the dado head to "creep" under a heavy cut than a light cut. If the total width is beyond twice the capacity, set up for a little over one-third of the total and make it in three cuts.

The design of the teeth of a dado head allows it to cut equally as well across the grain, with the grain or at an angle to the grain. (It is from a dado saw that the "combination" circular saw was developed.)
The distance from the dado head to the ripping guide regulates the location of the dado or groove. When using the miter gauge for dadoing across grain, the location of the dado is marked on the edge of the piece and the groove located by that.

Blind dadoing, where the groove starts or stops, or both, inside the edges of a board is done accurately by clamping “stops” to the ripping guide to regulate the beginning and end of the cut.

The end of the piece being cut should not come in contact with the ripping guide itself during this operation. The guide is used merely as a means for holding the stops. Where the groove being cut is so long that the “stops” are beyond the capacity of the ripping guide, a longer piece of wood is attached temporarily to the guide and the stops mounted on this strip.

When dadoing across grain or at an angle, the miter gauge and stop rods are made use of as in cross-cutting. When a groove cut occurs in the inner surface of a piece of wood, that is, away from the edges, it is called dadoing. When that same groove occurs along the edge of a piece of wood, it is called rabbeting. Rabbeting is essentially the same operation and calls for practically the same set-ups as dadoing.

Tenoning

One of the most useful operations to which the dado head may be put is tenoning. To cut a tenon “accurately” one edge and one face only of the piece are used. The first face is made with one edge of the piece against the miter gauge face, with the miter gauge in the left hand table groove. The second face is made by putting the miter gauge in the right hand
table groove turning the piece of wood end for end, but keeping
the same edge against the miter gauge face. The outer end of the
piece being cut should rest against a stop block clamped to a strip
of wood which has been fastened to the face of the miter gauge.

Tilted Table Operation

The advantage of a tiltable table on a power bench saw is not
fully realized until one builds a piece of furniture, such as a
Martha Washington sewing cabinet, the edges of which are
beveled to odd angles. And then these beveled edges are grooved
for slip tongues. The ease with which work of such type is
handled, and the accuracy with which it is done, make one realize
the real usefulness of the machine.

It is assumed that you have carefully checked the accuracy
of the gauge which indicates the degree of tilt of the table, and
that you found it o.k. But, even if it is perfect, there is always
the human element to consider. When we take into consideration
the fact that the spacing between the marks on the indicator
are usually about 1/32" apart, and that a mis-setting of only
100th of an inch at the indicator may become, on some saws, as
much an error as 1/16" in the actual cut (due to the difference in
distance from the pivoting point) it behooves the operator to be
careful. The best insurance against error is the cut-and-try
method. After you have set the table
to the desired angle by the gauge, cut
a piece of scrap wood, and check the
cut with a good bevel protractor. If
there is any error, it can be corrected,
and no good lumber has been ruined.
This is one of the fundamental points
of good machine operation — check
and recheck all adjustments before
cutting costly lumber.

The most widely used setting for
tilted table work is the 45° angle.
Triangular stripping, for use as glue blocks are run at this angle.
The same type of stripping is used for fastening mirror plates
into frames, but angles of from 30° to 60° are used instead.

The above mentioned angle of 45° is widely used for beveling
the corners on large pieces of stock preliminary to turning. The
usefulness of a bench saw as an adjunct to other machines is demonstrated here.

In using the tilted table, always try to work below the blade, whether ripping or cross-cutting. Any tendency of the wood to creep will then be away from the saw, and no jamming or binding of the blade may result. There are, of course, examples where some maneuvering is necessary to accomplish special cutting, such as the grooving of the beveled edge of a board, as illustrated. (This is a segment of the Martha Washington sewing cabinet.) If the ripping guide of your saw is not of the tilting type, tack a strip of wood on its face to form a surface to support the board.

Jigs and Fixtures

There are comparatively few users of the small power bench saw who realize the value of special jigs, and naturally, since the manufacturer has very few calls for them, there are none manufactured. The craftsman, however, can with a little effort, make some of these jigs or accessories for himself. Let it be pointed out that a jig worth making is worth making well, since it may be used again and again.

One of the first "jigs" which the craftsman should provide himself with is the one for cutting tapered pieces. This jig was described and illustrated in the section on ripping. The "pusher" or notched stick, while not really a jig, comes under the head of very necessary special equipment, and for that reason is mentioned again.
The ripping guide and the miter gauge should each be faced with "laminated" wood pieces, to increase their usefulness and accuracy. For the miter gauge provide strips of different lengths, which may be fastened to the miter gauge facing. To these strips, "stop blocks" may be attached for accurately cutting off duplicate pieces of the same length. If these strips are already made and close to hand they will be used considerably.

Two items that are important in conjunction with a bench saw (and a jointer) are stock rests. They are not jigs but their importance as an aid to good work compels their mention. Two types are suggested. One with a roller may be used in front and behind the saw to support the ends of long stock. The other is for supporting long stock while cross-cutting and should be as long as the depth of your table. It is wise to make their height adjustable, since numerous other uses will be found for them around the shop.

It is well worth while, when making any of the jigs described or any other special jig, to make them substantial, and keep them for future jobs. The satisfaction derived from producing good clean work more than repays for the small amount of time needed to make them.

Table Extension—Front

Increasing the distance (table area) between the front of the table and the front edge of the saw blade will prove an added convenience. It affords more room for resting wide boards when cross-cutting and facilitates handling of long stock when ripping. Several manufacturers are now supplying such attachments as extra equipment. A typical one is illustrated at the top of the next page. It is composed of two strips of steel clamped to the ripping guide bar. The section between the outer ends of the bars and the ripping guide control mechanism is filled in with wooden strips. Some operators prefer to use two or three wooden
rollers instead of the wood strips. Rollers will be of greater help in ripping long stock.

If your saw table is not equipped with a ripping guide bar it is not a difficult job to attach one to it. A piece of cold rolled steel of sufficient rigidity to bear the weight can easily be bolted or screwed to the table edge.

Production Work

That is, the making of a number of duplicate pieces or parts for a group of some particular article—is nothing more than setting up your machine, with gauges, jigs, stops or other necessary accessories to enable you to run through a succession of pieces, make identical cuts on each, with a minimum amount of exertion and loss of time. A definite routine or schedule of motion or handling should be thought out and adhered to for the full run of pieces. This makes for speed, ease of handling, for more certain accuracy and less possibility of error. Whenever you have a “run” of duplicate pieces, give a little thought to the routine you are going to follow before actually starting work.

Always square up one edge of a piece with an adjacent side as the first operation and then work from this edge or side only throughout all subsequent operations, as far as possible.

That's all there is to production. A machine, plus intelligent planning of operations, with consideration for as little handling of the piece as possible. And remember, working to pencil marks is all right for rough work, where variations of 1/16” or more are permissible, but for cabinet work, use jigs, stops, length gauges, etc., if you want the best possible service from your machine.
The Bench Saw

Trouble Shooting

Saw binds under ordinary cutting conditions; may be caused by insufficient power, which may be low line voltage, motor too weak, saw binding or belt slipping. The first, line voltage may be checked with a volt meter by the electric company. The second may only be determined by trial of a motor of greater power. The third may be due to incorrect adjustment of the ripping guide or the wood warping as it is being cut, or by a saw table that is not perfectly level, allowing the ends of the wood to sag or be lifted up, thus binding the saw. A splitter mounted as close behind the saw blade as possible will offset to some extent any binding caused by warpage of the wood, or readjustment of the ripping guide, if that be the cause. If the table of the saw has warped, causing the wood to sag or you are cross-cutting long boards without supporting the extreme ends, the binding of the saw blade can become dangerous to the operator.

Binding of the saw blade; is seldom, if ever caused by a saw blade that is not true running. A saw blade that is binding may be recognized by several symptoms, even if you have sufficient power to push it through. If the piece of wood nearest the ripping guide shows a clean cut edge until it reaches the rear part of the saw blade, then it takes on a rough jagged appearance, it is a clear indication that the adjustment of the ripping guide is at fault. The edges of the pieces of wood showing burn marks is another indication, but these marks may also be due to a dull saw.

The saw blade cuts through without apparent effort, but leaves a considerably rough surface. This is more than likely due to incorrect setting of the teeth, and the remedy is to “joint” the saw teeth lightly on each side, then lightly touch up the teeth with a fine file.

The saw will not cut a square edge in ripping or cross-cutting, even though you are positive that the saw blade is square with the table. This indicates that either the saw arbor or its housing is loose and under the pull of the belt and motor, works out of line.

Always stop machine before making adjustments. Tilting of the table, aligning the splitter, adjusting the guard and similar operations should be done with the machine stopped. Not only is there danger of ruining the saw blade through contact with some other part; it also subjects the operator to unnecessary hazards.
Special Uses for the Bench Saw

Among the special and very useful jobs to which the modern bench saw is put is the cutting of metal, tile, brick, composition material, gypsum slabs, marble, brake lining, and other similar substances.

For facing a large number of these materials on a sanding disc, various grades of abrasive paper may be obtained. For cutting metal, such as steel, brass, copper, etc., there are a number of different types of abrasive wheels available. For cutting tile, brick and other building materials, a different grade of abrasive wheel is used.

Other shop accessories such as wire scratch wheels, cloth buffers, grinding wheels and fiber brushes may be used on the bench saw in place of the blade providing their center holes are the same diameter as the saw spindle. Thus it is possible to sharpen tools, buff, polish, remove rust and paint, and do countless other jobs with the bench saw.

Sanding

Provision is made on most bench saws for attaching a sanding disc. Very accurate work can be done at various angles with the tilting saw table. The illustration shows a piece of wood being sanded to a perfect 45° angle. Coarse grit discs are used for fast cutting, fine for finishing.

Cutting Metal

By replacing the saw blade with an abrasive cut-off wheel you can cut hardened or unhardened steel, cast iron and many other metals. Operating speed should be the same as for sawing wood. No water or lubricant should be added, all metal sawing being done with the wheel dry.