THE BENCH SAW JOINTER AND SHAPER

THEIR USE AND APPLICATION

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The Band Saw and Jig Saw

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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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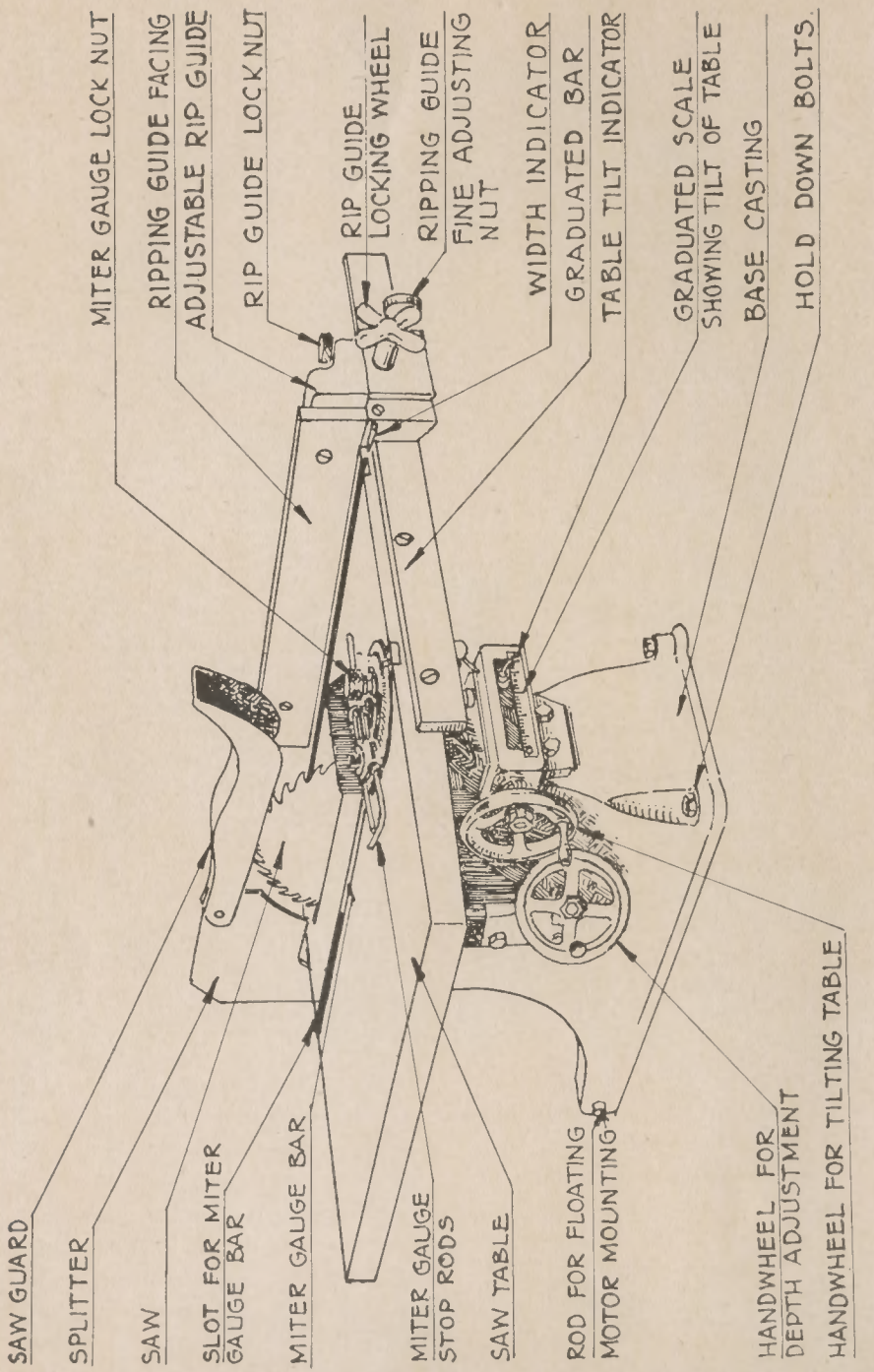


BOOK ONE

The Bench Saw

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 guage 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.

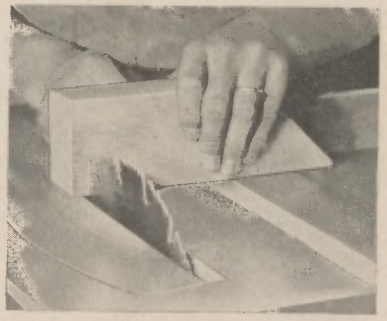
On a well designed saw, the arbor should not be threaded for a distance of at least ⅛" from the collar to allow saws to ride on the arbor and **not** on the threads (dadoes excepted).

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.

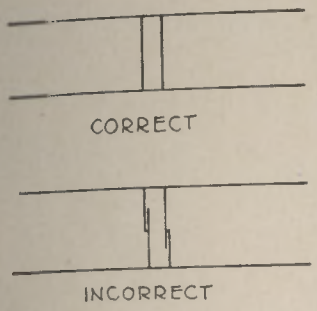
Checking Up a New Bench Saw

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.



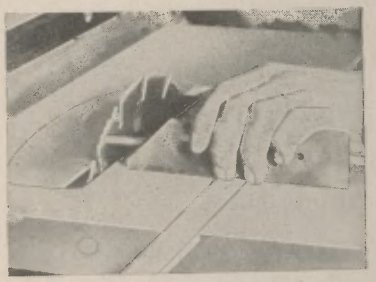
Checking blade alignment using the saw cut method.

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 1¾" x 1¾" x 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



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.

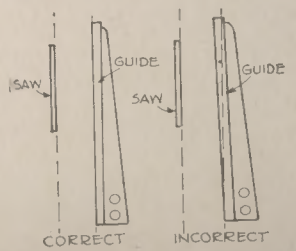
Now, set the miter gauge at exactly 90°, and with a piece of wood at least 6" wide (8" is better) held tightly against the gauge, cut one end of it off, then check the squareness of the cut with an accurate try square. If it does not show up correct adjust the miter gauge slightly and make another cut,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



Using the miter gauge to check blade alignment with table slots.

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.

Squaring the saw blades with the table.

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

$$\frac{\text{Speed of motor x diameter of motor pulley}}{\text{diameter of saw arbor pulley or speed of saw required}}$$

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:

$$\frac{1750 \text{ (speed of motor) x } 4\text{″ (dia. of pulley)}}{3500 \text{ (speed of saw)}}$$

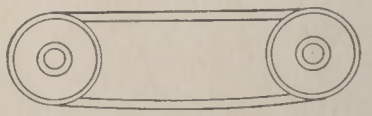
which works out to $\frac{7000}{3500}$ or 2 (which indicates that the other pulley should be 2″ in diameter.)

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

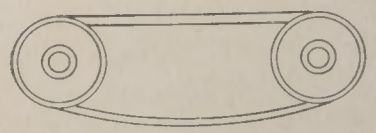
$$\frac{1750 \times 4}{2} \text{ or } 3500 \text{ R.P.M.}$$

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.



CORRECT



INCORRECT

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 1½″ without the belt slipping is not as serviceable as an 8″ saw with 2¼″ capacity that will cut 2¼″.

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 ⅓ 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.

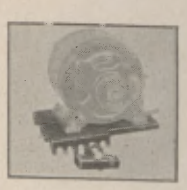
If Motor Does Not Pull Well Check up on Your Wiring

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



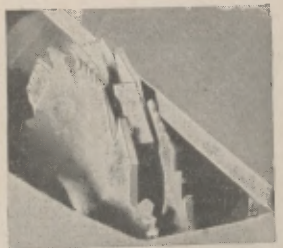
A recent development, the individual motor base, is very helpful in supplying full power to each machine. Extra mounting rods and brackets (part of the base illustrated) are mounted behind each machine and the motor with notched base moved from one machine to another as required. This prevents power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



A correctly set up dado head. Note position of chippers.

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.

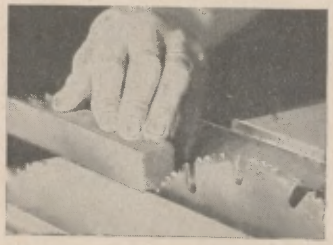
Mounting the Saw

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.

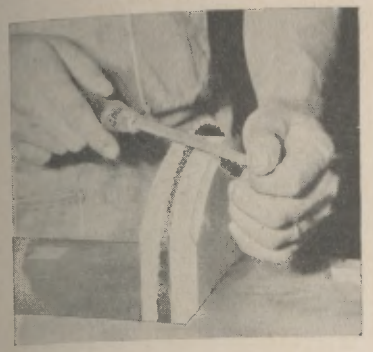
Sharpening and Care of Saws

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



How saw is jointed by holding oil stone against teeth.

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.



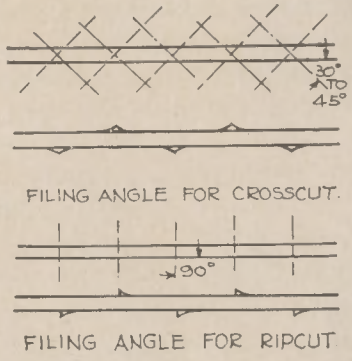
Home-made saw clamp. Note guide lines on upper edge.

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.