BOOK TWO
The Jointer

Jointer or Planer

ITERALLY, the machine to be described is a planer, since it planes wood from a surface as the wood is passed over a revolving cutter head, but in woodworking plants and lumber mills this type of machine is known as a jointer. The stock, or wood is held on the table and fed by hand, and the machine is used mainly for surfacing narrow widths and edges of stock for making glued joints. The larger or heavier machine, where the wood is fed by power driven rollers and the capacity in width is 12" or more, is known as a planer. Since the home workshop owner does a wider variety of work either name will suffice, but for sake of coherence throughout this treatise, it will be called a jointer.

Mechanical Points of Importance

There are several points that are of utmost importance in a jointer, namely, the alignment and method of adjustment of the tables, the type of cutter head, the type of bearings in which the cutter head revolves, the design and accuracy of the "ways" on which the tables slide, the size and weight of the main casting or base, the design and size of the tables, and the design and construction of the fence or guide.

Testing Tables for Alignment

First in importance in a jointer is the alignment of the tables. A jointer may be of the finest design, with the best of bearings and materials available, but, if the tables are not on the same plane the machine is absolutely useless, as far as accurate work is concerned. If there is any doubt about alignment place a straight-edge on the tables, in each of the five positions indicated.

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in the sketch. The straight-edge should be long enough to extend the full length of both tables. Place the straight-edge on the rear table, with the knives of the cutter head turned down out of the way, and then adjust the front table upwards until it just touches the straight-edge. With the straight-edge in any of the five positions indicated it will be easy to determine the degree of alignment.

Bearings and Lubrication

Examine the bearings. If the bearings are of the sleeve type, make sure that facilities have been provided for proper lubrication. If the bearings are of a high quality ball type, there is every possibility that they are packed with lubricant and dust sealed. If so, they are good for many months of operation without any attention, under continuous daily use. With the intermittent use that the home workshop owner gives a jointer, he will probably never need to worry about lubricating the bearings.

For the sleeve type of bearings, a good grade of medium engine oil should be used and the oil cups or reservoirs kept filled. Oil distribution and retention is usually accomplished by felt washers or wicks, so that it is necessary only to maintain a supply of oil in the cups, for proper distribution.

Cutter-Head and Knives

The design and type of material used in a cutter-head are both important considerations. The design is important, since it must insure safety in operation as well as balanced rotation. Most of the present day machines are equipped with an approved type round safety head. Metal alloy is used in the cutter-heads of some machines while the higher priced heads are made of solid machined steel. Both types have proved very practical. Ordinarily the three-knife head is preferred over the two-knife type due to the fact that three cuts are made per revolution of the head as against two with the two-knife type.
"Ways" and Base

The "ways" on which the tables rest and slide must be accurately machined, on both tables and on the base, if continued satisfactory operation is to be expected. The tables should be held in contact with the base firmly, with just enough looseness of tension to allow movement of the tables by means of the adjusting screw.

The size and weight of the base and tables also play an important part in the accuracy of a jointer. A light flimsy base may look attractive but it may not stand up, and unless it is set up on an absolutely level foundation, may throw the "ways" out of alignment, thus causing serious trouble.

Fence or Guide

The fence on a modern power jointer is so arranged that it may be tilted at least 45° either way from the 90° or vertical position and locked in that position for jointing the edges or surfaces of boards at an angle. Utilizing this feature, one may joint edges of boards that are thinner on one edge than the other, with the assurance that the edges will be square or beveled according to the setting of the fence. The fence may be shifted across the tables and with this feature, different portions of the knives may be used for cutting, distributing the wear over the whole blade, rather than confining it to one section.

Hold-Down Spring

This attachment, usually attached to the lever or guide, is very helpful especially when planing thin stock. The spring holds the stock down firmly on the tables promoting uniformity of work.

In most devices of this sort the amount of spring tension is adjustable and the point of contact with the table may be retained.
THE JOINTER

Guard

The modern jointer is also equipped with a guard, a swinging cover which covers the portion of the knives which are not being used. It is automatically moved out of the way by the piece of wood that is being pushed forward on to the knives. Although some cases necessitate using the jointer without the guard (to be discussed later) it will always be found advisable for the safety of the operator to keep the guard in position.

Installation and Power

A 1/2 H.P. motor is usually specified for driving the average 4" jointer although a 1/4 H.P. motor may carry a ball bearing jointer if not loaded too heavily. As the average user is concerned more with accuracy and smoothness of cut, than he is with working a large quantity of stock, the 1/2 H.P. motor will fill all ordinary requirements.

A sleeve bearing jointer may be run at speeds up to 5000 R.P.M., while the ball bearing type may be operated up to 8000 R.P.M. or even more. Nothing, however, is really gained by running it any faster than 8000, except in production work. The "whine" or high-pitched moan at higher speeds caused by the cutter-head is objectionable around the house.

To obtain the speed of 4000 to 5000 R.P.M. for the cutter-head, if the motor runs 1750 R.P.M. and the jointer head pulley is 1\(\frac{3}{4}\)" in diameter, use a 4" pulley on the motor which will give you

\[
\frac{1750 \times 4}{1.75} = 4000 \text{ R.P.M.}
\]

while the use of a 5" pulley would give

\[
\frac{1750 \times 5}{1.75} = 5000 \text{ R.P.M.}
\]

so that, since the jointer usually is purchased with a pulley attached it is necessary only to change the formula around a bit to know what pulley is needed to obtain a desired speed. The formula then reads

\[
\frac{5000 \times 1.75}{1750} = 5" \text{ diameter}
\]

Detailed information as to installing a particular machine may be secured from the manufacturer. Most power tool manufacturers have service departments who will gladly assist you with any special problems of installation.

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When mounting the machine on a table or bench, make sure that the table is comparatively level. Of still greater importance is the need that the base rest solidly on all feet, before being bolted down, otherwise a strain will be induced into the base casting, possibly enough to throw the tables out of alignment. Remember that there is a terrific pulling power in a \( \frac{3}{8}'' \) bolt and when this power is applied, something has to give, and it may be something that sooner or later will cause trouble.

### Alignment and Sharpening of Knives

Jointer blades must always be on a level with the tables, and kept sharp. Both these points are very important. To check the alignment of the blades with the table, first remove the fence, or guide, from the machine. Secure a piece of wood about 2 feet long, with one edge perfectly straight. Lay this along the center of the rear table, with one end projecting over the cutter blades, but not extending over the front table. Turn the cutter head by hand, in the regular cutting direction, that is, toward the front of the machine. Adjust the height of the rear table so that the blade touches the wood, but does not move it. All three blades should touch alike. Now, set the wood along one edge of the table and turn the cutter-head. All three blades should touch, as they did in the first position. If a blade does not touch it is low, while if a blade moves the wood, it is high. Mark the low or high blade. Then lay the wood along the other edge of the table and repeat, marking the low and high blades. A convenient marking is "L" and "H."

If a blade has "L" on one end and "H" on the other, loosen the two end lock studs only, and adjust by lightly tapping the high end with a piece of hard wood. If a blade is low on one end only, loosen that end and the middle stud and raise the knife by inserting a small punch under the bottom edge of the blade. If a blade is marked "H" on one end only, loosen the stud at that end and the middle, and drive it down with the hard wood block.
Always level the knives properly before sharpening. When this is accomplished proceed as follows using either the front or rear table as a guide.

Drop the table about 1/16" below the knife or blade edge when the blade is at the top of its sweep or cut. A large flat oil stone of medium grade with a piece of paper wrapped around two-thirds of its length is laid on the table and knife. (The paper is to prevent scratching the table.) Rub the stone, with an even pressure, in a circular motion over the knife edge, which should be held motionless with one hand, until all nicks are taken out of the blade. Then take the next blade and finally the third.

Readjust the rear table until it is on a level with the blades at their topmost sweep. Use the piece of wood which you prepared for a straight-edge. When this rests on the rear table, the blades should just touch this wood when revolved, but not enough to move the wood. For all jointer work, the rear table is left in this position. It is made adjustable for one reason only, and that it to enable you to adjust it to knife cutting level, as the blades are worn down through continued sharpening.

**Blades Should Be Kept Sharp**

How often to sharpen the blades? The finest high speed steel will not hold its edge indefinitely and must be resharpened periodically. Contrary to general opinion, hard wood will not dull the blades any quicker than soft wood. The cause is usually dust particles which have settled on the wood. If you have wood that has lain around the cellar for several weeks, it is quite certain that there is a film of dust or grit on the surface. Dust each piece of wood off, before running it over the jointer. Blades will probably need sharpening every few months, the frequency, of course, depending on how much they are used. There is great satisfaction in a tool that is razor sharp and does not have to be coaxed.

When the jointer seems to require unusual power or the surface of the planed wood has a fuzzy look, sharpen the blades.
Alignment of Tables

The method and adjustment of the rear table, in relation to the cutter head, has already been covered, and to make it still more positive, we repeat, that the rear table should be on a level with the cutting arc of the blades, and left there, for all jointer operations.

The front table, however, is adjustable for an entirely different reason. With it, the thickness of the cut to be taken is regulated. As the table is lowered it allows a thicker cut to be taken, until the maximum cut is reached. This maximum depth of cut, for all operations, is determined by the height of the knives above the housing of the bearings, and not the amount that the front table can be dropped.

Planing

Under this heading, we will consider the surfacing of the faces of boards only. For boards or strips of wood under 1/2" in thickness it is wise to provide oneself with a block for use with the left hand to hold down the strips as they pass over the knives. Some jointers are equipped with spring hold-down clips, which serve the purpose of the block. For the right hand, a pusher block, such as shown in the sketch, should be made and kept handy to the machine. It is not alone a matter of safety, but accuracy of work, that necessitates the use of these blocks, since it is next to impossible to hold down thin strips with the fingers alone, and get a smooth even surface.

Wider pieces and more than 1/2" thick may be held down and fed with the hands only. As a matter of precaution don't let any of your fingers grasp the sides or edges of the wood as they pass over the knives, since there is always a chance that they may come in contact with the knives.
Planing Pieces Over 4" in Width

Pieces of wood up to 4" in width may be surfaced with the guard and guide in place. For wider boards it is necessary to remove them both. Boards 12" or more in width may be readily surfaced by the following method. Let us choose an 8" board as an example. The cutters will have a capacity of 4", but we do not utilize the full capacity. We take a cut about 2½" along one side, then a 2½" cut along the other side, leaving a 3" cut in the middle of the board for the last. On a 10" board we can make it in two 3½" and one 3" cut. This insures enough surface to form ample bearing on the tables, for each cut, so there will be little occasion or chance to "tilt" or wobble the board while cutting. With a little practice, and using a very shallow cut of not more than 1/32", one can surface boards that are quite wide. This removes a lot of the drudgery of woodworking, and after all that is the main purpose of power machinery.

There is a right and wrong way to plane wood; namely, with the grain and against the grain. Refer to the sketch which shows this clearly. If the knives cut against the grain they have a tendency to tear the wood out, rather than cut it off. There are some woods in which the grain direction changes several times in a piece and one has no choice but to cut against the grain. Cherry, beech, and more particularly birk, are examples of this.

When one is confronted with this problem, adjust the front table for a very shallow cut and feed the wood very slowly. It is doubly imperative that the knives have as keen an edge as you can put on them for this type of work.

For jointing, the fence is utilized. For flat work, where it is desired to have the edges square with the surface, the fence is set to a 90° angle. The board is laid on its edge on the table and, as it is fed across the knives care is taken to hold its whole surface against the fence. As much pressure must be exerted sideways as down. Here again the value of a block for the left hand, is advantageous, particularly when jointing such woods as fir, long leaf pine and others which splinter easily.
Strive to maintain a uniform pressure and feed. When planing or jointing long boards or strips, make use of the stock support illustrated on page 22.

For bevel jointing, the same procedure of operation is followed, except that the fence is adjusted at an angle to give the desired bevel. The fence may be adjusted either way from the vertical, whichever seems the most convenient for you to use. As in jointing square edges, due attention must be paid to holding the side of the board in contact with the fence, at the same time it is held down against the table and fed through.

Rabbeting

This is one of the special uses to which the modern jointer may be put and for that purpose a "rabbeting ledge" is incorporated in the front table, which is merely an extension of the table, to help support boards that are being rabbeted.

To make the following description more clear, when the width of a rabbet is mentioned it means the distance in from the edge of a board, as indicated by W in sketch, and the depth of a rabbet is the distance down from the face, as indicated by D.

The width of the rabbet is determined by the distance the fence is set from the left end of the knives, not the table, as shown by W. The depth of the rabbet is determined by the distance the front table is dropped below the cutting circle of the knives, as shown by D.

The rear table serves no other function than to support the wood after the rabbet has been cut, and no adjustment of it is necessary except as it should be for regular planing or jointing. The full depth of the rabbet, if not beyond the capacity of the machine, should be made in one cut. This, of course, in wide rabbeting, throws a considerable load on the machine and it should be fed slowly.
Mouldings

Because a jointer planes, bevels and rabbets we can utilize it to make certain types of mouldings, in which the cuts are all flat or beveled surfaces. A few examples of such mouldings are shown in the accompanying sketch.

Work of this type usually is associated with the functions of other machines but, as these five examples indicate, creditable moulding work is done with the jointer. Many other designs can be worked out by experimenting.

Trouble Shooting

If the board gets thinner along one edge than it does at the other or wedge shaped after being planed off, one or more of the knives are too high on the side which planed thin. Adjustment of the knives is the remedy.

If the board is planed true for most of its length, but the latter portion of it shows up wedge shaped the tables are not in the same plane, that is, one of the two tables has a low corner, allowing the wood to drop before the cut is completed. Internal stresses in the table castings, usually beyond the control of the manufacturer generally causes this, and while it is not of frequent occurrence, it is cited as one of the things that do happen. The trouble in this case may sometimes be overcome by loosening the nut on the underside of the table and slipping a piece of thin shim brass under the low corner in the "ways."

If the surface planed is concave or low in the middle it is almost certain that one table is higher at the end nearest the knives. The remedy just mentioned above applies in this case, except that the shims are put under both sides of the table, in the "ways."

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If the surface planed shows up convex, or high in the middle, one of the tables is low at its end nearest the knives. Again shims may remedy the trouble. If, in jointing the edge of a piece of wood, one end of it proves to have a square edge, but the other end does not, the fault may usually be found in a warped fence. If the fence is of the usual solid cast iron type, the only remedy is a new one unless you have access to a local machine shop that has a surface grinder or planer.

If the surface planed has a number of indentations in it, but is otherwise planed smooth, this is caused by chips coming up from beneath and getting between the knife edge and the surface. Provide ample outlet for the chips to fall from beneath, and this trouble will not occur.

If the surface shows a decided ripple, this may be caused by insufficient speed, feeding the wood too fast, or a loose belt. Sometimes it may be caused by taking a cut that is too heavy, and not exerting enough pressure with the hands to hold the wood down on the tables.

If the machine slows down considerably while a cut is in progress, it indicates insufficient power or a loose belt. Loose pulleys sometimes contribute to this trouble. There is always the possibility of low voltage in the house current. If the loss of power is more noticeable at night than in the daytime it is almost a sure indication that the trouble lies at this source. (A simple test is to start a 1/4 H. P. motor, with no load, and watch the lights. If they dim considerably when the motor starts, have the line voltage checked.)