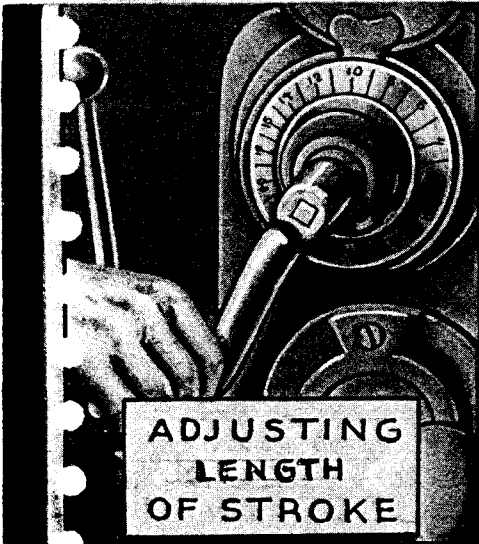
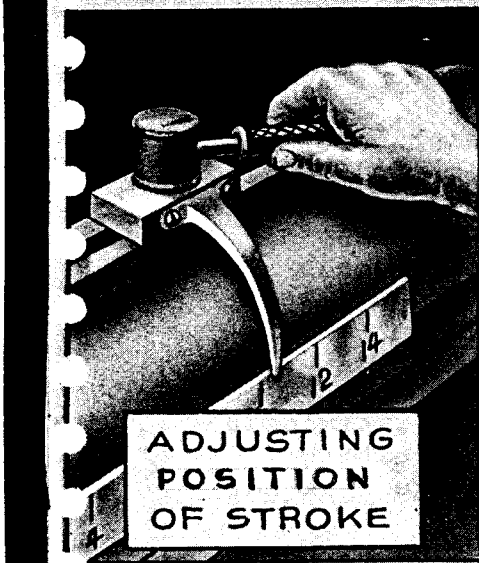


HOW TO ADJUST THE SHAPER

Unit 1-P52(A) Part III Pages 75 to 96



ADJUSTING
LENGTH
OF STROKE



ADJUSTING
POSITION
OF STROKE

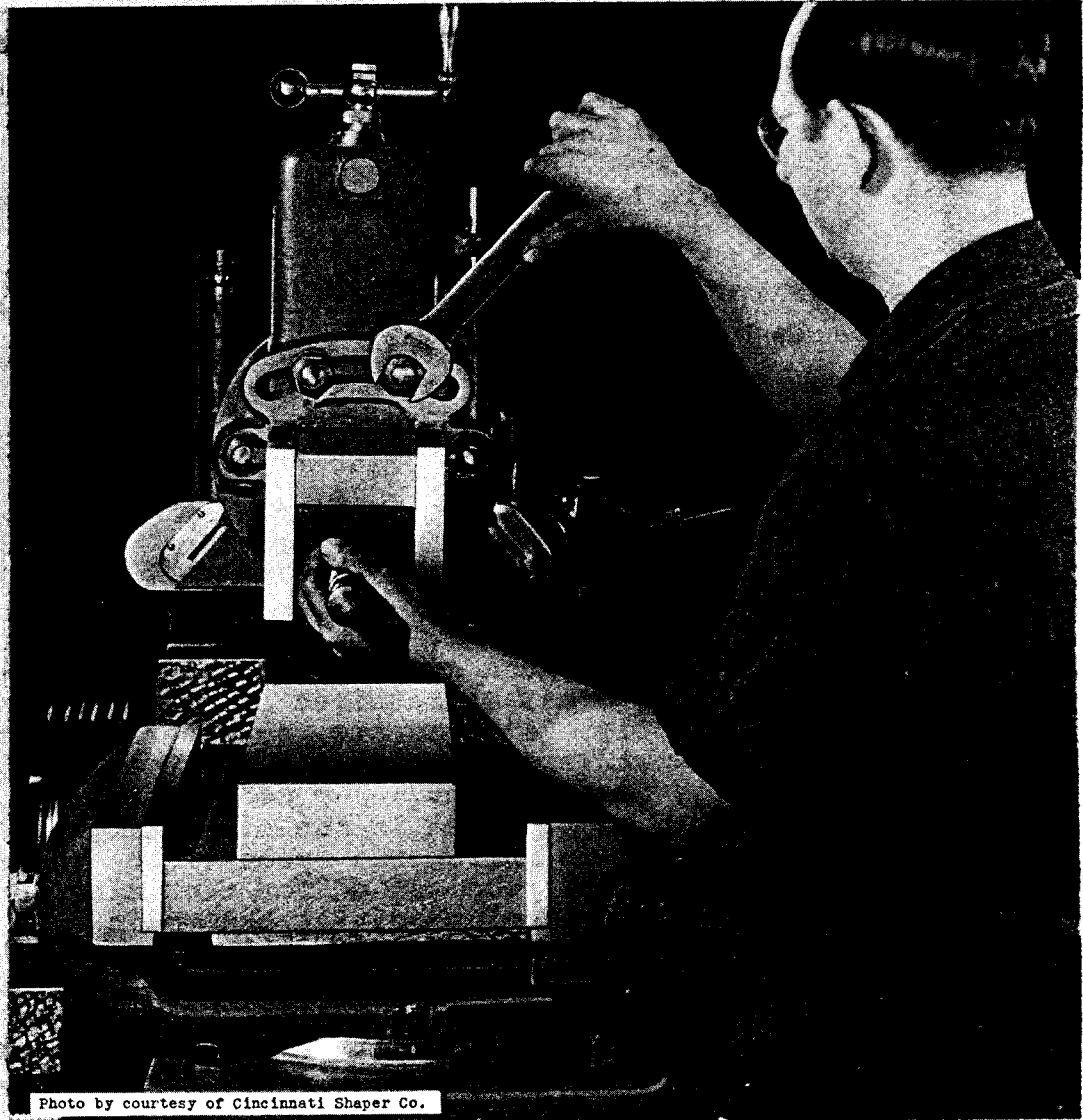


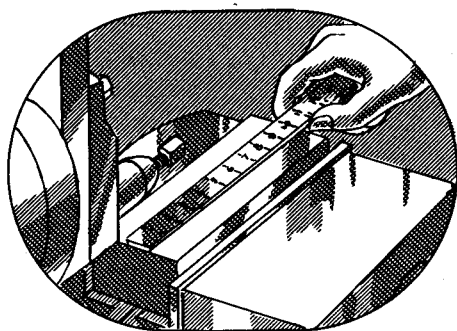
Photo by courtesy of Cincinnati Shaper Co.

UNIVERSITY OF THE STATE OF NEW YORK
STATE EDUCATION DEPARTMENT
BUREAU OF INDUSTRIAL AND TECHNICAL EDUCATION

HOW TO ADJUST THE SHAPER

OBJECTIVES OF UNIT

1. To point out the machine adjustments which should be made prior to actual machining operations.
2. To show how to make these adjustments on various parts of both the crank shaper and the hydraulic shaper.
3. To explain how job specifications influence machine adjustments.



INTRODUCTORY INFORMATION

Certain definite machine adjustments must be made, or at least must be given consideration, for every job performed in the shaper; for if the machine is to be set up rigidly and if the work is to be performed without an undue amount of lost motion and lost time, the machine must be adjusted to meet the requirements of the job.

Since two jobs are seldom exactly alike in all respects, several machine adjustments may be required in order to have the machine operate efficiently. For example, considerable variation in the height of the work requires that the table be adjusted vertically for rigidity in the setup. For economy of time, the length of stroke should be adjusted to the minimum required for each job, and for the same reason the speed of the shaper should very closely approach that recommended for machining the material in the job with the particular cutting medium in use.

Furthermore, the type of cut, whether rough or finish, influences the amount of feed used and, therefore, requires an adjustment of the feed mechanism whenever it is necessary to change from one type of cut to another.

Most of these adjustments should be made preferably after the job has been located in the machine vise or in whichever other holding device is used for gripping the work. Furthermore, they should be made in the sequence suggested here, and, *most important of all*, for the safety of both the operator and the machine, should be made prior to starting.

Whenever the directions for making an adjustment on the hydraulic shaper differ from those given for making a like adjustment on

the crank shaper, a set of directions has been written for adjusting both types of shapers.

The directions for adjusting the hydraulic shaper, however, have been placed in a separate section beginning on page 92.

TOOLS AND EQUIPMENT

Shaper
Scale

Wrenches of correct size
Oil can for machine oil

Tool holder
Tool bit

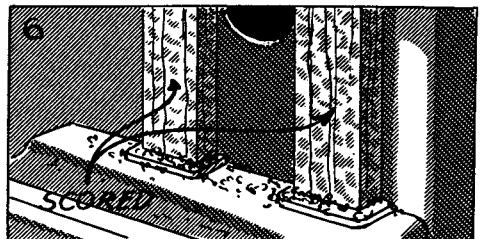
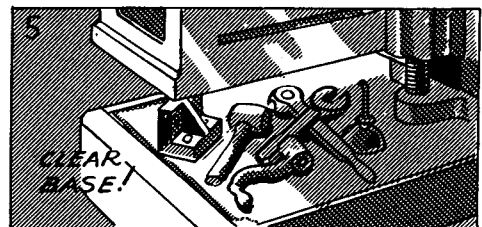
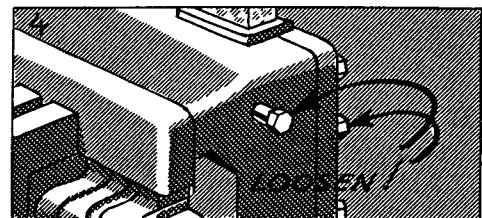
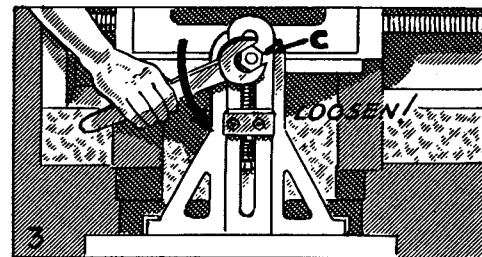
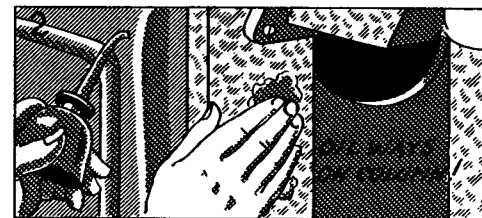
PROCEDURE

HOW TO ADJUST THE CROSS RAIL

1. Wipe all chips and dirt from the front faces of the column, for when the vertical position of the table must be changed, the cross rail is moved up or down on these bearing surfaces.
2. Apply a small quantity of oil to the clean bearing surfaces of the column, distributing the oil evenly with the fingers.
3. Loosen the table support clamps **C** which fasten this support (if one is used) to the table. (Refer to page 11.)
4. Loosen the clamping nuts, or the clamping levers — on both sides of the column — which lock the cross rail rigidly to the column. In some makes of shapers the clamps for both sides may be manipulated from the operator's side. (Refer to page 8.)

NOTE: Do not loosen the other strap bolts as they are adjusted to hold the rail "slideably" to the column.

5. Avoid possible damage to the machine from tools and work pieces placed on the base of the shaper by removing them before changing the position of the rail.
6. Make certain that chips and dust do not become lodged between the column and the cross rail. Foreign material between their surfaces will cause misalignment of these parts and also may cause scoring of their faces, if these parts are moved when chips are present.



7. Place a crank on shaft S which is connected with the elevating screw through bevel gears within the rail.

8. Turn this crank in a clockwise direction to lower the table and vice versa to raise the table. In either case, whether the table is raised or lowered, the underside of the ram should clear the work by no less than two inches for the safety of the operator.

9. Tighten the clamps used for locking both sides of the cross rail rigidly in place on the column.

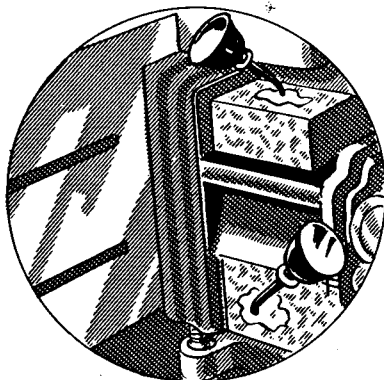
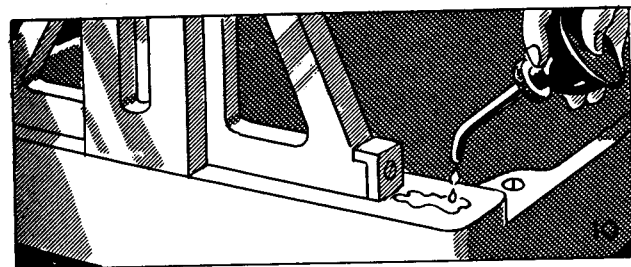
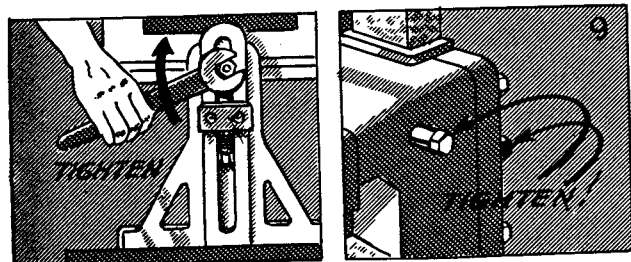
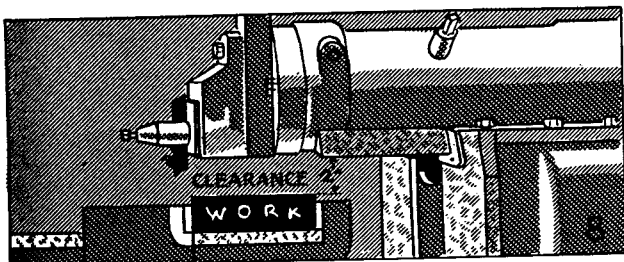
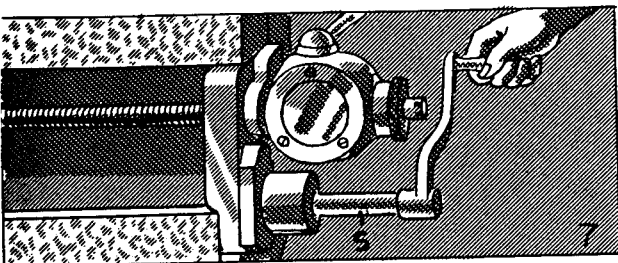
10. See that the slide for the table support is clean; apply a few drops of oil thereto; and then tighten the table support clamps, making sure that the support rests on its sliding surface.

NOTE: The rail clamps always should be tightened before the table support is adjusted, for with the rail clamps loose, the table sags somewhat because of its weight. Thus, if the support is adjusted and clamped with the rail clamps loose, their subsequent tightening will raise the support slightly from its slide and result in table deflection under pressure of the cut.

HOW TO ADJUST THE TABLE HORIZONTALLY

1. Examine the bearing surfaces of the cross rail over which the saddle, together with the table, moves. If these surfaces are found to lack oil, or, if the oil is found to be dirty and laden with grit, proceed according to the directions given in No. 12 on page 53.

NOTE: Considerable pressure is exerted on the faces of the cross rail because of the overhang of the table. In addition,

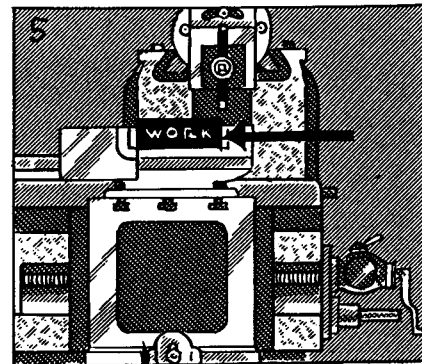
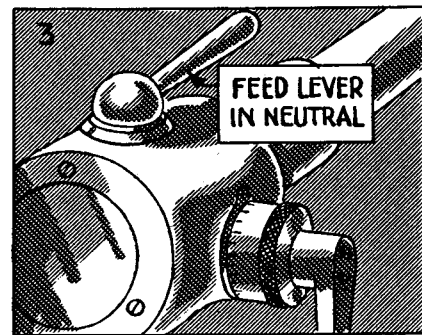
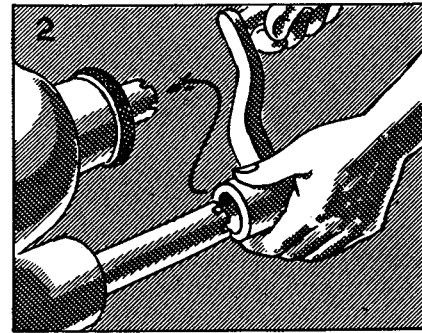


these faces are continually exposed to dust and chips. As a result of these conditions the cross rail will wear out of shape rapidly and will make accurate work difficult, unless the bearing surfaces are kept clean and well oiled at all times. On modern shapers, felt wipers impregnated with oil help somewhat to clean the surface and to apply oil.

2. Remove the handcrank from the elevating shaft and place it on the end of the cross-feed screw.

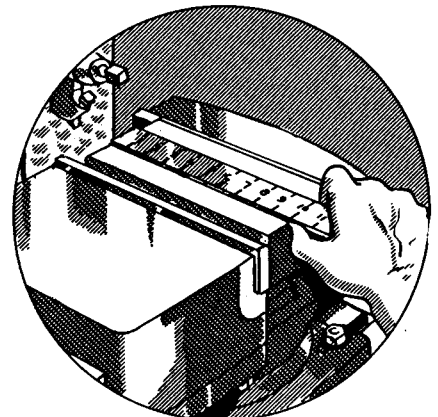
NOTE: In a machine equipped with rapid power traverse, the cross-feed screw, instead of being squared on the end to receive the crank, usually has clutch teeth of one form or another. This design eliminates the hazard of a rapidly revolving crank, for although it remains on the screw, the crank does not revolve with it when the automatic feed is applied. For hand feeding, the crank is pushed forward, meshing the teeth on the crank with those on the screw which are held out of engagement by a spring.

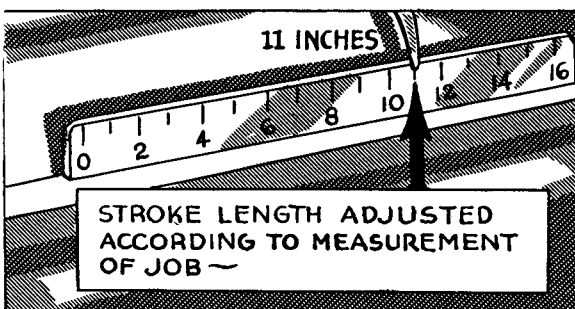
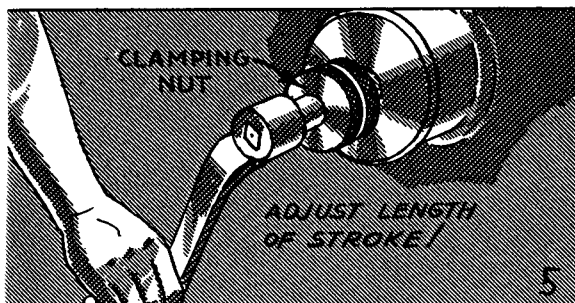
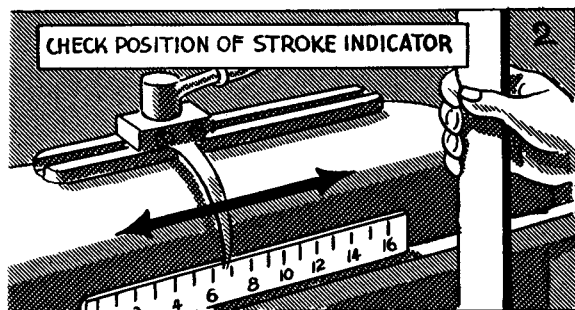
3. Make certain that the feed knob or the feed lever, whichever construction is used, is in neutral, a position in which the automatic feed is disengaged.
4. Rotate the crank on the cross-feed screw in a clockwise direction to move the table away from the operator and vice versa to move the table toward the operator.
5. Move the table over until one edge of the surface to be planed is approximately central with the ram.



HOW TO ADJUST THE STROKE ON SHAPERS WITH A SCALE ADJACENT TO THE RAM

1. To determine the length of stroke for which the shaper must be adjusted, measure the length of the surface which is to be planed; then add one inch to this dimension to provide for clearance of the cutting tool at both ends of the job.
2. Before adjusting the stroke, pull the belt by hand, or turn the handwheel if the shaper is motor-driven, and stop when the





stroke indicator, moving with the ram, ceases to move along the stationary scale. The highest number reached indicates the present stroke-length and determines whether or not an adjustment is needed.

3. Loosen the clamping nut on the outer end of the stroke-adjusting shaft. (Refer to page 20.)
4. Place the proper crank on the square end of the stroke-adjusting shaft.
5. Turn the crank in one direction or another, depending on whether the stroke is to be made shorter or longer, until the stroke indicator is over the number on the stationary scale which corresponds with the length of ram stroke required. This number should be the one derived in step No. 1 above. (Refer to page 20.)
6. Tighten the clamping nut on the stroke-adjusting shaft, so that the length of ram stroke will not change during the operation of the shaper.
7. Remove the crank from the stroke-adjusting shaft.

HOW TO ADJUST THE STROKE ON A SHAPER WITH A DIRECT-READING STROKE INDICATOR

1. Measure the length of the surface which is to be planed and add one inch to this measurement in order that the ram stroke will permit the tool to travel beyond the back and front ends of the work.
2. Place the proper crank on the square end of the stroke-adjusting shaft (Fig. 72).
3. Turn the crank, together with the dial, until the number coinciding with the indicator corresponds with the length of stroke in inches as derived in step No. 1 above. (Refer to page 21.)

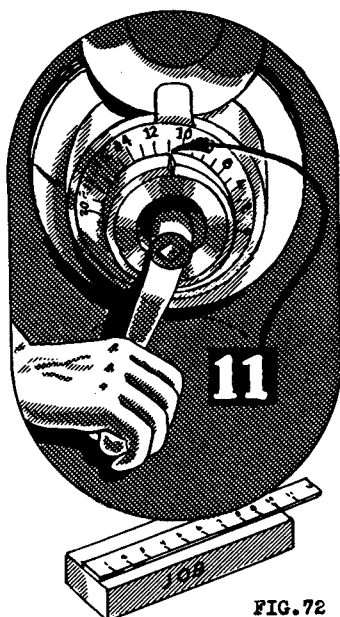


FIG. 72

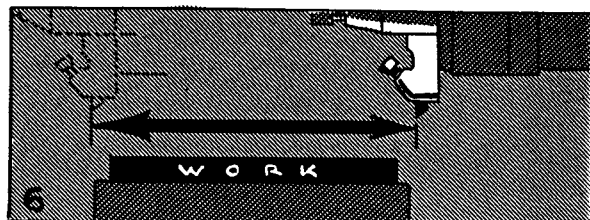
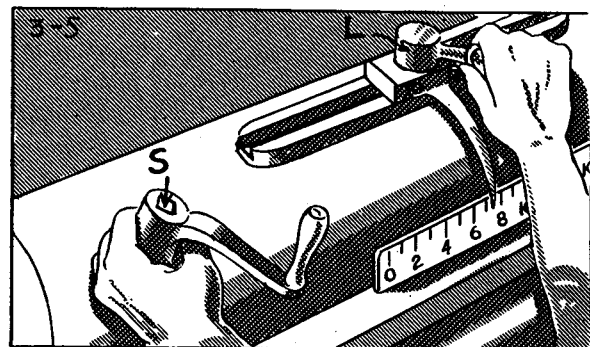
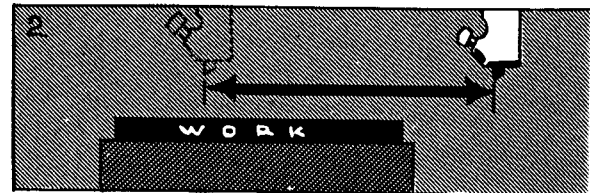
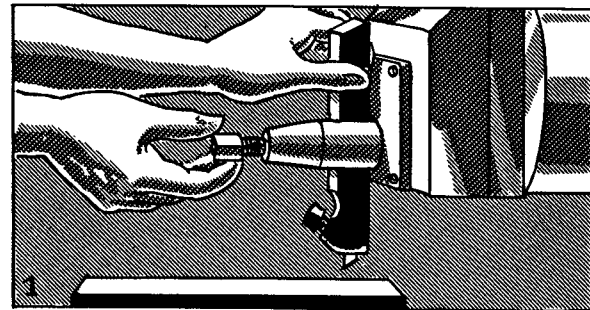
4. Remove the crank from the stroke-adjusting shaft.

NOTE: The two actions, unlocking the stroke-adjusting shaft before setting the ram stroke and again locking it after the setting has been made, occur co-incidentally with the insertion and withdrawal of the crank. (Refer to page 21.)

FOR ADJUSTMENT OF
THE STROKE ON THE
HYDRAULIC SHAPER,
REFER TO PAGE 92.

HOW TO ADJUST THE POSITION OF THE RAM

1. Place the tool holder, together with the cutting tool, in the tool post and clamp it in the approximate position it will occupy during the cutting process.
2. To ascertain whether or not the stroke will cover the work, stop the ram, after moving it to its extreme forward position by pulling the belt, turning the handwheel, or using whichever other means is appropriate for the shaper being used.
3. Loosen the clamping block by turning the binding lever L in a counter-clockwise direction.
4. Place a crank on the square end of the ram-adjusting shaft S; then adjust the ram until the cutting tool extends about one-fourth inch beyond the front edge of the surface to be planed.
5. Remove the crank and turn the binding lever clockwise, clamping the ram securely in position.
6. Pull the belt by hand, or use whichever other means is most appropriate to the shaper in use, and move the ram to the extreme end of its return stroke. When the ram occupies this position, the cutting tool should extend about one-half inch beyond the work. If, however, the feed operates at the beginning of the stroke, instead of during the return stroke, slightly more clearance and a longer stroke must be provided.



HOW TO ADJUST THE SPEED OF THE RAM

Eight different ram speeds, indicated as strokes per minute, are usually provided on the shaper. The speeds are available in two series of four each: a direct series for the faster speeds and shorter ram strokes, and a series through the back gears for the slower speeds and longer ram strokes. Thus, two speeds are possible for each position of the gear-shift lever on the shaper with a geared transmission, and also for each step of the cone pulley on a belt-driven shaper — one speed with the back gears "in" and another with the back gears "out." (Refer to page 21.)

It is desirable, usually, to adjust the speed of the shaper, that is, to regulate the number of strokes per minute, so that the cutting speed of the tool in feet per minute closely approximates the established rate at which each different material can be machined most economically. In other words, for cutting similar material, the shaper must make twice as many strokes for a cut 6" long as it does for a cut 12" long, if the cutting speed is to be at the same rate for both cuts.

Apparently then, if a uniform cutting speed is to be maintained, the number of ram strokes per minute must be reduced when the stroke is lengthened, and must be increased when the stroke is shortened.

Most modern shapers have a speed chart attached. From this chart the operator can determine, without calculations, how many strokes per minute of a given length the ram must make for the tool to attain a desired cutting speed.

In the operation of a shaper which is not equipped with this convenient speed chart, it becomes necessary to use calculations similar to those in Unit 1-T53(D) beginning on page 293, to determine the correct ram speed required for various stroke lengths and for various materials.

Since each make of shaper employs a somewhat different method for setting the speed of the ram, it will be impossible to explain all of them. However, directions have been given for adjusting the ram speed on several makes. Familiarity with the methods explained here, together with a study of a particular one which differs from these, should enable the operator to set the speed on any shaper without difficulty.



HOW TO USE A SPEED CHART TO ADJUST THE
SPEED ON A CONE-DRIVEN SHAPER

1. Pull the belt until the stroke indicator reaches the largest number on the stroke-index plate in order to determine the length of stroke for which the ram has been adjusted.
2. Refer to plate P above the cone pulley. From the numbers appearing on this plate, choose the one which most nearly corresponds with the length of the stroke. The location of this number on plate P determines the position of the belt.

NOTE: For strokes of an odd number of inches in length, such as 7, 9, etc., which do not appear on plate P, the position of the belt should be on the next larger or smaller step of the pulley, depending on whether or not the material being cut can be machined at a cutting speed that is higher or lower than average.

3. Remove the belt from its step on the lower cone pulley, pulling down on one side of the belt as well as out. It is the downward pull which sets the belt in motion and makes its removal easier.
4. Shift the belt to the desired step on the upper cone pulley, then run the belt onto the corresponding step on the lower cone pulley.

CAUTION Do not start the shaper when it is necessary to shift the belt, for unlike most other cone-driven machines, the outer end of the pulley on the shaper is frequently unsupported, and there is nothing to prevent the belt from leaving the pulley entirely. A belt moving unrestrictedly may cause serious personal injury or may cause damage to the machine.

5. Observe in which column on plate P the number corresponding to the stroke length appears, and note the direction in which the arrow at the head of this column points. (Refer to Fig. 73.)
6. Move the back-gear lever L in the direction indicated by the arrow at the head of the column in which the stroke length appears; move it toward the column for strokes eight inches or less in length, and out from the column for strokes from ten inches to sixteen inches in length.

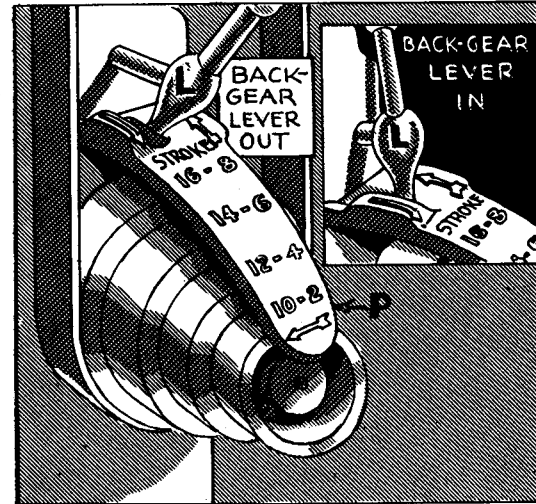
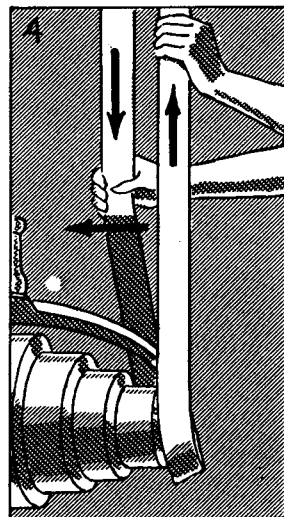
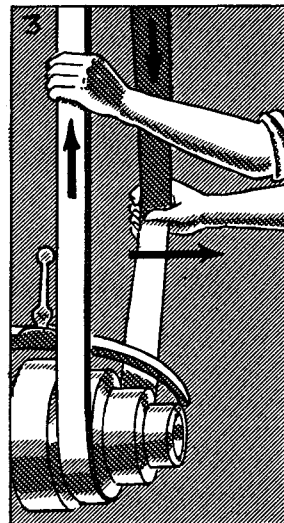
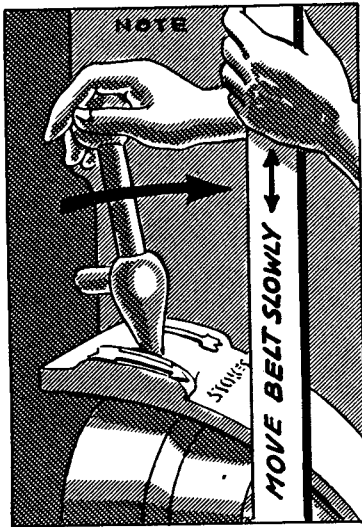


FIG. 73





NOTE: If, as occasionally happens, the teeth on the back gears are in such a relative position that they cannot be engaged readily, do not use force, but pull the belt slowly to change this relationship, and then the gears will slide into mesh easily.

7. Close the door on the belt guard when the speed setting has been completed.

NOTE: When the foregoing instructions have been followed implicitly, the ram will make the number of cutting strokes per minute of the length indicated, and this will result in a cutting speed in feet per minute which is approximately correct.

HOW TO ADJUST THE SPEED ON CONE-DRIVEN SHAPERS WITHOUT A SPEED CHART

Many cone-driven shapers lack speed charts and plates such as are provided on the modern shaper to help the operator determine the correct cutting speed. The operator of a shaper of this type either must calculate the speed, using as a basis the figures representing such factors as the length of stroke, etc., or he must depend upon his own judgment which, if it is reliable, gives consideration to the same factors used when calculations are made, but with experience as the basis instead of figures.

If the shaper has the usual four-step cone pulley and back gears such as shown in Fig. 73, but without plate P, some general rules may be formulated to assure the shaper's being operated at a safe and approximately correct speed. Minor increases and decreases can then be made from the approximate speed when differences in materials and unusual cutting conditions warrant such changes.

Proceed as follows to determine which step of the cone pulley to use for machining work requiring any stroke length within the capacity of the shaper.

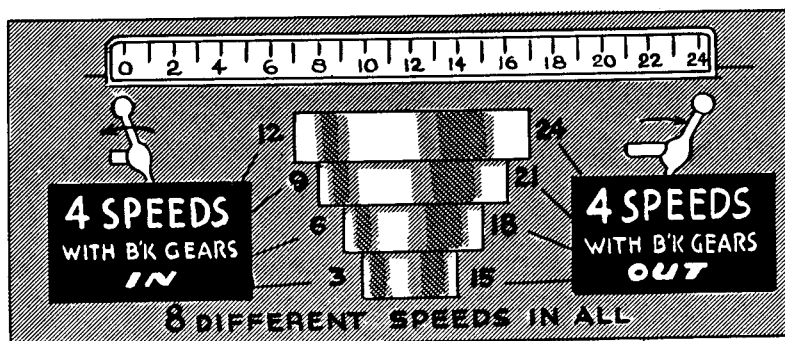


FIG. 74

1. Divide the maximum stroke length given on the index plate by the number of different speeds available on the shaper (Fig. 74).
2. Let the result of the division be the stroke-length in inches for which the smallest step on the cone

pulley will be used in direct speed (without back gears).

3. Increase by the amount derived in step No. 1 above, the length of stroke for which each succeeding, and larger, step of the pulley will be used.
4. Continue to increase by the same amount, the stroke-length for which each step of the pulley is to be used in the back-gear series of speeds, again beginning with the smaller step of the cone pulley.

A formula for these calculations could be written and used as follows:

$$I = \frac{A}{N}$$

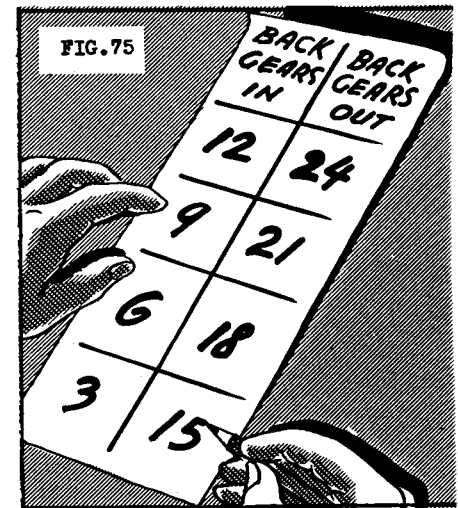
in which

I = maximum stroke-length to be used with the small pulley;
 I = amount of increased stroke-length for larger pulleys;
 A = maximum stroke-length for which the shaper can be used;
 N = number of different speeds available on the shaper.

Proceed as follows, to make a speed chart for a 24-inch back-gear shaper having a four-step pulley:

FORMULA: $I = \frac{A}{N}$, or, by substitution, $I = \frac{24''}{8} = 3''$.

Thus, the smallest step is used for ram strokes not exceeding three inches in length. The second and succeeding steps are used for strokes six inches, nine inches, and twelve inches in length, respectively. If this procedure is carried through, the series of back-gear speeds will begin with fifteen inches for the small step and continue to eighteen inches, twenty-one inches, and twenty-four inches for the progressively larger steps. The chart in Fig. 75 shows how the numbers should be arranged for a 24-inch shaper with eight speeds.



HOW TO ADJUST THE SPEED OF THE RAM ON A GEAR-DRIVEN SHAPER

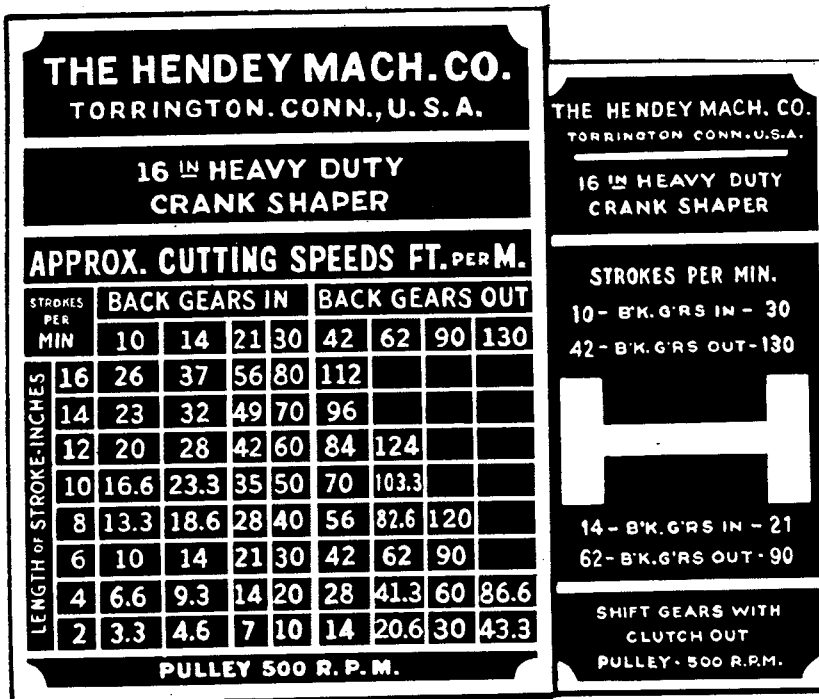
To adjust the ram speed on a gear-driven shaper, follow the instructions given in the operator's manual supplied by the manufacturer, if it is available, for this contains specific directions on how to proceed. In the absence of a manual, the careful operator proceeds cautiously when adjusting the speed on a shaper which he has not previously operated. He examines the speed-adjusting mechanism thoroughly to determine wherein it resembles one with which he is familiar. This investigation will disclose familiar parts

which, in turn, will lead to a prompt understanding of the remainder of the mechanism.

Directions for adjusting the speed (number of strokes per minute) on several makes of shapers will be presented herewith in order to give the student an idea of some of the different ways in which this is accomplished.

Proceed as directed to adjust the speed on a Hendey Shaper.

1. Examine the speed plate, and observe that the factors required to determine the speed of the shaper have been included on it, notably:
 - a. the Length of Stroke in Inches, arranged in a vertical column on the left side of the plate,
 - b. the number of Strokes per Minute, represented by the figures in the upper row, and divided into two series of speeds — one series attainable with the Back Gears In, and the other with the Back Gears Out,
 - c. the Approximate Cutting Speeds in Feet Per Minute which result from the various combinations of stroke lengths and ram speeds.
2. Observe the numbers on the stroke plate, and note that they correspond with those in the upper horizontal row of the speed plate.



3. Determine the cutting speed in feet per minute at which the kind of material in the job should be machined. (Refer to the table on page 308.)
4. Consult the stroke-index dial and ascertain therefrom the length of the stroke for which the ram has been adjusted (Fig. 72).
5. In the first column on the left side of the speed plate, locate the number which corresponds with the length of the ram stroke as indicated on the stroke-index dial.

FIG. 76

6. In one of the vertical rows to the right of this number, locate the figure corresponding with that of the cutting speed selected in step No. 3.
7. Read the figure appearing at the top of this column; this represents the number of strokes per minute for the ram.
8. Observe the precautions which appear on the stroke plate regarding the shifting of the gears.
9. Select from the numbers on the stroke plate the one which most nearly approximates the number of strokes per minute as noted in step No. 7.
10. Move lever L into the slot, or place it in the position opposite which this number appears. (Refer to Fig. 78.)
11. Shift the back-gear lever B to its position marked "In" (for slower speeds) if the number of strokes per minute for which the shaper is to be adjusted appears in the left section of the speed chart. Shift the lever to the position marked "Out" if the number appears in the right section. The position which the back-gear lever should occupy during various speeds is indicated on the stroke chart also.

For example, to adjust the speed (number of strokes per minute) for taking a roughing cut on a cast-iron job requiring a 12-inch ram stroke, proceed in the following order. (Refer to Fig. 77.)

1. On the chart of allowable cutting speeds, page 308, find the cutting speed in feet per minute for a roughing cut on cast iron. The speed recommended is 60 feet per minute.
2. Find number 12, which is the length of stroke required, in the first column on the left side of the speed chart.
3. Move to the right in the row opposite number 12 and stop at number 60, which represents the cutting speed in feet per minute as determined in step No. 1 above.
4. Move up in the column above number 60 to number 30 which appears at the top and indicates the number of ram strokes per minute.
5. Shift lever L to the posi-

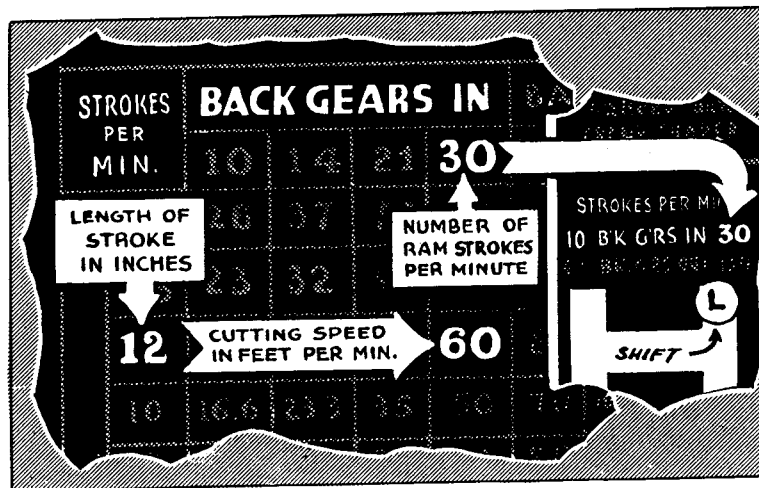
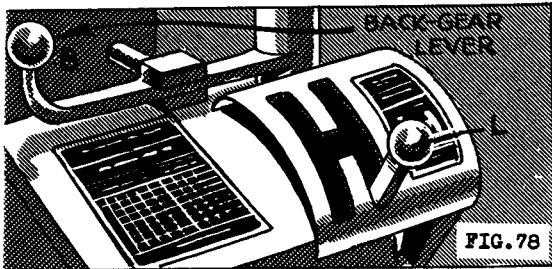


FIG. 77



tion under number 30 on the stroke chart.

6. Shift back-gear lever B to the position marked "In", as noted on both charts for a ram speed of 30 strokes per minute.

Proceed as directed to adjust the speed of a Cincinnati Shaper.

1. Determine the cutting speed in feet per minute which is recommended for shaping the kind of material in the job. (Refer to the table of Allowable Cutting Speeds on page 308.)
2. Ascertain from the stroke-index dial the length of stroke for which the shaper has been adjusted. (Refer to Fig. 72.)

NOTE: The cutting speeds which result from various combinations of stroke lengths and ram speeds — two factors which determine the cutting speed of the shaper tool — are frequently supplied on a speed chart attached to the shaper, as shown in Fig. 76. This manufacturer, however, supplies a table of cutting speeds in the operator's manual instead. This table has been reproduced here for use when the speed of the shaper is being adjusted. (Refer to Fig. 79.)

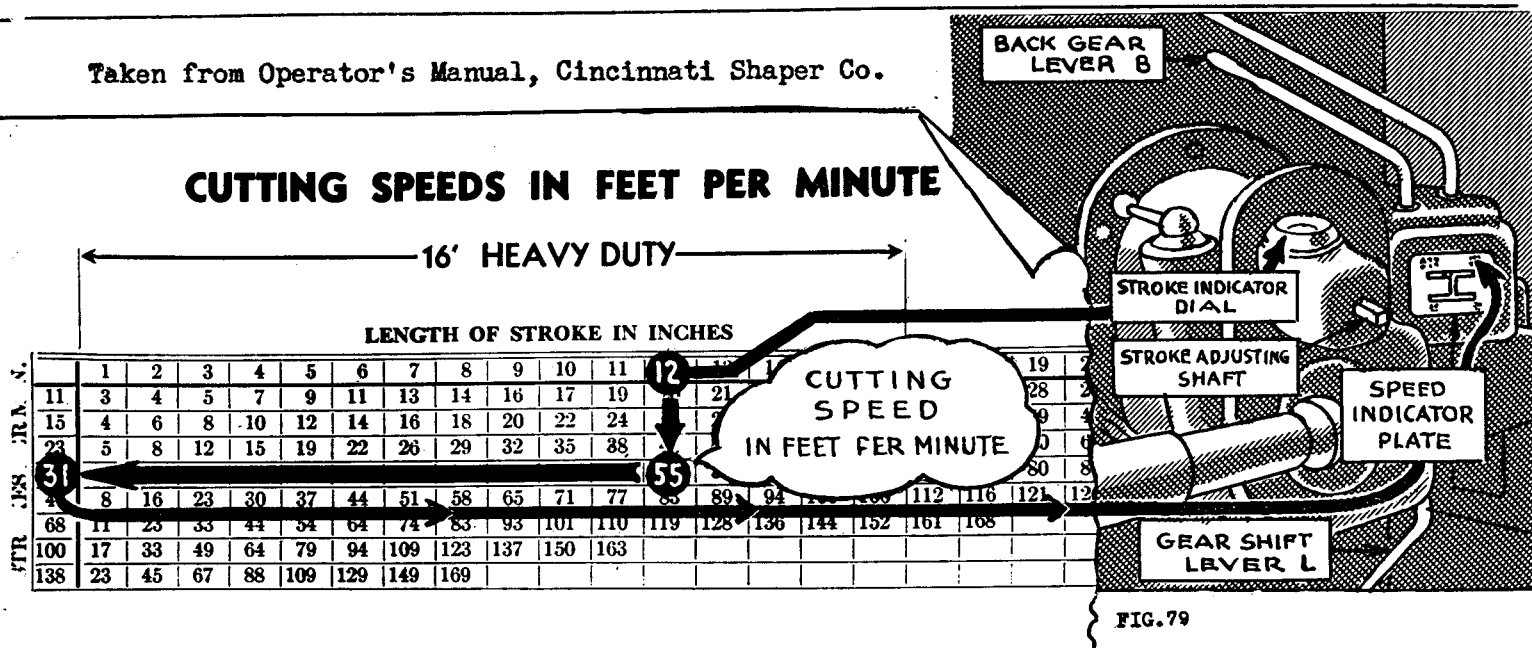
3. In the upper row of the table, locate the number which corresponds with the length of the ram stroke.
4. In the column below this number, find the figure which most nearly corresponds with that of the cutting speed in feet per minute, as determined in step No. 1.
5. Move to the extreme left column in the same row in which the cutting speed has been located. The number appearing at this point represents the strokes per minute for which the shaper is to be adjusted.
6. Select from the numbers on the stroke plate, the one which corresponds exactly with the number of strokes per minute as noted in step No. 5.

CAUTION

Do not shift gears when the clutch has been engaged.

7. By means of lever L, shift the speed indicator to the slot adjacent to the selected number.
8. Shift back-gear lever B to position A or B, the choice depending upon which of these letters precedes the speed selected in step No. 5. (Refer to page 293.)

Taken from Operator's Manual, Cincinnati Shaper Co.



HOW TO ADJUST THE AUTOMATIC FEED ON A CONE-DRIVEN SHAPER

1. Read the description of the feed mechanism used on this type of shaper. (Refer to page 23.)
2. Determine, approximately, in thousandths of an inch, the amount of feed most desirable for the job, giving consideration to the factors which influence the selection of the proper amount of feed. These factors have been described in the section beginning on page 304.

3. Adjust the slide block out from the center of the feed disc or feed rocker arm, whichever is used, a distance estimated to produce the desired amount of feed, not forgetting that the farther from center the block is moved, the greater becomes the amount of feed.

NOTE: If the slide block is moved out from the center of one side of the feed disc or feed rocker arm, the feed will become operative during the cutting stroke; if the block is moved out from the center of the feed-regulating device on the opposite side, however, the feed will operate on the return stroke of the ram. This latter adjustment is preferable for most work. (Refer to Fig. 80.)

4. To determine the amount of table feed for which the shaper has been adjusted, apply the automatic feed; then pull the belt by hand and note how many thousandths of an inch the micrometer dial on the cross-feed screw advances for each stroke of the ram.

NOTE: The minimum amount of feed for which any shaper using this type of feed mechanism can be adjusted, is established by the amount of movement produced in the cross-feed screw when the feed pawl rotates the ratchet wheel one tooth only for each stroke of the ram. This amount, in thousandths of an inch, will vary with the number of teeth on the ratchet wheel and with the lead of the thread on the cross-feed screw.

5. Continue to make additional adjustments of the slide block in its feed-regulating device, if the first estimated setting does not result in the desired amount of feed.

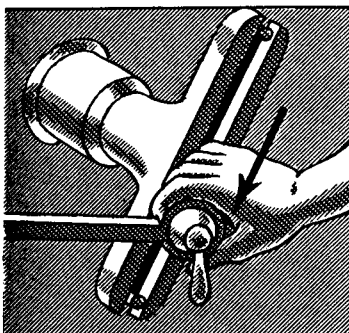
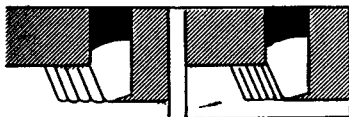
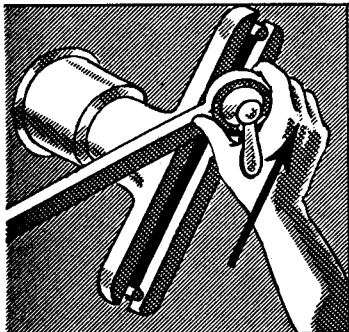
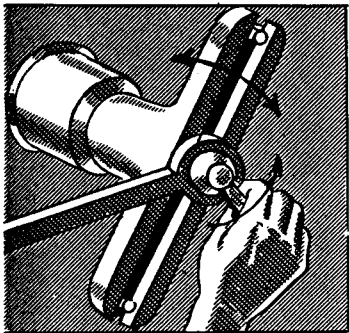
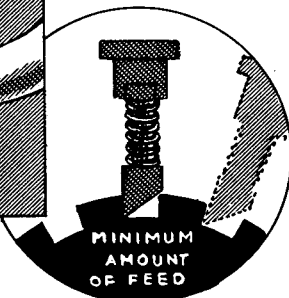


FIG. 80



HOW TO ADJUST THE AUTOMATIC FEED ON A SHAPER
USING A DIRECT-READING FEED DIAL

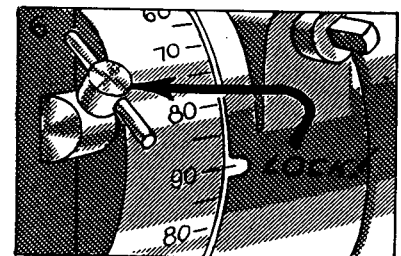
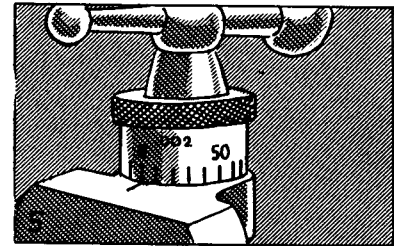
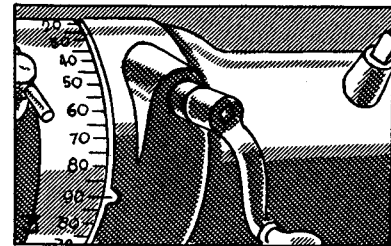
1. Read the description of this type of feed mechanism on page 28.
2. Determine, in thousandths of an inch, the amount of feed which will be desirable for the job. Base the selection of the amount of feed on those influencing factors which have been described in the section beginning on page 304.
3. Select from the numbers on the feed dial, the one which most nearly corresponds with the selected feed in thousandths. Then move this number on the dial to the index line, using whichever means has been provided for this purpose.

For example, the feed dials on page 28 have been adjusted for a feed of .090, .100, and .170 for dials A, B, and C, respectively.

HOW TO ADJUST THE TOOL HEAD

1. Read the description of the tool head beginning on page 14.
2. Loosen the binder bolts or other clamping devices which hold the swivel block to the end of the ram, if the position of the tool head must be changed.
3. Set the tool head to the position required for taking the type of cut specified. In other words, for vertical and horizontal cuts, set the head in a vertical position with the 90° mark on the swivel block opposite the index mark on the ram; or, for angular work, place opposite the index line on the ram whichever graduation on the swivel block will produce the desired angular cut. (Refer to page 227.)
4. Clamp the tool head in the selected position, making certain that the position has not changed during the clamping process.
5. By means of the ball crank on the down-feed screw, adjust the cutting tool so that it just barely clears the high point of the job.
6. Set the zero on the micrometer dial on the down-feed screw to its index line so that the depth of cut may be accurately determined. (Refer to page 65. Then, to prevent movement of the tool slide during the cut, tighten the screw on the tool-slide lock.

FOR ADJUSTMENT OF
THE AUTOMATIC FEED
ON THE
HYDRAULIC SHAPER,
REFER TO PAGE 95.



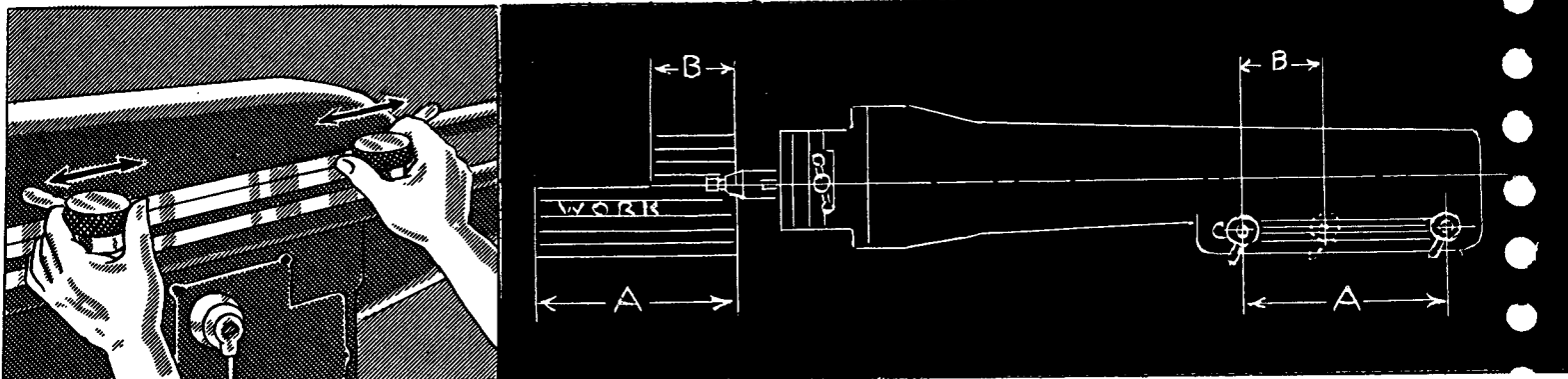


FIG. 81

HOW TO ADJUST THE STROKE AND THE POSITION OF THE RAM ON A HYDRAULIC SHAPER

1. Read the description of the pilot valve on page 45.

NOTE: Both the stroke-length and its position relative to the work may be adjusted simultaneously, since both these adjustments are controlled by the trip dogs on the ram. The position of the trip dog at the front determines how far the ram may travel toward the rear of the shaper; likewise, the position of the trip dog at the rear determines how far the ram may move forward, inasmuch as these dogs actuate the pilot valve which in turn causes the ram to reverse its direction of travel.

2. Measure the length of the surface to be planed after the work has been located in the shaper.
3. Turn the knobs on the trip dogs in order to loosen them so that they may be located about equidistant from the ends of the ram slot and spaced a distance approximately the length of the job for the purpose of making the trial adjustment.
4. Set the speed-control lever for one of the slower speeds on the shaper while the length and position of the stroke are being adjusted. (Refer to page 58.)

CAUTION

Make certain that neither the cutting tool nor the

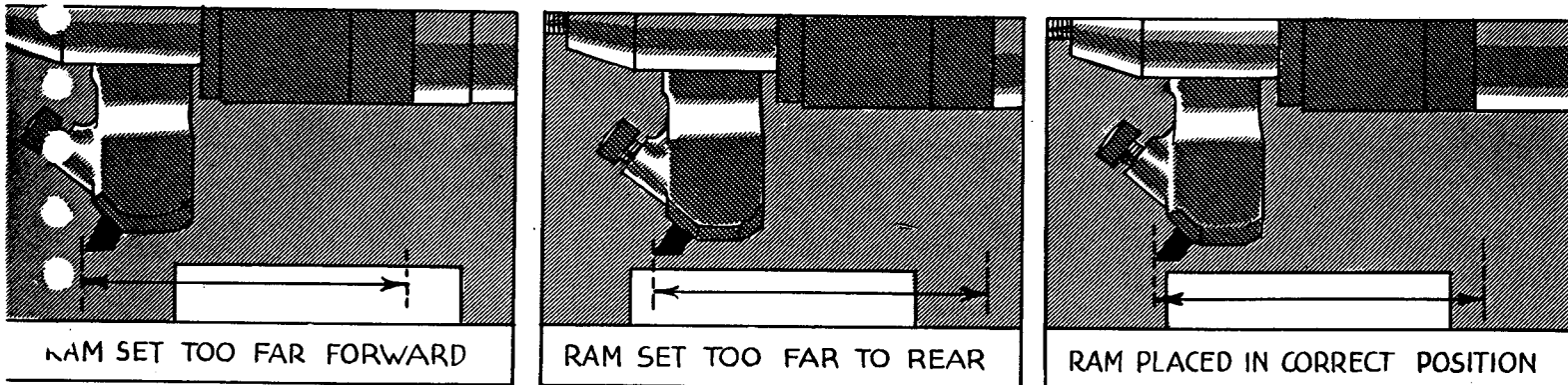
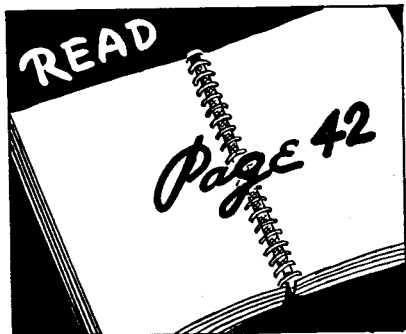


FIG. 82

ram will strike the work when the shaper is set in motion.

5. See that the control lever is in its "Stop" position before starting the motor which operates the pump for the hydraulic system. (Refer to pages 42 and 58.)
6. Cautiously start the shaper, and run the ram to its forward position; then stop the machine and note whether or not it is necessary to make a further adjustment of the trip dog which controls this end of the ram stroke. (Refer to page 64.)
7. If the cutting tool has run beyond the forward end of the work more than one-fourth of an inch (the desired clearance at this end), the rear trip dog has been improperly placed. To correct this condition, move the rear trip dog forward (to the left) a distance equivalent to the distance which the tool has overrun the job in excess of the usual quarter-inch allowance.
8. If the cutting tool, on the other hand, falls short of clearing the front end of the job by the desired distance, move the rear trip dog back (to the right) a distance equivalent to this deficiency. (Refer to Fig. 82.)
9. Make further adjustments of the rear trip dog if the first trial does not produce the result desired.
10. Start the shaper again and allow the ram to run to its rear position; then stop the shaper.
11. Observe the position of the cutting tool with relation to this end of the work. If the tool passes beyond the work more than three-fourths of an inch, move the front trip dog back a distance equivalent to the excess in length of the stroke. Conversely, if the cutting tool does not travel back sufficiently to clear the work by the required distance, move the front trip dog forward a distance equivalent to the deficiency in stroke length. (Refer to Figs. 81 and 82.)

HOW TO ADJUST THE SPEED OF THE RAM ON A HYDRAULIC SHAPER



1. Read the description of the flow-control and over-load-relief valve on page 42 and that of the start-and-stop valve on the same page.
2. Determine the cutting speed in feet per minute recommended for machining the kind of material in the job with the particular cutting material in the tool. (Refer to the Chart of Allowable Cutting Speeds - Feet Per Minute on page 308.)

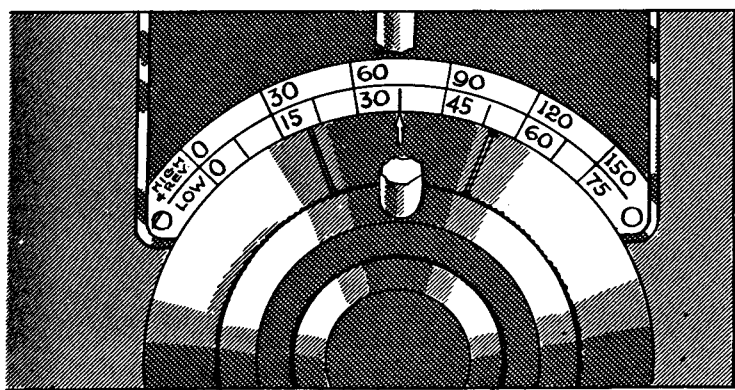
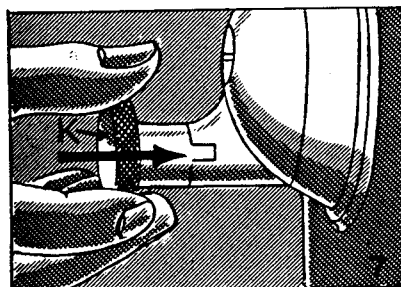
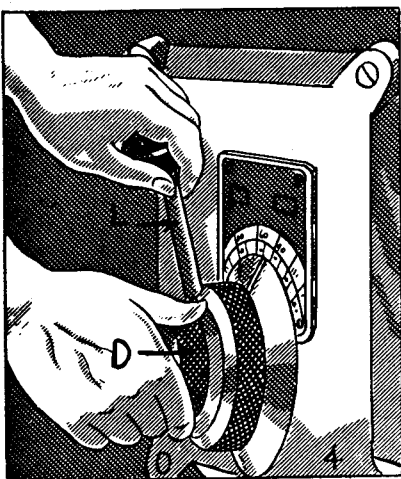


FIG. 83



3. Select from the speed-index plate on the shaper, the number which most nearly approximates that of the cutting speed in feet per minute as determined by consulting the Chart of Allowable Cutting Speeds (Fig. 83).
4. Loosen the knurled locking disc when it is necessary to change the cutting speed of the tool.
5. Move lever L in the direction necessary to place the adjacent index line under the desired cutting speed in feet per minute on the index plate. (Refer to Fig. 83.)
6. Lock lever L in position by tightening the knurled locking disc D.
7. For the series of slower speeds, and for heavy cuts, push in knob K on the starting lever. Then, when the entire setup has been completed and the shaper is ready to be set in motion, move the starting lever to its "Low" position.

NOTE: When the starting lever occupies this position ("Low"), any of the cutting speeds in the lower arc on the speed dial become available. It is necessary only to move the index line adjacent to lever L to any position desired in order to secure an infinite number of speed changes on this type of shaper. Obviously, the speeds in the upper arc are available when the starting lever is in its "High" position.

8. Pull out knob K on the starting lever and then

turn it through 180° when one of the speeds in the faster series has been selected, and when light cuts are to be made. Then move the starting lever to its "High" position, but only when the job setting has been completed and the machine adjustments have been made.

NOTE: The cutting speed of the tool in the hydraulic shaper, when once adjusted on its speed-index plate, remains constant even though the length of the stroke may be made shorter or longer. This is in contrast with the crank shaper in which the cutting speed changes whenever the stroke-length changes. This latter design, therefore, requires that the number of strokes per minute, and their length as well, be known in order that the cutting speed may be calculated. (Refer to page 301.)

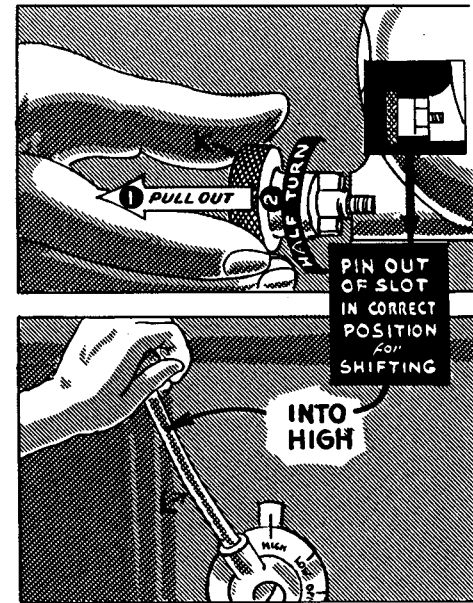


FIG. 84

HOW TO ADJUST THE CROSS FEED ON A HYDRAULIC SHAPER

1. Determine the amount of feed to be used. Base the estimate on the factors which affect the amount of feed which can be used, as indicated in the section beginning on page 304.
2. Move selector lever **B** toward the operator, bringing the word "Cross" on its hub to the index line.
3. Move the directional-reverse lever **A** in the direction in which the work is to feed: toward the operator for movement of the work in this direction but toward the column for feeding in the opposite direction. (Refer to Fig. 85.)
4. Close off the feed entirely by turning the handwheel **C**, shown in Fig. 86, to the right (clockwise).
5. Start the shaper with lever **L** (Fig. 84) after making

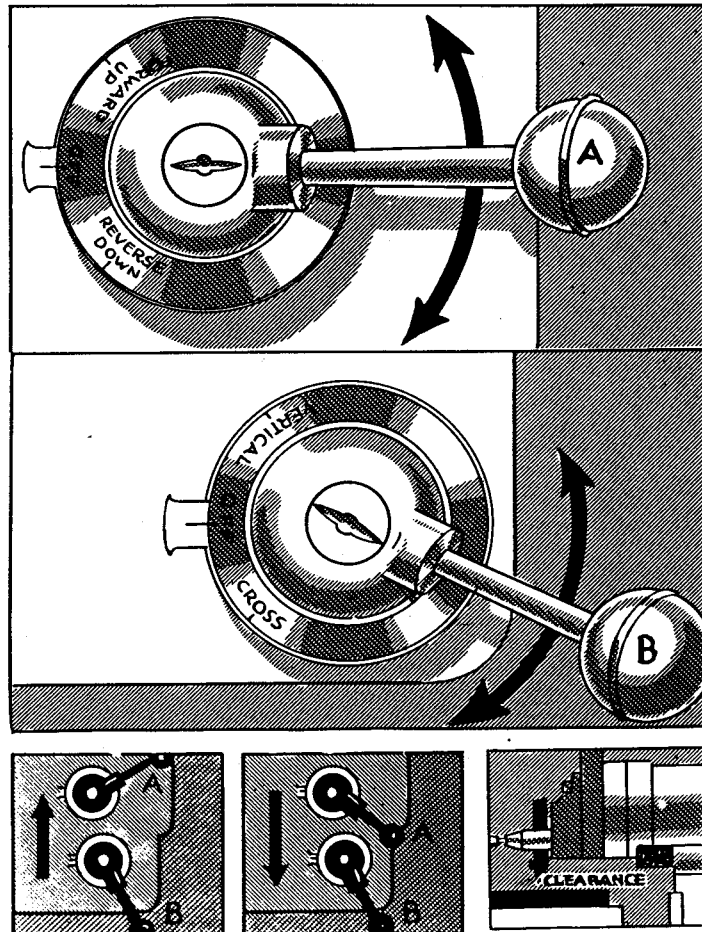


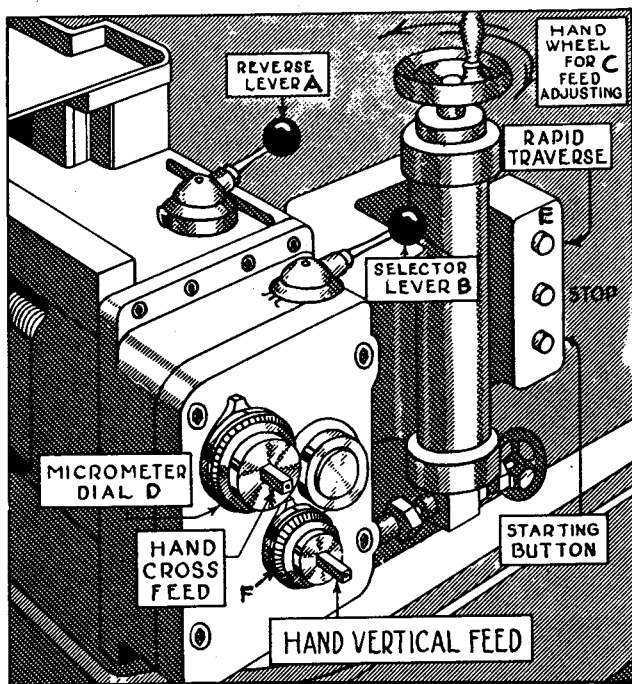
FIG. 85

certain that both the tool and the ram will clear all parts of the job.

6. Open the feed by slowly turning handwheel C to the left (counterclockwise) continuing the rotation of the handwheel until the graduated dial D on the cross-feed screw moves the desired number of thousandths for each cutting stroke.
7. Disengage the feed by moving reverse lever A in one direction or the other and aligning the word "Off" on its hub with the index line (Fig. 85).

HOW TO ADJUST THE VERTICAL FEED ON THE HYDRAULIC SHAPER

1. Determine the rate of feed which is to be used, giving consideration to the influential factors mentioned in the section beginning on page 304.
2. Move selector lever B toward the column of the shaper, thus



3. Move the directional-reverse lever A in one direction or the other so that either the word "Up" or the word "Down" appears opposite the index line, depending upon which vertical movement is desired (Fig. 87).
4. Repeat step No. 4 on page 95.
5. Repeat step No. 5 on page 95.
6. Open the feed by slowly turning the handwheel C to the left (counterclockwise) continuing the rotation of the handwheel until the graduated dial F on the elevating shaft moves the desired number of thousandths per stroke.
7. Repeat step No. 7 above.

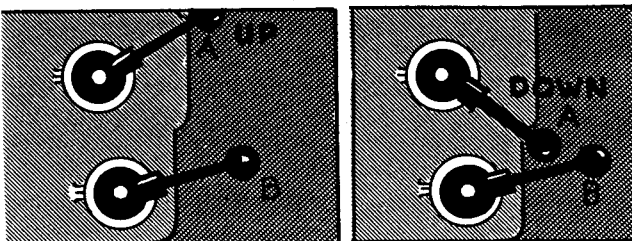


FIG. 86 FIG. 87

NOTE: The rapid power traverse unit which functions in connection with the feed mechanism has been described on page 46; its operation has been explained in How to Operate Rapid Power Traverse on the Hydraulic Shaper on page 62.