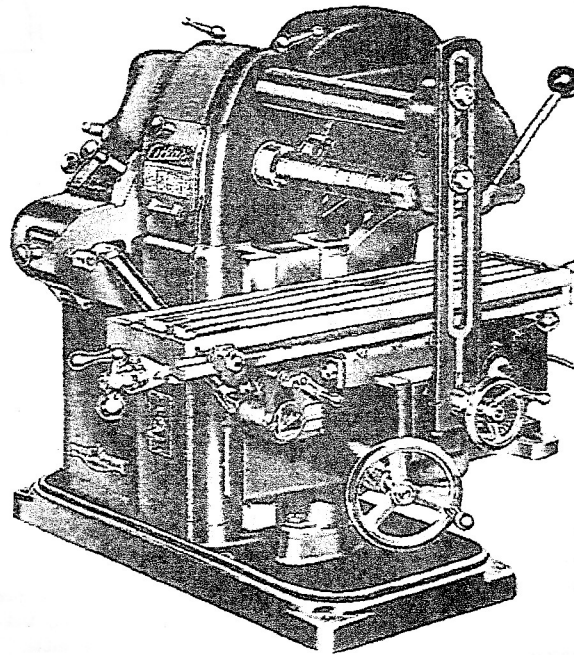


Atlas

INSTRUCTIONS AND PARTS LIST FOR ATLAS MILLING MACHINE

CATALOG NOS. MFC, MIC and MHC



ATLAS PRESS COMPANY - KALAMAZOO 13D - MICHIGAN - U.S.A.

OPERATING INSTRUCTIONS

MILLING MACHINE INSTRUCTIONS

All the equipment furnished with the Milling Machine is packed in the carton in the miller crate. Be sure everything has been removed before the carton is destroyed.

Use kerosene to remove the rust preventive coating from the machined surfaces.

Before using the Milling Machine, lubricate thoroughly according to instructions in Lubrication Chart, page 6.

MOUNTING MOTOR

The Atlas Milling Machine requires a $\frac{1}{2}$ HP, 1725 RPM motor, preferably a capacitor or repulsion-induction type. (For a $\frac{1}{2}$ -inch diameter motor shaft, motor pulley No. 9-428 is required.)

Make all wiring connections before fastening motor to motor base. Motor must rotate counterclockwise when viewed from the end of the motor opposite the shaft — Figure 1 shows the correct hook-up for either 110V or 220V current.

Slide pulley on motor shaft so that small step is next to motor; tighten pulley set screw. Mount motor on motor base, place belt around small step of countershaft pulley and large step of motor pulley, aligning motor until belt is straight and adjusting motor base until belt is tight. Bolt motor in this position. **IMPORTANT:** Maintain proper belt tension — belt should be just tight enough to prevent its slipping.

Mount the Milling Machine to a sturdy level bench. Level the Miller using a machinist's spirit level. To do this, check with level on each end of Miller table at right angles to table travel; and also in center of table parallel to table travel. By placing thin metal shims or washers around mounting bolts beneath miller base, adjust until level.

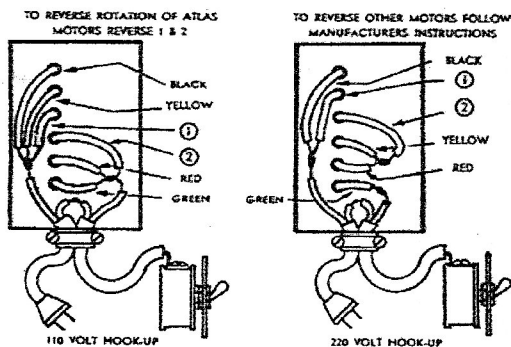


Fig. 1 Wiring hook-up for Atlas motors.

readings show that miller table is level. Slight variations may be corrected when tightening mounting bolts. Bolt miller securely in position, tightening each bolt a little at a time, rechecking level reading every few turns.

OPERATIONS AND CONTROLS

POWER FEED MODEL—see Figure 2.

A. ARBOR SUPPORT ARM LOCKS — The arbor support arm is adjusted and held in position by means of coordinate locks actuated by handle A.

B. REVERSE TUMBLER LEVER — controls the direction of table travel. Has three index positions — forward, neutral, and reverse.

C. CHANGE-O-MATIC INDEX KNOB — indexes the change gears in four different positions. Pull out knob and rotate change gears by means of large knob, located below index knob, until index knob drops into position.

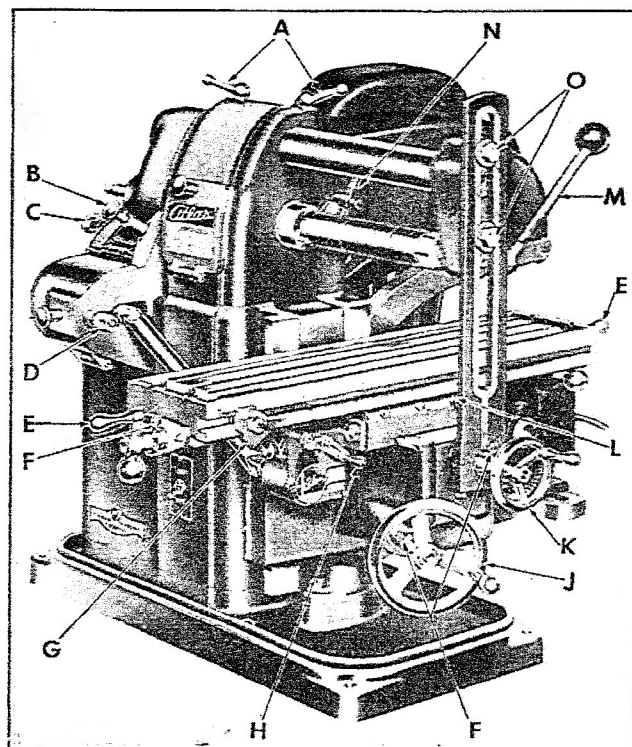


Fig. 2 Atlas Power Feed Model Milling Machine.

CHANGE-O-MATIC KNOB (See Fig. 7) — rotates change gears so that anyone of the following four feeds are obtained; .003", .006", .0125" and .025". For further information regarding feeds, see **READING THE CHANGE-O-MATIC DIAL**, page 3. Always pull out index knob before changing feeds.

D. UNIVERSAL DRIVE GEAR LOCK NUT — The four table feeds per revolution of spindle are considered enough for most purposes. Other feeds are obtained by using different gears on the universal drive shaft in place of the standard 64-tooth gears. Loosen the lock nut D to make the necessary gear mesh adjustment.

E. TABLE FEED HANDLES — used to move table by hand. Always loosen gib lock L before moving table.

F. MICROMETER DIAL LOCK SCREWS — used to lock the micrometer dials at the zero reading. Each division on the dial represents one thousandth of an inch travel. Always remove back lash before setting collar.

G. KICK-OUT — automatically disengages the table travel when in power feed by tripping kick-out lever H. Kick-out may be set at any position along the table.

H. KICK-OUT LEVER — engages power to the table. Power is transmitted to the table by lowering the lever. Lever may be disengaged at any time. **CAUTION:** Be sure to disengage lever before table reaches its limit of travel. Serious damage may result if table is jammed against the cross slide.

J. TABLE LIFT HANDWHEEL — controls the table elevation. Always release gib lock located on right side of knee, and the two lock screws O before positioning table.

K. TABLE TRANSVERSE HANDWHEEL — controls the forward and backward movement of the table. Always release gib lock located on right side of cross slide and the two locks A before positioning table.

L. TABLE GIB LOCKS — be sure to tighten locks on feed not in motion (longitudinal, cross or vertical).

CAUTION: The table gib lock located on front of saddle, Power Feed Model (MFC), should always point downward to prevent it striking the kick-out.

M. BELT TENSION LEVER — shift lever to the right to tension belt for operation. For belt adjustment, see ADJUSTMENTS, part 2.

N. BACK GEAR LEVER — engages back gears with spindle gears. After back gears are engaged be sure to pull out sliding pin which locks the large spindle gear to the spindle pulley. Use the special wrench furnished.

When back gears are disengaged be sure sliding pin is replaced in the large spindle gear.

O. ARBOR SUPPORT LOCKS — be sure screws are tightened securely when using the cutting arbor for milling operations. Always loosen screws when positioning table.

HAND FEED MODEL—See Figure 3.

See POWER FEED MODEL for controls not listed below.

P. TABLE STOP — can be set anywhere along the length of the table to stop table at any desired point. Set screw provides vernier adjustment.

LEVER FEED MODEL—See Figure 4.

See POWER FEED MODEL for controls not listed below.

P. TABLE STOP — can be set anywhere along the length of the table to stop table at any desired point. Set screw provides vernier adjustment.

R. TABLE FEED LEVER — used to move table for milling operations. The crank handle furnished moves table its full length of travel.

S. TABLE LIFT LEVER — controls the table elevation. The crank handle is also used to raise or lower table. Always release gib lock, located on right side of knee, and the two lock screws O before positioning table.

T. TABLE STOP COLLARS — regulates table travel. Adjust collars to length of travel desired and lock collars in place.

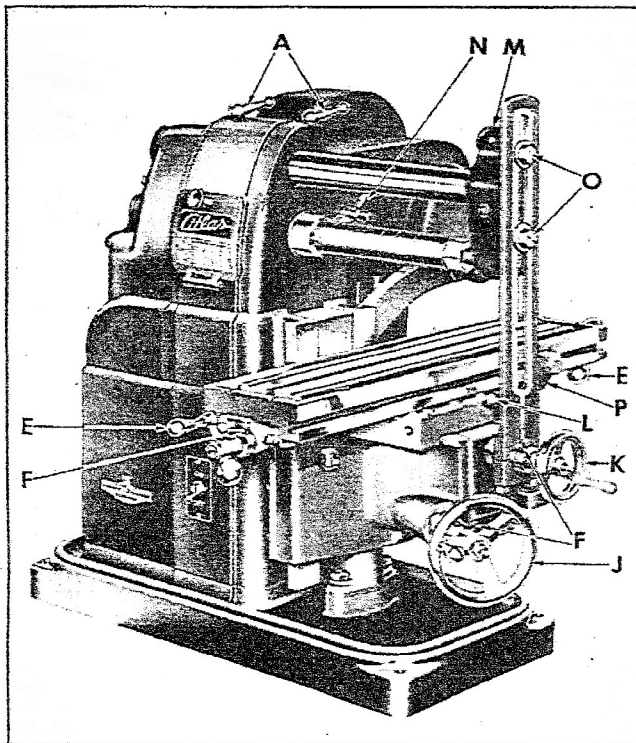


Fig. 3 Atlas Hand Feed Model Milling Machine.

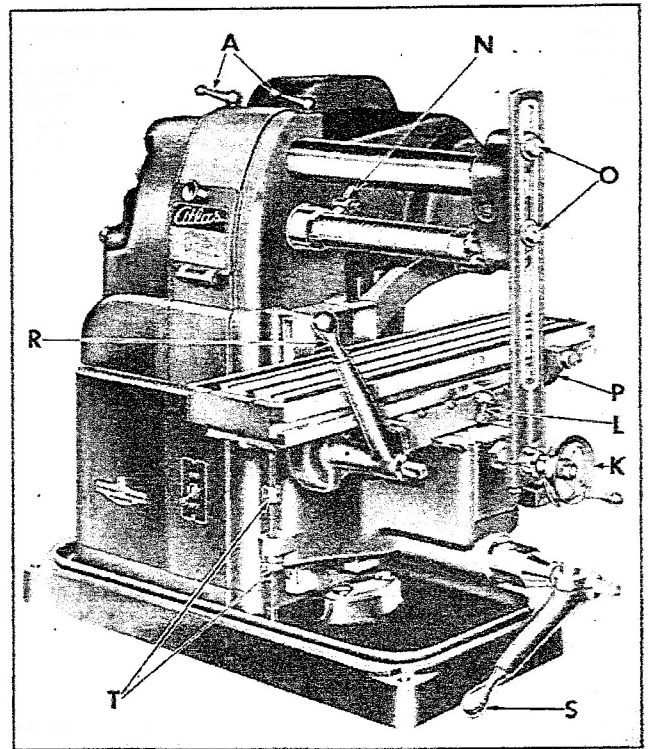


Fig. 4 Atlas Lever Feed Model Milling Machine.

ADJUSTMENTS

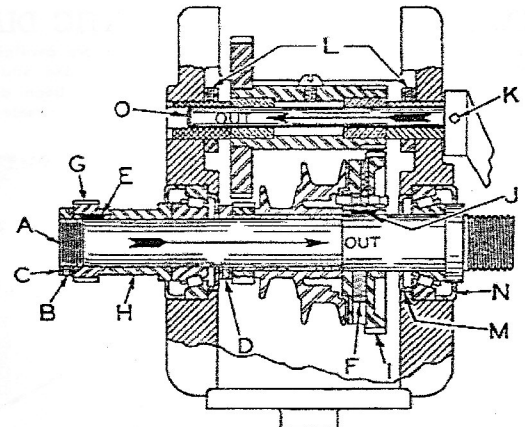


Fig. 5 Cross Section of Miller Head.

The following applies to all models:

1. SPINDLE ADJUSTMENT—Adjustment of the Timken Bearing is not often necessary, but if the spindle spins too freely or play is noticeable when the spindle is pushed back and forth, the following simple procedure will adjust the bearings:

Run the miller between thirty minutes and an hour to warm up the spindle (a temperature rise of 50 degrees Fahr. increases the length of the spindle about .002 inch between bearings). Then loosen the set screw (B) on the thrust nut (C), at the extreme left end of the spindle (A), see Figure 5, and turn it up to a point where no play can be detected in the spindle. Advance this thrust nut $\frac{3}{4}$ turn (equal to one tooth of the spindle gear) past that point in order to provide the correct preload. Tighten the set screw. It is necessary to remove change gear guard on rear of miller to get at the adjusting collar. This is easily accomplished after loosening the hex screws.

2. BELT TENSION:

(a) Spindle belt — Two headless set screws located on the countershaft hanger serve to take-up belt slack. When adjusting these screws, put belt tension lever in tension position and relock screws after adjustment is made.

(b) Motor belt — Tension on this belt is decreased or increased by moving the motor base up or down. This is accomplished by turning the two hex nuts located on the stud which goes through the upright

on the motor base. After adjustment is made, lock nuts in place.

Caution: Do not have belt too tight, just enough tension to prevent its slipping.

3. **TABLE AND CROSS SLIDE**—It is very important that the gibs on the table and cross slide always fit snugly and that all play is absent. Gib adjusting screws are provided for making any necessary adjustment. The gib screws should always be locked in place with the hex nuts after adjustment is made. The table and cross slide should move with a slight "drag" effect. If any play is present, chattering cuts and rough finishes will result.

4. **KNEE**—The knee gib should also fit snugly at all times, but not so tightly that the knee cannot be moved without difficulty. Always lock set screws in place after adjustment is made.

No play should ever be present in the knee slides. Shims between the knee and knee anchor plates afford necessary take-up adjustment. The shims are .010" thick and made up of (4) .002" and (2) .001" leaves held together with a light film of solder and can easily be separated with a knife blade. See Fig. 6. The .001" side is colored gray.

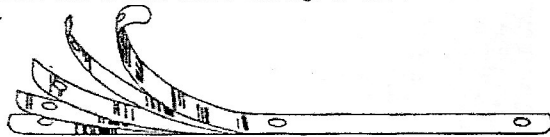


Fig. 6

SPINDLE SPEED-CHART

A speed-chart located on the side cover plate on the head of the miller shows all the speeds available and the belt set-ups to obtain them.

TABLE FEED PER REV. OF CUTTER

Table feed is the distance the table travels per one revolution of the cutter.

The table feed depends mainly upon the number of teeth on the cutter and for this reason the feed will vary for each cutter.

In general, the table feed should be less for the same material when a cutter with a few number of teeth is used than one with many teeth. The hardness and type of material also are determining factors to be considered.

READING THE CHANGE-O-MATIC DIAL

Four different table feeds per revolution of cutter are available on the Change-O-Matic. These feeds are shown in each case under the title "Feed Per Rev." After the proper table feed has been decided upon, set the Change-O-Matic so that the nearest approximate table Feed per Rev. appears through the dial window.

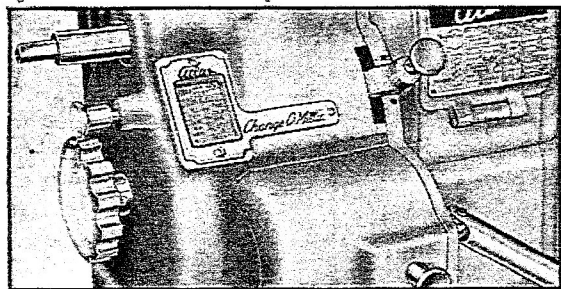


Fig. 7

Below the "Feed Per Rev." are two columns, one showing the R.P.M. and the other the Feed in inches per minute. After the proper cutter speed has been obtained in R.P.M., as explained under "Cutter Speed," refer to the R.P.M. column and choose the nearest approximate R.P.M. shown. The adjacent number in the "Feed" column will show the distance the table will travel in inches per minute at that particular spindle speed. By dividing this figure into the length of the portion to be milled, the time required for milling can easily be determined.

There is a total of 20 different table feeds per minute on the Change-O-Matic dial. Do not confuse "Table Feed Per Rev. of Cutter" with "Table Feed Per Minute."

CUTTER SPEED

The cutter speed is the amount of material removed linearly by the cutter per minute and is usually expressed in feet per minute; that is, the circumferential speed per minute of the outside of the cutter. The cutter speed is determined by the size (dia.) of the cutter, and of course, other factors, such as: hardness of the material to be milled, type of operation, etc.

The following simple rule will prove practical in most cases for arriving at the proper cutter speed in R.P.M.

(a) Take the circumference of the cutter to be used, expressed in inches (Cir. = 3.1416 X dia.) and divide it by 12. Then, divide the quotient into the recommended cutting speed in feet per minute for the particular material to be milled (see chart below). This will give the cutter speed in revolutions per minute.

$$\text{Cutter Speed in RPM} = \frac{\text{Cutter Speed (in FPM)}}{\text{Dia.} \times .262}$$

In general, the above rule will prove satisfactory but the following things should also be kept in consideration when determining cutter speed.

(a) In T-slot milling operations, the table feed per minute should be reduced considerably (about 1/2) due to the great amount of friction present in this type of milling operation. If the feed is not reduced, the cutter will become excessively hot, and be ruined.

(b) The harder the material, the slower should be the feed per min.

CUTTING SPEEDS FOR VARIOUS MATERIALS

MATERIAL	HIGH-SPEED STEEL FEET PER MINUTE
Cast Iron, 160B*	70-80
Malleable Iron	75-95
1020 S.A.E. Steel	75-95
1050 S.A.E. Steel	70-80
3145 S.A.E. Steel	60-70
Tool Steel, annealed	50-55
Steel Castings	65-75
Yellow Brass	200-500
Bronze, 40R †	200-350
Bronze, 75R †	75-95
Aluminum	800-2500

* Approx. Brinell hardness number
† R = Rockwell B scale

SELECTION OF CUTTER

The type and size of cutter to use depends entirely upon the shape of the piece to be milled. Some operations would require slab milling (Fig. 8); others, end milling, such as cutting a slot (Fig. 25); or dovetailing (Fig. 11 and 12), in which case a dovetail cutter is used. One very important thing should be kept in mind: When selecting a cutter the size should be the smallest permissible to perform the operation. The larger the cutter the more power it takes to drive it.

MILLING OPERATIONS

1. **PLAIN MILLING OR COMMON SLAB OR SURFACE MILLING**: For this type of milling operation a plain milling cutter is used. A plain milling cutter is one which machines surfaces parallel to its own axis of rotation. The cutting teeth are only on the periphery of the cutter. The cutting teeth on some plain milling cutters are parallel to the axis of the cutter; others have helical edges which have an advantage over the parallel edge type because the full cutting edge of the tooth does not contact the work at the same time but rather the cut commences at one corner and gradually proceeds across the work in a shearing-like action, thereby resulting in much smoother cutting action. (See Fig. 8.)

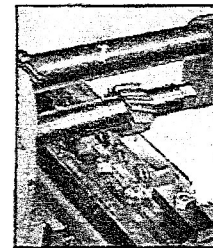


Fig. 8 — SLABBING

Another type of cutter which falls under the plain milling cutter classification is the metal slitting saw.

This cutter is used for the following operations: slitting and slotting, cutting small keyways (Fig. 10), and cut-off operations.

2. **SIDE MILLING**: In side milling, the sides of the cutter cut as well as the face. Therefore, the cutter is similar in design to the plain milling cutter except for the additional teeth on the side. This cutter is used for such operations as slotting, grooving, cutting keyways, etc. (See Fig. 21.)

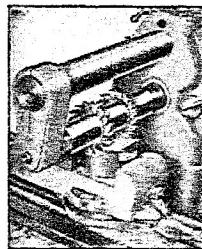


Fig. 9 — STRADDLE

Side milling cutters placed on an arbor with a spacer to regulate the distance between them permits two sides of the work to be operated on at the same time and is known as "straddle milling." (See Fig. 9.)

If a combination of side and plain milling cutters are used on the arbor at the same time, this is called "gang milling."

3. **T-SLOTTING**: In this case a T-slot cutter is used. The straight slot is milled first with a side mill cutter and then the T-slot cutter is used to complete the job. Do not confuse a T-slot cutter with a keyway cutter. The two differ in this respect that the

T-slot cutter has cutting teeth on the sides as well as the face while the keyway cutter has teeth only on the face.

4. **CUTTING KEYWAYS:**—Woodruff keyways are cut with a keyway cutter. The cutter is brought down into the work to the desired depth. The depth of the cut, of course, depends upon the size of the keyway. Bring the work, after it has been mounted properly, so it just touches the cutter. Tighten the gib locks on the table and cross slide. Set the micrometer dial on the knee lift shaft to the zero reading. By watching this dial as the work is advanced the correct depth of cut can be determined.

To cut a keyway along the entire length of a shaft, a side mill is used. If the keyway is not very deep, a slitting saw may be used.

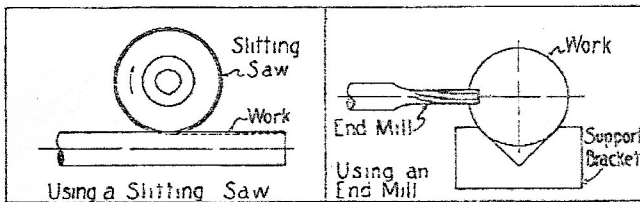


Fig. 10

Since a slitting saw has no cutting edges on the sides much friction is set up between the sides of the cutter and the work. Therefore, caution should be exercised to prevent the cutter from "burning up". (See fig. 10.)

Another way to cut keyways is by using an end mill. (See fig. 10.) An end mill cutter has cutting edges on the end as well as on the face. In many cases an end mill cutter has to be used because it is not permissible to use a slitting saw due to the shape of the work. For example, a shaft with two different diameters but only the smaller one is to be keywayed. The cutter would cut partly into the larger diameter portion of the work as it approached the end of the cut.

5. **DOVETAIL CUTTING:**—For dovetailing it is necessary to use an angular cutter. (See fig. 11.) There are single and double angular cutters. The single angle type, like the one used for dovetailing, has one cutting face inclined at an angle to the axis of rotation of the cutter. A double angled one has two surfaces at an angle to the axis of rotation and are usually used for fluting taps, reamers, and similar work where it is important that two surfaces operated on at the same time are finished equally well.

When cutting the male dovetail, (see fig. 12), it is advisable to first mill the top surface of the work and then mill the sides with a side mill to the proper width. Finish the job with the dovetail cutter. First cut the one side. Then, without moving the work forward or backward, raise or lower the work, depending upon which side was



Fig. 11—DOVETAILING

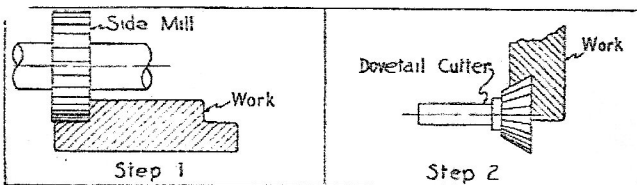


Fig. 12

milled first and without changing the rotation of the cutter, mill the other side by feeding the work against the cutter in the opposite direction.

The two sides of the female dovetail are also cut in the same way; that is, leave the cutter rotation the same and feed from opposite directions. (See fig. 11.)

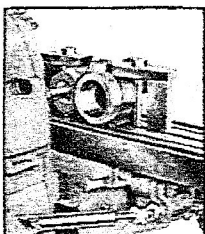


Fig. 13—BORING

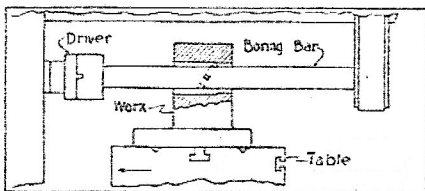


Fig. 14

6. **BORING:**—For boring, a special arbor with an inserted cutting bit is used. (See fig. 14.) If the work can be bored close to the head of the miller, the use of a short shank arbor is permissible (see fig. 13); otherwise the arbor should be of such a length so that the arbor support bracket can be used to support the other end.



Fig. 15
DRILLING - LAYOUT

7. **DRILLING - LAYOUT:**—By using a chuck mounted on the miller spindle and a center drill, work can be accurately prepared for drilling. (See fig. 15.)

8. **GEAR CUTTING:**—For gear cutting operations (see fig. 16), formed gear cutters are used. The shape of the cutter teeth, of course, depend upon the pitch of the teeth which are going to be cut. The index centers attachment is recommended for this milling operation. See catalog.

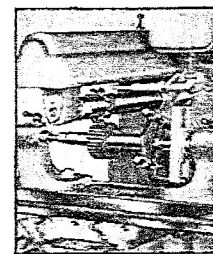


Fig. 16
GEAR CUTTING

HOLDING THE WORK

In many cases the work can be clamped directly to the milling machine table. Since pieces to be milled are of such various sizes and shapes, no definite instructions can be given as to mounting and much depends upon the ingenuity of the operator along this line. Just a few suggestions are given here which may be of some help.

The V grooves in the table facilitate the easy clamping of round stock to the table. The grooves are parallel to the line of the longitudinal table travel. Fig. 17 shows a set-up for milling a keyway into a shaft with an end mill. The shaft is clamped down by means of clamp bars resting on the work and spacer blocks under the other end and fastened to the table by means of tee-bolts.

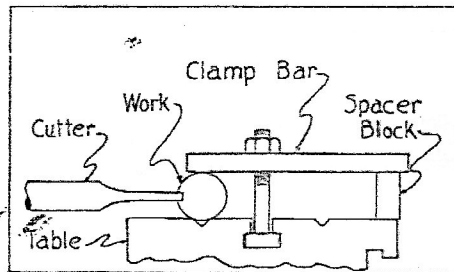


Fig. 17

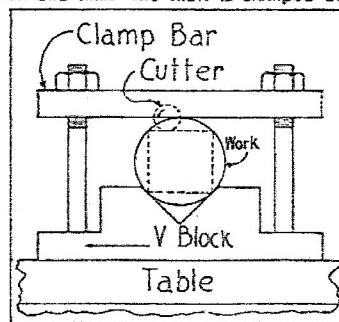


Fig. 18

Square stock may also be clamped in the V slots. Another type of mounting for round stock is shown in Fig. 18. In this case a square is to be milled with an end mill on the end of the shaft. An auxiliary vee block is used and set at right angles to the table travel. Note that the tee bolts go through the vee block and placed equidistant from work so that each bolt takes an equal share of the pull. The vee block also acts as a pressure block against the table above the tee bolts which is a very important point to remember. Without disturbing the work, all four sides of the square are milled at one setting—first the bottom, side, top and finally the other side.

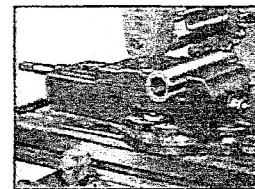


Fig. 19

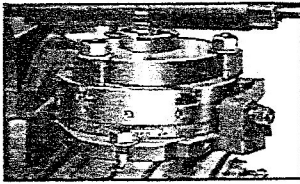


Fig. 20

A swivel vise, see figs. 9 and 19 will be found to be an indispensable attachment to hold work for most milling operations.

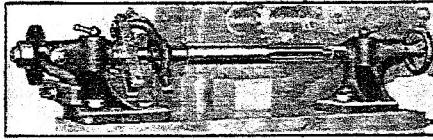


Fig. 21

The following attachments are also available: Index Centers, used for splining, fluting, gear cutting and squaring shafts (see figs. 16 and 21); Rotary Index Table, for angular indexing and spacing (see fig. 20); and Angle Plate, which holds work which cannot be gripped in the vise or bolted to the table (see fig. 24.)

When gripping work in a vise which is less in thickness than the depth of the vise jaws, place spacers underneath work to obtain sufficient clearance above jaws.

If any production work is to be done, it is advisable to make a special fixture or jig to hold the work.

MOUNTING THE CUTTERS

Slab mills, side mills and metal slitting saws are mounted on an arbor which is supported on both ends—one end in the spindle and the other in the arbor support bracket. The cutter is driven by mere

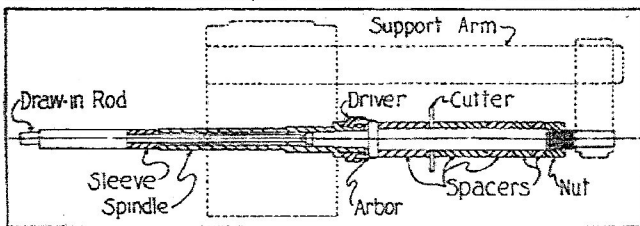


Fig. 22

frictional force of the spacers which are tightened up against it. See fig. 22. A key should be used on the larger cutters. The arbor driver is screwed on the spindle nose and the two prongs drive the cutter arbor. The cutter arbor has a tapered shank which fits into the spindle taper. Be sure these tapers are scrupulously clean before mounting cutter arbor. The arbor is locked into the spindle by means of a draw bar. After arbor is locked into position, place the arbor support bracket over the other end of the cutter arbor. Turn the spindle by hand so that the arbor bracket will adjust itself and clamp securely in place on the arbor support arm after arm is also locked into place.

To remove the cutter arbor, loosen and remove the arbor bracket and draw-in rod. With a BRASS rod, bump the arbor out of the spindle.

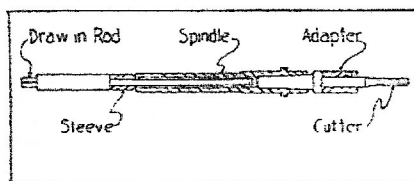


Fig. 23

between cutters is obtained. In some instances it might be advisable to turn out a spacer on a lathe to the correct size.

Dovetail cutters, end mills and keyway cutters are mounted in a shank cutter adapter. See fig. 23.

The arbor support unit is not used in this case.

End mills use bushings on cutters with shanks less than 1/2" diameter.

To remove the shank cutter adapter, loosen and remove the draw-in bar and with a BRASS rod, bump the adapter out of the spindle.

The spiral end mill is adapted to the spindle by a shell end mill driver. This driver has two driving pins which fit into recesses in the cutter and a ground pilot for cutter hole with a large retainer screw. Fig. 26 shows a spiral end mill.

Fig. 28 shows a set-up for cutting flutes in a piece of tapered work. The work is held between centers which in turn are clamped in the V of the table. The difference in diameters of the centers is equal to the difference in diameters of the two ends of the tapered stock.

FORMED CUTTERS

Occasionally a specific shape is wanted. In such cases a formed cutter will have to be used and is made specially to give the desired shaped cut. Only in the case of production set-ups is it advisable to warrant the expense of a formed cutter.

DEPTH OF CUT

The depth of cut will vary, of course, according to the amount of stock to be removed. THE MAXIMUM DEPTH OF CUT SHOULD NEVER EXCEED 1/8" ON THIS MILLER EXCEPT ON SLITTING OPERATIONS. The first cut on a rough casting should be deep enough to cut below the "surface scale" otherwise the cutter will quickly become dulled, because the "scale" is much harder than the rest of the casting.

FINISHING CUTS

When taking a finishing cut, drop the Change-O-Matic to the next lower "Feed per R.P.M." setting. This has the same effect as if the R.P.M. of the cutter were speeded up.

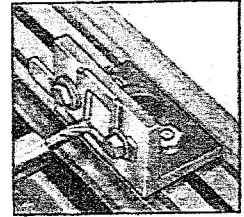


Fig. 24

CUTTING FLUIDS

Cutting fluids are used mainly for cooling purposes, that is, to carry the heat away from the cutter. Cutting fluids also have a slight lubricating quality and serve to flush away the chips from the cutter. The following materials do not require lubrication: ordinary gray cast iron, yellow brass castings and babbit. Some kind of lubricant should be used when milling wrought iron, steel, steel castings, malleable-iron castings, bronze, copper and the various copper alloys.

The best lubricant is pure lard oil. A mixture of soluble oil and water will also make a good lubricant.

An automatic coolant system or a coolant tank (gravity feed) are available for your milling machine. Refer to catalog for full information.

UP-MILLING AND DOWN-MILLING

(Also Known as Climb Milling)

In the case of up-milling, the teeth of the cutter, when they come in contact with the work, rotate against the direction in which the work is traveling. In the down milling operation (climb milling), the opposite is the case, namely, the cutters rotate in the direction the work is traveling.



UNDER NO CIRCUMSTANCES SHOULD DOWN MILLING BE USED ON THIS MACHINE. THE MACHINE IS NOT INTENDED FOR THIS KIND OF MILLING AND IF USED THE CONSEQUENCES CAN ONLY BE BLAMED TO THE OPERATOR AND NOT TO THE MACHINE.

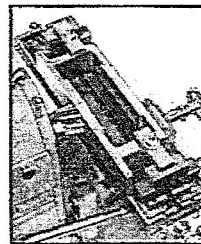


Fig. 26 - FACING



Fig. 27 - PROFILING

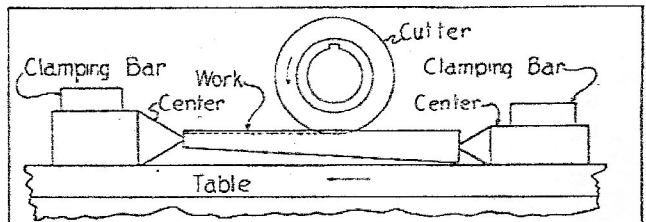


Fig. 28

INSTRUCTIONS FOR REPLACING THE SPINDLE BELT

See Fig. 29. First set the Change-O-Matic feed in the .003 position as shown at "A". This will enable the rotary change gear bracket inside gear case "C" to clear the frame of the milling machine when removing gear case.

Next remove the four cap screws marked "B". Gear case "C" can then be removed by pulling directly away from inner gear plate "D".

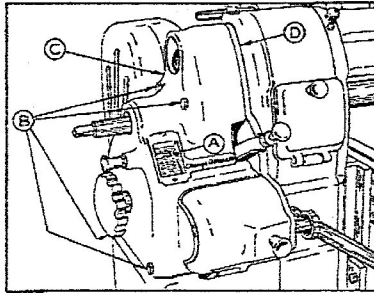


Fig. 29

See Fig. 30. Remove cap screw "E" and pull off the feed gear. With a thin end wrench unscrew stud "F." The complete tumbler gear assembly may then be removed from the machine.

Next remove four cap screws "G," inner gear plate "D" may then be pried off with the aid of a screw driver. Care should be taken not to damage or lose the two dowel pins "H." This may be accomplished by prying alternately on opposite sides of the plate.

See Fig. 5, page 2. Loosen set screw "B" and unscrew collar "C" by turning counter-clockwise. Care should be exercised not to lose the small cushion of soft material that is located under set screw "B". Gear "G" may now be removed by pulling directly away from the head.

Next pry out Woodruff key "E" and pull collar "H" off from the spindle. Loosen set screw in collar "D" and TWO set screws "F" in gear "I". With a lead hammer or a machinist's hammer and a block

of wood, carefully drive the spindle "A" in the direction shown by the arrow until Woodruff key "J" appears beyond the face of gear "I". The spindle then should be rotated until the Woodruff key enters the notch in the top of dust cover "M". After the key has entered the notch, proceed to drive out the spindle the rest of the way; dust cover "N" will be automatically removed with it. Care should be exercised not to lose the various loose parts such as the spindle pulley, spindle gear and adjustment collar when removing the spindle.

TO REMOVE BACK GEARS

Next, it is necessary to remove the back gears. Drive out pin "K" in the eccentric handle and loosen the two set screws "L". Back gear shaft "O" can be pushed out in the direction indicated by the arrow.

The old belt can now be pulled out of the machine and a new belt inserted.

TO REASSEMBLE

All parts should first be cleaned. Then put the back gear assembly together, reference to Figure 5 will assist in getting the parts in their proper places.

Next, assemble the spindle with its various parts and refer to page 2 for making the proper adjustments.

Both assemblies should then be thoroughly oiled and greased according to the lubrication chart.

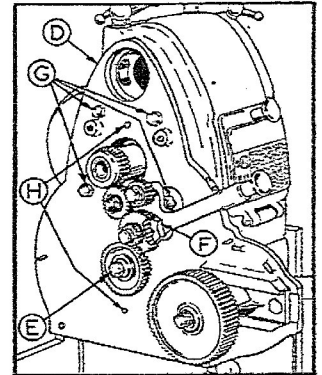


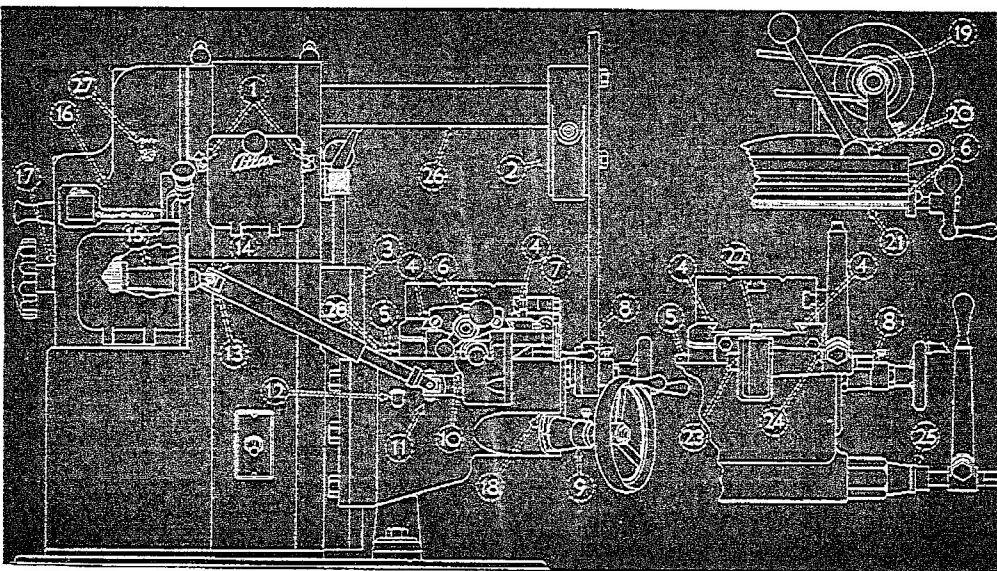
Fig. 30

LUBRICATION CHART

Following applies to all Models (except Nos. 22, 23 and 24 which applies to Hand Lever Model only). Use a good grade of S.A.E. No. 10 motor oil or equivalent throughout unless otherwise specified.

1. SPINDLE BEARINGS (left and right): Oil every time the milling machine is used.
BACK GEARS (not illustrated): Every time back gears are used, remove small screw in center of back-gear spindle and oil freely. Replace screw. Occasionally, also apply oil to back-gear eccentrics.
SPINDLE PULLEY BEARINGS (not illustrated): Oil at regular intervals. To oil, remove set screw in large step of spindle pulley.
2. ARBOR SUPPORT: Oil every time cutter arbor is used in conjunction with support.
3. VERTICAL KNEE WAYS: Clean regularly and occasionally apply a liberal quantity of oil.
4. CROSS SLIDE WAYS (for table): Clean regularly and apply a liberal quantity of oil every time machine is used.
5. CROSS SLIDE WAYS (on knee): Clean regularly and apply a liberal quantity of oil every time machine is used.
6. TABLE FEED SCREW BEARINGS: Occasionally apply a few drops of oil.
7. KICK-OUT TRIPPER SHAFT: Occasionally apply a few drops of oil.
8. CROSS FEED SCREW BEARING: Occasionally apply a few drops of oil.
9. KNEE LIFT SCREW SHAFT: Occasionally apply a few drops of oil.
10. FEED GEAR CASE BEARING: Apply a few drops of oil every time machine is used.

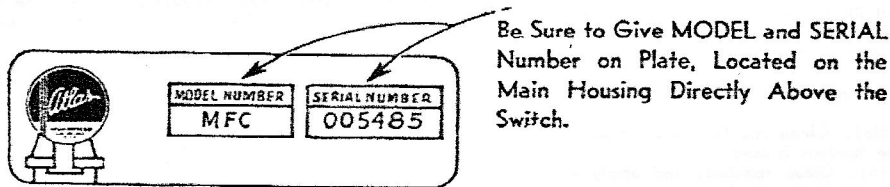
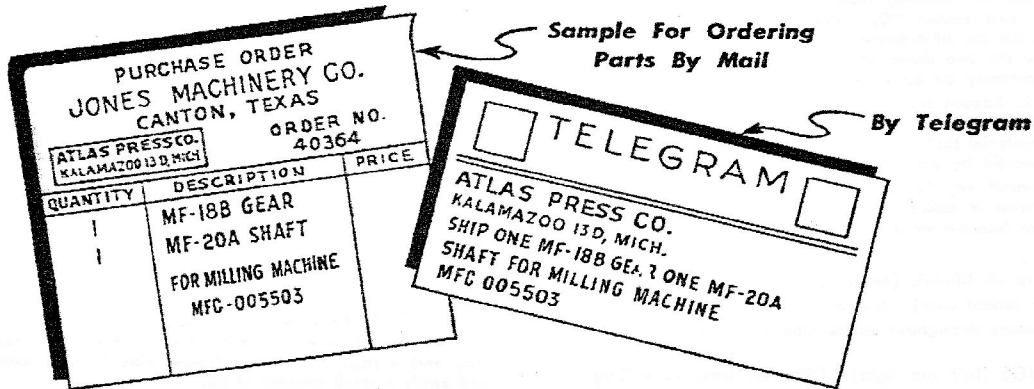
11. and 14. UNIVERSAL DRIVE JOINTS: Apply a few drops of oil every time machine is used.
12. KNEE LIFT SCREW AND GEARS: Oil every time the machine is used. About once a month clean the knee lift screw with kerosene and a small stiff brush, (raise table to its maximum height) and apply a small amount of oil.
13. UNIVERSAL DRIVE SCOPE: Frequently remove oil screw and apply a small amount of oil; then, replace screw.
14. See number 11.
15. UNIVERSAL DRIVE SHAFT BRACKET: Open side gear cover and apply a few drops of oil every time machine is used.
16. GEARS: A small amount of heavy graphite outer gear lubricant applied to gear teeth will aid in obtaining smoother, quieter operation. Be sure to remove all oil in the gear teeth before applying lubricant or it will not adhere. The best way to get at the gears is to remove gear guard (change-o-matic unit). A small amount of oil should also be applied to change gear bearings.
17. CHANGE-O-MATIC KNOB BEARING: Occasionally apply a few drops of oil. Especially to ball oiler.
18. KNEE LIFT SHAFT BEARINGS: Put a few drops of oil in the oil hole after removing the small screw. Replace screw.
19. COUNTERSHAFT BEARINGS: Oil these two bearings every time machine is used.
20. ROCKERSHAFT BEARINGS: Apply a few drops of oil occasionally to the rockershaft bearings.
21. TABLE FEED SCREW: About once a month clean the feed screw threads with kerosene and a small stiff brush and apply a small amount of oil along its entire length.
22. TABLE FEED RACK: About once a month apply a small amount of cup grease to the rack after cleaning with kerosene and a small stiff brush.
- 23 and 24. RACK GEAR SHAFT BEARINGS: Apply a few drops of oil every time machine is used.
25. KNEE LIFT SHAFT BEARING: Apply a few drops of oil every time machine is used.
26. SUPPORT ARM: Occasionally apply a little oil to the cutter support arm.
27. TUMBLER GEARS: Apply a few drops of oil every time machine is used.
28. CROSS FEED AND KNEE LIFT SCREWS: Oil at regular intervals. To oil, move table to extreme front position and with a screw driver slide screw cover forward until screws are exposed.



ORDERING INFORMATION

IMPORTANT: The following information must be furnished on all repair part orders.

1. Quantity Required
2. PART NUMBER and Name of Part
3. Model and Serial Number of Milling Machine



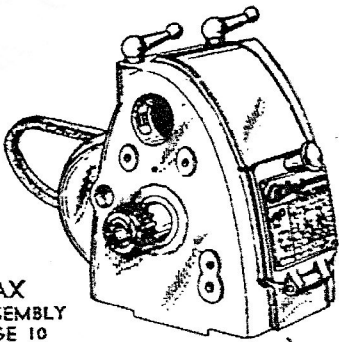
Parts shown without part numbers are standard parts and should be purchased locally. We reserve the right to make changes in design and specifications without notice.

INDEX FOR MILLING MACHINE PARTS AND PRICES

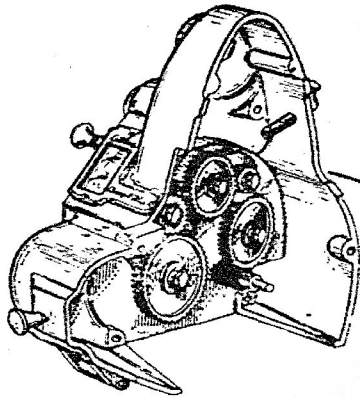
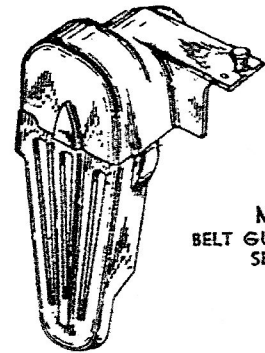
UNIT ASSEMBLIES	8
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UNIT ASSEMBLIES FOR MFC, MIC AND MHC MODEL MILLING MACHINES

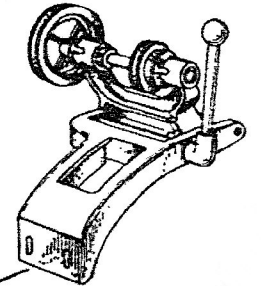
MI-2AX
HEAD ASSEMBLY
SEE PAGE 10



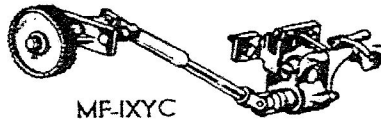
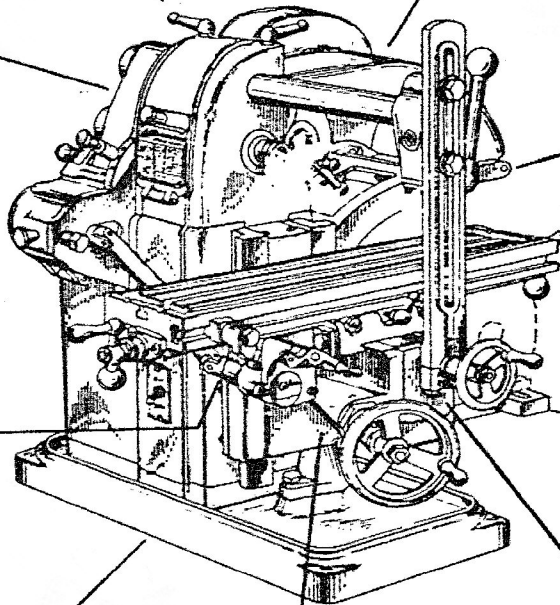
MI-400BX
BELT GUARD ASSEMBLY
SEE PAGE 9



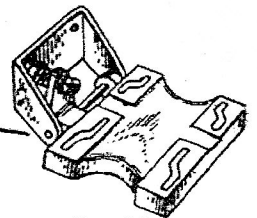
MF-28X
GEAR GUARD AND
CHANGE GEAR ASSEMBLY
SEE PAGE 11



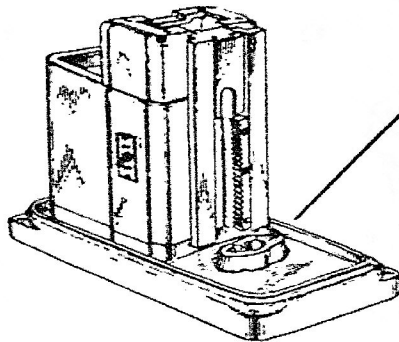
MI-21BX
COUNTERSHAFT ASSEMBLY
SEE PAGE 9



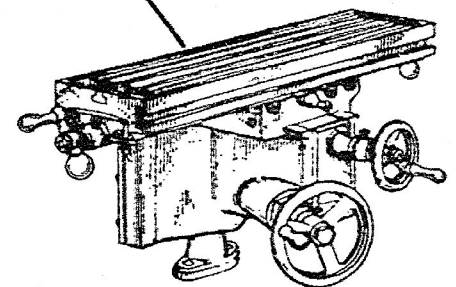
MF-IXYC
TABLE FEED ASSEMBLY
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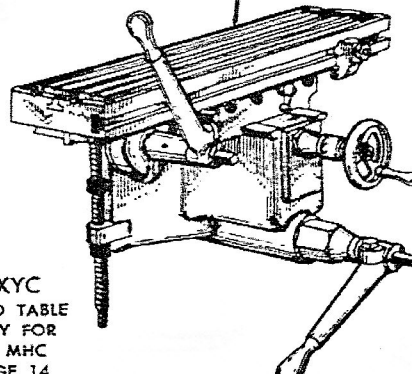
MI-108X
MOTOR BASE ASSEMBLY
SEE PAGE 9



MI-3X
BASE ASSEMBLY
SEE PAGE 9



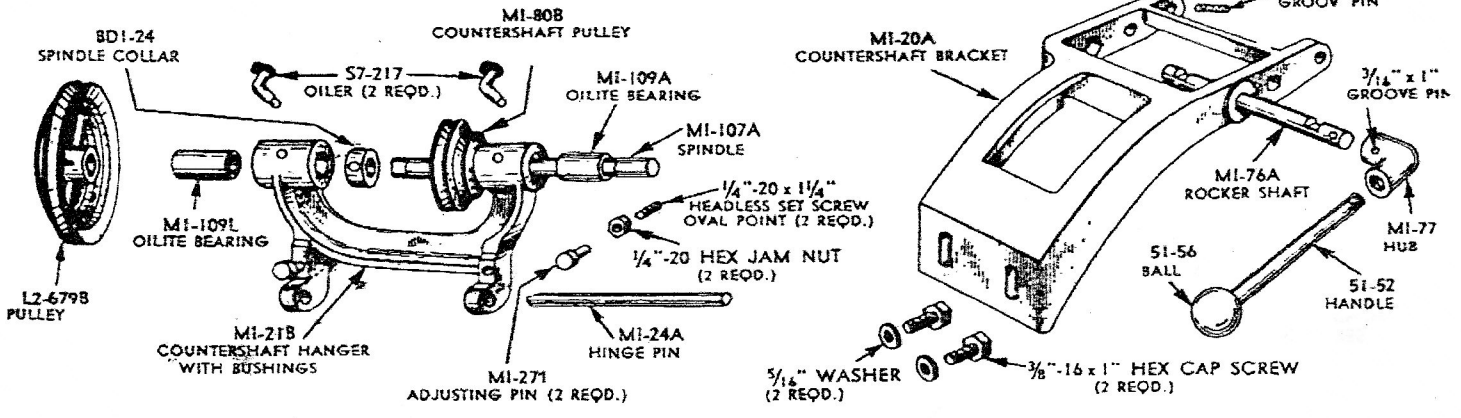
MI-6XKC
KNEE AND TABLE ASSEMBLY
FOR MODELS MFC AND MIC
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MH-6XKC
KNEE AND TABLE
ASSEMBLY FOR
MODEL MHC
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PARTS LIST

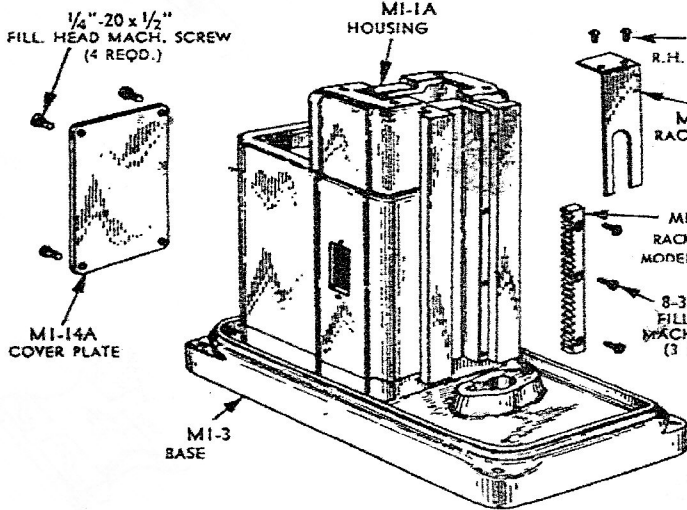
All parts on this page are used on MFC, MIC and MHC Models



MI-21BX COUNTERSHAFT HANGER ASSEMBLY

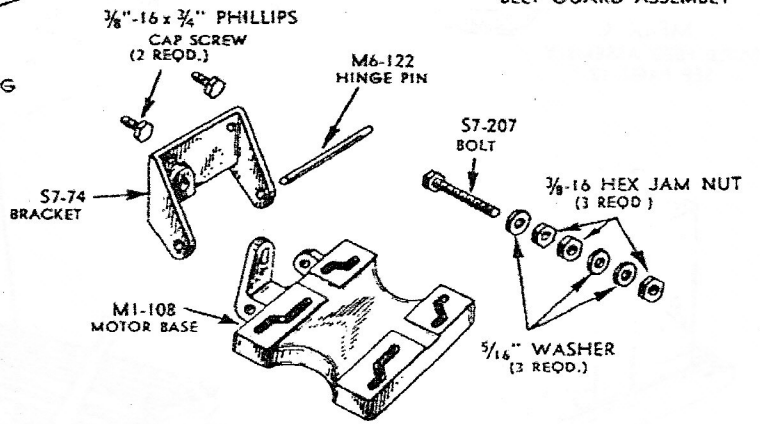
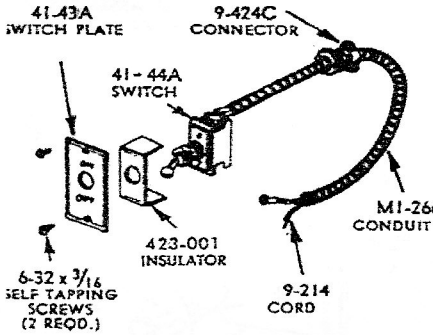
MI-21BXY COUNTERSHAFT ASSEMBLY CONSISTS OF MI-21BX AND MI-20AX ASSEMBLIES

MI-20AX COUNTERSHAFT BRACKET ASSEMBLY

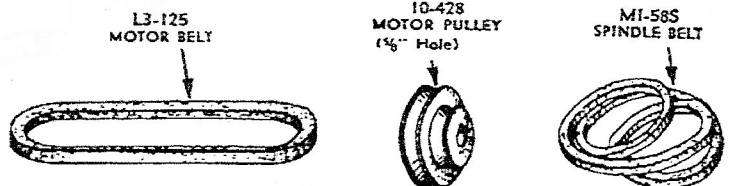
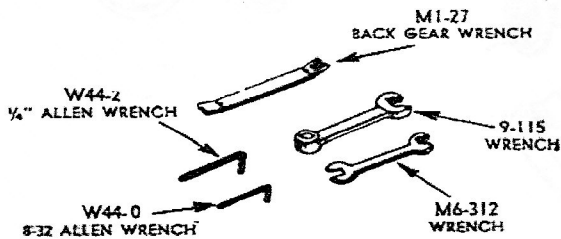


MI-3X BASE AND HOUSING ASSEMBLY

MI-400BX BELT GUARD ASSEMBLY

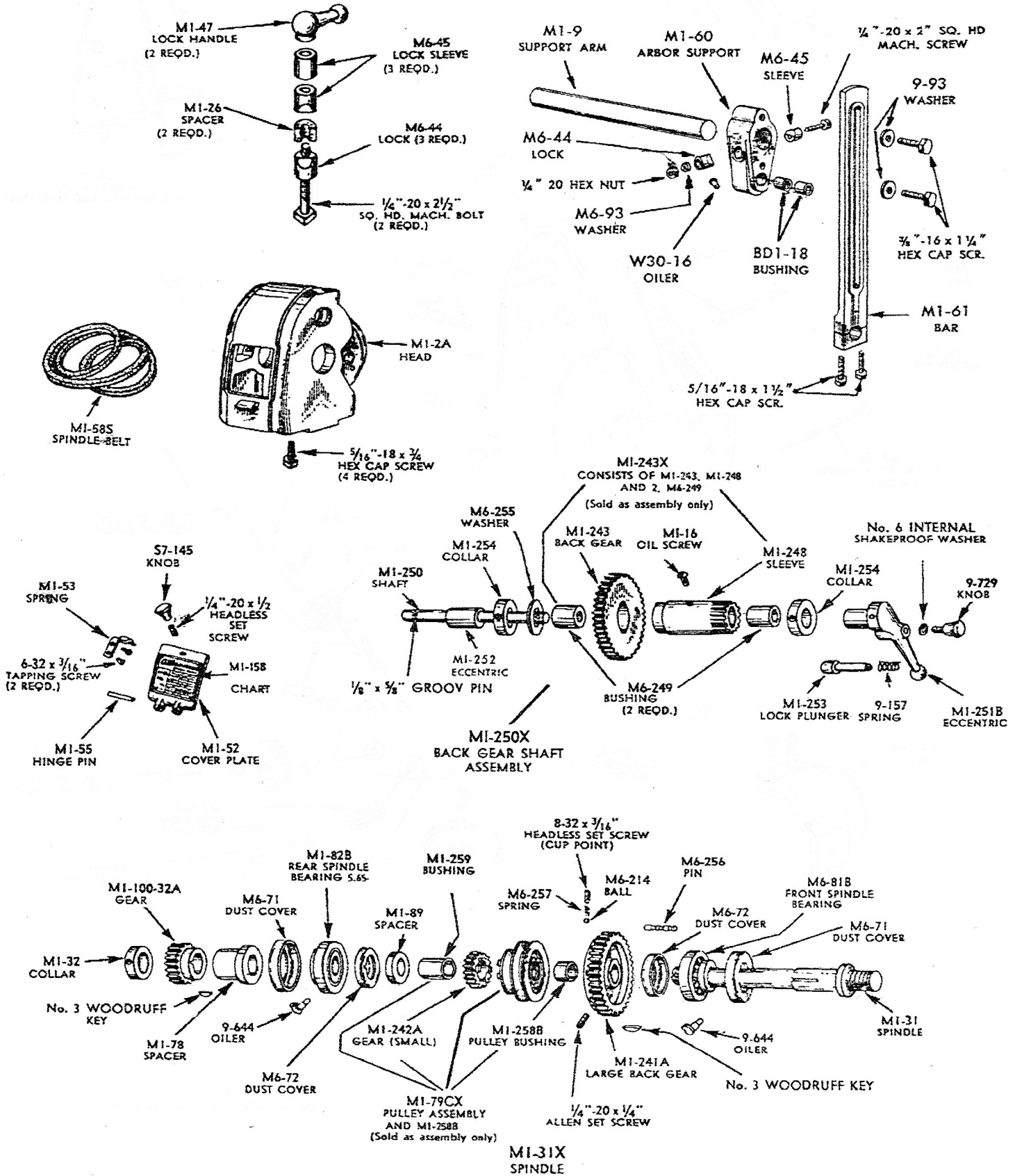


MI-108X MOTOR BASE ASSEMBLY

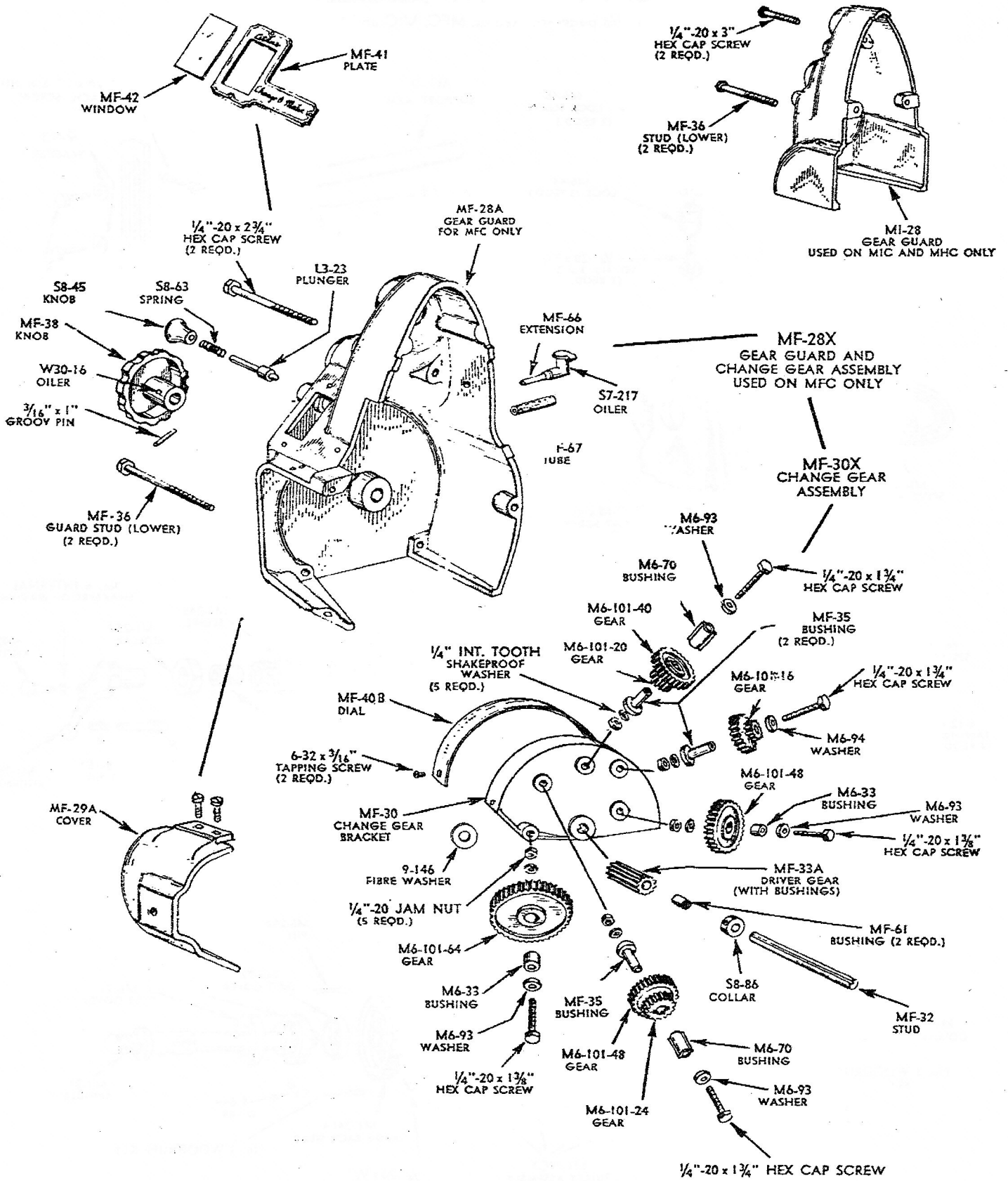


PARTS LIST OF MI-2AX HEAD ASSEMBLY

All parts on this page are used on MFC, MIC and MHC Models

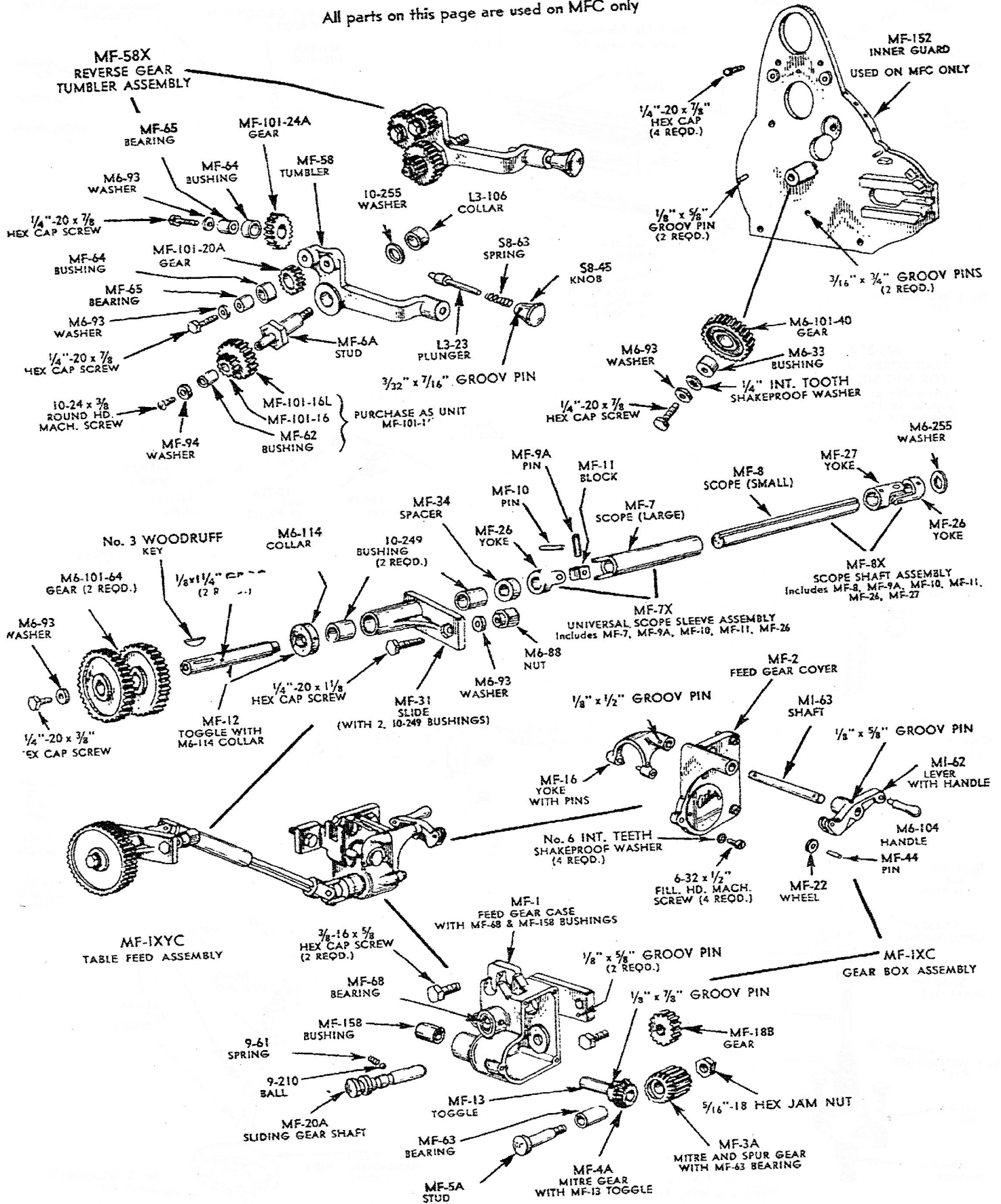


PARTS LIST

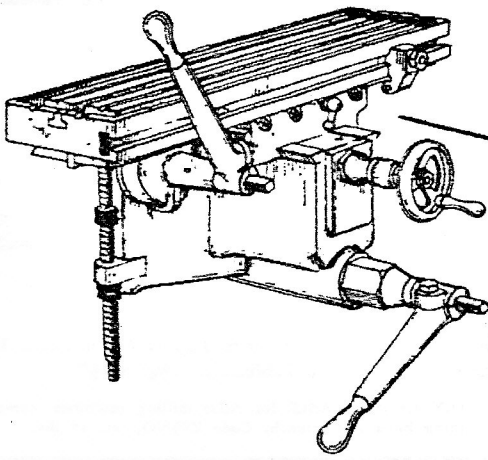


PARTS LIST

All parts on this page are used on MFC only



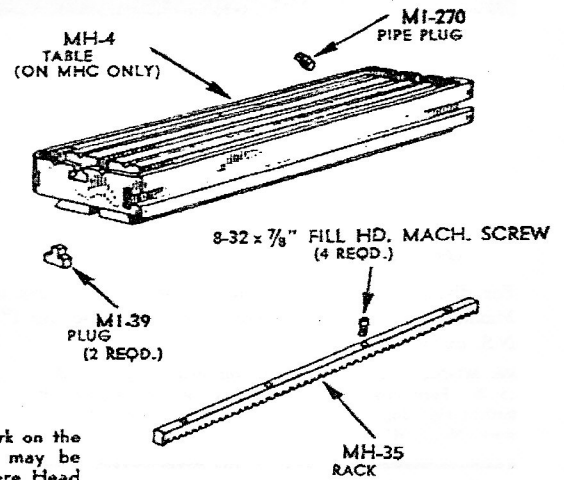
PARTS LIST



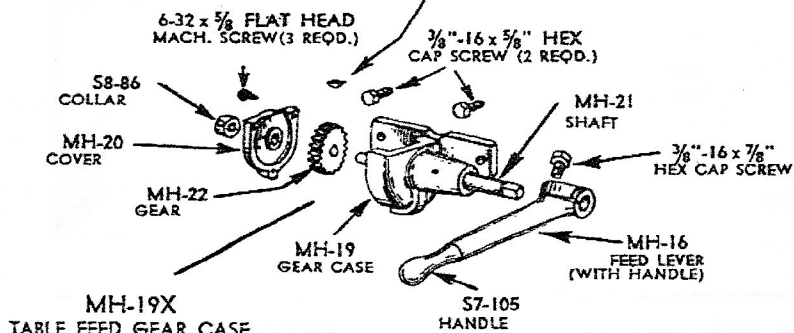
MH-6XCY
KNEE AND TABLE ASSEMBLY
USED ON MHC ONLY

No. 3 WOODRUFF KEY

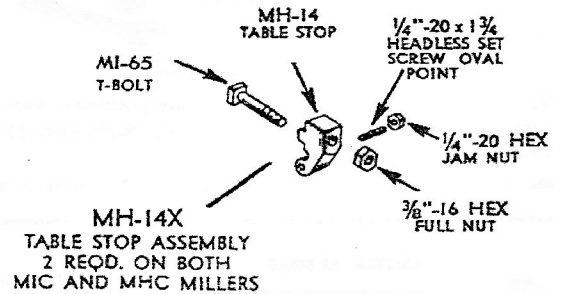
NOTE—T-bolts for holding work on the table of the Milling Machine may be made by procuring $\frac{3}{8}$ " Square Head Machine Bolts from your local hardware and reducing the thickness of the head to $\frac{7}{32}$ ".



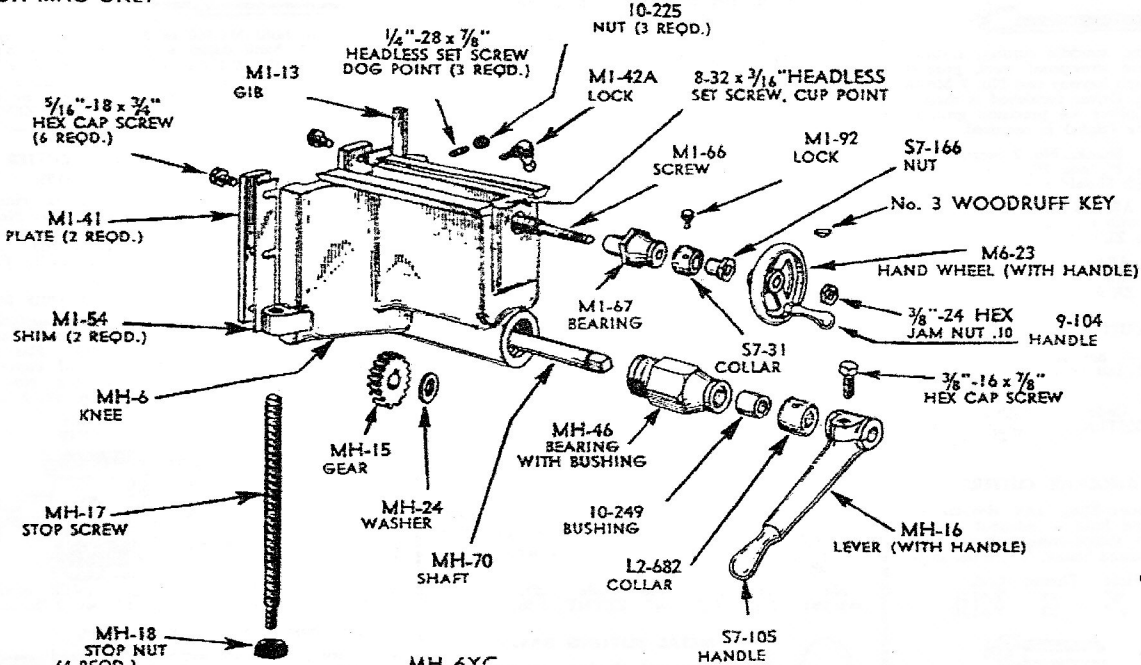
MH-4X
TABLE ASSEMBLY
FOR MHC ONLY



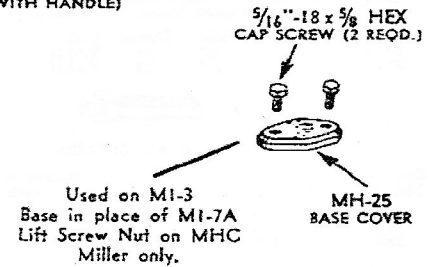
MH-19X
TABLE FEED GEAR CASE
ASSEMBLY
USED ON MHC ONLY



MH-14X
TABLE STOP ASSEMBLY
2 REOD. ON BOTH
MIC AND MHC MILLERS

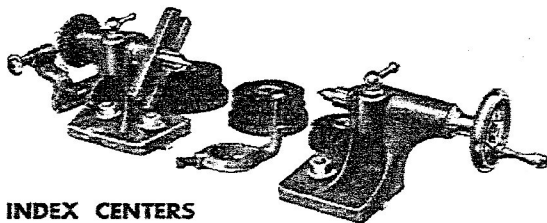


MH-6XC
KNEE ASSEMBLY
FOR MHC ONLY
(Includes MH-43 Rack)



Used on M1-3
Base in place of M1-7A
Lift Screw Nut on MHC
Miller only.

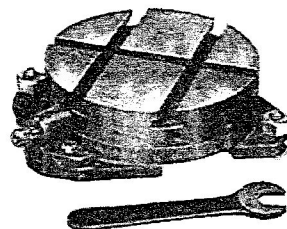
Atlas MILLING MACHINE ACCESSORIES



INDEX CENTERS

For dividing operations. Centers position for work up to 9" long. Maximum swing, 6". Headstock spindle nose has 1" dia., 10-pitch N.S. threads.

No. M1-200 INDEX CENTERS for Atlas milling machine. Code ZESLE, wt. 15 lb. Furnished: 9 indexing gears (36, 40, 44, 46, 48, 52, 54, 56 and 64 teeth); 1 1/2" dog, driver, bolts; two 60° centers — No. 2 Morse taper for headstock, No. 1 MT for tailstock.

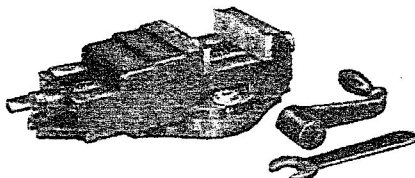


ROTARY INDEX TABLE

Holds work for accurate angular indexing and spacing operations. Swivel base is graduated from 0 to 90° left and right. Indexing holes every 30°

Table Diameter.....5 1/2" Height to Top of Table.....1 7/8"
Three T-Slots, Top of Table.....3/8" x 5/8"

No. M1-350 ROTARY INDEX TABLE for Atlas milling machines, complete with two base-clamping bolts and wrench. Code ZESNO, wt. 15 lbs.



SWIVEL VISE

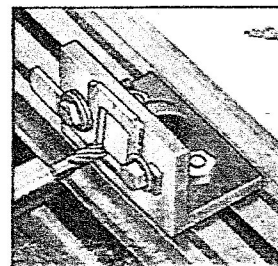
Vise turns complete circle — locks in any position — base graduated 0-90° left and right. Jaws are 3" wide, 7/8" high, open 3 1/8" — operated by crank handle furnished.

No. M1-300 SWIVEL VISE with bolts. Code ZESON, weight 15 lbs.

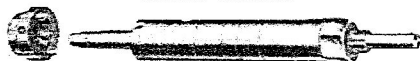
ANGLE PLATE

The angle plate holds irregular shapes that cannot be gripped in vise or bolted to table. Base and face each measure 2 1/2" x 4" x 7/16".

No. 57-430 ANGLE PLATE with bolts. Code ZEHUD, wt. 3 lbs.



CUTTER ARBORS



Hold cutter for slabbing, straddle cutting, slitting, forming, etc. Arbors are stressproof steel, ground all over — have full-length keyway and No. 2 Morse taper shank for spindle. Driver furnished is threaded for spindle nose. Collars are precision ground. No. M1-576 draw-in bar (right) is required.

Diam. Collars.....1 3/8" Shank.....No. 2 Morse Taper
Collars Furnished: two 2", one 1", one 3/4", one 1/2", one 1/4". Length Shoulder to Nut 6 1/4"

No. M1-560 CUTTER ARBOR for Atlas milling machine, complete with nut, six collars and driver. 7/8" Diam. Code ZETYR, wt. 5 lb.

No. M1-560L CUTTER ARBOR for Atlas milling machine, complete with nut, six collars and driver. 1" Diam. Code ZEWAN, wt. 6 lb.

SLAB MILLING CUTTER

For plain surfacing — has RH spiral teeth. Held on M1-560 arbor. Wt. 2 1/2 lb., hole 7/8".

No. Diam. Face Code
M1-580 2 1/4" 1" ZETLA



ANGULAR CUTTERS

For face-milling and dovetailing. Threaded hole — adapted to No. M1-577 shank-cutter adapter with arbors listed below. Wt. 6 oz. each.

No.	Thick	Diam.	Hole	Thread	Code
574A	7/16"	1 1/4"	3/8"	24	YALIF
574B	9/16"	1 3/8"	1/2"	20	YALJE



ARBORS FOR ANGULAR CUTTERS

Required for holding No. 574 angular cutters in No. M1-577 shank-cutter adapter. Wt. 8 oz. each.

No.	For No.	Code
572	574A	YEWTE
567	574B	YEWUX

R. H. SPIRAL END MILLS

For general milling operations — slots, facing and routing, squaring and splining shafts, cutting straight keyways. Straight shank — held in No. M1-577 shank-cutter adapter with bushings below. Wt. 4 oz. each.



No.	Lgth.	Flute	Diam.	Code
576A	5/8"	1/4"	YAKCE	
576B	1 1/16"	5/16"	YAKEC	
576C	3/4"	3/8"	YAKFO	
576D	7/8"	7/16"	YAKID	
576E	1 5/16"	1/2"	YAKOF	

END MILL BUSHINGS

Required to adapt 576 straight shank end mills to No. M1-577 shank-cutter adapter. Not required for No. 576E 1/2" diameter end mills. Wt. 4 oz. each.



No.	For End Mill	Code
563D	No. 576A	YAKYH
563C	No. 576B	YALAC
563B	No. 576C	YALCA
563A	No. 576D	YALDE
563E	Set of 4. Above Bushings	YALD

SIDE MILLING CUTTER

For slotting, grooving, keyways, etc. — used in pairs for straddle milling. Teeth have cutting edges on three sides. Held on M1-560 arbor.



No.	Diam.	Face	Hole	Code	Wt.
M1-581	2 1/2"	1/4"	3/8"	ZETME	1 lb.

METAL SLITTING SAWS

For slitting and slotting, cutting small keyways, and cut-off operations. Sides taper-ground for proper clearance. Held on M1-560 arbor, 7/8" hole, wt. 8 oz. each.



No.	Diam.	Thickness	Code
M1-582	2 1/4"	1/32"	ZETOP
M1-583	2 1/2"	1/16"	ZETPO
M1-584	2 1/2"	1/8"	ZETRY

DRAW-IN BAR



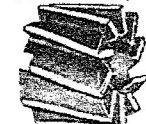
Required to hold M1-560 or M1-560L, cutter arbor and M1-577 shank cutter adapter in spindle taper. No. M1-576 DRAW-IN BAR. Code word ZEVAM, weight 1 1/2 lbs.

No. 57-100 CRANK HANDLE required for No. M1-576 and No. M1-500 visc. Code ZEVYS, weight 1 1/2 lb.



SHANK-CUTTER ADAPTER

Holds 1/2" straight shank cutters (angular cutters, end mills, Woodruff keyway cutters). Has No. 2 Morse taper shank and is held in milling machine spindle with M1-576 draw-in bar (required). No. M1-577 SHANK CUTTER ADAPTER. Code word ZEVEN, weight 1 lb.



RH SPIRAL SHELL END MILL

For wide facing cuts, surfacing, and end milling — recommended for heavy-duty work. Has RH spiral teeth. Back of cutter is slotted to fit driving pins of M1-570 driver (required). 2 lb.

No.	Diam.	Thickness	Hole	Code
M1-585	2"	1 3/4"	3/4"	ZEVIP

SHELL END MILL DRIVER

Required for No. M1-585 end mill. Threaded for spindle nose and has two driving pins for slot in back of cutter, ground pilot for cutter hole, and large retainer screw.

No. M1-570 SHELL END MILL DRIVER required for M1-585 shell end mill. ZEVMA, wt. 2 lb.



WOODRUFF KEYWAY CUTTERS

For cutting Woodruff keyways — also used for milling slots, grooves, T-slots, etc. Straight shank — held directly in No. M1-577 shank-cutter adapter, 6 oz. each.

No.	Diam.	Thick	Code
575A	1/2"	1/8"	YALUH
575B	3/4"	3/16"	YALYJ
575C	1"	1/4"	YAMAD
575D	1 1/4"	5/16"	YAMDA
575E	1 3/4"	3/8"	YAMEF

