

CLEEREMAN JIG BORER

Instruction and Parts Manual

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CLEEREMAN MACHINE TOOL CORPORATION

JIG BORER

Serial No. _____

This manual is designed to assist you in using your Cleereman machine tool.

It is a handbook for the operator, service department, shop foreman, plant engineer, master mechanic, methods and processing department, and tool design personnel.

The following pages give details covering installation, lubrication, operation, and care of the machine. Instructions, supplemented by drawings and parts lists, are included for your guidance in disassembling the components of the machine and identifying the parts.

Your machine was work-tested and performed actual drilling and boring; it was adjusted for accuracy, alignments, and proper operation before being shipped to you. Cleereman design and manufacture assures long, reliable machine life; however, should natural wear or accidental damage cause a stoppage, the procedures outlined herein will be a definite help in accomplishing quickly and accurately any repair work which may be necessary.

Cleereman Machine Tool Corporation keeps a record by serial number of each machine built. To insure prompt and efficient service, include the serial number of your machine with any inquiry or parts order. The serial number will be found on left end of carriage way.

A Cleereman Machine Tool is precision equipment — keep it clean and well lubricated and it will render efficient service for many years.

Study this manual and keep it for future reference. Additional copies are available upon request.

LOCATION AND FOUNDATION REQUIREMENTS

Due to the precise nature and precise alignments which are a necessary part of the CLEEREMAN Jig Borer, a proper location for the machine is of paramount importance.

Ground floor locations are preferred and the best foundation material is reinforced concrete. If the floor selected is four inches or more in thickness a separate foundation is usually not necessary. Should it be found necessary to place the machine on an upper floor or balcony, place it as near a pillar or supporting wall as possible.

In no instance should you install the machine near or subject to the direct blast of ventilating fans, heating pipes, direct rays of sunlight or where it will be subject to drafts of changeable temperature, such as near outside doors or adjacent to outside uninsulated walls.

The foundation plan fig. 1, gives all the basic dimensions and the total weight of your machine to further assist in the selection of a proper location.

In the event considerable dust or dirt is prevalent or extreme temperature changes are encountered a totally enclosed room is recommended. This may be constructed of any suitable material such as plywood or wall board and should be large enough to accommodate the machine, a work bench and all accessories and tooling.

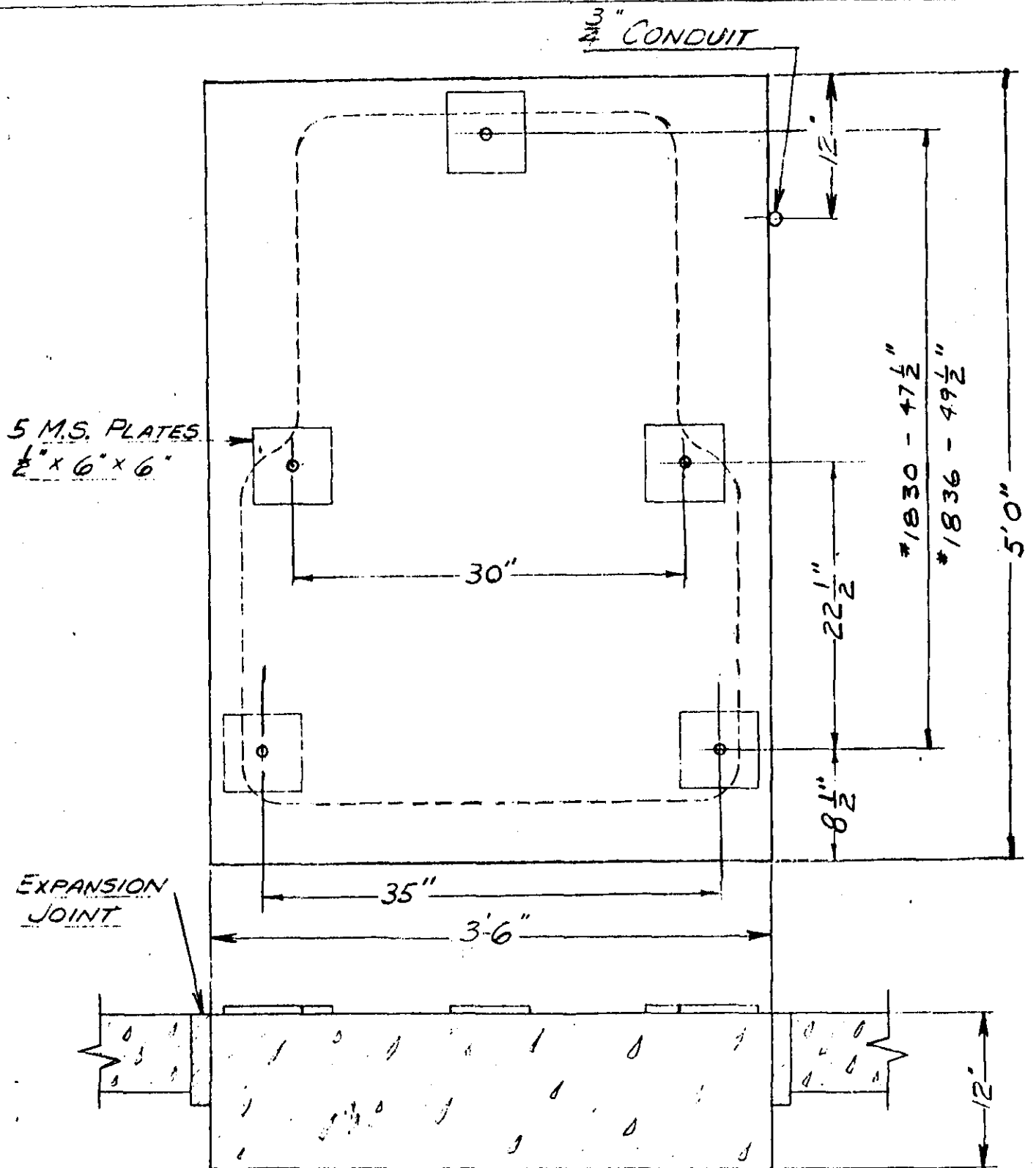


FIG 1
FOUNDATION PLAN
GLEEREMAN JIG BORER
GLEEREMAN MACHINE TOOL CO.

UNCRATING, HANDLING AND CLEANING

Remove the crating, but be careful to save all small boxes which may be attached to it. They contain important parts of the machine. Carefully read and save for future reference caution or instruction tags fastened to the crate or to parts of the machine. All loose parts such as shafts, guards, way guards, measuring rods and tools are packed in a separate wood box attached to the skids in one of the crates.

The skids should remain attached to the machine and column until it has been removed to its permanent location or under a crane for handling. If a crane is used to lift the machine, the rope sling should be used as shown in figure 2. Place suitable pads where the rope contacts the machine to prevent marring the painted or finished surfaces.

Carefully remove all protective grease from the machine using clean rags free from lint and clean kerosene. Never use fast drying, harsh cleaning solvents. The moveable parts of the Jig Borer are fitted very closely with a minimum clearance for an oil film. If all lubrication is dissolved by cleaning, subsequent movement of the various moveable parts of the machine may result in scoring of the finished surfaces which can never be removed except by complete rebuilding of the damaged portions of the machine.

Do not use an air hose to get in corners, because air pressure will drive the dirt between the finished surfaces. A stiff bristle brush will do the job very well.

LEVELING AND ASSEMBLY

Remove the blocking which holds the counterweight inside the column. This is done through the openings in the rear of the column. (CAUTION) Do not move the spindle or the sliding head before removing the blocking because of the danger of getting the counterweight chain off the sheaves.

Remove the skids from the base and remove the bushings from the tapped holes in the base which are provided for leveling screws.

Holes are provided in the front of the base and in the column for lifting. When setting the column on the base extreme care must be taken before assembly so that the mating surfaces are clean and free of burrs. Consult the diagrams for proper method of lifting, figures 2 and 3.

Place the machine so that the five leveling screws rest on steel leveling plates 3/4" x 6" square. When it is necessary to set the machine on a wood floor, one large piece of boiler plate should be used under the machine base. Failure to do this will result in misalignments of the machine.

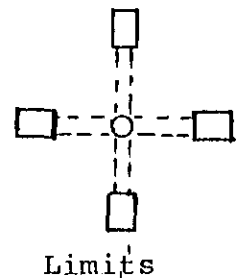
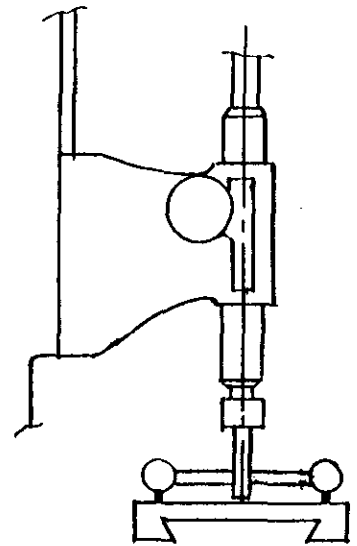
LEVELING AND ASSEMBLY (CONTD.)

Level the machine by placing a precision level on the table and adjust the two front leveling screws and the one rear leveling screw until the machine rests only on these three screws and is level in all directions. At this time DO NOT set the two leveling screws found on each side in the center of the base. (CAUTION) a precision level must be used for this operation; the ordinary machinist's or carpenter's level is not sensitive enough to properly level precision machine tools.

Fill all oil cups and oil reservoirs as outlined under lubricating instructions.

The machine should now set in this position for at least 24 hours so as to adjust itself to the temperature of the surrounding shop and any strains introduced by lifting or moving the machine may adjust to normal.

The various small parts and guards may now be assembled and any necessary electrical wiring may be completed at this time. To complete the installation, recheck the level. Place an indicator (1/10,000 graduations) on the machine as shown in Fig. 4. Place the spindle speed lever in neutral and rotate the spindle to check the alignment of the spindle with the table top. If the readings obtained are not within the limit of plus or minus, .0002" adjust the two remaining leveling screws in the center of the sides of the base. Considerable misalignment noted when making this check means the column has dirt or burrs between it and the base or that the machine has been damaged in shipment to you.



Front to Back - .0002"
Side to Side - .0002"

FIG. 4

ELECTRICAL WIRING

A wiring diagram, figures 4a and 4b gives the complete electrical circuit for your jig boring machine.

The make and type of switches and controllers used is not shown as these items will vary with different machines as some customers specify the type and make of electrical equipment wanted.

As a result of this condition, check the wiring diagram inside the covers of your starter or switch for information on the internal wiring of this equipment.

On reduced voltage starters, when used, a suitable transformer is connected between the line wires and the starter magnet coils which makes the control circuit operate at a lower voltage than the motor.

Before shipment all wiring is tested and the machine operated with it. It is then disconnected and marked in two boxes inside the rear opening to the column.

When the column is set on the base, two cables pass up through holes in the rear bottom column flange and should be connected to their respective boxes. All wires are fitted with terminals and are marked for easy identification.

No box is provided at the motor for connections to the motor. There is a large two piece metal cover that is used to cover the entire motor and its wiring.

MOTOR BRAKE

Directions for adjustment of the motor solenoid brake will be found cemented inside the cover which encloses the brake.

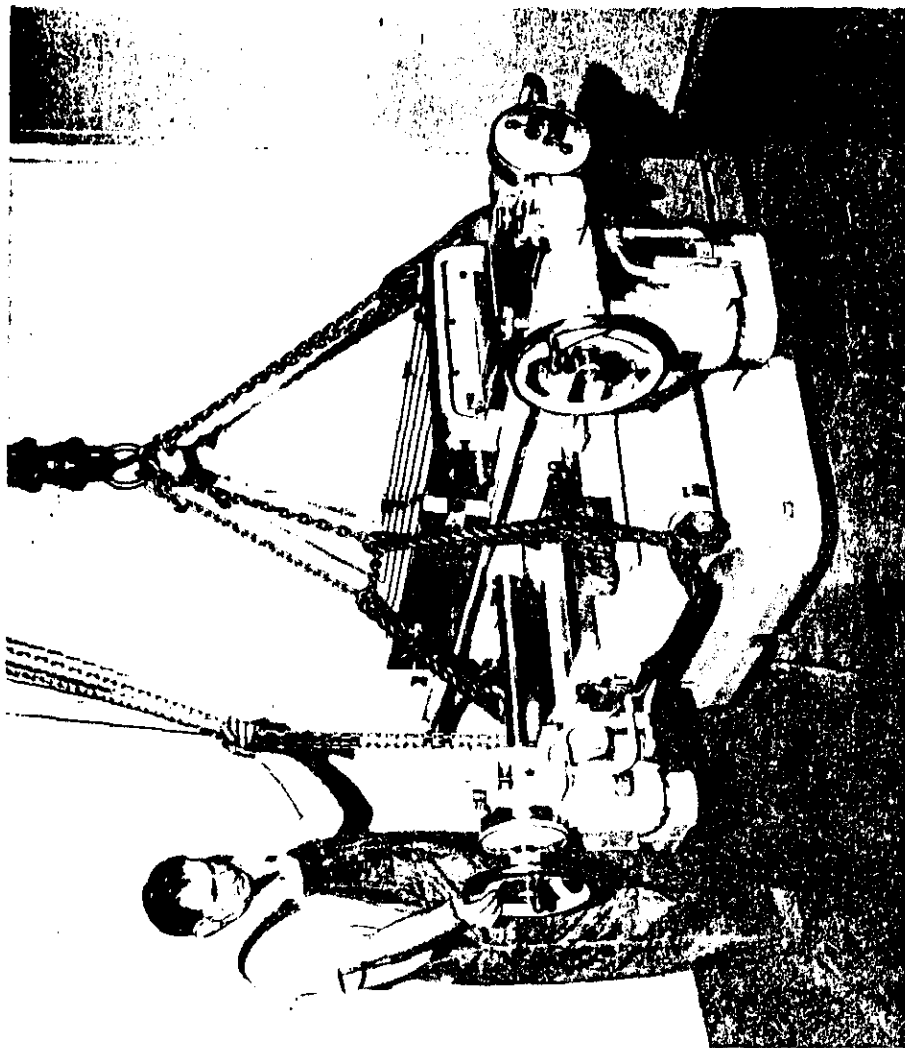


FIG. 2. With a 1 1/2" bar through the holes in the front of the base, place rope slings around the bar and through the openings cored in the rear of the base casting and lift into place. Use wooden blocks to protect the finished surfaces and padding to protect the paint as shown.

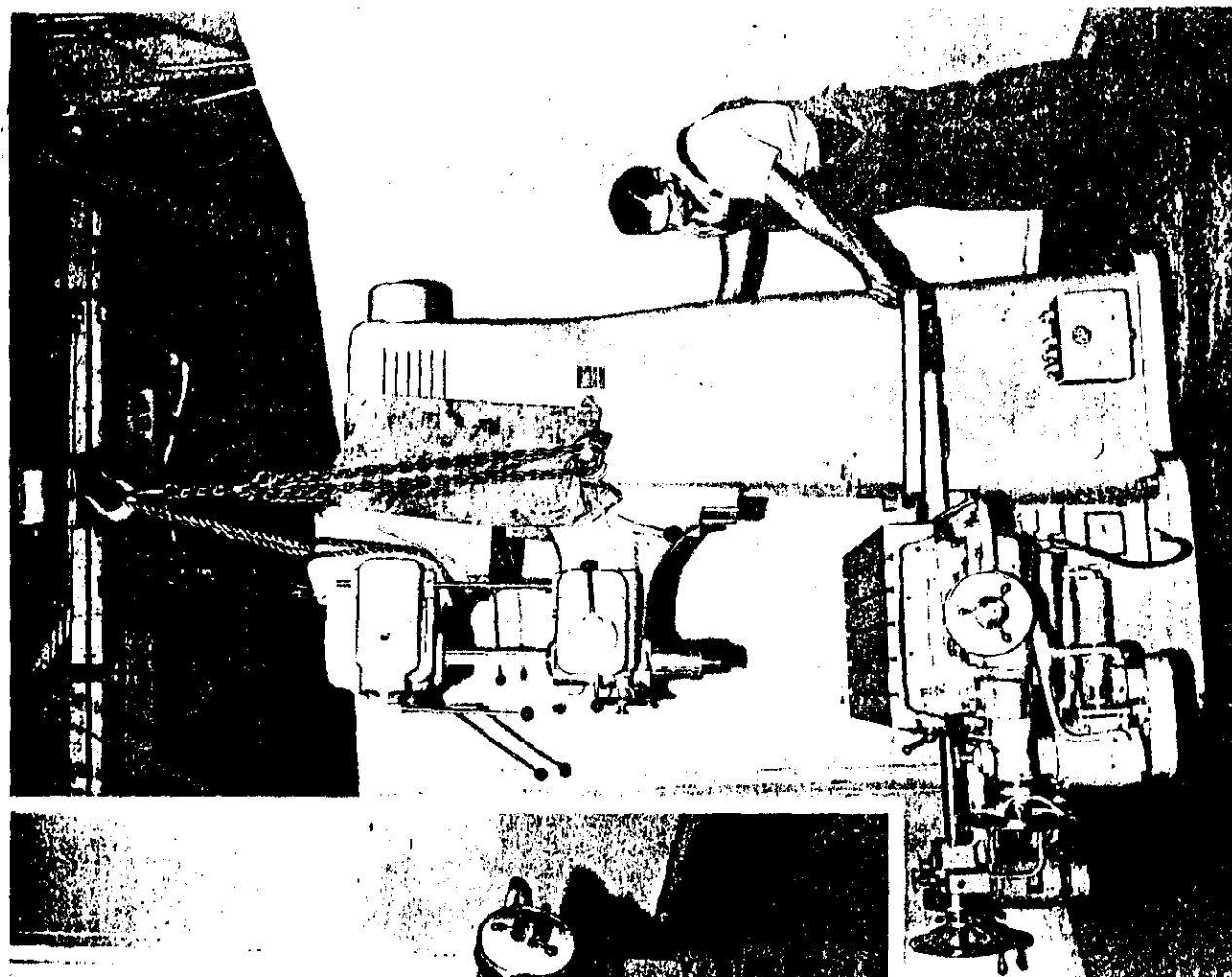


FIG. 3. With a 1 1/2" bar through the holes in the column, place a sling around the bar to lift the column assembly. Place a second sling under the top head to balance the load. Before setting in place on the base, be sure that the mating surfaces are clean and free from burrs.

LUBRICATION INSTRUCTIONS

1. **GEARED HEAD.** Fill head with turbine oil having a viscosity of 450 to 550 seconds saybolt at 100 degrees fahrenheit up to the mark "Oil Level." The capacity of the head is approximately 4 quarts. The head should be drained, flushed and refilled once a year. Check the oil level once a week and replenish as necessary. The pressure gauge shows at a glance if the head is properly lubricated. Low pressure indicates low oil level or a leak in the oil line. High pressure indicates a plugged oil line. If either of these conditions exist, investigate at once. Remove top cover to examine piping. A difference will be noted in the oil pressure, however, when the machine is run on high speed side of the motor and on the low speed side. This is a natural condition due to the fact that the motor travels at only half speed when the switch is on the low speed side. The oil pump is driven directly off the shaft coupled to the motor.

2. **SLIDING HEAD.** Fill feed worm gear case with a turbine oil having a viscosity of 450 to 550 seconds saybolt at 100 degree fahrenheit up to the mark "Oil Level." This requires about one quart of oil. The worm gear case should be drained, flushed and refilled once a year. Check the oil level once a week and replenish as necessary.

3. **SPINDLE.** The spindle bearings are packed with a suitable grease at assembly and are sealed for life and require no further attention. Lubrication of these bearings will cause overheating of the spindle and consequent sticking in its sliding head bearing and damage to the precision bearings in the spindle.

4. **SPINDLE QUILL.** The spindle quill bearing in the sliding head is fitted as close as is physically possible and therefore requires special attention to lubrication. Use a fine grade of turbine oil having a viscosity of 70 to 125 seconds saybolt at 100 degree fahrenheit. A button type oiler is provided in the top of the bearing cap and this should be filled every four hours of machine operation. Keep the quill clean at all times.

5. **TABLE & CARRIAGE WAYS.** All the ways of the table and carriage and the centerguide are lubricated by means of a Bijur one shot lubricator located on the rear of the carriage. The machine is shipped with sufficient quantity of oil in the lubricator to last approximately 30 days. After this supply is used up, keep the lubricator filled with a specially compounded way oil such as GG Vacuoline No. 1409. Merely lift the handle of the lubricator and let go once every four hours of operation to keep all sides properly oiled. It is necessary to grease the lead screws by means of grease fittings in the face of the table and saddle above the lead screws. On jobs where checking work only is done or where considerable tramming or indicating of the piece is done the screws should be greased every four hours of operation.

6. **MISCELLANEOUS OIL CUPS.** There are a limited number of bearings which must be oiled daily by means of an oil can. Use a good grade of oil having a viscosity rating of 225 to 300 SSU for this purpose. Locations are as follows:

- A. Left side of Sliding Head.
 - 1. Ends of Shafts protruding through sides.
 - 2. Vertical column ways.
- B. Right side of Sliding Head.
 - 1. Turnstile lever unit.
 - 2. Vertical feed shaft bearing.
 - 3. Vertical column ways.
- C. Two oil cups top of sliding head.
- D. End of pin thru counterweight sheave at top of column.
- E. Change gear selectors.
- F. Counterweight chain-lubricate once a week.

7. **MOTOR.** The motor is equipped with grease fittings, apply grease with a pressure gun once a year. This includes the main drive motor and the power rapid traverse motors.

OPERATING INSTRUCTIONS
CLEEREMAN JIG BORER

The rotation of the spindle of the machine is controlled by either one of two switches which are electrical interlocked so that one may not be operated while the other one is in running position. The most used switch will be found mounted on the front of the base as shown at No. 1 in figure 7. Turning this to its left hand position causes the spindle to rotate clockwise. Placing it in the right hand position causes counterclockwise rotation. Thrusting inward on this same switch while in its neutral position causes the motor brake to be released so that the spindle may be turned by hand when the speed selector is engaged in the higher speed range. It is not practical to turn the spindle when engaged in the lower speed range due to the gear reduction to the spindle in this position.

In the event that it is necessary to operate the machine from the left hand side, a second switch, No. 2, is found on the left side of the geared head. This is controlled by means of a long handle extending downward. Depressing this handle causes the spindle to rotate clockwise. Raising it causes the spindle to reverse to run in a counterclockwise direction. A second switch No. 3 is located directly to the left of the spindle rotation switch in the front of the base. This switch governs the two speed motor driving the spindle of the machine. There are three positions to this switch. Moved to the left, the machine is running on the slow motor speed. Moved to the right, the machine is running on the high motor speed. When the handle is in the center position the current to the motor is off entirely and spindle cannot be rotated by moving the spindle rotation switches in either direction.

Various spindle speeds are selected by the handle No. 4 located on the left hand side in the front of the geared head. To change speed, pull outward on this handle to its full limit of travel and rotate it to the right or left to select the desired speed. A quick thrust inward on this same handle shifts the train of gears so that the spindle will run at the speed selected. All spindle speeds with the exception of the four highest may be changed while the machine spindle is rotating. The spindle should be shut off however, when shifting the four highest speeds. Twelve speed changes are governed by this handle. An additional twelve speeds is provided by moving the motor speed selector switch to its other position. It will be noted on the chart which is under the pointer attached to the gear shift handle that two lines of figures one in black and one in red are imprinted thereon. One of these lines of figures pertain to the high motor speed and the other to the low motor speed giving a total of twenty-four (24) spindle speeds to the machine.

It is recommended that the motor be run at low speed while changing speeds with the gear shift handle. Spindle feeds are selected in the same manner as the spindle speeds using the other shift lever No. 5 mounted on the right hand front of the upper gear box. This handle may be shifted throughout its entire range while the spindle is in motion. The shifting being accomplished in the same manner as with spindle speeds.

There are three other levers governing the feed mechanism of the Jig Boring Machine. The turnstile handle No. 6 mounted on the right hand side of the sliding head governs the hand traverse of the spindle up and down. Thrusting outward on either of these handles engages the feed clutch to the spindle.

The handwheel No. 7 mounted directly in front of the sliding head governs the hand feed of the spindle up and down. There is a push-pull knob No. 8 found in it's center which when in its neutral position allows the handwheel to be rotated freely for hand feeding. Pulling out on this knob causes the spindle to power feed in a downward direction. Pushing in on this same knob causes the feed to reverse and feed the spindle upward. An additional neutral position is provided in the spindle speed selector lever so that when considerable hand feeding is done on the machine this handle is put in it's neutral position which disengages the feed gearing from the main gear box.

To set the feed depth gauge No. 9, run the tool down until it touches the work by means of the turnstile levers. Loosen the binder nut on the feed depth gauge on the left side of the head and turn the knurled dial until the arrow points at the desired depth. Tighten the binder nut, start the machine, and engage the power feed.

To raise and lower the sliding head to position the spindle in relation to the work mounted on the table, a large handwheel No. 10 is provided on the left hand side of the sliding head. A clamping lever No. 11 mounted on the right hand side of the head must be released prior to turning this large hand wheel to raise and lower the head. Clamping or unclamping the sliding head will not disturb its relationship to the work, the clamp being of a non-distorting type.

Mounted on the front of the spindle quill bearing cap for locking the spindle quill tightly when doing light milling operations is a small lever, No. 12. This should never be tightened when using feeds to the spindle quill or as a means of compensating for wear or looseness of the quill bearing. Adjustments to the bearing are outlined under the heading of adjustments further on in this manual.

On machines equipped with power traverse, a separate switch No. 13 for actuating this device is mounted adjacent to the power traverse motor. To engage the power traverse or the hand traverse, a screw knob No. 14 is located in the center of the large handwheel No. 15 mounted on the end of the screws. Screwing this knob inward toward the machine engages both the power traverse and the small fine feed handwheel No. 16 mounted directly above the traverse motor. Screwing this same knob outward as far as it will go engages the large handwheel for hand traversing the table.

All clamps provided on the machine for clamping the table, saddle and sliding head in position, are of a non-distorting type. Clamping or unclamping these will not cause movement and inaccuracy in work position on the machine or subsequent movement of the table or saddle.

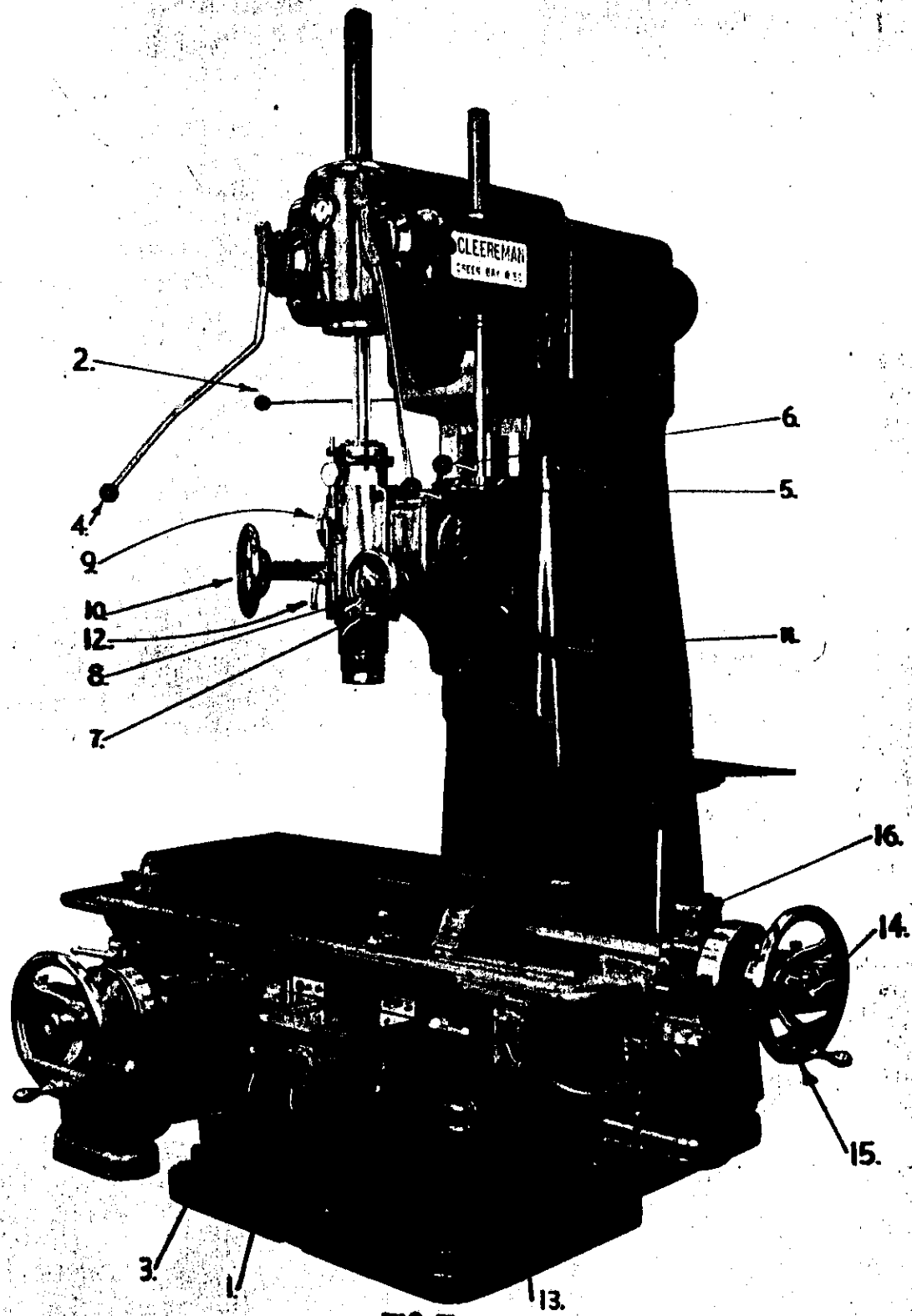


FIG. 7

OPERATION OF THE MEASURING SYSTEM

Either of two systems of measurement are available on all CLEEREMAN Jig Boring Machines. One is by means of hardened and ground screws and large dials verniered to one ten thousandth inches. All finish movements made with the screw should be in a counter-clockwise direction. After the required movement is obtained, backlash should be deliberately put into the screws so as to relieve all tension from them. Failure to do this may result in subsequent movement of the table or saddle in the event the machine is jarred or vibration takes place adjacent to where the machine is placed. Hardened and ground screws should be used only when limits of movement are such that extreme precision is not required. They are generally used for certain manufacturing operations where the limits of hole location in the piece parts do not have to be held closer than a few thousandths of inches. On all precision work where limits of tolerance are in ten thousandths of inches, the end measuring rods only should be depended upon. When using the end measuring rods and micrometers supplied with the machine, it will be noted these micrometers are marked one with a black band and one with a red band. The micrometers are used only from their zero setting to their full markings and not as an overall accurate gauge. Therefore, if one micrometer is used for longitudinal movements it should always be used there and not interchanged into the other trough.

In use the table and saddle are moved to obtain the starting position in relation to the work by centering the spindle with one finished edge or by indicating a location plug or hole in the piece to be bored.

At this point the micrometers are set at zero and placed adjacent to the dial indicators in their respective troughs. The rest of the trough is now filled with gauge rods and the moveable plunger mounted at the end of the trough opposite the dial indicators is moved until the indicator registers about $1/2$ revolution on its dial. Rotate the moveable dials on the indicators until the hand points at zero.

By adding or subtracting from these basic rod lengths and adjusting the micrometer for dimensions of less than one inch any desired movement can be obtained in increments of .0001 of an inch within the range of the machine. Extreme caution should be used to be sure that the ends of the measuring rods are clean and also the ends of the micrometer and the points where they contact on the machine.

The entire table top of your Jig Borer is precision scraped. Therefore jobs should be alternated over the entire surface so undue wear will not take place in the center of the table. All parts, clamp and blocks used on the table should be carefully examined for nicks and burrs so they will not damage this accurate surface.

BORING PROCEDURE

Precision boring of holes on a CLEEREMAN Jig Boring Machine is an operation that can be performed by any mechanic with a reasonable knowledge of boring with single point tools.

The machine is constructed very accurately. Its scraped alignments and the face, top and tee slots of the table are held to precision limits in reference to the machine travel.

Parts to be bored must be clean, free from burrs and flat before clamping to the machine table. Where precise location is required with reference to an end or wedge, the edge should be finish machined accurately before starting boring operations or error will result. Where tolerances will permit, this finished edge may be located against a plate clamped to the front face of the table or against keys inserted in the Tee-slots of the table. For extreme accuracy, the work piece should be traversed back and forth with a dial indicator held against the finished edge. Adjust the work piece until a zero reading is obtained at both ends. Clamp the piece securely and check again to be sure the work did not move.

Location of the starting point on the work piece may be obtained by any one of a number of methods, and the method used will depend entirely on the nature of the work and the operator's choice. One of the most commonly used is a small indicator placed on the end of a suitable rod held in the machine spindle. The indicator is then rotated around a pin or small piece of known thickness held up against this finished surface or edge on the piece part. When the indicator checks zero on each side of the piece, the spindle is centered over the center of this piece. The table is then moved $1/2$ the thickness of the piece which centers the spindle over the edge of the work.

In using the end measure systems of hole location, attention to a few details will prevent errors and make for faster, more accurate operation of your machine. The end measures should be kept at the machine when in use so that they are at all times the same temperature as the machine. The ends should be examined before placing in the trough to see that dirt does not adhere to this surface.

All adjustment for length should be made with the micrometer and not compensated for on the dial indicator as an indicator is only a reference instrument and is not absolutely accurate for graduation over any great range.

BORING PROCEDURE (Cont'd.)

When the table or saddle is moved to bring the rods and micrometer in contact with the indicator and a setting obtained, the handwheel of the movement should be backed up slightly so as to take all tension off the table or saddle screws. Failure to do this may cause the table or saddle to move or jump when the machine is jarred due to the tension left on the screws.

The graduated dials found on the ends of the table and saddle screws are graduated in thousandths and verniered in ten thousandths. These are accurate enough for precision work only when a machine is supplied with precision hardened and ground lead screws as extra equipment.

When precision screws are used, they are not intended to be as accurate as the end measure system and should only be used where limits of tolerance of the finished part fall within the limits of the screw itself.

The degree of accuracy in the finished piece part will govern the best and fastest method of finishing the holes in it.

A good rule of thumb is as follows: When limits for location of $1/4$ thousandth or less are required single point boring using as many finish cuts as are necessary to take all the spring out of the tool is the only known method of holding these close limits.

One or two boring cuts and the use of a jig boring type of end mill reamer for finishing will hold limits of one to two thousandths between holes.

Where broader limits than these are allowable, drilling and reaming alone will be sufficient.

The foregoing examples are very general, as the size of the part, the diameter of the holes and the material worked on all have a bearing on how it should be handled, and there is no set rule which will apply in all cases. As an example, a large aluminum casting would require more attention as to induced heat which would cause expansion and consequent errors in spacing of bored holes than a steel plate of the same general dimension.

Holes to be bored are generally first spotted for location with a center drill and opened up to the desired diameter by using drills in progressive steps of approximately $1/2$ " in diameter in each step. In the event that considerable amount of stock is to be removed, from the solid preliminary rough drilling on a heavy drill press is recommended leaving sufficient stock for finish boring. A machine such as the 25" or 30" CLEEREMAN Geared Head Drill is ideal for this work.

BORING (CONTD.)

All holes should be rough drilled and rough bored to within .200" of size before any finishing operations are started. Before finish boring for size the original pick up for location should again be checked and finish boring operations may now be completed. It is very important that this procedure be followed for close limit work. Due to the heat introduced by roughing operations and also any movement of the piece part in roughing it is impossible to hold close dimensions between holes by alternately roughing and finishing on the same hole before moving on to the next.

Considerable time and operator fatigue is eliminated by proper use of the power traverse to the table and saddle of the machine.

This device is so designed that, in use, the table or saddle may be traversed up against and measures set in their respective troughs without damage to the measuring equipment. A small amount of hand movement with the fine feed knob is then necessary after the table automatically stops to bring the end measures in actual contact with their respective indicators.

In use, the job should be started with the table and saddle in their extreme position away from the operating handwheels. Then, while the spindle is performing its work on the piece part, the rods and micrometers may be removed and shortened for the next operation or hole. Upon completion of the cut, the spindle is retracted and the traverse switches thrown to move the saddle to its next location. This is continued until all holes are covered in the operation.

ADJUSTMENTS

GIBS - Sliding head, Table and Saddle. - Loosen the large head cap screw at the thin end of the gib and tighten the screw at the opposite end of the gib. Gibs should be adjusted so that there is a perceptible amount of drag but should not be tight. Reset the cap screw at the thin end of the gib to prevent end float of the gib but do not set the screw tightly. Setting the gib screws too tight may cause the gib to bow, throwing a heavy bearing in the center of may even upset the metal in the gib under the screw heads.

SLIDING HEAD BINDER - (dwg. 20-236) - To adjust the binder, loosen the hex lock screw at the rear of the head elevating bracket. Back off the binder lever on the right side of the sliding head and then turn the large dial nut on the opposite end of the binder screw right hand the desired amount to bring the binder lever into the most convenient position when locked. Tighten the hex lock screw to maintain the adjustment.

FRICTION FEED CLUTCH - (Dwg. 20-236) Slippage in the feed clutch can be detected by a jerky feed when using larger size drills. To adjust the clutch, place the quick traverse levers in position for hand feed and tighten the set screws which may be found thru the holes in the quick traverse levers. Do not adjust the clutch too tight; a slight turn on each set screws should be enough. Tighten each screw the same amount.

SPINDLE DRIVE COUPLING - (Dwg. 20-236) - The star shaped leather coupling 12H in time may need replacement. Unscrew the top bearing closure 13K from the top of the spindle quill. Lift up the splined shaft and the coupling 12H may then be easily removed and replaced.

TABLE CLAMP - To reset the clamp handle knock out taper pin holding the handle in place on the clamp screw. Remove the screw and grind enough off its end to permit it to be rotated in the new position selected for the clamp handle.

SADDLE CLAMP - To reset the clamp handle knock out taper pin holding the handle in place on the clamp screw. Remove the screw and grind enough off its end to permit it to be rotated in the new position selected for the clamp handle.

TABLE AND SADDLE NUTS. - No adjustment of these nuts is required. The amount of backlash is immaterial as all machine movements are concluded in a left hand direction.

ALIGNMENT OF COLUMN WITH BASE - Should a misalignment be noted between either the spindle quill travel or the sliding head travel and the table of the machine proceed as follows:

1. Take up play in the quill bearing cap first as outlined under Spindle Quill Bearing.
2. Back off the two center leveling screws found in the center of each side of the base and relevel as described under setting up instructions. Reset the two leveling screws checking with an indicator as outlined in the latter part of the leveling instructions.
3. Check the spindle quill travel with a square set up on the table and note the reading obtained. Without moving the square, run the sliding head up and down the column and note the indicator reading. The spindle travel should be square with the table and parallel to the head travel within one quarter thousandth.

INSTRUCTIONS FOR TAKING UP WEAR IN SPINDLE QUILL BEARING
AND INSTRUCTIONS FOR REMOVING SPINDLE

1. Unscrew the top bearing closure 13B from the top of the spindle quill. Remove the spindle guard from the top of the head. Raise the spindle drive shaft high enough so that it can be held by means of a 1-5/8" set collar encircling the upper end.
2. Lower the sliding head until the bottom is flush with the lower end of the column ways.
3. Insert a 3/16" hex wrench (the type used for hollow head cap screws) through the counterweight chain directly under the sheave with the short leg of the wrench pointing down behind the chain and the long leg lying horizontal, pointing to the spindle.
4. Raise the sliding head on the column until the 3/16" hex wrench is up against the face of the column and the spindle begins to slip down in the head.
5. Lock the head securely to the column.
6. Raise the spindle slightly so that the chain is barely slack below the hex wrench. Cut wooden blocking to hold the spindle at this point.
7. Put a pencil mark on the sliding head above the arrow which points at the feed trip dial and set and lock the dial 29A so that the zero line is in line with the pencil line. This line must be on the head -- not on the bearing cap. This is done so that the dial may be set in the same place when replacing the spindle.
8. Engage the power feed clutch by thrusting outward on the quick return levers 42A. This is done to prevent movement of the cross spindle after removing the spindle. As a precaution, it is advisable to wire the levers in this position.
9. Remove the quill binder screw 129F.
10. Remove the quill bearing cap 23N.
11. Scrape the flat flanges of the cap to compensate for wear. By checking regularly, it will never be necessary to scrape very much at any one time. Therefore, the scraping should be done very lightly and repeated several times if necessary:
12. The spindle may be lifted out for repairs if necessary.
13. Leave the blocking in place on the table so the spindle assembly can be replaced in the same position. When replacing the spindle assembly, set it on the blocking to obtain the proper vertical position. Turn the feed trip dial counterclockwise to take up the slack in the chain. The zero line on the scale should then match up with the pencil line on the head. Push the quill into place and replace the bearing cap and binder screw.

REPAIR PARTS LIST

CLEEREMAN SLIDING HEAD DRILL

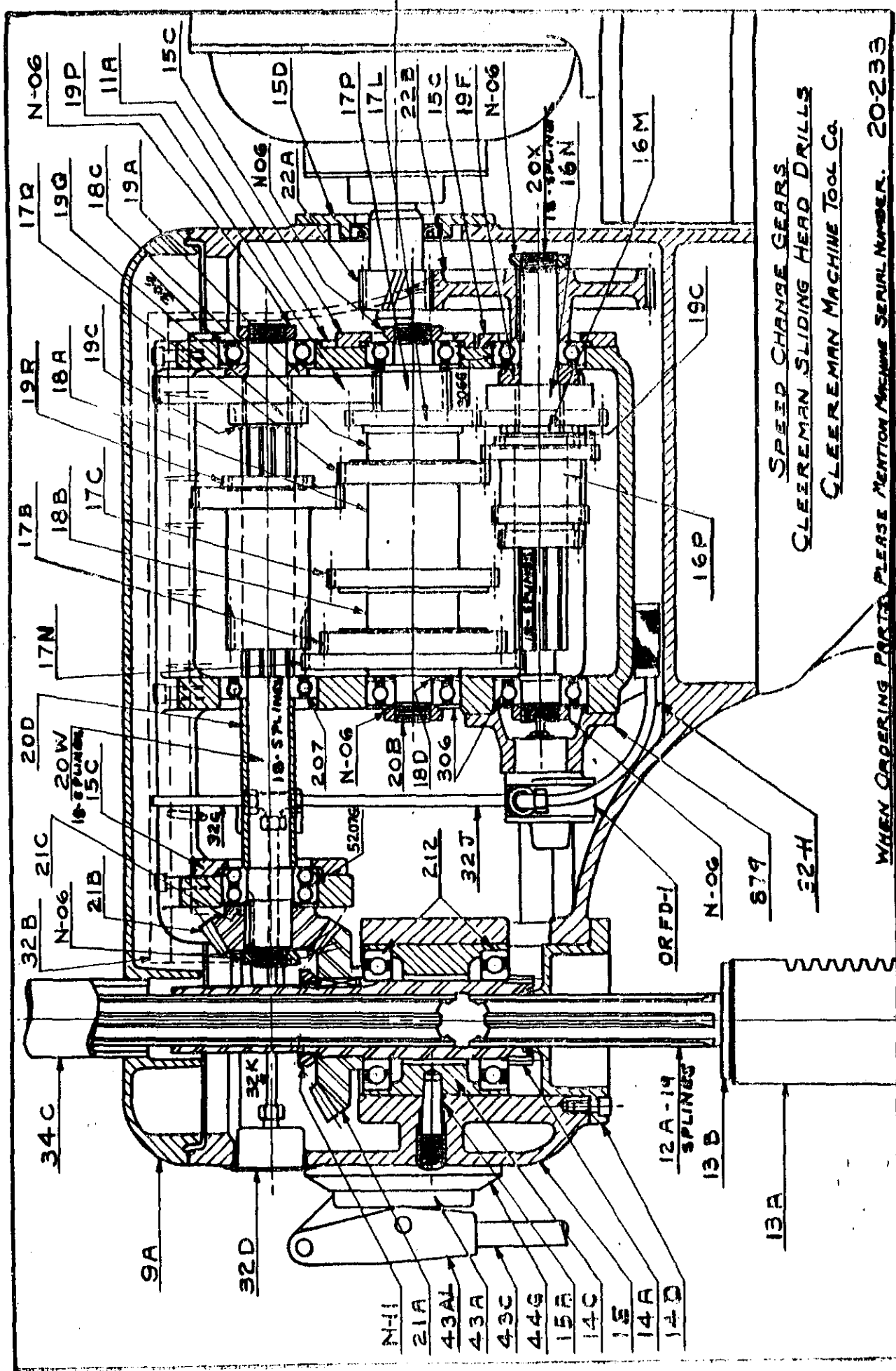
Speed Change Gears

(Dwg. 20-233)

1	1E	Top Head	1	20B	Intermediate Shaft
1	9A	Top Cover	1	20X	Bottom Shaft *
1	11A	Sub Frame	1	20D	Bearing Spacer
1	12A	Spindle *	1	21A	Bevel Gear **
1	13A	Spindle Quill	1	21B	Bevel Pinion **
1	13B	Top Closure	1	22A	17 T Pinion **
1	14A	Spindle Drive Sleeve *	1	22B	57 T Drive Gear *
1	14C	Bearing Cartridge	1	32B	Oil Trough
1	14D	Bearing Closure	1	32D	Oil Gage
1	15A	Locating Plug	1	32G	Oil Distributor
3	15C	Bearing Caps	1	32H	Oil Strainer Assembly
1	15D	Motor Shaft Seal	1	32J	Tee-Pump Connecting Tube
1	16M	Clutch Gear	1	32K	Tee-Gauge Connecting Tube
1	16N	Idler Gear	1	34C	Spindle Guard
1	16P	Cluster Gear	1	43A	Lever Hub
1	17B	43 T Gear	1	43AL	Speed Change Lever
1	17C	40 T Gear	1	43C	Lever Handle
1	17L	31 T Gear	1	44G	Dial Cap
1	17N	52 T Gear	1	207	Ball Bearings
1	17P	17 T Gear	2	212	Ball Bearings
1	17Q	35 T Gear	3	306	Ball Bearings
1	18A	Gear Sleeve	2	306G	Ball Bearings
1	18B	Gear Spacer	1	879	Pump Bracket
1	18C	Gear Spacer	1	5207G	Ball Bearings
1	18D	Washer	6	N06	Locknuts
1	19A	Spacer	1	N11	Locknut
2	19C	Washers	6	W06	Lockwashers
1	19F	Spacer	1	W11	Lockwasher
1	19Q	Clutch Gear	2	E838	Bushings
1	19R	Cluster Gear *	1	275120	Oilseal
1	19P	53 T Gear	1	ORFD-1	Oilpump
1	20W	Top Shaft *			

* When ordering these parts, state number of splines to the shaft or bore.

** These gears are speed alternates and vary with the speed the customer has ordered.



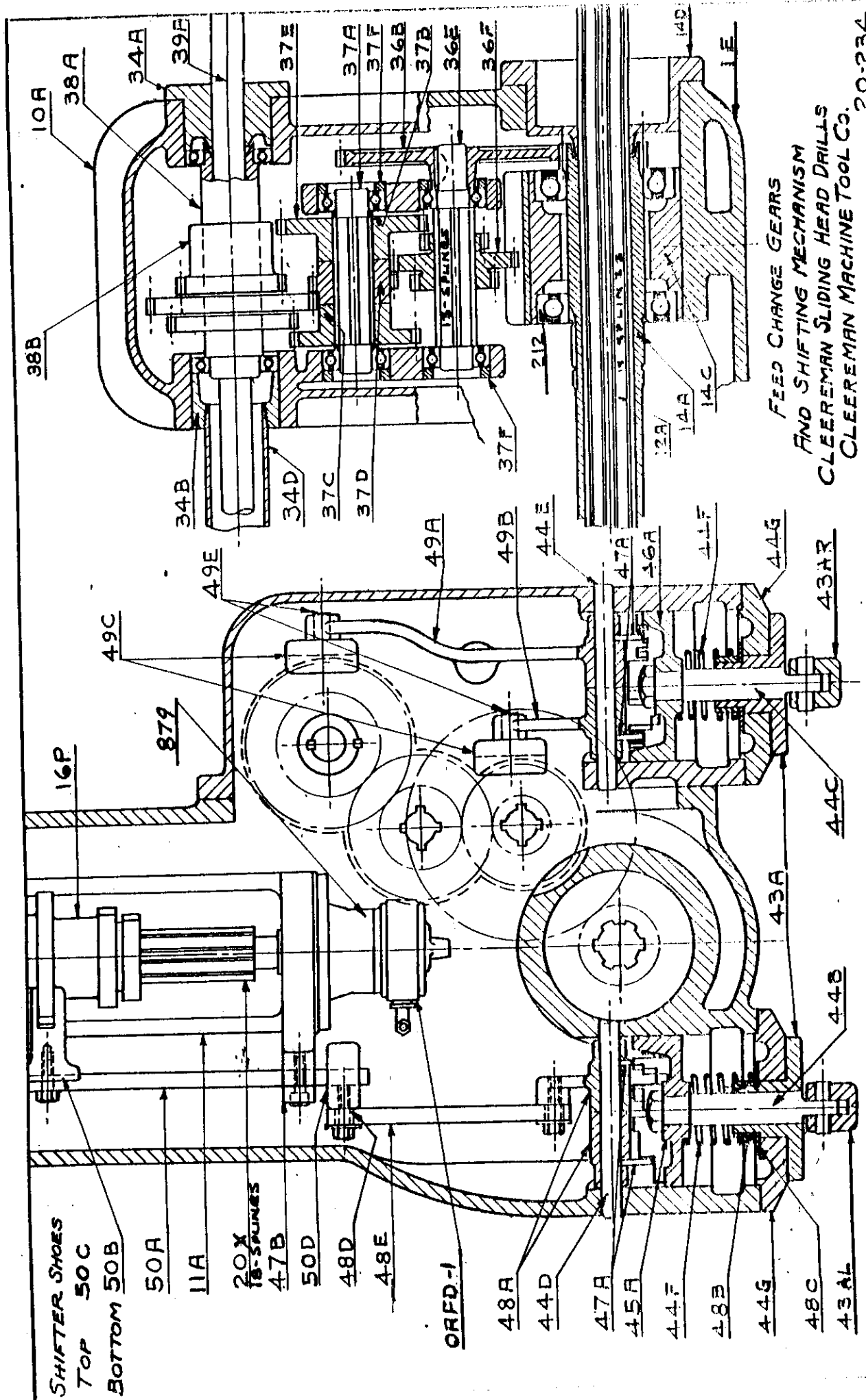
REPAIR PARTS LIST

CLEEREMAN SLIDING HEAD DRILL

Feed Change Gears

(Dwg. 20-234)

1	10A	Feed Gear Box	1	44E	Feed Shifter Pin
1	11A	Sub Frame	2	44F	Springs
1	12A	Spindle	2	44G	Dial Caps
1	14A	Spindle Drive Sleeve	1	45A	Speed Selector
1	14C	Bearing Cartridge	1	46A	Feed Selector
1	14D	Bearing Closure	4	47A	Gear Shift Lock
1	16P	Cluster Gear	2	47B	Keeper Bar
1	20X	Bottom Shaft	1	47E	Extension Spring
1	34A	Bearing Cap	2	48A	Shifter Arms
1	34B	Bearing Closure	2	48B	Bushings
1	34D	Feed Shaft Guard	2	48C	Washers
1	36B	Take-off Gear	4	48D	Bushings
1	36E	Splined Shaft	2	48E	Links
1	36F	Cluster Gear	1	49A	Shifter Arm
1	37A	2nd Feed Shaft	1	49B	Shifter Arm
2	37B	Spacers	2	49C	Shifter Shoes
1	37C	30 T Gear	1	49D	Compression Spring
1	37D	20 T Gear	2	49E	Pins
4	37E	Bearing Collars	2	50A	Gear Shifting Bars
1	37F	Bearing Retainer	1	50B	Bottom Shoe
1	38A	Transfer Quill	1	50C	Top Shoe
1	38B	Change Gear	2	50D	Collars
1	39A	Feed Drive Shaft	1	S13R	Ball Bearing
2	43A	Lever Hubs	1	S13RP	Ball Bearing
1	43AL	Feed Change Lever	4	1205	Ball Bearings
1	44B	Speed Rod	1	879	Pump Bracket
1	44C	Feed Rod	1	ORFD-1	Oil Pump
1	44D	Speed Shifter Pin			



FEED CHANGE GEARS
AND SHIFTING MECHANISM
CLEERMAN SLIDING HEAD DRILLS
CLEERMAN MACHINE TOOL CO.

WHEN ORDERING PARTS MENTION MACHINE SERIAL NUMBER.

20-234

CLEEREMAN JIG BORER

SLIDING HEAD ASSEMBLY

(Dwg. 20--236)

1	12E	Spindle Drive Shaft *	2	41C	Dowel Pins
1	12H	Coupling Spider	2	41D	Taper Pins
1	12J	Hand Nut	2	42A	Turnstile Levers
1	12R	Spindle *	2	42C	Lock Pins
1	12S	Drive Coupling Half *	3	42D	Springs
1	12T	Spindle Coupling Half *	1	119E	Sliding Head Gib
1	12U	Washer	1	128F	Sheave Pin
1	12V	Slinger	1	129F	Quill Binder Screw
1	12W	Outer Ring Spacer	1	129G	Binder Lever
1	12X	Inner Ring Spacer	1	129J	Binder Plug
1	13N	Tang Plug	1	133S	Washer
1	13R	Spindle Quill	1	133T	Hand Knob
1	13S	Top Closure	1	137A	Rack Pinion
1	13T	Bottom Closure	1	137B	Bevel Gear
1	13U	Bearing Spacer	1	137C	Bevel Pinion
1	13V	Oil Slinger	1	137D	Washer
1	23D	Bushing	1	137E	Nut
1	23E	Bushing (644 - GP)	1	137F	Bushing
2	23F	Bushings	1	137G	Binder Screw
1	23N	Bearing Cap	1	137H	Shaft
1	23M	Sliding Head	1	137J	Thumb Screw
1	23U	Key Plug	1	137K	Key
1	25C	Rack	1	137L	Key
1	25K	Rack Stop	1	138A	Elevating Bracket
1	26B	Balance Gear Shaft	1	138E	Binder Lever
1	26H	Roller Bearing	1	138F	Handwheel
1	27A	Chain Sheave	1	139A	Bushing
2	27F	Set Collars	1	139B	Clutch Cone
1	28A	Sliding Head Cover	2	139C	Clutch Dogs
1	29A	Feed Depth Dial	2	139D	Keys
1	29B	Feed Dial Hub	1	139M	Cross Spindle
1	29C	Hand Nut	1	139N	Transfer Pinion
1	29D	T-bolt	1	139R	Balance Gear
1	29E	42 T. Gear	1	139S	Balance Gear Shaft
1	30G	Ball Bearing	1	139T	Balance Gear Pin
1	30H	Needle Bearing	1	140A	Bevel Gear
1	30J	Feed Dial Stud	1	140B	Bevel Gear
1	30L	Feed Trip Dog	1	140C	Diving Key
2	30M	Safety Trip Dogs	1	140E	Spacer
1	35E	Ball Thrust Bearing	1	140F	Spacer
2	35F	Oil Seals	1	140G	Worm Shaft
1	35G	Handwheel	1	140H	Stud
1	35M	Feed Worm	1	140J	Spring
1	35N	Feed Worm Gear	1	140M	Nut
1	39B	Bearing	1	140N	Flat Spring
1	39C	Set Collar	1	140P	Feed Reverse Rod
2	39F	Bushings	2	OL09	Bearings
1	39J	Bevel Pinions	2	OL11	Bearings
1	39L	Feed Drive Shaft	1	3209	Bearing
2	40B	Cam Pins	1	N09	Locknut
2	40E	Washers	1	W09	Lockwasher
1	40F	Push Rod	2	B-1220-6	Bushings
1	41A	Quick Return Hub			

* When ordering parts, state number of splines to shaft or bore.

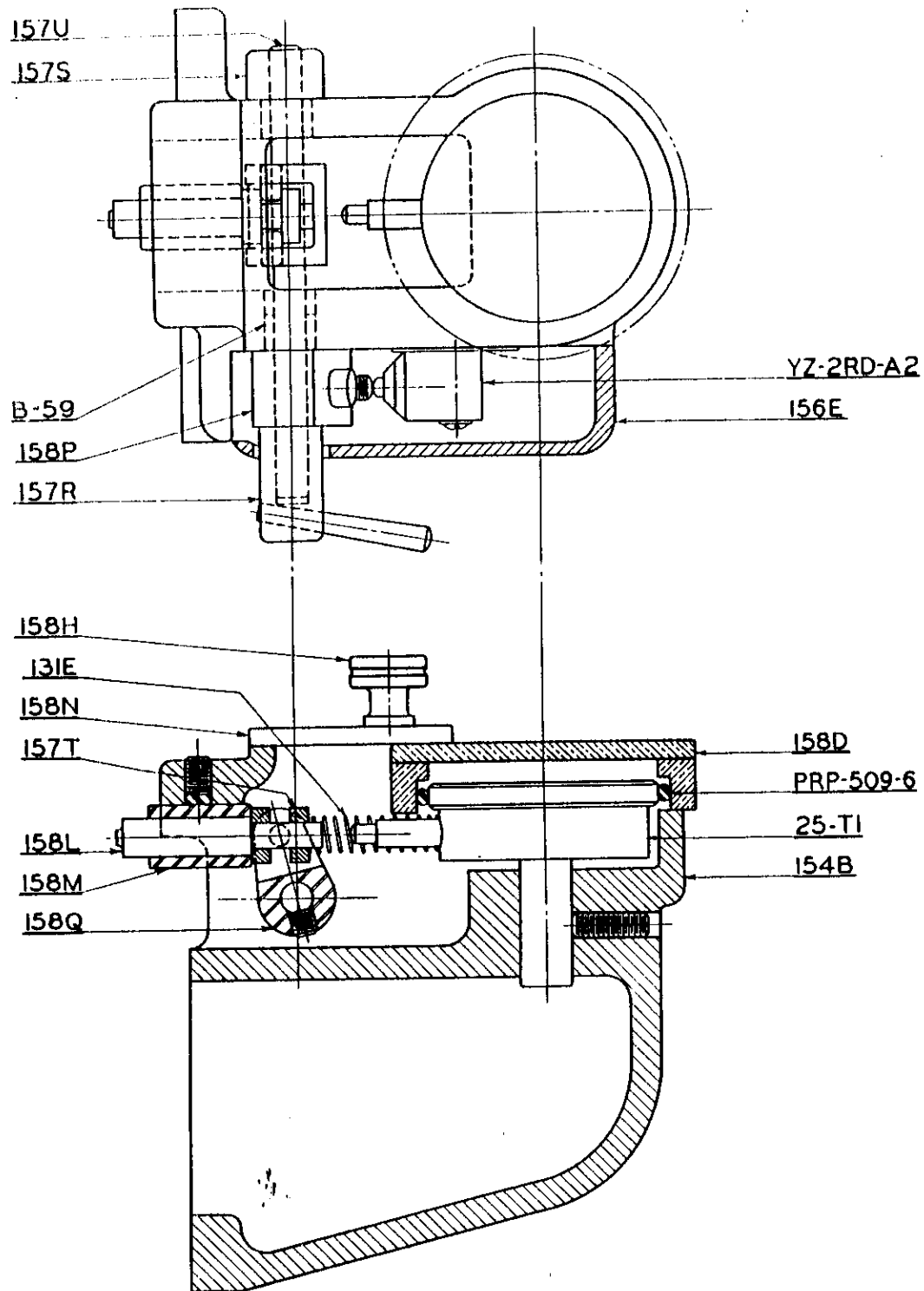
REPAIR PARTS LIST

CLEEREMAN JIG BORER

DIAL INDICATOR HOUSING

(Dwg. 20-153)

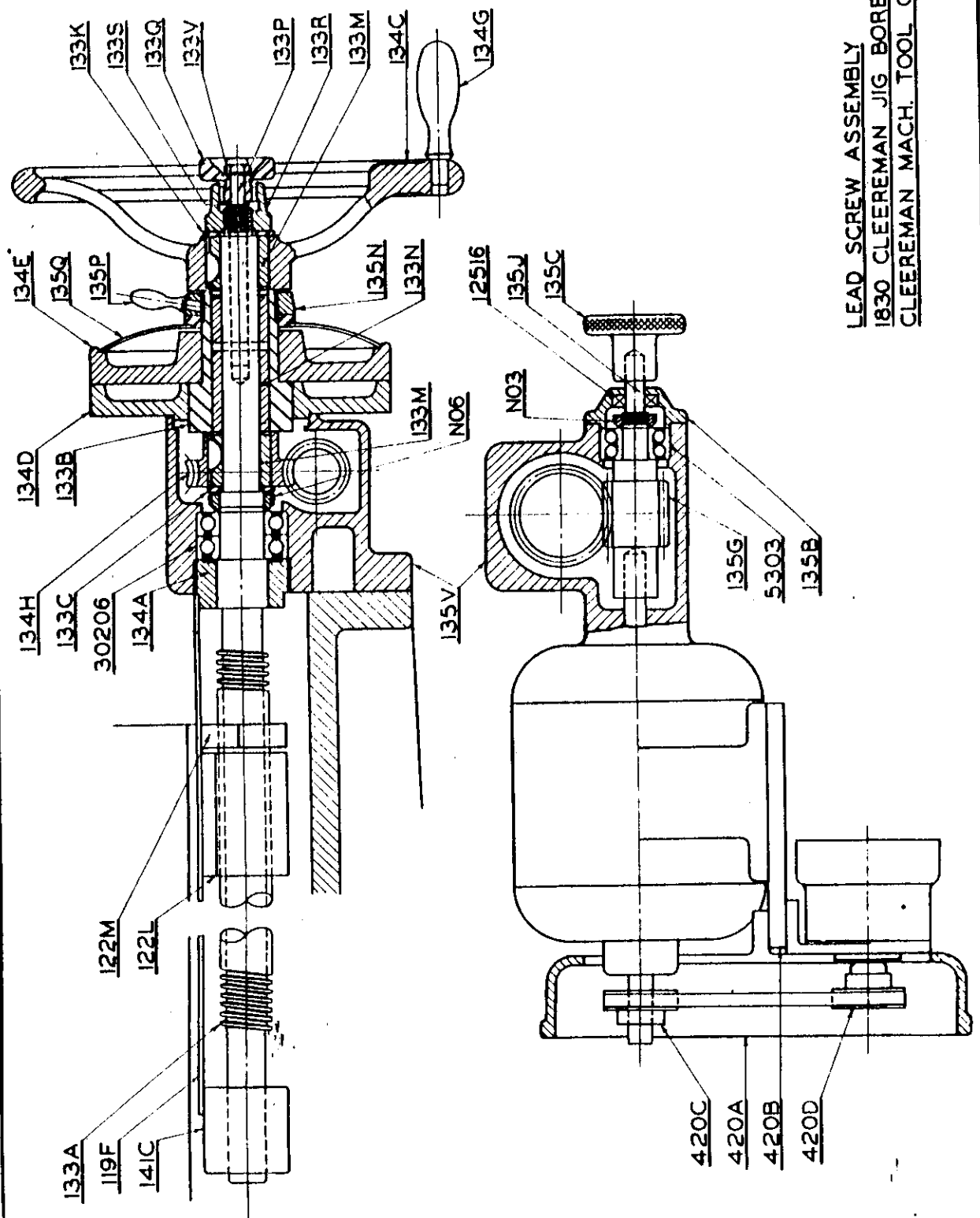
2	131E	Springs
2	154B	Dial Indicator housings
2	156E	Switch covers
2	157R	Hand Levers
2	157S	Set Collars
4	157T	Washers
2	157U	Lever Shafts
4	157Y	Washers
2	158H	Clamp Screws
2	158L	Contact Rods
2	158M	Rod bushings
2	158N	Clamp Plates
2	158P	Switch Levers
2	158Q	Rod Levers
4	B-59	Needle Bearings
2	PRP-509-6	Elastic Snap Rings
2	25PT1	Dial Indicators
2	YZ-2RD-A2	Micro switch



DIAL INDICATOR HOUSING
CLEEREMAN JIG BORER
CLEEREMAN MACH. TOOL CO.

REPAIR PARTS LIST
1830 CLEEREMAN JIG BORER
LEAD SCREW ASSEMBLY
(Dwg. 20-285)

1	119D	Chip Guard
1	119F	Chip Guard
2	122L	Fixed Feed Nuts
1	122M	Lash Lock Nut
1	133A	Lead Screw
1	133B	Dial Sleeve
2	133C	Thrust Washers
1	133F	Lead Screw
2	133K	Washers
4	133M	Serrated Clutches
4	133N	Sliding Keys
2	133P	Shift Rods
2	133Q	Hand Knobs
2	133R	Nuts
2	133S	Washers
2	133Y	Spacers
2	134A	Bearing Closures
2	134C	Handwheels
2	134D	Fixed Dials
2	134E	Feed Dials
1	134F	Thrust Washers
2	134G	Machine Handles
2	134H	Worm Gears
2	135B	Bearing Caps
2	135C	Handwheels
2	135G	Worms
2	20-950	Worm Shafts
6	135P	Machine Handles
2	135Q	Disc Hub
2	135V	Screw Brackets
2	141C	Outboard Bearings
2	5303	Ball Bearings
4	206DB	Ball Bearings
2	N03	Locknuts
2	N06	Locknuts
2	W03	Lockwashers
2	W06	Lockwashers
2	12516	Oil Seals



LEAD SCREW ASSEMBLY
1830 CLEERMAN JIG BORER
CLEERMAN MACH. TOOL CO.

WHEN ORDERING PARTS MENTION MACH. SERIAL NO.

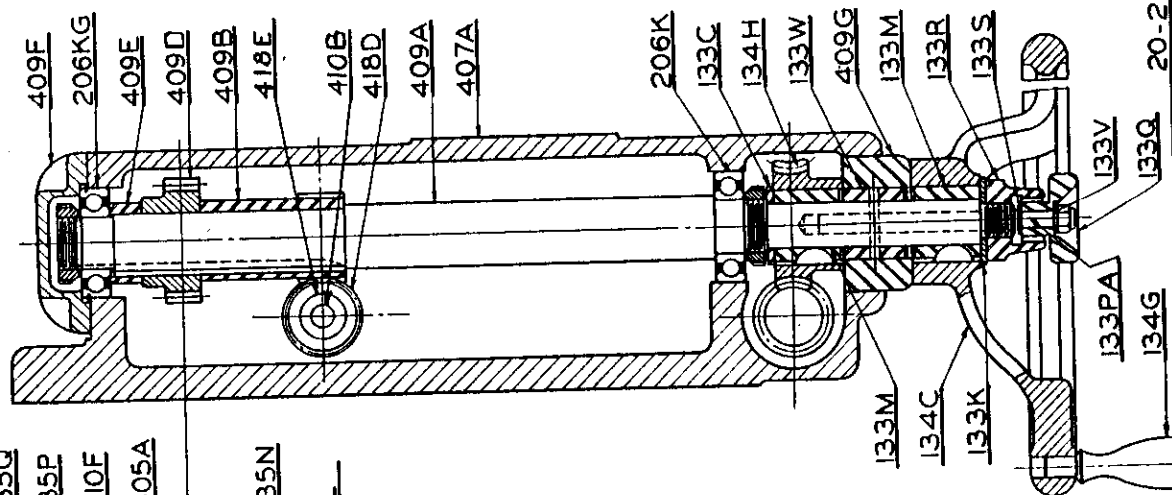
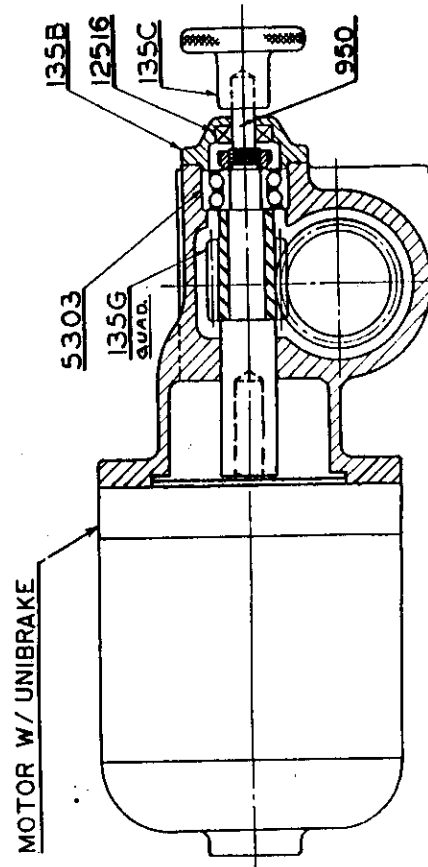
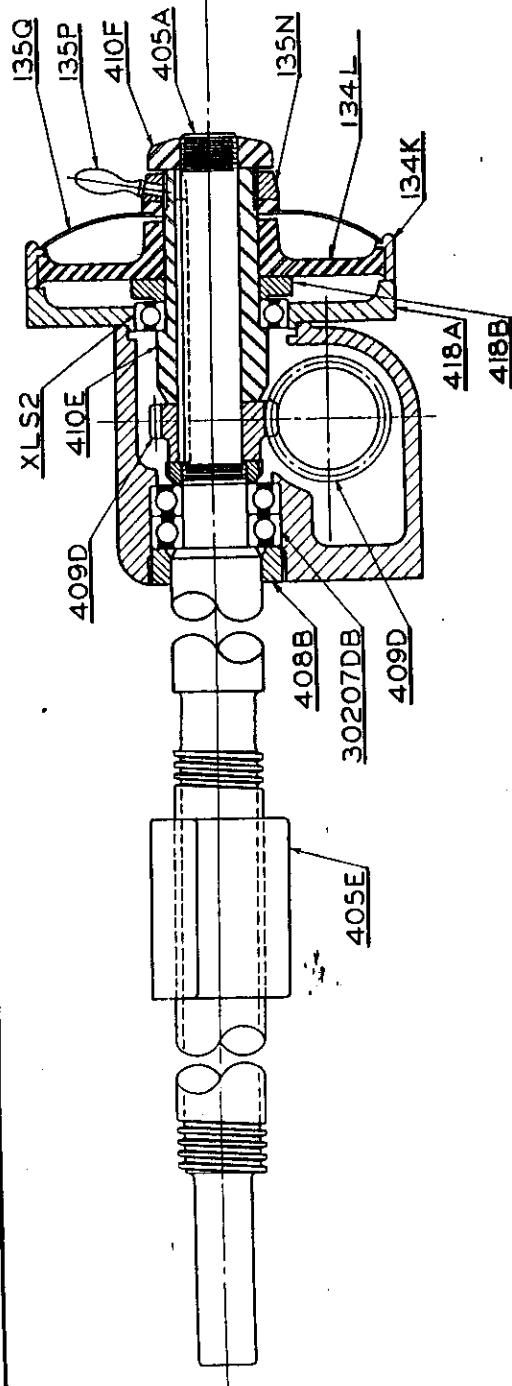
REPAIR PARTS LIST

1836 CLEEREMAN JIG BORER

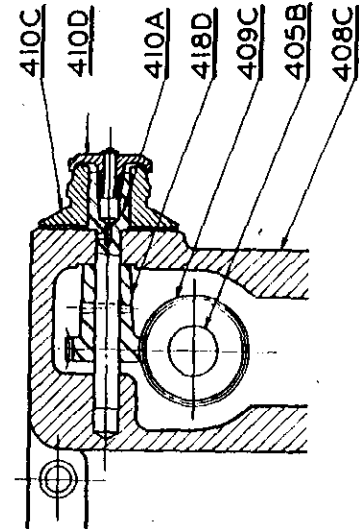
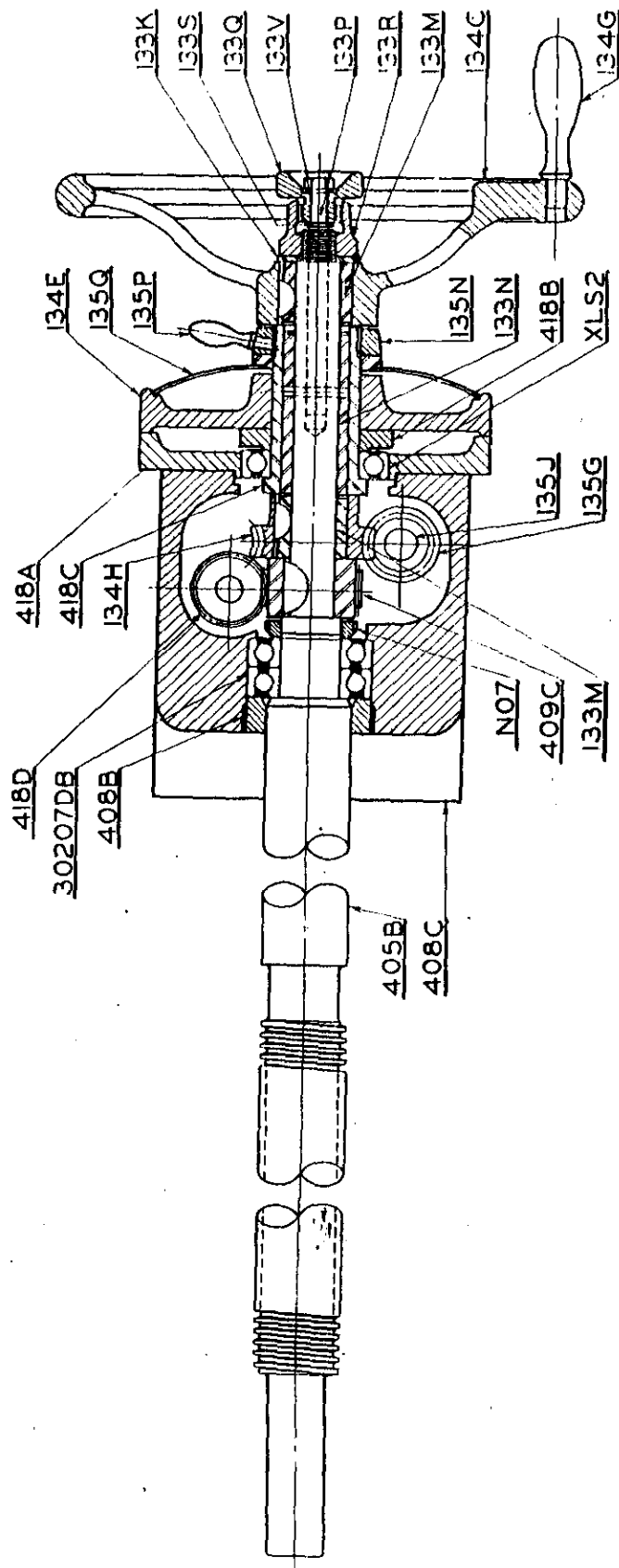
LEAD SCREW ASSEMBLY

(Dwg. 20 - 286 & 20 - 287

2	133K	Washer	1	409C	Worm
4	133M	Serrated Clutch	2	409D	Helical Gears
2	133N	Sliding Keys	1	409E	Spacer
2	133P	Shift Rods	1	410A	Worm Gear Shaft
2	133Q	Hand Knobs	2	410C	Secondary Dials
2	133R	Nuts	2	410D	Binder Screws
2	133S	Washers	1	410E	Dial Sleeve
2	133V	Washers	1	410F	Shaft Nut
1	133W	Sliding Clutch	2	418A	Zero Dials
2	134C	Handwheels	2	418B	Thrust Washers
2	134K	Feed Dial Rings	1	418C	Dial Sleeve
2	134G	Machine Handles	2	418D	Worm Gears
2	134H	Worm Gears	2	XLS2	Ball Bearings
2	134L	Feed Dial Hubs	4	207DB	Ball Bearings
2	135B	Bearing Caps	1	206K	Ball Bearings
2	135C	Handwheels	1	206KG	Ball Bearings
2	135G	Worms	2	5303	Ball Bearings
2	20-950	Worm Shafts	2	N06	Locknuts
2	135N	Capstan Nuts	1	N07	Locknut
6	135P	Machine Handles	2	N03	Locknuts
2	135Q	Disc Hubs	1	N09	Locknut
1	405A	Longitudinal Lead Screw	1	W07	Lockwasher
1	405B	Transverse Lead Screw	2	W03	Lockwashers
2	405E	Lead Screw Nuts	1	W09	Lockwasher
1	407A	Screw Bracket	2	12516	Grease Seal
2	408B	Bearing Closure			
1	408C	Screw Bracket			
1	408G	Spacer Collar			
1	409A	Drive Shaft			
1	409B	Worm			



LONGITUDINAL LEAD SCREW
1836 CLEERMAN JIG BORER
CLEERMAN MACH. TOOL CO.



TRANSVERSE LEAD SCREW
 1836 CLEERMAN JIG SCORER
 CLEERMAN MACH. TOOL CO.

WHEN ORDERING PARTS MENTION MACH. SERIAL NO.

SERVICE INSTRUCTIONS
CLEEREMAN JIG BORER

I. FEED GEAR BOX REMOVAL
(Dwg. 20-234)

The feed gear box is a complete unit in itself and may be removed from the head and taken to the bench for disassembly. The feed gear box must be removed before attempting any disassembly of the head.

1. Unscrew and remove shaft guard 34D.
2. Loosen cap screws on head shaft bearing 39B, on sliding head (20-236).
3. Raise feed shaft 39A up high enough to entirely clear the sliding head and lock in place by means of a 1" set collar slipped over the upper end of the shaft.
4. Remove two of the 3/8" cap screws in the upper flange of the gear box and insert in their place two studs 3" or longer in length. Remove the rest of the cap screws and pry the box off its dowel pins. The box will now hang on the studs and may be easily removed.
5. In replacing this assembly a gasket of the same thickness as the old one must be used as any change in thickness will effect the mesh of the driving gears.
6. The long feed shaft 39A may now be withdrawn from the feed box.

II. DISMANTLING THE FEED GEAR BOX
(Dwg. 20-234)

1. Remove the set screw from the end of the first shaft and the large takeoff gear 36E and 36B.
2. Remove the set screws which hold the two bearing retainer rings 37F on the upper side of the feed gear box.
3. With a bronze rod against the lower end of the intermediate shaft, drive the shaft out until the lower ball bearing is unseated from the shaft. The shaft may then be drawn out and the gears lifted out.
4. Remove the lower bearing cap 34A from the gear box.
5. Proceed as in paragraph 3 to remove the first and third shafts, 36E and 38A.

III. GEAR SHIFTING MECHANISM REMOVAL (Dwg. 20-234)

1. Loosen three cap screws in the plated dial 44G and lift out the entire unit.
2. Screw a 3/8" threaded rod into the end of the lever shaft 44D or 44E. Place a fairly heavy collar over the rod and then a large washer and finally a 3/8" nut. Using the collar as a bumper, withdraw the shaft leaving the levers free to be lifted out.

IV. SPEED GEAR TRAIN REMOVAL (Dwg. 20-233)

The transmission gears are assembled as a unit in a transmission frame which may be removed from the head for further disassembly.

1. Loosen the cap screws and remove the gear box cover 9A.
2. Remove the cap screws holding the motor shaft oil seal 15D in place on the rear of the geared head.
3. Remove the motor dowel pins and cap screws holding the motor in place. Tilt the rear of the motor to cause enough slack in the chain drive to disengage it and slide the motor back so its sprocket will be out of the way of the gear box.
4. Disconnect the copper tubing from the back of the oil pressure gauge.
5. It is necessary at this point to remove the feed gear box as described under item 1. Reach thru the feed box opening and loosen the set screws in the square collar 50D which are mounted on the gear shifter bars (Refer to 20-234). By pulling out on the speed change lever, the collars can be slipped off of the shifter bars.
6. Remove the transmission frame 11A.
7. To remove the spiral bevel gear unit, remove the bottom closure 14D and unscrew the locating plug 15A, and remove the set screw located on the right hand side of the cartridge closure. Drive the bearing cartridge upward using a bronze rod to drive against the lower end of the cartridge.

V. DISMANTLING THE TRANSMISSION FRAME (Dwg. 20-233)

1. Remove the pump including its mounting bracket, the piping and oil distributing trough.

2. Remove the two shifter bars.
3. Remove the three bearing caps 15C and the ball bearing locknuts on the rear end of the shafts.
4. Pull the motor drive gear 22 B.
5. Drive the intermediate shaft to the rear sufficient to place two small spacers between the large gear 17N and the frame 11A. Drive on the rear end of the shaft with a babbitt hammer, driving the shaft out of the front end of the frame.
6. Remove the lower shaft, driving on the rear end of the shaft with a babbitt hammer to unset the rear ball bearing. It is then possible to withdraw the shaft thru the front of the transmission frame.
7. Remove the wire snap ring from the outer race of the double row ball bearing on the front end of the top shaft. Cut two spacers from bar stock about 8-1/4" long, to be placed between the large gear 19 P and the transmission frame. Drive on the rear end of the shaft with a babbitt hammer to unset the rear ball bearing. The shaft may then be withdrawn through the front of the frame.

VI. SLIDING HEAD

(Dwg. 20-236)

Most repairs to the sliding head are of a nature that will not require the removal of the sliding head from the column so we will deal with this phase first. It is to be strongly urged that these steps be followed carefully and no more parts removed than necessary due to the time involved in making adjustments and timing the various functions. (See X for Sliding Head Removal.)

1. Knock out the taper pins from the turnstile hub and remove the two turnstile levers 42A.
2. Remove the cover 28A.
3. If repairs are only required on the feed clutch or worm gear, disassembly of this unit can be carried on with the cross spindle remaining in the sliding head. Proceed exactly as described in paragraph VIII.
4. Knock out the taper pins from the worm 35M and pull the worm shaft 140G out far enough to permit the bevel gear and worm to drop down. Do not strip the ball thrust bearing 35E from the shaft unless necessary.

VII. CROSS SPINDLE REMOVAL

(Dwg. 20-236, Part 139M)

1. Proceed as outlined above in paragraph VI and paragraphs 1 to 7 under spindle and quill instructions on page 17. The feed clutch and cross spindle may then be removed from the machine.

VIII. CROSS SPINDLE DISASSEMBLY - JIG BORER

(Dwg. 20-236 - Part 139M)

1. Remove the two set screws which retain the turnstile hub on the cross spindle and pull the hub off the cross spindle. CAUTION: If this operation is done on an arbor press do not attempt to remove the unit all the way because of the sunk keys in the hub. Do not lose the springs under the clutch fingers.
2. Lift out the sunk keys and remove the worm gear.

IX. FEED DIAL REMOVAL

(Dwg. 20-236)

1. Remove the two 1/4-20 set screws from the lock screw 30A and insert in their place 2 - 1/4 x 1" machine screws. Place a screw driver or other piece of material between the two screws and screw out the lock screw.
2. Turn the moveable portion of the depth dial until the zero coincides with the pointer on the quill cap and lock in this position.
3. Thrust outward on the turnstile levers of the cross spindle which will push the depth dial off its stud.

X. SLIDING HEAD REMOVAL

(Dwg. 20-236)

In case of counterweight chain breakage inside the sliding head or if repairs are needed on the counterweight gear or elevating mechanism it will be necessary to remove the sliding head.

1. Disconnect the feed drive shaft from the sliding head as outlined in paragraph 2 and 3 of Item I - Feed Box Removal.
2. Drain the oil from the sliding head.

3. Block the counterweight as outlined in paragraph 3 and 4, of spindle and quill instructions, Page 17, and break the counterweight chain by removing the connecting link. This is visible on the chain a few inches above the sliding head.
4. Raise the sliding head and remove the small brass block found in the lower portion of the column gear rack.
5. Place a rope or chain sling around the speed gear box and hang there on a small chain fall or rope block of at least 1/4 ton capacity.
6. Disconnect the splined drive shaft from the quill as outlined under paragraph 1 and 2 of spindle and quill instructions and raise the quill to its highest position.
7. Lock the spindle quill clamp.
8. Connect the chain hoist to a sling passed around the sliding head. This will balance if the sling passes behind the turnstile levers.
9. Move the Jig Borer table out toward the front of the machine as far as it will go,
10. Take up the chain hoist until the weight of the sliding head is carried by it. Remove the taper gib and lower the head until it rests on the jig borer table. Note: It may be necessary to tip the front of the head slightly while lowering it to clear the head from the last one inch of the lower portion of the column ways.

XI. NOTES ON REASSEMBLY OF SLIDING HEAD

1. Block up the spindle as directed in spindle and quill instructions, Page 17, paragraph 13.
2. If the feed dial has been removed, reach through the opening in the left side of the head (under the feed dial) with a screw driver and turn the counterweight gear 139R in a counterclockwise direction to take up all of the slack in the counterweight chain.
3. Have the ball thrust bearing 35E in place on the worm shaft before replacing the cross spindle. Check also to be sure the 1/2" rods are in place in the cross spindle and then insert.
4. Try moving the spindle by turning the cross-spindle by hand. Movement up should be difficult with the counterweight parked because it will be necessary to lift the weight of the spindle and quill. Movement down, after removing the blocking should move the wrench which is through the counterweight chain away from the column face almost immediately. Remove the wrench.

5. Replace the worm, bevel gears, cover and turnstile levers.
6. To replace the feed trip dial run the spindle down to the end of its travel as shown on the instructions plate and replace the dial assembly.
7. If the dial has been removed by someone else or has been repaired or replaced, proceed as follows:
 1. Run the spindle down as far as it will go.
 2. Be sure the push rods 40B and 40 F are in place in the cross spindle.
 3. Place the feed trip dial on the stud and with the hand nut directly under the center of the stud, push it back against the head.
 4. Assemble the lock screw in the end of the stud only enough to eliminate all end play in the feed trip dial.
8. To be certain that the assembly is correct, raise the spindle about one inch and set the feed trip dial at about six inches. Shift the feed gears to neutral, engage the feed clutch and feed the spindle down by means of the fine feed handwheel. The feed should disengage about 3/16" to 3/8" before the limit of travel is reached.
9. Run the spindle up to within one inch of the upper limit of travel. Engage the feed and feed the spindle upward by means of the handwheel. The feed should disengage before the limit of travel is reached.
10. To obtain the correct setting, it may be necessary to reset the feed trip dial forward or backward one tooth.
11. After the desired setting is obtained, lock the lock screw 30A against rotation by tightening the two small set screws in the head of the screw.
12. DO NOT USE THE POWER FEED until you have CHECKED the operation of the counterweight and FEED TRIP DIAL.

XII. REMOVE HEAD SCREW ASSEMBLY (Dwg. 20-285 - 286 - 287)

1. Run the table away from the lead screw bracket (to the left or rear).
2. Disconnect the conduit and wiring to the power traverse motor and plugging switch.
3. Remove the cap screws in the flange of the lead screw bracket.
4. Turn the lead screw in a clockwise direction to back the bracket off its dowels.
5. Support the weight of the bracket and continue turning the lead screw until the thread clears the nut.

XIII DISMANTLING THE SCREW BRACKET

It is not necessary to remove the bracket from the machine for disassembly. Repairs to the clutch or gears may be made on the machine. Replacing the ball bearings require removal of the bracket.

1. Remove the screws from the closure 135B and pull up on the fine feed handwheel 135C to remove the worm shaft.
2. Remove the 5/16" nut from the center of the handknob 133Q and then remove the large nut 133 R after which washer 133K and handwheel 134C may be removed.
3. On the 1836 Jig Borer table screw the clutch is exposed by removing the bushing 409G which is retained in the housing 407A by means of a set screw.
- 3A. Back out the dog point set screw in the capstan nut 135N and unscrew the nut and remove the friction disc 135Q. Pull the pin key and remove the graduated dial and the back up washer. Loosen the set screw in the dial sleeve and remove the sleeve. It will help if the capstan nut is replaced to pull on.
4. The clutch keys 133 N may be removed and the 3/16" pin in the slot in the screw may be removed to permit removal of the fine feed worm gear 134H.
5. The lead screw is removed through the rear of the bracket by unscrewing the spanner nut 134A or 408B.

CLEEREMAN JIG BORE²

TAPERED COLLETS

<u>Part No.</u>	<u>Size</u>
34456	No. 4 Morse
34457	No. 3 Morse
34458	No. 9 B & S
34459	No. 2 Morse
34460	No. 1 Morse
34461	No. 7 B & S
34462	No. 5 B & S

STRAIGHT COLLETS

34463	3/8" Collet
34464	7/16" Collet
34465	1/2" Collet
34466	9/16" Collet
34467	5/8" Collet
34468	11/16" Collet
34469	3/4" Collet
34470	13/16" Collet
34471	7/8" Collet
34472	15/16" Collet
34473	1" Collet
34474	1-1/16" Collet
34475	1-1/8" Collet

Write Factory for price and delivery.
Please let us know the serial number of the
machine when ordering parts.

Thank you.