

CLEEREMAN
Drilling Machine
25" & 30" DC
1955 and before

Instruction and Parts Manual

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CLEEREMAN MACHINE TOOL

SLIDING HEAD DRILLING MACHINES

DC
Model 25" x 30" 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; 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 at the bottom of the sliding head 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.

INSTRUCTIONS FOR UNCRATING AND SETTING UP CLEEREMAN SLIDING HEAD DRILLS

1. Remove the crating but be careful to save any small boxes which may be attached. They contain important parts of the machine. The skids should remain attached to the machine until it has been moved to its permanent location or under a crane. Lift the machine with a crane using a rope sling as shown in Fig. 1. Place a pad or felt between the rope and the machine to prevent marring the painted surface. All loose parts such as spindle and shaft guard, piping and wrenches are packed in a separate wooden box attached to the skids.
2. Cleereman Upright Drills have a large base in proportion to its size and weight so it may be located on any good floor. However, it is well to remember that the more solid the foundation, the less trouble there will be from vibration and distortion and the more accurate will be the results. If machines are to be placed on balconies or upper floors, place the machine as near to a pillar or supporting wall as possible.
3. It is recommended that all machines be bolted down but if the machine is placed on a rigid floor with little or no vibration it is not necessary to bolt the machine down.
4. Remove the blocking which holds the counterweight inside the column. On Round column drills it is only necessary to lift the machine off the skid a sufficient height to permit the blocking to fall out. On Box column drills the blocking is removed through the openings in the rear of the column. CAUTION: Do not move the spindle up before removing blocking because of the possibility of getting the counterweight chain off the sheaves.
5. Carefully remove all slushing compound from the spindle, quill, table and ways. Use new clean kerosene and clean rags free from lint. Use a stiff bristle brush to get into corners. Do not use an air hose for cleaning because air pressure will drive grit and dirt into bearing surfaces.
6. All machines are normally shipped completely wired and ready to connect to the line. Connect the wires to the proper terminals of the magnetic switch as indicated on the diagram in the switch cover. The connections should be such that pushing the starting lever on the left side of the head down will cause the spindle to rotate right hand or ready to drive a drill or right hand tap.
7. Fill transmission head and sliding head with oil and oil machine at all oilhole covers on sliding head and table before operating machine under power. See instruction plate on machine and lubricating instructions in this book for full details. (Page 3)
8. For leveling use a sensitive spirit level both lengthwise and crosswise of the base. Use either screw adjusting leveling blocks or wooden wedges under the base as may be necessary.

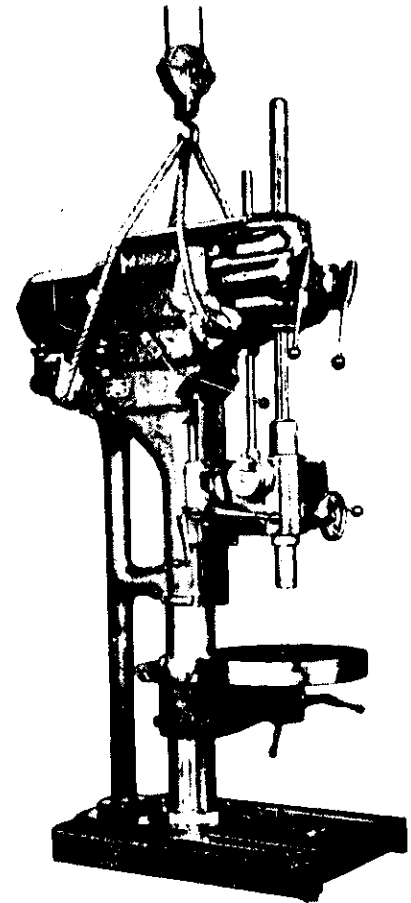


FIG. 1

LUBRICATING INSTRUCTIONS CLEEREMAN SLIDING HEAD DRILLS

1. **Head**—Fill head with a good turbine oil having a viscosity of 450 to 550 seconds Saybolt at 100° F. up to the mark "Oil Level" (Navy code No. 3065). The capacity of the head is about 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 head is being properly lubricated. Low pressure indicates low oil level or 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.

2. **Sliding Head**—Fill feed worm gear case with a "worm gear oil" up to the mark "Oil Level" (Navy code No. 6135). This requires about 2 quarts 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 high grade ball bearing grease suitable for at least six months operation. Replenishment should be about every six months thereafter using about one teaspoonful of grease for each bearing. Pipe plugs, one on the top of the spindle quill and one on the side near the lower end, are provided for this purpose. Use Standard Oil Co. (Ind.) Superla 2X (Navy Symbol 14L3B, Grade B, Medium Grease). A can of suitable grease is included with the machine and additional grease may be purchased from the Cleereman Machine Tool Co. in 1 lb. cans. Apply oil once a week to the splined driving and of the spindle, being sure to get oil on the sides of the splines.

4. **Table and Sliding Head Ways**—The ways for the table and the sliding head ways on the column and also the bearing for the spindle quill in the sliding head should be oiled once a day using a good grade of oil having a viscosity rating of 225 to 300 SSU (Navy Code 2135). This same oil should also be used at the points listed below.

5. **Miscellaneous Oil Cups**—Oil these bearings daily by means of an oil can.
- | | |
|--|---|
| <p>1. Left side of spindle head.</p> <p>(a) Bearing for head elevating shaft</p> <p>(b) Ends of shafts protruding thru side</p> <p>2. Right side of spindle head</p> <p>(a) Turnstile lever unit (all operating parts)</p> <p>(b) Vertical feed shaft bearing</p> <p>3. Two oilcups on top of spindle head</p> | <p>4. End of pin through counterweight sheave at top of column</p> <p>5. Round table arm assembly</p> <p>(a) Two oilcups on elevating mechanism</p> <p>(b) Three oilholes; one in each of the binder levers and clevis</p> <p>6. Counterweight chain—lubricate every week</p> <p>7. Change gear selectors</p> |
|--|---|
6. **Box Column Table Jack**—Grease all fittings with No. 1 consistency Ball Bearing grease with a pressure gun once a week. Apply grease to the screw threads also.
7. **Motor**—The motor is equipped with grease fittings. Apply grease with a pressure gun once a year.

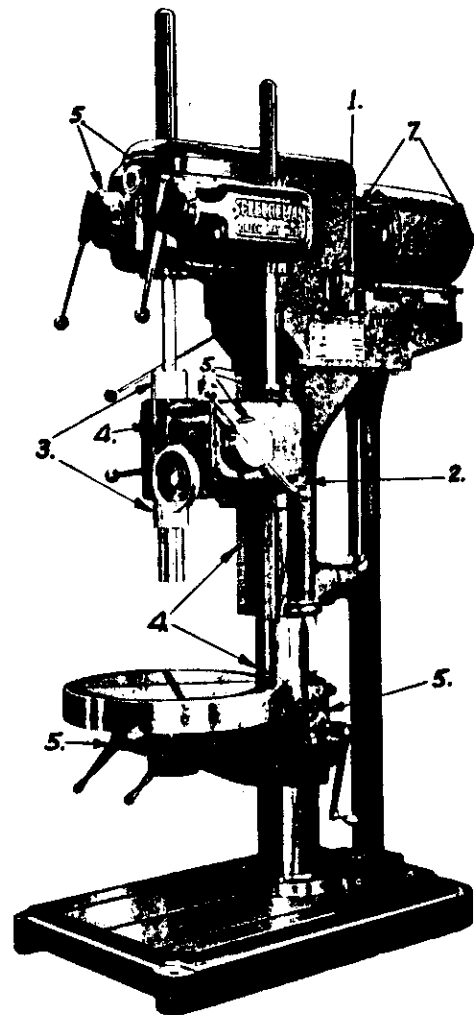
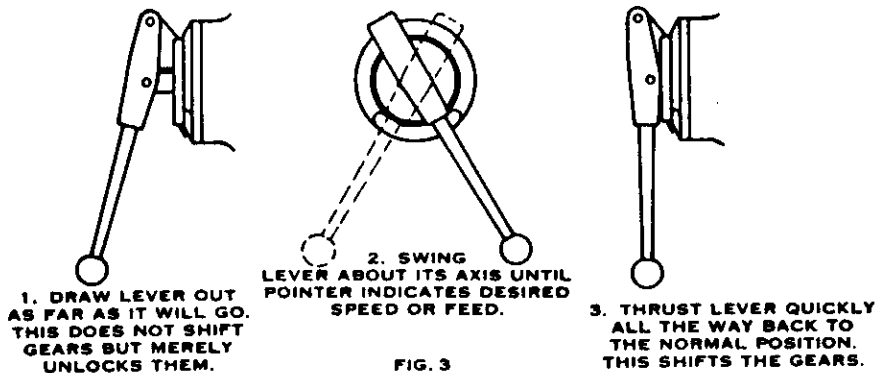


FIG. 2

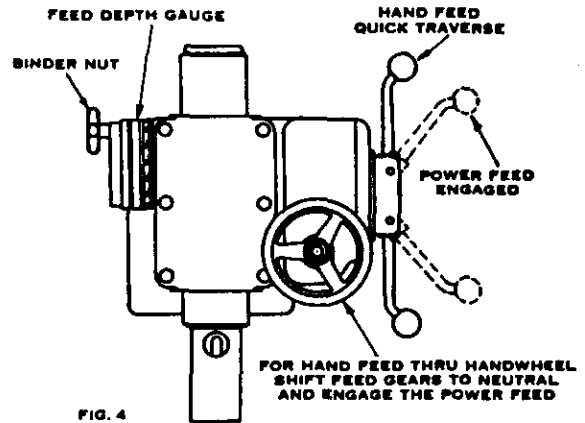
OPERATING INSTRUCTIONS CLEEREMAN SLIDING HEAD DRILL



1. The rotation of the spindle is controlled by means of the long lever on the left side of the machine. The motor should be wired so that pushing the lever down causes the spindle to rotate right hand. Lifting the lever up should reverse the spindle for backing out taps.
2. To change speeds, pull outward on the speed lever, swing to right or left until the arrow points at the desired speed and then thrust the lever all the way in toward the machine. (Fig. 3). Thrusting the lever toward the machine shifts the gears and therefore this should be done with one strong quick motion. It is always best to shut off the motor when changing speeds and it is also helpful to change speeds after the motor is shut off and the machine is coasting to a stop. Any of the four lowest speeds may be selected while the machine is running idle. After becoming accustomed to the machine, the next four speeds may also be changed while running idle. We recommend that the four highest speeds be selected only with the motor shut off.
3. The speed chart indicates directly the proper speed for each drill size at a cutting speed of 80 feet per minute. The speeds indicated are generally suitable for soft tool or machinery steel and for cast iron. Somewhat slower speeds must be used when drilling alloy steels. Materials such as brass, aluminum and magnesium may be drilled at much higher speeds, a good average being $2\frac{1}{2}$ to 3 times as fast as indicated on the chart.
4. Feed changes are made exactly the same as speed changes except the feeds may be changed while the machine is running idle.
5. Feeds shown on the chart are in thousandths of an inch per revolution of the spindle. In general, feeds should be from .005" to .007" for drills up to $\frac{1}{2}$ inch; from .007" to .015" for drills from $\frac{1}{2}$ " to 1"; and from .015" to .020" for drills larger than 1 inch.
6. The speeds and feeds given above are for the average application and may vary considerably on any specific job. They are given as being a good starting point. If conditions are favorable, either the speed or the feed, or both, may be increased. Harder material may cause the drill to wear away too quickly or chip out on the cutting edges in which case the speed and the feed must be reduced. The speeds outlined are for high speed drills only and at these speeds and feeds, a good cutting lubricant is recommended.
7. For drills larger than $1\frac{1}{2}$ ", horsepower requirements may be greater than the capacity of the motor, especially when drilling in steel. Obviously it will be necessary to reduce the speed and feed to stay within the capacity of the motor.

OPERATING INSTRUCTIONS (Cont'd)
CLEEREMAN SLIDING HEAD DRILL

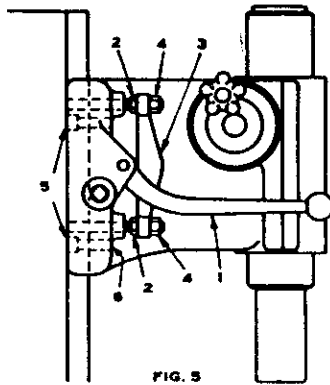
8. In general, it is better to increase the speed and use a lighter feed on all sizes of drills to obtain the maximum drill life (except in cast iron where a heavy feed is desirable).
9. To engage the power feed, thrust either of the quick traverse (turnstile) levers outward or to the right. (Fig. 4) A light thrust inward will disengage the power feed. It is not necessary to hold the power feed engaged; merely thrust out on the lever and then let it go. **DO NOT RIDE YOUR HAND ON THE QUICK TRAVERSE LEVERS.** Holding the power feed engaged will cause the spindle to feed past the desired point.



10. To set the feed depth gauge, run the drill down against the work by means of the quick traverse levers. Loosen the binder nut on the feed depth gauge on the left side of the sliding 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.
11. To use the hand feed through the hand wheel, shift the feed gears to "Neutral" and thrust the quick traverse levers to the right as when engaging the power feed. The small hand-wheel on the front of the sliding head may then be used to feed the spindle for boring, counterboring, spotfacing, heavy drilling, etc.
12. In setting up a job, the first consideration is convenience of operation. Raise or lower the table with a work piece in place to a suitable working height. Then position the sliding head with a drill in the spindle to suit. Always keep the spindle well up in the sliding head when setting up. Never attempt to do any heavy work with the spindle extended way down out of the sliding head. In other words, keep the the sliding head down as close to the work as possible to afford the best support for the spindle. This is especially important where accuracy and good finish are required.
13. Where drills with shanks smaller than No. 4 Morse Taper must be used, always use only one reducing sleeve. A multiplicity of reducing sleeves tends to produce excessive runout.
14. Keep all drills properly ground. It is impossible to drill a clean accurate hole with a drill which is dull or improperly ground.

ADJUSTMENTS

CLEEREMAN SLIDING HEAD DRILL



1. **Sliding Head Gib—(20-605)** (Fig. 5). Raise the binder lever (1) to the locked position. Loosen the locknuts (2) under the vertical binder bar (3). Tighten the nuts (4) on top of the vertical binder bar tight enough to firmly lock the sliding head to the column. Lock this adjustment with the locknuts. Tighten the two short cap screws (5) just enough to allow the head to slide easily when unlocked. This adjustment is locked by means of two set screws (6) extending through the front of the flange and bearing against the end of the cap screws.

2. **Spindle Quill Bearing—Split Bearing Type**—The quill bearing in the sliding head is honed with a $\frac{1}{8}$ " steel shim in place. To adjust for wear, remove the cap screws in the split cap, remove the shim and grind it down to suit.

3. **Spindle Quill Bearing—Removable Cap Type**—The quill bearing in the sliding head is fitted with a removable cap which is scraped flat and fitted before the quill bearing is honed. To compensate for wear, remove the cap and scrape the flanges where they fit on the sliding head. Note: Support the spindle by means of wooden blocking built up from the table, before removing cap.

4. **Table Gib—Box Column Drill**—The three cap screws should be brought up just tight enough to permit the table to be moved easily when unlocked. To adjust the table binder, raise the binder lever to a convenient position (approximately 30° below horizontal); tighten the nut on the rear end of the draw bar and lock with the lock nut.

5. **Table and Arm—Round Column Drill**—There are two binder levers on the front of the table arm under the table; the one on the right for clamping the table and the one on the left for clamping the arm to the column. These levers should be about 30° below horizontal when tightly clamped. To adjust either binder, set the lever in the desired position as above. Loosen the set screw slightly in the clamp screw bearing and tighten the hex nut until the table (or arm) is locked firmly. Tighten the set screw. The bolt at the lower rear of the arm should be brought up just tight enough to permit the arm to be moved easily when unlocked.

REPAIR PARTS LIST
CLEVERMAN SLIDING HEAD DRILL

Speed Change Gears

(Dwg. 20-233)

1	1A	Top Head	1	19M	53T Gear
1	9A	Top Cover	1	20A	Top Shaft *
1	11A	Sub Frame	1	20B	Intermediate Shaft
1	12A	Spindle *	1	20C	Bottom Shaft *
1	13A	Spindle Quill	1	20D	Bearing Spacer
1	13B	Top Closure	1	21A	Bevel Gear **
1	14A	Spindle Drive Sleeve *	1	21B	Bevel Pinion **
1	14B	Bearing Closure	1	22A	17 T Pinion **
1	14C	Bearing Cartridge	1	22B	57 T Drive Gear **
1	15A	Locating Plug	1	32A	Pump Bracket
3	15C	Bearing Caps	1	32B	Oil Trough
1	15D	Motor Shaft Seal	1	32C	Oil Pump
1	16H	Clutch Gear	1	32D	Oil Gauge
1	16J	Cluster Gear	1	34C	Spindle Guard
1	16K	Idler Gear	1	43A	Lever Hub
1	17B	43T Gear	1	43B	Speed Change Lever
1	17C	40T Gear	1	43C	Lever Handle
1	17J	52T Gear	1	44A	Dial Cap
1	17K	35T Gear	2	7212	Ball Bearings
1	17L	31T Gear	1	5207G	Ball Bearing
1	17M	17T Gear	1	207	Ball Bearing
1	18A	Gear Sleeve	3	306	Ball Bearings
1	18B	Gear Spacer	2	306G	Ball Bearings
1	18C	Gear Spacer	6	N06	Locknuts
1	18D	Washer	1	N11	Locknut
1	19A	Spacer	6	W06	Lockwashers
2	19C	Washers	1	W11	Lockwasher
1	19F	Spacer	2	F838	Bushings
1	19K	Clutch Gear	1	275120	Oilseal
1	19L	Cluster Gear *			

* 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
 CLEVERMAN SLIDING HEAD DRILL
 FEED CHANGE GEARS

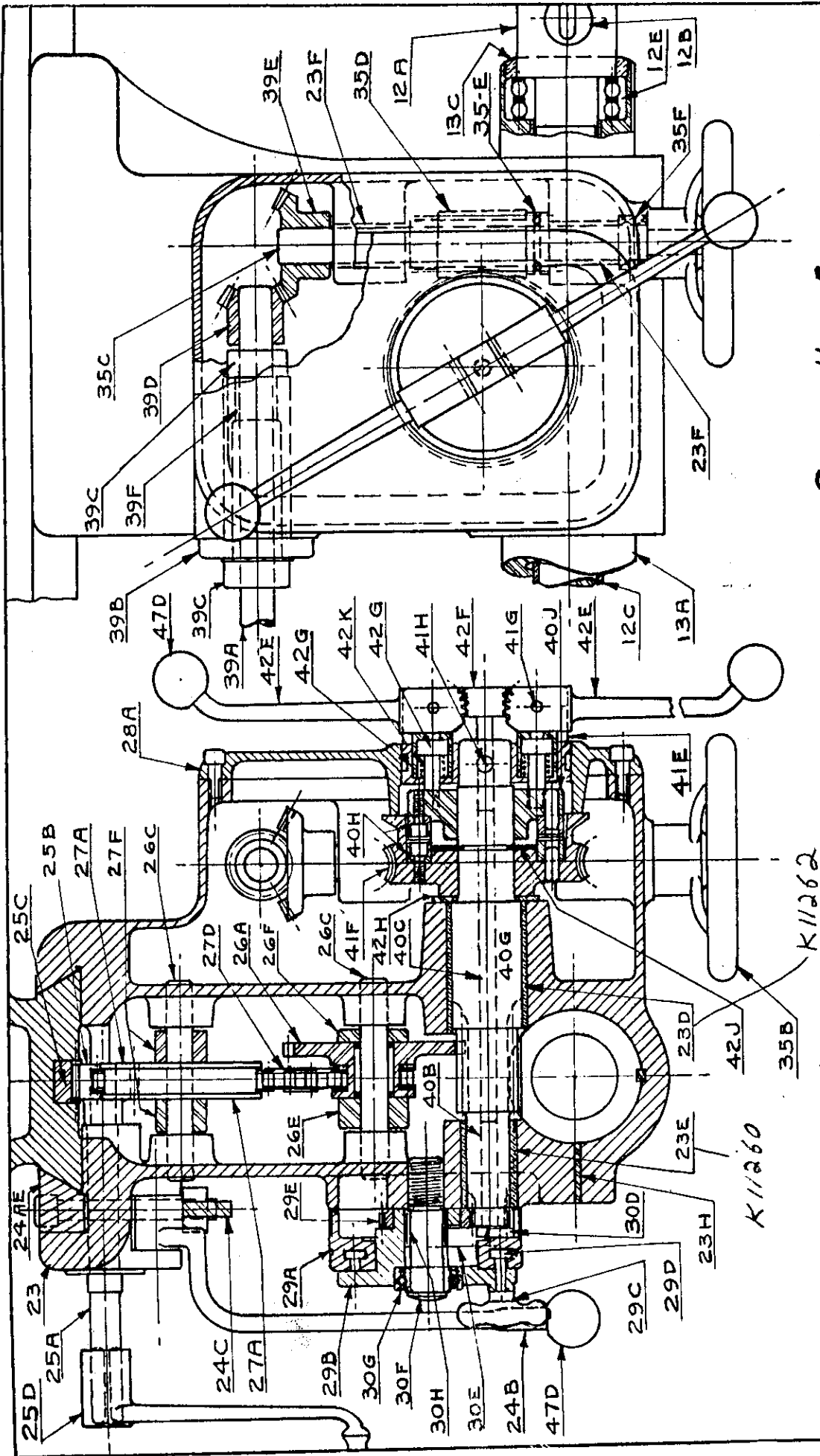
(Dwg. 20 - 234)

1	10A	Feed Gear Box	1	44B	Speed Rod
1	11A	Sub Frame	1	44C	Feed Rod
1	12A	Spindle	1	44D	Speed Shifter Pin
1	14A	Spindle Drive Sleeve	1	44E	Feed Shifter Pin
1	14B	Bearing Closure	2	44F	Springs
1	14C	Bearing Cartridge	1	45A	Speed Selector
1	16J	Cluster Gear	1	46A	Feed Selector
1	20C	Bottom Shaft	4	47A	Gear Shift Lock
1	32A	Pump Bracket	2	47B	Keeper Bar
1	32C	Oil Pump	1	47E	Extension Spring
1	34A	Bearing Cap	2	48A	Shifter Arm
1	34B	Bearing Closure	2	48B	Bushings
1	34D	Feed Shaft Guard	2	48C	Washers
1	36A	Splined Shaft	4	48D	Bushings
1	36B	Takeoff Gear	2	48E	Links
1	36C	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	38A	Transfer Quill	1	50B	Bottom Shoe
1	38B	Change Gear	1	50C	Top Shoe
1	39A	Feed Drive Shaft	2	50D	Collars
2	43A	Lever Hubs	1	S13R	Ball Bearing
1	43B	Feed Change Lever	1	S13RP	Ball Bearing
2	44A	Dial Caps	4	1205	Ball Bearings

REPAIR PARTS LIST
 CLEEREMAN SLIDING HEAD DRILL
 SLIDING HEAD ASSEMBLY
 (Dwg. 20-235)

1	12A	Spindle ^{6spl.} 34827 6 Spline	1	29D	T-bolt
1	12B	Tang Plug - 34104	1	29E	42 T. Ring Gear
1	12C	Spacer	1	30D	Feed Trip Dog
1	12D	Spindle Bearing (209) ^{KB-1167}	1	30E	Safety Trip Dog
1	12E	Spindle Bearing (5209) ^{KB-1170}	1	30F	Feed Dial Stud
1	13A	Spindle Quill	1	30G	Ball Bearing - ^{KB-11144}
1	13B	Top Closure	1	30H	Needle Bearing - ^{KB-5348}
1	13C	Bottom Closure	1	30K	Lock Screw
1	23	Sliding Head	1	35B	Handwheel
1	23D	Bushing	1	35C	Worm Shaft
1	23E	Bushing	1	35D	Feed Worm
2	23F	Bushings	1	35E	Ball Thrust Bearing
1	23G	Quill Key	2	35F	Oil Seals
1	23H	Bearing Cap	1	39A	Feed Drive Shaft
1	23R	Operating Shaft	1	39B	Bearing
1	23S	Lock Dog	1	39C	Set Collar
1	23T	Spring	1	39D	Bevel Pinion
1	24AE	Sliding Head Gib	1	39E	Bevel Gear
1	24B	Head Binder Lever	2	39F	Bushing
1	24C	Equalizer Bar	1	39G	Pinion Shaft
1	25A	Elevating Shaft	1	40B	Cam Pin - ⁴³¹⁸²⁻⁰¹⁻³⁴²⁰⁰
1	25B	Elevating Pinion	1	40C	Push Rod
1	25C	Elevating Rack	1	40G	Cross Spindle
1	25D	Crank Handle	2	40H	Clutch Rings
2	25E	Head Binder Studs	1	40J	Sliding Sleeve
1	25K	Rack Stop	1	41E	Quick Return Hub
1	26A	Balance Gear	1	41F	Feed Worm Gear
1	26B	Sheave Pin	2	41G	Taper Pin
1	26C	Balance Gear Pins	1	41H	Taper Pin
1	26E	Collar	2	42E	Turnstile Levers
1	26F	Spacer	1	42F	Equalizer Rack - ²⁵¹⁰⁴
2	27A	Chain Sheave	2	42G	Plungers
1	27D	Counterweight Chain	1	42H	Washer
2	27F	Set Collar	1	42J	Split Washer
1	28A	Sliding Head Cover	2	42K	Spring
1	29A	Feed Depth Dial	2	42L	Adjusting Screw
1	29B	Feed Dial Hub	1	42M	Pin
1	29C	Handnut			

NOTE: MANUAL INCLUDES TWO (2) DRAWINGS OF
 SLIDING HEAD ASSEMBLY -- 20-235 & 20-605.
 PLEASE USE WHICHEVER DRAWING APPLIES
 TO YOUR MACHINE.



SLIDING HEAD ASSEMBLY
 CLEERMAN SLIDING HEAD DRILLS
 CLEERMAN MACHINE TOOL CO.
 GREEN BAY WIS. 20-235

DRILLING MACHINE

WHEN ORDERING PARTS MENTION MACHINE SERIAL NUMBER

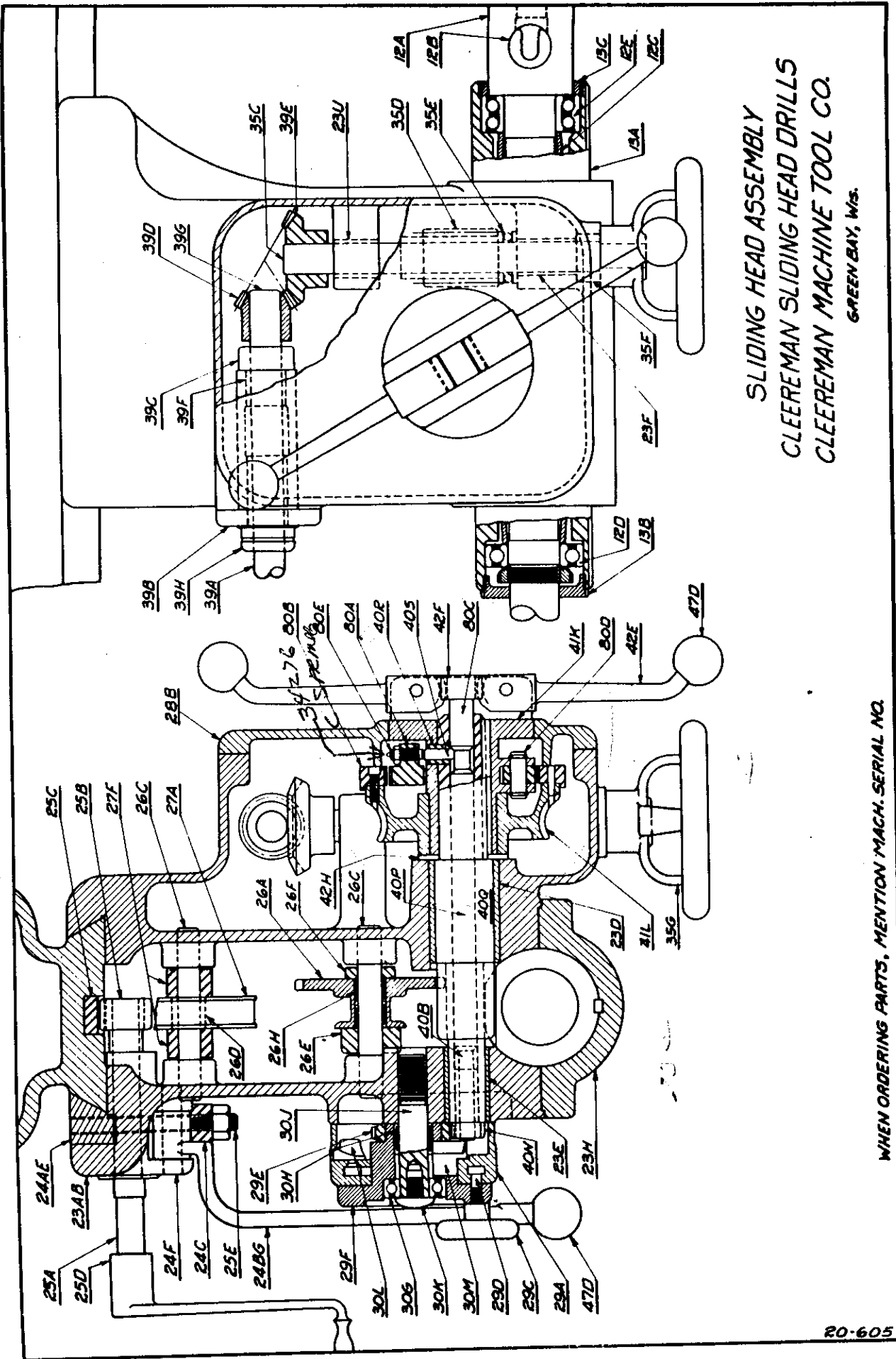
REPAIR PARTS LIST

CLEEREMAN SLIDING HEAD DRILL

SLIDING HEAD ASSEMBLY

(Dwg. 20-605)

1	12A	Spindle	1	29D	T-Bolt
1	12B	Tang Plug	1	29E	42 T Ring Gear
1	12C	Spacer	1	30G	Ball Bearing
1	12D	Spindle Bearing(209)	1	30H	Needle Bearing
1	12E	Spindle Bearing(5209)	1	30J	Feed Dial Stud
1	13A	Spindle Quill	1	30K	Lock Screw
1	13B	Top Closure	1	30L	Feed Trip Dog
1	13C	Bottom Closure	1	30M	Safety Trip Dog
1	23	Sliding Head	1	35C	Worm Shaft
1	23D	Bushing	1	35D	Feed Worm
1	23E	Bushing	1	35E	Ball Thrust Bearing
2	23F	Bushings	2	35F	Oil Seals
1	23H	Bearing Cap	1	35G	Hand Wheel
1	23R	Operating Shaft	1	39A	Feed Drive Shaft
1	23S	Lock Dog	1	39B	Bearing
1	23T	Spring	1	39C	Set Collar
1	23U	Key Plug	1	39D	Bevel Pinion
1	24AE	Sliding Head Gib	1	39E	Bevel Gear
1	24BG	Head Binder Lever	2	39F	Bushings
1	24C	Equalizer Bar	1	39G	Pinion Shaft
1	25A	Elevating Shaft	1	40B	Cam Pin
1	25B	Elevating Pinion	1	40N	Cross Spindle Pinion
1	25C	Elevating Rack	1	40P	Push Rod
1	25D	Crank Handle	1	40Q	Cross Spindle
2	25E	Head Binder Stud	2	40R	Bushings
1	25K	Rack Stop	2	40S	Actuating Pins
1	26A	Balance Gear	2	41G	Taper Pins
1	26B	Sheave Pin	1	41K	Quick Return Hub
1	26C	Balance Gear Pin	1	41L	Worm Gear
1	26E	Collar	2	42E	Turnstile Levers
1	26F	Spacer	1	42F	Equalizer Rack
2	27A	Chain Sheave	1	42H	Washer
1	27D	Counterweight Chain	2	80A	Feed Clutch Shoes
2	27F	Set Collars	1	80B	Feed Clutch Ring
1	28B	Sliding Head Cover	1	80C	Rack Pin
1	29A	Feed Depth Dial	2	80D	Shoe Pins
1	29B	Feed Dial Hub	2	80E	Actuating Screws
1	29C	Hand Nut			



SLIDING HEAD ASSEMBLY
 CLEEREMAN SLIDING HEAD DRILLS
 CLEEREMAN MACHINE TOOL CO.
 GREEN BAY, WIS.

WHEN ORDERING PARTS, MENTION MACH. SERIAL NO.

SERVICE INSTRUCTIONS

CLEEREMAN SLIDING HEAD DRILLS

I. FEED GEAR BOX REMOVAL

(Dwg. 20-234) (Page 8)

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 feed shaft bearing 39B, on sliding head (20-605) (Page 9)
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 or lathe dog slipped over the upper end of the shaft.
4. The cap screws in the flange of the feed gear box may now be loosened and the gear box removed from the head.
5. The long feed shaft 39A may now be withdrawn from the feed box.

II. DISMANTLING THE FEED GEAR BOX

(Dwg. 20-234) (Page 8)

1. Remove the set screw from the end of the first shaft and the large takeoff gear 36A and 36B.
2. Remove 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, 36A and 38A.

III. GEAR SHIFTING MECHANISM REMOVAL

(Dwg. 20-234) (Page 8)

1. Loosen three cap screws in the plated dial 44A and lift out the entire unit.
2. Screw a $\frac{3}{8}$ " 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 $\frac{3}{8}$ " 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) (Page 7)

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 from the cover 15D around the motor shaft.
2. Remove the cap screws which hold the motor down and lift the motor off the dowel pins. Slide the motor back far enough so that the motor gears are completely out of mesh.
3. Remove the top cover 9A.
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 I.
6. Reach thru the feed box opening and loosen the set screws in the square collars 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.
7. Remove the transmission frame 11A.
8. To remove the spiral bevel gear unit (after transmission is removed), remove the bottom closure 14B and unscrew the locating plug 15A. 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) (Page 7)

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 22B.
5. Drive the intermediate shaft to the rear sufficient to place two small spacers between the large gear 17J 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 unseat 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 8¼" long, to be placed between the large gear 19M and the transmission frame. Drive on the rear end of the shaft with a babbitt hammer to unseat the rear ball bearing. The shaft may then be withdrawn through the front of the frame.

VI. SLIDING HEAD

(Dwg. 20-605) (Page 9)

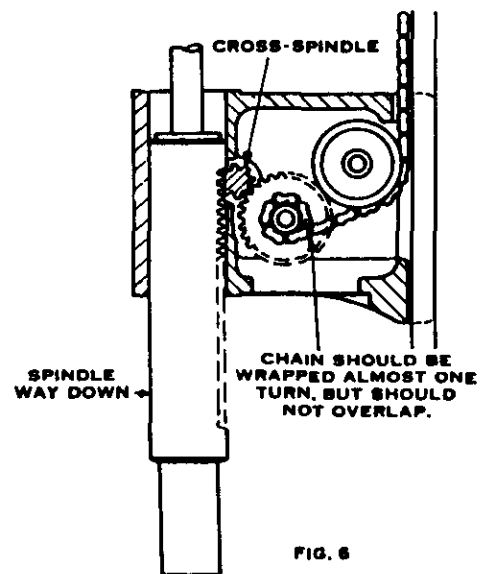
Most repairs to the sliding head are of a nature that will not require the removal of the sliding head from the column so we will deal with this phase first. It is to be strongly urged that these steps be followed carefully and no more parts removed than necessary due to the time involved in making adjustments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

1. Knock out the taper pins from the turnstile hub and remove the two turnstile levers 42E.
2. Remove the cover 28B.
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 IX.
4. Knock out the taper pins from the bevel gear 39E and the worm 35D and pull the worm shaft 35C 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.

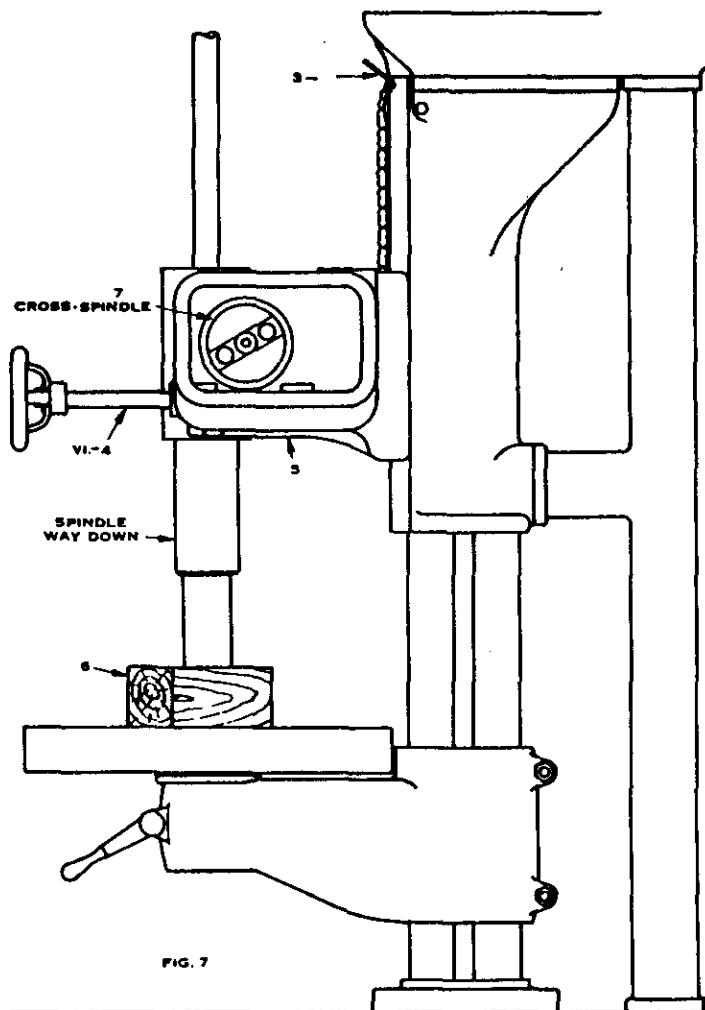
VII. CROSS SPINDLE REMOVAL

(Dwg. 20-605—Part 40Q) (Fig. 6 and Fig. 7)

1. Run the spindle and sleeve down as far as it will go in the sliding head. Mark the sleeve so that it may be reassembled at the same point.
2. Note carefully the exact reading on the feed depth dial and tighten the handnut so that this reading will not be changed. (See Par. XI, Items 1 and 2).
3. Insert a 3/16" hex wrench (the type used for hollow head set screws) through the counterweight chain directly above the sliding head with the short leg of the wrench pointing down behind the chain and the long leg lying horizontal, pointing at the spindle. (Fig. 7)



VII. CROSS SPINDLE REMOVAL (Cont'd)



4. Raise the sliding head on the column until $3/16$ " hex wrench is up against the face of the column and the chain is just barely slack beneath the wrench.
5. Remove the sheet steel plate from the under side of the sliding head and note the position of the chain on the chain gear so that this can be placed in the same position at reassembly. (Fig. 6)
6. Block up the spindle and sleeve with wooden blocking built up from the table.
7. The cross spindle, worm gear and feed clutch assembly may then be removed as a unit.
8. The spindle and sleeve may now easily be removed if desired. Insert a short length of $7/16$ " diameter rod through the drift slot to facilitate handling, remove the blocking and lower the spindle to the base.

VIII. CROSS SPINDLE DISASSEMBLY—DRILLING MACHINE

(Dwg. 20-605—Part 40Q) (Page 9)

1. Slide out rack pin 80C and push rods. Remove cap screws which hold the feed clutch ring to the worm gear and pull the taper dowel pins. Remove the clutch ring and "C" spring. Then swing feed clutch shoes 80A out of position for removal of actuating pins 40S. Next drive out the bushings 40R which pin the turnstile hub to the cross spindle.
2. The turnstile hub together with the worm gear may now be taken off the cross spindle.
3. If necessary, the clutch shoes may be removed from the turnstile hub by slipping off the rubber snap rings and driving out the dowel pins. Caution: Do not disturb the setting of the adjusting screws 80E unless absolutely necessary.
42L.

IX. CROSS SPINDLE REASSEMBLY—DRILLING MACHINE

(Dwg. 20-605—Part 40Q) (Page 9)

1. Hold the cross spindle in a vise in a horizontal position and reassemble first the washer, then press on the turnstile hub with worm gear in place. Insert a $3/4$ " rod in the cross spindle bore and drive in the bushings. Replace operating pins. With the clutch shoes in position replace the clutch ring on the worm gear.

IX. CROSS SPINDLE REASSEMBLY—DRILLING MACHINES (Con'd)

2. The clutch shoes should not need adjustment, but if necessary proceed as follows: Still holding the cross spindle in the vise, insert the rack pin as far as it will go. Next, engage the top clutch shoe teeth into those of the ring, and then adjust the shoe screw until there is no play. At this point make sure that the bottom pin does not touch the rack pin which floats in the bore. Now back off the screw about one-sixth of a turn. Engaging the bottom shoe to the ring, adjust the shoe screw until there is no play. Replace the operating levers to the turnstile hub and test this adjustment in different positions of the clutch ring. Equal pressure should be exerted on each clutch shoe. Lock the adjusting screws in place with jam nuts and insert the "C" spring in the set screw hex holes.

X. COUNTERWEIGHT CHAIN, ETC.

1. Proceed as outlined in paragraph VII, Items 1 to 5 inclusive.
2. Loosen the set screws in the collar 26E and drive out the pin 26C, thus permitting the chain gear to drop down.
3. The chain may be disconnected at the connecting link which is located about the middle of the chain along the face of the column.
4. Loosen the set screw which holds the shaft 26C through the chain sheave and drive out the shaft to remove the sheave 27A.

XI. FEED DIAL REMOVAL

(Dwg. 20-605) (Fig. 8)

1. The feed trip dial must be set in timed relation to the spindle to provide a safety feed disengagement at both ends of the spindle travel. To remove the feed trip dial and replace it correctly, proceed as follows:
2. Run the spindle down to the end of its travel (1). Loosen the handnut on the feed trip dial (2). Turn the knurled dial until the scribed lines on the rims of the knurled dial and the dial hub coincide (3). Note carefully the reading on the dial in line with the arrow (4). **MARK DOWN THIS FIGURE SO IT WON'T BE FORGOTTEN.**
3. Loosen the two set screws in the screw head (5) in the center of the feed trip dial and back out the screw. Pull off the dial—this can best be done by thrusting out on the quick traverse levers while the spindle is way down (6).

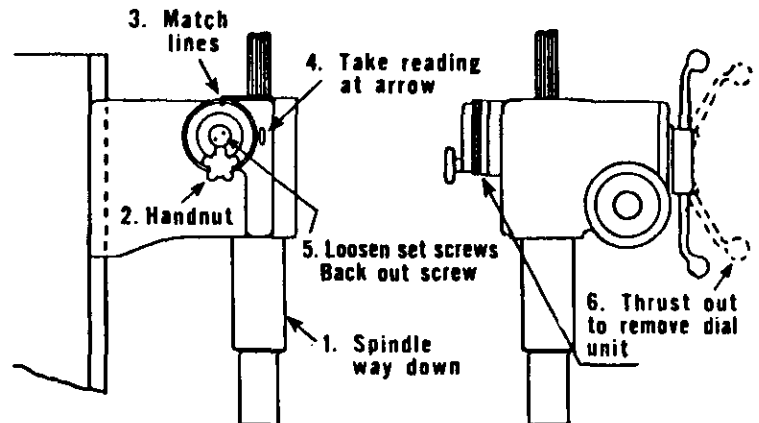


FIG. 8

XII. FEED DIAL DISASSEMBLY

(Dwg. 20-605) (Page 9)

1. Tap out the ball bearing 30G using a brass rod against the inner race.
2. Drive the needle bearing 30H out far enough to clear the safety trip dog 30M.
3. Loosen and remove the handnut 29C.
4. Push the safety trip dog 30M into the bore of the hub 29B enough to clear the knurled dial 29A.
5. The knurled dial may then be lifted from the hub.
6. The safety trip dog may then be slipped out of the hub and the feed trip dog may be removed by loosening one screw.

XIII. SLIDING HEAD REMOVAL

(Dwg. 20-605) (Page 9)

Any part on the sliding head which may become damaged or worn may be removed in accordance with the foregoing instruction. If for any reason it becomes necessary to remove the sliding head, proceed as follows:

1. Park the counterweight as directed in paragraph VII, Item 3.
2. Disconnect the chain at the connecting link which is located about the middle of the chain.
3. Lower the sliding head by means of the hand crank down near the end of the dovetail where it should be supported on wooden blocking built up from the table.
4. Remove the binder lever 24B and the binder equalizer bar 24C after which the studs and cap screws should be unscrewed from the gib.
5. The sliding head may then be swung away from the column.

XIV. NOTES ON REASSEMBLING THE SLIDING HEAD

(Dwg. 20-605) (Page 9)

1. Hold or block spindle and sleeve up as directed in Paragraph VII.
2. Reach through the opening in the underside of the sliding head and turn the chain gear 26A with the chain passing UNDER the gear to take up the slack in the chain or to the same relative position as noted in paragraph VII, Item 5 (see Fig. 6)
3. Have the ball thrust bearing in place on the worm shaft before replacing the cross spindle assembly. Check also to be sure that the push rods are in place in the cross spindle. Insert the cross spindle.
4. Try moving the spindle by hand. There should be little or no movement down since the spindle should be at its lower limit of travel. Movement up should be difficult because with the counterweight parked, it is necessary to lift the weight of the spindle and sleeve. Remove the wrench and try the spindle through its full travel. The chain should be wrapped on the hub of the chain gear almost a full turn (but not overlapping) (Fig. 6) when the spindle is down and tangent to the hub when the spindle is up.
5. Replace the worm shaft, fitting the ball bearing, worm and bevel gears as shown on drawing 20-605. Refill the worm gear case with oil.
6. Replace the cover 28B, and fit the turnstile levers.
7. To replace the feed trip dial, run the spindle down to the end of its travel (1). See that the scribed lines on the rim of the dials (3) are in line and then place the dial back on the stud so that the arrow points at the SAME FIGURE as it did when the dial was removed (4) (Refer to Paragraph XI) (Fig. 8).
8. If the dial has been removed without close attention to the instructions, or if a new dial is to be mounted proceed as follows:
 - a. Run the spindle down as far as it will go.
 - b. Be sure the push rods 40B and 40P are in place in the cross-spindle.
 - c. Place the feed-depth dial on the stud and with the hand nut directly under the center of the stud, push it back against the head.
9. Assemble the lock screw in the end of the stud only enough to eliminate all end play in the dial.
10. Raise the spindle about $1\frac{1}{2}$ " and set the depth gauge at about six inches. Engage the feed clutch by thrusting out on the turnstile levers. Shift the feed gears to neutral and feed the spindle down by means of the handwheel on the front of the sliding head. The clutch should disengage before the limit of travel is reached. Try it again, this time holding the turnstile levers in engagement. The clutch should be positively disengaged about $\frac{1}{4}$ " to $\frac{3}{8}$ " before the limit of travel is reached, and it should be impossible to re-engage the feed without first raising the spindle.

XIV. NOTES ON REASSEMBLING THE SLIDING HEAD (Cont'd)

11. Repeat this procedure near the upper limits of travel by feeding upward. To obtain the desired results, it may be necessary to rotate the dial forward or back one tooth. To back off the dial easily, remove the lock screw, set the dial between 0 and 12½ and thrust outward on the turnstile levers.
12. After the desired setting is obtained, lock the lock screw (5) (Fig. 8) against rotation by tightening the two small set screws in the head of the screw.
13. Set the dial to trip out at a small distance, say one inch, and note the position of the 0 at the point where the feed trips out. Set the pointer at this position so that it points at 0 when the feed trips out.
14. Do not use the power feed until you have checked the operation of the counterweight and the feed trip.