

# **CLEEREMAN**

## **Layout**

## **Drilling Machine**

### **Instruction and Parts Manual**

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# CLEEREMAN MACHINE TOOL CORPORATION

## LAYOUT DRILLING MACHINE

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.

INSTRUCTIONS FOR UNCRATING AND SETTING UP  
CLEEREMAN SLIDING HEAD DRILLS

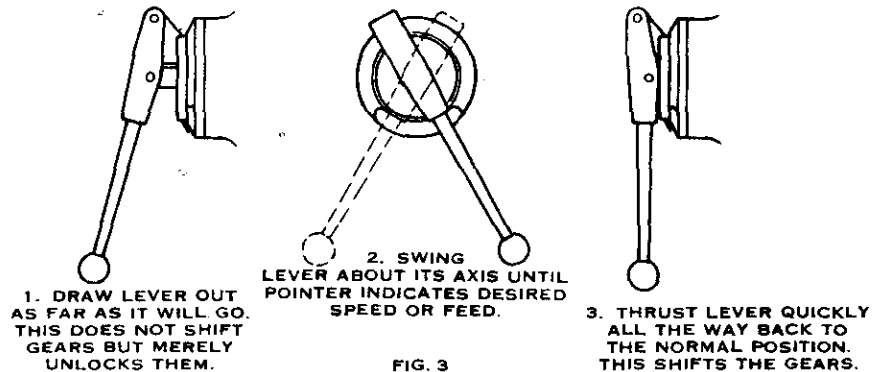
1. Remove the crating but be careful to save any small boxes which may be attached. They contain important parts of the machine. The skids should remain attached to the machine until it has been moved to its permanent location or under a crane. Lift the machine with a crane using a rope sling as shown 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 guard 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 oil-hole 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.

## SPECIAL INSTRUCTIONS

### CLEEREMAN LAYOUT DRILLING MACHINE

1. Set up the frame of the machine in accordance with the "Instructions for Uncrating and Setting Up" contained herein (preceding pages.)
2. Do not install this machine in direct blast from heating or ventilating fan, near a radiator or steam line or in direct rays of the sun.
3. Remove all shipping grease and every particle of foreign matter on sliding ways and bearing surfaces including the spindle and quill (any minute particle of foreign matter may change the machine alignment), and then apply a good grade of filtered oil (SAE 10).
4. Carefully level the machine using a precision mechanics level (not a carpenter or bricklayer type). Place the level on the table with the vial parallel to the length of the table. Add whatever shims may be necessary. With the level on the table with the vial parallel to the ways of the base, add the necessary shims to the rear pad of the base. It is advisable to check the machine periodically to keep it level.
5. All sliding ways including sliding head ways on the column and quill bearing in sliding head have been scraped to a very close fit, in fact almost metal to metal contact. ALL THE GIBS HAVE BEEN SET QUITE TIGHT, CONSEQUENTLY THE MACHINE WILL OPERATE A LITTLE STIFFLY FOR THE FIRST FEW WEEKS. KEEP ALL THESE SURFACES CLEAN AND WELL LUBRICATED TO PREVENT SCORING.
6. Keep screws for saddle and table movement well lubricated. THIS MACHINE IS EQUIPPED WITH PRECISION HARDENED AND GROUND LEAD SCREWS, SO THEY SHOULD BE OILED AT LEAST TWICE DAILY TO AVOID WEAR AND THUS KEEP THEIR ACCURACY. NEVER ATTEMPT TO MOVE SADDLE OR TABLE WHEN IN THEIR CLAMPED POSITIONS, SO AS NOT TO INJURE THE PRECISION SCREWS.

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.

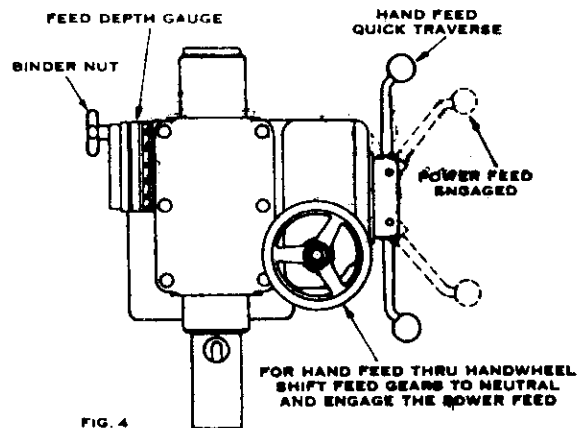
6. The speeds and feeds given above are for the average application and may vary considerably on any specific job. They are given as being a good starting point. If conditions are favorable, either the speed or the feed, or both, may be increased. Harder material may cause the drill to wear away too 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.

OPERATING INSTRUCTIONS (Cont'd.)  
CLEEREMAN SLIDING HEAD DRILL

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.

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.

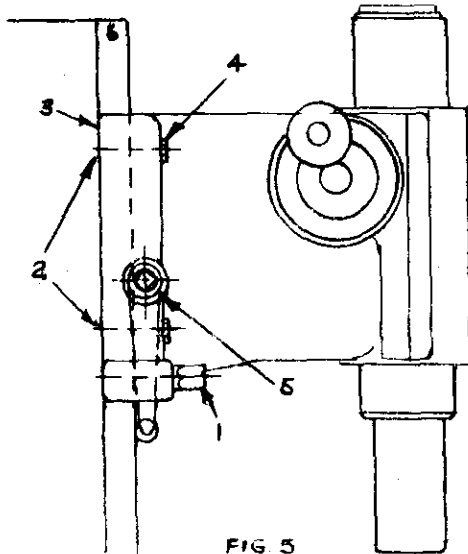
11. To use the hand feed through the hand wheel, shift the feed gears to "Neutral" and thrust the quick traverse levers to the right as when engaging the power feed. The small handwheel on the front of the sliding head may then be used to feed the spindle for boring, counterboring, spotfacing, heavy 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 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~~<sup>637</sup>) (Fig.5) - Loosen set screws (2) behind gib (3) and adjust hexagon head screws (4) evenly so that the sliding head can be moved up and down freely, with elevating lever and crank (5). Then check with a .0015 shim to see if all ways on sliding head are closed to the column ways (6), thus giving you proper bearing surface between sliding head and column. Re-tighten set screws (2) against hexagon head screws.

2. 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.

3. 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.

4. 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

## 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.





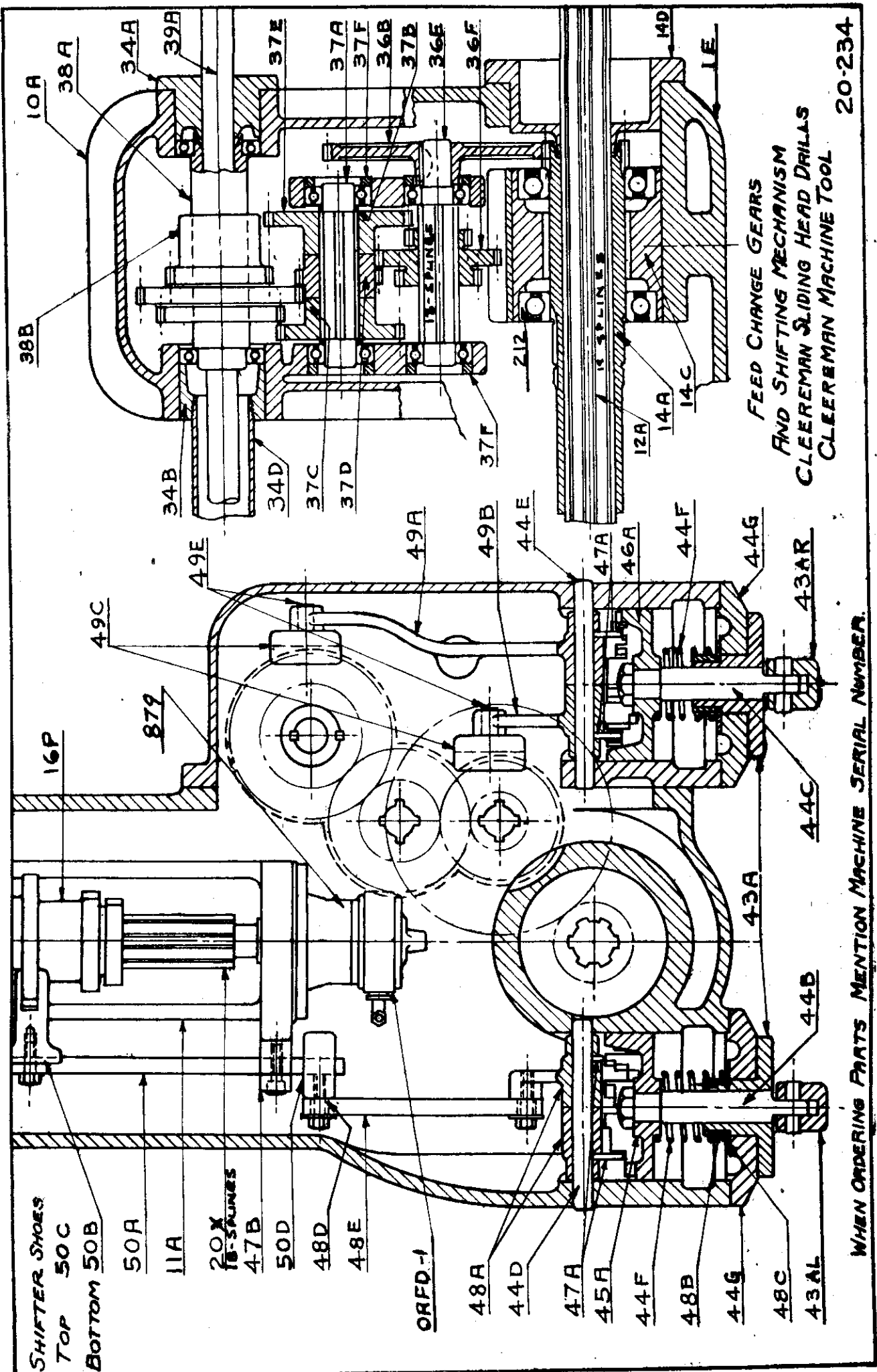
## REPAIR PARTS LIST

### 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  
CLEARMAN SLIDING HEAD DRILLS  
CLEARMAN MACHINE TOOL

20-234

SHIFTER SHOES  
TOP 50C  
BOTTOM 50B

50A  
11A  
20X  
18-SPLINES  
47B  
50D  
48D  
48E

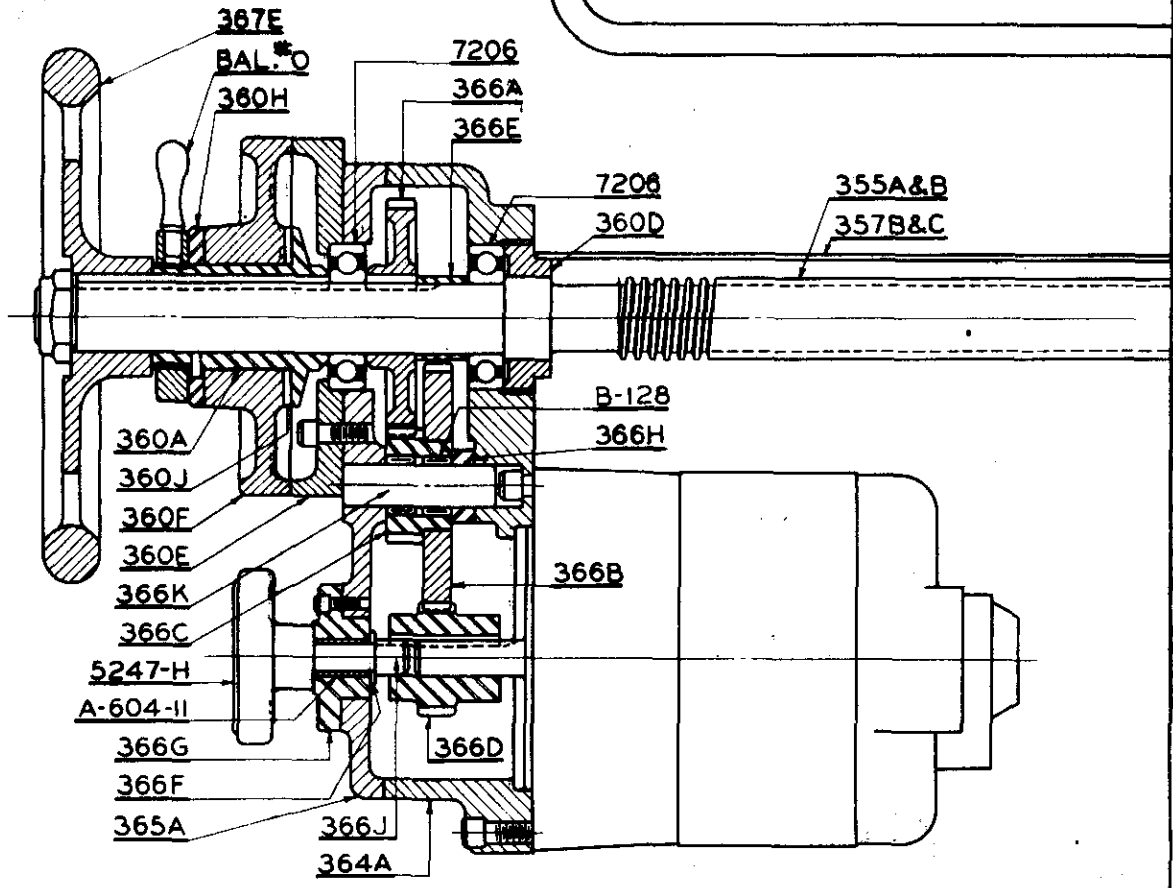
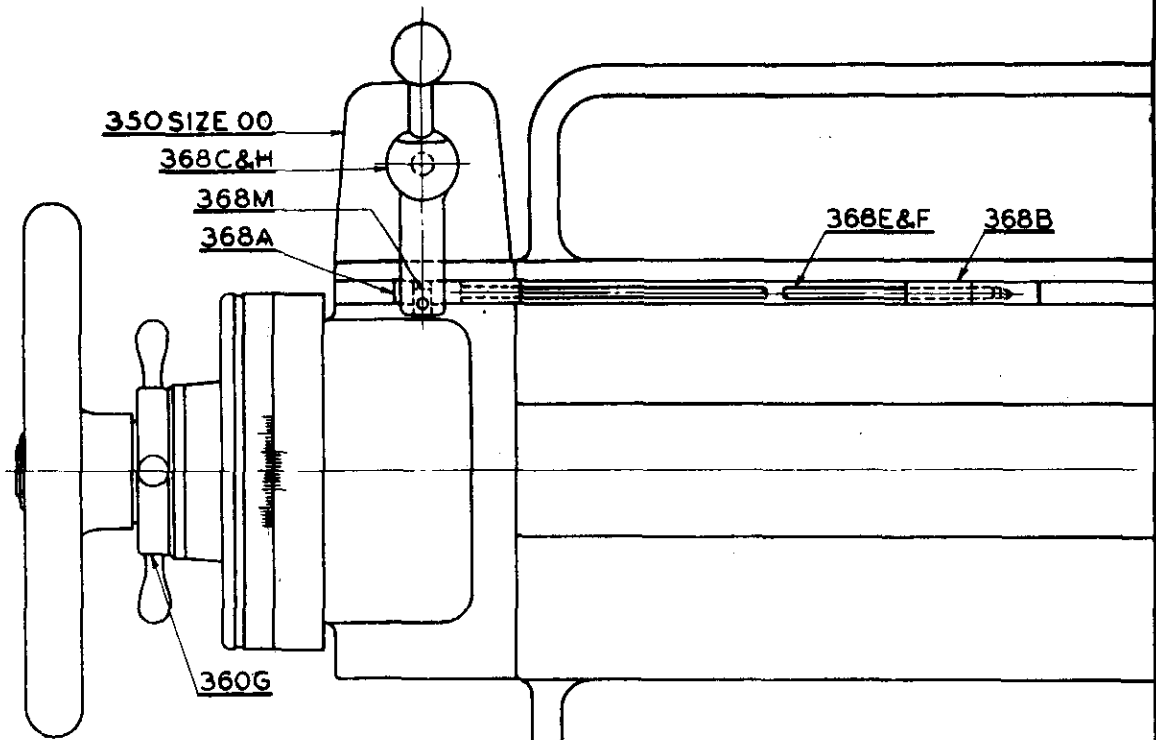
ORFD-1

48A  
44D  
47A  
45A  
44F  
48B  
44G  
48C  
43A  
43AL

WHEN ORDERING PARTS MENTION MACHINE SERIAL NUMBER.

REPAIR PARTS LIST  
 CLEVELAND LAYOUT DRILLING MACHINE  
 LEAD SCREW ASSEMBLY  
 (Dwg. 20 - 611)

1	1	355A	Longitudinal Lead Screw
	1	355B	Transverse Lead Screw
	1	357B	Lead Screw Guard
	1	357C	Lead Screw Guard
	2	360A	Dial Sleeves
	2	360D	Bearing Closures
	2	360F	Fixed Dials
	2	360F	Feed Dial
	2	360G	Capstan Nuts
	2	360H	Washers
	2	360J	Washers
	2	364A	Lead Screw Brackets
	2	365A	Lead Screw Bracket Covers
	2	366A	Lead Screw Gears
	2	366B	Idler Gears
	2	366C	Idler Pinions
	2	366D	Motor Gears
	2	366F	Spacers
	2	366F	Washers
	2	366G	Hand Feed Bearings
	2	366H	Spacers
	2	366J	Hand Feed Shaft
	2	366K	Idler Shaft
	2	367F	Handwheels
	2	368A	Switch Stop Keys - Front
	2	368B	Switch Stop Keys - Rear
	1	368F	Switch Lever Rod
	1	368F	Switch Lever Rod
	2	368M	Switch Lever Shoes
	2	368N	Switch Hand Knob
	4	7206	Ball Bearings
	4	B-128	Needle Bearings
	2	A-604-11	Bushings
	2	5247-H	Hand Knobs
	6	Bal.#0	Machine Handles

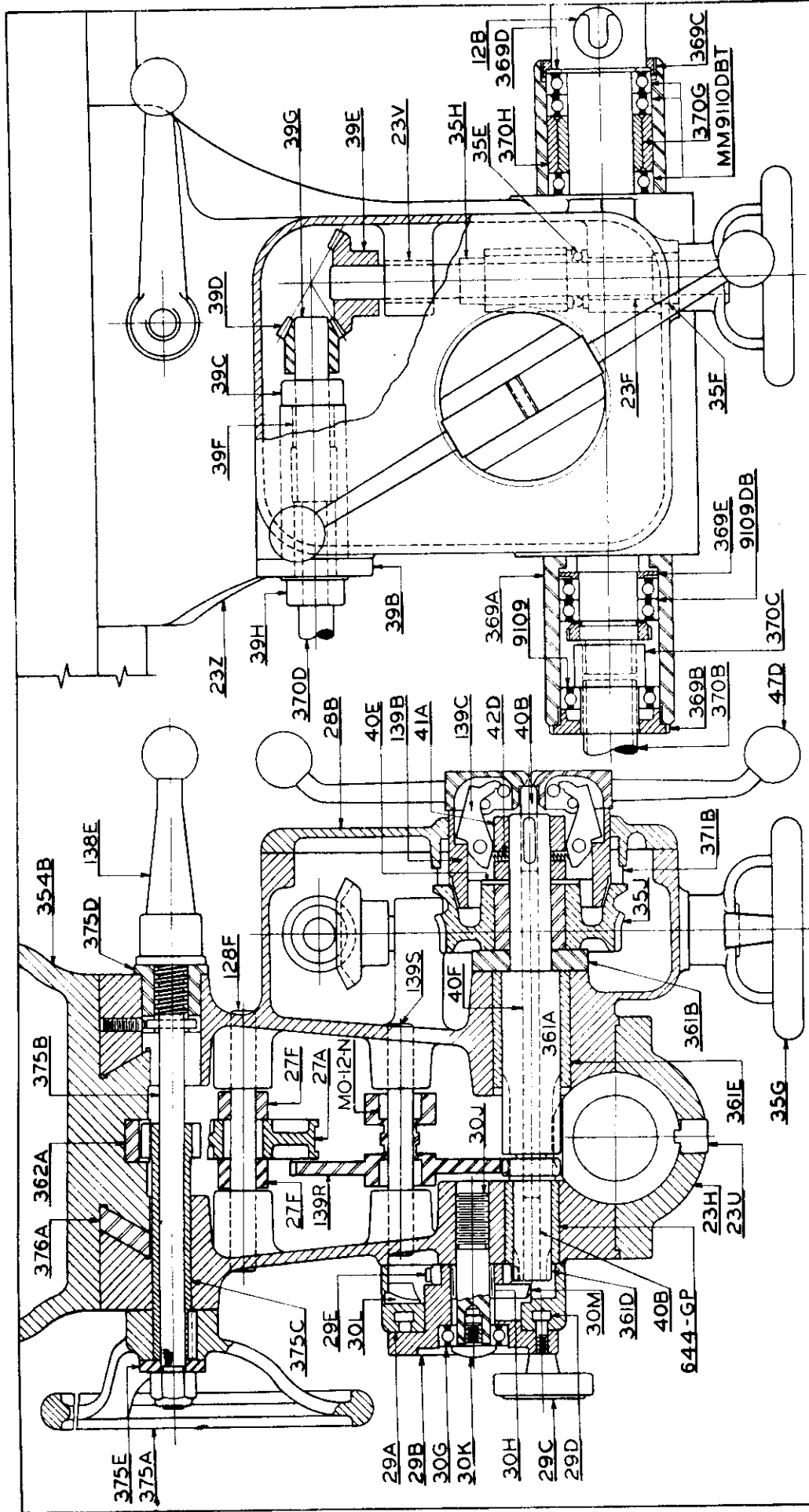


LEAD SCREW ASSEMBLY  
 LAYOUT DRILLING MACHINE  
 CLEEREMAN MACH. TOOL

REPAIR PART LIST  
 CLEEREMAN LAYOUT DRILLING MACHINE  
 SLIDING HEAD ASSEMBLY  
 (Dwg. 20 - 637)

1	23 E	Bushing (644-GP)	2	41 D	Taper Pins
1	23 F	Bushing	2	42 A	Turnstile Levers
1	23 H	Bearing Cap	2	42 C	Lock Pins
1	23 U	Key Plug	2	42 D	Springs
1	23 V	Bushing	1	128 F	Sheave Pin
1	23 Z	Sliding Head	1	138 E	Binder Lever
1	25 K	Rack Stop	1	139 A	Sleeve
1	26 D	Roller Bearing	1	139 B	Clutch Cone
1	27 A	Chain Sheave	2	139 C	Clutch Dogs
2	27 F	Set Collars	2	139 D	Keys
1	28 B	Sliding Head Cover	1	139 R	Balance Gear
1	29 A	Feed Depth Dial	1	139 S	Balance Gear Pin
1	29 B	Feed Dial Hub	1	139 T	Chain Pin
1	29 C	Hand Nut	1	361 A	Cross Spindle
1	29 D	T-Bolt	1	361 B	Spacer
1	29 E	42 T Gear	1	361 D	Transfer Pinion
1	30 G	Ball Bearing	1	361 E	Bushing
1	30 H	Needle Bearing	1	362 A	Rack
1	30 J	feed Dial Stud	1	369 A	Spindle Quill
1	30 K	Lock Screw	1	369 B	Top Closure
1	30 L	Feed Trip Dog	1	369 E	Spacer
1	30 M	Safety Trip Dog	1	370 B	Spindle Drive Shaft *
1	35 C	Worm Shaft	1	370 C	Spindle Coupling *
1	35 E	Ball Thrust	1	370 D	Feed Shaft
2	35 F	Oil Seals	1	370 G	Inner Ring Spacer
1	35 G	Handwheel	1	370 H	Outer Ring Spacer
1	35 H	Feed Worm	1	12 B	Tang Plug ) Morse
1	35 J	Feed Worm Gear	1	369 C	Bottom Closure ( Taper
1	39 B	Bearing	1	369 D	Grease Seal ( Spin-
1	39 C	Set Collar	1	370 A	Spindle * ) dle
1	39 D	Bevel Pinion	1	12 J	Spindle Hand Nut) Collet
1	39 E	Bevel Gear	1	370 E	Spindle * ( Type
2	39 F	Bushings	1	370 F	Bottom Closure ) Spindle
2	40 B	Cam Pins	2	9109	Ball Bearings
1	40 E	Washer	3	9110	Ball Bearings
1	40 F	Push Rod	1	N 10	Lock Nut
1	41 A	Quick Return Hub	1	W 10	Lock Washer
2	41 C	Dowel Pins			

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



SLIDING HEAD ASSEMBLY  
 LAYOUT DRILLING MACHINE  
 CLEERMAN MACH. TOOL

## SERVICE INSTRUCTIONS

### CLEEREMAN SLIDING HEAD DRILLS

#### I. FEED GEAR BOX REMOVAL

(Dwg. 20-234) (Page 10)

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 12.
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 10)

1. Remove the set screw from the end of the first shaft 36E and the large take-off gear 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, 36E and 38A.

#### III. GEAR SHIFTING MECHANISM REMOVAL

(Dwg. 20-234) (Page 10)

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) (Page 8)

The transmission gears are assembled as a unit in the 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.



#### IV. SPEED GEAR TRAIN REMOVAL (Cont'd.)

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 1.
6. Reach through 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 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 14D 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 8)

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 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 unseat the rear ball bearing. It is then possible to withdraw the shaft through 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  $8\frac{1}{4}$ " long, to be placed between the large gear 19P 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-~~600~~<sup>637</sup>) (Page 12)

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 42P.
2. Remove the cover DC-30.
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.

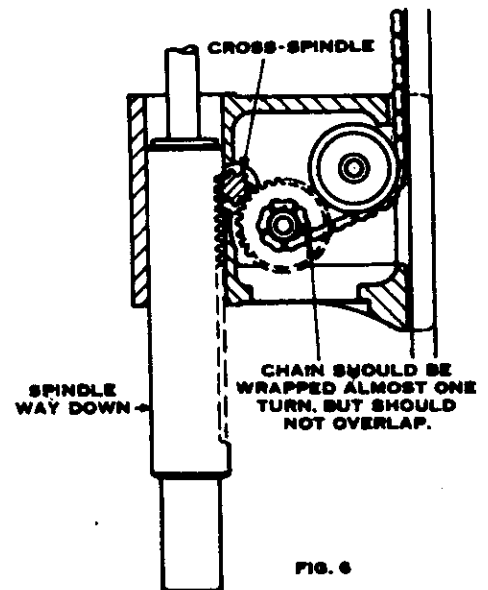
## VI. SLIDING HEAD (Cont'd.)

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. 20-637---Part 40Q) (Fig. 6 and 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 re-assembled 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)
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 spindle to the base.



VIII CROSS SPINDLE DISASSEMBLY  
(Dwg. 20 - 637 - Part 361A) (Page 12)

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 CROSS SPINDLE REASSEMBLY  
(Dwg. 20 - 637 - Part 361A) (Page 12)

1. Replace spacer 361B, sleeve 139A and worm gear on cross spindle.
2. Clutch cone 139B and turnstile hub 41A can be assembled as a unit together with the clutch fingers 139C before being inserted on the cross spindle. Replace the two set screws which retain turnstile hub to the cross spindle.
3. Replace turnstile levers 42A and test clutch cone engagement with the worm gear. If engagement is not uniform, proper adjustment can be made through the set screws in the clutch fingers, (can be reached through clearance holes in turnstile levers).
4. After proper adjustments have been made, test to see if equal pressure is exerted by each lever. This can be checked by inserting a feeler gage between the bore of the clutch cone and turnstile hub diameter.
5. The cross spindle can now be replaced in the sliding head.

## 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 DA-12, 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 DA-12 through the chain sheave and drive out the shaft to remove the sheave 27A.

## XI. FEED DIAL REMOVAL

(Eng. 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

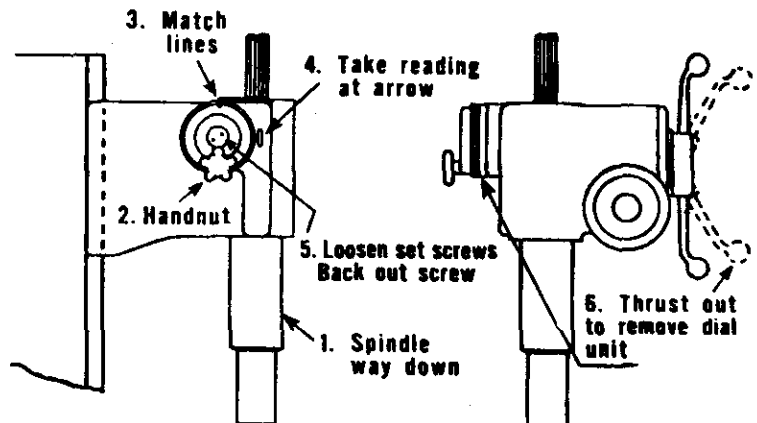


FIG. 8

## XI. FEED DIAL REMOVAL (Cont'd.)

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).

## XII. FEED DIAL DISASSEMBLY

(Dwg. 20-637 ) (page 12)

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 29F 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. 20-637) (Page 12)

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 elevating shaft. Crank (5) down near the end of the dovetail (6) where it should be supported on wooden blocking built up from the table.
4. Remove the two hex head bolts (4) and head binder stud (1) from sliding head. Then the sliding head gib (3) will slide down and out.
5. The sliding head may then be swung away from the column.

#### XIV. NOTES ON REASSEMBLING THE SLIDING HEAD

(Dwg. 20-637) (Page 12)

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 20-637. Refill the worm gear case with oil.
6. Replace the cover DC-30, 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 hand-wheel 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  $12\frac{1}{2}$  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.