

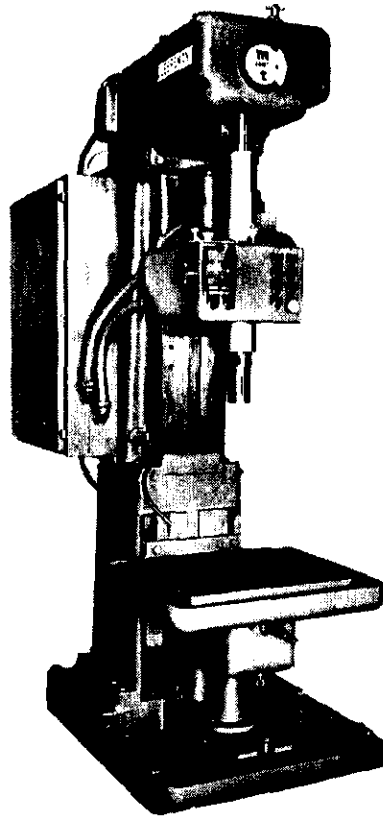
**CLEEREMAN**  
**Drilling Machine**  
**Models AD & ADT**

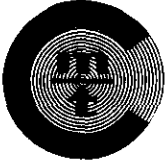
**Instruction and Parts Manual**

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**CLEEREMAN**  
**SERIES "A"**  
**OPERATION**  
**SERVICE AND PARTS**  
**MANUAL**





# CLEEREMAN

To the Purchaser of CLEEREMAN Machine Tools:

SUBJECT: CLEEREMAN Series "A" Automatic Production Drilling Machine  
Model AD and Model ADT

This manual is designed to assist you in using your CLEEREMAN Series "A" Drilling Machine. 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 on a plate affixed to the column of the machine and bottom of the adjustable head mounting surface.

Keep your machine clean and well lubricated and it will render many years of efficient, trouble free service. To insure the proper installation of your new Series "A", consult Section V of this manual.

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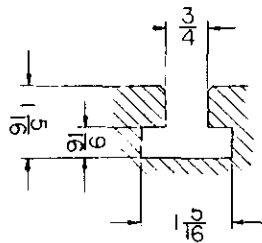
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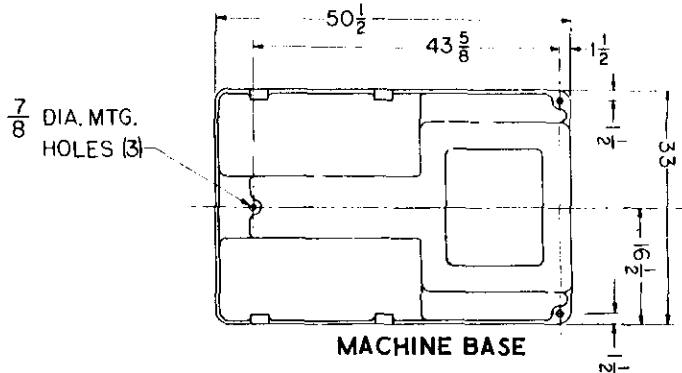
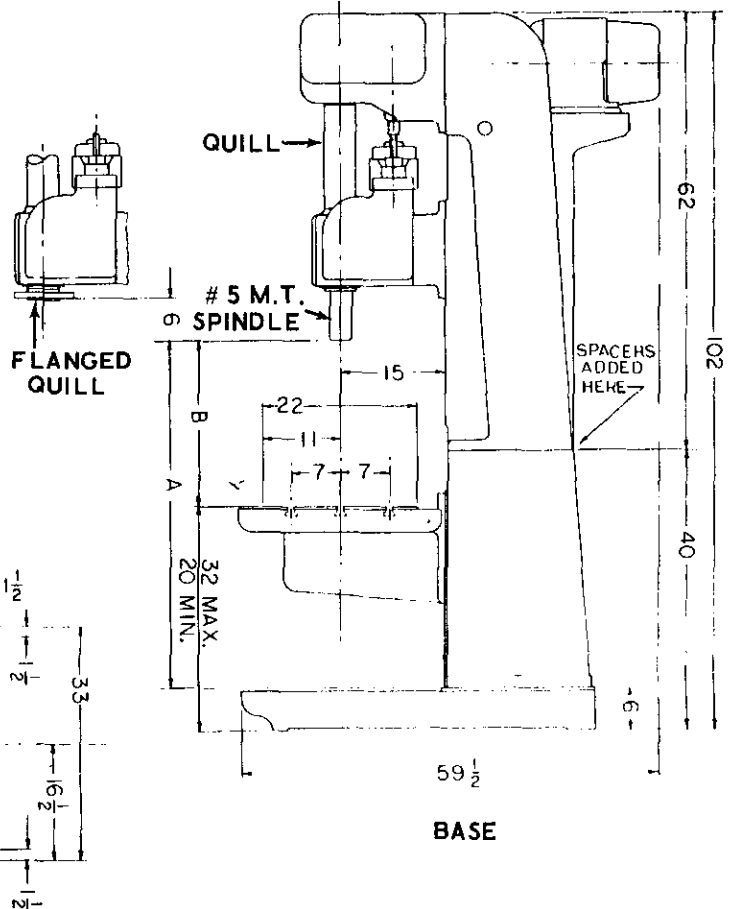
**SERIES "A"**  
**MODEL AD ---- MODEL ADT**  
**STANDARD MACHINE SPECIFICATIONS**

Table working surface . . . . .	22" x 24"
Spindle to column (throat) . . . . .	15"
Swing in plane of table . . . . .	28"
Head vertical adjustment (3" increments) . . . . .	6"
Table vertical adjustment (3" increments) . . . . .	12"
Height of base . . . . .	6"
Spindle travel . . . . .	12"
Spindle nose (Type) . . . . .	#5 M. T.
Spindle nose diameter . . . . .	3-1/8"
Spindle diameter at bearings . . . . .	2"
Quill diameter . . . . .	4-7/16"
Number of Spindle Speeds (See figure 2) . . . . .	32
Speed range (Low) . . . . .	64 to 580 RPM
Speed range (High) . . . . .	193 to 1740 RPM
Number of Spindle Feeds (See figure 2) . . . . .	63
Feed Range - Pick Off Gears . . . . .	.0029" to .250" L.P.R.
Spindle traverse motor . . . . .	3/4 HP
Spindle traverse rate . . . . .	160 IPM
Thrust capacity #5 M.T. spindle . . . . .	6,000 lbs.
Flanged Quill (See figure 13) . . . . .	7,500 lbs.
Spindle drive motor . . . . .	5, 7-1/2 or 10 HP/1800 RPM
Floor Space . . . . .	33" x 60"
Height . . . . .	102"
Weight, crated . . . . .	4,300 lbs.



**TABLE - T - SLOTS**

WORK HEIGHT CAPACITY AVAILABLE BY ADDING SPACERS						
SPACER	NONE	6"	12"	18"	24"	
A	MAX.	50	56	62	68	74
	MIN.	32	38	44	50	56
B	MAX.	36	42	48	54	60
	MIN.	6	12	18	24	30



**FIGURE 1. MACHINE SPECIFICATIONS**

# SECTION I

## DESCRIPTION

### 1.1 GENERAL

The CLEEREMAN Series "A" is a high production, drilling and tapping machine. The Model AD and Model ADT provide a completely automatic cycle at the touch of a button. These machines have provided industry with the latest and most advanced design of automatic drilling and tapping equipment.

The Series "A" machine is truly the most specialized standard machine, using elements of the "building block" concept -- thus assuring maximum economy in construction and yet readily adaptable to special fixturing or multiple drill heads. Its variety of uses and applications is limited only to the imagination.

Unusual rigidity in the heavy structural members, the heavy duty spindle and the reserve power, allow cutting tools to work at optimum efficiency. 100% use of anti-friction bearings with either lifetime sealed lubrication or lubricated from reservoirs eliminates outmoded hand oiling. The simple electrical and mechanical design also reduces maintenance cost. Easy set-up, quickly changed pick-off gears, broad ranges of speeds, feeds and tap leads make this high production machine ideal even for small lot production.

### 1.2 MODEL AD - MODEL ADT

The Series "A" is built in two model classifications. The Model AD is the drilling machine and the Model ADT is the drilling and tapping machine. High cycle tapping operations are accomplished by using rapid reversal motors.

A left hand tapping arrangement on the Model ADT is available as optional equipment. See paragraph 2.8.

### 1.3 MACHINE FEATURES (Standard)

#### a. POWER TRAVERSE

Power traverse approach and return is standard on all CLEEREMAN Series "A" machines. An auxiliary traverse motor is used on all machines. This is part of the automatic cycle and provides the built-in time saving feature for "approach" and "return" when the tools are not cutting. With the spindle counterweight assembly, extra heavy heads and tooling can be handled.

#### b. ADJUSTABLE HEAD

The heavy box section spindle head bolts rigidly to the face of the heavy upper column in any one of three positions. The spindle quill has 100% bearing in the head at all times. The front cover contains

pushbuttons and selector switches for all operations of machine.

#### c. AUTOMATIC CYCLE CONTROL

Adjustable dials control limit switches for operating the spindle traverse motor and electric feed clutch on the adjustable spindle head.

Model AD machines for automatic drilling or tapping with collapsible taps have an automatic cycle of -- Power Traverse Approach -- Feed to Depth -- Power Traverse Return.

Model ADT machines have Power Traverse Approach -- Tap In -- Reverse at Depth -- Tap Out -- Power Traverse Return in addition to the drilling cycle.

The locking knob on the left side of the head prevents any variation or change in the dial positions once they are set. Hand pressure locks dials firmly on setting required for feed engage -- depth -- and upper return.

#### d. FEED CLUTCH

The heavy duty electric feed clutch is engaged to furnish feed to the cutting tool after rapid advance. Design permits easy accessibility to both the feed clutch and the timing belt used for rapid approach when clutch is disengaged.

#### e. MICROMETER ADJUSTMENT FOR DEPTH

For adjustment requiring close depth tolerance, a built-in micrometer graduated in thousandths is provided on top of the head just above the depth dial. This feature makes it unnecessary to reset the depth dial when final adjustment in thousandths is required.

#### f. SPEED-FEED BOX

The shaved, heat treated pick-off gears are fast and simple to change. A safety switch prevents starting the machine when the hinged aluminum cover is raised to change gears. The gears actually "pick-off" their involute splined shafts and the closed cover retains them in place.

#### g. SPEEDS, FEEDS, TAP LEADS

The speeds, feeds and tap leads available give the broadest possible field of application. Machines are not limited to a built-in narrow range of speeds and feeds. With the wide ranges available on the Series "A" and the quick, easily changed, "pick-off" gears there is practically no limit to the versatility of the machine.



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## h. T-SLOTTED TABLE

A deep, sectional, T-SLOTTED TABLE bolts solidly to a large pad on the lower column face. An extra capacity coolant channel and a heavy adjustable screw for auxiliary support is included. A telescoping screw jack for vertical table adjustment can be furnished as optional equipment.

## j. SUMP TYPE BASE

This generous sump type base has ample coolant capacity and provides a broad mounting for the column. The machined central surface and outer pads are for mounting large fixtures.

## k. CONTROLS

J.I.C. Electrical Specifications are standard. All drive motors and coolant pump control contactors are in the control box. Terminal strip wiring is used. Terminals are provided in the main control box so fixture interlock switches, foot switches, palm buttons or other auxiliary controls can be quickly installed.

## l. GANG DRILL ARRANGEMENTS

Customers having special Series "A" gang drill arrangements will find that the information contained in this manual will cover almost all features of the individual drills in their gang drill unit. For information concerning the special portions of a gang drill arrangement, please contact the CLEEREMAN Machine Tool Corporation.



# SECTION II OPERATION

## 2.1 POSITIONING THE ADJUSTABLE HEAD AND TABLE

Changing the position of the Adjustable Head and the Table can be accomplished in several ways.

a. To raise or lower the Adjustable Head, use a house jack placed on the Table to contact the Adjustable Head directly in back of the Spindle, or a crane by fastening a rope sling around the Adjustable Head.

b. If the machine is equipped with a Table Elevating Screw Jack, the position of the Adjustable Head may be changed by inserting a piece of 4" x 4" lumber between the Table and Adjustable Head, directly in back of the spindle, and raising or lowering the Table the desired distance.

c. On machines not equipped with a Table Elevating Screw Jack, the Table may be raised or lowered by using a fork truck, house jack, or a crane. When using a crane, clamp a bar to the Table approximately two inches behind the center T-slot. The bar must extend beyond each side of the Table to accommodate a rope sling dropped down each side of the machine.

## 2.2 AUTOMATIC SPINDLE CYCLE

To gain the maximum savings and efficiency for which the machine is designed, it is essential to fully understand the fundamentals of the Automatic Spindle Cycle.

a. MODEL AD MACHINES are designed for automatic drilling and for automatic tapping with collapsible taps. The Automatic Cycle consists of:

- (1) Power rapid traverse to feed engagement point.
- (2) Feed to depth.
- (3) Retract at rapid traverse to adjustable upper spindle limit.

b. MODEL ADT MACHINES are designed for automatic drilling and for automatic tapping with solid taps. When the "Cycle Selector" switch is set on "Drill", the Cycle operates similarly to the Model AD Machine. When the "Cycle Selector" switch is set on "Tap", the Automatic Cycle consists of:

- (1) Power rapid traverse to feed engagement point.
- (2) Feed to depth.
- (3) Reverse spindle rotation at depth.

(4) Feed up, in reverse spindle direction, to feed engagement point.

(5) Retract at rapid traverse from feed engagement point to adjustable upper spindle limit.

## 2.3 CYCLE CONTROL DIALS - See Figure 4

Control dials, mounted on the left side of the adjustable head, fully govern the automatic spindle cycle by actuating limit switches which, in turn, control the power traverse motor and the magnetic feed clutch.

a. Standard Spindle Cycle (3 Dial) Arrangement provides adjustable settings for the point of feed engagement (Dial 1), depth of Feed (Dial 2), and upper limit of spindle return (Dial 5).

b. Optional Dual Spindle Cycles (5 Dial) Arrangement provides two independent spindle cycle adjustable settings, designated as Cycles "A" and "B", each with its individual point of feed engagement and feed depth settings. One upper limit of spindle return is common to both cycles. For Cycle "A" Dial #1 is used to set the point of feed engagement and Dial #2 is used to set the depth of feed. For Cycle "B" Dial #3 is used to set the point of feed engagement and Dial #4 is used to set the depth of feed. Dial #5 is used to set the upper limit of spindle return for both Cycles "A" and "B".

c. Optional Skip Feed Spindle Cycle (5 Dial) Arrangement provides two points of feed engagement and two depths of feed for drilling through a workpiece with two shelves. With Skip Feed engaged, the cycle is (1) power rapid traverse to the workpiece, (2) feed through first shelf, (3) power rapid traverse down to second shelf, (4) feed through second shelf, and (5) power rapid traverse up. Dial #1 is used to set the point of feed engagement above the first shelf; Dial #2 is used to set the depth of feed to penetrate the first shelf; Dial #3 is used to set the point of feed engagement above the second shelf; Dial #4 is used to set the depth of feed to penetrate the second shelf; and Dial #5 is used to set the upper limit of spindle return.

Well designed tooling and fixtures, properly correlated to the operation of the Automatic Spindle Cycle, are essential for optimum performance.

## 2.4 SETTING CONTROL DIALS FOR DRILLING - See Figure 4

The efficient operation of the Automatic Spindle Cycle is dependent upon correctly setting the Dials. After the workpiece is in place on the table or jig, and the drill inserted in the spindle, select the proper pick-off gears to give the spindle speed and feed desired.



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a. For Model ADT Machines, set the "Drill-Tap" selector switch to "Drill."

b. For Machines with 3 Dial Arrangement, proceed as follows:

- (1) Set the "Jog-Run" selector to "Jog."

**CAUTION**

Do not press the "Spindle Start" pushbutton. Do not rotate the spindle until Dials are set.

(2) By depressing the "Jog Down" pushbutton, jog the spindle down until the drill point is one-half inch above the work. Then loosen the dial locking hand knob on the left side of the adjustable head.

- (3) Set Dial #1 to zero.

**CAUTION**

Do not set the point of feed engagement too low or the drill will enter the work while in power rapid traverse.

(4) Set Dial #2 to desired depth of feed. Dial #2 is graduated in inches by tenths of an inch.

(5) Set Dial #5 to desired point of spindle retraction above the feed engagement point. Tighten the hand knob. The Upper Limit of spindle return should be set high enough to allow the drill to clear the work. Dial #5 is graduated in inches by tenths of an inch.

(6) With the spindle still at the feed engagement point, set the "Jog-Run" selector switch to "Run" and press the "Spindle Start" pushbutton and the drill will feed to the Depth set on Dial #2. At depth, the spindle will power rapid traverse up to the Dial #5 setting. This completes the cycle.

(7) Now press the "Cycle Start" pushbutton. The spindle will go through a complete cycle. If feed engages too high above the workpiece, gradually lower the point of feed engagement by slightly adjusting Dial #1. If depth of feed is too shallow, gradually lower the point of feed trip-out by slightly adjusting Dial #2. See fine Micrometer Adjustment, paragraph 2.6.

c. For Machines with 5 Dial Arrangement, set "Dial Selector" switch to "A" and proceed as follows:

- (1) Set the "Jog-Run" selector to "Jog."

**CAUTION**

Do not press the "Spindle Start" pushbutton. Do not rotate the spindle until Dials are set.

(2) By depressing the "Jog-Down" pushbutton, jog the spindle down until the drill point is one-half inch above the work. Then loosen the dial locking hand knob.

- (3) Set Dial #1 to zero.

**CAUTION**

Do not set the point of feed engagement too low or the drill will enter the work while in power rapid traverse.

(4) Set Dial #2 to desired depth of feed. Dial #2 is graduated in inches by tenths of an inch.

(5) Set Dial #5 to desired point of spindle retraction above the feed engagement point. Tighten the hand knob. The upper limit of spindle return should be set high enough to allow the drill to clear the work. Dial #5 is graduated in inches by tenths of an inch.

(6) With the spindle still at the feed engagement point, set the "Jog-Run" selector switch to "RUN" and press the "Spindle Start" pushbutton and the drill will feed to the depth set on Dial #2. At depth, the spindle will power rapid traverse up to the Dial #5 setting.

(7) Now press the "Cycle Start" pushbutton. The spindle will go through a complete cycle. If feed engages too high above the workpiece, gradually lower the point of feed engagement by slightly adjusting Dial #1. If depth of feed is too shallow, gradually lower the point of feed trip-out by slightly adjusting Dial #2.

(8) On machines equipped with the 5 Dial Arrangement, turn the "Dial Selector" to "B" and proceed as outlined above using Dial #3 to set point of feed engagement and Dial #4 to set depth of feed. Dial #5 is a common upper limit of spindle return for both Cycles "A" and "B".

## 2.5 SETTING CONTROL DIALS FOR TAPPING (MODEL ADT MACHINES ONLY)

After the workpiece has been placed on the table and tap inserted in the spindle, select the proper pick-off gears to give the speed and tap lead desired. Set the "Cycle Selector" to "Tap."

# PICK-OFF GEAR CHART

SPEED SHAFTS

FEED SHAFTS

SHAFT C

SHAFT B

SHAFT A

SHAFT F

SHAFT E

SHAFT D

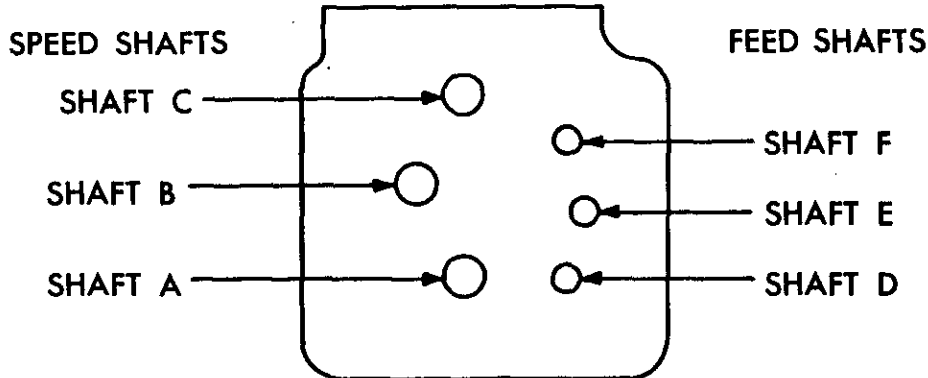
INSTALL ALL GEARS WITH HUB DOWN

SPINDLE SPEEDS			SPINDLE FEEDS					
LO-SPEED	PICK-OFF GEARS		HI-SPEED	FEEDS	PICK-OFF GEARS		LEADS	
With Gear No. 33355 on SHAFT C and Gear No. 33354 on SHAFT B (Lower Gear)	INSTALL PROPER PICK-OFF GEAR AS GIVEN BELOW OPPOSITE THE DESIRED SPEED		With Gear No. 33356 on SHAFT C and Gear No. 33357 on SHAFT B (Lower Gear)	With Gear No. 33353 on SHAFT D and Gear No. 33352 on SHAFT E (Lower Gear)	INSTALL PROPER PICK-OFF GEAR AS GIVEN BELOW OPPOSITE THE DESIRED FEED OR LEAD		With Gear No. 33352 on SHAFT D and Gear No. 33353 on SHAFT E (Lower Gear)	
	SPINDLE R.P.M.	SHAFT A SPINDLE			SHAFT B UPPER GEAR	SPINDLE R.P.M.	THOUSANDTHS PER REV.	SHAFT E UPPER GEAR
64	33413	33412	193	.0029	33710	33711		.0204
77	33415	33414	230	.0039	33380	33379	36	.0278
90	33417	33416	270	.0048	33353	33352	32	.0313
103	33419	33418	315	.005	33384	33383		.0347
123	33421	33420	369	.0052	33406	33407	28	.0357
141	33423	33422	423	.0059	33408	33409	27	.037
162	33425	33424	486	.0068	33386	33385	24	.0417
185	33427	33426	555	.0070	33388	33387		.0485
202	33426	33427	606	.0078	33404	33405	20	.050
231	33424	33425	693	.0087	33390	33389	18	.055
265	33422	33423	793	.0098	33392	33391	16	.0625
304	33420	33421	912	.0100	33395	33394		.069
355	33418	33419	1065	.0107	33403	33402	14	.0714
414	33416	33417	1242	.0112	33397	33396		.076
486	33414	33415	1461	.0117	33401	33400	13	.0769
580	33412	33413	1740	.0122	33399	33398		.0798
				.0126	33378	33378	12	.0833
				.0127	33398	33399	11 1/2	.0868
				.0131	33400	33401		.090
				.0137	33396	33397	11	.0909
				.0140	33402	33403		.0973
				.0156	33394	33395	10	.100
				.0177	33391	33392	9	.111
				.0195	33389	33390	8	.125
				.0201	33405	33404		.1385
				.0234	33387	33388	7	.1429
				.0263	33385	33386	6	.1667
				.0273	33409	33408		.1875
				.0280	33407	33406		.194
				.0310	33383	33384	5	.200
				.0350	33352	33353	4 1/2	.222
					33379	33380	4	.250

**CLEEREMAN SERIES-A  
PRODUCTION DRILLING  
MACHINE**

FIGURE 2. SPEED AND FEED PICK-OFF GEAR CHART (NEW NUMBERS)

# PICK-OFF GEAR CHART



SPINDLE SPEEDS			SPINDLE FEEDS					
LO-SPEED	PICK-OFF GEARS		HI-SPEED	FEEDS	PICK-OFF GEARS		LEADS	
33025 on SHAFT A and gear no. 33024 on SHAFT B lower gear	INSTALL PROPER PICK OFF GEAR AS GIVEN BELOW OP- POSITE THE DE- SIRED SPEED		33026 on SHAFT C and gear no. 33027 on SHAFT B lower gear	33023 on SHAFT D and gear no. 33022 on SHAFT E lower gear	INSTALL PROPER PICKOFF GEAR AS GIVEN BELOW OPP- OSITE THE DESIRED FEED OR LEAD		33022 on SHAFT D and gear no. 33023 on SHAFT E lower gear	
SPINDLE R. P. M.	SHAFT A	SHAFT B UPPER GEAR	SPINDLE R. P. M.	THOUSANDTHS PER REV	SHAFT E UPPER GEAR	SHAFT F	THREADS PER INCH	THOUSANDTHS PER REV
64	33082	33081	193	.0029	33373	33374		.0204
77	33084	33083	230	.0039	33050	33049	36	.0278
90	33086	33085	270	.0043	33052	33051	32	.0313
103	33088	33087	315	.0048	33054	33053		.0347
123	33090	33089	369	.005	33075	33076	28	.0357
141	33092	33091	423	.0052	33077	33078	27	.037
162	33094	33093	486	.0059	33056	33055	24	.0417
185	33096	33095	555	.0068	33058	33057		.0485
202	33095	33096	606	.0070	33073	33074	20	.050
231	33093	33094	693	.0078	33060	33059	18	.055
265	33091	33092	793	.0087	33062	33061	16	.0625
304	33089	33090	912	.0098	33064	33063		.069
355	33087	33088	1065	.0100	33072	33071	14	.0714
414	33085	33086	1242	.0107	33066	33065		.076
486	33083	33084	1461	.0108	33070	33069	13	.0769
580	33081	33082	1740	.0112	33068	33067		.0798
				.0117	33048	33048	12	.0833
				.0122	33067	33068	11½	.0868
				.0126	33069	33070		.090
				.0127	33065	33066	11	.0909
				.0137	33071	33072		.0973
				.0140	33063	33064	10	.100
				.0156	33061	33062	9	.111
				.0177	33059	33060	8	.125
				.0195	33074	33073		.1385
				.0201	33057	33058	7	.1429
				.0234	33055	33056	6	.1667
				.0263	33078	33077		.1875
				.0273	33076	33075		.194
				.0280	33053	33054	5	.200
				.0310	33051	33052	4½	.222
				.0350	33049	33050	4	.250

**CLEEREMAN SERIES A  
PRODUCTION DRILLING  
MACHINE**

**CLEEREMAN MACHINE TOOL**

FIGURE 2. SPEED AND FEED PICK-OFF GEAR CHART



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Set the Control Dials by following the same procedures as described for Drilling. Care should be taken when tapping blind holes to set the depth of feed shallower than the depth of the hole to be tapped.

When the point of feed depth is reached, the spindle will reverse and lead the tap out to the point where lead was initially engaged, then power rapid traverse up to the setting on the Upper Limit Dial #5. When the spindle reaches the upper limit on the return stroke, it will reverse direction of rotation again to forward, ready to tap the next hole. This completes the tapping cycle. The spindle will not traverse down again until the "Cycle Start" pushbutton is depressed.

## 2.6 MICROMETER ADJUSTMENT FOR DEPTH SETTING - See Figure 9

Fine depth setting can be accomplished by turning the micrometer dial which is located on top of adjustable head. The dial is graduated in thousandths and turning clockwise increases depth of feed; counterclockwise decreases depth of feed. This adjustment is done after the depth dial has been set and locked in position. The range of adjustment is approximately  $\pm .020$ " from zero (0) on the micrometer dial.

## 2.7 SPEED, FEED, AND TAP LEAD PICK-OFF GEARS

a. Various spindle speeds and feeds are obtained by combinations of Pick-Off Gears located in the Top Head of the machine. Each pair of Speed Pick-Off Gears may be transposed to obtain two speeds with one pair of Speed Intermediate Gears. An optional pair of Speed Intermediate Gears provides two additional speeds with each pair of Speed Pick-Off Gears. Each pair of Feed Pick-Off Gears may be transposed with their Intermediate Gears to obtain four rates of feed. The proper Pick-Off Gears to obtain desired speeds and feeds are listed on the Pick-Off Gear Chart affixed to the column of the machine and figure 2 of this manual.

b. A switch is provided to automatically disconnect all electrical power in the control circuit when the hinged Top Cover is lifted. This safety measure prevents any possibility of the machine starting when changing Pick-Off Gears.

c. Pick-Off Gears may be lifted on and off easily. Place them on the Shafts with protruding hubs down. Bosses on the inside of the Top Cover contact the Gears to hold them down.

d. It is important to inspect Gears before putting them in place to be certain they are clean of chips

and dust. Gears should be stored in a closed cabinet to eliminate any possibility of carrying chips to the oil in the Top Head.

### NOTE

When ordering additional Pick-Off Gears, it is necessary to give speed and feed required as well as the part number.

## 2.8 TO SET UP FOR LEFT HAND TAPPING (OPTIONAL EQUIPMENT)

a. Left hand tapping can be accomplished only on machines equipped with special Left Hand Tapping Arrangement.

b. Remove the two (2) Feed Intermediate Gears from Shafts "D" and "E" in the Top Head. Substitute in their place the special Feed Intermediate Gears and Idler Gear furnished with the Left Hand Tapping Arrangement.

## 2.9 PUSHBUTTONS AND SELECTOR SWITCHES - See Figure 4

a. Dials Selector switch or Cycle Selector (OPTION)

(1) With "A" selected, dials 1, 2, and 5 are active.

(2) With "B" selected, dials 3, 4, and 5 are active.

b. "Drill-Tap" selector switch (Model ADT only).

(1) With "Drill" selected, a normal drilling cycle is selected.

(2) With "Tap" selected, a normal tapping cycle with a spindle reversal at depth point is selected.

c. "Jog-Run" selector switch, "Jog Up - Jog Down" pushbutton.

(1) When "Jog" is selected, the "Jog Up" and "Jog Down" pushbuttons are operational. The Spindle cannot start. The "Jog" selector provides the operator with the means to traverse the spindle up or down for set-up purposes.

(2) When "Run" is selected, the machine can cycle according to dial settings after pressing the Spindle Start and Cycle Start pushbuttons. The "Jog Up" and "Jog Down" pushbuttons will not function when "Run" is selected.

d. "Spindle Start" pushbutton will start the spindle when "Run" is selected.



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e. "Cycle Start" pushbutton will start the selected cycle if "Run" is selected and the spindle is running.

f. "DWELL, OFF-ON" SELECTOR SWITCH (OPTION).

An adjustable timer provides spindle feed dwell for accurate depth control when drilling. By setting the "Dwell Selector" to the "On" position, the spindle will automatically dwell at the bottom of a hole or counterbore before power rapid traversing up. The duration of dwell is pre-set at the factory for one-half second. If a longer or shorter dwell is required, adjust the "Increase-Decrease" screw on the Timer located in the Electrical Control Panel.

NOTE

Do not use Dwell when tapping.

g. "STOP" - PUSHBUTTON.

The "Stop" pushbutton will stop the spindle rotation when it is running. The "Stop" pushbutton should be pressed only when the spindle is at its retract point.

NOTE

In cases of emergency during the cycle, use the "Emergency Return" pushbutton, not the "Stop" pushbutton. Pressing the "Stop" pushbutton allows the spindle to coast down until motor and gear trains lose momentum.

h. "EMERGENCY RETURN" PUSHBUTTON.

(1) Depressing the "Emergency Return" push-

button while power rapid traversing down causes the spindle to immediately power rapid traverse back up to the upper limit of spindle return.

(2) Depressing the "Emergency Return" pushbutton while a drill is feeding causes the spindle to immediately power rapid traverse up to the upper limit of spindle return.

(3) Depressing the "Emergency Return" pushbutton while a tap is leading in causes the spindle to immediately reverse and lead-out to the point where lead was initially engaged, then power rapid traverse up to the upper limit of spindle return.

(4) The spindle will not traverse down again until the "Cycle Start" pushbutton is depressed.

j. "SKIP FEED, ON-OFF" SELECTOR SWITCH (OPTION).

(1) When "OFF" is selected, the Series "A" will function normally as stated in paragraph 2.3b.

(2) When "ON" is selected, the Series "A" will function as stated in paragraph 2.3c.

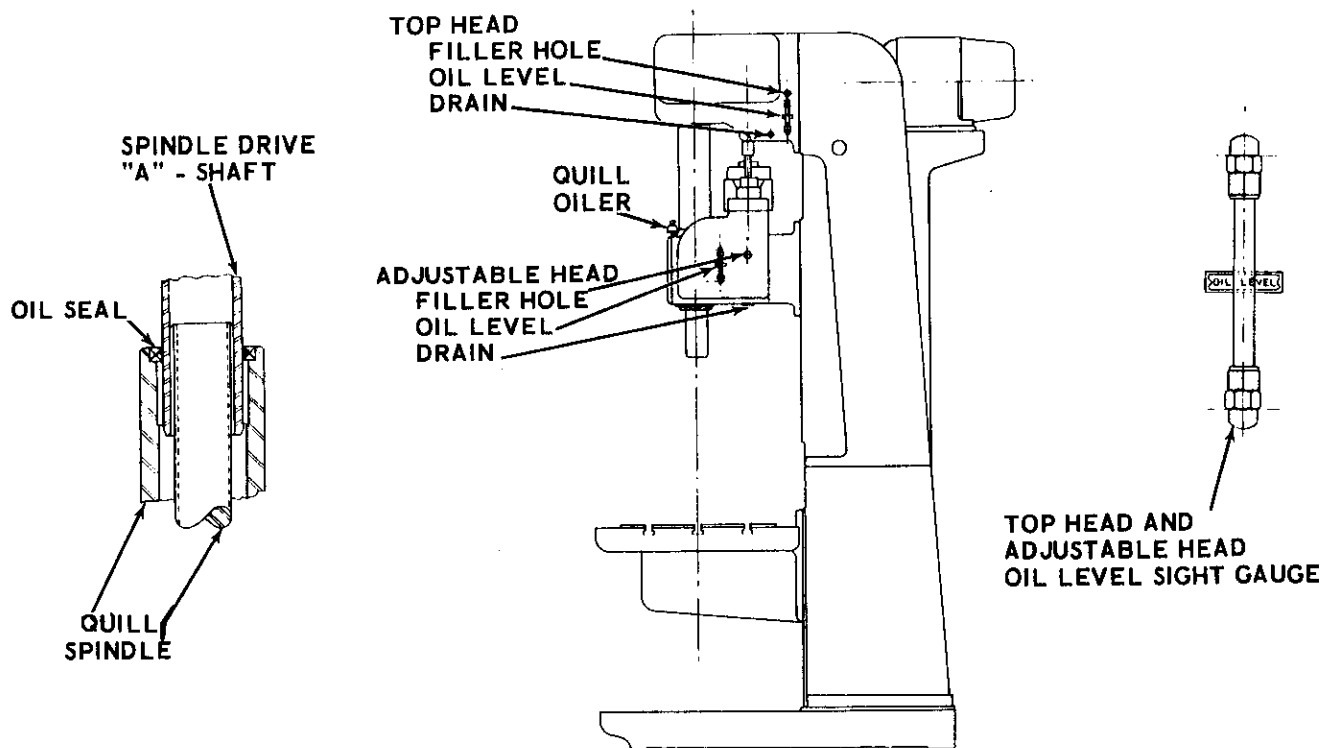
k. "COOLANT, OFF-ON" SELECTOR SWITCH (OPTION).

This switch turns the coolant pump motor on or off. Coolant will flow if "Run" is selected.

l. The "Jog Up" and "Jog Down" pushbuttons on other than a standard machine are usually located on the side of the machine column, and are readily accessible to the operator.

m. On machines having a "Remote Pushbutton Station" or a "Pendant Station" (OPTIONAL), the "Spindle Start", "Stop", "Cycle Start", and "Emergency Return" pushbuttons are usually located on this station and not on the machine front cover.

# SECTION III LUBRICATION



**FIGURE 3. CLEEREMAN SERIES "A" LUBRICATION DIAGRAM**

<b>TOP HEAD</b>	<p>Replenish oil as needed. Clean and flush every 2000 hours of machine operation. Refill with A.G.M.A. #2 Industrial Oil. SAE #20 with a viscosity of 310 SSU @ 100° F.</p>
<b>ADJUSTABLE HEAD</b>	<p>Replenish oil as needed. Clean and flush every 2000 hours of machine operation. Refill with A.G.M.A. #2 Worm Gear Lubricant, SAE #80 with a viscosity of 240/270 SSU @ 100° F.</p>
<b>QUILL OILER</b>	<p>Replenish oil as needed. Fill with A.G.M.A. #1 Oil. SAE #10 with a viscosity of 150 SSU @ 100° F.</p>
<b>SPINDLE DRIVE "A" - SHAFT</b>	<p>Saturate a cloth with a good grade of #2 Multi-Purpose grease and wipe the "A" shaft daily.</p>
<b>SPINDLE SPLINES</b>	<p>The spindle splines are lubricated automatically.</p>
<b>SPINDLE BEARINGS</b>	<p>Spindle bearings are packed with lifetime grease and never need repacking except when bearings are repaired.</p>
<b>MOTORS</b>	<p>All motors contain conventional sealed bearings and do not require periodical lubrication.</p>

# SECTION IV

## SERVICE INSTRUCTIONS

### 4.1 SPEED AND FEED GEAR TRANSMISSIONS - See Figure 5 and Figure 6

a. To remove the spindle speed transmission, proceed as follows:

(1) Turn the electric disconnect switch on the control panel to the "OFF" position. Make certain all electrical power to the machine is disconnected before proceeding.

(2) Separate the spindle drive motor coupling by removing the retaining ring from one side of the coupling. Then slide the coupling back until it clears the gap between the motor shaft and the pinion drive shaft 33507. It is not necessary to remove the motor.

(3) Remove the 33361 Top Head Cover at hinges 33377.

(4) Remove all pick-off gears from the speed and feed transmissions.

(5) Remove the five socket cap screws from the 33362 drive shaft cover and tap the cover back until its two locating dowel pins are out of the top head casting.

(6) Remove the two #8 taper pull pins and the four hex head bolts holding the speed transmission frame to the top head casting.

(7) Remove the two #8 taper pull pins and the four hex head bolts holding the feed transmission frame to the top head casting.

(8) By pivoting the feed transmission frame on Shaft "F", slide it away from the speed transmission frame and separate the two frames at Shafts "A" and "D".

(9) Insert an eyebolt in the 3/8"-16 tapped hole provided on top of the speed transmission frame adjacent to and between the "B" and "C" shafts. Then lift the transmission frame slowly and straight up with a crane until it clears the hole in the top head.

- CAUTION -

Rock the transmission frame slightly from side to side to prevent the spindle drive sleeve Shaft "A" from seizing on the spindle splines. Jerking motions by the lifting device may cause seizing or bend the "A" Shaft.

b. To remove the Spindle feed gear transmission, the Spindle speed gear transmission must first be removed as outlined above. Then lift the feed gear transmission by hand until the 33492 "F" Shaft clears the top head.





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## 4.2 REMOVING THE SPINDLE - See Figure 7

a. To remove the #5 M.T. spindle from the 33515 Quill, it is not necessary to remove the quill from the adjustable head. Proceed as follows:

(1) Turn the Electric Disconnect Switch on the Control Panel to the "OFF" position. Make certain all electrical power to the machine is disconnected before proceeding.

(2) Remove the table or place it in the lowest position on the column.

(3) Block up under the spindle to prevent it from dropping.

(4) Remove the Dutchman setscrew that locks the 33342 bottom closure in the quill.

(5) Turn out the 33342 Bottom Closure (R.H. Thread) and the Spindle Assembly is free to drop out the bottom of the quill. If the spindle does not drop out freely, tap the spindle nose lightly on the sides and bottom with a soft faced hammer.

b. To remove the spindle from a flanged quill, follow steps 1, 2, and 3 in paragraph 4.2a and proceed as follows:

(1) Pull out the two (2) 33452 Driving Pins located in the face of the 33450 Quill Flange. These pins are provided with 1/4"-20 tapped holes for inserting a threaded pin puller.

(2) Turn out the Quill Flange (R.H. Thread) and the Spindle Assembly is free to drop out the bottom of the quill. Tap the bottom of the spindle lightly with a soft faced hammer if the spindle does not fall out freely.

## 4.3 CONTROL DIALS - See Figures 4 and 8 - Three and five dial machines

a. The control dials, located on the front left side of the adjustable head can be removed as follows:

(1) Turn the Electric Disconnect Switch on the Control Panel to the "OFF" position. Make certain all electrical power to the machine is disconnected before proceeding.

(2) Remove the knurled dial locking knob and hub by turning counter-clockwise until it is loose from the 33695 dial sleeve.

(3) Remove the left side adjustable head control panel covers, 33511.



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(4) Remove the screws from the adjustable head front pushbutton cover and swing down.

(5) Remove the 33535 spacer and successive 33611 limit switch cam dials and 30595 friction discs. Do not remove the setscrews on the face of the graduated dial rings.

(6) The 33612 upper and lower safety limit cams which are locked on to the 33694 dial gear with setscrews can now be removed by loosening the setscrews or they can be removed with the 33694 dial gear as a unit. Mark the dial gear tooth position before removing.

(7) The control dials and the 33694 dial gear can be removed as a unit by removing the 1/2"-13 socket head bolt and 1/2" plain washer and sliding the 33695 dial sleeve off the 33555 dial shaft.

## NOTE

When reassembling the safety limit cams to the dial gear, make certain that they are replaced in their original order and that the setscrews are seated in the drilled spot holes in the 33674 dial gear.

Make sure that the dial gear is reinstalled in the original gear tooth position from which it was removed or upper and lower safety limit will not be safe for machine operation.

## 4.4 LIMIT SWITCH AND DIAL MOUNTING PANEL - See Figure 8

a. It is not necessary to remove the cycle control dials to remove the dial mounting panel. Follow steps 1, 2, 3, and 4 in paragraph 4.3 and proceed as follows:

(1) Accurately mark the gear teeth on the 33694 dial gear and the 33512 Idler Gear. Then mark idler gear location on the 33832 dial gear driver.

(2) Disconnect the wires coming from the rapid traverse motor and feed clutch.

(3) Disconnect the wires coming from the front cover pushbuttons.

(4) Disconnect the wires from the control panel. It is not necessary to remove the wires from the control dial limit switches.

(5) The micrometer dial assembly must also be removed. See figure 9 and paragraph 4.5.

(6) Remove the three (3) 10-32 socket head screws that fasten the dial mounting plate to the adjustable head.



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(7) You can now lift the dial mounting plate out of the adjustable head.

## NOTE

When reassembling, be certain that all gears are put back in their proper marked tooth location, otherwise the machine will be out of time with the upper and lower safety limit.

### 4.5 MICROMETER DEPTH DIAL - See Figure 9

a. Fine depth setting can be accomplished by turning the micrometer dial which is located on top of the adjustable head. The Dial is graduated in thousandths and turning clockwise increases depth of feed; counterclockwise decreases depth of feed. This adjustment is done after depth dial has been set and locked in position. This adjustment works on depth dial #2 only.

b. To remove the micrometer dial assembly from the top head, proceed as follows:

(1) Remove the 1/4"-20 setscrew on top of the 33560 micrometer dial. It is jammed against the top end of the 33563 stud.

(2) Remove the three (3) flat head screws that secure the 33562 cap to the adjustable head. Remove the cap and gasket.

(3) Turn the micrometer dial and the 33561 ball counterclockwise until the 33563 stud is free from the micrometer dial or the 33565 sliding pin. Be careful not to lose the two (2) 33568 spring shield liners or the K11187 spring.

(4) The 33565 sliding pin can now be removed from the 33699 slide.

c. To reassemble the micrometer dial, use the following steps:

(1) Replace the sliding pin on the slide.

(2) Turn the 33563 stud into the sliding pin until it is through the sliding pin approximately 1/32".

(3) Slide one 33568 spring shield liner onto the stud, then the spring and the second liner. Be sure that the small diameters of the spring shield liners are inside of the spring.

(4) Slide the 33561 ball onto the stud.

(5) Turn the micrometer dial onto the stud and hold the stud stationary by means of a screw driver slot on the top end of the stud.



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(6) Adjust the micrometer dial so that all travel of the 33699 slide, up and down, will be under adequate spring tension and jam the 1/4"-20 setscrew against the top end of the stud.

(7) Replace the 33562 cap and 33606 gasket over the micrometer ball. The white zero indicating line must face the left side of the machine. The 33563 stud must not bind in the ball for smooth operation of the micrometer dial.

(8) The micrometer dial adjustment is approximately  $\pm .020$  from the white indicating line on the ball.

## 4.6 POWER RAPID TRAVERSE - See Figure 8

a. The rapid traverse motor is attached to the 33572 feed clutch housing. To remove the motor from the feed clutch housing, proceed as follows:

(1) Turn the Electric Disconnect Switch on the Control Panel to the "OFF" position. Make certain all electrical power to the machine is disconnected before proceeding.

(2) Set the Adjustable Head in the lowest position on the column. See paragraph 2.1.

(3) Disconnect the wires leading to the Rapid Traverse Motor.

(4) Disconnect the flexible conduit containing the motor wires.

(5) Remove the four (4) hex head bolts holding the motor to the feed clutch housing. Traverse motors are sometimes shimmed to get the proper belt tension. Do not lose these shims.

(6) Tip the top of the motor away from the clutch housing to disengage the K11369 belt.

(7) You can now lift the motor up and out of the adjustable head.

## 4.7 MAGNETIC FEED CLUTCH - See Figure 8

The 33634 feed clutch is energized when the cycle control feed engagement dial, or dials actuate the proper limit switches behind them. To remove the magnetic feed clutch, proceed as follows:

(1) Remove the Power Rapid Traverse Motor as outlined in paragraph 4.6.

(2) Disconnect the feed clutch wires and flexible conduit.

(3) Remove the 33579 clutch cover.

(4) Raise the CP3127 feed shaft driver and lift it off the 33574 feed shaft.



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(5) Remove the four (4) socket head screws and two (2) #6 taper pull pins that hold the clutch housing to the adjustable head.

(6) Slide the clutch housing out the right hand side of the adjustable head.

(7) Remove the 5/32" roll pin from the upper and lower clutch sections. Loosen the setscrews in the hubs of the upper and lower clutch sections.

(8) Remove the upper clutch section 33634 and the lower E6260 armature plate from their shafts and replace. The motor belt K11369 can also be replaced at this time, if necessary.

## 4.8 TRAVERSE MOTOR BELT - See Figure 8

To change traverse motor belts, it is not necessary to remove the magnetic feed clutch assembly. Follow this method.

(1) Loosen the four (4) Rapid Traverse Motor mounting screws.

(2) Tilt the motor back and disengage the belt from the motor pulley.

(3) Remove the 5/32" roll pin and loosen the setscrew in the 33575 collar.

(4) Raise the top 33634 clutch section and the 33574 feed shaft.

(5) Slip the K11369 belt through the separation between the upper and lower clutch sections.

(6) Replace the faulty belt.

(7) Line up the 5/32" roll pin hole and replace the pin. Then tighten the setscrew in the 33575 feed shaft collar.

(8) Make sure the clutch gap is at least .030".

(9) Slide the belt around the motor pulley and reinstall the motor to the clutch housing.

## 4.9 FEED WORM SHAFT - See Figure 8

a. The 33573 feed worm shaft is located in the adjustable head under the feed clutch assembly. To remove the feed worm gear, follow these steps:

(1) Remove the Rapid Traverse motor as in paragraph 4.6.

(2) Remove the Magnetic Feed Clutch as in paragraph 4.7.



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- (3) Remove the drain plug from the bottom side of the adjustable head and drain the worm gear oil.
- (4) Remove the 33702 worm gear cover,
- (5) Drive out the roll pin and loosen the setscrew in the lower clutch section and lift it off.
- (6) Remove the 33642 worm gear pulley by lifting up.
- (7) Block up under the spindle to prevent it from dropping. Leave 3/4" between blocking and spindle. Block up under the counterweight.
- (8) Turn the feed worm shaft to feed the quill up until the counterweight is resting securely on its blocking. Remove the 33484 counterweight attachment from the upper back side of the quill. See figure 12.
- (9) Loosen the 1/4"-20 setscrew that locks the 33358 bearing retainer and turn the bearing retainer out (R.H. Thread).
- (10) Turn a long 3/8"-16 bolt into the bottom end of the feed worm shaft in the 3/8"-16 tapped hole provided.
- (11) Tap the bolt up until the feed worm shaft comes out of the lower KB11142 bearing.
- (12) Then turn the feed worm shaft and maneuver it past the 33433 feed worm gear and out of the adjustable head.

## 4.10 CROSS SPINDLE AND QUILL - See Figures 7 and 8

- a. To remove the cross spindle and quill, proceed as follows:
  - (1) Remove the feed worm shaft as outlined in paragraph 4.9.
  - (2) Do not move the blocking under the spindle or counterweight.
  - (3) Accurately mark the control dial gear and the idler gear. Then mark the dial gear driver 33832 and remove the limit switch and dial mounting panel as outlined in paragraph 4.4.
  - (4) Remove the four (4) socket head screws from the 33338 bearing retainer.
  - (5) Remove the 33832 dial gear driver from the end of the 33547 cross spindle.
  - (6) Insert two (2) 3/8"-16 x 4" socket head cap screws into the tapped holes provided in the 33433 Feed Worm Gear. Using the cap screws as a wheel puller, turn them evenly against the inside of the Adjustable Head to pull out the Cross Spindle.



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## NOTE

When reassembling, the dial gear, the dial gear driver, and the idler gear must be in the exact gear tooth position as before disassembling; otherwise the spindle and quill will be out of time with its safety upper and lower limit. See paragraph 4.11 for timing procedure.

b. With the cross spindle removed from the adjustable head, the quill can now be removed by following these steps.

(1) Working through the cross-spindle bore from the right side of the adjustable head, tap out the 33440 left roller, the KB11161 bearing and the 33360 spacer.

(2) Carefully remove the blocking from under the spindle and drop the spindle and quill assembly out the bottom of the adjustable head.

## CAUTION

The spindle and quill assembly is heavy and care must be taken during its removal from the adjustable head.

c. When reassembling the machine, it is necessary to time the spindle and quill travel. Follow the instructions in paragraph 4.11.

### 4.11 TIMING THE SPINDLE - See Figures 4 and 8

a. When the spindle and quill have been removed from the machine, it is necessary to reassemble and time the spindle in the following manner.

(1) Insert the Spindle and Quill Assembly into the Adjustable Head and push it up high enough so that the next to last rack-tooth on the lower end of the quill shows through the opening in the cross spindle bore.

(2) Block up the spindle and quill in this position.

(3) Replace the 33547 cross spindle assembly. Turn the quill slightly, so the 33437 right roller does not hit the side of the quill at the flat on the quill which is the bearing surface for the roller.

(4) Replace the 33339 bearing retainer.

(5) Turn the quill tightly against the 33437 right roller and insert the 33440 left roller and the KB11161 bearing.

(6) Replace the 33360 spacer. Do not replace the 33832 dial gear driver.



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(7) Replace the limit switch and dial mounting panel and the micrometer dial assembly.

(8) Replace the feed worm shaft.

(9) Replace the magnetic feed clutch assembly.

(10) Replace the rapid traverse motor.

(11) Remove all blocking from under the spindle.

(12) Insert a 3/8"-16 x 4" long bolt into the bottom end of the 33573 worm shaft and lock it with a 3/8"-16 jam nut.

(13) Replace the 33484 counterweight attachment. Manually turn the 3/8" bolt and feed the quill down until the blocking can be removed from under the counterweight.

(14) By manually turning the 3/8" bolt, feed the spindle up to its maximum upper limit of travel. Mark the position of the quill in the adjustable head.

(15) Turn the bolt and feed the spindle down 1/2" from its upper limit.

(16) Rotate the control dials assembly until the 33612 upper safety limit dial trips its limit switch on the limit switch mounting bracket.

(17) Without moving the dials or the quill, replace the 33832 dial gear driver on the end of the cross spindle. If the dial gear driver does not readily mesh into the 33512 idler gear, turn the dials slightly clockwise (down) until the gears mesh.

(18) Check the lower safety limit switch trip point to be sure there is enough overtravel on the quill in the down direction.

(19) The quill is now in time.

b. Be sure all wiring is reconnected and the feed worm gear oil reservoir has been filled before turning the electrical controls on. With the machine control power "ON", jog the spindle up and down to check the upper and lower spindle safety limits before proceeding with normal machine operation.



# SECTION V

## SET-UP INSTRUCTIONS

### 5.1 REMOVING FROM CRATE

Exercise care in removing the crate and blocking to prevent any damage or marring. Inspect all the small boxes and account for all parts against the Packing List. Preparatory to bolting the machine together, clean the top surface of the Lower Column Section. The Upper Section may be lifted with a crane by placing a rope sling underneath the Top Head and a double chain sling around a 1-1/2" diameter bar inserted through the cored holes in the side of the Column. Lift the Upper Column Section as level as possible to facilitate insertion of bolts and pins when it is set on the Lower Column Section. When the Column Sections are in place, first loosely tighten the bolts and drive the dowel pins, then tighten bolts securely. To lift the machine after it has been bolted together, the rope sling underneath the Top Head is no longer necessary. The machine will ride in a level position using only a double chain sling around the bar inserted through the cored holes in the side of the column.

### 5.2 FOUNDATION

The CLEEREMAN Series "A" Drilling Machine has a large Base in proportion to its size and weight. However, it is well to remember that a solid foundation, free of external vibration, produces the most accurate results. If the machine is to be placed on a balcony or upper floor, location should be provided near a support wall or pillar.

### 5.3 LEVELING

The builder recommends that all machines be leveled and securely bolted to the floor. However, this is not mandatory when installation is made on a rigid floor with little or no external vibration. To level the machine, use a sensitive spirit level both lengthwise and crosswise on the Table. Use

either screw adjusting level blocks or wooden wedges under the Base as may be necessary.

### 5.4 CLEANING

Carefully remove all slushing compound from the Spindle, Quill, Table and Way surfaces. Use new, clean solvent and clean rags free from lint. Use a stiff bristle brush to get into corners. Do not use compressed air for cleaning; the pressure will drive grit and dirt into bearing surfaces.

Before placing the machine in operation, lubricate as outlined in the Lubrication Instructions.

### 5.5 ELECTRICAL CONNECTIONS

All machines are normally shipped completely wired, except that the Coolant Pump Motor has been disconnected. To connect the machine, bring Lead-In Wires to the proper terminals at the Disconnect Switch on the Electrical Control Panel mounted on the side of the Column, as indicated on the wiring diagram. To ascertain that the Spindle rotates right hand, that is, ready to drive a standard fluted drill or a right hand tap, press only the "Spindle Start" Button. If the direction of the rotation is not correct, transpose the Lead-In Wires on Terminals L1 and L3. Do not press any other button, except "Stop", until it has been determined that the direction of rotation is right hand.

To connect the Coolant Pump Motor, bring the cable up to the bottom of the Electrical Control Panel mounted on the side of the Column. Make connections as shown on the wiring diagrams, i.e., connect Wire 3T1 to Terminal 3T1, Wire 3T2 to Terminal 3T2, and Wire 3T3 to Terminal 3T3. Ascertain that the direction of rotation is as indicated by the arrow on the Pump by inserting a pencil slowly into one of the intake holes on the Pump. If rotation is incorrect, transpose the Coolant Pump Motor lead wires.

# SECTION VI

## TROUBLESHOOTING

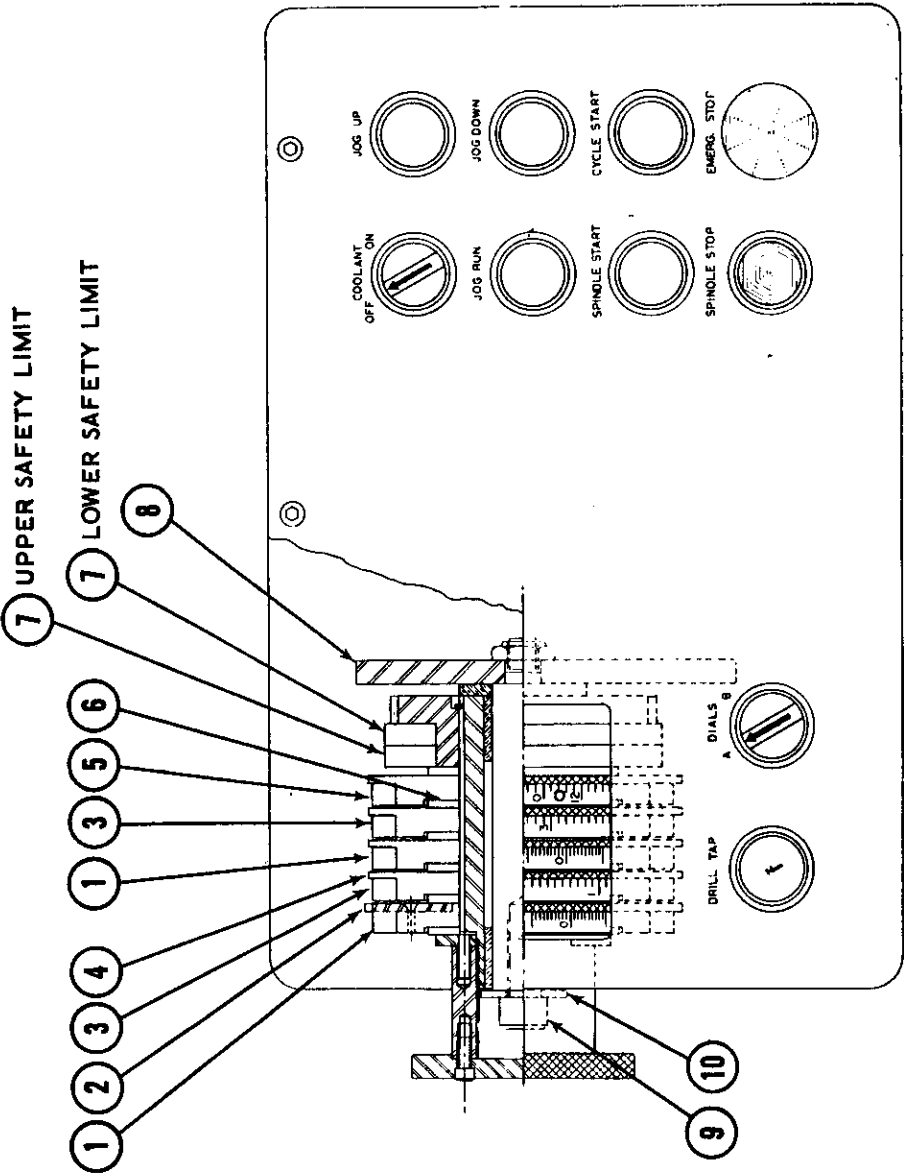
### 6.1 TROUBLESHOOTING NOTES

The following information is intended to be an aid when machine malfunctions occur. Consult the

electrical drawings which are provided and the assembly drawings in this manual when confronting the problems listed below or other malfunctions.

### 6.2 TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE
a. Feed Clutch fails to engage.	<ol style="list-style-type: none"> <li>1. Bad clutch coil or clutch gap.</li> <li>2. Faulty rectifier in control panel.</li> <li>3. Feed engagement limit switch bad.</li> <li>4. Blown fuses.</li> <li>5. Control dials not properly locked.</li> <li>6. Bad relay in control panel.</li> </ol>
b. Feed Clutch fails to disengage.	<ol style="list-style-type: none"> <li>1. Feed depth limit switch bad or not being tipped.</li> <li>2. If spindle feeds down from upper limit after a retraction, check plug stop timer setting.</li> <li>3. Control dials not properly locked.</li> </ol>
c. Feed Clutch slips.	<ol style="list-style-type: none"> <li>1. Faulty rectifier or clutch.</li> <li>2. Too much end thrust (see figure 13).</li> <li>3. Clutch gap too great.</li> </ol>
d. Spindle does not traverse down.	<ol style="list-style-type: none"> <li>1. Broken traverse motor drive belt.</li> <li>2. Belt not tight.</li> <li>3. If spindle feeds down instead of traversing, decrease the time on plug stop timer in control panel.</li> </ol>
e. Spindle does not traverse up.	<ol style="list-style-type: none"> <li>1. Feed depth limit switch.</li> <li>2. Bad relay in control panel.</li> <li>3. Broken belt.</li> <li>4. Dwell is "ON" instead of "OFF".</li> <li>5. Feed engage limit switch (when tapping).</li> </ol>



MODEL ADT - 5 DIAL ASSEMBLY WITH COOLANT

FIGURE 4. CONTROL DIALS, PUSHBUTTONS, SELECTOR SWITCHES

PARTS LIST FOR FIGURE 4

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	33542	Feed Engagement Dial Ring	1-2
2	33605	Trip Dog	3-5
3	33541	Feed Depth Dial Ring - (12" Spindle Travel)	1-2
	33540	Feed Depth Dial Ring - (18" & 24" Spindle Travel)	1-2
	33626	Feed Depth Dial Ring - (30" Spindle Travel)	1-2
4	33611	Knurled Dial Cam	3-5
5	33513	Upper Limit Dial Ring - (12" Spindle Travel)	1
	33517	Upper Limit Dial Ring - (18" & 24" Spindle Travel)	1
	33625	Upper Limit Dial Ring - (30" Spindle Travel)	1
6	30595	Friction Disc	5-6
7	33612	Overtravel Cam	2
8	33557	Dial Mounting Plate	1
9		1/2"-13 x 1" Socket Head Cap Screw (Nylok)	1
10		1/2" Plain Washer	1
		For 3 Dial Machines Use:	
	33696	Dial Spacer - (In Lieu of Dials 3 & 4)	1

Use column 1 under Quantity for 3 dial machines and column 2 for 5 dial machines.

Please specify machine serial number when ordering parts.

PICK-OFF GEARS CAN BE ORDERED FROM FEED CHART

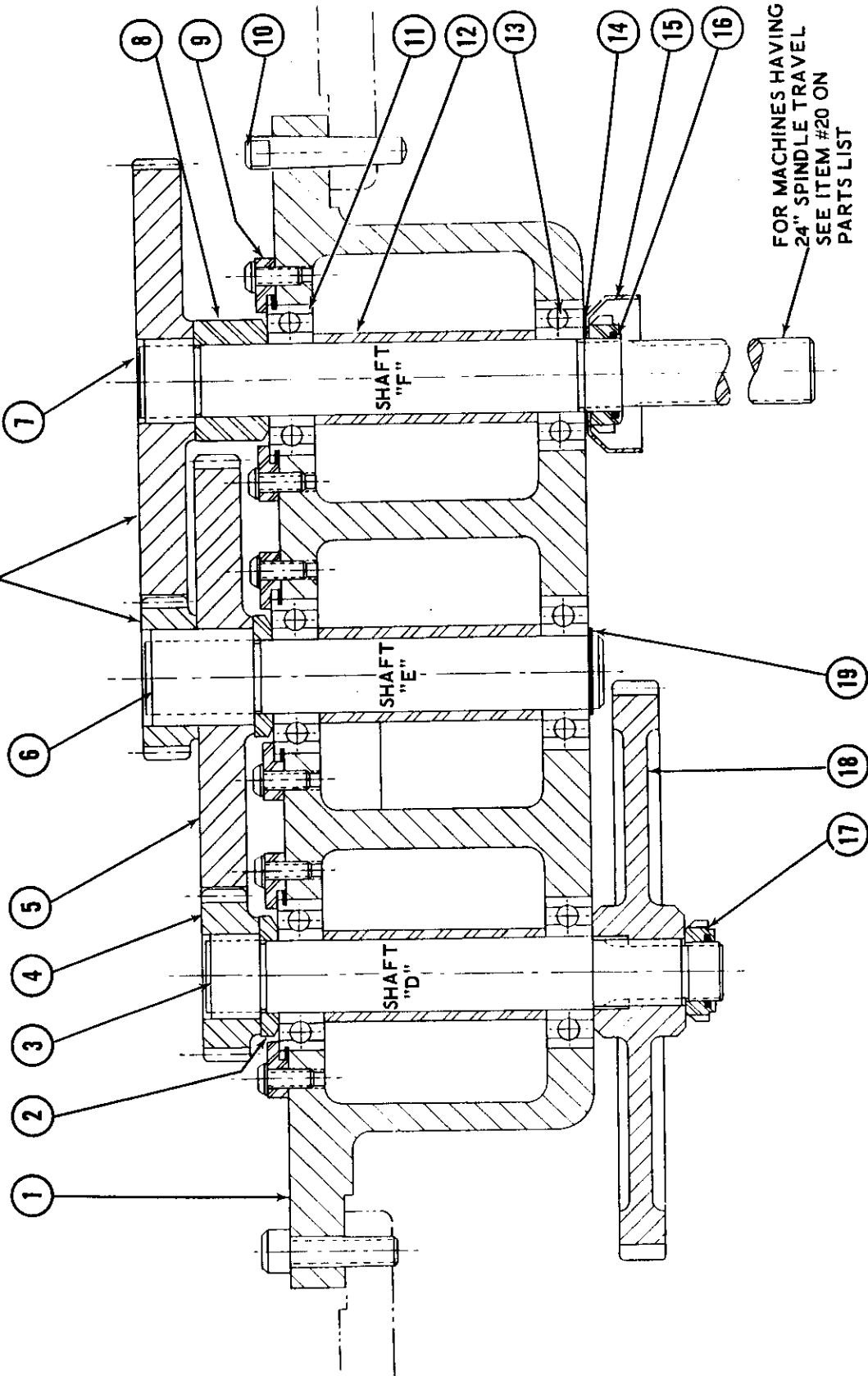


FIGURE 5. FEED GEAR TRANSMISSION ASSEMBLY

PARTS LIST FOR FIGURE 5

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	33363	Feed Gear Transmission Frame	1
2	33373	Gear Washer	2
3	33375	"D" Shaft	1
4	33353	Intermediate Feed Gear - 72T	1
5	33352	Intermediate Feed Gear - 27T	1
6	33374	"E" Shaft	1
7	33492	"F" Shaft - (12" & 18" Spindle Travel Only)	1
8	33376	Gear Spacer	1
9	33479	Bearing Clip	6
10		#8 x 2-1/4" Taper Pull Pin	2
11	KB6770	Bearing	3
12	33371	Bearing Spacer	3
13	KB11140	Bearing	3
14	33598	Worm Drive Shaft Gasket	1
15	33493	Oil Slinger	1
16	BL-N-05	Bearhug Nut	1
17	BL-N-04	Bearhug Nut	1
18	33432	Feed Drive Gear	1
19	K4598	Truarc Ring	1
20	33490	"F" Shaft - (24" Spindle Travel)	1

Please specify machine serial number when ordering parts.

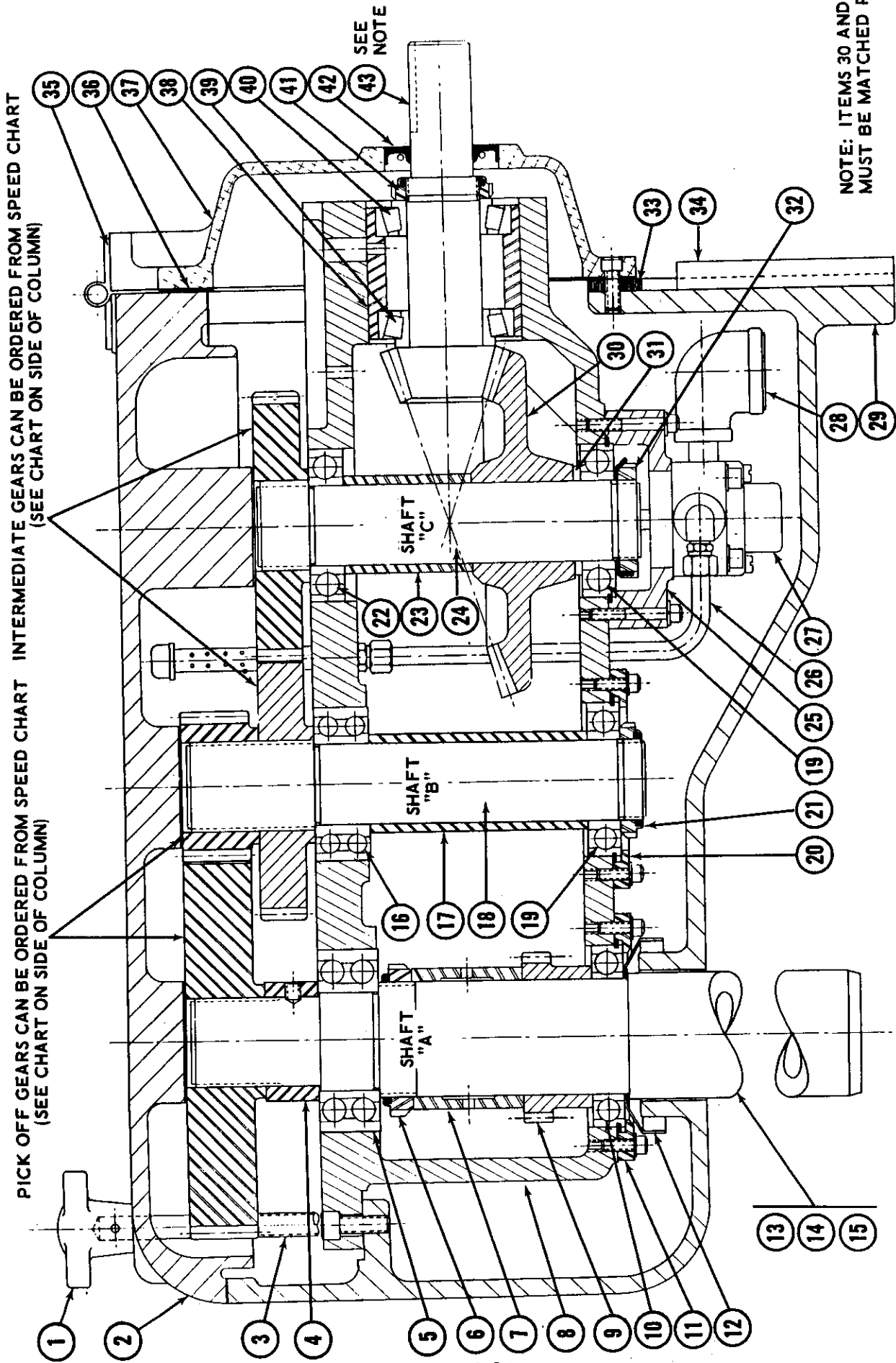


FIGURE 6. SPEED GEAR TRANSMISSION ASSEMBLY

## PARTS LIST FOR FIGURE 6

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	K11426	Knob	1
2	33361	Top Head Cover	1
3	33434	Knob Shaft	1
4	33349	Set Collar	1
5	KB11176	Bearing	1
6	BL-N-13	Bearhug Nut	1
7	33350	Spacer	1
8	33334	Transmission Frame	1
9	33431	Gear	1
10	KB11179	Bearing	1
11	33369	Bearing Retainer	1
12	33351	Oil Slinger	1
13	33837	"A" Shaft - (12" & 18" Spindle Travel)	1
14	33838	"A" Shaft - (24" Spindle Travel)	1
15	33839	"A" Shaft - (30" Spindle Travel)	1
16	KB11170	Bearing	1
17	33366	Spacer	1
18	33372	"B" Shaft	1
19	KB11168	Bearing	2
20	33368	Bearing Retainer	1
21	BL-N-09	Bearhug Nut	1
22	KB11166	Bearing	1
23	33367	Spacer	1
24	33370	"C" Shaft	1
25	33364	Pump Bracket	1
26	33597	Oil Line	1
27	K9842	Oil Pump	1
28	CP3133	Pump Strainer	1
29	33329	Top Head	1
30	33506	Bevel Gear - (See Item 43)	1
31	33365	Washer	1
32	N&W-09	Nut and Washer	1
33	33445	Top Head Seal	1
34	33442	Key	1
35	33377	Cover Hinge	1
36	33648	Gasket	1
37	33362	Cover	1
38	CP3134	Bearing Spacer	1
39	KB11341	Bearing	1
40	KB11342	Bearing	1
41	BL-N-08	Bearhug Nut	1
42	K9860	Oil Seal	1
43	33507	Drive Shaft - (Must be matched pair with item 30)	1

Please specify machine serial number when ordering parts.



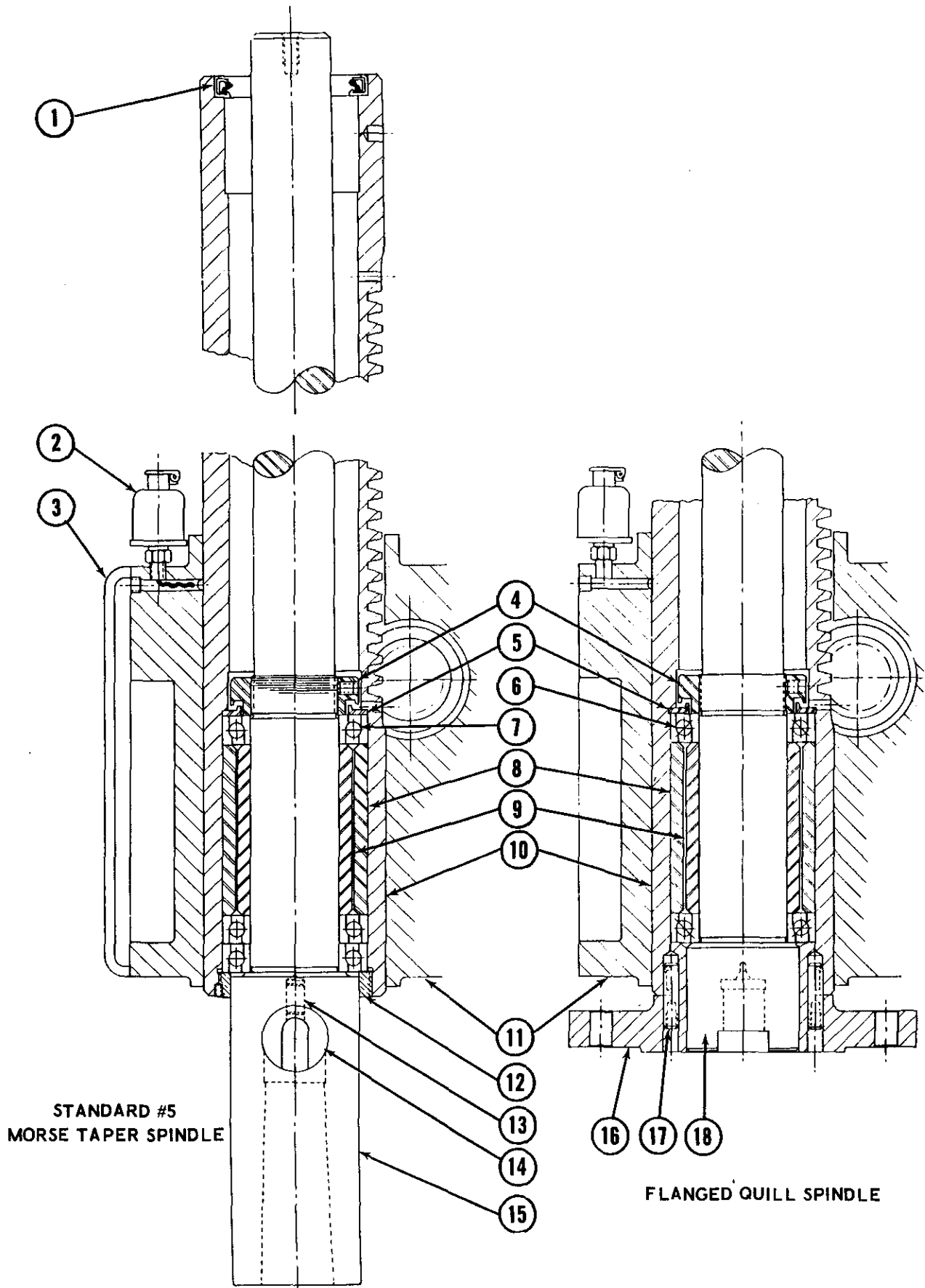


FIGURE 7. SPINDLE ASSEMBLIES 12" TRAVEL ONLY

PARTS LIST FOR FIGURE 7

Standard #5 Morse Taper Spindle - 12" Travel

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	33638	Oil Seal	1
2	K3546	Oiler - Wick Feed	1
3	33675	Adjustable Head Cover	1
4	33333	Spindle Nut	1
5	33436	Oil Slinger	1
6	KB11278	Bearing	Set of 3
7	33347	Spacer	1
8	33346	Spacer	1
9	33515	Quill - 12" Travel	1
10	33345	Adjustable Head	1
11	33342	Bottom Closure	1
12	34106	Pin	1
13	33341	Tang Plug	1
14	33335	Spindle - 12" Travel	1

Flanged Quill Spindle - 12" Travel

1	33638	Oil Seal	1
4	33333	Spindle Nut	1
5	33436	Oil Slinger	1
6	KB11274	Bearing	Set of 2
8	33347	Spacer	1
9	33346	Spacer	1
10	33515	Quill - 12" Travel	1
16	33450	Quill Flange	1
17	33452	Driving Pin	2
18	33451	Spindle - 12" Travel	1

OTHER SPINDLES & QUILLS - OPTIONAL EQUIPMENT

<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
#4 Morse Taper Spindle		
33639	Spindle - 12" Travel	1
33649	Spindle - 30" Travel	1
#5 Morse Taper Spindle		
33477	Spindle - 18" Travel	1
33500	Spindle - 24" Travel	1

(Continued To Page 6-11A)

<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
	Spindles For Flanged Quills	
33464	Spindle - 18" Travel	1
33460	Spindle - 24" Travel	1
	Quills	
33518	Quill - 18" Travel	1
33519	Quill - 24" Travel	1
33654	Quill - 30" Travel	1

Please specify machine serial number when ordering parts.

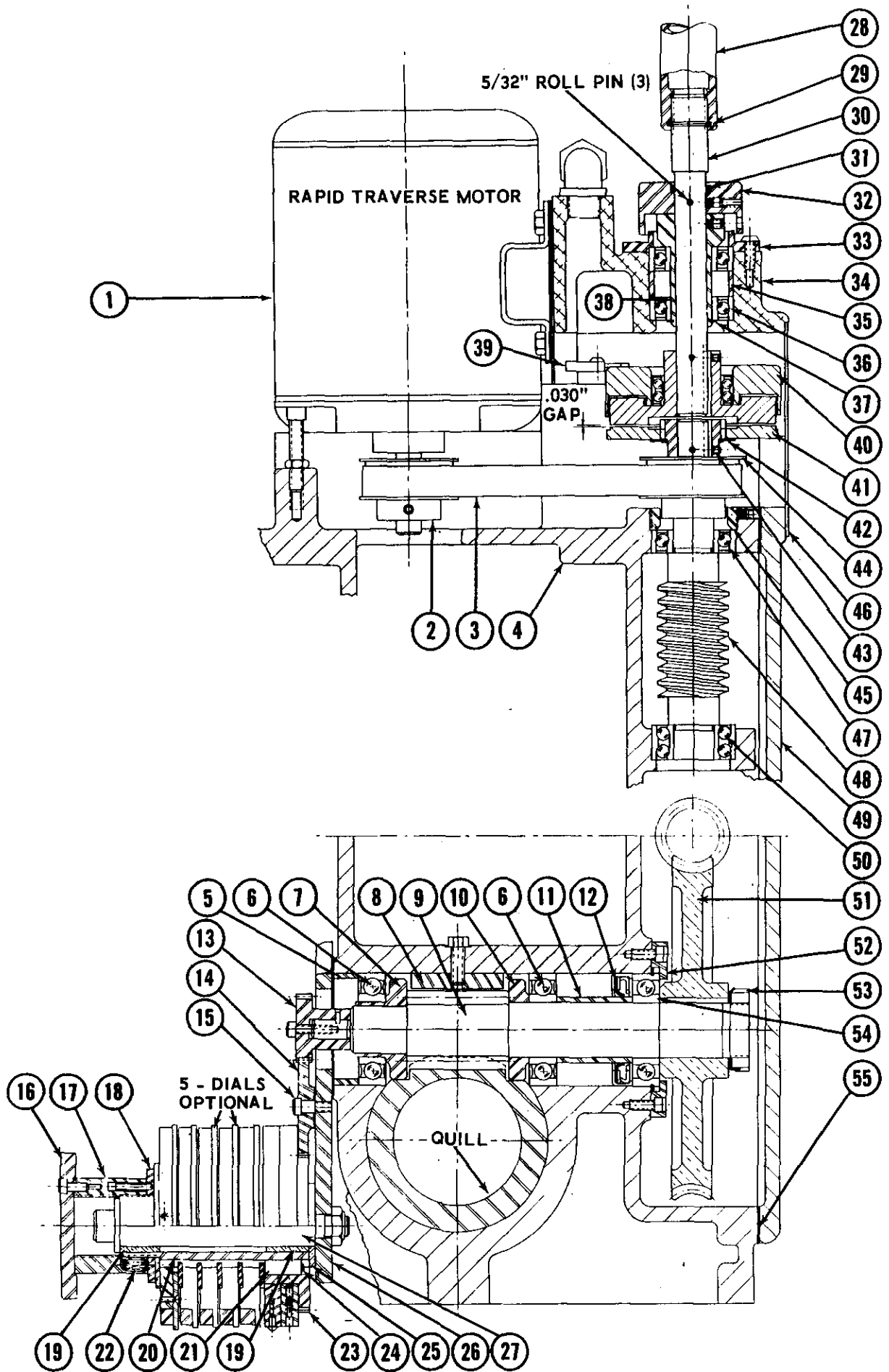


FIGURE 8. TRAVERSE AND FEED ASSEMBLY

## PARTS LIST FOR FIGURE 8

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	E6060	Rapid Traverse Motor	1
2	33643	Motor Pulley - (160 I.P.M. Traverse-Standard)	1
	33645	Motor Pulley - (130 I.P.M. Traverse-Optional)	1
	33646	Motor Pulley - (105 I.P.M. Traverse-Optional)	1
3	K11369	Belt - All Traverse Rates	1
4	33344	Adjustable Head	1
5	33360	Spacer	1
6	KB11161	Bearing	2
7	33440	Roller	1
8	33443	Sleeve	1
9	33547	Cross Spindle - (12", 18" & 24" Travel Spindle)	1
	33613	Cross Spindle - (30" Travel Spindle)	1
10	33437	Roller	1
11	33359	Bearing Spacer	1
12	K9862	Oil Seal	1
13	33832	Dial Gear Driver - (12" Travel Spindle)	1
	33833	Dial Gear Driver - (18" & 24" Travel Spindle)	1
14	33512	Idler Gear - (12" Travel Spindle)	1
	33516	Idler Gear - (18", 24" & 30" Travel Spindle)	1
15	K11520	Stripper Bolt	1
16	33537	Knurled Knob	1
17	33539	Hub	1
18	33535	Spacer	1
19	K11235	Bronze Bearing	2
20	33695	Dial Sleeve	1
21	K11096	Key	1
22	33581	Spring	3
23	33694	Dial Gear - (12", 18" & 24" Travel Spindle)	1
	33609	Dial Gear - (30" Travel Spindle)	1
24	K11108	Spirolox Ring	1
25	K11318	Thrust Bearing	1
26	33557	Plate	1
27	33555	Dial Shaft	1
28	CP3127	Feed Shaft Driver - (12" & 18" Travel Spindle)	1
	CP3128	Feed Shaft Driver - (24" Travel Spindle)	1
	CP3129	Feed Shaft Driver - (30" Travel Spindle)	1
29	33499	Spring	1
30	33574	Feed Shaft	1
31	K5470	"O" Ring	1
32	33575	Collar	1
33	33578	Bearing Retainer	1
34	33572	Clutch Housing	1
35	33577	Spacer	1
36	KB9217	Bearing	2
37	K4598	Retaining Ring	1
38	33576	Bearing Sleeve	1
39	33551	Coil Bracket	1
40	33634	Clutch Field	1

(Continued To Page 6-13A)

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
41	E6260	Armature	1
42	E6261	Spring	1
43	33636	Clutch Armature Hub	1
44	33642	Worm Shaft Pulley - (160 I.P.M. Traverse-Standard)	1
	33644	Worm Shaft Pulley - (130 I.P.M. Traverse-Optional)	1
	33622	Worm Shaft Pulley - (105 I.P.M. Traverse-Optional)	1
45	33358	Bearing Retainer	1
46	33579	Clutch Cover	1
47	KB9217	Bearing	1
48	33573	Feed Worm Shaft	1
49	33702	Worm Gear Cover	1
50	KB11142	Bearing	1
51	33433	Feed Gear	1
52	33338	Bearing Retainer	1
53	N&W-07	Nut and Washer	1
54	KB11157	Bearing	1
55	33607	Gasket	1

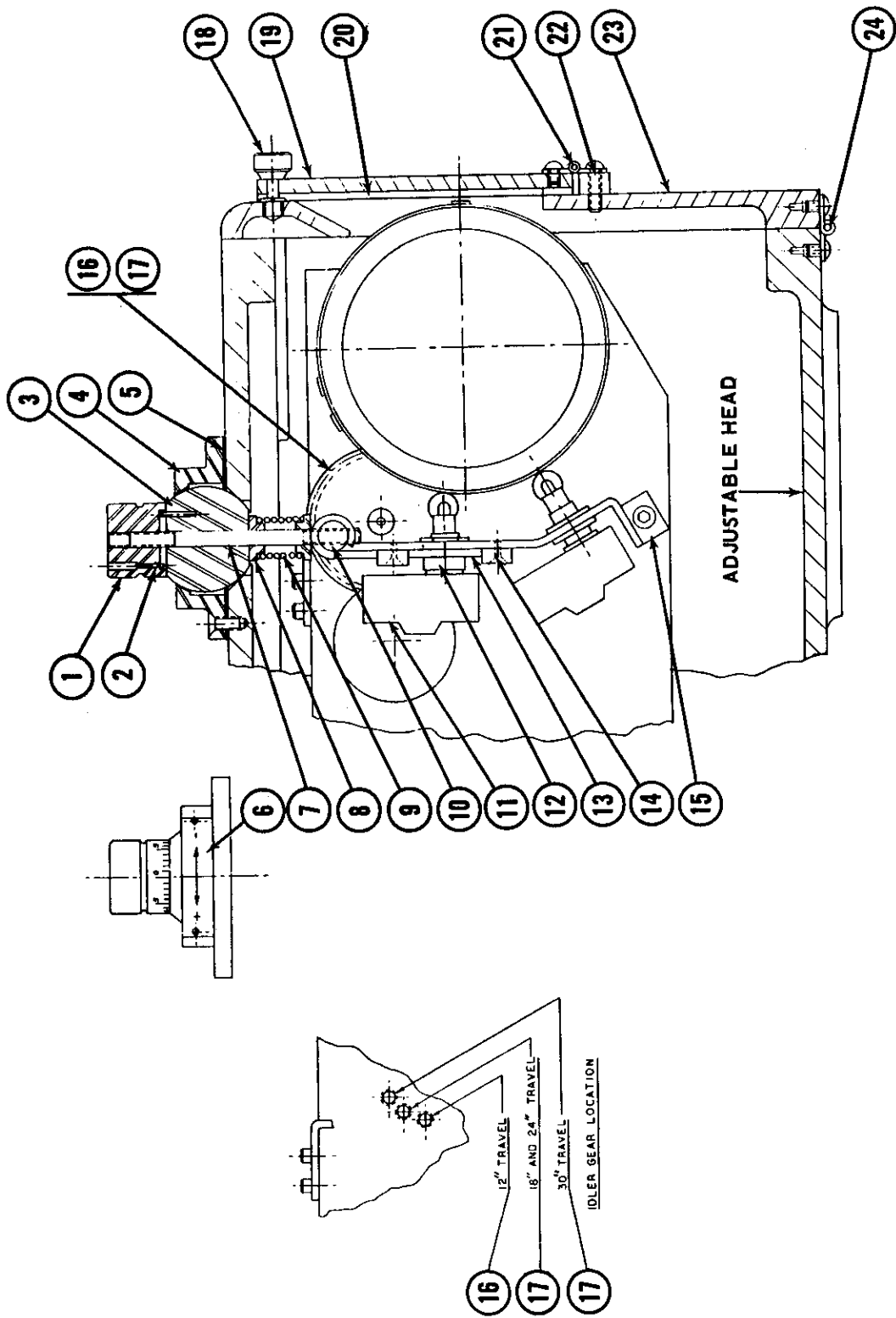


FIGURE 9. MICROMETER ADJUSTMENT FOR DEPTH DIAL

PARTS LIST FOR FIGURE 9

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	33560	Micrometer Dial	1
2		1/16" x 1/2" Diameter Roll Pin	2
3	33561	Ball	1
4	33562	Cap	1
5	33606	Gasket	1
6	33589	Name Plate	1
7	33563	Stud	1
8	33568	Spring Shield Liner	2
9	K11187	Spring	1
10	33565	Sliding Pin	1
11	E3221	Limit Switch	5
12	33570	Spacer	1
13	33699	Slide	1
14	33621	Slide Guide	2
15	33616	Limit Switch Bracket	1
16	33512	Idler Gear - (12" Spindle Travel)	1
17	33516	Idler Gear - (18", 24", 30" Spindle Travel)	1
18	33585	Lock Screw	1
19	33706	Dial Cover	1
20	33628	Rubber Strip	1
21	33705	Hinge	1
22	33704	Spacer Block	1
23	33703	Front Cover	1
24	33620	Hinge	1

Please specify machine serial number when ordering parts.



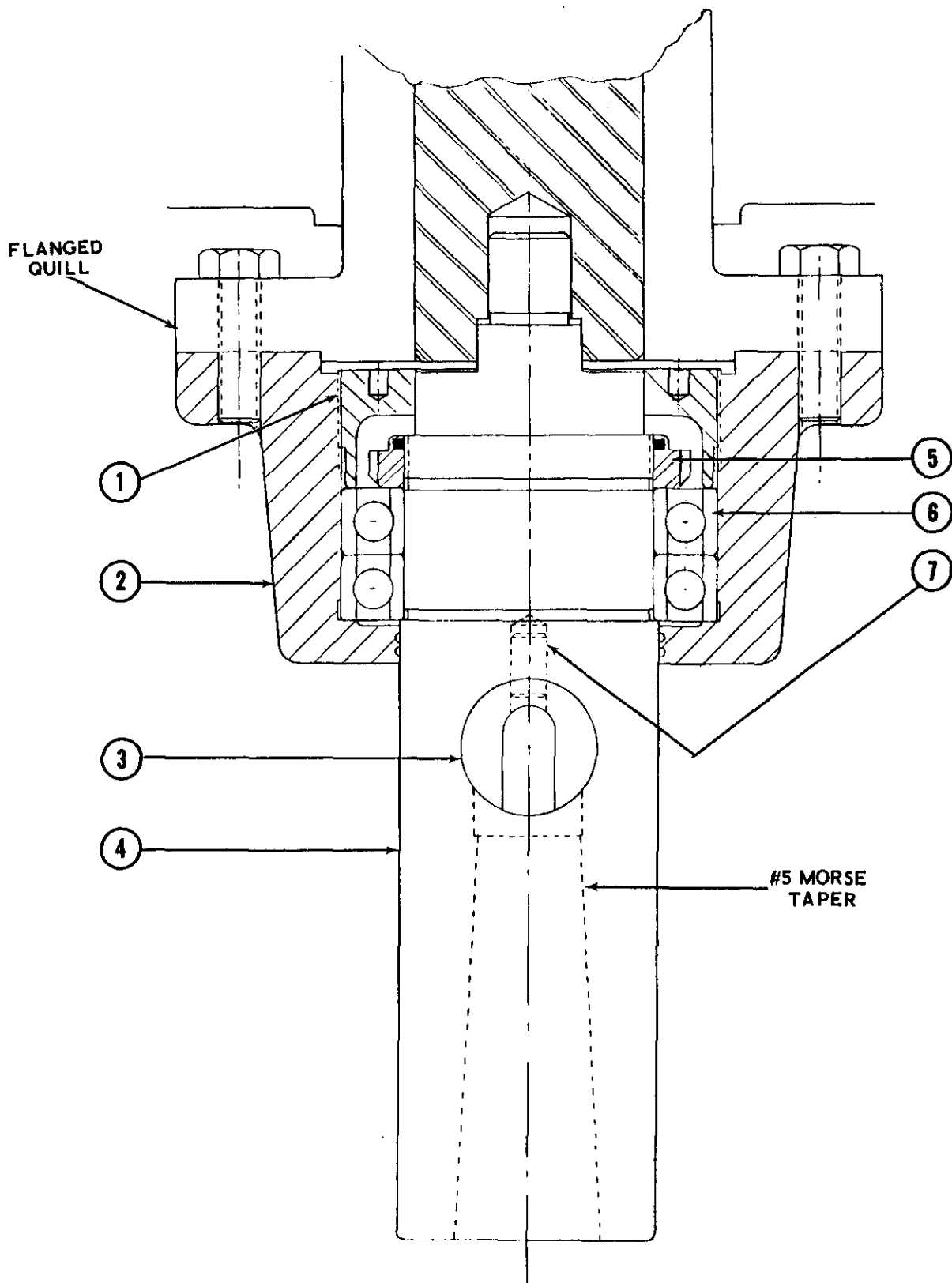


FIGURE 10. SINGLE SPINDLE DIRECT DRIVE HEAD ASSEMBLY  
(OPTIONAL EQUIPMENT)

PARTS LIST FOR FIGURE 10

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	33474	Bearing Closure	1
2	33476	Bearing Bracket	1
3	33341	Tang Plug	1
4	33475	Spindle Nose - #5 Morse Taper	1
5	BL-AN-15	Bearhug Locknut	1
6	KB11183	Bearing	2
7	34106	Pin	1

Please specify machine serial number when ordering parts.

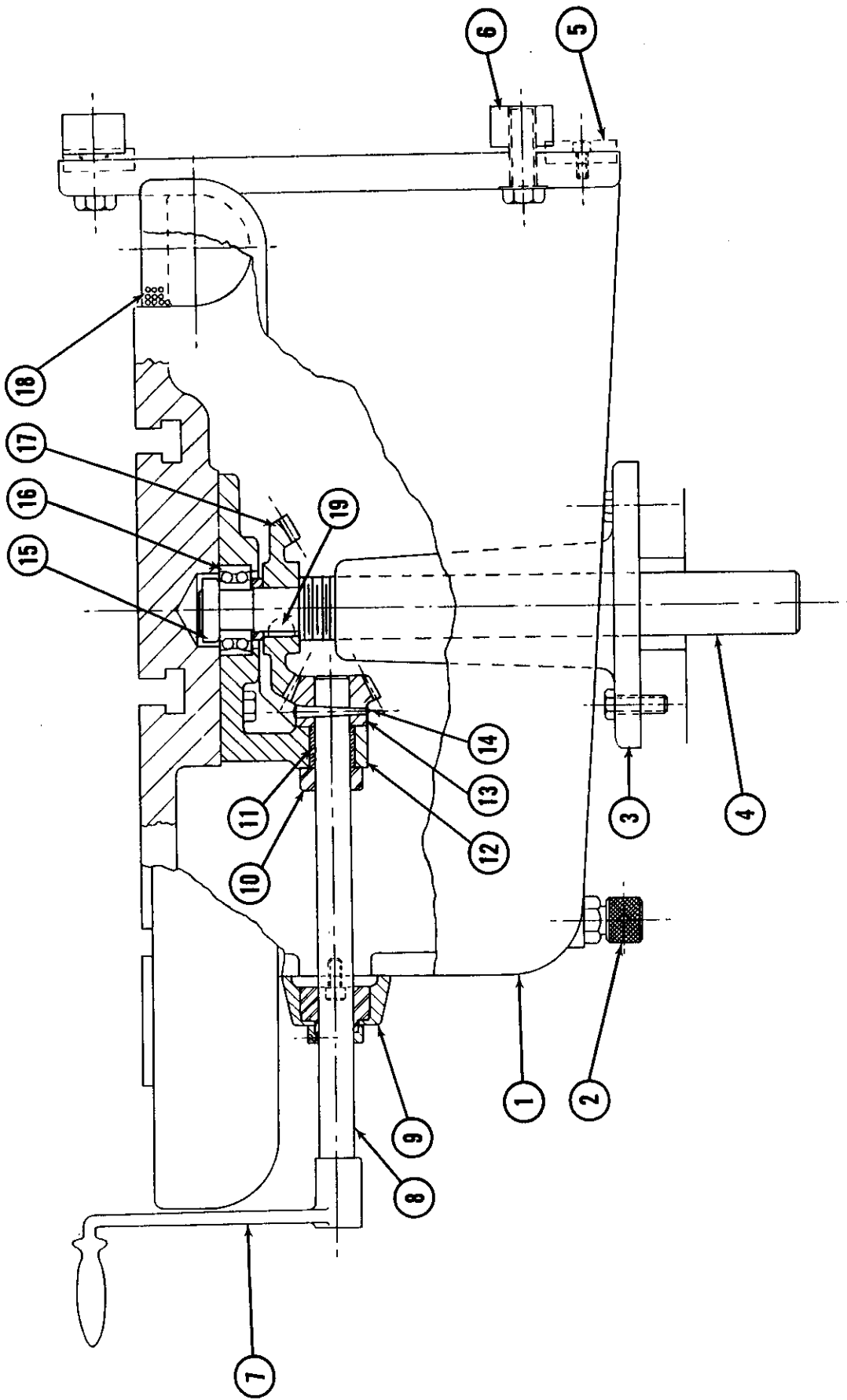


FIGURE 11. ADJUSTABLE TABLE ASSEMBLY

PARTS LIST FOR FIGURE 11

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
Standard Table - (Bolted)			
1	33632	Table	1
2	33435	Support Screw	1
5	33343	Key	2
Adjustable Table - (Elevating Stand) (Optional Equip.)			
1	33410	Table	1
2	33435	Support Screw	1
3	33341	Jack Screw Stand	1
4	34662	Jack Screw	1
5	33343	Key	2
6	K11430	T-Nut	4
7	K11519	Crank Handle	1
8	34295	Elevating Shaft	1
9	KB11321	Bearing	1
10	K11447	Set Collar	1
11	K11236	Bearing	1
12	34091	Gear Bracket	1
13	34094	Bevel Pinion	1
14		#4 x 2" Taper Pin	1
15	BLN-06	Bearhug Nut	1
16	KB11151	Bearing	1
17	34095	Bevel Gear	1
18	33441	Strainer	2
19		#A Woodruff Key	

Please specify machine serial number when ordering parts.

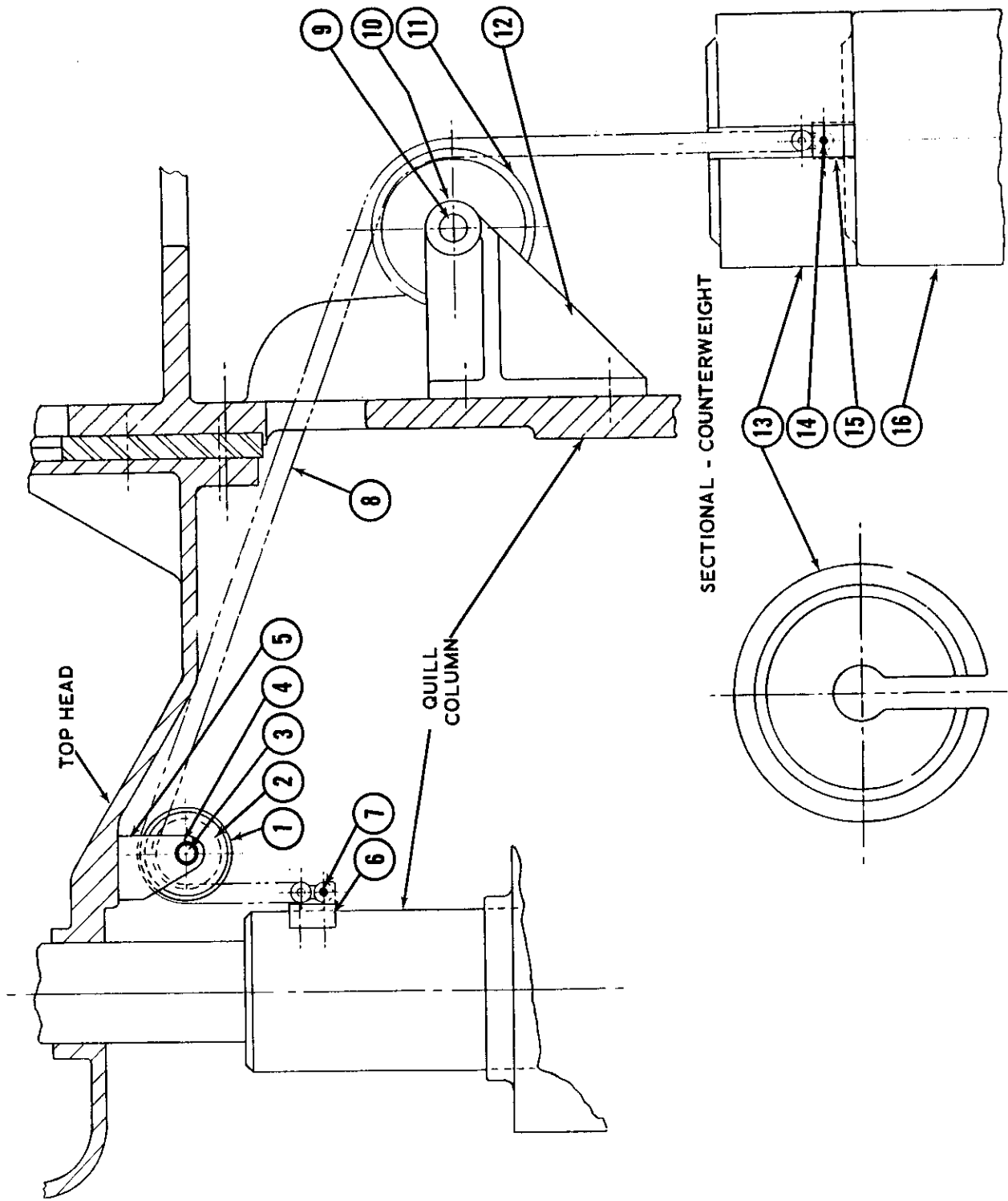


FIGURE 12. COUNTERWEIGHT ASSEMBLY

PARTS LIST FOR FIGURE 12

<u>ITEM NO.</u>	<u>PART NUMBER</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
1	33485	Counterweight Sprocket	1
2	K11224	Bronze Bearing	1
3	33456	Stud	1
4	K8187	Snap Ring	2
5	33488	Sprocket Support	1
6	33484	Counterweight Attachment	1
7	33491	Pin	1
8	K11427	Chain	1
9	33487	Stud	1
10	K11230	Bronze Bearing	1
11	34183	Sheave	1
12	33486	Sheave Support	1
13	33505	Sectional Counterweight - Approximately 33 Lbs.	1
14	34188	Pin	1
15	34184	Stud	1
16	33504	Counterweight - Approximately 106 Lbs.	1
	33849		

Please specify machine serial number when ordering parts.

Drill Size	ALUMINUM				CAST IRON			
	FEED in inches per revolution				FEED in inches per revolution			
	.005	.010	.015	.020	.005	.010	.015	.020
1/4	46	98			194			
3/8	62	129			258	449		
1/2	75	158	244		315	549		
5/8	88	185	286	389	369	642	888	1115
3/4	100	210	325	441	419	729	1010	1270
7/8	112	234	362	492	467	812	1125	1415
1	123	257	397	540	512	892	1235	1550
1-1/8	133	279	431	586	556	968	1340	1685
1-1/4	143	301	464	631	599	1040	1440	1815
1-3/8	153	321	496	675	640	1115	1540	1940
1-1/2	163	342	527	717	680	1185	1640	2060
1-5/8	172	361	558	759	720	1255	1730	2180
1-3/4	181	381	587	799	758	1320	1825	2295
1-7/8	190	399	616	838	795	1385	1915	2410
2	199	418	645	877	832	1450	2005	2520
2-1/4	216	454	700	953	904	1575	2175	2740
2-1/2	233	488	754	1025	973	1695	2340	2950
2-3/4	249	522	806	1100	1040	1810	2505	3150
3	264	555	856	1165	1105	1925	2660	3350

Drill Size	MACHINE STEEL				NICKEL CHROME STEEL			
	FEED in inches per revolution				FEED in inches per revolution			
	.005	.010	.015	.020	.005	.010	.015	.020
1/4	337				453			
3/8	447	725			602	938		
1/2	547	886	1175		736	1145	1485	
5/8	640	1035	1375	1680	860	1340	1740	2090
3/4	727	1175	1560	1905	978	1525	1975	2370
7/8	809	1310	1740	2125	1090	1695	2200	2640
1	889	1440	1910	2330	1195	1865	2415	2900
1-1/8	965	1565	2075	2535	1300	2025	2625	3150
1-1/4	1040	1685	2230	2725	1400	2180	2825	3390
1-3/8	1110	1800	2385	2915	1495	2330	3020	3625
1-1/2	1180	1910	2535	3100	1590	2475	3210	3855
1-5/8	1250	2020	2680	3275	1680	2615	3395	4075
1-3/4	1315	2130	2825	3450	1770	2755	3575	4295
1-7/8	1380	2235	2965	3620	1855	2895	3750	4505
2	1445	2340	3100	3760	1940	3025	3925	4715
2-1/4	1570	2540	3370	4115	2110	3285	4260	5120
2-1/2	1690	2735	3625	4430	2270	3540	4585	5510
2-3/4	1805	2925	3875	4735	2425	3780	4905	5890
3	1915	3105	4120	5030	2580	4020	5210	6260

Drill point thrust pressures are expressed in pounds. The thrust loads shown are for sharp drills; for dull drills add 50 percent.

FIGURE 13. TABLE OF END THRUSTS