



Service Manual

Installation

Operation

Maintenance

IMPORTANT

Please refer to the section on Hydraulic Oils on Page 8. We have encircled with ink the brand of oil which we will use in testing and making final adjustments on your machine. The use of any other brand may require a slight adjustment of valve setting.

Hydraulic

DOUBLE HOUSING PLANER

ROCKFORD MACHINE TOOL COMPANY

2500 Kishwaukee Street

ROCKFORD

ILLINOIS

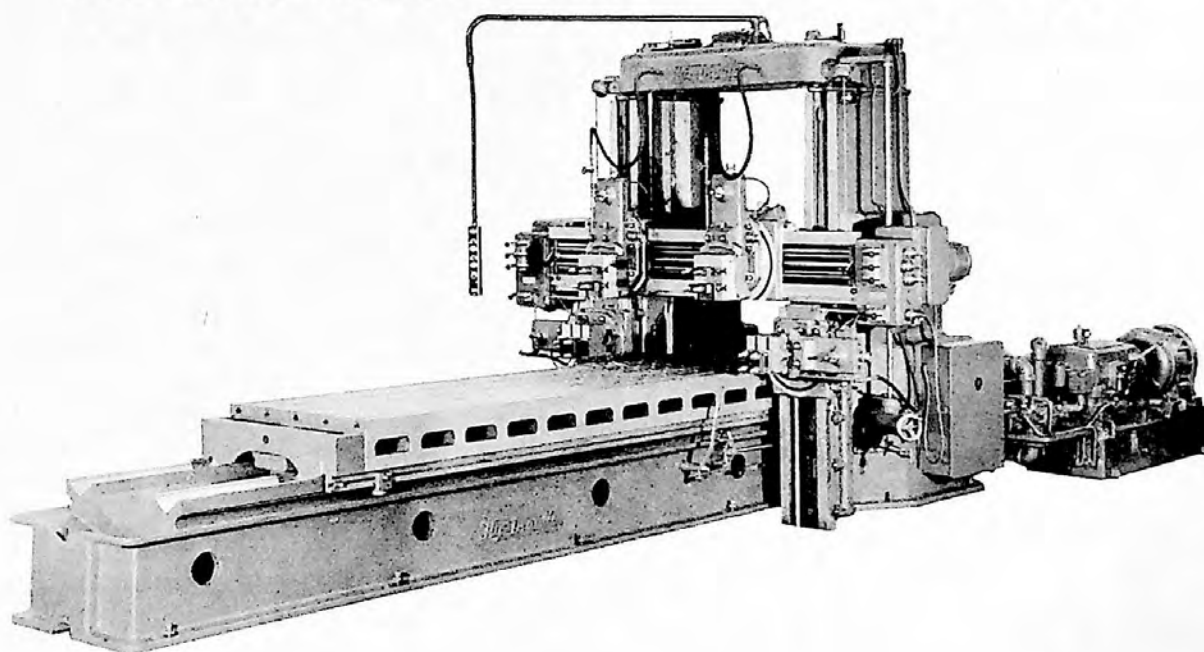
U. S. A.

Walter F. Rogers & Company

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SERVICE MANUAL
for the
INSTALLATION OPERATION
and
MAINTENANCE
of the
Hy-Draulic
DOUBLE HOUSING PLANER



Series 3
November 1, 1946

ROCKFORD MACHINE TOOL COMPANY
2500 KISHWAUKEE STREET
ROCKFORD • ILLINOIS

Price One Dollar

FOREWORD

The Hy-Draulic Planer is a fast and accurate machine on which careful study has been given to design and individual attention to construction.

It therefore merits the best of care in installation, operation, and maintenance in order that it may have a long and useful life in the rapid production of accurate work.

This does not mean that it must be petted or pampered. It is a husky and powerful machine and if given fair treatment it will play fair with you.

The owner is justified in the pleasure he receives in having selected the best machine for the job and the operator may take pride in the fact that this fine, new machine has been placed under his personal care. A good operator and a good machine make an unbeatable team.

Remember, we are interested in having this machine give full satisfaction, so, if there is any explanation or information that you desire, please feel free to call upon us at any time.

ROCKFORD MACHINE TOOL COMPANY
2500 KISHWAUKEE STREET
ROCKFORD — ILLINOIS
U. S. A.

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RECEIVING

Before accepting the machine from the transportation company make a preliminary examination for any possible damage in transit. If there is evidence of such damage a notation to that effect should be made on the receipt and the machine received subject to thorough inspection.

When the extent of damage has been determined your claim should be filed with the transportation company.

HANDLING

A planer having a table stroke of sixteen feet or more has its bed made in two sections and for shipment the sections are detached from each other and loaded separately. On machines having a stroke of fourteen feet or less the bed is made in one piece. In either case the machine is shipped with the table on the bed ways but detached from the piston rod. The ways of both bed and table are coated with a rust preventive compound and sheets of waxed paper placed between them to protect their accurately finished surfaces.

For unloading, remove the bracing from the table and also remove the gibs which clamp it to the bed. The table has a hole drilled in each end where bars are to be inserted for attaching the lifting chains or sling. Apply lifting pressure slowly as the rust preventive compound may have a tendency to cement the table and bed together.

The bed has cored holes passing horizontally through it near the front and rear ends where chains may be passed for lifting.

Be sure to place wood blocks or heavy padding under the chains at all points where there is a possibility of damage to finished surfaces or thin sections of metal.

CLEANING

Before shipment all unpainted surfaces were coated with a rust preventive compound. This may be removed by wiping with rags saturated with kerosene. Gasoline or naphtha may be used but the hazard of fire is greatly increased by the use of such materials.

Clean only by wiping and brushing. Do not use compressed air as this tends only to force dirt and grit into the working parts.

After removing the slushing compound wipe all finished surfaces with a cloth moistened with lubricating oil. Do not move any of the controls or other moving parts before the machine has been thoroughly cleaned and lubricated.

INSTALLATION

The first consideration in maintaining the accuracy of any machine tool is to see that an adequate foundation is provided. The best foundation known at present is of concrete.

Before shipment of your machine a certified floor plan was mailed showing the form and dimensions of the foundation. Anchor bolts should be embedded in the foundation as shown on the floor plan. These bolts may be positioned by using a template consisting of a framework of one inch boards having holes located to match those in the machine bed and column.

When building the foundation consideration should be given as to whether electric wiring is to be run under the floor. If it is to be brought to the machine beneath the floor a suitable piece of $1\frac{1}{2}$ " conduit should be embedded in the foundation and brought out at the point shown on the floor plan.

The foundation should be built well in advance of the arrival of the machine so that it may properly harden before installation of the machine.

The pumping unit, which is detached from the machine for shipment, does not require a heavy foundation. Anchor bolts set in a concrete floor will be sufficient. For aligning this unit steel shims may be used and, finally, grouting placed under and around the edges of the oil reservoir.

LEVELING AND GROUTING

Too much stress cannot be laid upon the importance of accurate leveling of the machine, both lengthwise and crosswise. Never attempt to level a machine with a carpenter's or mason's level or even an ordinary machinist's level. Always use a precision graduated machine level.

An excellent method of leveling is to use two cylinders of about 3" diameter by 8" length and a straight edge about 5' in length. The two cylinders must be of exactly the same diameter and each must be of uniform size from end to end.

If no such cylinders are available a simple method of making them is to use pieces of ordinary 3" pipe. Weld steel straps across the ends of the pipe in the form of a cross. Center drill the straps at both ends and, in a cylindrical grinder, grind the outside of the pipe to a clean finish. The straight edge should be at least $\frac{3}{4}$ " thick by $3\frac{1}{2}$ " wide and 5' long.

Begin leveling by laying the cylinders in the Vees of the bed directly opposite each other and above the first pair of leveling screws at the front end of the bed. Lay the straight edge across the two cylinders and level accurately by means of the screws provided.

Then slide the cylinder in the rear Vee back to the second leveling screw on that side and level diagonally across the bed using only that one screw to make adjustment. Next slide the right hand cylinder backward and the left hand one forward until their positions are reversed and level diagonally in that direction.

Proceed with the alternately diagonal leveling for the full length of the bed. If this procedure is followed carefully and accurately the bed will not only be level from side to side but will be level and straight from end to end.

Draw the nuts down firmly on all the anchor bolts and make a final check on the leveling.

Grout the bed in with a rich mixture of portland cement and clean building sand with enough water to make a thick mixture. Tuck the grout well under the machine bed and build it up around the outside to approximately the thickness of the flange. Do not set the table onto the bed until after the hydraulic pump has been started as explained in the section **STARTING THE MACHINE**.

ELECTRICAL EQUIPMENT

A panel, on which all electrical control units are mounted, is enclosed in a cabinet on the side of the machine column. When the machine is shipped three copies of the wiring diagram are enclosed in the cabinet with the panel.

The machine comes to you completely wired except that the leads from the main motor have been disconnected from the panel for shipping purposes. Your line wires must, of course, be connected at the panel.

The main drive motor is mounted on the oil reservoir of the hydraulic pump, connected to the pump by a flexible coupling and to a lubricating pump by a V belt.

The motor for traversing the tool heads is mounted on the back of the feed box at the end of the cross rail. It is connected through gearing to the traverse mechanism.

The motor for raising and lowering the cross rail is mounted on the top of the machine column and connected through worm gearing to the rail elevating screw.

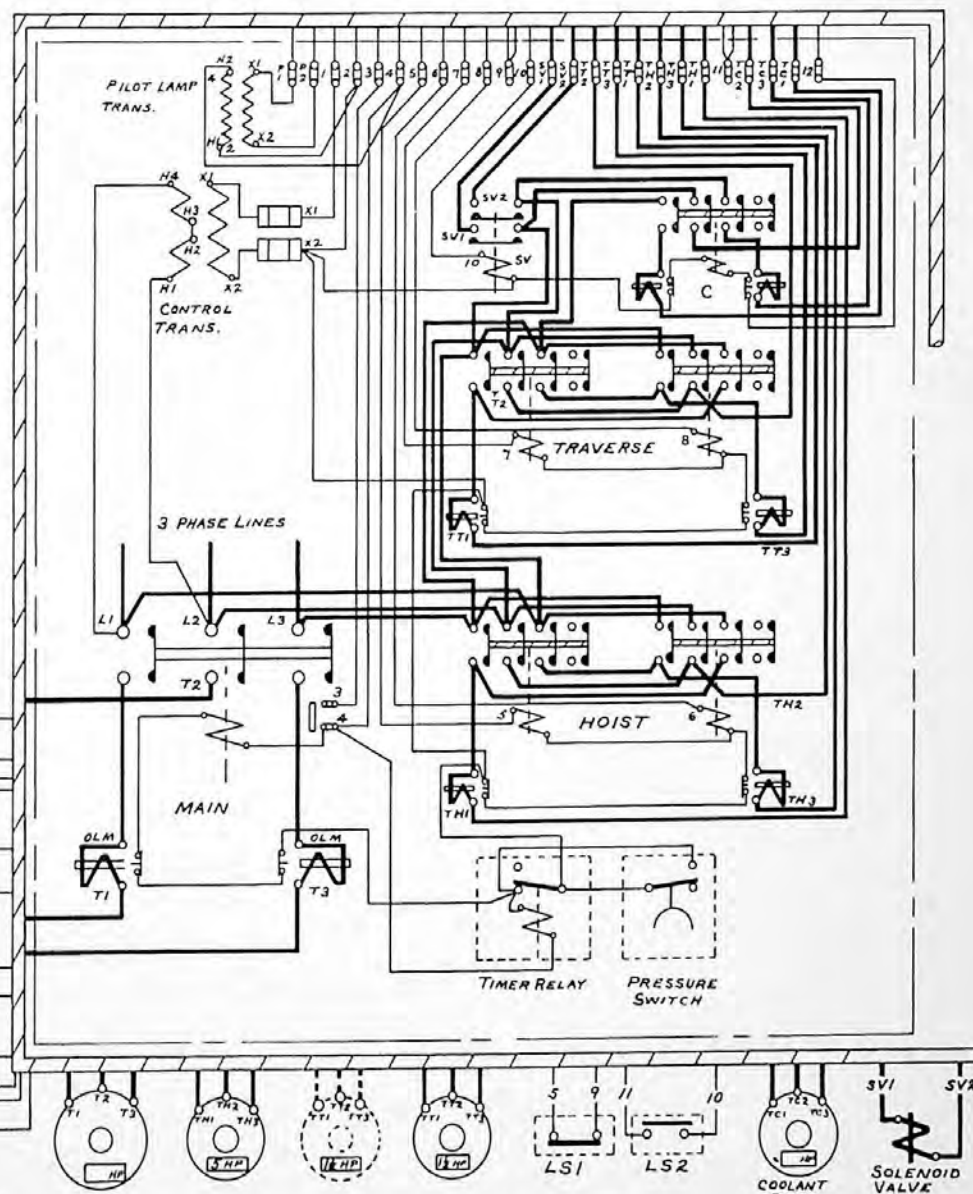
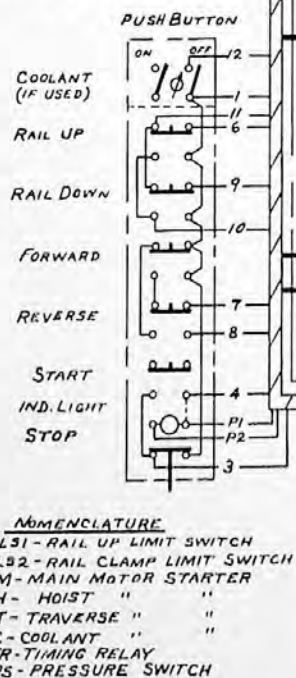
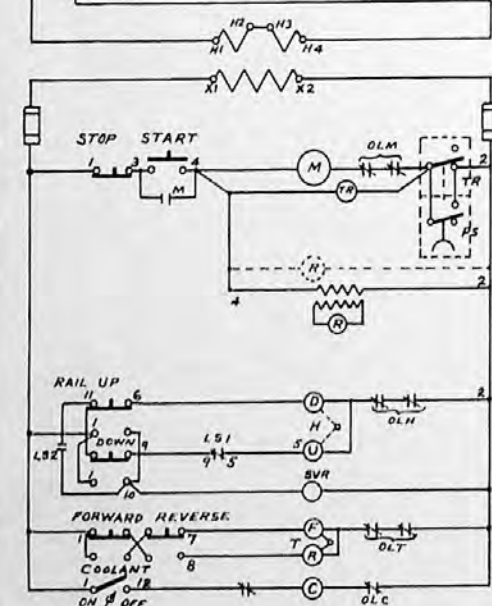
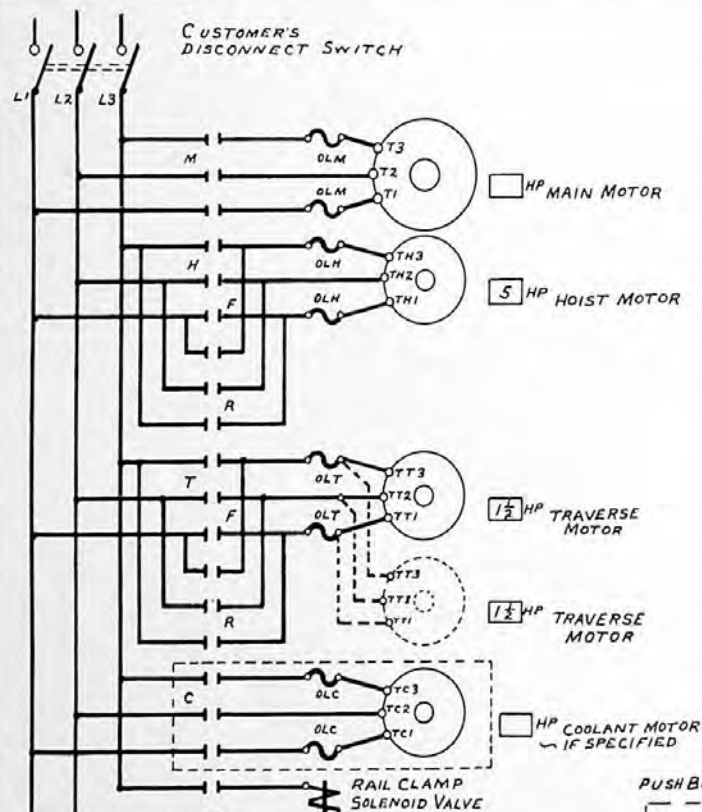
A limit switch is mounted on the upper front face of the right hand column to prevent over-travel of the cross rail in the upward direction.

On the back side of the column is mounted a solenoid operated valve for operating the mechanism which clamps the cross rail to the column. The solenoid is energized through the push buttons marked **RAIL UP** and **RAIL DOWN**. A limit switch mounted in the rear center of the cross rail is actuated by the rail clamping cylinder.

A pressure switch and timer relay are mounted on the lower part of the control panel to detect any loss of pressure in the lubricating lines to the bed and table ways. If, for any reason, this pressure should fail the switch and relay operate to stop the main drive motor. Until the cause of pressure failure is remedied the motor will operate only for a period of thirty seconds, at which time the relay will again stop it.

The pendent push button station contains six units and a pilot light. The two buttons marked **RAIL UP** and **RAIL DOWN** control the rail elevating motor and are self explanatory. The buttons marked **FORWARD** and **REVERSE** control the traverse motor on the feed box and indicate the direction of rotation of that motor. The motor runs only as long as the button is held in contact. The button marked **START** starts the main drive motor which then continues to run until the **STOP** lever is operated. The **STOP** lever is a rod projecting from the bottom end of the pendant station. A slight motion of this rod in any direction stops the motor. The indicating light shows when the main motor is running.

When connecting the line wires to the control panel jog the motor slightly to see that it runs in the direction indicated by the arrows on the pump. Do not let the motor run at full speed as there is danger of injury to the pump in running it before the reservoir has been filled with oil.



NOTE - CONTROL TRANS. SHOWN CONNECTED FOR 440 VOLTS ~ FOR 220 VOLTS CONNECT L1 TO H1 & H3 CONNECT L2 TO H2 & H4

NOTE - IF 110VOLT PILOT LAMP IS USED OMIT WIRE P1 & CONNECT TO 4 AS PER DOTTED LINE & CONNECT P2 TO #2 ON PANEL & OMIT PILOT LAMP TRANS.

Volts

Phase

Cycles

ROCKFORD MACHINE TOOL CO.	
WIRING DIAGRAM	
"DOUBLE HOUSING PLANNER"	
C.P.Y.	9/18-44
EL-PL-24W	

HYDRAULIC OILS

The oil used in the hydraulic system must be of a type proven suitable for the purpose. It should not foam nor emulsify under constant agitation, should have high resistance to oxidation, and must be free from lint, chips, water, sludge and all other foreign substances. In addition it should meet the following specifications:

Viscosity.....	300 S.S.U. at 100° F.
Cold Test.....	Minus 10° F.
Flash.....	Plus 355° F.
Fire.....	Plus 405° F.

Oils which have been used with satisfactory results include the following:

Socony-Vacuum Oil Co.
Gargoyle D. T. E. Hvy. Med

Texas Company
Regal Oil "C"

Sinclair Refining Co.
Rubilene Light

Gulf Refining Co.
Gulf Harmony "C"

Standard Oil Co. (Ind.)
Stanoil No. 31

Pennzoil Company
Pennzoil Turbine Hvy. Med.

Standard Oil Co. (Calif.)
Calol Turbine Heavy

Pure Oil Company
Puritan Heavy Medium

Atlantic Refining Co.
Ideal Heavy

Valvoline Oil Co.
E. T. C. Extra Medium

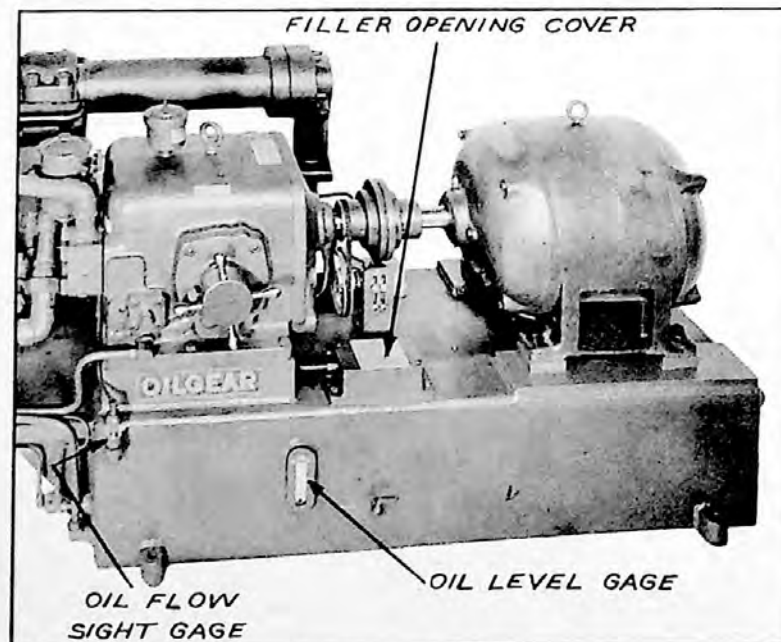
Sun Oil Company
Sunoco Turbine Medium

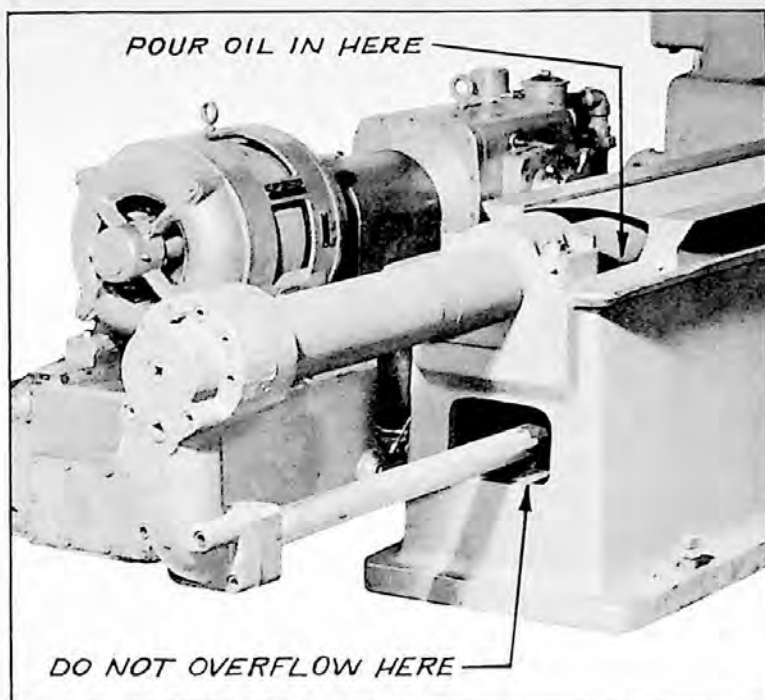
Shell Companies
Turbo 34 or 234

FILLING OIL RESERVOIR

The Hy-Draulic Planer has two oil reservoirs which are to be filled with the same grade of hydraulic oil. One is for the main hydraulic system and is located under the pump and motor forming a support for them. The other holds the oil for lubricating the bed and table ways and is inside the machine bed.

To fill the main hydraulic system remove the plate covering the opening in the top of the reservoir and pour in oil until it reaches the high level mark on the oil gage. In handling the oil use only clean containers and be careful that no foreign matter enters the oil reservoir.





The quantity of oil required is dependent upon the length of stroke of the machine. It is recommended that you have eighty-five gallons on hand at the time of installation.

Oil for lubricating the bed and table ways is of the same grade as is used in the hydraulic system and may be poured into the top opening of the machine bed at its extreme rear end. The oil will flow through the strainer covering the oil chamber and, when the chamber is filled, will remain standing on the floor of the bed.

This may be observed through the rectangular opening in the end of the bed at the rear.

STARTING THE MACHINE

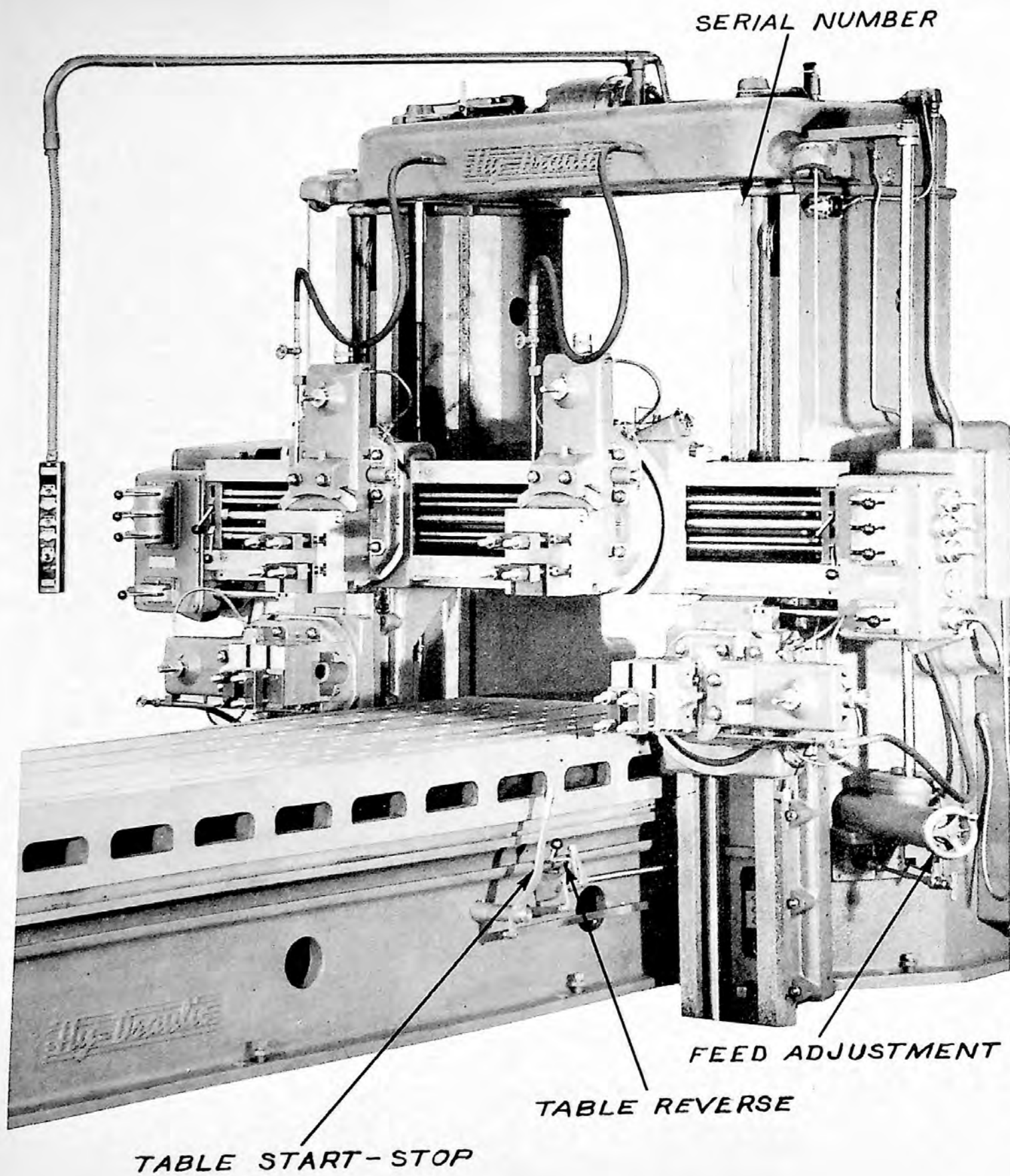
Before starting the machine it should be completely lubricated according to the instructions given in the section on LUBRICATION.

Do not install the table on the bed until after starting instructions have been carried out. Before starting the motor set the Table Start-Stop lever in the Stop position. This position is toward the rear of the machine.

When first starting the motor driving the hydraulic pump or after it has stood idle for any appreciable length of time (forty-eight hours or more) it is well, as a precautionary measure, to start and stop the motor several times without allowing it to reach full speed. This is done by alternately pressing the start button and stop rod which control that motor.

The pump was run for eight hours on a test block before installation and the machine was thoroughly tested, however, during the time of shipment and installation the oil has been gradually draining away from the working parts and, if the pump is started at full speed, there is a possibility of damage before sufficient oil reaches all its working parts. As an indication of the full flow of oil through the pump a small stream of oil may be seen flowing through the oil Flow Sight Gage shown at the upper left corner of the reservoir in the illustration under section FILLING OIL RESERVOIR.

When the pump is running at full speed there should be a generous flow of oil from the lubricating pump into the V ways of the bed. If this oil is not flowing it indicates that the lubricating pump has not primed itself. To prime the pump unscrew the top pipe fitting from the pump and pour some oil into the pump body. Replace the pipe fitting and again start the motor.



While the oil is flowing into the bed ways wipe the ways from end to end to see that they are washed perfectly clean.

Now shift the Table Start-Stop lever to the start position and allow the piston rod to run out five or six feet from the cylinder. Then shift the Table Reverse Lever to draw the piston rod back into the cylinder.

At first the pump may be noisy and the piston rod unsteady in its motion. This is due to the air in the hydraulic system. To assist in draining the air a drain cock is placed in each end of the cylinder. The cock at the front end of the cylinder will drain into the machine bed but for the rear cock a container should be provided to catch the oil which will be blown out with the air. Open the drain cocks and run the piston back and forth until the air is all drained out.

Close the drain cocks, stop the motor and prepare to install the planer table to the bed.

May we again remind you of the importance of seeing that the ways of the bed and table are perfectly clean and generously coated with lubricating oil before laying them together.

See that the hold-down gibs are removed from the under edges of the table and lift it into place on the bed. Slide the table toward the rear until the piston rod projects through the table bracket and the bracket seats against the shoulder on the rod. Place the washer over the end of the rod and screw the nut firmly against the washer. Note that when the nut is properly tightened a set screw may be screwed into the hole which is tapped half and half in the end of the rod and nut. Replace the hold-down gibs on the table and draw the screws up tight.

The oil drawn from the reservoir to fill the cylinder and piping has lowered the level in the reservoir. Add more oil to bring it up within one inch of the high level mark.

Inside the machine column are heavy weights suspended on cables to counterbalance the cross rail and side head. During shipment these weights are supported by steel bars passing through holes in the side of the column. To remove these supporting bars, first see that the cables are in proper position on their sheaves, then, by means of the RAIL DOWN push button, lower the rail until the weights are lifted off the supporting bars. The bars may then be removed and there is no further use for them unless the machine is to be shipped to another location.

OPERATING THE MACHINE

TABLE SPEEDS:

The cutting and return speeds of the table are governed by the volume of oil delivered by the hydraulic pump. The pump is of the variable delivery type, the volume being regulated by hand knobs as explained in the bulletin covering the pumping unit.

RAIL ELEVATION:

Raising and lowering the cross rail is accomplished by power from the motor on the column top operating through worm gearing to the rail elevating screw.

When the cross rail is to be raised or lowered it is not necessary to loosen any clamping screws nor gibs. The clamping mechanism is entirely automatic and is operated by hydraulic pressure. Simply press the correct button in the pendant station and hold it in until the rail reaches the desired position. When the button is released the rail is automatically clamped to the column.

FEEDS AND RAPID TRAVERSE:

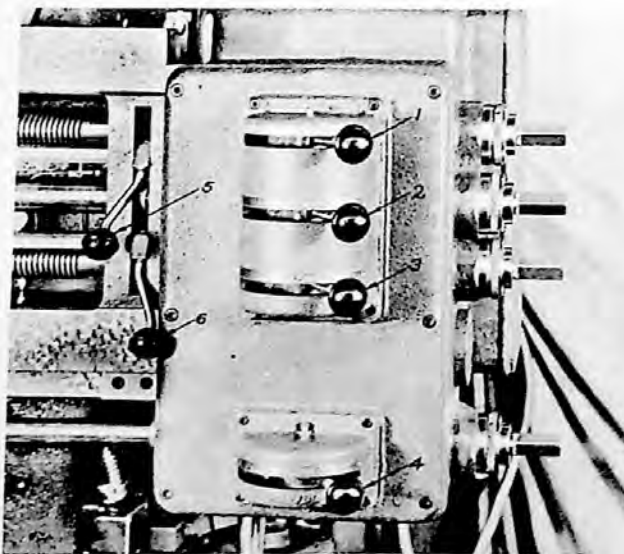
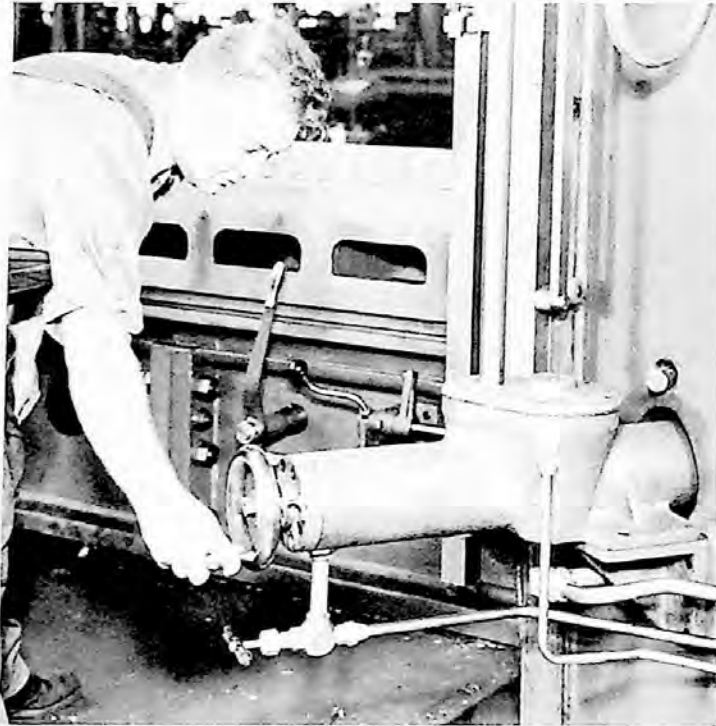
The tool heads on the cross rail have power feeds and rapid traverse in both horizontal and vertical directions. The side head has power feeds and traverse in the vertical directions and manually operated feeds horizontally, however, horizontal power feeds and traverse may be supplied if so ordered.

Any of the tool heads may be fed manually by means of a hand crank to be used on the squared ends of the various shafts. Graduated dials on these shafts indicate the amounts of feed, each graduation representing a movement of one thousandth (.001) inch of the tool head.

The amount of feed is regulated by the handwheel on the end of the feed cylinder. Turning the handwheel to the right, or clockwise, decreases the feed; to the left increases it.

The selection of the various movements of the tool heads is made by shifting the levers projecting horizontally through slots in the front of the feed box.

Lever 1 engages the right hand rail head for horizontal motion. With the lever shifted to the position marked Right or Left the feed is engaged for movement in the direction selected. To traverse the tool head shift the lever to the central or Traverse position; loosen the lock screw on the tool head saddle and press either the Forward or Reverse button in the pendent station according to the direction of travel desired. There are two Off, or neutral, positions and, with the lever in either of them both feed and traverse are disengaged and the head may then be moved by means of the hand crank applied to the squared end of the cross feed screw.



Lever 2 engages the vertical feeds and traverse of the rail heads. The action of this lever is similar to that of Lever 1 and the etched plate directly above the lever indicates its functions. The selection of the head to be moved is made by Levers 5 and 6. In the illustration both levers are shown in the Off, or neutral, position. To engage the right hand head for vertical travel shift Lever 5 upward to engage its clutch, then with Lever 2 select the type of movement desired. Lever 6 engages the left hand head and its operation is the same as Lever 5.

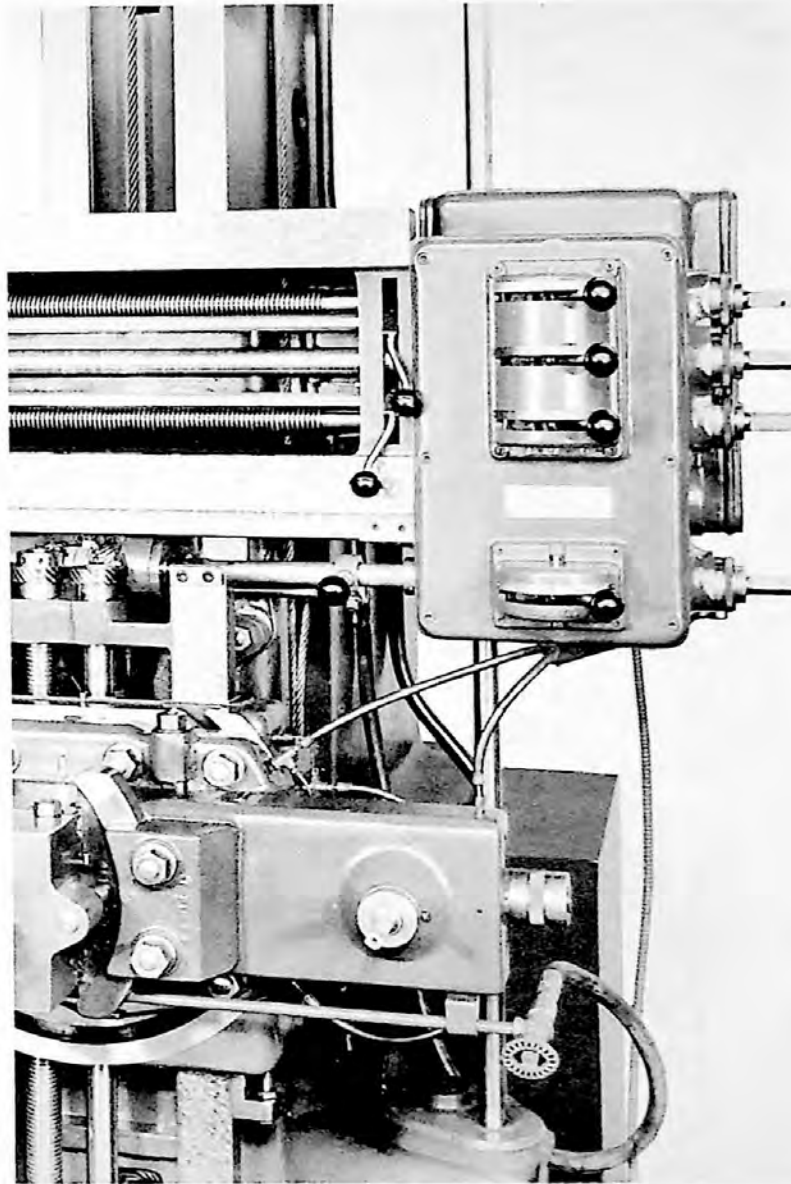
Lever 3 engages the left hand tool head and its operation is the same as that of Lever 1.

Lever 4 engages vertical feed or traverse of the side head. The etched plate above the lever indicates its functions.

Horizontal movement of the side head is manually operated unless power feed and traverse are ordered.

When horizontal power feed and traverse are provided this feature is accomplished by mounting an extra shaft in the side head rail and driving it through spiral gears from the same feed box mechanism that drives the vertical feed.

Selection for either vertical or horizontal movement is made by shifting a clutch mounted between the spiral driving gears and operated by a handle located between the feed box and the side head rail. Shifting the handle to the right, or toward the feed box, engages the horizontal movement of the tool head; toward the left engages the vertical movement. The selection for feed or traverse for both horizontal and vertical motion is made by the same shift lever in the feed box.



Levers for starting and stopping the table and for reversing its direction of travel are provided on both the right and left sides of the machine bed.

The start-stop lever stands in a vertical position on the side of the bed, handy to the operator's reach, and connected by suitable linkage to the stop valve in the hydraulic circuit. The stop position is toward the machine column; the start position toward the front.

The table reversing lever is mounted on the side of the bed just at the rear of the start-stop lever and is shaped in the form of a Z. Shifting this lever reverses the direction of table travel at any point during either the cutting or return stroke. (See illustration on page 10).

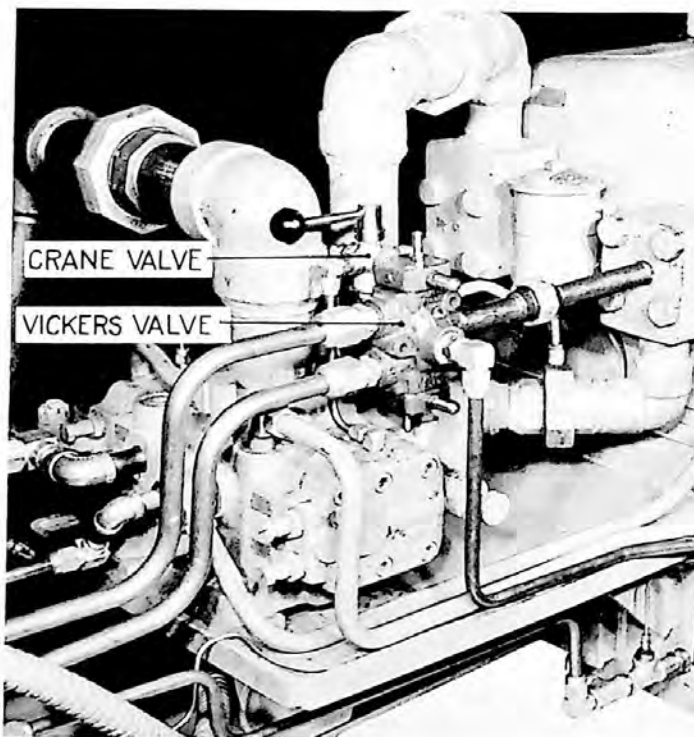
CUTTING TOOLS

Planer tools of the conventional type are suitable for use on the Hy-Draulic Planer. Either solid forged tools or the inserted bit type of tool holder sets, marketed by several manufacturers, may be used. The newer types of cast or sintered metal tools may be used on jobs adapted to their use.

FEED CIRCUIT

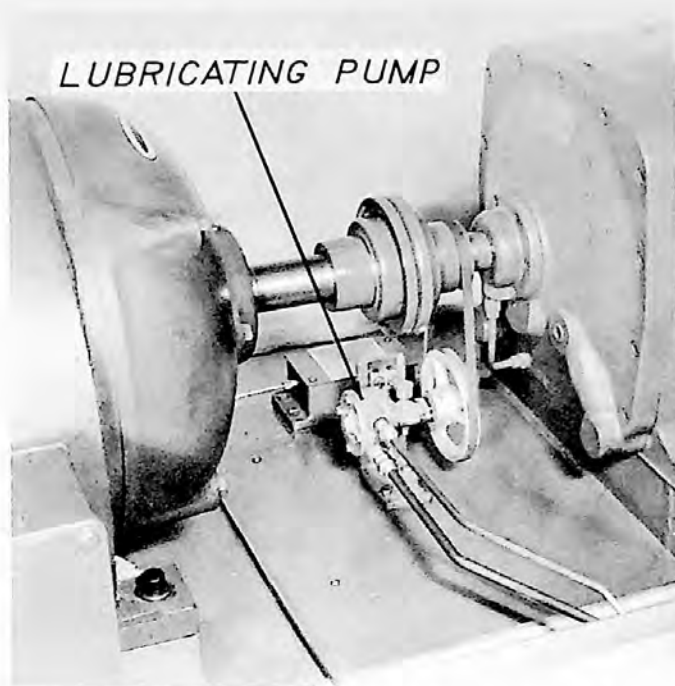
The flow of oil to and from the feed cylinder is automatically controlled by a pilot operated four way valve in the feed circuit. This valve is Vickers Model C2-440-S9. A parts list of this valve is shown on Vickers parts drawing 479-S.

Also connected into the feed circuit is a manually operated reversing valve by means of which the feed of the tool head may be made to take place either immediately after the end of the cutting stroke or after the end of the return stroke of the table. This valve is Crane Company Model 307- $\frac{3}{8}$ " P. T. having a special operating handle.



LUBRICATION

The ways of the bed and table are lubricated under pressure with filtered oil from a pump mounted on the oil reservoir of the main hydraulic pump and driven by a belt from the coupling of the main pump and motor.

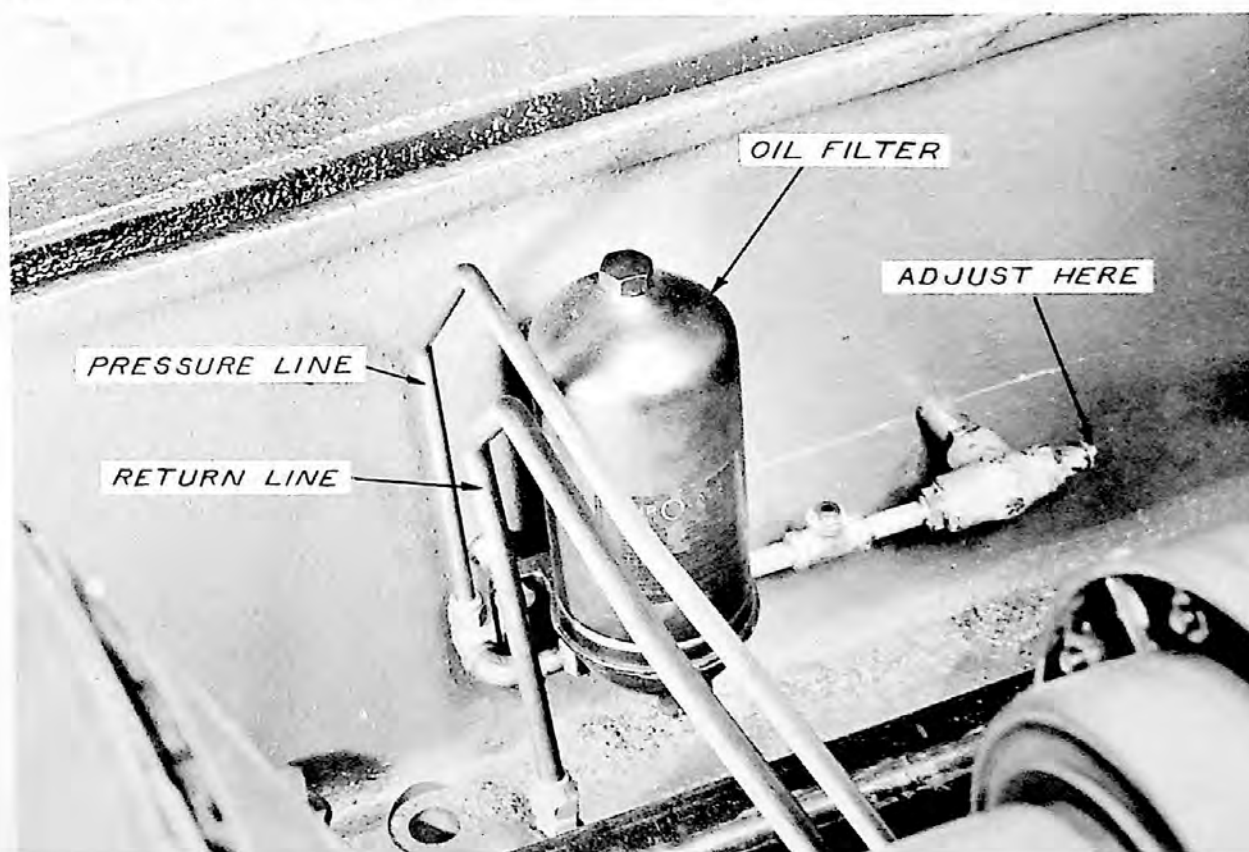


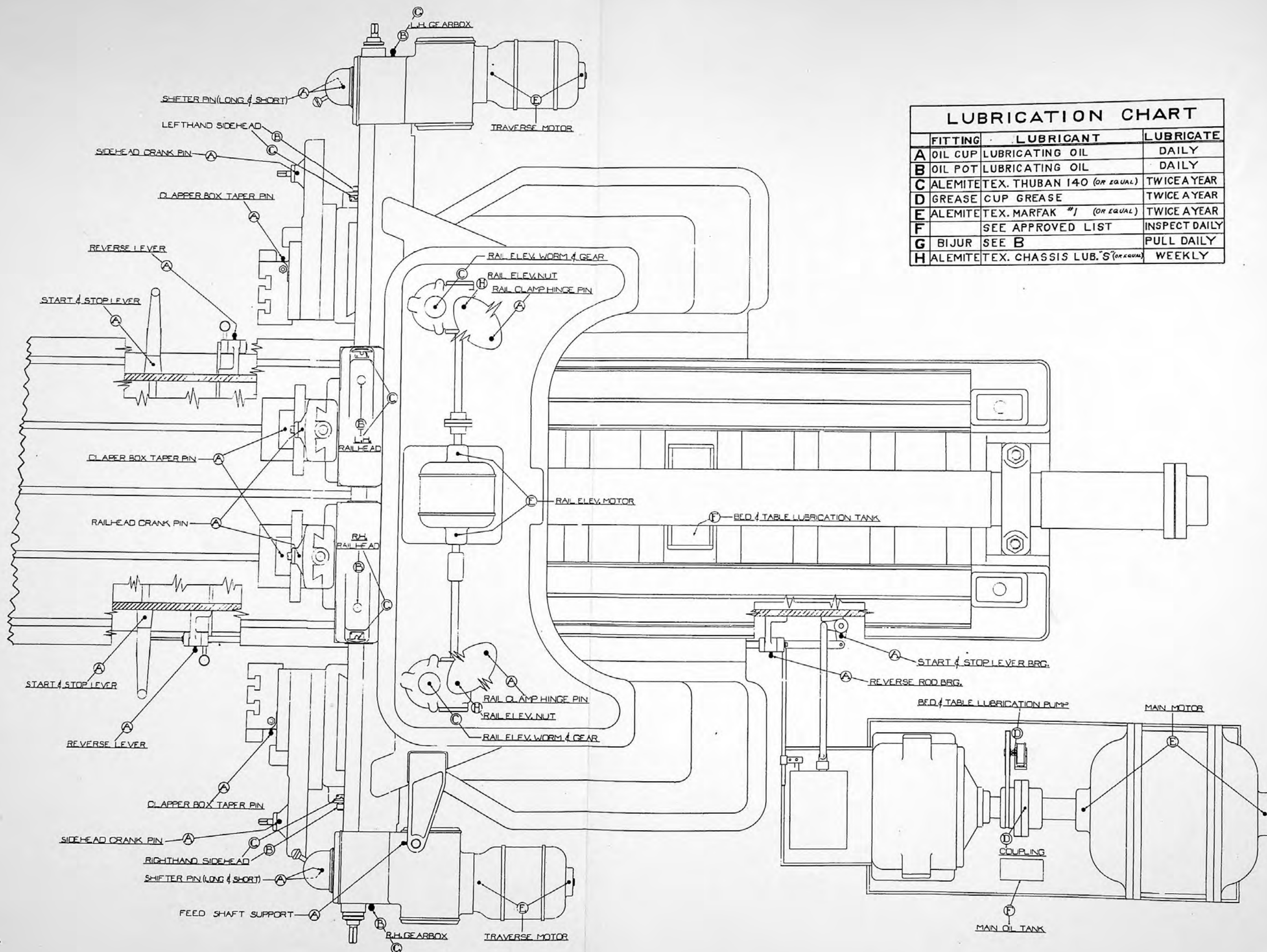
A pressure switch is connected into the lubricating line. If for any reason the pressure should fail the switch will operate to stop the entire machine. In such a case the cause of the failure in pressure should be determined and remedied before starting the main motor. Pressure failure would result from such causes as a broken belt or a lack of lubricating oil in the reservoir.

The filter for the lubricating oil is mounted on the side of the bed and is Purolator type B-759. This filter has a replaceable element which may be purchased from Purolator Products, Inc., 365 Freylinghuysen Ave., Newark 5 N.J. or from Rockford Machine Tool Co. The replacement element is number B-15-W. Filter elements should be replaced after each 1200 hours of service.

Just at the rear of the filter at the angle of the pipe a relief valve is used to regulate the pressure in the lubricating circuit. If pressure adjustment is necessary unscrew the cap from the end of the valve and adjust the screw which is then exposed. Turning the screw to the right, or clockwise, increases the pressure, to the left decreases. Never turn the screw in far enough to lock the valve shut as the excessive pressure would probably burst the oil filter.

Points requiring manual lubrication are shown on the lubrication chart on the following page. This chart shows the type of lubricant required and the frequency of lubrication.





LUBRICATION CHART			
	FITTING	LUBRICANT	LUBRICATE
A	OIL CUP	LUBRICATING OIL	DAILY
B	OIL POT	LUBRICATING OIL	DAILY
C	ALEMITE	TEX. THUBAN 140 (OR EQUAL)	TWICE A YEAR
D	GREASE	CUP GREASE	TWICE A YEAR
E	ALEMITE	TEX. MARFAK #1 (OR EQUAL)	TWICE A YEAR
F		SEE APPROVED LIST	INSPECT DAILY
G	BIJUR	SEE B	PULL DAILY
H	ALEMITE	TEX. CHASSIS LUB. S (OR EQUAL)	WEEKLY

MAINTENANCE

Except for regular lubrication and keeping the machine clean, there is very little maintenance required. A little time spent in cleaning and keeping chips removed is well repaid by the service the machine will give, both in accuracy of work and length of life. Cleaning should be done by wiping and brushing. Compressed air has a tendency to force dirt and chips into the working parts and its use is not recommended.

Considerable care and pride have gone into the construction of the machine and it is hoped that they may continue in its use.

Wear on sliding surfaces is inevitable, therefore adjustable gibs have been provided to take up any looseness. The machine will do more accurate work and have a longer life if these gibs are kept properly adjusted.

Change oil in the hydraulic system after each 2400 hours of machine operation.

In case it becomes necessary to order repair parts always refer to the machine by its serial number. This number is stamped on the right front way of the column near the top. Do not confuse this number with those stamped on the hydraulic pump or valve.

Please also be specific in the description of the parts wanted. If your first communication contains sufficient information for us to identify the piece it will save considerable correspondence and down time on your machine. In describing your needs too much detail is far better than too little.

SPECIFICATIONS

Planer Nominal Size.....	36"	42"	48"	60"
Table Width.....	36"	38"	44"	56"
Holes in Table, Rows.....	6	6	8	10
Diameter of Holes.....	1 1/4"	1 1/4"	1 1/4"	1 1/4"
T Slots in Table.....	5	5	5	5
Diameter of T Bolts.....	1"	1"	1"	1"
Table to Rail, Max.....	36"	42"	48"	60"
Planing Width, Max.....	36"	42"	48"	60"
Tool Shank Size, Max.....	2 3/4" x 3 1/2"	2 3/4" x 3 1/2"	2 3/4" x 3 1/2"	2 3/4" x 3 1/2"
Rail Head Vert. Trav.....	14"	14"	14"	14"
Rail Head Feeds, Horiz.....	.010" to .500"	.010" to .500"	.010" to .500"	.010" to .500"
Rail Head Feeds, Vert.....	.010" to .500"	.010" to .500"	.010" to .500"	.010" to .500"
Side Head Vert. Travel.....	20"	20"	40 1/2"	52 1/2"
Side Head Horiz. Travel.....	12"	12"	12"	12"
Side Head Feeds, Vert.....	.010" to .500"	.010" to .500"	.010" to .500"	.010" to .500"
Floor to Table Top.....	32"	32"	35"	35"
Overall Height, Approx.....	106"	116"	120"	132"

MECHANICAL CONSTRUCTION and PARTS LIST

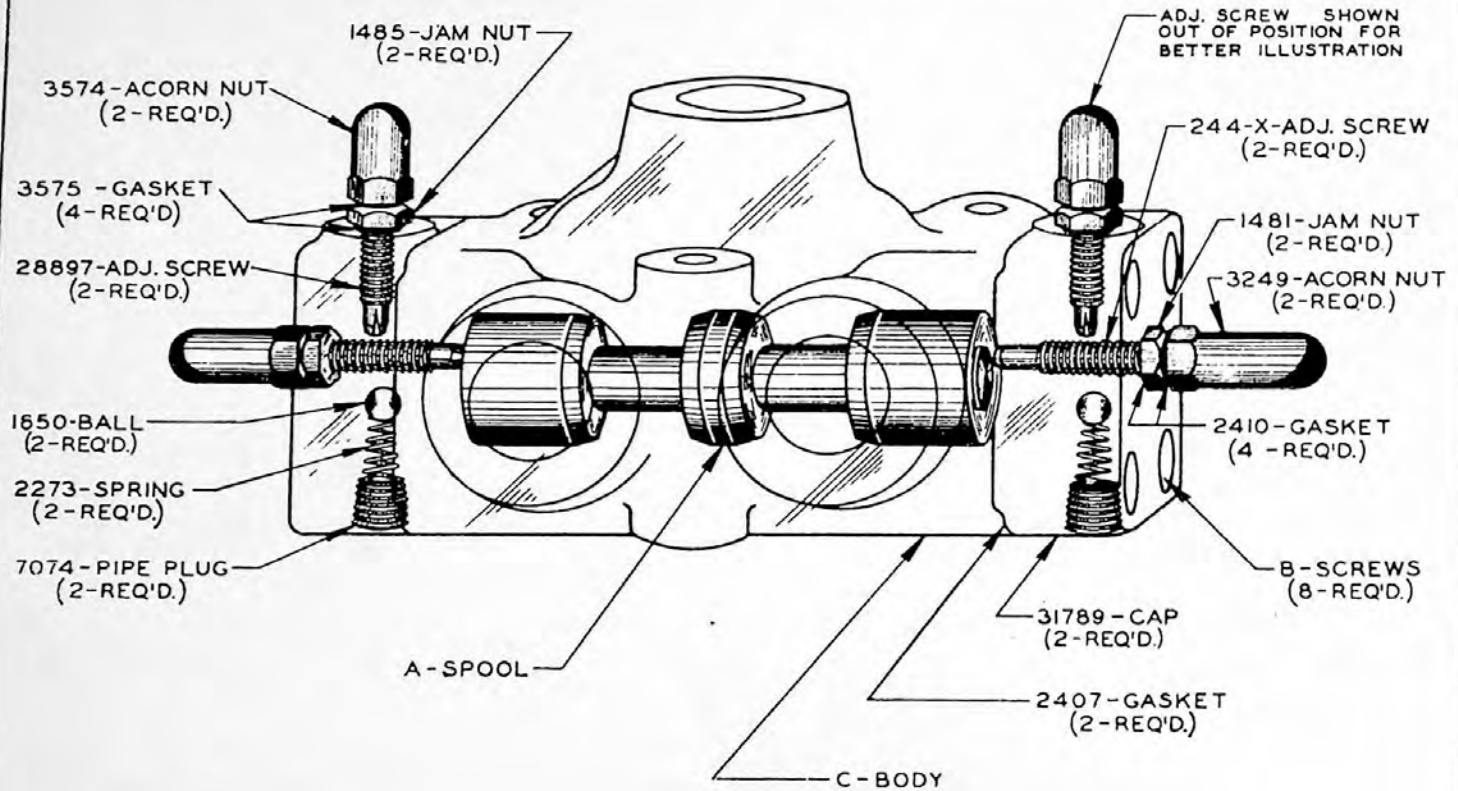
The following drawings and photographs are presented for the purpose of acquainting the operator with the construction of the machine, to assist in making adjustments and repairs, and to facilitate the ordering of repair parts whenever that occasion arises.

In ordering repairs remember, please, that the only information we have of your needs is what you put on paper and send to us. We urge, therefore, that in your first communication you give as full a description as possible of the parts wanted.

In many cases it will save much correspondence and down time on your machine if full information is given in your first request. Free hand sketches with the principal dimensions are very helpful.

Always refer to the machine by its Serial Number and give the Series Number of this book.

**REPAIR PARTS
FOR SERIES C2-400-S9 & C2-1400 - S9
PILOT OPERATED FOUR - WAY VALVES**



MODEL NUMBER	PIPE SIZE	A SPOOL	B SCREW	C BODY
C2-420-S9	1/2	66764	1072	5571
C2-440-S9	3/4	66764	1072	20527
C2-480-S9	1/4	6569	1072-A	6568
C2-482-S9	3/8	6569	1072-A	30683
C2-1420-S9	1"	33093	1072	11070

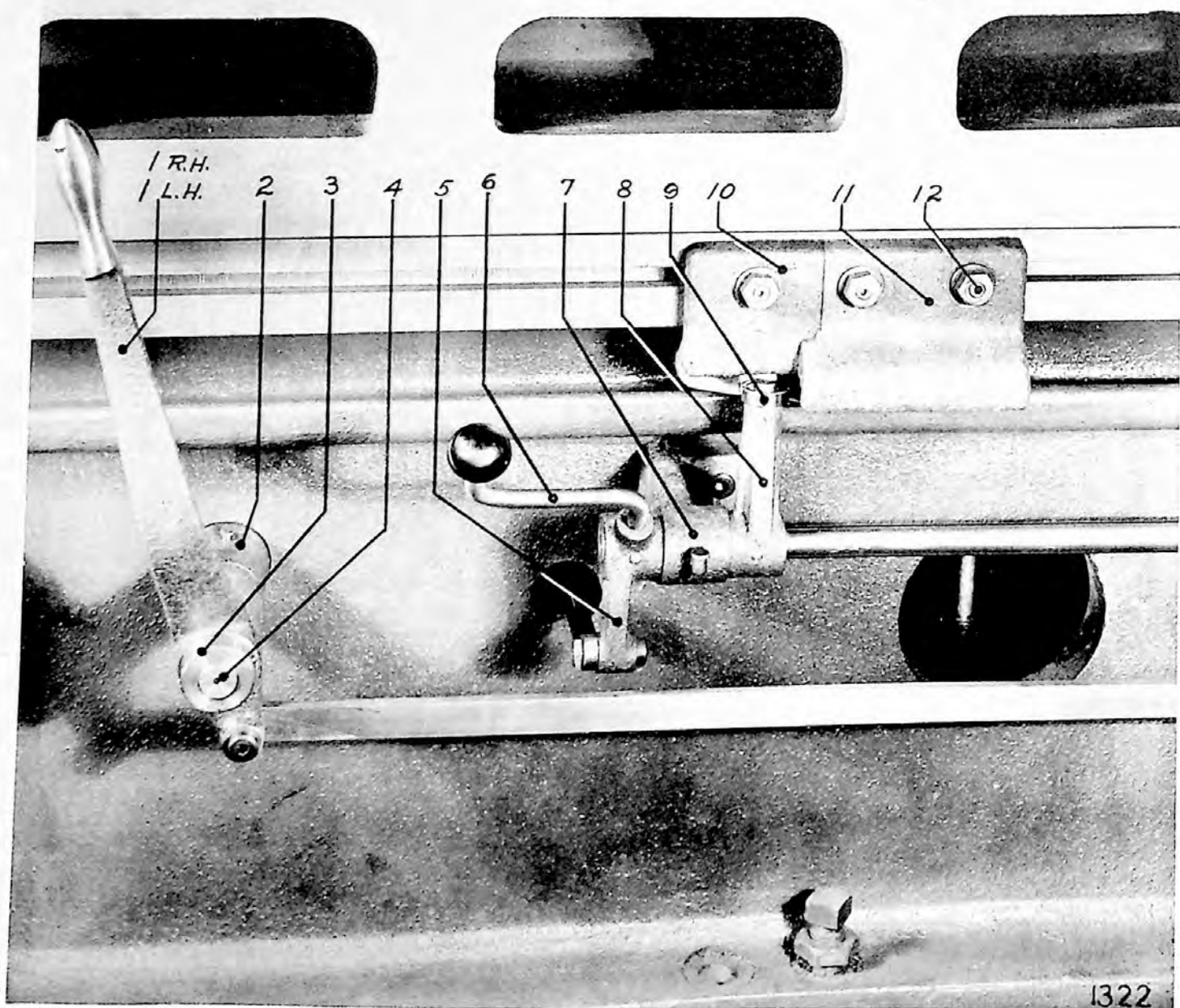
2-25-43

PARTS LIST

1	Operating Lever	52	Feed Piston Stop
2	Operating Lever Boss	53	Cylinder Head
3	Collar	54	Packing Gland
4	Operating Lever Shaft	55	Washer
5	Reverse Lever	56	Clamp Stud
6	Reverse Handle	57	Washer
7	Reverse Shaft Bracket	58	Pin
8	Reverse Roller Arm	59	Link
9	Reverse Roller	60	Clamp Stud
10	Reverse Cam — Front	61	Pin
11	Reverse Cam — Rear	62	Clamp Shaft
12	Cam Clamp Bolt	63	Trunnion
13	Flexible Tube	64	Rail Clamp
14	Flexible Tube	65	Pivot Shaft
15	Flexible Tube	66	Rail Gib
16	Flexible Tube	67	Feed Box
17	Flexible Tube	68	Drive Shaft
18	Worm Shaft	69	Idler Gear
19	Bearing Cap	70	Feed Gear
20	Oil Seal	71	Washer
21	Roller Bearing	72	Idler Gear Shaft
22	Spacer	73	Roller Bearing
23	Worm	74	Bearing Spacer
24	Thrust Nut	75	Idler Gear
25	Roller Bearing	76	Bearing Spacer
26	Worm Housing	77	Shifter Gear Shaft
27	Rail Raising Screw	78	End Cover
28	Adjustable Coupling	79	Shifter Gear Shaft
29	Oil Seal	80	Shifter Guard
30	Roller Bearing	81	Cross Feed Screw
31	Worm Gear	82	Rail End Cover
32	Worm Housing Cover	83	Collar
33	Bearing Cap	84	Thrust Bearing
34	Handwheel	85	Bushing
35	Lock Screw	86	Thrust Bearing
36	Packing	87	Collar
37	Adjusting Screw	88	Vertical Feed Shaft
38	Feed Cylinder	89	Bushing
39	Roller Bearing	90	Collar
40	Drive Pinion	91	Cross Feed Screw
41	Cylinder Cover	92	Control Shaft
42	Oil Seal	93	Lever Coupling
43	Feed Shaft	94	Bushing
44	Bushing	95	Collar
45	Ball Bearing	96	Bushing
46	Drive Gear	97	Idler Gear Shaft
47	Overrunning Clutch Unit	98	Roller Bearing
48	Feed Piston	99	Idler Gear
49	Cylinder Head	100	Spacer
50	Bushing	101	Bushing
51	Feed Pinion		

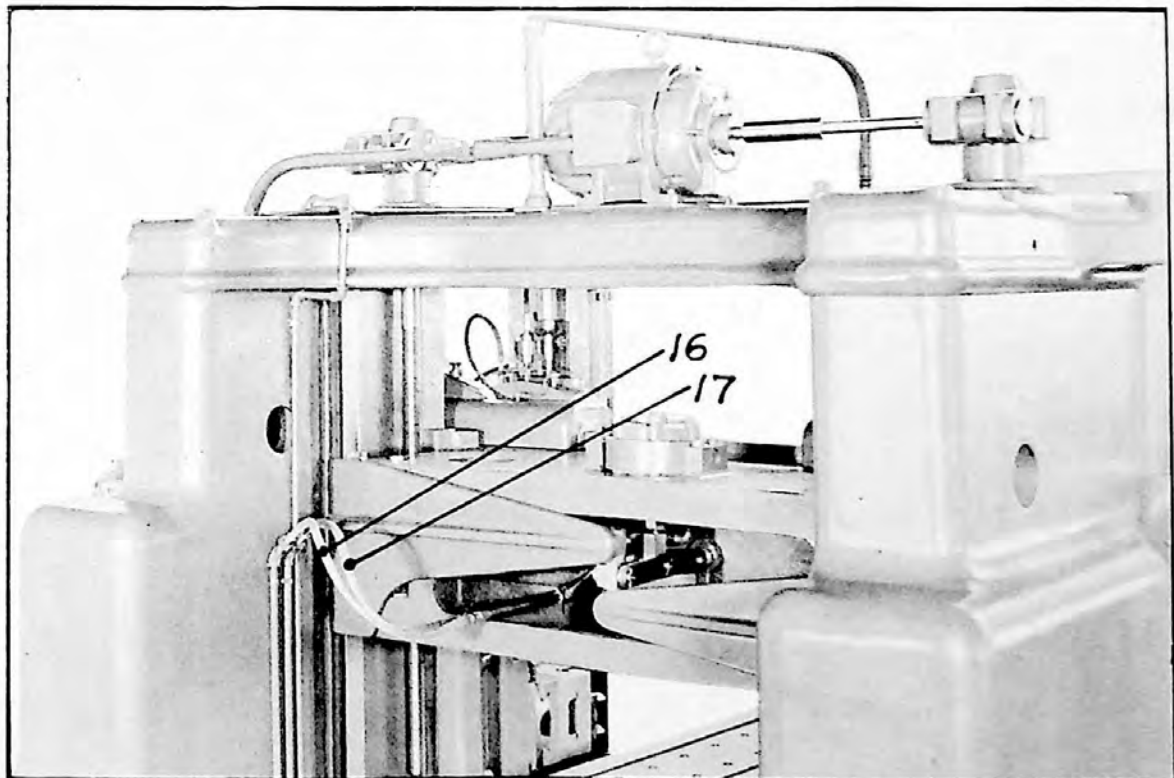
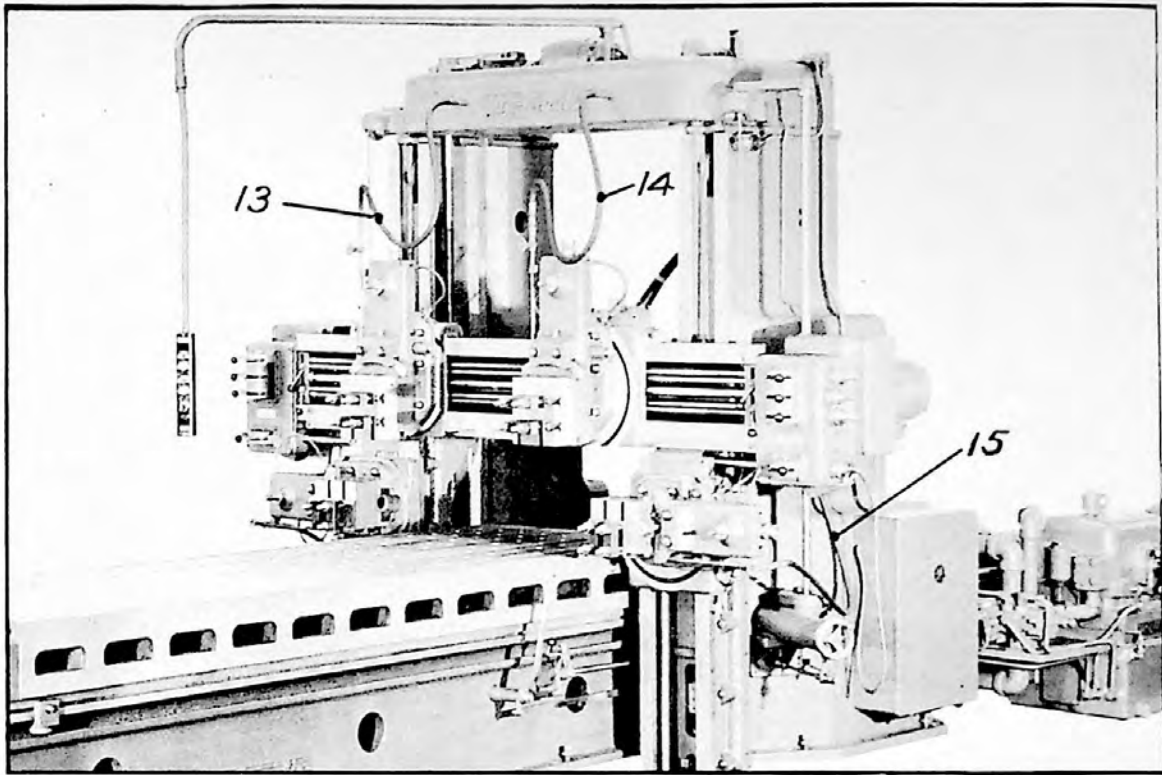
102	Shaft Cover	154	Spacer
103	Sliding Gear	155	Collar
104	End Cover	156	Crank Shaft
105	Gear Stud	157	Slide
106	Spur Gear	158	Clamp Stud
107	Bevel Gear	159	Washer
108	Motor Pinion	160	Clapper Box
109	Thrust Washer	161	Backing Plate
110	Roller Bearing	162	Clamp Bolt
111	Washer	163	Clamp Block
112	Idler Gear	164	Clamp Nut
113	Bushing	165	Tool Lifter Piston
114	Sliding Gear	166	Backing Plate
115	Roller Bearing	167	Clapper Block
116	Idler Gear Shaft	168	Bearing Cap
117	End Cover	169	Spring
118	Shifting Yoke	170	Packing Ring
119	Shifter Yoke	171	Swivel Screw
120	Shift Guard	172	Clamp Plate
121	Shifter Gear	173	Feed Screw Stop
122	Lever	174	Miter Gear Nut
123	Ball	175	Miter Gear
124	Feed Box Cover	176	Spacer
125	Bushing	177	Miter Gear Shaft
126	Graduated Collar	178	Miter Gear
127	Distance Collar	179	Spacer
128	Gear Stud	180	Bushing
129	Thrust Washer	181	Miter Gear
130	Feed Gear	182	Feed Nut
131	Miter Gear	183	Lock Nut
132	Washer	184	Swivel Plate
133	Cover	185	Feed Screw
134	Miter Gear	186	Thrust Bearing
135	Thrust Washer	187	Thrust Bearing
136	Roller Bearing	188	Graduated Collar
137	Gear Nut	189	Distance Collar
138	Washer	190	Nut
139	Miter Gear	191	Miter Gear
140	Thrust Washer	192	Spacer
141	Roller Bearing	193	Bushing
142	Bearing Spacer	194	Spacer
143	Gear	195	Miter Gear
144	Gear Shaft	196	Gear Shaft
145	Lubricating Pump	197	Miter Gear
146	Bolt	198	Feed Screw Nut
147	Washer	199	Lock Nut
148	Hinge Pin Bearing	200	Swivel Plate
149	Hinge Pin	201	Feed Screw
150	Gib	202	Miter Gear
151	Clamp Stud	203	Bushing
152	Washer	204	Distance Collar
153	Miter Gear	205	Graduated Collar

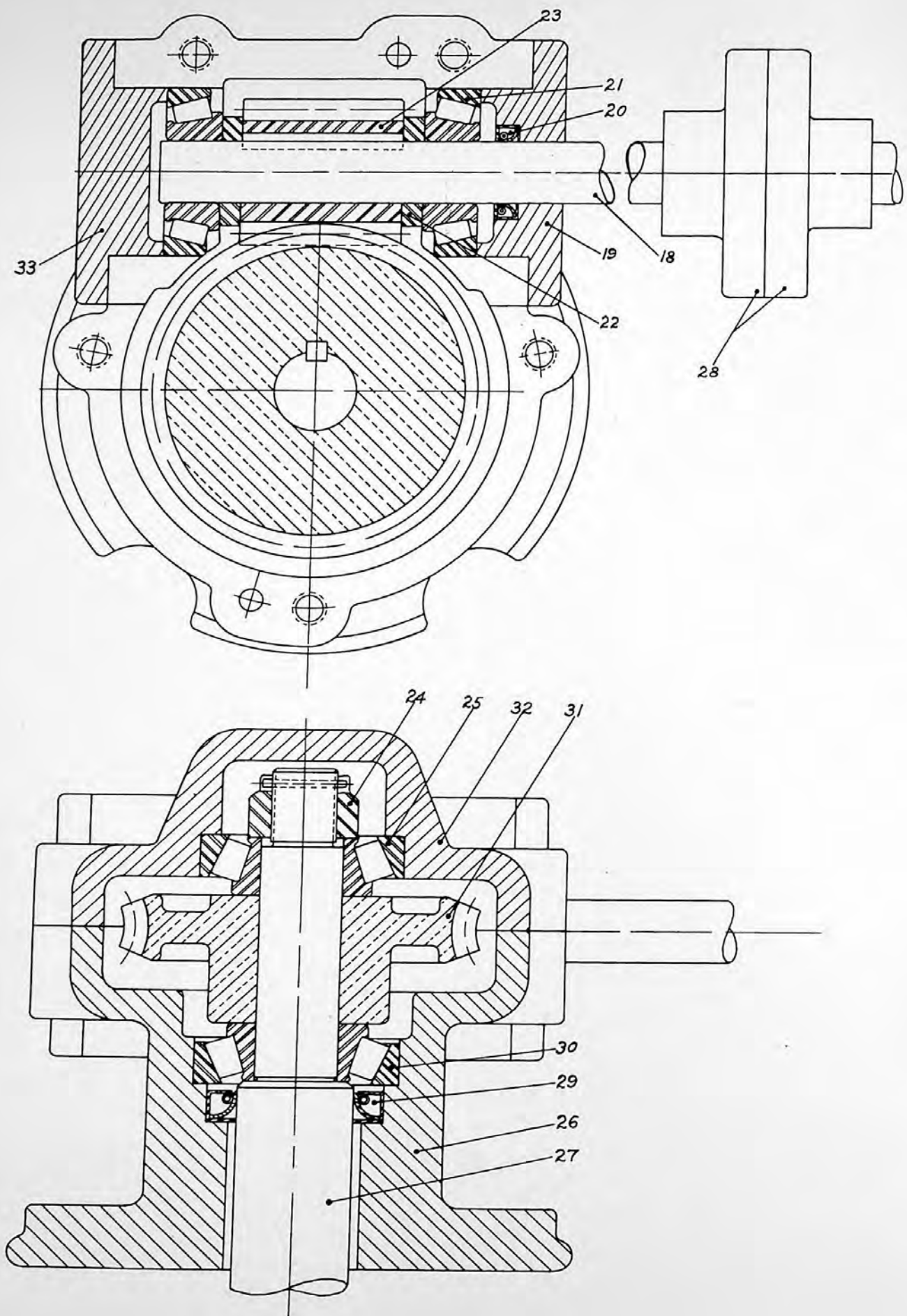
206	Thrust Bearing	258	Bushing
207	Thrust Bearing	259	Bearing Bracket
208	Spacer	260	Shifter Rod
209	Crank Shaft	261	Shifter
210	Collar	262	Shifter Lever
211	Slide	263	Lever Ball
212	Clapper Box	264	Shifter Fork
213	Washer	265	Feed Shaft
214	Clamp Stud	266	Miter Gear
215	Spring	267	Bushing
216	Spring Screw	268	Thrust Bearing
217	Clapper Block Pin	269	Nut
218	Clapper Block	270	Saddle Gib
219	Backing Plate	271	Saddle Gib
220	Bearing Cap	272	Saddle
221	Clamp Block	273	Cross Feed Nut
222	Clamp Nut	274	Nut Bracket
223	Clamp Bolt	275	Shifter Screw
224	Backing Plate	276	Shifter Fork
225	Tool Lifter Piston	277	Shifter Stop
226	Spring	278	Lever Coupling
227	Packing Ring	279	Lever
228	Swivel Screw	280	Feed Clutch
229	Clamp Plate	281	Bushing
230	Screw Stop	282	Collar
231	Pin Bearing	283	Clutch Gear
232	Washer	284	Piston Rod Bracket
233	Clamp Stud	285	Packing Gland
234	Slide Gib	286	Packing
235	Gib Adjusting Screw	287	Bushing
236	Gib Adjusting Screw	288	Snap Ring
237	Lock Nut	289	Gasket
238	Bearing Retainer	290	Bearing Cap
239	Roller Bearing	291	Cylinder
240	Bearing Spacer	292	Piston Rod
241	Bearing Bracket	293	Piston Head
242	Spiral Drive Gear	294	Bearing Cap
243	Feed Shaft	295	Piston Ring
244	Saddle Gib	296	Cylinder Head
245	Saddle Gib	297	Cylinder Bearing
246	Nut	298	Cylinder Bearing
247	Spiral Driven Gear	299	Cylinder Head
248	Thrust Bearing	300	Pipe Flange
249	Bushing	301	Gasket
250	Elevating Screw	302	Ball
251	Saddle	303	Plunger
252	Elevating Nut	304	Spring
253	Bushing	305	Check Plug
254	Side Head Rail	306	Gasket
255	Nut Bracket	307	Packing Gland
256	Spiral Drive Gear	308	Choke
257	Feed Clutch	309	Washer



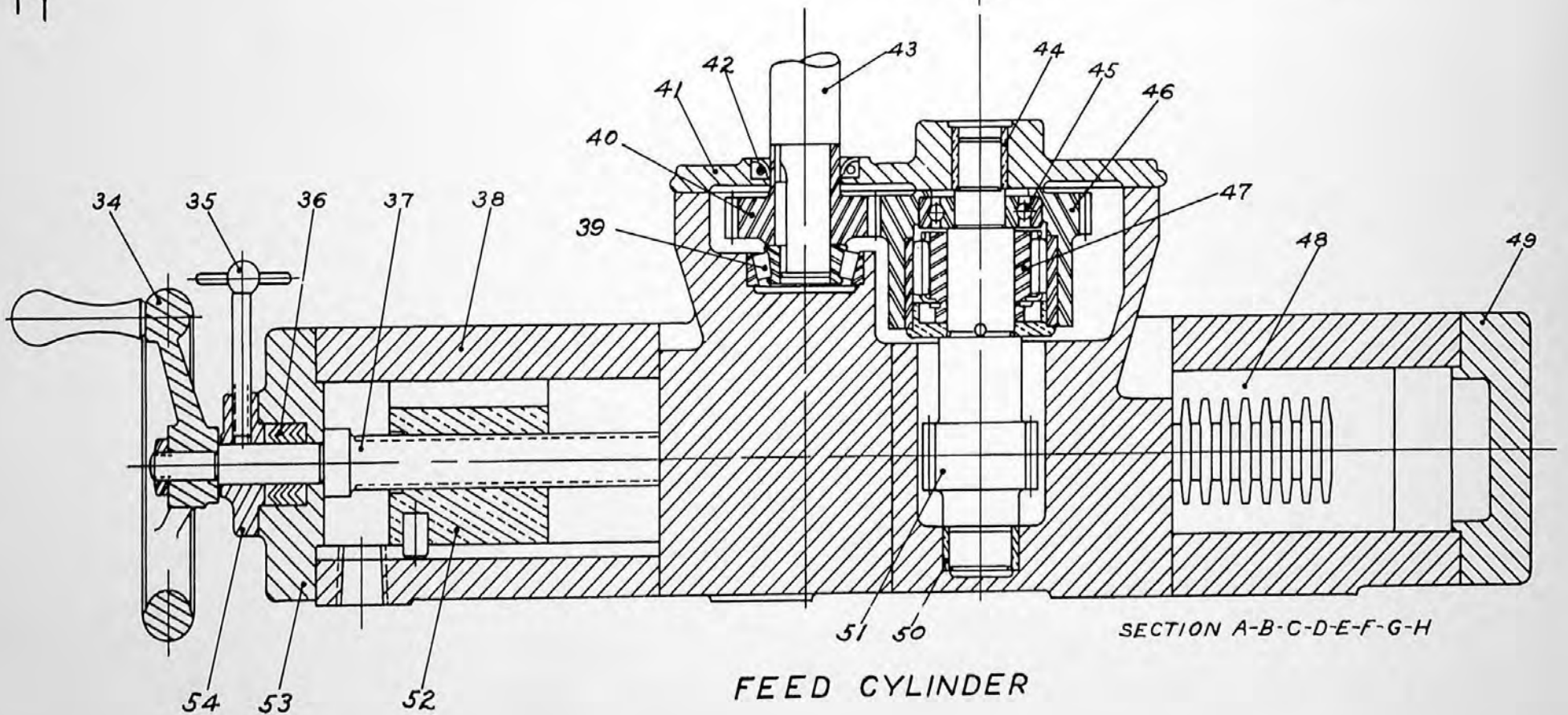
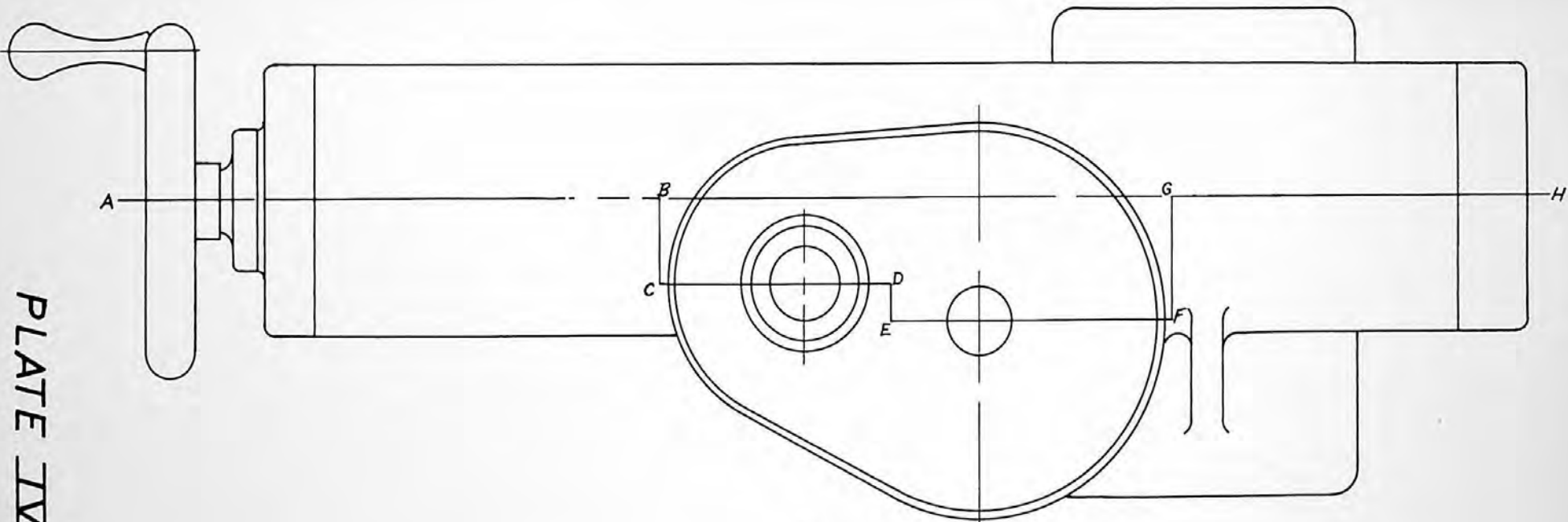
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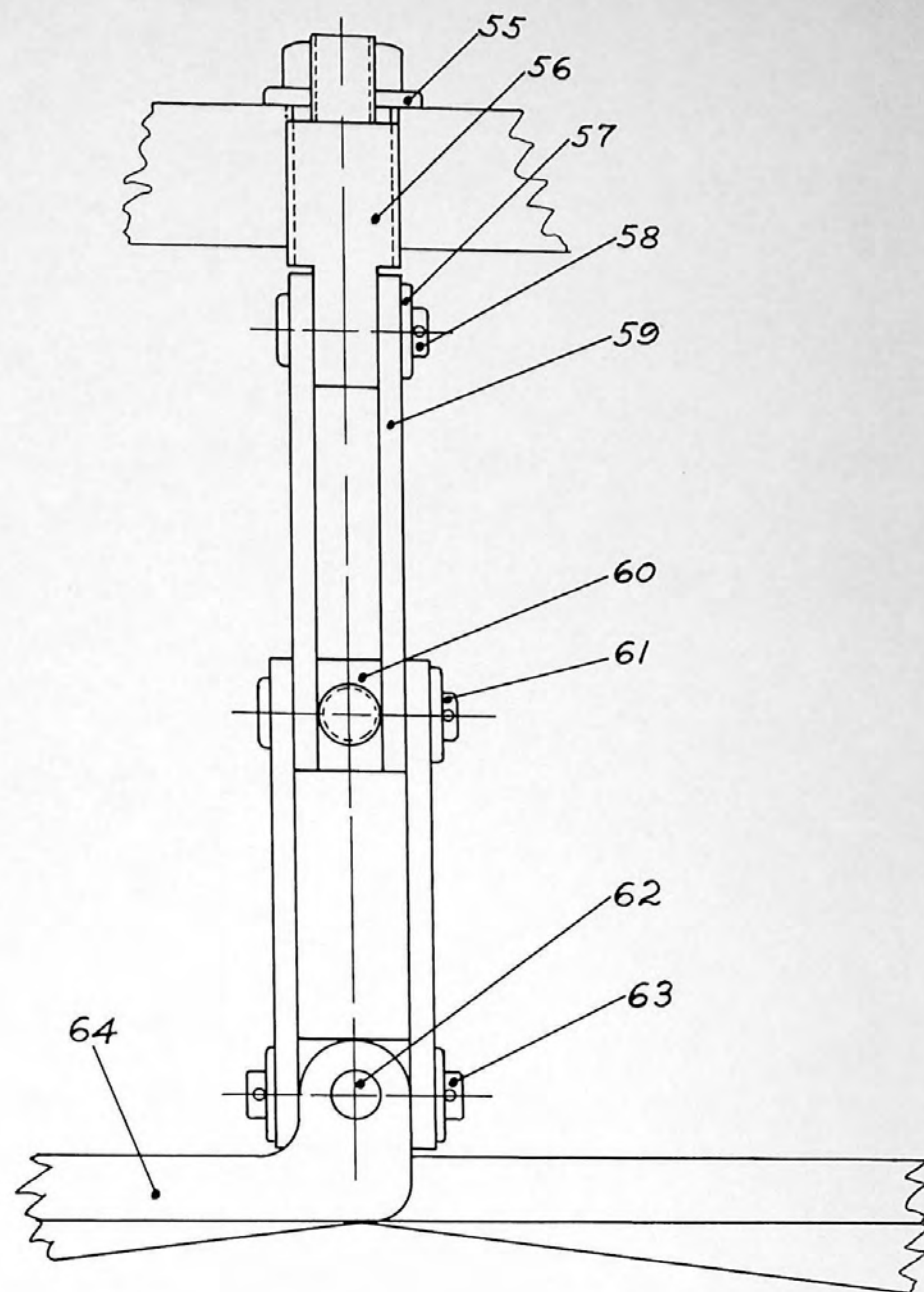
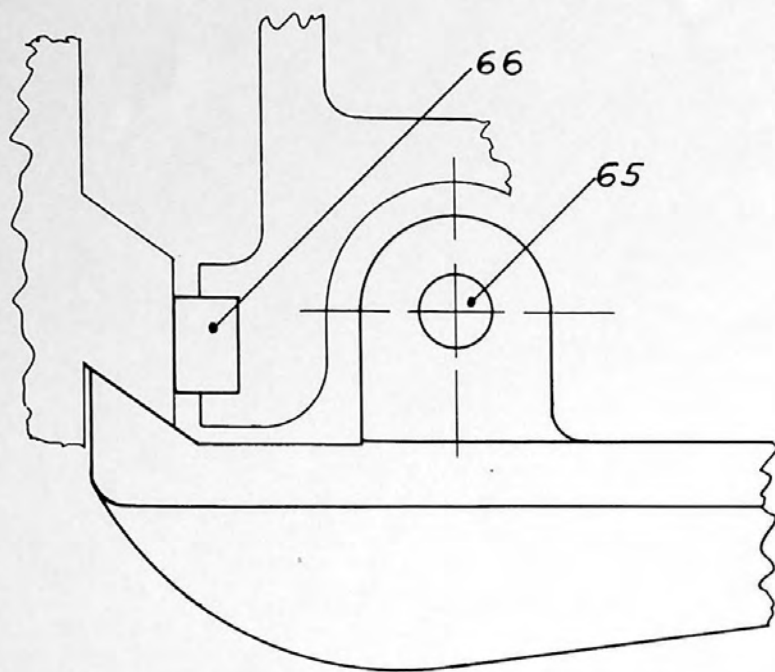
PLATE I



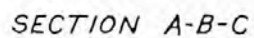


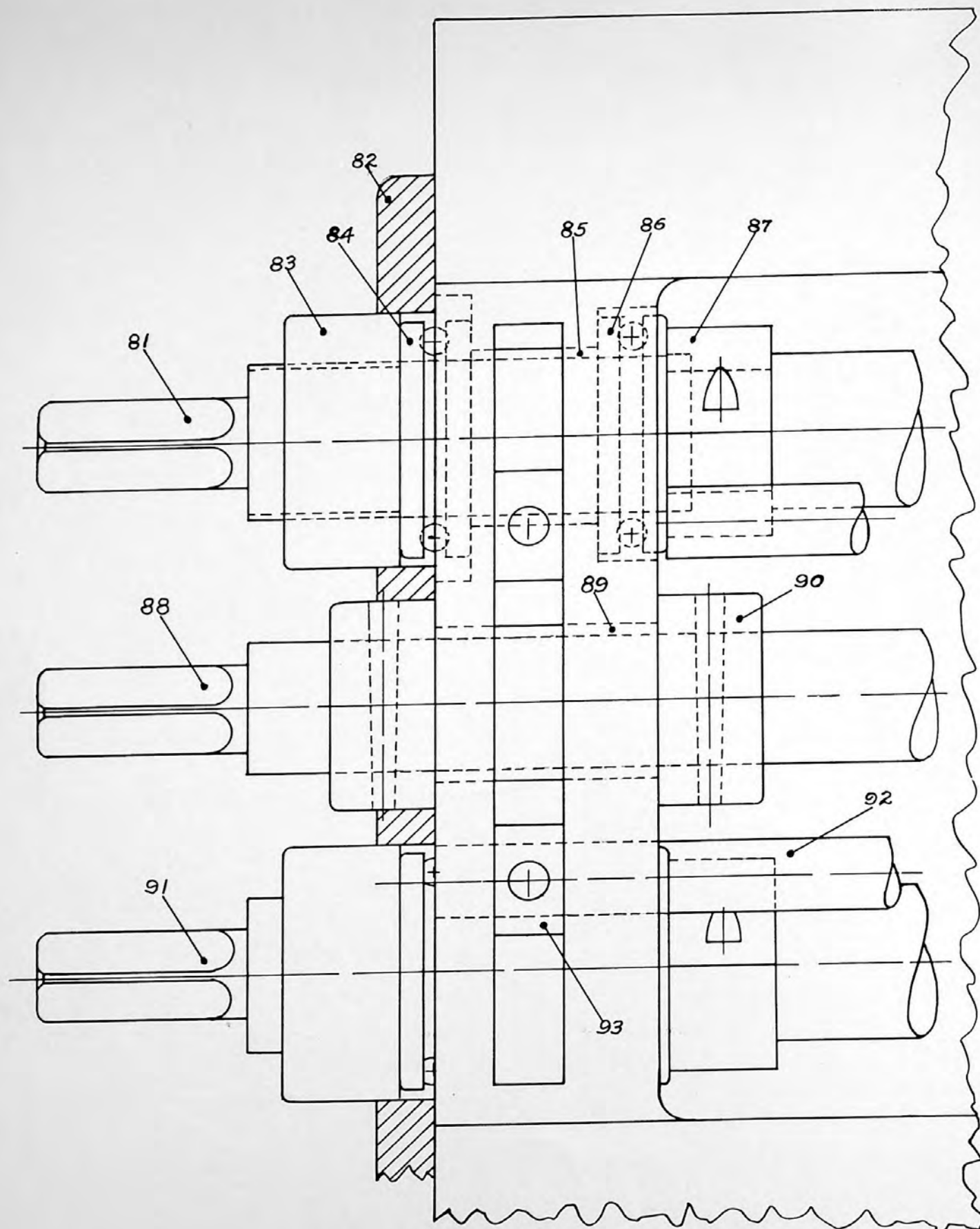
RAIL ELEVATING WORM DRIVE



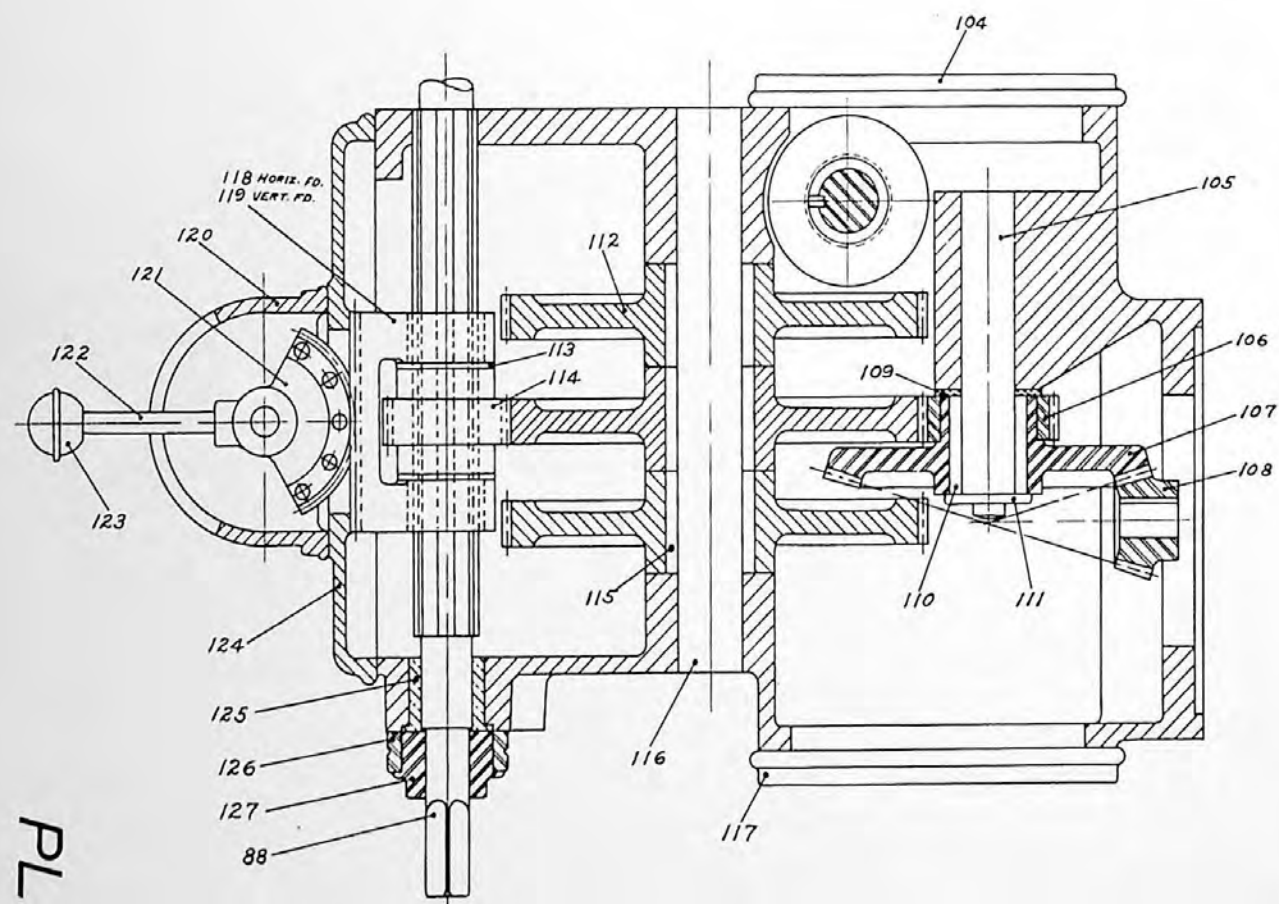


CROSS RAIL CLAMP

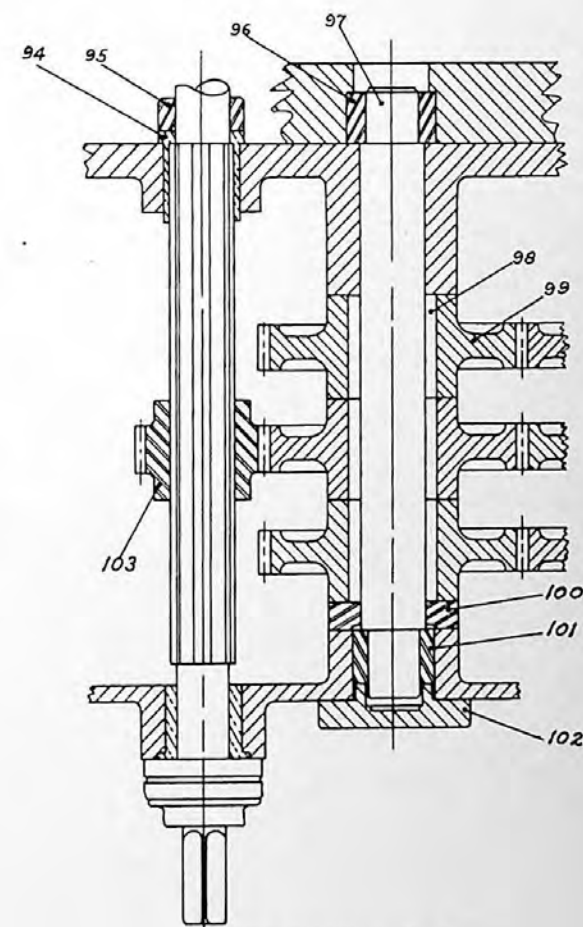




RAIL LEFT END ASSEMBLY

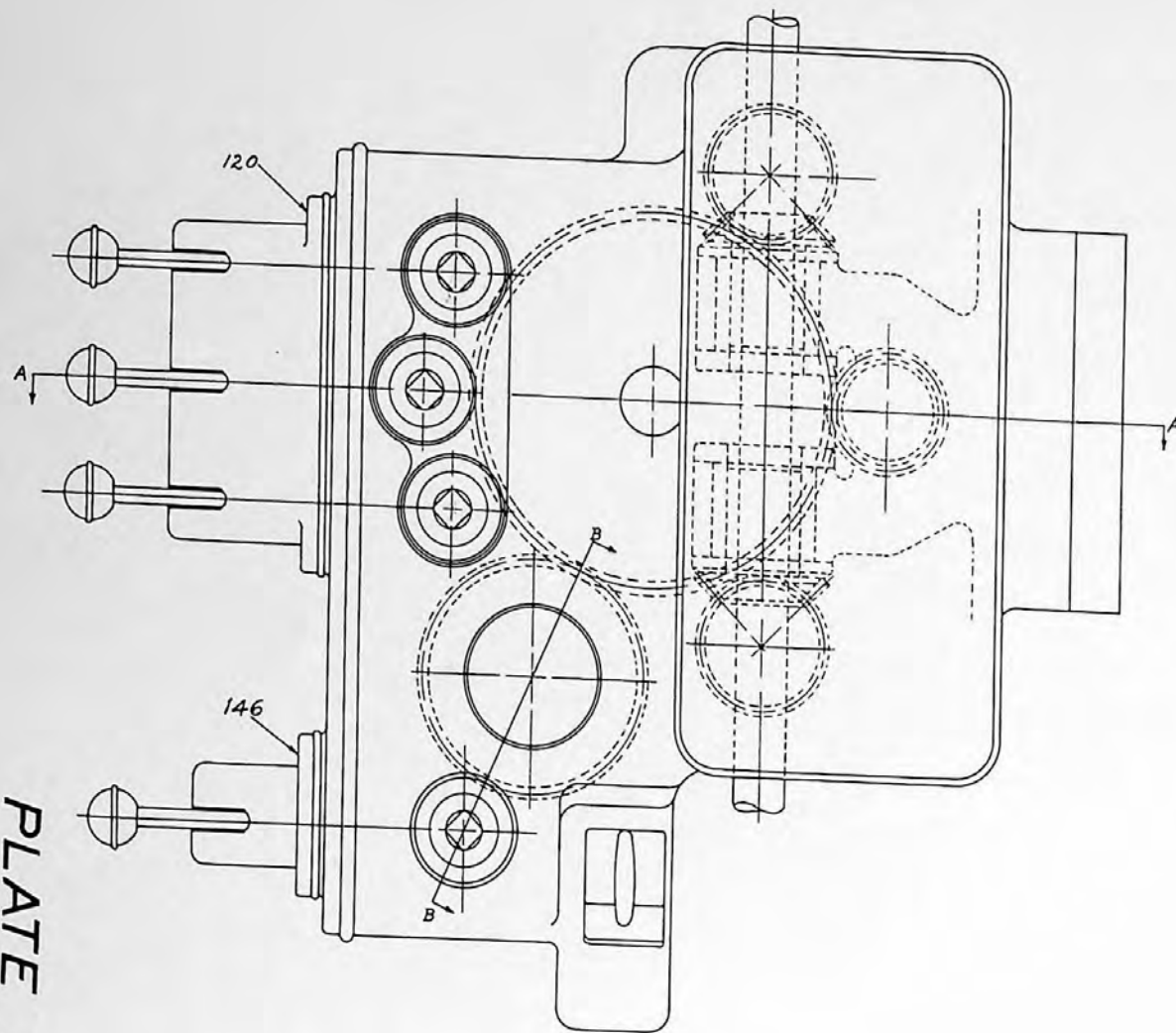


SECTION A-A OF PLATE IX



SECTION B-B

FEED BOX



FEED BOX

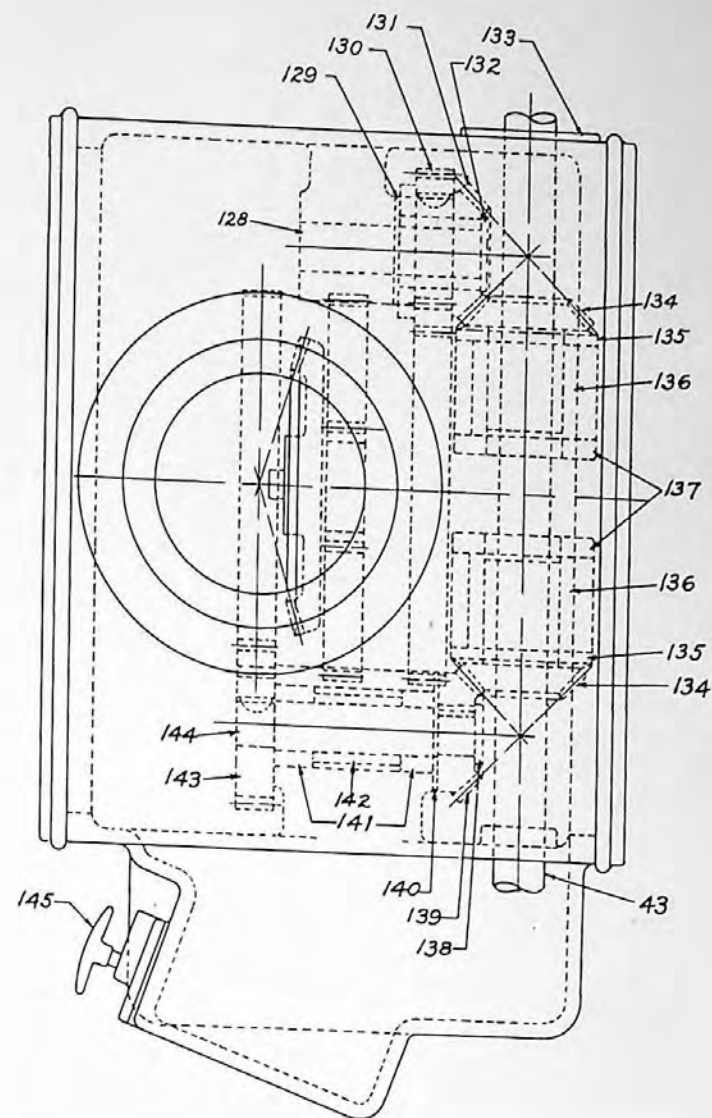
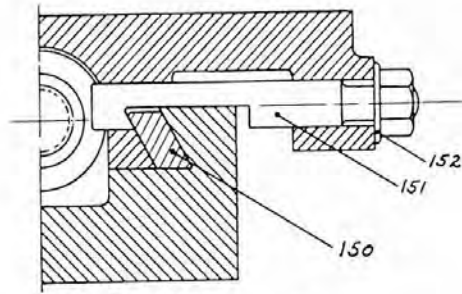
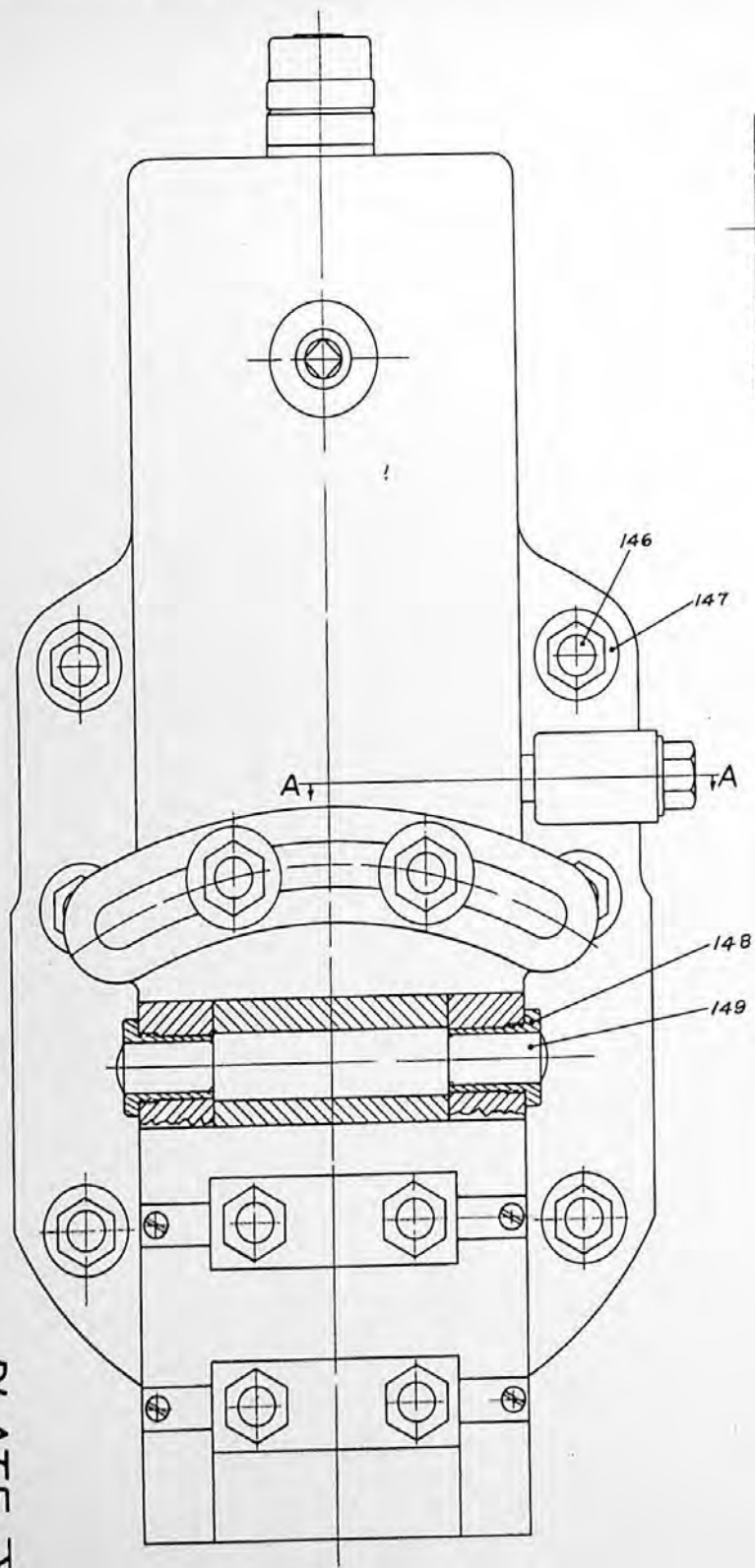
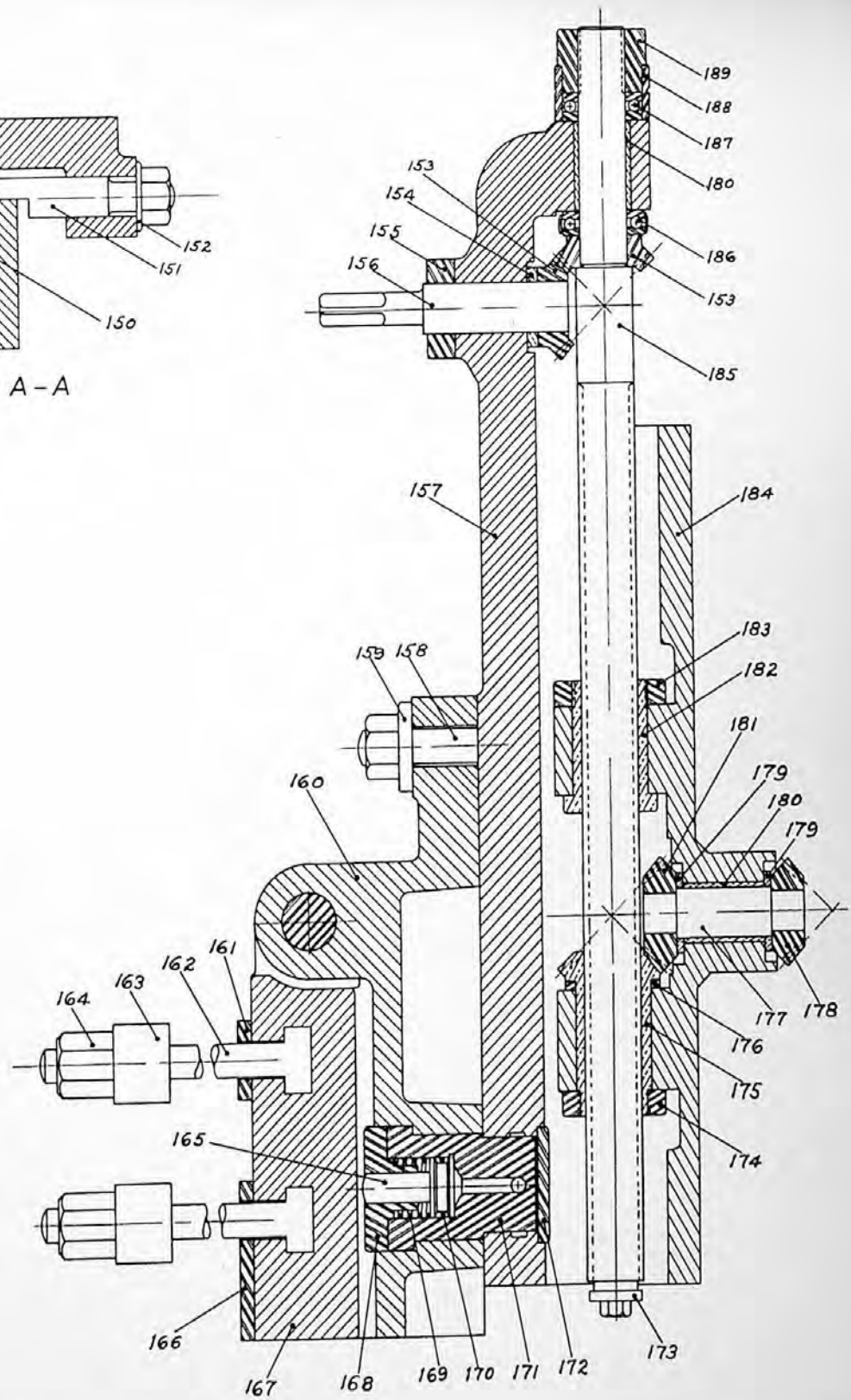


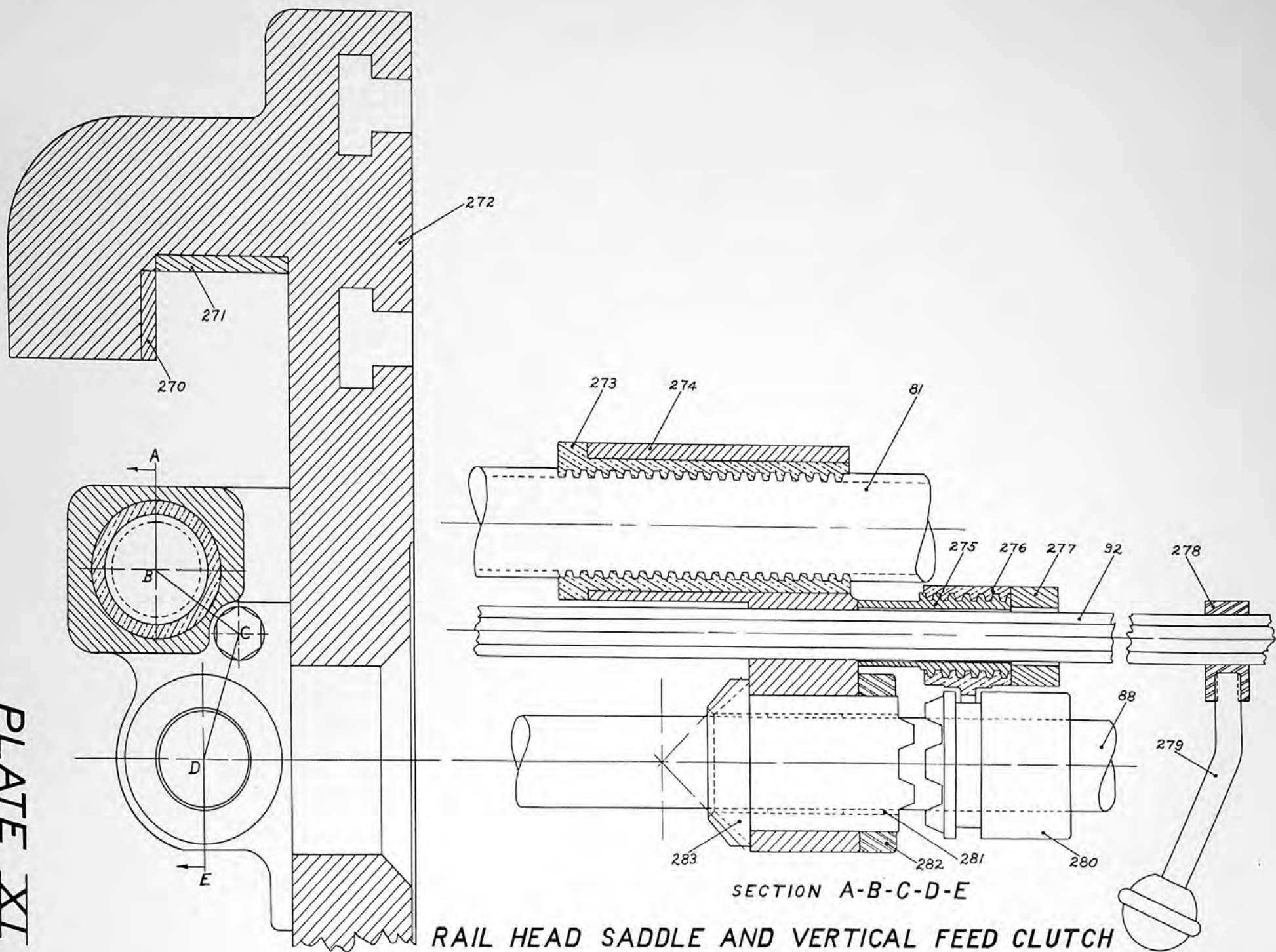
PLATE X



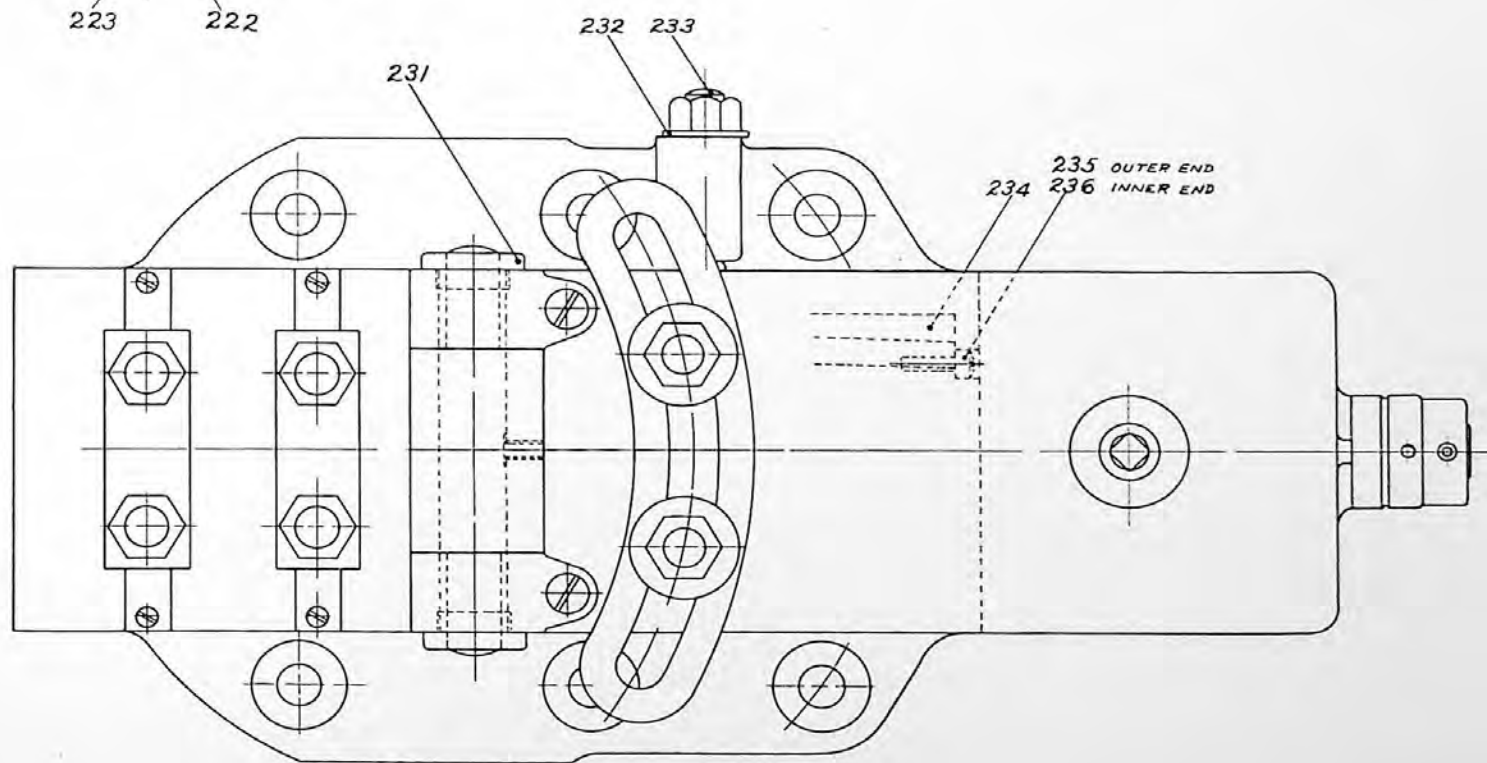
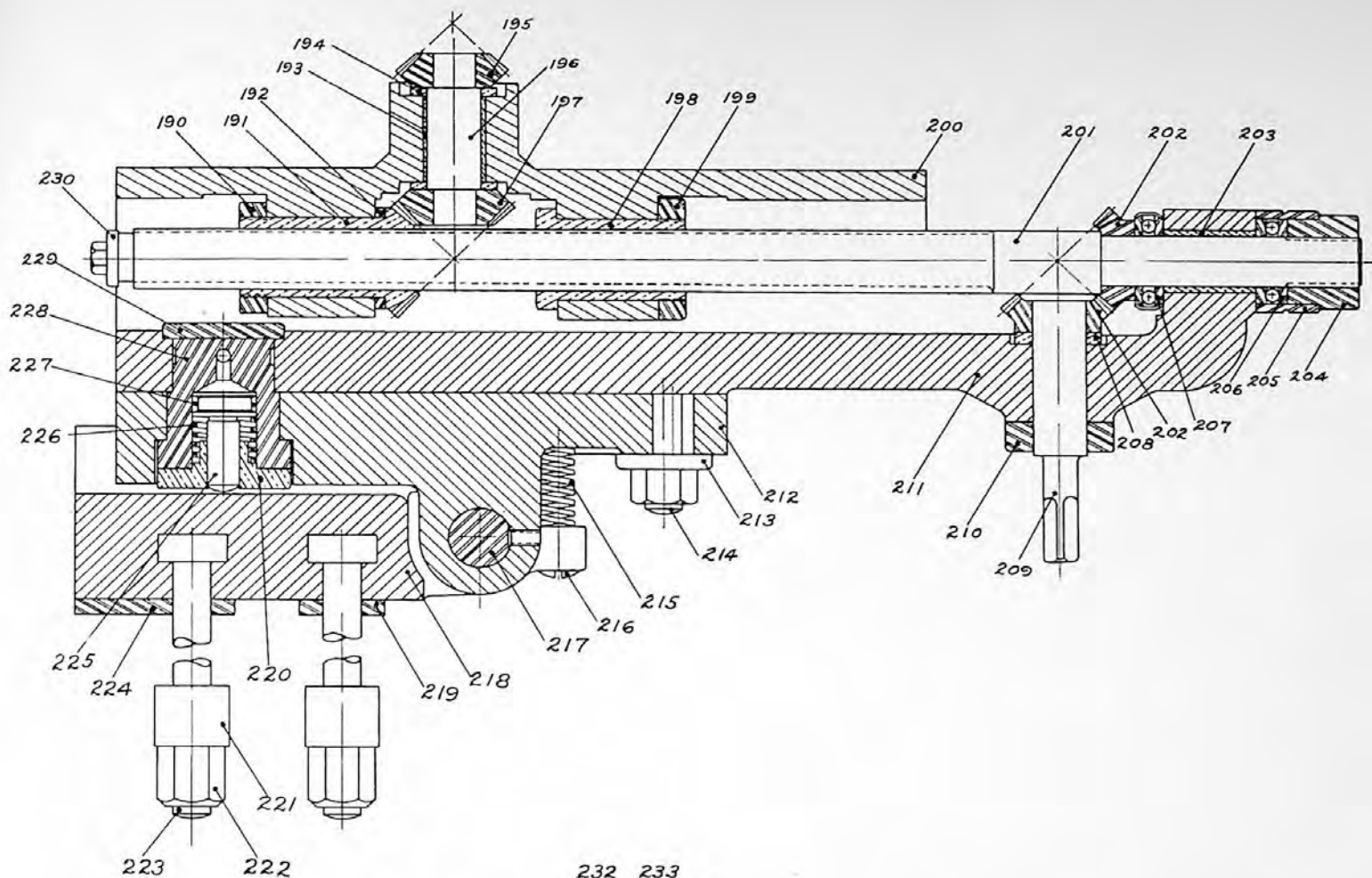
SECTION A-A



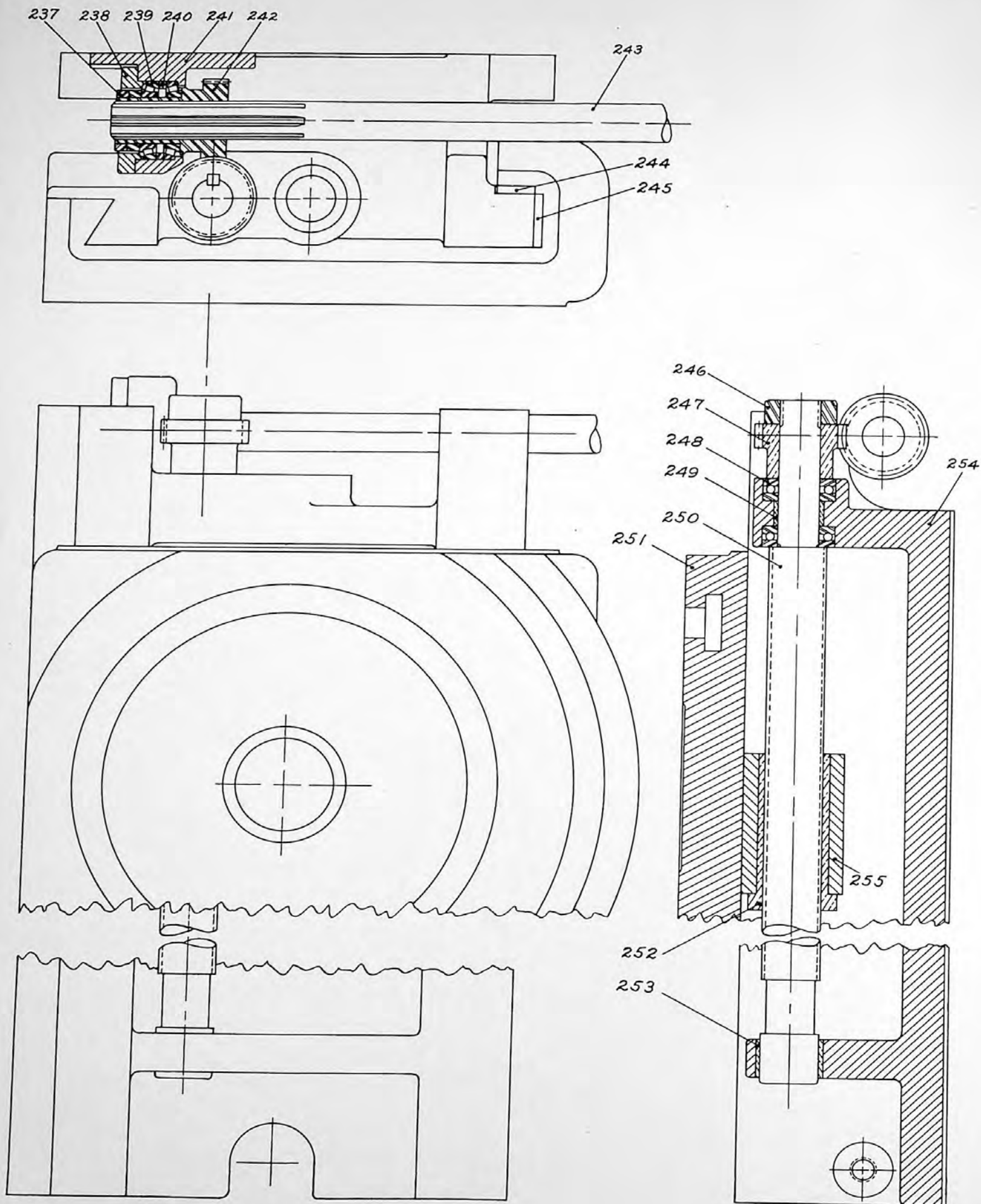
RAIL HEAD



RAIL HEAD SADDLE AND VERTICAL FEED CLUTCH

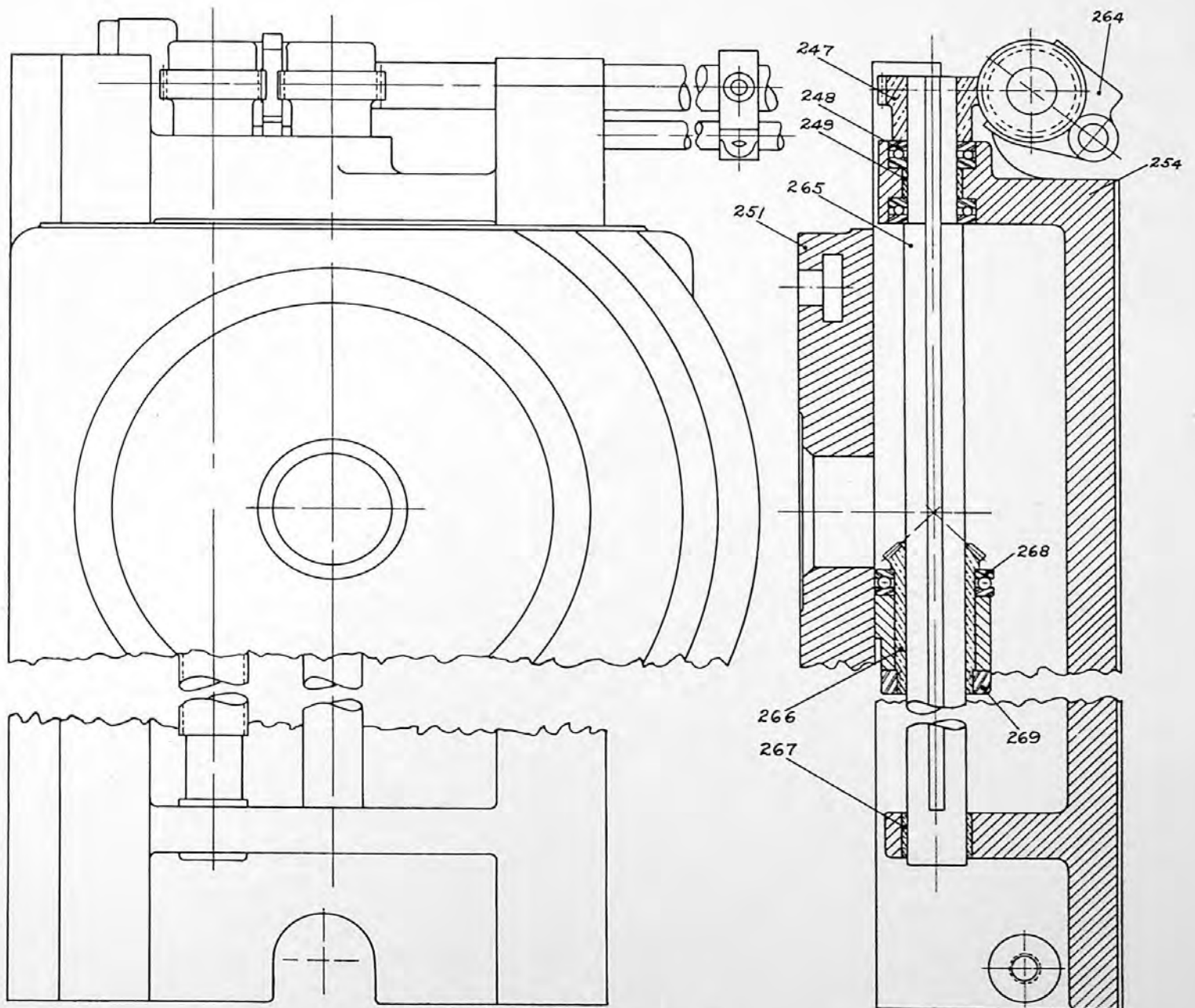
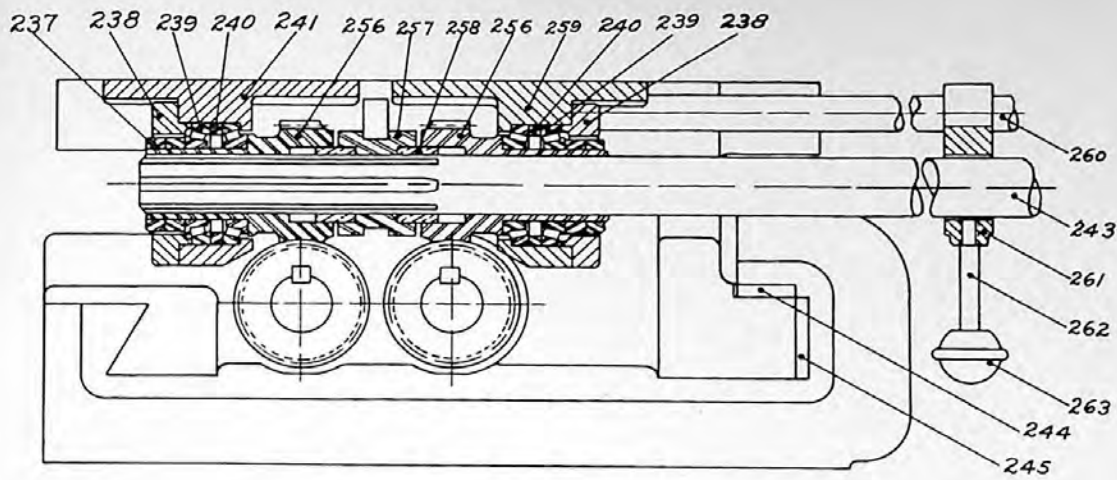


SIDE HEAD



SIDE HEAD RAIL

PLATE XIII



SIDE HEAD RAIL
WITH POWER HORIZONTAL FEED

