

**INSTRUCTION MANUAL**  
For OPERATING and MAINTAINING  
**2500 H. P. TRIPLE EXPANSION**  
**MARINE STEAM ENGINES**

**UNITED STATES MARITIME COMMISSION**  
**EC2-S-C1 CARGO VESSELS**

VM  
731  
454  
C.R

# INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE OF **2500 I. H. P.—24½—37—70 x 48"—76 R. P. M.** **VERTICAL TRIPLE EXPANSION MARINE** **STEAM ENGINES** FOR THE **UNITED STATES MARITIME COMMISSION** **EC2-S-C1 CARGO VESSELS**

Built By The Following Manufacturers:

Alabama Marine Engine Company  
Birmingham, Ala.

Joshua Hendy Iron Works  
Sunnyvale, California

The American Ship Building Company  
Cleveland, Ohio

National Transit Pump & Machine Co.  
Oil City, Pennsylvania

Clark Brothers Company, Inc.  
Olean, New York

Oregon War Industries, Inc.  
Portland, Oregon

Ellicott Machine Corporation  
Baltimore, Maryland

Toledo Shipbuilding Company, Inc.  
Toledo, Ohio

The Filer & Stowell Company  
Milwaukee, Wisconsin

Vulcan Iron Works  
Wilkes-Barre, Pennsylvania

Harrisburg Machinery Corporation  
Harrisburg, Pennsylvania

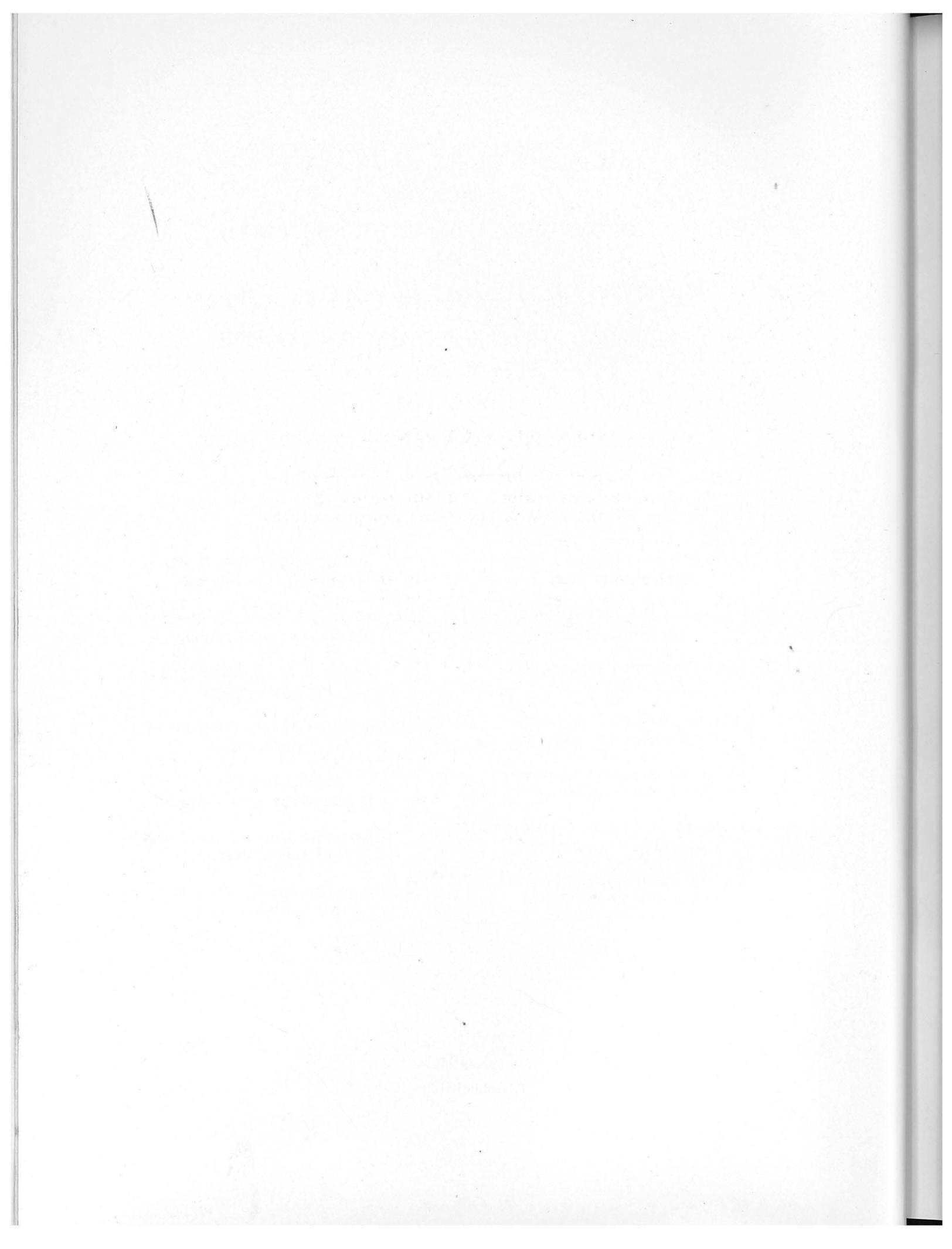
Willamette Iron & Steel Corp.  
Portland, Oregon

General Machinery Corporation  
Hooven, Owens, Rentschler Division  
Hamilton, Ohio

Worthington Pump & Machinery Corp.  
Harrison, New Jersey

1942

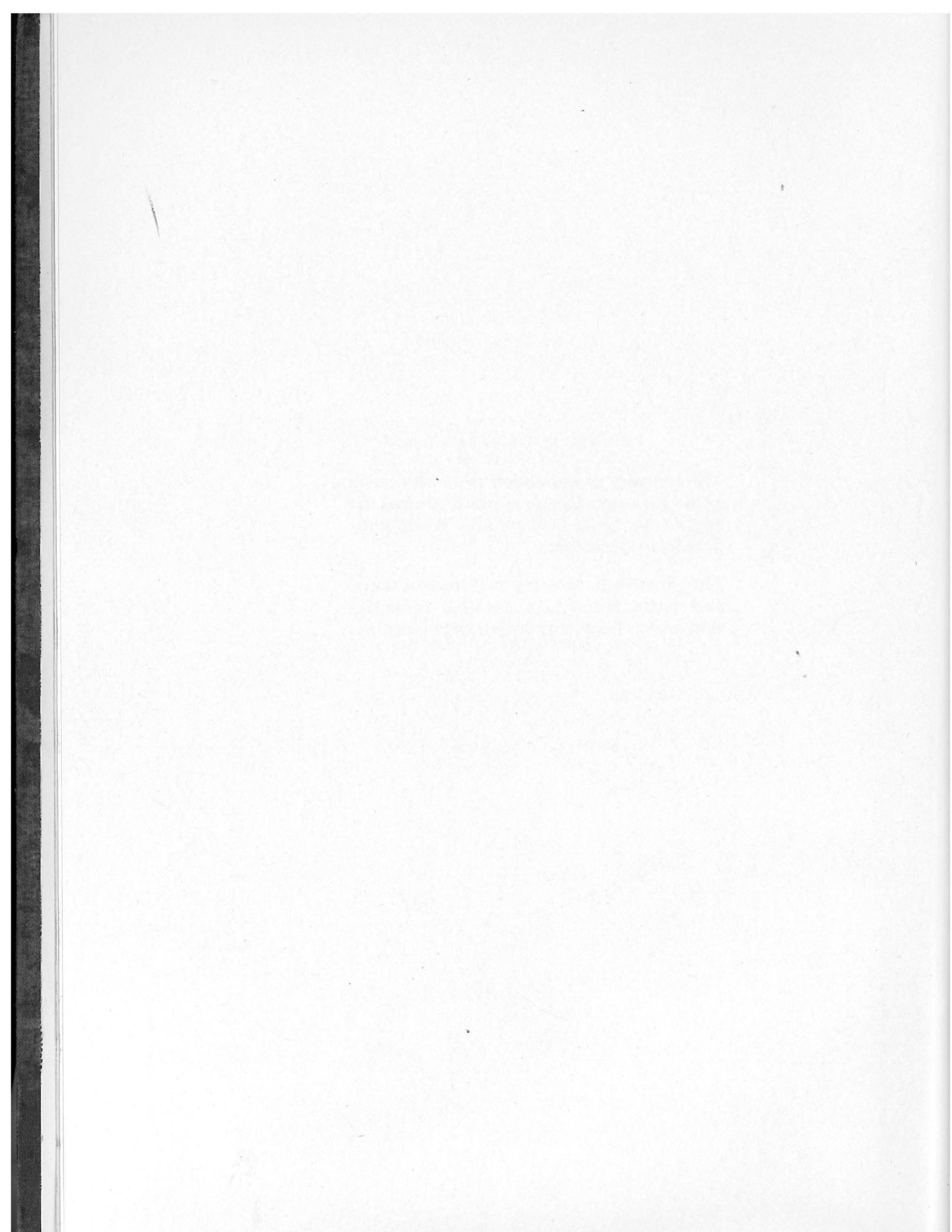
Printed in Hamilton, Ohio



## **INTRODUCTION**

The purpose of this book is to serve as a guide for operating and maintaining the engine so as to secure the most economical operation.

The drawings, descriptive instructions, and parts listed give detailed information as to the construction of the engine.



# I N D E X

## Views of Engine

	Page
Operating Side.....	6
Exhaust Side.....	7

## SECTION I General Engine Data

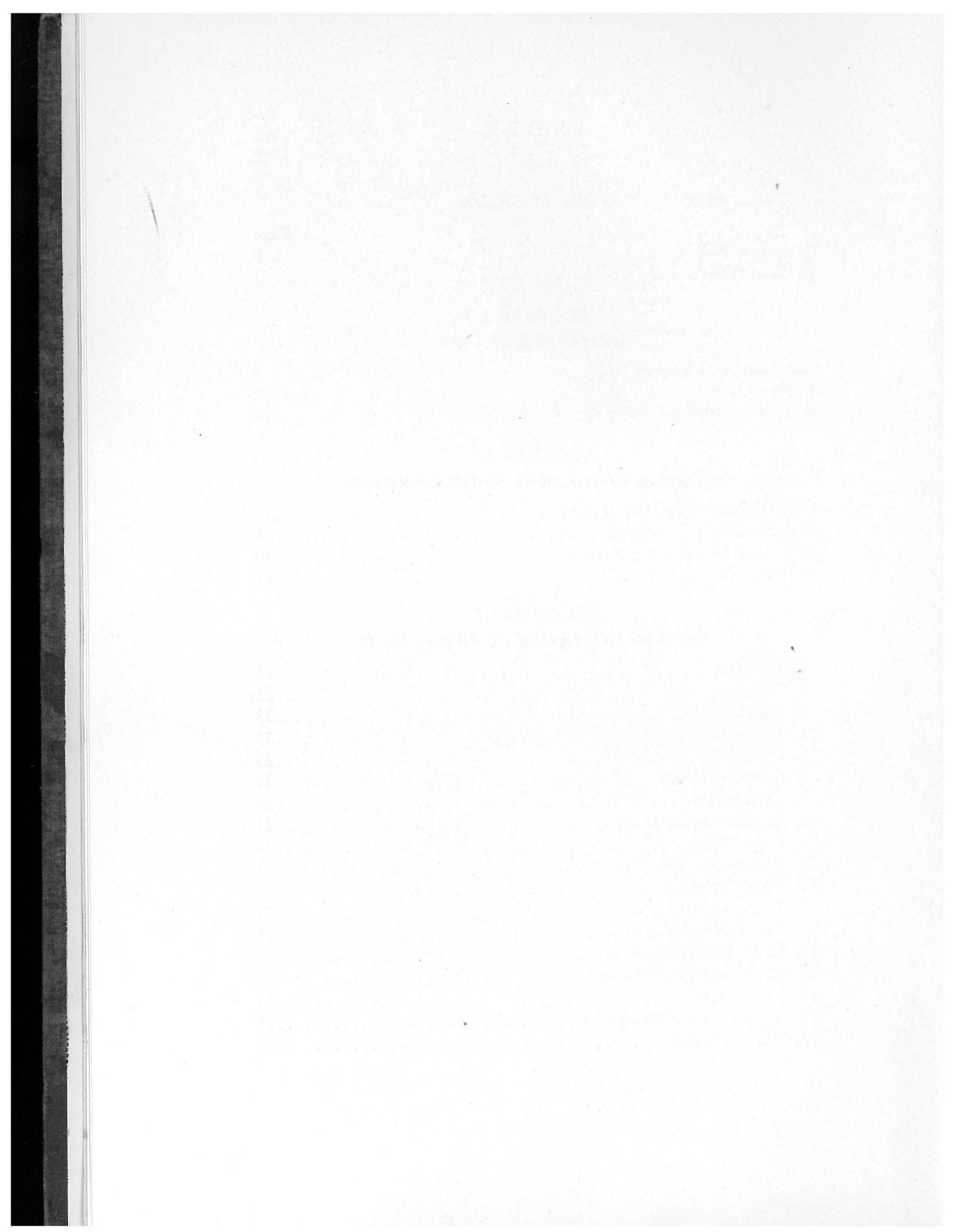
Description of Engine.....	9
Engine Data.....	12
Weight of Principal Parts.....	14

## SECTION II Operating Instructions and Maintenance

General Operating Instructions.....	17
Maintenance Information.....	18
Tolerance for Running Parts.....	20
Indicator Card.....	21

## SECTION III Detailed Description of Engine Parts

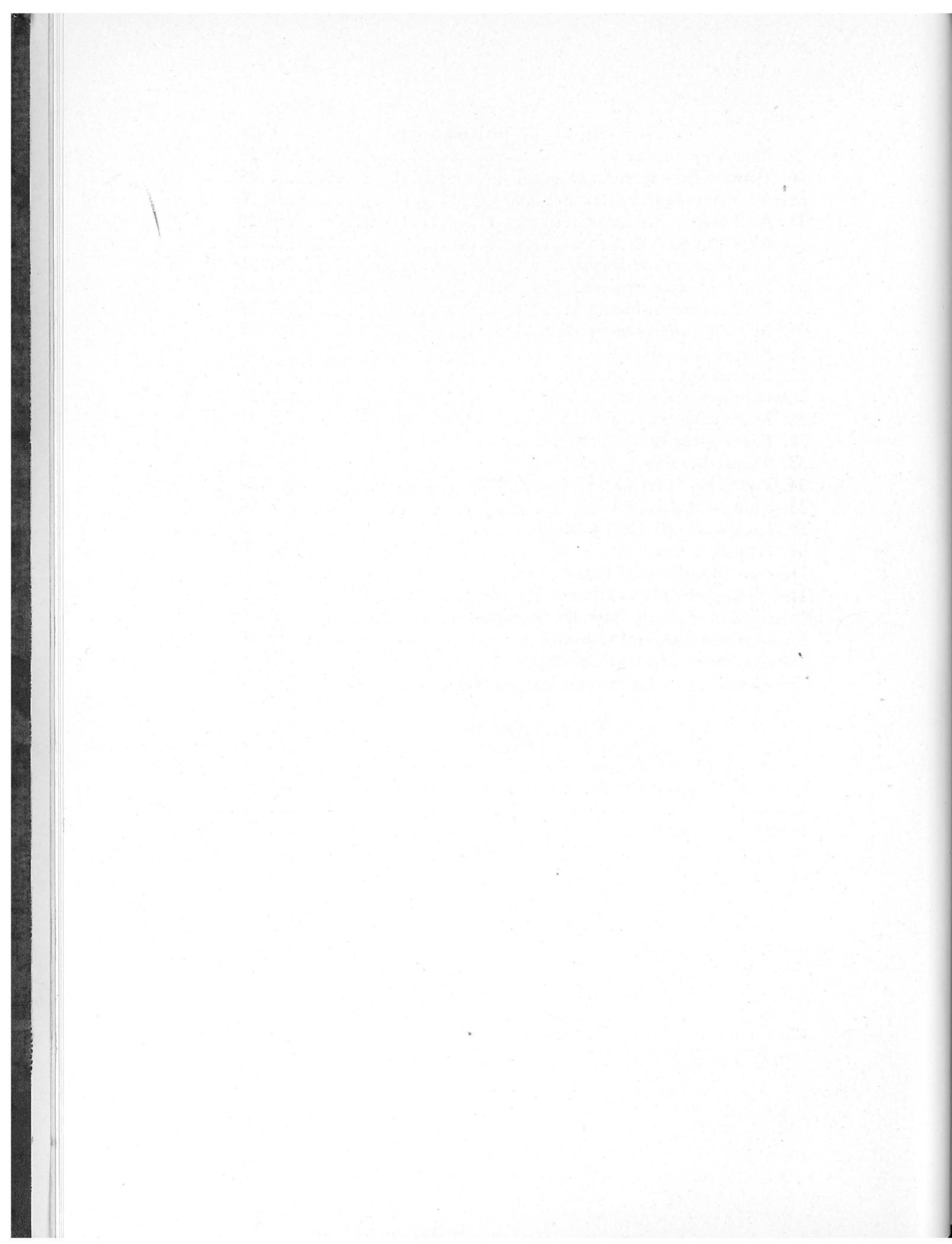
1. Bedplate.....	23
2. Columns.....	23
3. Crankshaft.....	23
4. Main Bearings.....	23
5. Cylinders.....	23
6. Cylinder Heads.....	23
7. Crossheads.....	24
8. Connecting Rods.....	24
9. Piston Rods.....	24
10. Pistons.....	24
11. Relief Valves.....	24
12. Drain Valves.....	24
13. Throttle Valve.....	24
14. H. P. Piston Valve.....	25
15. M. P. and L. P. Valves.....	25
16. Valve Gear.....	25
17. Eccentrics and Straps.....	25
18. Reverse Shaft.....	25



	Page
19. Reversing Engine.....	25
20. Turning Engine.....	25
21. Air Pump Beam.....	26
22. Air Pump.....	26
23. Bilge Pumps.....	26
24. Evaporator Feed Pump.....	26
25. Water Cooling Service.....	27
26. By-Pass Steam Piping.....	27
27. Indicator and Counter Gear.....	27
28. Engine Indicator.....	27
29. Lubrication.....	27
30. Lubricating Oil.....	28
31. Bearing Metal.....	28
32. Fouling Marks.....	28
33. Thrust Bearing.....	28
34. Piston Rod and Valve Stem Packing.....	28
35. Cylinder Lubricator.....	29
36. Lockwood and Carlisle Rings.....	29
37. Gauges.....	29
Description of C. Lee Cook Packing.....	30
Description of Paxton-Mitchell Packing.....	35
Description of U. S. Metallic Packing.....	36-A
Description of Manzel Lubricator.....	37
Description of McCord Lubricator.....	39
Description of Lockwood and Carlisle Rings.....	41

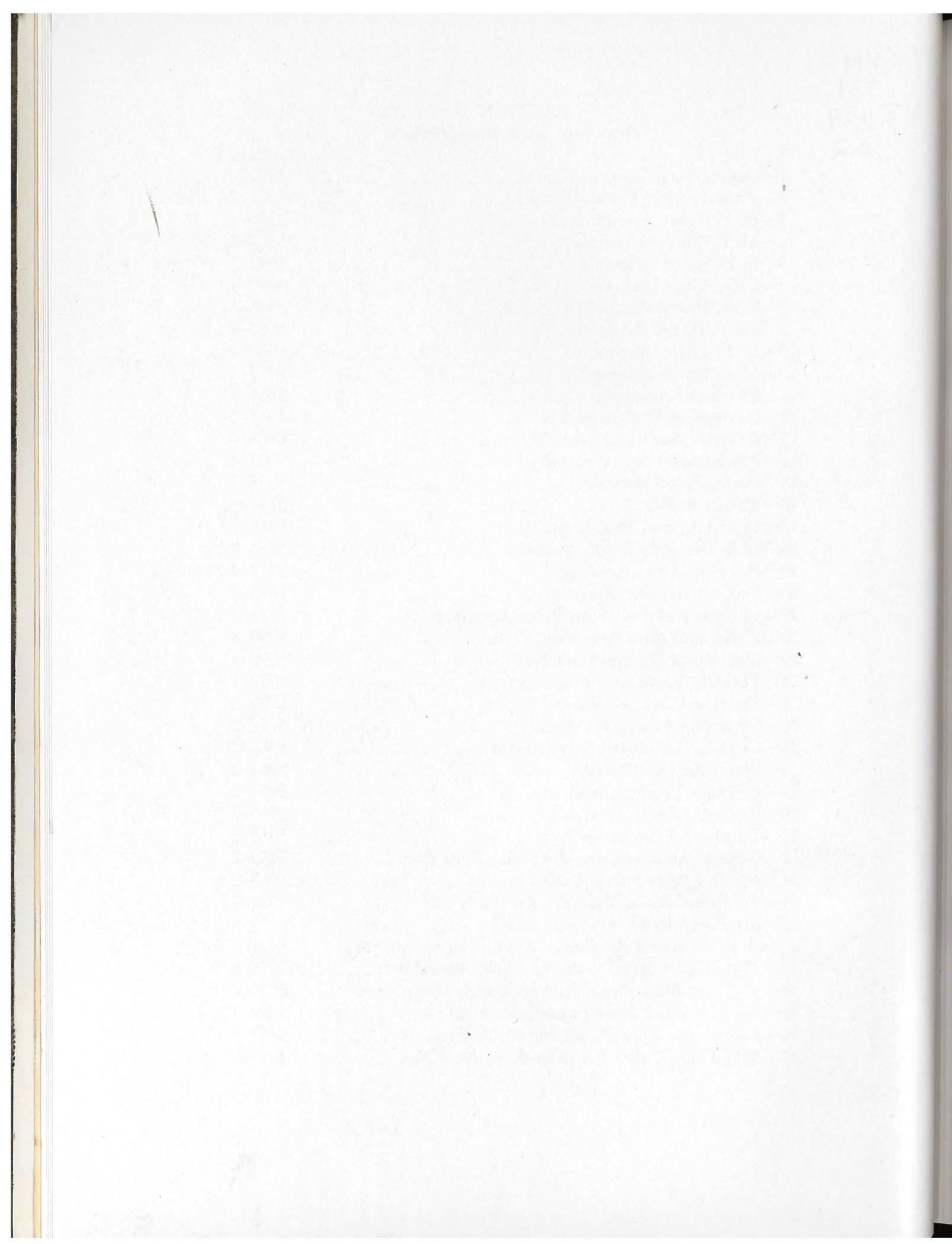
#### SECTION IV

Tools and Wrenches.....	48
Packing and Gasket Information.....	48
List of Spare Parts.....	49
Sketches of Special Wrenches.....	51



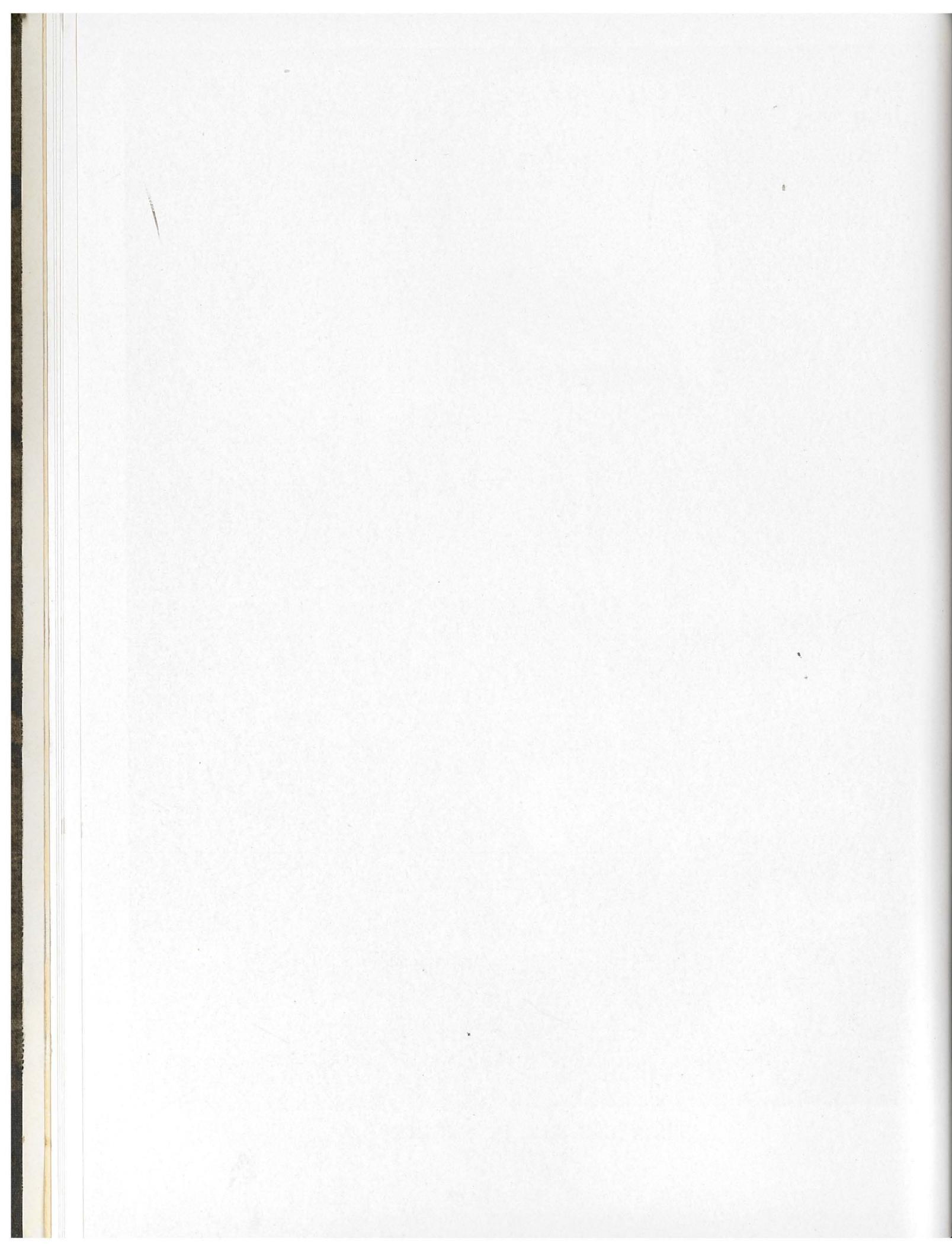
**SECTION V**  
**Drawings and Illustrations**

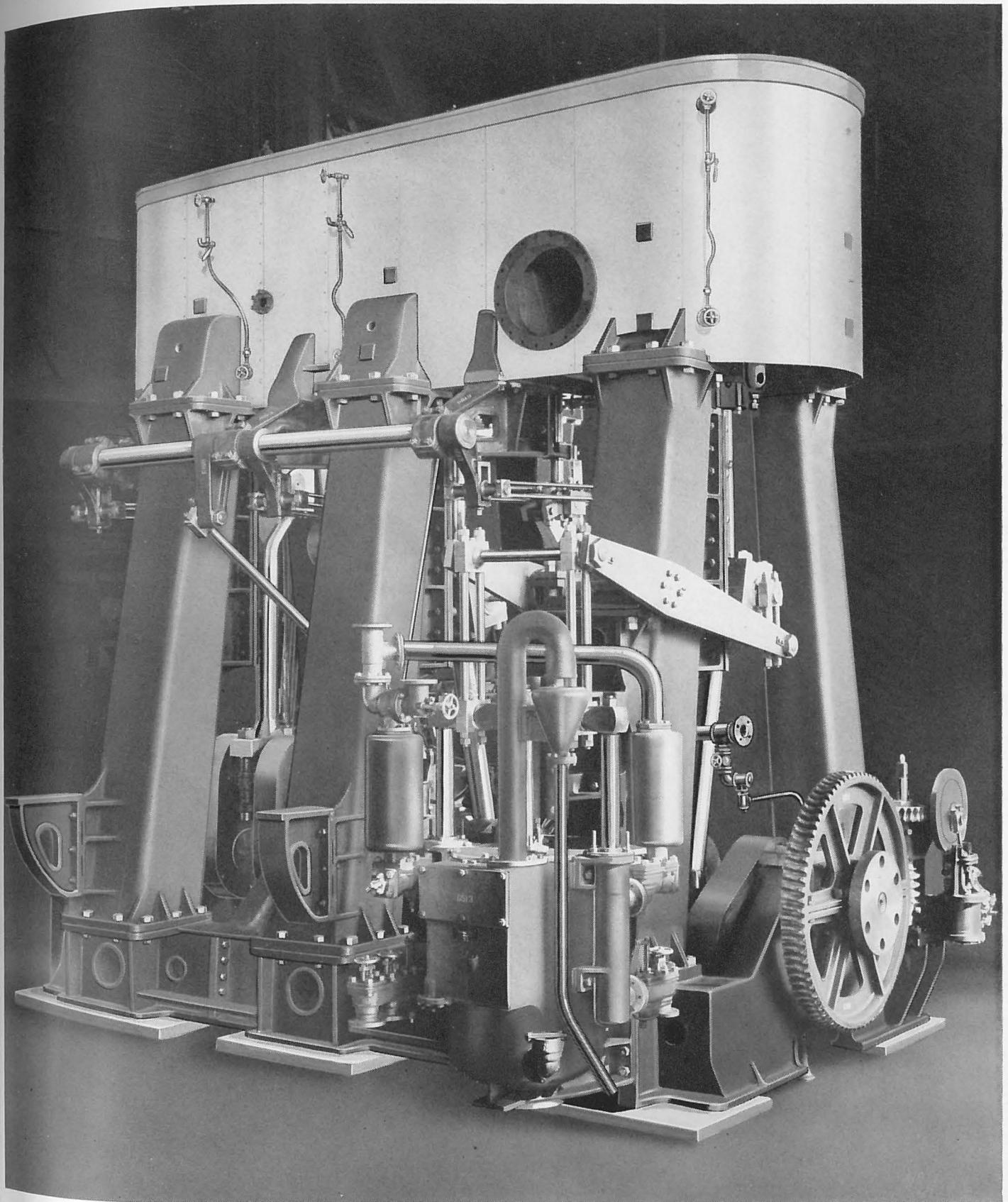
	Page
1—General Arrangement Engine.....	5972-2
2—Cross-Section Through Engine.....	5973-2
3—H. P. Valve Assembly.....	8990-4
4—M. P. Valve Assembly.....	5960-2
5—L. P. Valve Assembly.....	5961-2
6—Valve Gear Diagram.....	5979-2
7—H. P. Piston Assembly.....	8986-4
8—M. P. Piston Assembly.....	8985-4
9—L. P. Piston Assembly.....	8987-4
10—Main Bearing Assembly.....	5955-2
11—Crosshead Assembly.....	5956-2
12—Connecting Rod Assembly.....	5947-2
13—Reverse Shaft and Assembly.....	8965-4
14—Adjustable Lever Assembly.....	9007-4
15—Crankshaft Assembly.....	5928-2
16—Thrust Shaft.....	18151-8
17—Eccentric and Rod Assembly.....	5962-2
18—Link Bars and Block Assembly.....	5954-2
19—Handling Gear Assembly.....	5974-2
20—Drain Valve Arrangement.....	5975-2
21—Counter and Indicator Drive Assembly.....	5971-2
22—2" Relief Valves Assembly.....	8998-4
23—2½" Relief Valves Assembly.....	8996-4
24—Throttle Valve Assembly.....	5957-2
25—Starting Valve Assembly.....	8979-4
26—Oil piping Arrangement.....	5958-2
27—Cylinder Lubricating Arrangement.....	5966-2
28—Water Service Piping.....	5964-2
29—Cylinder Lagging Assembly.....	5951-2
30—Reverse Engine Assembly.....	5969-2
31—Turning Engine Assembly.....	5968-2
32—General Arrangement of Air and Bilge Pump.....	5959-2
33—Air and Bilge Pump Assembly.....	5965-2
34—Air Pump Beam and Link Assembly.....	8984-4
35—Air Pump Relief Valve Assembly.....	18279-8
36—Switch Valve Bilge Pump Discharge Assembly.....	8974-4
37—3½" Bilge Pump Discharge Chest Assembly.....	8975-4
38—3½" Aft Bilge Pump Suction Chest Assembly.....	8976-4
39—3½" Forward Bilge Pump Suction Chest Assembly...	5949-2
40—Evaporator Feed Pump and Drive Assembly.....	5967-2
41—32½ FGF Thrust Bearing—Kingsbury No.....	462800



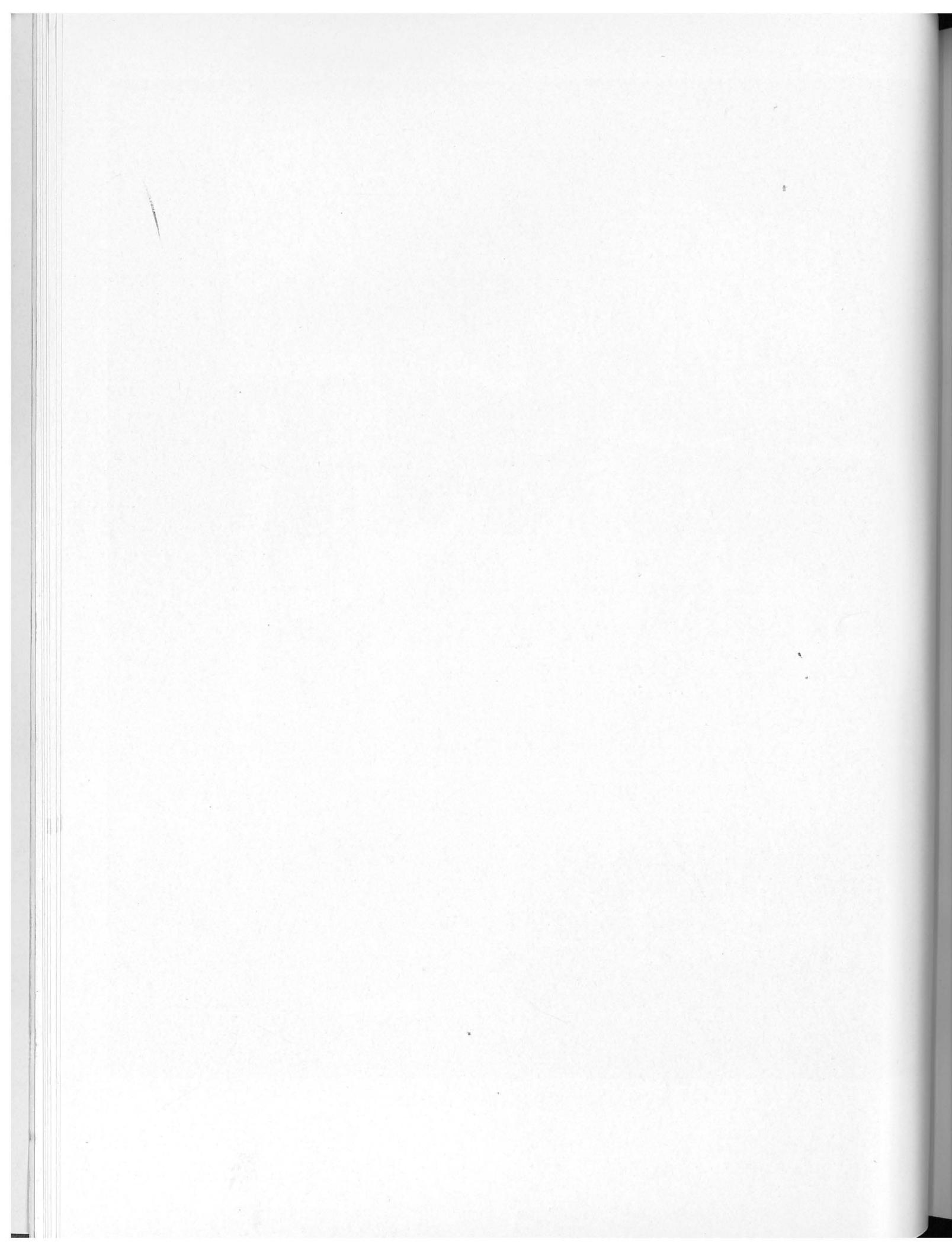


OPERATING SIDE OF ENGINE



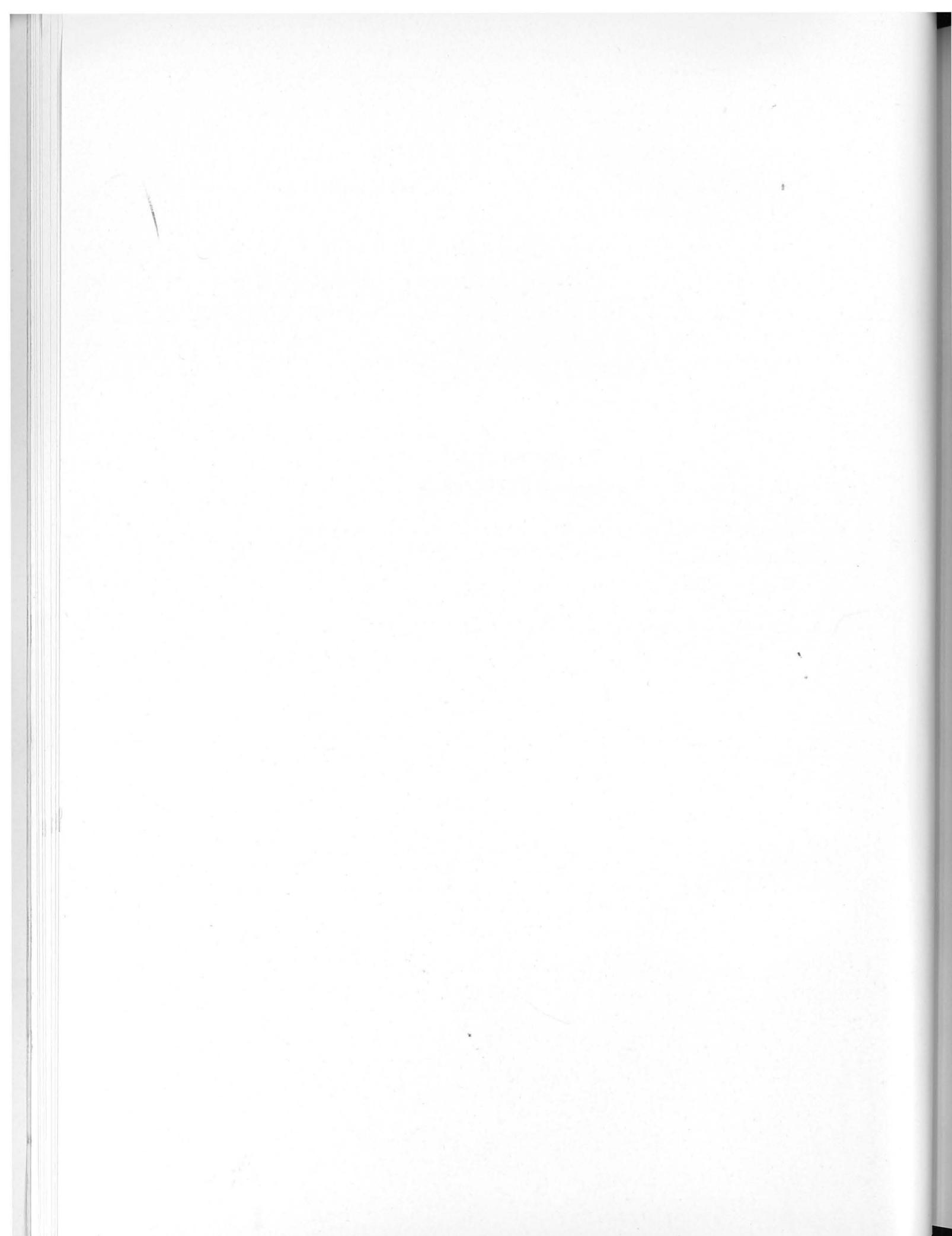


EXHAUST SIDE OF ENGINE



**SECTION I**  
**General Engine Data**

Description of Engine.....	9
Engine Data.....	12
Weight of Principal Parts.....	14



## SECTION I DESCRIPTION OF ENGINE

The main engine is of the vertical, 3-cylinder, triple expansion type with the following cylinder dimensions:

24½-37-70 x 48" stroke, developing 2,500 I. H. P. at 76 R. P. M.

Steam pressure 220#, maximum steam temperature 450°, 26" vacuum.

The engines are built to the American Bureau of Shipping classification AMS.

The cylinder arrangement from forward to aft is:

High Pressure; Medium Pressure; Low Pressure.

The H. P. cylinder is provided with liner for the piston as well as the piston valve.

All cylinders are cast individually and bolted together, forming unit block.

Steam chests are cast integrally with cylinders, thus eliminating interconnecting steam pipes.

The H. P. cylinder is fitted with piston valve, and M. P. and L. P. cylinder with box-type balanced slide valves.

The valves admit steam as follows: H. P. inside steam, M. P. and L. P. outside steam.

Bedplate is continuous under the entire engine and supports the cylinders through columns. The main bearings for supporting the crankshaft are set in recesses in cross girders. The bedplate is bolted directly through chocks to the tank top.

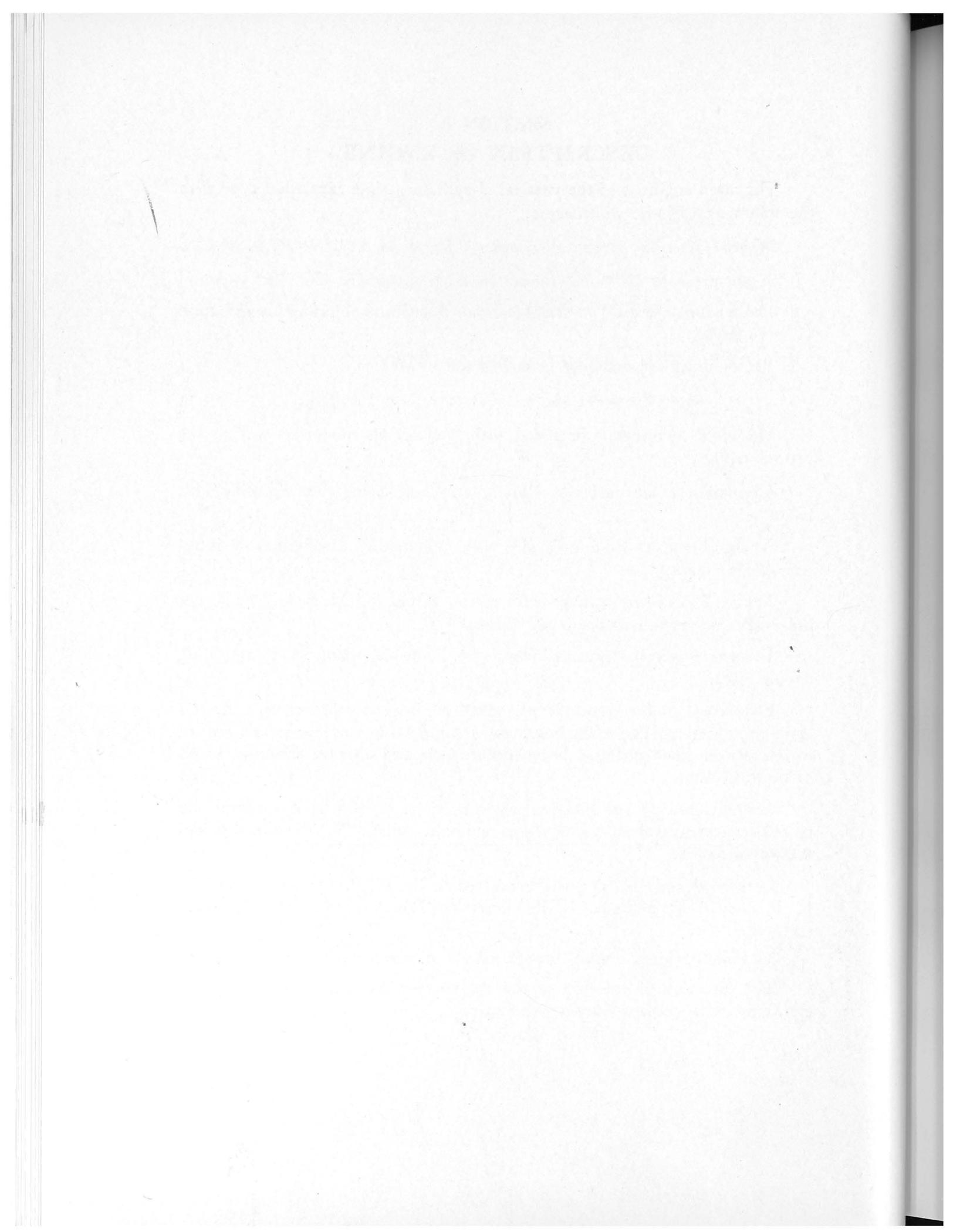
Columns are of the box-type construction; to the back columns are bolted separate crosshead guide plates and back guides. The crosshead guides are water cooled.

Lockwood and Carlisle rings are fitted to the H. P. piston valve and the H. P. and M. P. pistons. L. P. piston has Ramsbottom ring with coach springs.

Metallic packing is used throughout for all piston rods and valve stems.

The direction of rotation of the engine seen from the coupling end is clockwise, with crank sequence as follows:

H. P.—L. P.—M. P.



## SECTION I

The crankshaft is of the built-up type made in two sections with H. P. and M. P. forming forward section, and L. P. the aft section. The valve gear is of the Stephenson link type. The eccentric rods are crossed and attached to the eccentric straps at the bottom and to the link bars on top.

The reverse shaft is located on the back of the engine and secured to the M. P. and L. P. cylinders and H. P. back column.

The reverse levers are slotted for linking up screws for changing the points of cut-off of individual cylinders.

The reversing engine is of the all-around type bolted to the H. P. front column.

The turning engine is attached to the bedplate and used for turning the main engine over when required for repairs or setting valves.

The air pump is of the Edwards type, single-acting, and driven from the L. P. main crosshead through beams connected to the pump crosshead, and is attached to the bedplate and aft L. P. column.

Two bilge pumps, one bolted to each side of the air pump, are driven from the air pump beam. The suction and discharge valves are located in manifold valves with safety valves, and connections provided for attaching to the vessel piping.

The evaporator feed pump is attached to the L. P. back column, and driven from the beam through linkage.

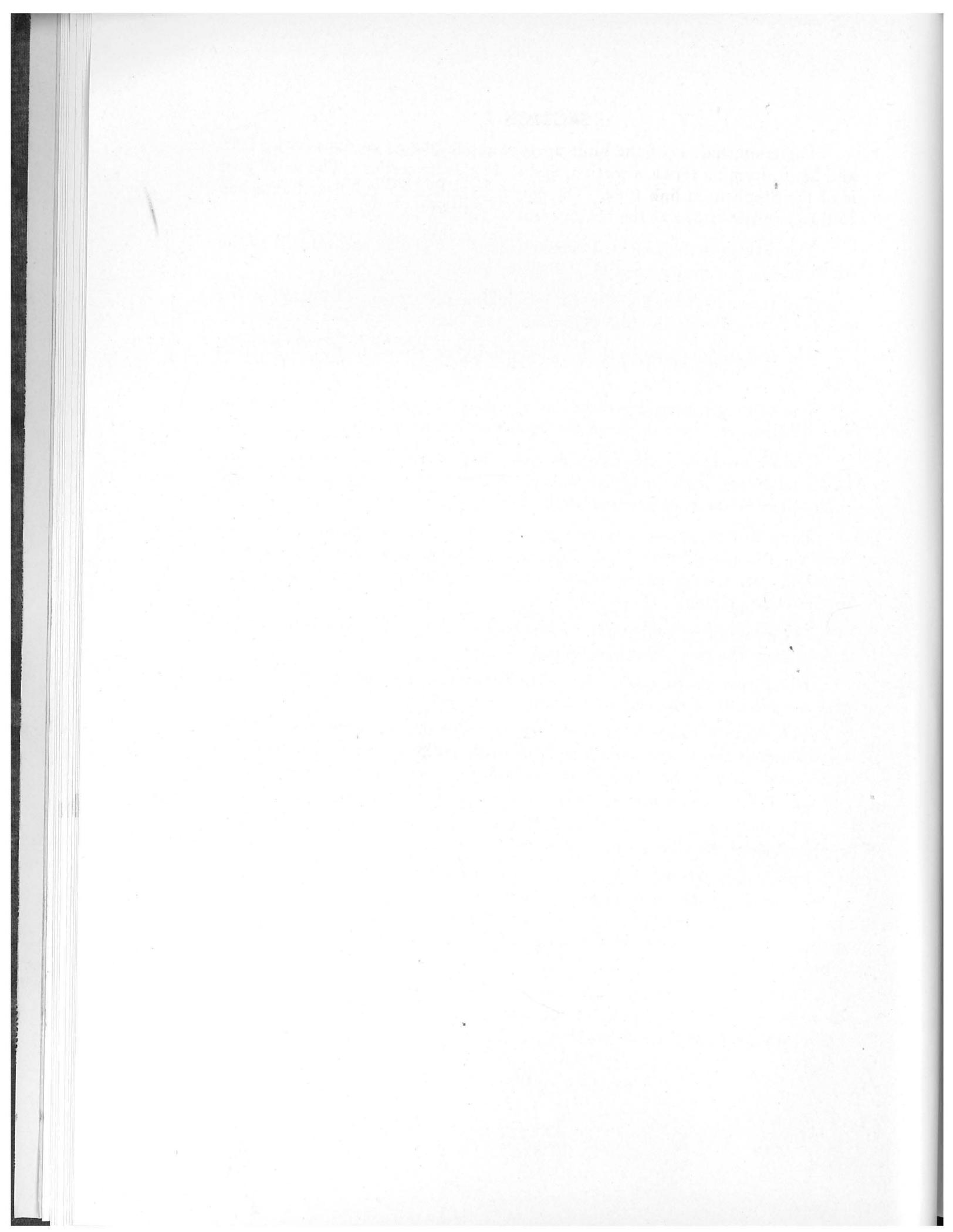
The thrust bearing is of the Kingsbury type, and bolted to the tank top independent of the engine bedplate.

The throttle valve is of the single-seated balanced type, operated by handwheel at the starting platform, and with extension above for operation from deck. A special butterfly valve is built into the throttle valve for quick opening and closing, and operated from the starting platform.

The by-pass valve and drain valves are attached to the cylinders, and operated from the starting platform.

Lubrication for running parts is from oil boxes located at the upper end of the cylinder, with pipes leading to boxes on running parts. Separate boxes are located on the eccentric rods for oiling the eccentric straps. Special lubricating boxes are located on the main and air pump beam bearings for the lubrication of same.

Forced feed lubricator is located on H. P. back column, and operated from the crosshead for positive lubrication to throttle valve, M. P. slide valve, and H. P. piston rod packing.



## SECTION I

Sea water cooling is provided for main bearings and eccentrics.

The gauge board is located at the starting platform, and contains the necessary gauges for observing operating conditions of the engine.

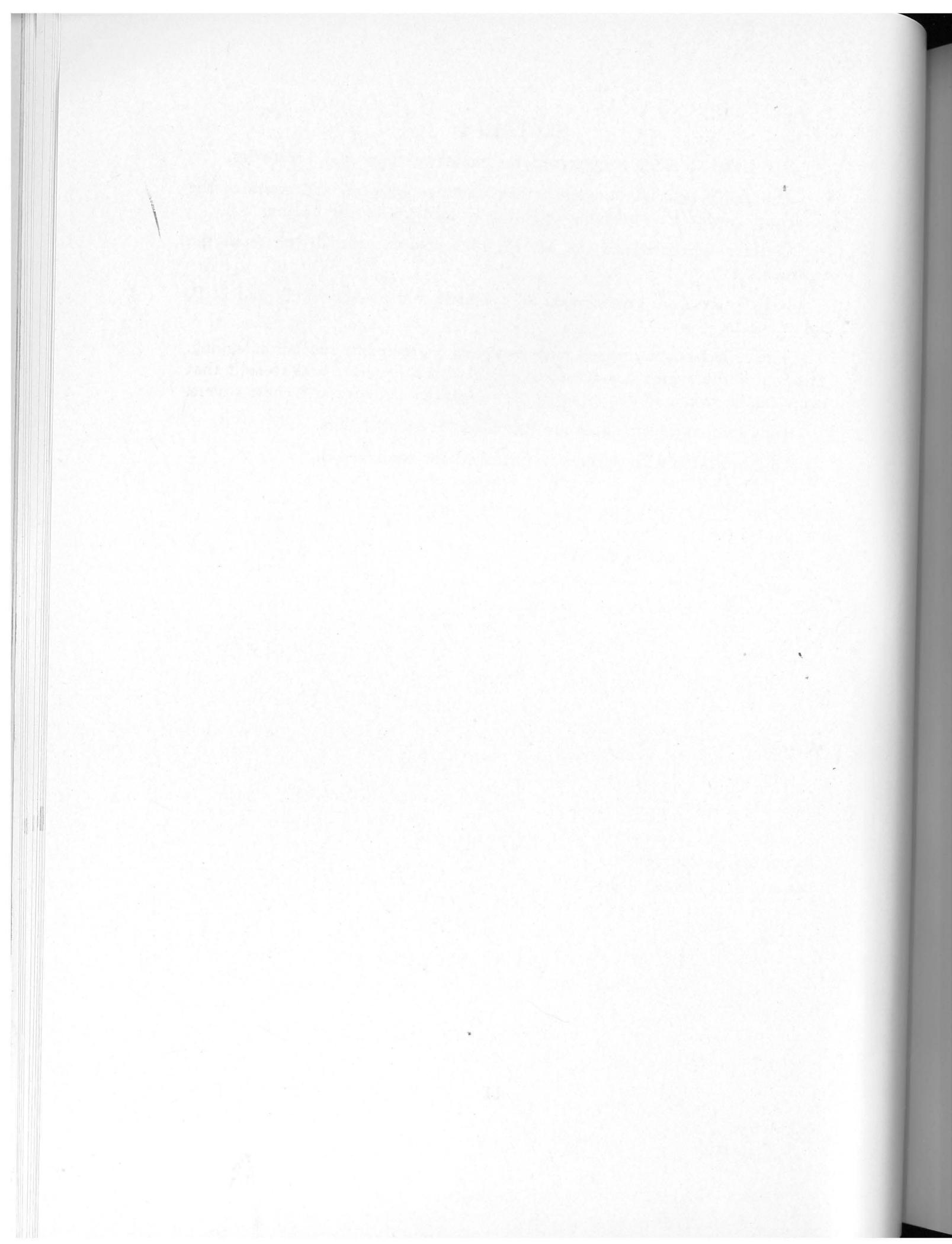
Counter is located on the M. P. front column, and driven from the crosshead.

Relief valves are provided on all cylinders and for the M. P. and L. P. valve chests.

The cylinders are covered with magnesia protected by sheet-iron lagging. The top of the engine has a mat covering with sheet iron, and so split that parts can be taken off for removal of the various cylinder and chest covers.

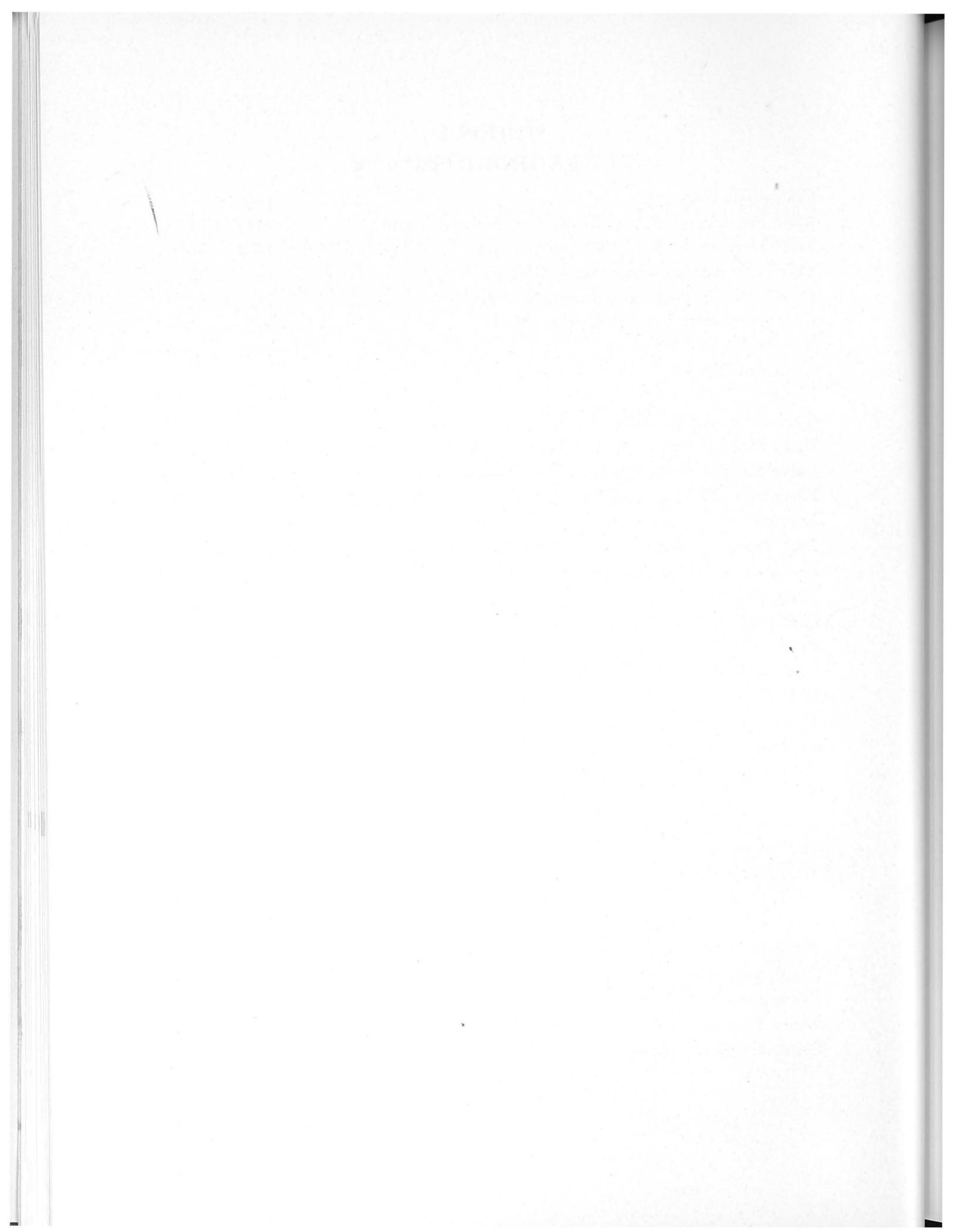
Indicator cocks and gear are provided for all cylinders.

One indicator with springs is furnished for each vessel.



## SECTION I ENGINE DATA

Crankshaft diameter.....	$14\frac{1}{4}''$
Main Bearings H. P. and M. P. diameter and length.....	$14\frac{1}{4}'' \times 15''$
Main Bearings L. P. diameter and length.....	$14\frac{1}{4}'' \times 16''$
Crank Pin Bearings diameter and length.....	$14\frac{1}{4}'' \times 15''$
Crosshead Pin Bearings diameter and length.....	$7\frac{3}{4}'' \times 7\frac{3}{4}''$
Connecting Rod, length between centers.....	96"
Connecting Rod diameter.....	7"
Crosshead Slipper, length and width.....	16" x 26"
Piston Rod diameter.....	7"
Cylinders—Top and Bottom, lineal clearance.....	$\frac{3}{8}'' - \frac{1}{2}''$
H. P. Piston Valve—Top and Bottom, diameter .....	$13\frac{1}{4}'' - 13''$
Valve Stem at packing, diameter.....	4"
Eccentrics, diameter and width.....	26" x $4\frac{3}{4}''$
Eccentric Rods, diameter.....	$3\frac{1}{4}''$
Link Block Pin diameter and length.....	$4\frac{3}{4}'' \times 3\frac{3}{4}''$
Eccentric Rod Pin diameter and length.....	$3\frac{1}{2}'' \times 3''$
Drag Link Pin diameter and length.....	$3\frac{1}{2}'' \times 3''$
Link Bar width and height.....	$1\frac{3}{4}'' \times 5\frac{1}{4}''$
Reverse Shaft diameter.....	$6\frac{1}{2}''$
H. P. and M. P. Eccentric travel.....	6"
L. P. Eccentric travel.....	7"
Thrust Shaft diameter.....	$14\frac{1}{4}''$
Collar of Thrust Shaft, diameter and thickness.....	$33'' - 5''$
Coupling Bolts, diameter and number.....	$3\frac{3}{8}'' - 6$
Reverse Engine diameter and stroke.....	6" x 7"
Turning Engine diameter and stroke.....	$8\frac{1}{2}'' \times 7''$
Air Pump diameter and stroke.....	24" x 26"
Bilge Pump diameter and stroke.....	$4\frac{1}{2}'' \times 26''$
Air Pump Crosshead Slipper, length and width.....	10" x $6\frac{1}{4}''$
Air Pump Lever Bearing diameter and length.....	5" x 8"
Pump Link Bearing—Air Pump End, diameter and length.....	$4\frac{1}{2}'' \times 4''$
Pump Link Bearing—Crosshead End, diameter and length.....	4" x 4"
Evaporator Feed Pump diameter and stroke.....	2" x 9"
Steam Pipe diameter.....	8"
Exhaust Pipe diameter.....	25"

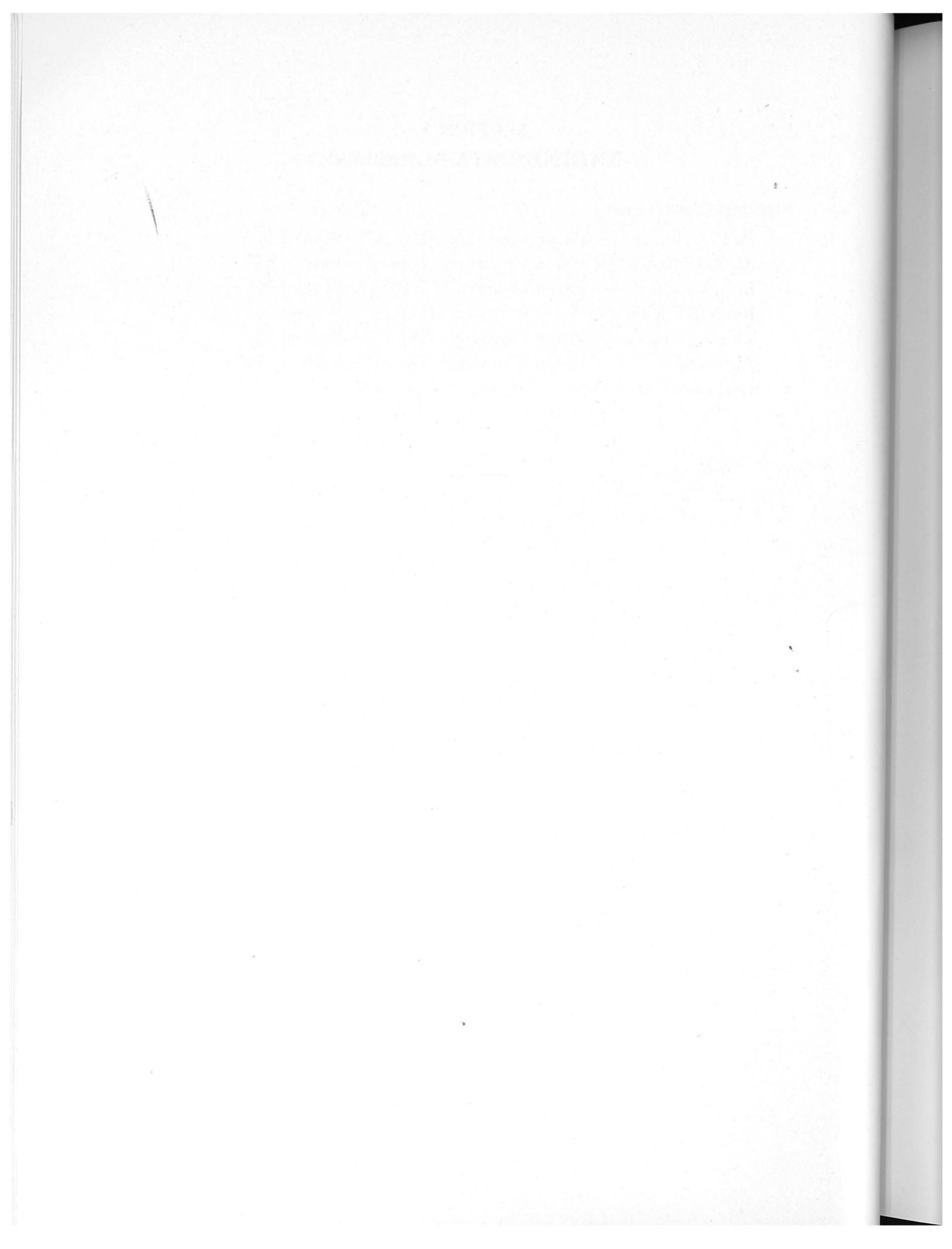


## SECTION I

### ENGINE DATA—Continued

#### **Striking Clearances:**

H. P. Cylinder — Piston Clearance—Top  $\frac{3}{8}$ "—Bottom  $\frac{1}{2}$ "  
M. P. Cylinder — Piston Clearance—Top  $\frac{3}{8}$ "—Bottom  $\frac{1}{2}$ "  
L. P. Cylinder — Piston Clearance—Top  $\frac{3}{8}$ "—Bottom  $\frac{1}{2}$ "  
Reverse Engine — Piston Clearance—Top  $\frac{1}{4}$ "—Bottom  $\frac{1}{2}$ "  
Turning Engine — Piston Clearance—Top  $\frac{3}{8}$ "—Bottom  $\frac{3}{8}$ "  
Air Pump — Piston Clearance—Top  $\frac{3}{8}$ "—Bottom  $1\frac{1}{8}$ "  
Evaporator Feed Pump—Piston Clearance—Bottom  $\frac{1}{2}$ "



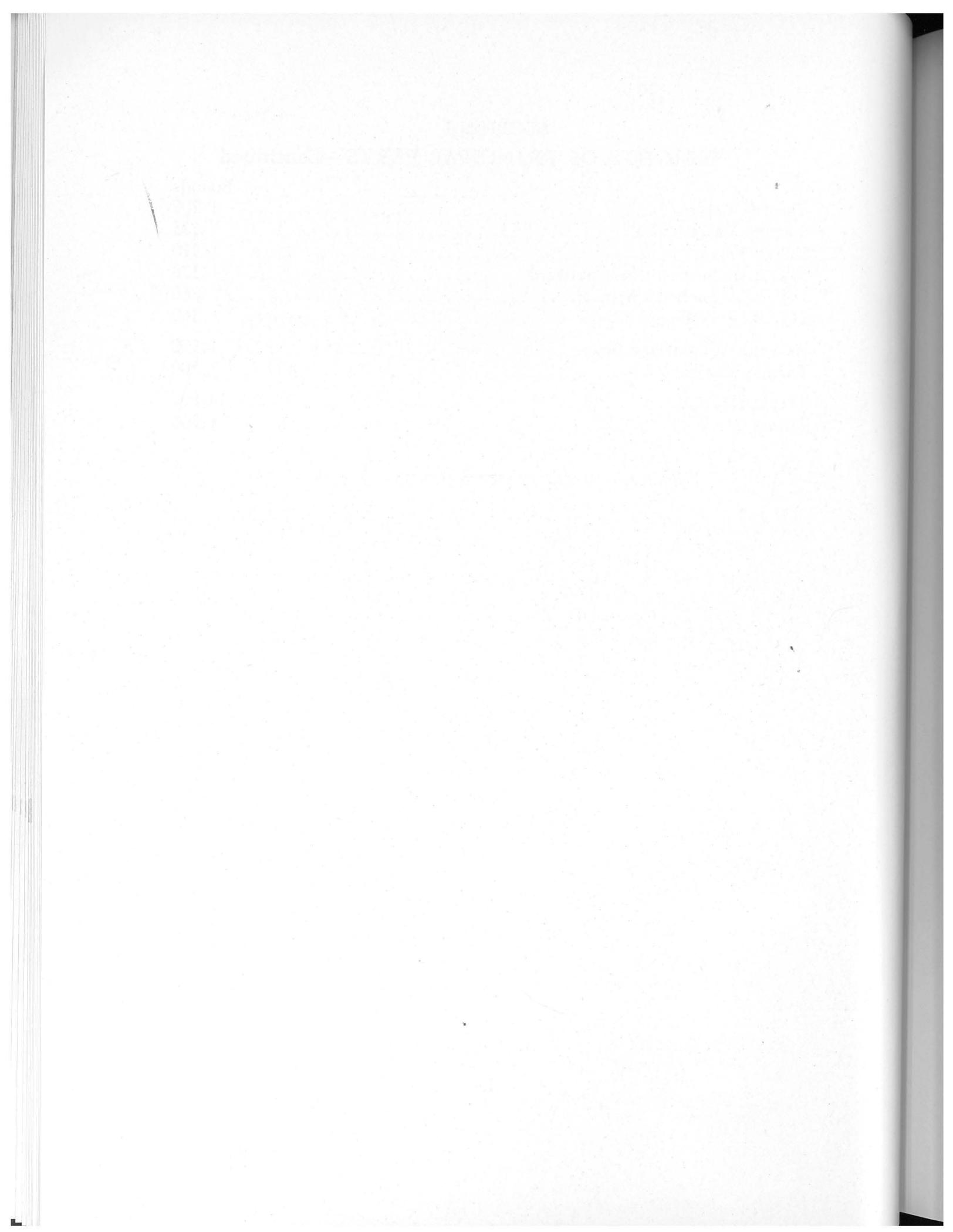
**SECTION I**  
**WEIGHTS OF PRINCIPAL PARTS**

	Pounds
Engine Complete, approximate.....	271,000
H. P. Cylinder with Liners.....	16,800
M. P. Cylinder with False Face.....	15,000
L. P. Cylinder with False Face.....	18,500
H. P. Cylinder Head.....	900
M. P. Cylinder Head.....	1,300
L. P. Cylinder Head.....	4,000
H. P. Piston Valve.....	360
M. P. Slide Valve.....	400
L. P. Slide Valve.....	1,100
Valve Stem Complete.....	425
M. P. Valve Bridle.....	1,450
L. P. Valve Bridle.....	3,500
Bedplate, Total.....	36,500
Main Bearing Box, each.....	650
Main Bearing Cap, each.....	300
H. P. Front Column, each.....	6,400
M. P. and L. P. Front Column, each.....	4,700
H. P. and M. P. Back Column with Guide and Gib, each.....	9,000
L. P. Back Column with Guide and Gib, each.....	10,000
Crankshaft Complete with Eccentrics and Straps.....	40,000
H. P. Piston and Rod.....	2,000
M. P. Piston and Rod.....	2,850
L. P. Piston and Rod.....	4,900
Crosshead and Slipper Assembly, each.....	950
Connecting Rod Assembly, each.....	3,000
Eccentric Rods, Link Bars and Link Blocks, per Cylinder .....	1,000
Reverse Shaft and Levers.....	2,500
Drag Rod for Reverse Engine.....	420
Air and Bilge Pump complete.....	6,400
Air Pump Beam Plate and Links.....	2,400



**SECTION I**  
**WEIGHTS OF PRINCIPAL PARTS—Continued**

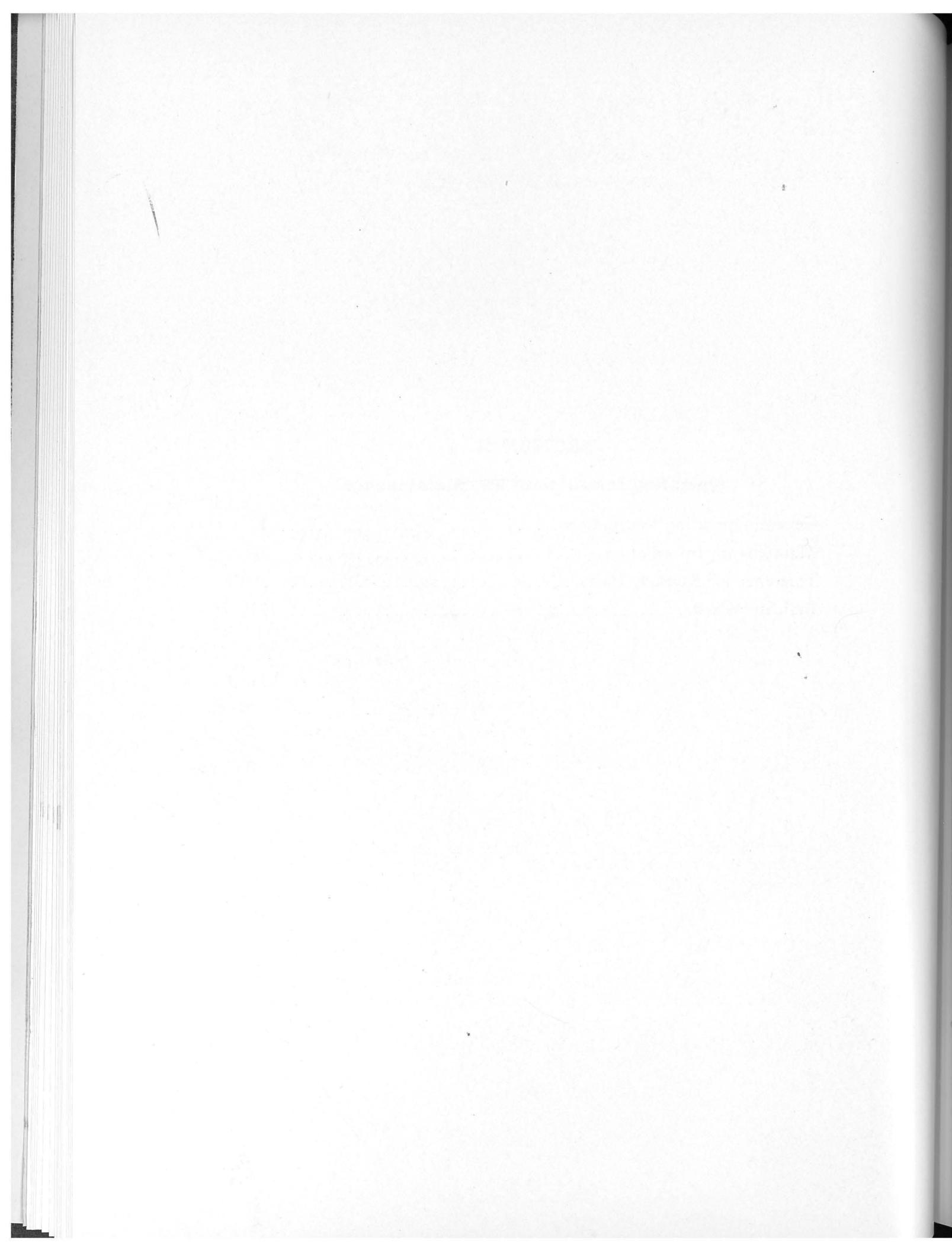
	Pounds
Throttle Valve.....	1,200
Starting Valve.....	125
Switch Valve.....	110
3½" Bilge Suction Chest, forward.....	170
3½" Bilge Suction Chest, aft.....	260
3½" Bilge Discharge Chest.....	160
Reversing Engine and Gear.....	1,900
Turning Engine.....	1,700
Thrust Shaft.....	8,000
Thrust Block.....	8,700



## **SECTION II**

### **Operating Instructions and Maintenance**

General Operating Instructions.....	17
Maintenance Information.....	18
Tolerance for Running Parts.....	20
Indicator Card.....	21



## SECTION II

### OPERATING INSTRUCTIONS AND MAINTENANCE

#### 1. Operation Instructions:

Main Steam Pressure.....	220 # Gauge
Pressure in M. P. Cylinder, about.....	75 #
Pressure in L. P. Cylinder, about.....	12 #
Vacuum.....	26"

Relief valves on the various cylinders are set as follows:

H. P. Cylinder.....	230 #
M. P. Cylinder.....	85 #
L. P. Cylinder.....	20 #

Valve chest relief valves are set at:

M. P. Steam Chest.....	85 #
L. P. Steam Chest.....	20 #

*It is of the utmost importance before putting steam on the engine, to check and be sure that the vertical worm on the turning engine shaft has been removed, to check that all discharges from attached pumps are open, to see that the circulating water overboard discharge and main injection valves are open and that the circulating pump is running.*

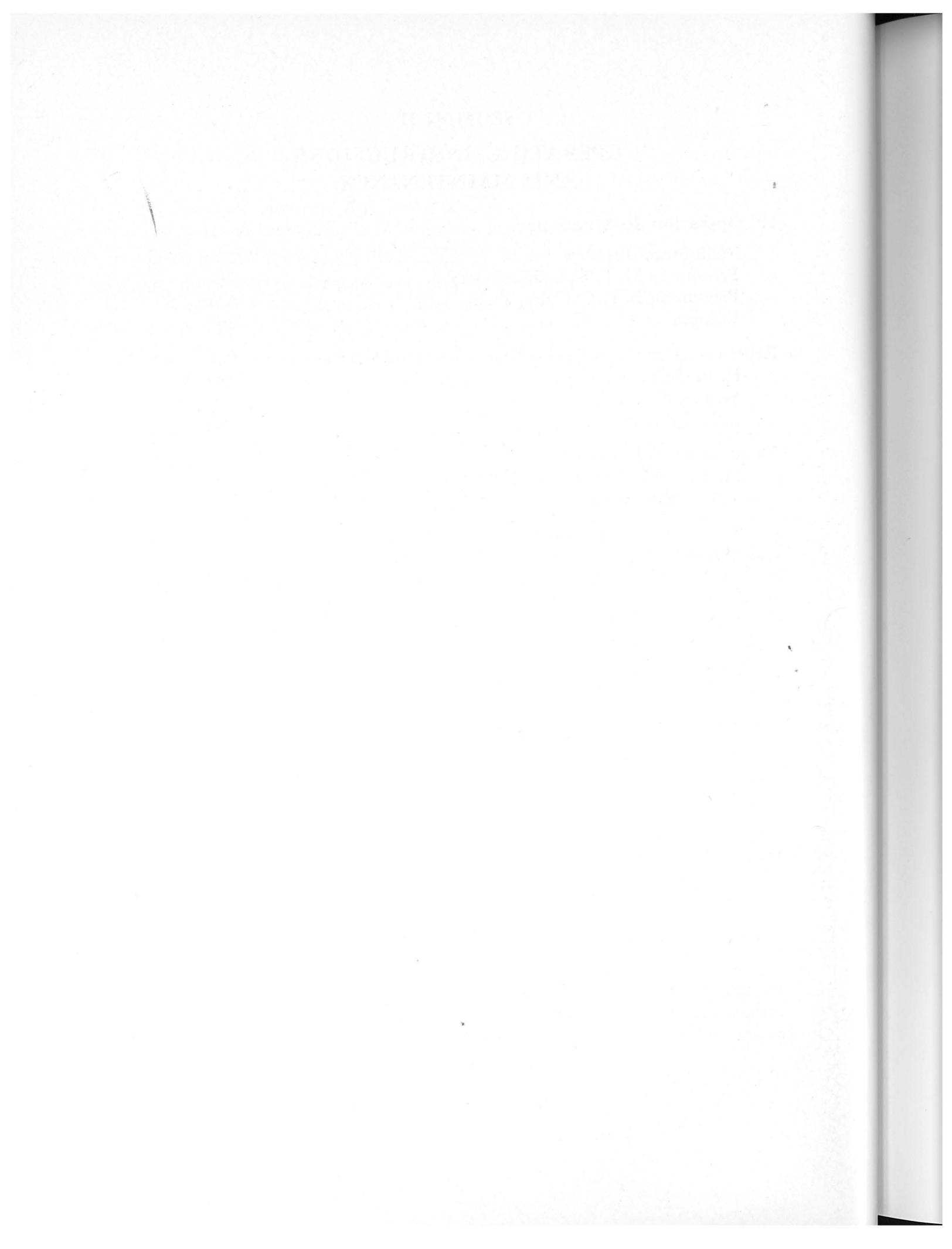
As a direct suction line from the main condenser is fitted to each feed pump, one of the feed pumps should be used to pump the condensate from the condenser into the feed and filter tank so as to prevent unnecessary waste of feed water when warming up and maneuvering.

Before starting, the lubricating oil feeder syphon wicks in all oil boxes should be inserted, and the supply of the oil to the bearings checked.

The mechanical lubricator should be cranked by hand a few turns before starting in order to be sure that the feed lines are filled. The tallow cocks for the L. P. cylinder valve should be filled and regulated for proper feed.

All drains from the main steam line, main engine valve chest and cylinders, and the reversing engine should be opened in order to clear these parts of dangerous accumulations of condensate.

When warming up the engine, the main throttle valve, MP and LP starting valves should be opened slowly and regulated as required to prevent lifting of the relief valves; and when the engine is warm, the reversing engine should be kept running slowly, thus reversing the valves and allowing the steam



## SECTION II

to flow through the cylinders. The warming up period should be sufficient to obtain normal running temperatures in the cylinders.

All moving parts are lubricated by gravity. It is, therefore, necessary for the operator to watch frequently to be sure that all parts receive the proper lubrication, and swab the rods occasionally while the engine is in operation.

Water service is provided on the engine so that in case of the heating up of any of the moving parts around the crankshaft, water stream can be used for cooling off.

When stopping the engine for any length of time, and particularly before putting in the worm of the turning engine, the stop valve in the main steam line must be closed and drain valves opened up.

The thrust bearing is of the Kingsbury type, and it is important to maintain the oil at the proper level. Plates indicating high and low oil levels are attached to the bearing housing. Fill up housing to high mark when not running; a slight draw down will occur when running. Occasionally it is necessary to make up the leakage and evaporation. The air vent holes should be kept open.

A cooling coil is installed in the thrust block, and under normal conditions no cooling is required, and the water should be shut off from the coil. If the bearing shows excessive heat, the temperature can be lowered by circulating water.

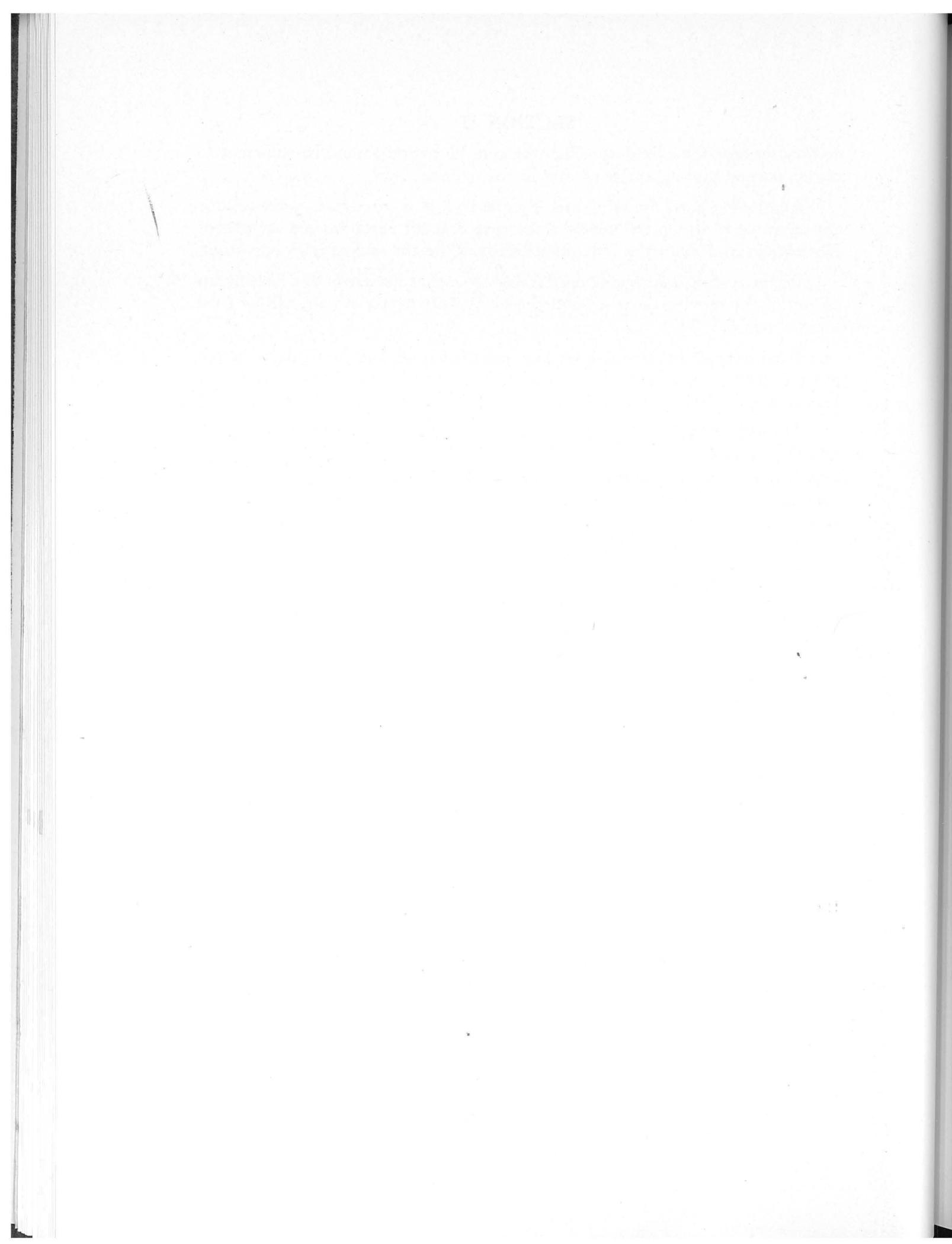
### 2. Maintenance:

The valve diagram and valve assembly drawings give the information as to the setting of the valves, and also show the change in the cut-off by linking up the valve gear. The original setting should not be disturbed unless after checking the valve gear it is found that the leads and laps are of considerable variance with the drawings.

A complete set of tools and wrenches is provided and listed on a separate page, identifying the parts for which they are used.

A bridge gauge which straddles the jaws of the bedplate is furnished for the main bearings. The wear can be measured with feelers between the top of the crankshaft and the bridge gauge. The original clearance should be stamped on this plate for all bearings which will give the amount of wear. For taking up the wear, laminated shims are inserted between the main bearings boxes.

For other bearings, it is not necessary to have a record, but laminated shims are provided in all important split bearings so that wear can be taken up by removing the laminated shims.



## SECTION II

The metallic packing for the piston rods and valve stems should not need any special attention, and full information as to the care of the metallic packing is given in the description of the packing.

Lockwood & Carlisle rings which are used in the H. P. and M. P. piston, and H. P. piston valve, should not be disturbed except for thorough cleaning at intervals. The frequency of cleaning depends on the type of engine oil, which might be subject to carbonization, and the cleanliness of the steam. When it is found that the rings are passing steam, and the process of cleaning does not correct the condition, it is advisable to increase the lateral compression of the spring. This is accomplished by inserting a shim between the coil spring and the link spring. To do this, withdraw the tie strip, disengage these springs at one end only, then the tie strip should be fixed back to its original position and wired in place. For the H. P. cylinder rings, restriction lugs should be relieved by filing for sufficient wearing clearance.

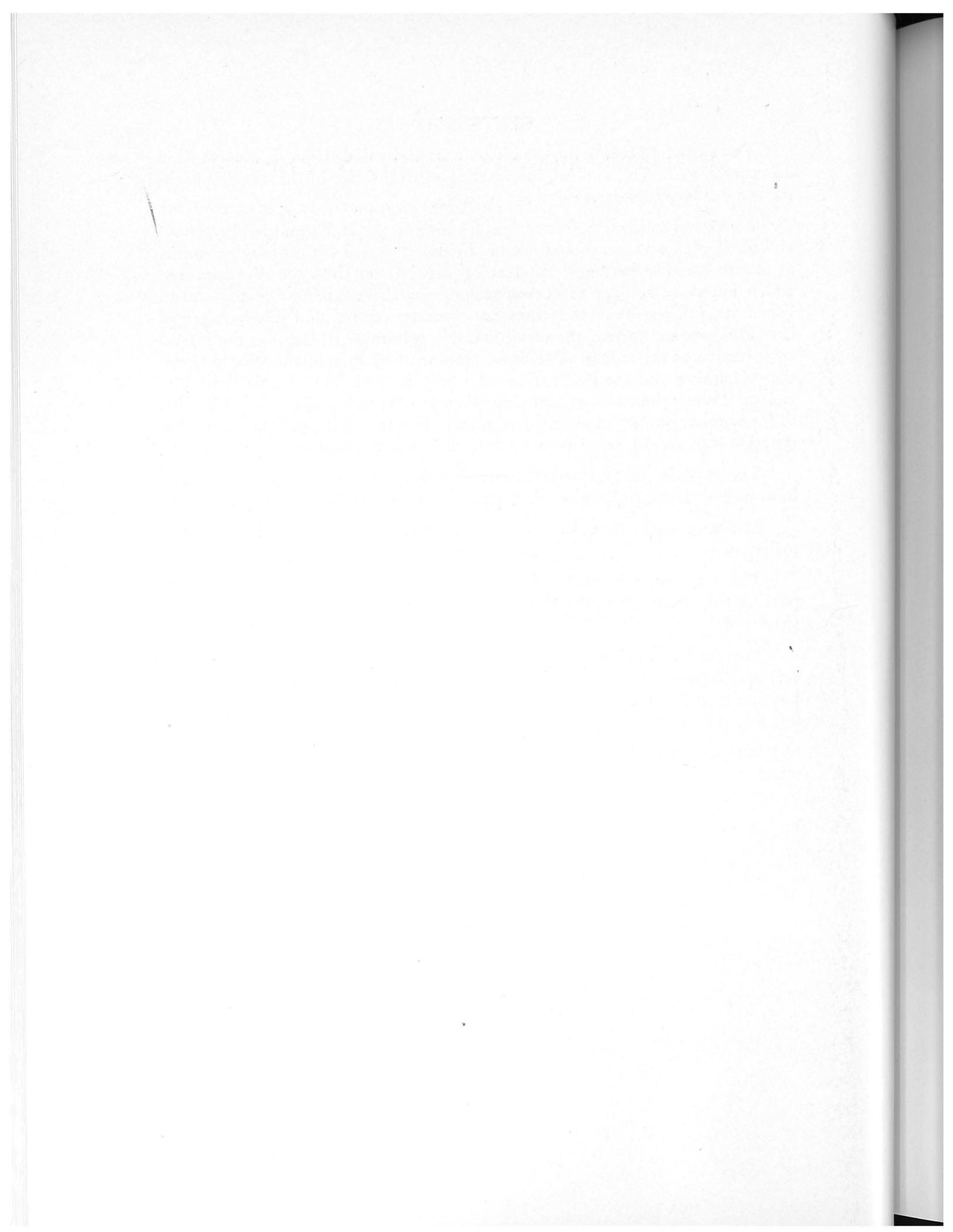
The cylinder lubricator is described fully in Section III, and sufficient information in detail is given for replacement and maintenance of any part.

Indicator cards should be taken to see that the load is balanced in the cylinders.

The top lead for the M. P. and L. P. Cylinders can be checked by putting the crank on upper dead center and measuring the opening of the valve port.

For the H. P. cylinder having inside steam, it is necessary first to measure the distance from top of the cylinder to bottom side of upper port; then put the crank on top center and measure from top of the cylinder to packing ring on valve.

Subtract the dimension from the top of the cylinder to top of ring, plus width of ring from dimension of cylinder top to bottom side of upper port, to ascertain the top lead.



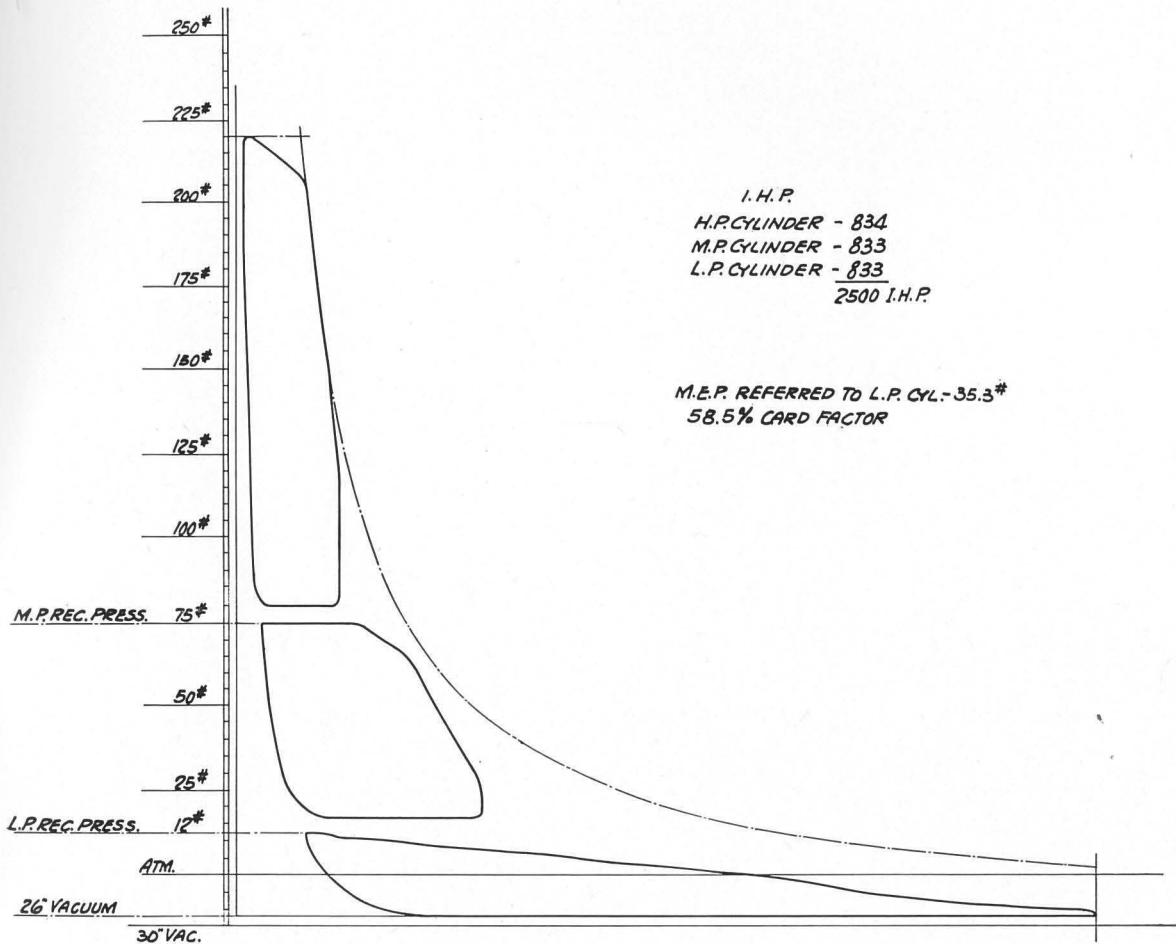
## SECTION II

### INITIAL CLEARANCES FOR RUNNING PARTS

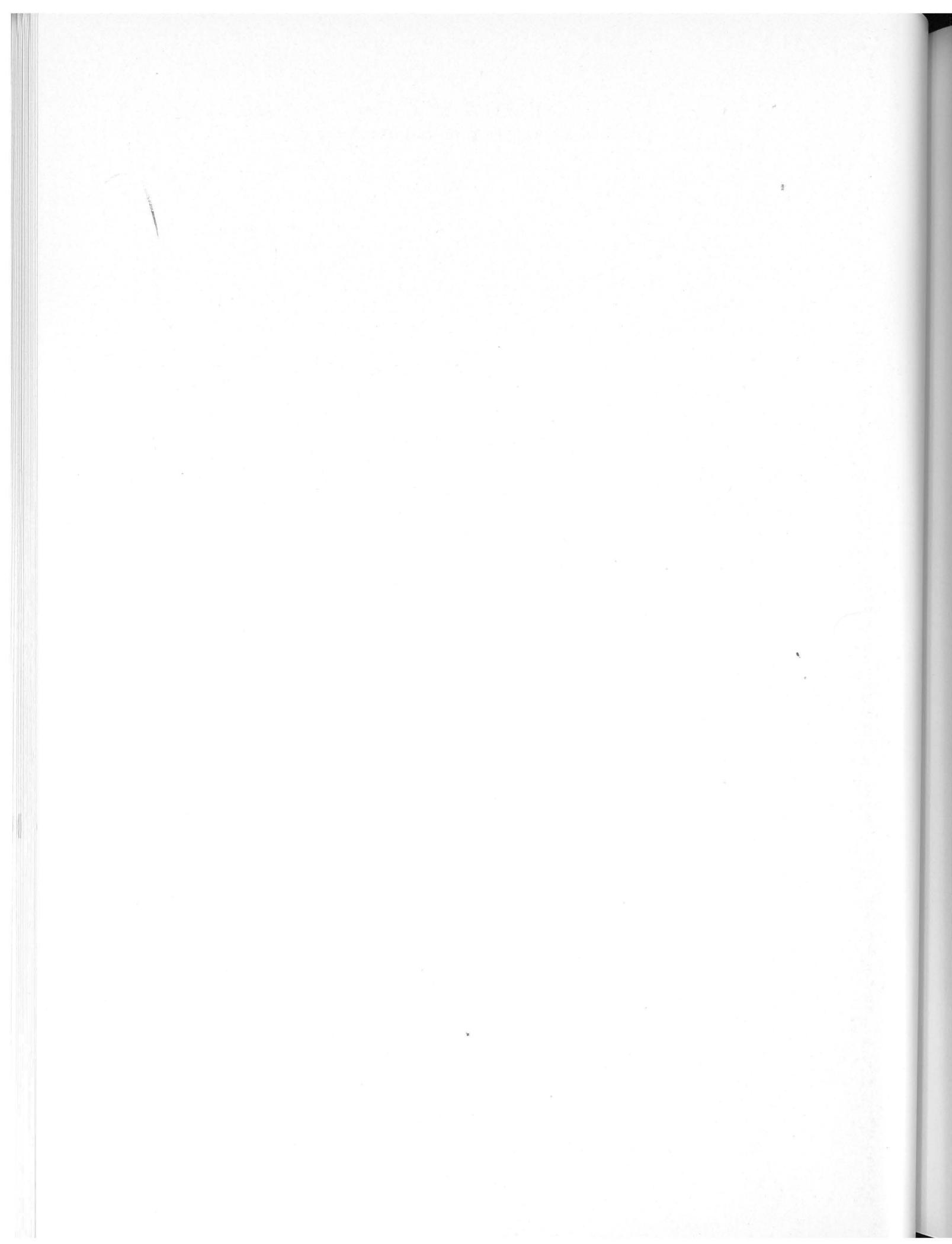
The dimensions are given in inches, and clearances are on the diameter unless otherwise specified.

		Min.	Max.
1.	Main bearing and shaft.....	.010	.014
2.	Connecting rod box and crank pin.....	.010	.014
3.	Connecting rod box and crosshead pin.....	.004	.008
4.	Connecting rod box, crosshead end, between box and crosshead.....	.008	.014
5.	Crosshead slipper and astern guides.....	.006	.010
6.	Crosshead slipper and astern guides, sideways.....	.017	.023
7.	Eccentric and strap.....	.012	.018
8.	Eccentric and strap, sideways.....	.016	.024
9.	Eccentric rod box and pin.....	.003	.006
10.	Eccentric rod box, between box and link bars.....	.011	.021
11.	Valve stem brasses and link block.....	.003	.006
12.	Valve stem brasses, between link block sides.....	.006	.010
13.	Valve stem and guide bearing.....	.004	.007
14.	Valve stem and guide dome bush.....	.003	.007
15.	Link block, between link bars.....	.014	.017
16.	Link bar and upper and lower gib.....	.002	.004
17.	Drag link bearing and pin.....	.003	.006
18.	Reverse shaft and bearing.....	.008	.012
19.	Air pump carriage gudgeon and lever bearing.....	.006	.010
20.	Air pump link bearing boxes and pins.....	.003	.006
21.	Air pump crosshead and bearing boxes.....	.004	.007
22.	Air pump head valve and pump rod.....	.005	.007
23.	Air pump gland bushing and pump rod.....	.036	.038
24.	Air pump bucket and liner.....	.014	.018
25.	Bilge pump bushes and pump ram.....	.030	.035
26.	H. P. piston head in cylinder liner.....	.076	.084
27.	M. P. piston head in cylinder.....	.056	.064
28.	M. P. slide valve and bridle, sideways.....	.008	.016
29.	M. P. slide valve and bridle, between valve and bridle..	.003	.006
30.	L. P. piston head in cylinder.....	.058	.068
31.	L. P. piston packing ring, between piston head and follower.....	.005	.008
32.	L. P. slide valve and bridle, sideways.....	.008	.016
33.	L. P. slide valve and bridle, between valve and bridle...	.005	.008



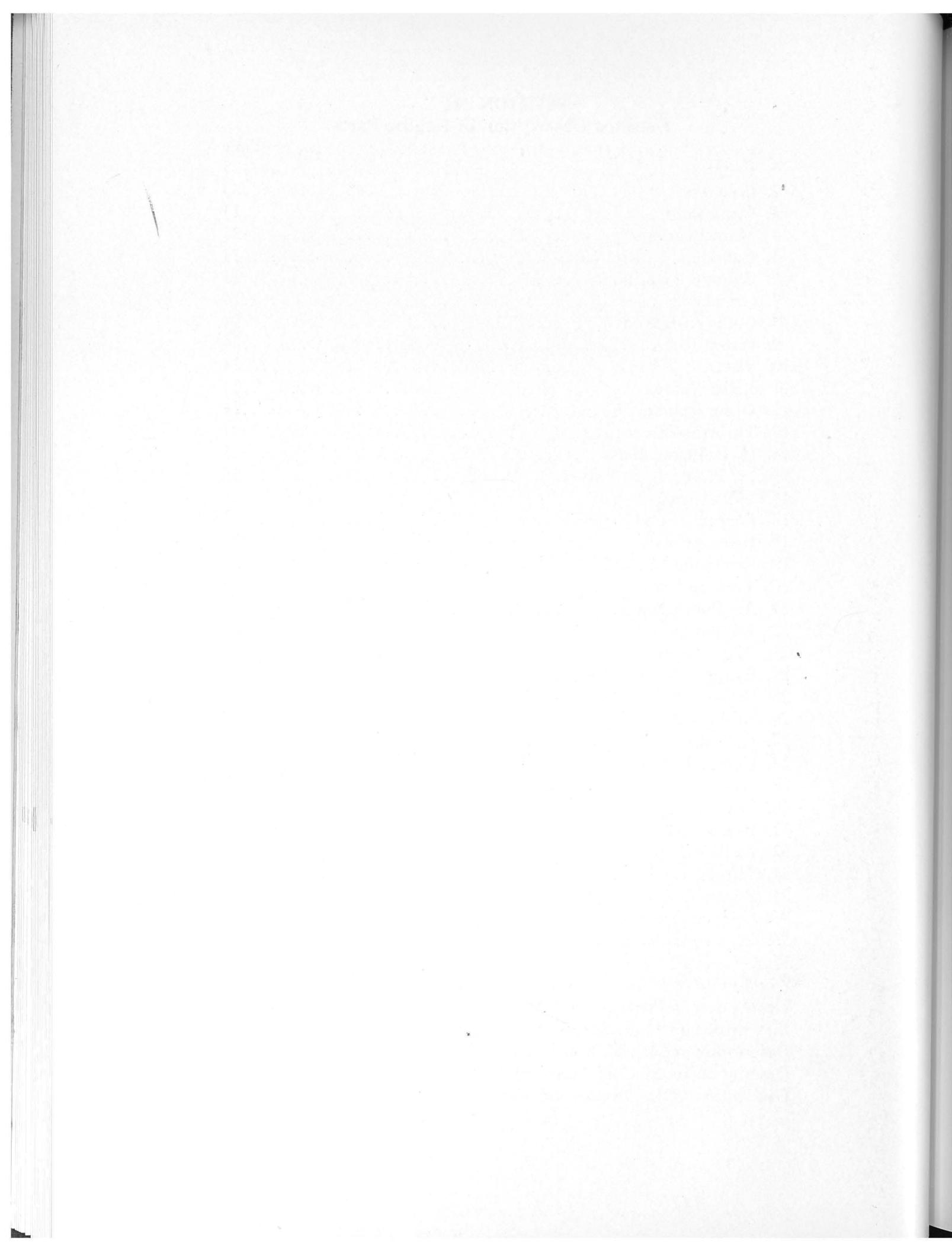


COMBINED INDICATOR CARD  
 24 $\frac{1}{2}$ -37-70" x 48" M. S. ENGINE.  
 2500 I.H.P. 76 R.P.M.



**SECTION III**  
**Detailed Description of Engine Parts**

	Page
1. Bedplate.....	23
2. Columns.....	23
3. Crankshaft.....	23
4. Main Bearings.....	23
5. Cylinders.....	23
6. Cylinder Heads.....	23
7. Crossheads.....	24
8. Connecting Rods.....	24
9. Piston Rods.....	24
10. Pistons.....	24
11. Relief Valves.....	24
12. Drain Valves.....	24
13. Throttle Valve.....	24
14. H. P. Piston Valve.....	25
15. M. P. and L. P. Valves.....	25
16. Valve Gear.....	25
17. Eccentrics and Straps.....	25
18. Reverse Shaft.....	25
19. Reversing Engine.....	25
20. Turning Engine.....	25
21. Air Pump Beam.....	26
22. Air Pump.....	26
23. Bilge Pumps.....	26
24. Evaporator Feed Pump.....	26
25. Water Cooling Service.....	27
26. By-Pass Steam Piping.....	27
27. Indicator and Counter Gear.....	27
28. Engine Indicator.....	27
29. Lubrication.....	27
30. Lubricating Oil.....	28
31. Bearing Metal.....	28
32. Fouling Marks.....	28
33. Thrust Bearing.....	28
34. Piston Rod and Valve Stem Packing.....	28
35. Cylinder Lubricator.....	29
36. Lockwood and Carlisle Rings.....	29
37. Gauges.....	29
Description of C. Lee Cook Packing.....	30
Description of Paxton-Mitchell Packing.....	35
Description of U. S. Metallic Packing.....	36-A
Description of Manzel Lubricator.....	37
Description of McCord Lubricator.....	39
Description of Lockwood and Carlisle Rings.....	41



## SECTION III

### DETAILED DESCRIPTION OF ENGINE PARTS

#### **1. Bedplate**

The bedplate is made of cast iron in three sections and is held together securely by fitted bolts. Cross girders provide flat bottom recesses for the main bearings. The bottom of the bedplate is flat, but slightly tapered, and is bolted to the tank top with a number of holding-down bolts.

#### **2. Columns**

The columns are of box-section type. There are three front columns and three back columns. The lower ends of the columns are bolted to the bedplate, and the upper ends bolted to the cylinder feet. All joints are securely held with a number of fitted bolts. To the back columns are bolted cast-iron crosshead guides provided with water cooling. The astern guides are of cast iron and bolted to the ahead guide.

#### **3. Crankshaft**

The crankshaft is of forged steel, solid forged or of the built-up type. The crankpins and shafts are shrunk into either forged or cast-steel crankwebs. The shaft is made in two sections, the forward section making the H. P. and M. P. cylinder, the aft section the L. P. cylinder. All eccentrics are bolted to the forward shaft section, and L. P. section carries the turning gear worm wheel. Coupling flanges are forged integral with the shaft and held by fitted bolts.

#### **4. Main Bearings**

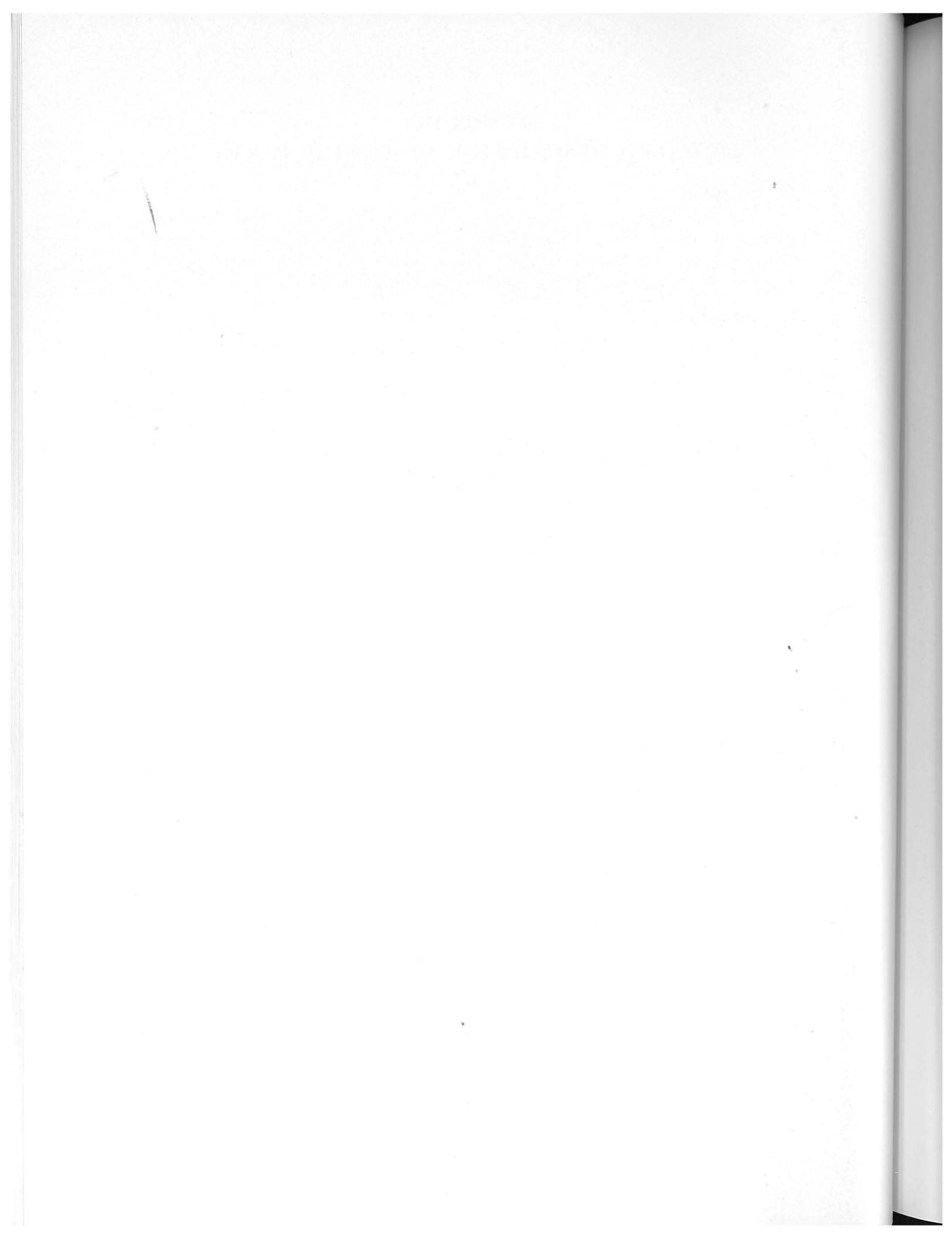
The main bearing construction consists of upper and lower cast-iron babbitted boxes, fitted snugly into a recess on the bedplate, and held in place with a flat steel bearing cap. The main bearing bolt extends through to the bottom of the bedplate. Laminated shims are provided for taking up wear.

#### **5. Cylinders**

The cylinders are made of cast iron and cast individually, the H. P. cylinder being provided with liners both for the main piston and piston valve. The M. P. and L. P. cylinders are provided with false faces for slide valves. The passage of steam from one cylinder to another is through passages cast around the H. P. and M. P. cylinder, and provide ample receiver capacity. The cylinders are bolted together with a number of fitted bolts.

#### **6. Cylinder Heads**

The cylinder heads are made of cast iron, heavily ribbed and flanged. The top is covered with steel plate, and the heads are insulated with 85% ground magnesia. Starting bolts are provided for removal of cylinder heads.



## SECTION III

### 7. Crosshead

The crossheads are made of forged steel and the construction is of the single slipper type. The crosshead slipper is made of cast iron and bolted to the crosshead. The go-ahead side is babbitted. A comb is attached to the crosshead slipper, dipping into the trough at the bottom of the crosshead guide and providing lubrication for the ahead guide, in addition to the two feeds from oil syphon box on cylinders. The astern guides are provided with cups for hand lubrication.

### 8. Connecting Rod

Connecting rods are made of forged steel of the marine type, with cast-steel babbitted boxes on the crank, and bronze boxes for the crosshead end. Laminated brass shims are provided for taking up wear.

### 9. Piston Rods

The piston rods are of a straight cylindrical construction, with taper provided on each end for securing the piston in the crosshead. Nuts on each end are securely locked.

### 10. Pistons

The pistons are made of cast iron of box-section, and provided with separate follower rings, which are held by a number of studs to the main piston for removal and replacement of piston rings. The pistons have a taper bore for the piston rod. The H. P. and M. P. pistons are provided with Lockwood & Carlisle type of rings, and the L. P. piston has Ramsbottom ring with keeper and coach springs.

### 11. Relief Valves

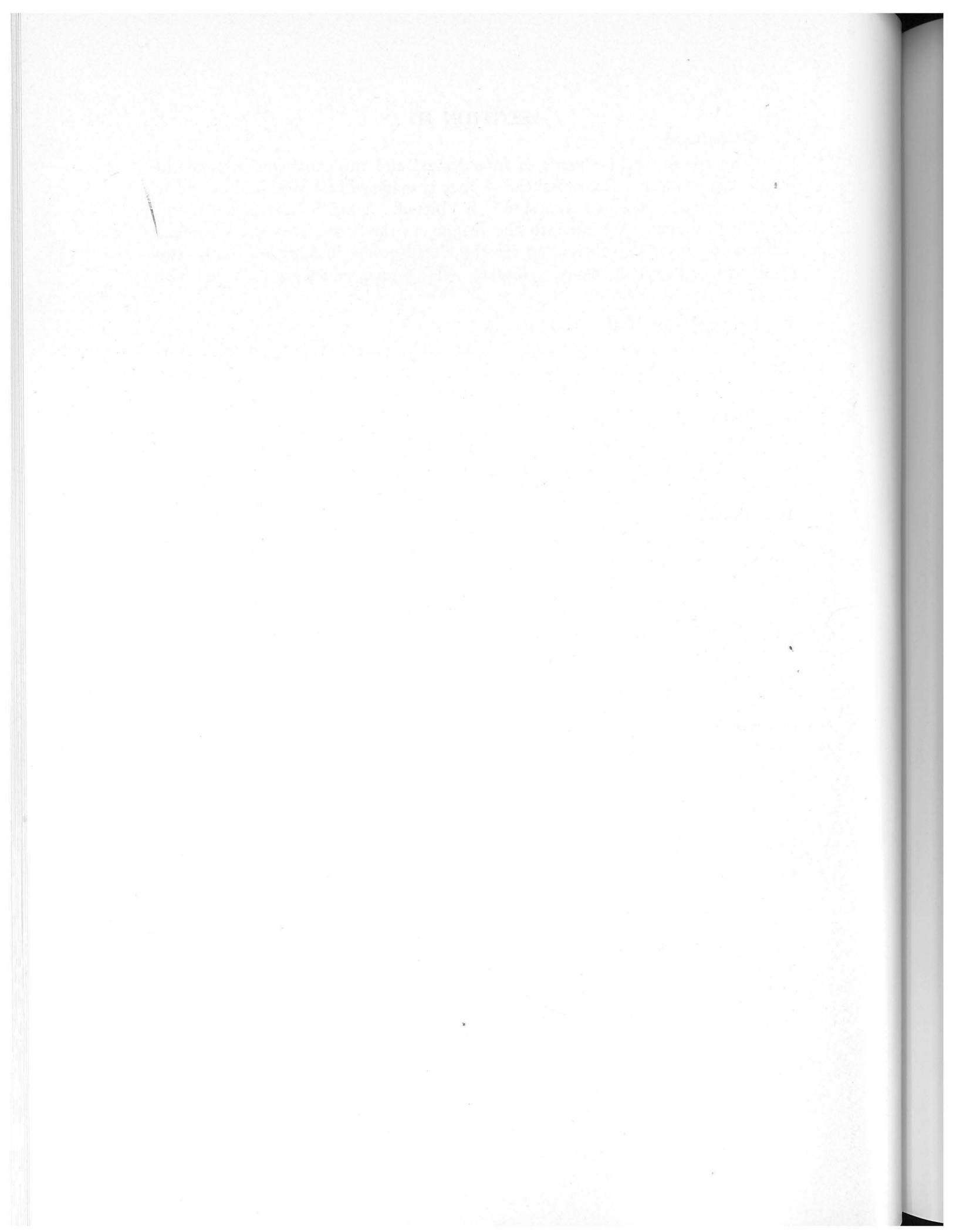
Relief valves are provided on top and bottom of all cylinders, and on top of steam chest covers. The valves are of simple construction and set to relieve when pressure is excessive, (see operating instructions).

### 12. Drain Valves

Drain valves are mounted on the bottom of all cylinders and steam chests. The H. P. valves are made of steel, and the M. P. and L. P. of heavy duty bronze. These valves are operated from the starting platform.

### 13. Throttle Valve

The throttle valve is of the single seat, balanced poppet type. The body is made of steel casting, and the seat and the valve of Monel metal. There is a pilot valve provided to relieve the pressure for the balancing piston for easy operation of the valve. The valve is operated by a handwheel on the platform, and an extension for closing the throttle valve from deck is provided. A butterfly valve for quick throttling is built into the extension neck of the throttle valve to the H. P. cylinder chest.



## SECTION III

### 14. H. P. Piston Valve

The H. P. valve is of the piston type, and provided with Lockwood & Carlisle rings.

### 15. M. P. and L. P. Valves

The M. P. and L. P. valves are of the double ported box type. A bridle held in place by a heavy spring provides the balancing of the valve.

### 16. Valve Gear

The valve gear is of the Stephenson link type with double bar. The valve stem bolted to the valves is attached to the link blocks with brass bushing and shims for adjustment. The valve stems are guided in the guide bracket attached to the cylinder with split brass boxes which allows adjustment for wear. Link blocks are of forged steel and fitted with bronze gibs forming a large bearing on the link bar.

### 17. Eccentrics and Straps

The eccentrics and straps are made of cast iron, the straps being lined with babbitt metal and the eccentrics keyed to the crankshaft. The eccentric rods are made of forged steel, and bolted to the eccentric straps; the upper part has bronze boxes for attaching to the link bar pins. One set of link bar pins is extended to take the drag rod bronze bearings.

### 18. Reverse Shaft

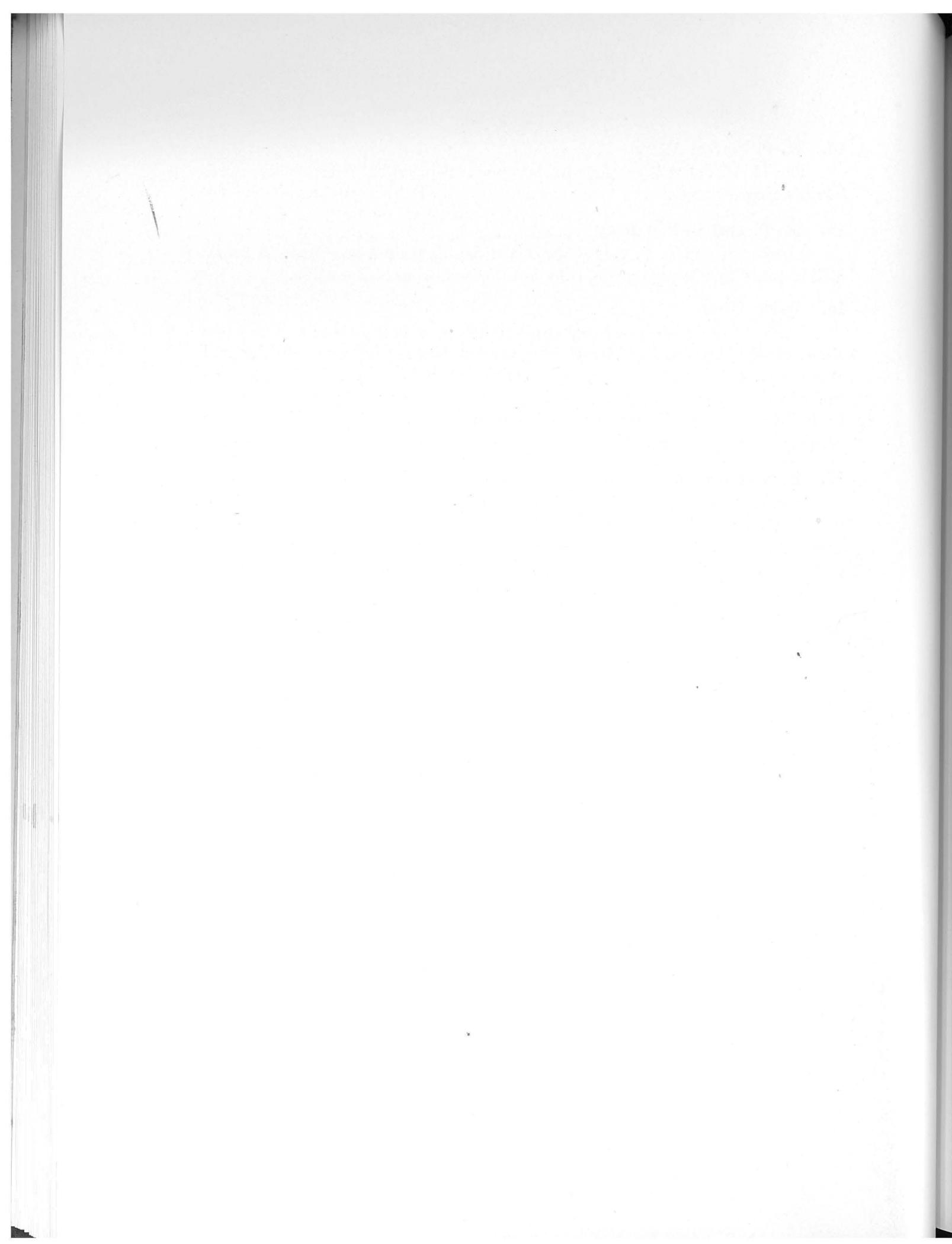
The reverse shaft is of steel. The reverse levers are keyed to the reverse shaft, and slotted with the screw arrangement to permit a change in the cut-off of the individual cylinders.

### 19. Reversing Engine

The reversing gear is of the all-around type, operated by a single cylinder reversing-valve engine located on the aft side of the H. P. front column. Reversing is accomplished through a worm attached to the reversing engine crankshaft driving a worm wheel. The pin on the worm wheel connects to the reverse arm on the reverse shaft through a drag rod. A pointer is located on the worm wheel indicating ahead or astern position of the engine.

### 20. Turning Engine

The turning engine consists of a single cylinder, steam-driven unit mounted on the aft end of the bedplate on the front of the engine. It operates through two sets of worm gears to the crankshaft of the main engine. This engine is reversible and used for setting the valves or making repairs to the main engine. The worm meshing with the worm wheel on the crankshaft must be removed before the main engine is started.



## SECTION III

### 21. Air Pump Beam

The air pump beam is located around the L. P. back column and driven through links from L. P. crosshead. The beams are made from steel plate held rigid by gudgeons bolted between the beams. The bearings for the beams are made of bronze, and split to allow adjustment for wear. Links connect the beam to the air pump crosshead.

### 22. Air Pump

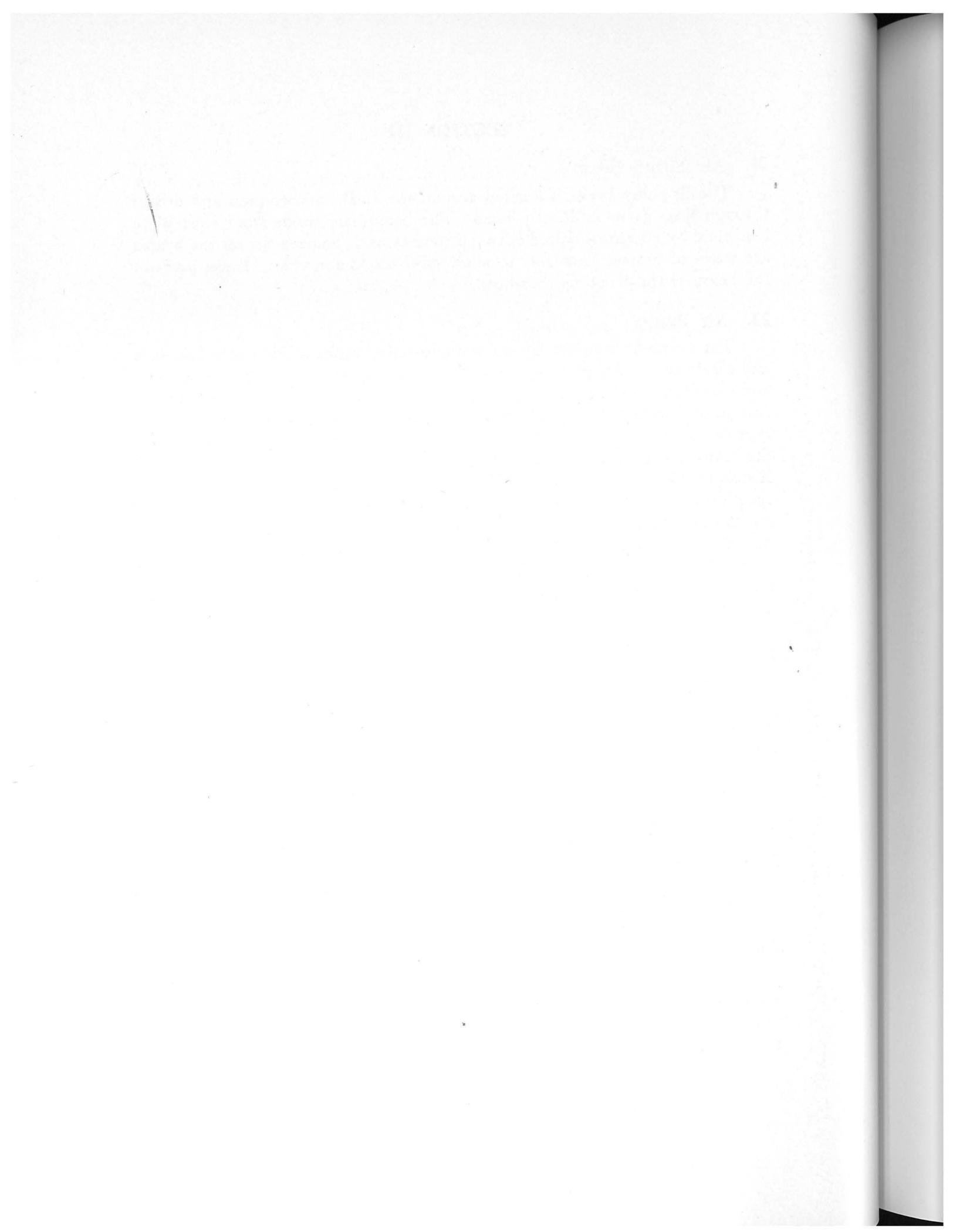
The air pump is of the Edwards single-acting type, bolted to the bedplate and aft column. The pump body is of cast iron, with removable bronze liners and cast-iron bucket with bronze bucket rim. The lower end of the liner has cast ports through which condensate is admitted into pump cylinder. This type of pump requires no suction valves. The discharge valves are located on the headplate, bolted to the top of the liner. The valves are all bronze, of the Kinghorn type without springs. The valves are accessible through an inspection door on the side of the pump body. The bucket rod is of Muntz metal secured to the bucket by a large cone, and locked by a nut on top of the bucket. The upper end of the bucket rod is attached to the air pump crosshead. A relief valve is mounted at the lower end of the pump body. The air pump discharge chamber is provided with an overflow pipe discharging into a funnel, and drains to the bilge.

### 23. Bilge Pumps

Attached one on either side of the air pump are two bilge pumps, driven from the air pump crosshead. The bilge pump is of cast iron with bronze plunger of the vertical ram type. The aft bilge pump suction chest is of the manifold type, with suction shut-off chest and a safety valve. The discharge valve has a quick closing non-return check valve. The forward bilge pump suction valve is also of the manifold type and provided with double suction, one with direct suction from the sea and the other suction from the bilge. A safety valve is provided. Discharge valve is duplicate of the forward bilge pump valve. Each bilge pump is provided with cast-iron air chambers. A switch valve is provided in the discharge for either overboard discharge or discharge to the deck.

### 24. Evaporator Feed Pump

The evaporator feed pump is attached to the forward side of the L. P. column. It is of the single-acting plunger ram type and driven from the air pump beam through links. Suction and discharge valve box is bolted directly to the pump. The box is cast iron, and the valves and seat are bronze.



### SECTION III

#### 25. Water Cooling Service

Water cooling service is provided for the eccentrics and main bearings and crankpin box. The nozzles connect to the main service piping through a swivel joint, with necessary valves to be used on individual parts when required. The crosshead guides are provided with continuous water cooling, draining into open funnels on the back column, and a connection is made for the cooling coil in the thrust block. The cooling piping is connected to the sea water piping in the vessel.

#### 26. By-Pass Steam Piping

To be able to admit H. P. steam to the various cylinders, a by-pass starting valve is bolted to the throttle valve, and pipe connection is made to the M. P. and L. P. cylinders, also to the reversing engine. These valves are operated from the starting platform, and are made of steel and fitted for H. P. service.

#### 27. Indicator and Counter Gear

To be able to take indicator cards on the various cylinders, an indicator gear is attached to the columns, with the motion taken from the crosshead rods, reducing to the proper travel for the indicator. Each cylinder is provided with indicator piping for the top and bottom to a three-way valve in the center of the cylinders.

The counter gear is similarly driven from the crosshead and the counter is located on the M. P. column near the starting platform.

#### 28. Engine Indicator

One indicator is furnished with each engine, and has the following springs: 125#, 40#, 10#.

When taking indicator cards the following springs should be used:

H. P. cylinder, spring scale 125#

M. P. cylinder, spring scale 40#

L. P. cylinder, spring scale 10#

#### 29. Lubrication

The engine is provided with pressure lubrication for the H. P. cylinder by a nozzle connection in the throttle valve and to the H. P. piston rod metallic packing, and also special leads are provided on each side for the M. P. slide valve. Tallow cocks are used for the lubrication of the L. P. slide valve, and also for the domes on the M. P. and L. P. valve stems.

For the main engine lubrication, brass oil boxes are located at the top of the cylinder, with siphon feeder wicks and pipes leading to individual running parts on the engine. The eccentrics are lubricated by individual cups on the eccentric rods, these to be hand lubricated. On each main bearing is located an oil box with wicks for the lubrication of the bearing. Individual lubricating oil boxes are also located on the air pump beam links and the air pump cross-head.

## SECTION III

### 25. Water Cooling Service

Water cooling service is provided for the eccentrics and main bearings and crankpin box. The nozzles connect to the main service piping through a swivel joint, with necessary valves to be used on individual parts when required. The crosshead guides are provided with continuous water cooling, draining into open funnels on the back column, and a connection is made for the cooling coil in the thrust block. The cooling piping is connected to the sea water piping in the vessel.

### 26. By-Pass Steam Piping

To be able to admit H. P. steam to the various cylinders, a by-pass starting valve is bolted to the throttle valve, and pipe connection is made to the M. P. and L. P. cylinders, also to the reversing engine. These valves are operated from the starting platform, and are made of steel and fitted for H. P. service.

### 27. Indicator and Counter Gear

To be able to take indicator cards on the various cylinders, an indicator gear is attached to the columns, with the motion taken from the crosshead rods, reducing to the proper travel for the indicator. Each cylinder is provided with indicator piping for the top and bottom to a three-way valve in the center of the cylinders.

The counter gear is similarly driven from the crosshead and the counter is located on the M. P. column near the starting platform.

### 28. Engine Indicator

One indicator is furnished with each engine, and has the following springs: 125#, 40#, 10#.

When taking indicator cards the following springs should be used:

H. P. cylinder, spring scale 125#

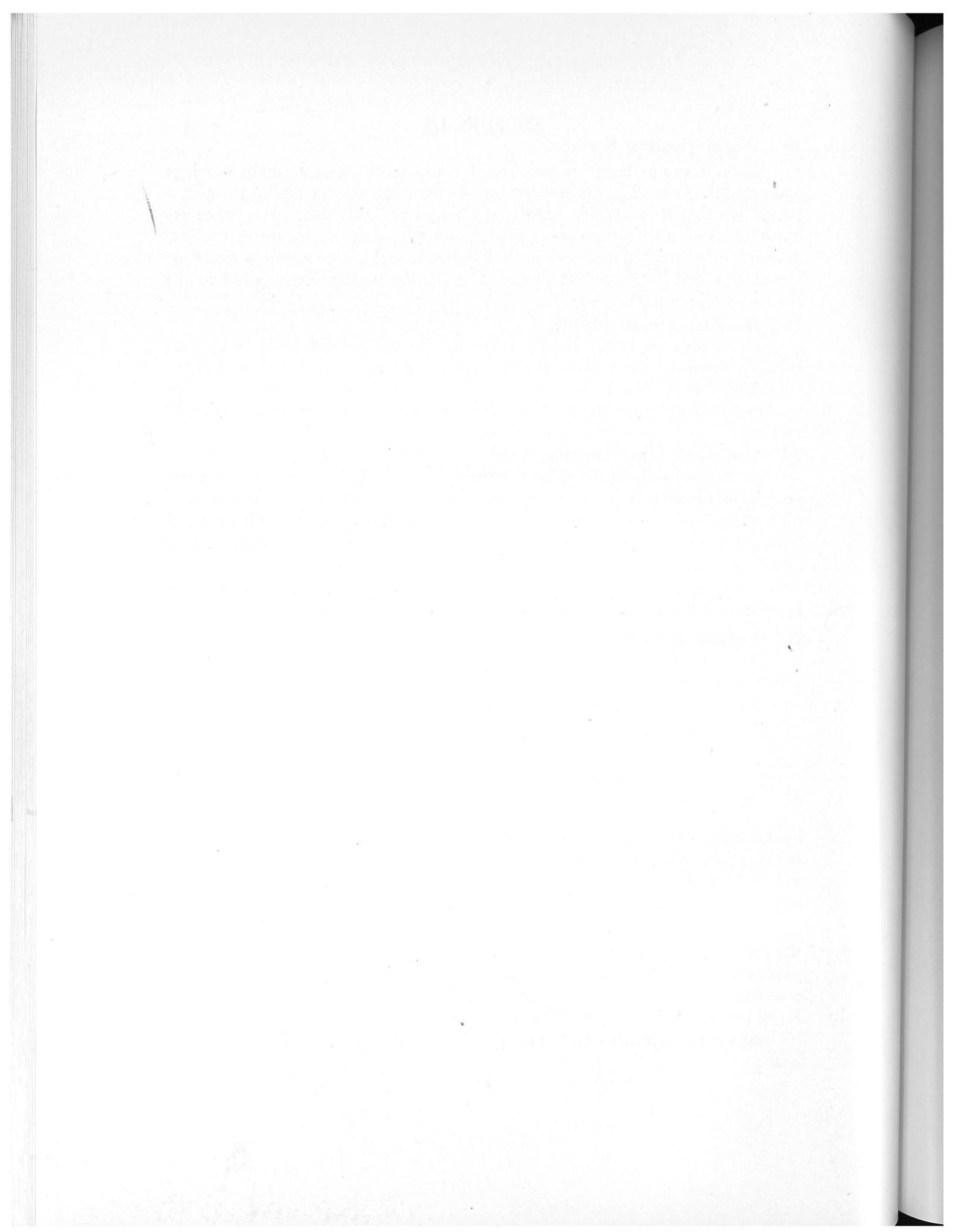
M. P. cylinder, spring scale 40#

L. P. cylinder, spring scale 10#

### 29. Lubrication

The engine is provided with pressure lubrication for the H. P. cylinder by a nozzle connection in the throttle valve and to the H. P. piston rod metallic packing, and also special leads are provided on each side for the M. P. slide valve. Tallow cocks are used for the lubrication of the L. P. slide valve, and also for the domes on the M. P. and L. P. valve stems.

For the main engine lubrication, brass oil boxes are located at the top of the cylinder, with siphon feeder wicks and pipes leading to individual running parts on the engine. The eccentrics are lubricated by individual cups on the eccentric rods, these to be hand lubricated. On each main bearing is located an oil box with wicks for the lubrication of the bearing. Individual lubricating oil boxes are also located on the air pump beam links and the air pump cross-head.



## SECTION III

### 30. Lubricating Oil

For the operating parts a medium heavy good grade lubricating oil is satisfactory. For the cylinder lubrication it is recommended that the oil possess the necessary qualifications to maintain lubricating film under the influence of high temperature and steam condensation.

### 31. Bearing Metal

The bearing metals for the crankpin bearings and eccentric straps, main bearings, and crosshead slipper, are a high-grade babbitt equivalent to Parsons No. 2 bearing metal. All bronze boxes on the engines are made of 88-10-2 bronze.

### 32. Fouling Marks

On the top and bottom of the astern guide, fouling marks are made for the purpose of checking the end clearance of the top and bottom of the piston. Hard-up marks will be stamped on the piston rod, main bearing and crosshead bolts and nuts in the shipyard before the engines are put in service.

### 33. Thrust Bearing

The principal parts include a semi-steel housing with two journal bearings, a thrust shaft with integral forged collar, and two pairs of thrust shoes (two shoes for ahead and two for astern thrust). Each shoe covers about 60 degrees of arc. They are individually adjustable fore and aft by jack screws. The journal bearings have removable lower half shells lined with babbitt metal. The upper half bearing babbitt is cast in the housing cover, leaving large pockets for oil.

Lubrication is automatic, being accomplished by a metal scraper riding on the collar and distributing oil to the collar surfaces and the journal bearings.

Ordinarily, the bearing will cool itself by radiation. However, a small copper cooling coil is provided in the oil bath for emergencies. The ends of the bearing are sealed by stuffing boxes around the shaft.

### 34. Piston Rod and Valve Stem Packing

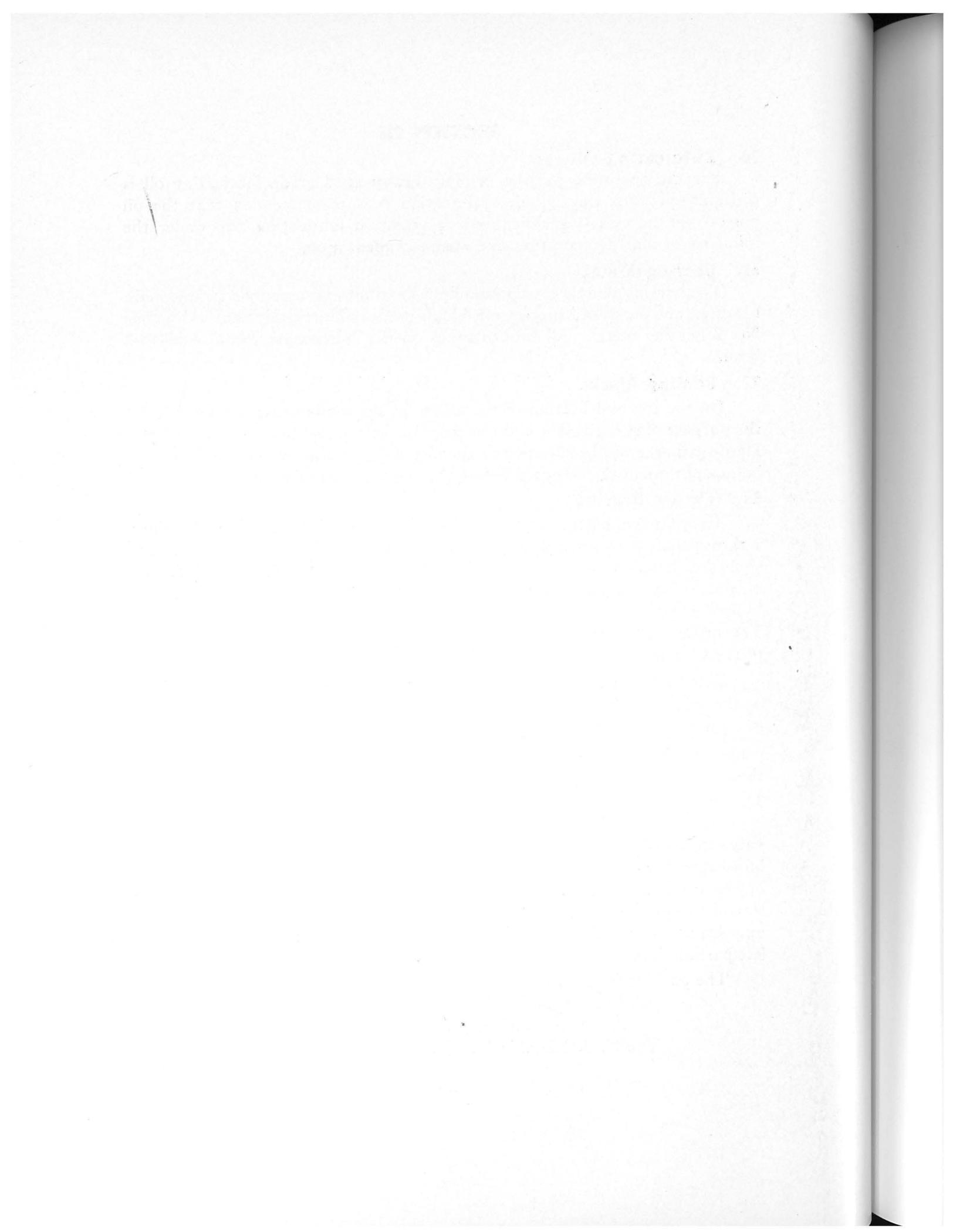
Special bulletins covering the metallic packings for the piston rod and valve stem follow. The H. P. piston rod only is lubricated from the mechanical lubricator; the other rods and the valve stems should be periodically swabbed in the usual manner. All packing boxes are provided with drains, which should be operated to allow the condensate to drain before engine is warmed up. After condensation ceases, the valves on the drain line may be closed or left partially open.

The packing is supplied as designated on the name-plate by

C. Lee Cook Mfg. Co., Louisville, Kentucky, or

Paxton-Mitchell Co., Omaha, Nebraska, or

The U. S. Metallic Packing Co., Philadelphia, Pa.



## SECTION III

### 35. Cylinder Lubricator

The mechanical lubricator is fully described on separate sheets, and is supplied as designated on the name-plate by

Manzel Bros. Co., Buffalo, New York, or  
McCord Radiator & Mfg. Co., Detroit, Michigan.

### 36. Lockwood and Carlisle Rings

The complete information on the Lockwood and Carlisle rings and their installation, is covered by separate instruction sheets.

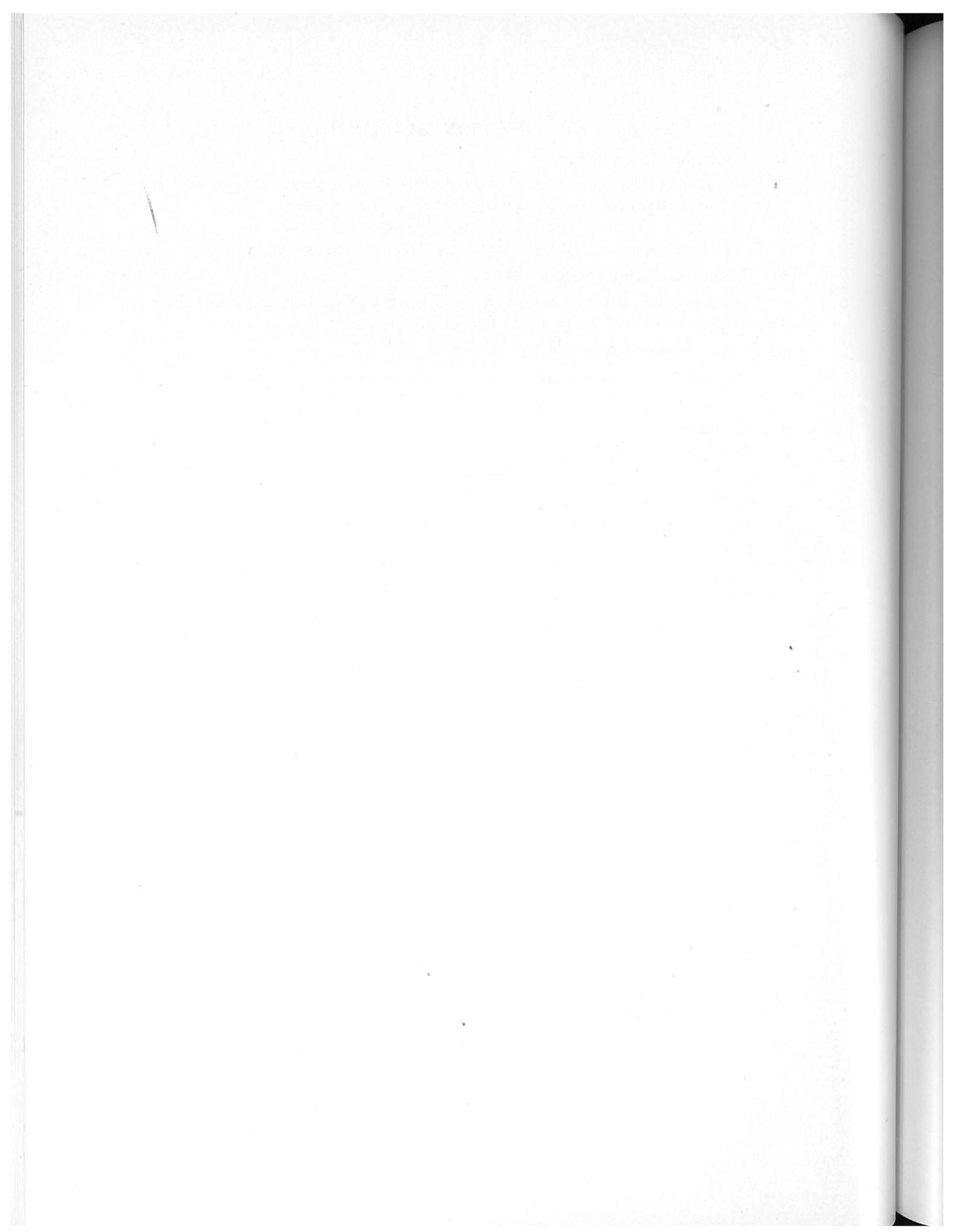
These rings are supplied by

Kearfoot Engineering Co., Inc., New York, N. Y., or  
C. Lee Cook Mfg. Co., Louisville, Kentucky.

### 37. Gauges

The following gauges are mounted on the gauge board:

Main steam gauge.....	0 # to 450 #
H. P. steam chest gauge.....	0 # to 450 #
M. P. steam chest gauge.....	0 # to 150 #
L. P. steam chest gauge .....	30" vacuum to 30 #
Vacuum gauge.....	0 # to 30" vacuum
Auxiliary steam gauge.....	0 # to 200 #



## DESCRIPTION OF C. LEE COOK PACKING

---

### COOK'S METALLIC ROD PACKING

The High Pressure Rod Packing—Type 201-C—is of the Pressure Breaker Type, consisting of an anti-friction metal breaker followed by a series of Graphitic Iron packing or sealing rings. It differs in every respect from the medium pressure packings—Type 202—for the Intermediate and Low Pressure Rods and the three Valve Stems and should be treated separately.

The Type 202 Packings for the Intermediate and Low Pressure Rods and the three Valve Stem packings are of duplicate design and all parts are interchangeable for the respective sizes.

The packings should be handled very carefully so that no parts become damaged, especially the ground joints between casings K and their respective seats and in particular the packing rings.

The engine builder should take particular precaution no moulding or core sand remains in the cylinder and valve chests or any other part of the engine that might work into the packings to score the rods and damage the packings. As a precautionary measure against this happening, it has been found good practice to remove and clean all packings after the initial dock trial of the engine and before the trial trip of the vessel is made.

Operating engineers should exercise the same care when overhauling the engine to make sure all borings and other deleterious matter have been carefully removed before closing up the cylinders.

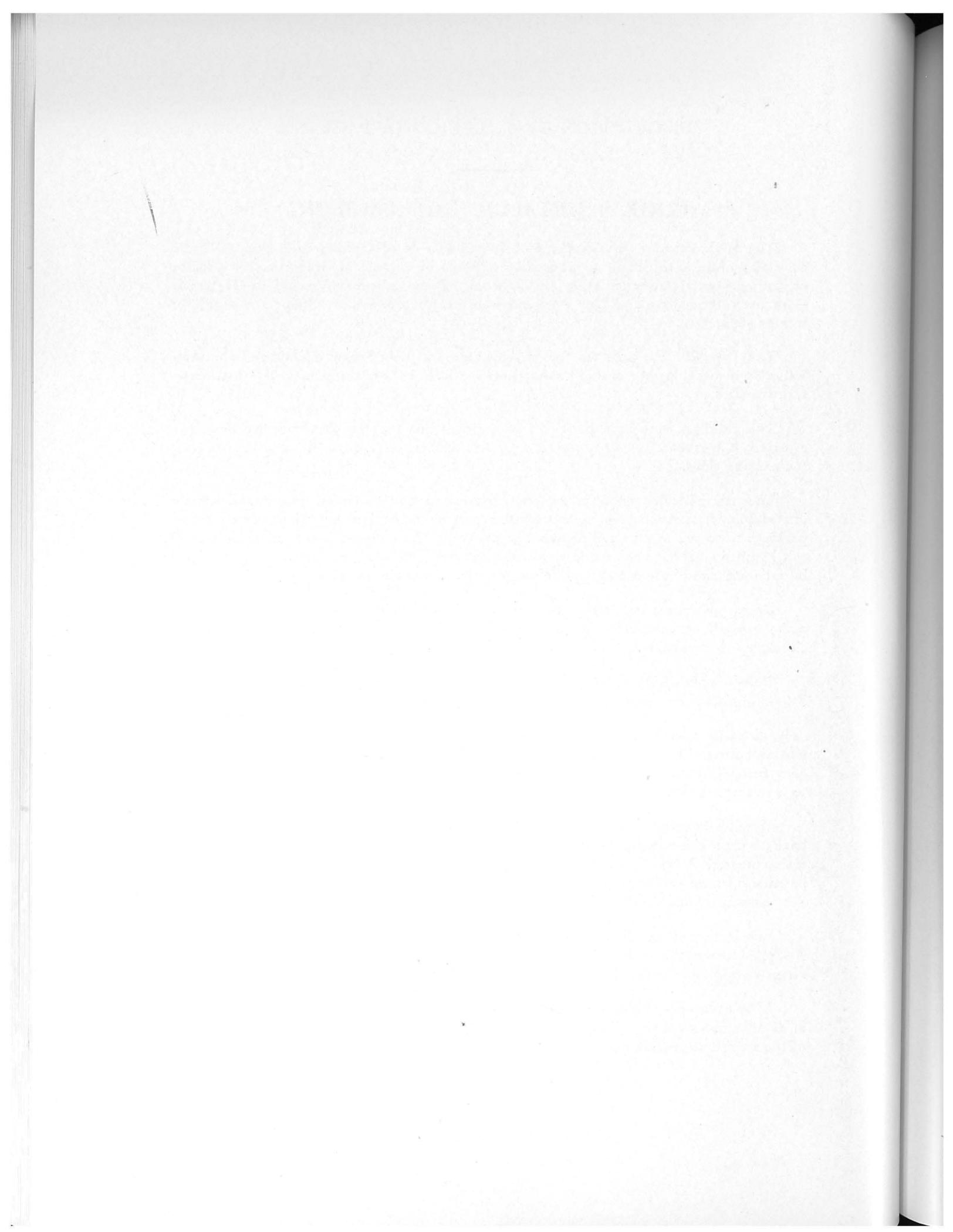
Before applying the packings, rods should be carefully examined for nicks or burrs and if found present they should be removed in an approved manner.

On initial operation it is not unusual for new packings to leak more or less until a mating between the packing ring and rod surfaces develops. However, if the packing has been carefully handled and properly applied and the rod is true and smooth, it will come to a steam tight bearing very quickly.

Metallic Packings are not designed to hold water; consequently tapped drain holes have been provided in each packing gland so that the condensation can be piped away to the condenser. A valve should be placed in each line near the packing. These valves should be wide open on starting up the engine and closed or left partially open after the engine has warmed up and condensation ceases.

Lubrication of the High Pressure Rod Packing is supplied by a mechanical lubricator. A tapped hole in the packing is provided to take the oil line. The other rods and the valve stems should be periodically swabbed in the usual manner.

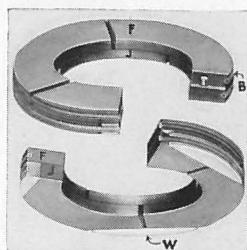
After thoroughly cleaning the packings and the rods as well as the stuffing boxes and all the dimensions having been checked and found correct, the application and maintenance of the several style packings should be made exactly as described herein.



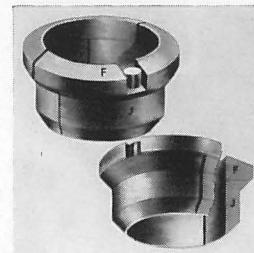
**DESCRIPTION OF C. LEE COOK PACKING**  
**HIGH PRESSURE PISTON ROD PACKING**  
 Type 201-C  
 as used for H. P. Piston Rod only

**INSTRUCTIONS FOR APPLYING:**

1. Assemble packing on rod according to accompanying illustration, first slipping over end of rod, Parts A, S, C, K, M, N, L-1, L-2 and O in the order named.
2. Now lower piston rod into crosshead.
3. After applying pressure breaker R (parts F and J) to casing K, inserting part J first, followed by part F, this much of the packing with plate M should be loosely inserted in the stuffing box and held in place by using a large washer on several of the studs or by a rope hitch.
4. Next apply packing ring E-1 to rod above spacer ring N. First hook garter spring B around the rod. Then apply under garter spring, segments J, *matching segment ends by the identifying letters which should face upward*. Now insert the three bridge pieces W under the spring against the flats of segments J so that the assembled ring will appear exactly as shown in the illustration of the Type E ring opposite. After hooking second spring B around rod, apply segments of radial ring immediately above the J or bridge ring, starting with the segment carrying dowel hole which should drop over dowel pin in ring J. Spacer ring N with packing ring E-1 now should be attached to the packing loosely bolted in the stuffing box.



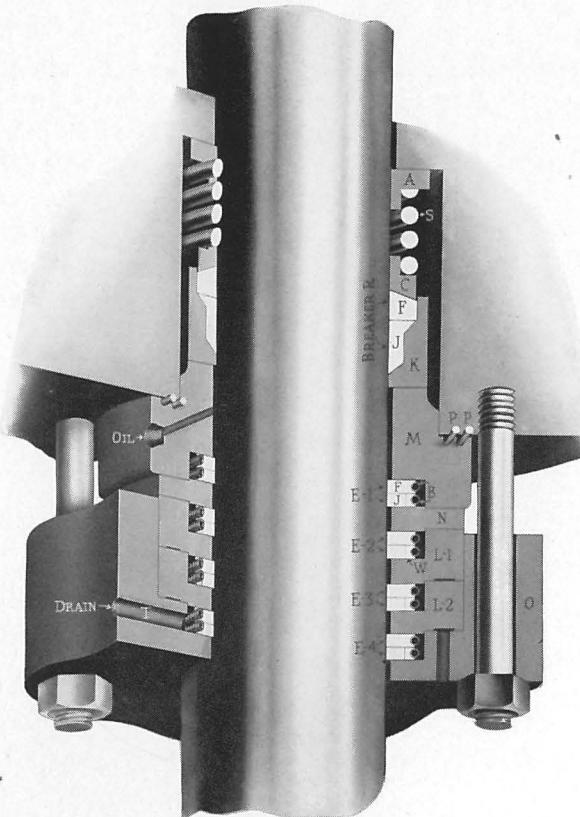
Packing Ring E

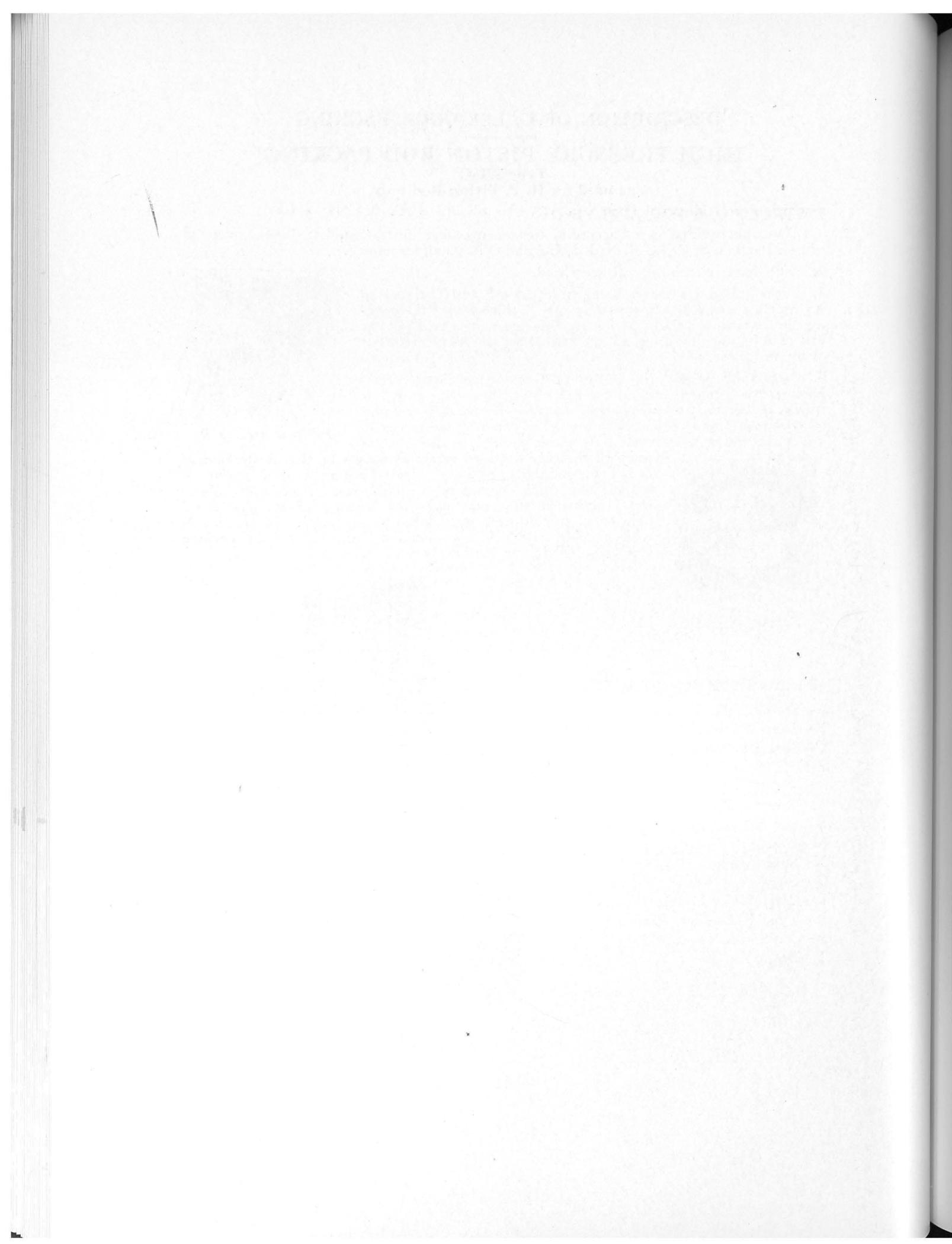


Pressure Breaker R

**PARTS TYPE 201-C PACKING**

- A—Spring Guide
- B—Garter Springs
- C—Spring Follower
- E-1, 2, 3 and 4—Type E Packing Rings, Parts F, J and W
- K—Pressure Breaker Casing
- L-1 and L-2—Cups
- M—Plate
- N—Spacer Ring
- O—Gland
- P—Copper Wire Gaskets
- R—Type R Breaker, Parts F and J
- S—Coil Spring
- T—Drain Tap





## DESCRIPTION OF C. LEE COOK PACKING

### HIGH PRESSURE PISTON ROD PACKING—Continued

5. The foregoing procedure should be followed in the case of

- (a) Packing ring E-2 and cup L-1
- (b) Packing ring E-3 and cup L-2
- (c) Packing ring E-4 and gland O

6. The packing as a whole now is ready to be bolted up tight. Before doing so, make sure face of stuffing box is clean and that no foreign matter is on face of plate M that might prevent gaskets P from making a steam tight joint. In tightening up the stud nuts the compression on each stud should be the same so as to cause no undue strain on any part of the packing assembly and to insure a tight joint against the face of the stuffing box.

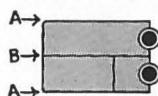
**CAUTION.** Unless packing rings E are installed as directed with the bridge ring J below the radial ring F, the packings will not seal.

#### MAINTENANCE:

1. Packings require a general cleaning periodically. The frequency of cleaning depends on the disposition of the engine to carbonize the lubricating oil and the degree of cleanliness of the steam. Kerosene or other non-acid solvent should be used in cleaning. All packing rings should be removed from rod and thoroughly washed.

2. When cleaning or inspecting packings the end clearance of the packing rings should be checked and the original clearances restored if found necessary. The total clearance between the segment ends (circumferentially) of the Type R Breaker (for both parts F and J) should be  $\frac{1}{2}$ " and that of the Type E Rings (for both parts F and J)  $\frac{21}{32}$ ". To increase the end clearances any one of several methods may be used, taking the usual precaution the segments are not crushed or damaged in any way if held in a vise. The preferable method is to remove an equal amount of material from the ends of each segment by filing. The Type E ring segments, since they are made of cast iron, may be ground down if a fine emery wheel is available.

3. All wire edges should be removed. Wire edges may be found around the bore of the rings if considerable wear has occurred. These should be removed with a file breaking the corners slightly. Do not break the corners where any two surfaces of a packing ring match; for example—see illustration.



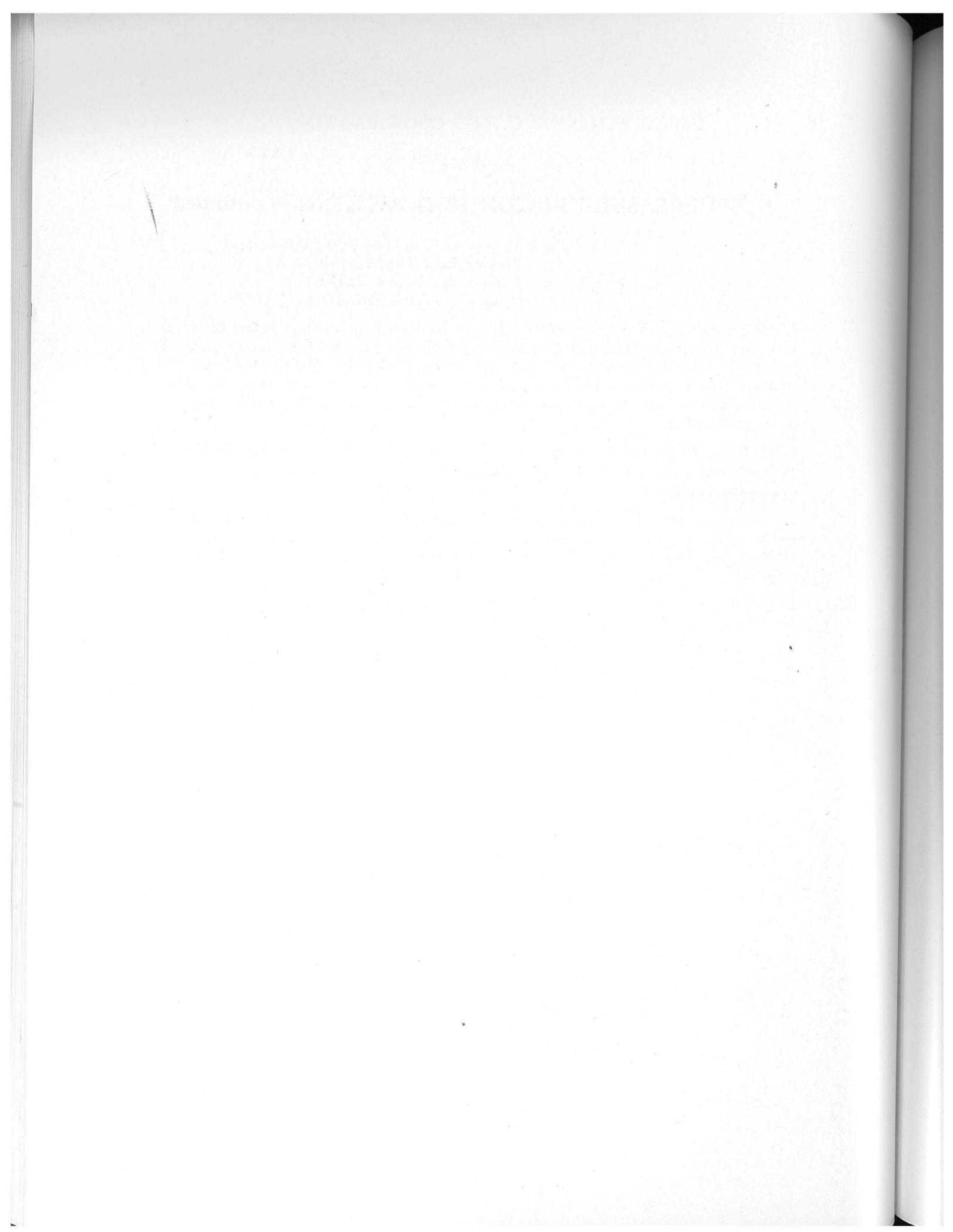
*Cross-section Type E Ring*

A—Break corners  $\frac{1}{64}$ ".

B—Remove wire edges but do not break corners.

4. Replace all broken garter springs and springs that may have lost tension for any reason.

NOTE. If cups L-1 or L-2 by chance become carbonized in gland O and are difficult to remove, a  $\frac{1}{4}$ " brass rod should be inserted in the hole in the face of gland O and lightly tapped. There are two of these holes diametrically opposite so the rod may be shifted from hole to hole and thus avoid cocking the cup in the gland.



## DESCRIPTION OF C. LEE COOK PACKING

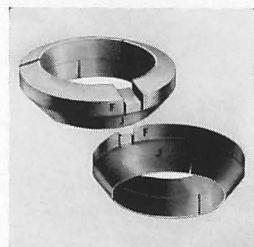
---

### MEDIUM AND LOW PRESSURE PACKING

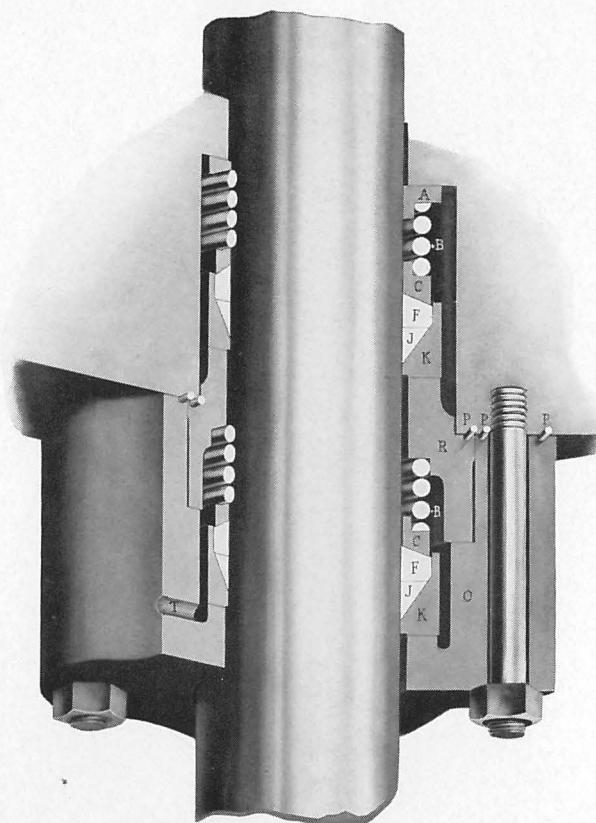
**Type No. 202**  
as used on the Intermediate and Low Pressure Piston Rods and on the  
High, Intermediate and Low Pressure Valve Stems

#### INSTRUCTIONS FOR APPLYING:

1. Assemble packing on rod according to accompanying illustration, first slipping over end of rod, Parts A, B, C, K, R, B, C, K and O in the order named. (In the case of the valve stems, the reverse order should be followed.)
2. Now lower piston rod into crosshead, or in the case of the valve stems pass stem upward through chest and connect up lower end.
3. Next insert the Type B Babbitt packing rings in casings K, applying the uppermost set first followed by the lower set. These rings should be applied as follows: after wiping the inside of casing K clean, the long tapered ring J which is cut in segments first should be inserted into the tapered walls of their respective casings. Then follow with lap joint ring F which is also cut in segments, the long tapered side facing upward.
4. The packing now is ready for inserting into the stuffing box and bolting into place. Before doing so, make sure face of stuffing box is clean and that no foreign matter is on face of plate R and gland O that might prevent gaskets P from making a steam tight joint. In tightening up the stud nuts, the compression on each stud should be the same so as to cause no undue strain on any part of the packing assembly and to insure a tight joint against the face of stuffing box.

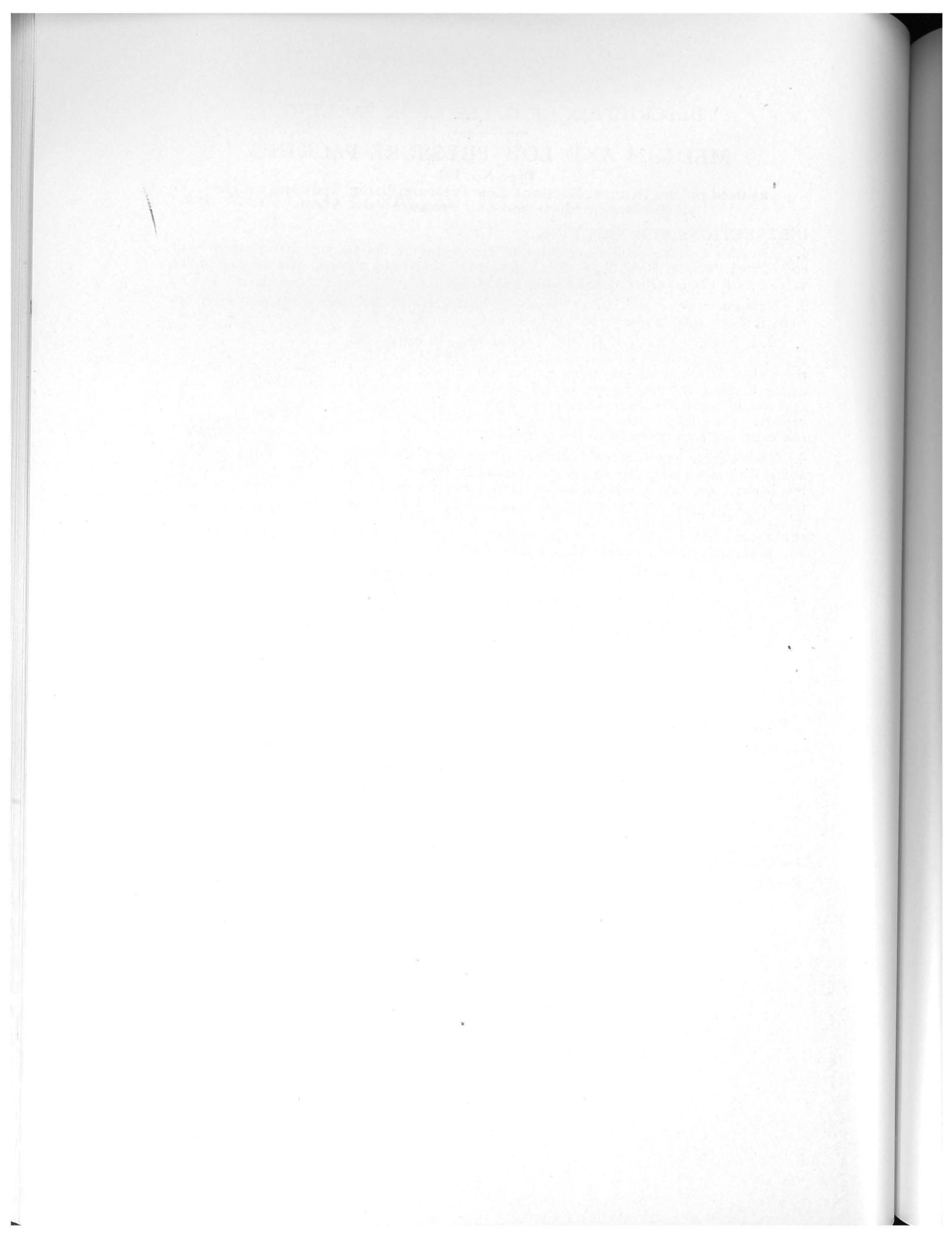


Packing Ring Type B



#### PARTS TYPE 202 PACKING

- A—Spring Guide
- B—Coil Spring
- C—Spring Follower
- F and J—Type B Packing Ring
- K—Packing Ring Casing
- O—Gland
- P—Copper Gaskets
- R—Plate
- T—Drain Tap



## DESCRIPTION OF C. LEE COOK PACKING

---

### MEDIUM AND LOW PRESSURE PACKING—Continued

#### MAINTENANCE:

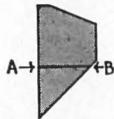
1. Read paragraph 1 under heading "Maintenance" for the High Pressure Rod Packing Type 201-C on page 32 since these general instructions apply equally to these Medium Pressure Packings.

2. When cleaning or inspecting packings, end clearance of the packing rings should be checked and the end clearances should be increased if found necessary. The total clearance between the ends of the segments (circumferentially) of both the F and J rings should be for the 7" diameter Piston Rod Packings— $\frac{11}{16}$ " and for the 4" diameter Valve Stem Packings— $\frac{9}{16}$ ".

To increase the end clearances, remove with a file an equal amount of material from the ends of each segment so that the sum of the total material removed will equal the increased clearance desired. This should be done without clamping in a vise since the possibility of damage by clamping is too great. By securely holding the flat surface of either style ring against a clean plate with the segment end overhanging the plate, the operation will be found comparatively easy.

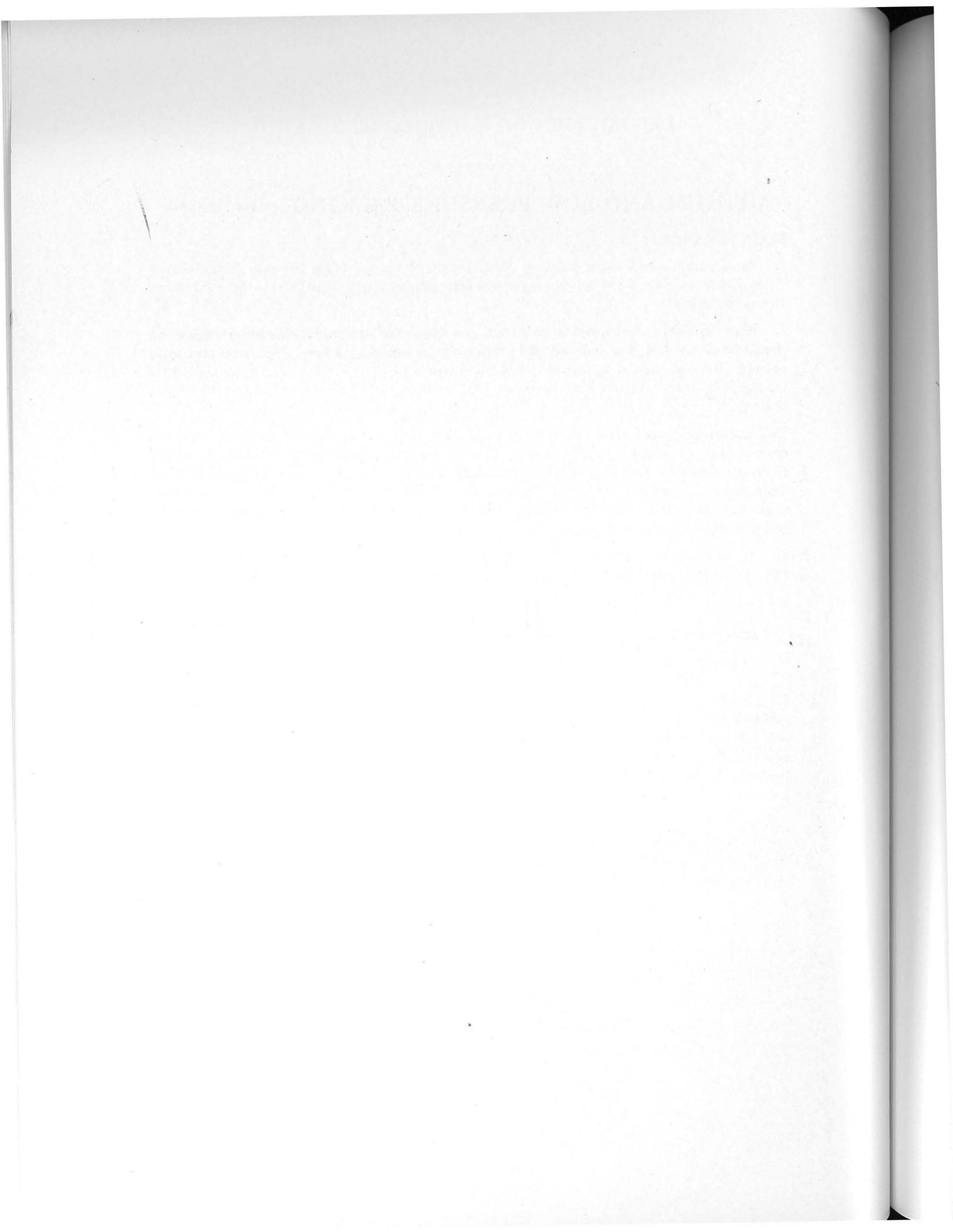
3. All wire edges should be removed by filing. However, the edges where the surfaces of the two rings match should not be rounded as the sketch indicates.

*Cross-section Type B Ring*



Edges A and B must not be rounded or broken.

4. If there is a tendency of ring J to shear down in between cup and rod, it will be found casing K is too large in diameter at the point where it fits the rod. This might indicate the rod has become worn and should be re-turned and new casings and rings installed to the new rod diameter, or it might indicate for some other reason the casing is too large and that it should be replaced with one of correct diameter.



# PAXTON - MITCHELL METALLIC PACKING

## 7" Piston Rod and 4" Valve Stem Tandem Style

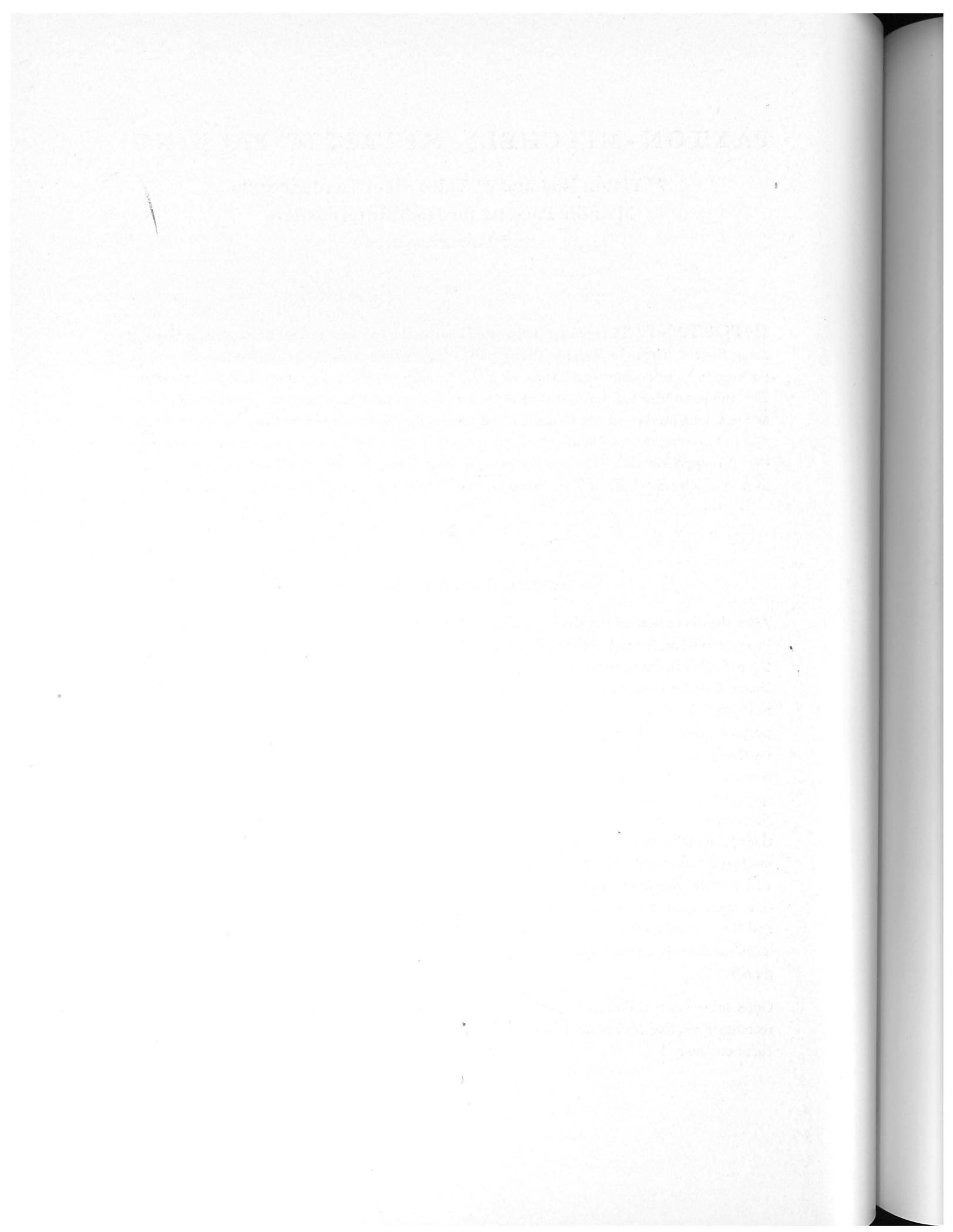
### Metallic Packing for High, Intermediate and Low Pressures

**IMPORTANT.** The packing parts assembled on the rod must never be clamped or pinched along the rod when the gland is finally pulled tightly into place. This applies to both sets of packing in this tandem installation, and the clearance required is shown in the illustration. This full floating of the parts allows the proper functioning of the segments in remaining seated and in taking up the wear at all times and a general flexibility of all of the other parts. To insure this full floating action, the depth of the stuffing box should always be checked to make sure that it is approximately  $1/16"$  deeper than the overall length of the combined solid parts which fit into it. This check should be made on initial installations as well as subsequent installations.

### Instructions for Applying

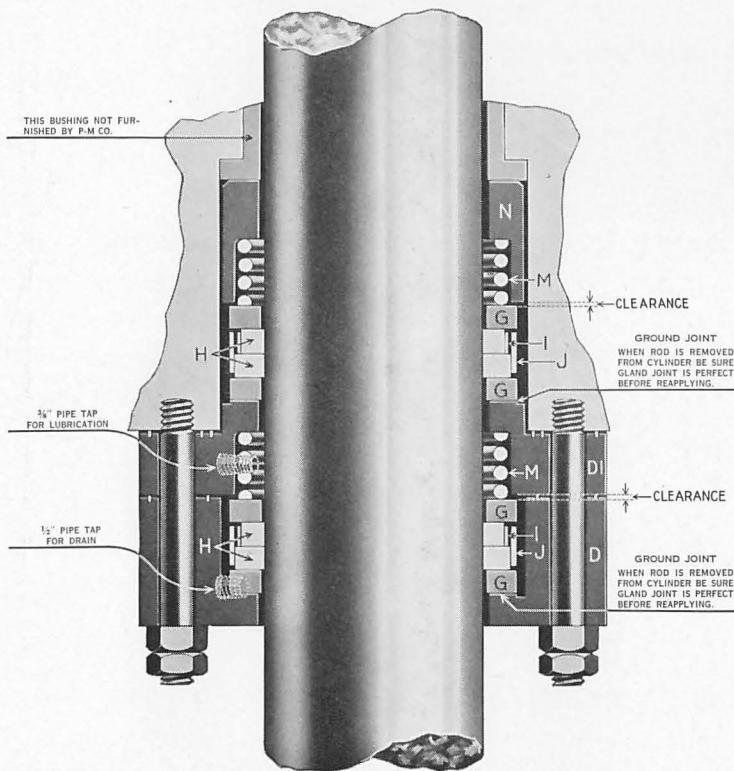
After the dimensions of the stuffing box and parts have been carefully checked, the parts should be assembled on the rod in the order as shown on the illustration, being slipped over the end of the rod. This includes parts N, M, G, J, G, D-1, M, G, J, G, and D. The piston rod or valve stem should then be connected up. After this, parts N, M, G, and J should be blocked in place. The next joint ring G should then be held on the rod below these parts—a rope hitch will serve the purpose. The first ring of packing segments H (2 pieces) should be assembled on the rod, resting on the joint ring. The retaining ring J should then be released from above, the other parts remaining blocked in place, and dropped over the ring of packing segments H. Supplemental springs I should then be placed, one between each segment and the retaining ring. The second ring of packing segments H should then be assembled on the rod in the retaining ring J with their joints  $90^{\circ}$  opposite or quartered from the joints of the first ring of segments. A suggested method is to place the second ring of segments around the rod so that they correspond exactly with the first ring in the retaining ring, then rotate them  $90^{\circ}$  before lowering them into retaining ring and applying supplemental springs behind these segments. Next raise parts G and D-1 and the assembly so far can be held in place by the stud nuts. The outer set is then erected in a similar manner and the stud nuts applied and tightened uniformly to prevent cocking of the glands.

Good lubrication is desirable to assist the packing in becoming seated to the rods and it is recommended that for breaking in, a coating of oil be applied to all of the parts when assembling them on the rod.



# PAXTON - MITCHELL METALLIC PACKING

## ILLUSTRATION SHOWING APPLICATION OF P-M METALLIC PACKING



## PARTS LIST—P-M 7" and 4" TANDEM METALLIC PACKING

Part	Name of Part	Material
D	Gland	Cast Iron
D-1	Gland	Cast Iron
G	Joint Ring	Cast Iron
H	Packing Segments	Composition
I	Supplemental Spring	Steel
J	Retaining Ring	Steel
M	Coil Spring	Steel
N	Filler	Cast Iron

### P-M PACKING SEGMENTS →

ENDS OF SEGMENTS ON BOTH RINGS MUST POINT IN SAME DIRECTION.

JOINTS OF SEGMENTS MUST BE QUARTERED AS SHOWN.

FACE OF JOINTS MUST NOT BE REDUCED AS IT OPENS UP JOINTS.

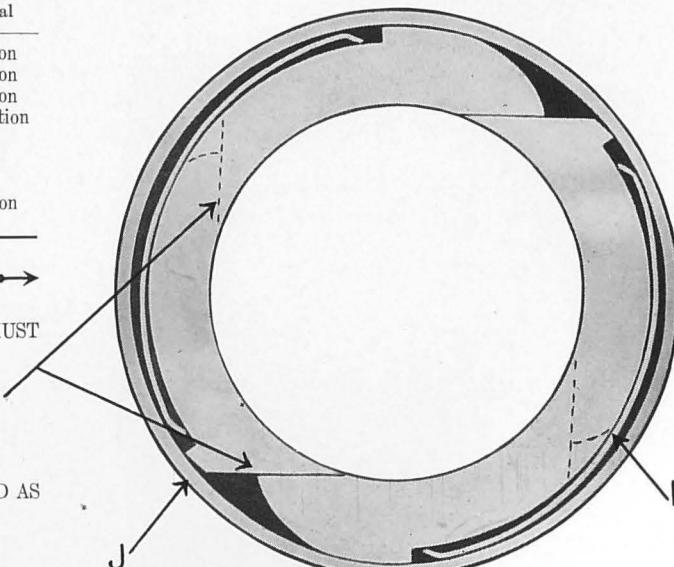
## Instructions for Maintaining

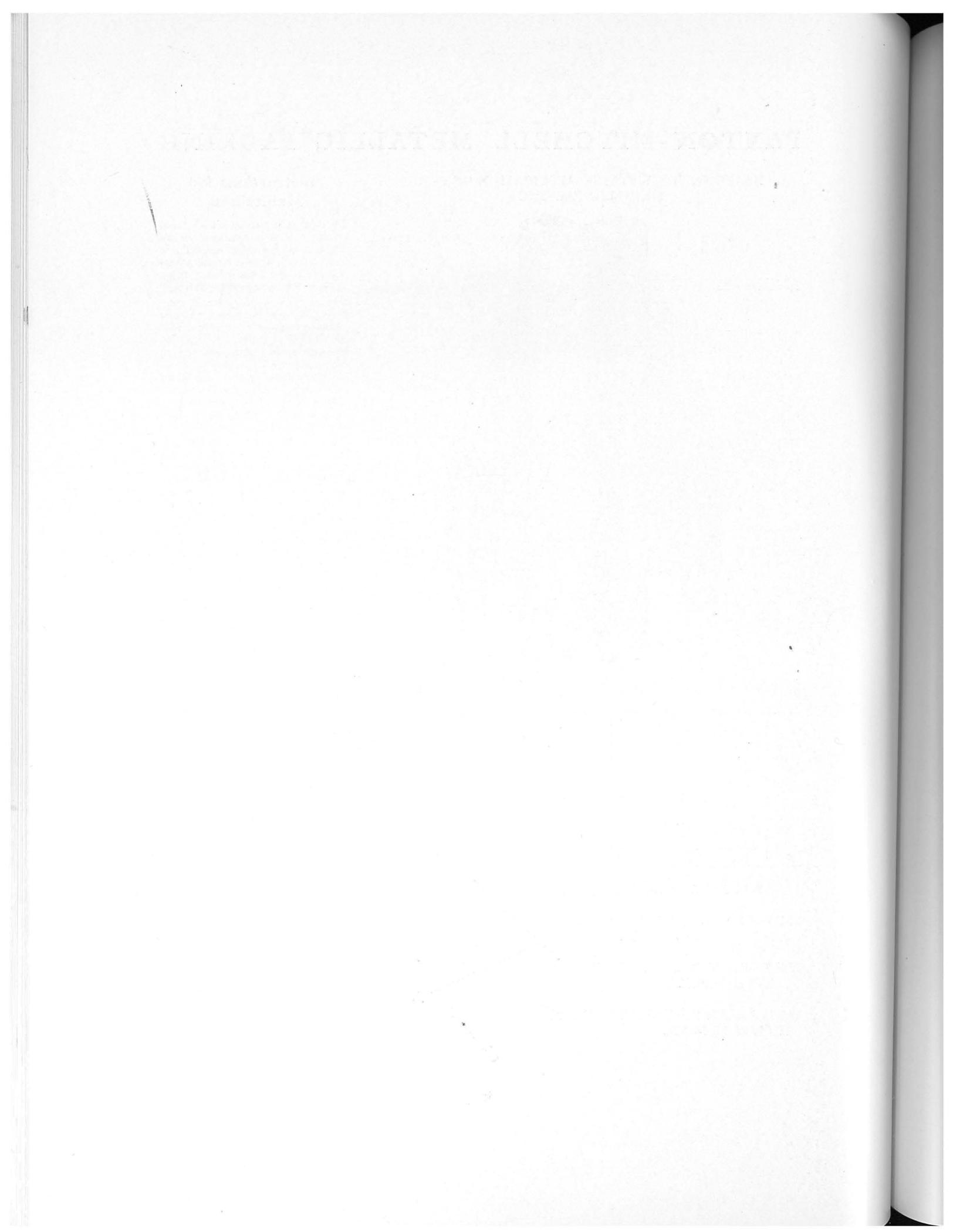
The P-M design with all joints between the various parts being flat and perpendicular to the rod assures ease and simplicity of maintenance. Should a joint require attention for any reason, it is a simple matter to true up the flat face.

Whenever it is necessary to take down the packing for any reason, all parts should be removed, thoroughly cleaned and replaced in the same position. Before applying the packing parts, the end clearance should be checked and necessary adjustments made to bring clearance to approximately  $\frac{1}{16}$ ". If clearance is not sufficient, a cut can be taken from top of filler N on inside set and from joint ring face of gland D on outside set. If clearance is too great, brass shim rings may be placed above filler N on inside set and a cut taken from gasket face of gland D on outside set, necessitating a new set of copper gaskets. The clearance should not be over  $\frac{1}{8}$ ". Rods and stems should be examined for burrs and scores. If the packing is rendering satisfactory service and the parts (particularly the packing segments) have not been in service long enough to require renewal, it is not recommended that the packing be disturbed.

If the bore of the joint ring G on the gland side of the packing segments becomes over  $\frac{1}{8}$ " larger than the rod diameter, it should be renewed.

The special alloy steel used in P-M coil springs provides maximum length of service. However, should a coil spring show a bad permanent set, it should be replaced.





## **DESCRIPTION OF U. S. METALLIC PACKING**

---

### **KING TANDEM METALLIC PACKING**

#### **Installation Instructions**

Before installing the KING Tandem Packing, carefully check the dimensions of the stuffing box, studs, stud centers, etc., with the blueprint enclosed in the box. Try gland on studs before connecting rod. **THIS IS IMPORTANT.** Install all parts of the packing on the rod in the exact order shown on the blueprint, omitting the packing rings, which are in halves and are to be installed later as explained below. Be sure that the sliding plates are applied with the lapped and recessed face next to the lapped faces of the gland and dividing bushing.

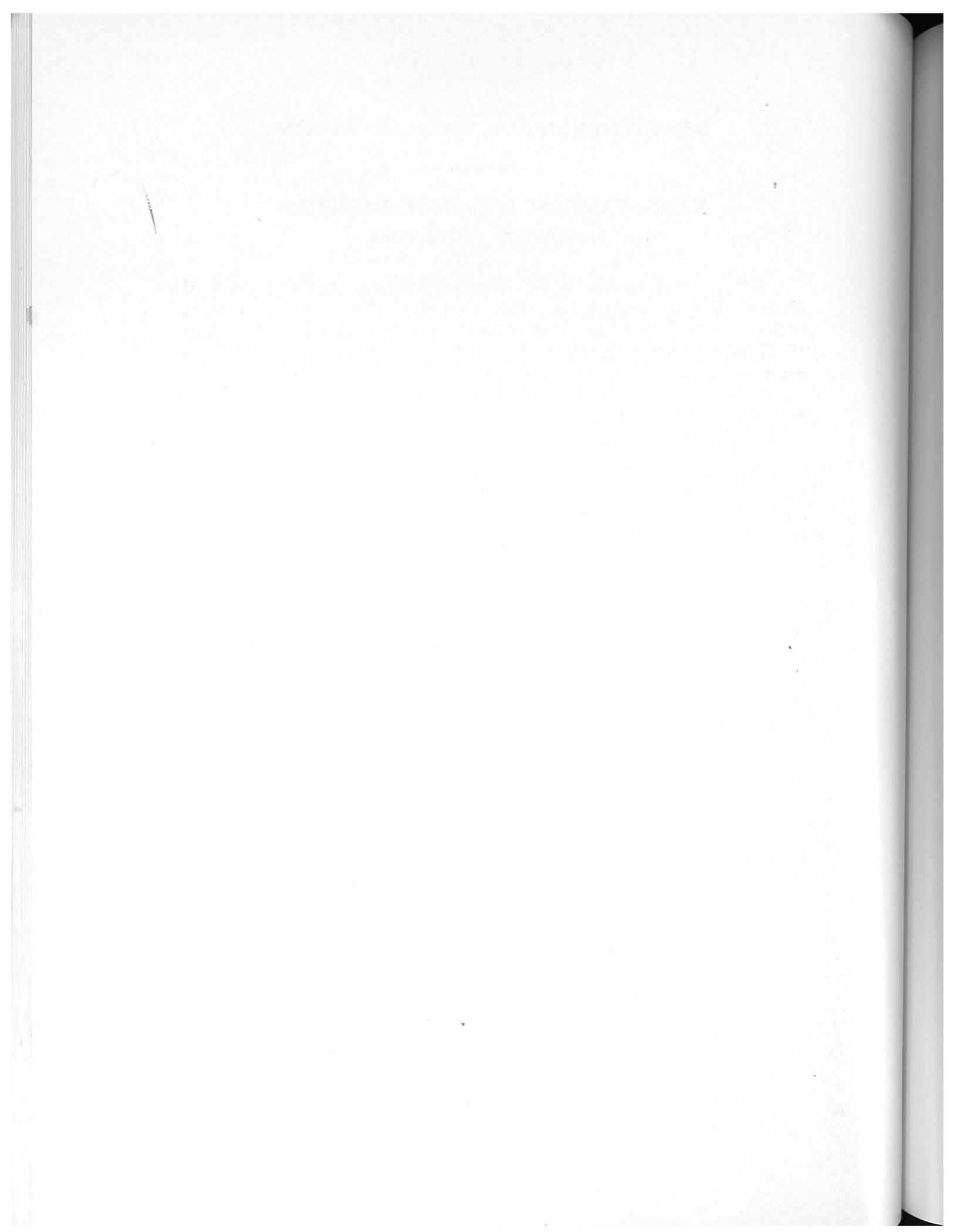
After all parts, without the packing rings, have been installed correctly, move the parts into the stuffing box and fasten the gland in place on the studs. Do not pull the gland up all the way. The rod should now be secured to the crosshead. After the rod has been connected to the crosshead, lower the packing gland and the other parts of the packing.

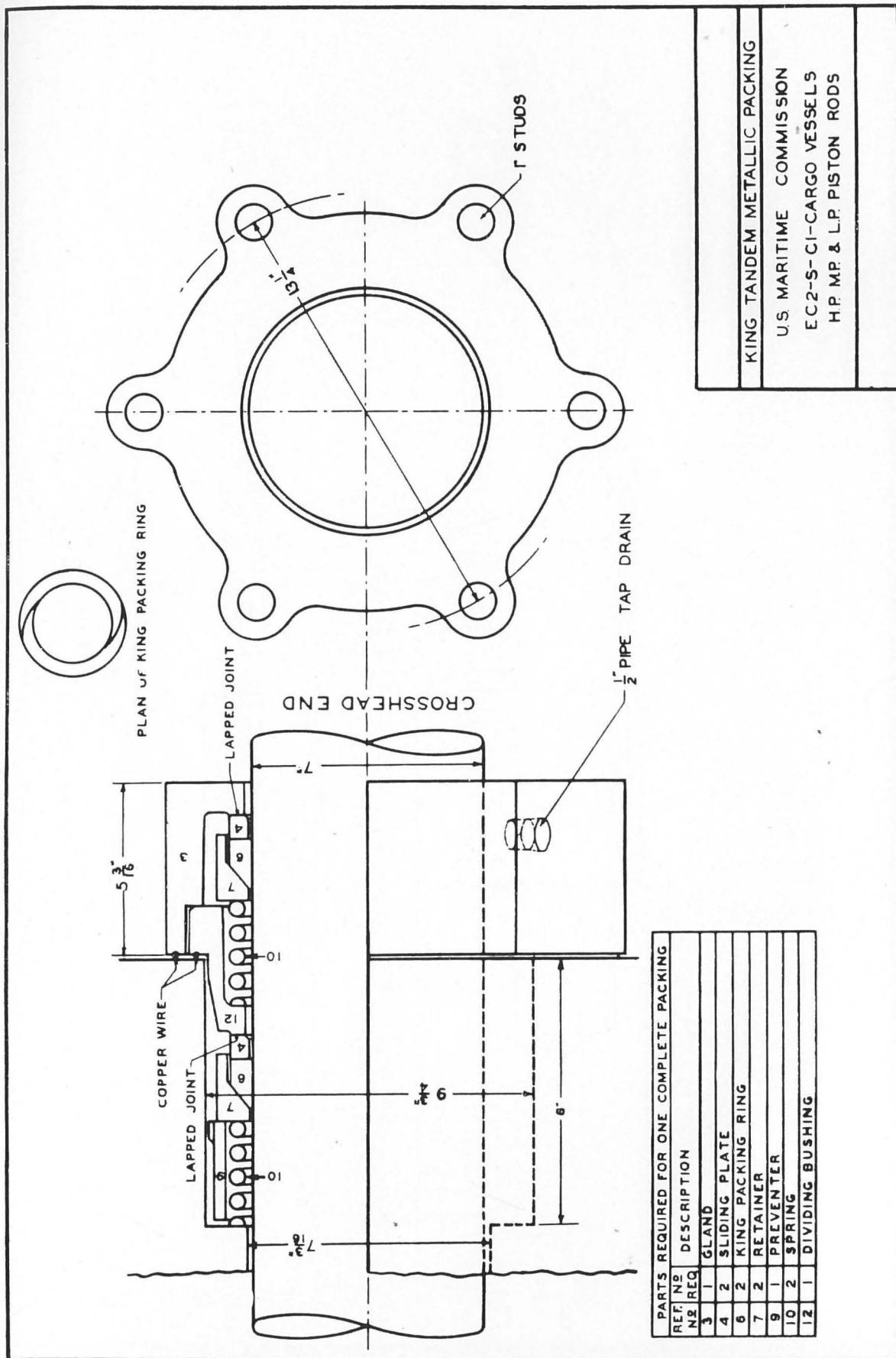
Apply the packing rings as follows:

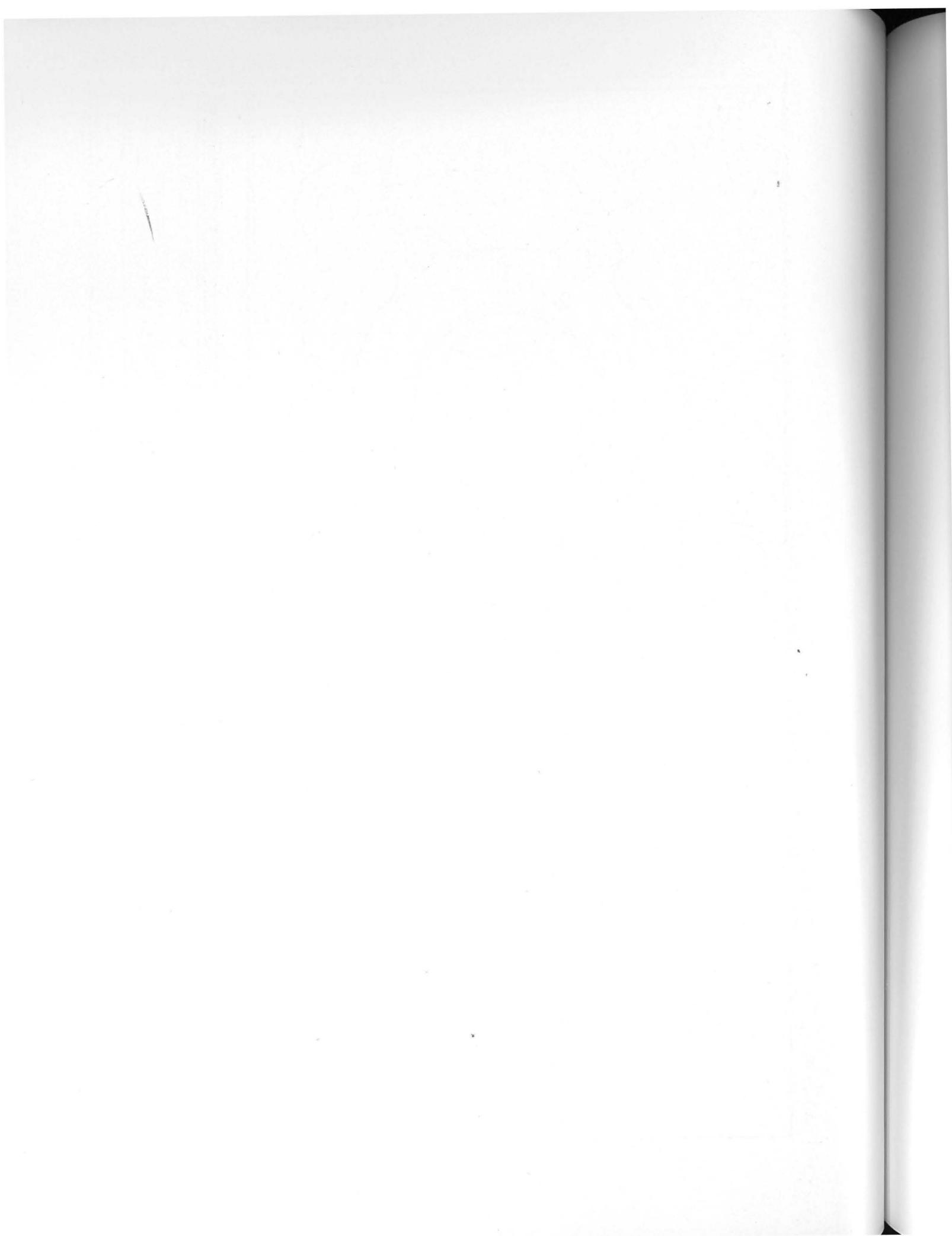
Apply one packing ring in the gland by placing one half of a packing ring on the rod; then place the corresponding half opposite and above the first half; SLIDE THE TWO HALVES TOGETHER. DO NOT ATTEMPT TO FORCE one half of the packing ring into the other half, but SLIDE THEM TOGETHER WITH BOTH HALVES TOUCHING THE ROD.

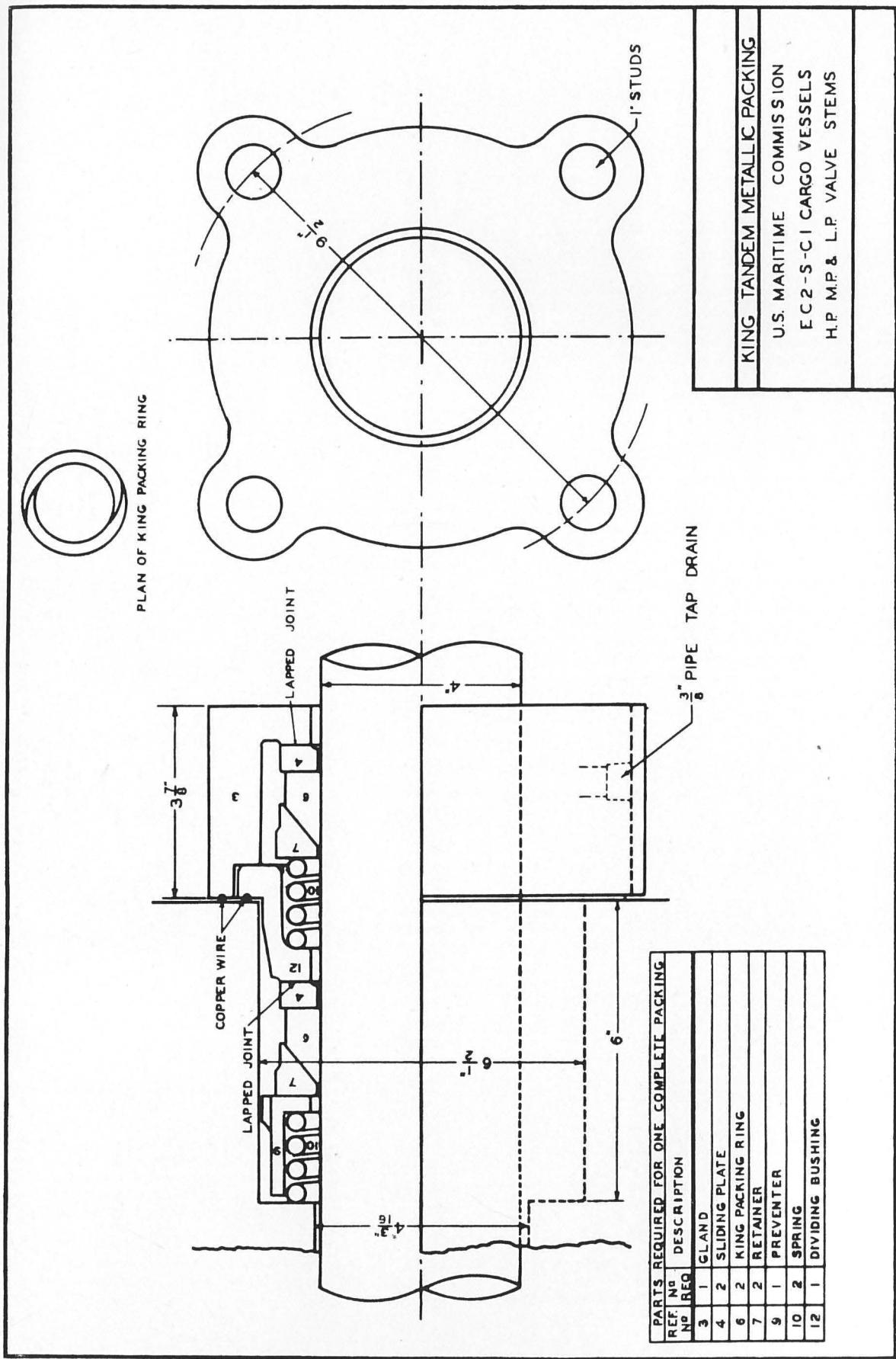
Then install the other packing ring in the same manner as the packing ring in the gland. The complete packing can be now be secured in place. Be sure to pull the gland up square.

**NEVER FILE OR HAMMER THE PACKING RINGS. DO NOT DESTROY THE FINE FEATHER EDGE ON THE LAPS OF THE PACKING RINGS.**





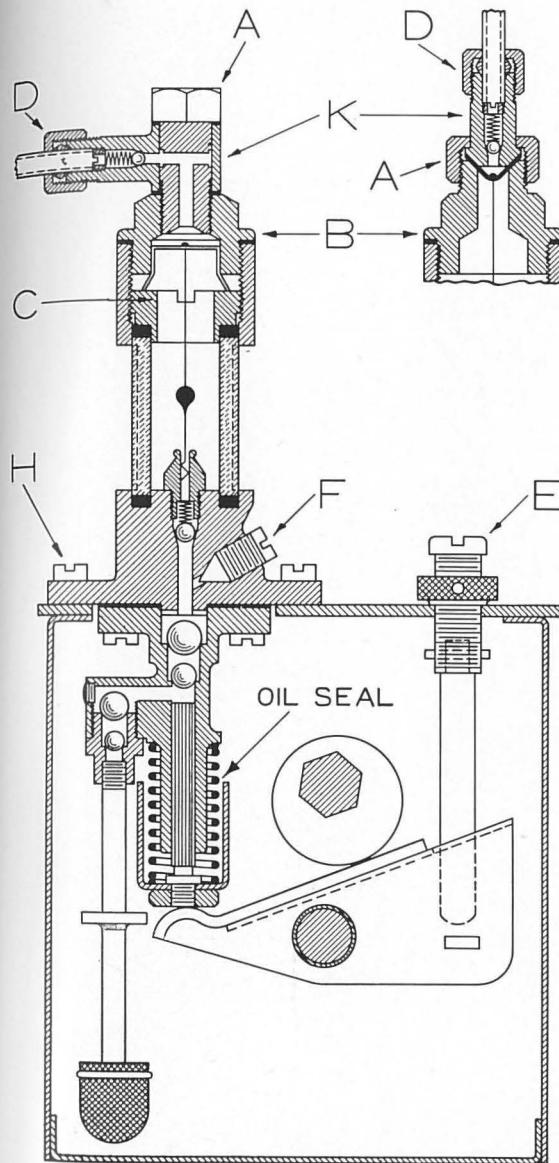




c  
t  
r  
t

a  
s

# INSTRUCTIONS FOR OPERATING “MANZEL” FORCE FEED LUBRICATORS MODEL “94”



## TO CLEAN OUT RESERVOIR

It is advisable to wash out the reservoir of lubricator with gasoline once or twice a year to remove any sediment which may accumulate in the bottom. A drain plug is provided for this purpose so that it is unnecessary to remove the lubricator from the engine. However, it is best to remove the cover in order to clean it out thoroughly.

## CAUTION: TO PREVENT FREEZING

If the lubricator remains idle in a place where freezing temperatures are likely to occur, be sure to drain the sight glasses entirely or add sufficient glycerine to prevent freezing.

## STARTING LUBRICATOR

Before starting lubricator be sure that reservoir is filled with oil to the top of the gauge glass.

Also be sure that all oil pipes are full. To fill oil pipes open up feeds to maximum capacity and turn hand crank until pipes are filled.

When starting for the first time open all regulating screws “E” as far as possible, loosen sight feed filling plug “F” below each sight feed and turn hand crank until oil emerges past plug. Then tighten plug “F” under each sight feed and regulate feeds to desired amount.

Should a pumping unit fail to deliver oil, or feed irregularly, when lubricator is in operation, follow starting instructions as given above. If this does not correct the trouble remove unit and wash in gasoline.

## TO REGULATE THE FEED

Each pumping unit is regulated independently by means of regulating screw “E”. To decrease the feed, loosen locknut and turn screw “E” to the right (clockwise). To increase, turn to the left (anti-clockwise). Nine complete turns are necessary to adjust from minimum to maximum feed. After feed has been adjusted to the proper amount, tighten locknut on screw.

## TO REMOVE A PUMPING UNIT

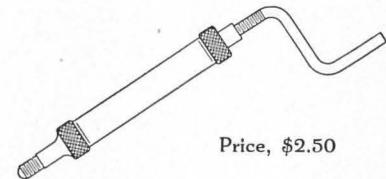
If the lubricator is in service, with discharge pipes connected, remove bolt (or nut) “A” before removing the unit. Do not disconnect the discharge pipe union “D” from connection “K”, as the check valve in the connection is intended to hold the oil in the pipe and prevent it from draining out while the unit is being repaired or replaced.

After the pipe is disconnected, remove the two screws “H” which hold the unit to the cover. The unit may then be lifted out of the reservoir. It is not necessary to stop the equipment on which lubricator is installed or to empty the reservoir.

## TO REFILL SIGHT FEED GLASS

The sight feed glasses are refilled by means of the “Manzel” Glycerine Gun shown at the right.

Fill gun with a mixture of equal parts of glycerine and distilled water; then remove sight feed filling plug “F”, screw the gun into hole from which plug is removed, and turn handle of gun until all oil is forced out of glass and the glass is full of clear liquid. After glass shows full give gun handle forty additional turns to completely fill the space above the glass with sight feed mixture. Then unscrew gun and replace plug.



Price, \$2.50

## TO REMOVE SIGHT GLASS FOR CLEANING

Remove bolt (or nut) “A” and bonnet “B”, unscrew plug “C” and lift out upper washer and glass.

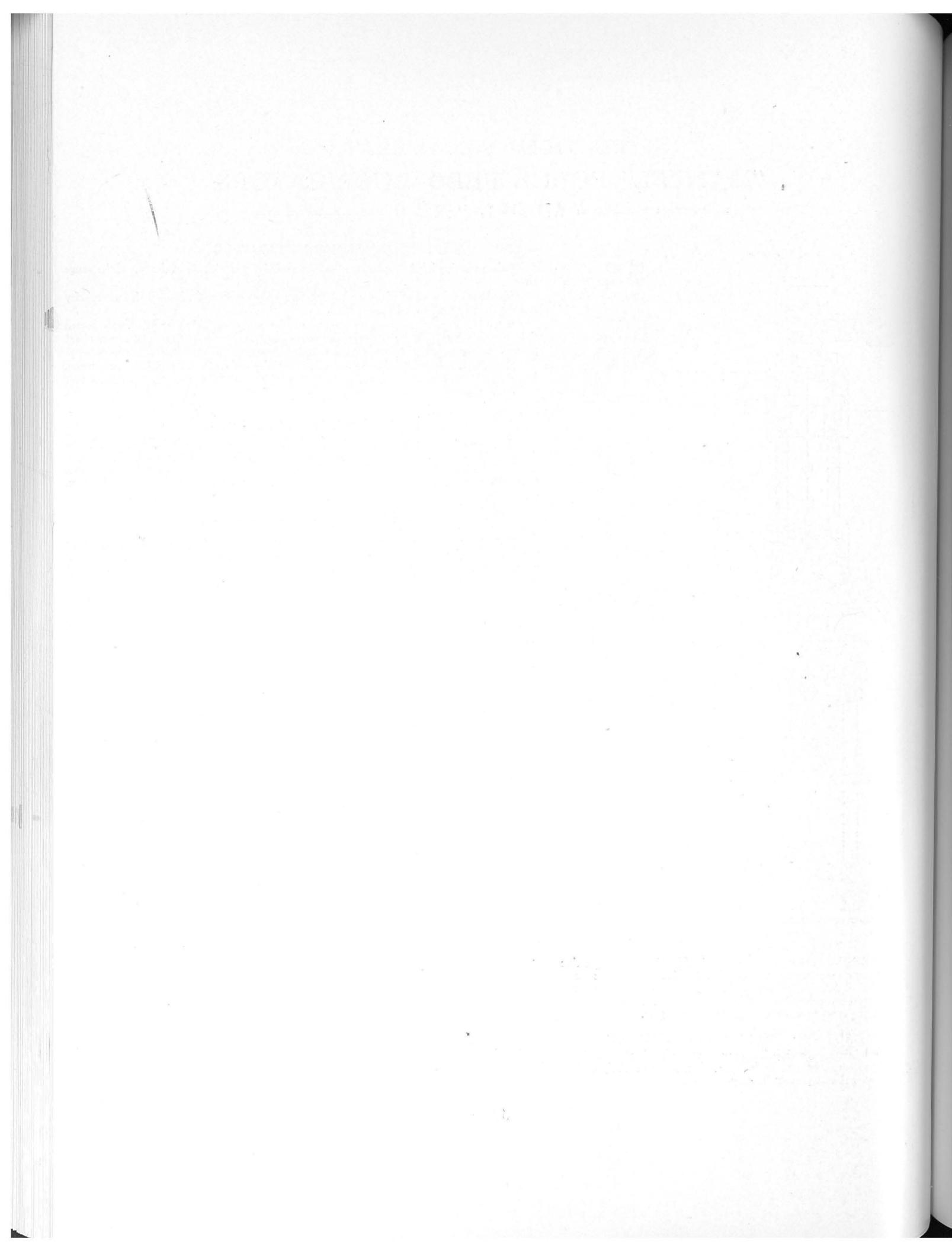
When replacing the glass, be sure that the lower washer is fitted properly in the recess in the bottom casing, then pass glass through the top of casing and set it on the washer. Next place zinc washer and rubber washer on plug “C” (with zinc washer between the rubber and plug) and screw plug in place.

Be sure that the glass sets in the recess properly before screwing down on the plug. The plug should be tightened enough to prevent leakage, but should not be screwed down too tightly as the glass is liable to break.

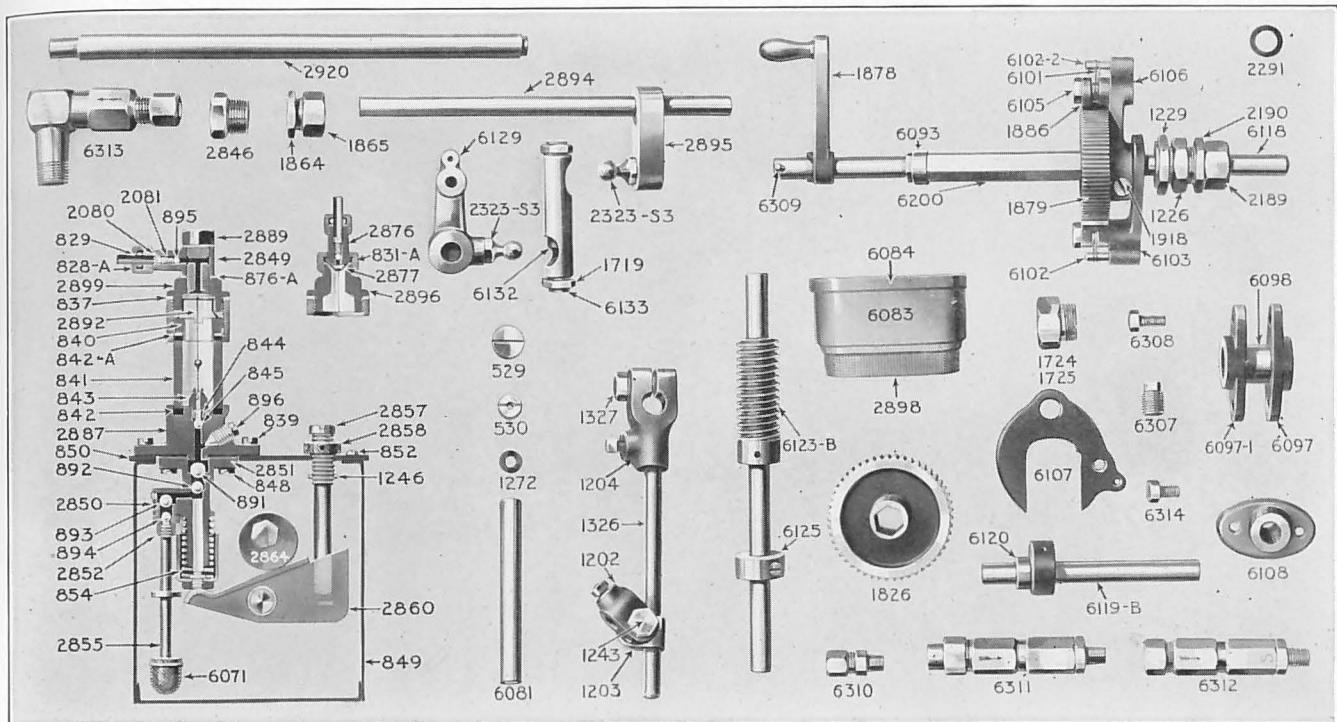
Now replace bonnet “B” and bolt (or nut) “A”.

## CRANK FOR HAND OPERATION

The hand crank on the end of the lubricator is for use before starting or for momentarily increasing the oil supply while the lubricator is in operation. The hand crank operates all of the feeds at one time. Its use does not effect the feed regulation.



**PRICE LIST OF PARTS**  
**"MANZEL" FORCE FEED LUBRICATORS, MODEL "94"**



Lubricator				Lubricator				Lubricator			
No.	Name of Part	Ptd. N. P.	Finish	No.	Name of Part	Ptd. N. P.	Finish	No.	Name of Part	Ptd. N. P.	Finish
529	Gauge Glass Cap Plug.....	\$ .30	\$ .30	1327	Rocker Arm Screw.....	.15	.25	6098	Center Bearing Bushing.....	.50	.50
530	Gauge Glass Plug.....	.15	.15	1725	End Bearing.....	.40	.50	6101	Torsion Spring.....	.10	.10
828-A	Union Nut For $\frac{3}{16}$ , $\frac{1}{4}$ , or $\frac{5}{16}$ " OD Tubing For $\frac{3}{8}$ or .405" OD Tubing....	.15	.15	1864	Inside Stuffing Box.....	.40	.40	6102	Torsion Spring Pin for Brake.....	.05	.05
829	Sleeve.....	.05	.05	1865	Inside Stuffing Box Nut.....	.20	.20	6102-2	Torsion Spg. Pin for Rocker Arm.....	.05	.05
831-A	Vertical Connection Nut.....	.50	.50	1878	Hand Crank.....	.40	.60	6103	Brake.....	.40	.40
837	Bonnet Gasket.....	.05	.05	1879	Ratchet Wheel.....	1.25	1.25	6105	Pawl Pin.....	.25	.25
839	Sight Feed Casing Screw.....	.15	.15	1886	Pawl.....	.25	.25	6106	Inside Rocker Arm.....	.75	.75
840	Sight Glass Plug.....	.45	.45	1918	Inside Rocker Arm Screw.....	.10	.10	6118	Ratchet Shaft.....	.40	.40
841	Sight Glass.....	.60	.60	2080	Outlet Valve Plug.....	.10	.10	6200	Eccentric Shaft.....	...	...
842	Sight Glass Washer.....	.10	.10	2189	Outlet Valve Spring.....	.05	.05	6307	Drain Plug.....	.05	.10
842-A	Sight Glass Zinc Washer.....	.05	.05	2190	Stuffing Box Packing Nut.....	.20	.30	6308	Center Bearing Screw.....	.05	.05
843	Nozzle.....	.25	.25	2291	Stuffing Box Locknut.....	.20	.30	6309	Hand Crank Pin.....	.05	.05
844	Nozzle Spring.....	.05	.05	2846	Stuffing Box Packing.....	.10	.10	6310	Single Check Valve for Bearings.....	.40	.60
845	Nozzle Ball.....	.05	.05	2849	Partition Bearing.....	.70	.70	6311	Double check Valve with Swivel Conn. for $\frac{1}{8}$ " Iron Pipe.....	2.00	2.25
848	Cylinder Screw.....	.05	.05	2850	Horizontal Outlet Conn.....	1.00	1.00	6312	Double Check Valve with Com- pression Fitting for Tubing.....	1.75	2.00
849	Reservoir Body.....	...	...	2850	Cylinder.....	2.50	2.50	6313	Double Ball Angle Check Valve.....	1.75	2.00
850	Reservoir Cover.....	...	...	(Complete with plunger, valves, spring, spring cup and nut).				FRONT OR REAR RATCHET DRIVE PARTS			
852	Cover Screw.....	.05	.05	2851	Cylinder Gasket.....	.10	.10	1719	Adjusting Screw Nut.....	.10	.10
854	Plunger Spring.....	.15	.15	2852	Suction Valve Cage.....	.25	.25	2323-S3	Ball Pin.....	.85	.85
876-A	Horizontal Conn. Washer.....	.05	.05	2855	Intake Tube, with Strainer.....	.50	.50	2894	Drive Shaft.....	.35	.35
891	Discharge Valve Ball—Large.....	.05	.05	2857	Regulating Screw.....	.40	.40	2895	Crank Plate.....	.75	.75
892	Discharge Valve Ball—Small.....	.05	.05	2858	Regulating Screw Locknut.....	.35	.35	6129	Rocker Arm.....	1.00	1.00
893	Suction Valve Ball—Large.....	.05	.05	2860	Regulating Lever Complete.....	1.00	1.00	6132	Ball Pin Spacer.....	.25	.25
894	Suction Valve Ball—Small.....	.05	.05	2864	Eccentric.....	.40	.40	6133	Adjusting Screw.....	.30	.30
895	Outlet Valve Ball.....	.05	.05	2876	Vertical Outlet Conn.....	1.00	1.00	END ROTARY DRIVE PARTS			
896	Sight Feed Filling Plug.....	.20	.20	2877	Vertical Conn. Gasket, with wire.....	.20	.20	6107	Inside Rocker Arm.....	1.00	1.00
897	Pumping Unit—(Tubular Type). (Complete with sight glass, outlet connection, cylinder, intake tube, strainer, etc.)	7.50	9.00	2887	Sight Feed Casing.....	2.50	3.00	6108	Bearing.....	.50	.50
1202	Adjustable Engine Conn.....	.30	.50	2889	Horizontal Conn. Bolt.....	.75	.75	6119-B	Drive Shaft.....	1.25	1.25
1203	Adjustable Connection.....	.30	.50	2892	Guide Wire with Holder.....	.20	.20	6120	Drive Shaft Washer.....	.15	.15
1204	Outside Rocker Arm.....	.60	.90	2896	Vertical Conn. Bonnet.....	1.35	1.35	6314	Bearing Screw.....	.05	.05
1226	Stuffing Box.....	.60	.75	2898	Strainer.....	.35	.35	FRONT OR REAR ROTARY DRIVE PARTS			
1229	Stuffing Box Jam Nut.....	.20	.20	2899	Horizontal Conn. Bonnet.....	1.15	1.15	1724	Worm Screw Bearing.....	.40	.50
1243	Adjustable Connection Pin.....	.20	.30	2920	Regulating Lever Shaft.....	...	...	1826	Worm Gear.....	...	...
1246	Regulating Screw Pin.....	.05	.05	6071	Intake Strainer.....	.10	.10	6123-B	Worm Screw.....	2.00	2.00
1272	Gauge Glass Washer.....	.05	.05	6081	Gauge Glass.....	.40	.40	6123-B	Worm Screw (Hardened).....	2.50	2.50
1326	Drive Rod.....	.25	.40	6083	Filling Cup.....	.35	.45	6125	Worm Screw Collar.....	.30	.30
				6084	Filling Cup Cover.....	.30	.40				
				6093	Spacer between feeds.....	.10	.10				
				6097	Center Bearing—Threaded.....	.50	.50				
				6097-1	Center Bearing—Not Threaded..	.50	.50				

NOTE: Be sure to give model and serial number of lubricator for which repairs are wanted. The numbers will be found on the name plate.



## OPERATING INSTRUCTIONS—McCORD CLASS "SF" LUBRICATORS

**1. PUMP OPERATION**—On the downward, or suction stroke, oil is drawn through tube (A) and suction valves (B) and (C). On the upward, or delivery stroke, suction valves B and C close automatically and oil is forced under pressure through delivery valves D and E and oil nozzle (F) into liquid chamber, thence through opening at top of sight feed.

The oil rises to the top due to difference of gravity between the oil and glycerine mixture.

**2. FEED ADJUSTMENT**—The stroke of each pump is adjustable. Turning the threaded sleeve (H) in a clockwise direction decreases the rate of feed, turning counter-clockwise increases the amount. The threaded sleeve is held in place by lock nut (M).

**3. TO START PUMP**—When starting, be certain all air is removed from pump unit by loosening vent screw (R) and operating hand flushing device (K) until all air is expelled; then re-tighten screw.

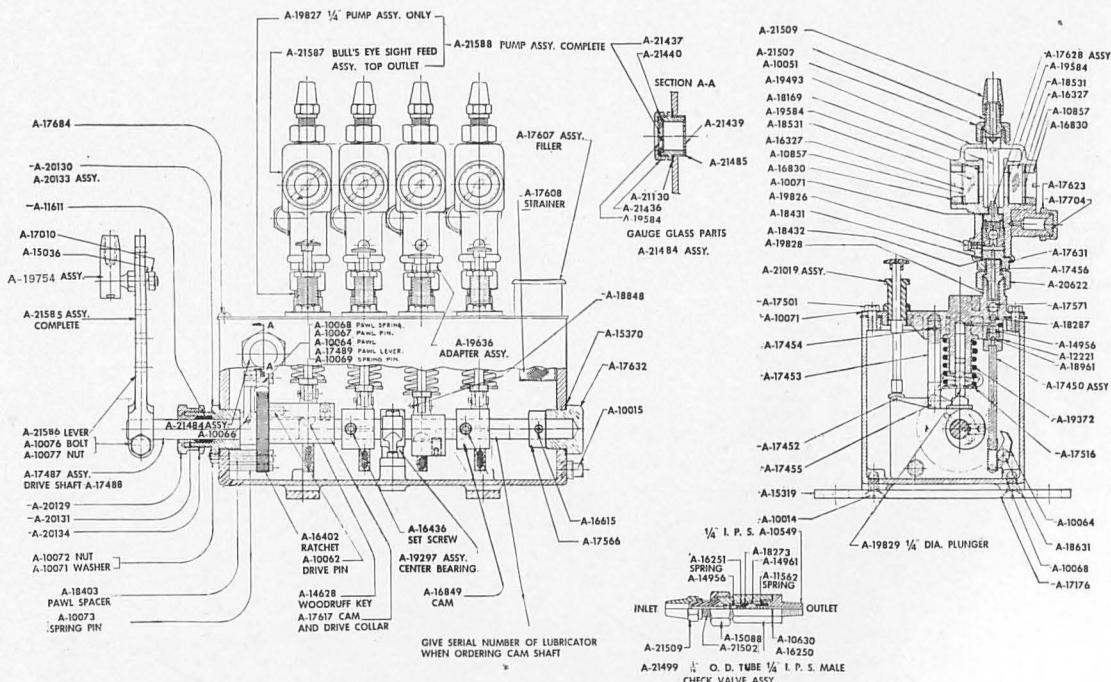
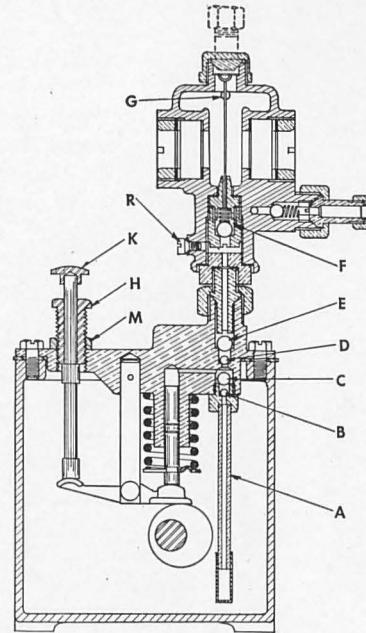
The hand flushing device (K) also serves to indicate the amount of plunger stroke.

Be sure oil flows from feed line before connecting to terminal check valve.

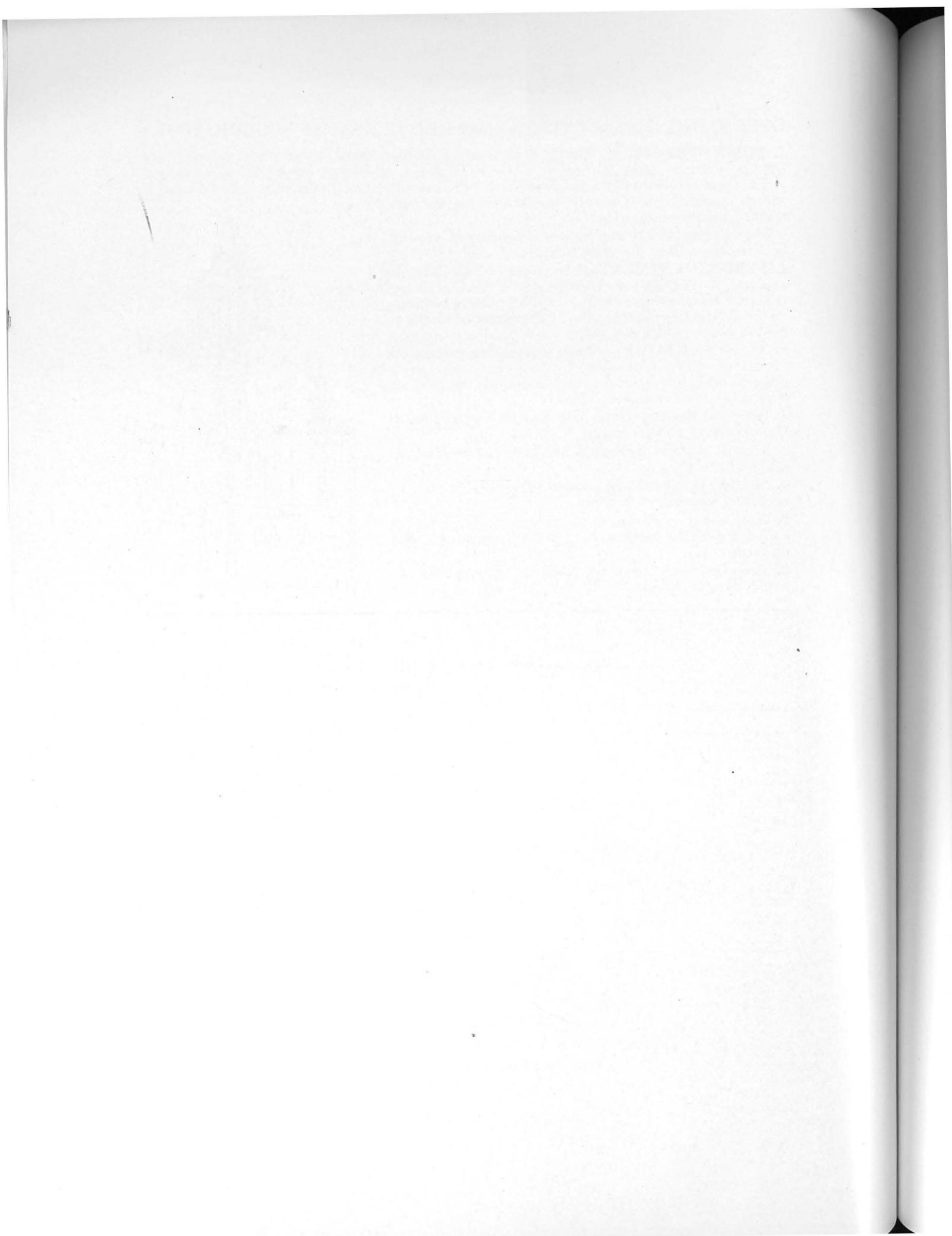
**4.** Should the reservoir be allowed to run dry, it may be necessary to prime each pump.

**5.** If necessary to dismantle the pump unit, be sure that all ball valves are replaced in their proper position. See diagram.

**6.** Periodical cleaning of the reservoir with clean gasoline is recommended. Replace all strainers.



See Next Page for Parts List and Prices.



## McCORD CLASS "SF" LUBRICATOR PARTS LIST

Part No.	Description	Price	Part No.	Description	Price
A-10014	Bracket Screw.....	\$ .15	A-17608	Filler Strainer.....	\$ .40
A-10015	Drain Plug .....	.15	A-17617	Drive Cam.....	2.50
A-10051	Union Nut.....	.25	A-17623	Blind Nut.....	.30
A-10062	Drive Pin.....	.10	A-17628	Nozzle Assy.....	.90
A-10064	Pawl.....	.20	A-17631	Adapter.....	.30
A-10066	Pawl Lever Pin .....	.05	A-17632	Blind Bearing.....	1.00
A-10067	Drive Pawl Pin .....	.10	A-17684	Cover Screw.....	.10
A-10068	Pawl Spring.....	.10	A-17704	Pressure Plug.....	.15
A-10069	Drive Pawl Spring Pin .....	.05	A-18169	Guide Wire .....	.20
A-10071	Washer.....	.05	A-18273	Spring Sleeve.....	.10
A-10072	Brake Pawl Pin Nut .....	.10	A-18287	$\frac{3}{16}$ " Stainless Steel Ball .....	.10
A-10073	Brake Pawl Spring Pin .....	.15	A-18403	Brake Pawl Spacer.....	.20
A-10076	Operating Lever Bolt .....	.20	A-18431	Copper Washer.....	.05
A-10077	Operating Lever Nut.....	.15	A-18432	Gasket .....	.05
A-10549	Check Valve Nipple.....	.25	A-18531	Bull's Eye Glass Disc .....	.60
A-10630	Check Valve Gasket .....	.05	A-18631	Brake Pawl Pin .....	.25
A-10857	Washer.....	.05	A-18848	Cotter Pin.....	.05
A-11562	Check Valve Spring.....	.10	A-18961	$\frac{5}{32}$ " Stainless Steel Ball .....	.10
A-11611	Packing.....	.15	A-19297	Center Bearing Assy.....	.90
A-12221	Gasket.....	.05	A-19372	Pump Spring.....	.50
A-14628	Woodruff Key.....	.05	A-19493	Bull's Eye Body.....	3.00
A-14956	$\frac{1}{4}$ " Stainless Steel Ball .....	.15	A-19584	Gasket .....	.05
A-14961	$\frac{3}{8}$ " Stainless Steel Ball .....	.20	A-19636	Adapter Assy.....	.90
A-15036	Ball Joint Nut Lock Washer .....	.05	A-19754	Ball Joint Assy.....	1.00
A-15088	Steel Union Nut.....	.25	A-19826	Bleeder Screw.....	.10
A-15319	Reservoir Bracket .....	.40	A-19827	$\frac{1}{4}$ " Pump Assy.....	7.00
A-15372	Gasket .....	.05	A-19828	Pump Body.....	2.50
A-16250	Check Valve Body.....	1.00	A-19829	$\frac{1}{4}$ " Plunger.....	.75
A-16251	Check Valve Spring.....	.10	A-20129	Packing Nut .....	.35
A-16327	Rubber Gasket .....	.05	A-20130	Stuffing Box .....	1.00
A-16402	Ratchet .....	1.25	A-20131	Packing Gland .....	.20
A-16436	Set Screw.....	.10	A-20133	Stuffing Box Assy.....	1.95
A-16615	Set Screw.....	.10	A-20134	Packing Nut Lock Nut .....	.25
A-16830	Bull's Eye Glass Retainer..	.75	A-20622	Union Nut.....	.30
A-16849	Cam .....	1.00	A-21019	Flushing Unit Assy.....	1.25
A-17010	Ball Joint Nut .....	.10	A-21130	Gasket .....	.05
A-17176	Bracket Screw Lock Washer .....	.10	A-21436	Gauge Glass Retainer Nut .....	.25
A-17450	Suction Tube Assy.....	.50	A-21437	Pyrex Gauge Glass Disc .....	.50
A-17452	Rocker Arm .....	.75	A-21439	Gauge Glass Reflector .....	.15
A-17453	Rocker Arm Support .....	.50	A-21440	Gasket .....	.05
A-17454	Rocker Arm Support Pin .....	.05	A-21484	Gauge Glass Assy.....	1.60
A-17455	Rocker Arm Pin .....	.10	A-21485	Gauge Glass Well .....	.50
A-17456	Union Sleeve.....	.30	A-21499	Check Valve Assy.....	2.25
A-17487	Drive Shaft Assy.....	2.00	A-21502	Union Sleeve.....	.35
A-17488	Drive Shaft.....	.15	A-21509	Flared Nut for $\frac{5}{16}$ " Tube .....	.25
A-17489	Pawl Lever .....	1.00	A-21585	Operating Lever Assy. (Complete) .....	2.95
A-17501	Pump Screw .....	.10	A-21586	Operating Lever .....	1.95
A-17516	Spring Retainer .....	.15	A-21587	Bull's Eye Assy. Top Outlet) .....	5.00
A-17566	Stop Collar .....	.25	A-21588	$\frac{1}{4}$ " Pump Assy. (Complete)	12.00
A-17571	$\frac{5}{16}$ " Stainless Steel Ball .....	.15			
A-17607	Filler Assy.....	0.60			



## DESCRIPTION OF LOCKWOOD AND CARLISLE RINGS

---

### 24½" DIAMETER H.P. CYLINDER RINGS

#### Installation Instructions

**THE HIGH PRESSURE RING** is of the restricted type. It is so designated because provision has been made to prevent the wearing rings (2) which contact the cylinder from expanding more than a predetermined amount. This is accomplished by plates (1) interposed between the wearing rings and the piston flanges that carry stops (8) which engage lugs (2-A) in the bore of the wearing rings after a predetermined amount of wear has occurred.

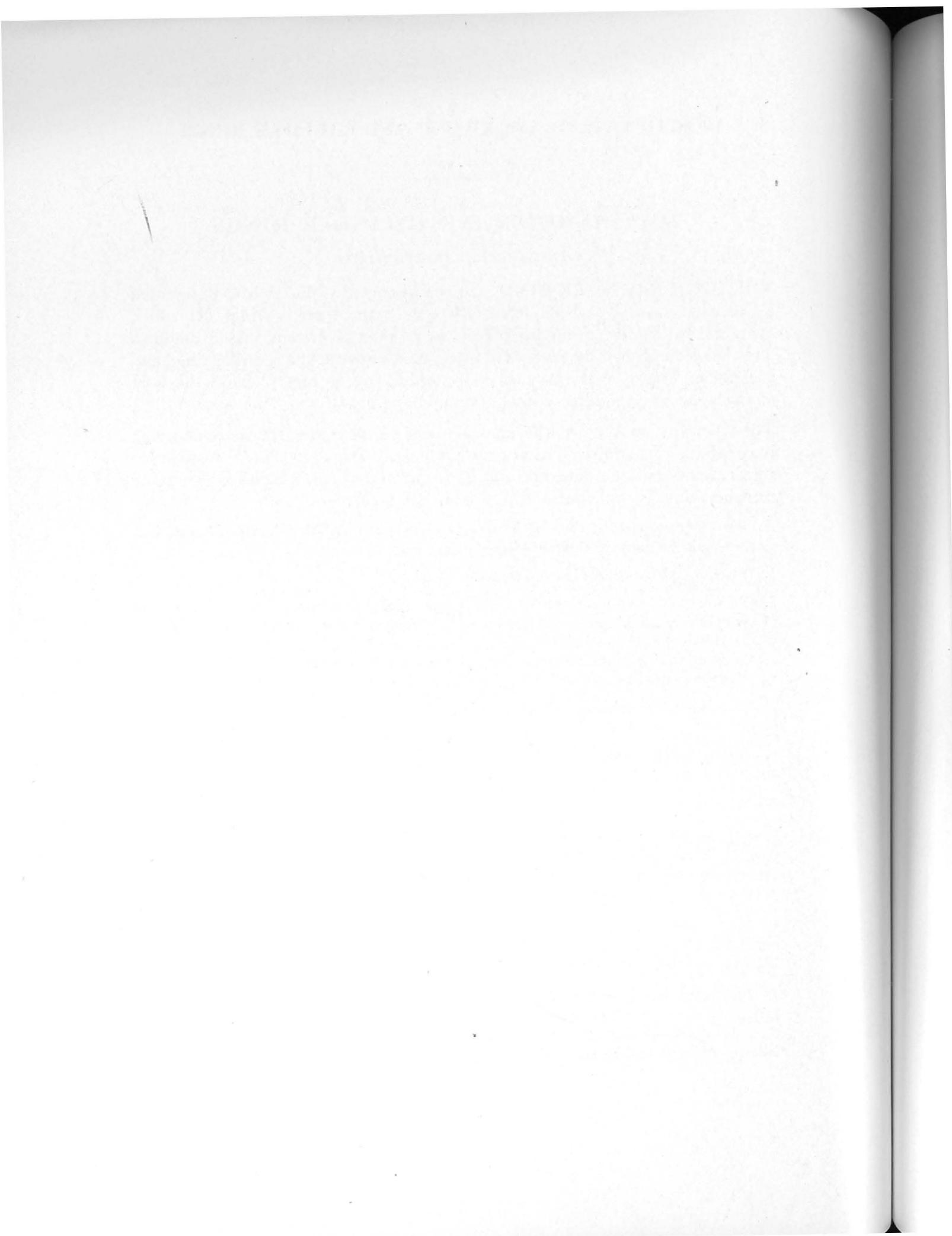
The assembly consists of the various parts listed under the accompanying illustration. In addition, each ring has loosely attached several washers or shims that should be detached and kept for later use in adjusting the spring compression after cylinder and ring wear has occurred.

As previously mentioned, the ring is shipped ready for installation (except for cleaning) which should be made in the following manner:

1. Place the piston on the bottom center.
2. Pass one of the wearing rings (2), with tongue piece (3) removed, from top to bottom of the cylinder, checking the end clearance (A) throughout this passage. At the point of smallest diameter, the end clearance should measure not less than  $\frac{3}{64}$ ". Now check the second wearing ring in the same manner and remove both rings from the cylinder. If the end clearances need increasing, do this by filing.

NOTE: When increasing end clearances of the rings, also file an equal amount off the ends of both tongue pieces (3).

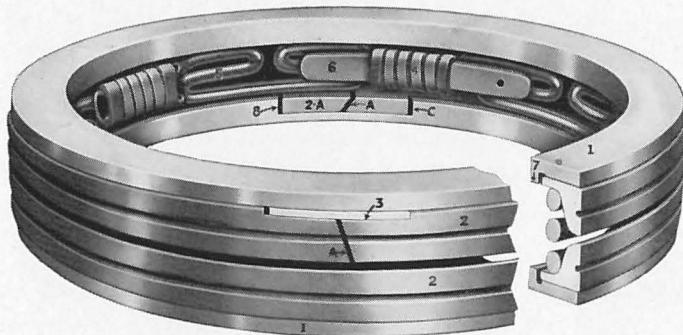
3. Next place the piston on the top center with the follower removed and again wipe clean the exposed part of the cylinder and the piston flange.
4. Now lower into place one of the restricting plates (1) with its flange (7) pointing upward.
5. One of the wearing rings (2) now should be lowered into place, but first place tongue piece (3) in the cylinder opposite the opening in the flange of the restricting plate. Lower the wearing ring into place, making sure the tongue piece fits properly into the recess provided for it and that the restricting lugs (2-A) rest in the recess in restricting plate (1).
6. Now check clearances between restricting lugs (2-A) and the flange stops (8) on the restricting plate (1). The sum total of clearance (C) should be  $\frac{1}{8}$ " or  $\frac{1}{16}$ " on each side. If found less, increase by filing down lugs (2-A).
7. Next take four lengths of  $\frac{1}{16}$ " lead wire approximately 2" long and place on the top surface of the vertical leg of the wearing ring that is in the cylinder at 90° spacing. Insert the second wearing ring (2) in the cylinder along with its plate (1) and install the piston follower which should be bolted down.



## DESCRIPTION OF LOCKWOOD AND CARLISLE RINGS

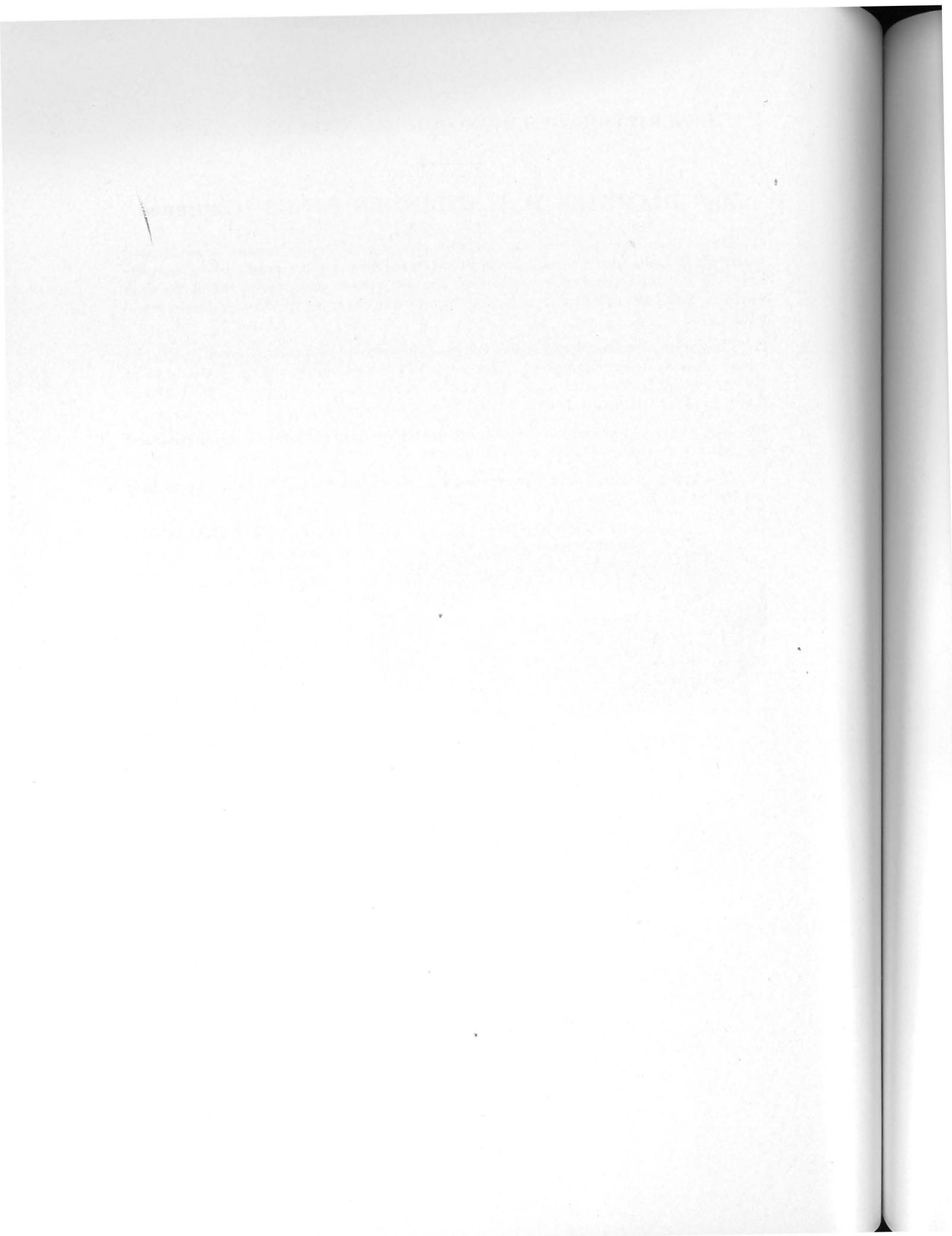
### 24½" DIAMETER H. P. CYLINDER RINGS—Continued

8. The follower and upper wearing ring with plate now should be removed and the lead wires, which have been crushed, should be measured with a micrometer. This measurement will give the vertical clearance between the two wearing rings without which the rings would be clamped and fail to function. This vertical clearance should measure in round figures  $\frac{1}{32}$ ".
9. The spring now should be lowered into place, followed by the second wearing ring, its tongue piece and restricting plate. The cut (A) of this second wearing ring should be at  $180^\circ$  to the cut in the lower ring. The end clearance between restricting lugs (2-A) and the stops (8) should be checked as in the case of the lower ring.
10. Top of the piston and lower surface of the follower again should be wiped clean and the follower lowered into place and bolted down.
11. The cylinder now should receive a coating of cylinder oil and be closed up to keep out foreign matter.



#### H. P. CYLINDER RING

- 1—Restricting Plates.
- 2—Wearing Rings.
- 2-A—Restricting Lugs.
- 3—Tongue Piece.
- 4—Coil Spring.
- 5—Link Spring.
- 6—Tie Strip.
- 7—Restricting Flange.
- 8—Restricting Stops.
- A—End Clearance.
- C—Clearance at Restricting Lugs.



## DESCRIPTION OF LOCKWOOD AND CARLISLE RINGS

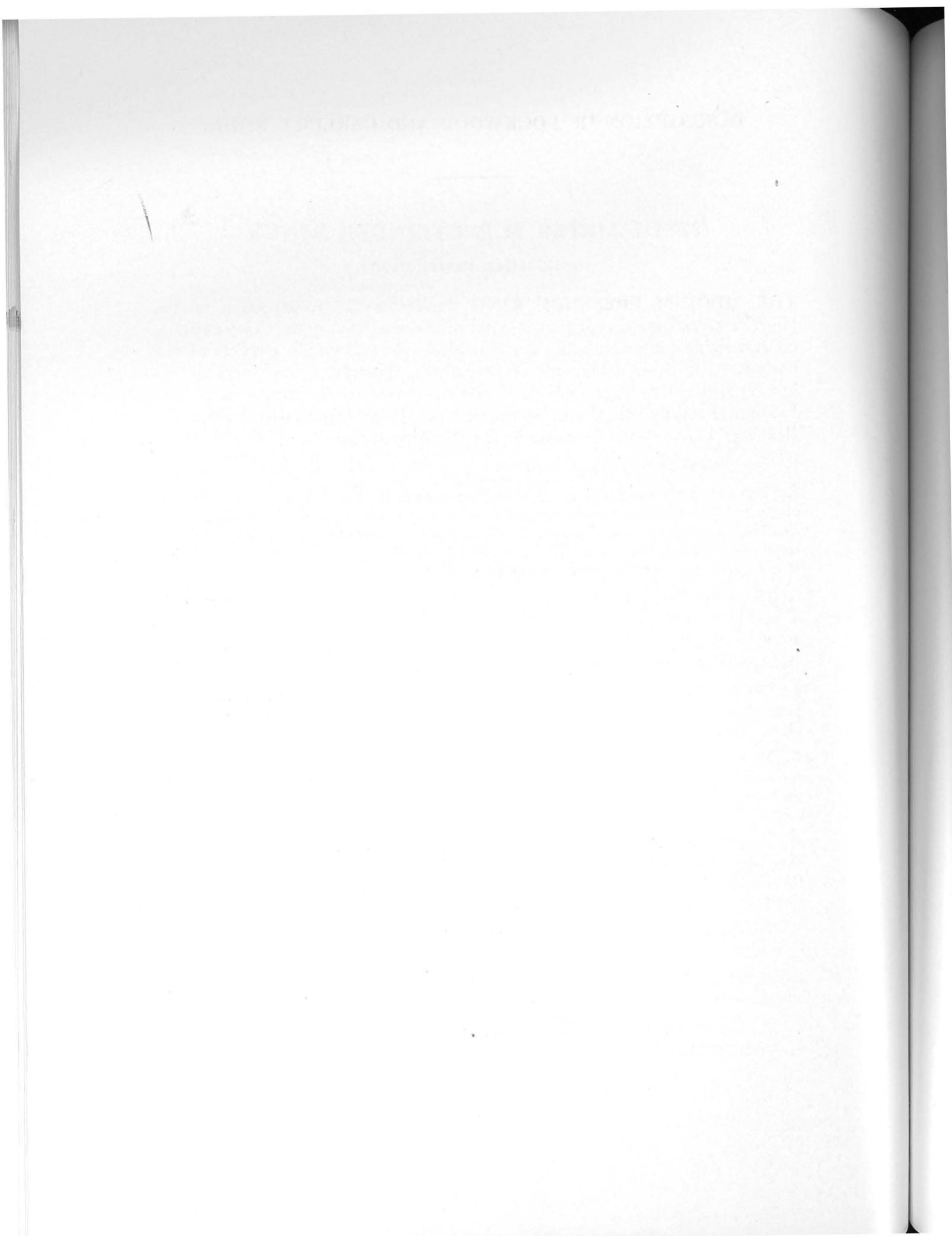
---

### 37" DIAMETER M.P. CYLINDER RINGS

#### Installation Instructions

**THE MEDIUM PRESSURE RING** duplicates the construction of the High Pressure Ring except that it is not of the restricted type. Consequently, no restricting plates and lugs are provided. The assembly consists of the various parts listed under the accompanying illustration and includes adjusting washers or shims which should be preserved for future use. The Medium Pressure Ring, too, is shipped ready for installation (except for cleaning) which should be made in the following manner:

1. Place the piston on the bottom center.
2. Pass one of the wearing rings (2), with tongue piece (3) removed, from top to bottom of the cylinder, checking the end clearance (A) throughout this passage. At the point of smallest diameter, the end clearance should measure not less than  $\frac{1}{16}$ ". Now check the second wearing ring in the same manner and remove both wearing rings from the cylinder. If end clearances need increasing, do this by filing.  
NOTE: When increasing end clearances of the rings, also file an equal amount off the ends of both tongue pieces (3).
3. Next place the piston on the top center with the follower removed and again wipe clean, the exposed part of the cylinder and the piston flange.
4. One of the wearing rings (2) now should be lowered into place, but first place the tongue piece (3) on the piston flange up against the cylinder. On lowering the wearing ring into place, take particular care the tongue piece fits the recess provided for it.
5. Next take four lengths of  $\frac{1}{16}$ " lead wire approximately 2" long and place on the top surface of the vertical leg of the wearing ring that is in the cylinder at 90° spacing. Insert the second wearing ring in the cylinder and install the piston follower which should be bolted down.
6. The follower and upper wearing ring now should be removed and the lead wires, which have been crushed, should be measured with a micrometer. This measurement will give the vertical clearance between the two wearing rings without which the rings would be clamped and fail to function. This vertical clearance should measure in round figures  $\frac{1}{2}$ ".
7. The spring now should be lowered into place, followed by the second wearing ring and its tongue piece. The cut (A) of this second ring should be at 180° to the cut in the lower ring.
8. Top of the piston and lower surface of the follower again should be wiped clean and the follower lowered into place and bolted down.
9. The cylinder now should receive a coating of cylinder oil and be closed up so as to keep out foreign matter.



## DESCRIPTION OF LOCKWOOD AND CARLISLE RINGS

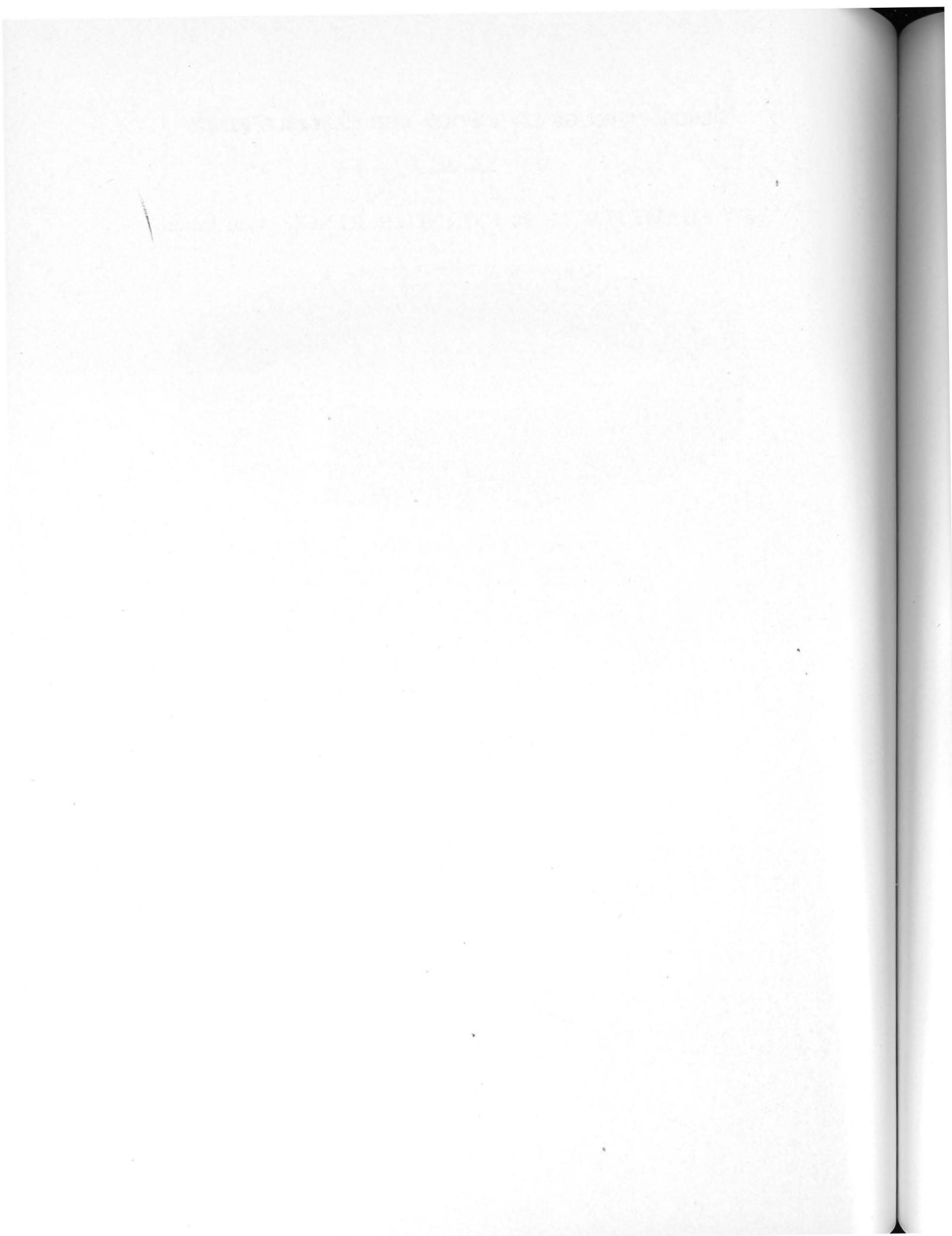
---

### 37" DIAMETER M. P. CYLINDER RINGS—Continued



M. P. CYLINDER RING

2—Wearing Ring. 3—Tongue Piece. 4—Coil Spring.  
5—Link Spring. 6—Tie Strip. A—End Clearance.



## DESCRIPTION OF LOCKWOOD AND CARLISLE RINGS

### 13 AND 13 $\frac{1}{4}$ " DIAMETER H.P. VALVE RINGS

#### Installation Instructions

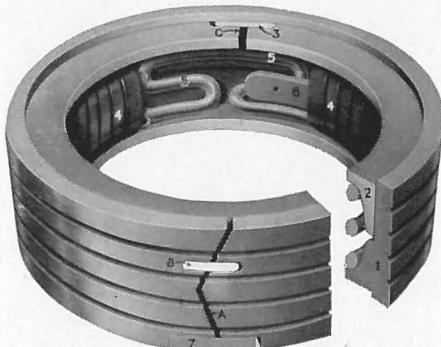
**THE HIGH PRESSURE VALVE RINGS** take a shape distinctly different from the working cylinder rings, as will be noted from the illustrations.

Each piston valve carries an upper and lower ring, the upper ring being 13 $\frac{1}{4}$ " and the lower ring 13" in diameter.

Both rings are of identical construction and consist of the various parts listed under the accompanying illustration. In addition, each ring has loosely attached several washers or shims that should be preserved for later use in adjusting the spring compression after ring and valve wear has occurred.

The Valve Rings, too, are shipped ready for installation (except for cleaning). The installation of these two rings follows different procedures and will be treated separately. The lower valve ring should be applied to the valve spool, with the spool removed from the engine, while application of the upper ring follows very much the procedure outlined for the Medium Pressure Cylinder Ring.

It should be noted the Valve Rings have exhaust and steam edges. The rings must be installed with these edges facing in the direction shown in the illustration of the valve spool, otherwise the rings will fail to function.



H. P. VALVE RING

- 1—Wearing Ring.
- 2—Sealing Ring.
- 3—Tongue Piece.
- 4—Coil Spring.
- 5—Link Spring.
- 6—Tie Strip.
- 7—Tongue Piece.
- 8—Tongue Piece.
- A—End Clearance.
- C—End Clearance.

#### 13" DIAMETER LOWER VALVE RING

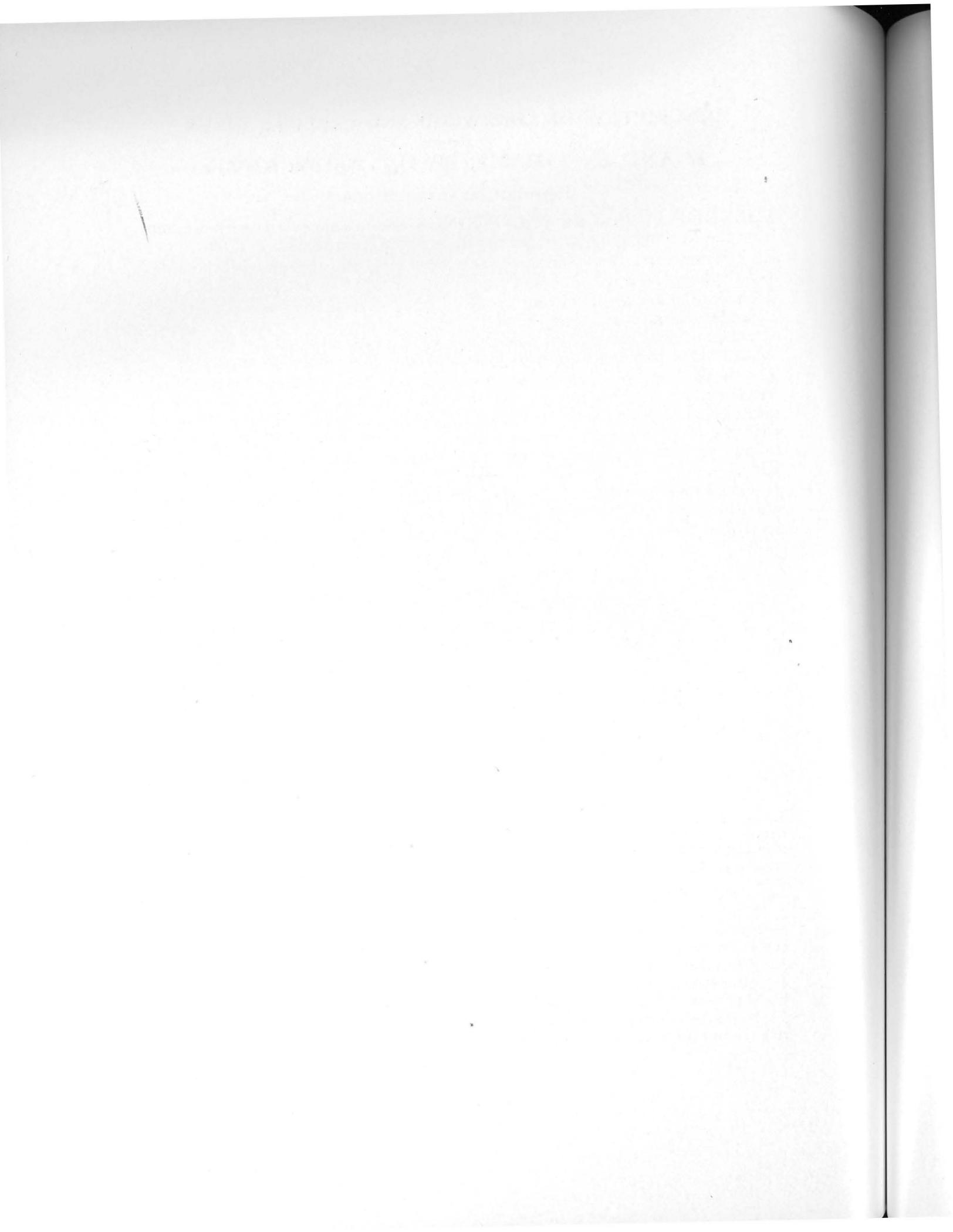
1. As in the case of the cylinder rings, end clearance (A) of the wearing ring (1) should be checked at the outset. This can be accomplished by using the valve spool or by providing a special fixture for holding the ring while inserting and withdrawing from the liner. This clearance, taken by a wedge gauge, should measure not less than  $\frac{3}{64}$ ". If found less, increase the necessary amount by filing and at the same time increase an equal amount the end clearance (C) of sealing ring (2) as well as the clearances of all three tongue pieces.

2. Now proceed and apply the ring to the spool, which should be stood on end and fastened securely with its lower end uppermost and with the followers removed and all parts thoroughly cleaned.

3. First take wearing ring (1) and lower into place.

4. After removing tongue piece (3) from sealing ring (2), insert the sealing ring into the barrel of wearing ring (1), making sure tongue piece (8) is in place.

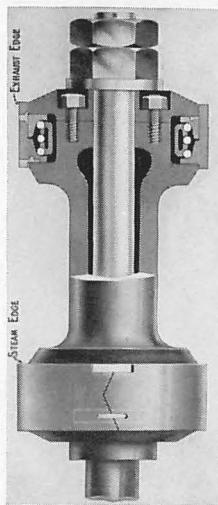
5. Next take four lengths of  $\frac{1}{16}$ " lead wire about 1" long and place on the top side of sealing ring (2) near its outer edge at 90° spacing and install follower which should be bolted down.



## DESCRIPTION OF LOCKWOOD AND CARLISLE RINGS

### 13 and 13 $\frac{1}{4}$ " DIAMETER H. P. VALVE RINGS—Continued

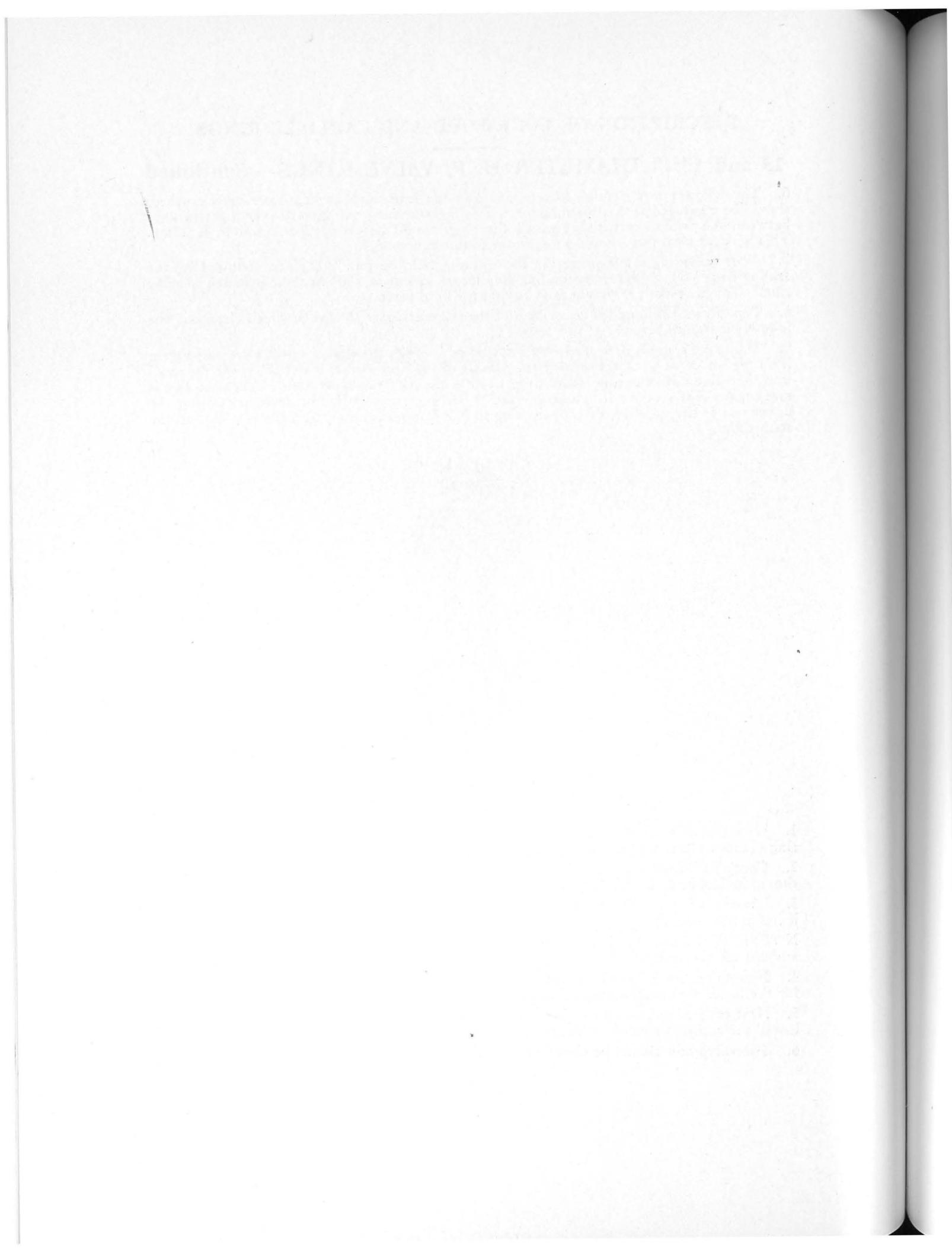
6. The follower now should be removed and the lead wires, which have been crushed, should be measured with a micrometer. This measurement will give the vertical clearance between the two rings without which the rings would be clamped and fail to function. This vertical clearance should measure in round figures  $\frac{1}{2}$ ".
7. After removing sealing ring (2) the spring should be put into place, followed by the sealing ring. On applying the sealing ring locate its cut at 180° to the cut in the wearing ring. Tongue piece (3) should now be dropped into place.
8. Top of the spool and lower surfaces of the follower again should be wiped clean and the follower bolted in place.
9. The valve spool is now ready for installation. Turn the engine so that the valve stem is on the top center. After coating the outside of the ring with cylinder oil, lower the spool into the valve until the ring comes to rest on the taper of the lower liner. Since the ring is machined slightly larger in diameter than the liner, it will be found necessary to tap the upper end of the spool to collapse the ring so it will enter the liner and come to rest on the stem collar.



Valve Assembly

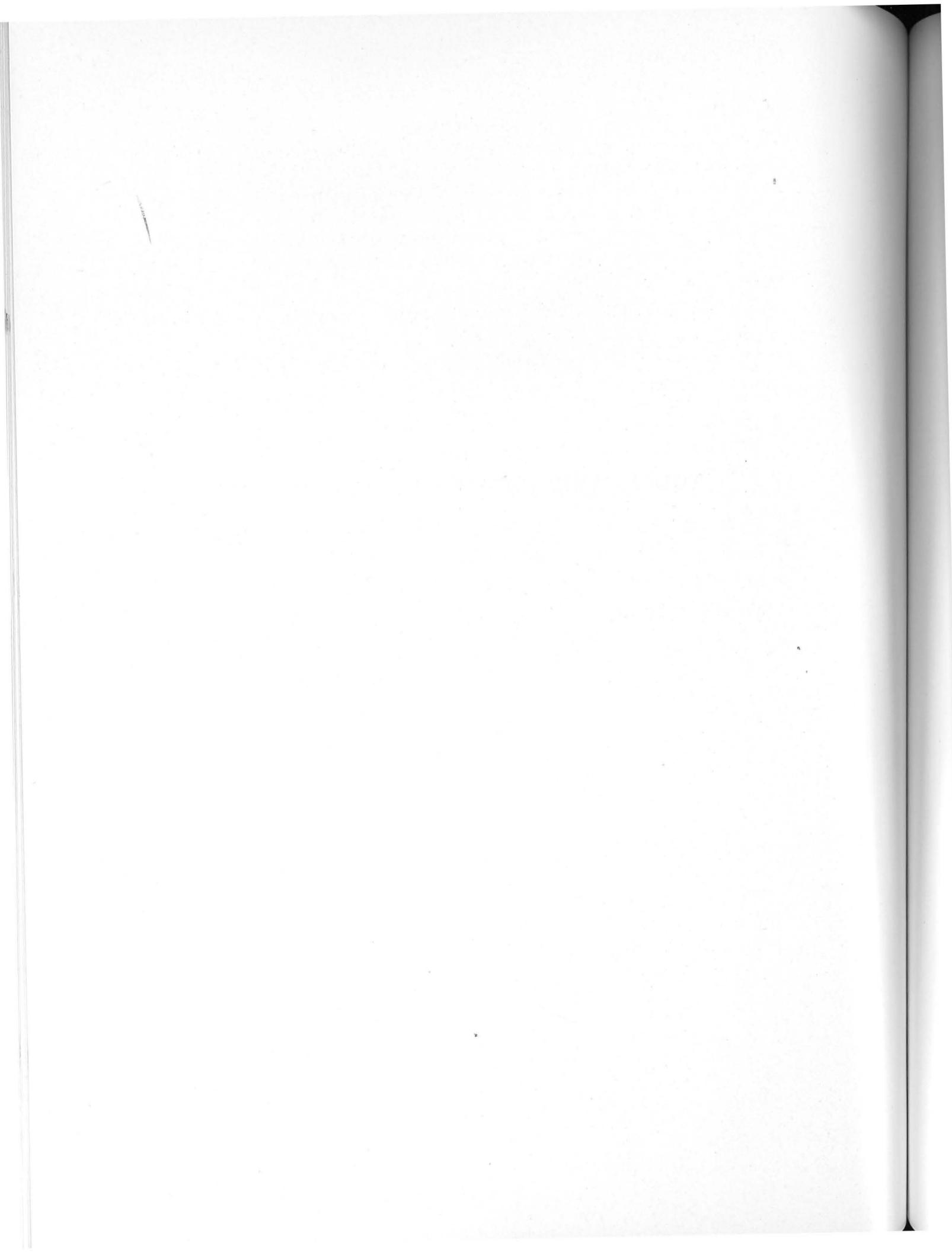
### 13 $\frac{1}{4}$ " DIAMETER UPPER VALVE RING

1. With the valve spool already in place, coat the liner with cylinder oil and lower wearing ring (1) into place, tapping lightly to collapse the ring so it will enter the liner.
  2. Check end clearance (A) with a feeler gauge. If found less than  $\frac{3}{64}$ ", the clearance should be increased by filing.
  3. Lower sealing ring (2) into place and check end clearance (C) and increase by filing if found less than  $\frac{3}{64}$ ".
- NOTE: When increasing end clearances of the wearing and sealing rings, also file an equal amount off the ends of all tongue pieces.
4. Now take "leads" to check the vertical clearance between the two rings as described for the lower ring in paragraph 5 above.
  5. Next proceed as in the case of the lower ring. After removing follower and sealing ring, install the spring, followed by the sealing ring, its tongue piece and the valve follower.
  6. The valve now should be closed up to keep out foreign matter.



**SECTION IV**  
**TOOLS, WRENCHES AND SPARE PARTS**

Tools and Wrenches.....	48
Packing and Gasket Information.....	48
List of Spare Parts.....	49
Sketches of Special Wrenches.....	51



## SECTION IV

### Tools and Wrenches

Each vessel will have a complete set of all necessary standard open wrenches mounted on the hardwood wrench board. A complete set of all necessary special wrenches and tools is provided. The proper identification of the special wrenches and tools is shown on attached sketches.

### Spare Parts

All the spare parts furnished with the engine are listed on attached sheets.

### Packing and Gaskets

For the cylinder heads, covers and etc., high pressure compressed asbestos graphited gaskets are used. Between the cylinder joints high grade  $\frac{1}{2}$ " thick asbestos woven wire inserted gaskets are provided. For water service a good grade of rubber gasket is used. For the air and bilge pump plungers and rod, a good grade of soft flax graphited packing is provided. A semi-metallic packing of the All-pax type is used for the piston rod and valve stems of the reversing and turning engines. On the throttle valve stem and butterfly valve stem a graphited fiber asbestos yarn packing, good for 600° temperature is used.

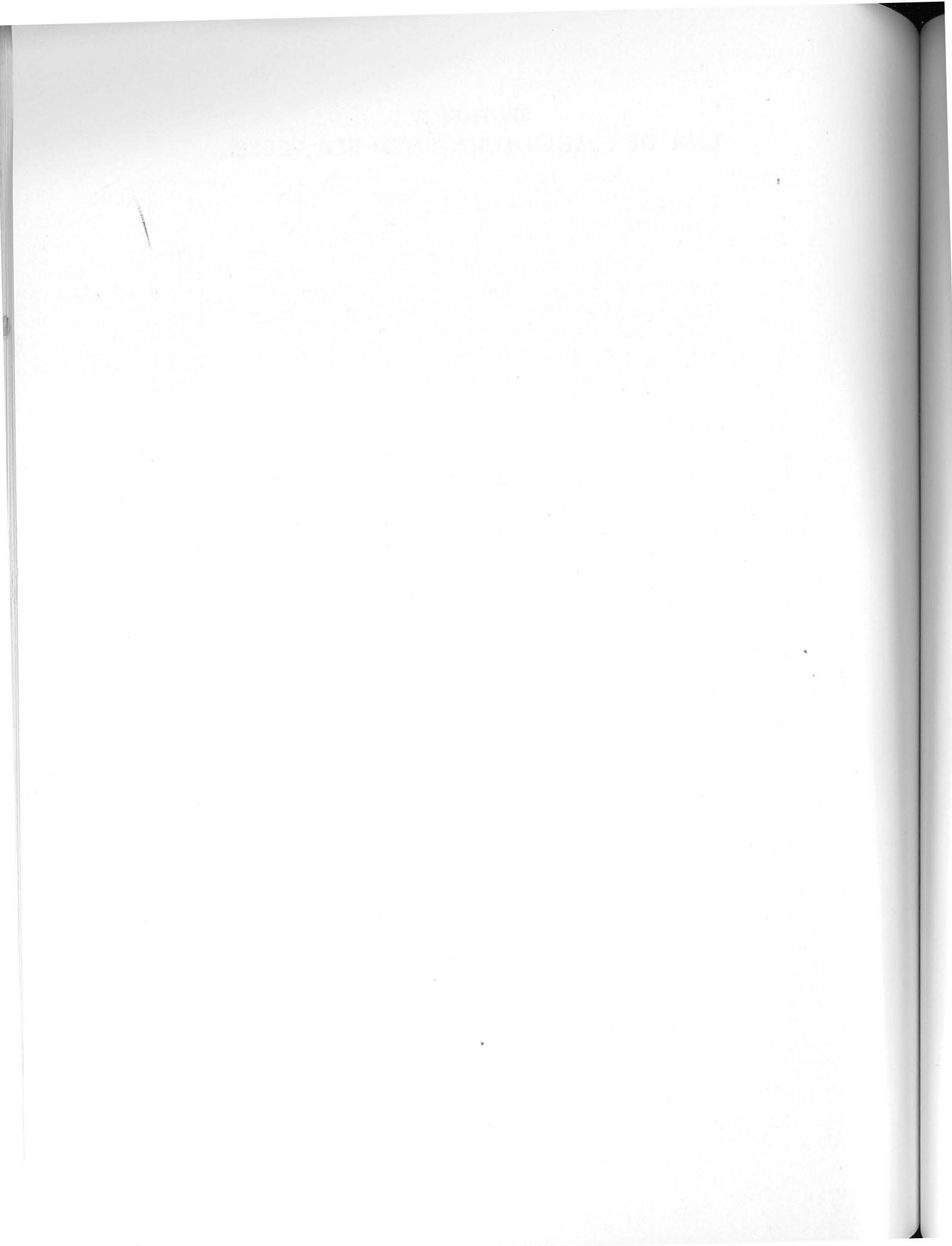
### Size of Packing

Evaporator Feed Pump.....	1 Set, 6 Rings,	$\frac{3}{8}$ " Sq., ea.	$8\frac{3}{4}$ " lg., Graph. Fibre Asb. Yarn
Air Pump Rod.....	1 Set, 6 Rings,	1" Sq., ea.	$17\frac{1}{2}$ " lg., Graph. Fibre Flax
Bilge Pump Rams.....	2 Set, 5 Rings ea.,	1" Sq., ea.	$20\frac{1}{2}$ " lg., Graph. Fibre Flax
Throttle Valve.....	1 Set, 4 Rings,	$\frac{1}{2}$ " Sq., ea.	$8\frac{3}{4}$ " lg., Graph. Fibre Asb. Yarn
Butterfly Valve.....	1 Set, 4 Rings,	$\frac{9}{16}$ " Sq., ea.	8" lg., Graph. Fibre Asb. Yarn
Starting Valve.....	3 Set, 3 Rings ea.,	$\frac{1}{4}$ " Sq., ea.	4" lg., Graph. Fibre Asb. Yarn
Bilge Suction Chest, Ford.....	2 Set, 3 Rings ea.,	$\frac{1}{4}$ " Sq., ea.	4" lg., Graph. Fibre Asb. Yarn
Bilge Suction Chest, Aft.....	1 Set, 3 Rings,	$\frac{1}{4}$ " Sq., ea.	4" lg., Graph. Fibre Asb. Yarn
Bilge Pump Disch. Chest.....	1 Set, 3 Rings,	$\frac{1}{2}$ " Sq., ea.	$6\frac{1}{2}$ " lg., Graph. Fibre Asb. Yarn
Bilge Switch Valve.....	1 Set, 3 Rings,	$\frac{5}{16}$ " Sq., ea.	$5\frac{1}{4}$ " lg., Graph. Fibre Asb. Yarn
Reverse Engine Piston Rod . . .	1 Set, 3 Rings,	$\frac{9}{16}$ " Sq. . . . .	Trade Name, Allpax Size B
Reverse Engine Valve Stems . .	2 Set, 4 Rings ea.,	$\frac{5}{16}$ " Sq. . . . .	Trade Name, Allpax Size $\frac{5}{16}$ "
Turning Engine Piston Rod . . .	1 Set, 4 Rings,	$\frac{7}{16}$ " Sq. . . . .	Trade Name, Allpax Size A
Turning Engine Valve Stems . .	2 Set, 4 Rings ea.,	$\frac{5}{16}$ " Sq. . . . .	Trade Name, Allpax Size $\frac{5}{16}$ "
Thrust Bearing.....	2 Set, 2 Rings ea.,	$\frac{7}{8}$ " Sq., ea.	51" lg., Graph. Fibre Asb. Yarn

94

**SECTION IV**  
**LIST OF SPARES FURNISHED PER VESSEL**

Quantity	Name of Part	Item No.	Dwg. No.
1	Connecting Rod Box and Cap.....	2	5947-2
2	Connecting Rod Bolt with Nut.....	3, 4	5947-2
4	Crosshead Pin Box Halves.....	9	5947-2
4	Crosshead End Bolt with Nut.....	10, 11	5947-2
2	Main Bearing Bolt with Nuts.....	9, 10, 11	5955-2
6	Coupling Bolt with Nut.....	15, 16, 17, 20	5928-2
12	Piston Follower Studs.....	5	8986-4
6 Sets	Air Pump Valve Discs.....		5965-2
1	Bilge Suction Chest Valve.....	24	5949-2
		24	8976-4
1	Bilge Suction Chest Valve Seat.....	25	8976-4
		25	5949-2
1	Bilge Suction Chest Valve.....	4	5949-2
		6	8975-4
		4	8976-4
1	Bilge Suction Chest Valve Seat.....	5	5949-2
		5	8975-4
		5	8976-4
1	Bilge Discharge Chest Valve and Seat.....	14, 15	8975-4
2 Sets	H. P. and M. P. Piston Rod Packing.....		
1 Set	L. P. Piston Rod Packing.....		
3 Sets	H. P., M. P. and L. P. Valve Spindle Packing.....	15	8990-4
		33	5960-2
		33	5961-2
1 Set	H. P. Piston Rings and Springs.....	10	8986-4
1 Set	M. P. Piston Rings and Springs.....	10	8985-4
1 Set	Piston Valve Top and Bottom Rings and Springs.....	13, 14	8990-4
1	L. P. Piston Ring.....	10, 15, 16	8987-4
1	Compression Spring for L. P. Piston.....	13	8987-4
26	Compression Spring for L. P. Piston.....	14	8987-4
1 Set	Thrust Block Pad—Ahead Face.....	Kingsbury No. 462800	
4	Lubricator Sight Feed Glasses.....		
4	Springs for Lubricator.....		
8	Gaskets for Lubricator.....		
1	Pump Unit complete for Lubricator.....		
6	1½" x 4⅞" Studs.....	H. P. Cylinder Cover	
6	1½" C. P., S. F. Hex Nuts.....	H. P. Cylinder Cover	



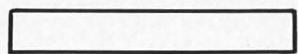
SECTION IV  
LIST OF SPARES FURNISHED PER VESSEL—Continued

Quantity	Name of Part	Item No.	Dwg. No.
6	1 $\frac{1}{4}$ " x 4 $\frac{1}{8}$ " Studs.....	Valve Chest Cover	
6	1 $\frac{1}{4}$ C. P., S. F. Hex Nuts.....	Valve Chest Cover	
1	Upper Main Bearing.....	1, 3, 5, 7	5955-2
1	Lower Main Bearing.....	2, 4, 6, 8	5955-2
1	H. P. Cyl. Relief Valve Spring.....	6	8998-4
1	M. P. Cyl. Relief Valve Spring.....	5	8998-4
1	L. P. Valve Chest Relief Valve Spring.....	7	8998-4
1	L. P. Cylinder Relief Valve Spring.....	5	8996-4

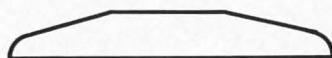
ЧИМОГИА  
Рекомендовано для отечественных РВЗА № 1211

—  
Р.  
О.

HANGING BAR FOR  
PISTON ROD  
DWG. No 18178-8

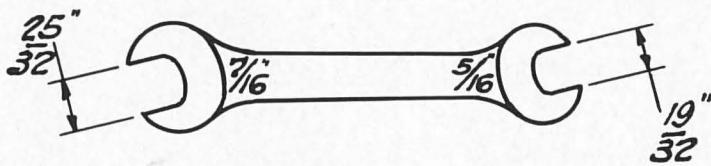


FOR H.P. & M.P.

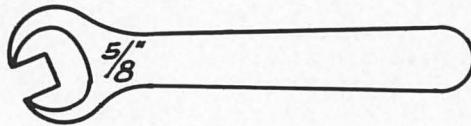


FOR L.P.

DOUBLE HEAD WRENCH  
FOR GENERAL USE  
ON WRENCH BOARD



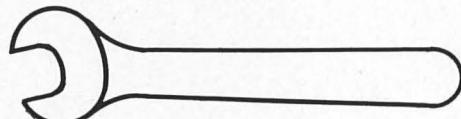
SET SCREW WRENCH  
ON WRENCH BOARD

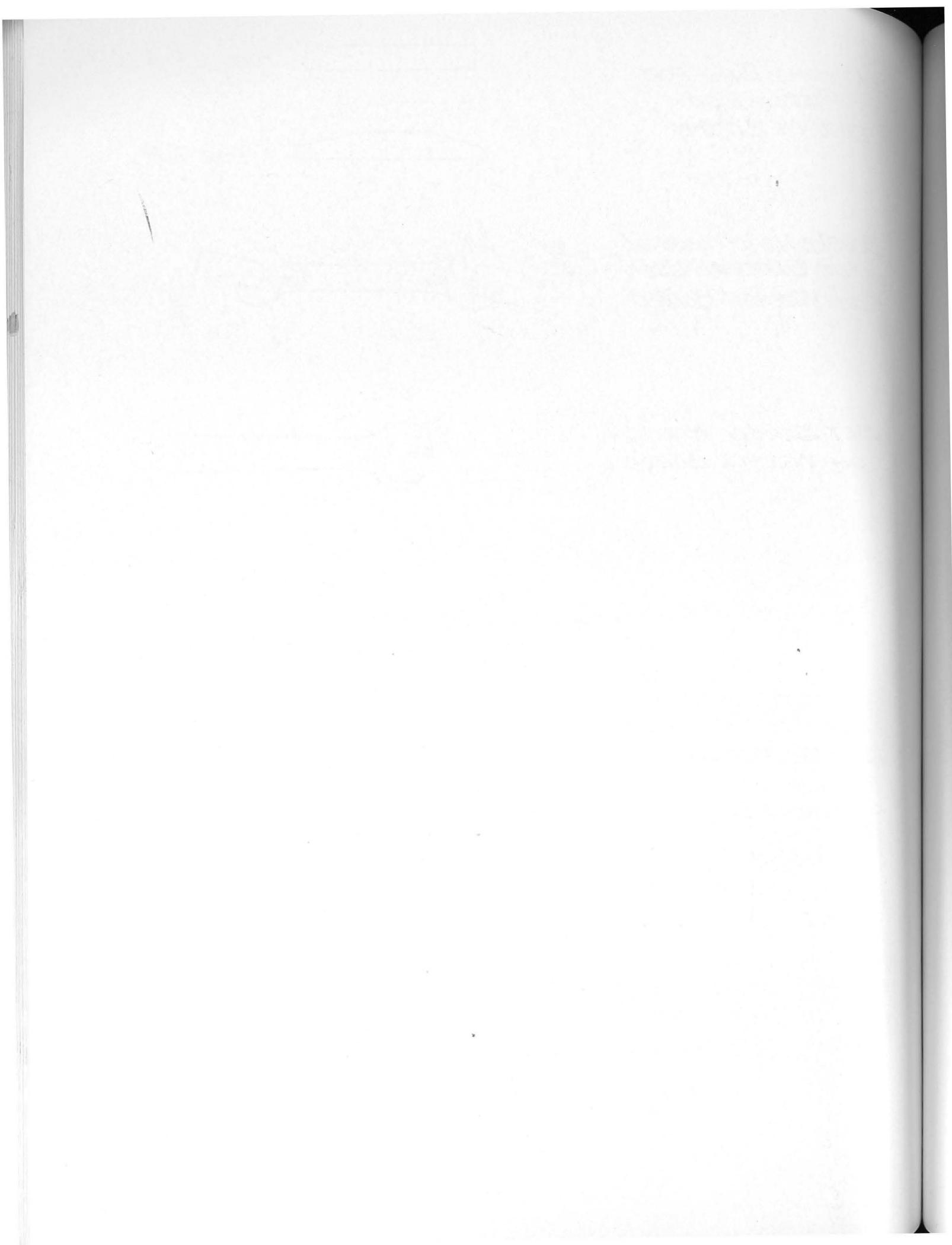


2" WRENCH -  $3\frac{1}{8}$ " OPENING

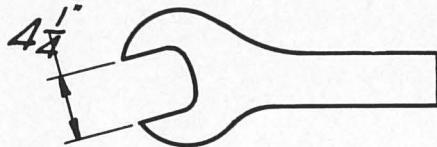
STD. WRENCHES  
FOR GENERAL USE  
ON WRENCH BOARD

$\frac{1}{8}$ "	"	$2\frac{5}{16}$ "	"
$\frac{3}{16}$ "	"	$2\frac{3}{4}$ "	"
$\frac{5}{16}$ "	"	$2\frac{9}{16}$ "	"
$\frac{1}{2}$ "	"	$2\frac{5}{8}$ "	"
$\frac{3}{8}$ "	"	$2\frac{3}{16}$ "	"
$\frac{1}{4}$ "	"	$2"$	"
$\frac{5}{16}$ "	"	$1\frac{13}{16}$ "	"
$\frac{3}{16}$ "	"	$\frac{5}{8}$ "	"
$\frac{1}{8}$ "	"	$\frac{7}{16}$ "	"
$\frac{1}{16}$ "	"	$\frac{1}{16}$ "	"
$\frac{3}{32}$ "	"	$\frac{1}{4}$ "	"
$\frac{5}{64}$ "	"	$\frac{1}{16}$ "	"
$\frac{1}{32}$ "	"	$\frac{7}{8}$ "	"
$\frac{1}{64}$ "	"	$\frac{1}{16}$ "	"
$\frac{1}{128}$ "	"	$\frac{1}{2}$ "	"

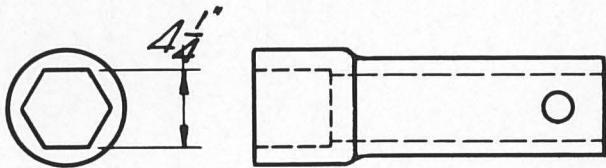




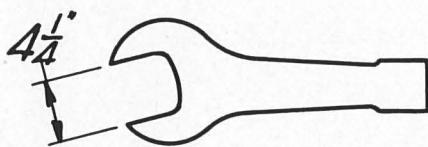
WRENCH FOR VALVE  
STEM NUT  
DWG. № 18354-8



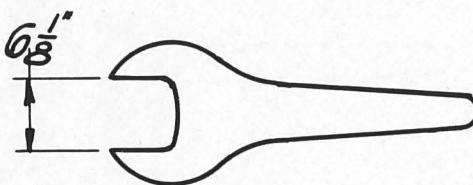
SOCKET WRENCH FOR VALVE  
STEM CHECK NUT  
DWG. № 18353-8



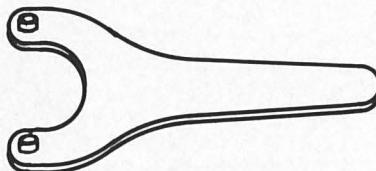
WRENCH FOR CRANKSHAFT  
COUPLING BOLTS  
DWG. № 18352-8



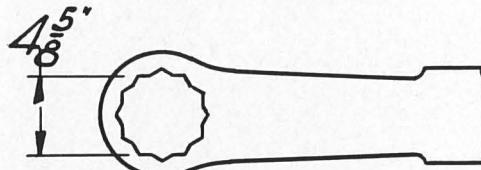
WRENCH FOR AIR PUMP  
LEVER PIN  
DWG. № 18351-8



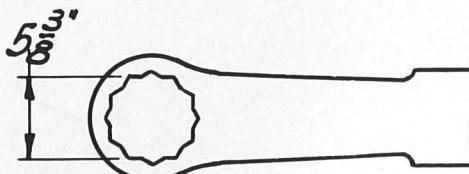
SPANNER WRENCH FOR  
AIR PUMP ROD NUT  
DWG. № 18350-8

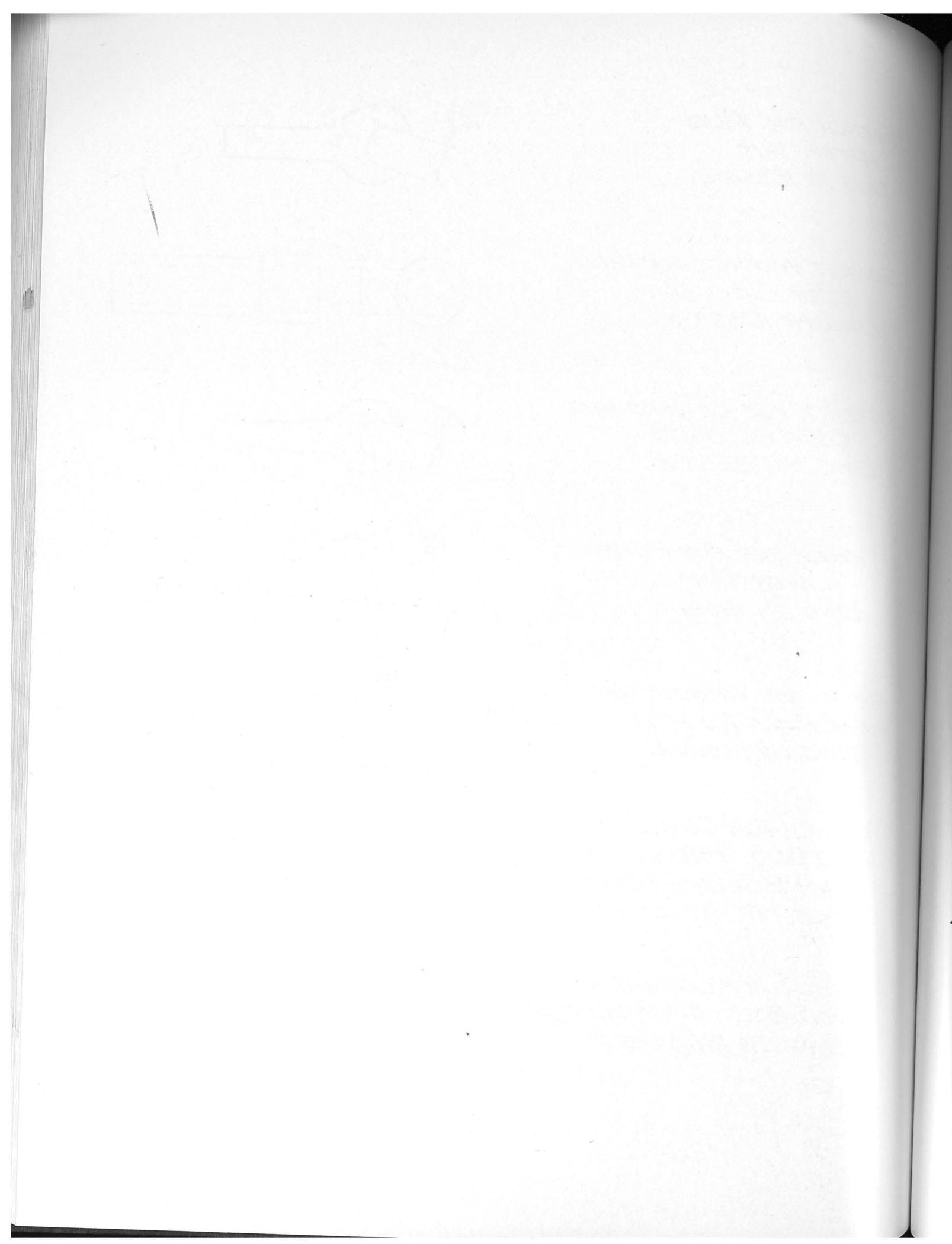


WRENCH FOR CONNECTING  
ROD BOLT-X-H'D. END &  
MAIN BEARING BOLT  
DWG. № 18349-8

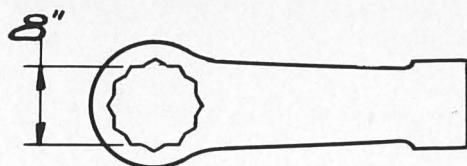


WRENCH FOR CONNECTING  
ROD BOLT - CRANK END  
DWG. № 18348-8

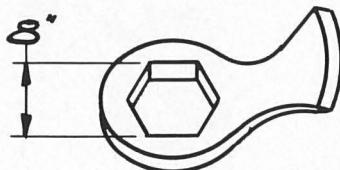




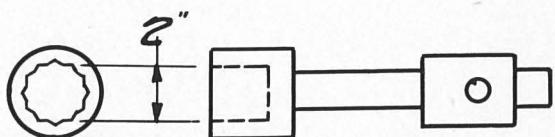
WRENCH FOR PISTON ROD  
NUT - LOWER END  
DWG. № 18344-8



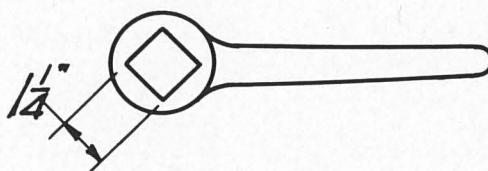
WRENCH FOR PISTON ROD  
NUT - UPPER END  
DWG. № 18343-8



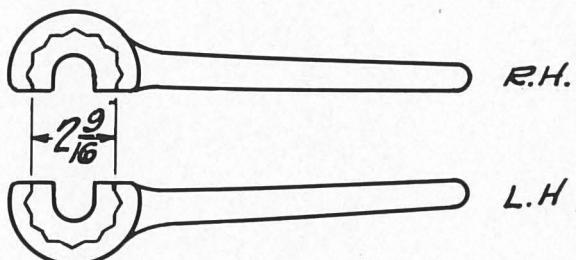
SOCKET WRENCH FOR PISTON  
FOLLOWER STUD  
DWG. № 18342-8



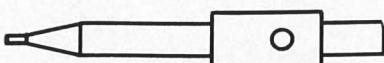
WRENCH FOR REVERSE SHAFT  
ADJUSTING LEVER BOLT  
DWG. № 18346-8



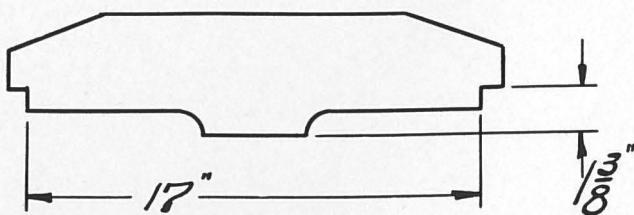
WRENCH FOR ECCENTRIC BOLT  
DWG. № 18345-8



SCREW DRIVER FOR  
M.P. & L.P. FALSE FACE  
DWG. № 18341-8

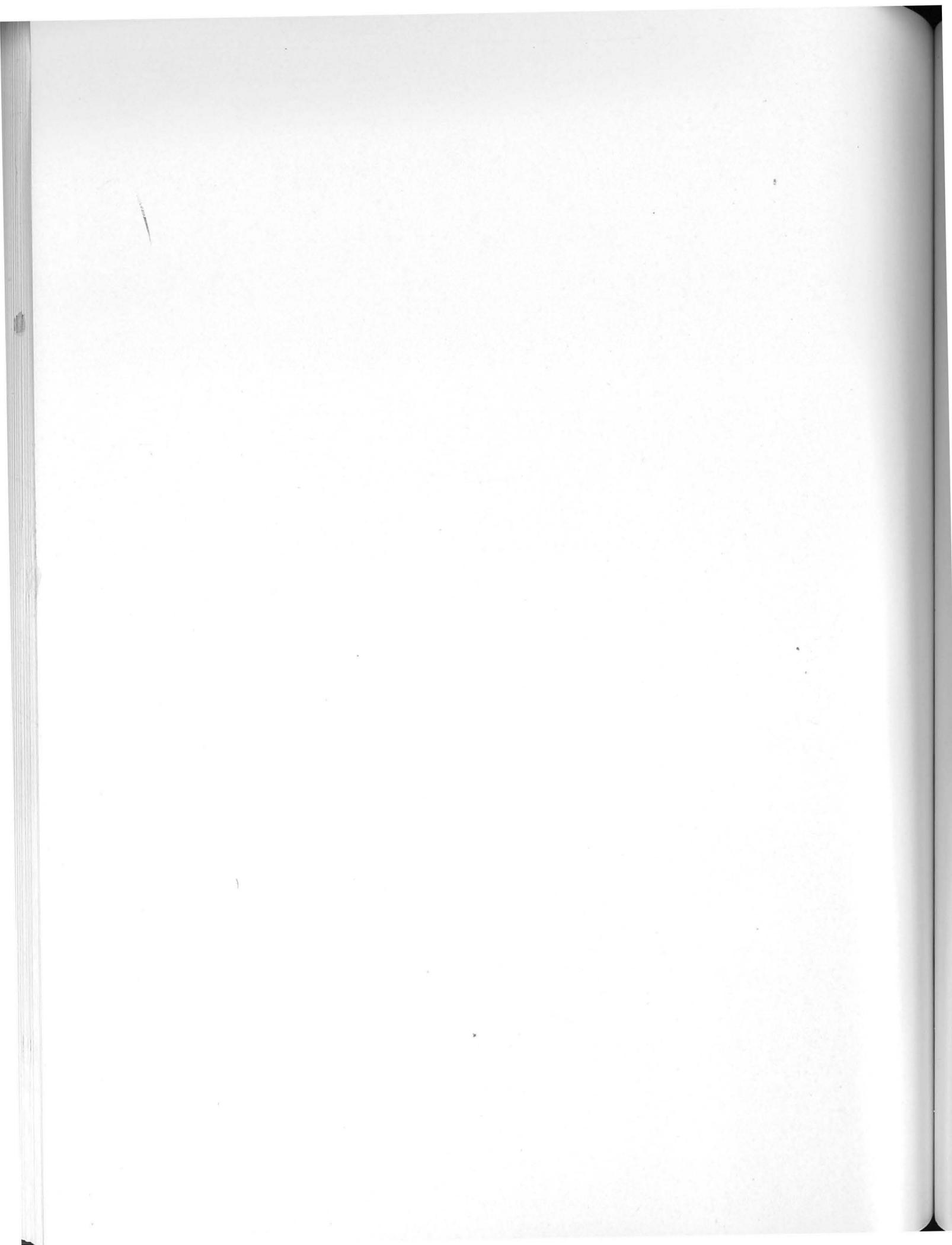


MAIN BEARING GAGE  
DWG. № 18340-8

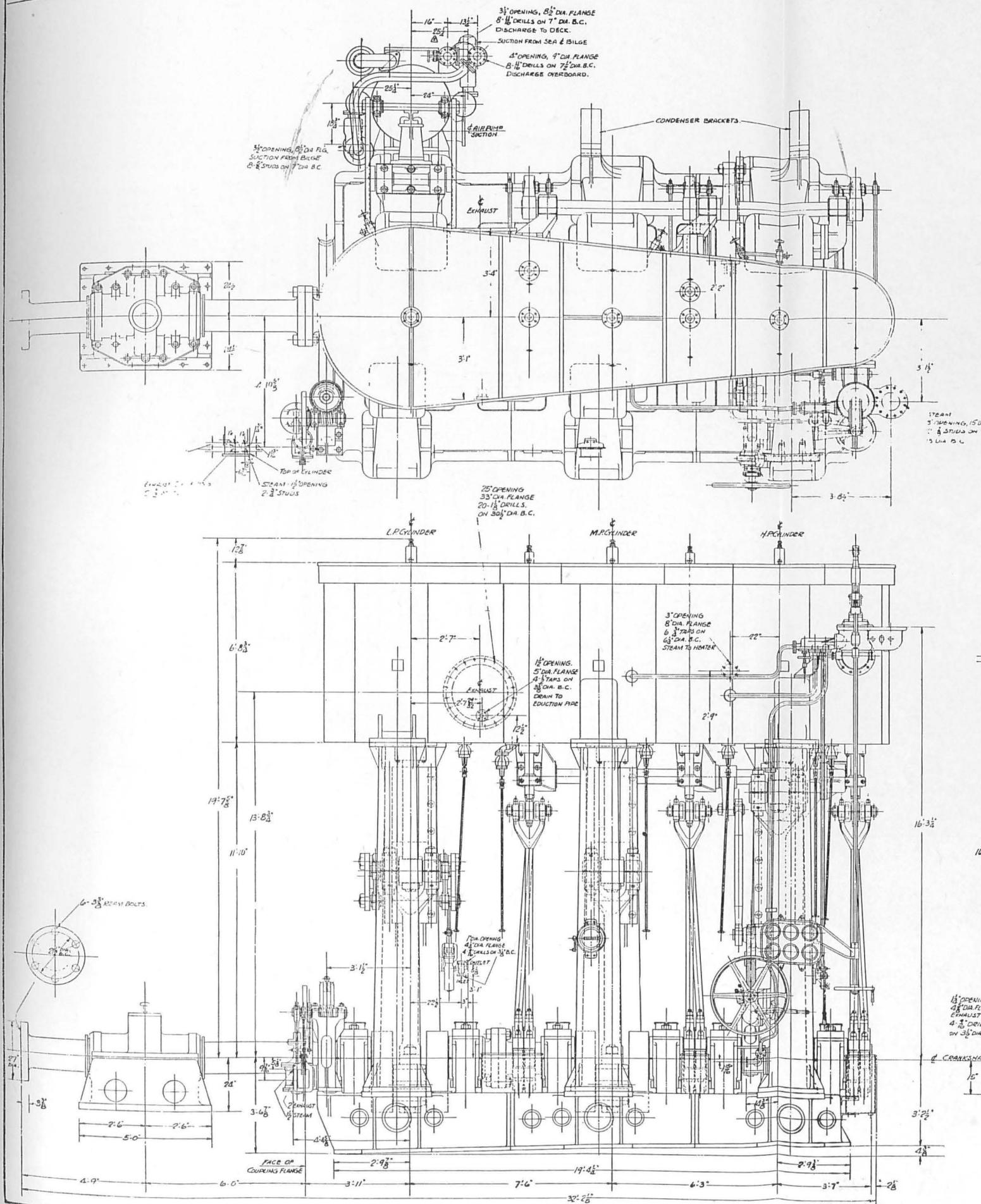




**SECTION V**  
**Drawings and Illustrations**



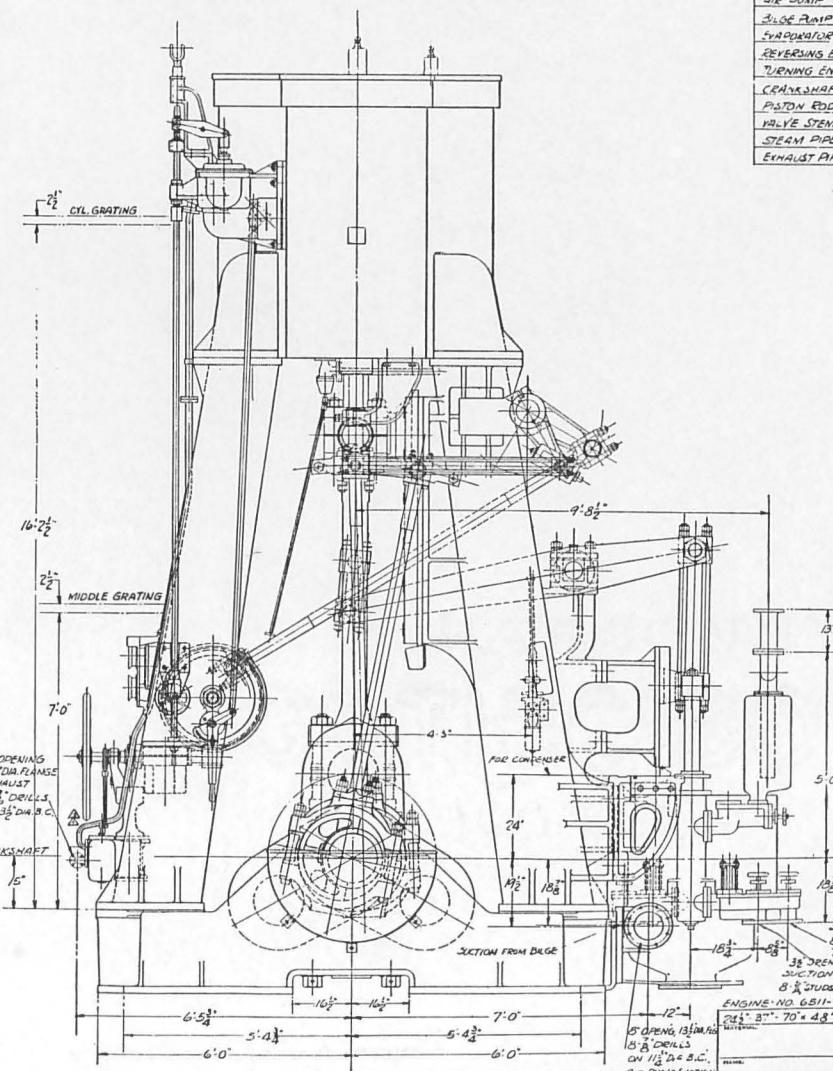
5972-2



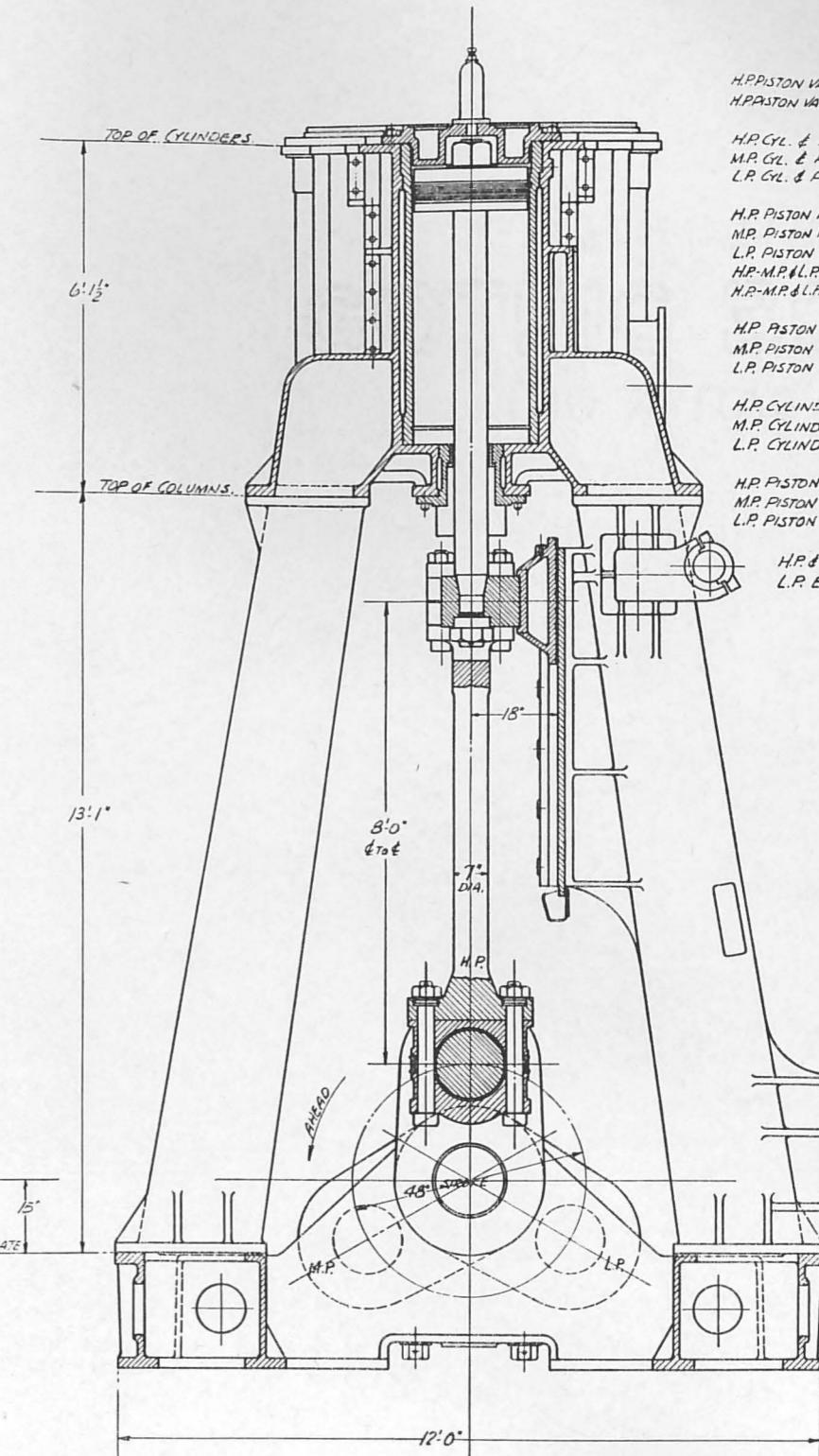
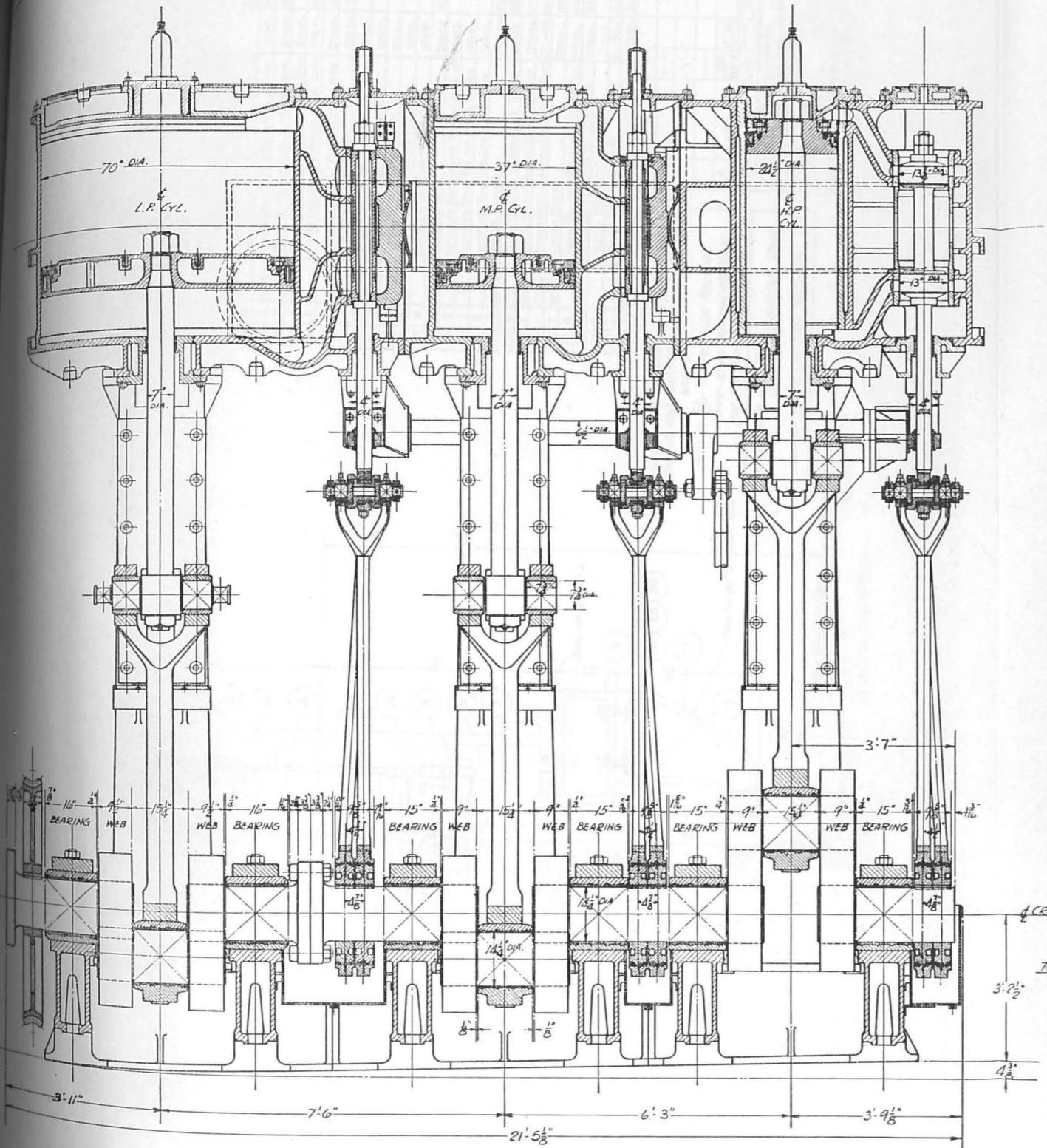
LIST OF ASSEMBLIES.			
NAME OF DRAWING	H.P.	M.P.	L.P.
FLINDERS	-5936-2	5432-2	5933-2
FLINDER COVERS	8901-4	8908-4	8910-4
HOUSINGS - FRONT	8926-4	8929-4	8923-4
HOUSINGS - BACK	8930-4	8924-4	8921-4
PISTONS	8986-4	8985-4	8987-4
PISTON POD STUFFING BOX	18148-8	18147-8	18147-8
VALVES	8990-4	8960-2	5961-2
ALIVE CHEST COVERS	18142-8	18146-8	18144-8
REVERSE SHAFT BRACKETS	18135-8	8938-8	8899-8
RELIEF VALVES	8998-4	8998-4	8998-4
RELIEF VALVES	—	—	8996-4

NAME OF DRAWING	DRAWING NUMBER	NAME OF DRAWING	DRAWING NUMBER
PLATE	5915-2	REVERSING ENGINE	5969-2
UNDATION DRILLING	5948-2	TURNING ENGINE	5968-2
IN BEARING	5955-2	THROTTLE VALVE	5957-2
SHAFT	5929-2	STARTING VALVE	5979-4
CONNECTING ROD	5947-2	SEW ARRANG. OF AIR & BULGE PUMP	5959-2
ROSSHEAD	5956-2	HANDLING GEAR	5974-2
ROSSHEAD GUIDE PLATE	8933-2	JIL PIPING ARRANGEMENT	5953-2
ROSSHEAD GUIDE GIB - ROD	8932-2	CYLINDER LUBRIC. ARRANG.	5946-2
ROSSHEAD GUIDE GIB - AFT	8938-2	WATER SERVICE PIPING	5964-2
CENTRIC & ROD	5962-2	CYLINDER LASSING	5951-2
WIK BAR & BLOCK	5958-2	THRUST SHAFT	1815-1 KINSHAW 4462-00
VERSE SWIFT & LEVERS	8965-4	THRUST BLOCK	
OPERATOR FEED PUMP	5967-2	COUNTER & INDICATOR DRIVE	5771-2
		DRAIN VALVE ARRANGEMENT	5975-2

<b>DR. DRAPE</b>	<b>24" DIAM</b>	<b>26" STROKE</b>
<b>ULGE PUMP</b>	<b>1½" DIA</b>	<b>26" STROKE</b>
<b>EVAPORATOR PUMP</b>	<b>2" DIA</b>	<b>4" STROKE</b>
<b>REVERSING ENGINE</b>	<b>6" DIA</b>	<b>7" STROKE</b>
<b>BURNING ENGINE</b>	<b>32" DIA</b>	<b>7" STROKE</b>
<b>SHAFTSHAFT</b>	<b>16.25" DIA</b>	
<b>STON ROD</b>		<b>7" DIA</b>
<b>VALVE STEM</b>		<b>4" DIA</b>
<b>STEAM PIPE</b>		<b>6" DIA</b>
<b>CHRAULST PIPE</b>		<b>25" DIA.</b>



6-5-4



H.P. PISTON VALVE PKG. RING OVERTAKE, UPPER CYLBORE (TOP  $\frac{3}{8}$ "  
BOT.  $\frac{3}{8}$ ")  
H.P. PISTON VALVE PKG. RING OVERTAKE, LOWER CYLBORE (TOP  $\frac{3}{16}$ "  
BOT.  $\frac{3}{16}$ )

H.P. CYL. & PISTON END CLEARANCE - TOP  $\frac{3}{8}$ ", BOT.  $\frac{1}{2}$ "  
M.P. CYL. & PISTON END CLEARANCE - TOP  $\frac{3}{8}$ ", BOT.  $\frac{1}{2}$ "  
L.P. CYL. & PISTON END CLEARANCE - TOP  $\frac{1}{2}$ ", BOT.  $\frac{1}{2}$ "

H.P. PISTON RING - CYLBORE OVERTAKE - TOP  $\frac{3}{16}$ " BOT.  $\frac{3}{16}$ "  
M.P. PISTON RING - CYLBORE OVERTAKE - TOP  $\frac{3}{16}$ " BOT. - LINE TO LINE  
L.P. PISTON RING - CYLBORE OVERTAKE - TOP  $\frac{3}{16}$ " BOT. - LINE TO LINE  
HP-M.P. & L.P. CROSSHD. SLIPPERS OVERTAKE GUIDE - TOP 2" BOT. 2"  
H.P.-M.P. & L.P. CROSSHEAD SLIPPERS - 10" WIDE X 26" LONG

H.P. PISTON CLEARANCE VOLUME - TOP 1892 CUIN. - BOT. 1670 CUIN.  
M.P. PISTON CLEARANCE VOLUME - TOP 6047 CUIN. - BOT. 5710 CUIN.  
L.P. PISTON CLEARANCE VOLUME - TOP 15623 CUIN. - BOT. 16722 CUIN.

H.P. CYLINDER VOLUME - TOP 22,629 CUIN. - BOT. 20,784 CUIN.  
M.P. CYLINDER VOLUME - TOP 51,609 CUIN. - BOT. 49,716 CUIN.  
L.P. CYLINDER VOLUME - TOP 184,723 CUIN. - BOT. 182,880 CUIN.

H.P. PISTON CLEARANCE IN % - TOP .837 BOT. .805  
M.P. PISTON CLEARANCE IN % - TOP .11.7 BOT. .11.5  
L.P. PISTON CLEARANCE IN % - TOP .845 BOT. .915

H.P. & M.P. ECCENTRIC TRAVEL = 6"  
L.P. ECCENTRIC TRAVEL = 7"

CHARGE NO.	WAB	BY DATE	CHECKED	CHARGE NO.
SCALE 34'11 1/2" TOLERANCE ON FINISHED DIMENSION $\pm$ 0.00 UNLESS OTHERWISE SPECIFIED				
REMOVED BURRS BREAK SHARP EDGES .010 MAX.				
WORK TO SIZE .010 DO NOT SCALE				
11 ROUGH MACH 14 RUST OR POLISH 12 SMOOTH MACH 15 FILE 13 GRIND LAP 16 HAMM 17 FILE 18 SPOTFACE				
BY DATE	BY DATE	BY DATE	BY DATE	
DRAWN BY 6-11-41	CHECKED BY 6-11-41	APPROVED BY C.K.		
TRACED				
PURCHASED FROM	DATE OF FAB.	FILE NUMBER	ITEM NO.	ITEM NO.
MADE FROM				
HEAT TREAT	CASE DEPTH	HARDNESS		
NAME:				
DRAWING NO. 5973-2				

ENGINE NO. 6511-401NC  
24 1/2" x 37" x 70" x 48" M.S. ENGINE

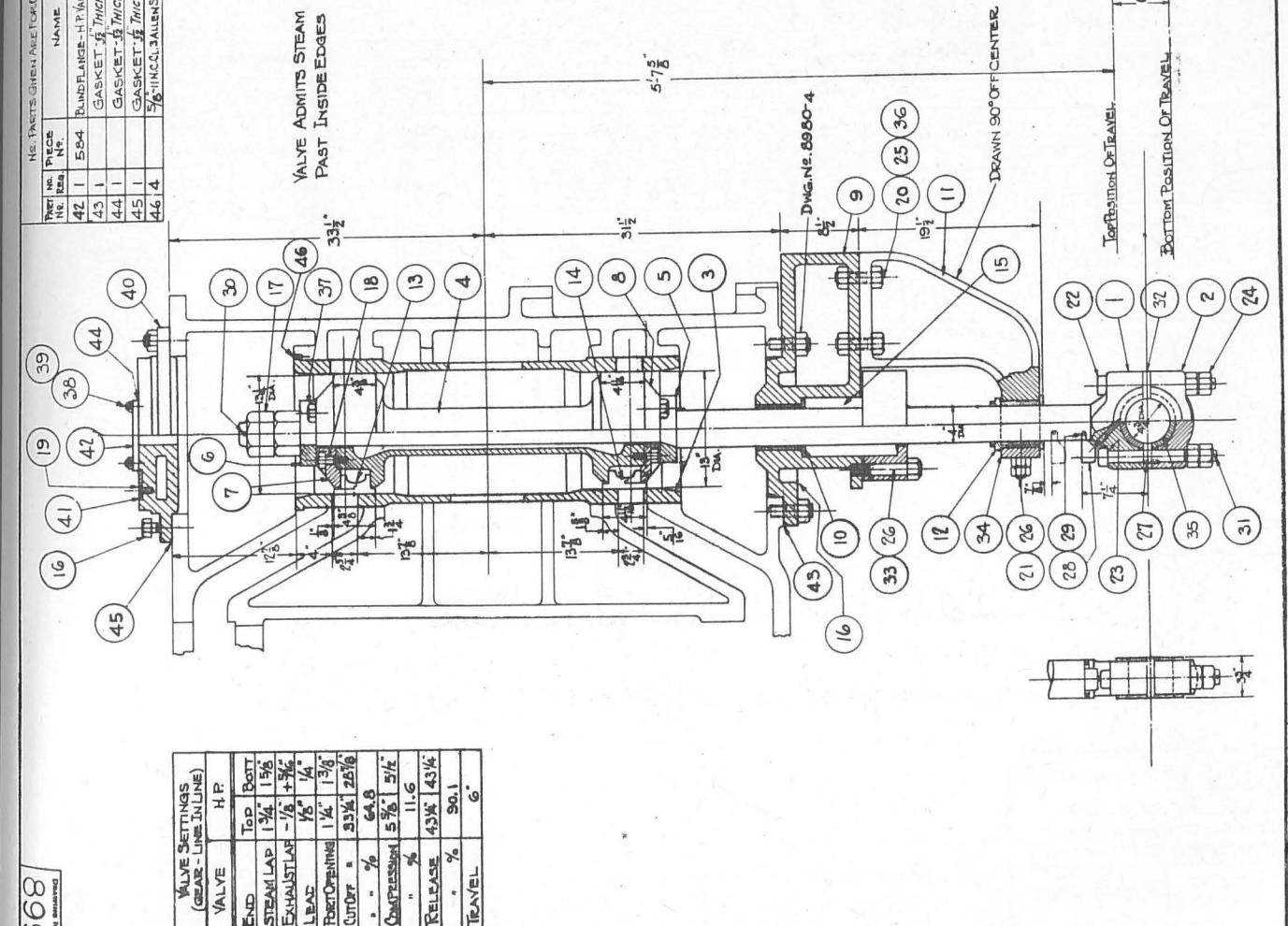
GENERAL MACHINERY CORPORATION	R. D. R. - DIESEL DIVISION - HAMILTON, OHIO

CROSS SECTION THRU ENGINE

5973-2

L-18-14T  
J.E.P. Grant

8990-4  
Dental office file



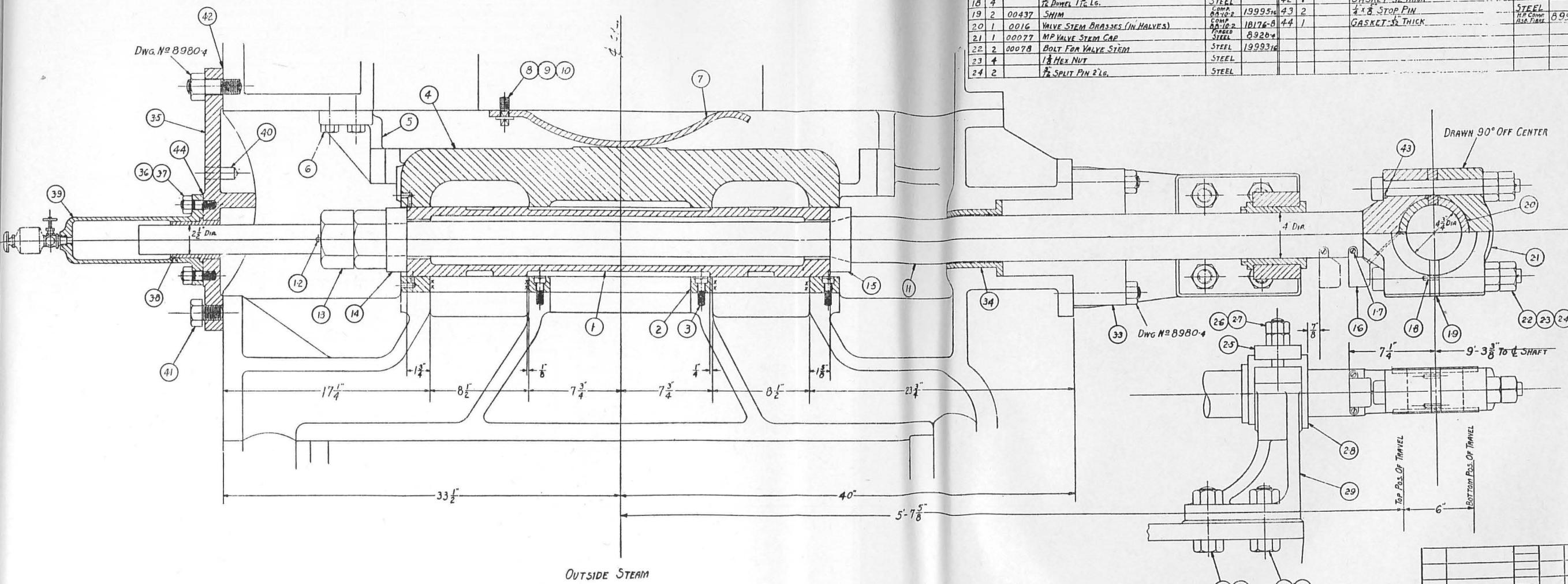
NO. PARTS GIVEN AS FOLLOWS IN THE DRAWING						
NO. OF PARTS	PART NO.	NAME	MATERIAL	DRAWING PART NO.	PIECE NO.	NAME
12	1	BLIND PLATE	CAST IRON	1	00077	H.P. VALVE STEM
1	1	GASKET .15" THICK	ASST. STEEL	1	00077	H.P. VALVE STEM CAP
13	1	GASKET .15" THICK	ASST. STEEL	2	00077	H.P. VALVE LINER
44	1	GASKET .15" THICK	ASST. STEEL	3	064	H.P. PISTON VALVE
45	1	GASKET .15" THICK	ASST. STEEL	4	061	LOWER VALVE STEM COLLAR
46	4	5/16" INC. BALENS. 3/4" LG.	STEEL	5	000417	UPPER VALVE STEM COLLAR
	6			6	00074	TOP FOLLOWER
	7			7	62	BOTTOM FOLLOWER
	8			8	63	TOP STUFFING BOX
	9			9	526	VALVE STEM STUFFING BOX
	10			10	527	STUFFING BOX BUSH
	12			12	1	VALVE STEM GUIDE BRACKET
	13			13	1	VALVE STEM GUIDE BEARING
	14			14	1	TOP STUFFING BOX PIN
	15			15	1	METALLIC PACKING (ASST.)
	16			16	4	JACK BOLTS 1 1/4" - 2 1/4" LONG
	17			17	2	DOOR NUTS 2 1/4" - 3" LONG
	18			18	8	BOLTS 3/4" - 1 1/4" LONG
	19			19	4	COUNTERSINK FOR 3/8"-16 NC CL. 3-3/8" LONG
	20			20	2	THRU BOLTS 1/4"-16 NC CL. 3 - 4" LONG
	21			21	2	STUD BOLTS 1 1/2" - 8 N.C. - 5/8" LONG
	22			22	2	BOLTS - VALVE STEM
	23			23	2	STOP PIN 1/4" DIA. X 5/8" LONG
	24			24	4	NUTS - 5/16" - 16 NC CL. 3
	25			25	4	NUTS - 1/4" - 16 NC CL. 3
	26			26	5	NUT - STD. 1" - 8 N.C. CL. 3
	27			27	4	DOMELS 5/16" DIA. X 1 1/8" LONG
	28			28	1	OIL Drip
	29			29	2	SCREW 20-40 BUTTON HD. 5/16" DIA. X 2 1/2" LONG
	30			30	1	COTTER PIN 3/8" DIA. X 3 1/4" LONG
	31			31	2	COTTER PIN 3/16" DIA. X 2" LONG
	32			32	2	SOLID SHIMS
	33			33	4	STUD BOLTS 1" - 16 NC - 7" LONG
	34			34	1	VALVE STEM GUIDE PLACET CAP
	35			35	1	BRASS SIS (HALVES) VALVE STEM PLACET
	36			36	2	REAM BOLTS
	37			37	4	JACK BOLTS 3/4" - 16 NC CL. 3 1/4" LG.
	38			38	4	STUD BOLTS 5/16" DIA. X 2 1/2" LONG
	39			39	4	NUTS - 5/16" DIA. CL. 3 - STD.
	40			40	1	VALVE CHEST COVER
	41			41	1	VALVE CHEST COVER PLATE

ITEM NO. (5) - U-SMETALLIC PACKING  
 TYPE - KING TANDEM METALLIC  
 FOR 220-351N. & 575 TOTAL TEMP  
 ENGINE NOS. 6700-59 } MARITIME COMM.  
 6760-6802 }  
 ITEM NO. (5) - C-LEE COOK PACKING.

## H.P. Valve Assembly

8990-4  
No. 3

596



LIST OF MATERIAL PARTS GIVEN FOR ONE ENGINE							LIST OF MATERIAL PARTS GIVEN FOR ONE ENGINE						
ITEM NO.	ITEM NO.	NAME	MATERIAL	ITEM NO.	ITEM NO.	NAME	MATERIAL	ITEM NO.	ITEM NO.	NAME	MATERIAL	ITEM NO.	ITEM NO.
1	306	M.P. SLIDE VALVE	C.I.	8931-4	25	1	0001112	VALVE STEM GUIDE BRKT CAP	STEEL	20066-16			
2	1	M.P. FALSE FACE	C.I.	8911-4	26	2		1 STUD 5" LONG	STEEL	8980-4			
3	68	0023 FILL. HEAD SCREW	BRONZ. BRZ.	8911-4	27	4		1 HEX NUT	STEEL	0010-2	18141-8		
4	1	M.P. VALVE BRIDLE	C.I.	8934-4	28	1	0011	VALVE STEM GUIDE BEARING	C.I.	18133-8			
5	2	532 BRACKET FOR M.P. BRIDLE	C.I.	18188-8	29	1	54	VALVE STEM GUIDE BRACKET	STEEL	8973-4			
6	8	HEX BOLT 3/8" X 2 1/2"	STEEL	8968-8	30	2	0001080	1/4 FITTED BOLT 4 1/2"	STEEL	8968-4			
7	1	0001017 SPRING FOR M.P. BRIDLE	STEEL	18181-8	31	4		1/2 HEX NUT	STEEL	8968-4			
8	2	0001133 SPEC. STUD 3/8"	STEEL	20076-16	32	2		1/8 HEX BOLT 4 1/2"	STEEL	8968-4			
9	2	0001134 SPEC. WASHER	STEEL	20076-16	33	1		(NOTE) △ METALLIC PACKING					
10	2	SPLIT PIN 1/8" X 1 1/2"	STEEL	8928-8	34	1	527	STUFFING BOX BUSH	C.I.	18150-8			
11	1	00072 M.P. VALVE STEM	STEEL	18303-8	35	1	32	M.P. VALVE CHEST COVER	C.I.	18146-8			
12	1	SPLIT PIN 1/8" X 3 1/2"	STEEL	18303-8	36	6		1/4 STUD 2 1/2"	STEEL	8980-4			
13	2	0001102 2 1/2" HEX NUT GN CL3	STEEL	20063-16	37	6		1/4 HEX NUT	STEEL				
14	1	00076 UPPER COLLAR	STEEL	18172-8	38	1	00497	BUSH FOR GUIDE DOME	BRONZE	20050-16			
15	1	000859 LOWER COLLAR	STEEL	18172-8	39	1	576	VALVE ROD GUIDE DOME	C.I.	18262-8			
16	1	00515 VALVE STEM OIL CUP	BRAZ	18303-8	40	2		1/4" DIA X 2 1/2" DOMEL PINS	STEEL	8967-4			
17	2	BUTTON HO SCREWS 1/2" X 1 1/2" LONG & LG.	STEEL	18303-8	41	2		1/4" DIA JACK BOLT	HE. COMB. ASA FLANGE	8999-4			
18	4	PEWEL 1/2" LG.	STEEL	18303-8	42	1		GASKET .12 THICK	STEEL				
19	2	00437 SHIM	COMP. 18176-8	43	2			.1/16 STOP PIN	HE. COMB. ASA FLANGE	8999-4			
20	1	0016 VALVE STEM BRASSES (IN HALVES)	COMP. 18176-8	44	1			GASKET .5 THICK	STEEL				
21	1	00077 M.P. VALVE STEM CAP	HE. COMB. STEEL	8926-8									
22	2	00078 BOLT FOR VALVE STEM	STEEL	19993-16									
23	4	1/2" HEX NUT	STEEL										
24	2	1/8" SPLIT PIN 2 1/2"	STEEL										

ADDED *E.T.K.*  
BY *E.P. Grant* DATE *10-14-41*  
SCALE *3-1/16* TOLERANCE ON PREFERRED DIMENSION  $\pm .010$   
NOTICE SURFACE: MACHINING SURFACES. DO NOT SCALE.  
NOTICE TO DRAFTSMAN: DO NOT SCALE.  
11 ROUGH MACH. 14 BUFF OR POLISH 17 FILE  
12 SMOOTH MACH. 15 DRILL 18 SCRAPER  
13 GRIND LAP 16 BURR 19 RIVETFACE  
14 SWEEP MACH.

ENGINE N<sup>o</sup> 6511-40

ITEM NO. 33 - U.S. METALLIC PACKING

TYPE - KING TANDEM METALLIC  
FOR 220° STM. & 575° TOTAL TEMP.

ENGINE N<sup>o</sup> 6700-59 } MARITIME COMM.

6760-6802 }

ITEM NO. 33 - C. LEE COOK PACKING.

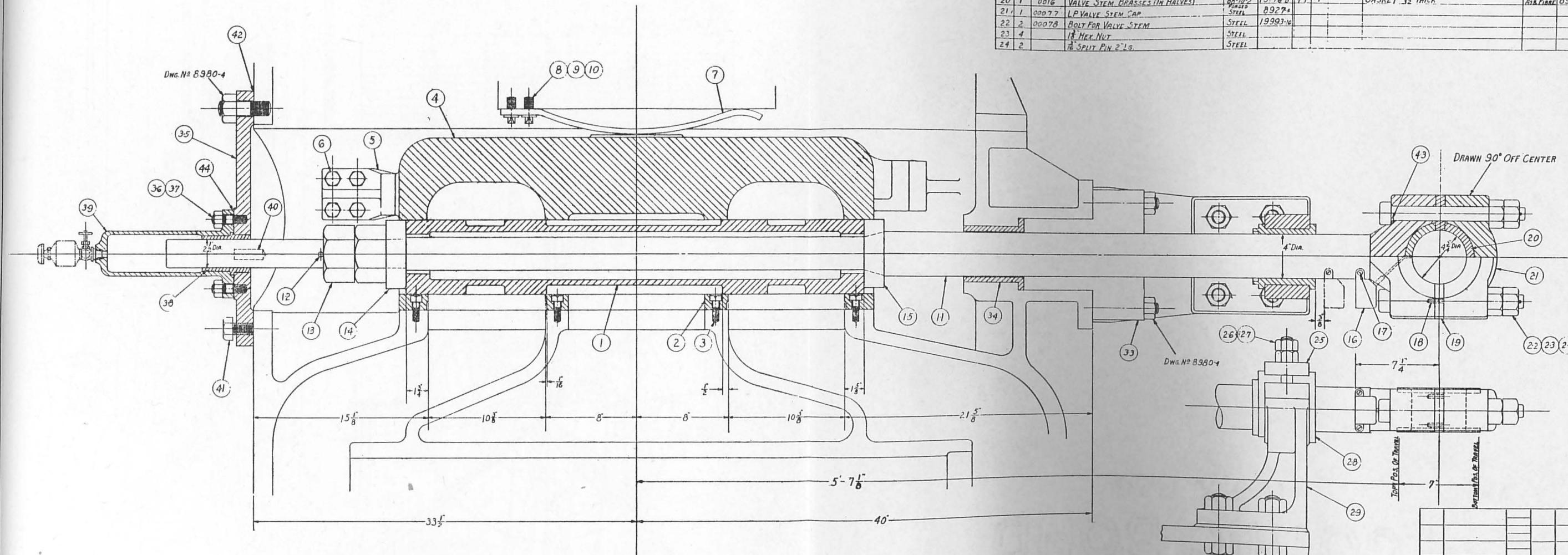
MATERIAL:		DRAWING NO.	
NAME: M.P. VALVE ASSEMBLY		5960-2	

GENERAL MACHINERY CORPORATION  
H. O. R. - DIESEL DIVISION - HAMILTON, OHIO

5960-2

5961-2

DRAWING NO.



VALVE SETTINGS (GEAR LINE INCH)				LAST OF MATERIAL				LIST OF MATERIAL				PARTS GIVEN FOR ONE ENGINE		
VALVE	L.P.													
END	TOP	BOTT.	ITEM NO.	NO.	PC NO.	NAME	MATERIAL	DWG. NO.	ITEM NO.	NO.	PC NO.	NAME	MATERIAL	DWG. NO.
STEAM LAP	1 1/2"	1 1/2"	1	1	53	L.P. SLIDE VALVE	STEEL	5937-3	25	1	0001112	VALVE STEM GUIDE BRKT CAP	STEEL	20066-6
EXHAUST LAP	+1/8"	+1/8"	2	1	34	L.P. FALSE FACE	STEEL	8913-1	26	2		1" STUD & LONG	STEEL	8980-4
LEAD	1/2"	5/8"	3	86	0023	FILL HEAD SCREW	TOBIN BRZ	8913-4	27	4		1" HEX NUT	STEEL	
PORT OPENING	1 3/8"	1 3/8"	4	7'	365	L.P. VALVE BRIDLE	STEEL	5918-2	28	1	00111	VALVE STEM GUIDE BEARING	STEEL	8810-2
CUT OFF OPENING	3 1/8"	3 1/8"	5	2	531	BRACKET FOR L.P.BRIDLE	STEEL	18183-8	29	1	54	VALVE STEM GUIDE BRACKET	C.I.	18133-8
CUT OFF %	3 1/8"	3 1/8"	6	8		HEX BOLT 3/8-24 LG.	STEEL	8968-4	30	2	0001080	1/4 FITTED BOLT 4 1/2 L.	STEEL	8973-4
CUT OFF %	6 1/2"	6 1/2"	7	2	0001010	SPRING FOR L.P.BRIDLE	STEEL	18182-6	31	4		1/4 HEX NUT	STEEL	
COMPRESSION OPENING	7 1/4"	6 1/2"	8	4	0001133	SPEC. STUD 3"	STEEL	20076-16	32	2		1/4 HEX BOLT 4 1/2 LG.	STEEL	8968-4
COMPRESSION %	14.3		9	4	0001134	SPEC. WASHER	STEEL	20076-16	33	1		(Note) △ METALLIC PACKING		
RELEASE OPENING	43 1/8"	43 1/8"	10	4		SPLIT PIN 3/4"	FORGED STEEL	8927-1	34	1	00436	STUFFING BOX BUSH	C.I.	18144-8
RELEASE %	91.0		11	1	20073	L.P. VALVE STEM	STEEL	8927-1	35	1	33	L.P. VALVE CHEST COVER	STEEL	8980-4
TRAVEL	7"		12	1		SPLIT PIN 3/8" X 3 1/2"	STEEL	8927-1	36	6		1/4 STUD 2 1/2 LG.	STEEL	
			13	2	0001102	2 1/2" HEX NUT 6-N CL3	STEEL	20063-16	37	6		2 HEX.NUT	STEEL	
			14	1	000499	UPPER COLLAR	STEEL	18173-8	38	1	00497	BUSH FOR GUIDE DOME	C.I.	18262-8
			15	1	000500	LOWER COLLAR	STEEL	18173-8	39	1	576	VALVE ROD GUIDE DOME	STEEL	
			16	1	00515	VALVE STEM OIL CUP	BRASS	18303-8	40	2		1/4" X 2 1/2" DOWEL PINS	STEEL	
			17	2		BUTTON HO. SCREW 1/4-10NC 3/8 LG.	STEEL	18303-8	41	2		1/4" JACK BOLT	STEEL	8968-4
			18	4		1/4" DOWEL 1 1/2 LG.	STEEL	19095-6	42	1		GASKET .12 THICK	STEEL	8999-4
			19	2	00437	SHIM	COMP. BRASS	19095-6	43	2		1/4" DIA X 3/8 LG. STOP PIN	STEEL	8999-4
			20	1	0016	VALVE STEM BRASSES (IN HALVES)	BRASS	18176-8	44	1		GASKET .12 THICK	STEEL	8999-4
			21	1	00077	L.P. VALVE STEM CAP	STEEL	8927-1						
			22	2	00078	BOLT FOR VALVE STEM	STEEL	19993-16						
			23	4		1/4" HEX NUT	STEEL							
			24	2		1/4" SPLIT PIN 2 1/2 LG.	STEEL							

△  
ENGINE NO. 6511-40 } BRITISH COMMISSION  
6541-70 }  
ITEM NO. 33 - U.S. METALLIC PACKING  
TYPE - KING TANDEM METALLIC  
FOR 220# STEAM & 575° TOTAL TEMP.  
  
△  
ENGINE NO. 6700-59 } MARITIME COMM.  
6760-6802 }  
ITEM NO. 33 - C. LEE COOK PACKING.

4 ADDED	10-14-41	E.K.
CHANGE	WAS	COLLECTED
SCALE	1/8"	DATE
3:1 FT.	TOLERANCE ON FINISHED DIMENSIONS: 0.00 UNLESS OTHERWISE SPECIFIED.	
REMOVE BURRS, BREAK SHARP EDGES, .010 MAX. WORK TO DIMENSIONS, DO NOT SCALE.		
/1 BUSH MACH.	/4 BURN OR POLISH	/2 FILE
/2 SMOOTH MACH.	/5 DRILL	/3 SMOOTH
/2 GROOVE LIP	/6 SMOOTH	/4 SPOTFACE
BY DATE		
DRAWN H.M.	4/24/41	CHECKED W. H. H.
TRACED		APPROVED E.R.
PURCHASED	LAPTOP, IN PROG. NO.	PROGRESSIVE PAY. NO.
ON MARK PAY.		NEW MATERIAL NO.
HEAT TREAT		
CASE DEPTH.		
HARDNESS		
DRAWING NO. 5961-2		

ENGINE NO. 6511-40  
24 1/2 - 37 - 70 x 48 M.S. ENG.

MATERIAL

NAME:

JEP Grant.

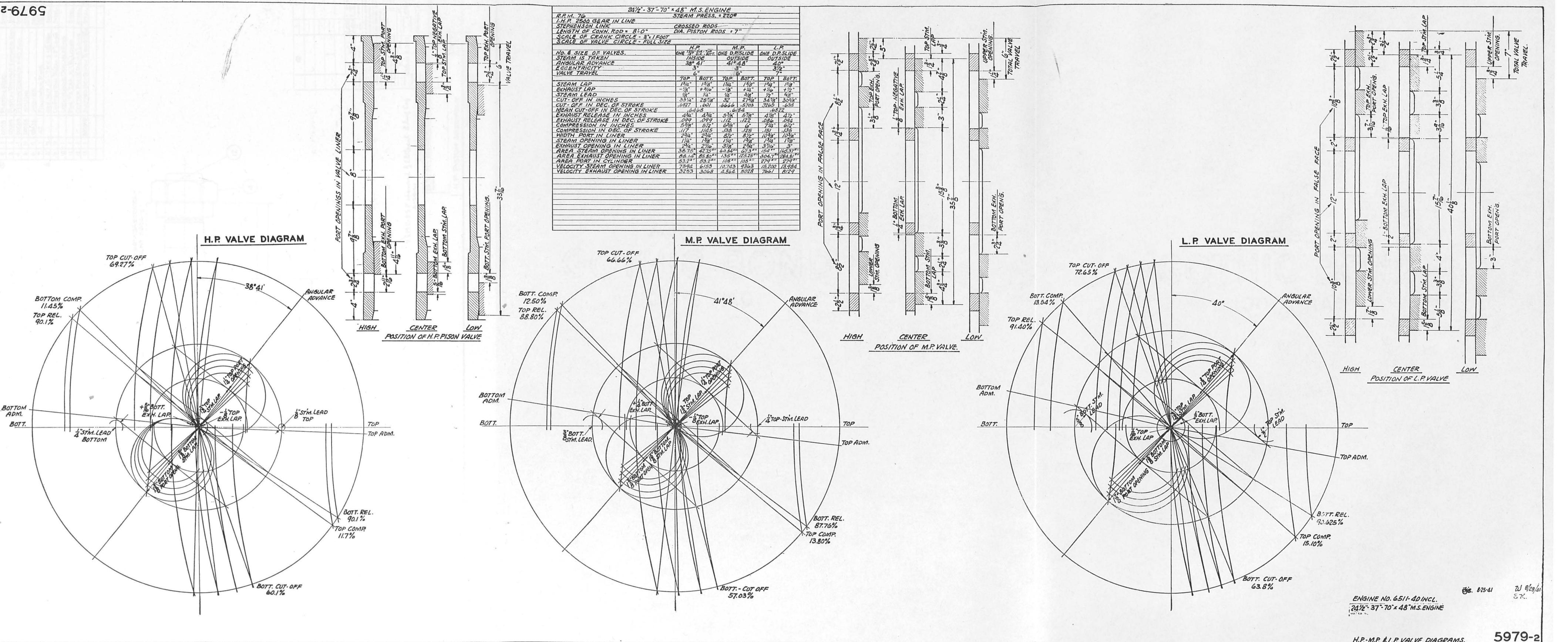
5-1-41

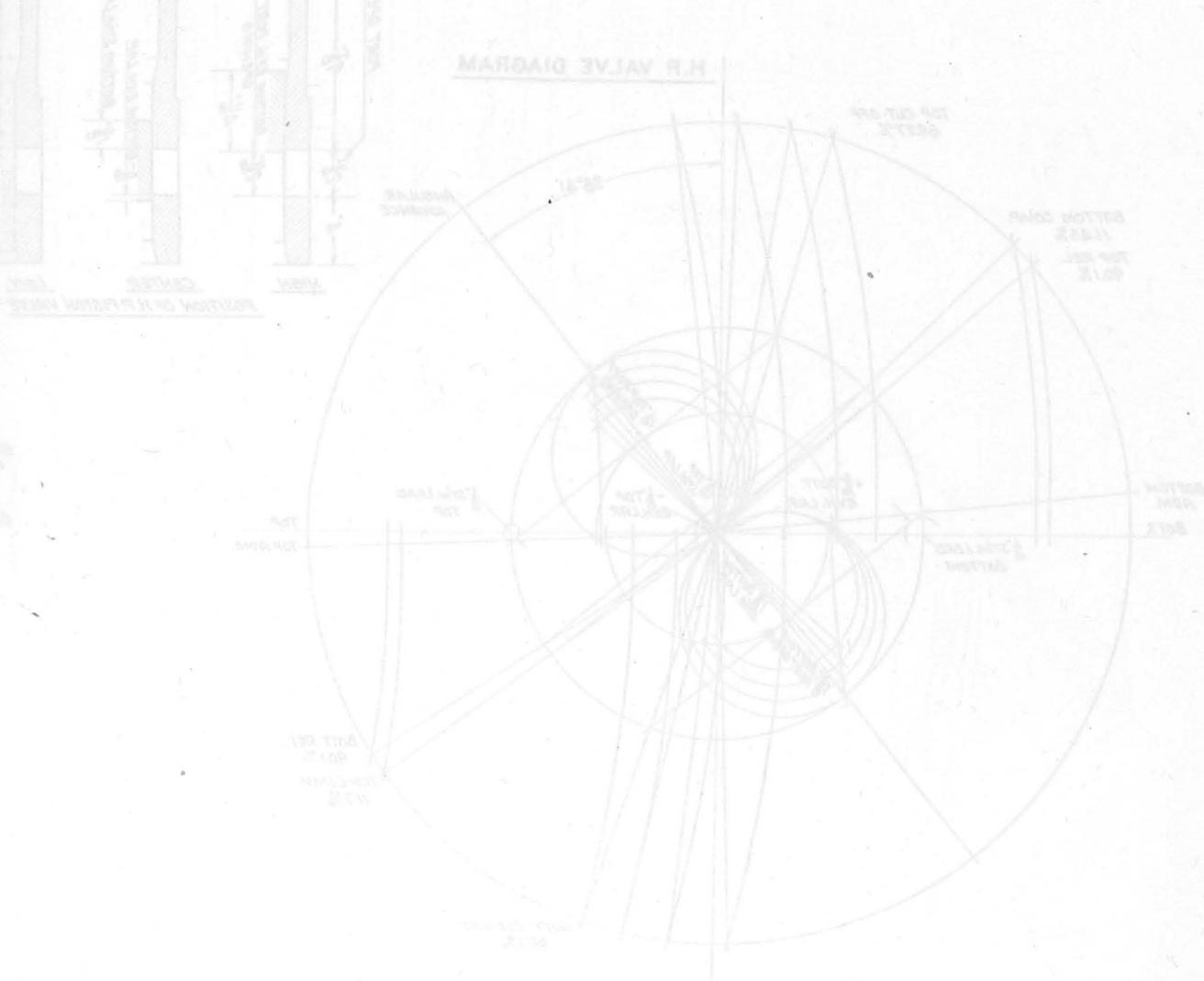
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

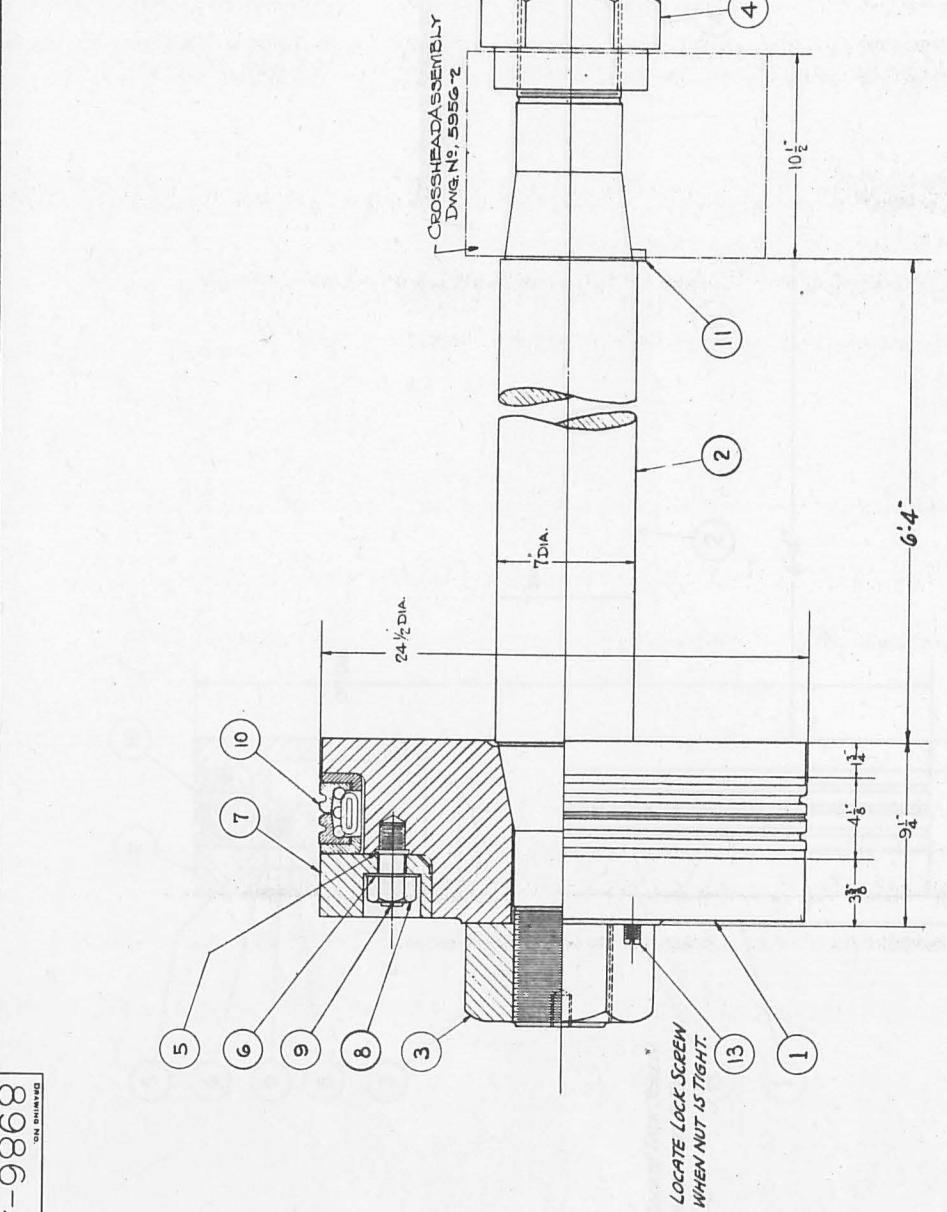
5961-2

5979-2





7-9868



No.	Part No.	Description	Material		Drawing No.
			Cast Iron	Steel	
1	41	H.P. PISTON BODY	Cast Iron	1519-4	
2	1 0008	PISTON ROD	STEEL	18187-8	
3	1 0008	PISTON RODNUT-PISTON END	STEEL	20000-14	
4	1 00089	PISTON RODNUT-X HD. END	STEEL	19290-4	
5	9 00053	STUDS	STEEL	19334-14	
6	9 00436	WASHER	BRONZE	19333-14	
7	1 42	FOLLOWER RING	STEEL	18120-8	
A	8 9	HEX NUT 1/4-7N C. 3 1/16 HIGH	STEEL		
9		COTTER PIN 1/16 IN. X 2 LONG	STEEL		
10	1	LOCKWOOD & CARLISLE RING			
11	1	PIN 1/2" Dia. X 1 1/4" LONG	STEEL		
12	1	COTTER PIN 1/2" Dia. X 6 LONG	STEEL		
13	1 000272	SLOTTED SET SCREW 3/16" C. 1/16" STEEL	STEEL	20103-14	

CROSSHEAD ASSEMBLY  
DRAWING NO. 5556-2

No.	Part No.	Description	Material		Drawing No.
			Cast Iron	Steel	
②					
③					
④					
⑤					
⑥					
⑦					
⑧					
⑨					
⑩					
⑪					
⑫					
⑬					
⑭					

No.	Part No.	Description	Material		Drawing No.
			Cast Iron	Steel	
①					
②					
③					
④					
⑤					
⑥					
⑦					
⑧					
⑨					
⑩					
⑪					
⑫					
⑬					
⑭					

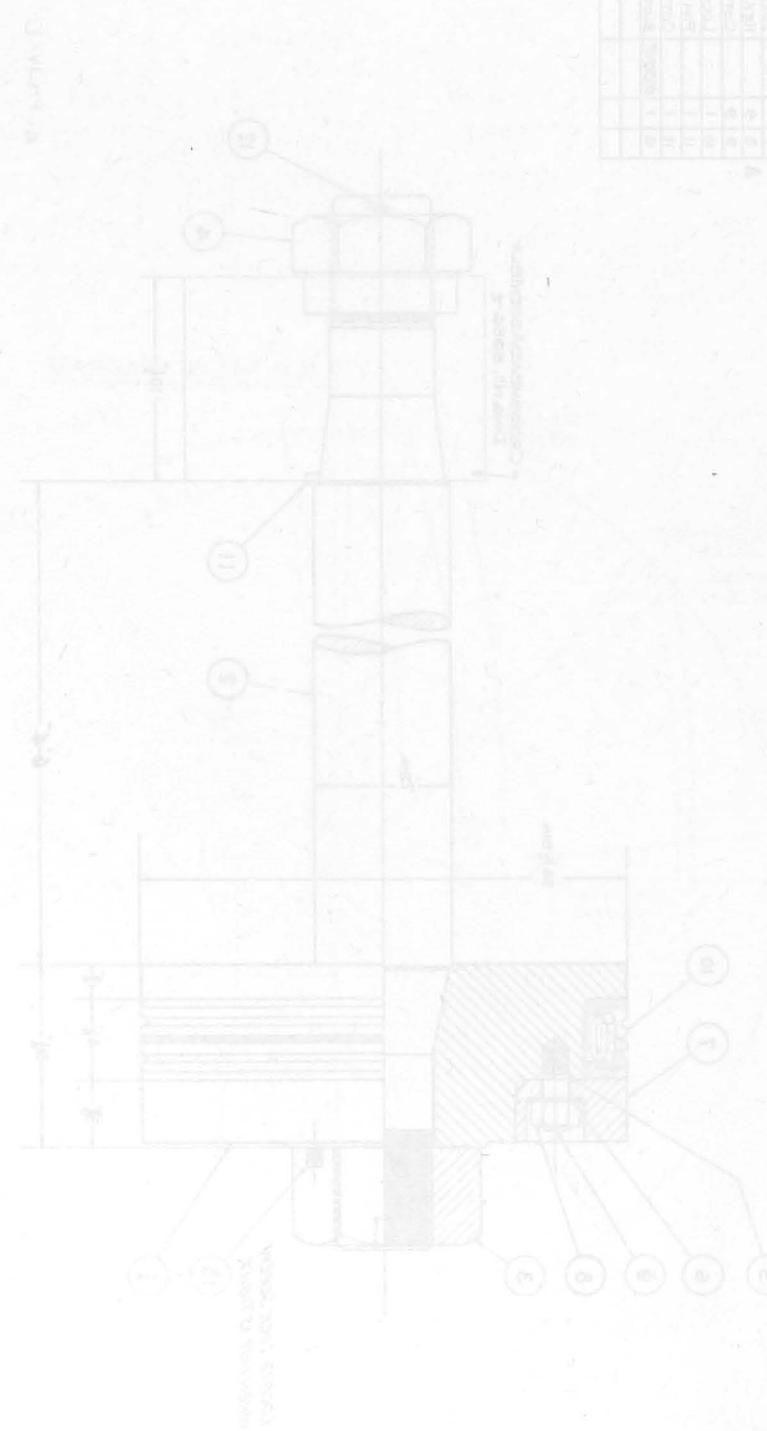
No.	Part No.	Description	Material		Drawing No.
			Cast Iron	Steel	
①					
②					
③					
④					
⑤					
⑥					
⑦					
⑧					
⑨					
⑩					
⑪					
⑫					
⑬					
⑭					

8986-4  
No. 7

GENERAL MACHINERY CORPORATION  
HAMILTON, OHIO

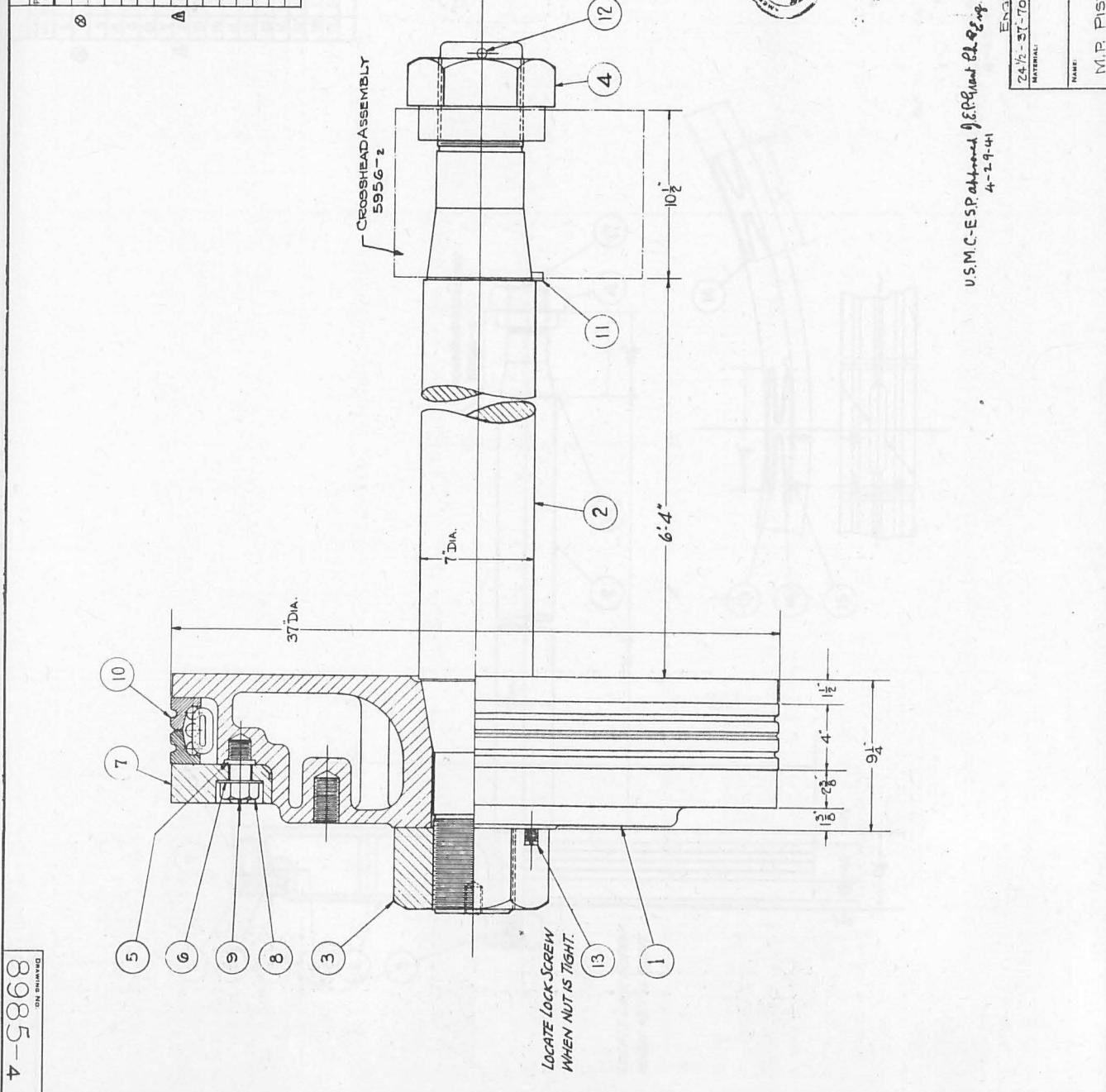
8986-4

GENERAL MACHINERY CORPORATION  
HAMILTON, OHIO



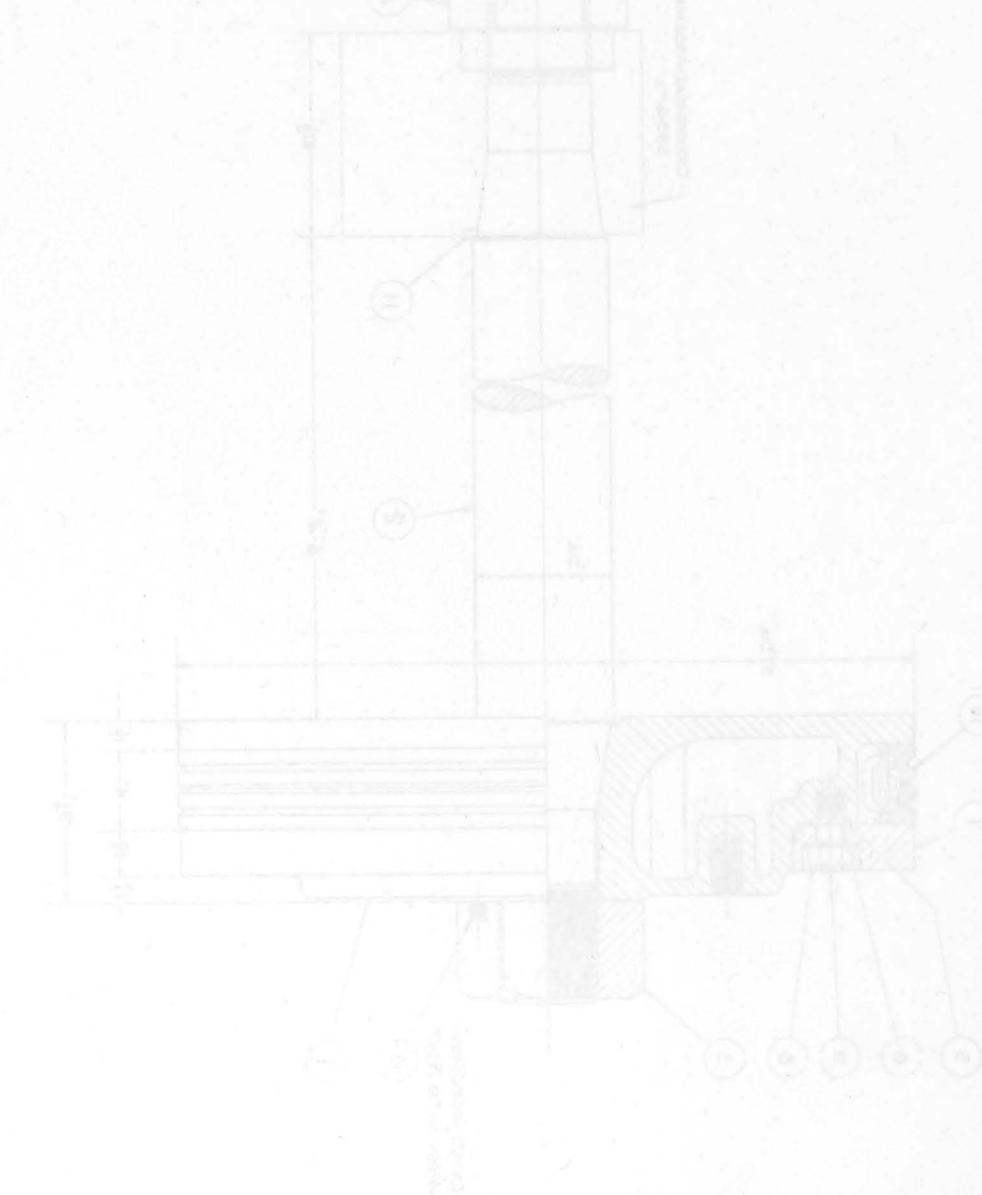
4-5868

No. OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
Part No.	PIECE NO.	NAME	MATERIAL
1	1	M PISTON BODY	COPPER DRAWING NO. 8927-4
2	1	Piston Rod	FORGED STEEL 1618-T-B
3	1	Piston Rod Nut - X-Hd. End	STEEL 200003
4	1	Piston Rod Nut - X-Hd. End	STEEL 19997-6
5	12	STUDS	STEEL 19934-16
6	12	WASHER	BRONZE 19933-16
7	1	FOLLOWER RING	CAST IRON 1821-8
8	12	HEX NUT 1/4" INC 3 - 1/8" HIGH	STEEL
9	12	COTTER PIN 3/16 DIA X 2 LONG	STEEL
10	1	LOCK-NUT & CAPSILE RING	
11	1	PIN 1/2 DIA X 1/8" LONG	STEEL
12	1	COTTER PIN 1/2 DIA X 6 LONG	STEEL
13	1	SPLITTER SET SCREW 1/4-16 NC STEEL	STEEL 20035-16

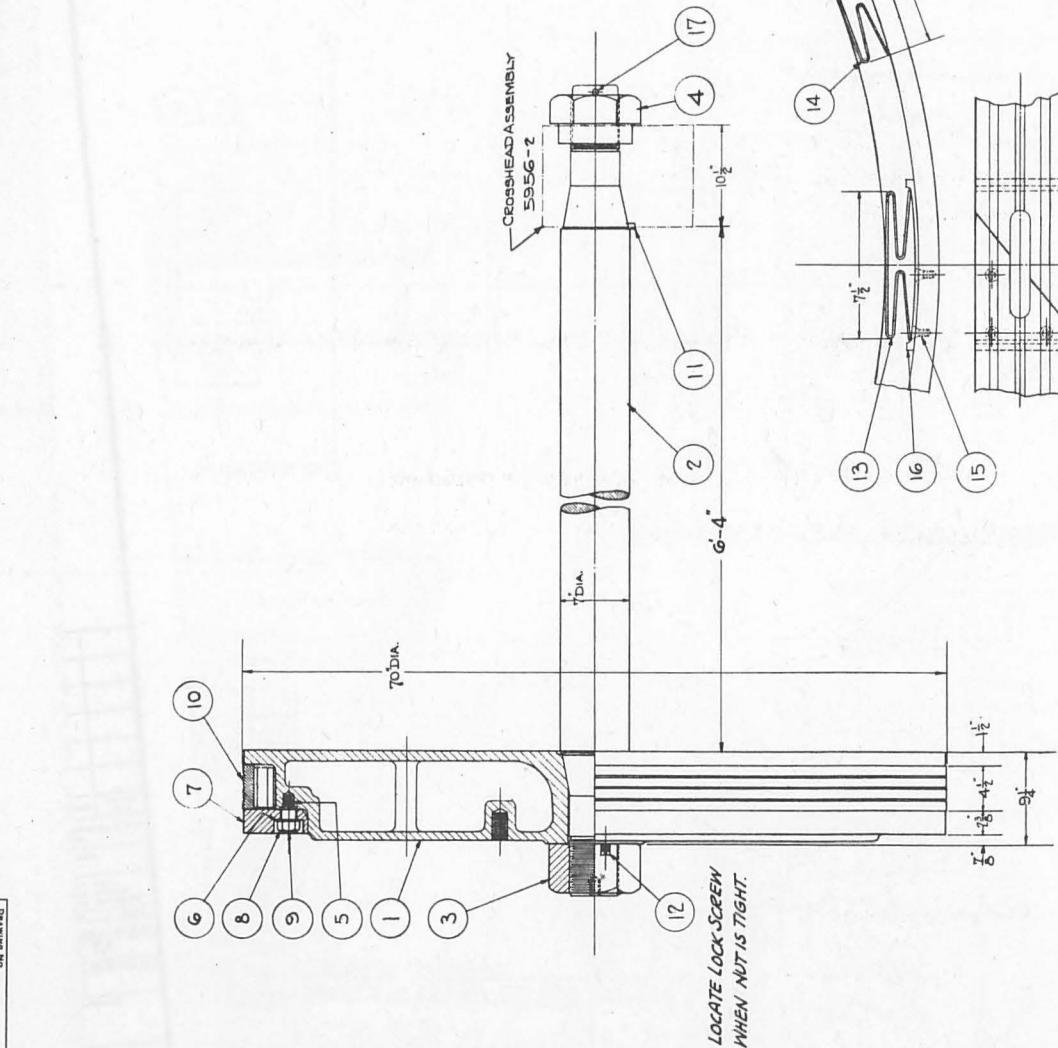


M.P. Piston Assembly

8985-4  
No. 8



4 - 7868



No. OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
Part No.	Ref. No.	Name	Quantity
1	137	L.P. PISTON BODY	1
2	1008	PISTON ROD	1
3	1008	PISTON ROD NUT - PISTON END	1
4	1008	PISTON ROD NUT - X HEAD END	1
5	24	STUDS	16
6	24	WASHER	16
7	26	FOLLOWER RING	1
8	24	HEX NUT 1/4" - INC. 3 - 1/8" HIGH	1
9	24	COTTER PIN 3/16" DIA. 2" LONG	1
10	27	PISTON RING	1
11	1	PIN 1/2" DIA. X 1/4" LONG	1
12	1	SLOTTED SENSER 2 1/4" LONG 1/16" Dia.	1
13	1	000366 PISTON SPRING	1
14	26	000216 PISTON SPRING	1
15	3	FLAT HEAD CRICK 3/16" DIA. 3/4" LONG	1
16	1	TONGUE PIECE	1
17	1	COTTER PIN 1/2" DIA. 2" LONG	1

Part No.	Ref. No.	Name	Quantity
1	137	L.P. PISTON BODY	1
2	1008	PISTON ROD	1
3	1008	PISTON ROD NUT - PISTON END	1
4	1008	PISTON ROD NUT - X HEAD END	1
5	24	STUDS	16
6	24	WASHER	16
7	26	FOLLOWER RING	1
8	24	HEX NUT 1/4" - INC. 3 - 1/8" HIGH	1
9	24	COTTER PIN 3/16" DIA. 2" LONG	1
10	27	PISTON RING	1
11	1	PIN 1/2" DIA. X 1/4" LONG	1
12	1	SLOTTED SENSER 2 1/4" LONG 1/16" Dia.	1
13	1	000366 PISTON SPRING	1
14	26	000216 PISTON SPRING	1
15	3	FLAT HEAD CRICK 3/16" DIA. 3/4" LONG	1
16	1	TONGUE PIECE	1
17	1	COTTER PIN 1/2" DIA. 2" LONG	1

L.P. Piston Assembly

8987-4  
No. 9

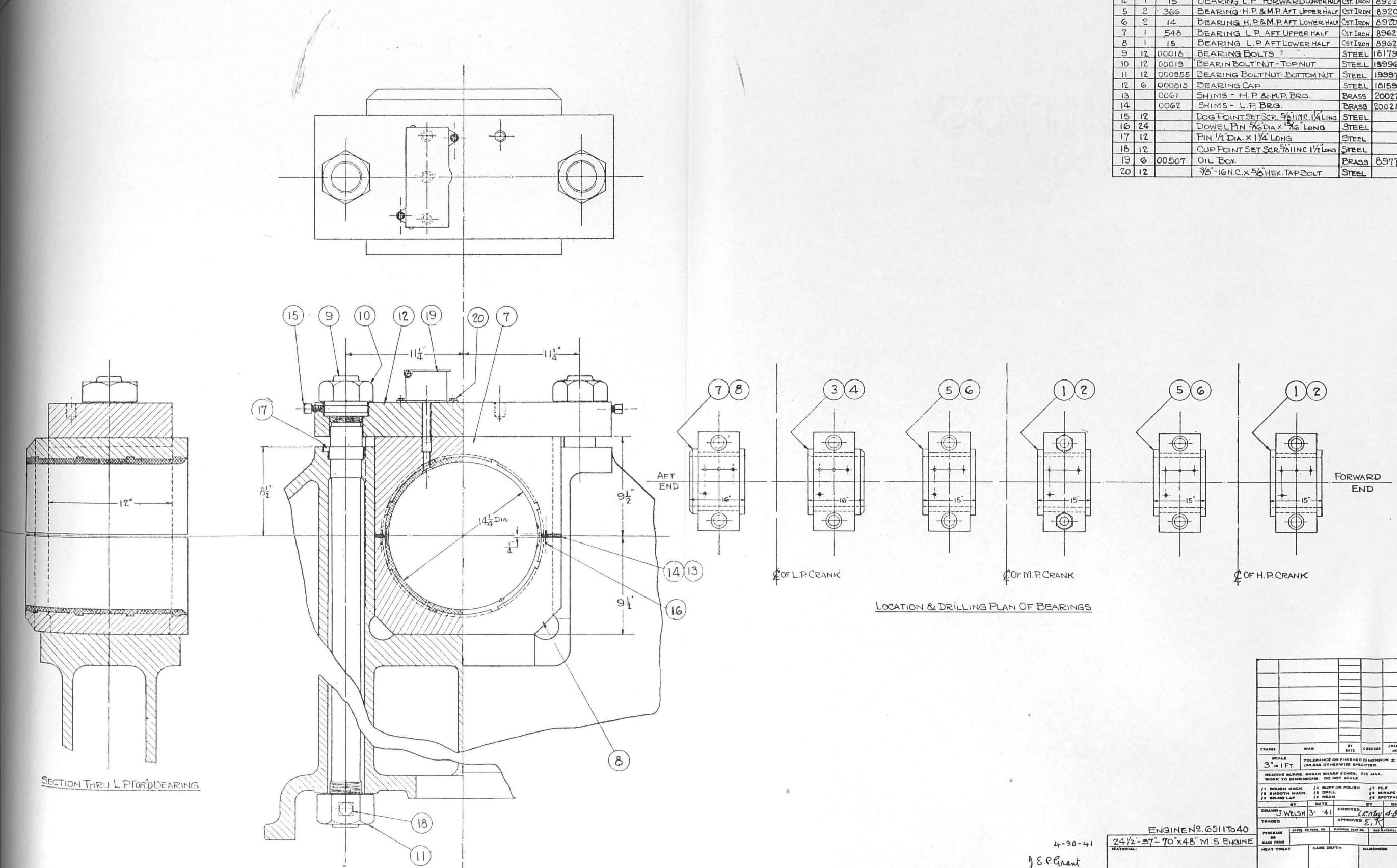
L.P. PISTON ASSEMBLY

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

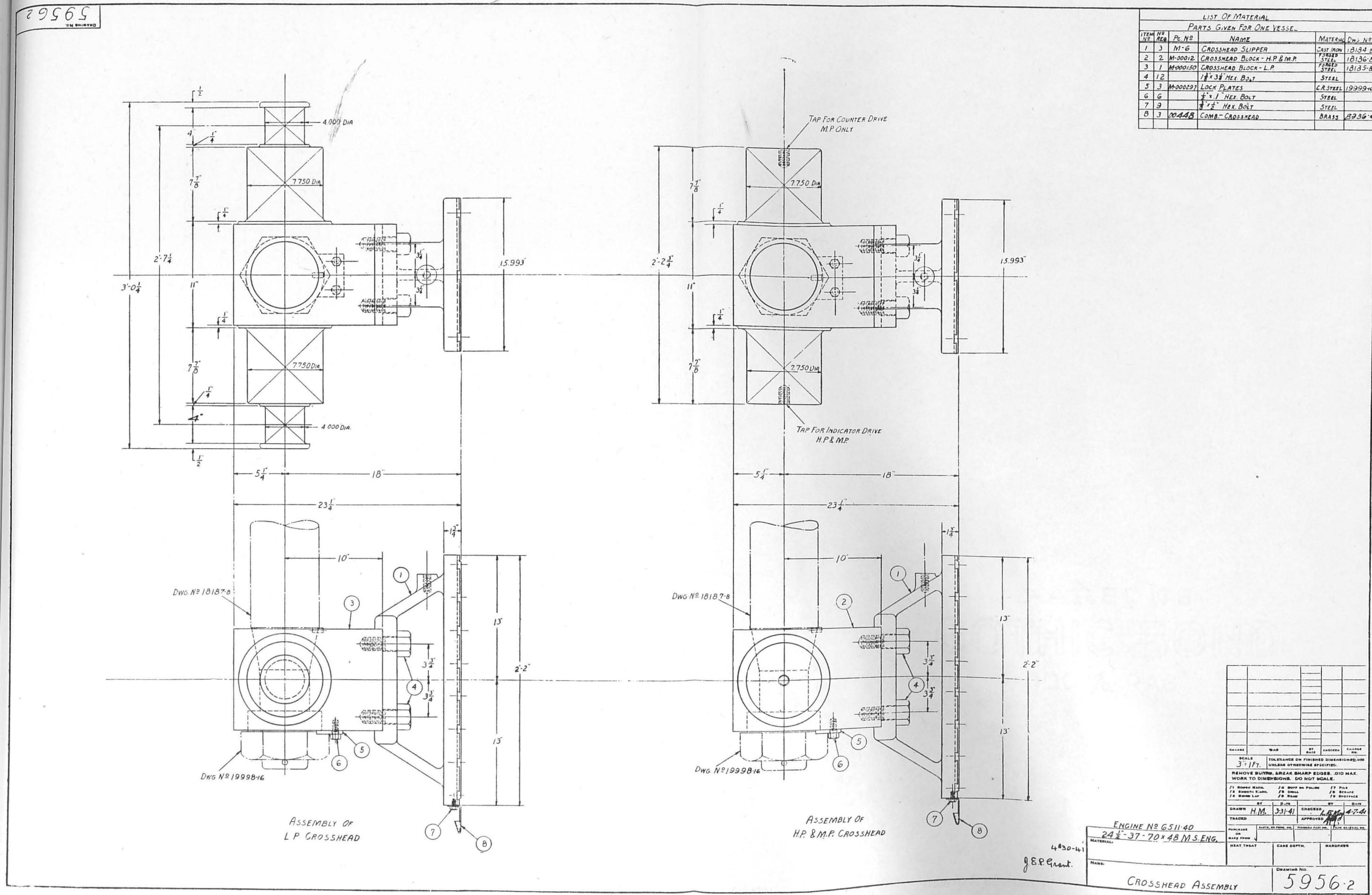
8987-4

NO. OF PARTS LISTED ARE FOR ONE ENGINE				
PART NR.	QTR. REQ.	PIECE NR.	NAME	MATERIAL
1	2	366	BEARING H.P. & M.P. FORWARD UPPER HALF	CST.IRON
2	2	14	BEARING H.P. & M.P. FORWARD LOWER HALF	CST.IRON
3	1	548	BEARING L.P. FORWARD UPPER HALF	CST.IRON
4	1	15	BEARING L.P. FORWARD LOWER HALF	CST.IRON
5	2	366	BEARING H.P. & M.P. AFT UPPER HALF	CST.IRON
6	2	14	BEARING H.P. & M.P. AFT LOWER HALF	CST.IRON
7	1	548	BEARING L.P. AFT UPPER HALF	CST.IRON
8	1	15	BEARING L.P. AFT LOWER HALF	CST.IRON
9	12	00018	BEARING BOLTS	STEEL
10	12	00019	BEARING BOLT NUT - TOP NUT	STEEL
11	12	000855	BEARING BOLT NUT - BOTTOM NUT	STEEL
12	6	000813	BEARING CAP	STEEL
13	-	0061	SHIMS - H.P. & M.P. BRG.	BRASS
14	-	0062	SHIMS - L.P. BRG.	BRASS
15	12		DOG POINT SET SCR. 5/16 INCH 1/4 LONG	STEEL
16	24		DOWEL PIN 5/16 DIA X 1 1/2 LONG	STEEL
17	12		PIN 1/2 DIA X 1 1/4 LONG	STEEL
18	12		CUP POINT SET SCR. 5/16 INCH 1 1/2 LONG	STEEL
19	6	00507	OIL BOX	BRASS
20	12		3/8-16 N.C.X 5/8 HEX.TAP BOLT	STEEL

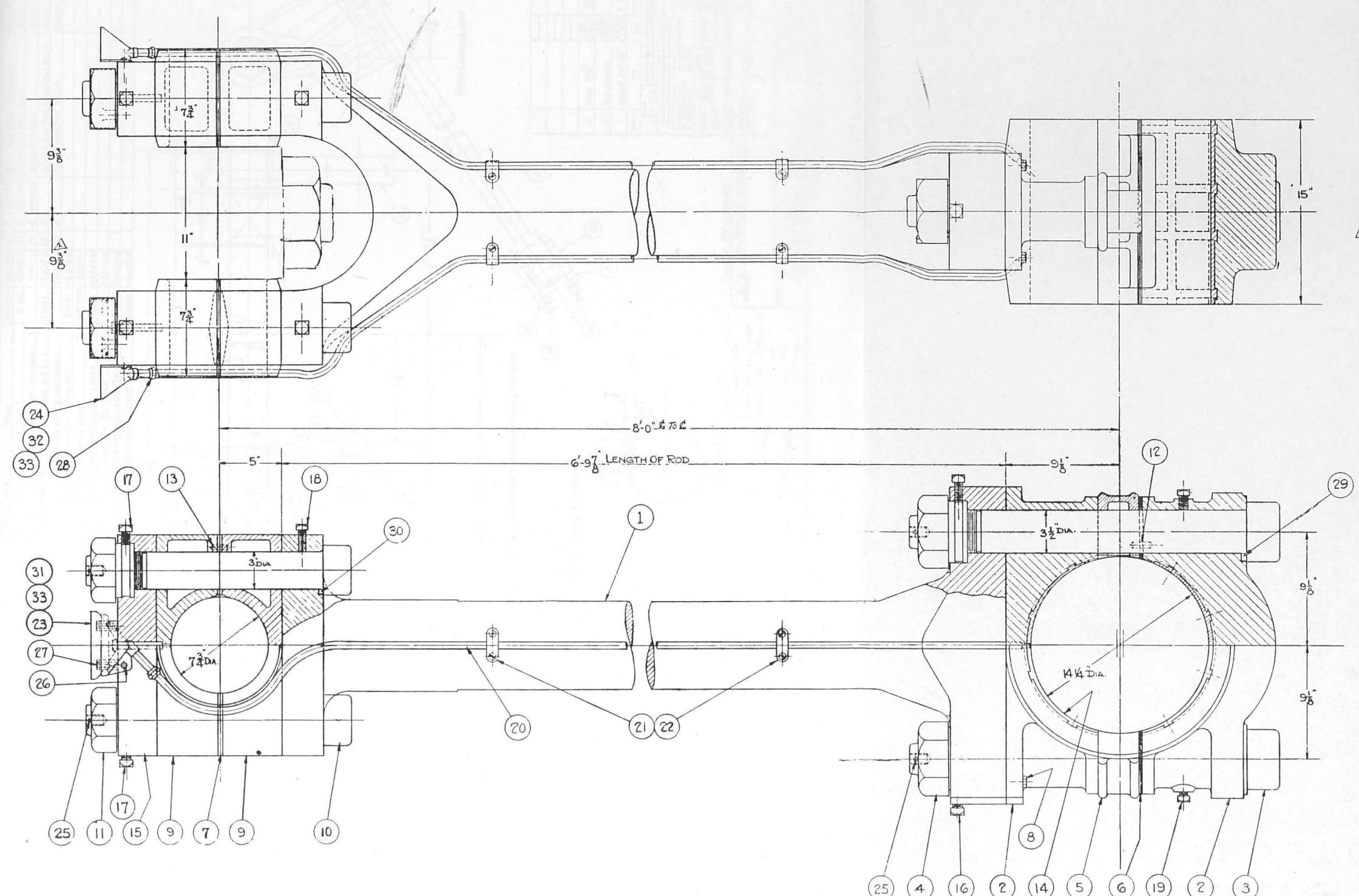


CHARGE NO.	WAB	BT	MANUFACTURER	CHARGE NO.
SCALE	TOLERANCE ON FINISHED DIMENSION $\pm .010$ UNLESS OTHERWISE SPECIFIED			3 1/2" / FT
REMOVE SURFACES, BREAK SHARP EDGES, .010 MAX. WORK TO DIMENSIONS DO NOT SCALE				
1/1 POLISH MACH. / 1/4 BUFF OR POLISH / 1/7 FILE 1/2 SMOOTH MACH. / 1/8 DRILL / 1/8 SCRAPE 1/3 GRIND CAP / 1/9 REAM / 1/0 SPOTFACE				
DRAWN BY J. WELSH		3-41	BY DATE	LETHAY 4-8-41
TRACED			BY DATE	APPROVED BY
PENALTY 25 PER CENT		PERCENTAGE	40 PER CENT	PERCENTAGE
BASE FROM		BY DATE	PERCENTAGE	PERCENTAGE
HEAT TREAT		CABIN DEPTH		HARDNESS
NAME:		DRAWING NO.		
MAIN BEARING ASSEMBLY		5955-2		

59562



5947-2



PART NO.	REQ.	PIECES	MATERIAL	NAME	DRAWING NO.
1	3	0007	FORGE ST.	CONNECTING ROD	18125-8
2	2	0004-PAIR 0005-CAP	CAST IR.	CONNECTING ROD BOX & CAP	88394-4
3	6	00013	LOND ST.	CONN. ROD BOLTS - CRANK END	18127-8
4	6	00014	LOND ST.	CONN. ROD NUTS - CRANK END	18127-8
5	6	18	CAST IRON	LINER FOR CRANK END	18126-8
6	6	004	BRASS	SHIMS FOR CRANK END	18129-8
7	12	003	BRASS	SHIMS FOR CROSSHEAD END	19951-6
8	6	18 PAIRS	STEEL	BOLTS FOR DISASSEMBLING	18123-8
9	PAIRS	001	IRON PLATE	CROSSHEAD END BEARING PAIRS	18123-8
10	12	00015	LOND ST.	CONN. ROD BOLTS - CROSSHD. END	18126-8
11	12	00016	LOND ST.	CONN. ROD NUTS - CROSSHEAD END	18126-8
12	12		STEEL	DOWELPINS - CRANK END	
13	24		STEEL	DOWELPINS - CROSSHEAD END	
14			BABBITT	WHITE METAL - CRANK END	
15	6	000288	STEEL	CONN. ROD CROSSHD. ENDCAP	18124-8
16	6	5/8 HD. DOGPOINT SETSCREW 1/4 LONG	STEEL	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	
17	12	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	STEEL	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	
18	12	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	STEEL	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	
19	6	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	STEEL	5/8 SQ. HD. DOGPOINT SETSCREW 1/4 LONG	
20	60 FT		BRASS PIPE	3/8 I.P. SIZE BRASS PIPE	
21	12	00500	BRASS	OIL PIPE CLAMP	20048-1
22	24		STEEL	CLAMP SCREW 5/16" I.D. X 1/2" L.G.	
23	6	00460	BRASS	OIL BOX - CROSSHD. BEARING	18259-8
24	6	00495	BRASS	OIL BOX - CRANK END BEARING	18258-8
25	18		STEEL	COTTER PIN 3/8" DIA X 4 LONG	
26	12		STEEL	TAP BOLTS 3/8"-16 N.C. - 5/8" LONG	
27	12		STEEL	TAP BOLTS 3/8"-16 N.C. - 1 1/8" LONG	
28	6		BRASS	UNION 3/8" I.P. SIZE	
29	6		STEEL	DOWEL PIN - IN BOLT - CRANK END	18127-8
30	12		STEEL	DOWEL PIN - IN BOLT - CROSSHD. END	18126-8
31	6	00461	BRASS	PERFORATED PLATE	18259-8
32	6	00496	BRASS	PERFORATED PLATE	18258-8
33	48		STEEL	#10-24 BUTTON HD. SCREW 1/4 LONG	
				OIL GROOVES IN CRANK END BRG	89724



MANUFACTURED AND TESTED  
BY A. B. S. SURVEYORS

APPROVED

APR 20 1941

ENGINE NO. 6511 To 40

24 1/2" x 37-70 x 48" M.S. ENGINE

MATERIAL:

PURCHASED OR MANUFACTURED

HEAT TREAT:

CASE DRYING

HARDNESS

DRAWING NO.

GENERAL MACHINERY CORPORATION

H. O. R. - DIESEL DIVISION HAMILTON OHIO

U.S.M.C approved JEP Grant  
4-27-41

CONNECTING ROD ASSEMBLY 5947-2

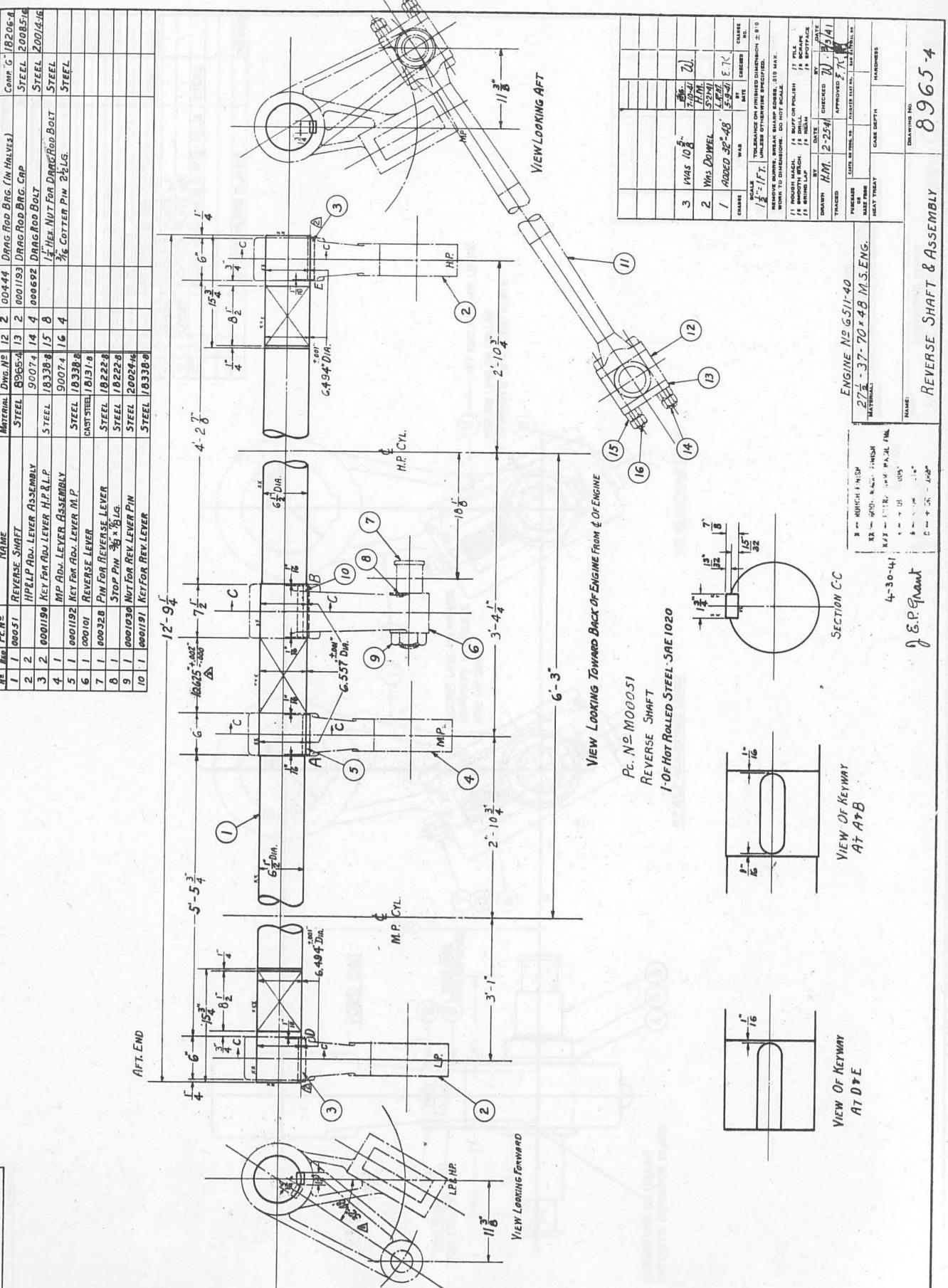
4-5968

## PARTS GIVEN FOR ONE ENGINE

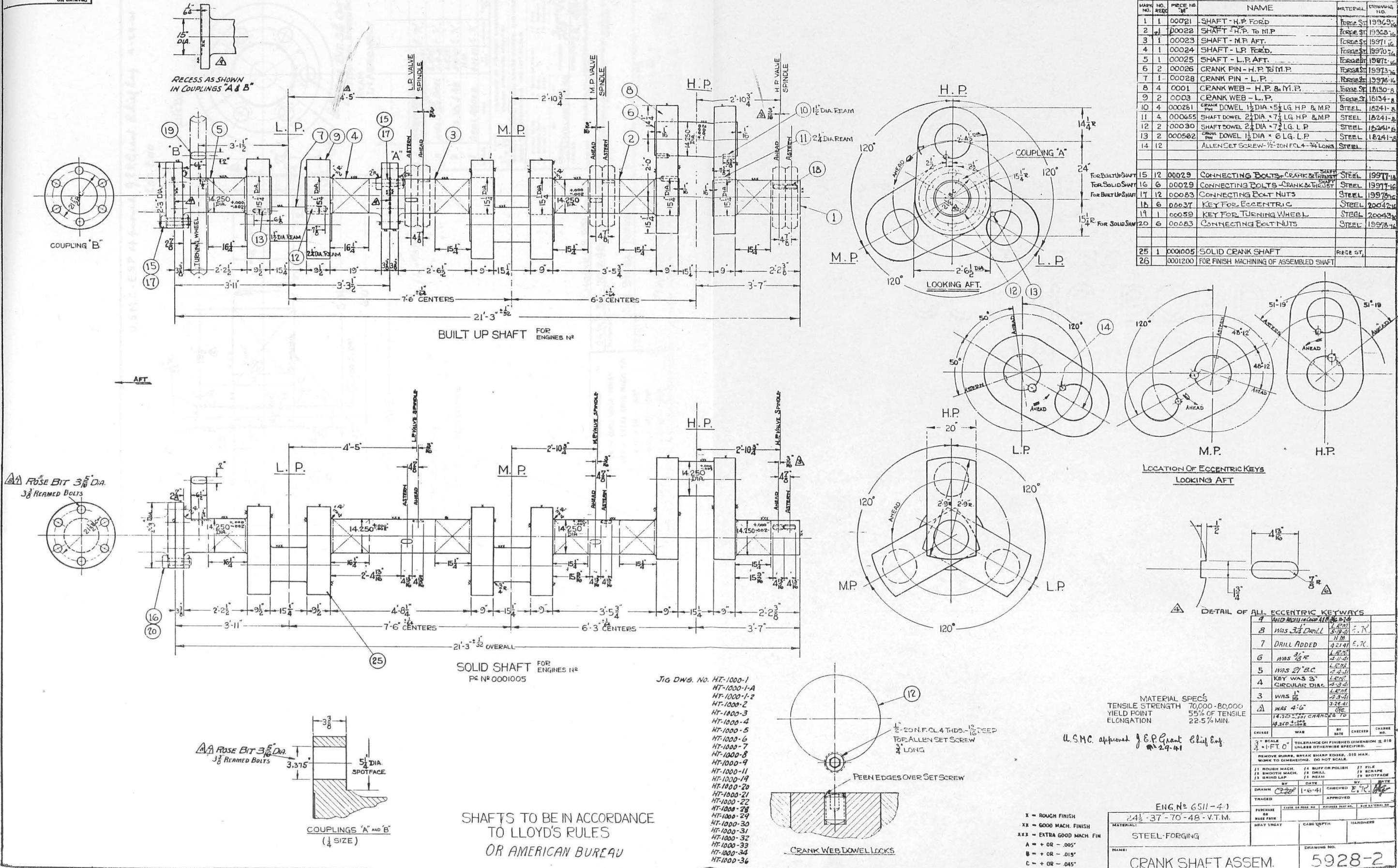
ITEM No.	P.C. No.	NAME	MATERIAL	Dwg. No.	11
1	00051	REVERSE SHAFT	STEEL	8965-4	Drag Rod
2	2	H.P. & M.P. LEVER ASSEMBLY	STEEL	8965-5	004-44 Drag Rod Brdg. (In Holes)
3	2	KEY FOR ADJ. LEVER H.P. & L.P.	STEEL	90074	000692 Drag Rod Bolt
4	1	M.P. ADJ. LEVER ASSEMBLY	STEEL	18338	1/4" HEX. NUT FOR DRAG ROD BOLT
5	1	ADJ. LEVER ASSEMBLY M.P.	STEEL	90074	3/16" COTTER PIN 2616
6	1	REVERSE LEVER	CAST STEEL	18338	STEEL
7	1	STOP PIN 3/16" I.D.	STEEL	18338	STEEL
8	1	STOP PIN 3/16" O.D.	STEEL	18338	STEEL
9	1	NUT FOR REV. LEVER PIN	STEEL	200246	STEEL
10	1	KEY FOR REV. LEVER	STEEL	18338	STEEL

AFT. END

12'-9 1/4"



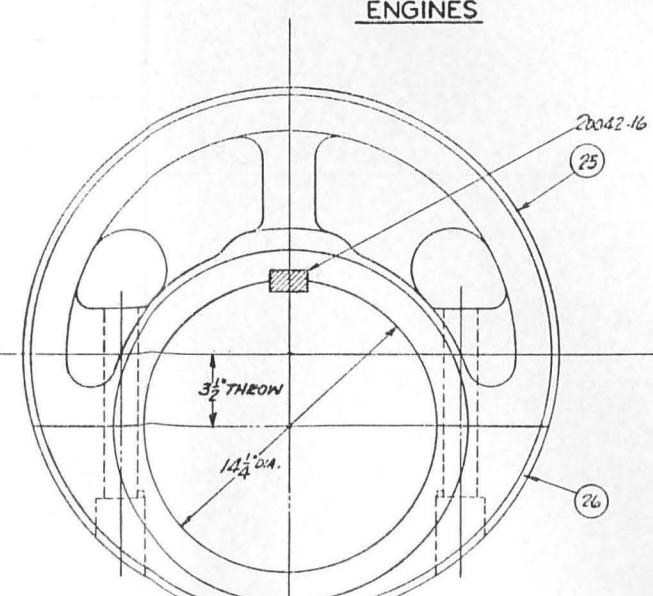
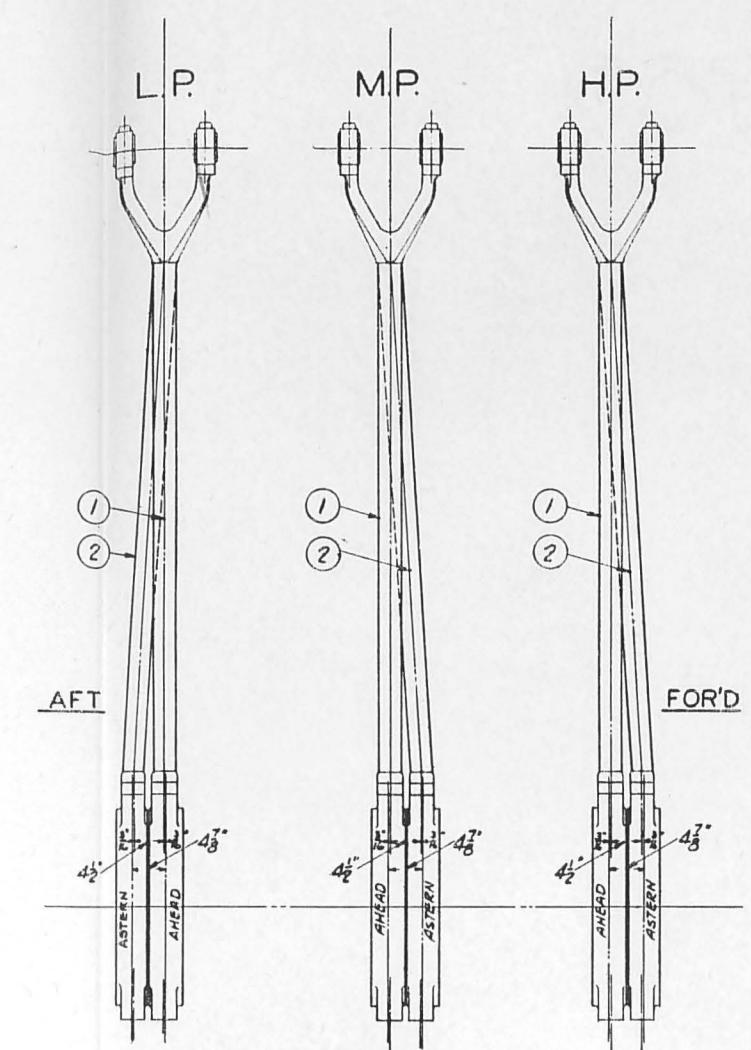
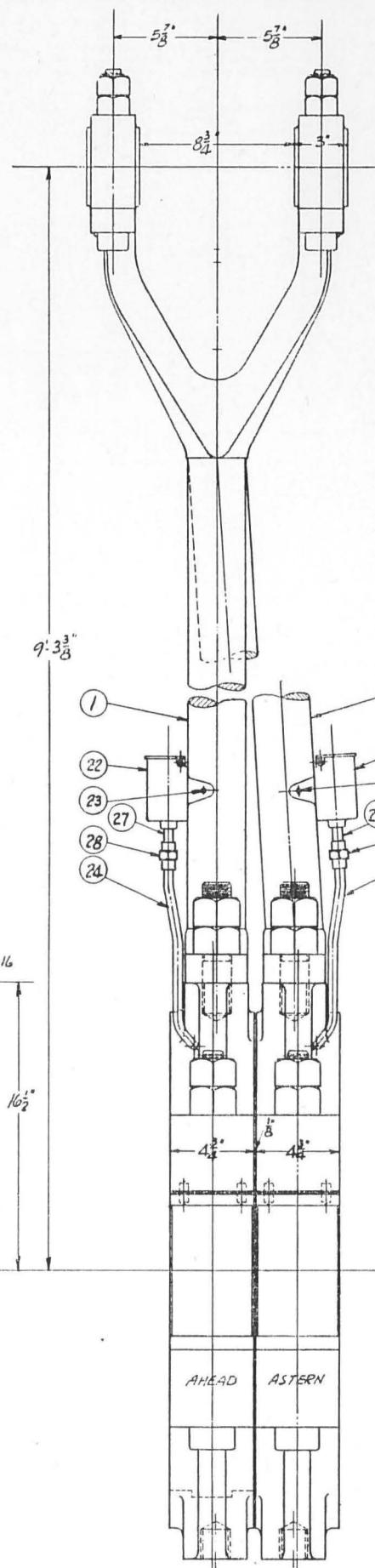
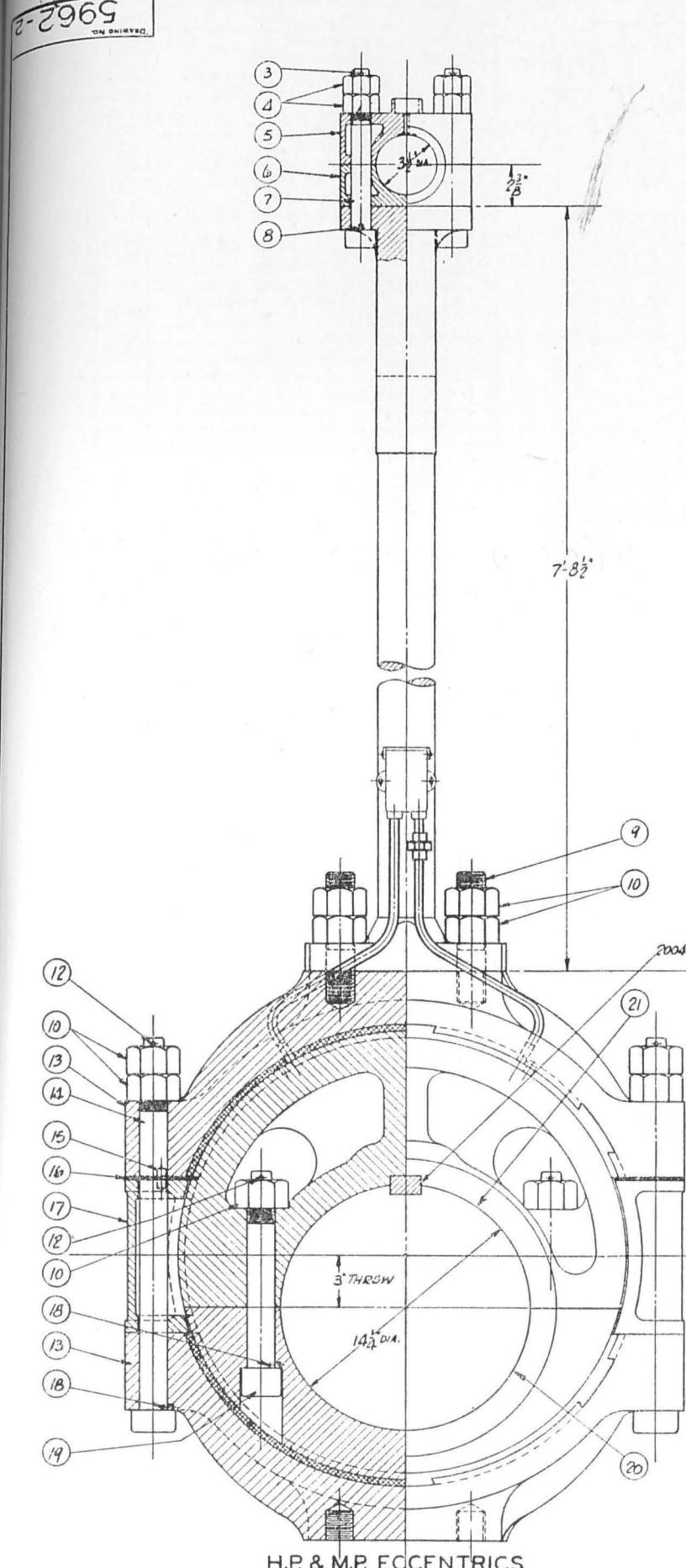
5928-2





5962-2

ON DRAWING



L.P. ECCENTRICS

NO. OF PARTS GIVEN ARE FOR ONE ENGINE			
ITEM NO.	REF. NO.	NAME	MATERIAL
1	3	AHEAD ECCENTRIC ROD	ALLOY ST 39.5-4
2	3	ASTERN ECCENTRIC ROD	FORG ST 39.7-4
3	24	COTTER PIN $\frac{1}{16}$ " DIA. X $1\frac{1}{4}$ " LONG	STEEL
4	43	1/8" STD. HEX NUT	STEEL
5	12	ECCENTRIC ROD CAP	BRONZE 18.53.8
6	12	ECCENTRIC ROD BOX	BRONZE 18.53.8
7	24	ECCENTRIC ROD BOLT	STEEL 1993.6
8	24	LOCK PIN $\frac{1}{16}$ " DIA. X $5/8$ " LONG	CR. ST 1993.6
9	12	30035 STUD	STEEL 1993.6
10	60	1/8" STD. HEX NUTS	STEEL
11			
12	24	COTTER PIN $\frac{1}{16}$ " DIA. X $2\frac{1}{4}$ " LONG	STEEL
13	6	22	CAST IRON 83.93.6
14	12	ECCENTRIC STRAP BOLT	STEEL 1993.6
15	24	DOMEWS $\frac{1}{16}$ " DIA. X $3/16$ " LONG	CR. ST 1993.6
16	12	005 ECCENTRIC STRAP SHIMS	BRASS 1993.6
17	12	82 LINE	CAST IRON 84.83.8
18	24	LOCK PIN $\frac{1}{16}$ " DIA. X $1\frac{1}{2}$ " LONG	STEEL
19	12	00036 ECCENTRIC BOLT	STEEL 1993.6
20	4	A.H. & M.P. ECCENTRIC (SMALL HALF)	CAST IRON 18.13.8
21	4	A.H. & M.P. ECCENTRIC (LARGE HALF)	CAST IRON 18.18.8
22	6	00503 OIL BOX	BRASS 18276.8
23	12	BUTTON HEAD SCREWS - $\frac{3}{16}$ " DIA. X $5/8$ " LONG	STEEL
24	185	1/4" I.P.S. PIPE	BRASS
25	2	L.P.ECCENTRIC (LARGE HALF)	CAST IRON 18.75.8
26	2	L.P.ECCENTRIC (SMALL HALF)	CAST IRON 18.76.8
27	6	1/4" I.P.S. NIPPLE - $1\frac{1}{2}$ " LONG	BRASS
28	6	1/4" I.P.S. UNION	BRASS

ENGINE NO. 6511-40 INCL.  
24 1/2"-37 1/2" x 48" M.S. ENGINE  
MATERIAL:  
NAME: ASSEMBLY OF H.P.-M.P. & L.P.  
AHEAD & ASTERN ECCENTRICS & RODS.

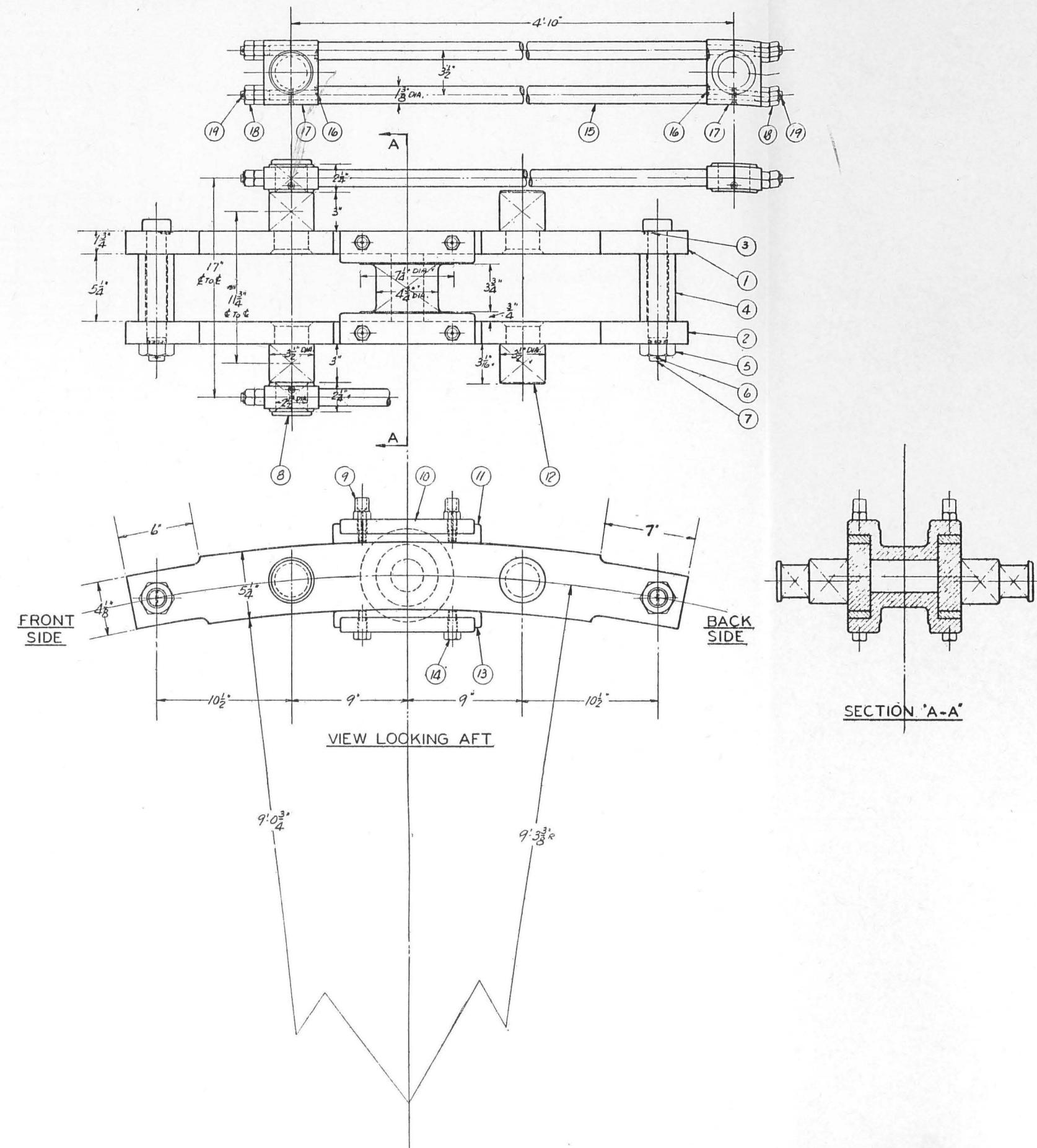
DRAWING NO. 5962-2  
GENERAL MACHINERY CORPORATION  
HAMONTON, OHIO

ADDED PARTS 27-28 627-4	
CHANGED	WAS
SCALE	DATE
18 3/4" x 10"	TOLERANCE ON FINISHED DIMENSIONS .010 UNLESS OTHERWISE SPECIFIED
REMOVE BURRS, BREAK SHARP EDGES, DO NOT WORK TO DIMENSIONS. DO NOT SCALE.	
/S ROUGH MACH.	/S BUFF OR POLISH
/S FINISH MACH.	/S FILE
/S DRILL LUGS	/S TURN
/S REAM	/S SMOOTH
BY	DATE
DRAWN 5-24	5-24
TRACED	CHECKED E. 7C APPROVED E. 7C
PURCHASED DATE	FINISHED PART NO.
NAME:	NAME:
HEAT TREAT	CASE DEPTH
NAME:	HARDNESS

b-5-41  
J.E.P. Grant

954-2

卷之三



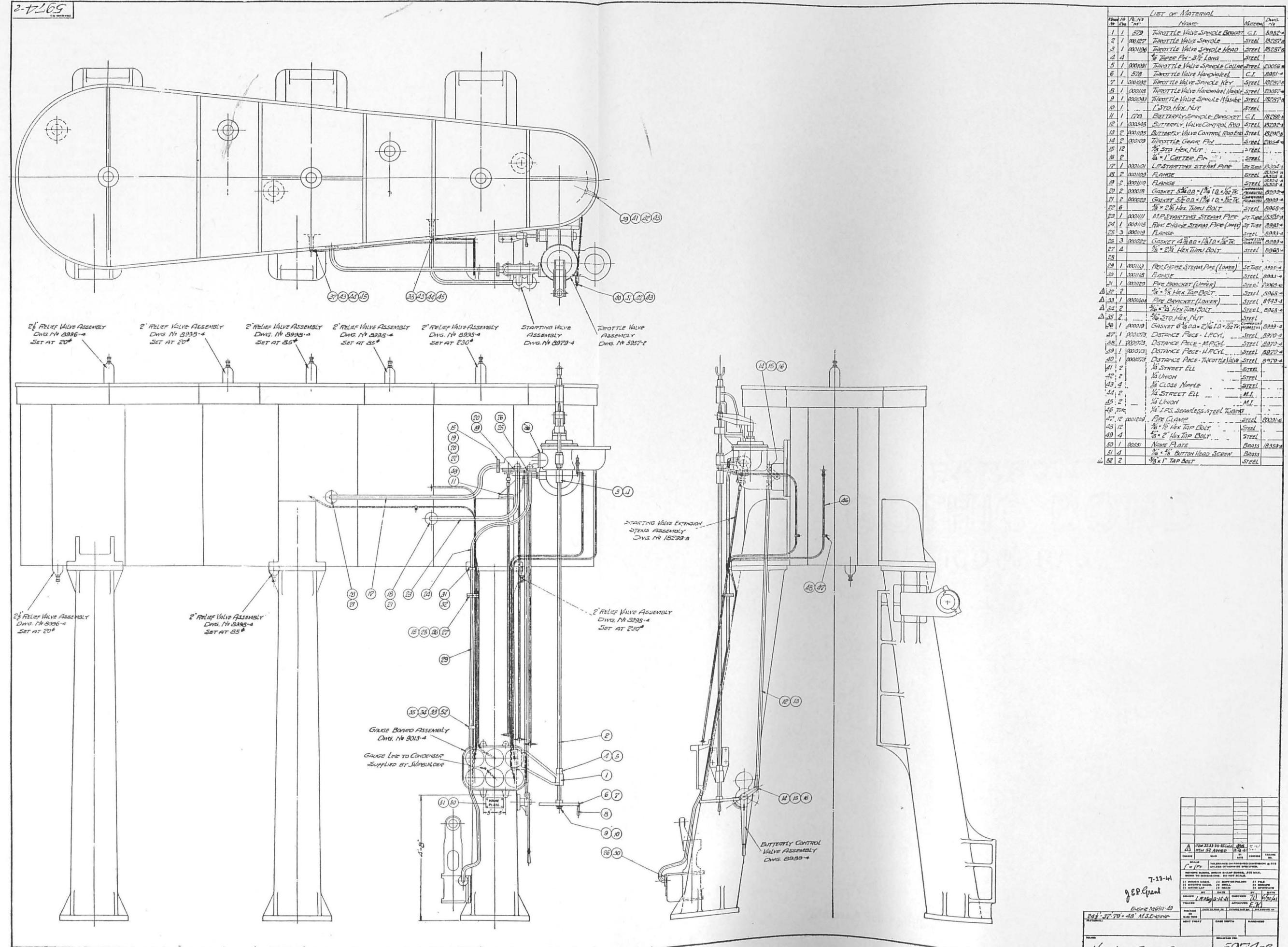
NO. OF PARTS GIVEN ARE FOR ONE ASSEMBLY						
MARK NO. REF.	PC. NO. M.	NAME	MATERIAL	DRAWING NO.		
				1	2	3
1 1	000131	AFT LINK BAR	STEEL	18237-8		
2 1	00062	FORWARD LINK BAR	STEEL	18189-8		
3 2		1/8" STOP PIN - LINK BAR BOLT	STEEL	19982-6		
4 2	000108	LINK BAR DISTANCE PECE	STEEL	19980-6		
5 2		1/8" HEX NUT 7/8" HIGH	STEEL			
6 2		1/8" COTTER PIN	STEEL			
7 2	00064	LINK BAR BOLT	STEEL	19982-6		
8 2	00065	DRAG LINK & ECC. ROD PIN.	STEEL	1856-2		
9 4	000101	OIL CUP SET SCREW	STEEL	19984-6		
10 1	00063	LINK BLOCK	STAINLESS STEEL	837-3		
11 2	0012	UPPER SIB FOR LINK BLOCK	STAINLESS STEEL	837-3		
12 2	00066	ECC. ROD PIN.	STEEL	8150-3		
13 2	0013	LOWER SIB FOR LINK BLOCK	BRONZE	832-2	18288	
14 4		5/8" X 1 1/8" TAP BOLTS.	STEEL			
15 4	00047	VALVE GEAR DRAG LINKS	STEEL	8160-8		
16 8		1/8" X 1 1/8" STOP PIN - DRAGLINKS	STEEL	8160-8		
17 4	00185	DRAG LINK BEARING	BRONZE	831-10	8161-8	
18 16		3/4" STD. HEX NUTS.	STEEL			
19 8		1/8" X 1 1/8" COTTER PIN.	STEEL			

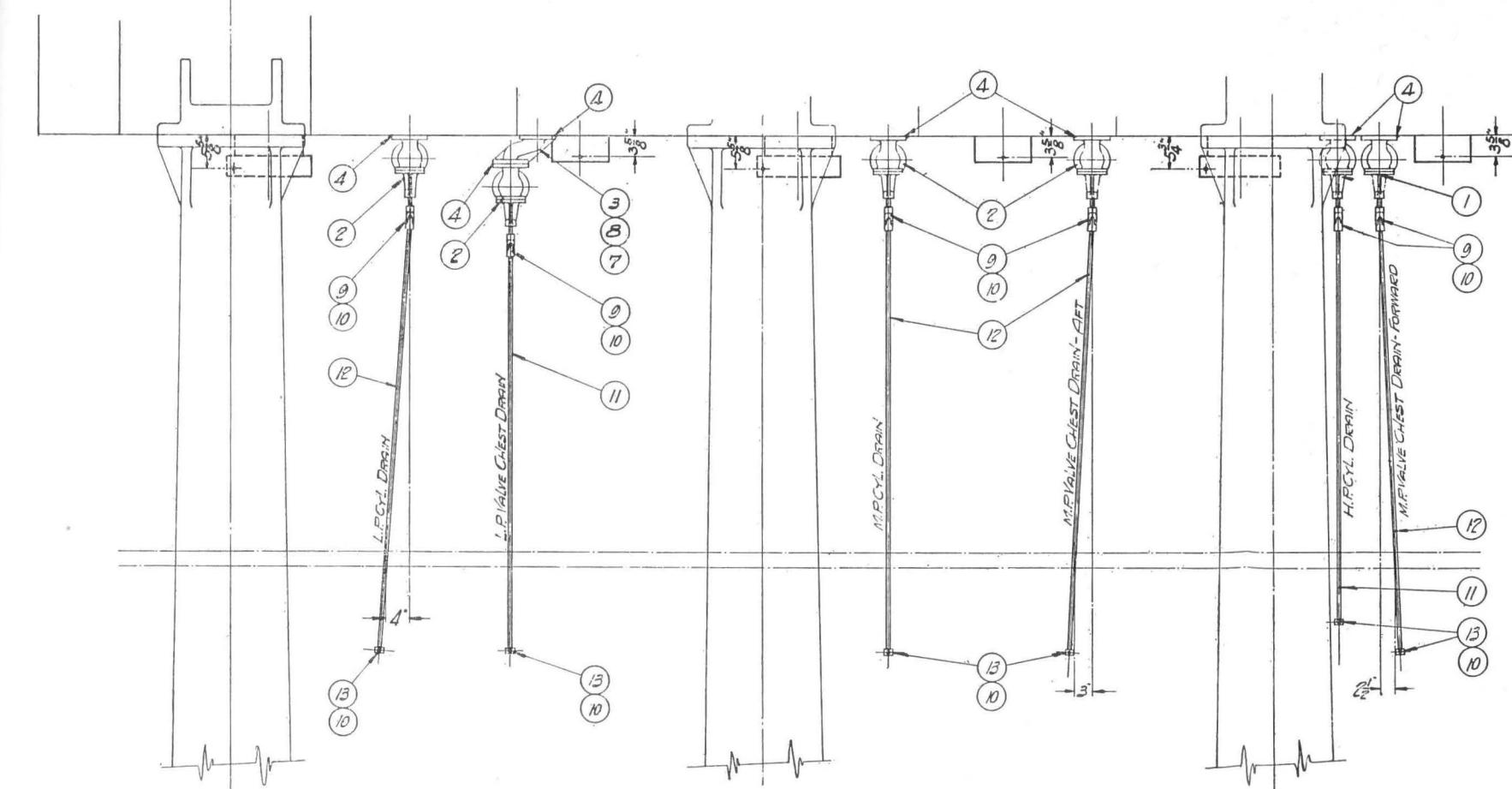
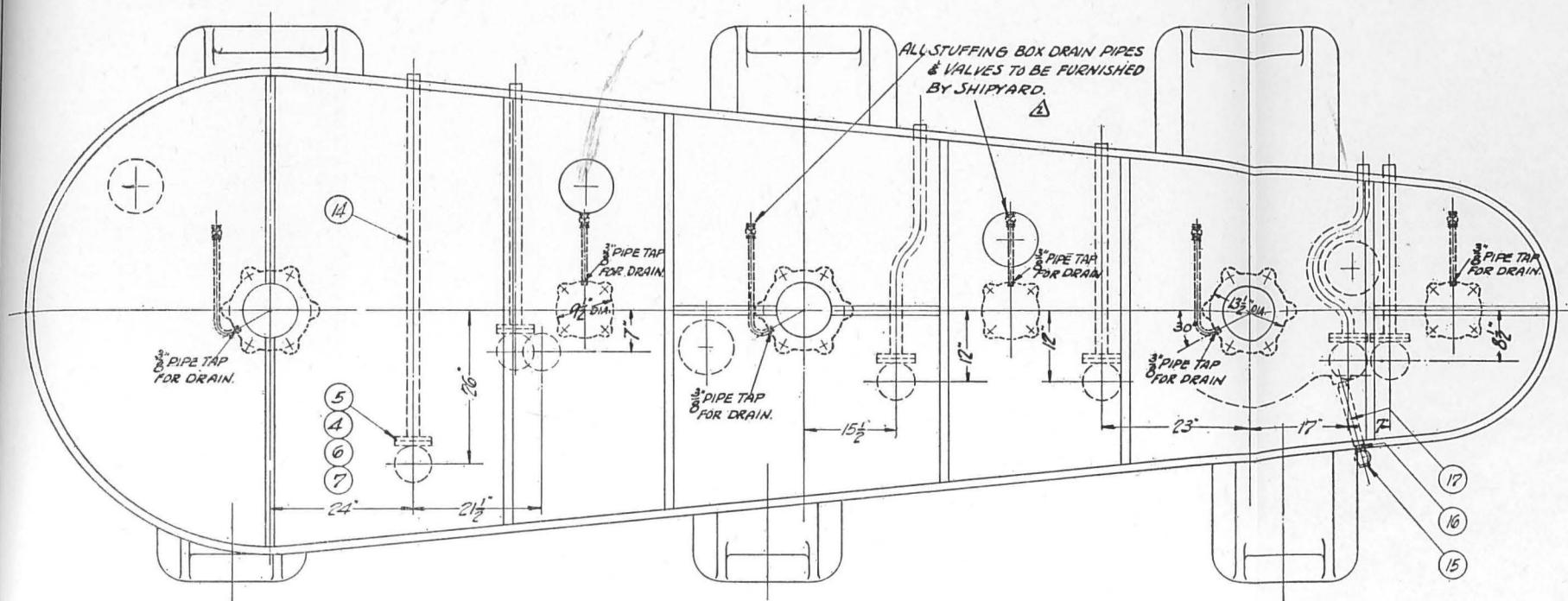
1	P/N M 000131	L.E.M.	
		4-21-41	
CHARGE	WAB	DATE	CHECRED BY
SCALE 3":1:0"	TOLERANCE OR FINISHED DIMENSION(S) .010 UNLESS OTHERWISE SPECIFIED		
REMOVE BURRS, BREAK SHARP EDGES, DIG MAX WORK TO DIMENSIONS. DO NOT SCALE			
/3 ROUGH MACH	/3 BURST MACH	/3 Buff or Polish	/3 FILE
/3 SMOOTH MACH	/3 DRILL	/3 REAM	/3 SCRAP
/3 BRING LIP			/3 SPOTFACE
DRAWN	BT	DATE	BT
	<i>J.L.</i>	3-26-41	<i>E.K.</i>
TRACED			<i>APPROVED</i>
PURCHASED OR MASS PROD	SOURCE, OR POSE NO.	FINISHED POSE NO.	ITEM NUMBER, IF
MEAT TREAT	CASE DEPTH		HARDNESS
BARS	DRAWING NO. 5954-2		

ENGINE NO. 6511-40 INCL.  
24 $\frac{1}{2}$ <sup>°</sup> - 37<sup>°</sup> - 70<sup>°</sup> x 48<sup>°</sup> M. S. ENGINE

4-30-

ASSEMBLY OF LINK BARS  
& AXLE



2-5165  
ON DRAWING

NO OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
Part No. No. Ref.	Part No. "A"	Name	Drawing No.
1 2	1/2" ANGLE VALVE	FORGED STEEL	NOTE 1
2 4	1/2" ANGLE VALVE	BRASS	NOTE 2
3 1	VALVE OFFSET	C.I.	18294-8
4 13	GASKET 6 1/2" O.D. X 1/8" I.D. X 1/2" THK.	COMPRESSED ASBESTOS	8999-4
5 6	1/2" COMPANION FLANGE	BRASS	NOTE 3
6 24	2 1/2" X 2 1/2" HEX THRU BOLT	STEEL	
7 28	2 1/2" STA. HEX NUT	STEEL	
8 4	2 1/2" STUD	STEEL	8980-4
9 6	UNIVERSAL JOINT	STEEL	NOTE 4
10 12	1/2" TAPER FRI - 1/2" LONG	STEEL	
11 2	EXTENSION STEM	STEEL	18297-8
12 4	EXTENSION STEM	STEEL	18297-8
13 6	STEM HANDLE	M.I.	20064-8
14 25A	1/2" I.P.S. PIPE	BRASS	
15 1	1/2" GLOBE VALVE	STEEL	NOTE 5
16 1	1/2" SHORT NIPPLE - EXTRA STRONG	STEEL	
17 1	DISTANCE PIECE	STEEL	8970-4

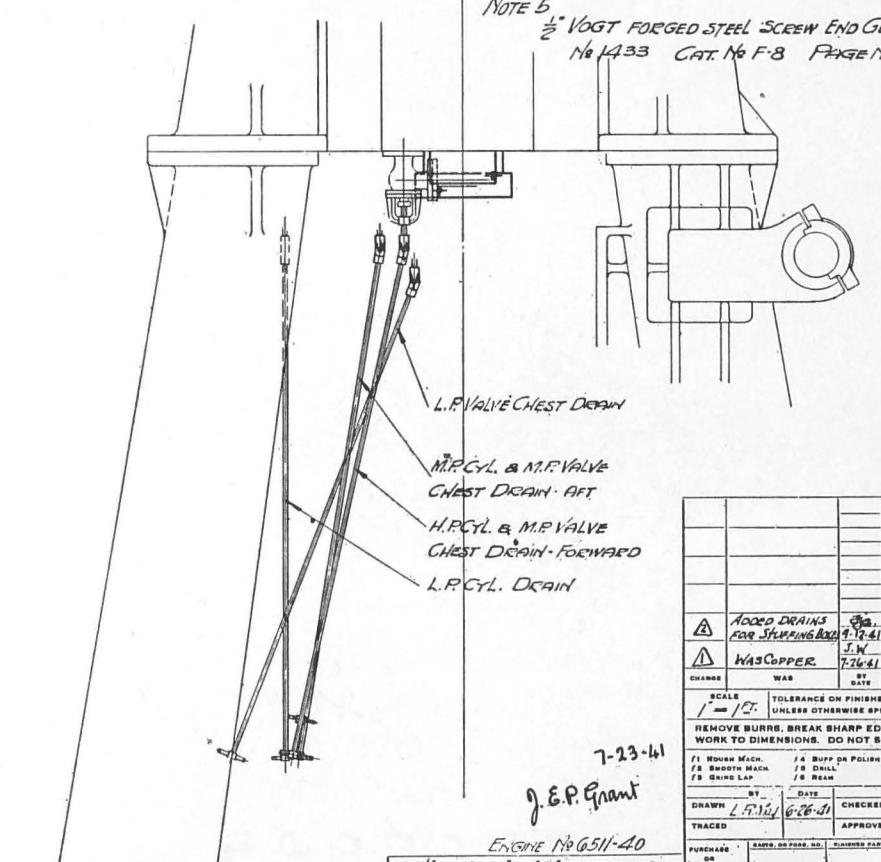
NOTE  
1/2" CRANE FORGED STEEL MARINE ANGLE VALVE  
No. 3657-XR Cat. No. 313 Page No. 87

NOTE 2  
1/2" CRANE BRASS MARINE ANGLE VALVE  
No. 87 1/2 Cat. No. 52 Page No. 497

NOTE 3  
1/2" CRANE BRASS COMPANION FLANGE,  
No. 2109 Cat. No. 52 Page No. 262

NOTE 4  
BOND #7-48-B UNIVERSAL JOINT

NOTE 5  
1/2" VOGT FORGED STEEL SCREW END GLOBE VALVE  
No. 1433 Cat. No. F-8 Page No. 53



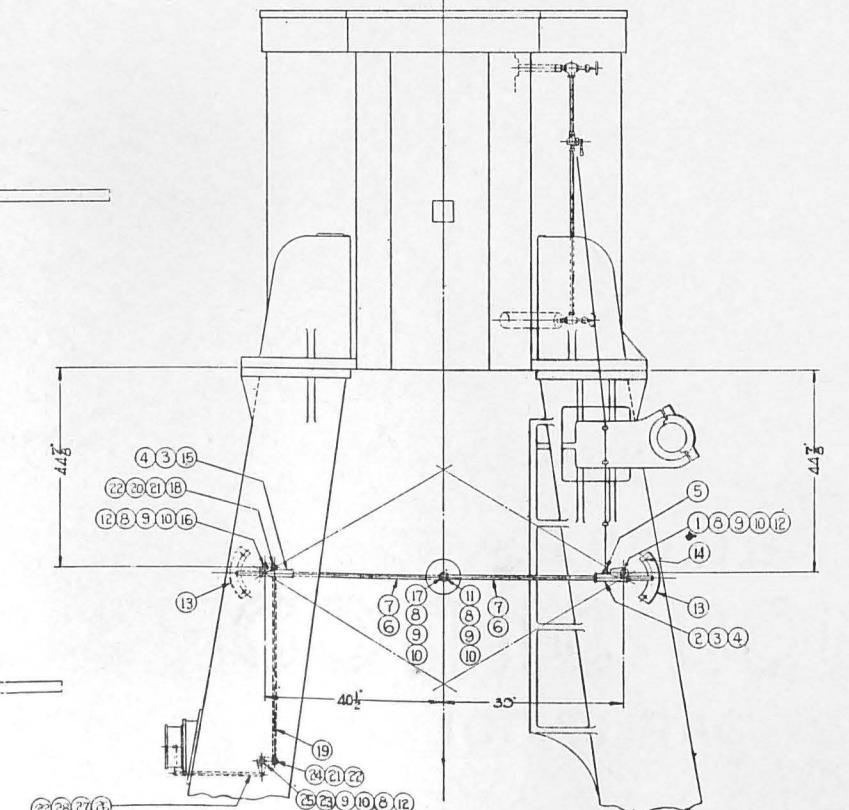
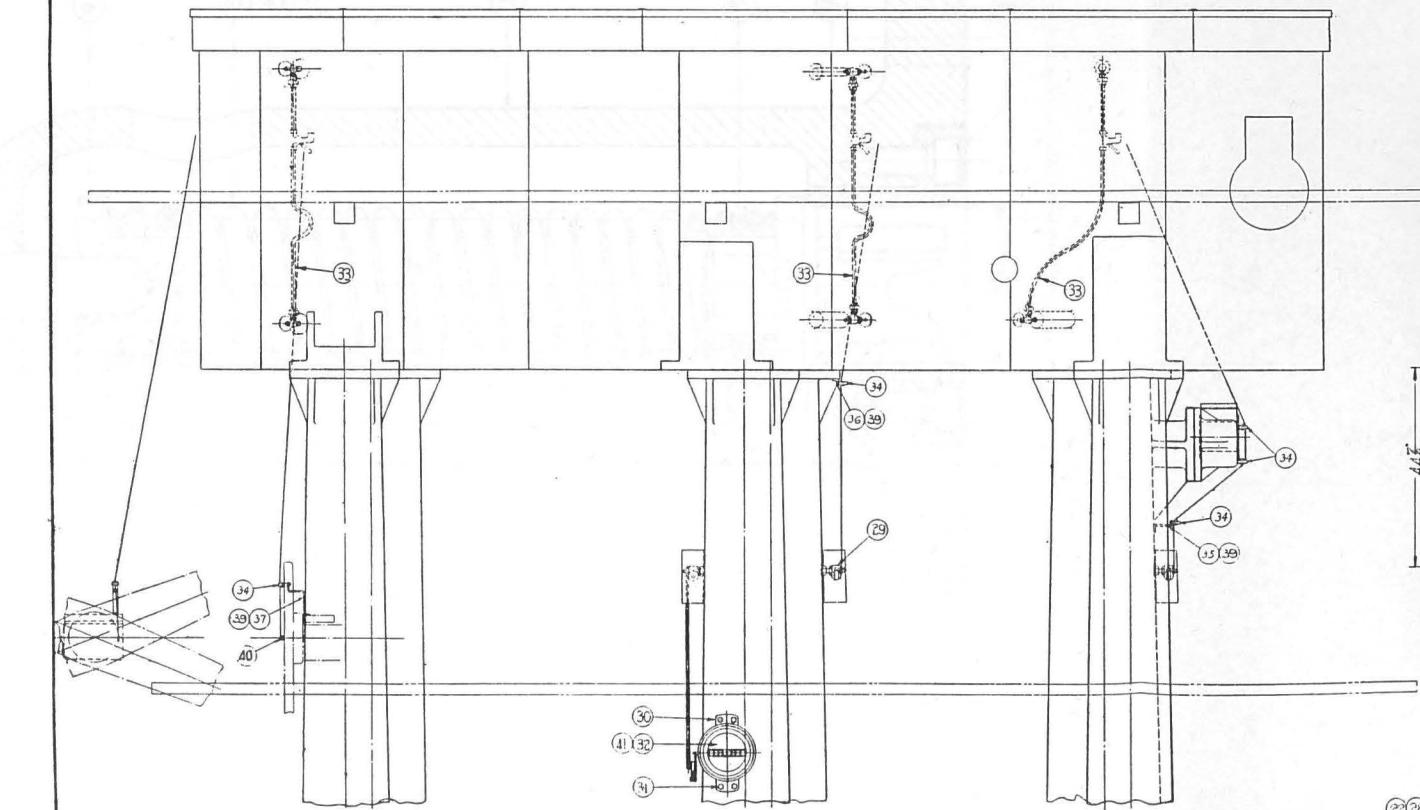
DRAWING NO.		NAME:		DRAWING NO.	
7-23-41	J. E. Grant	ENGINE NO. 651-40	5975-2		
DATE	BY	DATE	BY	DATE	BY
6-26-41	L. T. J. L.	6-26-41	E. T. K.	6-26-41	
TRACED	APPROVED	CHECKED	RECORDED	RECORDED	
PURCHASED OR MADE ON PURCHASED OR MADE ON PURCHASED	SAFETY DATA SHEET NO.	NUMBER PART NO.	SAFETY DATA SHEET NO.	NUMBER PART NO.	
HEAT TREAT	CASE DEPTH	HARDNESS			

DRINK VALVE ARRANGEMENT  
GENERAL MACHINERY CORPORATION  
HAMILTON, OHIO

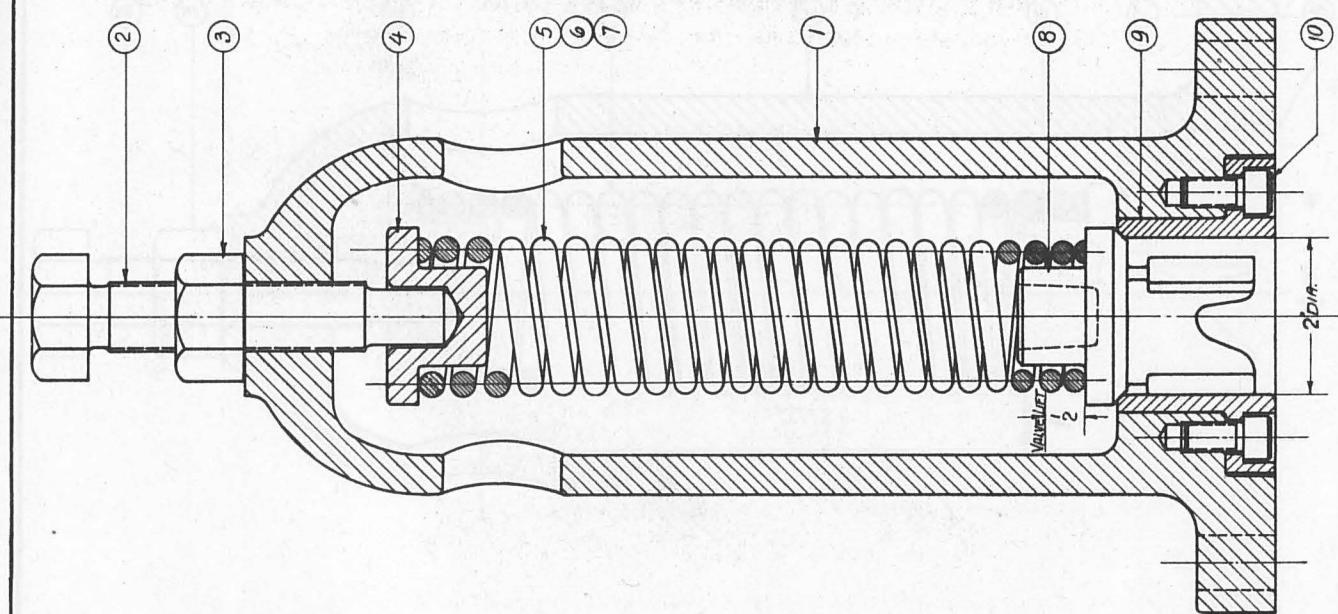
5975-2

5971-2

N° OF PARTS GIVEN ARE FOR ONE ASSEMBLY	
NAME	MATERIAL
1 2 000085 INDICATOR GEAR COLUMN PIN	STEEL 102534
2 1 000572 COTTER PIN	COTTON 00244-0
3 1 004066 SLEEVE BUSHING	BRONZE 000476
4 6 ALLEN SETSCREW # D-24- $\frac{1}{16}$ LG.	STEEL
5 2 00000406 BUTTON	STEEL 10245-0
6 3 004057 DRIVING ROD BUSHING	BRONZE 002478
7 3 00001046 DRIVING ROD	STEEL
8 7 00004483 COLLAR	STEEL 102520
9 9 5A STD HEX NUT	STEEL
10 9 COTTER PIN $\frac{1}{16}$ DIA. + 1 LG.	STEEL
11 2 000082 INDICATOR DRIVE PIN	STEEL 102520
12 4 5 STD TAP BOLT	STEEL
13 3 0000108 DRIVING ROD GUARD	STEEL 102520
14 1 0000724 $\frac{1}{16}$ X $\frac{1}{16}$ HEX TAP BOLT	STEEL 00268-0
15 1 580 DRIVING BUSH	CAST IRON 00266-A
16 1 0000722 FULCRUM PIN	STEEL 10265-0
17 1 0000163 COUNTER DRIVE PIN	STEEL 10266-0
18 1 0000199 SLEEVE PIN	STEEL 10267-0
19 1 000044 INTERMEDIATE LINK	STEEL 10270-0
20 1 0000199 WASHER	STEEL 10261-0
21 3 5 STD HEX NUT	STEEL
22 3 1 0000108 DRIVING ROD GUARD	STEEL 10271-B
23 1 0000238 INTERMEDIATE LEVER	CAST STEEL 10271-B
24 1 0000658 INTERMEDIATE LEVER PIN	STEEL 10263-0
25 1 0000723 FULCRUM PIN	STEEL 10264-0
26 1 000246 COUNTER LINK	STEEL 10265-0
27 2 0000662 COUNTER LINK PIN	STEEL 10263-0
28 2 000059 WASHER	STEEL
29 1 571 MP SLEEVE	CAST IRON 10249-0
30 1 131 REVOLUTION COUNTER BONED	STEEL 10272-0
31 4 STD TAP BOLT $\frac{1}{16}$ X $\frac{1}{16}$ LG	STEEL 00268-0
32 1 1000047 INDICATOR CORD MARCH - B FIG.	STEEL
33 3 0000765 INDICATOR PULLEY	STEEL 10269-0
34 5 INDICATOR CORD DRIVE PULLEY	STEEL
35 1 0001199 LP INDICATOR PULLEY BRACKET	STEEL 00114
36 1 0001200 MP INDICATOR PULLEY BRACKET	STEEL 00114
37 1 0001188 LP INDICATOR PULLEY BRACKET	STEEL 00114
38 1000114 INDICATOR CORD	STEEL
39 6 $\frac{3}{8} \times \frac{1}{4}$ HEX TAP BOLT	STEEL 00268-0
40 1 000047 FLANGE LEVER BUTTON	STEEL 10248-0
41 3 $\frac{1}{4} \times \frac{1}{2}$ BUTTON HEAD SCREW	BRASS



7-8668



## LIST OF MATERIAL

## PARTS GIVEN FOR ONE ENGINE

ITEM NO.	DESCRIPTION	NAME	WATERMILL NO.
1	6 000117 RELIEF VALVE BODY	RELIEF VALVE BODY	5997-4
2	6 000140	ADJUSTING SCREW	SAC-135
3	6 000125	7/16" HEX. NUT	20074-6
4	6 000125 SPRINGS FOR H.P. C.R. & VALVE CHEST	C.R. SPRINGS	20074-6
5	6 000342 SPRINGS FOR H.P. C.R. & VALVE CHEST	SPR. NAME 1/320-8	SPR. NAME 1/320-8
6	2 000341	H.P. CHAMFER	SPR. NAME 1/320-8
7	1 00034	L.P. VALVE CHEST	SPR. NAME 1/320-8
8	6 00032 RELIEF VALVE	VALVE	NAME 1/320-8
9	6 00033 "	SEAT	NAME 1/320-8
10	12 3-16" ALLEN SCREWS 3/8" LONG	COMMIT.	

NOTE: STAMP ON FLANGE  
OF VALVE

L.P. 20#

1 - 2 RELIEF VALVE WITH SPRING 7000314 FOR L.P. VALVE CHEST

VALVE SET TO BLOW AT . . . 20 LBS. SQ. IN.

5

MAXIMUM ALLOWABLE VALVE LIFT =  $\frac{5}{8}$ 

3 - 2 RELIEF VALVE WITH SPRING 7000341 FOR H.P. CR. TOP &amp; BOTTOM X VALVE CHEST

VALVE SET TO BLOW AT . . . 85 LBS. SQ. IN.

MAXIMUM ALLOWABLE VALVE LIFT =  $\frac{5}{8}$ 

2 - 2 RELIEF VALVE WITH SPRING 7000341 FOR H.P. CHAMFER TOP &amp; BOTTOM

VALVE SET TO BLOW AT . . . 230 LBS. SQ. IN.

MAXIMUM ALLOWABLE VALVE LIFT =  $\frac{5}{8}$ 

ITEM NO.	DESCRIPTION	NAME	WATERMILL NO.
1	246-37-70x48 N/S E/16, 1/E	VALVE	
2	246-37-70x48 N/S E/16, 1/E	VALVE	
3	246-37-70x48 N/S E/16, 1/E	VALVE	
4	246-37-70x48 N/S E/16, 1/E	VALVE	
5	246-37-70x48 N/S E/16, 1/E	VALVE	
6	246-37-70x48 N/S E/16, 1/E	VALVE	
7	246-37-70x48 N/S E/16, 1/E	VALVE	
8	246-37-70x48 N/S E/16, 1/E	VALVE	
9	246-37-70x48 N/S E/16, 1/E	VALVE	
10	246-37-70x48 N/S E/16, 1/E	VALVE	

5-1-41

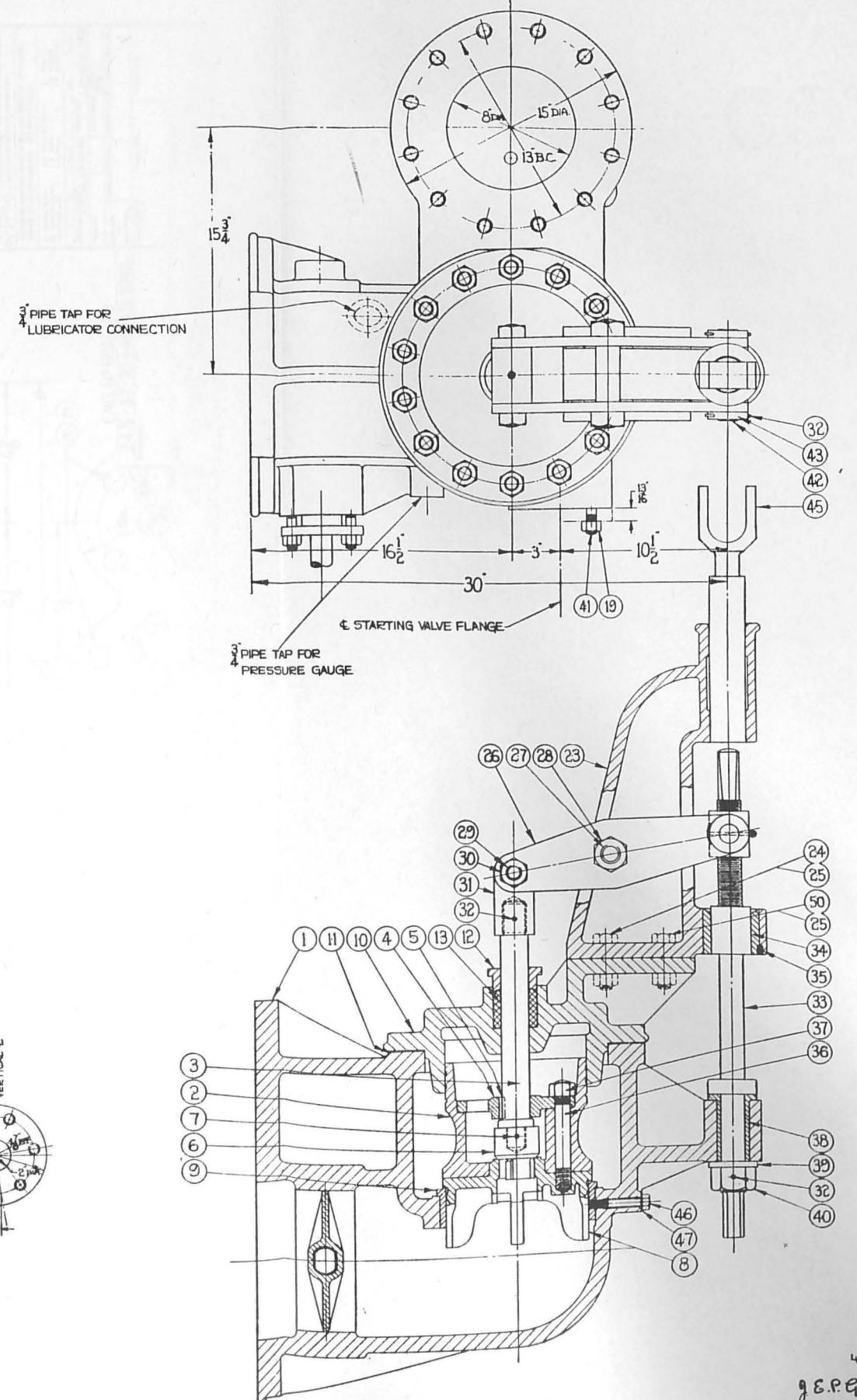
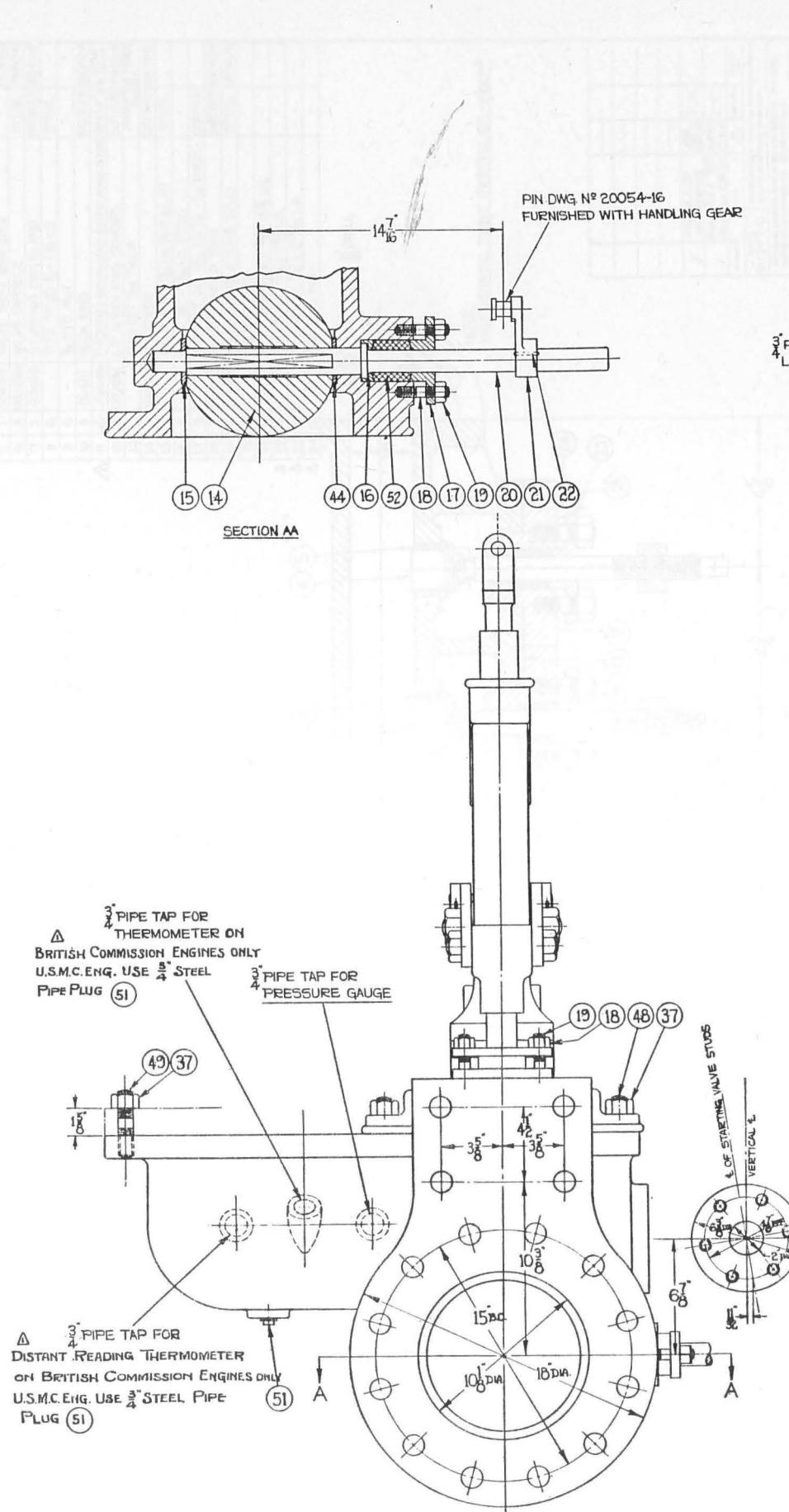
g E.R. part

ASSEMBLY OF 2" RELIEF VALVE.

8998-4



5957-2

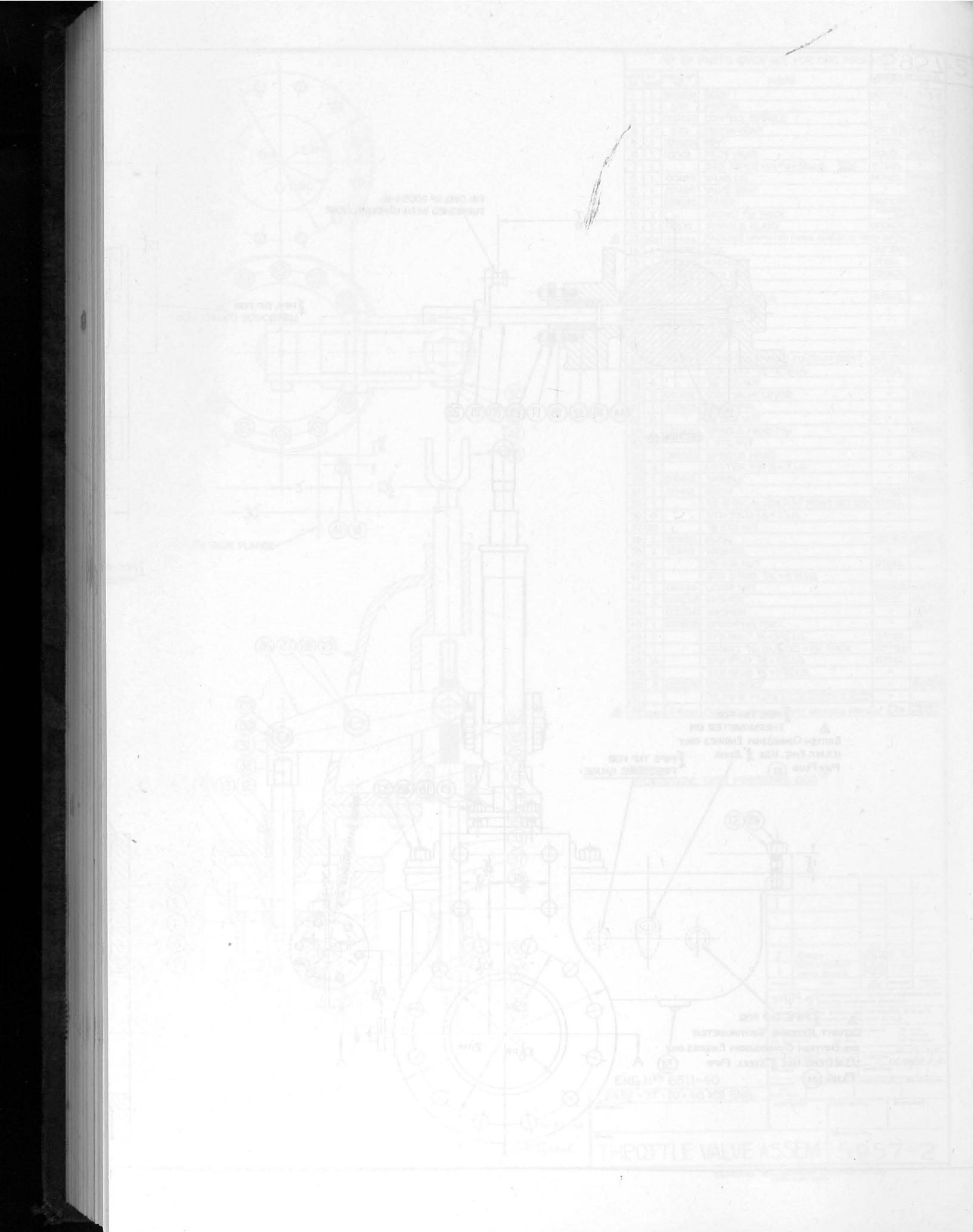


N° OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
MARK	PIECE N°	NAME	MATERIAL
1	1 0001031	BODY	CAST STEEL 5943-2
2	1 569	PISTON	- IRON 5944-2
3	1 000422	CONTROL SPINDLE	STEEL 18256-6
4	1 570	PISTON KEEP	CAST IRON 5944-2
5	1 0001034	KEY	STEEL 18256-6
6	1 00501	PILOT VALVE	MONEL 8967-4
7	1	STD. TAPER PIN #4 x 3 1/4 LG. SPLIT END	STEEL
8	1 00489	VALVE LID	MONEL 5944-2
9	1 00488	VALVE SEAT	- 5944-2
10	1 0001045	COVER	CAST STEEL 5946-2
11	1	GASKET $\frac{1}{32}$ THICK	ASBESTOS FIBRE SHEET
12	1 00510	SPINDLE GLAND	BRONZE 18256-6
13	SET 4 RINGS	PACKING GRAPHITED FIBRE ASBESTOS YARN 600° FABRICATION	CAST STEEL 18249-6
14	1 0001050	DISC	CAST IRON 18249-6
15	1 0001075	WASHER	STEEL 8967-4
16	1 00488	NECK RING	BRONZE 8967-4
17	1 00175	GLAND	- 10249-6
18	4	STUD $\frac{5}{16}$ x 3 1/4 LG.	STEEL
19	10	$\frac{5}{16}$ STD. NUT	"
20	1 000439	SPINDLE	8967-4
21	1 000438	LEVER	CAST STEEL 18275-8
22	1 0001065	KEY	STEEL 8967-4
23	1 0001044	OPERATING SPINDLE FULCRUM BRKT	CAST STEEL 5946-2
24	2	STD. BOLT $\frac{3}{4}$ x 2 1/8 LG.	STEEL
25	4	$\frac{3}{16}$ STD. NUT	"
26	2 000431	STOP VALVE LEVER	8967-4
27	1 000426	LEVER PIN	- 18256-6
28	2	$\frac{1}{16}$ STD. NUT	"
29	1 000430	SPINDLE HEAD PIN	- 18254-8
30	2	$\frac{1}{16}$ STD. NUT	"
31	1 0001053	SPINDLE HEAD	- 18254-8
32	4	COTTER PIN $\frac{1}{16}$ x 3 1/4 LG.	"
33	1 0001051	SPINDLE	- 18251-8
34	1 00491	BUSH	BRONZE 18251-8
35	1	$\frac{3}{16}$ -16-N.C. ALLEN FLAT POINT SET SCR.	STEEL
36	4	STD. STUD $\frac{7}{16}$ x 7 LG.	"
37	30	$\frac{7}{16}$ STD. NUT	"
38	1 00492	BUSH	BRONZE 18251-8
39	1 00493	WASHER	- 18251-8
40	1	$\frac{1}{16}$ STD. NUT	STEEL
41	6	STD. STUD $\frac{5}{16}$ x 2 3/8 LG.	"
42	1 00494	LEVER NUT	BRONZE 18254-8
43	2 0001052	WASHER	STEEL 18254-8
44	1 0001049	WASHER	- 8967-4
45	1 0001095	OPERATING FORK	- 18290-8
46	1	STD. BOLT $\frac{5}{16}$ x 3 1/4 LG.	STEEL
47	1	GASKET $\frac{1}{16}$ ID. $\frac{15}{16}$ OD. $\frac{1}{32}$ THICK	COPPER
48	14	STD. STUD $\frac{7}{16}$ x 3 1/4 LG.	STEEL
49	12	STD. STUD $\frac{7}{16}$ x 3 1/4 LG.	"
50	2 0001096	REAM BOLT	- 18290-8
51	1	3/4 PIPE PLUG 1-WTD. FOR BRITISH COMM. 3-WTD. FOR U.S.M. COMM.	"
52	SET 4 RINGS	PACKING GRAPHITED FIBRE ASBESTOS YARN 600° FABRICATION	140 LB X 227.00

NOTE:  
HYDROSTATIC TEST PRESSURE 660 LB

2 ADDED	9/19/44 E.T.K.
1 THERMOMETER	L.A.M. 5/24
1 NOTE ADDED	1/19/44
CHANNEL	WAS RATE CHARGED
3 1/2" I.D. 10"	TOLERANCE ON FINISHED DIMENSIONS .010 MAX. UNLESS OTHERWISE SPECIFIED.
REMOVE SURRS. BREAK SHARP EDGES. .010 MAX. WORK DIMENSIONS. DO NOT SCALE.	
J1 REIN. RAD.	J4 BUFF OR POLISH
J2 BEVEL. RAD.	J5 FILE OR GRIND
J3 SWING LAP	J6 ROLL
	J7 SPOTFACE
	J8 ROLL
DRAWN C 2024 3-31-44	BY DATE CHECKED BY DATE
TRACED	APPROVED
FORGE	PRINTED OR DRAWN
MADE	BY DATE
HEAT TREAT	CASE DEPTH
MAINTAIN	HARDNESS

ENG. N° 6511-40  
24 1/2 - 37 - 70 x 48 MS. ENG.  
MATERIAL: HEAT TREAT: CASE DEPTH: HARDNESS:  
THROTTLE VALVE ASSEM. 5957-2  
DRAWING NO. 14-30-44  
g E.P. Grant  
GENERAL MACHINERY CORPORATION  
HAMILTON, OHIO

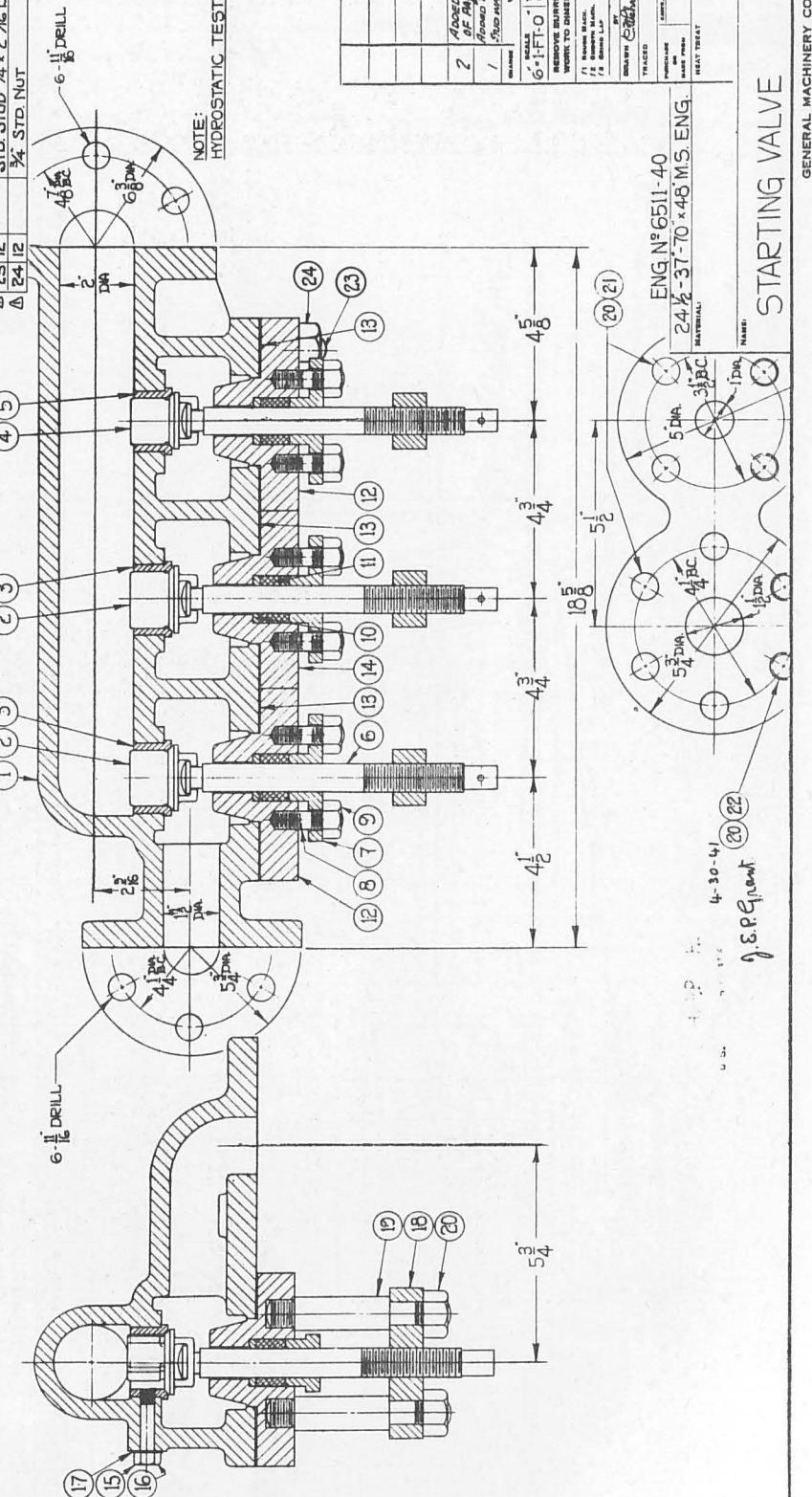


8979-4

N° OF PARTS GIVEN ARE FOR ONE ASSEMBLY

WORK N° IN RECD.	PIECE N° M.	NAME	MATERIAL N°	DRAWING N°
1	1 0000040	BODY	CAST STEEL	59462
2	2 00484	VALVE M.P. & L.P.	MONEL METAL	16246-8
3	2 00482	VALVE SEAT M.P. & L.P.	-	16246-8
4	1 00485	VALVE REV. ENG.	-	16246-8
5	1 00463	VALVE SEAT REV. ENG.	-	16246-8
6	3 000042	VALVE SPINDLE	STEEL	16246-8
7	3 00480	STUFFING BOX GLAND	BRONZE 16246-8	
8	6 000041	STD. STUD $\frac{1}{2} \times \frac{1}{8}$ LG.	STEEL	
9	6 00481	NECK RING	-	
10	3 000041	STD. NUT	-	
11	2 000041	JARMS	PACKING GRAPHITED FIBER 16246-8	
12	2 000041	L.P. & REV. ENG. COVERS	BRONZE 16246-8	
13	1 000077	GASKET $\frac{1}{2}$ THICK	ASBESTOS CEMENT	
14	1 000077	M.P. COVER	CAST STEEL	
15	2	BOLT $\frac{1}{2} \times \frac{1}{8}$ LG. (M.P.&L.P.)	STEEL	
16	1	BOLT $\frac{1}{2} \times \frac{1}{8}$ LG. (REV.)	-	
17	3	GASKET O.D. $\frac{1}{2}$ I.D. $\frac{1}{8}$ $\times \frac{1}{8}$ THICK	COPPER	
18	3 00479	VALVE SPINDLE YOKE	BRONZE 16246-8	
19	6 000045	VALVE SPINDLE YOKE STUD	STEEL	16246-8
20	6 000045	STD. NUT	-	
21	6	HEX. THRU BOLT $\frac{1}{2} \times 2\frac{1}{4}$ LG.	-	
22	4	STD. STUD $\frac{1}{4} \times 2\frac{1}{8}$ LG.	-	
23	12	STD. STUD $\frac{1}{4} \times 2\frac{1}{8}$ LG.	-	
24	12	STD. NUT $\frac{1}{4}$	-	

NOTE: HYDROSTATIC TEST PRESSURE = 6600 lb



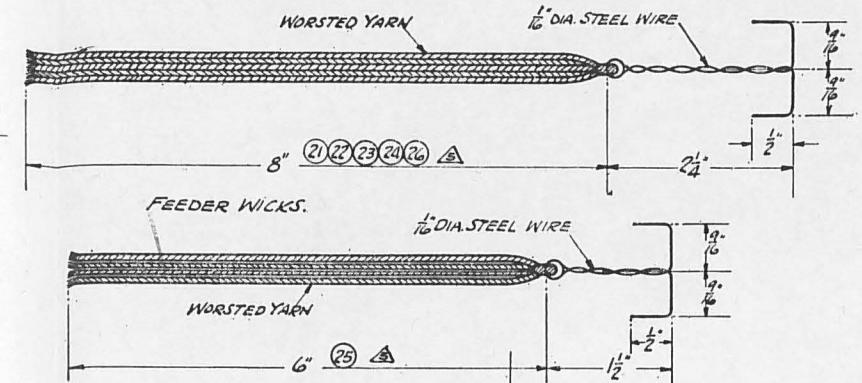
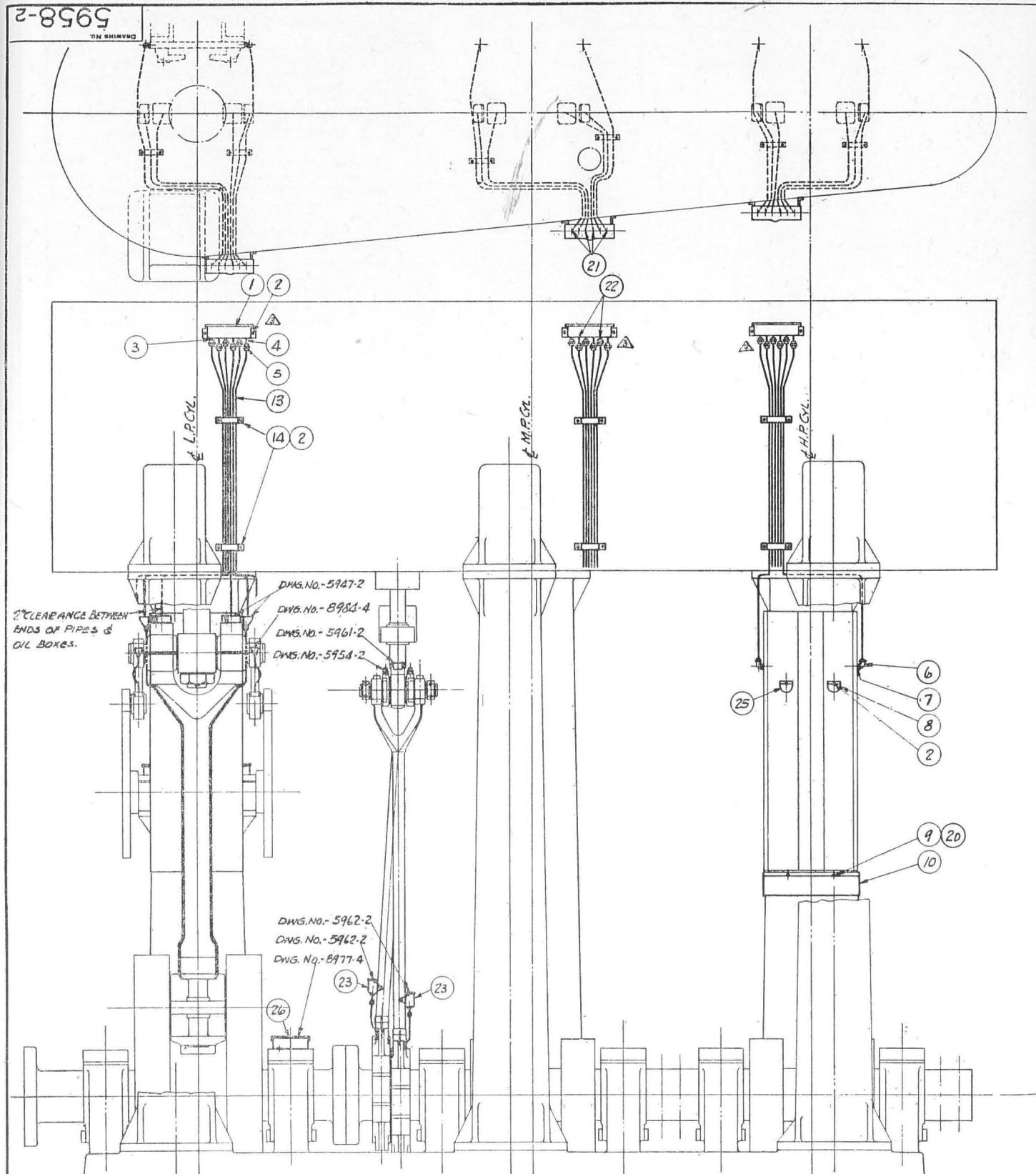
Starting Valve Assembly

8979-4

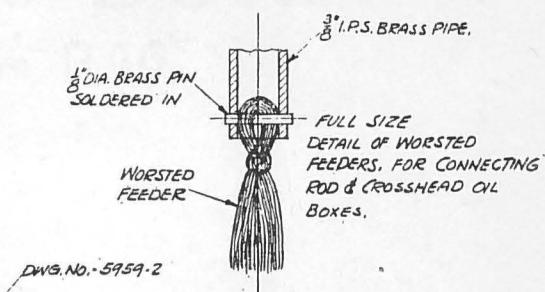
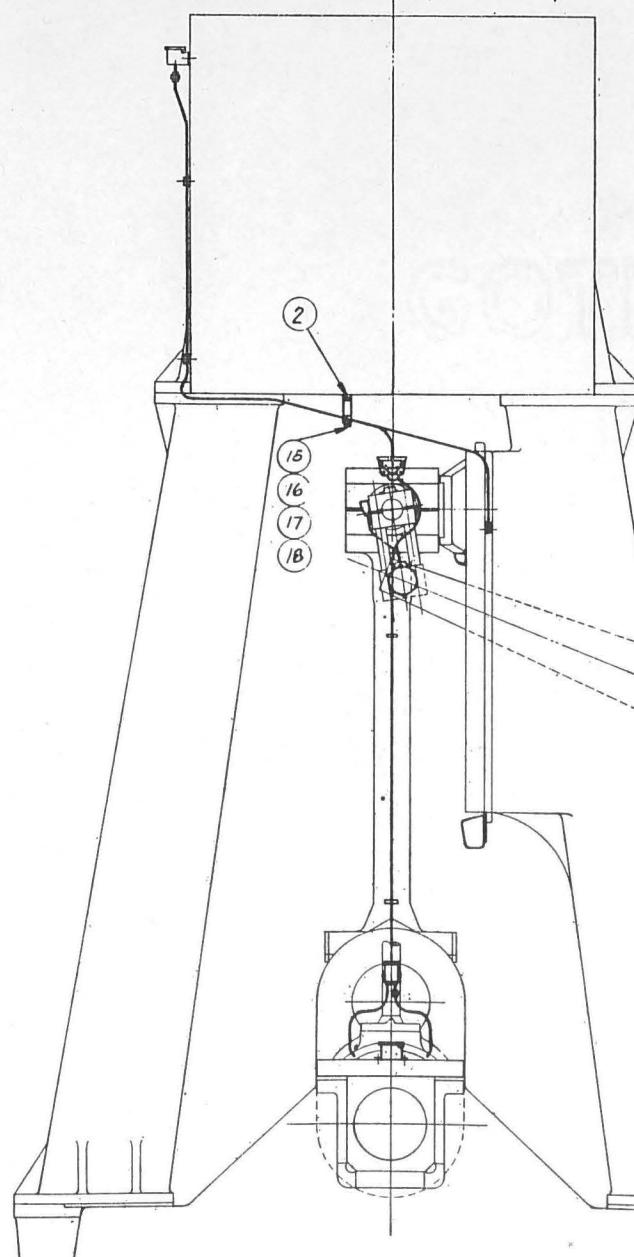
No. 25

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO



NO. OF PARTS GIVEN ARE FOR ONE ENGINE						
WEEK NO.	NO.	PIECE NO.-M <sup>2</sup>	NAME	MATERIAL	DETAILED NO.	
1	3	00508	OIL SYPHON BOX	BRASS	8978-4	
2	36		TAP BOLTS $\frac{1}{2}$ " N.C. X $\frac{5}{8}$ " LONG	STEEL		
3	9		NIPPLE $\frac{1}{2}$ " I.P.S. - $\frac{1}{2}$ " LONG	BRASS		
4	9		NIPPLE $\frac{1}{2}$ " I.P.S. - 3" LONG	BRASS		
5	18		UNION $\frac{1}{2}$ " I.P.S.	BRASS		
6	6		UNION ELBOW $\frac{1}{2}$ " I.P.S.	BRASS		
7	6		NIPPLE $\frac{1}{2}$ " I.P.S. - 1" LONG.	BRASS		
8	6	00505	OIL CUP - ASTERN GUIDE	BRASS	18278-6	
9	6		SPECIAL BOLTS	STEEL	20067-6	
10	3	001028	OIL BOX - CROSSHEAD GUIDE	STEEL	8936-4	
11						
12						
13	1657		$\frac{1}{2}$ " I.P.S. BRASS PIPE	BRASS		
14	6	00514	PIPE STRAPS	BRASS	18294-8	
15	6	0001106	PIPE STRAPS	STEEL	18301-8	
16	6	0001107	STEAM PLATES	STEEL	18301-8	
17	12		THRU BOLTS $\frac{1}{2}$ " - 16 N.C. - $\frac{1}{2}$ " LONG.	STEEL		
18	12		$\frac{1}{8}$ " STD. HEX NUTS.	STEEL		
19	12		WROUGHT FEEDERS			
20	12		5/8" C.R.S.F. HEX NUTS	STEEL	20065-16	
21	12	8-STRAND	FEEDER WICK FOR OIL BOX - TOP & BOTTOM ENDS & GLOBE	WRISTED TIN		
22	6	12-STRAND	" " " "	CRANK PIN	"	
23	12	4-STRAND	" " " "	- ECC. STRAP	"	
24	4	4-STRAND	" " " "	- AIR PUMP LEVER BAR	"	
25	6	4-STRAND	" " " "	CUP - ASTERN SUITE	"	
26	18	6-STRAND	" " " "	BOX - MAIN BRGS.	"	



**FEEDER**  **KODAK CROSSED-HEAD CAL  
BOXES.**

DWIG No - 8984-A

Nº 18291-a

<b>A</b>	ALTERED ITEMS #21 TO #26	B-1-A1 NO.	E.T.K.	
<b>A</b>	ACCORD FEEDER KICKS	7-15-41	E.T.K.	
<b>A</b>	LOCATION OF OIL BOXES & LINER CHG	F-14-A1	E.T.K.	
<b>A</b>	ADDED ITEM 20	6-29-41	E.T.K.	
<b>I</b>	OMITTED ITEMS N 18 & 19	H.M. 5-14-41	E.K.	
CHANGE	WAS	BY DATE	CHANGED	CHARGE NO.
<b>SCALE</b> <b>94-1-0</b>	TOLERANCE ON FINISHED DIMENSIONS ± .010 UNLESS OTHERWISE SPECIFIED.			<b>D10</b>
REMOVE BURRS, BREAK SHARP EDGES. DO NOT MAX. WORK TO DIMENSIONS. DO NOT SCALE.				
<b>J1</b> ROUGH MACH.	<b>J4</b> BUFF OR POLISH	<b>J7</b> FILE		
<b>J2</b> SMOOTH MACH.	<b>J5</b> DRILL	<b>J8</b> SCRAPER		
<b>J3</b> GRIND LAP	<b>J6</b> REAM	<b>J9</b> SPOTFACE		
BY	DATE	BY	DATE	
DRAWN	4-9-41	CHECKED	4-14-41	
TRACED		APPROVED	E.R.	
PURCHASED FROM MANUFACTURER	CARTON NO., P.O. NO.	ITEMIZED PART NO.	BASIC MATERIAL NO.	
HEAT TREAT		CASE DEPTH,	HARDNESS	

ENGINE NO. 6511-40 INCL.

24 $\frac{1}{2}$ " - 37" - 70" x 48" M.S. ENGINE

**MATERIALS**

**NAME:** \_\_\_\_\_

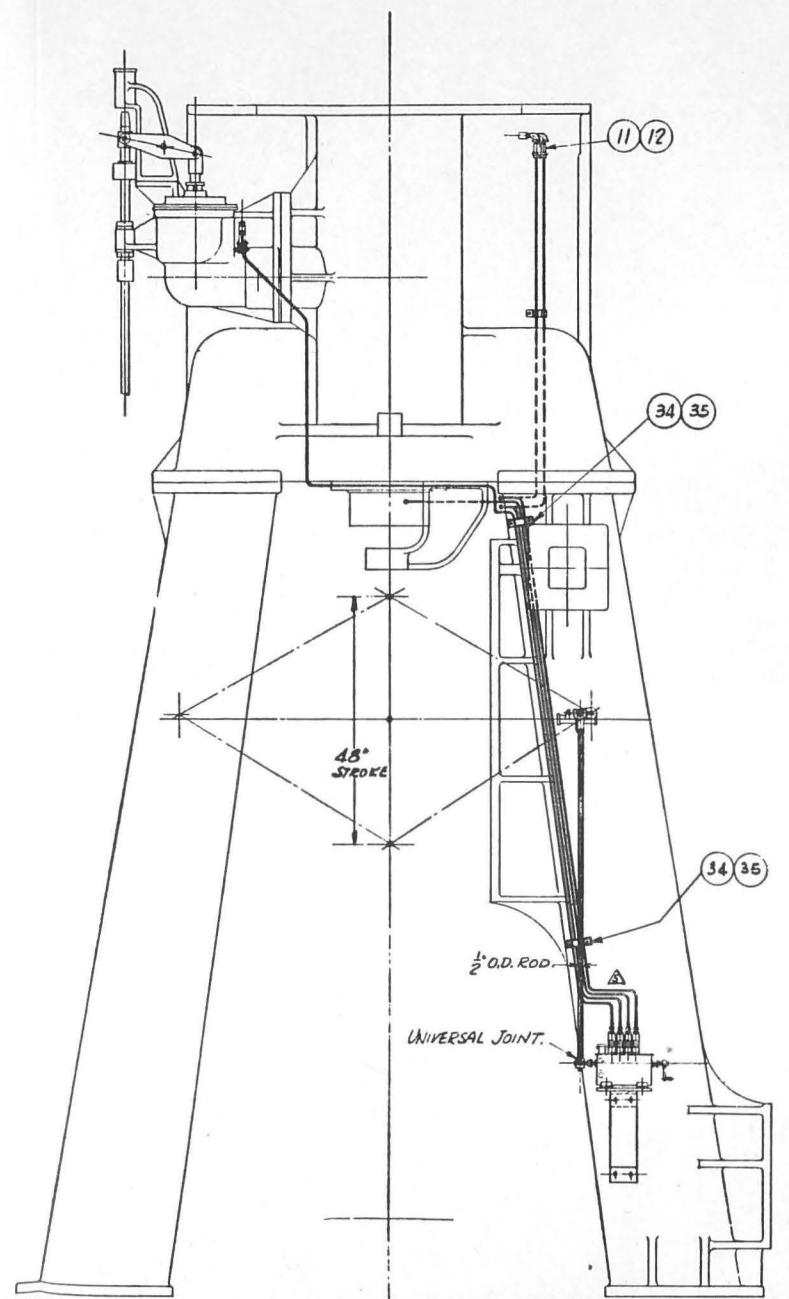
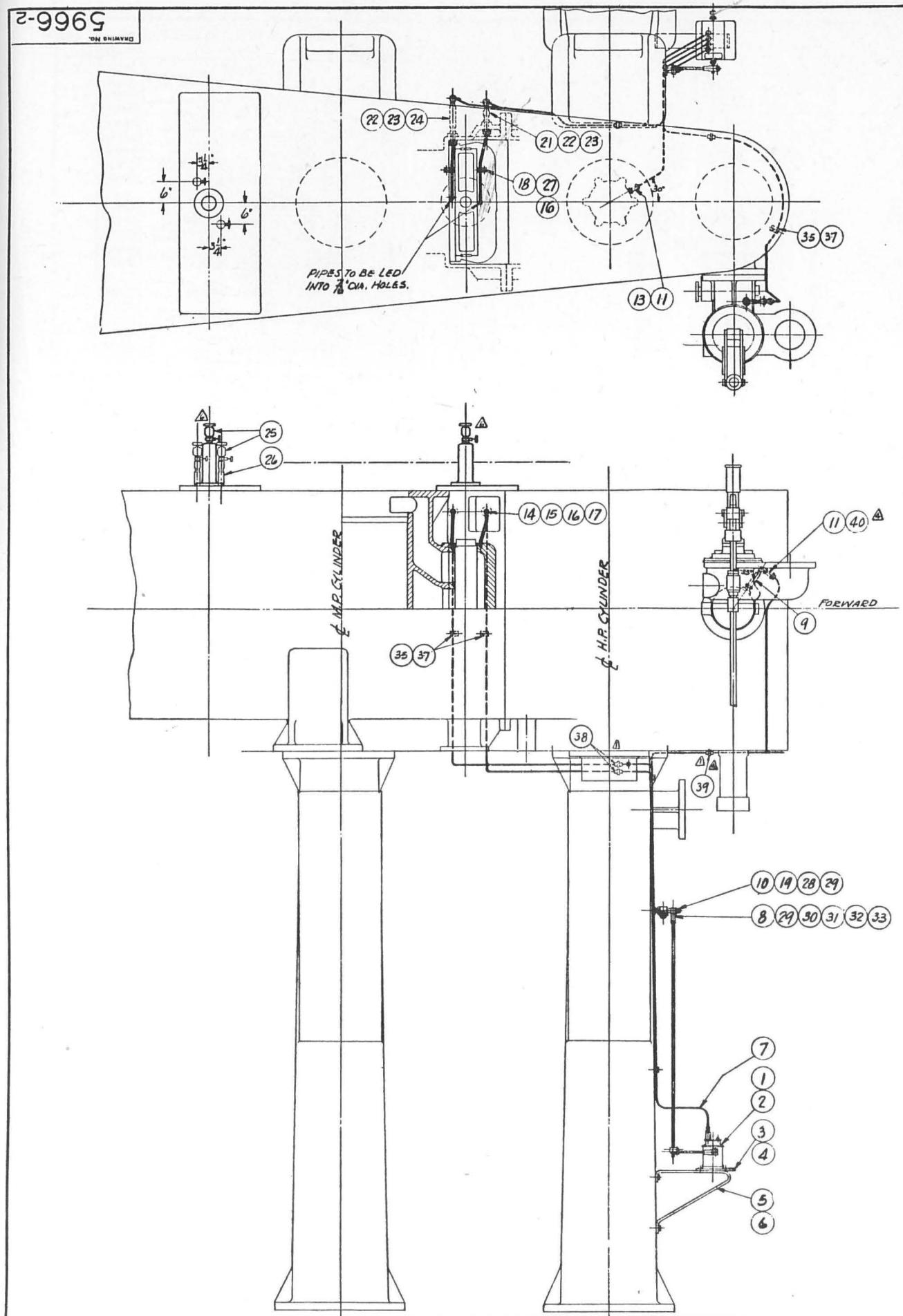
Journal of Computer Science

### OIL PIPING ARRANGEMENT

**GENERAL M**

5958-2

5966-2



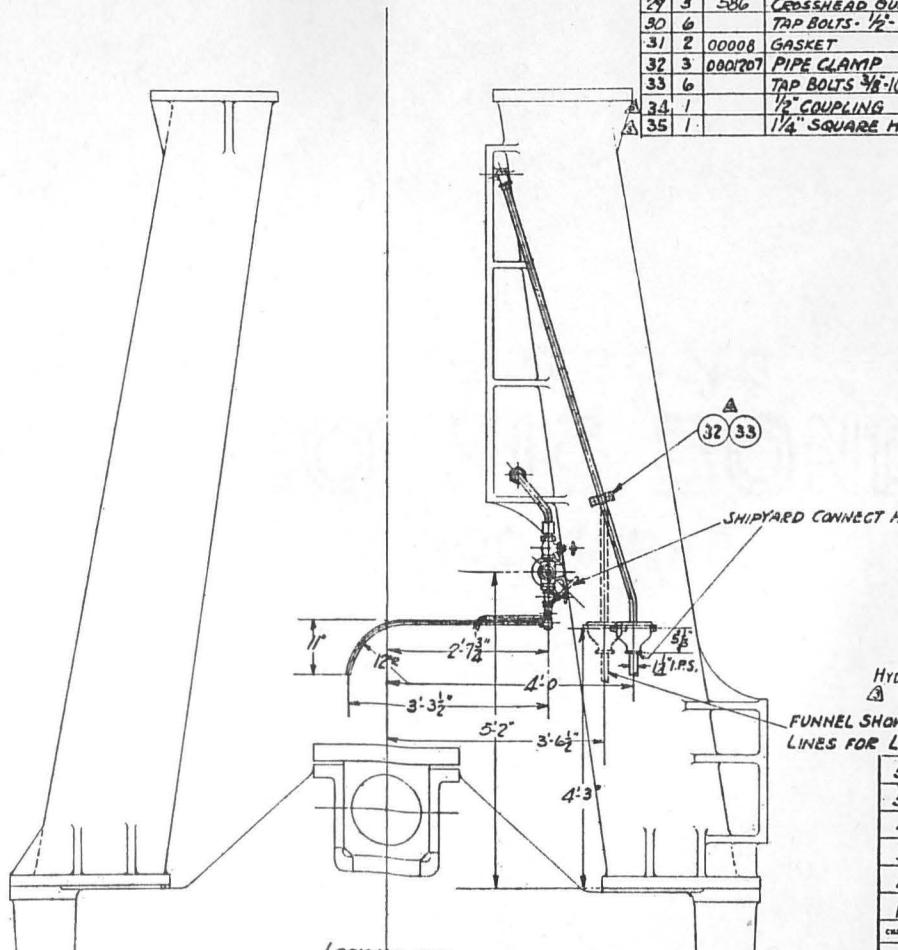
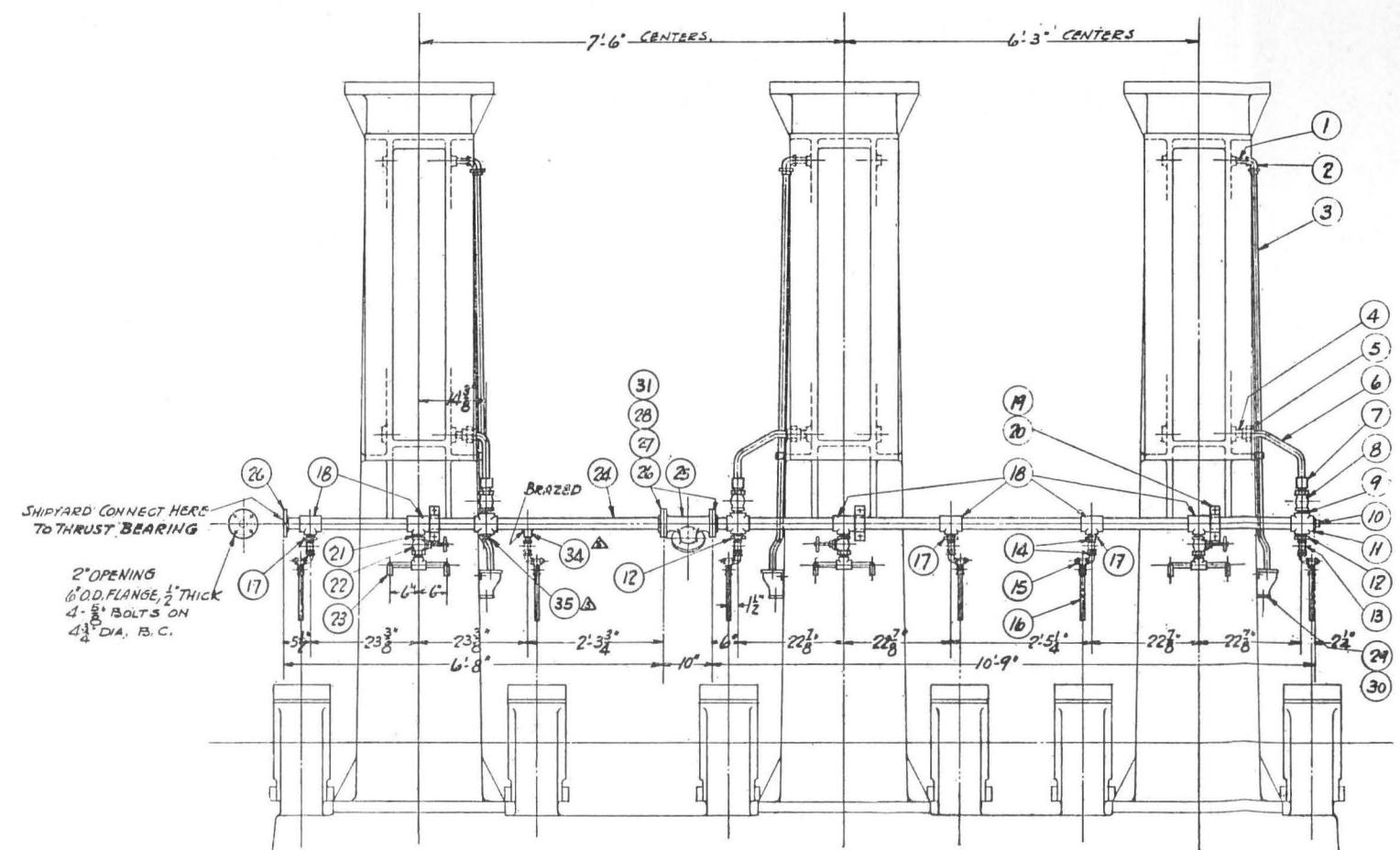
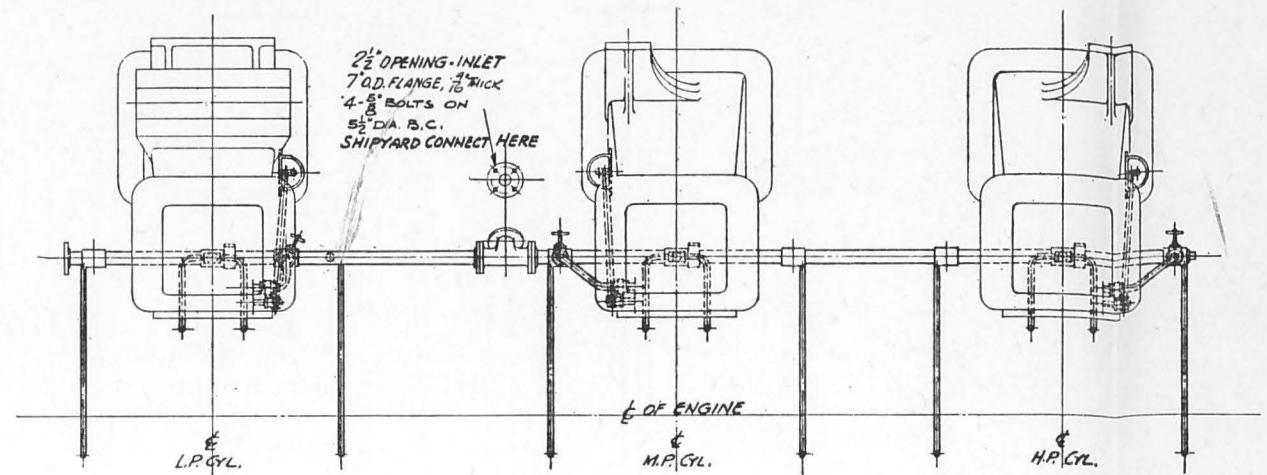
PART NO.	QUANTITY	NAME	MATERIAL	DRAWING NUMBER	
				NO. OF PARTS GIVEN ARE FOR ONE ENGINE	PE. NO. "M"
1	1	4 FEED MANZEL LUBRICATOR - MODEL 748 L.H.	STEEL		
2	4	TAP BOLTS $\frac{1}{8}$ " I.N.C.C.L.3 - $\frac{1}{8}$ " LONG	STEEL		
3	1	NAME PLATE	BRASS	20077-16	
4	2	#10-24 BUTTON HEAD SCREWS - $\frac{1}{8}$ " LONG	STEEL		
5	1	0001132 LUBRICATOR BRACKET	STEEL	18324-8	
6	4	TAP BOLTS $\frac{1}{8}$ " I.N.C.C.L.3 - $\frac{1}{8}$ " LONG	STEEL		
7	80 <sup>21</sup>	$\frac{1}{8}$ " O.D. X .060 WT. TUBING	COPPER		
8	1	0001141 UNIVERSAL PLATE	STEEL	18332-8	
9	1	0001156 DISTANCE PIECE	STEEL	18331-8	
10	1	0001143 PIN FOR UNIVERSAL JOINT	STEEL	20081-16	
11	4	CHECK VALVES - MANZEL #8841 - 598	BRASS		
12	2	$\frac{1}{4}$ "-90° STREET ELL - CRANE CAT #32 PHB 282	BRASS		
13	1	$\frac{1}{8}$ " X $\frac{1}{4}$ " REDUCING BUSHING	BRASS		
14	2	00519 SPECIAL CONNECTION	BRASS	18328-8	
15	2	0001135 SPECIAL BOLT	STEEL	20081-16	
16		LOCKWIRE	STEEL		
17	5 <sup>21</sup>	$\frac{1}{8}$ " O.D. X .060 WT. TUBING	COPPER		
18	2	00520 PIPE CLAMP	BRASS	20079-16	
19	1	WASHER $\frac{1}{8}$ " I.D. X $\frac{1}{8}$ " O.D. X $\frac{1}{8}$ " TH.	STEEL	20081-16	
20					
21	1	0001158 LUBRICATOR CONNECTION - SHORT	STEEL	18330-8	
22	2	0001139 SPECIAL HEX NUT	STEEL	18330-8	
23	2	GASKET - $\frac{1}{8}$ " I.D. X $\frac{1}{8}$ " O.D. X $\frac{1}{16}$ " TH.	COPPER		
24	1	0001137 LUBRICATOR CONNECTION - LONG	STEEL	18339-8	
25	4	TALLOW COCK - WILLIAMS CAT #34-P72	BRONZE		
26	2	0001071 DISTANCE PIECE	STEEL	8970-1	
27	2	TAP BOLTS $\frac{1}{8}$ " I.N.C.C.L.3 - $\frac{1}{8}$ " LONG	STEEL	20081-16	
28	2	$\frac{1}{8}$ " COTTER PIN, $\frac{1}{4}$ " LONG	STEEL		
29	3	$\frac{1}{2}$ " STD. HEX NUTS	STEEL		
30	1	0001140 UNIVERSAL BLOCK	STEEL	18332-8	
31	1	0001145 SWIVEL PIN	STEEL	18332-8	
32	2	0001144 DRIVING ROD	STEEL	18332-8	
33	2	TAP BOLTS - $\frac{1}{8}$ " I.N.C.C.L.3 - $\frac{1}{8}$ " LONG	STEEL		
34	2	00523 PIPE CLAMP	BRASS	20081-16	
35	9	TAP BOLTS - $\frac{1}{8}$ " I.N.C.C.L.3 - $\frac{1}{8}$ " LONG	STEEL		
36					
37	3	00521 PIPE CLAMP	BRASS	20081-16	
38	2	UNION $\frac{1}{8}$ " I.P. SIZE (CRANE NO. 523)	BRASS		
39	1	UNION $\frac{1}{8}$ " I.P. SIZE (CRANE NO. 252-M)	STEEL		
40	1	$\frac{1}{4}$ "-90° STREET ELL (CRANE NO. 303-D)	STEEL		

NO. REQ. WAS 3	ADDED 1	CHANGED 0
WELL DRAWN DETAILS	7/16-41	
#36 ELIMINATED	7/16-41	
#36 WAS / READ	7/16-41	
ADDED PIPING	7/16-41	
ADDED 39-40	6-30-41	
NO. REQ. WAS 3	6-30-41	
2	Was 20080-6314-41	H.M.
1	UNIONS ADDED	5-9-41
CHANGE NO.	BY	CHECKED BY
WAS		
SCALE		
$\frac{1}{8}$ " = 1:10		
TOLERANCE ON FINISHED DIMENSIONS = .010 UNLESS OTHERWISE SPECIFIED.		
REMOVE BURRS, BREAK SHARP EDGES, .010 MAX. WORK TO DIMENSIONS - DO NOT SCALE.		
1/8" BORE MACH.	1/8" BURP OR POLISH	1/8" FILE
1/8" SMOOTH MACH.		1/8" SCRAPER
1/8" GRIND LAP		1/8" SPOTFACE
1/8" REAM		
DRAWN	4-25-41	4-25-41
TRACED		
PURCHASED	DATE, NO. FWD. NO.	FINISHED PART NO.
MATERIAL		REV. NUMBER
HEAT TREAT	CASE DEPTH.	HARDNESS
NAME:	DRAWING NO.	
CYLINDER LUBRICATING ARRANGEMENT		
5966-2		

GENERAL MACHINERY CORPORATION  
HAMONTON, OHIO

5964-2  
LAWMING NO.

5



MARK NO.	NO. EQD.	PRICE NO.-M <sup>1</sup>	NO. OF PARTS GIVEN ARE FOR ONE ENGINE		MATERIAL	DRAWING NO.
			NAME			
1	3		3/4" NIPPLE - 3" LONG		BRASS	
2	3		3/4" BRASS UNION ELBOW CRANE # 8751 PAGE 262		BRASS	
3	24 <sup>FT</sup>		3/4" I.P.S. BRASS PIPE		BRASS	
4	3		1/4" NIPPLE - 2 1/2" LONG		BRASS	
5	3		1/4" UNION		BRASS	
6	52 <sup>FT</sup>		1/4" I.P.S. BRASS PIPE		BRASS	
7	3		1/4" COUPLING		BRASS	
8	3		1/4" GLOBE VALVE-UNION END - CRANE # 4220 PAGE 31		BRASS	
9	3		1/4" NIPPLE - 1 1/2" LONG		BRASS	
10	1		2" SQUARE HEAD PLUG		C.I.	
11	3		2" x 2" x 1 1/2" x 1/4" CROSS		BRASS	
12	2		1/4" x 1/2" HEXAGON BUSHING		BRASS	
13	6		1/2" GLOBE VALVE CRANE # 70 PAGE 31		BRASS	
14	12		1/2" NIPPLE - 1/2" LONG		BRASS	
15	6		1/2" DOUBLE SWIVEL JOINT - CRANE # 70 PAGE 31		BRASS	
16	24 <sup>FT</sup>		1/2" I.P.S. BRASS PIPE		BRASS	
17	3		3/4" x 1/2" HEXAGON BUSHING		BRASS	
18	6		2" x 2" x 3/4" TEE		BRASS	
19	6		TAP BOLTS - 5/8" 11 N.C.C.L.3 - 1 1/2" LONG		STEEL	
20	3	0001/22	PIPE CLAMPS		STEEL	20071-4
21	3		3/4" NIPPLE - 1 1/2" LONG		BRASS	
22	3		3/4" GLOBE VALVE-UNION END - CRANE # 4220 PAGE 31		BRASS	
23	3	0051/6	CRANE PIN BEARING COOLING PIPE		BRASS	18307-8
24	15 <sup>FT</sup>		2" I.P.S. BRASS PIPE		BRASS	
25	1	0051/7	SPECIAL FLANGED TEE		BRASS	18308-8
26	3		2" PIPE FLANGE		BRASS	
27	8		5/8" BOLTS - 1 1/2" LONG		STEEL	
28	8		5/8" STB HEX NUTS.		STEEL	
29	3	586	CROSSHEAD GUIDE DRAIN FUMMEL		C.I.	18309-8
30	6		TAP BOLTS - 1/2" 13 N.C.C.L.3 - 1 1/2" LONG		STEEL	
31	2	00008	GASKET		RUBBER	9005-4
32	3	0001/207	PIPE CLAMP		STEEL	20089-1
33	6		TAP BOLTS 5/8" 16 N.C.C.L.3 - 3/4" LONG		STEEL	
34	1		1/4" COUPLING		BRASS	
35	1		1/4" SQUARE HEAD PLUG		C.I.	

P. ONLY.			
5	NO. B602 WAS. 3	7-3-41	E.T.K.
5	34-35 ADDED	7-3-41	E.T.K.
4	32-33 ADDED	7-3-41	E.T.K.
3	NOTE ADDED	6/1/41	E.T.K.
		6-3	
2	WAS 1/2 BONUS PLUG 41		W.L.
		H.M.	
	WAS JENKINS VALVE	52641	
SCALE	WAB	DATE	CHARGE
6" x 1"			
TOLERANCE ON FINISHED DIMENSION $\pm .010$ UNLESS OTHERWISE SPECIFIED.			
DEEMPE SMOOTH, BREAK SHARP EDGES, .010 MAX. WORK TO DIMENSIONS, DO NOT SCALE.			
ROUGH MACHINING			
SMOOTH MACHINING			
DRILL			
GRIND LAP			
BY	DATE	BY	DATE
AWN	4-17-41	CHECKED	W.L. 8/1/41
ACED		APPROVED	E.T.K.
PURCHASE	Length. 20 Prod. No.	Dimensions Part No.	Spec. Drawing No.
BY PCRS			
AT THREAT	CASE DEPTH	HARDNESS	
DRAWING NO.			
5964-2			

ENGINE NO. - 6511-40 INCL.

~~242-5710 X 40 M. S. ENGINE~~  
MATERIAL:

[View this page as a PDF](#)

**NAME:**

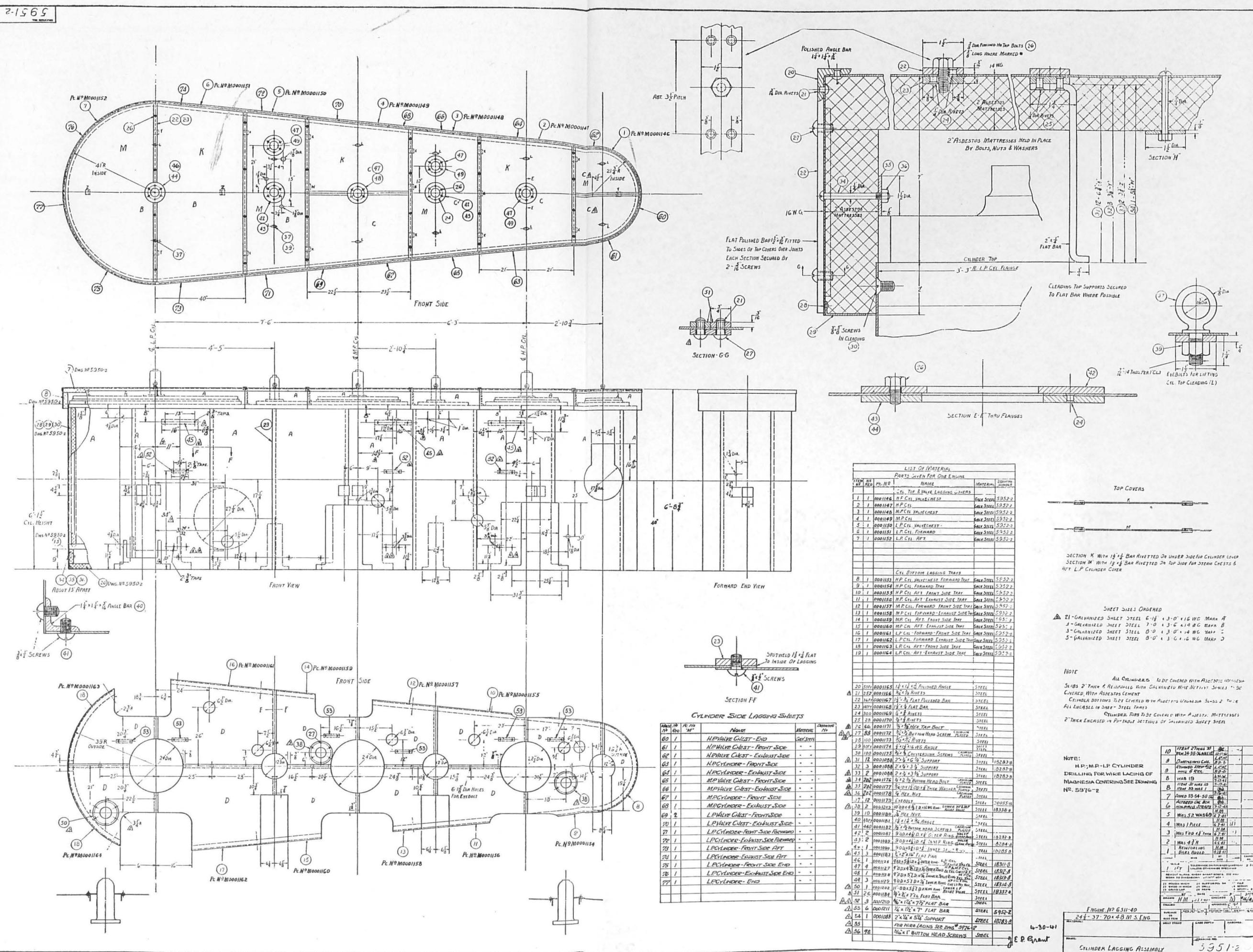
### WATER SERVICE PIPING

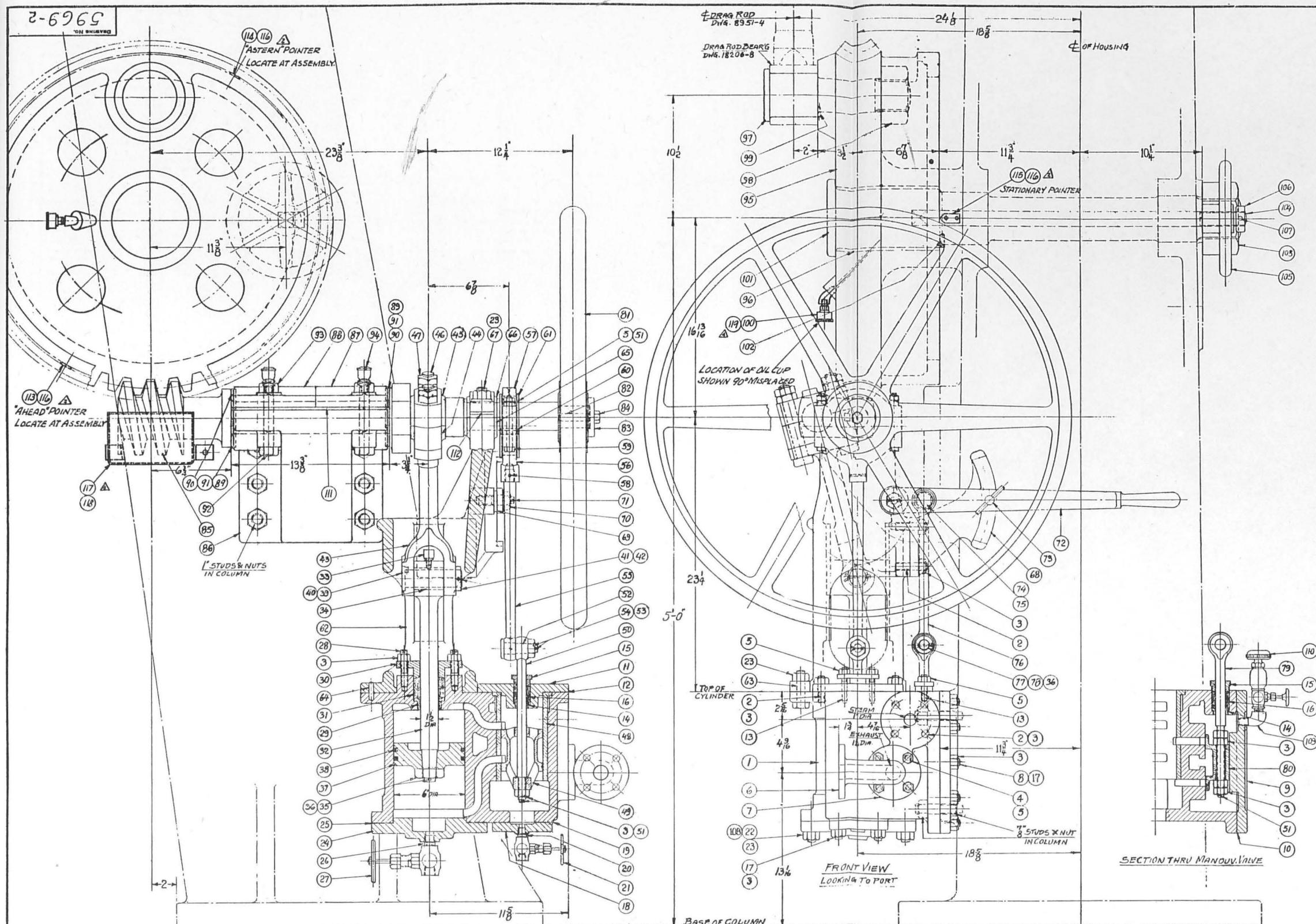
---

GENERAL- M

H. O. R.-DIESEL DIVISION-HAMILTON, OHIO E

596





SIDEVIEW, LOOKING FORWD. &amp; SECTION THRU CYLINDER &amp; VALVE

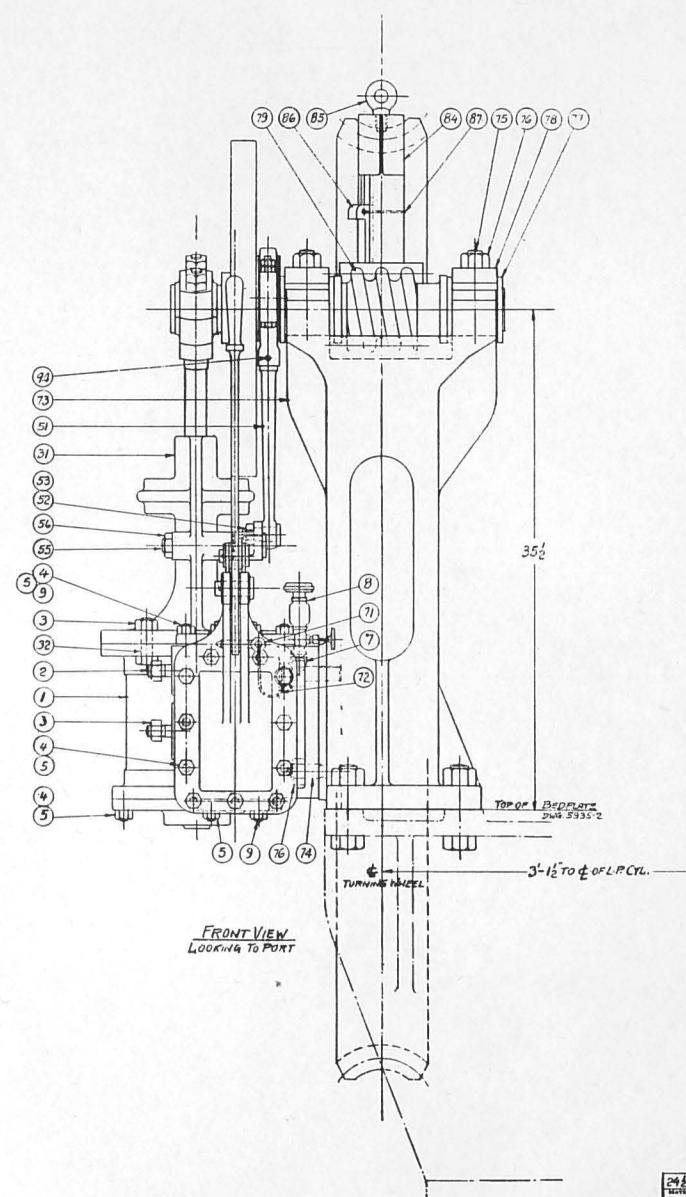
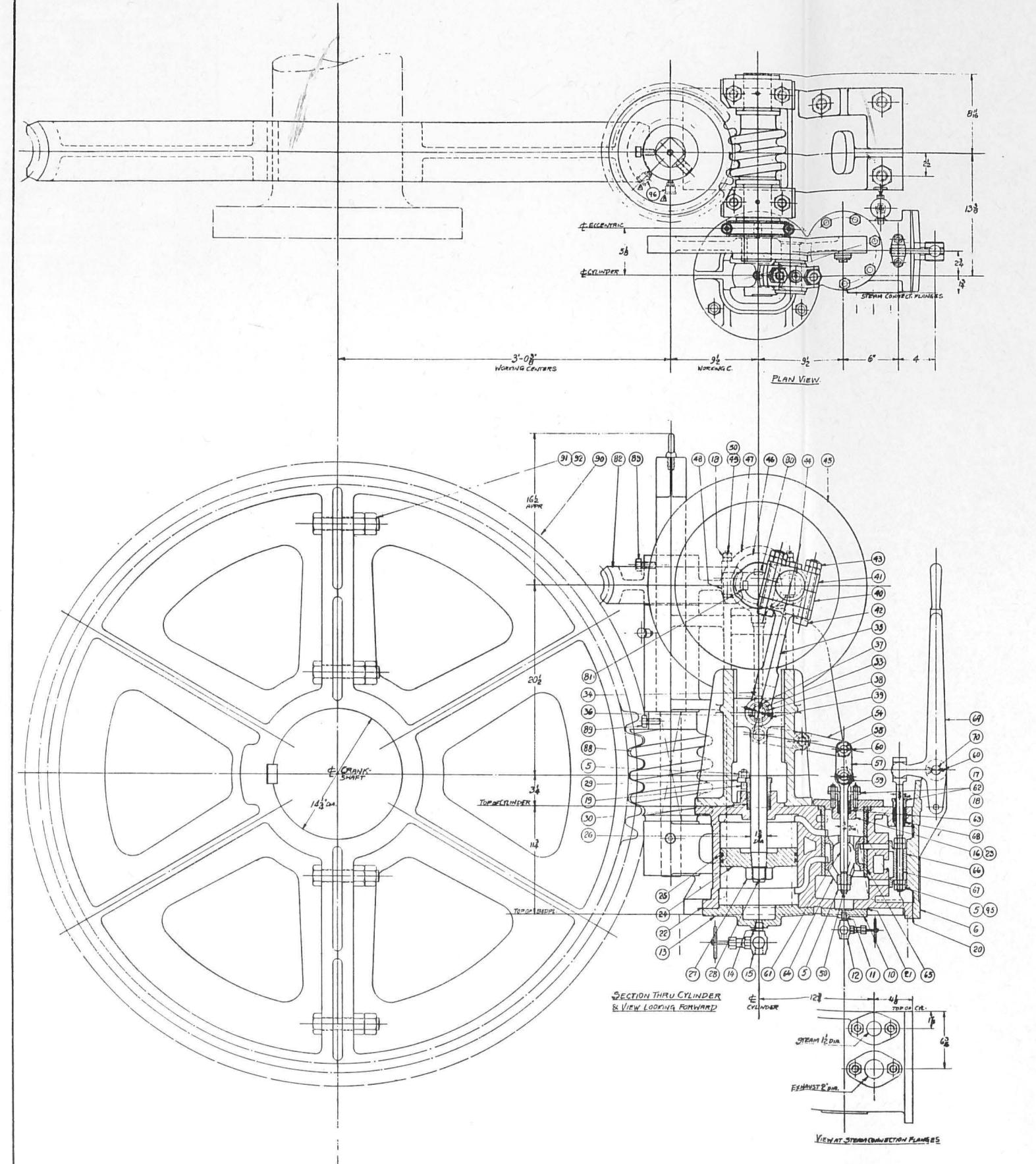
VALVE TRAVEL  
VALVE LAP, IN & OUTSIDE, ECCENTRIC MIDPOSITION  
PISTON STROKE  
PISTON CLEARANCE ON TOP  
" " BOTTOM

ITEM NO.	REQ. NO.	PIECE NO.	PIECE NO. M.	NAME	MATERIAL	DWG. NO.
103	1	103	1	5/8" STD. STREET ELBOW	MALLEABLE BRONZE	1001-16
110	1	110	1	3/8" LUBRICATOR "WILLIAMS" N.I.D. #0	MALLEABLE BRONZE	1001-16
111	2	111	2	WORM SHAFT BEARING SHIM	STEEL	18360-8
112	2	112	2	PEV ENGINE BEARING SHIM	STEEL	18360-8
113	1	113	1	POINTER (AHEAD)	BRASS	18369-8
114	1	114	1	POINTER (ASTERN)	BRASS	18369-8
115	1	115	1	STATIONARY POINTER	BRASS	18369-8
116	1	116	1	1/2" 20NC BUTTON HB SCREWS, 1/2" LONG	STEEL	18387-8
117	1	117	1	OIL PAN	STEEL	18387-8
118	3	118	3	3/8" x 3/8" HEX TAP BOLTS	STEEL	108

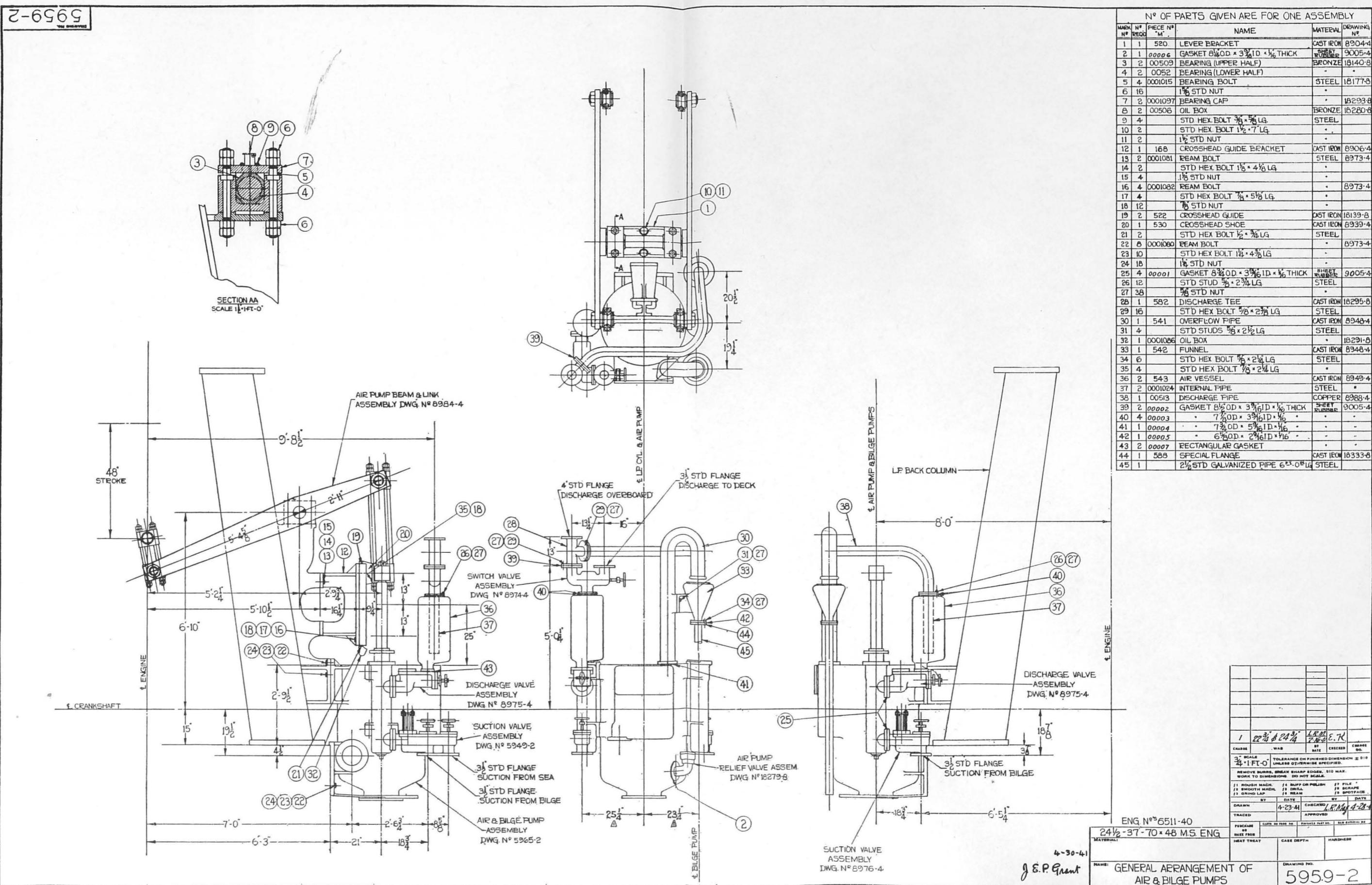
ITEM NO.	REQ. NO.	PIECE NO.	PIECE NO. M.	NAME	MATERIAL	DWG. NO.	ITEM NO.	REQ. NO.	PIECE NO.	PIECE NO. M.	NAME	MATERIAL	DWG. NO.
95	1	378	1	NORM WHEEL	CAST IRON	8940-6	81	1	375	1	HAND WHEEL	CAST IRON	18257-8
96	1	00273	1	BUSHING	SAE-1020	20010-16	82	1	376	1	KEY	SAE-1020	20051-16
97	1	000728	1	PIN	STEEL	20010-16	83	1	0001078	1	WASHER ON WORM SHAFT	SAE-1020	"
98	1	98	1	2 1/8 STD. HEX. NUT, 2 1/8" HIGH	STEEL	"	84	1	1/2" HEX. HD SCREW 1" LONG	1	1/2" HEX. HD SCREW 1" LONG	SAE-1020	"
99	1	100	1	STOP PIN 5/8" x 1/2"	STEEL	18199-8	85	1	000694	1	WORM SHAFT	FORG. STEL	8943-4
100	1	100	1	WORMSHAFT CUP "LUNKENHEIMER" FIG. 513-80	BRONZE	18199-8	86	1	376	1	BEARING	CAST IRON	8959-8
101	1	101	1	WORM WHEEL SPINDLE	SAE-1020	18199-8	87	1	358	1	(CAP (FRONTEND))	SAE-1020	18216-8
102	1	102	1	LOCKING PIN 5/8" DIA. 1" LONG	STEEL	18199-8	88	1	539	1	(WORMEND)	SAE-1020	18217-8
103	1	103	1	3/8" STD. HEX. NUT 3" HIGH	STEEL	"	89	2	00463	1	LOWER THRUSTRING	FORG. STEL	8959-4
104	1	104	1	WORM WHEEL LOCKING BAR	SAE-1020	18236-8	90	2	00462	1	UPPER BEARING	CAST IRON	18216-8
105	1	105	1	LOCATING BAR HAND WHEEL	CAST IRON	18237-8	91	1	36	1	BEARING	STEEL	"
106	1	106	1	STOP COLLAR	STEEL	20041-16	92	4	186	2	8 FITTED HEX. HD BOLT 5/8" LONG	SAE-1020	"
107	1	107	1	6 1/4 TAPER PIN 2 1/4" LONG	STEEL	20041-16	93	4	187	2	7/8" STD. HEX. NUT	SAE-1020	"
108	2	108	2	3/8 STUDS 2 1/4" LONG	SAE-1020	"	94	2	188	2	1/4" OIL CUPS "LUNKENHEIMER" FIG. 540-2	SAE-1020	"

LIST OF MATERIAL PARTS GIVEN FOR ONE ENGINE ONLY		
ITEM NO.	PIECE NO.	NAME
1	113	CYLINDER CAST IRON
2	14	5/8" STD. 2 1/8" LONG SAE-1020
3	35	7/8 STD. HEX. NUTS STEEL
4	4	1/2 STD. 1 1/4 LG. EXHAUST FLANGE SAE-1020
5	12	16 STD. HEX. NUTS STEEL
6	1	551 EXHAUST ELBOW CAST IRON
7	1	GASKET 5/8" THICK ASBESTOS
8	9	48 STUDS 2 1/4" L.G. CAST IRON
9	10	147 STEAM CHEST COVER GASKET 5/8" THICK CAST IRON
11	1	535 PISTON VALVE COVER, TOP GASKET 1/2" THICK CAST IRON
12	1	537 PISTON VALVE COVER, BOTTOM GASKET 1/2" THICK CAST IRON
13	4	1/2 STUDS 2 1/4" L.G. THROATFORGE 1 1/4" LG. CAST IRON
14	2	540 GLAND ASBESTOS
15	1	STUFFING BOX PACKING ALUMINUM SIZE 4 1/8" (ZINCATED) (CONTINUOUS) SAE-1020
16	5	1/8" STUD 2 1/8" L.G. CAST IRON
17	1	536 PISTON VALVE COVER - BOTTOM GASKET 1/2" THICK COMMERCIAL
18	1	1/4" SHORT NIPPLE 1/4" DIA. 2 1/8" LONG COMMERCIAL
19	1	1/4" STUDS 2 1/8" LONG COMMERCIAL
20	1	1/4" STD. HEX. NUT
21	1	172 CYLINDER COVER GASKET 1/2" THICK COMMERCIAL
22	6	1/2" SHORT NIPPLE 1/2" DIA. 2 1/8" LONG COMMERCIAL
23	6	1/4" DRAIN VALVE "CRANE" # 222H COMMERCIAL
24	1	1/2" STUD 3 1/4" THRD FORNUIT 1 1/8" LG. SAE-1020
25	1	1/2" STUD 3 1/4" THRD FORNUIT 1 1/8" LG. CAST IRON
26	1	1/2" STUD 3 1/4" THRD FORNUIT 1 1/8" LG. COMMERCIAL
27	1	1/2" STUD 3 1/4" THRD FORNUIT 1 1/8" LG. SAE-1020
28	2	1/2" STUD 3 1/4" THRD FORNUIT 1 1/8" LG. CAST IRON
29	1	539 NECKRING FOR PISTON ROD GLAND
30	1	538 GASKET 1/2" THICK COMMERCIAL
31	1	000141 STUFFING BOX PACKING ALUMINUM SIZE B (ZINCATED) (CONTINUOUS) SAE-1020
32	1	000443 PISTON ROD NUT OILCUP COMMERCIAL
33	1	000036 CROSSHEAD BUSHING OILCUP COMMERCIAL
34	1	000036 PISTON ROD NUT OILCUP COMMERCIAL
35	1	188 PISTON COMMERCIAL
36	1	1/4" RING COMMERCIAL
37	1	000107 CONNECTING ROD GUDGEON PIN 1/8" DIA. 2 1/8" LG. COMMERCIAL
38	1	000106 CONNECTING ROD GUDGEON PIN 1/8" DIA. 2 1/8" LG. COMMERCIAL
39	1	000362 CONNECTING ROD COMMERCIAL
40	1	00078 CONNECTING ROD COMMERCIAL
41	2	00079 CONNECTING ROD COMMERCIAL
42	1	545 CONNECTING ROD COMMERCIAL
43	1	546 CONNECTING ROD COMMERCIAL
44	1	000144 CONNECTING ROD COMMERCIAL
45	4	1/2 STD. HEX. NUT 3/8" HIGH COMMERCIAL
46	4	1/2 STD. HEX. NUT 3/8" HIGH COMMERCIAL
47	4	1/2 STD. HEX. NUT 3/8" HIGH COMMERCIAL
48	1	545 PISTON VALVE LINER COMMERCIAL
49	1	546 PISTON VALVE LINER COMMERCIAL
50	1	000824 CONNECTING ROD COMMERCIAL
51	4	1/2 STD. HEX. NUT 3/8" HIGH COMMERCIAL
52	1	000824 CONNECTING ROD COMMERCIAL
53	1	1/2 STD. HEX. NUT 3/8" HIGH COMMERCIAL
54	1	000824 CONNECTING ROD COMMERCIAL
55	1	000700 ECCENTRIC ROD COMMERCIAL
56	1	00270 LOWER STRAP COMMERCIAL
57	1	00269 LOWER STRAP COMMERCIAL
58	1	000368 ECCENTRIC STRAP BOLT COMMERCIAL
59	1	547 KEY COMMERCIAL
60	1	000171 SKEWIE COMMERCIAL
61	1	533 CROSSHEAD GUIDE COMMERCIAL
62	1	3/8" HEX. HEAD BOLT 2 1/8" LONG COMMERCIAL
63	4	1/2" HEX. HEAD BOLT 2 1/8" LONG COMMERCIAL
64	1	00529 LOWER CRANKSHAFT BEARING COMMERCIAL
65	1	587 LOWER CRANKSHAFT BEARING COMMERCIAL
66	2	1/4" STUD 3 1/4" LONG CAP COMMERCIAL
67	2	1/4" STUD 3 1/4" LONG CAP COMMERCIAL
68	1	000171 CONTROL LEVER BRACKET COMMERCIAL
69	1	98 CONTROL LEVER BRACKET COMMERCIAL
70	1	000108 CONTROL LEVER BRACKET COMMERCIAL
71	1	000109 CONTROL LEVER COMMERCIAL
72	1	000109 CONTROL LEVER COMMERCIAL
73	1	000774 LOCKING HANDLE COMMERCIAL
74	1	000774 LOCKING HANDLE COMMERCIAL
75	1	000171 PIN FOR REVERSE (CONTROL) LEVER COMMERCIAL
76	1	000171 3/8" STD. HEX. NUT 3/8" HIGH COMMERCIAL
77	1	030820 CONTROL SLIDE VALVE CONNECT LINK COMMERCIAL
78	1	030139 PIN COMMERCIAL
79	1	030818 COLLAR COMMERCIAL
80	1	04441 SPINDLE COMMERCIAL

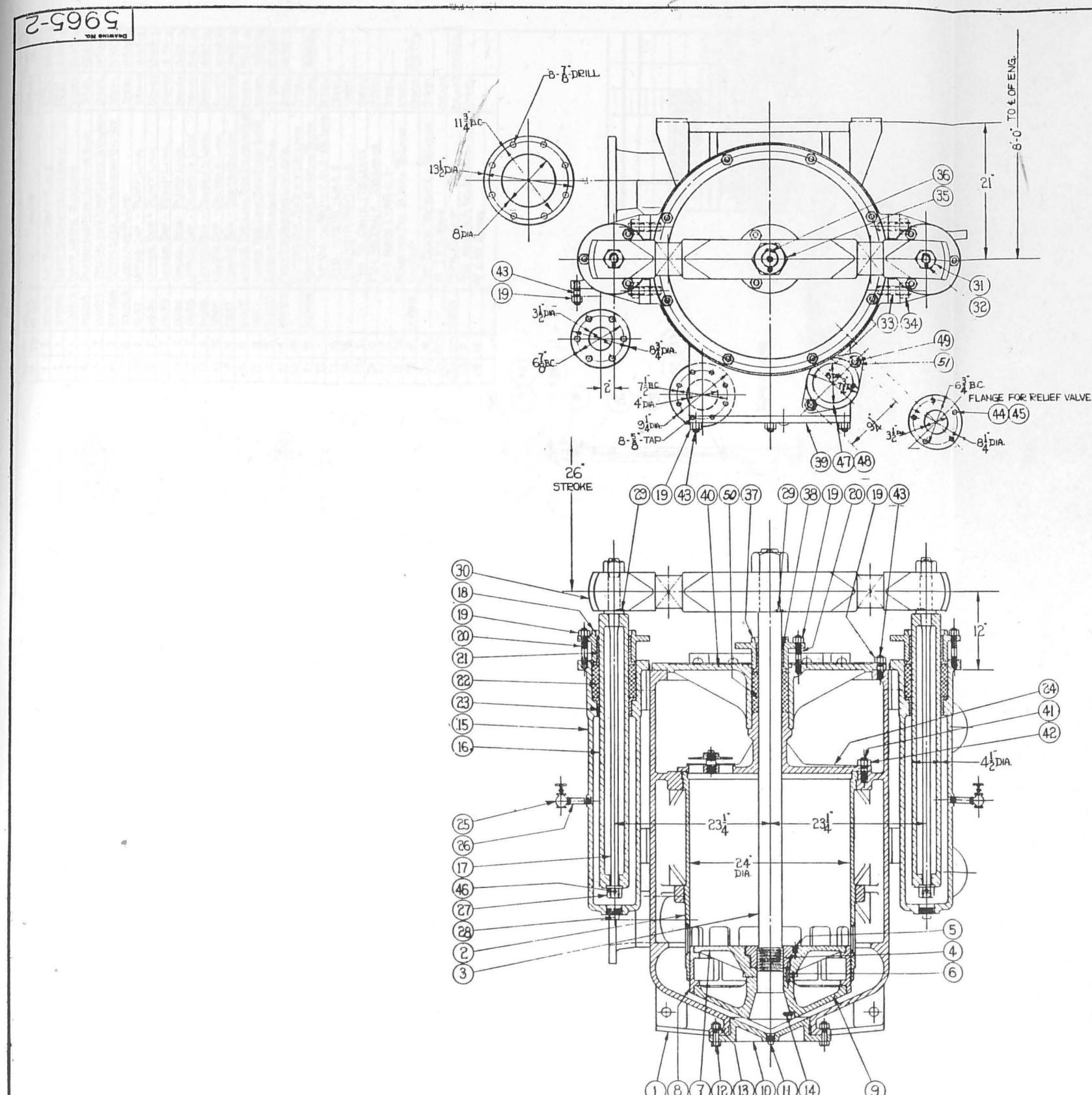
4	ADDED ITEM #119	1/2" DIA. 2 1/8" L.G.
3	ADDED ITEM #117-118	1/2" DIA. 2 1/8" L.G.
△	ADDED #13-14-15-16	7/17-14 E.T.R.
1	ITEM #11-12 HOLLOW PIN	E.R.
DRAWN BY: BY DATE: BY DATE:		
SCALE: 3'-0" 1 FT. TOLERANCE ON FINISHED DIMENSIONS .010 UNLESS OTHERWISE SPECIFIED.		
REMOVE BURRS, BREAK SHARP EDGES, .010 MAX. WORK TO DIMENSIONS.		
1/8" BORE MACH.	1/8" BURF OR POLISH	1/8" FILE
1/8" SPOT MACH.	1/8" BURF	1/8" REFILE
1/8" SWING LIP	1/8" REFILE	1/8" SPOTFACE
TRACED BY: APPROVED BY: CHECKED BY: DATE:		
DRAWN: 5-2-41 APPROVED: 5-2-41 CHECKED: 5-2-41 DATE: 5-2-41		
ENGINE NO (511-40 PURCHASE OR MAKE FROM: SALES ORDER NO.: FINNISH PLATE NO.: DATE MATERIAL: 24-2-37-70x48 M.T.S. ENGINE NAME: ASSEMBLY OF REVERSING ENGINE DRAWING NO. 5969-2 GENERAL MACHINERY CORPORATION HAMILTON, OHIO		



5959-2



5965-2



N° OF PARTS GIVEN ARE FOR ONE ASSEMBLY				
ITEM N°	PIECE N°	NAME	MATERIAL	
1	165	AIR PUMP BODY	CAST IRON 5930-2	
2	0094	LINER	BRONZE 8909-4	
3	00202	ROD	BRONZE 8916-4	
4	00101	AIR PUMP NUT	BRONZE 8916-4	
5	1	SCREW DOWEL $\frac{3}{16}$ -10 x 1 LG	STEEL	
6	1	DRIVE STOP PIN $\frac{1}{2}$ DIA x 2 LG	STEEL	
7	521	PUMP BUCKET (UPPER)	CAST IRON 8907-4	
8	0095	PUMP RIM	BRONZE 8907-4	
9	159	PUMP BUCKET (LOWER)	CAST IRON 8914-4	
10	158	BOTTOM COVER	CAST IRON 8914-4	
11	1	1 STD PIPE PLUG	BRASS	
12	10	$\frac{3}{4}$ STD HEX BOLT $2\frac{1}{8}$ LG	STEEL	
13	10	$\frac{3}{4}$ STD NUT	STEEL	
14	1	SCREW DOWEL $\frac{1}{2}$ -13 x 1 1/4 LG	STEEL 8916-4	
15	2	169	BILGE PUMP BARREL	CAST IRON 8902-4
16	2	00117	BILGE PUMP RAM	BRONZE 8917-4
17	2	000340	RAM ROD	STEEL 8917-4
18	2	172	PACKING GLAND	CAST IRON 8902-4
19	47	1/4 STD NUT	STEEL	
20	9	STD STUDS $\frac{7}{8}$ x 6 1/4 LG	STEEL	
21	2	00114	PACKING GLAND BUSHING	BRONZE 8902-4
22	2	5-RINGS	PACKING GRAPHITED BRAIDED FIBRE FLAX	
23	2	00115	SQUARE $\frac{1}{2} \times \frac{1}{2}$ IN.	
24	1	PUMP HEAD VALVE ASSEMBLY	BRONZE 8902-4	
25	2	1/2 WALWORTH ANGLE SCREW DOWN BALL CHECK VALVE $\frac{1}{2}$ IN.	BRONZE	
26	2	1/2 PIPE NIPPLE 4 LG	BRONZE	
27	2	00118	RAM ROD BOTTOM NUT	BRONZE 8917-4
28	2	1 STD PIPE PLUG	BRASS	
29	3	PIN $\frac{3}{8}$ DIA x $\frac{1}{8}$ LG	STEEL	
30	1	000339	CROSSHEAD	STEEL 8903-4
31	2	1/4 STD NUT	STEEL	
32	2	COTTER PIN $\frac{3}{16}$ x 1 3/4 LG	STEEL	
33	8	STD STUD $\frac{1}{4}$ x 4 1/2 LG	STEEL	
34	8	1/4 STD NUT	STEEL	
35	1	3 STD NUT	STEEL	
36	1	COTTER PIN $\frac{1}{16}$ x 3 1/4 LG	STEEL	
37	1	161	PUMP COVER GLAND	CAST IRON 8912-4
38	1	00100	COVER GLAND BUSHING	BRONZE 8912-4
39	1	162	INSPECTION PLATE	CAST IRON 18155-8
40	1	164	PUMP COVER	CAST IRON 8912-4
41	6	STD STUD 1 x 3 1/2 LG	BRONZE	
42	6	1 STD NUT	BRONZE	
43	38	STD STUDS $\frac{7}{8}$ x 3 1/4 LG	STEEL	
44	5	STD STUDS $\frac{5}{8}$ x 2 1/4 LG	STEEL	
45	5	5/8 STD NUT	STEEL	
46	2	PIN $\frac{1}{4}$ DIA x 2 5/16 LG	BRASS	
47	1	0001007	INTERNAL PIPE OVERFLOW	STEEL 19979-4
48	1	GASKET $6\frac{1}{4}$ ID x $7\frac{3}{4}$ O.D. x $\frac{1}{16}$ THICK	SHEET RUBBER	
49	2	STD STUD 1 x 3 3/4 LG	STEEL	
50	2	6-RINGS	PACKING GRAPHITED BRAIDED FIBRE FLAX	
51	2	SQUARE $\frac{1}{2} \times \frac{1}{2}$ IN.	STEEL	

## AIR PUMP PISTON CLEARANCE

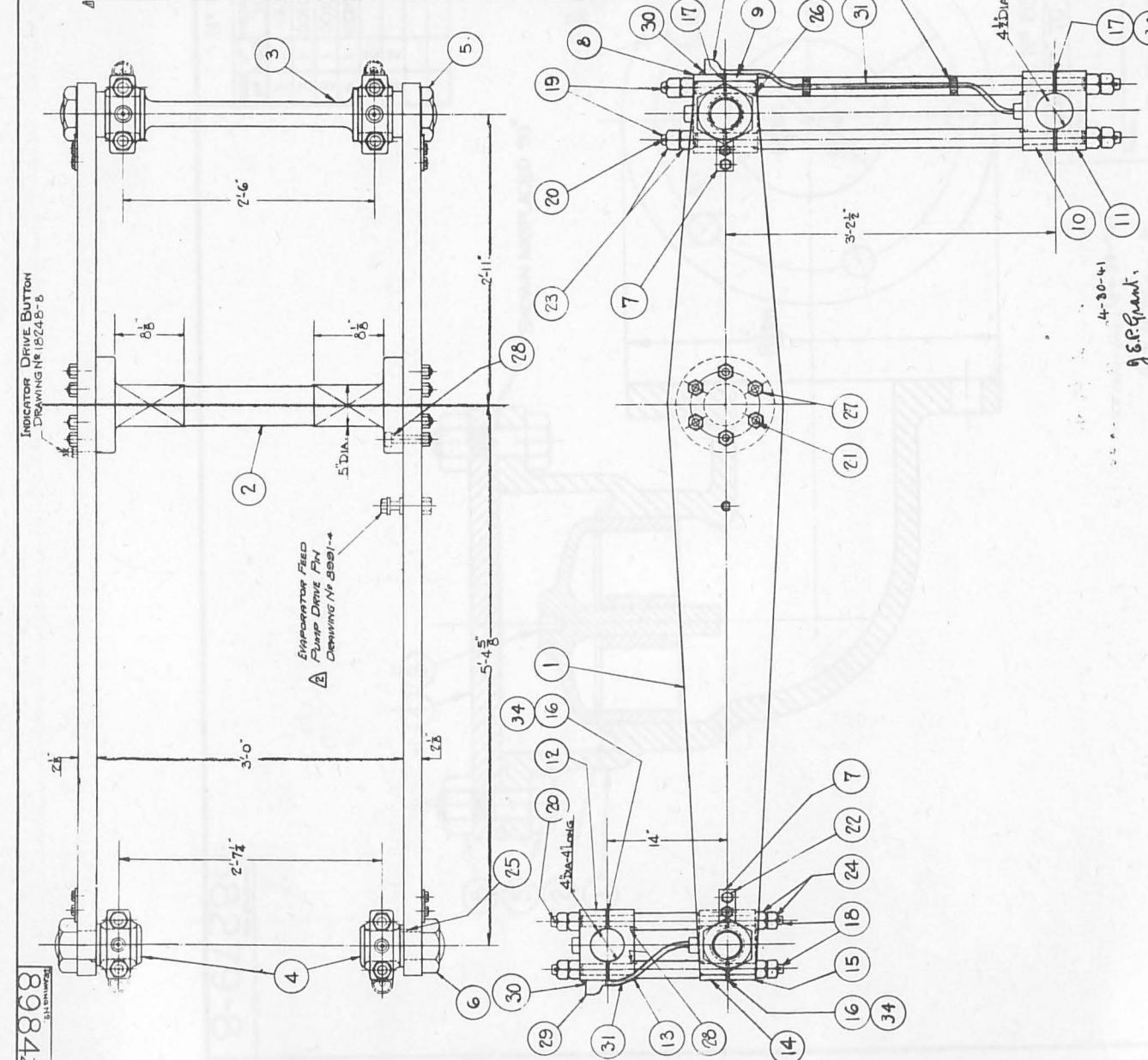
TOP  $\frac{3}{8}$   
BOTTOM  $\frac{1}{8}$ ENG N° 6511-40  
24 1/2 - 37' - 70 x 48 MS ENG.4-30-41  
24 Dia. x 26" STROKE

J.S.P. Grant

GENERAL MACHINERY CORPORATION		HAMILTON, OHIO	
NAME:	4-18-41	DATE:	4-26-41
APPROVED:	LE. May	CHECKED:	LE. May
TRACED:	4-18-41	BY:	4-26-41
DRAWN:	4-18-41	DATE:	4-26-41
PURCHASED:	4-18-41	MADE FROM:	4-26-41
STAMPED, OR PAINTED, NO.	4-18-41	NUMBERED PART NO.:	4-26-41
HEAT TREAT:		CASE DEPTH:	
DRAWING NO.:		HARDNESS:	

**OF PARTS GIVEN ARE FOR ONE ASSEMBLY**

No. OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
PART No.	PIECE No.	NAME	MATERIAL
1	2	AIR PUMP BEAM PLATE	STEEL
2	1	PUMP CARRIAGE GUIDE BENCH	STEEL
3	1	PUMP LEVER, GUIDEON	STEEL
4	2	CROSS HEAD PINNS, ENGINE END	STEEL
5	2	SPECIAL NUT, PUMP LEVER GUIDEON	STEEL
6	2	PUMP LEVER CROSSHEAD PIN NUT	STEEL
7	4	LOCKING PLATE	STEEL
8	2	UPPER CAP - PUMP LINK	Bronze
9	2	UPPER BOX - PUMP LINK	Bronze
10	2	LOWER CAP - PUMP LINK	Bronze
11	2	LOWER BOX - PUMP LINK	Bronze
12	2	UPPER BOX - CROSSHEAD LINK	Bronze
13	2	UPPER BOX - CROSS-HD LINK	Bronze
14	2	LOWER CAP - CROSS-HD LINK	Bronze
15	2	LOWER BOX - CROSS-HD LINK	Bronze
16	3	LINER FOR LINK BOX (CROSSHEAD)	BRASS
17	8	LINER FOR LINK BOX (CROSSHEAD SIDE)	BRASS
18	4	ENGINE CROSSHEAD LINK BAR	STEEL
19	4	PUMP CROSSHEAD LINK BAR	STEEL
20	16	COTTER PIN 3/16" X 2 1/4" LONG	STEEL
21	12	PUMP CARRIAGE GUIDE BENCH BOLTS	STEEL
22	8	TAP BOLTS 5/16" X 1 1/2" LONG	STEEL
23	16	STD. NUTS 1/4"-7NC.3	STEEL
24	16	STD. NUTS 1/4"-7NC.3	STEEL
25	16	PIN 1/2" Dia. X 1 1/8" LONG	STEEL
26	8	PIN 3/8" Dia. X 7/8" LONG	STEEL
27	12	STD. NUTS 1/4"-8NC.3	STEEL
28	20	HOLDING PIN 1/4" Dia. 3 1/2" LONG	STEEL
29	4	ON CUP	BRASS
30	4	TAP DOL. 3/8"-LONG, C. 5/8" LONG	STEEL
31	6FT	1/4" IPS PIPE	BRASS
32	4	PIPE CLAMP	BRASS 200-27
33	6	5/16" I.D. x 1/2" OD. NO. MACH SCR.	STEEL
34	16	1/4" x 1/2" DOME	



## Air Pump Beam and Link Assembly

8984-4  
No. 34

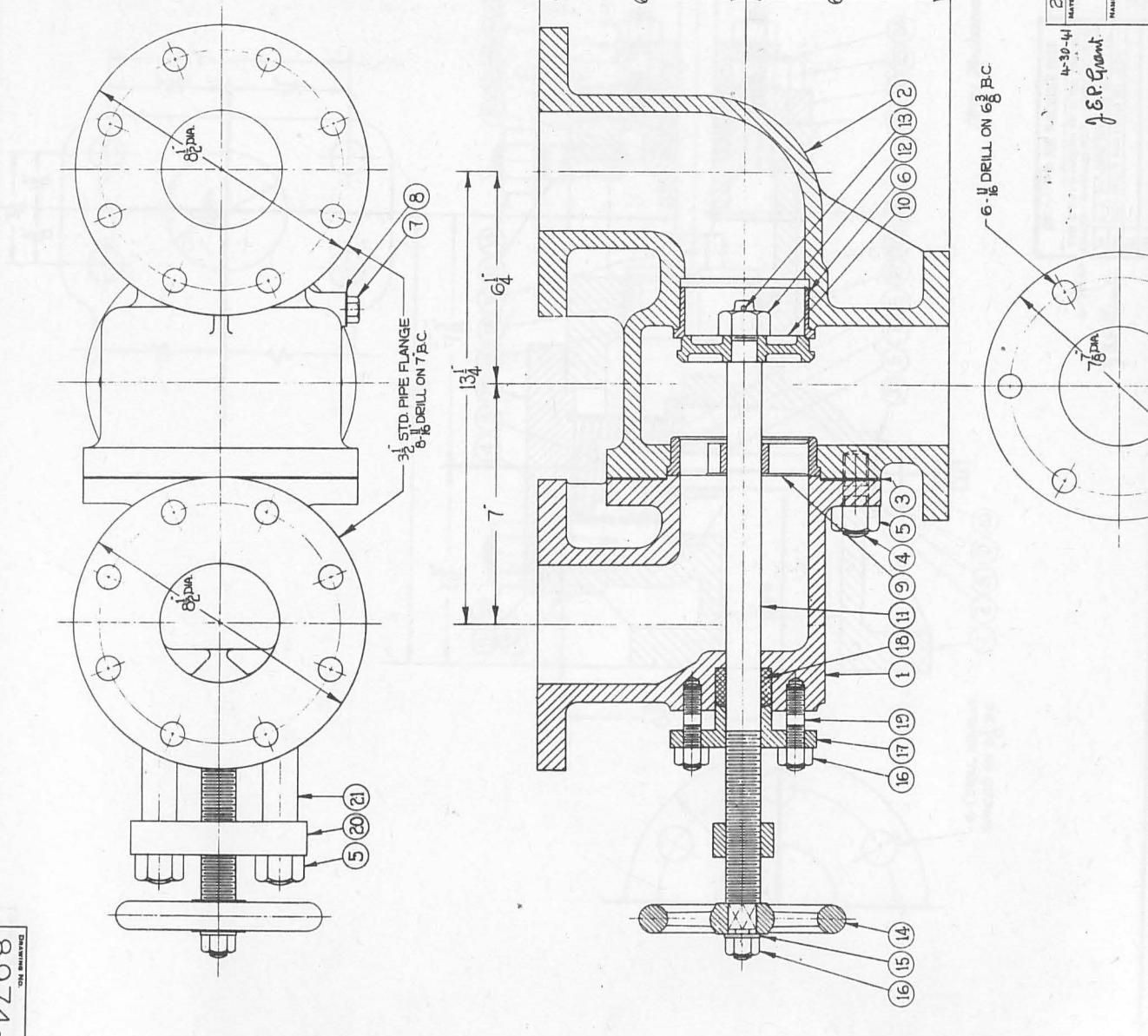
AIR PUMP BEAM & LINK ASSEMBLY 8984-4  
GENERAL MACHINERY CORPORATION  
HULL DIESEL DIVISION, HAMILTON, ONTARIO



N° OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
MATERIAL	NAME	PIECE N°	MATERIAL
N° ITEM	N° ITEM	N° ITEM	N° ITEM
CAST IRON	DECK DISCHARGE VALVE CHEST	550	CAST IRON
STEEL	OVERBOARD DISCHARGE VALVE CHEST	549	STEEL
GASKET 1/2 INCH O.D. 1 D-4% STD. STUDS 2 1/2 LG.	GASKET 1/2 INCH O.D. 1 D-4% STD. STUDS 2 1/2 LG.	548	BUBBER
STEEL	STD. 3/4" NUT	547	STEEL
BRONZE	VALVE SET (COVERBOARD DISCHARGE)	00469	STEEL
STEEL	STD. 3/8" BOLT 2 LG.	546	COFFER
BRONZE	GASKET 1/2 INCH O.D. 1 D-4% VALVE SEAT(DECk DISCHARGE)	00468	BRONZE
BRONZE	STD. 1/2" NUT	00466	SWITCH VALVE
BRONZE	STD. 3/4" NUT	00467	SPINDLE
BRASS	COTTER PIN 3/32" 1 1/2 LG.	562	HAND WHEEL
CAST IRON	WASHER 1/2 SAE.	562	STEEL
STEEL	STD. 1/2" NUT	562	STUFFING BOX GLAND
BRONZE	PACKING, GRAPHITED FIBRE ASBESTOS MANUFACTURED BY STEEL	00476	100%
STEEL	STD. 1/2" STUD 2 1/2 LG.	562	VALVE SPINDLE YOKE
STEEL	VALVE SPINDLE YOKE STUDS	000105	STEEL
STEEL		21	

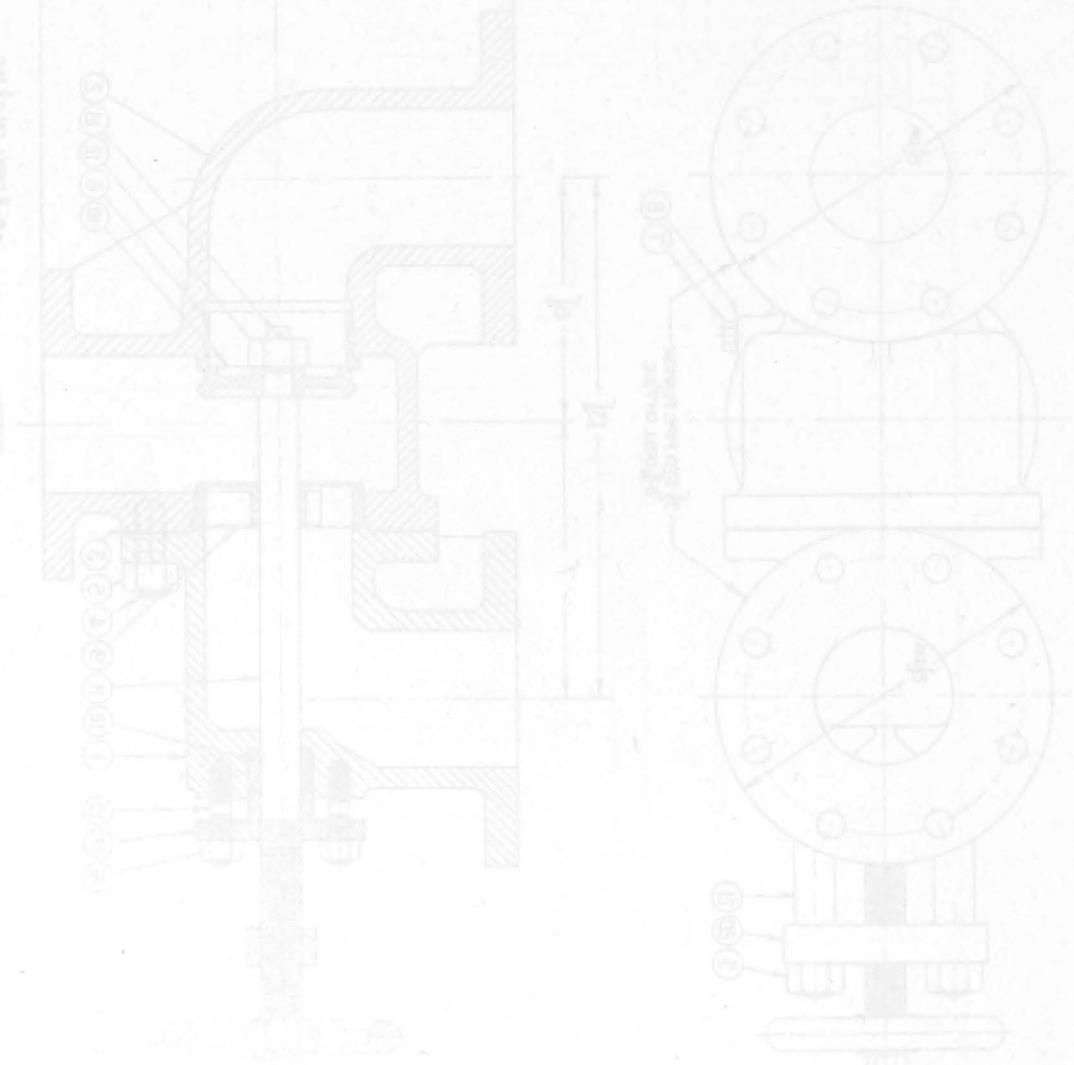
INFORMATION AND DISCUSSION

THIS DRAWING DIFFERS FROM THE ORIGINAL  
ENGLISH DRAWING IN THE FOLLOWING RESPECTS

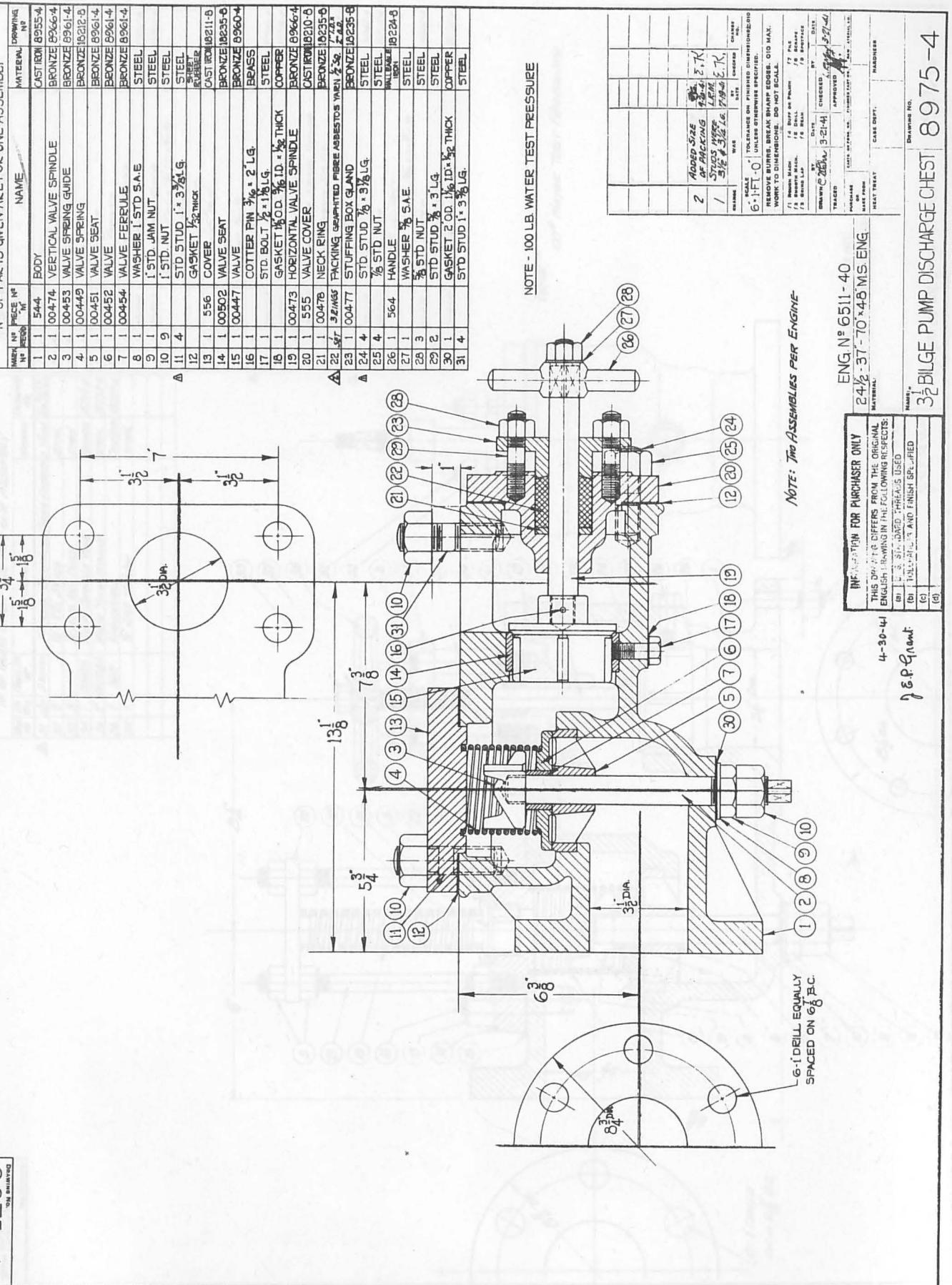


## **Switch Valve Bilge Pump Discharge Assembly 8974-4**

No. 36

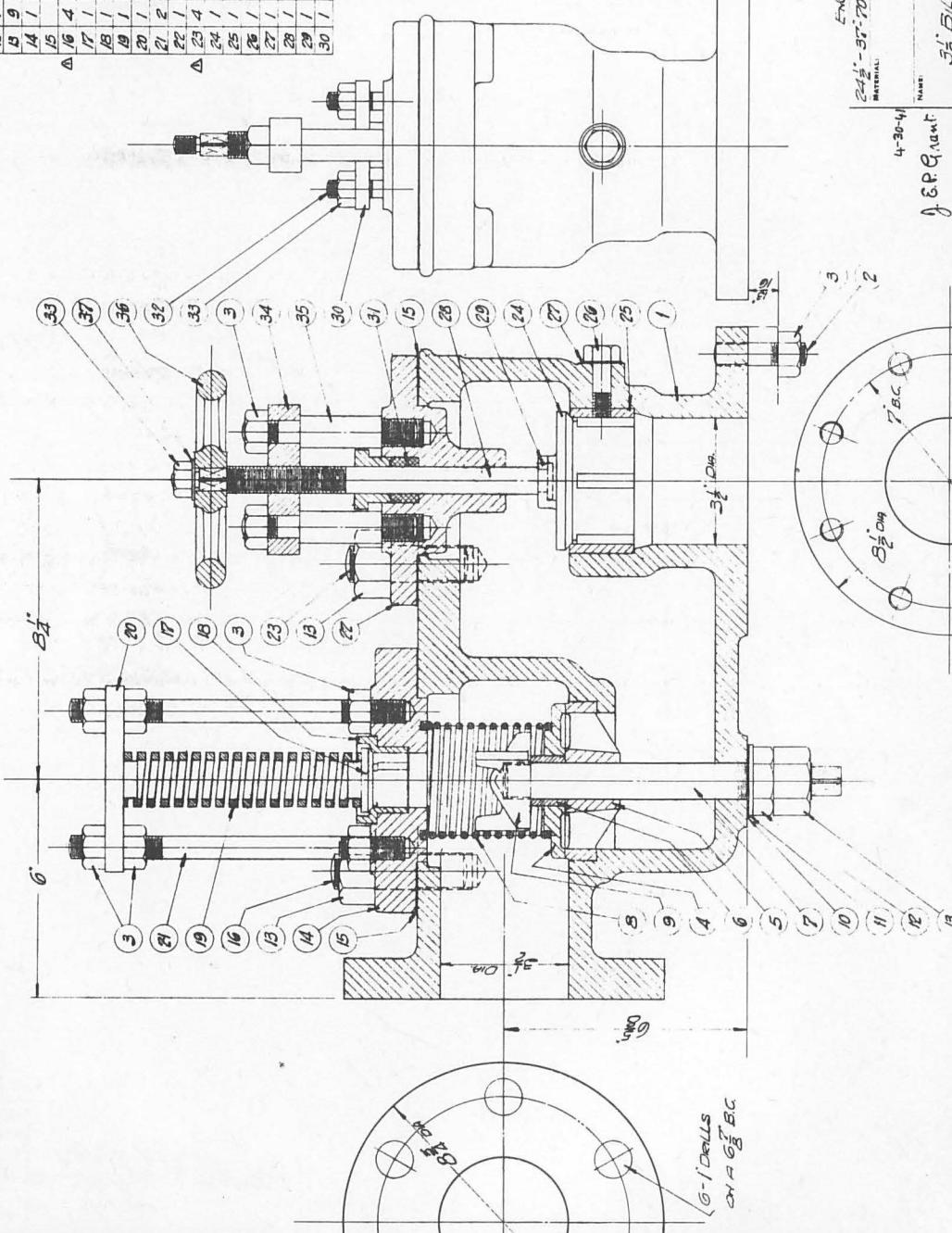


8975-4



110

N<sup>O</sup> OF PARTS GIVEN ARE FOR ONE ASSEMBLY

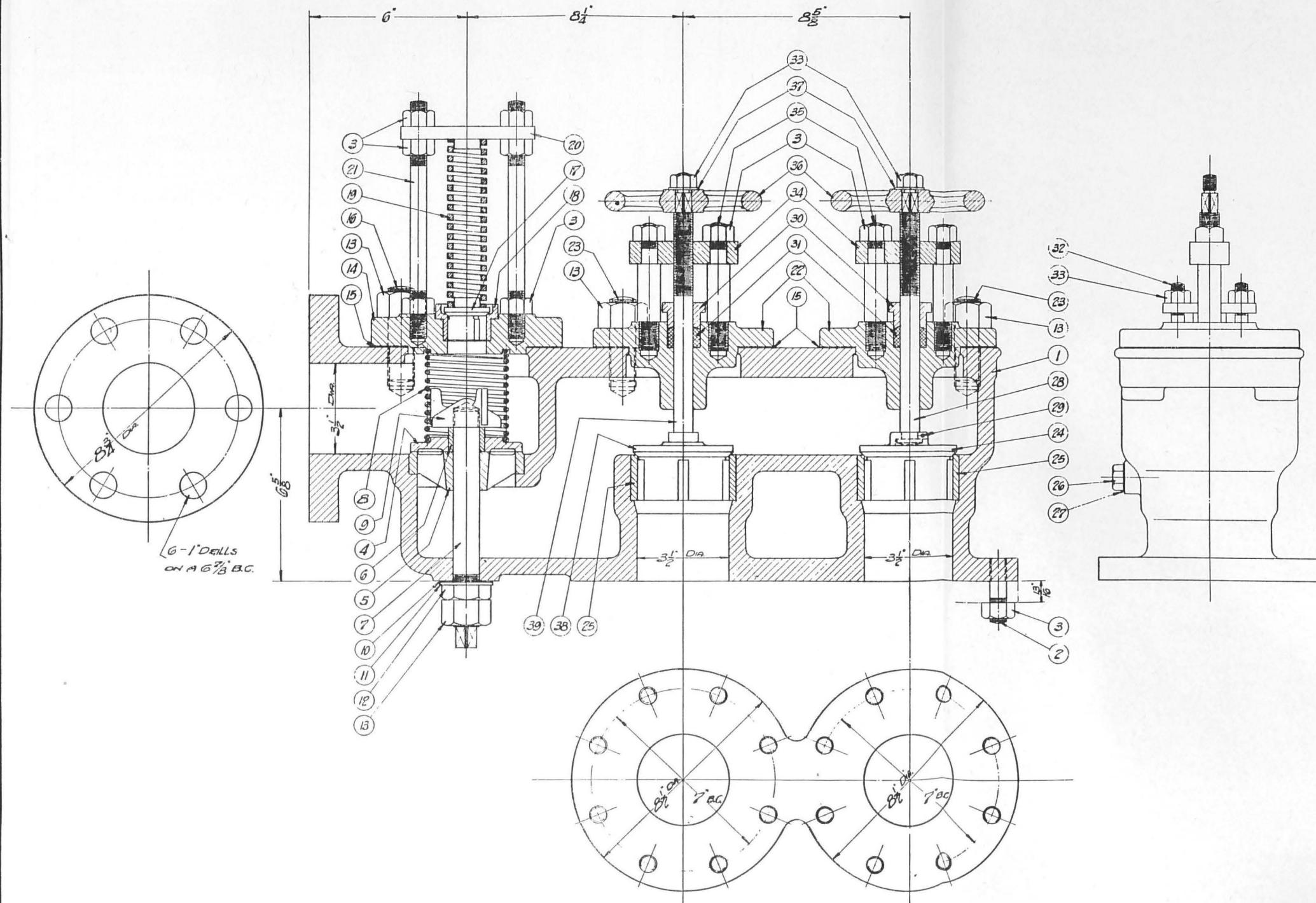


#### **3½" Aft Bilge Pump Suction Chest Assembly**

8976-4

2-6769

DRAWING NO.



NO OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
Part No.	Part No.	Name	Material
1 1	552	BODY	CAST IRON 5941-2
2 10	5 1/2" STUD	STEEL	
3 26	5 1/2" STD. HEX. NUT	STEEL	
4 1	00452	VALVE	BRONZE 8961-4
5 1	00451	VALVE SEAT	BRONZE 8961-4
6 1	00454	VALVE FERRULE	BRONZE 8961-4
7 1	00472	VALVE GUIDE SPINDLE	BRONZE 18212-8
8 1	00450	VALVE SPRING	BRONZE 18212-8
9 1	00453	VALVE SPRING GUIDE	BRONZE 8961-4
10 1		GASKET 2 1/2" O.D. X 1/2" T.H.	COPPER
11 1		1" S.A.E. WASHER	STEEL
12 1		1" STD. CHECK NUT	STEEL
13 13		1" STD. HEX. NUT	STEEL
14 1	553	COVER	CAST IRON 18208-8
15		GASKET 1 1/2" T.H.	SHEET STEEL
16 1		1" X 3 1/8" STUDS	STEEL
17 1	00464	ESCAPE VALVE	BRONZE 18219-8
18 1	00465	ESCAPE VALVE SEAT	BRONZE 18219-8
19 1	0001029	ESCAPE VALVE SPRING	STEEL 18212-8
20 1	0001033	ESCAPE VALVE SPRING BRIDGE	STEEL 18233-8
21 2	0001032	SPRING BRIDGE STUDS	STEEL 18233-8
22 2	554	VALVE COVER	CAST IRON 18209-8
23 8		1" X 3" STUDS	STEEL
24 1	00445	VALVE	BRONZE 8960-4
25 2	00457	VALVE SEAT	BRONZE 18214-8
26 2		1/2" X 1 1/8" HEX. BOLT	STEEL
27 1	00451	VALVE SPINDLE	BRONZE 8966-4
28 1		1/2" X 1 3/4" COTTER PIN	BRASS
29 1	00459	STUFFING BOX GLAND	BRONZE 18214-8
30 2	562	HAND WHEEL	CAST IRON 18221-8
31 SET	3 RINGS	PACKING - GRAPHITED FIBER ASBESTOS YARN	1/2" X 1 1/2"
32 4		1/2" X 2 1/8" STUDS	STEEL
33 6		1/2" STD. HEX. NUTS	STEEL
34 2	00458	VALVE SPINDLE YOKE	BRONZE 18244-8
35 4	0001034	VALVE YOKE STUDS	STEEL 18233-8
36 2	562	HAND WHEEL	CAST IRON 18221-8
37 2	1/2" S.A.E. WASHER	STEEL	
38 1	00446	VALVE	BRONZE 8960-4
39 1	00470	VALVE SPINDLE	BRONZE 8966-4

2	ADDED SIZE OF PACKING	1/16" E.R.
	STUDS WHERE	1 1/2" L.E.M. E.R.
1	3 1/2" X 3 1/4" L.G.	2 1/2" D.I.
CHARGE	WAS	BY DATE
SCALE	CHARGE NO.	BY CHARGE NO.
6" = 1/8"	TOLERANCE ON UNSHAPED DIMENSION ± .010	
REMOVED SURFACES, SWELLS, SHARP EDGES, ETC. MAX. WORK TO DIMENSIONS. DO NOT SCALE.		
1/16" POLISH MACH. 1/16" BUFF OR POLISH 1/16" FILE		
1/16" SMOOTH MACH. 1/16" DRILL OR POLISH 1/16" SCRAPER		
1/16" GRIND LAP 1/16" RHEM 1/16" SPOTFACE		
DRAWN	3-22-41	CHECKED
TRACED	4-30-41	APPROVED
FUSCATE	DATE OR PAGE NO.	FINISHED PAGE NO.
OR	MADE FROM	BASE MATERIAL NO.
HEAT TREAT	CASE DEPTH	HARDNESS

ENG. NO 6511-40 INCL.

24 1/2" - 37" - 70" X 48" M.S. ENGINE

MATERIAL:

4-30-41

E.P.G. Agent

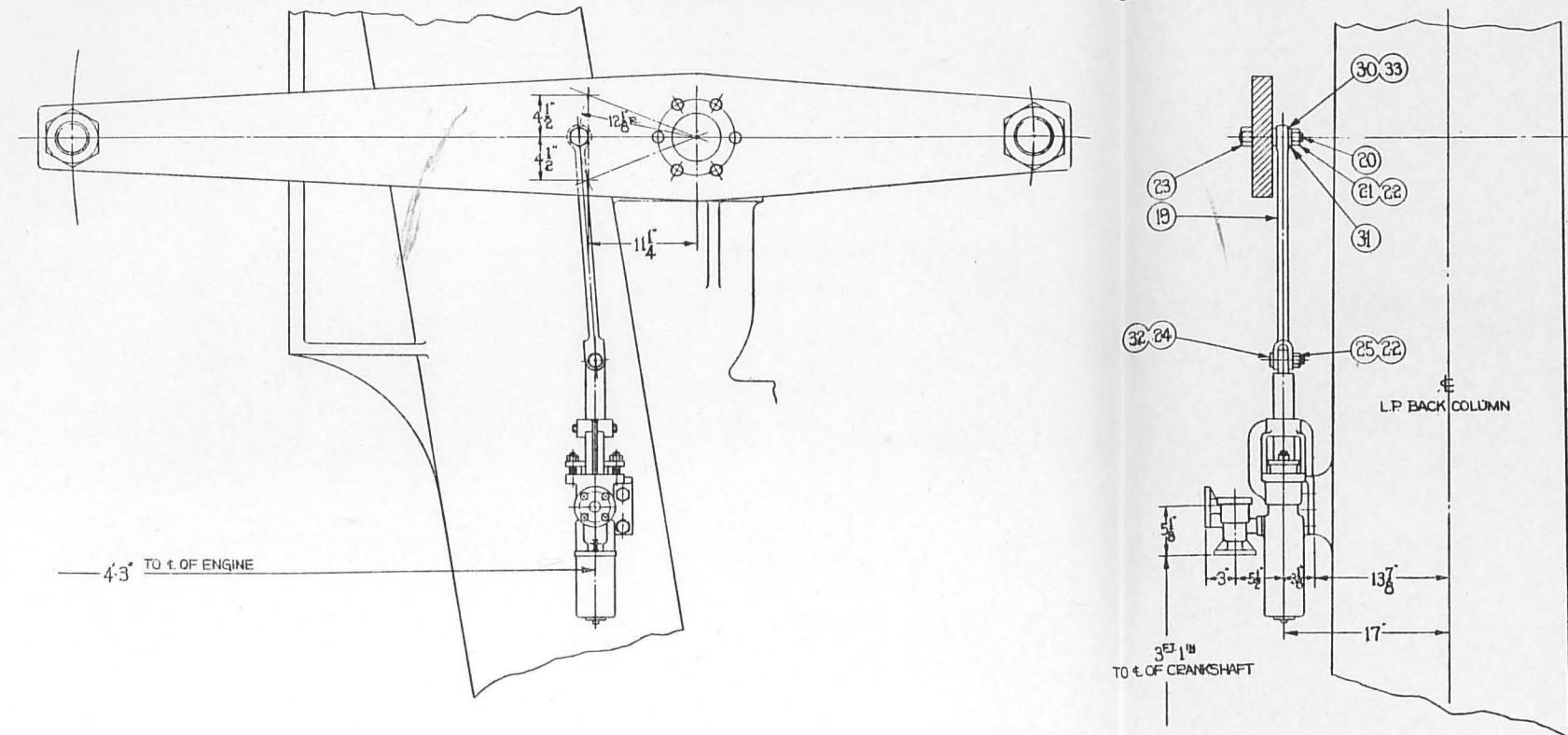
NAME:

3 1/2" BILGE SUCTION CHEST

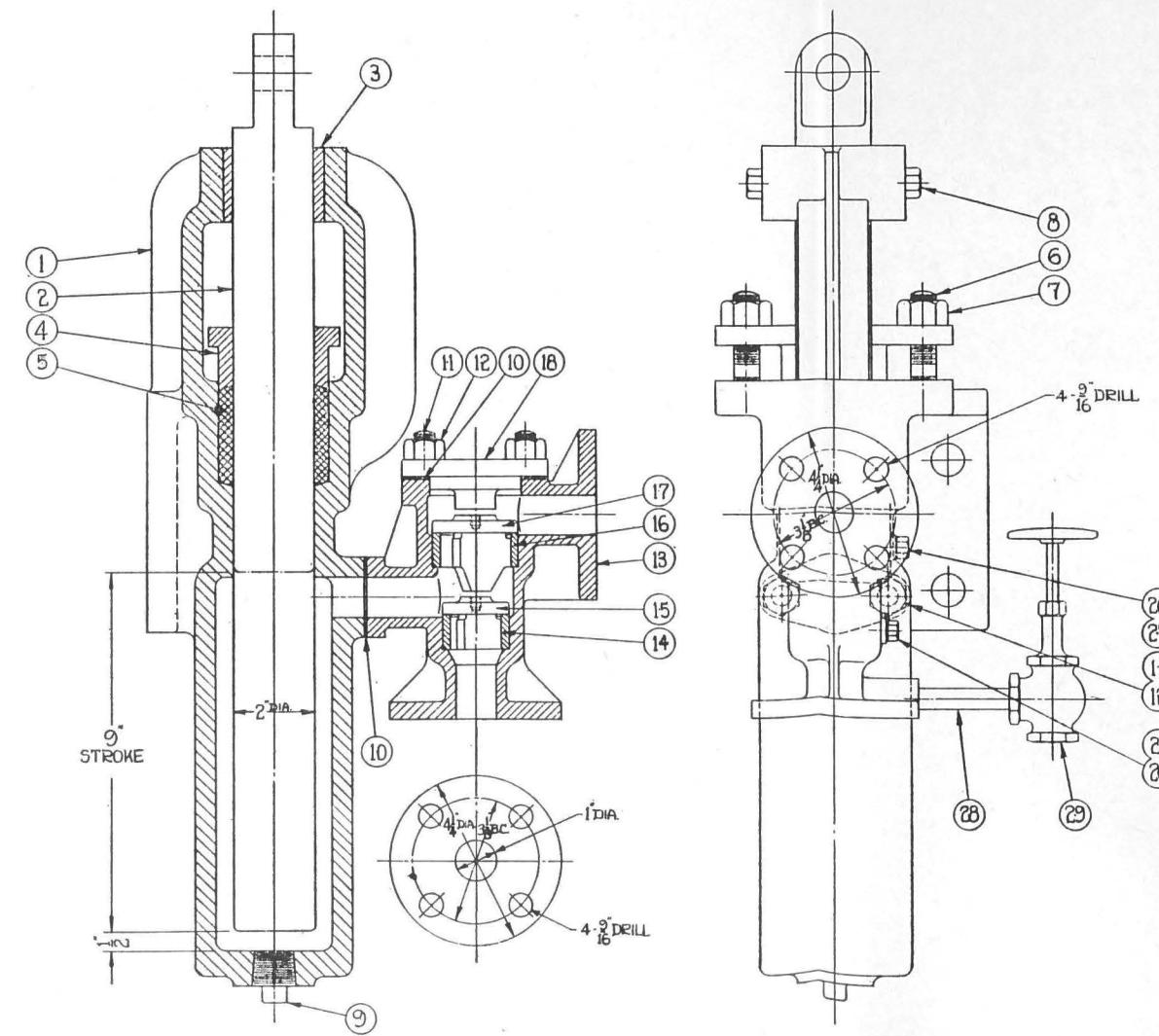
DRAWING NO. 5949-2

GENERAL MACHINERY CORPORATION  
H. O. R. - DIESEL DIVISION - HAMILTON, OHIO

5967-2



NO. OF PARTS GIVEN ARE FOR ONE ASSEMBLY			
MARK N°	PIECE N°	NAME	MATERIAL DRAWING N°
1	1	PUMP BODY	CAST IRON 9002-4
2	1	RAM	BRONZE 18327-8
3	1	00147	" "
4	1	00148	" "
5	1 SET	GRINGS	PACKING GRAPHITED FIBRE ASBESTOS YARN 3/8" SQUARE 1/34 DIA.
6	2	STD STUD	3/8" X 3" LG. STEEL
7	2	5/8 STD HEX NUT	" "
8	2	STD HEX BOLT	3/8" X 5/8" LG. "
9	1	1/2 STD PIPE PLUG	BRASS
10		GASKET 1/16" THICK	SHEET RUBBER
11	6	STD STUD	1/2" X 1/2" LG. STEEL
12	6	1/2 STD NUT	" "
13	1	202	VALVE BOX CAST IRON 9001-4
14	1	00150	VALVE SEAT (LOWER) BRONZE 18325-8
15	1	00518	VALVE (LOWER) "
16	1	00149	VALVE SEAT (UPPER) "
17	1	00151	VALVE (UPPER) "
18	1	203	VALVE COVER CAST IRON 18326-8
19	1	000397	PUMP DRIVING ROD STEEL 8991-4
20	1	000395	PIN-BEAM PLATE "
21	1	1/2 STD HEX NUT	" "
22	2	COTTER PIN 1/8" X 1" LG.	" "
23	1	1/8 STD HEX NUT	" "
24	1	000393	PIN-PUMP BEAM 8991-4
25	1	3/8 STD HEX NUT	" "
26	2	STD HEX BOLT 1/4" X 5/8"	" "
27	2	GASKET 3/16" THICK 9/16" I.D. X 5/8" O.D.	COPPER
28	1	1/4 PIPE NIPPLE 3" LG.	STEEL
29	1	1/4" HALWDTH ANGLE SCREW DOWN BALL CHECK VALVE 1/4"	BRONZE
30	1	00161	BUSHING "
31	1	000394	WASHER STEEL "
32	1	PIN 3/16" DIA X 3/8" LG	" "
33	1	SET SCREW #10-24 5/16" LG.	" "



NOTE:-  
100# WATER TEST PRESSURE

6-5-41

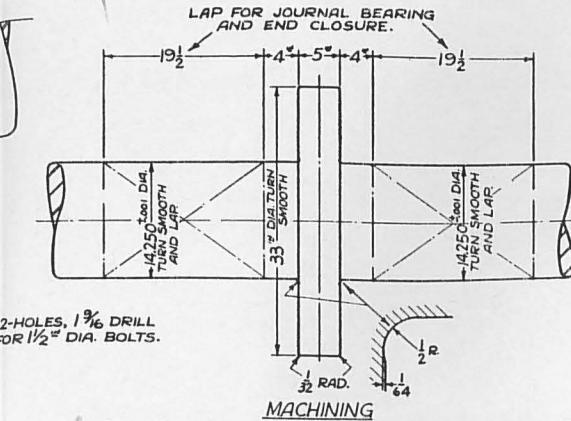
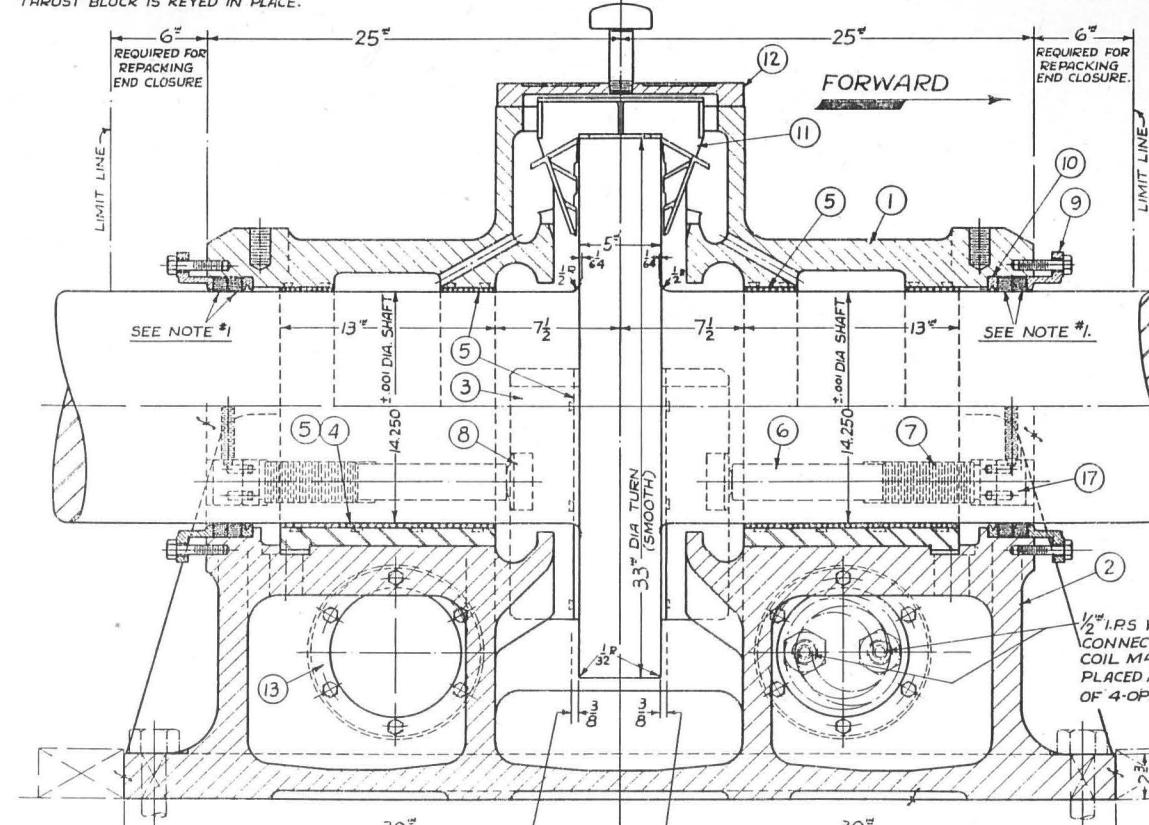
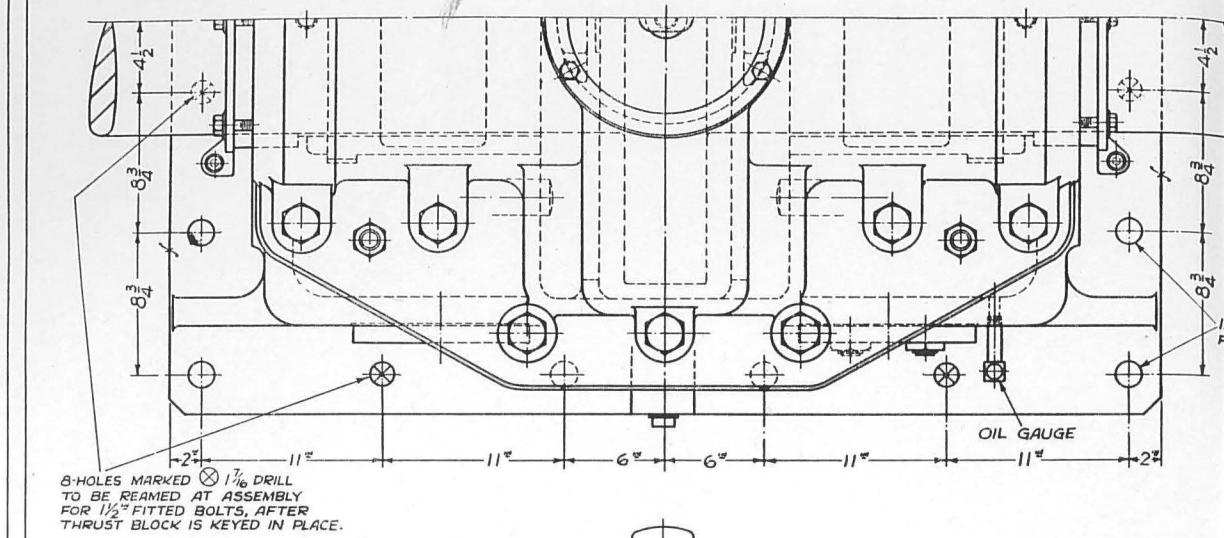
J.E.P. Grant

ENG. N° 6511-40  
24 1/2" - 37" - 70" - 48" MS ENG.

MATERIAL	DATE	BY	FILE
DRAWN C. 7/30/41	7/30/41	CHECKED L.R. May 5-5-41	7/30/41
TRACED		APPROVED E.M.C.	
PURCHASED	DATE NO. PONO.	MANUFACTURED BY	DATE
MADE FROM	HEAT TREAT	CASE DEPTH	HARDNESS
NAME: EVAPORATOR FEED PUMP & DRIVE ASSEMBLY	DRAWING NO. 5967-2	GENERAL MACHINERY CORPORATION HAMILTON, OHIO	

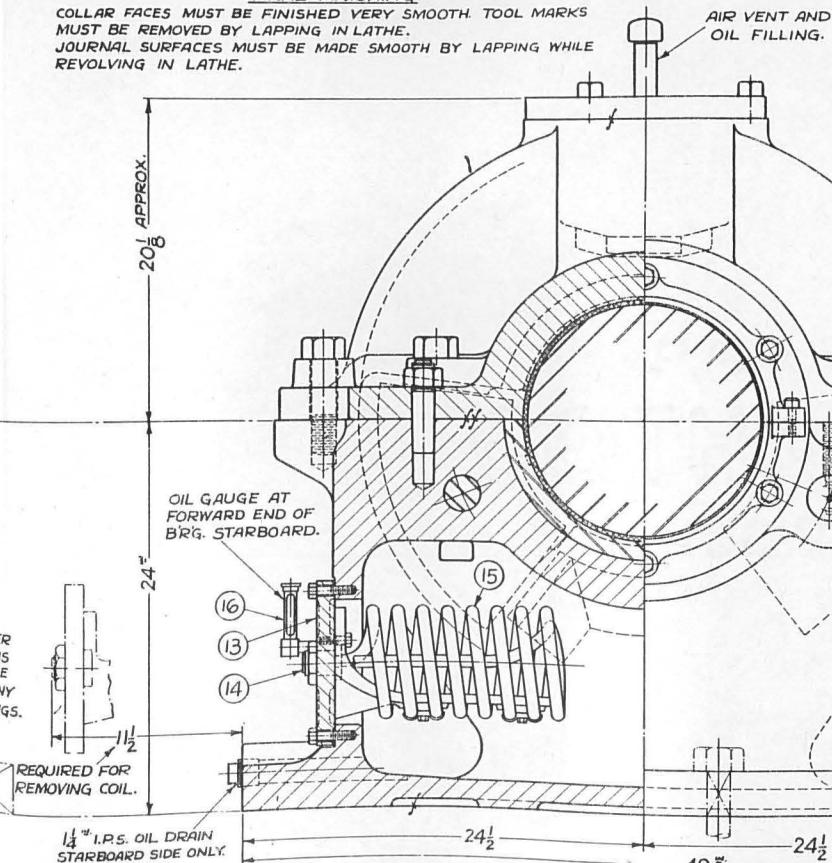
LIST OF PRINCIPAL PARTS

ITEM	NAME	MATERIAL
1	HOUSING UPPER HALF	SEMI-STEEL 20 TO 25% STEEL
2	HOUSING LOWER HALF	SEMI-STEEL 20 TO 25% STEEL
3	SHOE	CAST STEEL .25-35 CARBON ANNEALED
4	BEARING SHELL	ROLLED STEEL
5	HOUSING UPPER HALF, SHOE AND BEARING SHELL BABBITT	A#1 BABBITT 85-TIN, 10-ANTIMONY, 5-COPPER ELECTRIC FURNACE STEEL .80-.90 CARBON
6	THRUST PIN	STEEL-30-40 CARBON, ANNEALED
7	JACK SCREW	ELECTRIC FURNACE STEEL .80-.90 CARBON
8	SHOE SUPPORT IN SHOE	GUN METAL 88-COPPER, 10-TIN, 2-ZINC
9	STUFFING BOX GLAND	LEAD-BRONZE 80-COPPER, 10-TIN, 10-LEAD
10	STUFFING BOX BUSHING	GUN METAL 88-COPPER, 10-TIN, 2-ZINC
11	OIL SCRAPER	CAST IRON
12	TOP COVER PLATE	CAST IRON
13	SIDE COVER PLATE	CAST IRON
14	COOLING COIL HEADER	TOBIN BRONZE
15	COOLING COIL TUBING	COPPER TUBING 3/4 O.D.X .083 WALL X15 LG. APPROX. THOROUGHLY TINNED INSIDE
16	OIL GAUGE	BRASS
17	JACK SCREW LOCK	COLD ROLLED STEEL



FINAL FINISHING

COLLAR FACES MUST BE FINISHED VERY SMOOTH. TOOL MARKS MUST BE REMOVED BY LAPPING IN LATHE. JOURNAL SURFACES MUST BE MADE SMOOTH BY LAPPING WHILE REVOLVING IN LATHE.



NOTE #1:-  
PACKING NOT FURNISHED  
BY K.M.W. INC. USE A GOOD GRADE  
IMPREGNATED SOFT PACKING  $\frac{7}{8}$ "  
SQUARE AND SET UP LIGHTLY.

NOTE #2:-  
PROVIDE .020" TO .030"  
FOR TOTAL END PLAY.

LOAD, AREA AND BEARING PRESSURE  
ESTIMATED THRUST LOAD (MAX) - 60,000 LBS.  
NET THRUST SHOE AREA (EACH WAY) - 215 SQ. IN.  
CORRESPONDING BRG. PRESSURE - 279 LBS.  
REVOLUTIONS PER MINUTE - - - - - 76

APPROVED  
APRIL 21, 1941.  
AMERICAN BUREAU OF SHIPPING  
NEW YORK.

APPROVED  
FEB. 20, 1941  
LLOYD'S REGISTER OF SHIPPING  
NEW YORK.

KINGSBURY THRUST BEARING  
SIZE -  $32\frac{1}{2}$  FGF  
TYPE - HORIZONTAL-DOUBLE 2-SHOE  
DR. J.J.Z. TR. R.H CH. G.H.M.  
SCALE: 3 = 1 FOOT DATE JAN 20, 1941.  
KINGSBURY MACHINE WORKS, INC.  
PHILADELPHIA, PA.

No. 462800

FOR BILL OF MATERIAL, SEE DWG. # 202959.

HO 6810

REV 1/2/41 2/3/41 2/1/41 2/2/41 2/3/41 2/7/41 2/28/41

