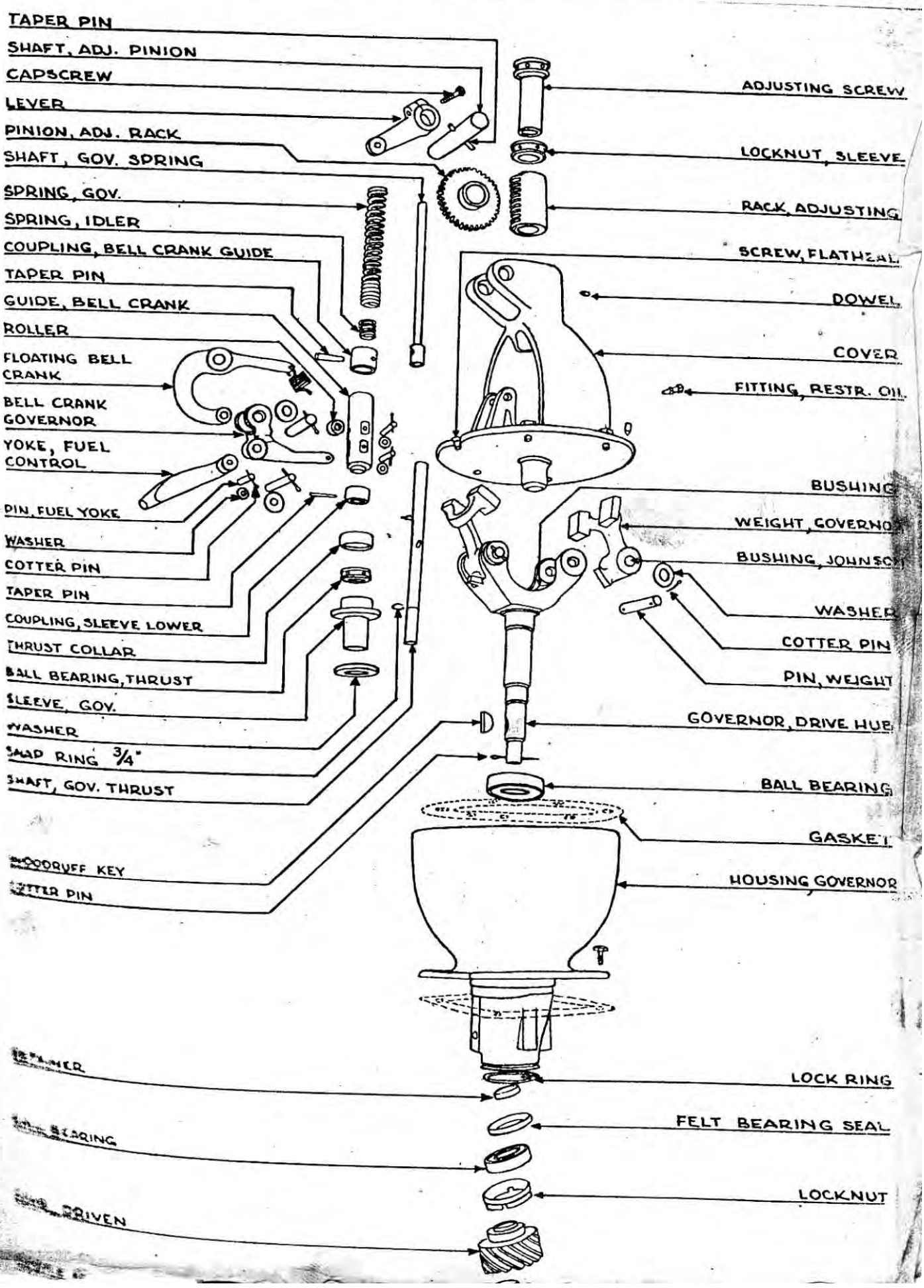


OPERATION OF GOVERNOR

INDEX SHEET 2
ENGINEERING SPECIFICATIONS ENGINE DMG-36 45125

CUSTOMER Pacific Exploration Co. Inc. HP 600 RPM 400

No.	Assembly Name	Qty.	Remarks
G 23 A	Intermediate Camshaft Bearing	6	
G 24 Y	Cams & Shaft	1	
G 25 B	Gear Case	1	Special Machining Dwg. G-1360
G 26 C	Gear Set	1	Assy. Dwg. G-1113
G 27 C	Governor & Tackometer Drive	1	
G 28 P	Air Starter Linkage	1	
G 29 Q	Reverse Control	1	
G 30 KK	Governor	1	
G 31 T	Governor Control	1	
G 32 UU	Fuel Pump Control	1	
~~33~~	~~Main Air Compressor~~		
G 34 W	Water Pump	2	
~~35~~	~~Water Pump Valve~~		
G 36 P	Fuel Transfer Pump	1	
G 37 R	Lube Oil Pump	1	
~~38~~	~~Force Feed Oiler~~		
G 39 H	Lubrication Fittings	1	
G 40 V	Fuel Injection	6	
G 41 A	Thrust Bearing	1	
~~42~~	~~Base Extension~~		
~~43~~	~~Reverse Gear~~		
~~44~~	~~Sailing Clutch~~		
~~45~~	~~Winch Clutch~~		
~~46~~	~~Cam Gear Cover~~		
G 47 B	Thrust Shaft	1	

Installation Dwg: G-1220
Piping Diagrams: F.W.11712 Alt.7 L.O.11709 Alt.1 S.A.11708 Alt.4
S.W.11714 Alt.5 F.O.12112 ~~Alt.6~~

INDEX SHEET 1
ENGINEERING SPECIFICATIONS

ENGINE DMG-36 45125

HP 600 RPM 400

CUSTOMER Pacific Exploration Co., Inc CUSTOMER'S ORDER RFC P.O. DPC 1

INSPECTION ABS OUR ORDER 238

DATE SHIPPED 5-17-46

No.	Assembly Name	Qty.	Remarks
G 1 R	Base	1	
G 2 H	Front Main Bearings	1	
~~3~~	~~Center Main Bearings~~		
G 4 H	Intermediate Main Bearings	5	
G 5 K	Rear Main Bearings	1	
G 6 R	Crankshaft	1	~~80,000# Minimum Tensile Strength~~
G 7 N	Flywheel	1	
G 8 S	Cylinder Block & Special Covers	1	Special Drilling Dwg. 75292
G 9 F	Standard Covers, Cylinder Block	1	
G 10 A	Cylinder Liners	6	
G 11 K	Pistons & Pin	6	
G 12 K	Connecting Rod & Bearings	6	~~80,000# Minimum Tensile Strength~~
G 13 G	Cylinder Head	6	
G 14 C	Valve	6	
G 15 A	Safety Valve	6	
G 16 F	Rocker & Push Rods	6	
G 17 DD	Tappet & Guide	6	
G 18 J	Intake Manifold	1	
G 19 L	Exhaust Manifold & Ells	1	
G 20 A	Water Manifold	1	
G 21 D	Starting Air Manifold	1	
G 22 B	Front Camshaft Bearings	1	

INDEX SHEET 3
ENGINEERING SPECIFICATIONS ENGINE DMG-36 45125

CUSTOMER Pacific Exploration Co. Inc HP 600 RPM 400

No.	Assembly Name	Qty.	Remarks
~~48~~	~~Reverse Gear Control~~		
~~49~~	~~Oiler Lines & Fittings~~		
G 50NN	Fuel Oil Header & Fittings	1	
G 51F	Strainer & Fittings	1	
G 52BBB	External Lube Lines	1	Use Assy. List
~~53~~	~~Ignition Equipment~~		
~~54~~	~~Fuel Pump & Oiler Drive~~		
G 55V	Operating Control	1	
~~56~~	~~Magneto Drive~~		
G 57J	Exhaust	1	
~~58~~	~~Lube Oil Tank, Attached~~		
G 59QQ	Circulating Water Fittings	1	
G 59XX	Circulating Water Fittings	1	
~~60~~	~~Eccentric Shaft~~		
~~61~~	~~Reverse Sector~~		
~~62~~	~~Camshaft Shifter~~		
~~63~~	~~Handwheel & Interlocking~~		
~~64~~	~~Air Control Valve~~		
~~65~~	~~Fuel Shutoff & Indicator~~		
~~66~~	~~Generator & Comp. Drive~~		
~~67~~	~~Generator & Mount~~		
~~68~~	~~Idling Control~~		
G 68DD	Lube Filter	1	
G 69CC	Lube Filter	1	
G 70SS	Fuel Filter	1	
G 70GG	Fuel Filter	1	
~~71~~	~~Revolution Counter~~		
G 72R	Supercharger	1	Serial #1693
G 73N	Jacket Water Outlet	1	
G 73M	Jacket Water Temp. Control	1	
99	Shop Tests		Use Test Schedule

INDEX SHEET 4
ENGINEERING SPECIFICATIONS ENGINE DMG-36 45125

CUSTOMER Pacific Exploration Co. Inc. HP 600 RPM 400

No.	Assembly Name	Qty.	Remarks
101WW	Instruments	1	2R,6E,11A,16K,17A,18B,19C
~~102~~	~~Auxiliary Air Compressor~~		
~~103~~	~~Air Receivers & Fittings~~		
104R	Lube Oil Tanks & Fittings	1	
~~105~~	~~Fuel Oil Tanks & Fittings~~		
~~106~~	~~Propeller Equipment~~		
~~107~~	~~Circulating Water Fittings~~		
108FF	Tool Set	1	
108LL	Tool Set, Turbocharger	1	
109 L	Operating & Maintenance Instruct.	1	
~~110~~	~~Purse Seine Equipment~~		
111GG	Pyrometer	1	9 Thermocouples
112ZZ	Lube Oil Cooler & Fittings	1	
113E	Spare Parts	1	
113	Spare Parts, Turbocharger	1	
~~114~~	~~Muffler~~		
115T	Tachometer	1	500-0-500; Red 400-500 1.3889 times Eng. Speed
~~116~~	~~Stack, Exhaust~~		
~~117~~	~~Pilot House Control~~		
~~118~~	~~Electrical Equipment~~		
~~119~~	~~Indicator Equipment~~		
120	Miscellaneous		
~~121~~	~~Underwater Fittings~~		
~~122~~	~~Governor Remote Control~~		
~~123~~	~~Reversing Remote Control~~		
~~124~~	~~Sailing Clutch Remote Control~~		
~~124~~	~~Reverse Gear Remote Control~~		
~~125~~	~~Air Starting Remote Control~~		
~~126~~	~~Boat Tanks~~		
127	Valve Cage Puller		

INDEX SHEET 5
ENGINEERING SPECIFICATIONS ENGINE DMG-36 45125

CUSTOMER Pacific Exploration Co. Inc. HP 600 RPM 400

No.	Assembly Name	Qty.	Remarks
~~128~~	~~Radiator~~		
129JJJ	Heat Exchanger	1	
~~130~~	~~Air Cleaner~~		
~~131~~	~~Bilge Pump~~		
~~132~~	~~Bilge Pump Lines & Fittings~~		
~~133~~	~~Underwater Fittings - Engine~~		
~~134~~	~~Underwater Fittings Purse Seine~~		
~~135~~	~~Water Discharge Fittings~~		
~~136~~	~~Spring Bearing~~		
~~137~~	~~Bulkhead Stuffing Box~~		
138T	Flywheel Barring Device	1	
139A	Lube Hand Pump	1	To be mounted on engine
~~140~~	~~Fuel Oil Hand Pump~~		
~~141~~	~~Aux Engine Unit~~		
~~142~~	~~Fire Pump~~		
~~143~~	~~Sanitary Pump~~		
~~144~~	~~Lube Oil Purifier~~		
~~145~~	~~Lube Oil Transfer Pump~~		
~~146~~	~~Fuel Oil Transfer Pump~~		
~~147~~	~~Winch Drive~~		
148TT	Safety Alarm	1	220/240 V.A.C., 60 Cycle, 3 phase
~~149BB~~	~~Auxiliary Pump~~	~~1~~	~~220/240 V.A.C., 60 Cycle, 3 phase~~
~~150~~	~~Battery~~		
~~151~~	~~Pump Priming~~		
152Q	Water Surge Tank	1	

INDEX SHEET 6
ENGINEERING SPECIFICATIONS ENGINE DMG-36 45125

CUSTOMER Pacific Exploration Co. Inc HP 600 RPM 400

No.	Assembly Name	Qty	Remarks
153 H	Pyrometer Conduit	1	
154 C	Main Coupling	1	
~~155~~	~~Main Power Transmission Unit~~		
~~156~~	~~Flexible Exhaust Hose~~		
~~157~~	~~Sub-Base~~		

These Parts On G-201-R

Date Issued: 11-1-43
Retyped: 6-1-53

ASSEMBLY NO. G-1-R
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Base
6 Cyl. Marine, Kingsbury or Timken

FIRST USED ON: _____

ASSY DWGS: 79002 - Timken
78138 - Kingsbury

It.	Part No.	Part Name	Matl	Qty	Remarks
1	78249-1	Base	CI	1	
2	704	Stud, Base - Crankcase		28	
3	7695	Through Bolt Base-Crankcase		14	SAE 4140 H.T.
4	7697	Washer, Through Bolt	CRS	14	
5	135	Nut, Hex. Through Bolt		14	Union Cold Drawn Hymo
6	136	Nut, Square, Through Bolt		14	Union Cold Drawn Hymo
7	X-2965-1	Collar, Set, Through Bolt	CRS	14	
8	79150-1	Ring, Sealing Through Bolt	1	14	See Dwg. for Materia l
9	78070-1	Gasket, inner, Base-Case	Vel.	14	1/32"
10	78282-1	Gasket, Outer (Rear)	Vel	2	1/32
11	78282-2	Gasket, Outer (Center)	Vel	2	1/32
12	78282-3	Gasket, Outer (Front)	Vel	2	1/32
13		Nut, Base - Crankcase Stud		28	7/8-9
14		Lockwasher Crankcase Stud		28	7/8 Std.
15	78158-1	Stud, Main Bearing		28	SAE 4140 H.T.
16	7690	Washer, Main Bearing	CRS	28	
17	126	Nut, Main Bearing		28	Union Cold Drawn Hymo
18		Pin, Cotter, Main Brg. Stud		28	1/8 x 1-1/2
19	165	Nut, Square - Main Bearing		28	
20	78160-1	Pin, Locking - Inter, Bearing		10	
21	78160-2	Pin, Locking - Front Bearing		2	
22	78160-3	Pin, Locking - Rear Bearing		2	

Gasket Set 79629

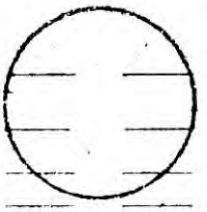
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 11-1-43
Retyped: 8-17-48

ASSEMBLY NO. G-1-R
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Base

FIRST USED ON: ___

ASSY DWGS: 79002 - Timken
78138 - Kingsbury

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Cotter Pin		28	3/32 x 1
2		Washer		28	3/8 SAE
3		Allen Cup Point, Set Collar Setscrew		14	1/4-20 x 1/4"
4					
5		Combination Pre-Assy.			
6	G-1489	Pre-Assy. Base, Studs, & Brg. Caps			C5G or K C1R, C2F, or H, C4D or H
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-801

Date Issued: 10-10-45
Retyped: 6-23-49

ASSEMBLY NO. G-2-H
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1

ASSY NAME: Front Main Bearing ~~(2 groove)~~
Single groove, new style

FIRST USED ON: 45142

ASSY DWGS: 76802

It.	Part No.	Part Name	Matl	Qty	Remarks
1	76813-1	Cap, Bearing	CS	1	
2	G-1264-1	Shell, Bearing Lower & upper		2	Pre- Assy. for Pair G-1345, Satco NSS
3	7682-1	Ring, Locking	CRS	2	
4		Capscrew		2	1/2-13x4 Allen
5	76789-1	Key, Base Main Bearing	Drill Rod	4	
6		Capscrew		4	1-4-20 x 12 Allen
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-201

Date Issued:
Retyped: 6-23-49

ASSEMBLY NO. G-4- H
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 5
8 CYL. 7

ASSY NAME: Intermediate Main Bearing

FIRST USED ON: 45142

ASSY DWGS: 76802

It.	Part No.	Part Name	Matl	Qty	Remarks
1	76808-1	Cap, Bearing	CS	1	
2	G-1334-1	Shell, Bearing Upper & Lower		2	Pre-Assy. for Pair G-1346, Satco NSS
3	7682-1	Ring, Looking	CRS	2	
4		Capscrew		2	1/2-13x4 Allen
5	76789-1	Key, Base-Main Bearing	Drill Rod	4	
6		Capscrew		4	1/4-20 x 1/2 Allen
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-201

Date Issued: 3-6-43
Retyped: 4-14-49

ASSEMBLY NO. G-5-K
SHEET NO. ____

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. 1
8 CYL. 1

ASSY NAME: Rear Main Bearing
(Does not take thrust) Used on marin
w/o sailing clutch

FIRST USED ON: ____

ASSY DWGS: 76802

It.	Part No.	Part Name	Matl	Qty	Remarks
1	76811-1	Cap, Bearing	CS	1	
2	77418-1	Shell, Brg., Upper & lower		2	Pre-Assy.Group 77724 Satco NSS
3	7682-1	Ring, Locking	CRS	2	
4		Capscrew		2	1/2-13 x 4 Allen
5	76789-1	Key, Base-Main Brg.	Drill Rod	4	
6		Capscrew		4	1/4-20 x 1 Allen
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

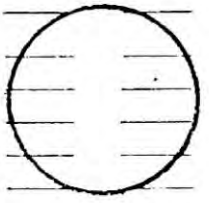
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 3-13-46

ASSEMBLY NO. G-6-R
SHEET NO. ____

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. 1
6 CYL. 1
8 CYL. ____



ASSY NAME: Crankshaft
8-1/2" Journals, 8" Pins 6 Cyl.--FS--
For Supercharged Engines
80,000 P.SI. Min.Tensile ABS Require-
FIRST USED ON: ____ ments

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	77009-~~A~~	Crankshaft	FS	1	For rough Mach. see 77397 Forge see also 77018
2	7545-2	Key, Crankshaft	CRS	1	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

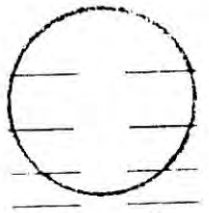
SAME AS G-207-N

Date Issued: 10-22-43
Retyped: 6-27-49

ASSEMBLY NO. G-7-N
SHEET NO.

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1



ASSY NAME: Flywheel
10-1/2x33 With Cast Slots.
(Marine)

FIRST USED ON: 43153-332

ASSY DWGS: 78138

It.	Part No.	Part Name	Matl	Qty	Remarks
1	78143-1	Flywheel	CI	1	
2	7643	Bolt, Flywheel		6	SAE 4140
3	126	High Nut		6	1-1/4-12 Union CD Hymo
4		Cotter Pin		6	3/16 x 2-1/4
5	78146-1	Pointer, Flywheel	CS	1	
6		Capscrew, Pointer-Block		2	1/2-13 x 1
7	104-2	Dowel, Pointer-Block		2	1/4 x 7/8
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

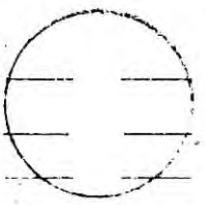
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

(For List of Special Drillings see Dwg. G-2299)

Date Issued: 6-18-43 THESE PARTS ON G-208-S ASSEMBLY NO. G-8-S
Retyped: 8-9-49 SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.



ASSY NAME: Cylinder Block
RH-6 Cyl. Turbocharged or Non-Turbocharged

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75383-1	Cylinder Block	CI	1	
2		Plug, Drain	Blk	1	3/4 Male
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

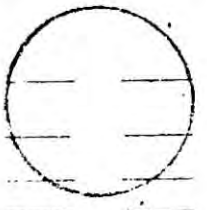
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 11-11-43
Retyped: 12-13-48

ASSEMBLY NO. G-9-F
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Cylinder Block Cover R.H.6, W/O Overspeed Trip

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78410	Pre-Assy., Rear Oil Seal		1	Consisting of:
3	78377-1	Seal, Lower Rear End Oil	CI	1	
4	78288-1	Gasket, Seal-Seal		2	1/32 Vel
5	7644-1	Seal, Upper Rear End Oil	CI	1	
6		Bolt		4	1/2-13 x 1-3/4
7		Nut		4	1/2-13
8	106-3	Dowel		2	
9					
10					
11	7029-A	Side Door Covers	See Dwg.	12	
12		Capscrew		96	1/2-13 x 1-1/2
13	78181-1	Gasket		12	Gar. #660
14	7844-1	Cover, Camshaft Left End	CI	1	
15	7843-1	Cover, Camshaft Center	CI	1	
16		Capscrew		9	1/2-13 x 1-1/4
17	78290-1	Gasket, Upper Seal to Block	Vel	1	
18		Capscrew		15	1/2-13 x 1-1/2
19		Lockwasher		15	1/2 SAE
20		Capscrew		8	1/2-13 x 1-1/4
21		Bolt		4	1/2-13 x 1-1/2
22		Nut, Hex		4	1/2-13

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

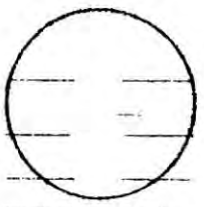
CONTINU
NEXT PA

Date Issued: 11-11-43
Retyped: 12-13-48

ASSEMBLY NO. G-9-F
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Cylinder Block Cover

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks	
1	7842-1	Cover, Camshaft Right End	CI	1		
2		Capscrew, Cover-Block		11	1/2-13 x 1-1/4	
3		Bolt, Cover - Gear Cover		3	1/2-13 x 1-3/4	
4		Nut, Hex		3	1/2-13	
5	78286-1	Gasket		1	Gar. 660	
6	78179-1	Gasket to Block		2	Gar. 660	
7	78183-1	Gasket, End		2	Gar. 660	Gasket Set 79631
8	77927-1	Gasket - Upper Half		1	Gar. 660	
9	77928-1	Gasket - Lower Half		1	Gar. 660	
10	77926-1	Gasket to Gear Case		1	Gar. 660	
11	108-1	Dowel		2		
12	B-3736	Breather, Crank Case		1	Vortox 2205	
13	4833-1	Pipe, Breather		1		Blk
14	533	Stud, Int., Exh., Tappets		24		
15		Nut, Hex		24	5/8-18	
16		Lockwasher		24	5/8 Shakeproof	
17	538	Stud, Fuel Tappet		12		
18		Nut, Hex		12	5/8-11	
19	532	Stud, Cam Bearing	St	14		
20		Nut		14	5/8-18	
21		Lockwasher		14	5/8 Shakeproof	
22	607	Stud, Idler Stub	CRS	3		

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED
NEXT PAGE

Date Issued: 11-11-43
Retyped: 12-13-48

ASSEMBLY NO. G-9-F
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Cylinder Block Cover

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Nut, Castle		3	3/4-10
2		Pin, Cotter		3	1/8 x 1-1/2
3	77527-2	Name Plate	See Dwg	1	
4		Screw, Countersunk Hd.	St.St.	22	P.K.No.6 x 1/2 Type Z
5	78366-1	Gasket, Lower Seal to Base	Vel	1	
6		Capscrew		15	1/2-13 x 1-1/2
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

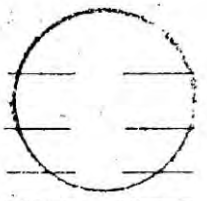
SEE G-208

Date Issued: 1-26-39
Retyped: 8-10-49

ASSEMBLY NO. G-10-A
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1



ASSY NAME: Cylinder Liner

FIRST USED ON: 9001 - 9010

ASSY DWGS: Group Dwg. 78435

It.	Part No.	Part Name	Matl	Qty	Remarks
1	7657	Cylinder Liner		1	See Dwg. for Material
2	7026	Ring, Sleeve Seal	RBr	2	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 6-27-45
Retyped: 2-16-49

ASSEMBLY NO. G-11-K
SHEET NO. ____

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. 6
8 CYL. 8

ASSY NAME: Piston & Pin
Oil Cooled, C.I., 450 RPM & Below, Suprchgd.

FIRST USED ON: ____

ASSY DWGS: G-1712

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	G-1155	Pre-Assy., Piston & Pin		1	Consisting of:
3	G-1090-1	Piston	CI	1	
4					
5	79352	Pre-Assy., Plug & Screw		2	EACH Consisting of:
6	78779-1	Screw, Piston Plug	CRS	1	
7	7273-1	Plug, Piston	Al	1	
8					
9	G-1095-1	Seal	CAl	1	
10		Capscrew, Hex		4	3/8-16 x 1
11	180-2	Clip, Locking	St	4	
12	7648	Pin, Piston	St	1	For .005 Oversize Replacement of Pin 7648 Use G-4170, for .010 oversize, use G-4164
13					
14		Rings to be arranged in order shown:			
15	G1439	RING SET 1 PISTON			
16	~~G-2391*~~	CANCELLED Pre-Assy., Rings		1	Consisting of:
17	B-3847	Ring, Comp., Str.Cut		2	Chrome Plated Entr.Grv. AH 12 x 3/16 x .389
18	B-3605	Ring, Comp., Str.Cut		3	Taper Face AH 12 x 3/16 x .389
19	~~B-3088~~	~~Ring, LHA Oil Cutter~~		~~2~~	AH 12 x 1/2
20	~~B-3083~~	CANCELLED ~~Ring, Oil Wide Chamfered~~ st cut		1	AH 12 x 1/2
21	B-6336	- 2 ring } oversize			
22	B-6337-3	" }			

*Order G-2391 from G-11-Q

Pre-Assy G-1481

Pre-Assy. G-1156

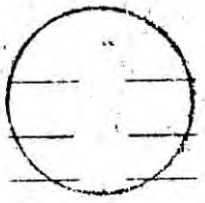
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3
Date Issued: 3-11-46
Retyped: 6-29-49

ASSEMBLY NO. G-12-K
SHEET NO.

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 6
8 CYL. 8



ASSY NAME: Con. Rod & Bearing ABS (80,000 PSI), CI Oil Cooled Pistons

FIRST USED ON: ___

ASSY DWGS: 78775

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	G-1671	Pre-Assy., Con.Rod & Bearing		1	Consisting of:
3	G-1206-~~2~~	Connecting Rod NSS } Pre-Assy. G-2732		1	Steel Forging Dwg.79250 } Pre-Assy. G-1828
4	7650	* Bushing, Con.Rod } Pre-Assy. G-2732	Brz	1	
5	G-1215-1	Screw, Oil Control	CRS	1	
6	78513	Box, Con.Rod Brg.	CS	1	
7	** G-1337-1	Not Flanged — Shell, Con.Rod NSS		2	Pre-Assy. ** G-1344
8	78508-1	Ring, Locking	CRS	2	
9		Capscrew, Allen		2	5/16-18 x 1
10	76957-1	Bolt, Con.Rod		4	
11	76984-1	Nut, Con.Rod Bolt		4	
12		Cotter Pin		4	3/16 x 2"
13	76970-1	Shim, Compression	St	2	
14	76970-2	Shim, Compression	St	1	
15	76970-3	Shim, Compression	St	1	
16					
17					
18					
19					
20		* (Note: For Field Replacement use 76893-1 Bushing instead of item 4 above)			
21		** Note: For Field Replacement Use G-4728 Assembly (G-4368 Shell)			
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

When ordering assembled units see note at end of parts list.

Date Issued: 6/15/43
Retyped 3/3/48

SEE G-13-R & G-13-Q (Stat.)
G-13 & 14 COMBINED.
for complete Replacement
Use Retainer 77844-1

ASSEMBLY NO. G-13-G
SHEET NO. 1

ENGINE MODEL G

ASSY NAME: Cylinder Head (Air Starting) Single Valves

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8

FIRST USED ON:

Group Assy. 78237

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	77873	Pre-Assy., Cylinder Head		1	Consisting of:
3	75092Alt3	Cylinder Head		1	Cr. Moly CI
4	7726	Tube (Cast In) Assy. G-4603	CRS	1	Seamless Tube 3/8x3/4 x 13-5/8
5	G-4599	Plug, Tube		2	
		Plug, Pipe		2	1½" Flush
6	77843-1	Nozzle Sleeve ✓	Stless St	1	
7	7703-1	Guide, Valve		2	Ni, Cr. Cast Iron
8	77906-1	Gasket, Nozzle Sleeve ✓	Cop	1	.028 - .032
9	77845-1	Stud, Nozzle Holder		2	SAE 4140
10	75854	Stud, Rocker Shaft		2	SAE 4140 HT
11	312	Stud, Cylinder Head Cover		2	SAE 1120
12	75115	Stud, Air Starting Valve		2	SAE 4140
13	7922-1	Cover, Blind	See Dwg.	1	
14	79099 ~~78305-1~~	Gasket, Cover		1	3/16 Gar. 660
15		Capscrew, Cover		3	Allen 5/16-18 x 3/4
16					
17					
18	7694-1	Stud, Cylinder Head		7	SAE 4140 H.T.
19	142	Nut, Cylinder Head		7	Union Cold Drawn Hymo
20	7690	Washer, Cylinder Head		7	
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel

CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE NEXT PAGE

When ordering assembled units see note at end of parts list.

Date Issued: 6-15-43
Retyped: 12-6-46

ASSEMBLY NO. G-13-G
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8

ASSY NAME: Cylinder Head ~~(Air Starting) Single Valves~~

FIRST USED ON:

Group Assy. 78237
ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	7754	Pre-Assy., Cyl. Head Cover		1	Assy. Dwg. 7754 Consisting of:
3	76986-1	Cover, Cylinder Head		1	Pressed Steel
4	7755-1	Nut, Cylinder Head Cover		2	See Dwg. for Mat'l.
5	79965-1	Ring, Lock		2	
6					
7					
8	78304-1	Gasket, Cylinder Head Cover		1	3/16 Gar. #660
9	~~G-3698 7793~~	Gasket, Cylinder Head Set # ~~G-4004~~		1	~~#AMS-3232-C 3/64 Johns-Man. #76~~
10	~~G-3693~~	Gasket, Cylinder Head			
11		See Below -			
12	NOTE:	Use following for ordering completely assembled units:			
13	77873	Pre-Assy., Cyl. Head with Guides & Studs, G-13-G			
14	78045	Pre-Assy., Cyl. Head with Guide Studs, Intake & Exh. Valve G-13-G, G-14-C			
15	78044	Pre-Assy., Cyl. Head with Guides, Studs, Int. & Exh. Valves, Air Starting & Safety Valves, G-13-G, G-14-C, G-15-A			
16	78790	Pre-Assy., Cyl. Head with Guides, Studs, Int. & Exh. Valve, Air Starting Valve, G-13-G, G-14-C.			
17					
18	~~79552~~	Group of Gaskets for Head Replacement.			
19	G6344	Copper Head gskt		1	upgraded 3/9/73
20	G6345	shroud gskt		1	
21	G6044	grommet small		4	=24
22	G6047	" - large		2	=42

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 7 3 SEE G-13-N & P (G-13 & 14 COMBINED)

Date Issued: 7-24-39
Retyped: 8-23-48

ASSEMBLY NO. G-14-C
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8

ASSY NAME: Valve (Air starting)

FIRST USED ON: 9020, 9021, 9022

Group
ASSY DWGS: 78237

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	76751	Pre-Assy. Air Starting Valve		1	See Assy. Dwg. 75105 Consisting of:
3	75112	Air Inlet Cage	CI	1	
4	75113-1	Valve, Air-Inlet		1	SAE 3140
5	96669	Nut, Cap		1	½-20
6		Cotter Pin		1	1/8 x 1
7	7901	Retainer, Spring	CRS	1	
8	7903	Spring		1	Spring Wire
9	75114	Spacer	Br	1	
10	7904	Washer	CRS	1	
11	7900	Piston, Auxiliary		1	Brass Bar Stock
12	B-3054	Rings, ~~Str. Cut~~		2	1¼ x 1/8 Amer. Ham
13	7897	Piston	CBrz	1	
14	B-3055	Rings, ~~Step Seal~~		2	2x1/8
15	79006-1	Cap	St	1	Pre-Assy. 7898
16	79007-1	Plug		1	Tool Steel
17	79108-1	Washer		1	Annealed Copper
18					
19	7116	Gasket	Cop		
20	7907	Ring, Sealing	Rub	1	
21	7905	Retainer, Air Valve Cage	CS	1	SAE 1030
22		Nut, Air Start Valve	St	2	5/8-18

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED NEXT PAGE

Edition: 3
Date Issued: 7-24-39
Retyped: 1-10-49

ASSEMBLY NO. G-14-C
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8

ASSY NAME: Valve

FIRST USED ON: 9020, 9021, 9022

ASSY DWGS: 78237

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-4981 ~~7668-1~~	Valve, Intake		1	SAE 3140
2	G-4982 ~~7668-2~~	Valve, Exhaust		1	
3	7700-1	Spring, Inner		2	Spring Steel
4	G-5625	Spring, outer		2	Spring Steel
5	75785	Spring Seal (Lower)	CRS	2	
6	75294	Retainer	CRS	2	
7	7669-2	Wedge	CRS	4	Halves
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

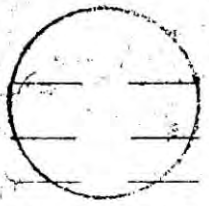
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued:
Retyped: 1-11-49

ASSEMBLY NO. G-15-A
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8



ASSY NAME: Relief Valve
Air Starting

FIRST USED ON: 9019

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	76398	Pre-Assy., Relief Valve		1	See Assy. Dwg. 75095 Consisting of:
3	75094	Body		1	Cr. Moly C.I.
4	7059	Stem	CRS	1	
5	60359-1	Spring		1	
6	6256-C	Cap	CRS	1	
7	6256-D	Locknut	CRS	1	
8	6256-G	Handwheel	CRS	1	
9	6256-H	Collar, valve stem	CRS	1	
10		Pin, Cotter		1	1/16 x 1
11		Plug, Pipe	Blk	1	1/2"
12					
13					
14	78306-1	Gasket		1	3/64 Johns-Man. #60
15		Capscrew		2	1/2-13 x 1-1/4 Allen
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-216-F

Edition 3

Date Issued: 3-8-46
Retyped: 8-19-52

ASSEMBLY NO. G-16-F
SHEET NO. 1

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. 6
8 CYL. 8

Marine

ASSY NAME: Rocker & Push Rod (Air Starting) Wide Roller Tappets

FIRST USED ON: ____

ASSY DWGS: 75776

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	76757	Pre-Assem. Rocker Arms & Shaft		1	See Assem. Dwg. 78517 Consisting of:
3	G-3685	Rocker Arm L.H.	CS	1	
4	G-4772	Bushing		1	Made from Half of H-342 } Pre-Assem. 76761
5	G-4771	Bushing		1	Made from Half of H-342
6		Pipe Plug, Slotted 1/8		1	
7	G-3686	Rocker Arm, R.H.	CS	1	
8	G-4772	Bushing		1	Made from Half of H-342 } Pre-Assem. 76815
9	G-4771	Bushing		1	Made from Half of H-342
10		Pipe Plug, Slotted 1/8	1	1	
11	75111-1	Rocker Arm, Air	CS	1	Pre- Assem. 76755
12	12503-5	Bushing	Brz	2	
13	75116-1	Screw, Adjusting, Air		1	SAE 4140
14		Nut, Jam		1	3/4-16
15	7725-1	Shaft, Rocker		1	SAE X-1315
16		Pipe Plug, Slotted	BR	1	1/4
17	75778	Body, Hydraulic Lifter		2	SAE 1020 Hardened
18	75779 75780	Screw, Adjusting Locknut, Adj. Screw	CRS CRS	2 2	
19	75781	Lock, Lifter Body		2	Spring Steel
20	B-3092	Zero Lash Unit		2	
21		Elbow 90° Street Nipple	Imp Blk	1 1	50F 1/4T 1/8P 1/8 x 2
22		Union Nut	Imp	1	41F 1/4T

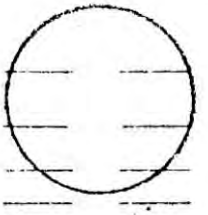
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 3-8-43
Retyped: 1-10-49

ASSEMBLY NO. G-16-F
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8



ASSY NAME: Rocker & Push Rod

FIRST USED ON:

ASSY DWGS: 75776

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	76816	Pre-Assy. Roller & Pin		[3]	EACH Consisting of:
3	7073-A	Roller	CRS	1	
4	7073-B	Pin		1	
5					
6					
7	G-3940 ~~78139~~	Pre-Assy. Push Rod		[2]	Assy. Dwg. ~~78139~~ G-3940 EACH Consisting of:
8	G-3941 ~~77335-1~~	Tube, Push Rod, Int.&Exh.		1	~~Remachine 7756-1 Seamless Steel~~ Welded
9	G-3902 ~~7756-2~~	Top, Push Rod, Int.& Exh.	CRS	1	
10	G-3901 ~~7756-3~~	Bottom, Push Rod, Int. &Exh.	CRS	1	
11					
12					
13	77671	Pre-Assy. Push Rod		1	Assy. Dwg. 77671 Consisting of:
14	75290-1	Push Rod, Air	CRS	1	Welded
15	75290-2	Top, Push Rod, Air	CRS	1	
16					
17					
18	148	Nut, Rocker Shaft		2	Hymo CD
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-217-DD

Date Issued: 12-1-44
Retyped: 1-10-49

ASSEMBLY NO. G-17-DD
SHEET NO: 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6
8 CYL. 8

RH. Rev. Marine

ASSY NAME: Tappet & Guide
~~Wide Int.& Exh.Rollers~~, Air Starting; Brz.Bushed Int.,Exh.,& Fuel; Fuel Guide without insert Without Liners, ~~RH~~
FIRST USED ON: All Speeds

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78153	Pre-Assy. Fuel Tappet & Guide		1	Assy.Dwg. #77968 Consisting of:
3	76882-1	Tappet SAE 1040		1	
4	76741-1	Roller SAE X-1315		1	Pre-Assy. 77072 NSS
5	79959-1	Bushing Pre-Assy 79256	Brz	1	NSS
6	76886-1	Pin		1	NSS
7	77853-1	Guide & Fuel Pump Base	CI	1	
8	76884-1	Umbrella Locknut		1	Stressproof
9	6202-A	Plug, Adjusting		1	SAE 1020
10	76885-1	Shaft, Priming		1	SAE 4140
11	7744-1	Locking Screw		1	
12		Lockwasher		1	1/4
13	7745-1	Spring, Locking		1	Spring Wire
14		Plug, Pipe	Br	1	1/8 Slotted
15	B-5307	Ball	St	1	5/16 Dia.
16		Connector		1	Imp.68F 1/4T 1/8P.T.
17					
18					
19		Capscrew, Allen		2	3/8-16 x 3-1/4
20	77967-1	Gasket		1	1/32 Vel.
21					
22					

Pre-Assy 78115

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

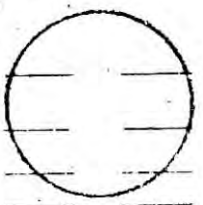
CONTINUED NEXT PAGE

Date Issued: 12-1-44
Retyped: 1-10-49

ASSEMBLY NO. G-17-DD
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 6
8 CYL. 8



ASSY NAME: Tappet & Guide

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	79653	Pre-Assy. Int. & Exh. Air Tappet & Guide		1	Assy. Dwg. 79728 Consisting of:
3	79640-1	Guide	CI	1	
4					
5	77433	Pre-Assy. Tappet, Int. & Exh.		2	EACH consisting of:
6	77392-1	Tappet, Int. & Exh.		1	SAE 4140
7	77390-1	Roller, Int. & Exh. (Pre-Assy 79255)		1	See Dwg. NSS
8	G-4791 ~~10640-41~~	Bushing, Int. & Exh. (Pre-Assy 79255)	Brz	1	Pre-Assy 78120 NSS
9	77389-1	Pin, Int. & Exh. (Pre-Assy 79255)		1	SAE X-1315 NSS
10					
11	75281	Tappet, Air (Gr. Shafting)		1	
12	75276	Roller, Air (Pre-Assy 78119)		1	Pre-Assy 77434 SAE X-1315 NSS
13	G-3952 ~~4616-2~~	Pin, Air (Pre-Assy 78119)		1	SAE X-1315 NSS
14	7797	Dowel	CRS	2	
15		Plug, Pipe	Blk	2	Male 1/8
16	77391-1	Spring, Air Tappet		1	Spring Steel
17	79982-1	Retainer, Spring	St	1	
18	79983-1	Snap Ring		1	Spring Steel
19		Elbow 90°	Imp.	1	69F 1/4T 1/8P
20		Connector	Imp	1	68F 1/4T 1/8P
21					
22	106-6	Dowel	CRS	1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

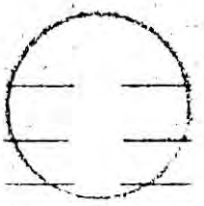
USE UP STOCK ON 6 CYL. SUPER
THEN SHIFT TO G-18-CC

Date Issued: 2-17-43
Retyped: 6-7-49

ASSEMBLY NO. G-18-J
SHEET NO.

ENGINE MODEL F G

	F	G		
2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1	1		
8 CYL.				



ASSY NAME: Intake Manifold
6 Cyl. Supercharged Engines

FIRST USED ON: 43001

ASSY DWGS:

8-1

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75537-1	Ell, air inlet	CI	6	
2	78310-1	Gasket, ell - c.c.		6	3/32 Garlock 660
3	78309-1	Gasket, ell - head		6	3/32 Garlock 660
4		Capscrew, ell - c.c.		24	1/2-13 x 1-1/4
5	76054-1	Cover, intake man.	CI	3	
6	78308-1	Gasket, Cover-Blk		3	3/32 Garlock 660
7		Capscrew		36	1/2-13 x 1-1/4
8	G-2002-1	Cover, Rear Man. Opening	St.Pl.	1	
9	G-2003-1	Gasket, Cover-Block	Vel	1	1/16 — For Front Turbo. Eng.
10		Capscrew		6	3/4-10 x 1-1/4 — For Front Turbo. Eng.
11	G-2459-1	Cover, Front Man. Opening	St.Pl.	1	
12	G-2254	Gasket, Cover	Vel	1	1/32 — For Rear Turbo. Eng.
13		Capscrew, Cover-Block		8	3/4-10 x 1-1/4 — For Rear Turbo. Eng.
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-8-43
Retyped: 9-4-46

ASSEMBLY NO. G-19-L
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.

ASSY NAME: Exhaust Manifold
Water Cooled Supercharged RH, 6 Cyl.

FIRST USED ON: 43001

ASSY DWGS: 77201

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78332	Pre-Assy., Exhaust Manifold		2	EACH Consisting of:
3	77194-1	Manifold - Outer Section	CI	1	
4		Plug, Pipe	Blk	2	1" Female
5		Plug, Pipe	Blk	5	⅛" Male
6		Bushing, Jacket Water Vent	Blk	1	3/4 to ½ PT
7		Plug, Pipe	Blk	1	3/4" Male
8	77197-1	Cover, Manifold	CI	1	
9	78829-1	Gasket, Cover, Manifold		1	3/32" Rubber
10		Capscrew		14	½" - 13 x 1-3/8"
11					
12					
13	78333	Pre-Assy., Ech. Manifold Mid-Section		1	Consisting of:
14	77195-1	Manifold, Mid-Section	CI	1	
15		Plug, Pipe	Blk	2	1" Female
16		Plug, Pipe	Blk	4	½" Male
17		Plug, Pipe	Blk	1	3/4" Male
18	77197-1	Cover, Manifold	CI	1	
19	78829-1	Gasket, Cover, Manifold		1	3/32" Rubber
20		Capscrew		14	½" - 13 x 1-3/8
21					
22					

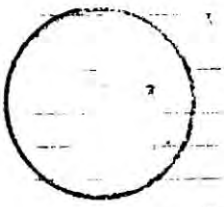
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-8-43
Retyped: 9-4-46

ASSEMBLY NO. G-19-L
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.



ASSY NAME: Exhaust Manifold
~~Water Cooled Supercharged RH, 6 Cyl.~~

FIRST USED ON: 43001

ASSY DWGS: 77201

It.	Part No.	Part Name	Matl	Qty	Remarks
1	92603-1	Gasket betw. manifold		2	1/16 Gar. #7508
2	78800-1	Gasket, Cylinder head		4	1/16 Gar. #7508
3		Capscrew, Cylinder Head		8	5/8-11 x 1¾
	77198-1	Capscrew, Cylinder Head	CRS	8	
4		Bolt		10	5/8-11 x 2½
5		Nut, Hex		10	5/8-11
6		Capscrew		2	5/8-11 x 1¾
7	92603-1	Gasket betw. manifold		1	1/16 Gar. #7508
8	76262	Gasket, Cylinder head		2	1/16 Gar. #7508
9		Capscrew, Cylinder head		4	5/8-11 x 1¾
10	77198-1	Capscrew, Cylinder head	CRS	4	
11		Bolt		5	5/8-11 x 2½
12		Nut, Hex		5	5/8-11
13		Capscrew		1	5/8-11 x 1¾
14	92558-1	Cover, Blind	CI	1	
15	92603-1	Gasket		1	1/16 Gar. #7508
16	92565-1	Cover, water, Exh. Manifold	CI	6	
17	92604-1	Gasket		6	1/16 rubber
18		Capscrew		24	⅜-13 x 1
19	92562-1	Jumper	CI	3	
20	92604-1	Gasket		6	1/16 rubber
21		Capscrew		12	⅜-13 x 1¼
22		Capscrew		12	⅜-13 x 2¼
		Pipe plug	Blk	3	¼" male

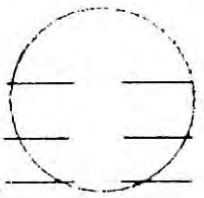
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-26-39
Retyped 6-1-53

ASSEMBLY NO. G-20-A
SHEET NO. ____

ENGINE MODEL F G

	F	G		
2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1	1		
8 CYL.				



ASSY NAME: Water Manifold with Water - Cooled Exhaust - 6 Cyl. Manifold

FIRST USED ON: 9001-9010

Group

~~ASSY~~ DWGS: 78399

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79248-1	Cover, Water Manifold	St	3	5/16 Thick Boiler Plate
2	78836-1	Gasket, Cover-Crankcase	R Br	3	3/32
3		Capscrew, Cover-Crankcase		60	1/2-13 x 1
4	7811	Screen		6	Monel 1/4 Mesh
5		Capscrew, Screen		24	1/2-13 x 3/4 Monel
6	7673-1	Ell, Head - Manifold	CI	6	
7	78832-1	Gasket, Ell to Head	R Br	6	1/16
8	78831-1	Gasket, Ell to Manifold	R Br	6	1/16
9		Capscrew, Ell		24	3/8-16 x 1
10		Pipe Plug, Ell		6	3/4
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 2-8-45
Retyped: 4-14-49

SEE G-221-K&L

ASSEMBLY NO. G-21-D
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL. (Reversible Eng. Only)
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.

ASSY NAME: Starting Air Manifold
CI. 6 cyl. with piston type rev. mech. Marine

FIRST USED ON:

Group
~~ASSY~~ DWGS: 79766

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75093-1	Jumper, Air	CI	5	
2	78844-1	Gasket, Jumper to Cyl. Hd.		5	3/64 Johns-Man.#60
3		Capscrew, Jumper to Cyl.Hd.		10	1/2-13 x 2-1/4
4		Capscrew, Jumper to Cyl.Hd.		20	1/2-13 x 3-1/4
5	75733-1	Flange, Blind	St	1	1/2" St.Plate
6	78838-1	Gasket, Flange to Cyl.Hd.		1	3/64 Johns.Man.#60
7		Capscrew, Flange to Cyl.Hd.		3	1/2-13 x 1-1/4
8		Ell, Street		1	3/8" Blk
9		Nipple, Hydraulic		1	3/8" x short Blk
10	B-3254	Valve, 250# Globe	Brz	1	3/8"
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-208 & G-224

Date Issued:
Retyped: 6-1-53

ASSEMBLY NO. G-22-B
SHEET NO.

ENGINE MODEL F G

	F	G		
2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1	1		
8 CYL.	1	1		

ASSY NAME: Front Camshaft Bearing
Reversible, Marine

FIRST USED ON: 9020-9022

ASSY DWGS: 75270

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75301-1	Cap, Bearing	CS	1	
2					
3	78383	Assembly Shell		1	Consisting of:
4	75301-2	Shell (lower)		1	NSS
5	75301-3	Shell (upper)		1	NSS
6					
7					
8	75303-1	Ring, Bearing Locking	CRS	2	
9		Machine Screw, Flat Head		2	10-24 x 3/4
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

SEE G-208 & G-224

Date Issued: 8-9-46
Retyped 6-1-53

ASSEMBLY NO. G-23-A
SHEET NO.

ENGINE MODEL F G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 6 6
8 CYL. 8 8

ASSY NAME: Intermediate Cam Bearing

FIRST USED ON: 9020-9022

ASSY DWGS: 75270

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75302-1	Cap Bearing	CS	1	
2					
3	78385	Assembly Shell		1	Consisting of:
4	75302-2	Shell (Lower) NSS		1	
5	75302-3	Shell (Upper) NSS		1	
6					
7					
8	75303-1	Ring, Bearing locking	CRS	2	
9		Flat head machine screw		2	10-24 x 3/4
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

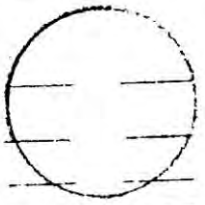
FOR REPLACEMENT ORDER FROM G-24-UU

Date Issued: 2-19-45
Retyped: 3-10-49

ASSEMBLY NO. G-24-Y
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Cams
Direct reversible, air starting, Supercharged, 6 cyl. with piston type rev. mech. R.H.
FIRST USED ON: ___

ASSY DWGS: 79790

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	77521	Pre-Assy., cam ring gear		1	Consisting of:
3	7061-2	Gear, cam ring		1	190-210 Brinnell Cr. Moly C.I.
4	G-2526-1	Hub, cam gear	CS	1	
5	7593	Bolt, cam ring gear		4	SAE 4140
6		Nut, slotted		4	9/16-18
7		Washer		4	9/16 SAE
8					
9					
10	76411	Pre-Assy., camshaft R.H.		1	Consisting of:
11	75299-1	Camshaft		1	Gr. shafting
12	79662-1	Key, cam		6	5/8 sq. drill rod
13	79663-1	Key, gear hub		1	
14	75661-1	Cam, intake (~~M75663-1~~ G-4139)		6	SAE 2315 G4068
15	75662-1	Cam, exhaust (M75663-2)		6	SAE 2315 G4062
16	75306-1	Cam, air (M75287)		6	SAE 2315
17	75307-1	Cam, fuel (M75286)		6	SAE 2315
18	1013	Setscrew, cams-shaft		30	
19		Setscrew, cams-key		18	1/2-13 x 1/2 Allen
20	75300	Washer, cam gear hub	CRS	1	
21	149	Nut, slotted, hub-shaft		1	Union C.D. Hymo
22		Cotter Pin		1	5/16 x 4-1/2

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel

CRS = Cold ~~Rolled Steel~~
CBr = Cast Brass
CBrz = Cast Bronze

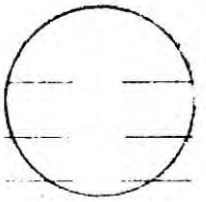
CONTINUED NEXT PAGE

Date Issued: 2-19-45
Retyped: 1-11-49

ASSEMBLY NO. G-24-Y
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.



ASSY NAME: Cams

FIRST USED ON:

ASSY DWGS: 79790

It.	Part No.	Part Name	Matl	Qty	Remarks
1	7593	Bolt, Cam Ring Gear		2	SAE 4140
2		Nut, Slotted		2	9/16-18
3		Washer		2	9/16 SAE
4		Pin, Cotter, Ring Gear		6	1/8 x 1-1/4
5	B-5231	Cerro Base Metal		1	1-1/2 lb. bar
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

REPLACED BY G-25-W

Date Issued: 8-14-39
Retyped: 11-18-48

ASSEMBLY NO. G-25-B
SHEET NO. 1

ENGINE MODEL	F	G		
2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1	1		
8 CYL.	1	1		

ASSY NAME: Gear Case
Direct Reversible RH. ~~Large Crank Cap,~~ Cent.Water Pump ~~(or Viking @ 350 Eng.RPM)~~

FIRST USED ON: 9020-9022

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75338-1	Gear Case	CI	1	
2	78852-1	Gasket, gear case-cyl.block	Vel	1	1/32"
3	78852-2	Gasket, gear case-cyl.block	Vel	1	1/32"
4	78852-3	Gasket, gear case-cyl.block	Vel	1	1/32"
5	78852-4	Gasket, gear case-cyl.block	Vel	1	1/32"
6		Capscrew		25	1/2-13 x 1-1/4
7					
8	75357-1	Cover, idler gear	CI	1	
9	78863-1	Gasket, cover-case		1	1/16 Gar. 660
10		Capscrew		4	1/2-13 x 1-1/2
11					
12	G-3217-1	Cap, Crankshaft	See Dwg.	1	
13	78897-1	Gasket	Vel	1	1/32
14		Capscrew		4	3/8-16 x 1-1/4
15	6294-A	Cover, crankshaft cap	CI	1	
16	78996-1	Gasket		1	1/32 Vel.
17		Capscrew		2	1/4-20 x 5/8
18					
19	7918-1	Cover, gear case side	CI	3	
20	78997-1	Gasket		3	1/16 Gar. 660
21		Capscrew		18	1/2-13 x 1-1/4
22					

Gasket Group 79795

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED ON NEXT PAGE

Date Issued: 8-14-39
Retyped: 10-7-46

ASSEMBLY NO. G-25-B
SHEET NO. 2

ENGINE MODEL F G

	F	G		
2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1	1		
8 CYL.	1	1		

ASSY NAME: Gear Case

FIRST USED ON: 9020-9022

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	7780-1	Cover, Camshaft Gear	CI	1	
2	78998-1	Gasket		1	1/16 Gar. 660
3		Capscrew		7	$\frac{1}{2}$-13 x 1$\frac{1}{4}$
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

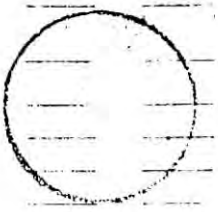
For Gear Set Assemblies See Dwg. 77945

Date Issued: 3-15-35
Retyped: 9-4-46

ASSEMBLY NO. G-26-C
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.



ASSY NAME: Gear Set
Water Pump Speed up Drive
300-400 Eng. RPM.
Reversible Engines
FIRST USED ON: 45057

ASSY DWGS: 77793

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79890-1	Gear, Crankshaft (Forging (Dwg. 79149)		1	Brinnell 245-260 Forge SAE 3145
2	7758	Shaft, Idler Gear Stub	CS	1	
3					
4	77672	Pre-Assy., Idler Gear & Bush		1	Consisting of:
5	7757	Gear, Idler		1	Cast Steel 1040 Brinnel 210-230
6	7759	Bushing, Idler Gear	Brz	2	
7					
8					
9	7760	Washer, Idler Gear Thrust	CRS	1	
10	7761	Shim, Thrust Washer	Br	14	.003" thick
11	7768	Capscrew, Thrust Washer	CRS	2	5/8-11 x 1½
12		Wire, Capscrew		1	3/32 dia x 7½
13	109-1	Dowel, stub shaft		2	
14	79897-1	Gear, drive	CS	1	SAE 1030
15		Capscrew, gear		6	½-13 x 2
16	G-2043-1	Locking Clip		3	
17	79883-1	Key, gear		1	Key stock
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 7-3

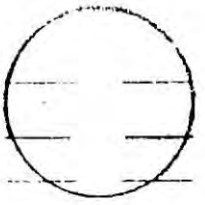
REPLACED BY G-27-P
w/Steel Tach.Dr.Gear

Date Issued: 6/17/39
Retyped: 4/12/49

ASSEMBLY NO. G-27-C
SHEET NO. 1

ENGINE MODEL F G

2 CYL. ___ ___
3 CYL. ___ ___
4 CYL. ___ ___
5 CYL. ___ ___
6 CYL. 1 1
8 CYL. ___ ___



ASSY NAME: Governor & Tachometer Drive
Reversible Engine - Enterprise Gov. w/o Rev. Counter Drive
FIRST USED ON: 9020-9022

ASSY DWGS: 7915,75350

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	77329	Pre-Assy. Gov. & Tach.Drive		1	Consisting of:
3	G-3634 ~~6403-J~~	Stub shaft, gov.drive	CS	1	
4	G-3551	Gear, tachometer drive		1	Micarta
5	7913	Gear, governor drive		1	SAE 2315
6	G-3640 ~~6403-C~~	Flange, tach.drive stub	CI	1	
7	G-3641 ~~6404-B~~	Bolt, gear sleeve			
8	G-3642 ~~6404-C~~	Shaft, tachometer drive	CRS	1	
9	G-3639 ~~6403-D~~	Bushing, sleeve, large		1	Ph. Brz. Pre-Ass'y
10	G-3638	Bushing, sleeve, small		1	Ph. Brz. 78809
	G-3635	Sleeve, drive gear	CS	1	
11	G-3636 ~~6402-B~~	Washer, stub shaft	CRS	1	
12	103-3	Dowel, washer - stub shaft		1	
13	G-3637 ~~6403-B~~	Flange, tach. drive gear	CRS	1	
14		Pipe plug, stub shaft end	Br	1	1/8 slotted
15		Taper pin, tach.		1	#1 x 1
16		Pin, cotter		4	3/32 x 7/8
17		Nut, high castle		4	3/8-24
18		Capscrew, sleeve - shaft		1	1/2-30 x 1
19		Lockwasher, External		1	1/2" Star
20		Connector		1	68F 1/4T 1/8P
21	91233-2	Shim - thrust washer	St	14	.003" thick
22		Washer		4	SAE 3/8

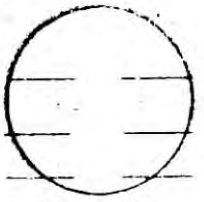
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 8-17-39
Retyped: 4-14-49

ASSEMBLY NO. G-27-C
SHEET NO. 2

ENGINE MODEL F G

	F	G
2 CYL.		
3 CYL.		
4 CYL.		
5 CYL.		
6 CYL.	1	1
8 CYL.		



ASSY NAME: Governor & Tachometer

FIRST USED ON: 9020-22

ASSY DWGS: 7915, 75350

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75349-1	Flange, tachometer conn.	CI	1	
2	106-2	Dowel, Stub Shaft, Case		2	
3	79004-1	Gasket, Tach.Drive Flange	Vel	1	1/32
4	455	Stud, Stub Shaft - Case		4	
5	6613-A	Cap, Tachometer Flange		1	Omit if tach. is used
6	79003-1	Gasket, Tachometer Flange	Cop Asbes	1	" " " " " Victor 2067
7	B-5646 ~~B-3730~~	Oil Seal		1	Nat'l. #50119-S
8		Capscrew, Tach.Drive Flange		3	3/8-16 x 1
9		Nut, Slotted		4	1/2-13
10		Pin, Cotter		4	3/32 x 1-1/8
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

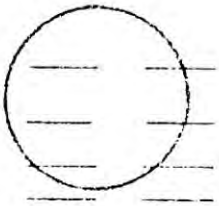
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 2-8-45
Retyped: 10-26-49

ASSEMBLY NO. G-28-P
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1



ASSY NAME: Air Starting Lines R.H. Reversible Engine with Piston Type Rever. Mech.

FIRST USED ON: _____

Group
~~ASSY~~ DWGS: 79766

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Line from Air Tank to Operating Control Hsg.			
2	B-3161	Valve, 250# Globe	Brz	1	1-1/2"
3		Nipple		1	Extra Heavy 1½"xclose Blk
4	B-4288	Strainer, Y	CI	1	1-1/2" 600#
5					
6	G-2915-1	Pipe Bent	St	1	
7	79768-1	Flange	CS	1	
8					
9	79771-1	Gasket, Flange to Control Hsg.		1	Johns-Man. #60
10		Capscrew, Flange to Cont. Hsg.		4	5/8-11 x 3-3/4
11					
12		Line from Operating Control to Air Manifold			
13	79771-1	Gasket, Flange to Cont. Hsg.		1	Johns-Man. #60
14		Capscrew, Flange to Cont. Hsg.		4	5/8-11 x 3-3/4
15					
16	79768-1	Flange	CS	1	
17	79796-1	Pipe Bent	St	1	
18		Ell, 90° Welding	St	1	1-1/2"
19	79767-1	Ell	CS	1	
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

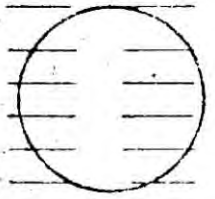
CONTINUED NEXT PAGE

Date Issued: 2-8-45

ASSEMBLY NO. G-28-P
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1



ASSY NAME: Air Starting Lines
~~G.M. Marine Eng. with Piston Type Rev.Mech.~~

FIRST USED ON:

Group
~~ASSY~~ DWGS: 79766

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Pipe Plug	Blk	1	1/4"
2		Capscrew, Ell to Cyl.Hd.		1	1/2-13 x 2-1/2
3		Capscrew, Ell to Cyl.Hd.		2	1/2-13 x 3-1/2
4	78838-1	Gasket, Ell to Cyl.Hd.		1	3/64 Johns.Man.#60
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 12-21-44
Retyped: 9-4-46

~~CAT~~ DMG-36

ASSEMBLY NO. G-29-Q
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
~~4~~ CYL. 1

ASSY NAME: Reverse Mechanism
R.H. Piston Type

45125-127 +129

FIRST USED ON: 45057

ASSY DWGS: ~~79679~~

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	~~79722~~	Pre-Assy., Reverse Mechanism		1	~~Assy. Dwg. 79722 Consisting of:~~
3	79688-1	Housing, Cylinder	CBrz	1	Pre-Assy. 79701 Assy. Dwg. 79701 Ni. Plate #6-32 x 3/8
4	G-1105-1	Caution Plate	Bake	1	
5	79675-1	Pin, Thrust	St	4	
6		Screw, Round HD. Mach. Screw		4	
7	101-3	Setscrew, Thrust Pin	St	4	
8					
9	B-3712	Seal, Piston Shaft		1	
10	79678-1	Piston 2010	CBrz	1	
11	79681-1	Key, Woodruff Shaft, Piston	St	1 1	#5 (1/8 x 5/8)
12	79677-1	Nut, Piston Shaft	Br	2	Pre-Assy. & Dwg. 79722
13	79683-1	Clip, Piston Nut Locking	St	2	
14	B-3710	Ring, Piston 3130	Brz	1	R.H. angle cut
15	B-3711	Ring, Piston 1090	Brz	1	L.H. angle cut
16	79680-1	Hub, Thrust	CBr	1	
17	7815-1	Ring, Thrust	CS	1	
18	77520-1	Spacer, Thrust		1	Steel plate
19	7814-1	Shim, Thrust Ring		1	1/16 Lam. Steel
20		Capscrew	St	2	$\frac{1}{8}$-13 x $2\frac{1}{2}$
21	180-3	Clip, Locking	St	2	
22		Key, Woodruff	St	1	3/16 x 1"

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE NEXT PAGE

Date Issued: 12-21-44
Retyped: 9-4-46

ASSEMBLY NO. G-29-Q
SHEET NO. 2

ENGINE MODEL G

ASSY NAME: Reverse Mechanism

2 CYL. —
3 CYL. —
4 CYL. —
5 CYL. —
6 CYL. 1
8 CYL. 1

FIRST USED ON: 45057

ASSY DWGS: ~~79679~~

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79676-1	Pin, Interlock lower	St	2	
2	79696-1	Pin, Interlock middle	St	2	
3	79685-1	Pin, Interlock upper	St	2	
4		Nut, Regular Jam	St	2	1/2-20
5	79697-1	Cover, Cylinder	CBrz	1	
6	B-3713	Seal, Piston Shaft		1	Pre-Assy.
7	79698-1	Gasket, Cover	Vel.	1	& Dwg. 79722
8		Capscrew, Socket Head	St	8	5/8-11x1 1/2 Allen or equa
9		Capscrew, Socket Head	St	2	5/8-11x2 1/2 Allen or equa
		Capscrew, Socket Head	St	2	5/8-11x2 3/4 Allen or equa
10	79684-1	Cap, Cylinder Cover	CBrz	1	
11	B-3188	Cock, Drain	Br	2	
12					
13					
14	~~79140-1~~	~~Ring, Locking~~		~~1~~	See 108 Assy.
15	~~79492-1~~	~~Nut, Manual Reverse~~		~~1~~	
16	G-2527-1	Capscrew, Thrust Ring	St	6	
17		Nut, Hex, Slotted	St	6	1/2-13
	~~100-3~~	~~Clip, Locking Shaft Nut~~	~~St~~	~~6~~	
18	X-1847	Shim, Thrust Ring		1	5/32 Lam. Br.
19		Capscrew, Cylinder to case	St	10	1/2-13 x 1 1/4
20	79682-1	Gasket, Cylinder to case	Vel	1	
21		Washer	St	6	1/2 SAE
22		Cotter Pin	St	6	1/8 x 1-1/4

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

NEXT PAGE

Date Issued: 12-21-44
Retyped: 10-19-49

ASSEMBLY NO. G-29-Q
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1

ASSY NAME: Reverse Mechanism

FIRST USED ON: 45057

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2		USE THE FOLLOWING PRE-ASSY. NUMBER WHEN ORDERING COMBINATIONS			
3					
4	~~G-1151~~	~~Pre-Assy., Reverse & Operating Control~~			~~(G-29-Q & G-55-V)~~ (G-29-Q & G-55-Q)
5	79723	Pre-Assy., Reverse & Operating Control			(Assy. Dwg. 79679)
6	~~79870~~	~~Pre-Assy., Reverse & Operating Control~~			~~(G-29-Q & G-55-S)~~ (G-29-Q & G-55-T)
7	79994	Pre-Assy., Reverse & Operating Control			(Group Dwg. 79995)
8	G-2372	Pre-Assy., Reverse & Operating Control			(G-29-Q & G-55-V)
9	G-2880	Pre-Assy., Reverse & Operating Control			(G-29-Q & G-55-CC) (Assy. Dwg. G-2881)
10	G-2881	Pre-Assy., Reverse & Operating Control			(G-29-Q & G-55-EE)
11	G-4441	Assy.Comb. Reverse & Operating Control			(G-29-Q & 55 Exp.2)
12					
13					
14					
15					
16					
17					
18		For complete replacement of Air Motor type Rev. Mech. with Ram Type use Pre-Assy. Group No. G-3016			G-29-Q, G-28-S, G-31-Q G-32-DDD or EEE, G-55-X
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 5-7-45
Retyped: 9-10-46

ASSEMBLY NO. G-30-KK
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Governor Enterprise 351 to 450 RPM

FIRST USED ON:

ASSY DWGS: G-1277

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	G-1059	Pre-Assy., Governor		1	Consisting of:
3	6399-A	Housing, Governor	CI	1	
4	79372-1	Cover, Gov. Housing	CI	1	Pre-Assy. 79204
5	10640-89	Bushing	Brz	1	Pre-Assy. 79204
6	79373-1	Yoke, Bell Crank	CI	1	Pre-Assy. 78726
7		Capscrew		2	3/8-16 x 1
8		Lockwasher		2	3/8 Std.
9	79024-1	Gasket	Vel	1	1/32
10	79389-1	Dowel		1	
11		Capscrew		5	1/2-13 x 1
12		Screw, Flat Head		1	1/2-13 x 1
13	6440-A	Governor Drive Hub	CS	1	SAE 1030 NSS Pre-Assy. 78671
14	10640-91	Bushing		1	NSS Pre-Assy. 78671
15	B-3280	Ball Bearing		1	
16	B-3281	Ball Bearing		1	
17		Woodruff Key		1	1-1/4 x 1/4
18	6440-E	Washer	CRS	1	
19		Castle Nut		1	7/8-14
20		Cotter Pin		1	1/8 x 1-5/8
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 5-7-45
Retyped: 9-10-46

ASSEMBLY NO. G-30-KK
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Governor Enterprise

FIRST USED ON:

ASSY DWGS: G-1277

It.	Part No.	Part Name	Matl	Qty	Remarks
1	78993	Pre-Assy., Weight & Bushing		[2]	Each Consisting of:
2	75853	Weight, Governor	CS	1	
3	G-3278-1	Bushing, ~~Johnson~~	~~halves~~ 2		~~KR-221 Split in half~~
4					
5	G-1047-1	Bell Crank Governor	CBrz	1	
6	G-1195-1	Spring, Bell Crank Tension		1	Steel Wire
7	G-3705 ~~6408-H~~	Gear, Driven		1	SAE 3120
8	6433-A	Rack, Adjusting	CRS	1	
9	75886	Pinion Adjusting Rack	CRS	1	
10		Taper Pin		1	No. 5 x 1-5/8
11	6433-C	Shaft, Adjusting Pinion	CRS	1	
12	75878-1	Shaft, Governor Thrust	CRS	1	
13	79601	Snap Ring		1	¾ x 1/16 dia.
14	6566-A	Gov., Thrust Collar	CRS	1	
15	G-1262-1	Pin	CRS	1	¼ x 1-13/16
16	75876-1	Sleeve, Gov.	CRS	1	
17	79932-1	Washer		1	See Dwg.
18	10640-90	Bushing (Pre-Assy. 79849)		1	
19	10640-89	Bushing		1	
20	B-3282	Ball Bearing, thrust		1	
21	G-1048-1	Guide, Bell Crank	CBrz	1	
22	75887	Roller	CRS	1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 5-7-45
Retyped: 9-10-46

ASSEMBLY NO. G-30-KK
SHEET NO. 3

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Governor Enterprise

FIRST USED ON:

ASSY DWGS: G-1277

It.	Part No.	Part	Name	Matl	Qty	Remarks
1	113-4		Pin		1	
2			Washer		2	3/8 SAE
3			Cotter Pin		2	3/32 x 1
4	G-1187-1		Spring Post	CRS	1	
5	G-1046-1		Shaft, Gov. Spring	CRS	1	
6			Nut, Hex		2	5/8-11 Jam
7			Pin ("Groov-Pin")		1	$\frac{1}{4}$ Dia. x $1\frac{1}{4}$ Type 1
8	75885		Governor, Adj. Screw	CRS	1	
9	6434-D		Locknut, Sleeve	CRS	1	
10	75883		Pin, Bell Crank		1	$\frac{1}{8}$ Drill Rod
11			Cotter Pin		2	1/8 x $1\frac{1}{4}$
12	113-2		Pin, Fuel Control Yoke		1	
13			Washer		2	3/8 SAE
14			Cotter Pin		2	3/32 x 1
15	G-1005-1		Pin, Weight	CRS	2	X-1315
16	B-3862		Snap Ring		4	Truarc #62 External
17	6444-A		Locknut, lowest brg.	CRS	1	
18	6444-B		Lock Ring Brg. locknut		1	Spring Steel
19	76532-5		Spring, Governor		1	400 RPM
20	75879-1		Spring, Gov. Idling		1	Steel Wire
21	6783-1		Retainer, Felt	CRS	1	
22	6783-2		Felt Bearing Seal	Felt	1	

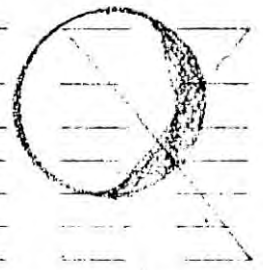
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 5-7-45
Retyped: 9-10-46

ASSEMBLY NO. G-30-KK
SHEET NO. 4

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. ___
8 CYL. ___



ASSY NAME: Governor Enterprise

FIRST USED ON: _____

ASSY DWGS: G-1277

It.	Part No.	Part Name	Matl	Qty	Remarks
1	6784	Spacer, Bearing	CRS	1	
2	6565-C	Pin	CRS	1	
3	45064-2	Fitting, Restricted Oil	IMP	1	NSS
4	45064-3	Plug	Br	1	Pre-Assy. 79203 NSS
5	75868-1	Yoke, Gov. Fuel Control	CBr	1	
6	76347-2	Lever	CBrz	1	
7		Capscrew		1	3/8-16 x 1¼
8					
9					
10	79025-1	Gasket to Gearcase	Vel	1	1/32
11		Capscrew		4	⅜-13 x 1¼
12					
13	**	FOR FIELD REPLACEMENT USE B-5910.			
14		Instruct Customer to remove Retainer 6783-1,			
15		Seal, Felt 6783-2, Spacer 6784-1 and insert new bearing with felt seal on top			
16					
17					
18					
19					
20					
21					
22					

9-29

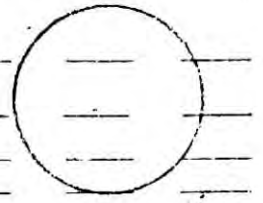
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 4-7-45
Retyped: 4-8-49

ASSEMBLY NO. G-31-T
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1



ASSY NAME: Governor Control, R.H. for Piston Type Rev. Mech.

FIRST USED ON: 45057

Group
~~ASSY~~ DWGS: 79952

It.	Part No.	Part Name	Matl	Qty	Remarks
1	For complete Pre-Assy.number see last page				
2		Pre-Assy, Gov. Control RH		1	Consisting of:
3	79927-1	Wedge	Brz	1	
4	79930-1	Handle	CBrz	1	Pre Assy
5	79928-1	Lever, RH	CBrz	1	79925
6	79998-1	Pin	CRS	2	Assy Dwg.
7	79999-1	Spring		1	79925 Spring Steel
8	76646	Screw, Locking	CRS	1	
9		Setscrew, Allen		2	1/4-20 x 1/4
10	79936-1	Lever, Gov. Control	CBrz	1	
11		Capscrew, Allen Hd.		3	3/8-16 x 3/4
12		Setscrew, Allen Cup Point		2	3/8-16 x 1-1/2
13		Nut, Jam		2	3/8-16
14	79937-1	Link, Man. Gov. Control	CRS	1	
15		Yoke		2	3/8 SAE Clevis
16		Nut, Jam		2	3/8-24
17	113-1	Pin		2	
18		Cotter Pin		4	3/32 x 3/4
19	79905-1	Bracket, RH	CI	1	
20	79934-1	Bearing, Fuel Control Shft.	CI	1	
21		Setscrew, Allen Dog Point		2	3/8-16 x 3/8
22		Capscrew, Bearing-Brkt.		2	3/8-16 x 2-1/4

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE NEXT PAG

Date Issued: 4-7-45

ASSEMBLY NO. G-31-T
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1

ASSY NAME: Governor Control, R.H.
~~For Piston Type Rev. Hook~~.

FIRST USED ON: 45057

Group
~~ASSY~~ DWGS: 79952

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	79939-1	Guard, Chain	C.I.	1	
3		Capscrew, Flat Hd.		2	1/4-20 x 1-3/4
4	79926-1	Segment, Lever		1	
		Capscrew, Allen		3	3/8-16x3/4
5					
6	79933-1	Shim, Brkt.-Gear Case	ST	5	
7		Capscrew, Brkt.-Gear Case		3	3/8-16 x 3/4
8	79935-1	Shim, Brkt-Brg.	ST	5	
9					
10					
11		Use the following Pre-Assy. numbers when ordering assembled			
12		Parts. Check Engine specifications for right combination			
		of assemblies.			
13					
14	G-1145	Pre-Assembly-Gov. & Fuel Control			G-31-T and G-32-UU
15	G-1251	Pre-Assembly-Gov. & Fuel Control			G-31-T and G-32-XX
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 4-6-45
Revised: 6-14-45

ASSEMBLY NO. G-32-UU
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Fuel Control - 6 Cyl. For Piston Type Rev. Mech. R.H. or L.H.

FIRST USED ON: 45057-58

Group ~~ASSY~~ DWGS: 79952

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	79053-2	Shaft, Fuel Control		1	Ground Shafting
3					
4	G-1333-2	Bracket, Fuel Control Shaft	CBrz	6	
5					
6					
7		Set Collar		2	1"ID x1-5/8 OD x5/8 wide
8	78987-1	Lever, Fuel Pump	See Dwg.	6	
9	~~78963-8~~	~~Clamp, Fuel Pump Lever~~	~~CBr~~	~~1~~	
10	78963-1	Clamp, Fuel Pump Lever	See Dwg.	6	
11		Capscrew, Clamping		6	3/8-16 x 1-1/2
12	79051-1	Spring	6	6	Spring Wire
13	78986-1	Set Collar	See Dwg.	6	
14	7736	Setscrew-Socket Hd, Cup Pt, Link Inj. Pump Lever	CRS	6 12	5/16 - 18 x ½
15	111-1	Pin		12	
16		Cotter Pin		24	1/16 x 1/2
17	79948-1	Stop, Fuel Control Shaft	CBr	1	
18		Setscrew, Allen Cup Point		2	5/16-18 x 3/8
19		Capscrew, Adj.		1	3/8-16 x 1-1/4
20		Nut, Jam		1	3/8-16
21	79946-1	Stop, Fuel Control	CBrz	1	
22		~~Setscrew, Allen Cup Point~~		~~1~~	~~5/8-16~~

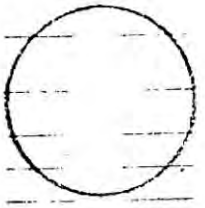
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 4-6-45
Retyped: 8-30-46

ASSEMBLY NO. G-32-UU
SHEET NO. 2

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. 1
8 CYL. ____



ASSY NAME: Fuel Control - 6 Cyl.

FIRST USED ON: 45057-58

Group
ASSY DWGS: 79952

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79945-1	Lever, Fuel Control	CBr	1	
2	79947-1	Stop, Fuel Control Lever	CBr	1	
3	76455-1	Lever, Gov.-Fuel Control	CS	1	
4		Capscrew, Clamping		1	3/8-16 x 1½
5	76738-1	Link, Gov. Fuel Control	CRS	1	
6		Nut, Jam		1	3/8-16
7		Yoke		1	3/8 SAE
8		Nut, Jam		1	3/8-24
9	79938-1	Pin, Lever		1	SAE 1315
10		Cotter Pin		2	3/32 x 3/4
11					
12	79748	Pre-Assy., Collapsible Rod		1	Use Assy.Dwg. 79748 Consisting of:
13	79740-1	Barrel	St Tube	1	Pre-Assy. 79818 Use Assy. Dwg. 79818
14	79741-1	Plug	CRS	1	
15	79747-1	Rod	CRS	1	
16		Nut, Jam		1	5/16-18
17	G-1075-1	Spring, Outer		1	St. Sp. Wire
18	79746-1	Washer	CRS	2	
19	79742-1	Stop	CRS	1	
20	79743-1	Rod End		1	½ SAE Rod Eye
21		Wire		1	1/16 x 11/16 lg.
22					

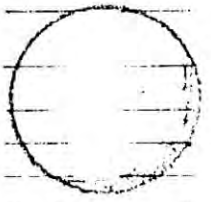
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 4-7-45
Retyped: 9-9-46

ASSEMBLY NO. G-32-UU
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Fuel Control-6 Cyl.

FIRST USED ON: 45057-58

Group
ASSY DWGS: 79952

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-1204-1	Capscrew, Hex. Hd.		1	
2		Nut, Jam		1	$\frac{1}{2}$-13
3	79944-1	Pin, Lever	CRS	1	
4		Washer		1	$\frac{1}{2}$ SAE
5		Cotter Pin		1	1/16 x $\frac{3}{4}$
6		Nut, Jam		1	3/8-16
7	79943-1	Lever, Fuel Control	CBr	1	
8		Setscrew, Allen Cup Point		1	3/8-16 x 3/8
9	79942-1	Sprocket, Remote Control		1	SAE 1040 H.R.
10		Setscrew, Allen Cup Point		1	5/16-18 x 1/4
11	79941-1	Shaft, Gov. Control	CRS	1	
12		Key, Woodruff		2	1/8 x 5/8
13	G-1265-1	Jaw, Coupling	CBr	1	
14					
15					
16	301	Stud, Bracket	CRS	12	
17		Lockwasher		12	3/8
18		Nut, Hex.		12	3/8-16
19		Taper Pin		4	#4 x $1\frac{3}{4}$
20		"Groov" Pin		1	$1\frac{1}{2}$ Style 1
21		"Groov" Pin		1	1/4 x $1\frac{3}{4}$ Style 1
22	SEE	ASSEMBLY 31 FOR COMBINATION	PRE-ASSY	NUMBER	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 6

For Complete Replacement use G-234-S3

Date Issued: 9-18-45
Retyped: 10-22-53

ASSEMBLY NO. G-34-W
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1

ASSY NAME: Water Pump

FIRST USED ON: ___

ASSY DWGS: G-1319

It.	Part No.	Part Name	Matl	Qty	Remarks
1	13791	Lockwasher, Shaft Nut	✓	1	
2	93513-1	Acorn Nut, Shaft Assem. G-2725	✓	1	
3	79893-1	Gear, Pump ✓		1	
4		Key, Woodruff ✓	✓	1	#608 1" Dia. x 3/16
5		Groov - Pin ✓		1	1/4 Dia x 3 Type 1
6	B-3737	Oil Seal	✓	1	
7	79891-1	Slinger	✓	1	
8	75328	Ring, Lantern	✓	1	
9	75327	Flange, Packing		1	
10		Packing		1	Flax 1/4 x 1/4 x 30
11					
12					
13	79041-1	Gasket		1	
14		Capscrew		8	1/2-13 x 1-1/2
15	104-2	Dowel, Pump, Gear Case		2	
16					
17					
18		"Attach Tag #12618 to each pump assembly going to			
19		Service Parts"			
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 5

for Complete Replacement Use
G-234-S3

Date Issued: 9-18-45
Retyped: 10-22-53

ASSEMBLY NO. G-34-W
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1

ASSY NAME: Water Pump Rev.Cent. (Small Pump), 300 to 400 Eng.RPM, Bearium Bushings (Pressure lubricated - any Angle)

FIRST USED ON: ___

ASSY DWGS: G-1319

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	G-1321	Assem., Water Pump & Bracket		1	Consisting of:
3	79899-1	Volute		1	
4		Pipe Plug	Br	3	1/4
5	78342-1	Gasket, Vol., Bkt.		1	
6	G-1315-1	Bracket } Assem. G-1316		1	NSS
7	G-1314-1	Bushing }		1	
8		Capscrew, Bkt. Vol.		8	1/2-13 x 1-1/4
9	332	Stud, Packing Gland		2	
10		Elbow, 90°		1	Imp.69F 1/8P x 1/4T
11		Nut, Hex.	Brass	2	3/8-16
12		Pipe Plug	Br	2	1/4" Countersunk Head
13	G-1317-1	Retainer, Gear } Assem. G-1318	CS	1	NSS
14	G-1314-1	Bushing }		1	
15	79892-1	Shims		1	Set,(3).003;(10).005
16		Capscrews, Retain, Bkt.		3	1/2-13 x 1-1/2
17		Pipe Plug		1	1/8"
18	180-3	Locking Clip		3	
19	106-1	Dowel		2	
20	79889-1	Shaft		1	
21	79898-1	Impeller } Assem. G-2725		1	
22		Key, Woodruff		1	#608 1" Dia. x 3/16

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3
Date Issued: 1-9-45
Retyped: 9-2-46

Replaced by G-36-Z

ASSEMBLY NO. G-38-P
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Duplex Fuel Transfer Pump
Drive Gear w/o Key
Reversible. For Tuna Boats

FIRST USED ON:

ASSY DWGS: 79763

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79764	Pre-Assy., Fuel Transfer Pump		1	Consisting of:
2	93745-1	Housing (Pre-Assy. 93746)	CI	1	Use Patt. 79083-1
3	32343	Shaft, Idler (Pre-Assy. 93746)	St ~~1030~~	1	
4	93744-1	Shaft, Drive (Pre-Assy. 93743 NSS) (Pre-Assy. 93745)	SAE 1025	1	~~NSS~~
5	31432-1	Gear, Drive (Pre-Assy. 93743 NSS) (Pre-Assy. 93745)	SAE 1025	1	~~NSS~~
6	G-5377 ~~31432-1~~	Gear, Idler NSS (Pre-Assy. 93745)	SAE 1025	1	~~NSS~~
7	31376	Gland, Packing	Br	1	
8	31377	Gland, Screw	Br	1	
9		Packing	Gar	1	Gar. #117 1/8 x 14
10	79084-1	Cover, housing	CI	1	
11	79085-1	Gasket, cover-housing	Paper	1	.002 - .003 ~~.010~~ thick
12	79085-2	Gasket, cover-housing	Vel.	1	.006 thick
		Capscrew, cover- housing		8	5/16-18x3/4
13	75521-1	Valve	Br.	4	
14	79086-1	Valve cage, lower	CI	1	
15	79087-1	Gasket, Valve cage housing	Vel	1	1/32
16		Capscrew, Valve cage housing		4	5/16-18x3/4 Allen
17		Capscrew, Valve cage housing		2	5/16-18x1-3/4 Allen
18		Pipe Plug - Valve cage	Blk	2	1/2
19	104-4	Dowel - Cover - Housing		2	
20	79088-1	Body, relief valve	CI	1	Pre-Assy. 79103 (cont.)
21	79078-1	Plunger	CRS	1	
22	79282-1	Spring	SpSt	1	

Pre-Assy. 79762 Assy. Dwg. 79761

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED NEXT

Date Issued: 1-9-45
Retyped: 9-2-46

ASSEMBLY NO. G-36-P
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Duplex Fuel Transfer Pump

FIRST USED ON:

ASSY DWGS: 79763

It.	Part No.	Part Name	Matl	Qty	Remarks	
1	79080-1	Screw, adjusting	Br	1		
2	79079-1	Lockmut	Br	1	Pre-Assy. 79103	
3	79076-1	Cap	St	1	Assy.Dwg. 79082 (cont.)	
4	79077-1	Gasket, cap		1	Soft Annealed Copper	
5		Pipe plug,countersunk head	Blk	2	1/2	Pre-Assy. 79762 Assy.Dwg. 79761 (cont.)
6	79089-1	Gasket-Relief Valve to Hsg.	Vel	1	1/32	
7		Capscrew Relief Valve toHsg.		6	5/16-18x7/8	
8	79542-1	Yoke, plunger pump	CI	1	Pre-Assy. 79557	
9		Pipe Plug	Blk	1		
10	79529-1	Gland,Packing	CB	1		
11		Packing	Gar	1	#31-3/16 sp.x27"lg.	
12	75521-1	Valve	Br	2		
13	79521-1	Cage, upper	CI	1		
14	79523-1	Gasket,upper&lower cage	Vel	2		Pre-Assy. 79546 Assy.Dwg. 79545
15	79526-1	Gasket, cover	Vel	1		
16		Capscrew, cover		4	5/16-18x1	
17	79525-1	Cover	CI	1		
18		Pipe plug	Blk	1	1/2	
19		Capscrews,upper&lower cage		8	3/8-16x1	
20	79522-1	Cage, lower	CI	1		
21	79520-1	Body, pump	CI	1		
22	253	Stud, gland - body		2		

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-9-45
Retyped: 9-2-46

ASSEMBLY NO. G-36-P
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. ___
8 CYL. ___

ASSY NAME: Duplex Fuel Transfer Pump

FIRST USED ON: ___

ASSY DWGS: 79763

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Nut, jam		4	5/16-18 Pre-Assy. 79546 (Cont.)
2	79543-1	Bracket, pump	CI	1	
3	10640-64	Bushing	Br	1	Pre-Assy. 79556 * *Replaced by G-2485
4	10640-62	Bushing	Br	1	
5	75054-1	Bracket, breather	CI	1	
6	4833-1	Pipe, breather	Blk	1	
7	B-3736	Cap, breather		1	
8	77969-1	Gasket, breather brkt-pump	Vel	1	
9		Capscrew, breather brkt-pump		2	3/8-16 x 1
10	79541-1	Eccentric	CRS	1	
11	79537-1	Slide, yoke	Br	1	
12	79538-1	Guide, yoke slide	CRS	1	
13	79550-1	Capscrew, guide		2	
14		Wire, capscrew		1	1/16 x 4" long
15		Key, pump shaft to eccentric		1	Woodruff #4-3/32x5/8
16	75510-1	Stub shaft, splined	CRS	1	
17	75512-1	Capscrew-stub shaft camsh		4	
18		Wire, Capscrew		1	1/16 x 10" long
19		Capscrews, plunger pump brkt. to		4	1/2-13 x 1-1/8
20	79536-1	Shim, plunger pump to t	St	10	.003 thick
21	104-4	Dowel-Clear Pump-Br		2	
22		Capscrew - Gear Pum t.		4	3/8-16 x 1-1/2

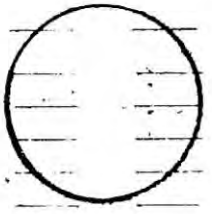
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-9-45
Retyped: 9-2-46

ASSEMBLY NO. G-36-P
SHEET NO. 4

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.



ASSY NAME: Duplex Fuel Transfer Pump

FIRST USED ON:

ASSY DWGS: 79763

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79573-1	Dowel, Plunger Pump-Brkt.		2	
2		Nut, Jam		2	1/4 -20
3		Nipple	Blk	1	3/8 x 1-1/2
4		Tee	Blk	1	3/8
5		Elbow, Imperial	Br	1	49F - 1/4P - 1/4T
6		Tubing	Cop	1	1/4 x 8
7		Nut, Union	Br	1	41F - 1/4
8		Bushing, Reducing	Blk	2	1/4 to 3/8
9	B-4316	Oiler		1	#3407 ¼ Gits
10					
11	79540-1	Gasket-Brkt-Gear Case	Vel	1	
12		Capscrew-Brkt-Gear Case		6	1/2 - 13 x 1-1/4
13	106-3	Dowel -Brkt-Gear Case		2	
14	~~B-4316~~	~~Oiler~~		~~1~~	~~#3407 1/4 Gits~~
15					
16					
17					
18					
19					
20					
21					
22					

CI = [illegible]t Iron
CS = [illegible]st Steel
FS = [illegible]orged Steel

CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

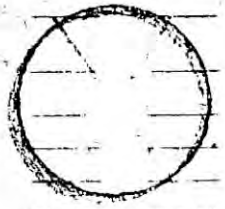
For Complete Replacement Use G-37-FF

Date Issued: 9-7-45
Retyped: 10-18-46

ASSEMBLY NO. G-37-R
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1



ASSY NAME: Lube Oil Pump
Double Reversible (Large Capacity)
R.H. CI Construction

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	G-1182	Pre-Assy., Lube Oil Pump		1	Assy.Dwg. G-1182 Consisting of:
3	G-1162-1	Housing	CI	1	Pre-Assy.G-1180 Assy.Dwg.G-1162-1
4	10640-97	Bushing	Brz	2	
5	G-1176-1	Shaft, Idler	Brz	1	
6	G-1174-1	Gear, Idler	CRS	1	NSS
7	G-1170-1	Shaft, Drive	CRS	1	Pre-Assy. G-2208 NSS
8	G-1175-1	Gear, Main, Scavenge	CRS	1	NSS
9		"Groov" Pin	St	1	1/4x2-5/8 Style 1 ~~NSS~~
10	G-1174-1	Gear, Idler	CRS	1	NSS
11	G-2171-1	Gear, Main, Pressure	CRS	1	Pre-Assy. G-2209 NSS
12	G-2170-1	Key, Main Gear-Dr.Shaft	St	1	~~NSS~~
13		Plug, Allen Pipe	St	1	3/8
14	G-1166-1	Gear, Drive	CI	1	
15		Taper Pin	St	1	#5 x 2-1/2
16		Cotter Pin	St	1	1/8 x 2
17	~~G-1178-1~~	~~Spring, Scavenge Relief~~	St	~~1~~	
18	G-1312-1	Spring, ~~Pressure~~ Valve Relief	St	2 ~~1~~	
19					
20	G-1288	Pre-Assy.Relief Vlv. & Rod		(2)	Assy.Dwg. G-1288 EACH Consisting of:
21	G-2032-1	Rod, Valve	CRS	1	
22	G-1171-1	Valve, Relief	CBr	1	

Pre-Assy. G-1287
Assy. Dwg. G-1287

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED NEXT PAGE

Date Issued: 9-7-45
Retyped: 1-5-49

ASSEMBLY NO. G-37-R
SHEET NO. 2

ENGINE MODEL G ___ . ___ ___

ASSY NAME: Lube Oil Pump

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. 1 ___ ___ ___
8 CYL. 1 ___ ___ ___

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-1173-1	Retainer, Spring	CBr	2	5000-250
2	B-3919	Snap Ring	St	2	Tru-Arc NAS
3	G-1167-1	Cover, Outside	CI	1	
4		Capscrew, Covers	St	13	3/8-16 x 1
5	180-2	Locking Clip, Inside Cover	St	6	
6	105-2	Dowel, Inside Cover	St	2	
7	G-1179-1	Gasket, Cover, Outside	Vel	1	
8		Pipe Plug, Housing	Blk	2	1/2"
9	G-1165-1	Cover, Inside	CI	1	Pre-Assy. G-1181
10	10640-97	Bushing	Brz	2	Use Dwg. G-1165-1
11	G-1163-1	Valve Cage, Upper	CI	1	
12	G-1168-1	Gasket, Upper Cage to Hsg.	Vel	1	
13	G-2166-1	Gasket, Inside Cover	Vel	1	
14		Capscrew	St	8	3/8-16 x 4
15		Capscrew		8	3/8-16 x 4-1/4
16		Capscrew	St	2	3/8-16 x 4-3/4
17		Capscrew	St	3	3/8-16 x 2-1/4
18		Capscrew	St	3	3/8-16 x 3/4
19	G-1169-1	Gasket, Lower Cage to Hsg.	Vel	1	
20	G-2256-1	Cage, Lower Valve	CI	1	
21	G-1244-1	Valve, Suction	CBr	4	
22	G-1245-1	Valve, Discharge	CBr	4	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 9-7-45
Retyped: 1-5-49

ASSEMBLY NO. G-37-R
SHEET NO. 3

ENGINE MODEL G

ASSY NAME: Lube Oil Pump

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-1289-1	Gasket, Housing - Gear Case	Vel	1	
2		Capscrew, Housing-Gear Case		4	5/8-11 x 1-1/2
3	78458-1	Dowel	CRS	2	
4		Nut, Hex		2	3/8-16
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3

Date Issued: 1-8-44 THESE PARTS ON G-239-H
Retyped: 10-19-49

ASSEMBLY NO. G-39-H
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Lube Oil Fittings
G-6 Cyl. Rev. & Non Rev. Engine 2" Suction Header

FIRST USED ON: 44001-44100

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Header Assembly		1	Consisting of:
2	75455-1 7824-1	Header, Main Oil	St	1	Marine Engine Stationary Engine
3	78396-1	Flange, Header	St	2	
4	78580-1	Gasket, Flange		2	1/16 Gar. 660
5	B-3806	Seal		2	National #50095
6		Capscrew		4	1/2-13 x 1-3/8
7		Setscrew, Base-Head		4	Unbrako knurled on point 1/2-13 x 2
8		Pipe Plug		1	1-1/4 Bl
9					
10	78241	Pre-Assy., and Assy. Dwg. Line to Main Bearing		[6]	Each Consisting of:
11		Elbow, 90°		1	Hays 9060 5/8T ~~1/2 Cop~~ x 3/8 IP
12	76792	Tube		1	SAE 75, Lt. Annealed C 5/8 x 45
13		Adapter		1	Hays 9000 5/8T ~~1/2 Cop~~ x 1/2
14					
15	78240	Pre-Assy. Line to Auxiliary Header		[2]	Each Consisting of:
16		Elbow, 90°	Imp	1	49F 1/2T 3/8P
17		Half Union Nut	Imp	1 2	48F 1/2T 3/8P 41F 1/2T
18	76791	Tube		1	SAE 75, Lt. Annealed 1/2 x 58
19					
20	77068 77066	Pre-Assy. Lube Oil Header Pre-Assy. Lube Oil Header	LH RH		Consisting of:
21	76982-1 75434	Header, Auxiliary	St	1	LH RH
22		Plug		1	3/8 B

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

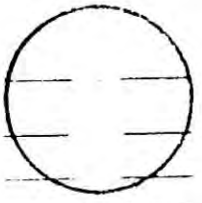
CONTINU
NEXT PA

Date Issued: 1-6-44
Retyped 7-16-53

ASSEMBLY NO. 9-32-H
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Lubo Oil Fittings

FIRST USED ON: 44001-44100

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Bushing	Blk	1	3/8 x 1/4
2		Ell	Imp	6	69F 1/4P 1/4T
3		Connectors	Imp	7	68F 1/4P 1/4T
4		Ell	Imp	2	49F 3/8P 1/2T
5		Union Nut	Imp	2	41F 1/2 Tube
6		Nipple	Blk	2	3/8 x 2-1/2
7		Sleeve	Blk	2	3/8
8					
9		Line to Rear Cam Bearing		1	Consisting of:
10		Tube		1	Annealed 1/4 x 12 SAE 75 Lt.
11		Tee	Imp	1	72-F 1/4T 1/4P
12					
13		Line to Intermediate Cam Bearing		[5]	EACH Consisting of:
14		Tube		1	Annealed 1/4 x 12 SAE 75 Lt.
15		Tee	Imp	1	72-F 1/8P 1/4T 1/4T
16					
17		Fuel Pump Base Line, Cam Brg.-Tappet Cluster &		[6]	EACH Consisting of:
18		Tube		2	Annealed 1/4 x 12 SAE 75 Lt.
19		Connector	Imp	1	68F 1/4T 1/8P
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

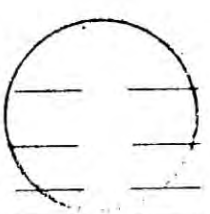
CONTINU
NEXT PA

Date Issued: 1-6-44
Retyped: 10-8-46

ASSEMBLY NO. G-39-H
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Lube Oil Fittings

FIRST USED ON: 44001-44100

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2		Line to front cam bearing			
3		Elbow, 90°	Imp	1	69-F 1/8P 1/4T
4		Tube	Cop	1	¼ x 12
5		Elbow, 90°	Imp	1	69-F 1/8P 1/4T
6					
7					
8		Line to Rocker Arm		6	EACH Consisting of:
9		Tube	Cop	1	¼ x 65
10		Union Nut	Imp	1	41-F ¼T
11					
12		Line to Gear Case			
13		Half Union	Imp	1	48-F 3/8T ¼P
14		Union Nut	Imp	1	41-F 3/8T
15		Tube	Cop	1	3/8 x 18
16		Union Nut	Imp	1	41-F 3/8T
17		Elbow, 90°	Imp	1	49-F 3/8T ¼P
18		Nipple	Blk	1	¼ x 1½
19		Tee, Female	Blk	1	¼P
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

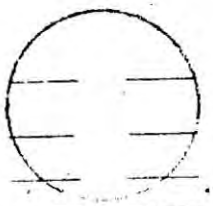
CONTINUED
NEXT PAGE

Date Issued: 1-6-44
Retyped: 11-19-48

ASSEMBLY NO. G-39-H
SHEET NO. 4

ENGINE MODEL G

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. 1 ___ ___ ___
8 CYL. ___ ___ ___ ___



ASSY NAME: Lube Oil Fittings

FIRST USED ON: 44001-44100

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2		Line to Idler Gear Stub			
3		Connector	Imp	1	68-F ¼T
4		Tube	Cop	1	¼ x 36
5					
6					
7		Line to Cross			
8		Connector	Imp	1	68-F ¼T ¼P
9		Tube	Cop	1	¼ x 12
10		Connector	Imp	1	68-F ¼T ¼P
11		Cross	Blk	1	¼P
12		Nipple	Blk	1	¼ x 2
13		Elbow, 90°	Blk	1	¼P
14	10272	Plug, Drilled	St	1	¼P
15					
16					
17		Line, Cross-Main Header			
18		Nipple	Blk	1	¼ x 2
19		Elbow, 90°	Blk	1	¼P
20		Half Union	Imp	1	48-F 3/8T ¼P
21		Union Nut	Imp	1	41-F 3/8T
22		Tube	Cop	1	3/8 x 40

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE
NEXT PAG

Date Issued: 1-6-44
Retyped: 11-19-48

ASSEMBLY NO. G-39-F
SHEET NO. 5

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Lube Oil Fittings

FIRST USED ON: 44001-44100

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Union Nut	Imp	1	41-F 3/8T
2		Elbow, 90°	Blk	1	¼P
3					
4					
5		Line, Cross-Governor Gear			
6		Connector	Imp	1	68-F ¼T ¼P
7		Tube	Cop	1	¼ x 18
8					
9					
10		Line, Header-Governor			
11		Elbow, 90°	Imp	1	69-F ¼T ¼P
12		Tube	Cop	1	¼ x 72
13		Elbow, 90°	Imp	1	69-F ¼T ¼P
14					
15					
16	79907	Pre-Assy. & Assy. Dwg. Line to Rear Main Bearing		1	Consisting of:
17		Elbow, 90°		1	Hays 9060 ½ Cop. x 3/
18	79874	Tube	Cop	1	5/8 x 45
19		Adapter		1	Hays 9000 ½ Cop. x ½
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

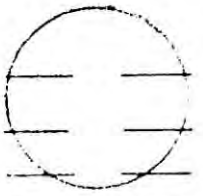
Edition 3 — These PARTS ON G-240-V

Date Issued: 1-5-43
Retyped: 6-8-53

ASSEMBLY NO. G-40-V
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 6
8 CYL. 8



ASSY NAME: Fuel Injection
Bendix Supercharged; 428 RPM & Belo

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3026	Pump, Bendix FCX-18		1	Bendix #10-23108-1
2		3/8 OD Injection Line, Steel Inlet Fitting			
3		10-23222 for 9/16 Supply Line, Time for Port Closing			
4					
5	G-2525	Assembly, Holder & Fittings		1	Consisting of:
6	B-3030	Holder, Bendix		1	Bendix 10-18360-15 NS
7		Connector, Return		1	Imperial 48F 1/8P 1/4
8		Nut, Return		1	41F 1/4T
9					
10	B-3032	Nozzle, Bendix		1	Bendix 10-16714
11	B-3036	Tip, Bendix, 8 Hole .012", 130°		1	Bendix 10-16730-20
12	G-4259	Clamp, Fuel Lines	CI	1	
13	79099-1	Gasket, Fuel Line Clamp		1	3/32 Garlock #660
14		Capscrew		5	5/16-18 x 3/4 Allen
15	1143	Gasket, Nozzle H older	Cop	1	
16					
17	77837	Assembly, Tubing, R.H.Eng.		1	Consisting of:
18	75466	Washer, Tubing NSS	St	2	With Pump
19	75477	Nut, Tubing NSS	St	2	With Pump
20	G-5676 76247-1	Tubing, Summerill NSS	St	1	3/8x5/32, See Spec Dwg 2
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

NEXT PAGE

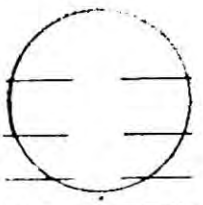
Edition 3

Date Issued: 2-22-45
Retyped: 6-8-53

ASSEMBLY NO. G-40-V
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 6
8 CYL. 8



ASSY NAME: Fuel Injection

FIRST USED ON: 42065; 42095

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1	77844-1	Retainer, Nozzle Holder	CS	1	
2	148	Nut, Nozzle Holder		2	Hymo CD
3	G-2461-1	Screw, Fuel Injection	See Dwg.	1	
4					
5					
6		For Left Hand Engine Use The Following Instead Of Items			
7		17-20 Sheet 1			
8	79859	Assembly, Tubing, L.H.Engine		1	Consisting of:
9	75466	Washer, Tubing NSS	St	2	With Pump
10	75477	Nut, Tubing NSS	St	2	With Pump
11	G-5675 ~~76347-2~~	Tubing, Summerill NSS	St	1	3/8x5/32, See Spec.Dwg.2
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 12-4-45 THESE PARTS ON G-241-AA ASSEMBLY NO. G-41-A
Retyped: 10-14-48 SHEET NO.
Item 1, 11-10-8

ENGINE MODEL F G

	F	G		
2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1	1		
8 CYL.	1	1		

ASSY NAME: Thrust Bearing
Kingsbury GH-15 7"
401 HP & Up - w/o Clutch

FIRST USED ON: 9020-22, 9033

ASSY DWGS: 75293

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3615	Thrust bearing for 7.000"		1	Assy. Dwg. #35-15-1E Kingsbury CH-15
2		shaft as per Kingsbury's Dwg. #35-15-1E without			
3		shaft. With water cooling coils.			
4					
5	7676-1	Bolt, bearing-base		8	SAE 3140
6	6817	Washer	CRS	16	
7	~~7676-2~~	Washer		8	~~1 1/4 SAE 1 1/16 ID x 2" OD x 1~~
8		Cotter Pin		8	1/8 x 1-3/4
9	141	Nut		8	1-14
10	75452	Shim	Steel	4	Sets
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

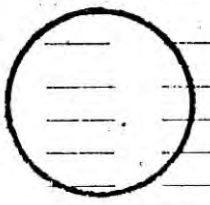
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 10-2-39
Retyped: 11-17-48

ASSEMBLY NO. G-47-B
SHEET NO. ____

ENGINE MODEL F G

	F	G
2 CYL.		
3 CYL.		
4 CYL.		
5 CYL.		
6 CYL.	1	1
8 CYL.	1	1



ASSY NAME: Thrust Shaft
Kingsbury GH-15 7", Located on Engine

FIRST USED ON: 9022, 9033

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	75361	Thrust Shaft	FS	1	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

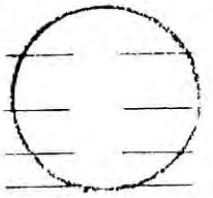
Assy. 70 & 74 for Fuel Filters, Bkts, & Drip Pan)

Date Issued: 9-26-44
Retyped: 11-23-48 REPLACED BY G-50-ZZ

ASSEMBLY NO. G-50-N
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.



ASSY NAME: Fuel Tank & Headers
Rev. Gear Pump. No accumulate Tan
G-6 Marine. Single Fuel Oil Drai

FIRST USED ON: 44184-223

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	76746	Pre-Assy. Fuel Header		1	Consisting of:
2	7746-2	Header, Fuel	St	1	Welded
3	76966-1	Fitting, Fuel Header	CRS	6	Welded
4					
5					
6	76867-1	Bracket, Tappet Drain Header		3	
7		Capscrew, Clamping		3	1/4-20 x 3/4
8		Capscrew		6	3/8-16 x 1-3/4 Alle
9	78699	Adapter, Fuel Header	CRS	1	
10		Washer	Cop	1	15/16 x 3/4 x 1/16
11	7749-2	Plug, Fuel Header	CRS	1	
12		Plug	St	1	1/8"
13		Washer	Cop	1	15/16 x 3/4 x 1/16
14					
15					
16	76747	Pre-Assy., Inlet Tube		6	EACH Consisting of:
17	7740-2	Tube, Fuel Connection	St	1	Welded
18	B-3025-15	Connector, Fuel Pump		2	Furnished with Pump Bosch NRV 22/3X or Bendix 10-23222 or ADECO-B-3024-1
19					
20					
21	7776	Screw, Fuel Line	CRS	6	Cadmium Plate
22	75454	Gasket	Cop	12	

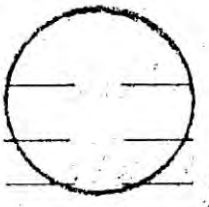
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 9-26-44
Retyped: 11-11-46

ASSEMBLY NO. G-50-NN
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.



ASSY NAME: Fuel Tank & Headers

FIRST USED ON: 44184-223

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78352	Header Pre-Assy., Fuel Oil Drain ^		1	Consisting of:
3	78247-1	Header, Tappet Drain	Blk	1	3/8 Std. Pipe
4		Connection	Imp	12	1/4T 1/8P 68F
5		Coupling	Blk	1	3/8"
6		Elbow	Imp	1	1/2 Tube 3/8 IPT 49
7		Nut	Imp	1	1/2T 41F
8		Cap	Blk	1	3/8 IPT
9					
10					
11	78848-2	Tube, Drain Header-head	Cop	6	
12		Ell, 90°, into head	Imp	6	1/4T 1/8P 69F
13		Connection, from head	Imp	6	1/4T 1/8P 68F
14	78848-1	Tube, Head-Nozzle	Cop	6	
15		Lockwasher		3	1/4 Light
16		Setscrew		3	1/2-13 x 5/8
17	77891-1	Tubing	Cop	6	1/4 x 7 Lg. (Approx
18		Tubing, to Drain	Cop	1	1/2 x 15 Lg. (Approx
19	B-3202 B-3199	Valve, Globe Valve, Air Vent	 Blk	1 1	1/2" 125 # 1/2"
20		Nipple	Blk	2	1/2 x Close
21					
22					

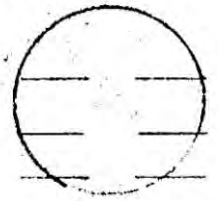
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 3-16-44 SEE G-201
Retyped: 10-19-49

ASSEMBLY NO. G-51-F
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1



ASSY NAME: Lube Strainer
L.H. & R.H. Marine 2" Suction Pipe

FIRST USED ON:

ASSY DWGS: 78575 RH, 79917 LH

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78579	Pre-Assy.,Lube Oil Suction	CBr	1	Welded Dwg. No. 78579 Consisting of:
3	78553-1	Suction Head	CBr	1	
4	78704-1	Screen	Br	1	
5	78833-1	Pipe		1	2" Std. Blk
6	78559-1	Flange	CS	1	
7					
8					
9		Capscrew		2	1/2-13 x 1-1/4
10		Capscrew		2	1/2-13 x 1-1/2
11		Lockwasher		4	1/2 Reg.
12	78581-1	Gasket		1	1/16 Vel.
13	78557-1	Elbow	CI	1	
14	78583-1	Pipe, Header		1	6 Cyl. Engine Blk
15	78583-2	Pipe, Header		1	8 Cyl. Engine Blk
16		Setscrew (Unbrako) Pt.Knurled		2	1/2-13 x 2
17	78396-1	Flange, Header	CI	1	
18	B-3936	Oil Seal, National		1	#50320
19	78580-1	Gasket		1	1/16 Gar. 660
20		Capscrew		2	1/2-13 x 1-1/2
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

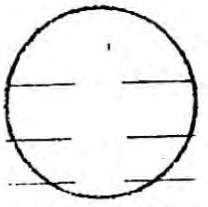
Edition 3

Date Issued: 10-2-45
Retyped: 4-12-49

ASSEMBLY NO. G-52-BBB
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1



ASSY NAME: External Lube Lines
(Ent. 4 Way Valve 2" Flanged)
(Used with G-37-R)

FIRST USED ON: 45142

ASSY DWGS: See Photos

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	G-1228	Pre-Assy., Four Way Valve		1	Assy.Dwg.G-1228 Consisting of:
3	G-1223-1	Body	CBrz	1	
4	G-1224-1	Plug - Regulating		1	Meehanite G.D.
5	B-3829	Packing - O Ring	Rub	1	AN-6227-24 B.F.Goodr
6	G-1226-1	Cover	St.Pl	1	
7		Setscrew - Oval Point		1	3/8-16 x 1-3/4
8	G-1229-1	Washer	Cop	2	
9		Nut, Jam		1	3/8
10		Nut, Acorn		1	3/8
11	G-1232-1	Gasket - Cover to Body	Vel	1	1/32
12		Capscrew - Cover to Body		4	3/8-16 x 1
13	G-1225-1	Lever	CS	1	Pre-Assy. G-1239
14		Setscrew - Cone Point		1	1/4x3/8
15					
16					
17	B-3582	Flange	CS	7	Std.F #554 150# 2" or Purch
18	G-1396-1	Flange - 4 Way Valve	St.Pl	4	
19	78663-I-1	Gasket	Vel	2	
20	79073-1	Gasket	Vel	7	
21	G-1190-1	Flange - Welded	St	2	2"
22	G-1942-1	Flange - Pipe Tap	St	1	2"

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

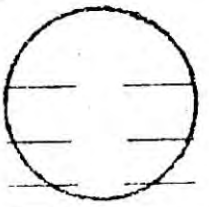
CONTINU
NEXT PA

Date Issued: 10-2-45
Retyped: 4-12-49

ASSEMBLY NO. G-52-BBB
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1



ASSY NAME: External Lube Lines

FIRST USED ON: 45142

ASSY DWGS: See Photos

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-1285-1	Flange, Lube Oil Suction	St	2	2"
2	G-1191-1	Gasket	Vel	3	
3	G-1286-1	Gasket	Vel	2	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

(SEE 29 ASSEMBLY FOR COMBINATIONS)

Date Issued: 6-7-45
Retyped: 12-22-47

REPLACED BY G-55-EE
w/Internal Grommet

ASSEMBLY NO. G-55-V
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1

ASSY NAME: Operating Control
R.H. Piston Type (C-CW Rot.)

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks	
1						
2	G-1133	Pre-Assy., Operating Control		1	Use Assy. Dwg. G-1133 Consisting of:	
3	79704-1	Lever, Control	CBr	1		
4	79707-1	Button, Lever Block	CBr	1		
5	79708-1	Pin, Lever Block	St	1		Pre-Assy. 79702
6	79709-1	Button, Valve Block	CBr	1		Assy. Dwg. 79702
7	79710-1	Pin, Valve Block	St	1		
8		~~Setscrew~~	~~St~~	~~2~~	~~#10-24 x 1/4 Long Cone Pt~~	
9		Ball	St	2	1/4" Dia.	
10	79711-1	Spring	St	2		
11		Plug	Br	1	1/8 Pipe Slotted Type	
12	79949-1	Housing, Control, R.H.	CBrz	1		
13	G-2825-1 79687-1	Plugs, metering Dowel, Lever Block	St	2 2		Pre-Assy. 79989
14	G-2825-1	Plug, Metering		2		Assy. Dwg. 79989
15	79712-1	Strip, Indicator, R.H.	CBr	1		
16		Screw, Chrome Plate	Br	3	Flat Head 1/4-20 x 1/2	
17		Ball, Indicator	St	1	5/8 Steel Ball	
18	79716-1	Spring, Indicator Ball	St	1		
19	G-1011-1	Shaft, Operating, R.H.	St	1		
20		"Groov" Pin		1	3/8 x 2	
21	79950-1	Plate, Thrust	CRS	1		
22		Setscrew, Allen Cup Point		2	5/16-18 x 1/2	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

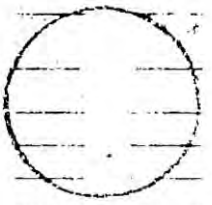
CONTINUED ON NEXT PAGE

Date Issued: 6-7-45
Retyped: 12-22-47

ASSEMBLY NO. G-55-V
SHEET NO. 2

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. 1
8 CYL. 1



ASSY NAME: Operating Control

FIRST USED ON: ____

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	79717-1	* Valve, Air Start	CBr	1	
2	G-2460-1	* "O" Ring Packing	Neo	1	
3		* FOR REPLACEMENT ORDER NEW VALVE G-2836-1 & "O" RING	B-5001	✓	
4					
5	B-3775	Ring, Air Start Valve ✓	Brz	1	1/8x2-3/4 AH Angle Cut
6	79718-1	Valve, Air Start Pilot	Br	1	
7	G-1067-1	Guide, Valve	Br	1	
8	G-1068-1	Valve Screw ✓	Br	1	
9	G-1070-1	Spring, Pilot Valve ✓		1	PH.Brz. Spring Wire
10	G-1066-1	Spring, Air Start Valve ✓		1	PH.Brz. Spring Wire
11	79700-1	Spring, Valve ✓		2	PH.Brz. Spring Wire
12	G-1069-1	Hand Wheel	CBr	1	
13		Screw, Rd. Hd. Mach.		1	#10-32 x 3/8
14		Washer		1	3/16 Std. ½ O.D.
15	G-1184-1	Washer	Rub	1	
16	79693-1	Pin, Air Start Cam ✓	St	1	
17	79694-1	Valve, Shift ✓	Br	2	
18	79692-1	Pin, Shift Valve Cam ✓	St	2	
19	79695-1	Cover, Valve Chest	CBrz	1	
20	79720-1	Gasket, Cover ✓	Vel	1	
21		Capscrew, Allen	St	4	5/8-11 x 1½
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE
NEXT PAG

Date Issued: 6-7-45
Retyped: 12-22-47

ASSEMBLY NO. G-22-V
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1

ASSY NAME: Operating Control

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Capscrew, Control Housing	St	4	5/8-11 x 1¼ Allen
2	79721-1	Gasket, Control Housing	Vel	1	
3	104-2	Dowel	St.	2	½- x 7/8
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18		SEE 29 ASSEMBLY FOR COMBINATIONS			
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 11-28-44
Retyped; 12-4-45

THESE PARTS ON G-257-J

ASSEMBLY NO. G-57-J
SHEET NO.

ENGINE MODEL G U

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Exhaust Connection
BF-26 - 10", 150# Std. Flange

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	78280-1	Adapter, Exhaust	W.St	1	
2	78284-1	Gasket, turbocharger		1	1/16 Gar. 7508
3	79161-1	Gasket, Ex. adapter		1	1/16 Gar. 7508
4		Capscrew		16	3/8-16 x 1¼
5		Pipe Plug 1/2"		1	Male
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 5-29-45

ASSEMBLY NO. G-59-QQ
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1

ASSY NAME: Circulating Water Fitti
300 to 400 RPM Rev. 2 Cent. (Sma
Pump) HE & LOC off engine With T
Brg.line, with 3" flanged tee in
FIRST USED ON: 45106-108

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Jacket Water Line from Pump			
2	79914-1 79896-1	Tee, Pump-Block Tee, Pump-Block	CI CI	1 1	LH Eng. RH Eng.
3	77686-1	Gasket, Pump-Tee	Rub	1	1/16
4	79132-1	Gasket, Tee-Block	Rub	1	1/16
5		Capscrew, Tee-Pump		8	1/2-13 x 1-1/2
6		Capscrew, Tee-Block Plug, Pipe	Blk	6 1	5/8-11 x 1-1/2 1/4
7	B-3568	Flange	CI	1	3" 125# Crane #553
8	77686-1	Gasket	Rub	1	1/16
9		Bolt, hex.		4	5/8-11 x 2
10		Nut, hex.		4	5/8-11
11		Plug, Pipe	Blk	1	3"
12					
13		Raw Water Inlet Connection and Air Vent			
14	79895-1	Flanged Tee 125#	CI	1	
15	77686-1	Gasket	Rub	1	1/16
16		Capscrew		4	5/8-11 x 1-1/2
17		Nipple	Br	1	1-1/4" x 10-1/2"
18		Sleeve	Br	1	1-1/4"
19		Bushing	Br	1	1-1/4" to 1/2"
20		Nipple	Br	1	1/2 x close
21	B-3130	Stop Cock	Br	1	1/2"
22		Pipe Plug	Br	1	1/2"

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

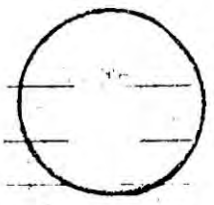
CONTINUED
NEXT PAGE

Date Issued: 5-29-45
Retyped: 10-19-49

ASSEMBLY NO. G-59-QQ
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1



ASSY NAME: Circulating Water Fitti

FIRST USED ON: 45106-108

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Nipple	Br	1	1/2" x close
2	B-3227	Vertical Check Valve	Br	1	1/2"
3					
4		Line to Gauge Board			
5		Ell, 90° Str.	Br	1	1/4
6		Nipple	Br	1	1/4 x short
7	B-3187	Valve, Globe	Br	1	1/4
8		Connection	Imp	1	68F 1/4P 1/4T
9		Tube	Cop	1	1/4 x 48
10		Connection	Imp	1	68F 1/4T 1/8P
11					
12		Raw Water Line to Thrust Bearing			
13		Nipple, from Pump Tee	Br	1	1/2 Short
14		Ell, 90°	Br	1	1/2
15		Nipple	Br	1	1/2 x Short
16	B-3202	Valve, Globe	Br	1	1/2" 125#
17		Ell, 90° Str.	Br	1	1/2
18		Nipple	Br	1	1/2 x close
19		Union	Br	1	1/2"
20		Ell, 45°	Br	1	1/2
21		Pipe, thd. both ends	Br	1	1/2 x 162-1/2"
22		Union	Br	1	1/2

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINU
NEXT PA

Date Issued: 5-29-45

ASSEMBLY NO. G-50-QC
SHEET NO. 3

ENGINE MODEL G

2 CYL.	
3 CYL.	
4 CYL.	
5 CYL.	
6 CYL.	1
8 CYL.	1

ASSY NAME: Circulating Water Fitt
~~300 to 400 RPM Rev. & Cont. (Sm~~
~~Pump) HE & LOC off engine With~~
~~Brg. 1in. with 8" flanged too~~
FIRST USED ON: 45106-108

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Pipe, thd. both ends	Br	1	1/2 x 110 6 cyl. 1/2 x 144 8 cyl.
2		Ell, 90°	Br	1	1/2
3		Pipe, thd. both ends	Br	1	1/2 x 33"
4		Union	Br	1	1/2
5		Nipple	Br	1	1/2 x close
6		Ell, 90°	Br	1	1/2
7		Nipple	Br	1	1/2 x 10
8		Ell, 90°	Br	1	1/2
9		Nipple into Bearing	Br	1	1/2 x 2
10		Ell, 90° str. from Brg.	Br	1	1/2
11		Plug	Blk	1	1/2
12		Clamps	Br	5	Parker 1/2"
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 9/13/45

ASSEMBLY NO. G-59-XX
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Circulating Water Lines Piping Around Supercharge B.F. 26 w/o [illegible] Circ. Pump

FIRST USED ON: 45134

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1	77199-1	Line From Exhaust Conn. to Flange	Block	1	
2	79142-1	Gasket		1	
3		Nipple	Blk	1	1-1/2 x Close
4		Ell	Blk	1	1-1/2 x 45°
5		Nipple	Blk	1	1-1/2 x 5"
6		Ell	Blk	1	1-1/2 x 45°
7		Nipple	Blk	1	1-1/2 x 4"
8		Tee	Blk	1	1-1/2
9		Nipple	Blk	1	1-1/2 x 9-1/2
10		Ell	Blk	1	1-1/2 x 90°
11		Nipple	Blk	1	1-1/2 x 3"
12	77199-1	Flange	CI	1	
13	79142-1	Gasket	Rub	1	
14					
15		Line from Tee to Supercharger			
16		Bushing	Blk	1	1-1/2 - 1"
17		Nipple	Blk	1	1" x 5"
18		Union	Blk	1	1"
19		Nipple	Blk	1	1" x 13"
20		Ell	Blk	1	1" x 90°
21		Nipple	Blk	1	1" x 5-1/2"
22		Union	Blk	1	1"

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

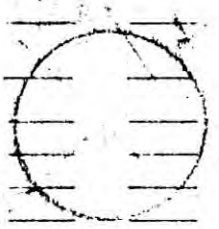
CONTINUED NEXT PAGE

Date Issued: 9/13/45

ASSEMBLY NO. G-53-XX
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Circulating Water Lines ~~Piping Around Superheater B.F. 26 w/o Circ. Pump~~

FIRST USED ON: 45134

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Nipple	Blk	1	1" x Close
2		Tee	Blk	1	1"
3		Nipple	Blk	1	1" x 2-1/2"
4		Ell	Blk	1	1" x 45°
5		Bushing	Blk	1	1" - 1/2
6		Nipple	Blk	1	1/2 x 3"
7		Bushing	Blk	1	1" -1/2"
8		Connection	Blk	1	1/2P 5/8T Hayes 540
9		Ell	Blk	1	3/8P 5/8T Hayes 520
10		Copper Tubing	Blk	1	5/8 x 24"
11	78627-1	Adapter	CI	1	
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

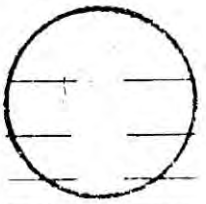
For Complete Replacement Use G-69-A6

Date Issued: 8-24-42
Retyped: 1-28-49

ASSEMBLY NO. G-69-DD
SHEET NO.

ENGINE MODEL Q

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. 1



ASSY NAME: Lube Filter
CS Strainer, 2" Weld P
20 Mesh, (Scav.Line)

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name		Matl	Qty	Remarks
1						
2	31063	Pre-Assy. 2" Scav.Strainer			1	Consisting of:
3	31052-1	Body, Strainer		CS	1	Use Patt.31053-1
4	31047-1	Basket, Strainer	Pre-Assy. 31070	CBr	1	
5	31048-1	Wire Screen	Pre-Assy. 31070	Br	1	20 Mesh 28 Gage
6	32633-1	Clamp, Strainer		CS	1	
7	32630-1	Cover, Strainer		CS	1	
8	32629-1	Gasket		Vel	1	1/32"
9	32631-1	Spring, Strainer			1	Spring Wire
10	32632-1	Clamp Screw	Pre-Assy. & Dwg. 31617	CRS	1	3/4 Dia. x 2-3/4
11	32628-1	Handle	Pre-Assy. & Dwg. 31617	CRS	1	
12		Pipe Plug			1	1/2"
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

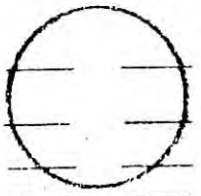
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 12-1-44
Retyped: 10-19-49

ASSEMBLY NO. G-70-SS
SHEET NO. ____

ENGINE MODEL G

2 CYL. ____ ____ ____ ____
3 CYL. ____ ____ ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. ____ ____ ____ ____
8 CYL. ____ ____ ____ ____



ASSY NAME: Fuel Oil Filter Duplex, Absorbent Type, 450-650 R

FIRST USED ON: 44288

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3705	Filter, Fuel Oil Duplex,		1	Winslow #802-BF-4
2		2 Element Absorbent Type, Commercial Construction			
3		with Bronze Head			
4					
5					
6					
7					
8					
9					
10					
11					
12					
13		Replacement Information			
14	B-3706	Filter Element			
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 7/30/42
Retyped; 12-7-45

ASSEMBLY NO. G-69-00
SHEET NO.

ENGINE MODEL

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Lube Strainer
Navy App'd - Metal - edge - Simplex and cleanable

FIRST USED ON: 42096-115 & 42116-149

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3409	Strainer, .003" spacing, scraper type metal edge Navy approved.		1	Cuno Dwg. #11287 Type EGF-2
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18		Replacement Order Information			
19	B-3150	Element		1	Cuno #11328
20					
21					
22					

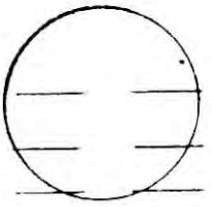
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-3-44

Retyped 9-23-53

ENGINE MODEL X G

2 CYL.	___	___	___	___
3 CYL.	___	___	___	___
4 CYL.	___	___	___	___
5 CYL.	___	___	___	___
6 CYL.	___	___	___	___
8 CYL.	___	___	___	___



ASSEMBLY NO. G-70-C

SHEET NO. ___

ASSY NAME: Fuel Filter
metal-edge, .003 spacing comm. construction, duplex, cleanable

FIRST USED ON: 42269

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3437	Filter, Model D-113-JJ-10		1	Purolator Products
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15		Replacement Information			
16	B-3396	Filter Element			
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 8-10-43
Retyped; 12-5-45

ASSEMBLY NO. G-72-R
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Supercharger
6 Cyl. R.H. Eng. Water cooled mar
BF-26-Dwg. No. X-810914-1 w/o Tac

FIRST USED ON: 43354

Code-BF-26-23M26
ASSY DWGS: 78151

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-5233	Supercharger, Elliott, BF-26		1	~~See individual Engine Specs for "B" number~~ B-5503 Oil Tank
2		Two Exh. inlets on vertical			
3					
4	78155-1	Bracket	CI	1	
5	79159-1	Gasket, to air flange		1	3/32 Gar. #660
6	608	Stud, cyl. block		12	
7		Nut, hex		12	3/4-10
8		Lockwashers		12	3/4" medium
9		Bolt, to air flange		8	½-13 x 2½
10		Nut, hex		8	½-13
11		Pipe Plug	Blk	1	2" Female
12	92556-1	Shim	St	6	1/64
13	78163-1	Adapter-Superch. Brkt.	CI	1	
14	515	Studs-Superch. Adpt.		4	5/8-11 x 2¼
15		Nut		4	5/8-11
16		Capscrew-Adpt. Brkt.		4	5/8-11 x 1-3/4
17	78161-1	Expansion pipe	CI	2	
18	79160-1	Gasket, superch.		2	3/64 JM #60
19	445	Stud		8	
20		Nut, hex	Brass	8	½-13
21	B-3890	Ring, Expansion		6	¼ x ¼ x 6
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED ON NEXT PAGE

Date Issued: 10-16-43
Retyped: 12-5-45

ASSEMBLY NO. G-72-R
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.

ASSY NAME: Supercharger
~~6 Cyl. R.H. Eng. Water Cooled ma~~
~~BF-26 Dwg. No. Y-820878~~

FIRST USED ON: 43354

~~Code 22043-36~~
ASSY DWGS: 78151

It.	Part No.	Part Name	Matl	Qty	Remarks
1	~~11548-1~~	~~Name Plate, Duchi~~	~~RBr~~	~~1~~	
2	~~11548-2~~	~~Screw~~		~~4~~	~~8-32 x 5/8~~
3	78485	Connector-supercharger	C.I.	1	
4		Capscrews		5	5/8-11 x 1-3/4
5		Bolt		1	5/8-11 x 2½
6		Nut		1	5/8-11
7		Pipe Plug	Blk	2	1½ Female
8	92564-1	Cover, connector	CI	1	
9	78830-1	Gasket		1	3/32 Rubber
10		Capscrews		6	½-13 x 1½
11	92817-1	Cover, Water Con.	CI	1	Use Patt. 92565
12	92604-1	Gasket		1	1/16 Rubber
13		Capscrew		4	1/2-13 x 1
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 10-16-43

A Y NO. G-73-R
T NO. 1 8

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.

ASSY NAME: Supercharger
~~6 cyl. R.R. Eng. Water Cooled~~
~~BF-26 Dwg No. X-92087~~

FIRST USED ON: 43354

CODE-226M3-26 [illegible]

ASSY DWGS: 78151

0

It.	Part No.	Part Name	Matl	Qty	Remarks
1	92817-1	Cover, Water con.	CI	1	Use Patt. 92[illegible]
2	92604-1	Gasket		1	1/16 Rubber
3		Capscrew		4	1/2-13 x 1
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

Remove from all Books!

This is now included on page 2

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 7-24-45

ASSEMBLY NO. G-73-1
SHEET NO.

ENGINE MODEL G

ASSY NAME: Jacket-Water Outlet 3" x 125# Flange

(Used with CI Exh.Manif.)
Supercharged

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.

FIRST USED ON: 45121

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-1233-1	Connector, Water Outlet	CI	1	
2	92604-1	Gasket		1	1/16 Rubber
3		Capscrew		4	1/2 - 13 x 1"
4		Pipe Plug	Blk	1	3/4 male
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

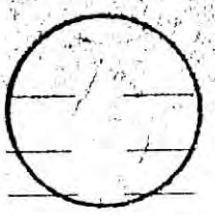
For alternate see G-73-Q (C)

Date Issued: 7-11-45
Retyped: 8-28-46

ASSEMBLY NO. G-73-M
SHEET NO.

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. ___
8 CYL. 1



ASSY NAME: Automatic Temp. Regulato
3" 3-Way Thermostatic Valve
Range 140°-180°
Up to 500 HP
FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Three-Way Thermostatic Valve		1	Fulton-Sylphon
2	B-3950 -	Type 923-3, with "WB"			
3		Valve, with provision for			
4		manual operation. Size 3"			
5		cast iron body, bronze			
6		trim, commercial flange			
7		per Fulton-Sylphon plan			
8		5291-R. Range 140°-180°,			
9		with 12' of armored tubing.			
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

(See individual Eng. Specs. for which pages to use. Also 103 Assem. for additional gauges.)

Date Issued: 1-2-45
Retyped 6-2-53

ASSEMBLY NO. 101-WW
SHEET NO. 2-R Sh.

ENGINE MODEL ____ ____ ____ ____

2 CYL. ____ ____ ____ ____
3 CYL. ____ ____ ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. ____ ____ ____ ____
8 CYL. ____ ____ ____ ____

ASSY NAME: Instrument Board & Gauges (Back Conn.)

FIRST USED ON: 44299

ASSY DWGS: 75905

It.	Part No.	Part Name	Matl	Qty	Remarks
1		MEDIUM SIZE PANEL 3-1/2" W/O FUEL, W/SEA WATER, W/STD. ROUND ALNOR PYROMETER.			
2					
3		(See end of list for Combination Assembly number.)			
4					
5	75909-1	Panel, Gauge Board on Engine		1	Bakelite
6		Drilled for the following Gauges:			
7		Tachometer		1	See 115 Assem.
8		Pyrometer		1	See 111 Assem.
9	B-3340	Starting Air Pressure		1	0-600
10	B-4237	Lube Oil Pressure		1	0-100
11	B-3715	Circulating Water Pressure		1	0-60
12	B-3654	Sea Water Pressure		1	Cent. Pump 0-60 (or 0-30, B-3342 i
13					
14		Line Inside Gauge Board.			
15		Union	Imp	4	62F 1/4T
16		Tube	Cop	1	1/4 x 12'
17		Ell	Imp	4	69F 1/4T 1/4P
18		Screw, Roundhead Gauge		12	8-32 x 3/4 Long
19		Nut, Hex		12	8-32
20		Lockwasher		12	3/16 Regular
21		Screw, Rd. Hd. Pyrometer		3	1/4-20 x 1 Long
22		Lockwasher		3	1/4 Regular

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-2-45
Retyped 6-2-53

ASSEMBLY NO. 101-WW
SHEET NO. 2-R Sh. 2

ENGINE MODEL ____ ____ ____ ____

2 CYL. ____ ____ ____ ____
3 CYL. ____ ____ ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. ____ ____ ____ ____
8 CYL. ____ ____ ____ ____

ASSY NAME: Instrument Board & Gauges

FIRST USED ON: 44299

ASSY DWGS: 75905

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Nut, Hex		3	1/4-20
2					
3					
4					
5	12438	Assem., Combination Panel and			2-R & 6-E
6		Frame			
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3 (See Individual Engine Specs.for which Pages to use)

Date Issued: 1-28-43
Retyped: 1-16-51

ASSEMBLY NO. 101-WW
SHEET NO. 6E

ENGINE MODEL ___ ___ ___ ___

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Instrument Board & Gauge

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1		MEDIUM SIZE RUBBER MOUNTED FRAME			
2		(See Panel Parts List for Comb.Assy.No.)			
3	75906-1	Frame, Gauge Board		1	Welded Steel
4	75906-3	Back Cover, Slotted	Br	1	Sheet St. 18 Gauge
5		Screw, Knurled		10	10 x 24 x 1/2
6	G-5394	Support, Frame		2	Steel Channel
7	B-3957	Pad, Mounting, Shear Type	Rub	4	Lord Series 150 PD1C
8		Capscrew, Hex		4	1/4-20 x 1-1/2
9		Nut, Acorn	Br	4	1/4-20
10	G-5400	~~Washer~~ Spacer	St	4	~~1/4~~
11		Lockwasher		4	1/4
12		Screw, Rd.Hd.Mach.	St	8	8-32 x 5/16 Assy.77319
13		Nut, Hex.		8	~~1/4-20~~ 8-32
14	G-5399	Lockwasher Bracket, Rubber Mounting	St	8 2	No.8
15	B-3998	Pad, Mounting Cylindrical	Rub	4	U.S.Royal #300
16		Nut, Hex.		8	1/4-20
17		Lockwasher Screw, Oval Hd. Mach.	St	8 10	1/4 #8-32 x 1/2
18		Washer, Finish, Cntrsnk.		10	1/2 O.D.
19		Lockwasher		10	1/4
20		Nut, Hex.		10	1/4-20
21	75972-1	Plate Conduit Support	St	1	
22	76482	Plate Conduit Support	St	1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

(See individual engine specs for which pages to use)

Date Issued: 5-5-42
Retyped: 1-6-49

ASSEMBLY NO. 101-WW
SHEET NO. 11A

ENGINE MODEL ___ ___ ___ ___

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Instrument Board & Gau

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2		BRACKET, G REVERSIBLE ENGINE RH MEDIUM BOARD			
3	76025-1	Bracket, instrument board		1	Welded steel
4		Capscrew, bkt-cyl.block		4	1/2-13 x 1
5		Bolt, board-bracket		4	1/2-13 x 1-3/4
6		Nut, hex		4	1/2-13
7		Lockwasher		4	1/2 Std.
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3 (See Inc ... for which Pages to use)

Date Issued: 1-28-43
Retyped: 1-16-51

ASSEMBLY NO. 101-WW
SHEET NO. 6E

ENGINE MODEL ___ ___ ___ ___

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Instrument Board & Gauge

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1		MEDIUM SIZE RUBBER MOUNTED FRAME			
2		(See Panel Parts List for Comb.Assy.No.)			
3	75906-1	Frame, Gauge Board		1	Welded Steel
4	75906-3	Back Cover, Slotted	Br	1	Sheet St. 18 Gauge
5		Screw, Knurled		10	10 x 24 x 1/2
6	G-5394	Support, Frame		2	Steel Channel
7	B-3957	Pad, Mounting, Shear Type	Rub	4	Lord Series 150 PD1
8		Capscrew, Hex		4	1/4-20 x 1-1/2
9		Nut, Acorn	Br	4	1/4-20
10	G-5400	~~Washer~~ Spacer	St	4	~~1/4~~
11		Lockwasher		4	1/4
12		Screw, Rd.Hd.Mach.	St	8	8-32 x 5/16 Assy.77319
13		Nut, Hex.		8	~~1/4-20~~ 8-32
14	G-5399	Lockwasher Bracket, Rubber Mounting	St	8 2	No.8
15	B-3998	Pad, Mounting Cylindrical	Rub	4	U.S.Royal #300
16		Nut, Hex.		8	1/4-20
17		Lockwasher Screw, Oval Hd. Mach.	St	8 10	1/4 #8-32 x 1/2
18		Washer, Finish, Cntrsnk.		10	1/2 O.D.
19		Lockwasher		10	1/4
20		Nut, Hex.		10	1/4-20
21	75972-1	Plate Conduit Support	St	1	
22	76482	Plate Conduit Support	St	1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 9/19/45
Retyped: 1-23-46

ASSEMBLY NO. 101-WI
SHEET NO. 16-K

ENGINE MODEL ____ ____ ____ ____

2 CYL. ____ ____ ____ ____
3 CYL. ____ ____ ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. ____ ____ ____ ____
8 CYL. ____ ____ ____ ____

ASSY NAME: Instrument Board & Gaug

FIRST USED ON: 45132

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	E-3387	Tagliabue Thermometers			
3	B-3387	Thermometer, 7" scale, straight form, for location as follows:			
4					
5		Oil to engine		1	
6		Oil from engine		1	
7		Oil to oil cooler		1	
8		Water to engine		1	
9		Water from each cyl. head		6	(or 8 for 8-cyl. eng
10					
11		If 2 water pumps are used			
12		with separate L.O. Cooler and H. Exchanger, add.		3	
13		If combination L.O. Cooler			
14		& Heat. Exchanger, add		2	
15		If supercharged add for		1	
16		water discharge			
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

(See Individual Engine Specs For Which Pages To Use)

Date Issued: 5-6-42
Retyped: 6-2-53

ASSEMBLY NO. 101-WW
SHEET NO. 17-A

ENGINE MODEL ____ ____ ____ ____

2 CYL. ____ ____
3 CYL. ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. ____ ____ ____ ____
8 CYL. ____ ____ ____ ____

ASSY NAME: Instrument Board & Ga
(Fuel Gage on Side of Cylinder Block)

FIRST USED ON: _____

ASSY DWGS: 76191

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	77609	Assem., Fuel Gage Bracket		1	Consisting of:
3	B-3365	Gauge, Fuel Oil Pressure 3½"		1	Bottom Conn. 0-60 l
4		Screw, Rd.Hd.		3	8-32 x 1/2
5	76193	Bracket	St	1	Welded
6	76192	Housing	CI	1	
7	B-3957	Mounting Pad	Rub	3	Lord 150-PD2
8		Screw, Rd.Hd.		6	6-32 x 5/16
9		Lockwasher		6	SAE #6
10		Nut, Hex		6	6-32
11		Bolt		3	1/4-20 x1-1/2
12		Washer		3	1/4" SAE
13		Nut, Hex.		3	1/4-20
14					
15		Elbow	Blk	1	1/4" 90°
16					
17	B-3958	Hose, 1/4" ID x 10" Long B.C.		As Reqd	Resisto-Flex Type S
18		On solid male; one swivel male, 1/4" ID Couplings			
19		Attached			
20	B-3232	Shut-Off Cock		1	1/4"
21		Bushing	Blk	1	
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3

Date Issued: 5-29-44
Retyped: 11-12-48

ASSEMBLY NO. 101-WW
SHEET NO. 16-B Sh.

ENGINE MODEL G Q X ___

ASSY NAME: INSTRUMENT BOARD & GAUGES
15" Length

	G	Q	X	
2 CYL.	___	___	___	___
3 CYL.	___	___	___	___
4 CYL.	___	___	___	___
5 CYL.	___	___	___	___
6 CYL.	1	1	1	___
8 CYL.	1	1	1	___

FIRST USED ON: ___

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1		MANOMETER			
2	B-3959	Manometer, Meriam, 15"		1	
3		gland packed, U Type as per Meriam Dwg.B-1105			
4		Scale graduated in inches			
5	B-3960	Mercury		1	Lb.
6					
7	79172-1	Bracket, Manometer	St	1	
8		Bolts-Brkt-Inst. Bd.		2	1/4-20 x 1/2
9		Mach.Scr.F.H-Man.-Brkt.		2	1/4-20 x 7/8
10		Nut		4	1/4-20
11					
12		Air Manifold Pressure Line to Gauge Board:			
13		Ell Intake Manifold	Imp	1	49F 3/8T 1/4P
14		Union Nut	Imp	1	41F 3/8T
15		Tube	Cop	1	3/8 x 15
16		Union Nut	Imp	1	41F 3/8T
17		Union	Imp	1	42F 3/8T
18		Union Nut	Imp	1	41F 3/8T
19		Tube	Cop	1	3/8 x 15
20		Union Nut	Imp	1	41F 3/8T
21		Half Union	Imp	1	48F 3/8T 1/8P
22	B-3348	Cock, Gauge	Br	1	1/4

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED NEXT PAGE

Edition 1

Date Issued: 1-23-53

ASSEMBLY NO. 101-WW
SHEET NO. 18B,Sh.2

ENGINE MODEL G Q X ___ ASSY NAME: Instrument Board & Gaug

	G	Q	X	
2 CYL.	___	___	___	___
3 CYL.	___	___	___	___
4 CYL.	___	___	___	___
5 CYL.	___	___	___	___
6 CYL.	1	1	1	___
8 CYL.	1	1	1	___

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Nipple	Br	1	1/4 x close
2		Ell	Br	1	1/4
3		Nipple	Br	1	1/4 x close
4		Ell 90° into Manometer	Br	1	1/4
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-22-44
Retyped: 10-3-46

ASSEMBLY NO. 104-R
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1

ASSY NAME: Lube Oil Tank
100 Gal. Rectangular
Rochester Magnetic Gage

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	94285	Pre-Assy., Lube Oil Tank		1	Consisting of:
3	93143-1	Tank		1	St #12 U.S.Gages Ga
4	93012-1	Flange	St.	1	Welded Together
5		Weldolet Pipe Flange	St.	3	2"
6		Coupling, Pipe		4	2"
7	93143-2	Cover		1	#12 U.S. Gage Galv.S
8	93149-1	Screen & Handle		1	#20 Mesh
9		Ell, 45° Street		1	2"
10		Plug, Pipe		6	2"
11					
12		~~Plug, Pipe~~		~~6~~	~~2"~~
13	B-4092	Gage		1	Rochester Mfg. Co. #4MFGR Dwg. #3144-E.
14		Gasket		1	Supplied with Gage
15		Capscrew, Gage		4	5/16-24 x 5/8
16					
17					
18					
19					
20					
21					
22					

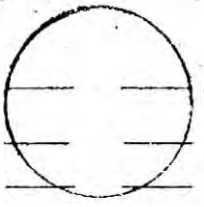
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 12-30-43
Retyped : 9-20-48

ASSEMBLY NO. 108-FF
SHEET NO. 1

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.



ASSY NAME: Tool List, G eng. Non-reversible & Reversible, w/o Grease Gun. (Used when Compr has no clutch)

FIRST USED ON: G engine

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3666	Eyebolt, Piston		1 2	For Alum. Piston " CI "
2	B-4034	Wrench, Zero Lash Unit		1	Bonney 1960, 1-7/8
3	B-6068	" Fuel Pump Bleeder		1	Armstrong 961J, 1/
4	B-4036	" Injedtion Line		1	Bonn. 1034, 7/8 1-
5	B-4037	" Fuel Cont. Shaft / Union Nut		1	Bonn. 1725B, 9/16
6	B-4038	" Crescent		1	8"
7	B-4039	" "		1	12"
8	B-4040	" Allen Screw, 5/16		1	Fits 3/8 & 7/16 Ca and 5/8 Set
9	B-4041	" " " 3/16		1	Fits 1/4 Cap and 7/8 Set
10	B-4042	" " " 1/2		1	Fits 5/8 Cap & 7/8
11	B-4043	" " " 3/8		1	Fits ½ Cap & 3/4 S
12	B-4044	Socket, Con Rod Nut		1	Bonn. 4252 1-5/8
13	B-4046	Adapter		1	Bonney 4213 1" Female, 3/4 Mal
14	B-4047	Handle for X-64 & 4258		1	Bonney X-31
15	B-4048	Extension for 4252 & 4258		1	" X-29
16	B-4049	Socket, Side Door		1	" 4024, 3/4 S
17	B-4050	Handle for 4024		1	" 4085
18	B-4051	Socket, Fuel Noz. Hold Down		1	" D-32 1"
19	B-5376 ~~B-4052~~	Pin Handle ~~Handle for D-32~~		1 ~~1~~	Plomb 5466 or B-4 ~~" 4082~~
20	B-5390 B-4053	Extension Head, Driving		1 1	Plomb 5461 Bonney 4 Bonney X-32
21	B-4054	" "		1	" X-33
22	B-5376 B-5377	Pin Handle Socket, T Type Nozzle } Assy. B-4055		1 1	Plomb 5466 PH Plomb 5428 ~~7/8 x~~

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINU
NEXT PA

Date Issued: 12-30-43
Retyped: 9-20-48

ASSEMBLY NO. 108-FF
SHEET NO. 2

ENGINE MODEL G

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Tool List, G eng.

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-5378 B-4056	Extension Assy.B-4055 Drag Link Socket		1 1	Plomb 5463 Bonney 4002
2	B-4057	Eyebolt, Liner Puller		1	Vulcan #30 1-8
3	B-4045 B-4043	Socket, Main Brg.		1	Arm. H-1258, 1-13/16
4	B-4213	" Cyl. Head		1	" X-1264, 2"
5	B-4215	Screwdriver		1	M & S D404, 4"
6	B-4216	Pliers		1	Bonney B-10, 10"
7	B-4217	Gage, Feeler		1	Lufkin 109T
8	B-4218	Socket, Safety Valve		1	Bonney D-34, 1-1/16
9	B-4219	Pin, Vise;Fuel Noz.Clean		1	Starrett 162A
10		Wire,Music; " " "		1	See 40 Ass 6"lg.Use.002 undersi
11					
12	B-4375	Wrench, Tappet Plug		1	Plomb 566T Bonn; 4290
13	1576	Bar, Tappet Wrench	CRS	1	Pre-Assy X-3259
14	12577-1	Wrench, #6 SAE Locknut		1	
15	B-4376	Oil Can, (Zinc Oilers)		1	Perko #3
16	B-4379	Paint, Enamel		1	Gal. Std.Shop Color
17	B-4534	Wrench, Nozzle Nut		1	Bonney 2812C 1-1/8 & 1-1/4 opng
18					
19	1317-5	Fixture Piston Ring	CI	1	
20	1554-1	Plate, Liner Puller	CI	2	
21	1554-3	Bolt, " "		1	1-8 x 50
22		Nut, " "		1	1-8

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE
NEXT PAG

Date Issued
Retyped.

ASSEMBLY NO. 108-FF
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Tool List, G eng.

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	1794-1	Bar, Flywh. Bolt, Thru-bolt	CRS	1	1-1/4 x 48
2	11717-1	*Jacking Screw for Eng. Base		4 6	For each 6 Cyl Eng. " " 8 " "
3		(not supplied if Sub-base is used)			
4		* Use 8 EACH for G-1-Z Base Use 10 EACH for G-1-AA "			
5		Jackscrew, Air Valve Cage		2	Setscrew, Sq. Hd. 1/2 - 13 x 3
6	11718-1	Wrench, Zero Lash Unit		1	
7	11719-1 11720-1	Tool, Brg. Shell Removing	St	1	Forged Crankshaft only Cast " "
8	11724-1	Bar, Cyl. Hd. Con. Rod, Main Brg.	CRS	1	1-1/8 x 36
9	11731-1	Body, Valve Grinding Tool	CRS	1	Pre-Assy 12028
10	11731-2	Pin, " " "		2	1/4 Drill Rod
11	11732-1	Wrench, Relief Valve		1	Welded
12	11845-1	Lifting Nut, Liner Puller		1	1 - 8
13	12562-1	Plate, Piston Holder	CRS	1	
14		Capscrew		1	per Cyl., 1/2-13x2
15	12584-1	Socket, Thru Bolt Nut	St	1 1	" " 1/2-13
16					
17	77242	Pre-Assy., Valve Spring Tool		1	Assy Dwg. 77242 Consisting of:
18	11723-1	Body	CS	1	
19	12642-1	Screw, Comp	CRS	1	5/8 - 11 x 8-1/2
20		Setscrew		2	3/8 - 16 x 2, Sq Hd
21	11722-1	Fork	CS	1	
22	12653-1	Handle	CRS	1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUED
NEXT PAGE

Date Issued: 12-30-43
Retyped: 9-20-48

ASSEMBLY NO. 108-FF
SHEET NO. 4

ENGINE MODEL G

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Tool List, G eng.

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78899	Pre-Assy., Tool Board		1	See Photo #11546 Consisting of:
3	1886	Tool Board		1	
4		Wood Screw		97	#12 x 3/4 long
5	11117-1	Bracket		2	
6	11117-2	"		1	
7	11117-3	"		1	
8	11117-4	"		1	
9	11117-5	"		1	
10	11117-6	"		1	
11	11117-7	"		1	
12	11117-8	"		1	
13	11117-9	"		1	
14	11117-13	"		2	
15	11117-16	"		1	
16	11117-19	"		2	
17	11118-1	"		1	
18	11120-1	"		1	
19	11120-2	"		2	
20	11120-4	"		4	
21	11120-5	"		2	
22	11121-1	"		1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

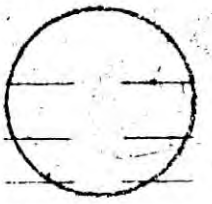
CONTINUE NEXT PAGE

Date Issued: 12-30-43
Retyped: 9-20-48

ASSEMBLY NO. 108-FE
SHEET NO. 5

ENGINE MODEL G.

2 CYL. ___ ___
3 CYL. ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___



ASSY NAME: Tool List: G eng.

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	11122-1	Bracket		1	
2	11122-2	"		2	
3	11122-3	"		2	
4	11122-6	"		1	
5	11122-10	"		4	
6	11122-11	"		2	
7	11122-12	"		1	
8	11122-13	"		1	
9	11122-14	"		2	
10	11122-16	"		1	
11	11124-7	"		1	
12	11124-8	"		1	
13	11124-9	"		1	
14	11124-10	"		1	
15	11124-11	"		1	
16	11124-12	"		1	
17	11124-13	"		2	
18	11124-18	"		1	
19	11124-19	"		1	
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronz

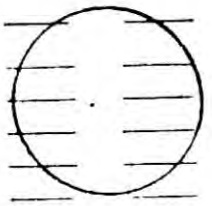
CONTINU
NEXT PA

Date Issued: 12-30-43
Retyped 8-12-53

ASSEMBLY NO. 108-F
SHEET NO. 6

ENGINE MODEL G ___ ___ ___

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___



ASSY NAME: Tool List, G. Eng.

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78901	Assembly Fixture Board		1	Photo 11547 Consisting of:
3	1887	Tool Board		1	
4		Wood Screw		90	# 12 x 3/4 long
5	11117-18	Bracket		2	
6	11119-1	Bracket		2	
7	11120-2	Bracket		2	
8	11122-19	Bracket		2	
9	11126-3	Bracket		1	
10	11126-4	Bracket		2	
11	11126-5	Bracket		2	
12	11126-9	Bracket		1	
13	11126-12	Bracket		4	
14	11126-16	Bracket		2	
15	11126-19	Bracket		2	
16	11126-20	Bracket		2	
17	11126-27	Bracket		2	
18	11126-28	Bracket		2	
19	11126-29	Bracket		1	
20	11127-2	Bracket		4	
21	11128-5	Bracket		2	
22	11128-6	Bracket		2	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 12-30-43
Retyped: 9-20-48

ASSEMBLY NO. 108-F[F]
SHEET NO. 7

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: Tool List, G eng.

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	11129-5	Bracket		1	
2	11130-1	"		2	
3	11130-4	"		2	
4	11130-5	"		2	
5	11132-3	"		2	
6	11879-1	"		1	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3
Date Issued: 2-28-44
Retyped: 2-7-49

ASSEMBLY NO. 108-LL
SHEET NO. ____

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. ____
8 CYL. ____

ASSY NAME: Tool Set For Elliott #BF-26 Turbocharger

FIRST USED ON: 43387

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Allen Wrench 1/2" Cap Screw		1	P-5480-27
2		Allen Wrench 5/16"Cap Screw		1	841520-1
3		Allen Wrench 1/4" Cap Screw		1	P-5480-7
4		Allen Wrench #10 Cap Screw		1	P-5480-6
5		Allen Wrench #10 Set Screw		1	P-5480-4
6		Bearing Shield		1	841087-4
7		Rotor Blocker		1	842401-1
8		Wrench-Oil Baffle Nut		1	830382-4
9		Allen Wrench 3/8" Cap Screw		1	P-5480-10
10		Wrench for Oil Pump Pipe Conn.		1	P-5472
11		Eyebolt for Back Plate		2	841345-1
12		Jack Screws for Bearing Supt.		2	841351-3
13		Bearing Inserting Tool		1	841554-1
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 8-16-44
Retyped: 1-4-49

ASSEMBLY NO. 109-L
SHEET NO. ____

ENGINE MODEL Q G X ____

2 CYL.	____	____	____	____
3 CYL.	____	____	____	____
4 CYL.	____	____	____	____
5 CYL.	____	____	____	____
6 CYL.	____	____	____	____
8 CYL.	____	____	____	____

ASSY. NAME: Operating & Maintenance Instructions (Commercia

FIRST USED ON: ____

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	11927-1	Plate, Instruction	Dural	1	
2		Screw, Flat Head		4	8-32 x 3/8 nickel plate
3					
4		Instruction Book		2	~~Quantity to suit~~
5		Parts Book		1	
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 4-30-42
Retyped: 11-12-48

ASSEMBLY NO. 111-GG
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.

ASSY NAME: PYROMETER (12 point, 0-1200°F) Std. Commer 4" Thermocouples

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-3672	Pyrometer, round multipoint		1	Alnor AX
2		dial numbered 1 to 12 and			
3		off. 0-1200°F front of board mounting.			
4	B-3675	Thermocouple, straight, Std.			Alnor AJ #1029 4"
5		rigid with coupling 4-1/2"			(For quantity see e specs. on each job
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 8-22-45
Retyped: 2-14-46

ASSEMBLY NO. 112-ZZ
SHEET NO. ____

ENGINE MODEL G ____ ____ ____

2 CYL. ____ ____ ____ ____
3 CYL. ____ ____ ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. 1 ____ ____ ____
8 CYL. ____ ____ ____ ____

ASSY NAME: Lube Oil Cooler Thermxchanger 836-BF 1-Pas

FIRST USED ON: 45136

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-4327	Oil Cooler, Thermxchanger		1	E. C. Cooley Co.
2		836-BF, single-pass, 4"			
3		tap jacket water connections,			
4		3" tap oil connections.			
5		Cooler to have name plate			
6		marked with our part number.			
7		3¼ Baffle Spacing.			
8					
9		ser. no. X-2471			
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

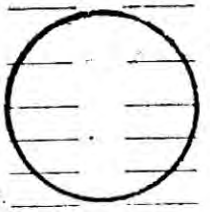
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 2
Date Issued: 12/28/45

ASSEMBLY NO. 113-E
SHEET NO. 1

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Spare Parts
DMG-36 Air Starting
w/Piston type Reverse Mech.
Oil cooled pistons large Lube Pump
FIRST USED ON: 45125

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2		The entire equipment shall be packed in a manner suitable			
3		to protect it from dirt, moisture and mechanical injury during ship-			
4		ment and storage. Standard wooden boxes should be used. Spare par-			
		should be packed separately from the miscellaneous engine parts.			
5		All parts shall be clearly tagged with part numbers.			
6					
7	B-3026	Pump, Bendix #FCX-18		1	Bendix
8	G-2525 ~~B-3033~~	Holder, Bendix #HCV-250		1	Bendix
9	B-3032	Nozzle		1	Bendix
10	B-3036	Tip, 8 hole .012" 130°		1	Bendix
11					
12	77837	Pre-Assy., Injection Line		1	
13					
14	76747	Pre-Assy., Inlet Tube		1	
15					
16	B-3026-13	Screw, Air Bleed		1	Bendix 10-22737
17	B-3354-13	Gasket, Bleeder Screw		1	Bendix 10-16466
18	1143	Gasket, Nozzle Holder	Cop	6	
19	75454	Gasket, Fuel Line Screw	Cop	6	
20					
21	B-3706	Element, Winslow #800-BF-4		2	Absorbent Element
22	B-3396	Element, Purolator #D-113JJ-10		1	Metal Element

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINU
NEXT PA

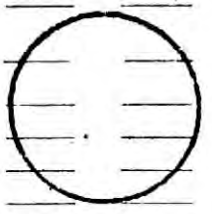
Edition 2

Date Issued: 12/28/45

ASSEMBLY NO. 113-E
SHEET NO. 2

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL.



ASSY NAME: Spare Parts
DMG-36 Air Starting
w/Piston Type Reverse Mech.
Oil cooled pistons Large Lube Pum
FIRST USED ON: 45125

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-4244 B-3150	Element, Cuno EGF-2 Element, Cuno #EGF-2		1 1	When G69HHH & G69B4 is When G69CC is used
2					
3	60359-1	Spring, Safety Valve		1	
4	7700-1	Spring, inner-Int. & Exh.		2	Spring Steel
5	7699-2	Spring, outer-Int. & Exh.		2	Spring Steel
6	75785	Spring Seat(lower) Int.&Exh.	CRS	2	
7	75294	Retainer	CRS	2	
8	7669-2	Wedge	CRS	4	Halves
9	7798	Gasket, Cylinder Head		6	3/64 Johns-Man. #76
10	B-3093	"Zero-Lash" Unit		2	Wilcox-Rich T-3572-A
11	7668-2	Valve, Exhaust		1	
12	7668-1	Valve, Intake		1	SAE 3140
13					
14	78120	Pre-Assy.Int.& Exh.Tappet Roller		2	
15					
16	78115	Pre-Assy.Fuel Tappet Roller		1	
17					
18	76398	Pre-Assy., Relief Valve		1	
19					
20	76751	Pre-Assy., Air Stg. Valve		1	
21					
22	G-1070-1	Spring, Pilot Valve		1	

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

CONTINUE
NEXT PAG

Edition 2
Date Issued: 12/28/45

ASSEMBLY NO. 113-E
SHEET NO. 3

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___

ASSY NAME: Spare Parts
DMG-36 Air Starting
w/piston Type Reverse Mech.
Oil cooled pistons Large Lube Pu
FIRST USED ON: 45125

ASSY DWGS: ___

It.	Part No.	Part Name	Matl	Qty	Remarks
1	G-1066-1	Spring, Air Start. Valve		1	
2	79700-1	Spring, Valve	Br	2	
3	B-3775	Ring, Air Start. Valve	Brz	1	Cut 1/8 x 2-3/4 AH Angle
4	B-5001 ~~B-3037~~	Packing "O" Ring		2	~~Goodrich AN 6227-18~~
5	B-3712	Seal, Piston Shaft		1	
6	B-3713	Seal, Piston Shaft		1	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

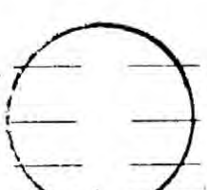
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 9-13-44
Retyped: 8-27-46

ASSEMBLY NO. 113-C
SHEET NO. 1

ENGINE MODEL

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___



ASSY NAME: Spare Parts for Supercharger BF-26 w/Tachometer

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B3519-17	Thrust Bearing		1	Elliott #840760-3
2	B3519-95	Thrust Collar		1	Elliott #840759-1
3	B3519-97	#1 Woodruff Key-Thrust Collar		1	Elliott #P-602
4	B3519-62	Gasket-Oil Drain Flange		1	Elliott #840878-1
5	B3519-38	Gasket-Oil Baffle		1	Elliott #840889-1
6	B3519-99	Labyrinth Ring-Inner		1	Elliott #840570-1
7	B3519-90	Labyrinth Ring-Outer		1	Elliott #840571-1
8	B3519-91	Gasket-Bearing Support-Inner		1	Elliott #840890-1
9	B3519-92	Gasket-Bearing Support-Outer		1	Elliott #840886-1
10	B3519-34	Bearing Shell-Outer		1	Elliott #840837-1
11	B3519-35	Bearing Shell-Inner		1	Elliott #840808-1
12	B3520-35	Gasket-Blower Casing Joint		1	Elliott #841373-1
13	B3520-34	Gasket-Turb. Casing Water Out.		1	Elliott #841460-1
14	B3519-114	½ Pt. form-a-gasket Cement		1	Elliott #P-5521
15		Gasket-Back Plate		1	Elliott #P-5522-1
16	B3519-32	Oil Pump Coupling		1	Elliott #840914-1
17	B3519-64	Relief Valve Spring		1	Elliott #840941-1
18	B3519-66	Gasket Oil Filter		4	Elliott 841167-1
19	B3519-67	Oil Filter Core		2	Elliott #850239
20	B3519-70	Gasket-Oil Pump Suct. &Dischgr.		2	Elliott #841168-1
21		Oil Seal-Oil Pump		2	Elliott #P-5520
22		Oil Pump Assembly		1	Elliott #P-5484-1

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

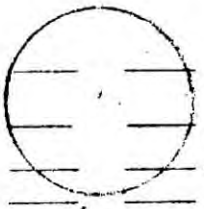
CONTINUE NEXT PAGE

Date Issued: 8-15-39
Retyped: 3-13-50

ASSEMBLY NO. 115-T
SHEET NO.

ENGINE MODEL UW FG

	UW	FG
2 CYL.		
3 CYL.		
4 CYL.		
5 CYL.		
6 CYL.	1	1
8 CYL.	1	1



ASSY NAME: Tachometer
Weston 2-Station, Reversible, Indicator in English

FIRST USED ON: 9020-22

ASSY DWGS: 10537

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-4012	Tachometer Generator, Model		1	Weston
2		724 Type C2 equipped with 3/16 Dia.Drive, to fit Std.			
3		SAE Marine Engine Tachometer Shaft Connections			
4		Tachometer Indicator, Model		2	Weston
5		271, Scale -0- RPM with Scale in red from to			See Engine Specs for
6		RPM. Gen. to run x Eng.Speed.			Data. Take-Off Ratio UW -1.406 x Eng.RP
7		Stud 1-1/2" long. To operate in parallel			Old FG -1.5625 x Eng. -1.3889xEng.R
8					X -1.3333xEng.R
9		Left Side to be marked "Astern", right Side to be marked "Ahead"			for Q {4x Eng.RPM Camshaft Drive
10					for Q {2x Eng.RPM Idler Gear Dri
11					
12	B-3812	Cable, Automotive ~~Armored~~		8 ft.	~~43-W-14~~
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 9-13-44
Retyped: 1-23-46

ASSEMBLY NO. 113-C
SHEET NO. 2

ENGINE MODEL

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Spare Parts for Supercharger BF-26 w/Tachometer

FIRST USED ON: _____

ASSY DWGS: _____

It.	Part No.	Part Name	Matl	Qty	Remarks	Elliott Numbers Parts #	Catalog
1	83519-110	Gasket Oil Pump Flange		1			#840898-1
2		Tachometer	Group #850401	1		251	830481
3		Tachometer Drive Shaft		1		232	841223
4		Tachometer Drive Gear		1		233	841222
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-18-46

ASSEMBLY NO. 129-JJJ
SHEET NO. ____

ENGINE MODEL ____ ____ ____ ____

2 CYL. ____ ____ ____ ____
3 CYL. ____ ____ ____ ____
4 CYL. ____ ____ ____ ____
5 CYL. ____ ____ ____ ____
6 CYL. ____ ____ ____ ____
8 CYL. ____ ____ ____ ____

ASSY NAME: Heat Exchanger
Thermxchanger, #860-BF, 1-Pass with 7" Baffle Spacing

FIRST USED ON: 45125-127, 45129

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1	B-4020	Heat Exchanger, Type #860-BF		1	Thermxchanger
2		Thermxchanger, single pass,			E.C.Cooley Co.
3		with 7" baffle spacing, 4"			
4		tap sea water & 3" tap			
5		jacket water connections.			
6		Cooler to have name plate			
7		marked ~~"Jacket Water Cooler"~~			
8		with our part number.			
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

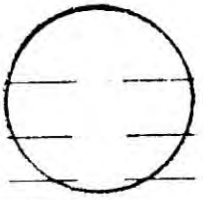
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 10-22-43
Retyped: 4-19-49

ASSEMBLY NO. 138-T
SHEET NO. ____

ENGINE MODEL G

2 CYL. ____
3 CYL. ____
4 CYL. ____
5 CYL. ____
6 CYL. 1
8 CYL. 1



ASSY NAME: Flywheel Barring Device
10½" (For cast slot flywheel)
Mounted on G Marine Base

FIRST USED ON: ____

ASSY DWGS: ____

It.	Part No.	Part Name		Matl	Qty	Remarks
1						
2	78141-1	Bracket, Barring	Pre-Assy 78873	CS	1	
3	9151-2	Pin, Bracket		CRS	1	
4		Cotter Pin			2	3/16 x 1-3/4
5		Capscrew, Bracket-Base			3	5/8-11 x 1-1/4
6	7848-1	End, Pry Bar	Pre-Assy 78870		1	
7	7848-2	Handle, Pry Bar			1	1-1/4" x 48" Blk.
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 11/26/37
Retyped: 1/30/46

ASSEMBLY NO. 139-A
SHEET NO.

ENGINE MODEL F G

2 CYL.				
3 CYL.				
4 CYL.				
5 CYL.				
6 CYL.	1			
8 CYL.		1		

ASSY NAME: Lube Oil Hand Pump
7.5 Rev. per gallon

FIRST USED ON: 7153

ASSY DWGS: 71037

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Pump, hand, 1¼"		1	Viking KK-57
2		direct ratio 7½ Rev. per gallon			
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

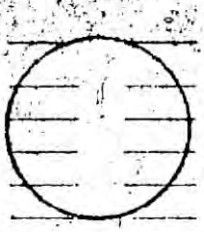
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 1-2-45

ASSEMBLY NO. 148-TT
SHEET NO.

ENGINE MODEL G

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL. 1
8 CYL. 1



ASSY NAME: Safety Alarm
Audible only, Marine Engines
Supercharged

FIRST USED ON: 44310

ASSY DWGS: 79753

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Howler, Weatherproof,		1	Benjamin Elec.Co.
2		Cast Body, Conduit Connection			For A.C. use #8546 B41 For D.C. use #8526 B41
3					
4	B-4109	Temperature Switch,		2	Detroit Lubricator Co
5		#250-WT Model RH-1, Range 180°-210° Single pole			Circuit closes with increase in temperatu
6		single throw 1/2" Male N.P.T. Set for 180° & above			
7					
8	B-4114	Pressure Switch, #250-WT		2	Detroit Lubricator Co
9		Model RB-1, Range 3-50 PSI, Single Pole, single throw			Circuit opens with increase in pressure
10		1/4" N.P.T. Set as follows: & below			
11		1 ea. Super Lube Oil Press. 5 Psi & below 1 ea. Lube Oil Press. 15 Psi & below			
12	B-4127	Throttle Switch		1	Micro Switch BZ-RS7
13	76616	Bracket, Throttle Switch	St	1	W/ A-2 terminals
14		Mach. Screw Rd.Hd.		2	6-32 x 1
15		Nut, hex		2	6-32
16		Capscrew		2	1/4-20 x 1/2
17		Fiber		1	1/32 x 1-7/8 x 1-7/8
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 2

Date I

ASSEMBLY NO. 149-B
SHEET NO.

ENGIN

ASSY NAME: Auxiliary Pump
Supercharger Cooling
Without Air Compressor

FIRST USED ON: 43055-56

5 CYL.
6 CYL. 1
8 CYL.

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1		Circulator, Model H-2,		1	Bell & Gosset Co.
2		Size 2", with cast iron			See Specs. for voltag
3		body, with 1/6 HP motor			
4	78609-1	Bracket, Circulator		1	1/4 Steel Plate
5		Capscrew		4	3/8-16 x 3/4
6		Lockwasher		4	3/8
7		Machine Screw, Circulator		4	#10-32 x 5/8 round he
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Edition 3

Date Issued: 9-11-43
Retyped: 12-2-52

ASSEMBLY NO. 152-C
SHEET NO. ____

ENGINE MODEL (G-36, G-8 & larger)

2 CYL. ___ ___ ___ ___
3 CYL. ___ ___ ___ ___
4 CYL. ___ ___ ___ ___
5 CYL. ___ ___ ___ ___
6 CYL. ___ ___ ___ ___
8 CYL. ___ ___ ___ ___

ASSY NAME: Water Surge Tank
35 Gal. 20" Dia.
Rochester Magnetic Gag

FIRST USED ON: ____

ASSY DWGS: ____

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	12343	Pre-Assy., Water Surge Tank		1	Consisting of:
3	11632-1	Tank & Cover	St	1	Welded Together
4	93012-1	Flange	St	1	
5	11984-1	Gasket, Cover		1	3/32 Gar.#660
6		Bolt		24	5/16-18 x 5/8
7		Nut, Hex.		24	5/16-18
8		Pipe Plug		2	1/2 Galvanized
9					
10					
11		Capscrew Gage - Tank		4	5/16-24 x 3/4
12	B-6744	Gage		1	Rochester Mfg.Co. Model #4MGFR 4" Dia
13					As per Dwg.3144-C
14					(For Water Tank) 12
15	B-5311	Gasket		1	
16					
17					
18					
19					
20					
21					
22					

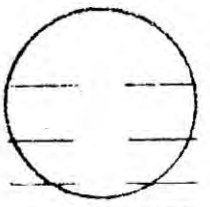
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 2-19-43
Revised: 3-2-44
Retyped; 4-19-49

ASSEMBLY NO. 153-H
SHEET NO.

ENGINE MODEL G

2 CYL. ___
3 CYL. ___
4 CYL. ___
5 CYL. ___
6 CYL. 1
8 CYL. ___



ASSY NAME: Pyrometer Conduit Assy
G-6 Supercharged, 9 Thermocouple
Water Cooled Ex.

FIRST USED ON: ___

ASSY DWGS: 78837

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	78137	Pre-Assy., Conduit		1	Consisting of:
3		Flex.Connector		1	1-1/4
4		Flex.Connector		1	1-1/4 x 90
5		Pipe Plug		1	1-1/4
6		Nipple Conduit		6	1-1/4 x 12-3/8
7		Greenfield		6	1/2 x 24"
8		Greenfield		1	1-1/4" x 35"
9		Tee Unilet		6	Appleton Cat.#33012
10		(Supercharger) Tee Unilet (Connections)	Cat.#33012	1	Appleton, Form 35 (See Assembly Dwg.)
11		Flex. Straight Connector		12	1/2
12		Flex.Connectors		6	1/2 x 90°
13		Greenfield- For No 7 Connection		1	1/2 x 27"
14		Greenfield-For No 8 Connection		1	1/2 x 28"
15		Greenfield-For No 9 Connection		1	1/2 x 42
16	B-6257	Leadwire, Rubber & Weather-		170'	~~170'~~ #CW2-14 (Brown
17		proof Braid compensated Iron Constantan			
18		Wire Tag		9	Oakland,C #7505 L.L.Burror Co
19					
20					
21	78353-1	Hanger Bracket	St	3	
22					

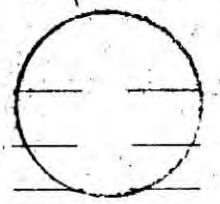
CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

Date Issued: 12-17-43
Retyped: 8-27-46

ASSEMBLY NO. 154-C
SHEET NO.

ENGINE MODEL

2 CYL.
3 CYL.
4 CYL.
5 CYL.
6 CYL.
8 CYL.



ASSY NAME: Main Coupling
~~5½" Core~~ 6½ Max. Bore
6⅓ Pilot, 15 O.D.Flange

FIRST USED ON:

ASSY DWGS:

It.	Part No.	Part Name	Matl	Qty	Remarks
1					
2	10455-3	Flange, coupling	CS	1	Do not bore
3	7111-A	Bolts, coupling flange		6	SAE 4140, 1⅛-12 x 5-
4	126	Nut, castle		6	
5		Pin, cotter		6	3/16 x 2-1/4
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

CI = Cast Iron
CS = Cast Steel
FS = Forged Steel
CRS = Cold Rolled Steel
CBr = Cast Brass
CBrz = Cast Bronze

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

PART I

INTRODUCTION

A. Introduction and Working Principles

The purpose of this booklet is to acquaint the owner and engineer with the operation of his engine. In order to obtain maximum efficiency and continuous trouble-free service, the contents of this booklet should be carefully studied and the instructions, particularly regarding inspection and maintenance, followed carefully.

Enterprise Diesel Engines have proven themselves, and are giving all over the World continuous trouble-free service, even under extremely severe working conditions. The design of the engines was selected after exhaustive research and many years of engine building experience, with the primary view in mind of obtaining maximum simplicity of operation and maintenance, and maximum dependability.

Every engine is carefully and thoroughly tested and inspected before leaving our plant, and only such adjustments should be made by the operator as are indicated in the succeeding pages. It is suggested that the operator establish a certain system of routine inspection suitable to his particular service condition. This will more than pay for itself in lowered maintenance cost and more satisfactory operation.

The matter of cleanliness can hardly be stressed enough. It indicates, in a large measure, the care the engine receives otherwise.

If there is any specific condition that troubles the operator, and for which there seems no explanation in this booklet, we suggest getting in touch with our Service Department, stating the condition in full.

Enterprise Diesel Engines operate on the four stroke cycle principle. They are of the full diesel, vertical, mechanical injection type. The fundamental principles of operation are as follows:

1. Intake Stroke:
   Air is drawn into the cylinder at atmospheric temperature and pressure.

2. Compression Stroke:
   The inlet valve closes when the piston is slightly past bottom dead center. During the upward stroke of the piston the air is compressed to approximately 400 lbs/sq.in. This raises the temperature sufficiently to ignite the fuel. Just before top dead center, the fuel is sprayed into the compressed air through a nozzle, which is designed for the proper distribution and atomization of the fuel.

3. Expansion Stroke:
   During this stroke work is done on the piston by the combustion of the fuel. The heated gasses expand during the downward stroke of the piston until, near bottom dead center, the exhaust valve opens.

4. Exhaust Stroke:
   The exhaust valve remains open during the next upward stroke of the piston, expelling the gasses, until the piston again reaches top dead center when the exhaust valve closes, the inlet valve opens and the cycle is repeated.

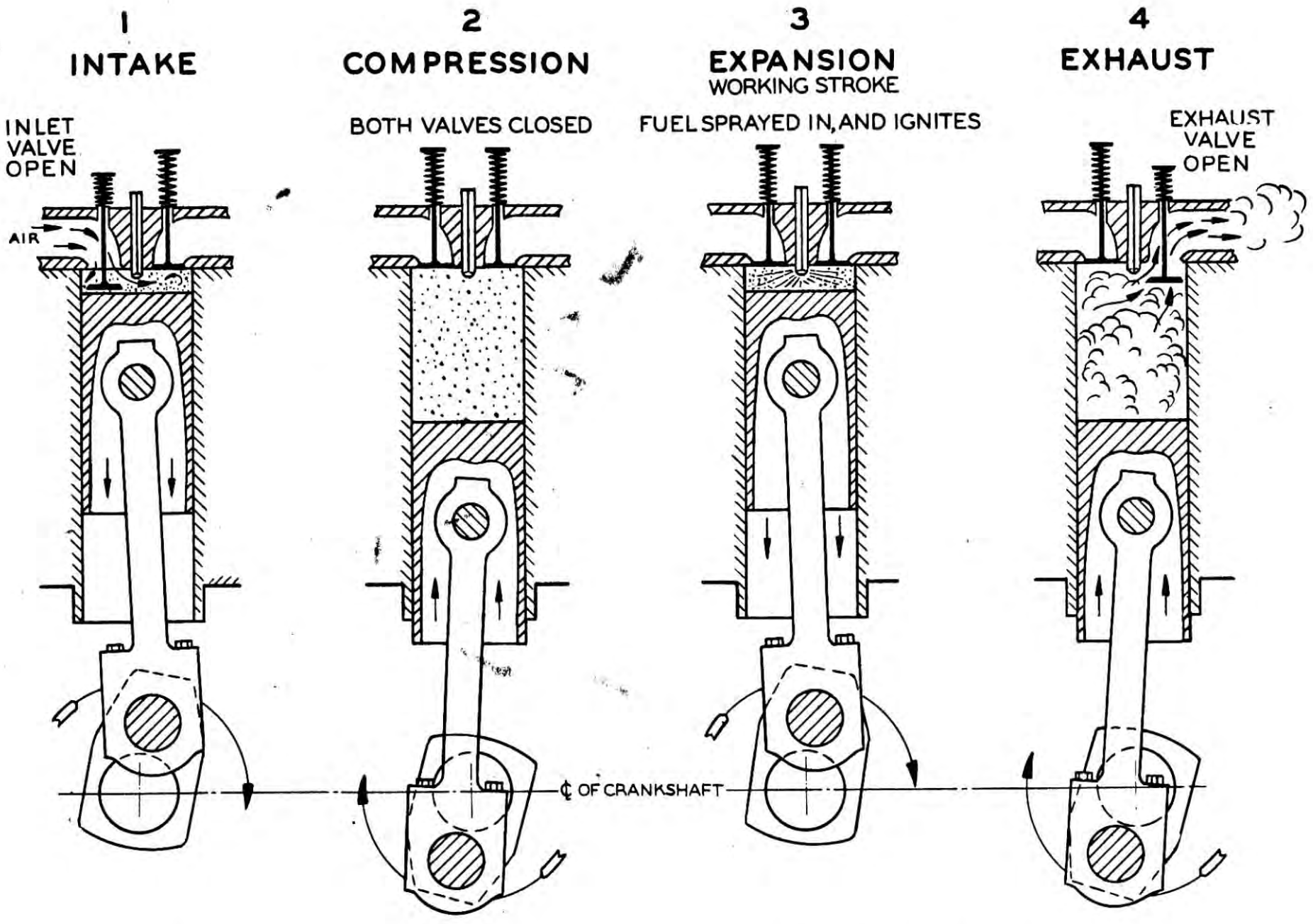


DIAGRAM OF WORKING PRINCIPLE

D-1061

PART II

INSTALLATION

A. General

The installation of the engine will vary according to its use. In all cases the Enterprise Engine & Foundry's installation drawing should be followed closely. All service lines should be piped in accordance with piping diagrams supplied by Enterprise, except as modified by the Naval Architect; however such modifications are to be approved by Enterprise. Accurate alignment of the engine and its drive is of prime importance, and all precautions should be taken to obtain maximum accuracy.

B. Placing Of Engine On Its Foundations.

Installation dimensions of the engine unit are given on Enterprise certified installation plan. Care should be exercised in planning installation to allow adequate clearances for servicing.

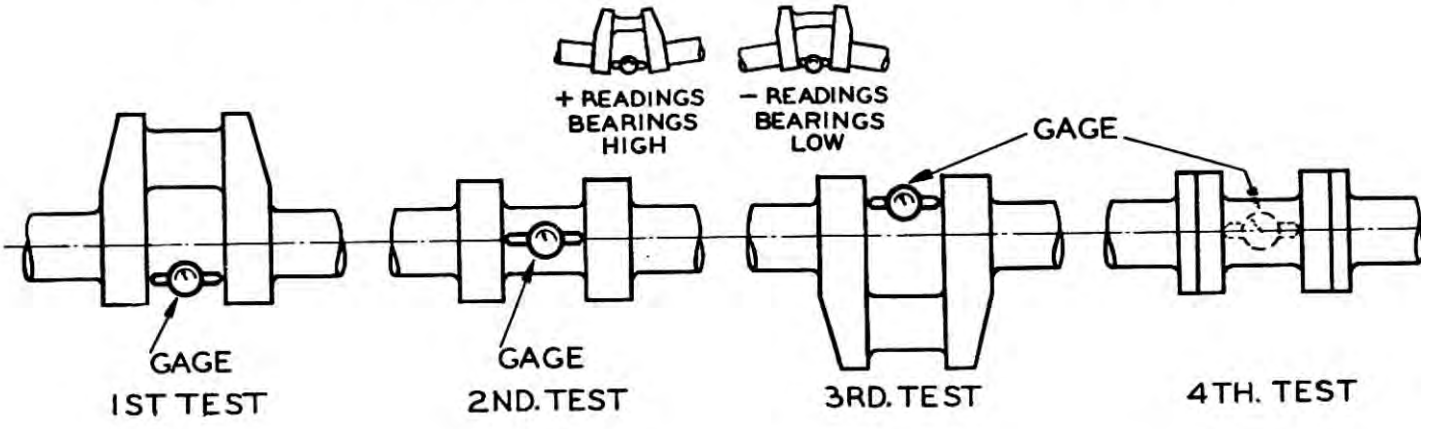
When placing the engine on its foundations, make sure (1) That the engine is evenly supported over its entire length so that there is no distortion of the base (2) That the crankshaft alignment with the generator remains accurate.

After the engine has been bolted down, check crankshaft alignment as follows: Measure distance between inside faces of crank webs with crankshaft deflection gage, or, if not available, with inside micrometers. Check this distance at intervals of approximately 90 degrees. Readings should not differ by more than .003". If misalignment is indicated, determine the cause and correct. Distortion at the last two cranks only usually indicates crankshaft is out of line with the generator. See crankshaft alignment sheet among illustrations in this book.

CRANKSHAFT ALIGNMENT CHECK

READINGS TO BE TAKEN AFTER FINAL INSTALLATION, BEFORE FINAL TESTS

READINGS ARE IN THOUSANDTHS (.001 ETC.) WITH INDICATOR SET ZERO AT TOP DEAD CENTER OF PISTON. NOTE WHETHER + OR −



POSITION WHEN VIEWED FROM TIMING GEAR END

CYLINDER NO.

	1	2	3	4	5	6	7	8
TOP								
RIGHT								
BOTTOM								
LEFT								

C. Piping

Note: Recommended (minimum) pipe sizes for all service lines are given on a separate sheet further on in this book.

Piping must under no circumstances cause deflections in the mountings of rotating or reciprocating equipment. The weight of heavy auxiliaries - such as booster pumps, or silencers - should never be carried by engine piping. All pipes and fittings should be thoroughly cleaned before assembly, to eliminate the possibility of foreign particles damaging the engine or its auxiliaries.

RECOMMENDED PIPE SIZES

FOR G-8 AND G-6 ENGINES

Starting Air	1½"
Exhaust	8"
Fuel Oil	½"
Lube Oil	2"
Sea Water	4"
Fresh Water	4"

These pipe sizes are for the average installation. ~~For this installation see piping diagrams in rear of this manual.~~

D. Cooling Water Lines (Fresh Water Cooled)

Jacket Water Lines

The jacket water system must be individual for each engine. Jacket water must be clean and soft - i.e. free from scale forming ingredients. Hard water is almost certain to cause scale and must be treated prior to use in the engine.

The jacket water cooling system for these engines consists of the necessary pumps to circulate the water; the heat exchanger where the jacket water is cooled; the passages within the engine through which the water flows and where heat is absorbed from the engine; and the surge tank which maintains a constant head on the pump and also provides for expansion and bleeding of trapped air. The pump, engine, and heat exchanger are connected in a single series circuit and should be provided with a bypass around the cooler. The surge tank should be installed above the highest point on the engine and connected with 1/2" lines from the top of the exhaust manifold and from any other points that may be a source of trapping air. A continuous rise in these pipes must be provided to avoid air pockets.

These 1/2" lines are to have globe valves that are to be just "cracked" about 1/8 turn (1/4 turn maximum).

Proper valving or thermostatic control around the heat exchanger must be provided in order to allow regulation of fresh water temperatures.

A drain valve must be installed in the lowest point in the system. The system may be filled at the surge tank or in the line from the surge tank running to the pump suction.

Salt Water Lines

The salt water system provides a cooling medium for the various units which require cooling. The sea water is pumped from the sea through a lube oil cooler and heat exchanger and hence pumped overboard. Provision must be made by means of suitably-positioned valves, to maintain control over fresh water and lube oil temperatures. Such control can be obtained by by-passes in either the liquid-to-be-cooled lines or in the sea water lines.

In some applications, it may also be necessary to run sea water lines to the thrust bearing and lube oil coolers of accessory equipment.

The sea chest, from which water is drawn by the sea water pump, should be located as far below the water line as possible to prevent its uncovering when the vessel rolls; adequate strainers must also be provided in the sea suction to protect the pump from foreign matter and to minimize the possibility of clogging the coolers and lines.

Provision must also be made for cleaning of the sea chest and for draining the pump suction line.

If positive displacement pumps are used, a relief valve bypassing to the pump suction must be provided between the pump discharge and the first valve in the discharge line. This relief valve may be one nominal size smaller than the water lines.

E. Fuel Oil Lines

The fuel oil is drawn from the storage tank by the fuel oil transfer pump and pumped through a pressure accumulator tank and through the filtering system into one end of the fuel oil header. From the fuel oil header the fuel oil passes through branch lines into the fuel-injection pumps, individual for each cylinder, and injected into the engine cylinders. A relief valve around the pump serves to maintain constant pressure in the fuel header and the injection pumps. Oil passing this relief valve is piped back to the suction line.

The accumulator tank serves to steady the flow into the fuel oil header and also acts as a vent to expel any air which may have gathered in the system.

The fuel oil filtering system must be highly efficient in removing even the most minute particles, in order to protect the precision made fuel injection pump and injection valve. This filtering unit must be kept in perfect working condition and should be of a duplex type, so that the filtering elements may be cleaned without stopping fuel flow into the engine.

A nozzle drain header to accumulate fuel oil bypassed from the fuel injection valves, and on some engines from leakage in the fuel injection pumps, is run the length of the engine and a line should be provided for gravity flow back to the bilge, waste tanks, or storage tanks.

A strainer ahead of the fuel oil transfer pump should be provided.

It is recommended that an auxiliary fuel transfer pump be provided for emergency operation.

F. Lubricating Oil Lines

The lubricating system is of the dry-sump type. The lube oil is carried from the service tank through a duplex basket-type filter, through the positive displacement gear type pump, after which a branch line takes part of the oil through an absorbent type filter and back to the service tank. The major portion of the oil, meanwhile; is forced on into the oil cooler, through a scraper type strainer and on to the lube oil header. By means of branches from this header and via proper grooves and drilled passages, the working parts of the engine are pressure lubricated. In some instances, lubricating oil is distributed to the pistons for their cooling, and also in some instances, a force-feed oiler, mounted on the engine, is used for lubrication of special working parts.

There are several precautions to be taken in installing lube oil servicing equipment:

Pump must be positive-displacement and should be provided with adequate relief valves. Oil should be filtered when hot, that is, prior to cooling in the lube oil cooler. A strainer, cleanable without disassembling, should be provided where the lube oil enters the lube oil header. Provision must also be made for control of lube oil temperature by means of proper bypasses either in the lube oil or sea water system. Means should also be provided for completely bypassing the lube oil cooler in the event of a leak between the lubricating oil and water sections. This is normally accomplished by providing the engines with a four-way valve, which allows the oil to either pass completely through the cooler or to be completely bypassed. This valve is not a flow control valve. It must be either one way or the other.

It is also recommended that hand lubricating oil pump for priming the engine before starting, be provided.

LUBRICATING OIL RECOMMENDATION

For the proper lubricating of engines operating in the various climatic zones, we recommend the following straight mineral oils:

TEMPERATE ZONE

Summer

SAE 30 which is equivalent to U.S. Navy Symbol 3065

Winter

SAE 20 which is equivalent to U.S. Navy Symbol 3050

ARCTIC ZONE

Summer

SAE 20 which is equivalent to U.S. Navy Symbol 3050

Winter

SAE 10 which is equivalent to U.S. Navy Symbol 2110

TROPIC ZONE

SAE 40 which is equivalent to U.S. Navy Symbol 3080

G. STARTING AIR SYSTEM

The compressed air from storage tanks is delivered through a control valve to the air starting valves in the cylinder heads on the engine.

Where pressure reducing valves are used which reduce air pressure from air tank storage pressure to the 250 psi. required for starting engine, valving to isolate and bypass pressure reducing valve should be provided, and a relief valve set at approximately 275 psi. This will allow starting should reducing valve fail.

H. Intake System

The air intake manifold is cast integrally into the cylinder block, and branches are led into each cylinder head. The air enters through louvres in the manifold covers and passes through bronze wool cartridges which are fabricated as a component part of the covers. The bronze wool acts as both a filter and silencer for the intake air.

For supercharged engines, air intake covers have no louvred openings and air is piped from supercharger directly to intake manifold. Where exhaust-gas driven superchargers are used, the air is cleaned and the air flow is silenced in a special unit built into the supercharger. The air is discharged under pressure from the blower directly into the intake manifold.

Where other types of superchargers, either engine or motor-driven, are used, the air is cleaned and the flow is quieted prior to its entrance into the blower. Discharge from the blower is direct into the intake manifold.

Air filters must be kept clean and are a necessity in dusty atmospheres. Each engine should have an independent intake system.

J. Exhaust System

Each engine should be provided with an individual independent exhaust system.

For unsupercharged engines, the exhaust manifold is a unit mounted along the length of the engine and is built in several sections, with flanged connection provided either at each end, or centrally.

Exhaust-gas supercharged engines are provided with a multipipe manifold and discharge directly into the turbocharger mounted on the engine. The gas discharges from the turbocharger through the exhaust silencer and into the exhaust stack.

Engines supercharged by other means exhaust directly through the exhaust silencer into the exhaust stack.

In laying out exhaust piping, as few bends as possible should be used; where bends are necessary, they should be of long radius. If more than three bends are used, the entire pipe should be increased to the next nominal size. If more than six bends are necessary the pipe size should be increased two nominal sizes. The length of the exhaust piping is not critical although if too long a pipe is used, the pipe size should be increased to reduce the back pressure.

To allow for movement, heat expansion, and the isolation of vibration, a length of flexible metal tubing should be installed in the exhaust line as near the engine as possible.

The exhaust manifold on the engine is generally water-jacketed and the exhaust line should in almost all cases be fully lagged in order to minimize heat radiation into the engine room. The weight of the exhaust silencer and exhaust line must not be imposed on the engine, therefore separate support should be provided.

PART III

INSTRUCTIONS FOR STARTING

A. Before Starting for First Time

When an engine is just installed or has been out of service for a long time, or if extensive work has been done on the engine, the following points should be observed before any attempts are made to start:

Check all bolts and nuts to make sure they are tightened down thoroughly, particularly main bearing, connecting rod, cylinder head and foundation bolts.

Check crankshaft alignment, as explained in Part II Installation.

Inspect all connections in lubricating and fuel oil, cooling water and starting air lines.

Bar engine over with relief cocks open, at least three complete turns, to make sure everything is clear.

Remove crankcase side covers and bar the engine over to allow easy access to lubricating oil suction inside the crankcase. Inspect lubricating oil suction in order to make sure it is not clogged and that no water or grit has accumulated in the crankcase.

Inspect also the lubricating oil service tank, which should be at least 3/4 full before starting. Open valves from the service tank and any other valves which are necessary to the flow of the lube oil through the system. Keep the lubricating and fuel oil filters clean at all times.

Set all injection pumps at full fuel.

Open the nozzle bleeder valve slightly and prime the pumps by means of the priming shaft on the pump base until a definite resistance is felt, indicating that all the air has been expelled. Do not use too long a wrench nor too great a force on the priming shaft. If, upon attempting to prime a pump, no resistance at all is felt, it is an indication that the fuel tappet is on the peak of the fuel cam. First prime those pumps that are not in this position and then bar the engine over until the tappets are contacting a low point on the cam, thus making it possible to prime the remaining pumps. This condition can readily be seen by observing the timing mark in the window in the fuel pump body.

Inspect adjustment of hydraulic valve lifters as explained in Section "Valve Gear" and clearance of starting air valve as indicated on Engine Instruction Plate. Be sure air valve cap is in upper position when checking clearance. (See Section, "Timing of Air Starting Valve.")

Lubricate fuel pump control and governor linkage making sure all pins and cotter pins are in place.

Open all valves in the water suction and discharge lines and make sure there are no obstructions in the lines.

B. Description of Controls

The engine is equipped with a starting button and a speed control lever which controls the speed of the engine through the governor.

Starting the Engine

To start the engine set the speed control lever at about one quarter speed. Then press the starting button and release as soon as engine fires.

Stopping the Engine

To stop the engine move the speed control lever back against the stop on the speed control segment.

C. Starting and Stopping

1. Air Pressure

Air pressure of not less than 200 lbs/sq.in. should be available although a warm engine may be started on 100 lbs/sq.in.

2. Operating Pressure Check

As soon as engine is running all the gages should be observed to check for proper operating pressure. Particularly note lube oil and circulating water. If conditions are not normal shut down and determine cause.

3. Warning!

Never use any other compressed gas but air for starting, and particularly do not use Oxygen under any circumstances as it will result in a violent explosion.

4. Emergency Stopping Procedure

If for any reason the engine cannot be shut off by the operating lever it may be stopped by applying pipe wrench to fuel control shaft and turning shaft in a counterclockwise direction, that is, when looking from gearcase end of engine to rear of engine. Continue to turn shaft until fuel is shut off.

D. Running and Inspection

1. Pressures

While running under normal load, at rated speed, pressure gages should read as follows:

Lubricating Oil	25 to 28	lbs/sq.in.
Circulating Water	15 to 20	lbs/sq.in.
Fuel Oil	10 to 15	lbs/sq.in.
Starting Air	150 to 250	lbs/sq.in.
Sea Water	3 to 15	lbs/sq.in.

2. Temperatures

While running under normal load, at rated speed, temperature should read as follows:

Lubricating Oil From Engine	120° to 160° F.
Circulating Water From Engine	140° to 170° F.
Exhaust Temperatures	750° to 1000°F. ON SUPERCHARGED ENGI

600° to 900° DEGREES
ON

General Maintenance

All parts of the engine should be felt frequently, especially during the first few hundred hours of operation, to detect any excessive temperature on head and cylinder side covers. Undue high temperatures in any connecting rod or main bearing can usually be detected by the higher temperature of the respective side cover.

If the fuel injection pumps require adjustment in order to average the exhaust temperatures, (50° F. range), care should be taken to see that the difference between any two pumps is not in excess of 2 millimeters on the control rod. (See illustration "Fuel Pump"). If the difference in exhaust cannot be corrected without exceeding this maximum difference, it is an indication of wear or improper adjustment of pumps or nozzles, or obstruction in the holes of the injection nozzles. This condition may also be due to carbon deposits on the thermocouples or the use of a thermocouple with the wrong length of stem.

Hourly

A reading on all instruments should be taken and recorded in the engine room log. In addition, feel side covers and check level in lubricating oil day tank. Turn handles on all knife edge strainers, if any, once every four hours.

Daily (Every 24 Hours)

The drains in the fuel filter, lubricating oil filter and strainers should be opened at least once a day to drain out any water or sludge which may accumulate; also check fuel, lubricating oil, and water systems for air.

Weekly (Every 60 Hours)

Fill governor oil container with a light oil, SAE 30.

Monthly (Every 250 Hours)

Remove crankcase breather and wash in a mixture of kerosene and lubricating oil.

Inspect inside of crankcase sump for an excess of water. Drain oil from sump if any great quantity of water or sludge is present, and determine the cause.

Remove camshaft covers and inspect tappets and rollers. Tappet clearances in guides should be checked with feelers, when roller is on low part of cam. (Adhere closely to clearances as given in "Table of Clearances").

Tappets should be raised by means of a brass pry-bar, and rollers and needle bearings checked for freeness on pins and in slot.

The fuel and starting tappets should return readily by the force of the springs.

To adjust the clearance for proper air starting valve timing, it is essential that the valve is in the extreme upper position. (See illustration "Air Starting Valve".) To accomplish this most conveniently proceed as follows: Close the globe valve in the starting air pipe and open the bleeder valve on aft starting air connection on no. 6 cylinder. Open the main starting valve wide by means of the jack screw underneath. (See illustration "Main Starting Valve".) Then crack the globe valve just enough to maintain 25# - 35# pressure in the manifold. This pressure will hold the valves up but it is not enough to turn the engine over. Now by pushing down on the push rod end of the rocker arm until the tappet roller contacts the low part of the cam, the clearance can be measured between the rocker roller and the top of the air starting valve. The recommended amount of clearance is stamped on the engine nameplate.

CAUTION! Always before attempting to bar the engine over, be certain that the globe valve in the air starting line is closed, and manifold bled of all air.

Every Three Months (750 Hours)

Remove and inspect one or more connecting rod bearings.

Remove the thermocouples from the exhaust manifold, and check stems for an accumulation of carbon. Scrape if necessary.

Remove and check relief valve on cylinder head (use a hydrostatic tester if available) to make sure it will release at specified pressure of 900 lb./sq.in.

Every Six Months (1,500 Hours)

Remove one or more valves and check for pitting or wear, also inspect valve lifting mechanism.

Remove covers on timing gear case and inspect gears. Test backlash between all gears, also radial and thrust clearance of idler bushings. Remove shims if necessary behind idler thrust plates.

If backlash between any pair of gears exceeds value given in Table of Clearances by .006" or more, due to excessive wear of the teeth, replace the worn gear.

Inspect camshaft bearings by means of feelers. If wear is indicated above allowable clearances (see "Table of Clearances") replace with new shells.

Never attempt to scrape or rebabbitt worn shells as they are faced with a special thin bearing metal.

If supercharger is supplied with engine, thoroughly clean supercharger and inspect bearings.

Flush the cooling system thoroughly with an approved solvent opposite to direction of normal flow. Then thoroughly flush with fresh water for an additional two or three hours to remove all trace of solvent. This should be done at least once every 1500 hours and oftener if necessary.

Avoid the use of any corrosive substance such as muriatic acid in flushing cooling system.

Annually (Every 3000 Hours)

Overhaul and clean entire engine removing and thoroughly cleaning all parts and accessories, and inspecting for wear. Replace all broken and worn parts. Disassemble all relief valves and test for pressure. Repack all glands.

PART IV

MAINTENANCE, DESCRIPTION OF PARTS, METHODS OF ASSEMBLY AND DISASSEMBLY

A. Fuel Pumps and Nozzles

There is an individual injection pump and nozzle for each cylinder. Pumps are operated from the main camshaft and are all connected to a common supply header. Each pump discharges through a separate injection tube to its respective nozzle in the center of the cylinder head. A full description of pump and nozzle is given below.

Nozzles

If engine has been running unevenly and a fuel nozzle is suspected, remove this nozzle and replace it with a spare.

To Remove Nozzle:

Disconnect inlet and drain. Remove nozzle retainer. Nozzle assembly may then be pried out.

Before replacing nozzle, remove all carbon or other foreign substance from nozzle seat in head. See that gasket surface is clean and gasket clean and in good condition. Tighten hold down nuts evenly and just sufficiently to prevent blow-by.

The nozzle may be tested by connecting it to the high pressure fuel line from any pump. Engine should then be turned over slowly by air. Other cylinders can be prevented from firing by opening vent screws on nozzle, which allows fuel to be by-passed from other pumps.

Nozzle can also be tested by means of test pump. When pressure as shown on gauge of test pump reaches the proper value, valve in nozzle should snap open and a finely atomized fuel spray should emerge from each of the orifices in the

nozzle. These sprays should be symmetrical and of equal density. If test pump is operated slowly, valve in nozzle will open and close rapidly, the condition commonly known as chattering. An experienced operator can tell from the sound of this chattering whether the nozzle is in good condition.

Nozzle should be replaced and repaired if it shows excessive dribble or if fuel emerges in a solid stream. Dribble will cause excessive carbon formation, even though nozzle atomizes properly. A solid stream is caused by a sticky stem or by foreign particles within the passages or under the seat.

If nozzle valve opens at a pressure below or above 2200 - 2300 lbs, the spring tension should be adjusted.

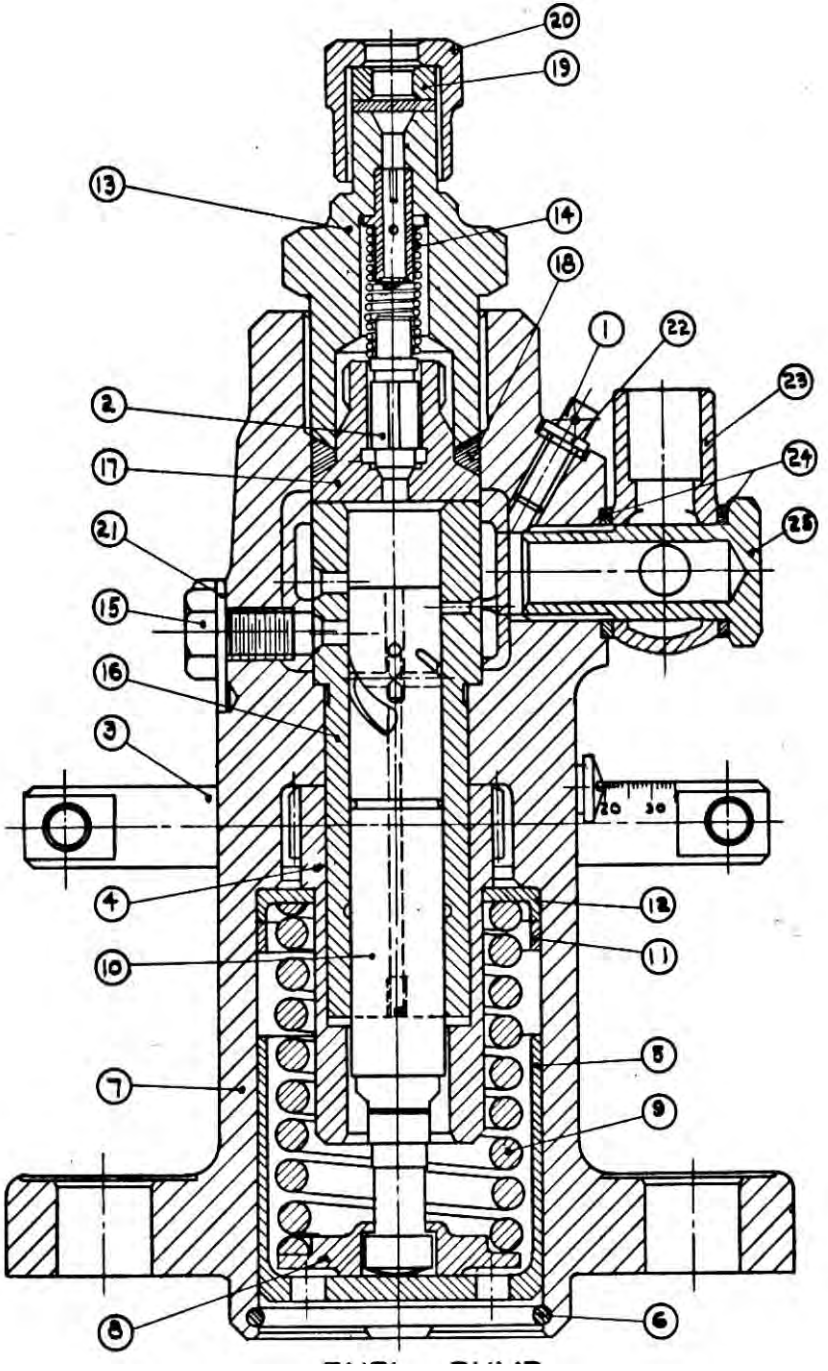
For methods of adjustment, disassembly and cleaning of nozzles, see Section "Nozzles".

B-3 Pumps - See drawings "Fuel Pump" and "Timing of "Fuel Pump"

If one of the injection pumps does not function properly, first ascertain if fuel oil is flowing freely to pump. To do this, loosen vent screw (1) on front of pump just above supply connection. Fuel oil should flow freely without showing air bubbles. Allow fuel to flow until all air bubbles disappear. If flow is sluggish it is probably due to clogged filters. In this case clean filters.

Next open nozzle bleeder valve by turning handle on top of nozzle body in center of cylinder head two turns in a counter-clockwise direction. Then, with the control rods on the pumps set at approximately 20 mm., operate the pump a few times by means of priming shaft on pump base in order to bleed all air from injection tubing and passages in nozzle body; then close bleeder valve. If tappet is on cam lobe (as shown by mark "A" on slidable pump plunger being above line on inspection window - see Drawing "Timing of Fuel Pump"), bar engine over until tappet is clear of lobe. If Pump still does not function properly, remove and replace with spare pump.

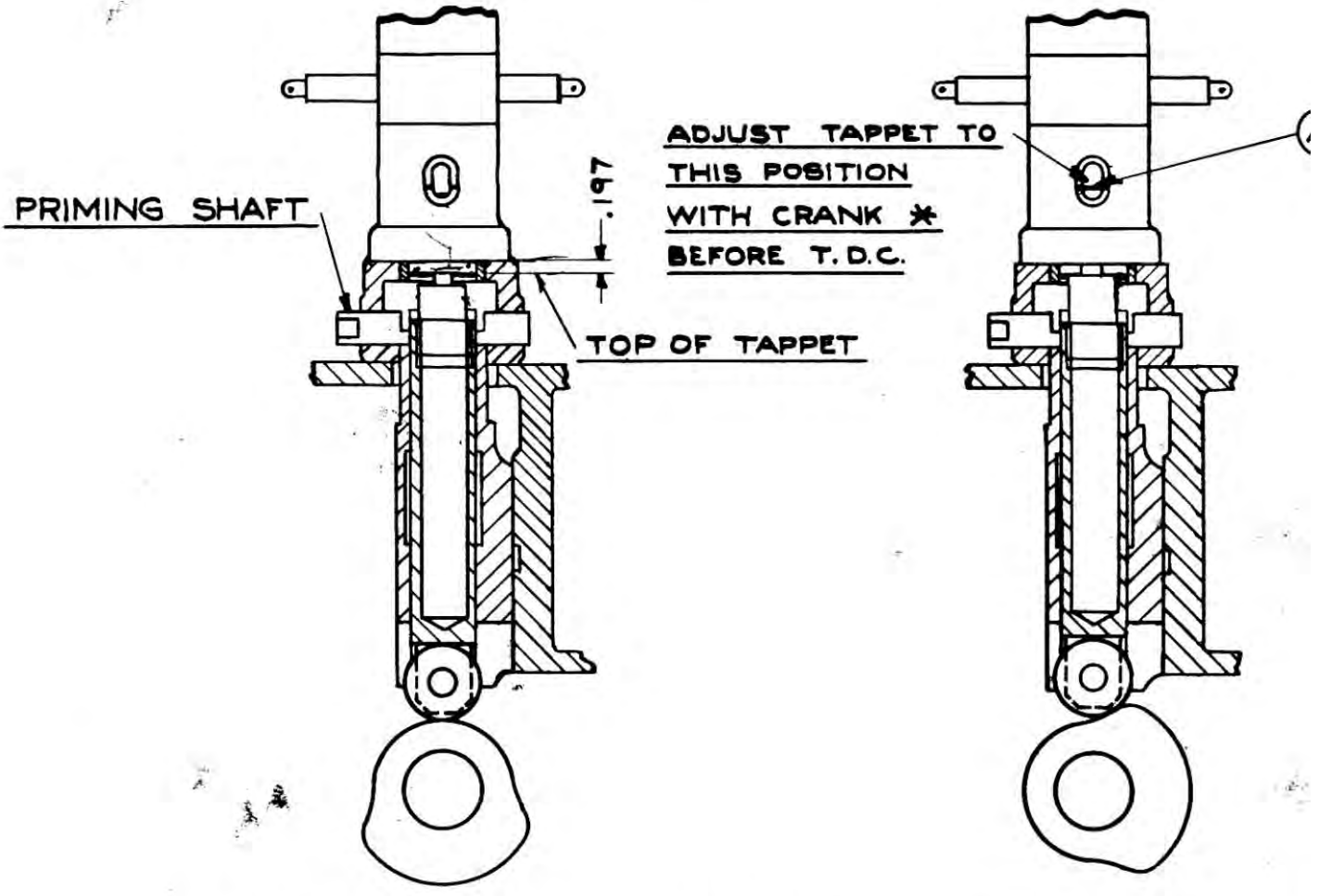
1. VENT SCREW
2. DELIVERY VALVE
3. CONTROL ROD
4. REGULATING SLEEVE
5. PLUNGER GUIDE
6. SPRING RING
7. PUMP BODY
8. LOWER SPRING PLATE
9. PLUNGER SPRING
10. PUMP PLUNGER
11. SPRING RING
12. UPPER SPRING PLATE
13. DELIVERY VALVE HOLDER
14. DELIVERY VALVE SPRING
15. BARREL SET SCREW
16. PUMP BARREL
17. DELIVERY VALVE SEAT
18. SPECIAL GASKET
19. WASHER, NIPPLE NUT
20. DELIVERY NIPPLE NUT
21. BARREL SET SCREW LOCKWASHER
22. VENT SCREW GASKET
23. FUEL INLET UNION
24. GASKET
25. RETAINING SCREW



FUEL PUMP

INITIAL ADJUSTMENT

FINAL ADJUSTMEN



IF THE ADJUSTING MARK "A" ON THE SLIDING PLUNGER
GUIDE DISAPPEARS AT THE UPPER EDGE OF THE INSPECTI
WINDOW, MECHANICAL DAMAGE WILL OCCUR TO PLUNG
AND DELIVERY VALVE.

* SEE INJECTION SETTING ON TITLE PAGE

Injection Pumps

Operation of Injection Pump

Fuel enters through inlet fittings 23 and 25 into the cavities surrounding the upper end of the barrel and, during the suction stroke of the plunger, is drawn into the cylinder through the inlet port. On the upstroke, the upper edge of the plunger closes the inlet port. Fuel is then delivered through delivery valve 2 to the spray nozzles. When the upper edge of the metering helix uncovers the by-pass port, the flow of fuel through the delivery valve is sharply terminated. During the remainder of the upstroke fuel is by-passed through a central hole in the plunger, through the metering helix and the by-pass port into the lower groove which surrounds the barrel. From here it may return to the inlet fitting.

It is seen from the above that the duration of injection and consequently the amount of fuel injected is determined by the angular position of plunger in the barrel. The quantity of fuel is regulated by rotating the plunger by means of the control sleeve 4 and the control rod 3. The plunger floats on a film of fuel during its entire stroke, and therefore requires only a very small amount of force for accurate and sensitive regulation. This condition is obtained by providing a small helical groove diametrically opposite the metering groove. These grooves distribute a fuel film evenly over the cylinder walls.

To Remove Pump

Take off short connection to fuel manifold. Remove lower end of injection tube. Draw out control rod pin; remove hold down nuts. Pump can now be lifted off pump base.

To Adjust Timing - See Illustrations "Timing on Fuel Pump"

Timing is controlled by position of tappet adjusting plug. Before replacing pump make preliminary adjustment by barring engine back one-half turn of the flywheel, or approximately 180 flywheel

degrees before firing top dead center. Tappet roller will then be clear of cam lobe. Top of adjusting plug should then be .197" below top surface of pump base. To change adjustment, loosen locknut on plug and screw plug up or down as required. One-half turn of plug changes position approximately .032". After this preliminary adjustment has been made, replace pump and tighten all hold down nuts. Bar over until top center mark on flywheel is as shown on title page. If timing is correct, mark "A" on slidable pump plunger will register with line on inspection window, as shown in Illustration "Timing on Fuel Pump".

Precautions to be Observed and Suggested Equipment for Repair of any Injection Unit.

Before disassembling any injection unit, cover bench with clean grease-proof paper. See that paper and all tools are perfectly clean. Place a pan, approximately 10" x 15" and about 2" deep about two-thirds filled with filtered kerosene in a convenient position. A pressed steel white enameled surgical pan is most convenient and is easy to keep clean. If parts are very dirty and a considerable number have to be washed, another pan arranged in the same way is advisable for final rinsing before re-assembly. A squirt can which allows a stream of kerosene to be directed under pressure through fine grooves and holes in various parts will also be found convenient. Hands should be kept clean, especially during re-assembly.

To Dismantle Pump - See Illustration "Fuel Pump"

Clamp pump in vise in inverted position. Press down plunger guide (5) and insert a 5/32" pin about 2" long in hole in flange spigot. Take out spring ring (6) by means of screw driver and pliers. Press plunger guide (5) down again and remove the temporary pin. All parts in lower portion of pump body (7) can then be removed in the following order: plunger guide (5), lower spring plate (8), plunger spring (9), pump plunger (10), regulating sleeve (4), spring ring (11), and upper spring plate (12).

Unscrew delivery nipple holder (13) and take out delivery valve (2) and delivery valve spring (14). Back off locking screw (15) about three turns. Carefully press out pump barrel (16) and delivery valve seat (17), including special gasket (18).

If plunger or pump barrel are found to be damaged, they should both be replaced. Never use a plunger from one barrel in another barrel, as the plunger and barrel are so accurately ground and lapped to fit that they cannot be interchanged. The same applies to the delivery valve and its seat.

Do not use grinding compound or extremely hard tools which may scratch closely fitted parts.

Before re-assembly, all parts should be washed in kerosene and oiled with a light lubricating oil.

To Re-assemble Pump

Install parts in reverse order from disassembly, proceeding as follows: Clamp pump body (7) in vise in upright position. Place pump barrel (16) in body in such a way that positioning groove on largest diameter lines up with locking screw (15). See that ground surfaces of joints are perfectly clean and free from scratches. Locking screw should fit into groove in pump barrel. Avoid binding and distortion of barrel. Test this by moving barrel up and down in body.

Next insert delivery valve seat (17), and special gasket (18). Be sure that lapped face of delivery valve seat makes a perfect joint with top face of barrel. Insert delivery valve (2) and spring (14). Screw delivery nipple holder (13) into body, tightening it sufficiently on gasket to prevent leaks.

Now invert pump body for installation of remaining parts. Position control rod (3) so that punch mark which is in center of rack in a space between the teeth is approximately in center of pump body.

Place regulating sleeve (4) in pump body so that punch marked tooth of sleeve meshes with punch marked space of control rod.

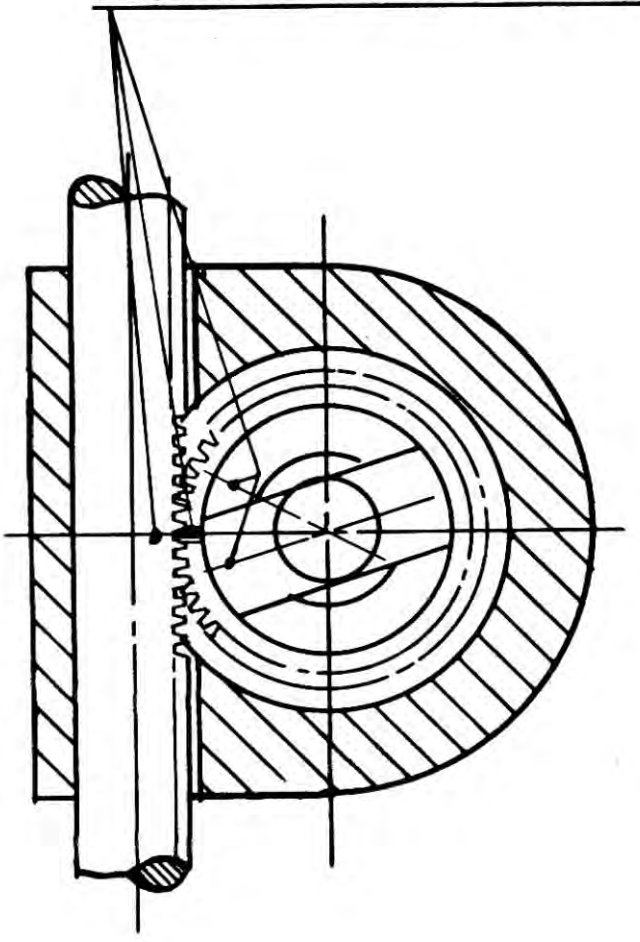
The following parts can now be re-assembled in the order given: upper spring plate (12), spring ring (11), plunger spring (9), pump plunger (10), and lower spring plate (8). When replacing pump plunger,

be sure to have mark on lug of plunger in line with marks on regulating sleeve and control rod. (See Illustration "Bottom View").

Insert plunger guide (5) on top of spring, press down, insert temporary pin in hole in flange spigot, press in spring ring (6) and remove temporary pin.

Re-assembly is now complete. For a check, work control rod back and forth. Test freeness of plunger by pushing plunger guide against spring a few times. This can be conveniently done by gripping a hammer handle in the vise and using end of handle as a tappet. Guide should return through force of spring and any sticking of plunger will be readily noticed.

ASSEMBLE PUMP ACCORDING TO THESE MARKS



FUEL PUMP-BOTTO
VIEW SHOWING LO
ATING MARKS

INJECTION PUMP TROUBLES AND REMEDIES

No Delivery or Insufficient Delivery

Probable Cause	Suggested Remedy
1. Fuel tank empty or valve in line closed.	1. Refill tank with fuel. Check whether transfer pump delivers fuel to tank. Open all valves in line.
2. Fuel inlet pipe clogged or third stage filter element dirty.	2. Clear pipe. Clean filter element.
3. Air lock in pump.	3. Vent pump and nozzle.
4. Pump plunger remains suspended in barrel.	4. Thoroughly clean all parts, particularly plunger and barrel. If either are damaged, replace both with spares.
5. Plunger spring broken.	5. Replace with spare.
6. Delivery valve does not seat properly.	6. Clean delivery valve and seating. If either are damaged, replace both with spares.
7. Delivery valve spring broken.	7. Replace with spare.
8. Leakage back to suction chamber from surfaces between top of barrel and delivery valve seat.	8. Clean faces. Remove burrs and scratches from delivery valve seat and barrel.
9. Worn or defective plunger or barrel.	9. Replace with spare.

Control Rod Jammed or Binding

10. Dirt causes pump plunger to jam or control rod rack is coated with dirt.	10. Dismantle and clean.

INJECTION PUMP TROUBLES AND REMEDIES

(Continued)

Leakage of Fuel

	Probable Cause	Suggested Remedy
11.	Supply connection leaks.	11. Install new gasket or replace connection if damaged.
12.	Leakage past spring guide caused by worn plunger or improper seal of barrel in main body.	12. Replace defective parts with spares

Nozzle - See Illustration "Fuel Nozzle"

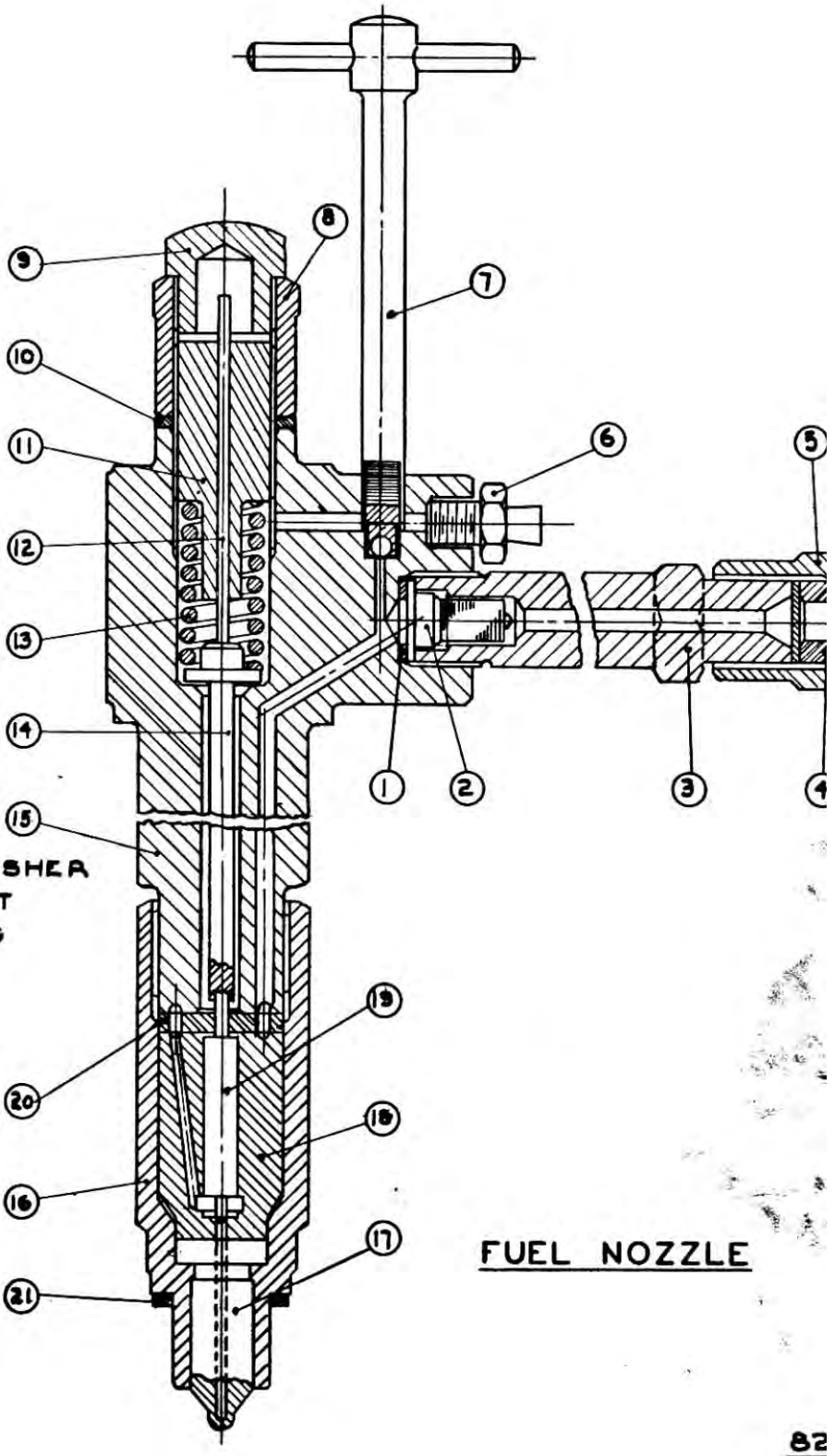
The nozzle consists of the nozzle proper, including the body (18), valve (19), nozzle holder (16), and the spray tip (17). Nozzle valve seals injection system from combustion chamber except during time that fuel pump has built up sufficient pressure to overcome spring pressure acting on valve. This pressure is set between 2200 - 2300 lbs/sq.in. and may be adjusted by pressure adjusting screw (11) and locknut (8) at the top of nozzle holder. When nozzle valve opens, fuel is injected into combustion chamber through orifices in spray tip in a finely atomized spray. Injection continues until pump plunger uncovers by-pass port, causing rapid drop of pressure. Nozzle valve then seats quickly to avoid dribble. A small amount of fuel leaks around nozzle valve, thereby lubricating valve stem. This fuel is drained through connection made to leak off nipple nut (6) at top of nozzle holder. The bleeder screw (7) also drains into this connection. Unscrewing bleeder screw allows ball valve to lift off its seat and fuel will by-pass, thus preventing injection.

An edge filter (2) is provided in fuel inlet stud (3). It consists of stainless steel and bronze discs of approximately .002" spacing. The purpose of this filter is to trap any particles which may be in the line past final fuel filter.

Before doing any work on nozzle see section "Precautions and Suggested Equipment for Repair of any Injection Unit".

To Adjust Nozzle Spring Pressure

Adjustment of spring pressure should only be attempted on test pump with gauge. While pumping fuel through nozzle in regular way, observe gauge and increase or decrease spring pressure to obtain opening pressure between 2200 - 2300 lbs/sq.in. To adjust spring pressure, remove protection cover (9). Loosen locknut (8) and adjust pressure adjusting screw (11) as required. Each quarter turn of adjusting screw changes opening pressure approximately 150 lbs/sq.in.



1. COPPER GASKET
2. FILTER
3. INLET NIPPLE
4. HIGH PRESSURE LINE WASHER
5. HIGH PRESSURE LINE NUT
6. LEAKAGE RETURN FITTING
7. BLEEDER VALVE
8. LOCK NUT
9. CAP
10. COPPER GASKET
11. ADJUSTING SCREW
12. FEELER PIN
13. SPRING
14. PRESSURE PIN
15. HOLDER BODY
16. ASSEMBLY NUT
17. SPRAY TIP
18. NOZZLE VALVE BODY
19. NOZZLE VALVE
20. STOP PLATE
21. COPPER GASKET

FUEL NOZZLE

To Remove or Change Nozzle

Place nozzle holder body (15) in vise on flat portions provided for purpose with nozzle body (16) in upright position. Unscrew nozzle cap nut (16) holding nozzle body to holder body. Use close fitting wrench to prevent damage to nut. Wash nut (16), spray tip (17), nozzle valve body (18), and valve (19) in clean kerosene. Interior of nozzle body should be cleaned out with a small strip of wood soaked in kerosene. Rub valve with a clean, soft (but not fluffy) cloth soaked in kerosene. Do not use grinding compound or extremely hard tools which may scratch closely fitted parts. If the nozzle valve can be rotated freely in its body without friction or "rattle", then it fits correctly in the nozzle. If nozzle body or valve are found to be damaged, they should both be replaced. Never use a valve from one nozzle body in another body, as the valve and body are so accurately ground and lapped to fit that they are not interchangeable.

Re-assembling of Nozzle

Wash nozzle body, valve and spray tip in clean kerosene. Bring valve and body together and see that valve revolves easily. Before replacing nozzle body, valve, and spray tip in holder, be sure lapped sealing surface on nozzle, holder, and spray tip are perfectly clean and free from burrs and scratches. Care should be taken in screwing down nut to tighten just sufficiently for good seal without distorting any part by using excessive force.

To Overhaul and Clean Nozzle Holder

Place nozzle holder body (15) in vise on flat portions provided for purpose with nozzle protection cover (9) in upright position. Remove protection cover. Loosen lock nut (8), and unscrew adjacent screw (11). Draw out pressure adjusting spring (13), and spindle (12). Wash all parts in kerosene. Unscrew inlet stud (3). Press out edge filter (2) with 3/16" pin. Clean filter and inside of inlet stud with kerosene.

Re-Assembly of Nozzle Holder

When replacing filter, fit should be such that it is just possible to press filter into stud by hand with aid of 3/16" pin. If filter is too loose, replace with a new filter. Be sure seating faces of inlet stud and nozzle holder body are clean and that inlet stud gasket (1) is clean and in good condition. Tighten inlet stud sufficiently to prevent leaks without distorting any part by excessive force.

Replace spindle, spring, and spring cap nut. Adjust nozzle opening pressure according to instructions, page 4-A-9. Replace protection cover.

INJECTION NOZZLE TROUBLES AND REMEDIES

Nozzle Valve Sticking

Probable Cause	Suggested Remedy
1. Dirt in nozzle	1. Remove and clean nozzle.
2. Poor lubricating qualities in fuel oil. (Fuel oil above 32° Baume gravity usually has poor lubricating quality).	2. Change to fuel of proper specifications.
3. Nozzle body and valve corroded or eroded due to acid, water, or dirt in fuel oil.	3. Replace nozzle body and valve with spares. Check fuel and filters.

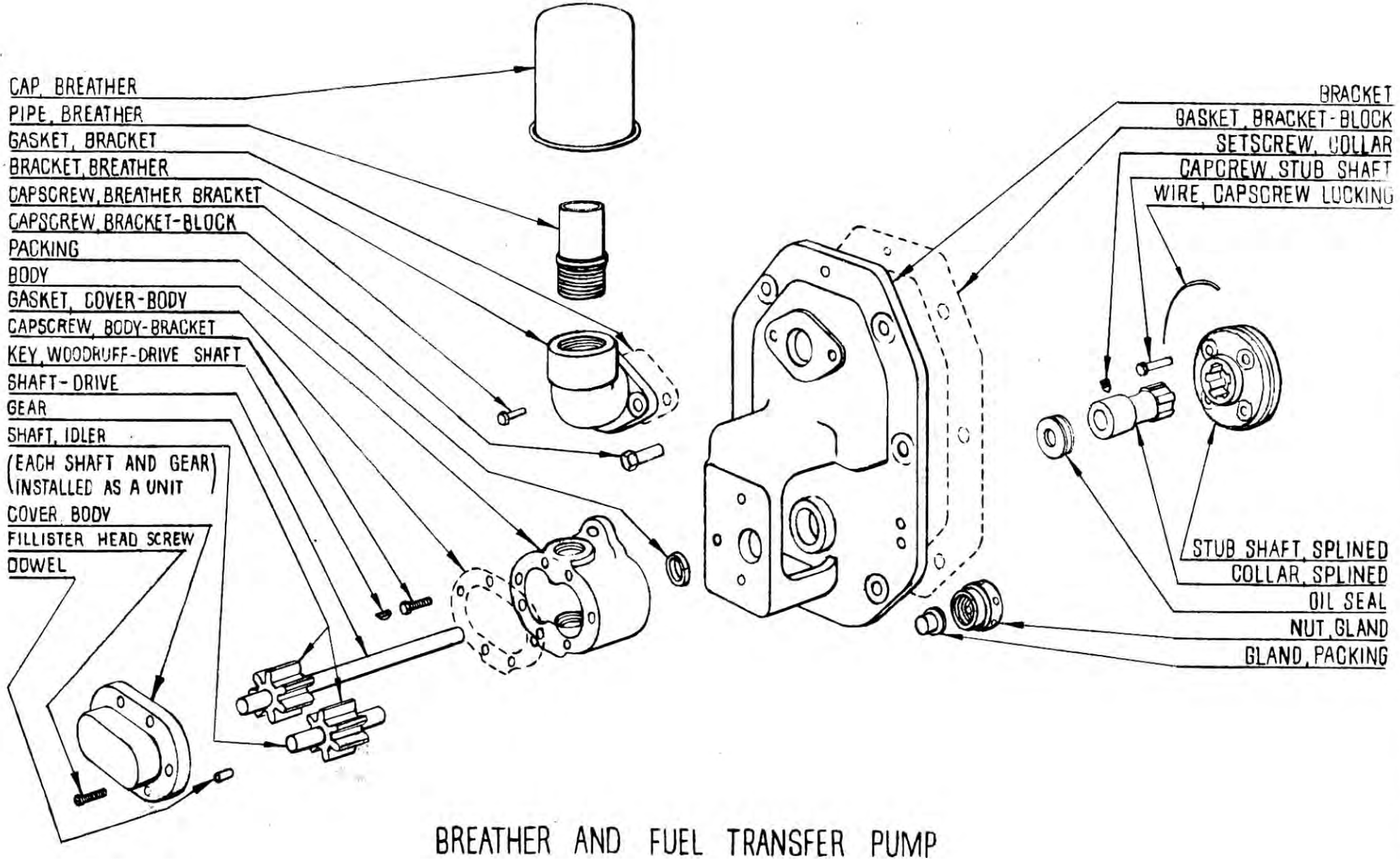
Leakage of Fuel Around Nozzle Holder or Excessive Leak-Off Through Nozzle Drain

4. Joint between nozzle holder and nozzle not tight.	4. Clean faces. Remove burrs and scratches from nozzle body and holder.
5. Nozzle valve worn and loose in nozzle body.	5. Replace nozzle body and valve with spares. Check fuel and filters.
6. Nozzle valve stuck in closed position or nozzle orifices clogged.	6. Remove and clean nozzle.

B. Fuel Transfer Pump

Fuel transfer pump is of the gear type; it is directly connected to the camshaft by means of a coupling.

If the fuel filters are in working order the transfer pump should require no attention except an occasional inspection of the stuffing box for leaks. When repacking, use 1/8" round packing about 12" long of a type approved for small rotary oil pump shafts.



BREATHER AND FUEL TRANSFER PUMP

C. Lubricating System

General

The lubricating oil is carried from the lube oil service tank through a duplex basket type strainer, forced through the positive displacement gear type pump, after which a branch line takes part of the oil through an absorbent type filter and back to the service tank. The major portion of the oil, meanwhile, is forced on to the oil cooler, through a scraper type strainer and on to the various parts of the engine requiring lubrication. A relief valve mounted on the pressure pump prevents oil pressure from exceeding 28 lbs/sq.in. by allowing excess oil to be by-passed back to the suction side of the pump. A four-way valve is placed in the line to and from the oil cooler. In case of any leaks between lubricating oil and water sections, turn four-way valve so oil flows directly into lube oil header, and replace cooler element at earliest convenience. A leak between lubricating oil and cooling water sections may be detected by a depletion of lube oil in service tank, in excess of normal lube oil consumption.

Lubricating oil strainer, between oil cooler and engine, consists of one large metal edge element. It should be cleaned about every four hours by turning handle one complete turn in a clockwise direction. Turning handle drives a scraper around face of element.

If oil pressure drops as shown on main lubricating oil gauge, it usually indicates that this filter element is being coated. Turning handle as explained above will usually correct this condition.

Never use a wrench on scraper handle. If handle sticks, it is a sign that some foreign substance has become wedged between scraper and element. If this should occur, stop engine at earliest convenience and remove filter element. Clean element, scraper and case. If scraper is bent, straighten and free all moving parts. During re-assembly, be sure all gaskets are in good condition and tighten all bolts firmly to avoid leaks.

Filters should be disassembled and cleaned at intervals of one to two months, depending upon the condition of the oil.

About once a month crankcase breathers should be removed and washed in a mixture of kerosene and lubricating oil. Inspect and clean inside of crankcase, especially lubricating oil suction screens and

reservoir below.

Remove oil from crankcase if any water or sludge is present.

Lubricating Oil Pump. See Illustration "Lubricating Oil Pump"

A gear type lubricating oil pump is used which is driven by a gear meshing with the camshaft auxiliary gear. The main impeller gear is splined to the drive shaft, which runs in bronze bushings. The idler shaft is held stationary in the housing and the bronze bushed idler gear rotates on this shaft.

If oil pressure drops as shown on main lubricating oil gauge, first see that there is sufficient oil in the lubricating oil service tank and that the lubricating filter is clean. Make sure that all piping connections are tight and that the lines are free. Make sure air bleeder vent on top of relief valve is clear and that relief valve is seating properly.

If oil pressure is still low, dismantle pump and check clearances (see table of clearances). Proper side clearance is obtained by means of .006" gasket on each side of pump body. If faces of inside or outside covers have become worn, face off in lathe until all evidences of wear have disappeared. If inner faces of housing have become worn, face off outside until exactly flush with faces of gears. Replace gears and bushings if necessary. Gears are cut in pairs and should not be interchanged.

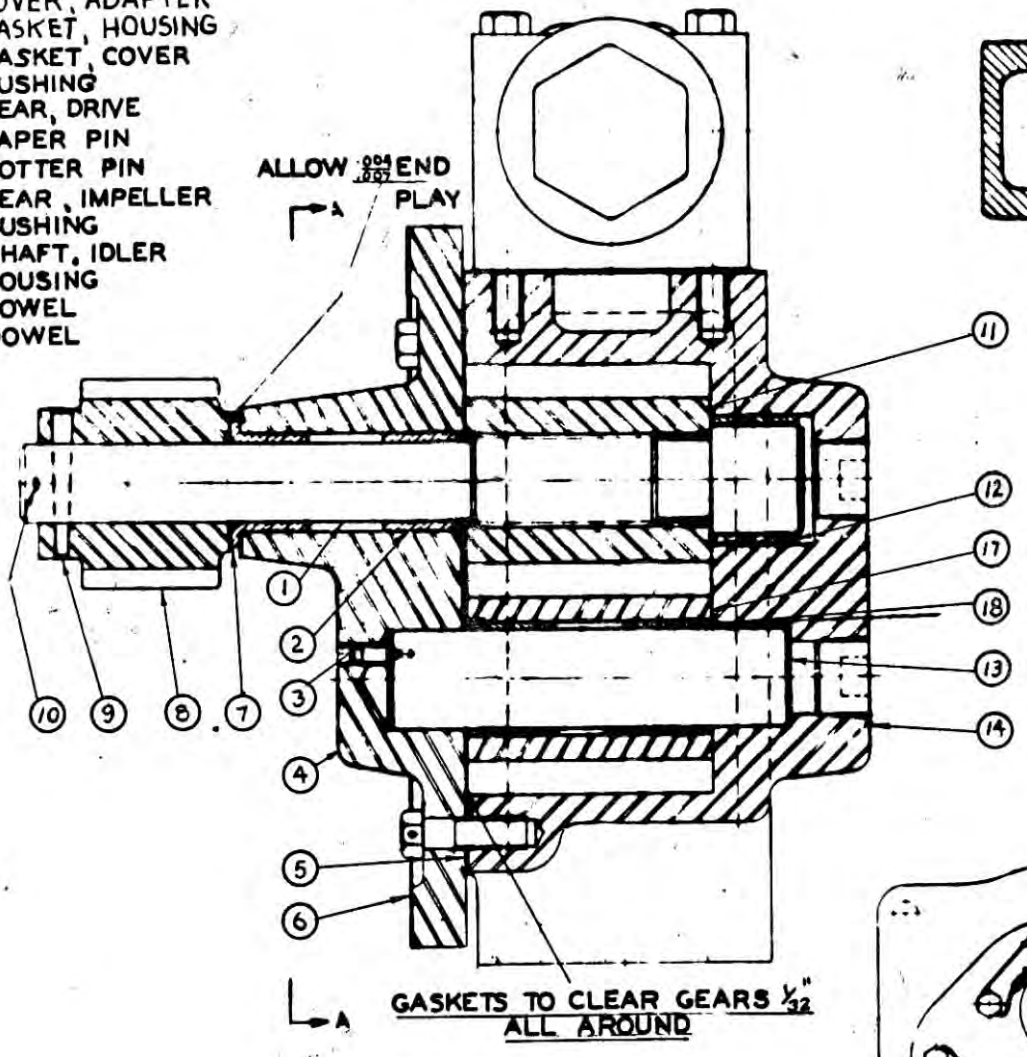
Re-Assembly

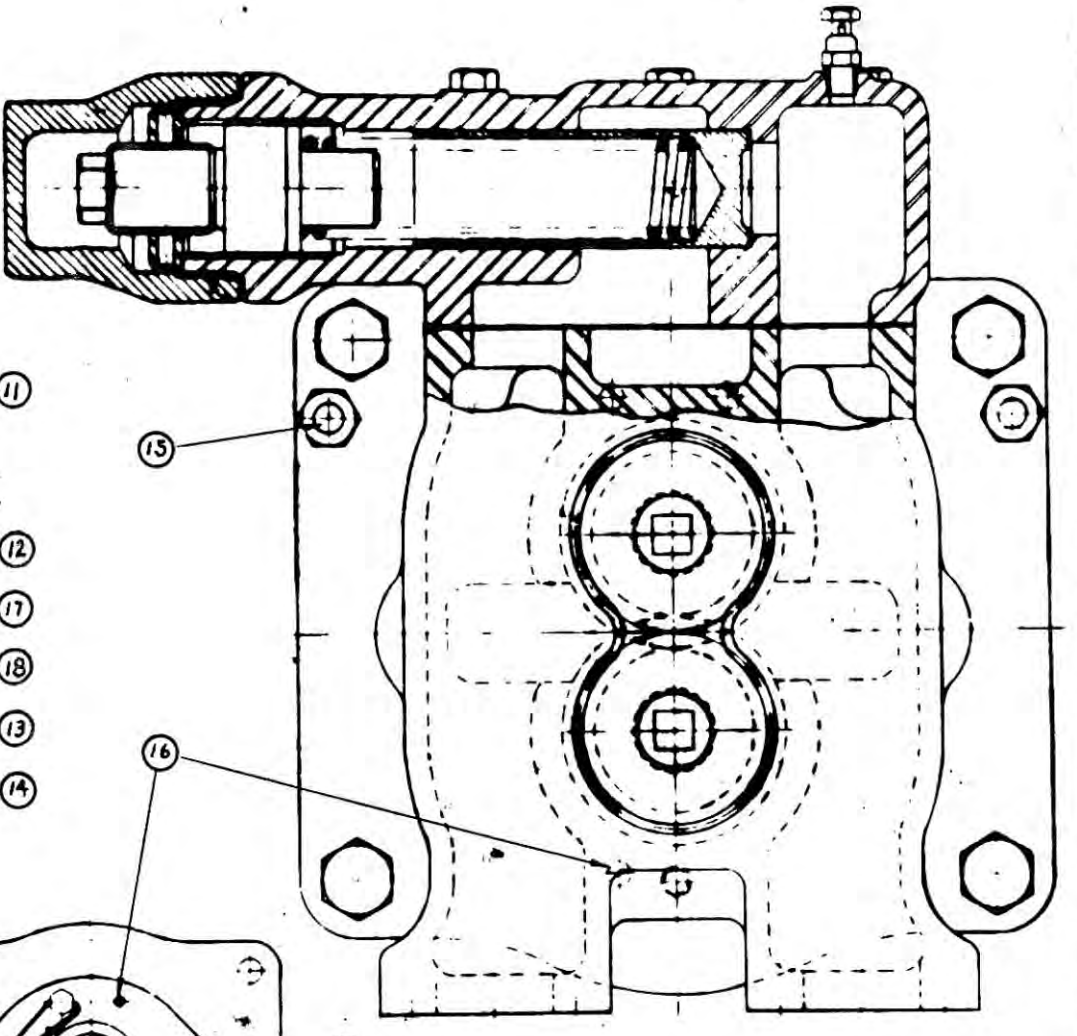
Place drive shaft in housing, assemble drive gear and impeller gear. Then replace adapter cover and gasket of proper thickness to make end clearance .006" and bolt in place.

Relief Valve

The relief valve consists of a bronze plunger operating in a cast iron housing. When the line pressure equals the pressure at which the valve is set, the plunger moves off its seat allowing the excess oil to by-pass to the suction side of the pump. The spring is correctly set at the factory to maintain a pressure of 28 lbs/sq.in. when oil is hot. Under normal conditions, the adjustment should not be changed. If adjustment becomes necessary, remove cap, loosen adjusting screw locknut and adjust as required.

1 SHAFT DRIVE
2 BUSHING
3 SETSCREW, ALLEN
4 COVER, ADAPTER
5 GASKET, HOUSING
6 GASKET, COVER
7 BUSHING
8 GEAR, DRIVE
9 TAPER PIN
10 COTTER PIN
11 GEAR, IMPELLER
12 BUSHING
13 SHAFT, IDLER
14 HOUSING
15 DOWEL
16 DOWEL
17 GEAR, IMPELLER
18 BUSHING
19 WIRE, LOCKING





VIEW A-A

PUMP CAPACITY
26 GALS. PER MIN. AT 625 (PUMP) RPM

LUBRICATING OIL PUMP

D-1617

D. Air Starting System - (See Illustration "Air Starting Valve")

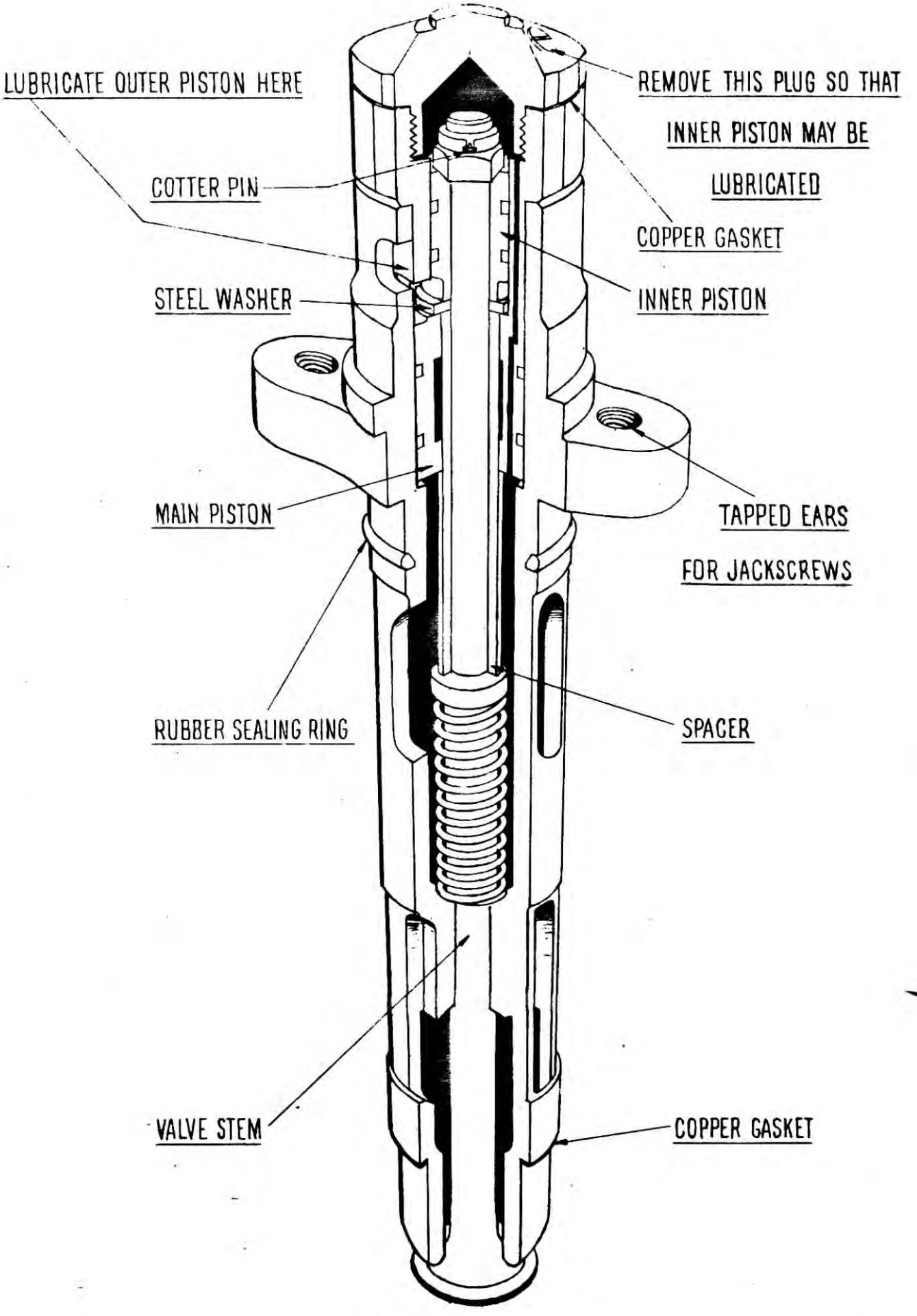
The air starting system consists of a main valve, piston operated, a pilot valve, and the starting valve in each head. The mechanism is put into operation by the starting button mounted at the front end of the engine.

The function of the pilot valve is to bleed the air off of the upper side of the piston of the main valve. The resultant overbalance of pressure on the lower side of the piston opens the valve, and thereby charges the air manifold. The air starting valves in each head are so constructed that as soon as pressure builds up in the air manifold a piston is forced upward against the rocker arm, which in turn, through the push rod, forces the cam follower against the air starting cam. The pressure on this piston also overbalances the tendency of the air pressure to open the valve. The action of the cam, push rod, and rocker is to force this piston down against the air starting pressure, thus eliminating its closing effect on the valve and allowing the valve to open.

There is also an auxiliary piston in the starting valve which is connected directly to the valve stem. It is acted upon by air pressure and aids in opening the valve against cylinder pressure.

If it is desired to turn the engine over slowly by air without starting it, this can be done by cracking the main valve; by means of the jacking screw on the bottom of the valve body.

Be sure the jacking screw is fully released before attempting to start the engine.



AIR STARTING VALVE

D-1538

Timing of Air Starting Valves

When adjusting the clearance for proper air starting valve timing, it is essential that the valve is in the extreme up position. To accomplish this most conveniently proceed as follows: Close the globe valve in the starting air line. Open the main valve wide by means of the jack-screw underneath. Then crack the globe valve just sufficient to maintain 25 - 35# pressure in the manifold. This pressure will hold the valves up but is not enough to turn the engine over. Now by pushing down on the push rod end of the rocker arm until the tappet roller contacts the cam, the clearance can be measured between the rocker roller and the top of the air valve. The recommended amount of clearance is stamped on the engine name plate.

It is very important, when checking clearance, to be certain that the air valve is in its normally closed position. If there is any doubt, bar the engine over until the inlet valve is open on the cylinder whose air valve is being adjusted.

CAUTION! Every time before attempting to bar the engine over, be certain that the globe valve in the starting air line is closed.

F. Valves and Valve Mechanism - See Illustration "Valve Mechanism"

Description

Intake and exhaust valves are of alloy steel. Exhaust valve has a deflector on the stem just below the guide.

To Remove Valve, Intake and Exhaust

Remove cylinder head as explained in Section, "Cylinder Head". Take off rocker shaft stud nuts and remove rocker assembly and hydraulic lifters. Place valve spring tool (furnished with engine) over valve retainer. Clamp tool in place by tightening set screws against cylinder head. Screw down fork by means of handle until retainer is depressed far enough to allow valve keeper wedges to be removed. Valve is now free and can be drawn out. Remove springs and if necessary, replace valve guide.

To Remove and Install New Valve Spring (Without removing head)

Bar engine until piston in cylinder, on which valve spring is to be changed is at top dead center. Take off rocker shaft stud nuts and remove rocker assembly. Place valve spring tool (furnished with engine) over valve retainer. Clamp tool in place by tightening set screws against cylinder head. Screw down fork by means of handle until retainer is depressed far enough to allow valve keeper wedges to be removed. If retainer sticks to valve stem a slight tap with a hammer will release this and valve will drop down and come to rest on top of piston which must be at top dead center. Release valve spring tool and remove retainer and valve spring. Install new spring and set retainer on top of spring. Put valve spring tool in position and screw down on fork until valve keeper wedges can be inserted in retainer. Release valve spring tool, being sure keepers are correctly located in retainers. Replace rocker arm assembly. Under no circumstances bar engine while valve spring is being replaced.

Inspection

Upon inspecting the valves, particularly exhaust valves, the seat surface may have the appearance of pitting due to the fact that small carbon particles may be trapped on the seats and impress themselves upon the metal; this condition has no effect upon operation unless there is an indication of blow-by. In this case valves should be reseated.

Reseating Valves

Valve may be refaced on standard valve refacing machine or ordinary lathe. Seat should be exactly 45°. If done in lathe by means of cutting tool, be sure to use very fine feed and sharp tool for final cut. If grinding wheel is used, wheel should be dressed for exact trueness before final grinding cut is taken. Remove only sufficient material to eliminate pits and to make seat run exactly true with stem.

Reseating Heads

If guide is worn, a new guide should be installed before refacing. Reface head in drill press if available, otherwise use hand reamer. Use standard 45° reamer and face just sufficiently for trueness and removal of pits. Next, limit width of seat to 11/32" ± 1/64" by means of 75° reamer. After this operation, valve should be replaced in head and face of valve checked with seat by means of blueing.

If proper tools for making these corrections are not available, and it is absolutely necessary that repairs be made, valve may be ground by means of grinding compound in usual manner, however, this will not produce a satisfactory seat; therefore, if such repairs have to be made, heads and valves should be refaced as soon as possible in accordance with the above instructions.

Air Starting Valve - See Illustration "Air Starting Valve"

To aid in removing the valve, in case it is stuck in the head, jacking screw holes have been provided on each side of the valve cage. To dis-assemble the valve, first unscrew the upper cap. To do this it is necessary to lock the piston by placing a pin through one of the cored slots in the valve cage and into the cored hole in the bronze piston. Next, remove the locknut on top of the valve stem and all parts will then come out. When cleaning always check the drilled air passage in the bronze piston for any obstruction.

The piston rings in both the main and auxiliary pistons are the type that seal on one side only. Care should be taken upon re-assembly that these rings be inserted properly. The rings on the larger piston seal pressure applied on the bottom, whereas the smaller rings seal pressure applied on top as in a normal engine piston. It is essential that the cap be screwed down securely and locked by bending copper gasket over flats of the cap and bronze piston.

Valve Gear - See Illustration "Valve Mechanism"

General Description

Intake and exhaust valves are operated through rocker arms and push rods which are actuated by cams and tappets. Lower end of push rod rests in the tappet. Top of push rod contacts lifter body which actuates rocker arm through the hydraulic lifter.

Action of the hydraulic lifter: Oil under pressure from the lubricating system is led through a duct drilled in the rocker arm connecting the lubricating hole in the rocker shaft with the annular groove on the outer diameter of the lifter body. A hole connects this groove to the inside of the lifter body. With the cam roller on the base circle of the cam and the valve seated, a light spring lifts the hydraulic plunger, so that its upper end contacts the adjusting screw, thus eliminating backlash in the valve mechanism. As the plunger moves upward, increasing the volume of the pressure chamber, the check valve is moved off its seat and oil from the supply chamber fills the pressure chamber. As the cam lobe lifts the roller, the lifter body is forced upward, slightly decreasing the volume of the pressure chamber, thereby closing the check valve. Further rotation of the camshaft lifts the valve through the confined column of oil.

During the time the valve is off its seat, a predetermined slight leakage of oil occurs providing for added length in the valve mechanism due to temperature changes. When the roller leaves the receding flank of the cam and contacts the base circle, the oil which fills the pressure chamber is exactly the right amount to eliminate all backlash in the valve mechanism.

While the roller is on the base circle, the force tending to open the valve is that due to the spring, and the oil pressure. This is much less than the main valve springs which hold the valve closed. The pressure of the oil in the supply chamber is negligible under normal operation due to the small area of the plunger.

The self-adjustment of the hydraulic lifter is effective immediately upon starting as the supply chamber remains filled from previous operation of the engine.

The upper end of the push rod is lubricated by oil from the hydraulic lifter. Leakage from the lifter body and hydraulic unit escapes through holes above the lifter body lubricating the lower end of the push rod and cam roller. A trough along the outside of the rocker provides lubrication for valve stem and guide.

Maintenance

Under normal operation, the valve gear should require no attention. Since the hydraulic lifters compensate for small amounts of wear in the valve mechanism, it is not necessary to adjust the valves periodically.

If noise develops in the valve mechanism, it is usually due to one of the following causes:

1. Excessive oil pressure
2. Air or air bubbles (foaming oil) in the lifters
3. Insufficient oil supply
4. Improper setting of adjusting screw on top of rocker
5. Plunger or lifter body sticking
6. Ball check valve sticking
7. Worn plunger or cylinder
8. Ball check valve leaking
9. Lifter spring defective

If oil pressure on lifter unit is above 50 lbs/sq.in. cylinder of hydraulic unit may leave its seat in body and prevent plunger from acting, thus causing excessive valve clearance. This may be checked by holding hand on the adjusting screw with the engine running at about half speed. If this causes the roller to leave the top of the valve stem immediately, it is an indication that the lifter unit is not functioning properly. Do not do this for more than 8 or 10 strokes as this will cause roller to leave valve stem even if lifter is operating properly. Next, observe whether

oil flows from leakoff holes in rocker. If there is no oil at this point, ascertain cause immediately and correct. Next, inspect lubricating oil piping for air leaks, especially suction piping to pressure and scavenge pumps. Excessive air in the lubricating oil line will usually be indicated by a fluttering of the oil pressure gage or by a loss of oil pressure.

Next, adjust hydraulic unit as follows: While engine is running at approximately half speed screw down adjusting screw until valve begins to ride slightly open at all times. This may be observed by pressure on adjusting screw as well as roller being tight at all times. Then back off from this point 1 turn, which is equal to 1/16" oil column in lifter body.

If improper operation is still indicated, remove lifter unit as follows: Disconnect rocker shaft lubricating line; remove rocker shaft stud nuts; lift rocker shaft until lifter units will clear push rods; remove lifter units and take off rocker assembly; remove plunger from cylinder; wash thoroughly all parts of the lifter unit and bore of rocker with kerosene. Be sure hole in lifter body is clear. If plunger or cylinder is found to be worn, or if spring is broken or shows signs of set, renew plunger and cylinder. Never use a plunger from one cylinder in another cylinder as they are tested at factory for proper rate of leak-down. Do not use grinding compound or extremely hard tools which may scratch the surfaces of these accurately fitted parts. Make sure plunger is a free fit but not loose in cylinder. Check unit as follows: Wash thoroughly in kerosene and dry. Hold in vertical position, release spring from counter-bore in cylinder and pull plunger out as far as possible retaining alignment in cylinder. Press plunger down and release quickly. If plunger kicks back repeatedly, it indicates that considerable air is retained and unit is in good condition. Usually when plunger is depressed as quickly as possible with index finger, it should kick back almost half its length; if excessive leakage is indicated, it may be at check valve or at plunger. To ascertain where leakage occurs, repeat operation described above with check ball submerged in kerosene. A leaky check ball will be indicated by considerable bubbling.

Re-assembly

Wipe off plunger and inside of cylinder with a clean, soft, (not fluffy) cloth. Replace plunger in cylinder, making sure plunger spring snaps into bore of cylinder; this can be done readily by a slight twisting motion in the direction to wind up the coil of the spring. Assemble lifter in lifter body. Replace unit in rocker arm; see that lifter body is free in rocker arm bore. Replace rocker assembly and tighten stud nuts.

To adjust lifter unit after re-assembly with cylinder dry; back off adjusting screw about two turns. Bar over until piston is on firing dead center; cam roller is now on base circle of cam. Take up on adjusting screw until plunger rests against bottom of cylinder; at this time roller on rocker contacts top of vlave stem and valve end of rocker cannot be raised. Next, back off adjusting screw one complete turn. Valve mechanism is now in proper adjustment. After a lifter unit has been removed and replaced, the valve gear will clatter when the engine is started as some time is needed to expel the air from the lifter cylinder, however, if lifter unit is in good condition this noise should cease in about 5 to 15 minutes. If valve noise persists, check adjustment with the engine running at approximately half speed as explained on preceeding page.

After engine has been idle for a period of time, or after having been tested a long period of time elapses before installation, the zero lash units may stick. This will make them slow to seat when engine is first started causing noisy valve action. If this still persists after a short time proceed as follows: With engine running at about half speed back the adjustment off until the rocker has a slight clearance, then tighten adjustment nut slightly which should eliminate the noise. The same noisy action may appear at maximum speed, if so, it can be corrected by the procedure outlined above.

Tappets and Guides - See Illustration "Valve Mechanism"

Description

Roller pin is serrated on one end to keep it from turning. Lubrication for both tappet in guide and tappet roller is from the auxiliary force feed header. Individual lines connect to each tappet cluster. Ducts distribute oil inside cluster to tappets. Oil flows to the inside of the tappet to lubricate the push rod end.

The fuel tappet guides are individual for each cylinder and are integral with the fuel pump base. The fuel tappets are also lubricated from the auxiliary force feed header.

Maintenance

About once a month, camshaft covers should be removed and tappets and rollers inspected. Tappet clearances in guides should be checked with feelers. Tappets should be raised by pry bar and rollers checked for freeness on pins and in slot. The fuel tappet should return readily through force of fuel pump spring.

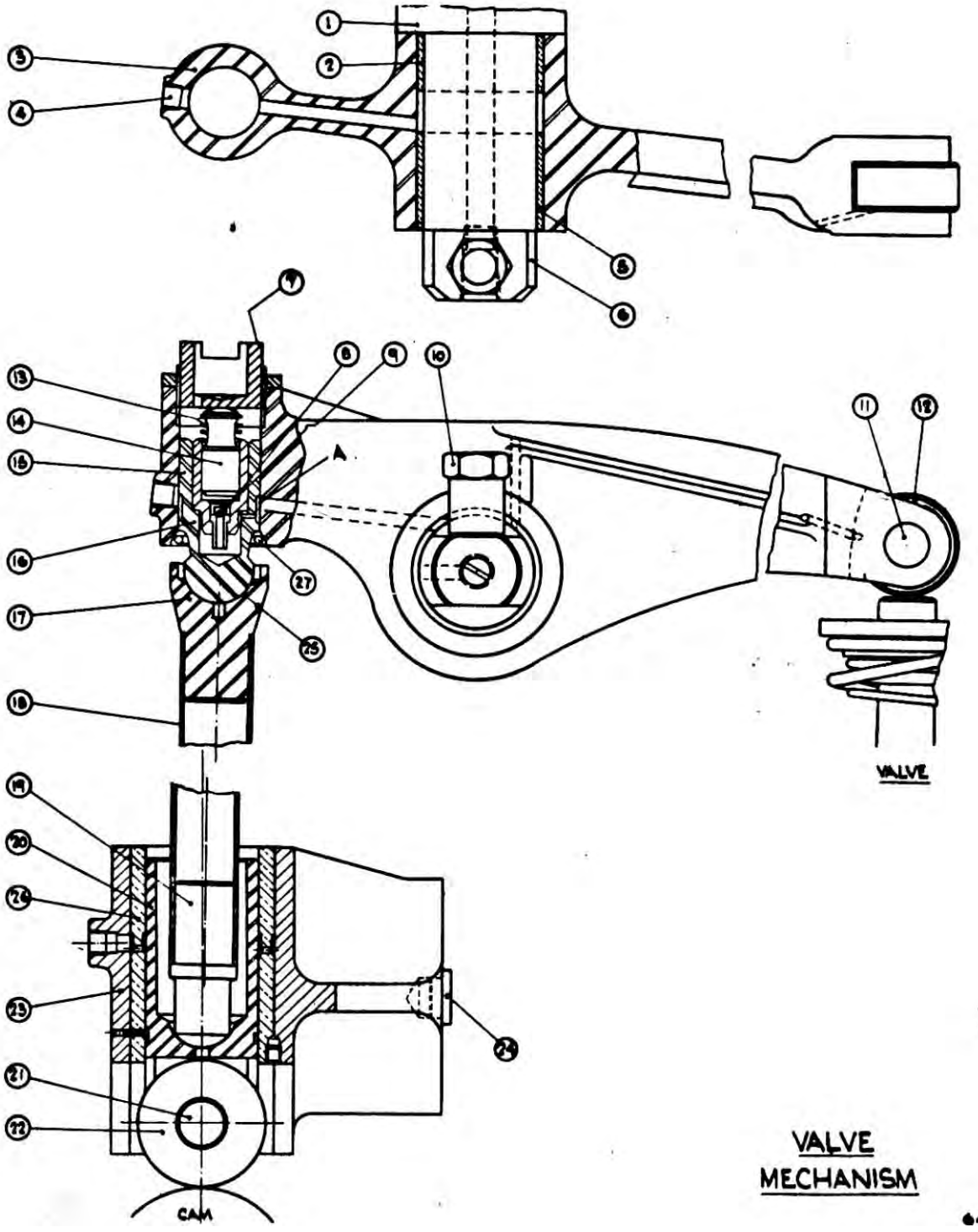
Recommended clearances are given in Table of Clearances and should be closely adhered to.

Assembly and Disassembly

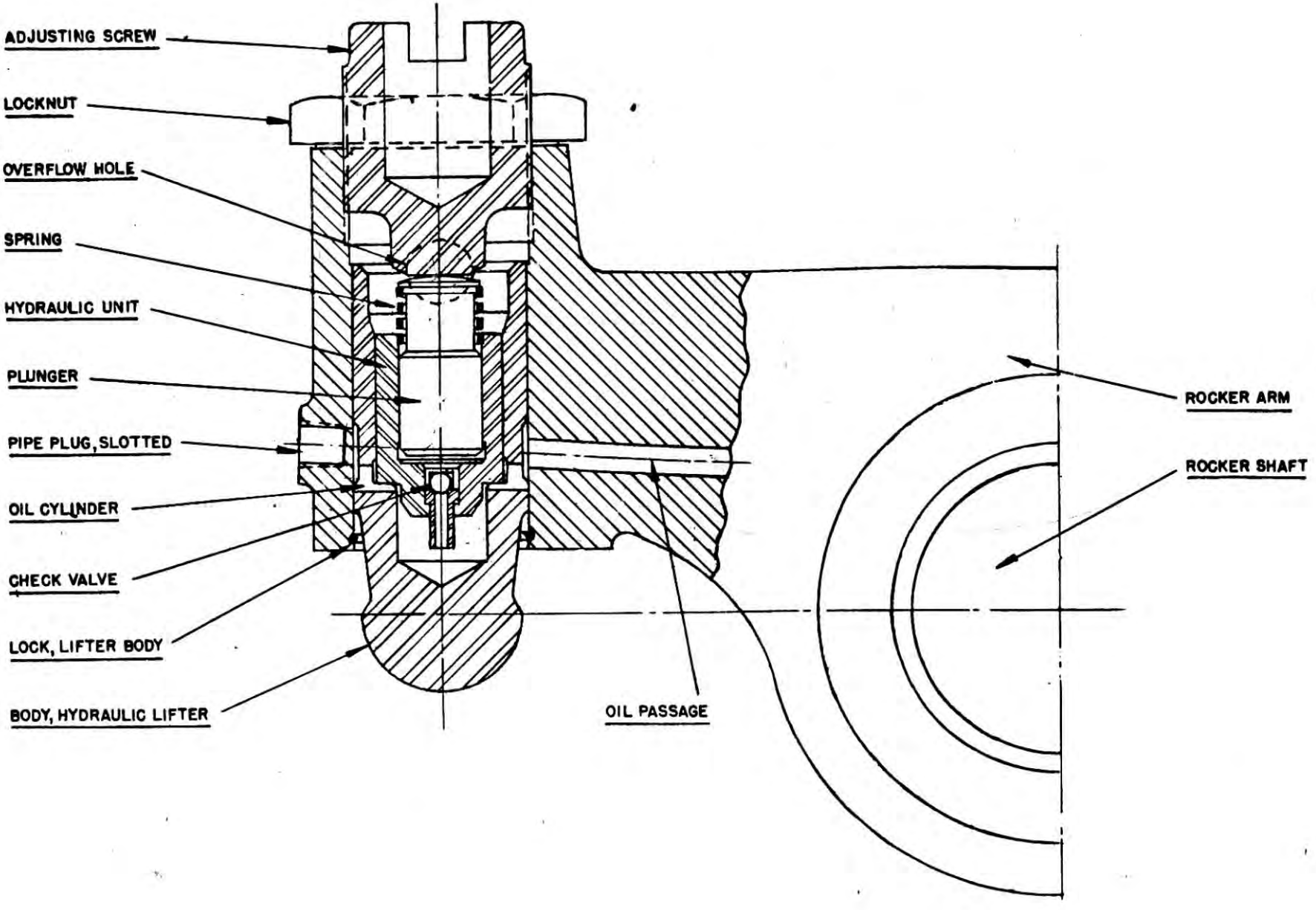
The inlet, exhaust, and air tappets are included in one cluster which can be readily removed by disconnecting all oil lines and removing the nuts holding it to the crankcase. Before removing, place small pins in the holes provided in the exhaust and inlet guides to support the tappets as they are drawn away from the cams. Upon re-assembly, be certain that the dowels that mate with the slot in crankcase have not fallen out. If the dowels are to be replaced or returned to their reamed hole in the cluster, be certain the flats line up exactly and that they fit well into the slot in the crankcase before tightening the hold-down nuts.

To remove fuel pump tappet, first disconnect lines to fuel pump and remove it. Then disconnect lube oil lines and draw out tappet and guide. Again tappet may be supported by pin placed into hole provided in the guide.

1 AIR ROCKER
2 BUSHING
3 ROCKER
4 PIPE PLUG
5 BUSHING
6 ROCKER SHAFT
7 ADJUSTING SCREW
8 BALL RETAINER
9 CHECK VALVE
10 ROCKER SHAFT STUD NUT
11 ROLLER PIN
12 ROLLER
13 PLUNGER SPRING
14 HYDRAULIC PLUNGER
15 CYLINDER
16 LIFTER BODY
17 PUSH ROD END-UPPER
18 PUSH ROD
19 PUSH ROD END-LOWER
20 TAPPET
21 ROLLER PIN
22 ROLLER
23 TAPPET GUIDE
24 DOWEL
25 BALL SEAT
26 TAPPET GUIDE LINER
27 SNAP RING



VALVE MECHANISM



HYDRAULIC VALVE LIFTING MECHANISM

G. Cylinder Head

To Remove Head

Drain water from engine. Loosen flanges which connect exhaust manifold and intake air elbow to head. Next remove rocker shaft assembly and hydraulic lifters. Disconnect fuel injection tube from pump. Disconnect nozzle drain fitting on outside of head. Remove nozzle as follows: Disconnect inlet and drain; remove nozzle retainer and pry out nozzle. Next unscrew all holding down nuts and head is ready to be lifted off. If head adheres to gasket, take strain on tackle and jar head with lead hammer.

Use new gaskets when re-assembling an engine. An old cylinder head gasket may appear to be in good condition, but after re-assembling the head and starting the engine the gasket may prove defective, necessitating the complete removal of the cylinder head and installing a new gasket.

With the head off, inside of combustion chamber and top of piston should be cleaned if excessive carbon is found. Piston should then be lowered to bottom dead center position and upper part of bore cleaned. Cylinder walls should be given a coating of clean lubricating oil before re-assembly.

Thoroughly clean off top of block and face of cylinder head to present a clean surface for the new head gasket.

When replacing head, screw hold down nuts hand tight. Next, insert capscrews holding exhaust manifold and air intake elbow to head and screw them hand tight. Then tighten hold down nuts with socket wrench furnished for the purpose. Tighten capscrews holding manifold and intake elbow.

H. Relief Valve

A relief valve is mounted on each cylinder head. An indicator cock connection is provided on relief valve body.

To release compression in cylinder, turn knurled handwheel on relief valve in clockwise direction until it lifts valve off its seat.

Relief valve is set at factory to release at 900 lbs/sq.in. pressure. If it should pop continually while engine is running, it is usually an indication that the maximum cylinder pressure is too high. This is caused by overloading of the engine or by too much fuel being injected into the cylinder.

If the operator has satisfied himself that the popping is not due to either of these causes, the relief valve should be removed and tested by hydro-static pressure. Valve should release when pressure reaches 900 lbs/sq.in. To increase release pressure, loosen locknut and screw down on adjusting nut. When making this adjustment care should be taken not to screw down on the adjusting nut until spring is compressed solid. If it is necessary to do this in order to prevent valve opening before pressure reaches 900 lbs/sq.in. it is an indication that the spring has become too weak and should be replaced.

I. Connecting Rod and Bearing -

Connecting rod is a solid steel forging bored out at top to receive connecting rod bushing. Rod is drilled through to allow oil under pressure from crankshaft to reach this bushing.

Connecting rod bearings are steel cast boxes separate from the connecting rods. They are provided with bronze shells lined with Bearing metal.

Compression shims between connecting rod and bearing allow adjustment of compression pressure if necessary. Normal clearance between top of piston and top of block with piston on top dead center should be .810- .815. When actual clearance agrees with recommended value, compression pressure should be 400 lbs/sq.in. to 420 lbs/sq.in. at rated speed. If pressure is much below this value, compression is being lost, and gaskets, valves, rings, etc., should be checked.

About once every six months one connecting rod bearing should be removed and inspected.

To Remove a Connecting Rod Bearing

Raise piston to top dead center position and insert piston holding fixture in hole near bottom of cylinder liner in order to hold piston and connecting rod in top center position when bearing is removed. Remove nuts and connecting rod bolts. Bearing box is now free of rod. The removal of a small bolt on each side of bearing box will allow halves to separate, and bearing can be removed from journal.

When re-assembling, remove all burrs especially from around hole in cylinder liner and from the bottom of the piston skirt.

To Check Alignment of Connecting Rod and Bearing

With bearing assembled, loosen connecting rod nuts about three turns. Tap connecting rod bolt on threaded end so it will drop down until bottom face of nut rests on top side of connecting rod foot. Bolts should now be free and have no binding action on bearing box. Bar engine over carefully to various

positions and check alignment between foot of rod and top of bearing box with feelers at forward and after faces of bearing box. If misalignment of more than .002" is found, check clearance of piston in liner and of piston pin in piston and bushing. Replace any worn parts. Recheck alignment and correct top surface of upper half of bearing to obtain correct alignment if necessary.

To Replace Bushing in Connecting Rod

A heavy press is necessary. If this is not available, bushing should be split by sawing with a hacksaw from the inside. This will relieve the pressure and bushing can then be readily driven out. To insert new bushing, remove all burrs and clean connecting rod thoroughly. Place entire connecting rod in a pan of oil heated to 350° - 450°F. Remove connecting rod and place on substantial support. Insert bushing with one of the oil holes in line with drilled hole in rod---drive in. This operation should be done quickly, as bushing will heat up and expand rapidly. Make sure bushing protrudes the same amount on both sides.

Tightening Connecting Rod and Main Bearing Nuts

When using a torque wrench to tighten connecting rod bolt nuts and main bearing stud nuts, the nuts should be set up to the following reading in foot pounds.

Con. Rod Nuts	450 ft. lbs.
Main Brg. Nuts	450 ft. lbs.

J. Piston -

Pistons are especially selected for heavy duty service. Rings used are plain compression rings, sealing rings and oil regulator and wiper rings.

Piston pin bearings are bronze alloy bushings pressed into the connecting rods. Four holes around the circumference provide full pressure lubrication from crankshaft oil ducts and hollow connecting rods.

Piston pins of carburized and hardened alloy steel are full floating, prevented from endwise movement by aluminum plugs in the pistons.

About once every six months to one year, one or more pistons should be removed and inspected.

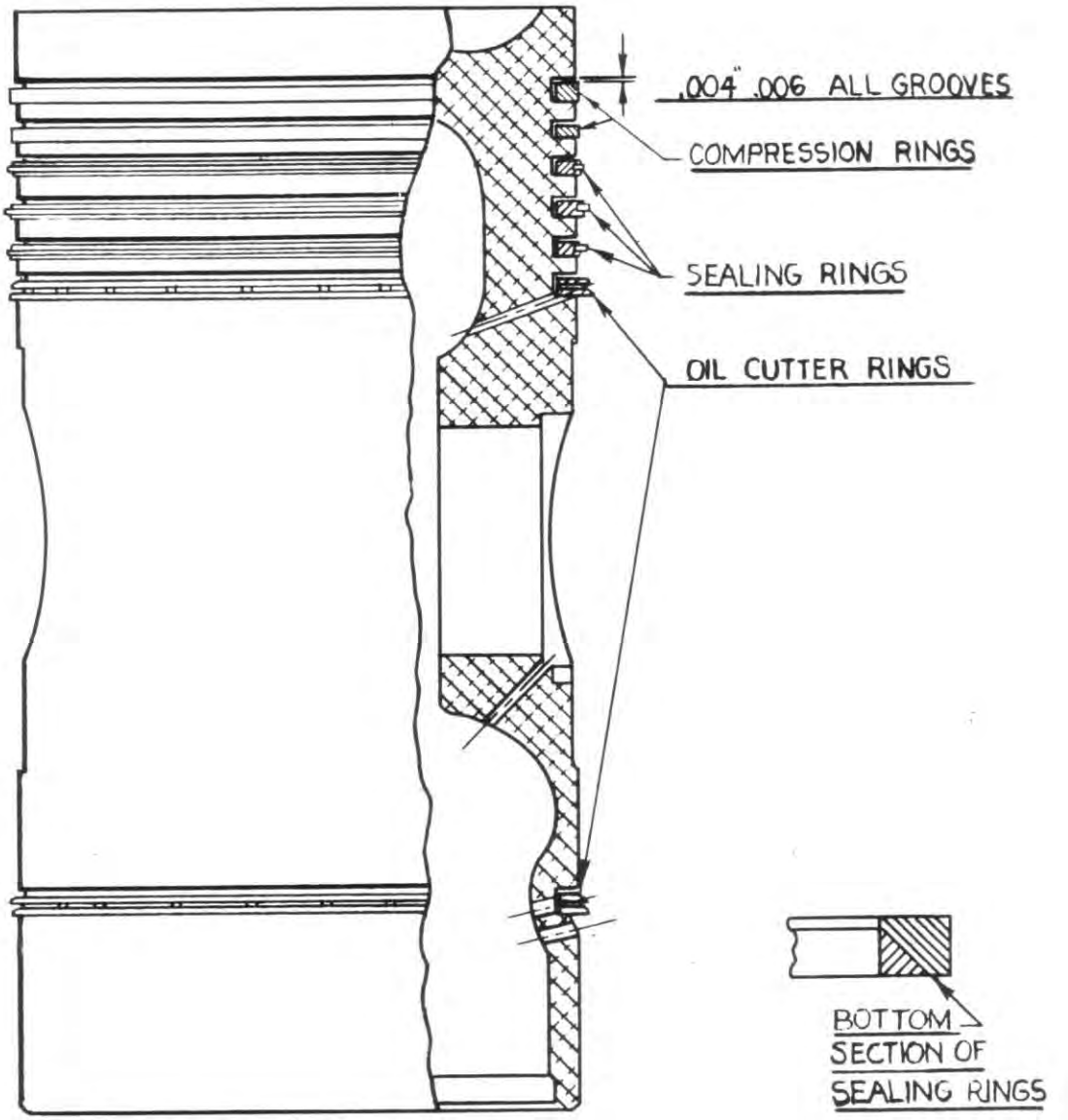
To Remove Piston

Remove cylinder head as outlined in section "Cylinder Head". Then bar engine until piston is at top dead center. Disconnect connecting rod bearing as instructed in section "Connecting Rod and Bearing".

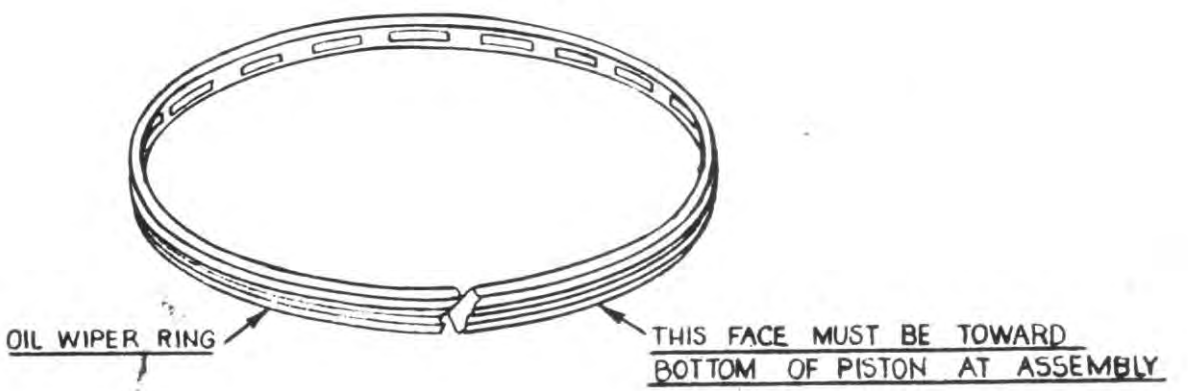
Insert eye bolts in tapped holes in piston head. Be sure that threads in tapped holes are clean so that eye bolts may be inserted at least 5/8". Piston and connecting rod may now be lifted with chain tackle. Make sure the holes in connecting rod foot are clear of the connecting rod bolts; otherwise there is danger of straining the piston with the tackle if the edges of the holes should catch in the bolt threads. Be careful to guide lower end of connecting rod through liner to prevent marring of liner bore.

To Remove Rings - (See Illustration "Piston Ring")

Insert a screw driver in ring gap. Spread ring and insert four 1/32" x 1/2" steel strips about 8" long between ring and piston equally spaced around circumference. Slide ring off carefully. Rings above piston pin should be removed over top of piston. Remove lower oil ring over bottom. As each ring is removed, attach tag so that when re-assembling ring will be in same position in its proper groove.



SEE "TABLE OF CLEARANCES" FOR PISTON RING CLEARANCES



PISTON RING

823A

Clean thoroughly all rings, grooves, and drain holes.

Check ring gap clearance as follows: Insert ring in liner and slide it down squarely, measuring gap at various levels in liner. Gap clearance should be determined at smallest diameter of bore traversed by ring. See Piston Illustration and Table of Clearances, for correct gap clearances.

If gap clearance exceeds by 1/16", or more, the recommended clearance given in the illustration and table, then the bore of the liner should be measured with inside micrometers. If bore at any point is worn more than .040" on the diameter, liner should be replaced. Liner wear is usually limited to last few inches of ring travel near the top, and if rings show excessive gap clearance near the bottom, it usually indicates ring wear. When replacing rings, fit gap clearance to amount given in illustration and table. Check gap clearance as outlined above.

If ring side clearance exceeds .008", or if groove is worn uneven or is tapered more than .003", remachine groove and use oversize rings, having proper clearances with new groove width.

To Remove Piston Pin

Withdraw each of the two aluminum plugs as follows: Place a washer 2" outside diameter, 9/16" inside diameter and 1" long over a 1/2" standard capscrew about 5" long. Insert capscrew in tapped hole in piston plug and withdraw plug using washer as a ram. The pin is a wringing fit in the piston and should push out easily with little force from either side.

Bushing end of connecting rod should be washed in kerosene and then blown out thoroughly with compressed air.

Correct clearances of piston pin in piston and bushing are given in Table of Clearances.

When installing new pin, scrape out all carbon and burrs from bore in piston. Make sure pin has proper clearance in both piston and bushing.

To Re-Assemble Piston in Liner

Assemble piston and rod, taking care to return them to their original relative positions. Aluminum plugs are marked and are not interchangeable. They should be from .003" to .008" below the diameter of the piston when checked with a long scale held against the surface of the piston skirt. Check with feelers, being certain to hold the scale parallel to the axis of the piston. Hang piston on chain tackle and install rings in proper positions. Cover cylinder walls with a coating of clean cylinder oil. Lower piston carefully into liner, using ring guide. With crankpin on top dead center and connecting rod bearing in place, let piston down slowly on bearing. Be sure proper number of shims are in place and that surfaces are clean. After assembly has been completed and before cylinder head has been replaced, measure distance from top of piston to top of cylinder block. (See Table of Clearances).

If any new wearing parts have been installed engine should be run for at least eight hours at about half speed and at a light load. During this time it should be stopped frequently to ascertain any undue heating of piston or pin.

K. Main Bearing

Main bearings are of the precision type. The cast steel caps are line bored with the engine base to insure accurate alignment. Upper and lower shells are identical; they are bronze back lined with bearing metal. No shims are used; accurate location of parts is accomplished by steel locking rings in cap, holding also upper shell to cap.

To Remove Main Bearing

Take off cap. Insert the tool provided into oil hole in crankshaft. Shell may now be rolled out by barring engine over carefully until shell is free. Remove one bearing at a time, inspect and clean it and replace before disturbing other bearings. Oil groove in shell is offset. When installing shells, make sure the grooves are staggered to prevent formation of a ridge in crankshaft journal by wear.

Alignment and Clearances

A careful check of alignment and clearances should be made about once every two months for the first six months and thereafter about once every six months.

Test Alignment As Follows:

Measure distance between inside faces of crank webs with crankshaft deflection gage, or if not available, with inside micrometers. Check this distance at intervals of approximately 90°. Readings should not differ by more than .003". ~~Refer to form in back.~~

If misalignment is indicated, it may be due either to uneven wear in the bearing shells or to distortion of the engine bed.

If uneven wear is indicated, replace the shells which are worn. Do not scrape shells or base or attempt to rebabbitt shells. If engine bed distortion is indicated, check and correct.

L. Liner

Liners are of the water contact type. They are inserted in cylinder block and located at top and bottom surfaces. Material is a special alloy cast iron having a hardness of 200 to 240 Brinell. The cylinder head holds the liner firmly through the gasket; the latter also seals the combustion chamber and circulating water passages. Two rubber rings seal the liner at the bottom. To facilitate installation, these rings are placed in grooves machined in the block. There is a cored chamber between the two grooves; a drain hole at the bottom of this chamber on each cylinder, prevents water from reaching the crankcase and also gives indication of any leak.

To Remove Liner

Remove cylinder head and piston in accordance with instructions given in Sections "Cylinder Head" and "Piston". Withdraw liner by means of plates and puller bolt supplied for the purpose.

Before replacing liner, install new sealing rings. A coating of a good grade of grease for rubber lubrication should be placed on rings and on those portions of liner which fit into rings and into bore at top of cylinder block. It is essential that liners be replaced in their original cylinders and that each liner be re-assembled in its original position relative to the cylinder block.

M. Cams, Camshaft and Camshaft Bearing

Cams are nickel alloy steel carburized, hardened and ground. Each cam is securely fastened on the camshaft by key and two setscrews. Each setscrew is kept from turning by a plug formed by Cerro-Base. To melt out, heat with a small blow torch. Be careful not to heat cam to point where it discolors, as this will reduce hardness of surface. Cerro-Base should be used in re-assembly. If it is not available solder may be used.

Bearings should be checked by means of feelers about once every six months. If wear is indicated above allowable, replace shells. Do not attempt to scrape or rebabbitt.

Camshaft bearings are of the precision type. The cast steel caps are line bored with crankcase to insure accurate alignment. Upper and lower shells are not alike; so care must be taken upon re-assembly. The upper shell has a drilled oil hole. The shells are steel backed, lined with bearing metal. No shims are used; accurate location of parts is accomplished by steel locking rings in cap which also hold the upper shell to cap.

N. Timing Gears - See Illustration "Gear Set"

Timing gears have accurately cut helical teeth. Gear teeth are lubricated by streams of oil directed in such a manner that all gears will have an abundance of oil at all times. About once every six months covers on gear case should be removed and gears inspected and backlash tested between all gears. Test radial and thrust clearance of idler bushing. If backlash between any pair of gears exceeds value given in the Table of Clearances by .006" or more, adjust as described below provided the backlash is not caused by excessive wear of the teeth. In this case, replace the worn gear.

Accessories on the front of the engine are flange mounted. When installing these accessories proceed as follows: Position flange of housing or mounting bracket so that the gears have the correct backlash, and slightly tighten bolts. Check by turning accessory gear back and forth by hand. Bar engine to several positions and check backlash. Adjust if necessary then tighten flange securely and make final check for proper clearance.

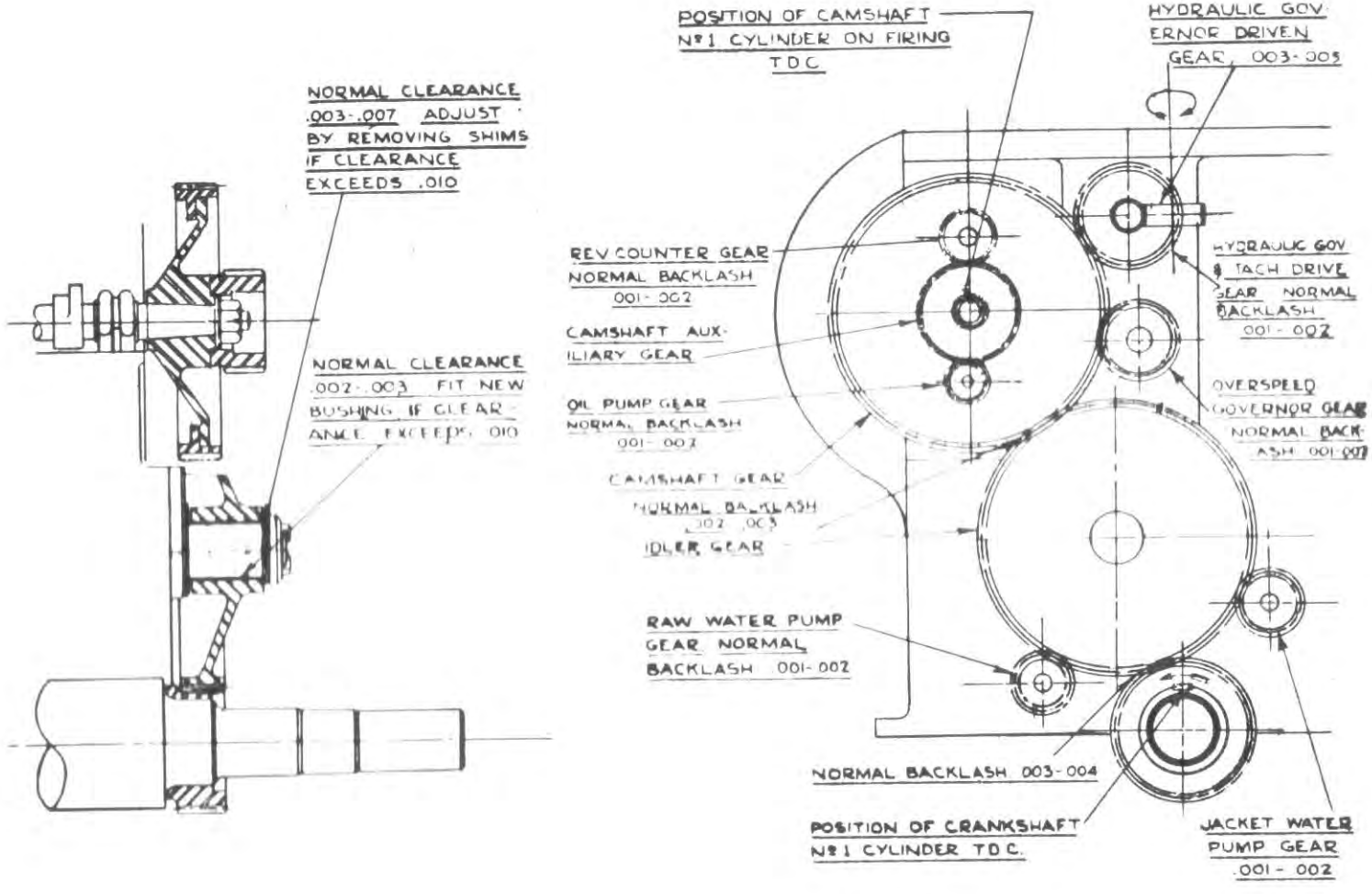
To Remove Gear Case

Take off all accessories, disconnect all lines to gear case, remove pin in eccentric shifter strap, which allows reversing mechanism to be removed, and unbolt gear case from cylinder block and base.

To Remove Idler Gear

Take off idler thrust plate and shims. Gear may now be withdrawn. Install new bushings if radial clearance exceeds .010". When installing new bushings, remove all burrs from bore of gear. When re-assembling gear on idler stub shaft, adjust thrust clearance to .003" by use of proper number of shims.

If the idler only is to be removed, be certain to mark the mating teeth on crankshaft, idler and camshaft gear before disassembly. This will eliminate the necessity of going through the engine timing procedure as stated below when re-assembling.


NORMAL CLEARANCE .003-.007 ADJUST BY REMOVING SHIMS IF CLEARANCE EXCEEDS .010
NORMAL CLEARANCE .002-.003 FIT NEW BUSHING IF CLEARANCE EXCEEDS .010
POSITION OF CAMSHAFT Nº1 CYLINDER ON FIRING T D C
HYDRAULIC GOVERNOR DRIVEN GEAR .003-.005
REV COUNTER GEAR NORMAL BACKLASH 001-.002
CAMSHAFT AUXILIARY GEAR
OIL PUMP GEAR NORMAL BACKLASH 001-.003
CAMSHAFT GEAR NORMAL BACKLASH .002-.003
IDLER GEAR
RAW WATER PUMP GEAR NORMAL BACKLASH .001-.002
HYDRAULIC GOV & TACH DRIVE GEAR NORMAL BACKLASH 001-.002
OVERSPEED GOVERNOR GEAR NORMAL BACKLASH .001-.002
NORMAL BACKLASH .003-.004
POSITION OF CRANKSHAFT Nº1 CYLINDER T D C.
JACKET WATER PUMP GEAR .001-.002

GEAR SET

To Replace Crankshaft Gear

The gear is a shrink fit on the crankshaft. To remove gear, split it by drilling a series of holes from top of keyway. Insert 3/4" studs about 24" long in tapped holes and withdraw gear. When installing a new gear, first fit a new key. Key should be a driving fit on the sides only in both crankshaft and gear; allow .005"-.010" clearance top or bottom. Remove all burrs from crankshaft.

Insert studs in tapped holes in gear. Place gear in a pan of oil heated to 350°- 450°F. Gear may now be placed in position on crankshaft.

To Replace Camshaft Gear Hub

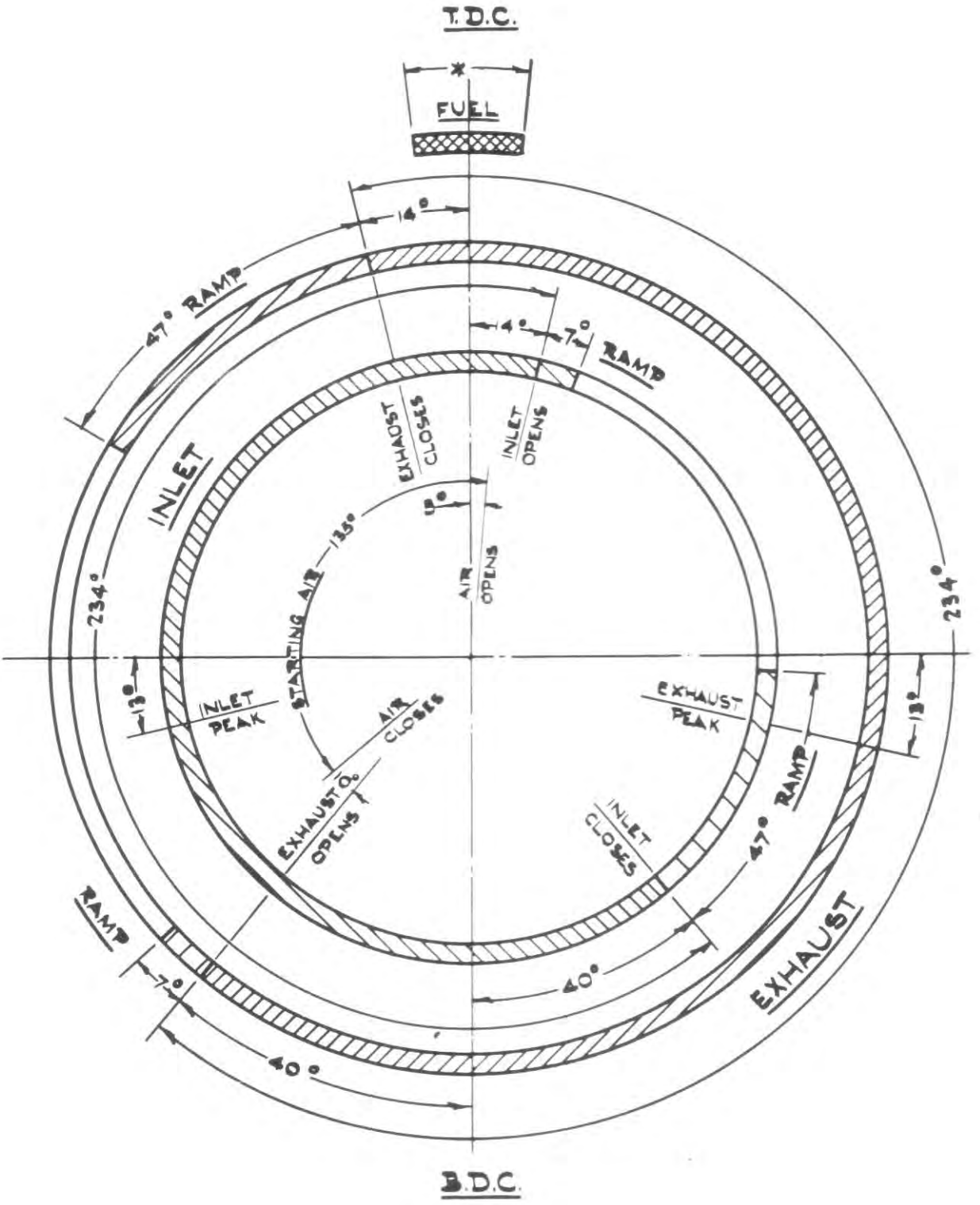
Remove camshaft nut and washer. Insert 1/2" studs about 6" long in tapped holes in hub. For a puller, use a 3/4" x 1-1/4" bar about 10" long with two holes 9/16" in diameter and at 8-1/8" centers. When replacing hub a new key should be fitted. In assembling a new ring gear and hub, position so that four slotted holes in hub are centered over the respective drilled holes in ring gear. Clamp gear and hub, but do not drill and ream the remaining two holes in ring gear until after camshaft has been timed, as these are locating holes. Replace gear assembly on camshaft, install washer and nut.

To Time the Engine

Remove idler gear as instructed earlier. Bar engine until mark "1-6" or "1-8" on circumference of flywheel is exactly under the center of the flywheel pointer. Position camshaft so that gear keyway is exactly vertically upward. (See Illustration "Gear Set"). Replace idler gear. Loosen camshaft ring gear hub and adjust position of camshaft until top surfaces on intake and exhaust rollers on #6 or #8 cylinder are exactly on the same level, with the piston on top center, indicating that intake valve is about to open and exhaust valve is closed. (See Timing Diagram). The timing is now correct; ream locating holes in ring gear with reamer and insert fitted bolts.

Camshaft may be timed by means of No. 1 fuel injection pump if operator is certain that timing of this pump is correct. When using this method proceed as follows: Remove idler gear. Bar engine until mark "1-6" or "1-8" on circumference of flywheel is exactly under center of flywheel pointer. Position camshaft so that gear keyway is exactly vertically upward. Replace idler gear. Next bar engine until mark "1-6" or "1-8" on circumference of flywheel is* ahead of center of flywheel pointer. Adjust camshaft until mark on slidable pump plunger registers with line on inspection window. Clamp gear to hub. Bar engine a few degrees in direction of normal rotation and make sure fuel cam continues to raise pump plunger. When adjustment is satisfactory, ream locating holes in ring gear with a reamer and insert fitted bolts.

* See injection setting on title page.



* SEE INJECTION SETTING ON TITLE PAGE

TIMING DIAGRAM

To Time the Engine After Installing a New Ring Gear

Check setting of fuel tappets as follows: Remove fuel pumps from first and last cylinders. Bar engine over until one of the above fuel tappet rollers is on the base circle of the cam. Place a straight edge across the top of the fuel pump base and measure the exact distance to the top of the tappet. This distance should be .197" (3/16" - .010"). If the distance is less or greater adjust tappet until this figure is obtained. Now bar engine until the other tappet roller is on the base circle of its cam and carry out the same operation as on the preceeding tappet.

Remove the idler gear as instructed earlier. Now bar engine in ahead direction until mark "1-6" or "1-8" on flywheel is exactly under center of flywheel pointer.

Position camshaft to neutral position manually, by inserting barring bar in capstan mounted underneath reversing mechanism housing and then rotating capstan.

Set camshaft so that position of fuel cam for number one cylinder is in position to begin the raising of the fuel tappet, and position of fuel cam of last cylinder is in the position of completion of its action.

Replace the idler gear, and loosen the ring-gear bolts. The ring gear is held to the hub by four bolts which are in slotted holes, and two fitted bolts. With the four slotted bolts loosened, and the fitted bolts not yet in place, the hub can be moved a slight amount in either direction for final adjustment as follows:

Rotate camshaft in either direction by turning hub, until first and last tappet measure the same distance from top surface of fuel pump base to top of tappet. When this is accomplished, drill a ½" locating hole through ring gear and hub, and ream to size of fitted bolt. Insert and tighten fitted bolt, then repeat the drilling and reaming operation to install

the other fitted bolt. The engine is now correctly timed. All fuel injection pumps should now be re-timed as previously explained.

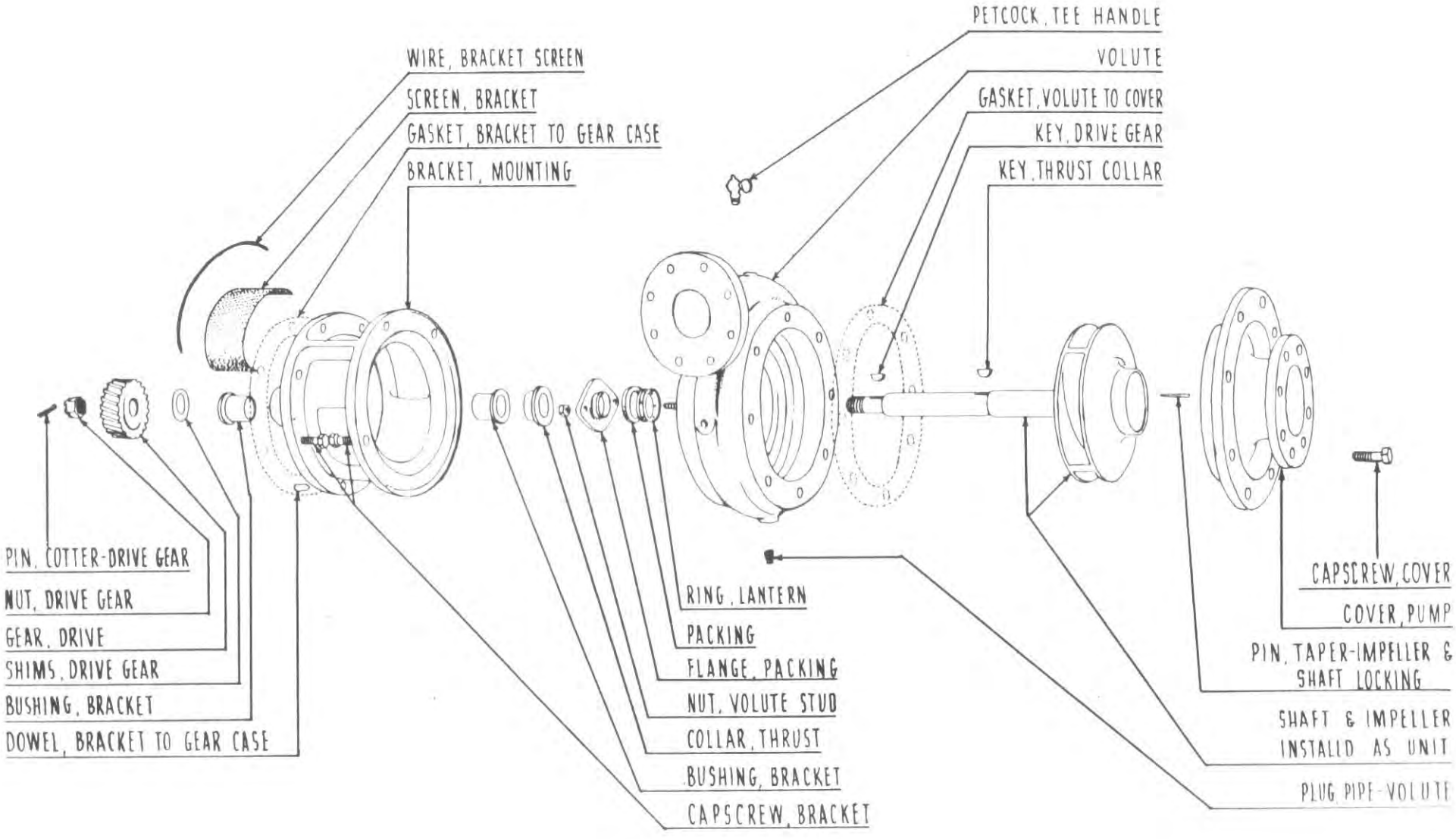
Camshaft may be timed by means of No. 1 fuel injection pump if operator is certain that timing of this pump is correct. When using this method proceed as follows: Remove idler gear. Bar engine until mark "1-6" or "1-8" on circumference of flywheel is exactly under center of flywheel pointer. Position camshaft so that gear keyway is exactly vertically upward. Replace idler gear. Next bar engine until mark "1-6" or "1-8" on circumference of flywheel is * ahead of center of flywheel pointer. Adjust camshaft until mark on slidable pump plunger registers with line on inspection window. Clamp gear to hub. Bar engine a few degrees in direction of normal rotation and make sure fuel cam continues to raise pump plunger. When adjustment is satisfactory, ream locating holes in ring gear to size of fitted bolt with a reamer and insert bolts.

* See injection setting on title page.

P. Water Pump

The fresh water pump and the sea water pump are both of the centrifugal non-reversible type, mounted on the engine, and driven from the gear set at the front of the engine. The pumps require no attention under normal operation. Occasionally check packing for leaks. Do not tighten gland too tight, however, as the packing may score the shaft.

An illustration of the pump follows.



WATER PUMP - CENTRIFUGAL - NON REVERSING

PART V

TABLE OF CLEARANCES

Valves

Exhaust Valve Clearance in Guide - - - - .0055" - .007"
Replace Guide if clearance exceeds .020"-.025"

Inlet Valve Clearance in Guide - - - - - .0035" - .005"
Replace Guide if clearance exceeds .020"-.025"

Air Starting Valve Clearance in Cage - - .015"

Main Piston in Cage - - - - - - - - - - - .002" - .004"
Replace Piston if clearance exceeds .015"

Auxiliary Piston in Main Position - - - .002" - .004"
Replace Worn Parts if clearance exceeds .015"

Rocker Arm

Radial Clearance on Shaft - - - - - - - - .002" - .004"
Replace rocker arm bushings if clearance exceeds .010"

Roller on Pin - - - - - - - - - - - - - - .0005" - .0025"
Replace pin and roller if clearance exceeds .010"

Tappets

Tappet in Guide - - - - - - - - - - - - - .001" - .003"
Replace with new Tappet Guide Liner if clearance exceeds .010"

Tappet Roller on Pin - - - - - - - - - - - .0015" - .0030"
Replace pin and roller if clearance exceeds .005"

TABLE OF CLEARANCES
(Continued)

Connecting Rod Bearings

Clearance on Crankshaft - - - - - - - - .008" - .0095"
Replace if Clearance exceeds .012"

Main Bearing

Clearance on Crankshaft - - - - - - - - .008" - .011"
Replace if Clearance exceeds .015"

Piston

Piston in Liner (Skirt clearance) - - .010" - .012"
Replace liner if diameter of bore at any point exceeds 12.040"

Piston Pin

In Piston - - - - - - - - - - - - Light Driving Fit @ 70° F.

Replace pin if clearance exceeds .002"

Piston Pin

In connecting Rod Bushing - - - .004" - .005"
Replace bushing if clearance exceeds .010"

Top of Piston to Top of Cylinder Block .810" - .815"
Adjust by means of compression shims between foot of connecting rod and bearing.

Piston Rings

Gap Clearance
Sealing Rings - - - - - - - - - - .040" - .055"
Top Compression Ring - - - - - - - .040" - .060"
Second and Third Compression Rings- - - - .025" - .040"
Oil Rings - - - - - - - - - - - - .025" - .040"
Replace rings if wear exceeds .200"

Side Clearance in Groove
Top Two Rings - - - - - - - - - - .006" - .0085"
All Other Rings - - - - - - - - - .004" - .0065"
Replace ring if side clearance exceeds .014"

TABLE OF CLEARANCES
(Continued)

LUBRICATING OIL PUMPS

End Clearance of Gears - - - - - - - - -	.005"-.007"
Radial Clearance of Gears in Housing -	.002"-.004"
Backlash in Gears - - - - - - - - - - -	.004"-.006"
End Clearance of Drive Shaft - - - - -	.004"-.007"
Adjust by removing shims under thrust washer if clearance exceeds .010"	
Bushings - Radial - - - - - - - - - - -	.001"-.003"
Replace bushings if clearance exceeds .010"	

PART VI

ENGINE TROUBLES AND SUGGESTED REMEDIES

ENGINE FAILS TO TURN OVER WHEN OPERATING CONTROL IS MOVED INTO START POSITION

Probable Cause	Suggested Remedy
1. Air Starting Equipment out of order	
a. Insufficient air pressure.	a. Pump up pressure to 200 to 250 p.s.i.
b. Valves closed in air supply.	b. Open all valves.
c. Air valves improperly timed.	c. Adjust timing.
d. Air Starting valve stuck or leaking.	d. Release pressure in cylinder by means of the relief valve. Remove air valve and clean.
e. Air not being bled from top of Air Starting Valve.	e. Check pilot valve and line to pilot valve for obstruction.

ENGINE TURNS OVER ON AIR BUT WILL NOT START

1. No fuel is being delivered	
a. No fuel in tank or valve closed.	a. Refill tank and open all valves.
b. Fuel inlet pipe clogged or filter dirty.	b. Clean pipe and filter.
c. Air in fuel line.	c. Vent system of air.
d. Water in fuel.	d. Drain all water from fuel system and refill with clean oil.
e. Fuel control linkage sticking in "off" position.	e. Free linkage.

ENGINE TURNS OVER ON AIR BUT WILL NOT START (Cont'd.)

Probable Cause	Suggested Remedy
f. Injection pump timing improperly set.	f. Adjust timing.
2. Lack of compression	
a. Valves sticking	a. Free valves and deposit oil on stems.
b. Valves riding open.	b. Adjust hydraulic lifters.
c. Valves not seating properly.	c. Reseat valves.
d. Leaky head gaskets.	d. Replace gaskets.
e. Incorrect clearance between top of piston and top of cylinder block.	e. Adjust clearance by adding shims between connecting rod and bearing. Check clearance of connecting rod bearings and piston pin bushings.
f. Stuck piston rings.	f. Clean rings, ring grooves and oil drains.
g. Rings or cylinder liners worn,	g. Replace rings. Use oversize rings if necessary. If liners are scored or worn more than .040" replace liners.
h. Cracked piston.	h. Replace piston.

ENGINE STOPS OR SLOWS DOWN WHEN RUNNING

Probable Cause	Suggested Remedy
1. Fuel tank running dry.	1. Check whether transfer pump delivers fuel to tank. Check whether air release on tank is operating properly.
2. Water in fuel.	2. Drain all water from fuel system. Refill with clean oil.
3. Exhaust manifold becomes clogged.	3. Clear manifold and ascertain cause of excessive accumulation.
4. Piston seizing. Actual seizure accompanied by high-pitched squeaking noise.	4. Stop engine immediately at first sign of a tight piston. Check cooling and lubrication. Inspect piston and liner. Replace if necessary.

ENGINE FIRES IRREGULARLY

1. Lack of proper fuel delivery	
a. Fuel inlet pipe clogged or second stage filter element dirty.	a. Clear pipe. Clean filter.
b. Fuel tank running dry.	b. Check whether transfer pump delivers fuel to tank. Check whether air release on tank is operating properly.
c. Air in fuel line.	c. Vent filter, supply header, injection pumps and nozzles.
d. Water in fuel.	d. Drain all water from fuel system. Refill with clean oil.

ENGINE FIRES IRREGULARLY (Continued)

Probable Cause	Suggested Remedy
2. One or more cylinders misfires or fires irregularly	
a. Fuel nozzle bleeder valve open.	a. Close bleeder valve.
b. Fuel nozzle stuck, clogged, damaged or worn.	b. Replace with spare and check.
c. Leaky joints in injection tubing.	c. Clean joint faces and tighten joints.
d. Fuel pump control lever improperly set.	d. Adjust fuel pump control lever until pyrometer reading for this cylinder coincides within 20°F. to readings on other cylinders. If, when this condition is satisfied, control rod reading on pump differs by more than 2 mm. from that of other cylinders, check cause and correct.
e. Fuel pump timing improperly set.	e. Adjust timing.
f. Fuel pump dirty, damaged or worn.	f. Replace with spare and check.
3. Lack of compression in one or more cylinders.	3. See page 6-A-2.

SMOKY EXHAUST - BLACK SMOKE CAUSED BY EXCESSIVE FUEL

1. Intake louvres or elbows clogged.	1. Remove and clean.
2. Injection nozzle not closing tightly or not atomizing properly.	2. Replace with spare and check.

SMOKY EXHAUST - BLACK SMOKE CAUSED BY EXCESSIVE FUEL (Continued)

Probable Cause	Suggested Remedy
3. Fuel pump improperly timed.	3. Adjust timing.
4. Engine overloaded.	4. Check load. Reduce if necessary.
5. One or more injection pumps delivering too much fuel per stroke.	5. Adjust fuel pump control lever until pyrometer reading for this cylinder coincides within 20°F. to readings on other cylinders. If, when this condition is satisfied, control rod reading on pump differs by more than 2 mm. from that of other cylinders, check cause and correct.

SMOKY EXHAUST -BLUE SMOKE - LUBRICATING OIL IN EXHAUST

1. Piston rings stuck or drain holes clogged.	1. Clean rings, grooves and oil drains.
2. Rings or cylinder liners worn.	2. Replace rings. Use oversize rings if necessary. If liners are scored or worn more than .040" replace liners.

ENGINE KNOCKS

1. Fuel pump timing improperly set.	1. Adjust timing.
2. Nozzle sticking open.	2. Replace with spare and check.
3. Type of fuel not suitable.	3. Check fuel with specifications.
4. Piston too loose in liner.	4. To check: Cut out cylinder in question by opening bleeder valve. If knock disappears, check piston skirt clearance. Install new liner, or piston, if necessary.

ENGINE KNOCKS (Continued)

Probable Cause	Suggested Remedy
5. Loose piston pin or piston pin bushing worn or burned out.	5. To check: Place piston on bottom dead center. Check with pry bar on piston. Replace piston pin or piston pin bushing if necessary.
6. Connecting rod bearing burned out or badly worn.	6. Check clearance with pry bar. Replace shells if necessary.
7. Main bearings burned out or badly worn.	7. Remove cap and inspect. Replace shells if necessary.

INSUFFICIENT LUBRICATING OIL PRESSURE AS SHOWN ON MAIN LUBRICATING OIL GAUGE

1. Insufficient oil in service tank	
a. Lubricating oil suction connection from base covered with sludge.	a. Clean suction connection.
b. Piping connections loose.	b. Tighten connections.
2. Lubricating oil filter clogged.	2. Clean filter.
3. Clogging of oil line.	3. Clear line.
4. Relief valve sticking, not seating properly or improperly adjusted.	4. Free valve, reseat and adjust if necessary.

INSUFFICIENT LUBRICATING OIL PRESSURE AS SHOWN ON MAIN LUBRICATING OIL GAUGE - Continued -

Probable Cause	Suggested Remedy
5. Loose or worn bearings.	5. Adjust bearing clearances. Replace if necessary.
6. Pressure piping connections loose.	6. Tighten connections.
7. Pressure pump defective.	7. Check clearances.

EXCESSIVE LUBRICATING OIL PRESSURE AS SHOWN ON MAIN LUBRICATING OIL GAUGE

1. Relief valve stuck or adjustment incorrect.	1. Free valve and adjust if necessary.

INSUFFICIENT JACKET WATER PRESSURE AS SHOWN ON MAIN WATER PRESSURE GAUGE

1. Air in jacket water pump.	1. Open vents on pump or on top of suction. Inspect circulating water piping for air leaks.

JACKET WATER PRESSURE SUFFICIENT BUT TEMPERATURE EXCESSIVE

1. Insufficient water supply due to --	
a. Sea suction clogged or valves closed.	a. Clear suction and open valves.
b. Loose connections.	b. Tighten.
c. Air in water pump.	c. Open vents on pump or on top of suction.
d. Overboard discharge clogged.	d. Clear discharge.

JACKET WATER PRESSURE SUFFICIENT BUT TEMPERATURE EXCESSIVE

Probable Cause	Suggested Remedy
2. Engine water passages clogged, or coated with scale.	2. Clean out engine with approved solvent.

MISCELLANEOUS TROUBLES

1. Lubricating oil temperature too high due to oil cooler passages clogged or coated with scale.	1. Clean oil cooler.
2. Engine speed fluctuates or fuel control shaft changes position constantly due to --	
a. Governor linkage or fuel control shaft stuck.	a. Free governor linkage and fuel control shaft.
b. Fuel pump control rod stuck.	b. Replace pump with spare.
c. Governor linkage worn.	c. Replace worn parts.

MISCELLANEOUS TROUBLES - Continued.

Probable Cause	Suggested Remedy
3. Excessive smoke from crankcase breathers due to --	
a. Stuck piston rings.	a. Clean rings, ring grooves, and oil drains.
b. Rings or cylinder liners worn.	b. Replace rings. Use oversize rings if necessary. If liners are worn more than .040", replace liners.
c. Cracked piston,	c. Replace piston.

TYPE BF THERMXCHANGER

OPERATING INSTRUCTIONS

INSTALLATION

The Type BF Thermxchanger is installed in a horizontal or vertical position, with oil and water connections piped as shown on drawing.

OPERATION

Water or oil to be cooled is circulated through the shell, passing over the tubes in cross flow directed by baffles. Cooling water passes through the tubes in each unit.

STARTING UP

Both tube side and shell side should be filled with respective liquids, with vents open to the atmosphere to allow escape of all air and insure that the units are completely filled with liquid. Vents should then be closed.

CLEANING---CHEMICALLY

The inside or the outside of the tubes can be cleaned by circulating a cleaning solution through the unit. A mild alkaline solution is generally satisfactory, but in the case of heavy carbonate or similar scales, a weak solution of hydrochloric or sulphuric acid is effective.

When cleaning, the cooler must be drained and the cleaning solution circulated from a separate pump and tank. All chemicals should be thoroughly washed out before putting the unit back into service. Acid solutions of proper strength can be circulated through engine jackets and coolers by the jacket water circulating pump.

CLEANING---MECHANICALLY

The inside of the tubes can be cleaned mechanically. First drain off all cooling water from the tubes and remove bonnets, thence the inside of the tubes can be cleaned with a standard tube cleaner of proper size. The tubes in the Type BF are 3/8" O.D. x #20 BWG.

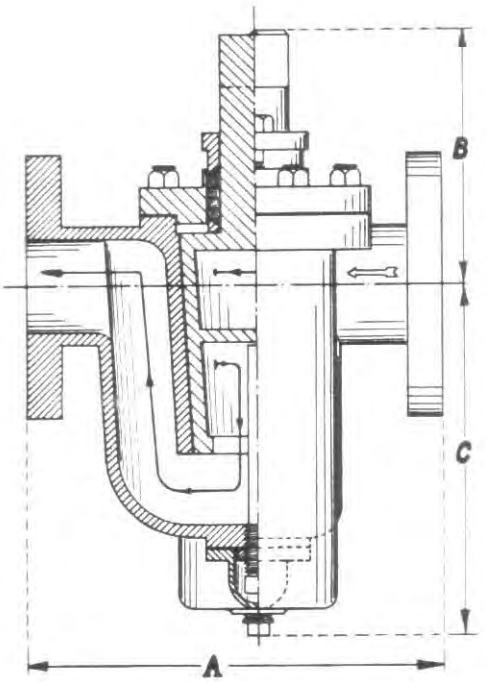
CORROSION ELIMINATORS

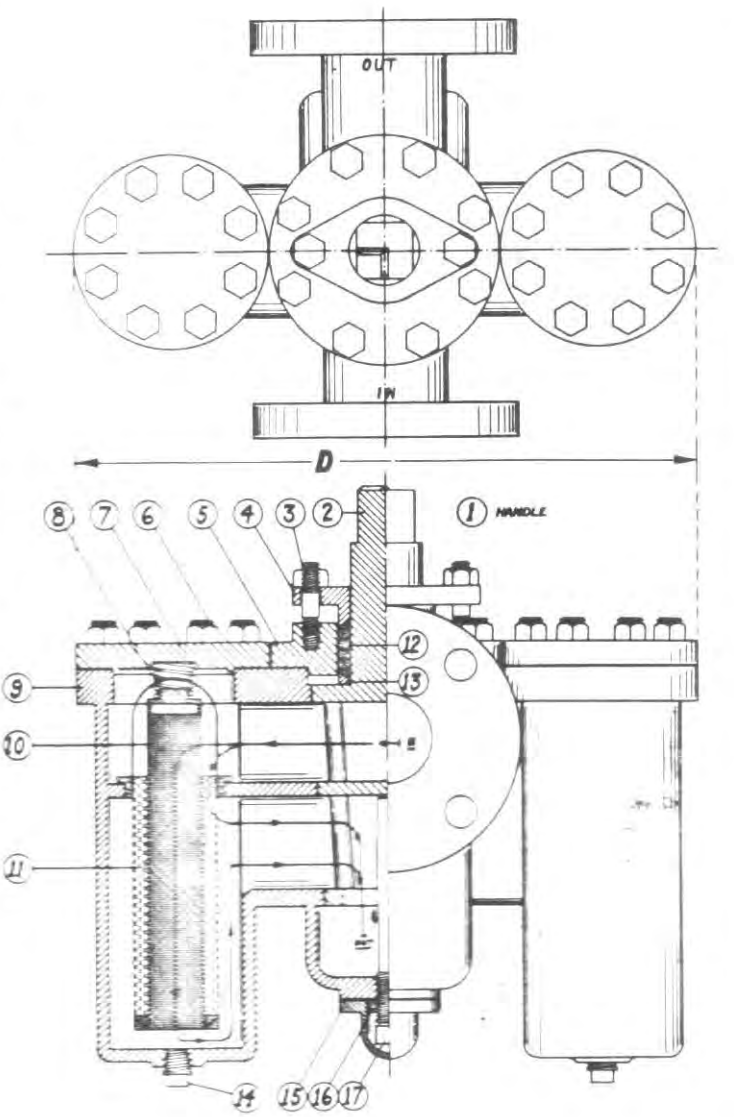
Coolers are furnished with replaceable zinc rods in bonnets. These rods are thread-attached to plugs in the entrance and return bonnets and can be replaced easily.

PERFORMANCE

The Type BF Thermxchanger is designed for this application with a liberal fouling allowance, and when used under the specified operating conditions of this engine, will keep the jacket water and lube oil within temperature limits required.

BAILEY NO. 200 DUPLEX BASKET STRAINER



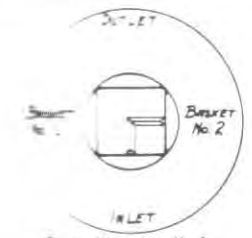


PARTS LIST

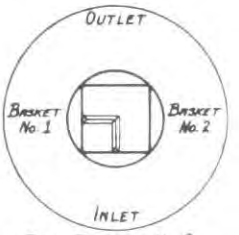
1: Lever Socket Wrench
2: Plug Valve (3-way or 2-way)
3: Studs & Nuts (Packing Gland)
4: Packing Gland
5: Plug Cover
6: Studs & Nuts (Cover)
7: Basket Cover
8: Spring
9: Body
10: Long Basket
11: Short Basket
12: Packing
13: Packing Ring
14: Plug (Drain)
15: Cap
16: Lock Nut
17: Plug Stem

DIMENSIONS

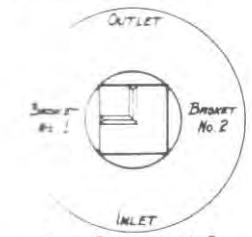
		1/2" & 3/4"	1" & 1-1/4"	1-1/2" & 2"	2-1/2"	3"	4"	5" & 6"
A	Scr'd	5-1/2"	6-3/4"	8-1/4"	11-3/4"	13-1/2"		
	Std.Flg.	6-3/16"	7-3/4"	8-1/4"	11-3/4"	13-1/2"	17-1/2"	20-1/4"
	Ex.Hvy.	6-3/8"	8-1/4"	8-3/4"	12-3/8"	14-1/4"	18-1/8"	21-1/8"
B		4-1/8"	4-3/4"	5-1/4"	7-1/4"	8-1/8"	8-5/8"	9-3/4"
C		4-1/2"	5-1/2"	8-1/2"	9-1/8"	12-1/2"	15-1/4"	20"
D		9"	11-5/8"	13-1/8"	17-3/4"	21-5/8"	27-1/2"	32-1/4"
WEIGHT Lbs.		32	44	62	122	215	410	640



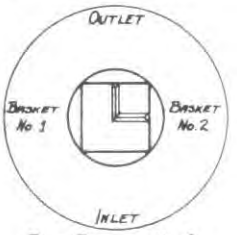
PLUG POSITION No. 1
FLOW THRU BASKET No. 2.
BASKET No. 1 CLOSED TO
BOTH INLET AND OUTLET.



PLUG POSITION No. 2
FLOW THRU BASKET No. 1
BASKET No. 2 CLOSED TO
BOTH INLET AND OUTLET.

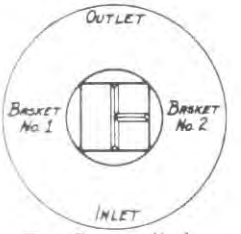


PLUG POSITION No. 3
NO FLOW. INLET CLOSED.
BASKET No. 1 OPEN TO OUTLET.

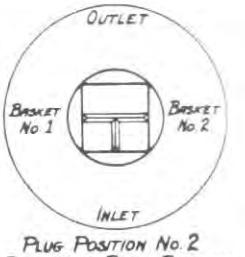


PLUG POSITION No. 4
No. 2 OPEN TO OUTLET. NO
FLOW. INLET CLOSED.

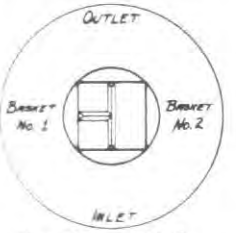
OPERATING DIAGRAMS FOR
NO. 200 TWO-WAY PLUG



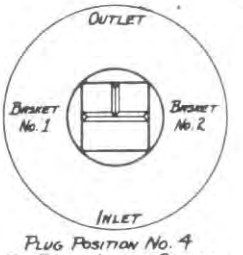
PLUG POSITION No. 1
FLOW THRU BASKET No. 2.
BASKET No. 1 CLOSED TO
BOTH INLET AND OUTLET.



PLUG POSITION No. 2
FLOW THRU BOTH BASKETS
NOTHING CLOSED.



PLUG POSITION No. 3
FLOW THRU BASKET No. 1.
BASKET No. 2 CLOSED TO
BOTH INLET AND OUTLET.



PLUG POSITION No. 4
NO FLOW. INLET CLOSED.
BOTH BASKETS OPEN TO OUTLET

OPERATING DIAGRAMS FOR
NO. 200 THREE-WAY PLUG

EFFECTIVE AREAS THRU STRAINER SCREENS IN SQ. INCHES

STRAINER SIZE	PERFORATIONS							MESH						
	1/64"	1-32"	3-64"	1-16"	3-32"	1/8"	3-16"	100,80 50,50	40,30	24	20,18	16,14,12	10	8
1/2 & 3/4	1.35	2.14	4.49	3.79	3.58	4.55	4.68	3.71	4.51	5.44	5.81	6.18	6.92	7.41
1 & 1-1/4	3.06	4.85	10.17	8.59	8.11	10.30	10.53	8.39	10.21	12.31	13.15	13.99	15.67	16.79
1-1/2 & 2	7.57	11.98	25.12	21.23	20.05	25.45	26.03	20.74	25.24	30.42	32.50	34.57	38.72	41.48
2-1/2	9.17	14.51	30.43	25.71	24.28	30.83	31.54	25.13	30.57	36.85	39.37	41.88	46.91	50.26
3	13.69	21.67	45.45	38.41	36.26	46.04	47.10	37.53	45.66	55.04	58.80	62.55	70.06	75.06
4	21.60	34.19	71.70	60.59	57.21	72.63	74.31	59.21	72.04	86.84	92.76	98.68	110.52	118.42
5 & 6	65.16	103.15	216.32	182.79	172.60	219.14	224.17	178.63	217.33	261.98	279.85	297.71	333.44	357.25

CONSTRUCTION FEATURES: Ruggedly constructed with large volume non-clogging body of Cast Iron, Bronze, Semi-Steel or Cast Steel, with Flanged or Screwed connections. Strong non-collapsible duplex strainer baskets of perforated sheet metal of brass, monel, galvanized steel, or stainless steel, all fitted with handles for ease of removal. Perforations 1/64" or larger available. Body fitted with screw at bottom for relieving of plug if necessary. Removable top plate is bolted, clamped or screwed type for ease of inspection or cleaning. Screwed or Clamped bonnet in sizes 1/2" to 2" inclusive, larger sizes with Bolted or Clamped Bonnet. Designed so that either or both baskets may be opened to flow or both baskets closed. Offset connections or special flanged connections furnished on application. Standard design is for horizontal lines only. Strainer furnished for vertical line installation on application.

PURPOSE: Suitable for installation on suction lines to pumps to remove sand, scale, chips, and foreign matter, and practically all strainer services on pressure pipe lines for straining hot or cold water, milk and liquid food products, hot or cold oil, steam and gas, and chemical solutions.

WORKING PRESSURE: The No. 200 Duplex Strainer with clamped bonnet suitable for pressures up to 75 pounds. Strainers with screwed or bolted bonnet of Cast Iron, Semi Steel or Bronze construction suitable for pressures to 250 pounds 450 degrees Fahrenheit, or 400 pounds hydrostatic pressure. Cast Steel body strainers for pressures to 400 pounds 750 deg. Fahr. or 600 lbs. hydrostatic pressure.

ORDERING INFORMATION: Specify Number, size, whether Screwed connections, standard flanged or Extra Heavy Flanged, Drilling, and whether Clamped, Screwed or Bolted Bonnets. State whether for pressure or suction service, fluid passing through strainer, screen material and size perforations. State material of body.

NOTE: When removing baskets for cleaning or inspection be sure to place spring on top of long basket when replacing.

PUROLATOR PRODUCTS, INC.

INSTRUCTIONS FOR OPERATING AND MAINTENANCE

OF THE

PUROLATOR TYPE D-113JJ

1. INSTALLATION

a. Mount the filter in a vertical position whenever possible, so that when the cleaning handle is turned to remove the accumulated dirt from the filtering element the dirt can be drained out easily after the drain plug is removed from the filter.

b. The filter shall be so located as to filter all of the circulating fluid in the system. It shall be readily accessible for cleaning without requiring drainage or disassembly of any part of the system except the filter.

c. Sufficient clearance should be left above the filter so that the cleaning handle may be turned by hand.

d. Sufficient clearance should be left below the filter so that the drain plug may be removed with a wrench and a receptacle may be held under the filter to catch the drainings.

2. MAINTENANCE

The two filtering elements incorporated in the filter are numbered 1 and 2. Either or both may be used for filtering. For normal operating conditions both elements should be used.

When elements become dirty and pressure drop increases, one of the elements may be shut off and cleaned. To do this, move control valve handle on top of filter until pointer hits stop marked either 1 and 2. When the pointer is at 1, it is indicated that element #1 is operating and #2 is shut off. The reverse is true when pointer is at #2.

In normal operation, the filter requires little attention which can be out-

B. REASSEMBLY

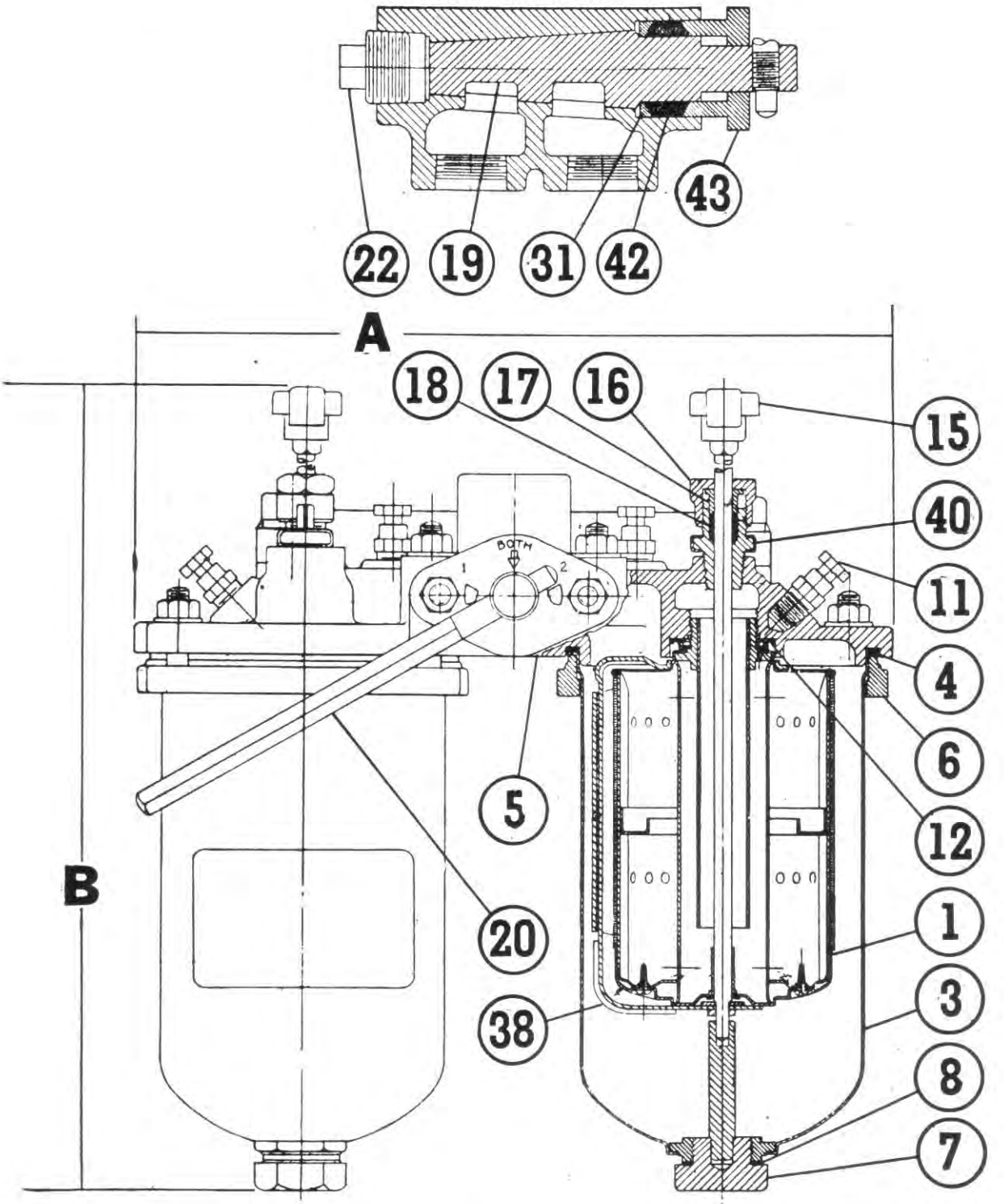
Reassembly procedure is the reverse of disassembly except new parts must be used where inspection has shown they are worn. Clamping ring nuts should be tightened evenly to prevent bending clamping ring.

IT IS NECESSARY TO SHUT DOWN ENGINE FOR FOLLOWING OPERATIONS:

To remove control (shut off) valve - THIS IS ONLY NECESSARY FOR INSPECTION OR RE-PAIR.

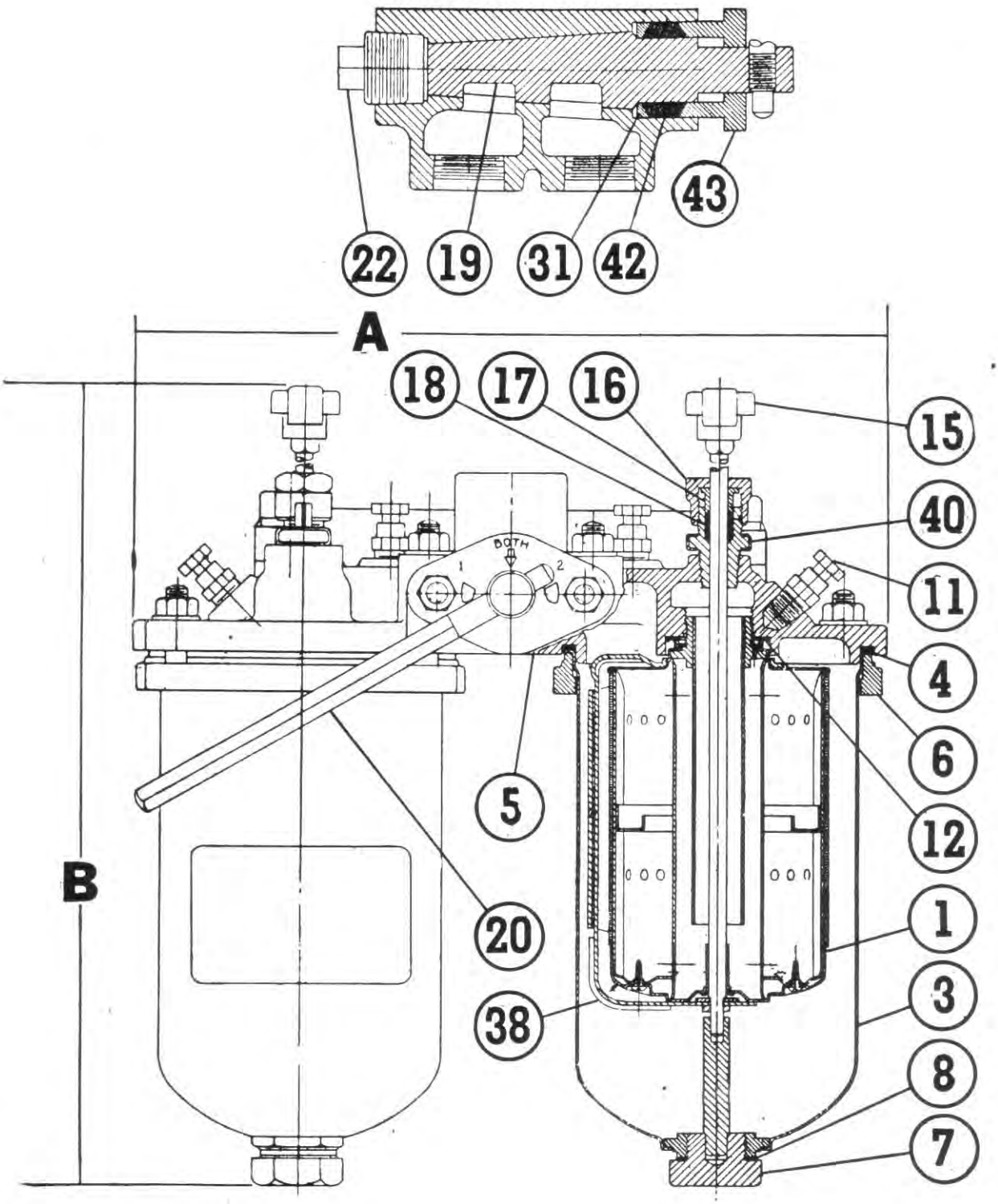
First remove lever by unscrewing lever from valve. Then remove stuffing box plate from top of valve by removing the two hex nuts from stuffing box studs. Remove old packing. The control valve can now be taken out with the retaining ring in it. Extreme care must be exercised not to damage lapped surface of valve or seat.

REVERSE OPERATIONS TO RE-ASSEMBLE.



TYPE D-113JJ

PUROLATOR PRODUCTS, INC., NEWARK, 5, NEW JERSEY



TYPE D-113JJ

PUROLATOR PRODUCTS, INC., NEWARK, 5, NEW JERSEY

PARTS LIST FOR ONE ASSEMBLY #31082

PUROLATOR TYPE D-113JJ-10

Pc. No.	Description of Part	No. Used	Symbol or Size	List Each	Group	Mfg's Drg No.	Eng. Mfg's Drg. No.
	D-113JJ-10 Purolator - Complete					31082	
38	Knife Assem.	2			.55	12729	
	Knife ... & frame *NSS	1				12743	
	Cleaning Knife *NSS	1				12735	
3	Case Assem. *NSS	2			1.50	14614	
	Case	1				13577	
	Bushing	1				13379	
6	Clamping Ring Assem.	2			2.25	21751	
	Clamping Ring	1				14796	
	Clamping Ring Stud	2				21754	
	Clamping Ring Stud	2				14795	
	Nut	4				7962	
	Washer	4				10959	
7	Drain Plug Assem.	2			.55	24007	
	Drain Plug *NSS	1				11216	
	Drain Shaft Guide *NSS	1				13685	
40	Stuffing Box & Spring Assem.	2			.35	17783	
	Spring *NSS	1				17772	
	Stuffing Box *NSS	1				16818	
1	Element	2				19003	
15							
5							
43							
42							
31							
	12						
19	11						
20	8						
	18						

Figure 1

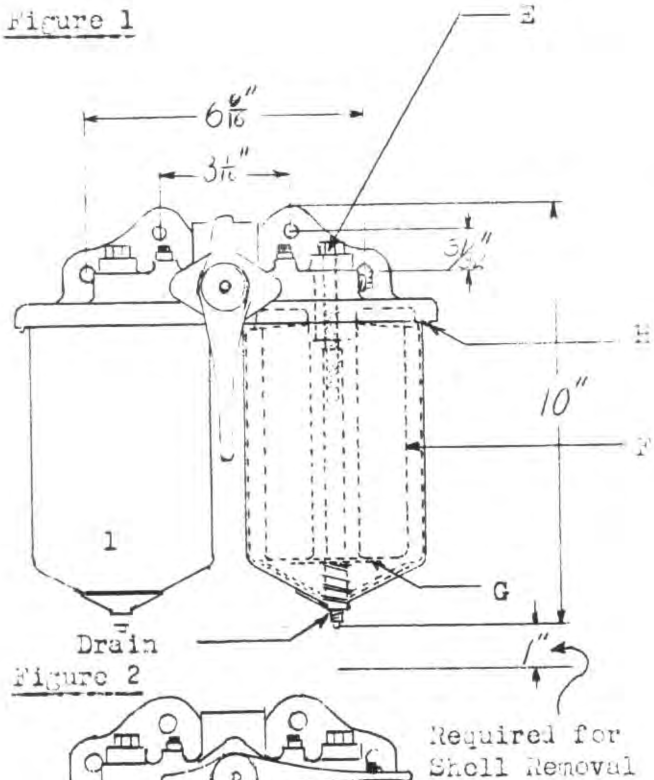


Figure 2

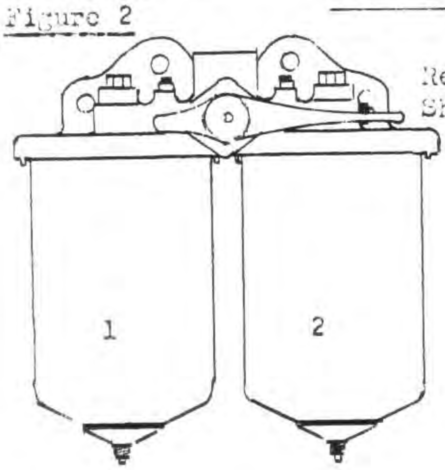


Figure 3

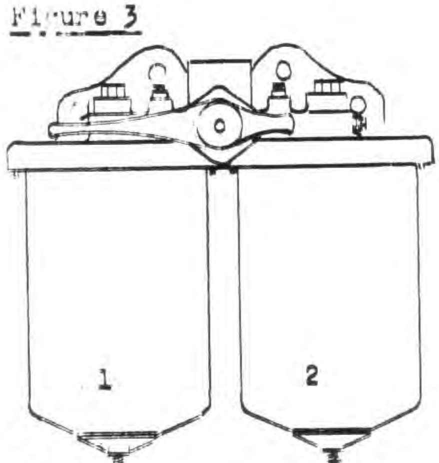
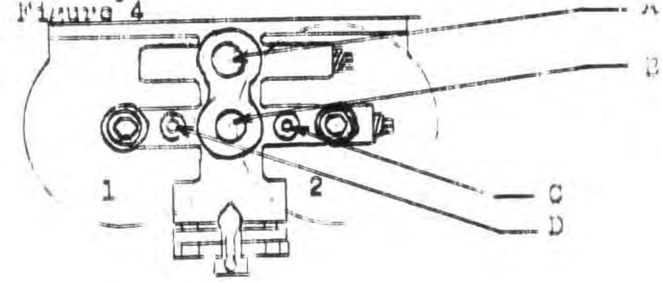


Figure 4



INSTRUCTIONS
FOR
INSTALLATION & OPERATION OF WINSLOW
DUPLEX FUEL FILTER No. 6[illegible]-FF-4
[illegible]
(2) No. F-635-6

OPERATION

1. Both units are on when valve handle is in vertical position - Figure 1.
2. Unit No. 1 is on when valve handle is in horizontal position with pointer hard against top of unit 1. Figure 2.
3. Unit No. 2 is on when valve handle is in horizontal position with pointer hard against top of unit No. 2, Figure 3.

CHANGING OF ELEMENTS

The filtering element must be changed when the pressure drop across the unit in use, has increased or the flow through the unit decreased to a point not sufficient to supply the engine.

1. Turn valve to correct position so the dirty unit will be free of oil flow.
2. Open drain plug and remove sediment.
3. Loosen top bolt (E) and remove shell.
4. Remove & discard dirty element (F).
5. Thrust new cork seal over center tube seating on spring & washer at (G).
6. Insert new F-635-6 Winslow element.
7. Clean top gasket surface (H) and replace gasket.
8. Replace shell, guiding element over center boss in top casting.
9. Draw shell into place with head bolt, compressing element and spring to assure adequate end seal.
10. Replace drain plug.
11. When this unit is again placed in service check for leaks and vent for air.

INSTALLATION

1. Set valve at position desired.
2. Bolt filter to engine mounting using 3/8" bolts or studs.
3. INLET: 3/4" pipe connection at rear-center of casting marked **(A)** on figure 4.
4. OUTLET: 3/4" pipe connection at center of casting marked (B) on figure 4.
5. When fuel is first run through filter, check for leaks and vent shell which is to be used, being sure all air is removed. (C) or (D) on figure 4.

IMPORTANT: Change element immediately upon increase of pressure drop across unit and decrease of flow rate to a point not sufficient to feed the engine.

WINSLOW ENGINEERING COMPANY
Oakland, 8, California

Printed in U.S.A.
Form W-266
9-30-43

BRIGGS LUBE OIL CLARIFIER MODEL D-2-BR-V13

DESCRIPTION

The purpose of the Briggs Oil Clarifier is to maintain lubricating oil within the limits considered safe for efficient engine lubrication.

The Clarifier is a compact unit embodying the Briggs Refills and a pressure relief valve within a round, rolled, steel tank.

The relief valve, built into the cover cap screw, is permanently set to maintain the correct pressure differential on the Briggs Refills for proper oil clarification. The oil which does not pass through the Refills discharges through the relief valve and returns to the lubricating system. Any air and foam which may enter the Clarifier is forced to by-pass through the relief valve, allowing only solid oil to be fed to the Refills.

An Orifice is installed on the Filter outlet to bleed a predetermined quantity of oil from the engine's lubrication system.

INSTRUCTIONS FOR OPERATING AND SERVICING

After installing Clarifier, remove cover and fill tank completely with oil. Replace cover and start Clarifier operation. Check Clarifier cover and all connections for leaks. Quantity of oil in lubricating system should then be checked and maintained at proper level.

If Briggs Cellulose Refills (D-Cel) are used, unless otherwise instructed, the Refills should be changed when the oil shows a precipitation number of more than .04 by analysis.

If Briggs Fullers Earth Block Refills (D) are used, the Refills should be changed when the oil begins to darken, or when, by chemical analysis, the oil shows a precipitation number of more than .05 or a neutralization number of more than .3.

Change Refills while the engine is shut down; or, in the event it is necessary to change Refills while the engine is in operation, divert the flow of oil around the Clarifier. Drain oil Clarifier through sludge drain before removing used Refills. No oil should enter the Clarifier while Refills are being changed.

INSTRUCTIONS FOR CHANGING REFILLS

1. Unscrew cap screw relief valve and remove cover assembly.
2. Remove upper Refill.
3. Insert handle in slots located in straps alongside Refill and pull up bottom plate to remove lower Refill from Clarifier.
4. Clean inside of Clarifier tank and all parts of the cover assembly.
5. Place one new Refill in Clarifier and center on raised bottom plate.
6. Install separator plate and align with the Refill.
7. Lower bottom plate, new Refill, and separator plate into Clarifier.
8. Place second new Refill in Clarifier and center on separator plate.
9. Check cork washer in Refill top plate.
10. Check cover gasket.
11. Fill the Clarifier with oil before replacing cover.
12. Replace cover assembly and tighten cap screw relief valve to seal cover gasket.

After new Refills have been installed, check oil level in lubricating system and cover for leaks when engine is started.

Sludge, which settles to the bottom of the Clarifier should be removed periodically through the sludge drain.

SPECIFICATIONS

Maximum flow capacity		30 G.P.M.
Oil required to fill Clarifier		37 Gals.
Minimum operating temperature		140° Fahr.
Number of Refills in Clarifier		4
Recommended flow through each Refill		1 G.P.M.
Number of relief valves in Clarifier		1
Maximum flow capacity through relief valve		30 G.P.M.
Pressure setting of relief valve		18 lbs.
Maximum working pressure		100 lbs.
Hydrostatic test pressure		150 lbs.
Clearance required to change Refills		13-1/4 in.
Dimensions:	Height	32-3/4 in.
	Diameter	23-1/2 in.
Weights:	Dry	388 lbs.
	Wet	662 lbs.
Inlet and outlet connections		1-1/2 in. I.P. Std. Navy Flange

SERVICE PARTS LIST

ITEM	PART NO.	LIST PRICE
Briggs Refill	D-197	$ 5.00
Gaskets		
Cover gasket	DI-1221	6.20
Relief valve assembly	DI-3871A	28.00
(One assembly consists of):		
1 - Spring retainer	DI-195	.20
2 - Spring retainer keys	DI-196	.10
1 - Valve spring (yellow)	DI-1000	.40
1 - Valve	DI-194	1.35
1 - Valve housing	DI-93C	25.85
Refill assembly	DI-2507	15.00
(One assembly consists of):		
1 - Cap screw	DI-587	.30
1 - Top plate	DI-469D	1.35
1 - Snap ring	DI-471B	.02
1 - Center rod assembly	DI-2502	12.08
1 - Plug, 1-1/8"	DI-2505	.75
1 - Spring	DI-959	.50
Miscellaneous		
Cover bolt and nut	DI-1116A	.15
Support ring	DI-1213	6.50
Support ring washer	DI-1407	.04
Support ring spacer	DI-1127	.15
Support ring stud	DI-1517	.20
Support ring keeper	DI-1325	.35
Support ring nut	DI-12	.03
Pressure gauge	DI-1412	3.85
Thermometer	DI-1409	3.50

Give Clarifier model and serial number when ordering parts.
Prices subject to change without notice. Minimum order $2.50.
All prices F.O.B. Washington, D. C.

LITHO. IN U.S.A.

OPERATING INSTRUCTIONS

for

HAND OPERATED CUNO AUTO-KLEAN FILTERS

1. Note IN and OUT marking. Do not hook up backwards.

2. Clean filter element by giving external handle one complete turn in either direction. This rotates cartridge past stationary cleaner blades which extend into the slots between discs, combing out all accumulated solids.

3. There is no danger of turning the handle too often - nothing to wear out, nothing to replace. Turn handle often until experience shows maximum allowable interval before cartridge begins to turn hard.

4. If handle turns hard, through failure to turn at sufficiently frequent intervals, rotate cartridge back and forth until the cleaner blades free themselves and the handle can be easily turned through a complete revolution.

5. Never use a wrench or other tool to turn a filter which has become plugged, or attempt to disassemble cartridge. This will void manufacturer's guarantee.

6. To free a plugged cartridge, remove from housing and wash in solvent until it turns freely. A filter which requires too frequent turning should be replaced by a larger one or one continuously turned by a motor drive.

7. Sump should be drained as often as experience indicates is necessary and, at periods of shutdown or overhaul, may be removed for flushing and inspection of cartridges. Great care should be taken not to damage discs or cleaner blades.

8. Filters having 4.4" and 7.6" diameter cartridges are so designed that worn cleaner blades can be easily replaced. NO OTHER CARTRIDGE REPAIRS SHOULD EVER BE MADE IN THE FIELD.

The Cuno Auto-Klean Filter is a carefully made mechanical device, manufactured to a high degree of accuracy, and if the above instructions are observed, it will give trouble-free service.

Fig. 2 shows the essential parts of a Cuno Auto-Klean Filter cartridge. Vertical dimensions have been exaggerated for greater clarity. The stack of discs and spacers, assembled as illustrated, is closed at one end, the opposite end being connected to the filter discharge. Thus all fluid, in order to pass the filter must go through the slots between discs. When the assembly of discs and spacers is turned by means of the rotatable spindle, solids that have lodged against the discs or between them are carried around until they meet the cleaner blades, which are held in position by the fixed cleaner blade rod, and are positively combed clear of the filter surface.

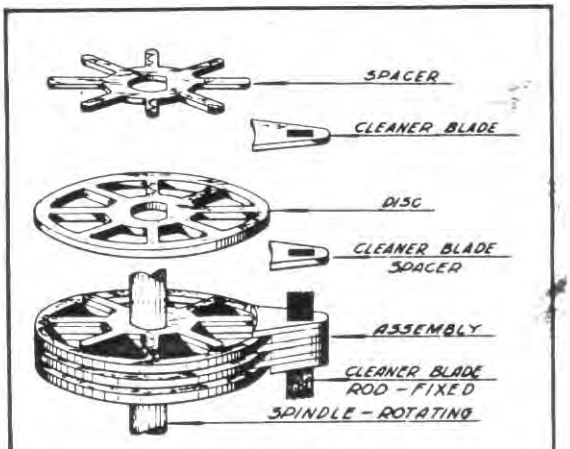
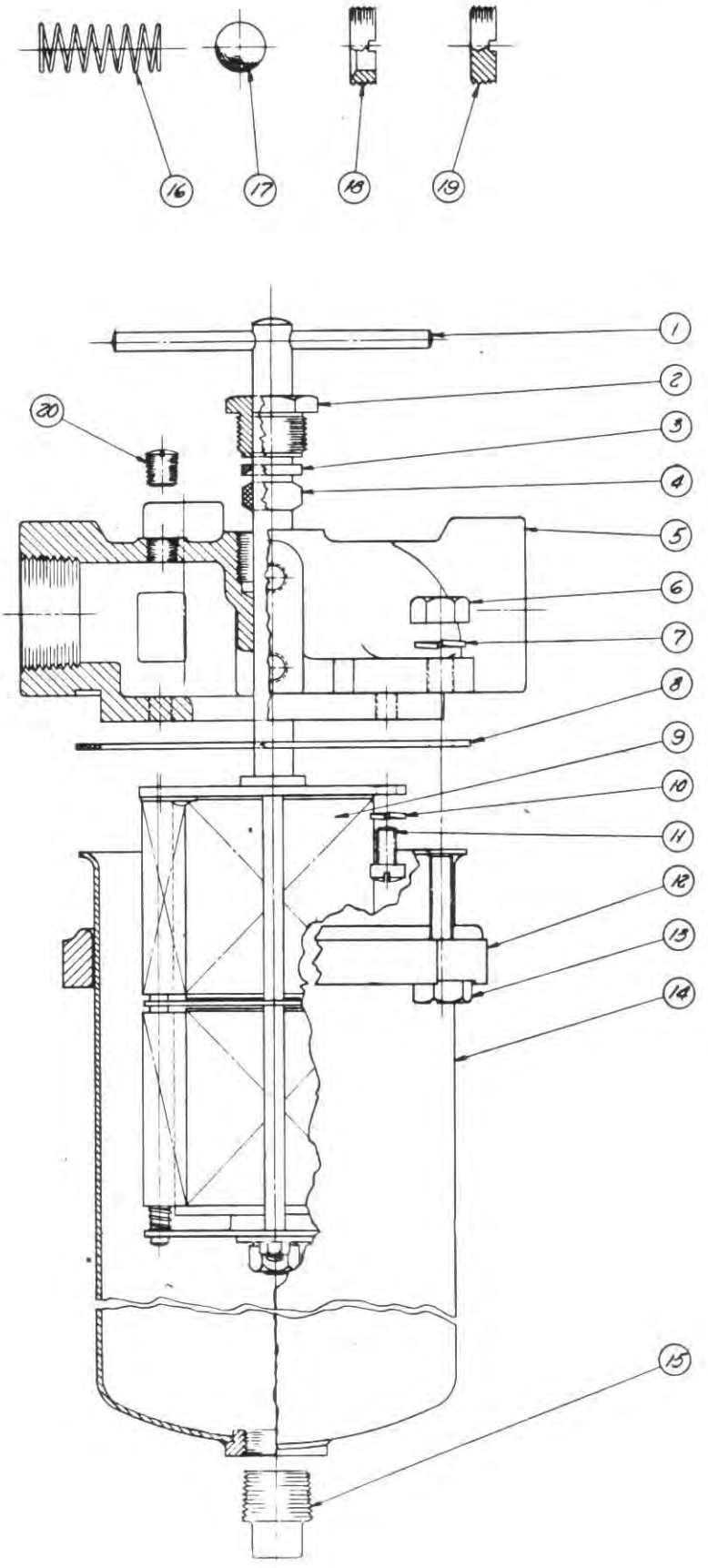


FIG. 2

Printed in U.S.A.



TYPE "EG" & "EGL"

CUNO AUTO-KLEAN FILTER

1. Handle
2. Nut,Gland
3. Follower, Gland Nut
4. Packing
5. Head Casting
6. Nut, Sump Bolt
7. Lock Washer, Sump Bolt
8. Gasket, Sump
9. Cartridge Assembly
10. Lock Washer, Cartridge Mounting Screw
11. Screw, Cartridge Mounting
12. Ring, Mounting
13. Bolt, Sump
14. Sump
15. Plug, Drain
16. Spring, Relief Valve
17. Ball Relief Valve
18. Seat, Relief Valve
19. Plug, Relief Valve - used only when filter has no relief valve
20. Plug, Vent

INSTALLATION & OPERATION
of
No. 923-3 Sylphon Temperature Regulator
Equipped With Style "WB" 3-Way Semi-Balanced Valve

GENERAL OPERATION:

This regulator automatically controls cooling medium (water) by throttling flow through the valve in response to temperature changes at the sensitive bulb. Vapor pressure is generated in the bulb by heat and is transmitted through the capillary tube to the Sylphon bellows where it acts against the valve through an adjustable spring. The regulator is active only within the temperature range stamped on its plate and may be adjusted to operate at any point within that range. Action at that point is throttling and modulating.

VALVES and FLOW LINES:

Valves are sized to the demand of the unit to be controlled. Valves should be installed as close as possible to the unit, preferably with a pipe line strainer ahead.

Valve has downward stroke with a rise in temperature at the bulb.

BULB LOCATION:

Correct bulb location is the most important detail of regulator installation. The bulb should be installed at a point of truly representative temperature (thermometer preferably immediately next to it) and should be in good circulation.

The bulb may be installed horizontally with arrow on its head plate pointing up; or it may be installed vertically or at a vertical angle with plate pointing up, but never vertically with plate down.

TUBING:

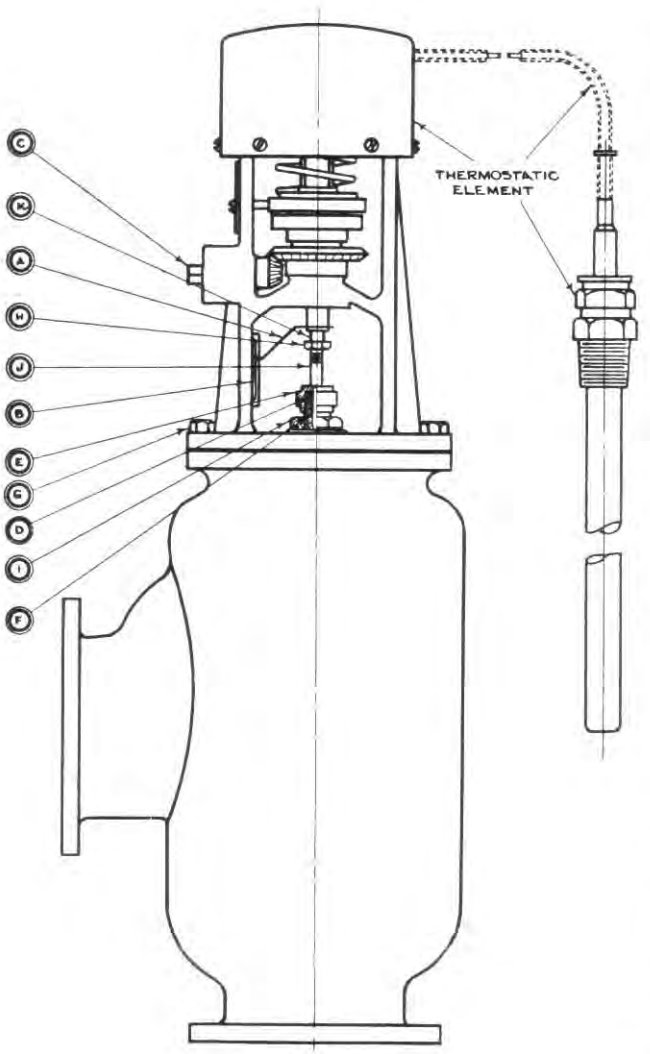
CAUTION: The flexible tubing connecting the bulb and valve must not be cut, kinked, mashed or unduly twisted. It may be bent on a 3-1/2" radius or larger. Tubing should be fastened in permanent position to a rigid location where not subject to rubbing or excessive vibration. It should not be fastened to steam pipes or other locations where subject to extreme temperatures. A small loop of tubing next to the valve is recommended to absorb vibrations occurring in pipe line.

ADJUSTMENT:

When pointer "A" (See illustration next page) is set to "thermostatic" on scale "B", the valve will operate thermostatically from temperature changes on the bulb.

Instructions

When manual operation of valve is desired or necessary, turn operator stem "C" in clockwise direction. This will move valve toward lower seats.



When pointer is at lower mark on scale "B", maximum cooling is available.

When pointer is at upper mark on scale "B", minimum cooling is available.

CAUTION: Do not force manual operator when pointer is at highest or lowest mark on scale, as this will damage regulator.

MAINTENANCE:

This regulator should require very little attention or maintenance but every piece of mechanical equipment deserves some care. If possible the regulator should be returned to our factory for any needed repairs. Such work will be handled promptly and at a reasonable charge. An estimate will be given upon receipt and examination of the regulator.

REPACKING VALVE:

The valve packing nut "E" should be kept only finger tight and occasionally have a drop of oil. Should it become necessary to replace the packing "D", remove nut "E", then take out packing gland "F". After gland is removed, clean out stuffing box and replace old packing with good grade asbestos wicking saturated with oil.

REGRINDING VALVE:

NOTE: Disassembling the regulator or removing the valve should be done only by an experienced person. Further - unless proper precaution is

taken, the reassembled regulator will not have the proper valve setting. For engine cooling, this valve does not require tight seating and therefore, it should not be necessary, except in cases of excessive leakage, to regrind the valve. In case it does become necessary to regrind the valve, proceed as follows:

1. To remove valve from the regulator:

   (a) Remove cap screws "G".
   (b) Loosen lock nut "H".
   (c) Remove packing nut "E".
   (d) Remove clamp nut "I".
   (e) Turn stem "J" in counter-clockwise direction until it is completely removed from regulator stem "K".

2. The valve is now disassembled from the "thermostatic" element and can be easily reground by the usual method. The two upper seats should be ground simultaneously. Then the lower seats should be ground in like manner. After grinding, remove all compound from the seats.

3. The valve may now be easily replaced on the regulator by employing the reverse of method used in its removal. To obtain proper valve setting after the valve is reinstalled, follow these instructions:

   (a) Lower temperature at bulb below set operating temperature.

   (b) Turn valve stem into regulator stem in clockwise direction until valve is just closed on lower seats.

   (c) Increase bulb temperature until valve moves off lower seat and turn stem one full turn further in a clockwise direction.

   (d) Tighten the lock nut "H".

CHECKING OPERATION:

Be sure manual operator is set on "thermostatic".

If engine jacket or lube oil overheats with lowest adjustment setting, be sure to check circulation of jacket water and lube oil through cooling circuit. Also check circulation of sea water in primary cooling circuit. All lines, strainers, hand valves, and passages in heat exchanger should be free and open. Check for fouling of heat exchanger tubes, which would reduce cooling effect.

Be sure packing gland is not binding valve stem, or valve is not otherwise stuck in "up" (minimum cooling) position.

If none of the above reveals trouble, it is probable that the thermostat is inoperative and should be replaced.

If undercooling is experienced at highest adjustment setting, check for sticking of valve in "down" (maximum cooling) position. This may be caused by a tight stuffing box or by dirt under lower valve seat thus letting excessive cooling water flow through heat exchanger.

REPLACEMENT OF THERMOSTATIC MOTOR ELEMENT:

Failure of the thermostatic motor element is indicated by inoperation of the regulator and by the position of the valve poppet. This would be "up" or "open" position of upper seats even on high temperature. Position of the valve may be observed by markings on the valve stem at the stuffing box.

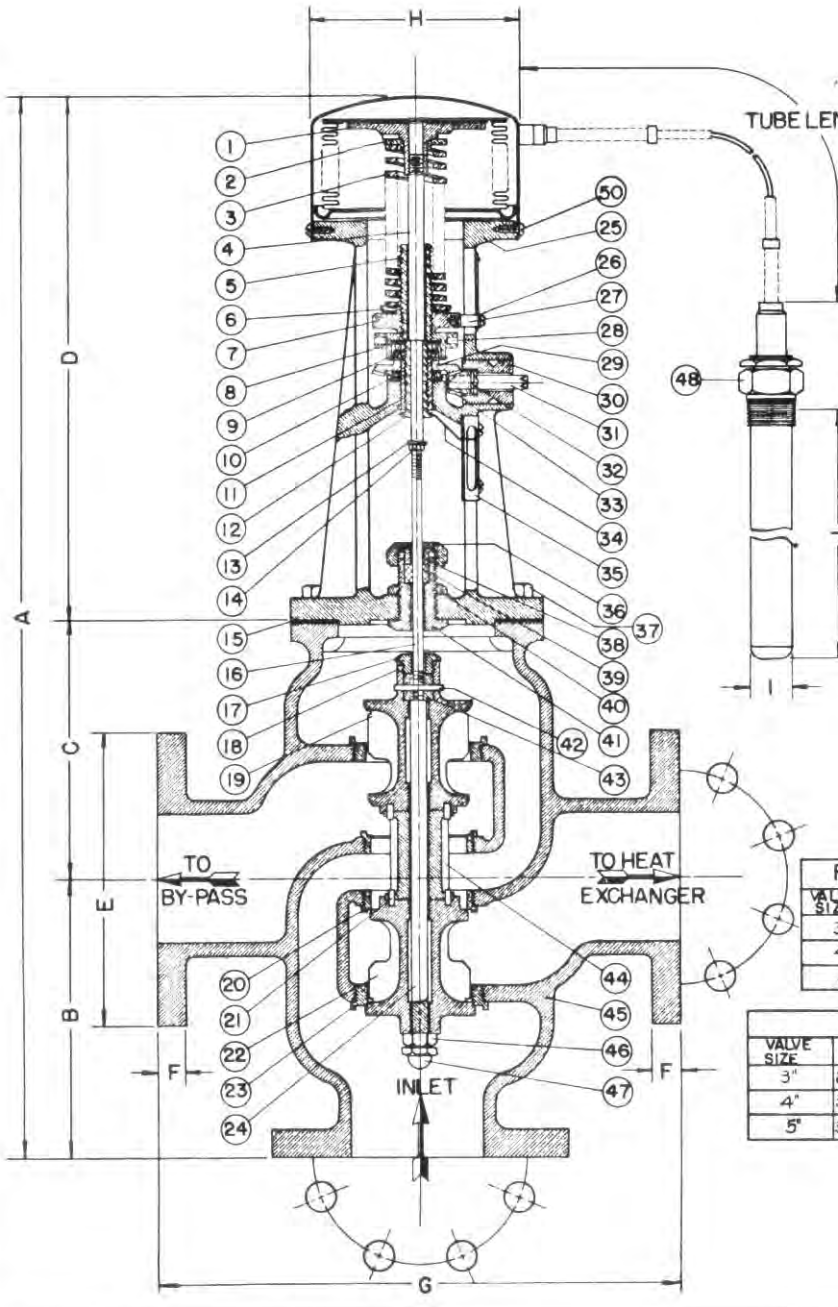
The thermostatic motor element may be replaced easily by removing screws from the bellows housing and lifting the assembly off the regulator frame. Bulb temperature should always be below range of regulator when removing or replacing the thermostatic element.

NOTE:

In all correspondence to the factory regarding specific regulators or replacement parts for specific regulators, the serial number should be referred to for the purpose of identification. The serial number is located on the nameplate. the bulb plate and the valve.

THE FULTON SYLPHON CO.

12-4-42
R.E.S.



NOTE 1: REFERENCE TO SERIAL NO. WILL IDENTIFY REGULATOR IN CASE OF REPAIRS OR REPLACEMENTS.
NOTE 2: SPRING NO. 851-500 FURNISHED FOR TEMP. RANGE 140°-170° F. 851-600 FURNISHED FOR TEMP. RANGE 140°-180° F.
NOTE 3: VALVES EQUIPPED WITH 125# AMERICAN STD. FLANGES.
NOTE 4: THERMOSTATIC ASSEMBLY CONSISTS OF BULB, CONNECTING TUBING, & BELLOWS ASSEMBLY FURNISHED AS A UNIT.

PARTS LIST

NO. REQD	DET. NO.	PART NAME	PART NUMBERS 3 SIZE	4 SIZE	5 SIZE
1	1	STEM HEAD	11919	11919	11919
1	2	SPRING PLATE	11920	11920	11920
1	3	LOAD SPRING	SEE NOTE 2	SEE NOTE 2	SEE NOTE 2
1	4	THERMOSTATIC STEM	10815	10815	10815
1	5	ADJUSTING STEM	10805-C	10805-C	10805-C
1	6	SPRING CUP	2802	2802	2802
1	7	ADJUSTING NUT	8232	8232	8232
4	8	THRUST WASHER	10803	10803	10803
2	9	SET SCREW	8233	8233	8233
2	10	THRUST BEARING	1709	1709	1709
1	11	ADJUSTING SLEEVE	10802	10802	10802
1	12	SEATING STEM	10810	10810	10810
1	13	LOCK WASHER	699	699	699
1	14	LOCK NUT	1865	1865	1865
1	15	GASKET	11928	11928	11930
1	16	UPPER STEM	11910	11757	11545
1	17	SWIVEL NUT	11913	11541	11541
1	18	SET SCREW	2154	7809-C	7809-C
1	19	TOP POPPET	11907	11755	11546
2	20	VALVE INSERT	11906	11752	11539
4	21	DOWEL PIN	11915	11760	11544
1	22	BOTTOM POPPET	11909	11754	11547
2	23	VALVE INSERT	11905	11753	11538
1	24	POPPET STEM	11911	11759	11542
1	25	FRAME	11925	11926	11927
1	26	POINTER	8236	8236	8236
1	27	GUIDE ROD	8235	8235	8235
1	28	ADJUSTING STEM KNOB	10807	10807	10807
1	29	BEVEL GEAR	10811	10811	10811
1	30	BUSHING	8242	8242	8242
1	31	CRANK PIN	8241	8241	8241
1	32	PIN	8244	8244	8244
1	33	PINION GEAR	8243	8243	8243
1	34	GUIDE STRIP POINTER	11935	11935	11935
1	35	INDICATOR PLATE	11936	11936	11936
1	36	PACKING NUT	11922	11922	11922
6	37	CAP SCREW	5369 R2	5369-R2	5369-R2
1	38	PACKING GLAND	11921	11921	11921
1	39	PACKING	11004-28	11004-28	11004-28
1	40	LOCK NUT	11923	11923	11923
1	41	PACKING BOX	11924	11924	11924
1	42	STEM PIN	11914	11758	11548
2	43	STEM HEAD	11912	11540	11540
1	44	SPACER	11908	11756	11537
1	45	VALVE BODY (SEE NOTE 3)	11904	11751	
1	46	NUT	11916	11543	11543
1	47	ACORN NUT	11917	11645	11645
1	48	BULB BUSHING	4329	4329	4329
1	49	BULB GASKET (NOT SHOWN)	4312	4312	4312
11	50	MACH. SCREW	3745	3745	3745
1	A	THERMOSTATIC ASSEM. (SEE NOTE 4)			

FLANGE DRILLING

VALVE SIZE	NO. HOLES	DIA. HOLES	B-C	SPOT FACE
3"	8	9/16	5 1/2	1 1/8 D.
4"	8	3/4	7 1/2	1 1/4 D.
5"	8	7/8	8 1/2	1 1/4 D.

PRINCIPAL DIMENSIONS

VALVE SIZE	A	B	C	D	E	F	G	H	I	J
3"	29 5/8	6 3/4	6 23/32	16 3/32	7 1/2	5/4	10 1/2	6 3/16	1 1/4	28
4"	32 9/16	8 9/16	7 29/32	16 5/32	9	15/16	15 7/8	6 3/16	1 1/4	28
5"	37 5/32	11 5/8	9 3/16	16 5/32	10	15/16	19 1/4	6 3/16	1 1/4	28

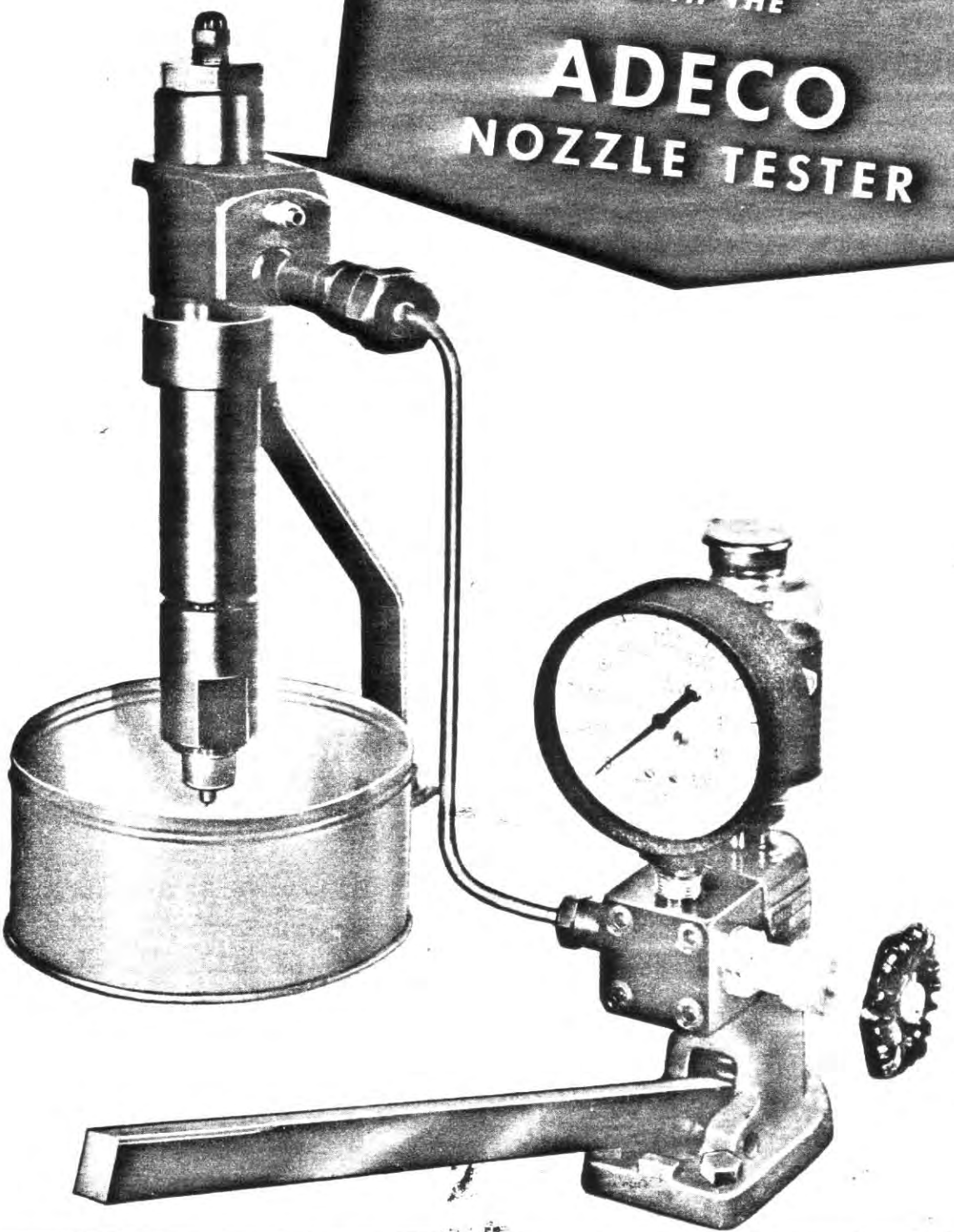
DATE _____
CONTRACTOR _____
PURCHASE ORDER _____
JOB NUMBER _____

THE FULTON SYLPHON CO.
SALES DEPT. KNOXVILLE, TENN.

*923-3 AUTOMATIC SYLPHON TEMPERATURE REGULATOR WITH MANUAL VALVE OPERATOR
3, 4 & 5 SIZE 3 WAY VALVE

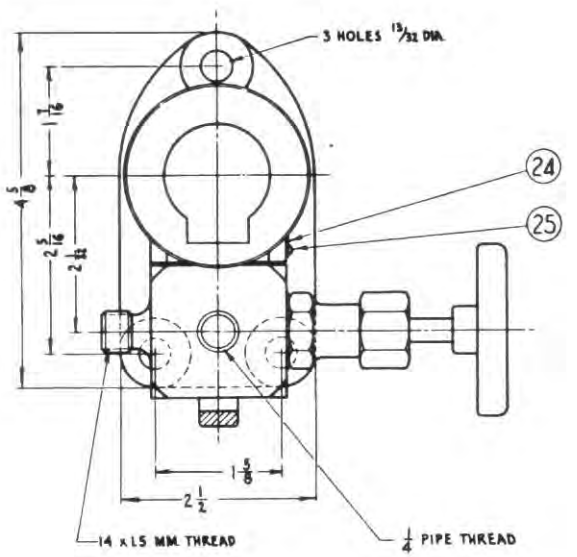
DRAWING NUMBER 5725-R
DATE 1-18-43
DRAWN BY RK

HOW TO SERVICE FUEL INJECTORS WITH THE ADECO NOZZLE TESTER



AIRCRAFT & DIESEL EQUIPMENT CORPORATION

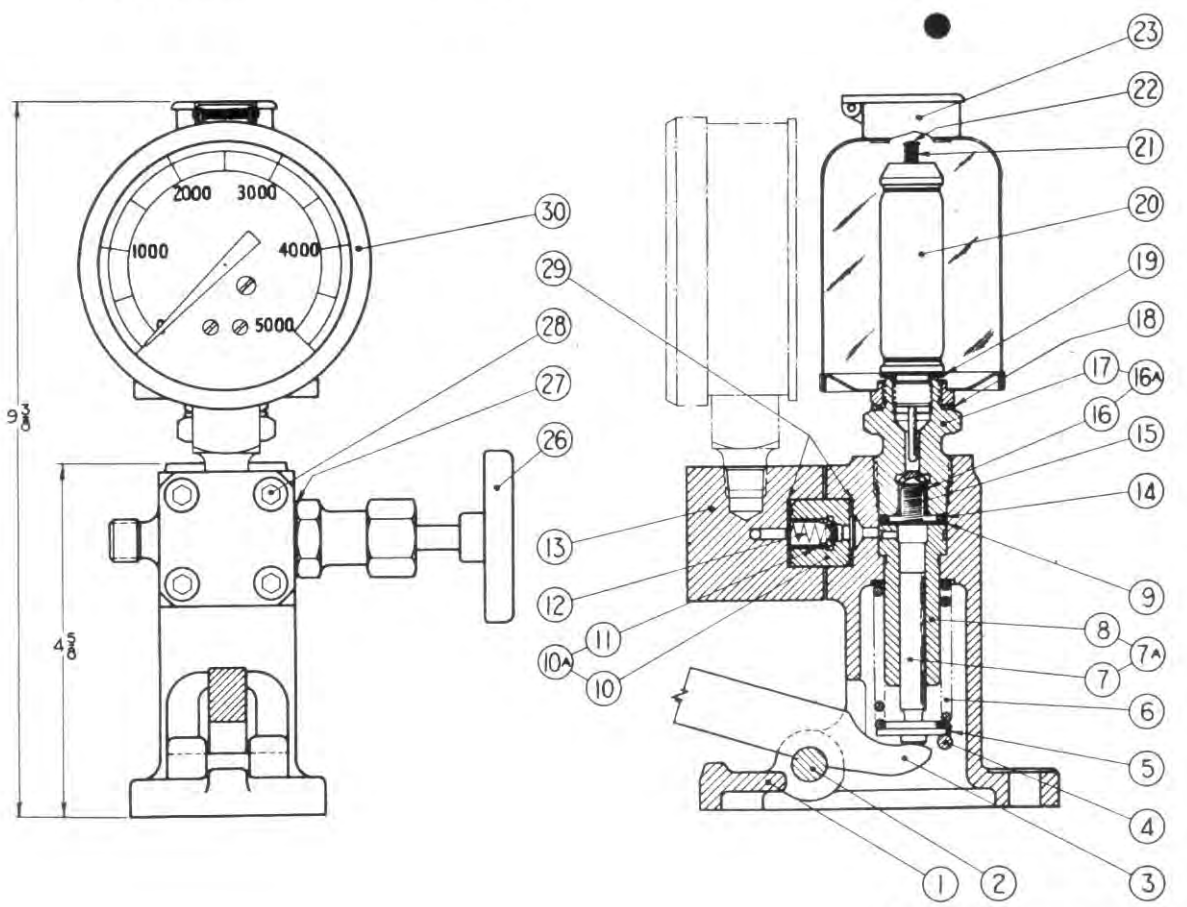
4401 NORTH RAVENSWOOD AVENUE, CHICAGO, ILLINOIS



DETAILED DRAWING

of Model PH-24

ADECO NOZZLE TESTER



AIRCRAFT & DIESEL EQUIPMENT CORP CHICAGO, ILL.	L-1935

AIRCRAFT & DIESEL EQUIPMENT CORP.—CHICAGO, ILL.

How to Service Fuel Injectors with the ADECO NOZZLE TESTER

ALL diesel fuel injectors require a periodical check-up and occasional corrective adjustments. This is unavoidable due to severe conditions to which these parts are subjected in service. High alternating pressures and temperatures, dirt particles in the fuel oil and accumulated carbon in the cylinder head, lead to gradual wear and deterioration, making regular check-tests absolutely necessary.

The procedure of testing nozzles will vary somewhat according to the "type" of the nozzle. For this purpose we may classify them as follows:—

1. Open nozzles
2. Mechanically operated nozzles
3. Closed differential valve type hydraulically operated nozzles

The open nozzles are of simple design, having one or more spring loaded check valves. The opening pressure is low and usually not adjustable, therefore it may be ignored in most cases when testing. They do not "pop" or chatter. The testing of these nozzles is limited to observing the spray pattern which should be regular and orderly in appearance.

The mechanically operated nozzles are controlled by mechanical means, either at the opening or at the closing end of the injection, therefore the usefulness of a nozzle tester is limited for testing leaks and spray pattern.

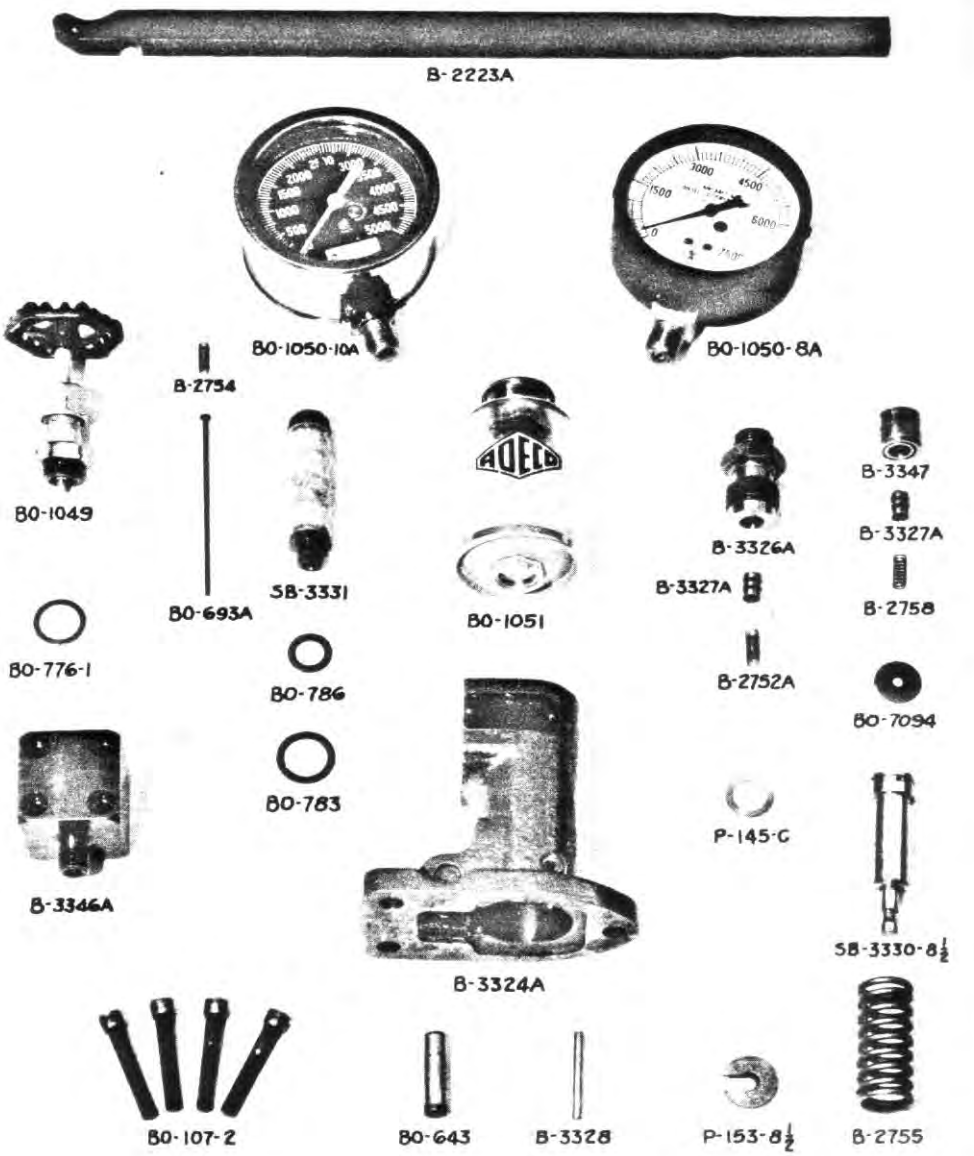
The closed differential valve type hydraulically operated nozzles are by far the most numerous in use today. The Adeco, Bosch, Caterpillar, Ex-Cell-O and many other makes belong to this classification. As a rule, the Adeco Nozzle Tester can be depended upon to give a thorough test to all makes of nozzles in this class. Nozzles, however, which are combined in a single unit with the injection pump, commonly called "Unit injectors," such as General Motors, Murphy Diesels, etc., can not be tested in a convenient, practical way with the Adeco Nozzle Tester, because the unit injectors require a rather elaborate device to actuate the pumping end of the unit in order to test the nozzle.

In the "differential type" nozzle, the valve opens when the hydraulic pressure overcomes the spring pressure which keeps the valve normally closed. The hydraulic pressure acts against the annular area between the O. D. of the valve and the O. D. of the valve seat. When the pressure equals the spring loading, the valve snaps open with a "pop". This quick opening is due to the fact that the entire area of the valve falls under immediate pressure at the instant the valve cracks open, and thus the combined pressure momentarily becomes considerably stronger than the opposing spring pressure. The "difference" between the normally exposed annular area and the total area of the nozzle valve determines the intensity of the "popping". The larger the "difference," the louder is the "pop". On the other hand, a small difference will eliminate "popping" entirely.

By varying the differential area of the nozzle valve and the "rate" of spring pressure etc., a wide variety of injectors can be produced with actions widely different in appearance; therefore, a hard and fast rule can not be made to apply on all the injectors in the "differential type" classification. However, as a general rule, these nozzles can be

PARTS PHOTOGRAPH—MODEL PH-24

ADECO NOZZLE TESTER



tested for at least 4 or more of the following characteristics:—

1. Valve opening pressure
2. Spray form
3. Leakage
4. Popping
5. Chattering

The valve opening pressure of the injectors, as specified by the engine manufacturer, may vary between 1200 and 4500 p.s.i., depending on requirements. This pressure is controlled by adjusting the spring pressure, which can be done by adding or removing shims or by turning the adjusting screw, as the case may be.

The spray form should be observed very carefully and any irregularity that may be present should be noted. The spray should be a finely atomized mist, never a solid stream. A lop-sided spray or a clogged nozzle hole is a sure indication of defect. For best results, compare the nozzle under test with a "master" nozzle which is known to be in good condition.

The pumping speed of the nozzle tester has a definite effect on the behavior of certain nozzles. This is the case especially on the "throttling pintle" type, which require fast pumping to observe the true spray form, otherwise they do not appear to function properly.

Leakage at the nozzle valve seat can be detected by maintaining pressure of 100-300 p.s.i. below the opening pressure of the nozzle and watching for the accumulation of oil drops at the tip, which should stay reasonably dry if the valve seat is in perfect shape. A perfect nozzle of the popping variety will start and stop injection without producing dribble at the tip. Dribble, however, might be caused by the method of handling the nozzle tester; therefore, it is recommended to repeat this test several times if necessary. Give a few quick strokes on the handle of the nozzle tester and wipe the nozzle tip dry before each test.

The "popping" of a nozzle depends on the design of the injector. If it is of the popping variety and in perfect working order, it will open up with a healthy "pop" when the correct opening pressure has been reached, and will close almost immediately. This action is sharp and characterized by the tip remaining virtually dry, indicating that the valve is tight and seats properly.

The chattering is nothing more than repeated "popping" in quick succession which occurs when pumping the tester at a steady rate. It is caused by the alternate opening and closing of the nozzle valve. By ordinary hand pumping sufficiently high rate of fuel flow cannot be maintained to keep the valve open continuously, therefore the valve closes when the fuel-pressure drops to a point that permits the valve to close. The frequency of chattering may vary widely due to different causes, but mainly because of the amount of the "pressure drop" that is designed into the nozzle by varying the differential area of the nozzle valve. (The "pressure drop" varies in different designs from 5. to 1800 p.s.i.)

Since the principal factor that influences chattering is a design feature, nozzles of the same kind should chatter approximately at the same frequency when tested under identical conditions.

When a "popping" type nozzle fails to chatter properly, it is a sure sign of defect which might be caused by dirt, broken parts, or, most frequently, defective valve seat.

While the chatter test is convenient and shows up defects almost at once, it is not a complete test, and can not be relied on entirely. For best results, tests should also be made for leakage, spray appearance and valve opening pressure.

INSTALLATION OF THE ADECO NOZZLE TESTER

The first procedure before using the nozzle tester is to fasten it to a substantial bench for permanent installation, or to a suitable block of wood for portable use. For this purpose, 3 holes are provided in the mounting flange of the pump for ⅜" dia. bolts.

For bench installation, the tester should be placed some distance away from the edge of the bench, but not further than 8", measuring to the near edge of the mounting flange.

For portable installation, the tester can be mounted on a fairly thick wooden board which should be long enough to extend about 2" beyond the projecting end of the pump handle in order to prevent the tester from tipping over when the handle is pressed down. It is a good idea to cut out clearance space for the hand as shown on Fig. 1.

For testing large injectors, a suitable supporting bracket should be provided. An adaptor (fuel line) 12" long is quite suitable for this type of installation. The small injector may be supported on the end of a short adaptor, but even in this case, a sup-

porting bracket or clamping device will prove to be a time-saver, especially when adjusting the opening pressure.

For a receptacle to catch the fuel spray, any flat type tin can may be used. For permanent bench installation in places where the nozzle tester is in continuous use, it is advisable to install a receptacle with slightly tapering bottom with a drain tube to carry the fuel away. The receptacle can be above the bench or flush with the bench if so desired.

The fuel supply for the tester can be made continuous by connecting a large supply tank to the regular supply cup by a siphon tube. This, however, is not necessary for ordinary use because the regular supply cup holds sufficient fuel to test several nozzles.

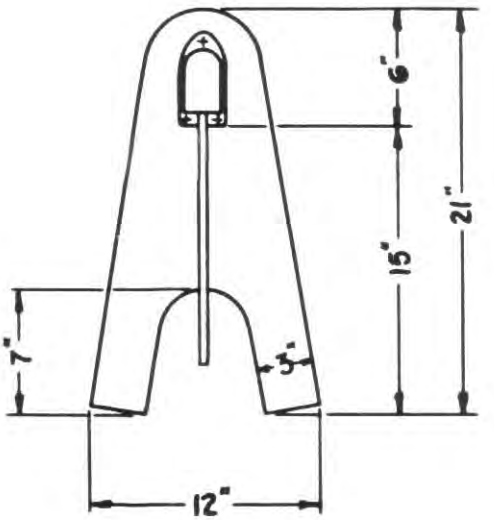


Figure 1

OPERATING INSTRUCTIONS

1. Fill the supply cup (23) with clean fuel oil.
2. Close shut-off valve (26) by turning handle clockwise.
3. Prime the pump by pressing down on the priming rod (22) several times in quick succession while pumping on the lever. (See illustration).
   NOTE:—Priming required only when starting with a dry pump.
4. Pump lever (3) a few times until fuel comes out freely from fuel tube.
5. Attach injector to adaptor.
6. Pump lever a few quick strokes to shock test nozzle.
7. Open shut off valve (26) and pump lever at a steady rate for about ½ minute or so to eliminate all air from the gauge.
8. Pump on the lever until the injector "pops". Repeat several times and note the opening pressure on the gauge at which point the "popping" occurs.
9. Test for leakage by pumping almost up to the opening pressure and by slow pumping keep the pressure up at 100-300 p.s.i. below the opening pressure of the injector and watch for the accumulation of oil drops at the tip.
10. Test for spray form and "popping", etc., operating the pump handle in steady

manner, rather than in a jerky way in order to avoid false readings.

If the injector opening pressure needs correction, adjust spring tension by adding shims or use adjusting screw as the case may be.

For those who test injectors for the first time, it is a good idea to test a nozzle that is known to be in good condition and note its action.

When the pump is used for testing leaks in parts that do not require the gauge reading, it is recommended to disengage the hydraulic gauge by closing the Gauge Valve No. 26, thereby saving the hydraulic gauge from unnecessary vibrations that may shorten its useful life.

Should any part of this pump require servicing, the same care should be exercised as usually given to the Fuel Injection Pumps and component parts.

Care should be taken to keep dirt out of the pump, as dirt is the most frequent trouble-maker in fuel injection equipment. While a fuel filter is provided in the supply cup to keep dirt out, it should not be relied upon entirely as the filter may clog up under continued use.

For connecting injectors or other devices, use a suitable adaptor. One end must fit the Nozzle Tester Discharge fitting (12) which has 14 x 1½ M.M. thread, the other end should fit the part to be tested. A number of standard connection tube assemblies are available as shown on the back page.

WARNING! Keep hands away from the fuel spray as it may puncture the skin and penetrate into the flesh. Fuel oil in the blood stream may cause blood poisoning.

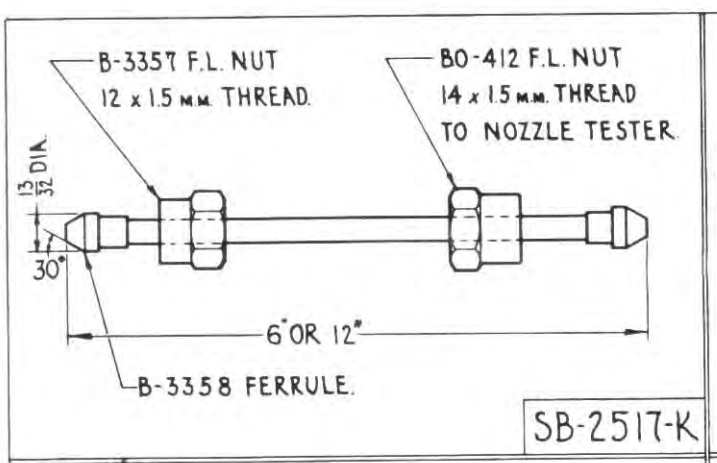
SERVICE PARTS LIST

FOR ADECO NOZZLE TESTER PH-24

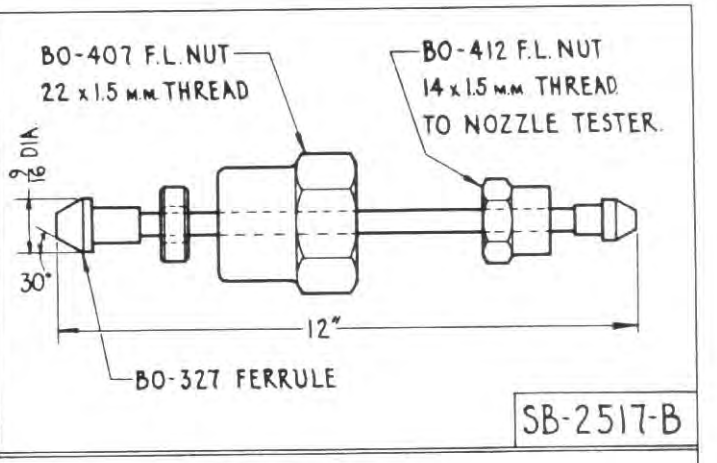
ITEM NUMBERS REFER TO ILLUSTRATION. PLATE No. L-1935
ORDER BY PART NUMBERS ONLY

Item	Part No.	Description	
1	B-3324-A	Nozzle Tester Body	
2	BO-643	Fulcrum Pin	
3	B-2223A	Hand Lever	
4	B-3328	Plunger Stop Pin	
5	P-153-8-½	Plunger Spring Collar	
6	B-2755	Plunger Spring	
7A	SB-3330-8-½	Plunger & Barrel Assem.	
9	BO-7094	Suction Valve Stop	
10A	SB-3347	Discharge Valve & Guide Assem.	
12	B-2758	Discharge Valve Spring	
13	B-3346	Discharge Fitting (⅜ P.T.)	
	B-3346A	Discharge Fitting (¼ P.T.)	
14	P-145C	Metal Seal Ring	
15	B-2752A	Suction Valve Spring	
16A	SB-3327-A	Suction Fitting & Valve Assem.	
18	BO-783	Supply Cup Gasket	
19	BO-786	Filter Body Gasket	
20	SB-3331	Filter Assem.	
21	B-2754	Priming Rod Spring	
22	BO-693-A	Priming Rod	
23	BO-1051	Fuel Supply Cup	
24	BO-1132	Name Plate	
25	BO-109	Drive Screw	
26	BO-1049	Gage Valve	
27	BO-776-1	Copper Washer	
28	BO-107-2	5/16—18 x 2 Hollow Hd. Screw	
29	BO-7101	Copper Washer	

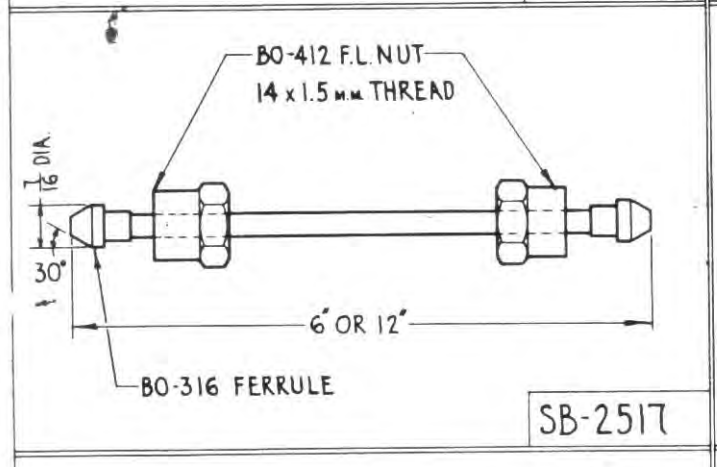
STANDARD NOZZLE ADAPTORS
FOR THE ADECO NOZZLE TESTER — Model PH-24



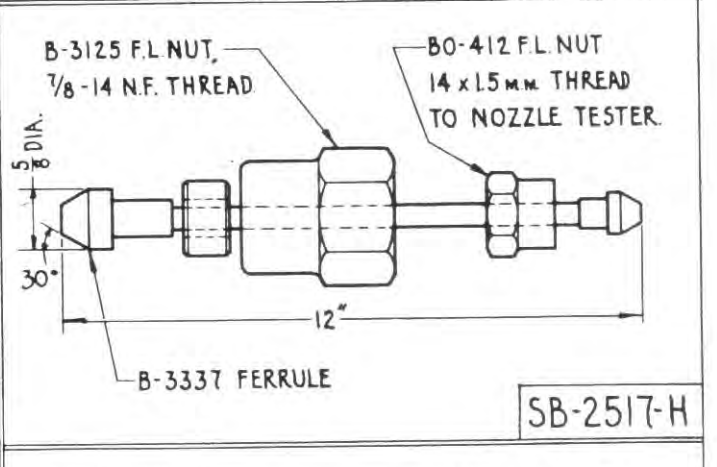
SB-2517-K



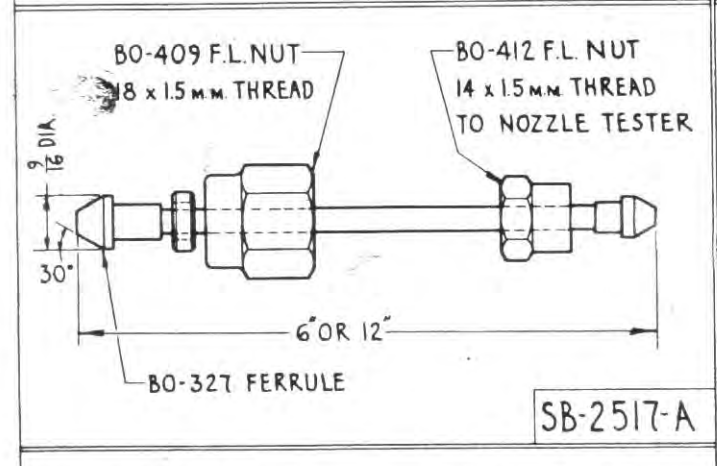
SB-2517-B



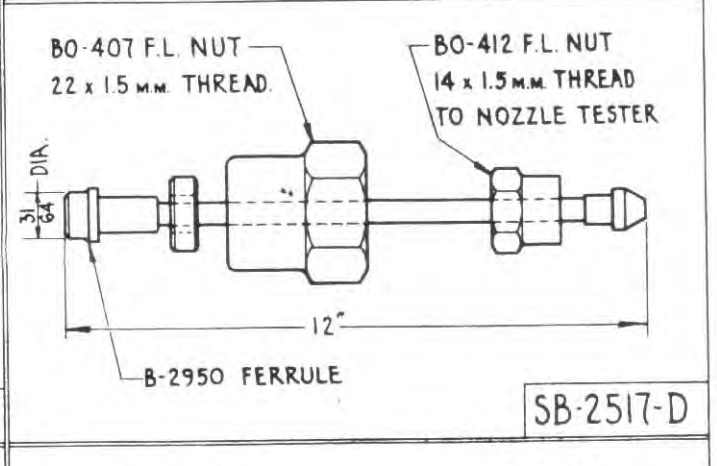
SB-2517



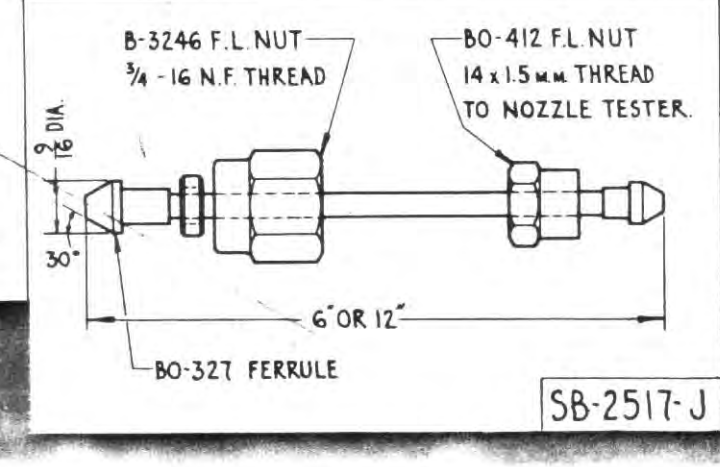
SB-2517-H



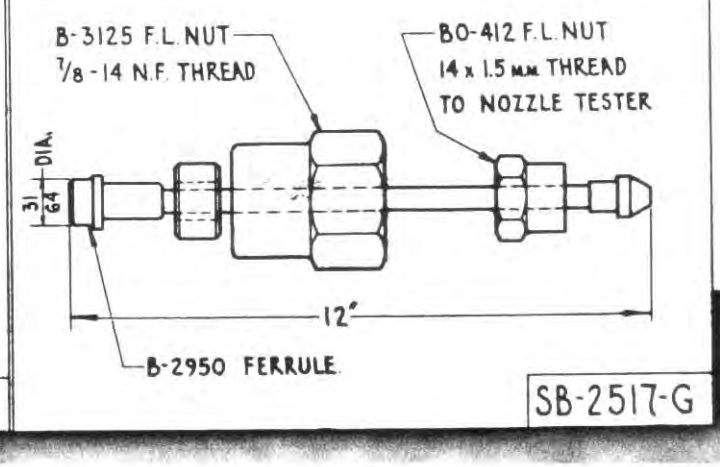
SB-2517-A



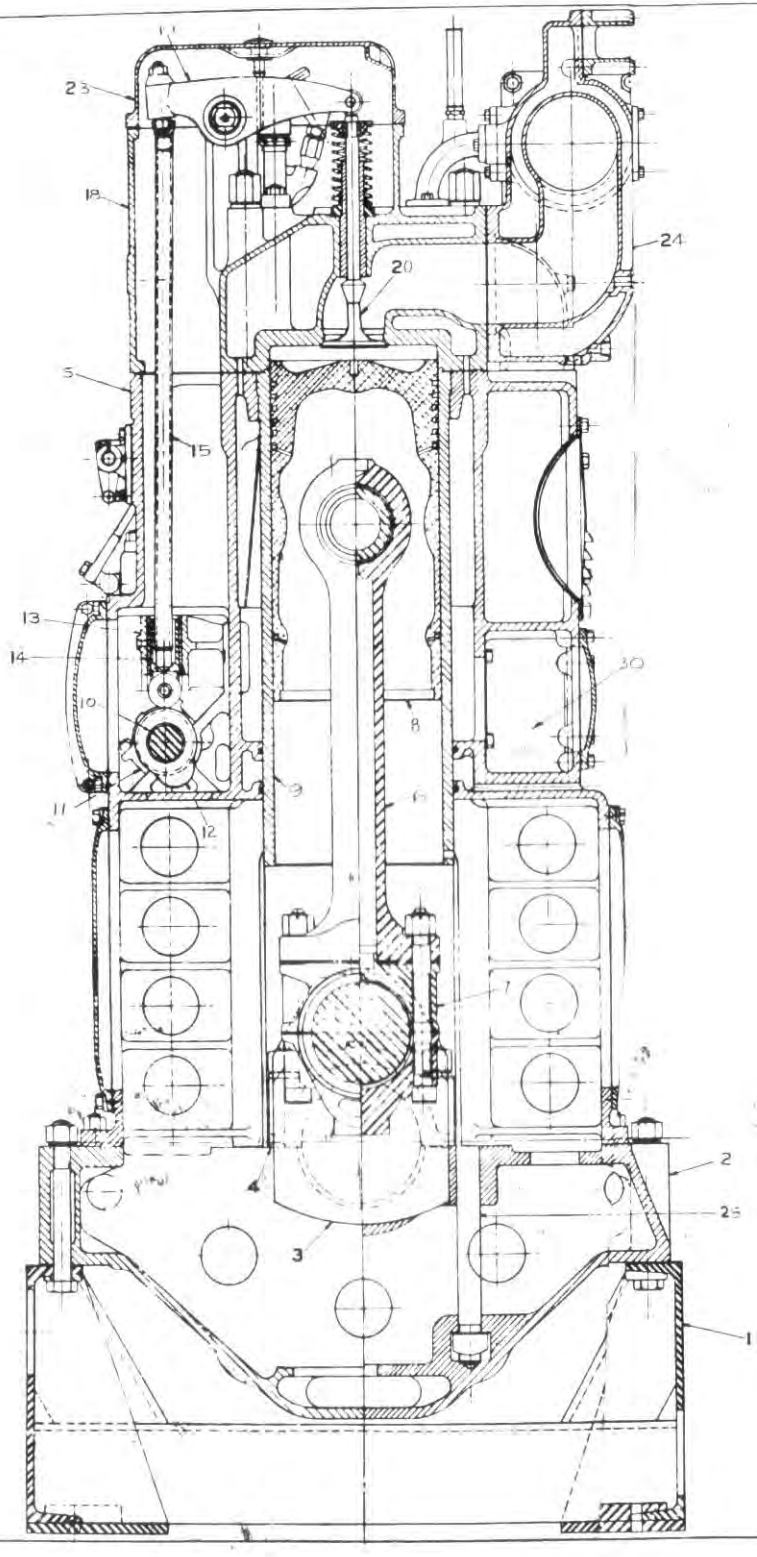
SB-2517-D

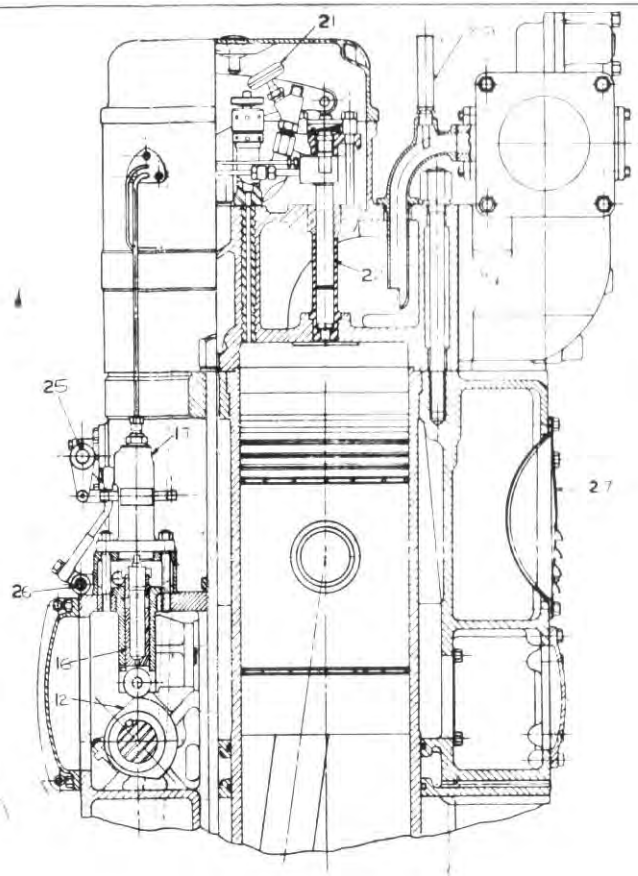


SB-2517-J



SB-2517-G





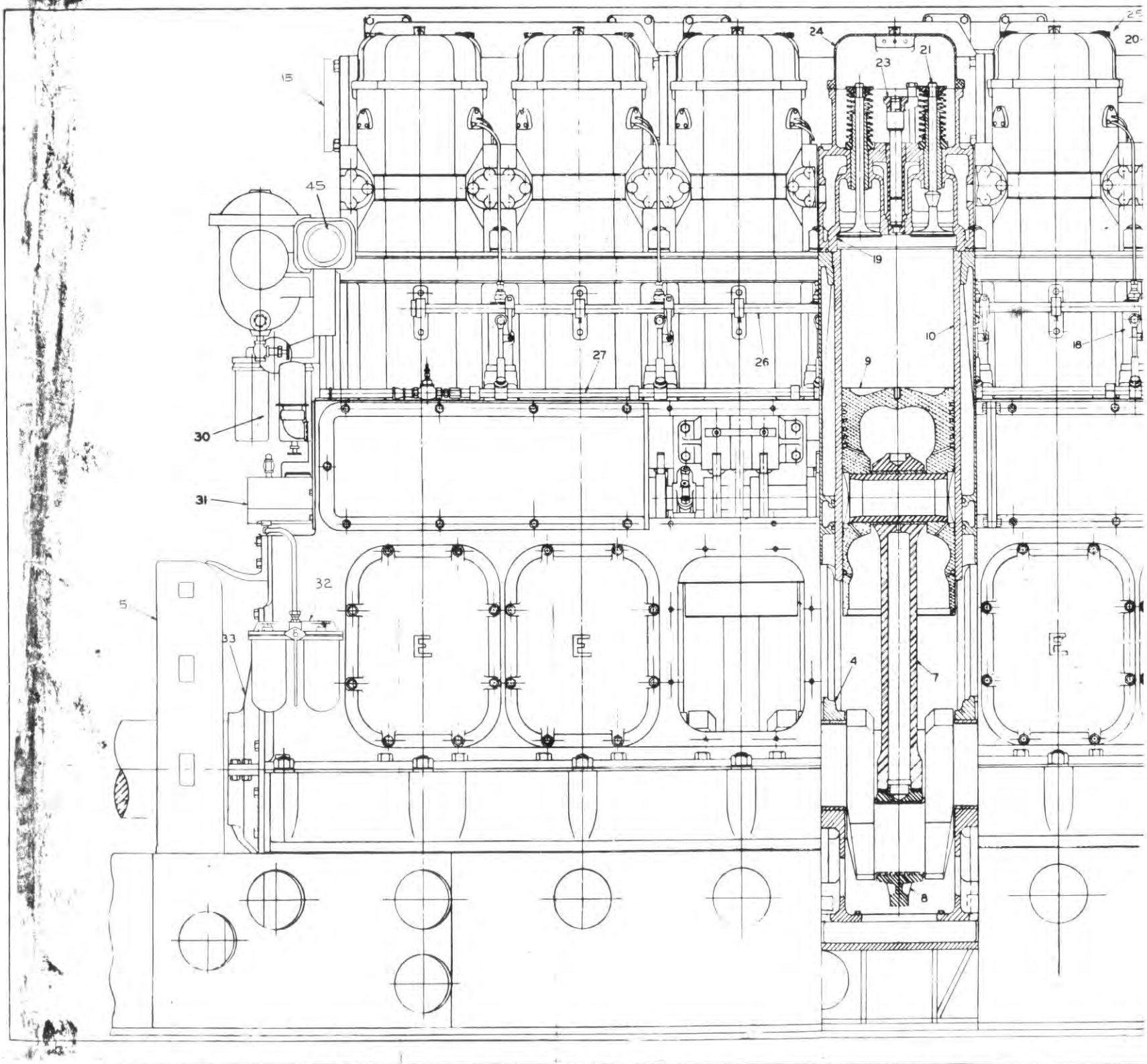
NO	DESCRIPTION
1	SUB BASE
2	ENGINE BASE
3	CRANKSHAFT
4	MAIN BEARING
5	CYLINDER BLOCK
6	CONNECTING ROD
7	CONNECTING ROD BEARING
8	PISTON
9	CYLINDER LINER
10	CAMSHAFT
11	CAMSHAFT BEARING
12	CAM
13	TAPPET GUIDE
14	INT & EXHAUST TAPPET
15	PUSH ROD
16	FUEL TAPPET
17	FUEL PUMP
18	CYLINDER HEAD
19	ROCKER ARM
20	VALVE
21	SAFETY VALVE
22	FUEL NOZZLE
23	CYLINDER HEAD COVER
24	EXHAUST MANIFOLD
25	FUEL CONTROL SHAFT
26	FUEL HEADER
27	AIR INLET MUFFLER
28	THRUBOLT
29	THERMOMETER
30	EXHAUST MANIFOLD

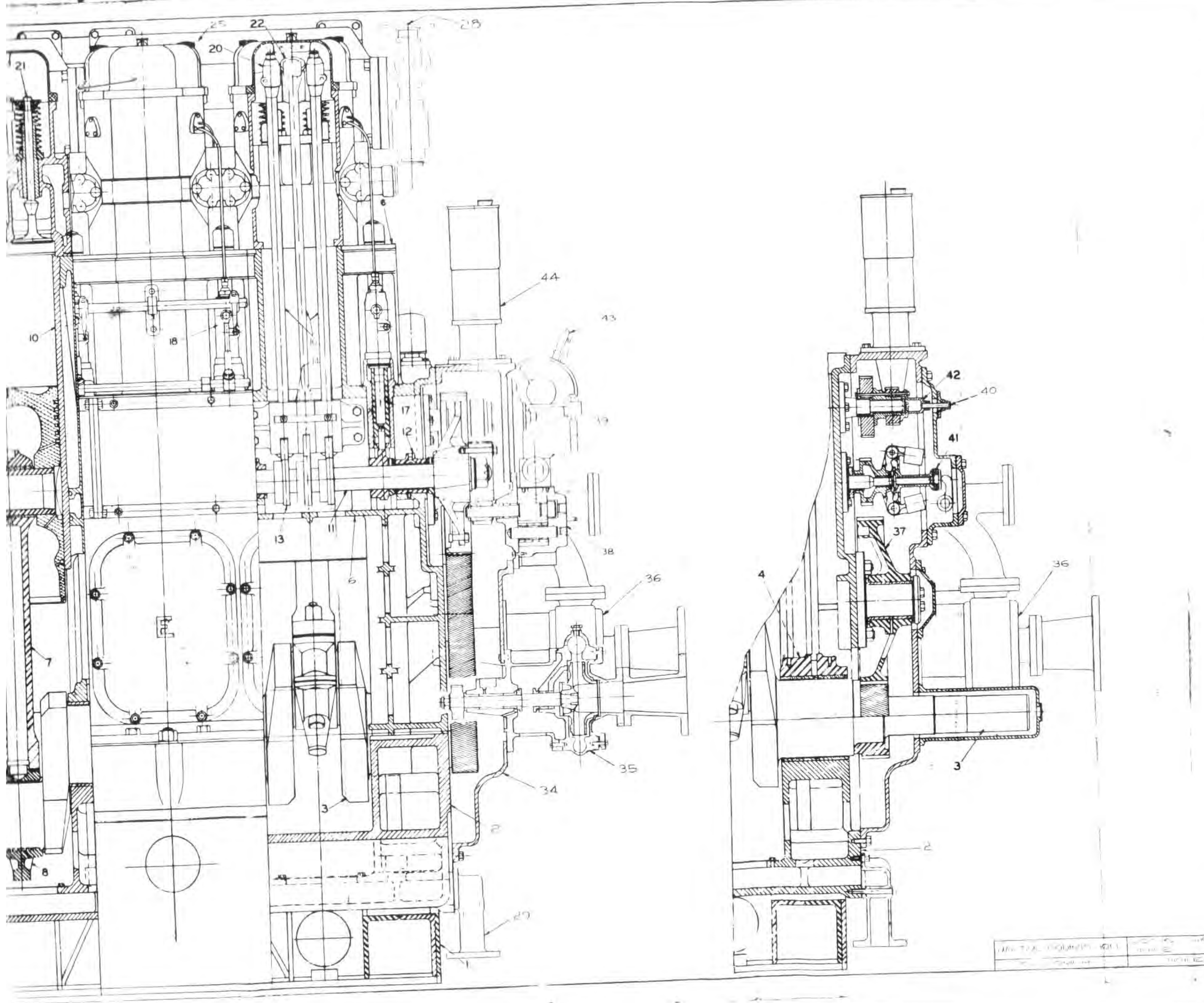
MARITIME COMMISSION

INSTRUMENT

CROSS SECTION

3358


1-2
15
45
24
21
23
20
19
10
18
9
26
27
30
31
32
5
33
4
7
8



NO	DESCRIPTION
1	SUB BASE
2	ENGINE BASE
3	CRANKSHAFT
4	MAIN BEARING
5	FLYWHEEL
6	CYLINDER BLOCK
7	CONNECTING ROD
8	CONNECTING ROD BEARING
9	PISTON
10	CYLINDER LINER
11	CAMSHAFT
12	CAMSHAFT BEARING
13	CAM
14	TAPPET GUIDE
15	EXHAUST OUTLET
16	PUSH ROD, INT & EXH.
17	FUEL TAPPET
18	FUEL PUMP
19	CYLINDER HEAD
20	ROCKER ARMS
21	VALVE, INTAKE & EXHAUST
22	SAFETY VALVE
23	FUEL NOZZLE
24	CYLINDER HEAD COVER
25	EXHAUST MANIFOLD
26	FUEL CONTROL SHAFT
27	FUEL HEADER
28	STARTING AIR INLET
29	LUBE OIL SUMP DR
30	FUEL FILTER, 2ND STA
31	FUEL OIL TRANSFER PUM
32	FUEL FILTER, 1ST S
33	REAR OIL SEAL
34	GEAR CASE
35	SEA WATER CIRCULAT
36	FRESH WATER CIRCULATIN
37	IDLER GEAR
38	LUBRICATING OIL PUMP
39	PRESSURE RELIEF VALVE
40	TACHOMETER CONN
41	OVERSPEED GOVERNOR
42	GOVERNOR & TACHOMETER
43	MANUAL FUEL CONTROL L
44	WOODWARD GOVERNOR
45	[illegible] OIL GAGE

ITEM	PART NAME

ENTERPRISE ENGINE & FO
SAN FRANCISCO, CALI

DWG. NAME LONGITUDINAL S

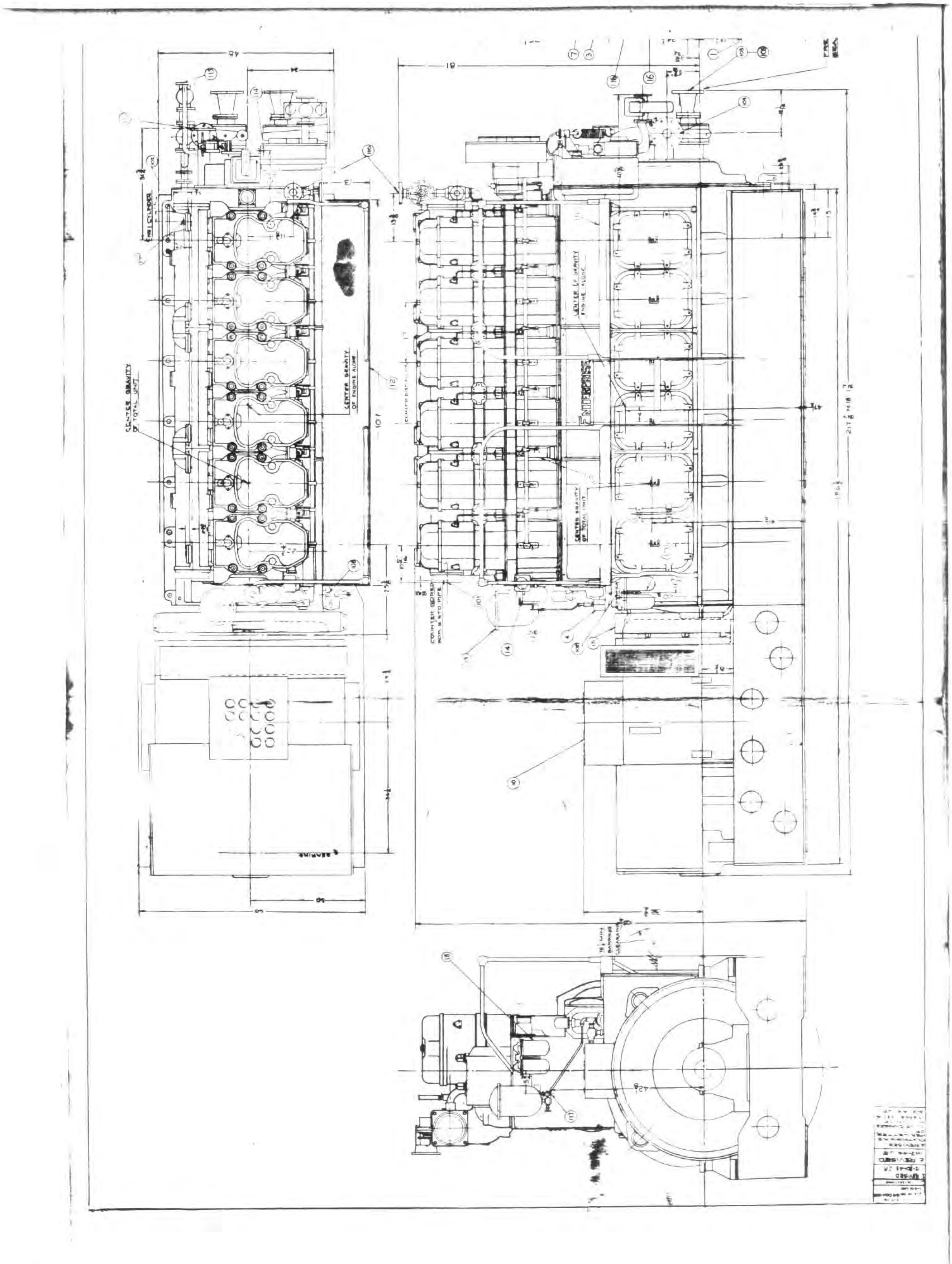
DRN. BY 4-8-44 F

CHECKED ST

APPROVED H

78

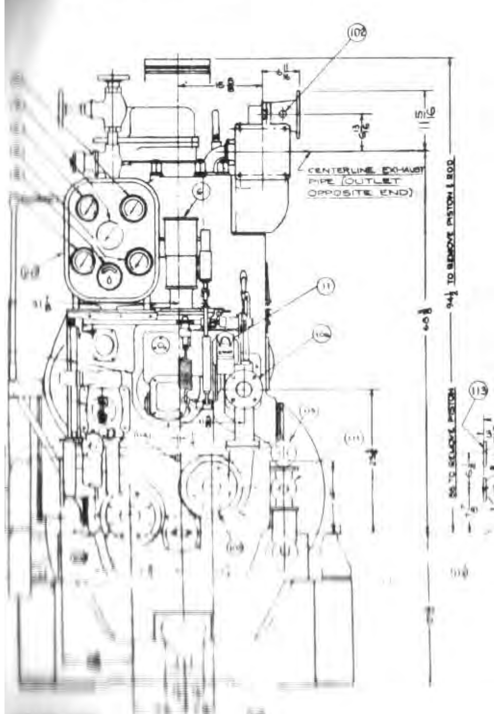
1-2

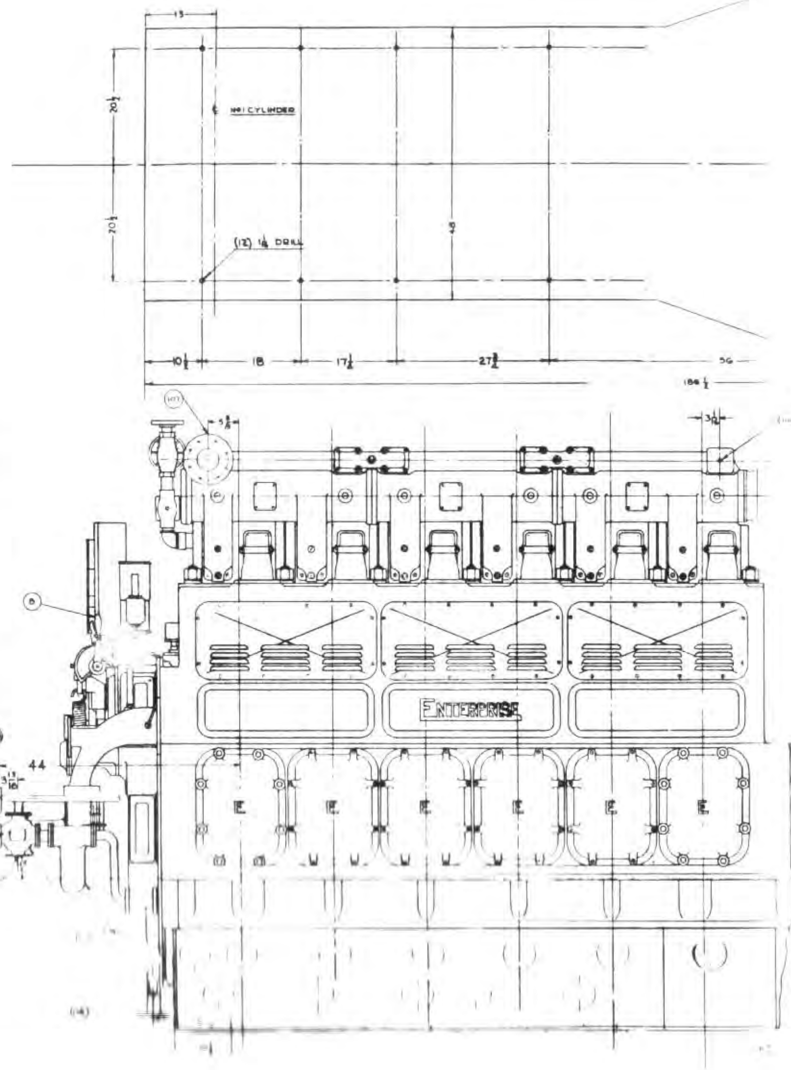

CENTER GRAVITY OF TOTAL UNIT
CENTER GRAVITY OF ENGINE ALONE
ENTERPRISE
CENTER OF GRAVITY ENGINE ALONE
CENTER GRAVITY OF TOTAL UNIT

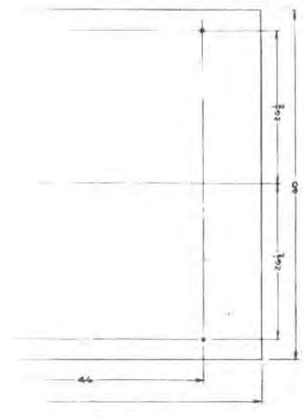
2-2

TABLE OF THERMOMETERS
LOCATION
LUBE OIL TO ENGINE
LUBE OIL FROM ENGINE
[illegible] WATER TO ENGINE
[illegible] WATER FROM EACH CYLINDER
[illegible] WATER TO OIL & WATER COOLERS
[illegible] WATER FROM FRE. WATER COOLER
[illegible] WATER FROM OIL COOLER

[illegible] BOARD GAGES
[illegible] AIR PRESS 0-500
[illegible] TACH MODEL 870S
[illegible] OIL PRESSURE — 0-60
[illegible] WATER PRESS — 0-80
[illegible] ALNOR #2926-12
[illegible] WATER PRESS 0-60







ITEM	DESCRIPTION
1	SEA WATER PUMP CENTRIFUGAL NON REV
2	FRESH WATER PUMP CENTRIFUGAL NON-REV.
3	LUBE OIL PUMP SINGLE NON REV
4	FUEL TRANSFER PUMP
5	FUEL INJECTION PUMP BENDIX
6	GOVERNOR WOODWARD SI
7	OVERSPEED GOVERNOR ENTERPRISE
8	CONTROL HANDLE SPEED
9	FILTER LUBE OIL PRESSURE [illegible]
10	GENERATOR GEN ELEC. 350KW 120-240 VOLT D.C.
11	STARTING BUTTON
12	ENGINE PLATFORM
13	FUEL OIL ACCUMULATOR TANK
14	FUEL OIL PRESSURE GAUGE
15	FLYWHEEL GUARD
16	FILTER LUBE OIL SCAVENGE BAILEY DUPLEX 350 [illegible]
17	4 WAY VALVE
18	FUEL FILTER DUPLEX WINSLOW "600-SP-4
19	PURLATOR DUPLEX D-11344-10
20	INSTRUMENT BOARD

PIPE SIZES	
EXHAUST	8 IN.
(NOTE: FOR OTHER PIPE SIZES & PUMP CAPACITIES SEE PIPING DIAGRAMS)	
FUEL OIL	DWG. NO. 78569
STARTING AIR	DWG. NO. 78579
FRESH WATER	DWG. NO. 78576
SEA WATER	DWG. NO. 78577
LUBE OIL	DWG. NO. 78578

ENGINE FRESH WATER CAPACITY 125 GAL

ITEM	DESCRIPTION	CONNECTION
101	EXHAUST OUTLET	8" [illegible] FOR 8" WELDED PIPE
102	ALARM CONNECTION - WATER	⅜ STD. PIPE TAP
103	SEA WATER SUCTION	4"-125# AM. STD. FLANGE 9" O.D. (8) 25/32 HOLES ON 7½" B.C.
104	SEA WATER DISCHARGE	4"-125# AM. STD. FLANGE 9" O.D. (8) 25/32 HOLES ON 7½" B.C.
105	FRESH WATER SUCTION	4"-125# AM. STD. FLANGE 9" O.D. (8) 25/32 HOLES ON 7½" B.C.
106	EMERGENCY WATER INLET	2½"-125# AM. STD. FLANGE 7" O.D. (4) ¾ HOLES ON 5½ B.C.
107	FRESH WATER DISCHARGE	4"-125# AM. STD. FLANGE 9" O.D. (8) 25/32 HOLES ON 7½" B.C.
108	FUEL OIL INLET	⅜ STD. PIPE TAP
109	JACKET WATER VENT	½" STD. PIPE TAP
110	STARTING AIR TO ENGINE	1½" 600# AM. STD. FLANGE 6⅛ OD (4) 13/16 HOLES ON 4½" B.C.
111	4 WAY VALVE TO L.O. COOLER	1½"-125# AM. STD. FLANGE 5 O.D. (4) ⅝ HOLES ON 3⅞ B.C.
112	COOLER TO 4-WAY VALVE	1½"-125# AM. STD. FLANGE 5 O.D. (4) ⅝ HOLES ON 3⅞ B.C.
113	EMERGENCY LUBE OIL CONN	1½"-125# AM. STD. FLANGE 5 O.D. (4) ⅝ HOLES ON 3⅞ B.C.
114	LINE TO BRIGGS FILTER	¾" STD. PIPE TAP
115	SUMP DRAIN	2" 125# AM. STD. FLANGE 6 O.D. (4) ⅝ HOLES ON 4¾ B.C.
116	LUBE OIL FROM SUMP TANK	1½"-125# AM. STD. FLANGE 5 O.D. (4) ⅝ HOLES ON 3⅞ B.C.
117	EMERGENCY FUEL INLET	½ STD. PIPE TAP
118	LUBE OIL THERMOM CONN.	½ STD. PIPE TAP

ENGINE DATA	
MODEL - ENTERPRISE STATIONARY DSS-6	
B.H.P. - 480	R.P.M. 480
BORE - 12	STROKE - 15
DISPLACEMENT/ENG. 10175	B.M.E.P. 77.8
FIRING ORDER 1,5,3,6,2,4	WEIGHT 46,800# DRY
NON-REVERSIBLE	SOLID INJECTION
DRY SUMP LUBE OIL SYSTEM	

USE CERTIFIED PRINT FOR INSTALLATION

[illegible] COMMISSION	DSS 6	4500-465
	TYPE	NO.
CUSTOMER	ENGINE	

ITEM	PART NAME	QTY	MATERIAL
ENT[illegible] & F[illegible]RY CO. SAN FRANCISCO, CALIFORNIA			
DWG NAME	INSTALLATION DWG		
DRAWN	12-11-44	78587	ALT 2
CHECKED			
APPROVED		PART & DWG. NO.	

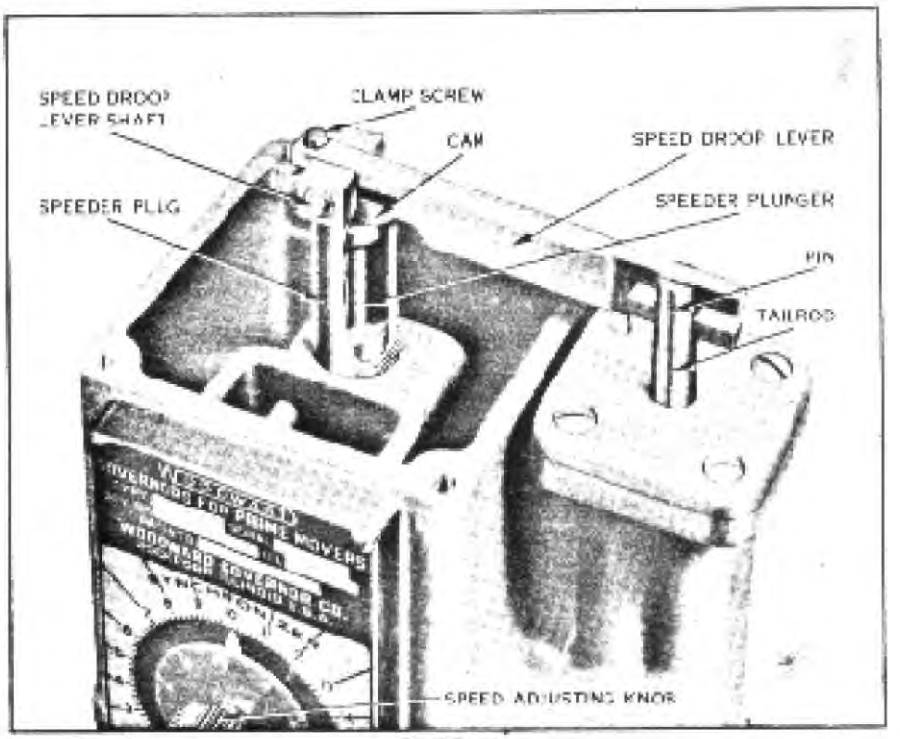
WOODWARD

SPEED DROOP TYPE SI GOVERNOR

BULLETIN 01007

JULY, 1943

GENERAL: Speed droop is used to balance and divide load between engines running in parallel. Speed droop or speed regulation of an engine is defined as the decrease in speed of the engine as its load is increased from no load to full load and is expressed in R.P.M., or as a percentage of normal speed. Since the normal speed of the governor is determined by the compression of the speeder spring, any change in compression of the speeder spring will change the normal speed of the governor.



Cut No. 1

OPERATION: The method of incorporating speed droop in the Woodward type SI Governor is shown in Cut No. 1. For any given speed adjustment setting, the SPEEDER PLUG is stationary. The position of the SPEEDER PLUNGER within the SPEEDER PLUG is determined by the position of the CAM on the SPEED DROOP LEVER.

When the POWER PISTON and ROD END move up in the direction to increase fuel as load is increased, the TAIL ROD also moves up. Upward movement of the PIN in the TAILROD rotates the SPEED DROOP LEVER about the SPEED DROOP LEVER SHAFT. As the CAM on the SPEED DROOP LEVER moves upward, the SPEEDER PLUNGER is moved upward inside the SPEEDER PLUG, thus decreasing the compression of the SPEEDER SPRING and the normal speed of the governor.

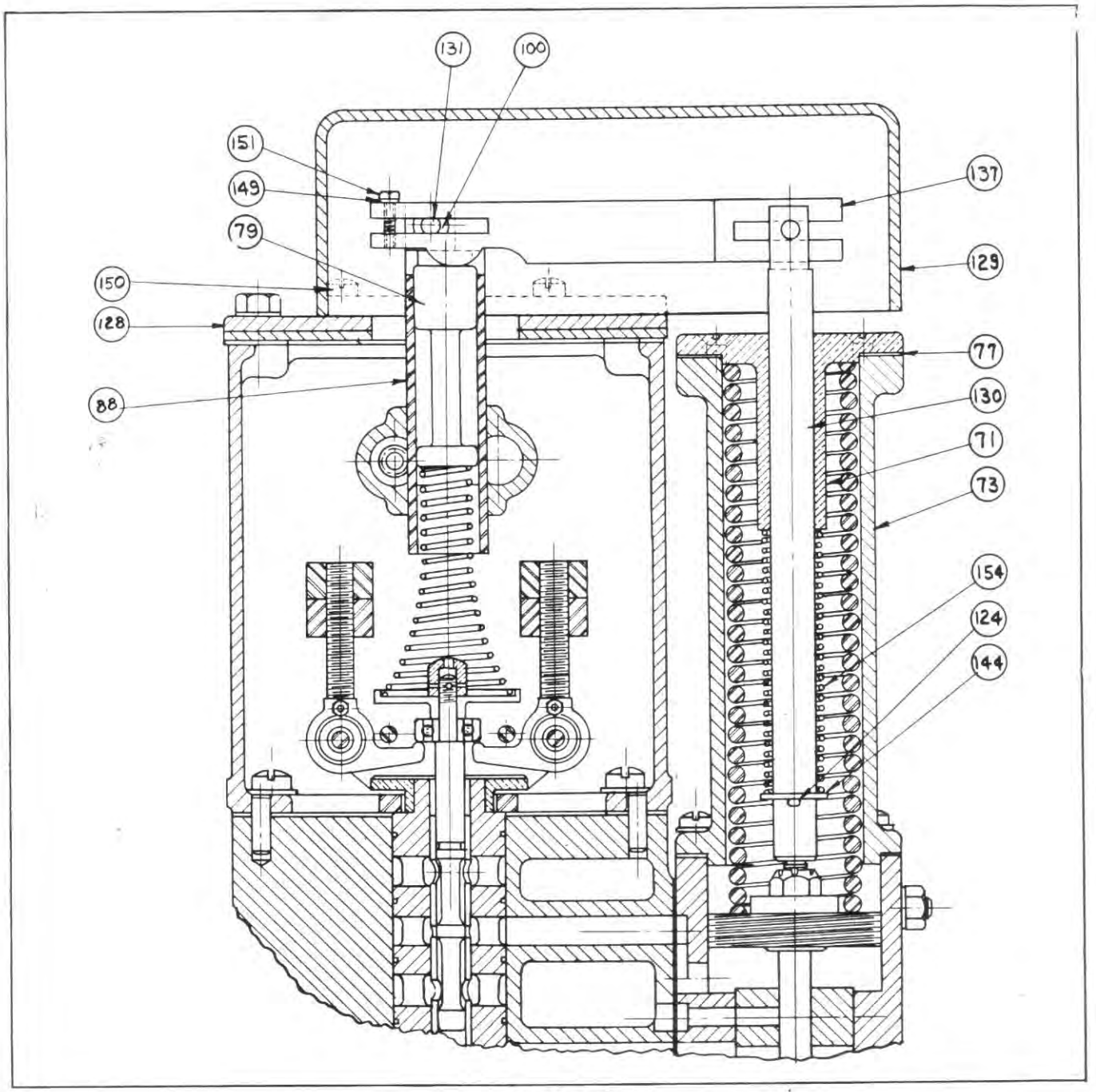
When the POWER PISTON and ROD END move down in the direction to decrease fuel as load is decreased, the TAILROD also moves down. Downward movement of the PIN in the TAILROD rotates the SPEED DROOP LEVER about the SPEED DROOP LEVER SHAFT. As the CAM on the SPEED DROOP LEVER moves downward, the SPEEDER PLUNGER moves downward inside the SPEEDER PLUG, thus increasing the compression of the SPEEDER SPRING and the normal speed of the governor.

ADJUSTMENT: Adjustment of the speed droop is accomplished by changing the position of the SPEED DROOP LEVER CAM with respect to the SPEED DROOP LEVER SHAFT. Moving the LEVER toward the POWER CYLINDER assembly increases the speed droop, and vice versa. When moving the LEVER in the direction to decrease speed droop, be careful to avoid moving LEVER so far that negative droop will result. After each adjustment, the SPEED DROOP LEVER should be clamped tightly on the SPEED DROOP LEVER SHAFT by the CLAMP SCREW in the LEVER.

INFORMATION AND PARTS REPLACEMENT: When requesting information concerning governor operation and maintenance or ordering replacement parts, it is very essential that the following information accompany the request:

1. Governor serial number (shown on governor nameplate).
2. Bulletin number.
3. Part number, name of part, or description of part. See Cut No. 2.

When ordering replacement parts not designated in this bulletin, refer to bulletin in which the parts are designated.



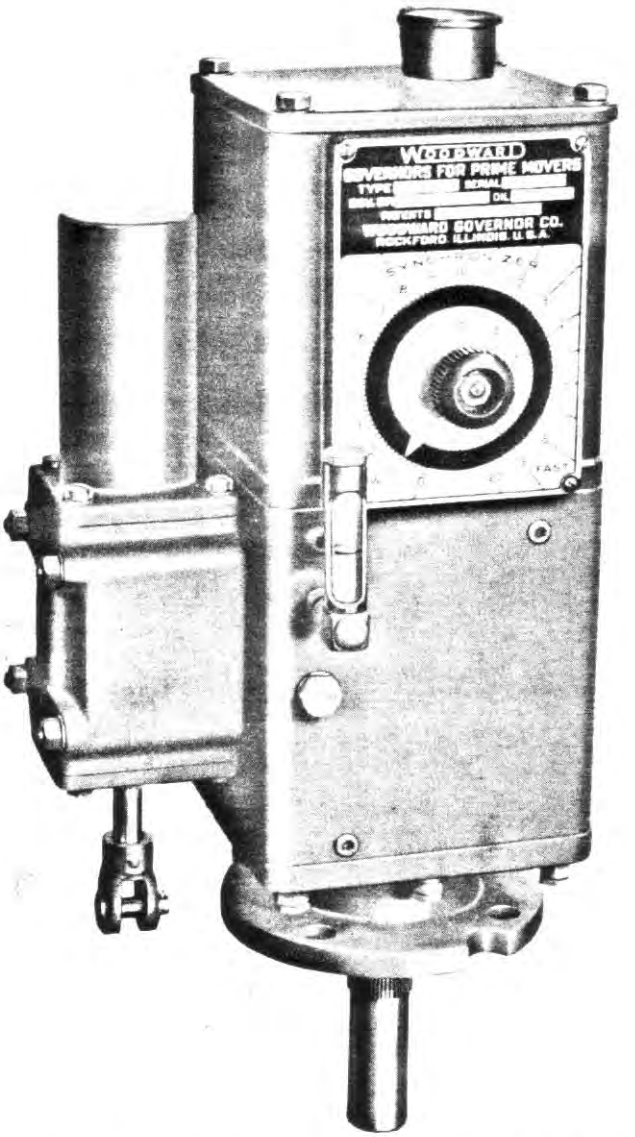
Cut No. 2

PC. NO.	NAME OF PC.	NO. REQ'D
71	Spring Guard Cap	1
73	Spring Guard	1
77	Spring Guard Cap Gasket	1
79	Speeder Plug Plunger	1
88	Speeder Plug	1
100	Needle Bearing	2
124	Cotter Pin 1/16" x 3/4"	1
128	Cover	1
129	Speed Droop Cover	1
130	Tail Rod	1
131	Speed Droop Lever Shaft	1
137	Speed Droop Lever	1
144	Washer 7/8" x 19/32" x 1/16"	1
149	#8 Shakeproof Washer	1
150	1/4"-28 x 1/2" Fil. Hd. Mach. Screw	4
151	#8-32 x 5/8" Hex. Hd. Mach. Screw	1
154	Spring	1
	Dowel Pin 1/4" x 9/16"	1

WOODWARD

TYPE SI GOVERNOR

BULLETIN 01002



This bulletin covers the basic type SI governor as used on most D.C. generating sets, pumping engines, and most single engine installations. The special auxiliary features required for A.C. generating sets, pressure control, marine propulsion, etc., are covered by other bulletins.

WOODWARD GOVERNOR COMPANY

ROCKFORD, ILLINOIS

FEBRUARY 1943

TYPE SI GOVERNOR

DIAL CONTROL

PART ONE

DESCRIPTION — INSTALLATION — ADJUSTMENT — OPERATION

GENERAL: The type SI governor is of the hydraulic type with its own independent oil supply and internal oil pressure pump with pressure storage accumulators. The governor is normally isochronous (same speed regardless of load). Speed adjustment is provided as standard equipment; many auxiliaries such as motor speed adjustment, speed droop, torque limit control, etc. can be furnished.

It is desirable that the engine be equipped with an overspeed trip device to prevent runaway in the event of any failure which may render the governor inoperative.

INSTALLATION: When the governor is installed on the engine, particular care should be exercised to see that it is mounted squarely and that the drive connection to the engine is aligned properly. The linkage from the governor to the fuel system should be aligned properly also; any friction or lost motion should be eliminated.

OIL SPECIFICATIONS: Use SAE 20 or SAE 30 oil for ordinary temperature conditions. If governor operating conditions are extremely hot, use SAE 40 or SAE 50; if extremely cold, use SAE 10.

The oil must not contain additives which are used to free up rings, remove carbon, etc. unless a non-foaming additive is also present. The oil should not foam or sludge excessively when agitated, or form gummy deposits when heated.

Dirty oil causes most governor troubles. Use clean new oil or filtered oil. All containers must be clean and should be rinsed with fuel oil before using.

Keep governor oil at correct level in oil gauge.

ADJUSTMENTS: Speed adjustment and compensating needle valve adjustment are the only external adjustments to be made.

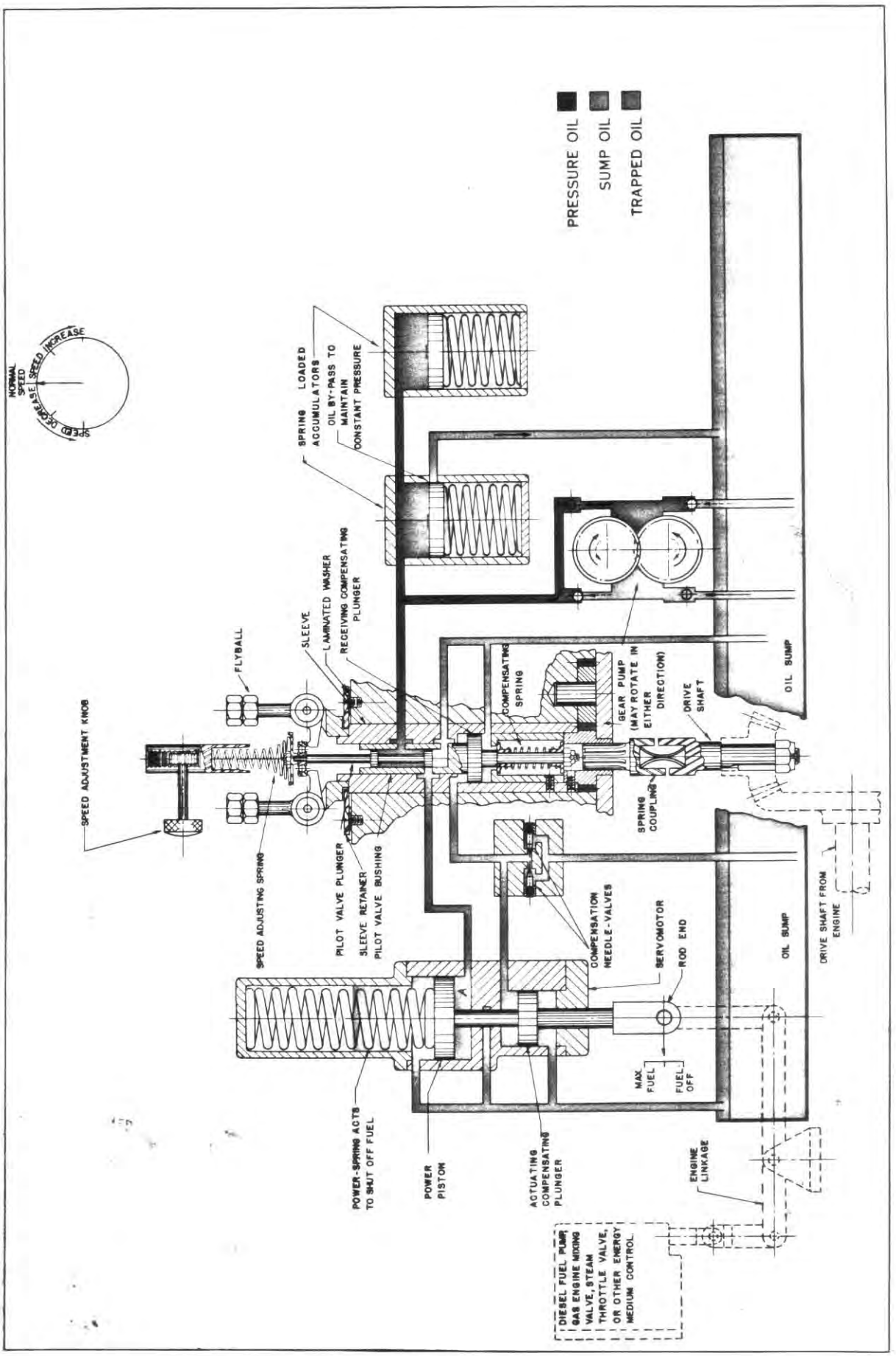
Start engine and turn SPEED ADJUSTMENT KNOB to obtain engine speed desired.

There are two COMPENSATING NEEDLE VALVES; either may be used for adjustment, but the other must be turned in against its seat. Open the one being used a full turn or more and allow engine to surge for thirty seconds; then close it until surging is just eliminated.

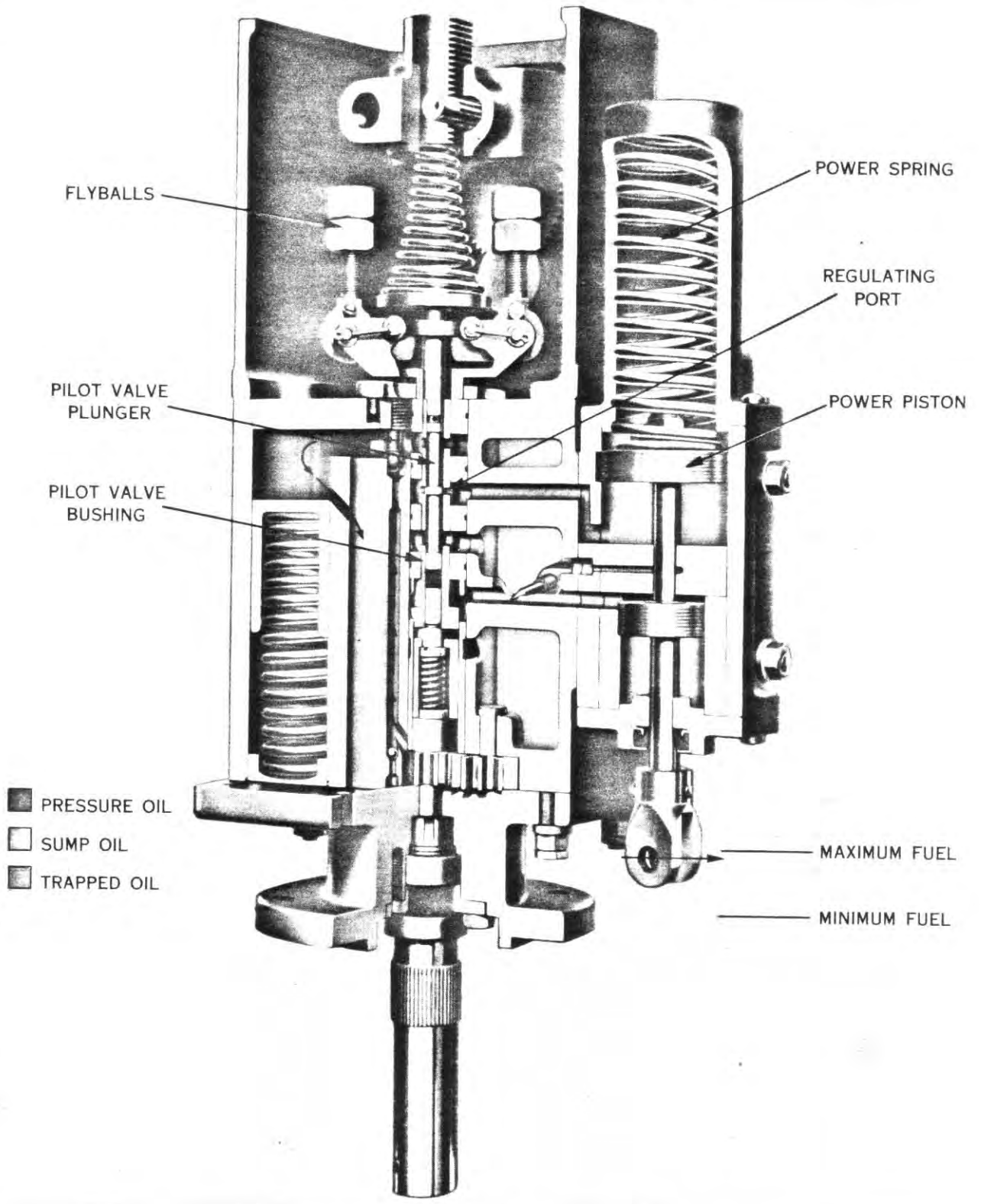
The NEEDLE VALVE will usually be about one fourth of a turn open for best performance, but the adjustment depends on the characteristics of the engine. Keep it as far open as possible to prevent sluggishness. After it is adjusted correctly for the engine, it should not be necessary to change it except for a permanent temperature change effecting the viscosity of the oil.

DESCRIPTION OF OPERATION: The schematic drawing shows a dial control SI governor without auxiliary equipment. The SERVOMOTOR POWER SPRING is used to decrease the supply of fuel to the engine. Oil pressure is used only to increase the supply of fuel.

PILOT VALVE BUSHING and RECEIVING COMPENSATING PLUNGER are made in one piece and consequently will move together. POWER PISTON and ACTUATING COMPENSATING PLUNGER are also assembled as one piece and move together. Governor PUMP, SLEEVE, PILOT VALVE BUSHING, and FLYBALLS rotate together driven by the DRIVE SHAFT. DRIVE SHAFT speed may be either engine speed or some ratio of engine speed as determined by the drive from the engine. Two ACCUMULATORS are provided for pressure oil storage capacity; maximum pressure of governor oil is regulated by a by-pass in one of them.

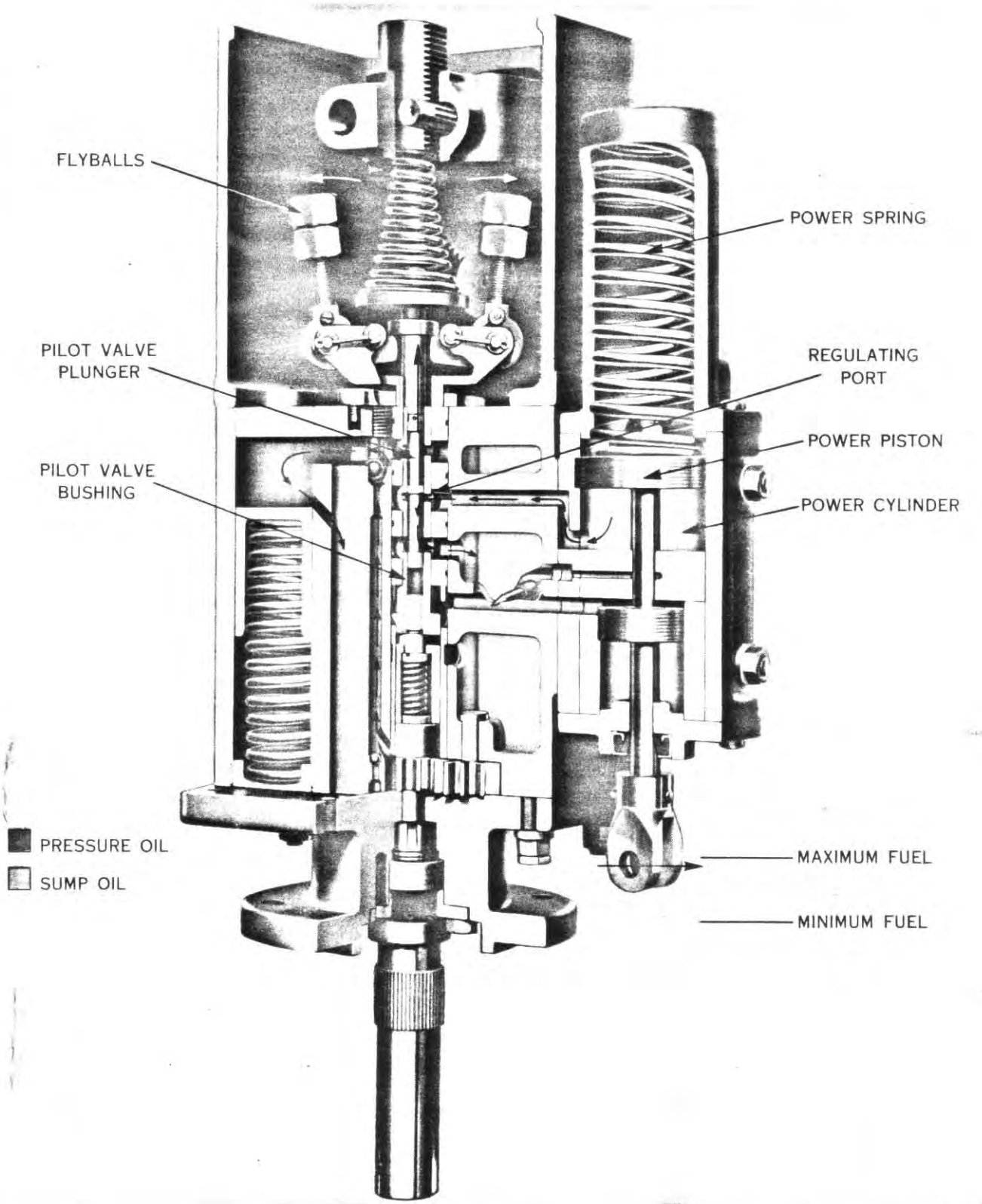

PRESSURE OIL
SUMP OIL
TRAPPED OIL
NORMAL SPEED
INCREASE SPEED
DECREASE SPEED
SPRING LOADED ACCUMULATORS
OIL BY-PASS TO MAINTAIN CONSTANT PRESSURE
FLYBALL
SLEEVE
LAMINATED WASHER
RECEIVING COMPENSATING PLUNGER
COMPENSATING SPRING
GEAR PUMP (MAY ROTATE IN EITHER DIRECTION)
DRIVE SHAFT
OIL SUMP
SPEED ADJUSTMENT KNOB
SPEED ADJUSTING SPRING
PILOT VALVE PLUNGER
SLEEVE RETAINER
PILOT VALVE BUSHING
SPRING COUPLING
COMPENSATION NEEDLE-VALVES
SERVOMOTOR ROD END
OIL SUMP
DRIVE SHAFT FROM ENGINE
MAX. FUEL
FUEL OFF
POWER-SPRING ACTS TO SHUT OFF FUEL
POWER PISTON
ACTUATING COMPENSATING PLUNGER
ENGINE LINKAGE
DIESEL FUEL PUMP, GAS ENGINE MIXING VALVE, STEAM THROTTLE VALVE, OR OTHER ENERGY MEDIUM CONTROL

Cut No. 1



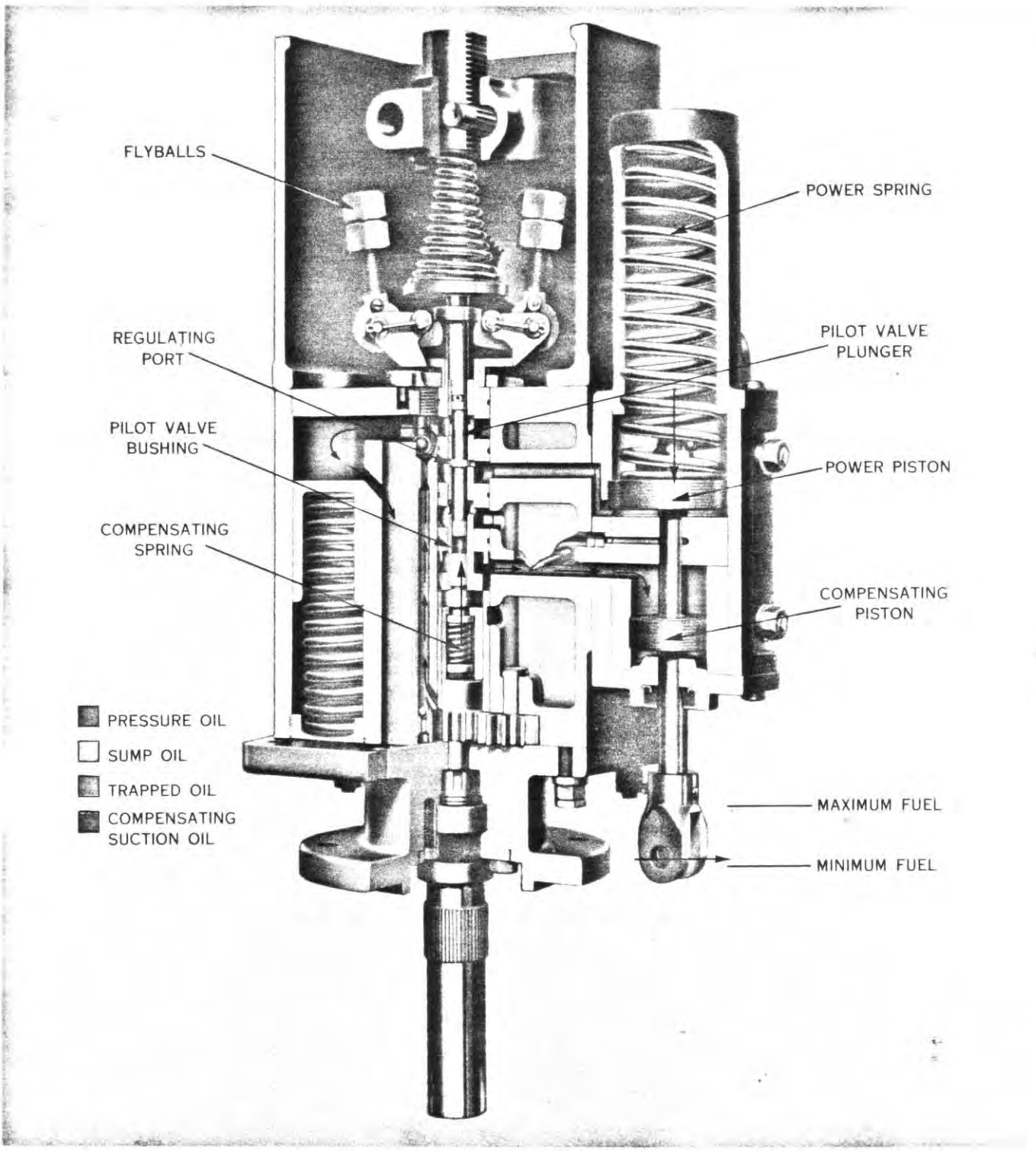
Cut No. 2

1. Engine is running at normal speed under steady load.
2. FLYBALLS, PILOT VALVE PLUNGER, and PILOT VALVE BUSHING are in normal positions; REGULATING PORT in BUSHING is covered by land on PLUNGER.
3. POWER PISTON is stationary.



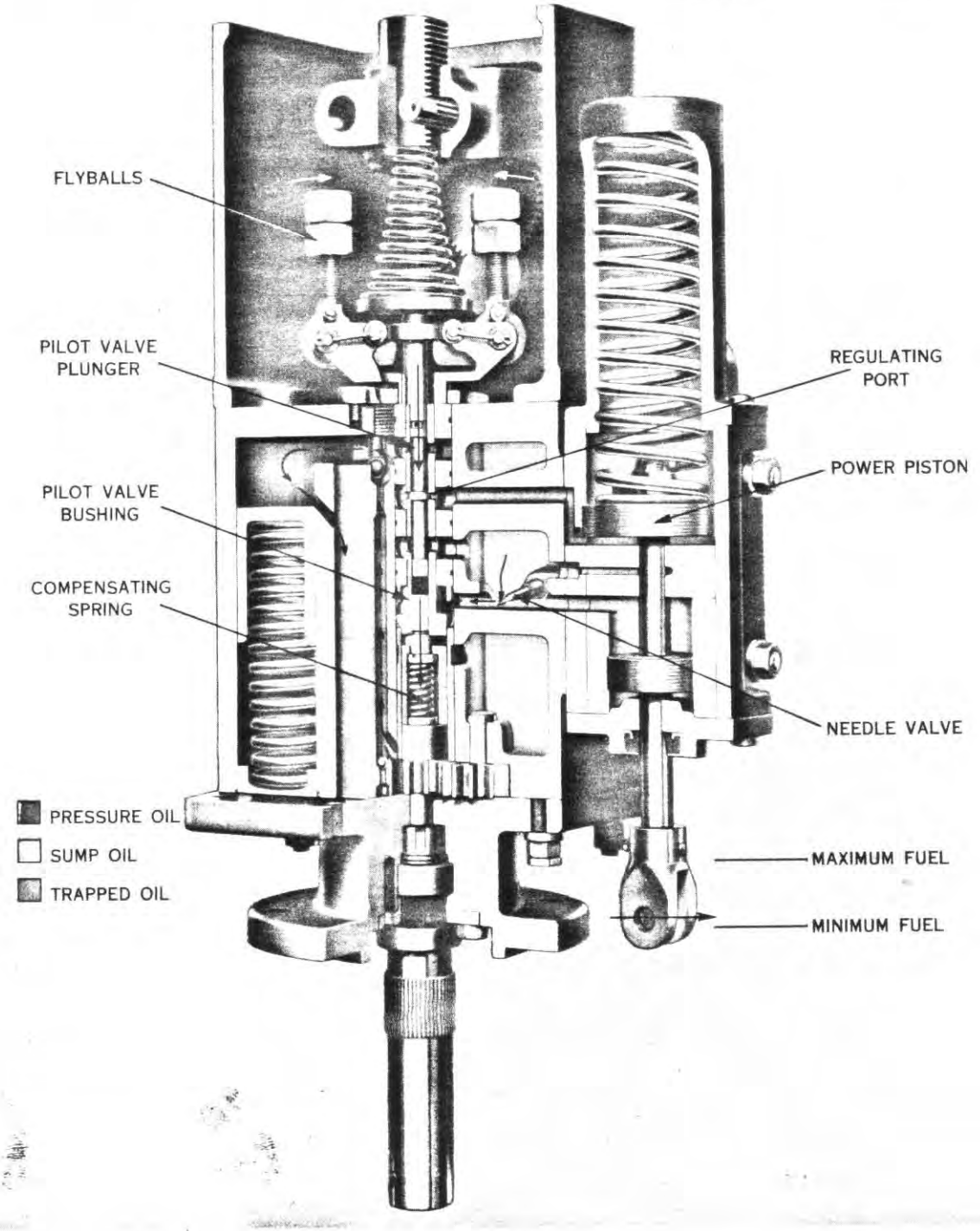
Cut No. 3

1. Load is decreased and speed increases.
2. As speed increases, FLYBALLS move out raising PILOT VALVE PLUNGER and uncovering REGULATING PORT in PILOT VALVE BUSHING.
3. Uncovering of REGULATING PORT opens POWER CYLINDER to sump and will allow POWER SPRING to force POWER PISTON down.



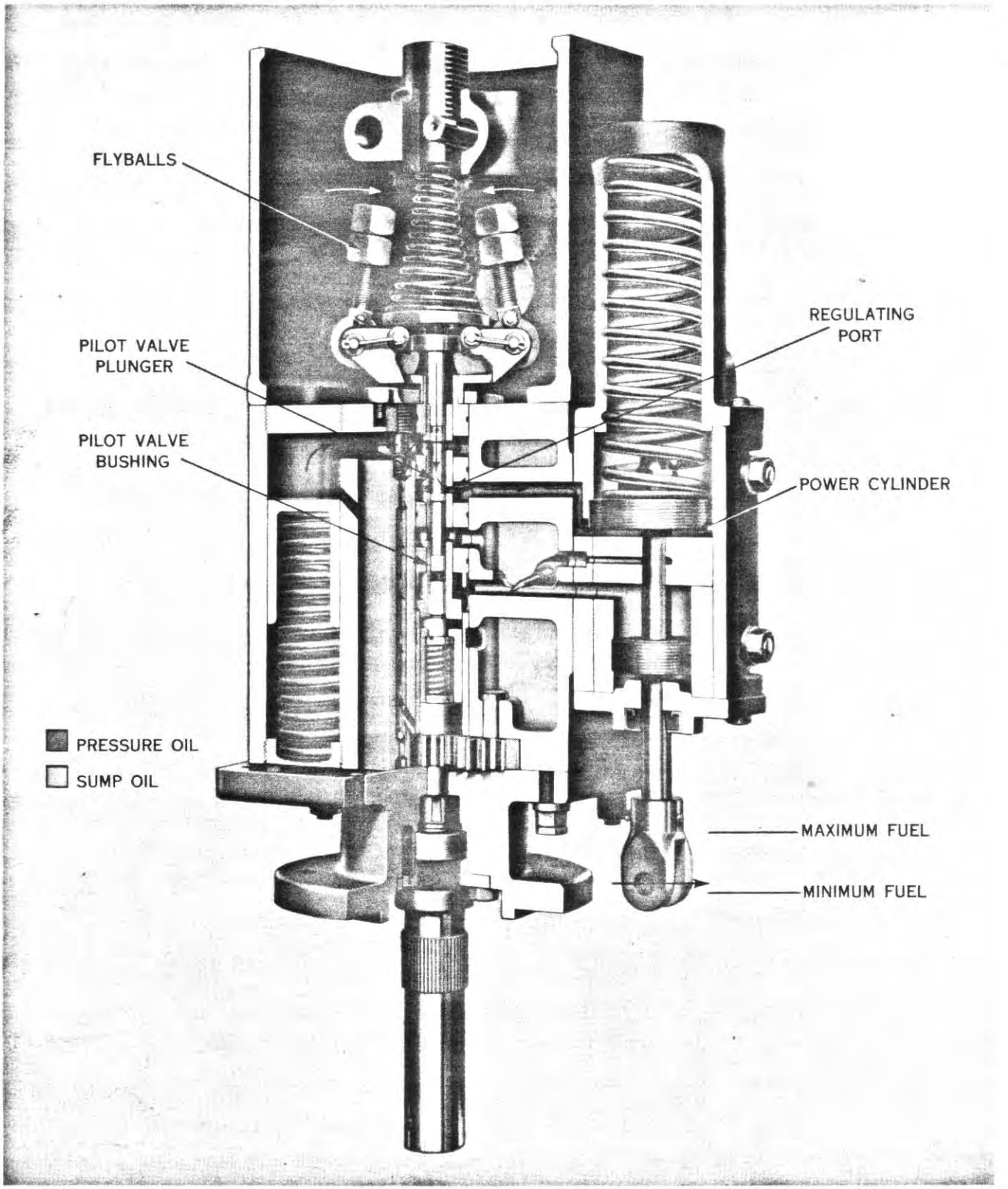
Cut No. 4

1. POWER SPRING moves POWER PISTON down in direction to decrease fuel.
2. As POWER PISTON moves down, COMPENSATING PISTON moves down and draws PILOT VALVE BUSHING up compressing COMPENSATING SPRING.
3. Movement of POWER PISTON and PILOT VALVE BUSHING continues until REGULATING PORT in BUSHING is covered by land on PLUNGER.
4. As soon as REGULATING PORT is covered, POWER PISTON is stopped at a position corresponding to decreased fuel needed to run engine at normal speed under decreased load.



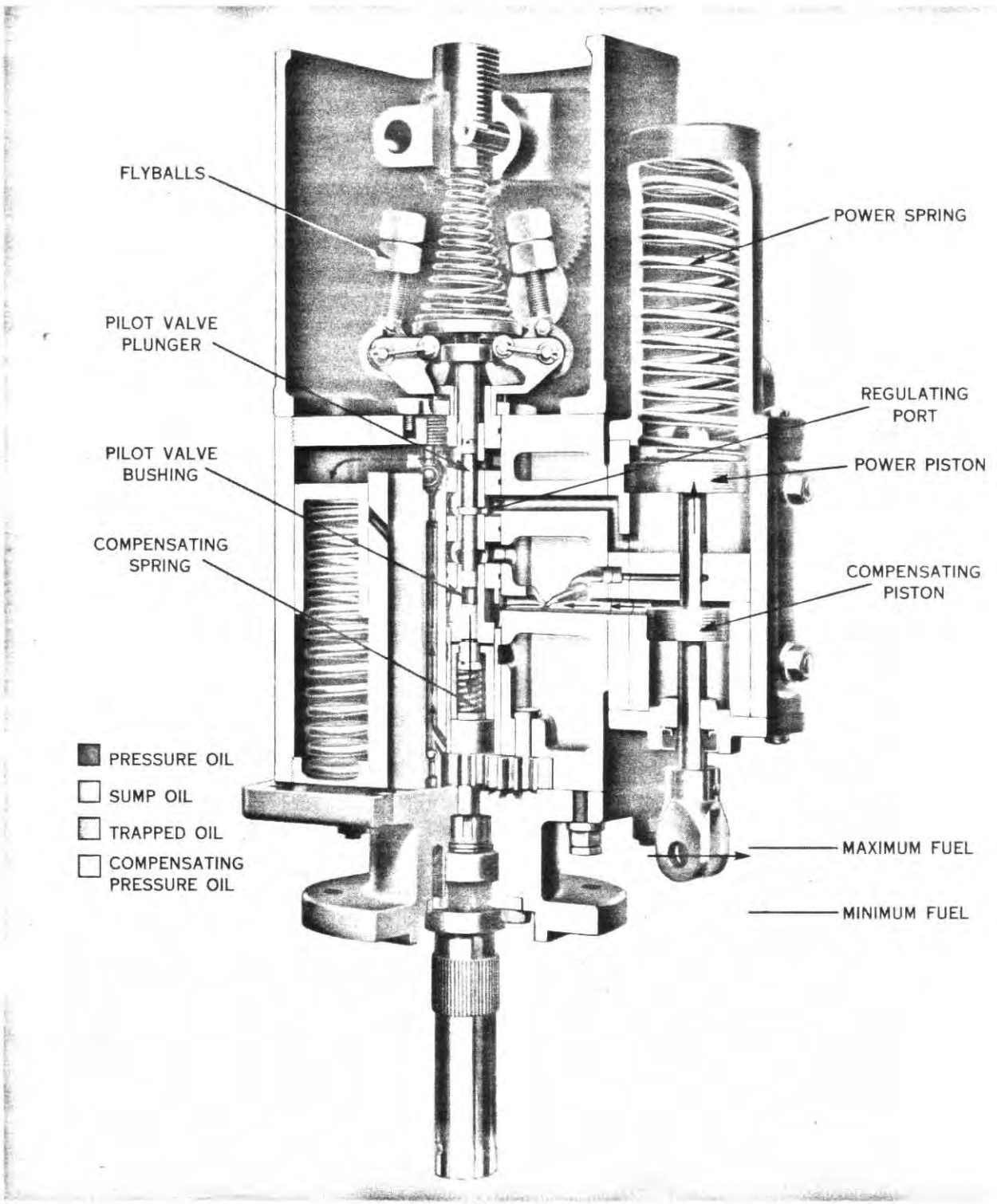
Cut No. 5

1. As speed decreases to normal, FLYBALLS return to normal position lowering PILOT VALVE PLUNGER to normal position.
2. PILOT VALVE BUSHING is returned to normal position by COMPENSATING SPRING at same rate as PILOT VALVE PLUNGER thus keeping REGULATING PORT in BUSHING covered by land on PLUNGER and POWER PISTON stationary; flow of oil through NEEDLE VALVE determines rate at which BUSHING is returned to normal.
3. At completion of cycle FLYBALLS, PILOT VALVE PLUNGER, and PILOT VALVE BUSHING are in normal positions; POWER PISTON is stationary at a position corresponding to decreased fuel needed to run engine at normal speed under decreased load.



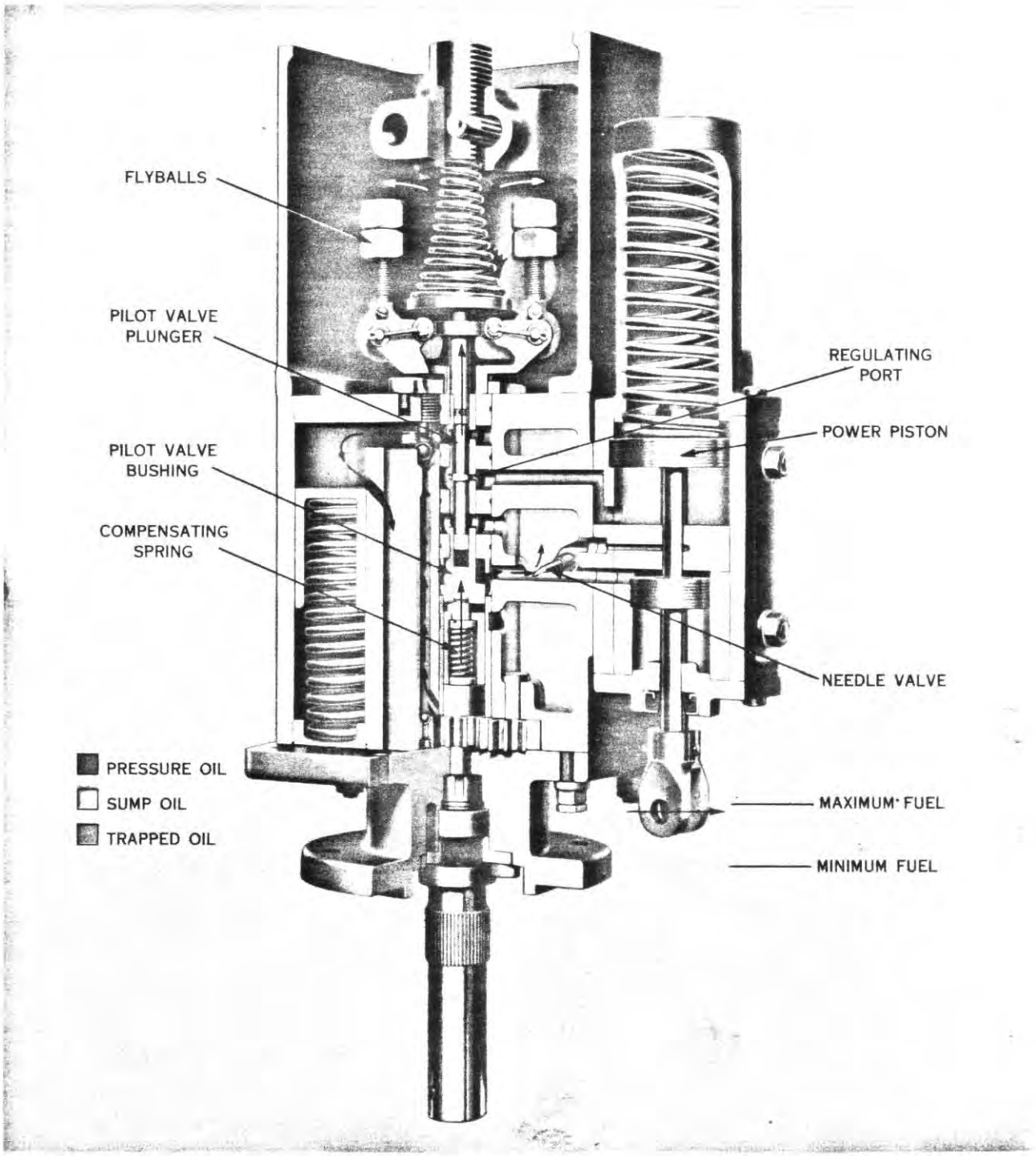
Cut No. 6

1. Load is increased and speed decreases.
2. As speed decreases, FLYBALLS move in, lowering PILOT VALVE PLUNGER and uncovering REGULATING PORT in PILOT VALVE BUSHING.
3. Uncovering of REGULATING PORT admits pressure oil to POWER CYLINDER.



Cut No. 7

1. Oil pressure moves POWER PISTON up in direction to increase fuel.
2. As POWER PISTON moves up, COMPENSATING PISTON moves up and forces PILOT VALVE BUSHING down compressing COMPENSATING SPRING.
3. Movement of POWER PISTON and PILOT VALVE BUSHING continues until REGULATING PORT in BUSHING is covered by land on PLUNGER.
4. As soon as REGULATING PORT is covered, POWER PISTON is stopped at a position corresponding to increased fuel needed to run engine at normal speed under increased load.



Cut No. 8

1. As speed increases to normal, FLYBALLS return to normal position raising PILOT VALVE PLUNGER to normal position.
2. PILOT VALVE BUSHING is returned to normal position by COMPENSATING SPRING at same rate as PILOT VALVE PLUNGER thus keeping REGULATING PORT in BUSHING covered by land on PLUNGER and POWER PISTON stationary; flow of oil through NEEDLE VALVE determines rate at which BUSHING is returned to normal.
3. At completion of cycle FLYBALLS, PILOT VALVE PLUNGER, and PILOT VALVE BUSHING are in normal positions; POWER PISTON is stationary at a position corresponding to increased fuel needed to run engine at normal speed under increased load.

PART TWO

MAINTENANCE — INTERNAL ADJUSTMENT

INFORMATION AND PARTS REPLACEMENT: When requesting information concerning governor operation and maintenance or ordering replacement parts, it is very essential that the following information accompany the request:

1. Governor serial number (shown on governor nameplate).
2. Bulletin number.
3. Part number, name of part, or description of part. See cuts No. 12 and 13.

OIL CHANGES: See OIL SPECIFICATIONS in part one.

The governor oil should be clean and free of foreign particles. Under favorable conditions, the oil may be used for approximately six months without changing. If adjustment of the COMPENSATING NEEDLE VALVE does not result in proper operation, dirty oil may be the cause of the trouble.

To change the oil, remove the governor from the engine, take off the cover, drain by turning upside down, and flush thoroughly with clean fuel oil to remove any foreign matter. Drain thoroughly, flush, and refill with clean governor oil. Follow the above procedure whenever the governor is removed from the engine for any reason.

If it is not possible to shut down long enough to remove the governor from the engine, drain the oil from the governor, fill with fuel oil, run for approximately thirty seconds with the needle valve open, drain, and refill with clean governor oil.

If the governor is stored, it should be filled with oil.

OIL SEALS: When it becomes necessary to add oil to the governor too frequently, the oil seals should be replaced. Refer to cuts No. 12 and 13.

To replace DRIVE SHAFT OIL SEAL, REMOVE LOCKWIRE AND CAP SCREWS, Pull DRIVE SHAFT assembly out of base. Remove LOCK RING and press DRIVE SHAFT out of BEARING. Remove BEARING RETAINER and press out OIL SEAL. Press new SEAL into RETAINER and reassemble.

To replace PISTON ROD OIL SEAL, remove SERVOMOTOR from governor. Drive out TAPER PIN and press PISTON ROD out of ROD END. Remove CYLINDER HEAD, pry out OIL SEAL, and press in new SEAL. Reassemble, being careful to avoid damaging lip of SEAL.

CAUTION: The ROD END is screwed onto the PISTON ROD in many of these governors. This construction will be recognized by the milled flats on the PISTON ROD and it is not necessary to remove the SERVOMOTOR to replace the OIL SEAL.

SPEED LIMIT ADJUSTMENT: Do not make this adjustment unless the engine linkage has been properly adjusted. See engine instruction book.

If the desired maximum (or minimum) speed can not be obtained by turning the SPEED ADJUSTMENT KNOB, the limits can be changed by turning the SPEEDER PLUG SCREW in the SPEEDER PLUG, if this screw is furnished.

If the limits can not be changed sufficiently by adjustment of the SPEEDER PLUG SCREW, or if the screw is not furnished, it can be done by changing the position of the STOP PINS with respect to the SPEEDER PLUG.

With engine shut down, remove DIAL PLATE, DIAL SHAFT NUT, SPEED ADJUSTMENT KNOB, and DIAL DISC. Refer to Cut No. 12. While doing this, place finger against inside end of DIAL SHAFT to prevent its being forced through BUSHING by DIAL SHAFT SPRING. Replace KNOB and NUT; pull GEAR forward unmeshing it from PINION.

Start engine and turn SPEED ADJUSTMENT KNOB to desired maximum (or minimum) speed; remesh GEAR in position where its maximum (or minimum) STOP PIN is against the PIN in the Dial Panel. Stop engine, remove NUT and KNOB again, and reassemble all parts.

BALLARMS AND BEARINGS: Erratic governor performance may indicate the need for replacement of BALLARMS, BALLARM BEARINGS, or PILOT VALVE PLUNGER BEARING.

If toes of the BALLARMS are worn too badly to be refinished, new BALLARMS should be used being careful to set FLYBALLS at same position on new BALLARMS as on old ones. BALLARM BEARINGS should be replaced if worn excessively. If BALLARM PINS do not fit tightly in inner race of BALLARM BEARINGS, they should be interchanged with BALLARM STOP PINS.

If PILOT VALVE PLUNGER BEARING is grooved, it should be either turned over or replaced. Extreme care must be used in disassembling PILOT VALVE PLUNGER assembly to avoid damaging the ground finish. After reassembling check pilot valve adjustment.

PILOT VALVE ADJUSTMENT: The pilot valve adjustment should be checked after doing any work on BALLARMS, PILOT VALVE PLUNGER, or PILOT VALVE BUSHING.

The REGULATING PORT (hole marked "A" on Cut No. 11) should be completely uncovered for both inner and outer positions of the BALLARMS. Movement of the REGULATING LAND on PLUNGER can be observed through REGULATING PORT in BUSHING while holding plunger assembly against the toes of BALLARMS and moving the BALLARMS through their full travel. If REGULATING PORT is not fully open at each end of BALLARM travel, position of PLUNGER with respect to BALLARMS can be changed by varying thickness of LAMINATED WASHER under BEARING on PLUNGER. Removing one layer from LAMINATED WASHER will raise PLUNGER .002".

PUMP GEAR END CLEARANCE: PUMP GEAR end clearance is determined by the thickness of LAMINATED WASHERS under ROTATING SLEEVE RETAINER. Clearance should be from .001" to .003". See Cut No. 11. Excessive end clearance will reduce pump capacity.

To get proper end clearance, remove one lamination at a time from WASHER under each end of RETAINER until ROTATING SLEEVE assembly turns hard; then put back one LAMINATION under each end. If there is not sufficient end clearance, excessive wear and possibly seizure will result.

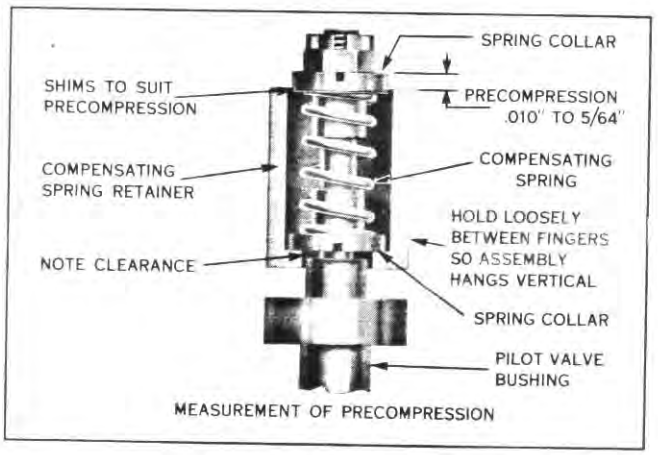
After the LAMINATED WASHERS have been completely removed, RETAINER should be replaced. To replace RETAINER, remove ROTATING SLEEVE assembly from POWER CASE and press ROTATING SLEEVE out of BALLHEAD. Reassemble using a new RETAINER and LAMINATED WASHERS. Adjust pump gear end clearance as before.

COMPENSATING SPRING ADJUSTMENT: Do not make this adjustment unless instructions given in ADJUSTMENTS, Part one, and OIL CHANGES, Part two, have been followed and operation is still not satisfactory. Remove TAPER SCREWS and pull out DRIVE GEAR and PILOT VALVE BUSHING assembly. Back off ADJUSTING NUT and change precompression as shown in Cut No. 9 and Cut No. 11.

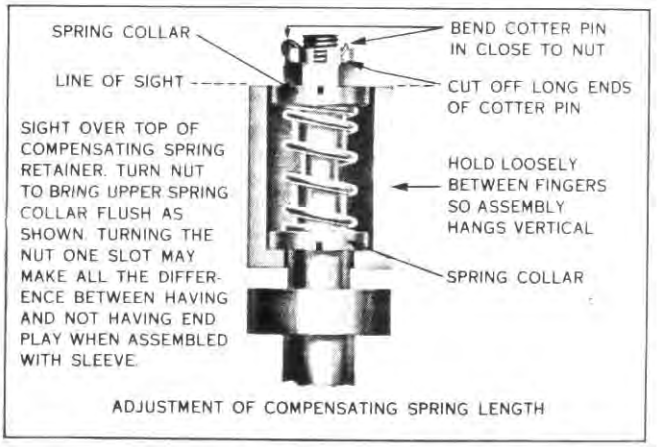
This precompression may vary from .010" to 5/64" depending upon characteristics of engine and load.

To eliminate a slow engine hunt, remove SHIMS to reduce precompression. To eliminate a surge, add SHIMS to increase precompression.

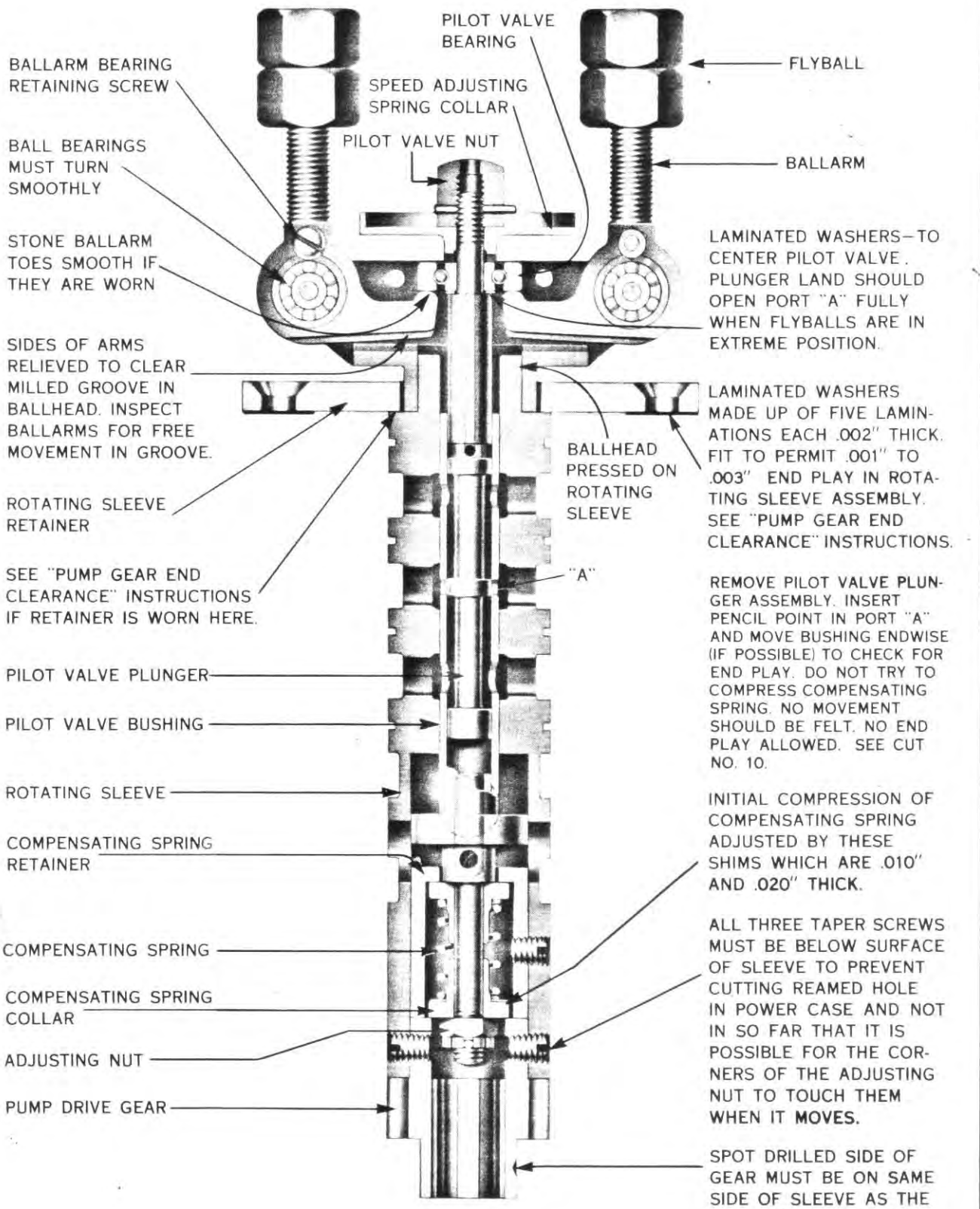
Adjust COMPENSATING SPRING length as shown in Cut No. 10 and reassemble with ROTATING SLEEVE and DRIVE GEAR as shown in Cut No. 11. Check for end play; none allowed.



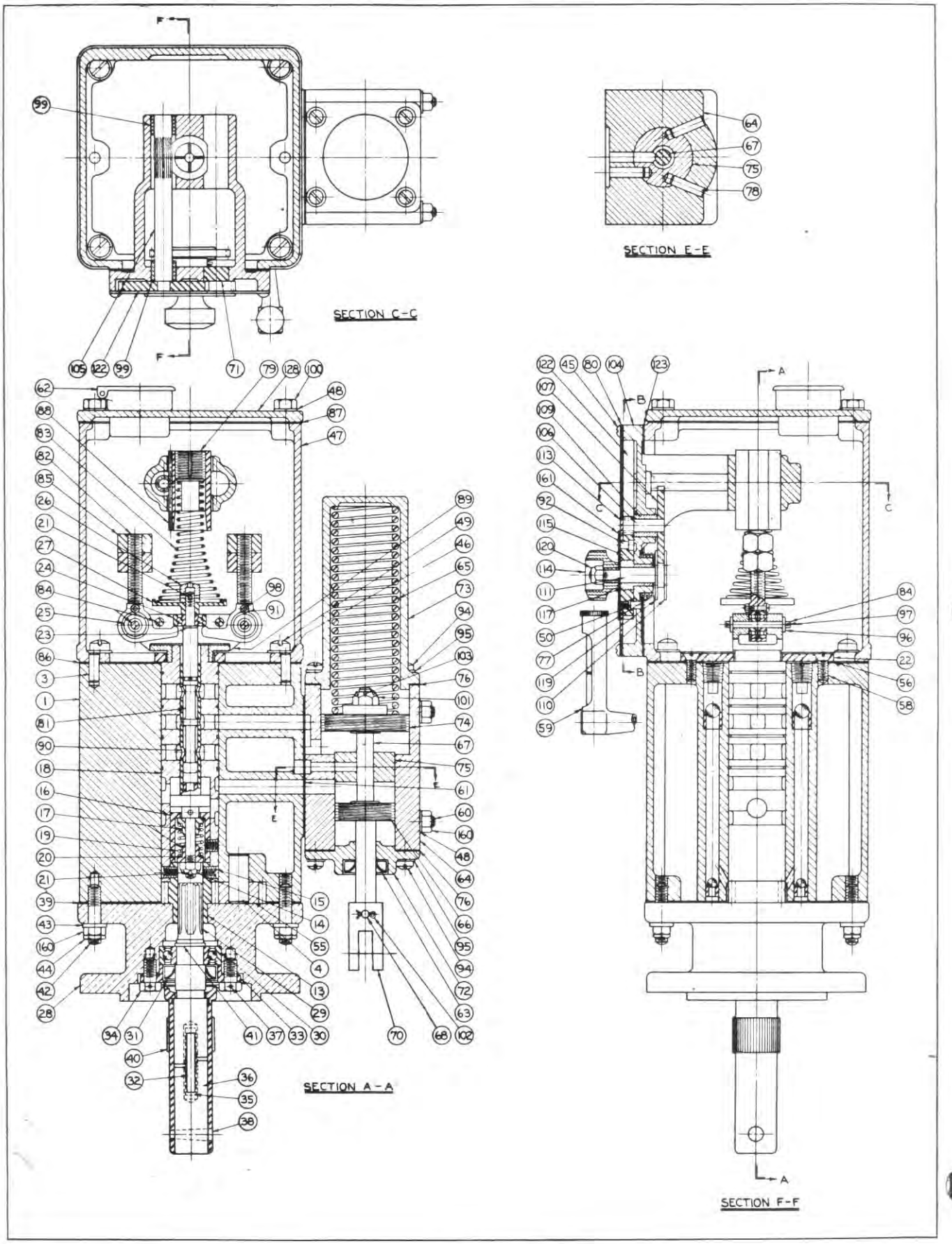
Cut No. 9



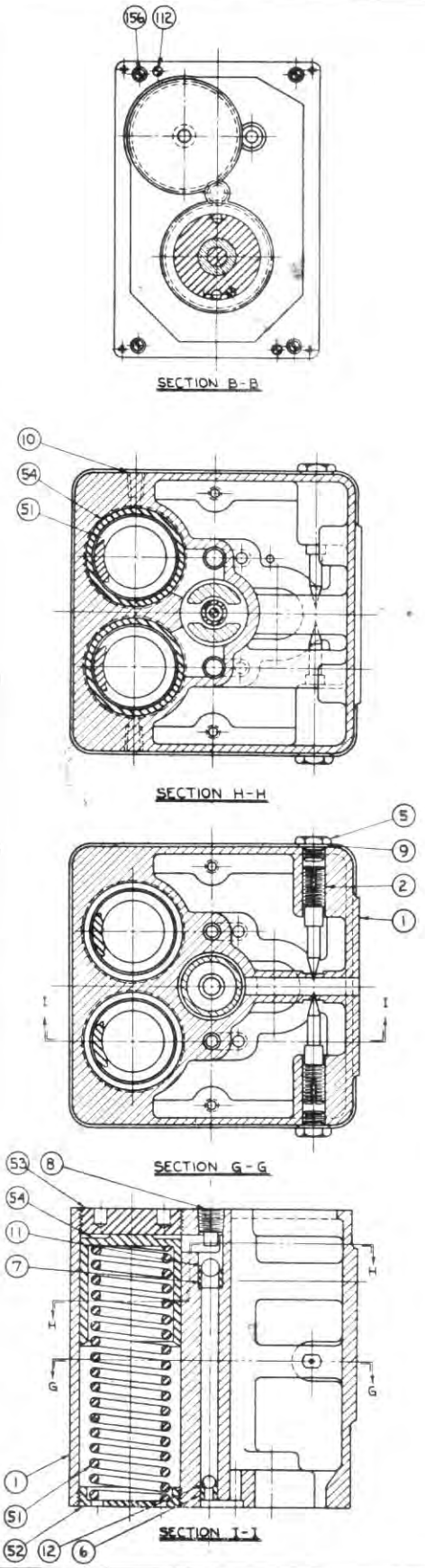
Cut No. 10


PILOT VALVE BEARING
FLYBALL
BALLARM BEARING RETAINING SCREW
SPEED ADJUSTING SPRING COLLAR
PILOT VALVE NUT
BALL BEARINGS MUST TURN SMOOTHLY
BALLARM
STONE BALLARM TOES SMOOTH IF THEY ARE WORN
LAMINATED WASHERS—TO CENTER PILOT VALVE. PLUNGER LAND SHOULD OPEN PORT "A" FULLY WHEN FLYBALLS ARE IN EXTREME POSITION.
SIDES OF ARMS RELIEVED TO CLEAR MILLED GROOVE IN BALLHEAD. INSPECT BALLARMS FOR FREE MOVEMENT IN GROOVE.
LAMINATED WASHERS MADE UP OF FIVE LAMINATIONS EACH .002" THICK. FIT TO PERMIT .001" TO .003" END PLAY IN ROTATING SLEEVE ASSEMBLY. SEE "PUMP GEAR END CLEARANCE" INSTRUCTIONS.
BALLHEAD PRESSED ON ROTATING SLEEVE
ROTATING SLEEVE RETAINER
"A"
SEE "PUMP GEAR END CLEARANCE" INSTRUCTIONS IF RETAINER IS WORN HERE.
REMOVE PILOT VALVE PLUNGER ASSEMBLY. INSERT PENCIL POINT IN PORT "A" AND MOVE BUSHING ENDWISE (IF POSSIBLE) TO CHECK FOR END PLAY. DO NOT TRY TO COMPRESS COMPENSATING SPRING. NO MOVEMENT SHOULD BE FELT. NO END PLAY ALLOWED. SEE CUT NO. 10.
PILOT VALVE PLUNGER
PILOT VALVE BUSHING
ROTATING SLEEVE
INITIAL COMPRESSION OF COMPENSATING SPRING ADJUSTED BY THESE SHIMS WHICH ARE .010" AND .020" THICK.
COMPENSATING SPRING RETAINER
ALL THREE TAPER SCREWS MUST BE BELOW SURFACE OF SLEEVE TO PREVENT CUTTING REAMED HOLE IN POWER CASE AND NOT IN SO FAR THAT IT IS POSSIBLE FOR THE CORNERS OF THE ADJUSTING NUT TO TOUCH THEM WHEN IT MOVES.
COMPENSATING SPRING
COMPENSATING SPRING COLLAR
ADJUSTING NUT
PUMP DRIVE GEAR
SPOT DRILLED SIDE OF GEAR MUST BE ON SAME SIDE OF SLEEVE AS THE TWO TAPER SCREWS.

Cut No. 11



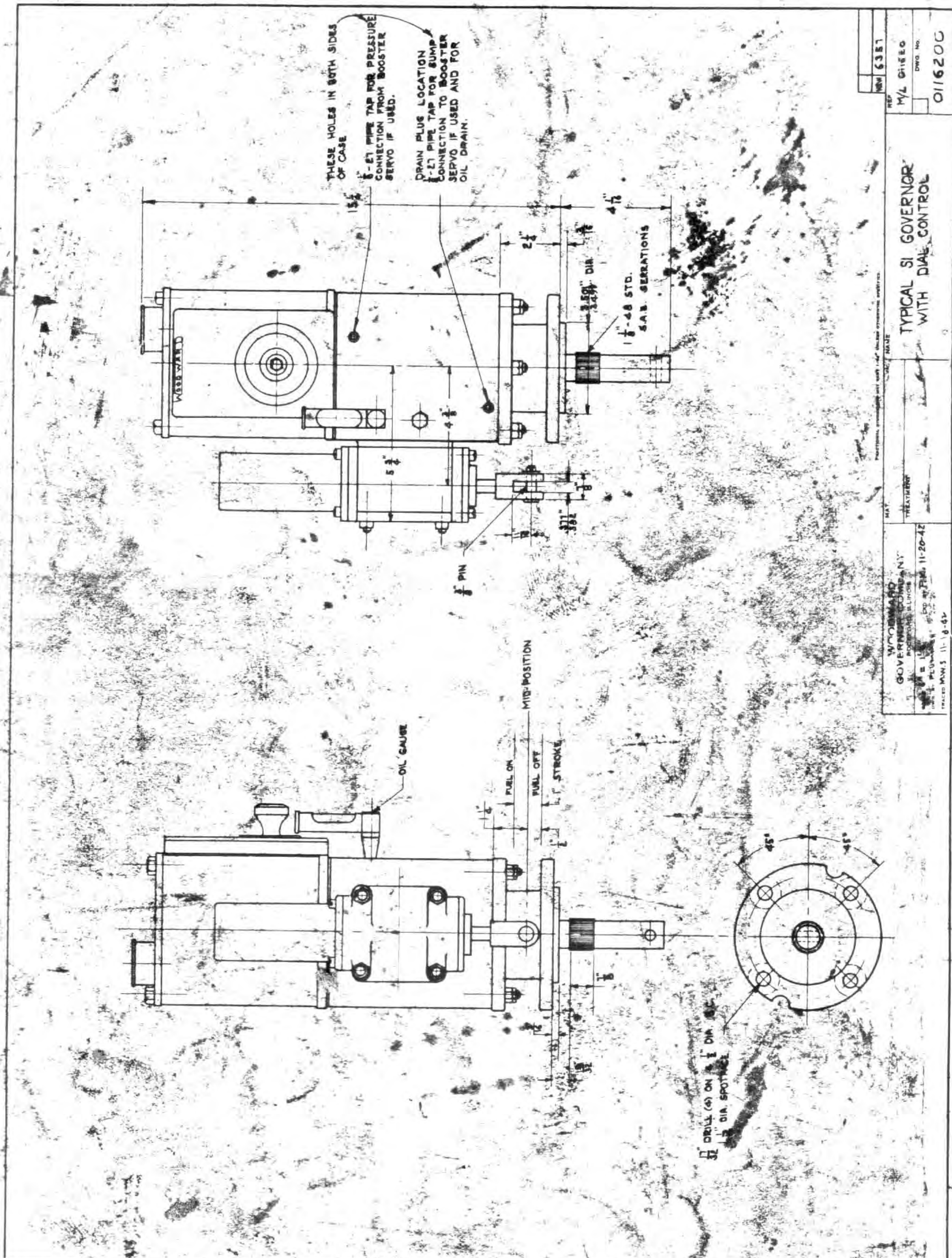
Cut No. 12



PC. NO.	NAME OF PIECE	No. Req
1	Power Case	1
2	Needle Valve Screw	2
3	Dowel Pin	2
4	Idler Shaft	1
5	Compensating Nut	2
6	Check Valve Bushing	2
7	Check Valve Bushing	2
8	Ball Check Plug	2
9	Washer 5/8" O.D. x 7/16" I.D. x 1/16"	2
10	1/8" Socket Hd. Pipe Plug	7
11	3/8" Ball	2
12	1/4" Ball	2
13	Pump Drive Gear	1
14	Castle Nut	1
15	Taper Screw	3
16	Comp. Spring Retainer	1
17	Comp. Spring Collar	2
18	Rotating Sleeve	1
19	Compensating Spring	1
20	Compensating Shims	
21	1/16" x 5/8" Cotter Pin	1
22	Rotating Sleeve Retainer	1
23	Washer 1/4" I.D. x 7/16" O.D. x .021"	1
24	Ball Bearing	1
25	Ball Bearing	4
26	Nut	1
27	Collar	1
28	Base	1
29	Drive Shaft	1
30	Ball Bearing	1
31	Oil Seal	1
32	Lamination	16
33	Bearing Retainer	1
34	Cap Screw	4
35	Spacer Pin	1
36	Spring Drive Plug	1
37	10" .035" Lockwire	1
38	#2 Taper Pin	1
39	Case-Base Gasket	1
40	Drive Sleeve	1
41	Lock Ring	1
42	Stud	8
43	5/8" O.D. x 1 1/2" I.D. x 1/8" Washer	8
44	5/16"-24 Pal Nut	8
45	#6-32 x 1/4" RD. HD. Screw	4
46	5/8" Split Spring Lockwasher	4
47	Column	1
48	5/16" Shakeproof Washer	8
49	5/16"-24 x 5/8" Fil. Hd. Mach. Scr.	4
50	Stop Pin	1
51	Accumulator Spring	2
52	Accumulator Plug	2
53	Accumulator Plug	2
54	Accumulator Piston	2
55	Pump Idler Gear	1
56	Laminated Washer	2
57	Dowel Pin	2
58	1/4"-28 x 1/2" Flat Hd. Screw	2
59	Oil Gauge	1
60	Stud	4
61	Case-Cylinder Gasket	1

PC. NO.	NAME OF PIECE	No. Req
62	Oil Hole Cover	1
63	Oil Seal	1
64	Power Cylinder	1
65	Power Spring	1
66	Actuating Comp. Plunger	1
67	Piston Rod	1
68	Taper Pin	1
70	Rod End	1
71	Plug	1
72	Cylinder Head	1
73	Spring Guard	1
74	Power Piston	1
75	Power Cylinder Bushing	1
76	Power Cylinder Gasket	2
77	Dial Shaft Spring	1
78	Pin	3
79	Speeder Plug Screw	1
80	Dial Plate	1
81	Pilot Valve Plunger	1
82	Ball Arm	2
83	Speed Adjusting Spring	1
84	Ball Arm Pin	4
85	Flyballs	4
86	Case-Column Gasket	1
87	Cover-Column Gasket	1
88	Speeder Plug	1
89	Ballhead	1
90	Pilot Valve Bushing	1
91	Retainer Nut	2
92	Stop Pin	2
94	1/4"-28 x 3/4" Fil. Hd. Mach. Scr.	8
95	1/4" Shakeproof Washer	8
96	17/64" I.D. x 3/8" O.D. x 1/16" Washer	8
97	1/16" x 1 1/2" Cotter Pin	4
98	#5-40 x 1/2" Rd. Hd. Mach. Scr.	2
99	Bushing	2
100	5/16"-24 x 3/4" Hex. Hd. Mach. Scr.	4
101	3/8"-24 Castle Nut	1
102	1/16" x 3/8" Cotter Pin	1
103	3/32" x 3/4" Cotter Pin	1
104	Dial Panel	1
105	Rack Shaft	1
106	Pinion	1
107	Gear	1
109	Bushing	1
110	Dial Shaft Washer	1
111	Dial Shaft	1
112	Dowel Pin	2
113	Pointer Disc	1
114	Speed Adjustment Knob	1
115	Gear	1
117	Dial Shaft Bushing	1
119	Washer	1
120	1/4"-20 Elastic Stop Nut	1
122	Rack Shaft Gear	1
123	Panel-Column Gasket	1
128	Cover	1
156	#10-24 x 1/2" Fil. Hd. Screw	4
160	5/16"-24 Hex. Nut	12
161	Dial Disc	1

Cut No. 13


THESE HOLES IN BOTH SIDES OF CASE
PIPE TAP FOR PRESSURE CONNECTION FROM BOOSTER SERVO IF USED.
DRAIN PLUG LOCATION
PIPE TAP FOR SUMP CONNECTION TO BOOSTER SERVO IF USED AND FOR OIL DRAIN.
DIA.
STD.
S.A.E. SERRATIONS
PIN
OIL GAUGE
FUEL ON
FUEL OFF
MID-POSITION
STROKE
45°
45°
TYPICAL SI GOVERNOR WITH DIAL CONTROL
WOODWARD GOVERNOR COMPANY
011620C