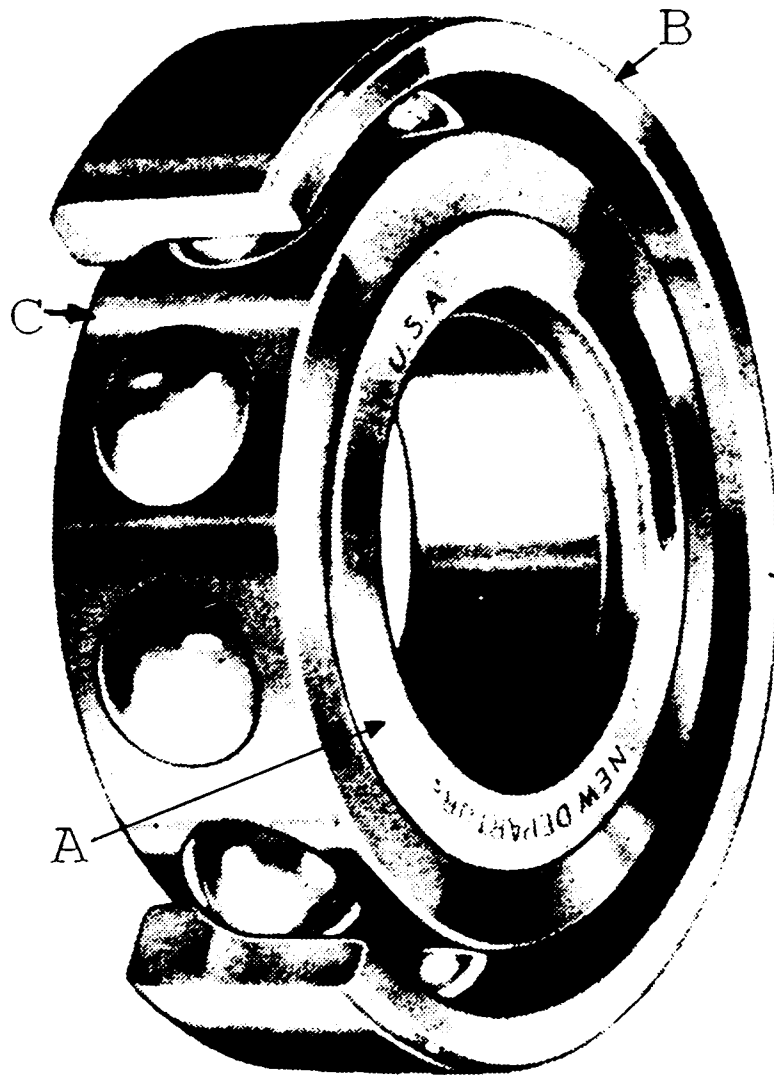
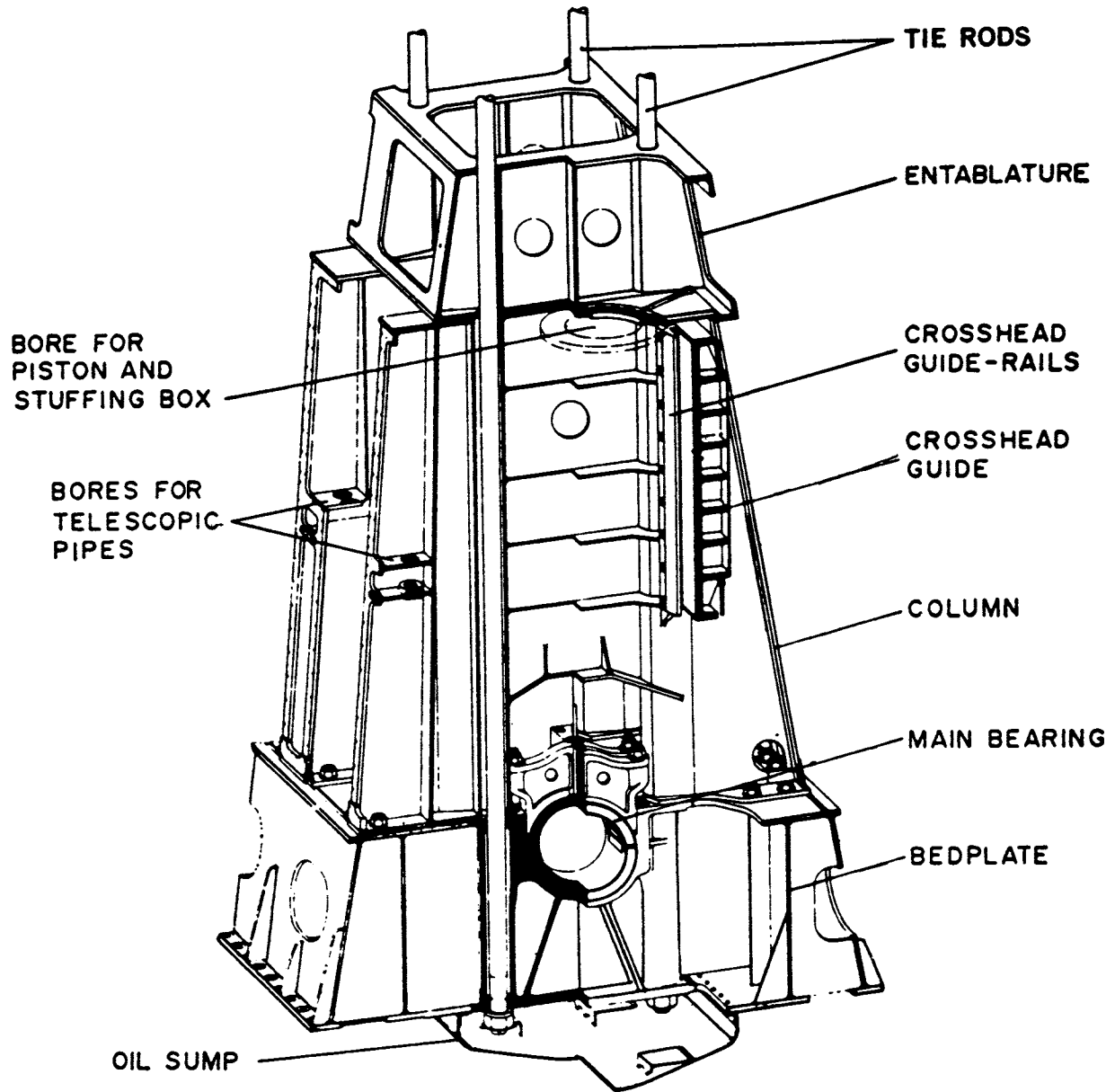


CHAPTER 3 MOTOR

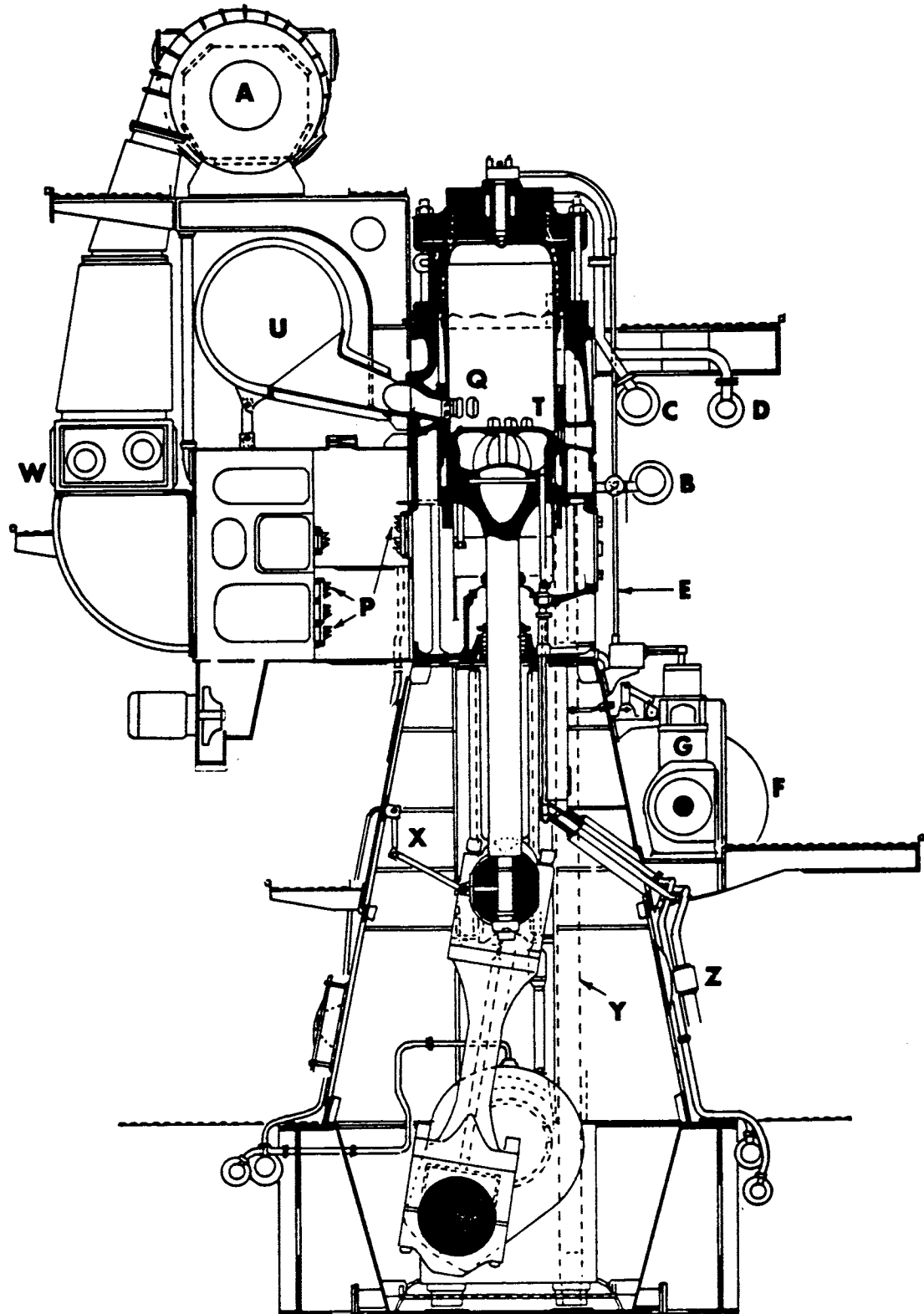
MO-0001



MO-0002



MO-0003



MO-0004

DIESEL - NON REVERSIBLE MARINE ENGINE

MODEL DMRV-16-4 ENGINE SERIAL NUMBER 72001 to 72010 Inclusive

B.M.E.P. 182 PSI

NO. CYCLES 4 NO. CYLINDERS 16

BORE 17" STROKE 21"

H.P. 7000 AT 400 R.P.M.

TOTAL DISPLACEMENT 76,266 CUBIC INCHES

*FUEL INJECTION TIMING 22° Left Bank
 20° Right Bank BEFORE TOP CENTER

SET $\frac{1}{8}$ inch Left Bank
 $\frac{7}{8}$ inch Right Bank BEFORE TOP CENTER ON
51 IN. DIAMETER FLYWHEEL

FIRING ORDER 1L-8R-4L-5R-7L-2R-3L-6R-8L-1R-5L-4R-2L-7R-6L-3R

FUEL INJECTION PUMP RACK AT FULL LOAD 31.5MM No. 2 Diesel Fuel Oil
 30.0MM 3500 SSU Heavy Fuel

STARTING SYSTEM Pilot Air - Gear Driven Distributor

CRANKSHAFT ROTATION Clockwise (VIEWED FROM FLYWHEEL END)

*AVERAGE FULL LOAD SHOP DATA

*** EXHAUST TEMPERATURE 870°F
AIR MANIFOLD PRESSURE 31 in.-hg
AIR MANIFOLD TEMPERATURE 110°F
AMBIENT TEMPERATURE 72°F
BAROMETRIC PRESSURE 30.11 in.-hg
** FULL LOAD FIRING PRESSURE 1225 PSI No. 2 Diesel Fuel
1200 PSI 3500 SSU Heavy Fuel

VALVE CLEARANCE WITH COLD ENGINE

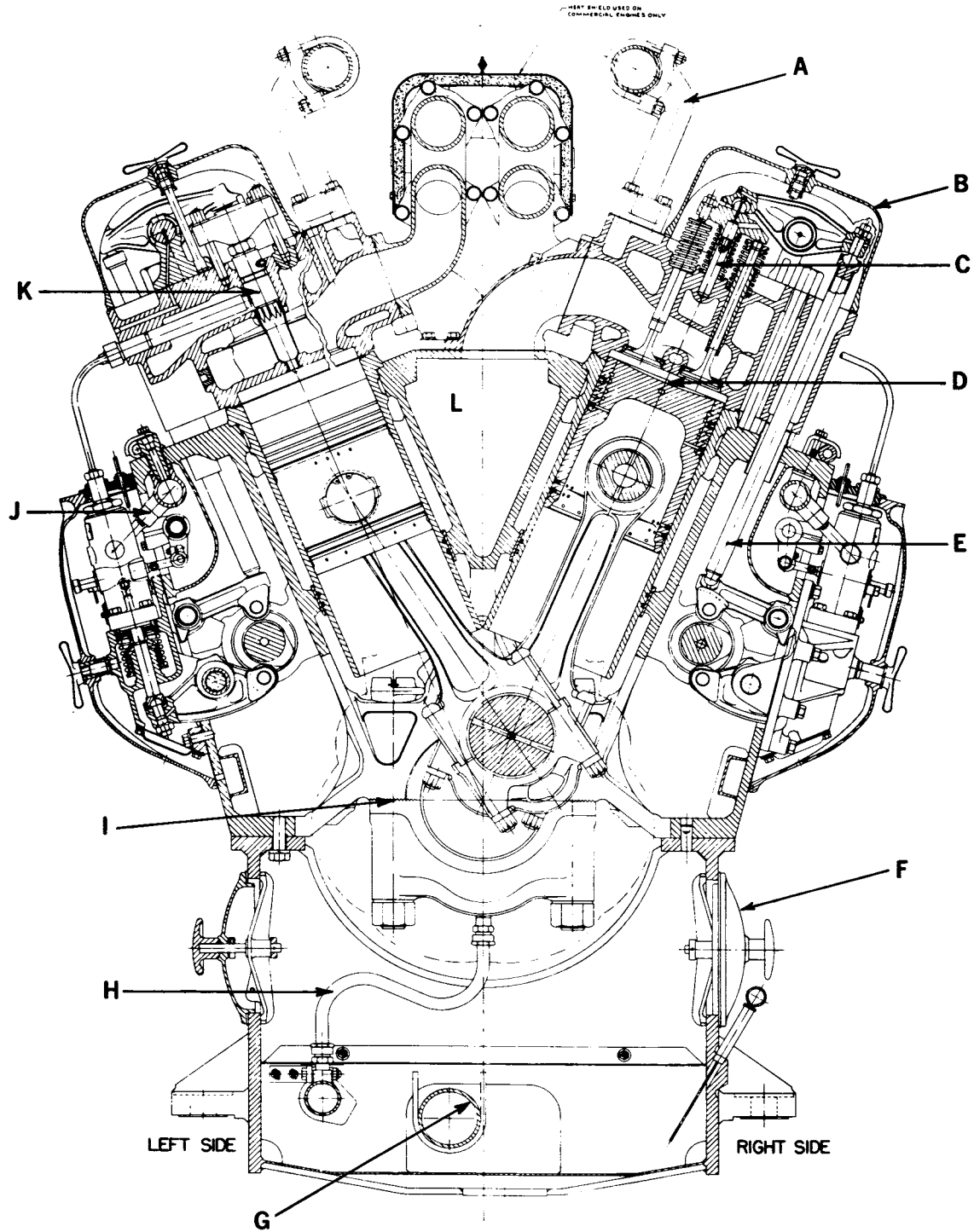
INTAKE .040" EXHAUST .040"

*Values based on No. 2 Diesel Fuel Oil

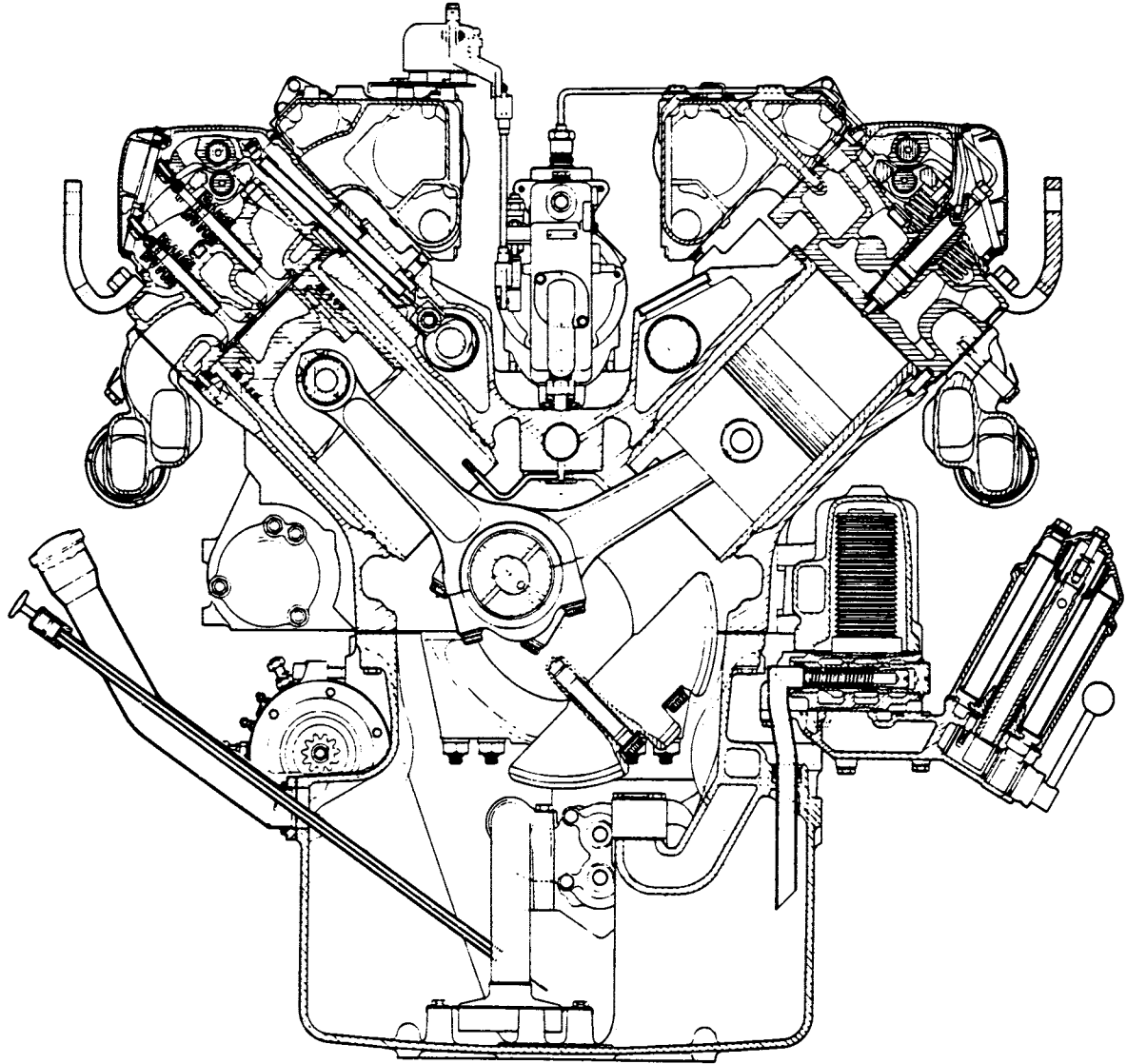
**ABS Allowable Firing Pressure 1400 PSI
Maximum allowable Differential Firing Pressure ± 50 PSI from mean.

***Maximum allowable Exhaust Gas Temperature 950°F.

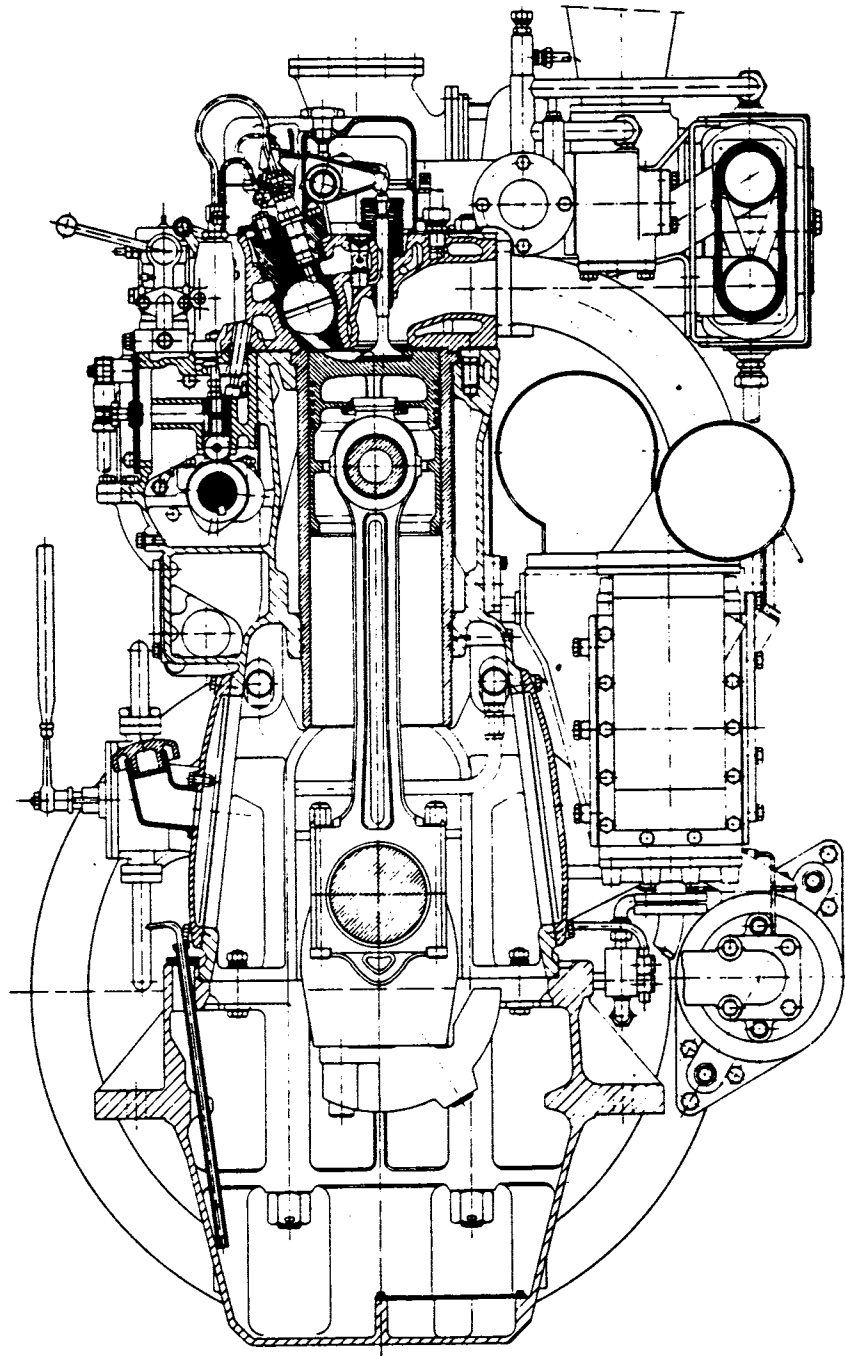
MO-0005



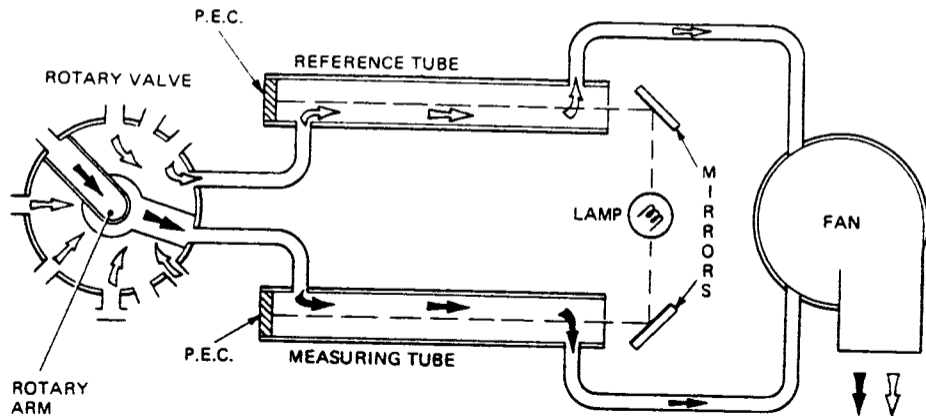
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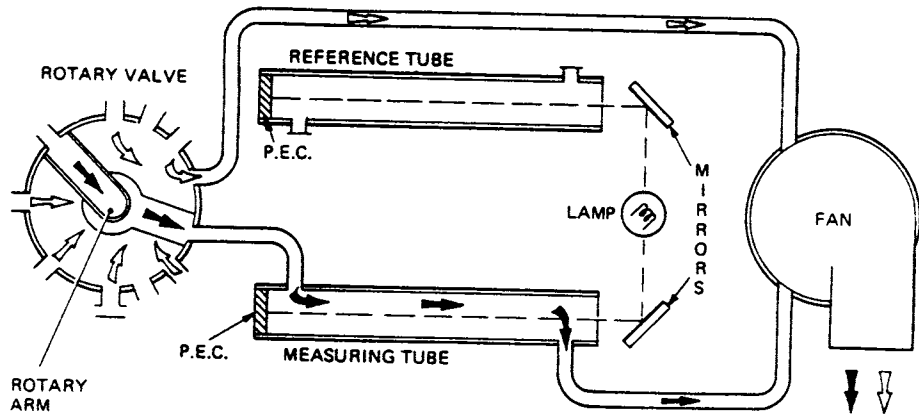
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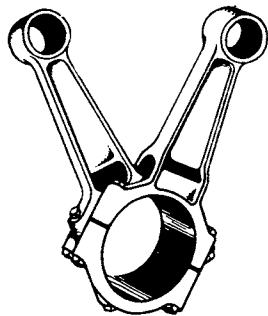
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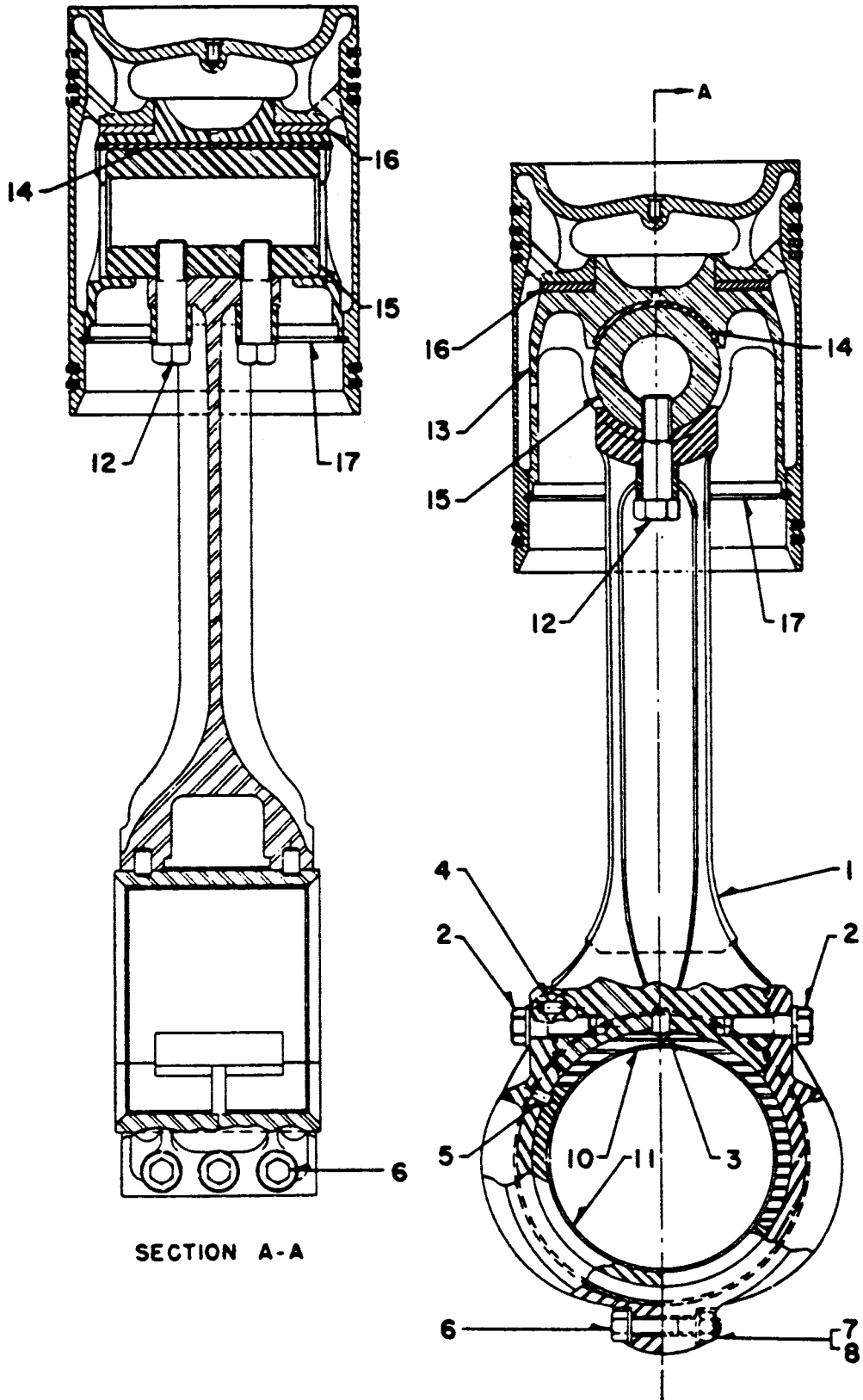
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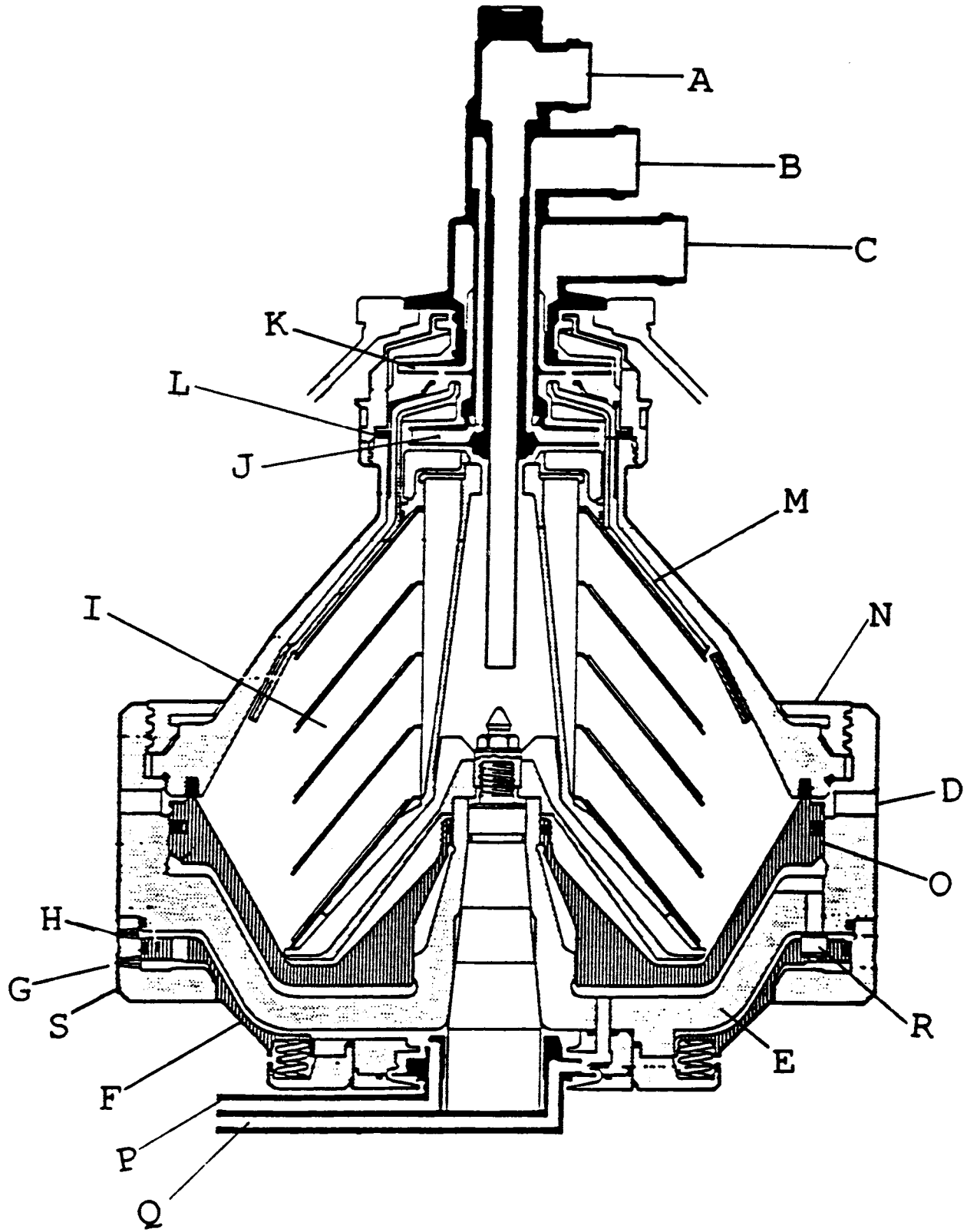
MO-0010



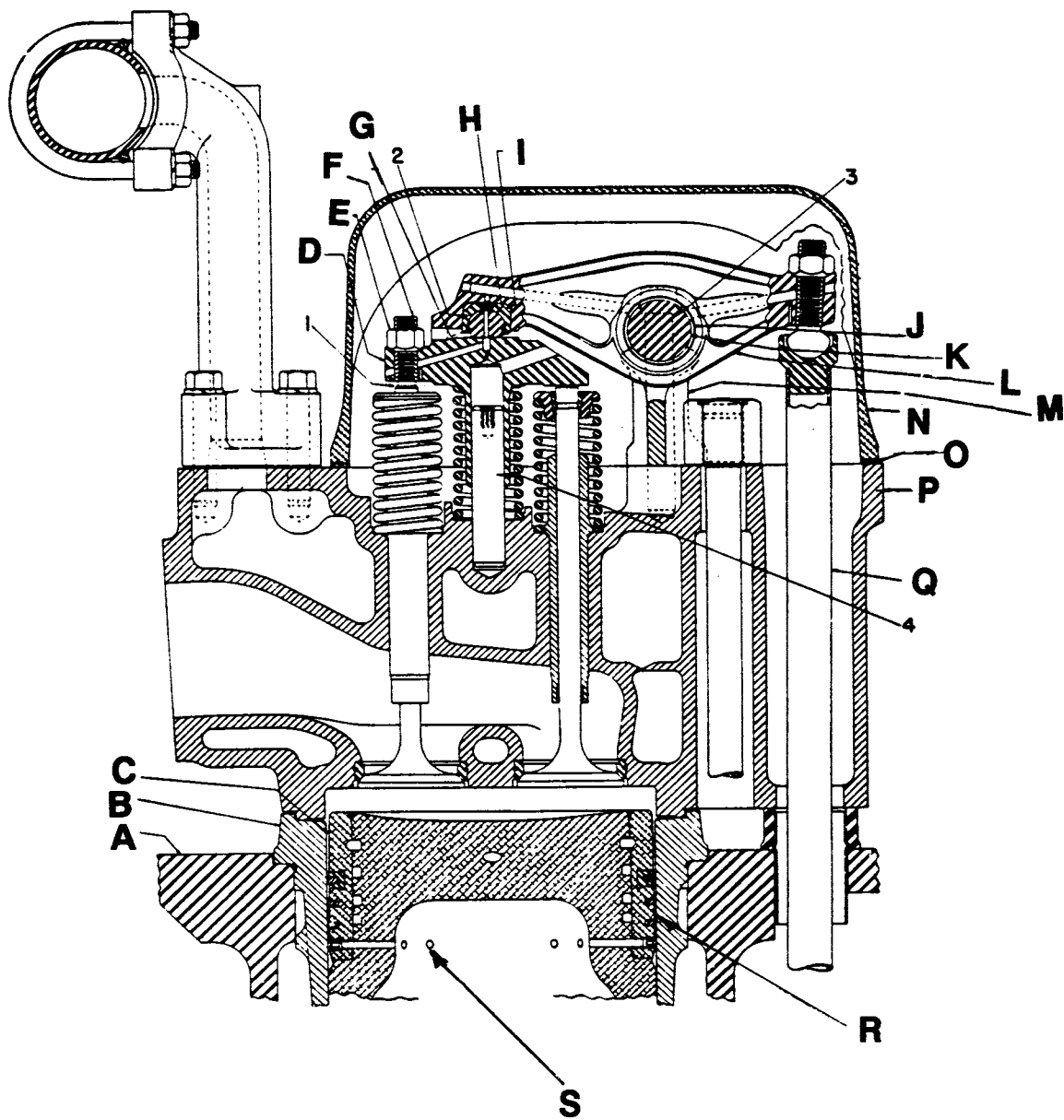
MO-0011



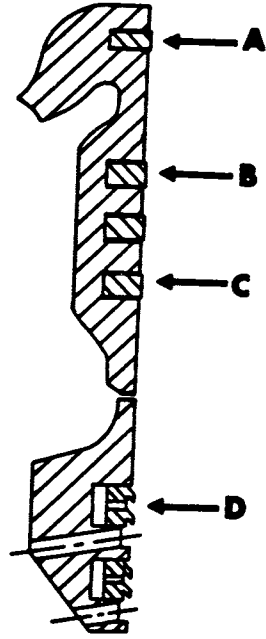
MO-0012



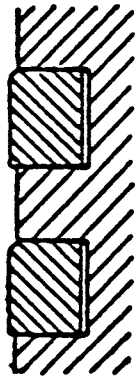
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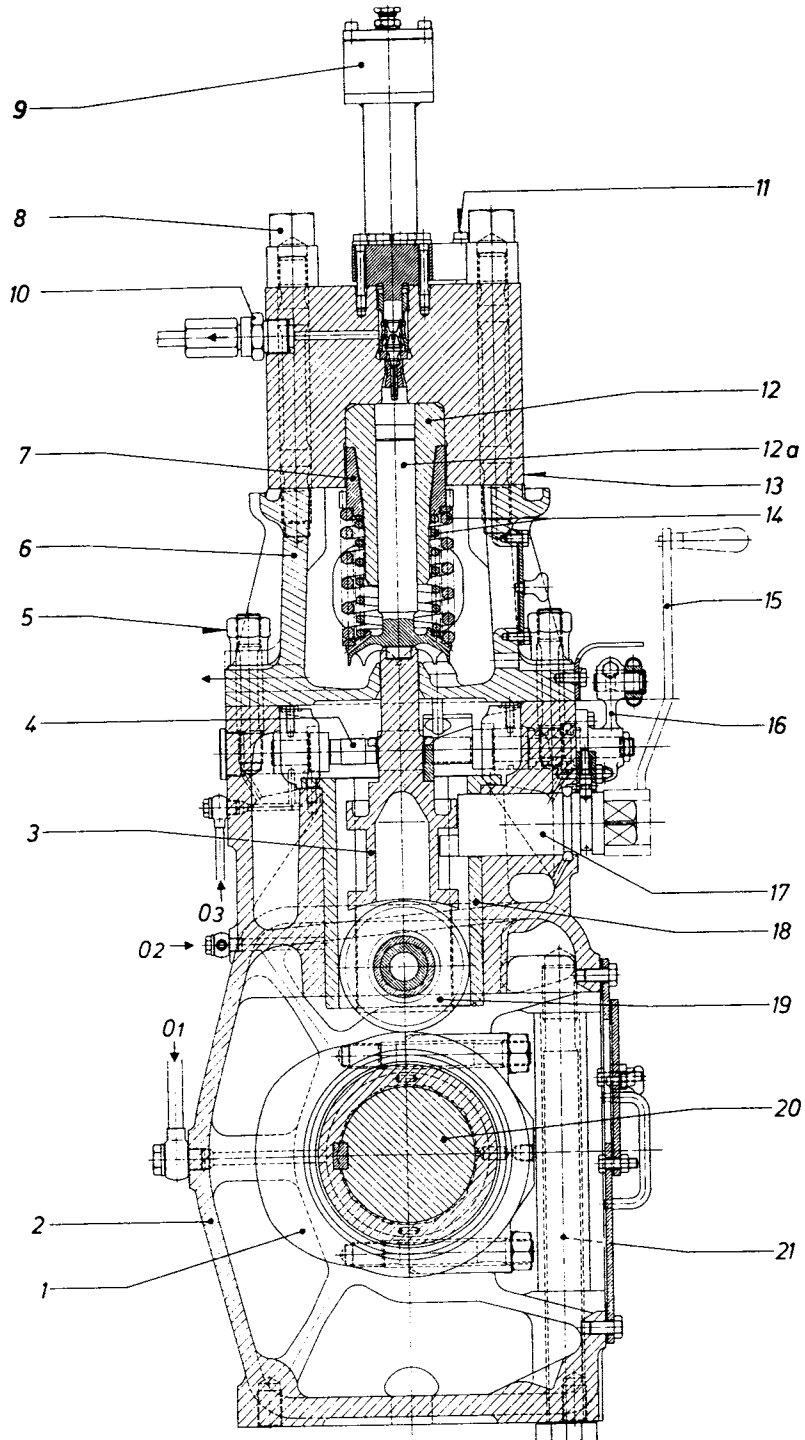
MO-0014



MO-0015

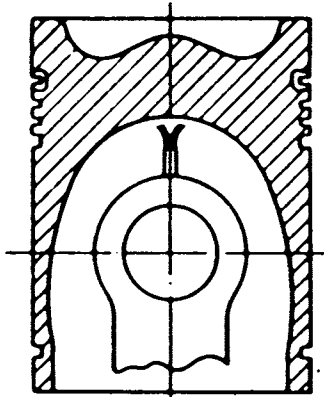


MO-0016

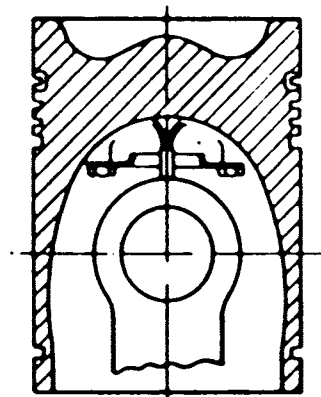


(Courtesy of New Sulzer Diesel)

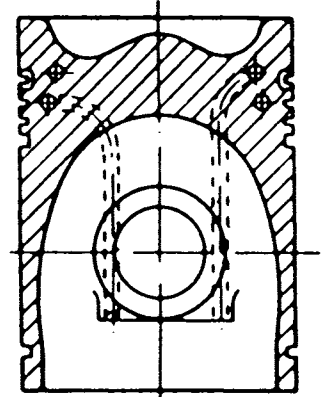
MO-0017



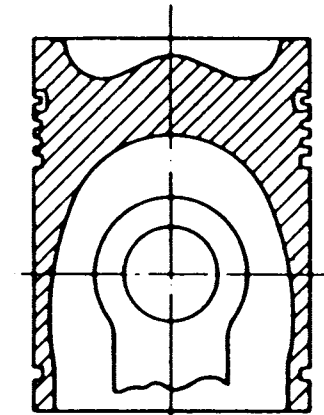
A



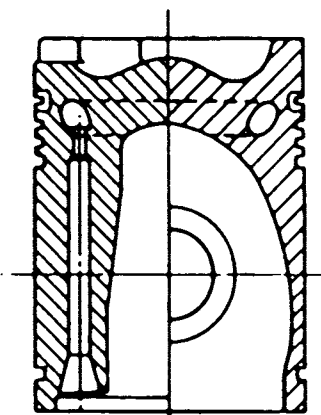
B



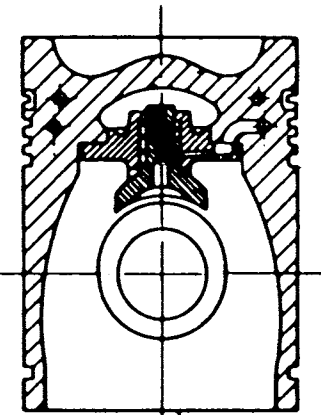
C



D

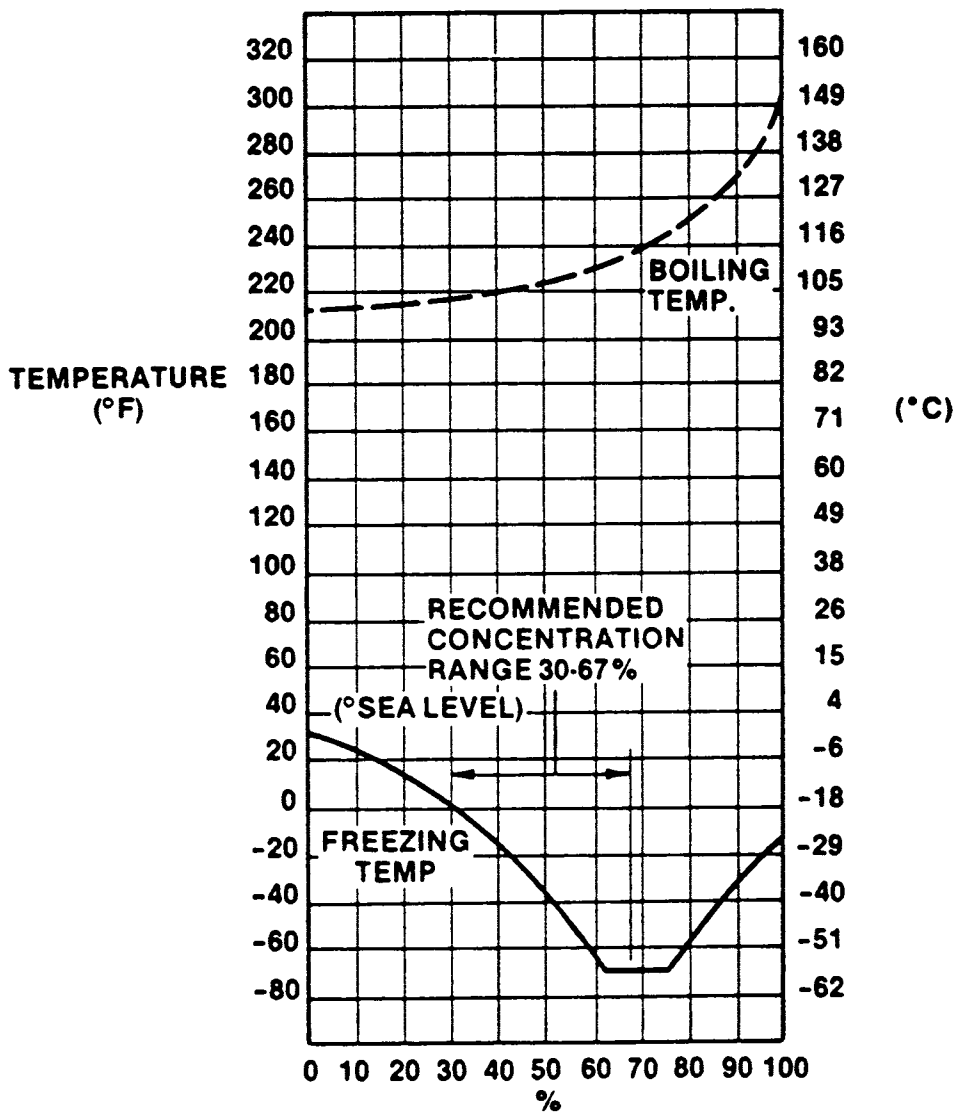


E



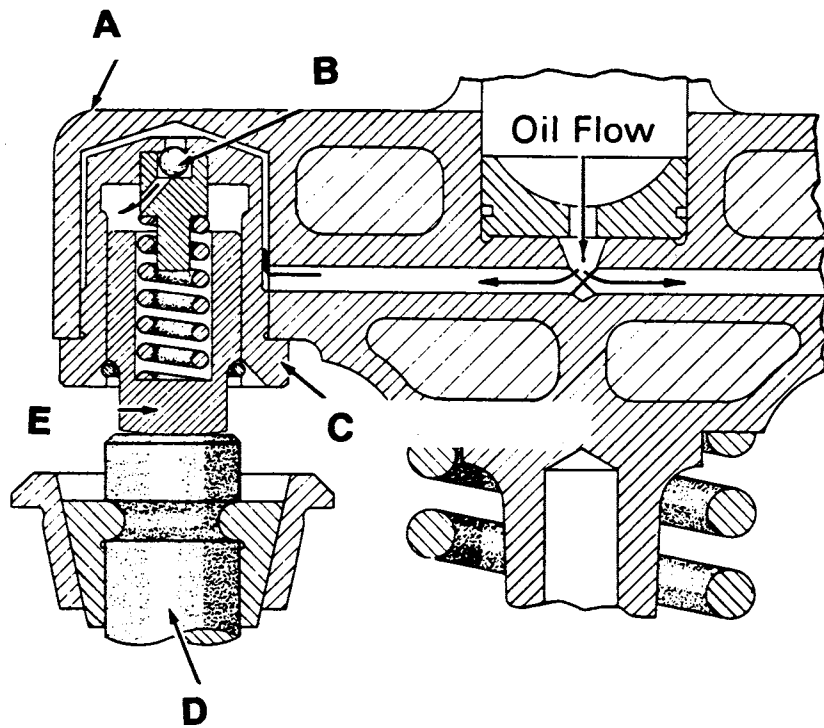
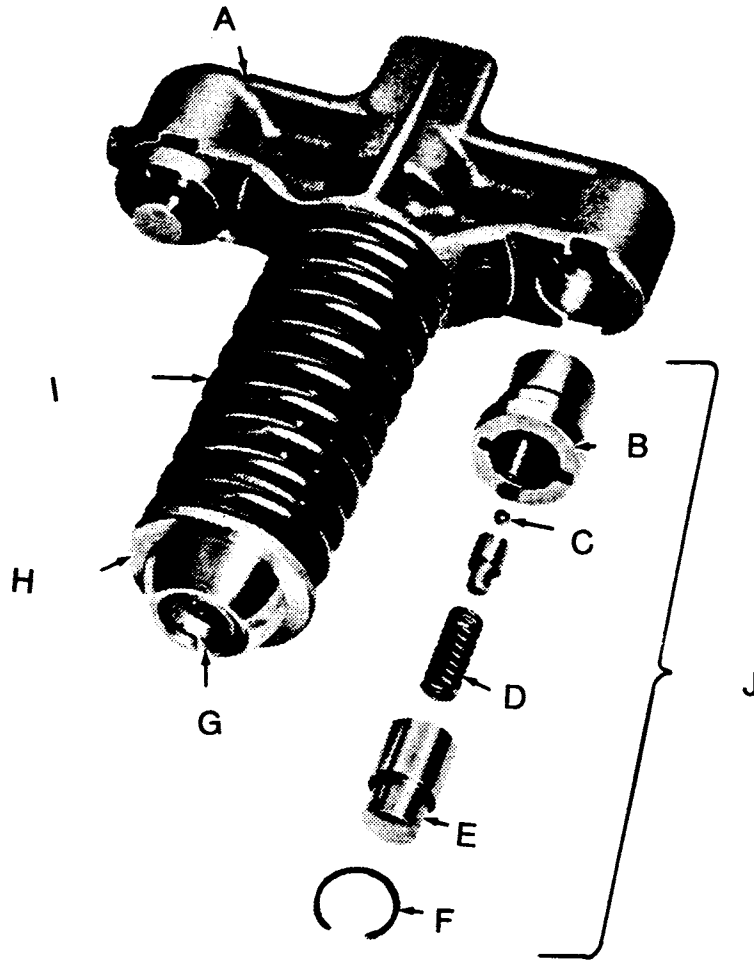
F

MO-0018

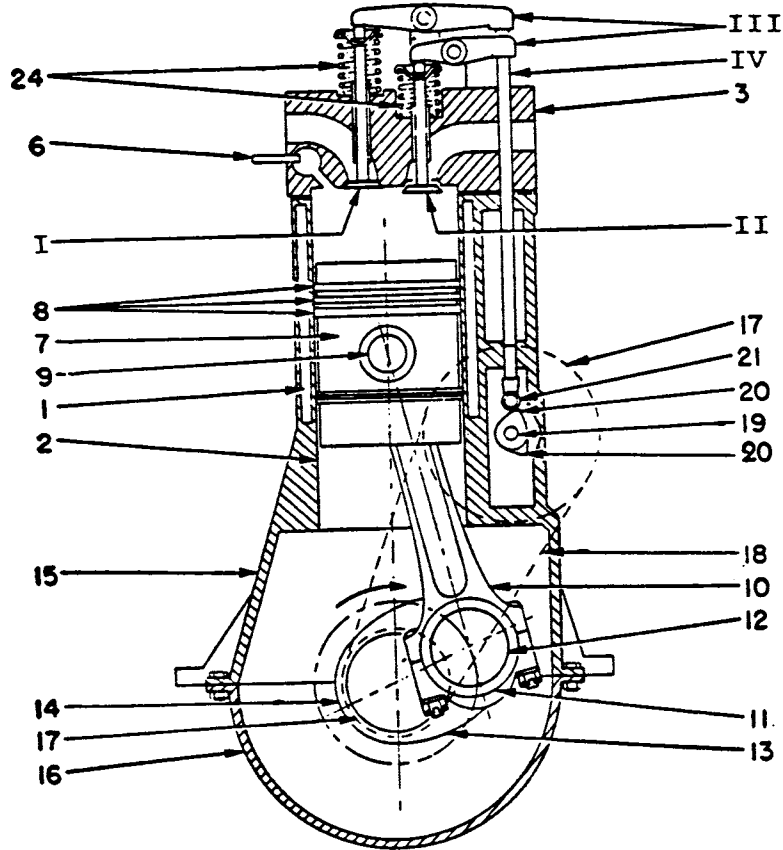


COOLANT FREEZING AND BOILING TEMPERATURES
VS. ETHYLENE GLYCOL CONCENTRATION

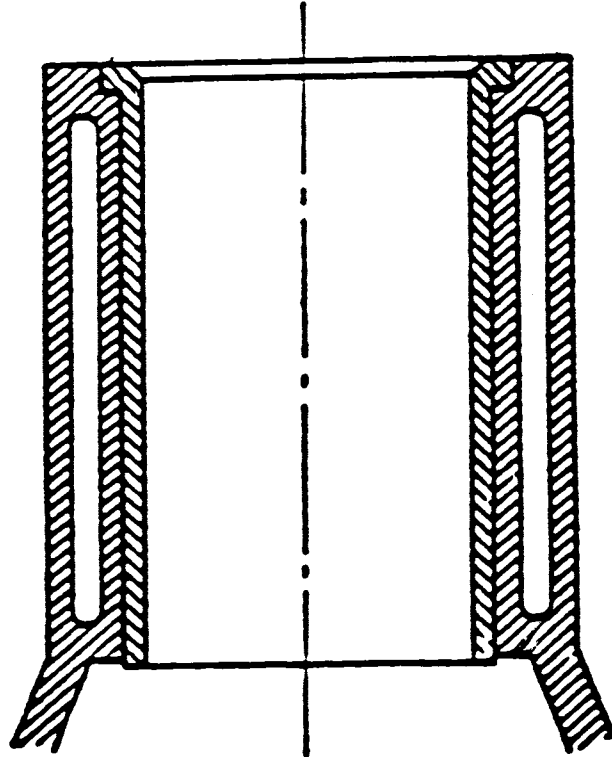
MO-0019



MO-0020

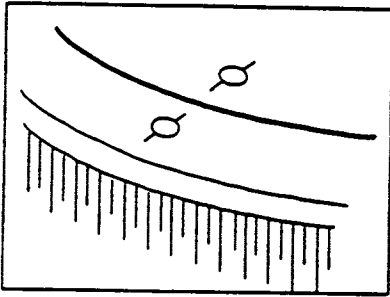


MO-0021

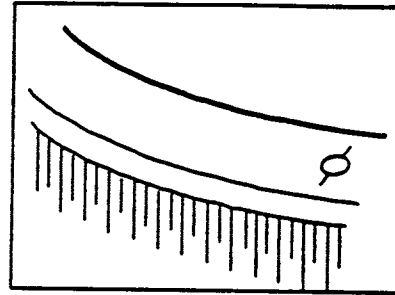


3-17

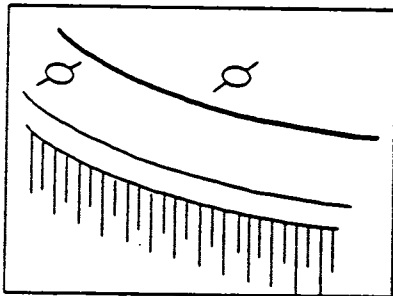
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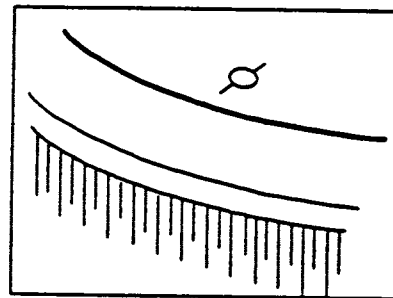
A



B

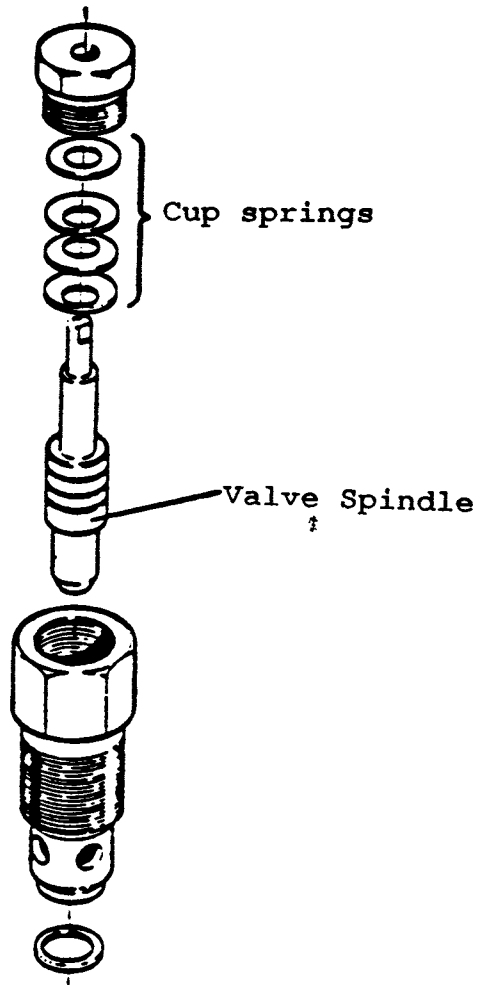


C

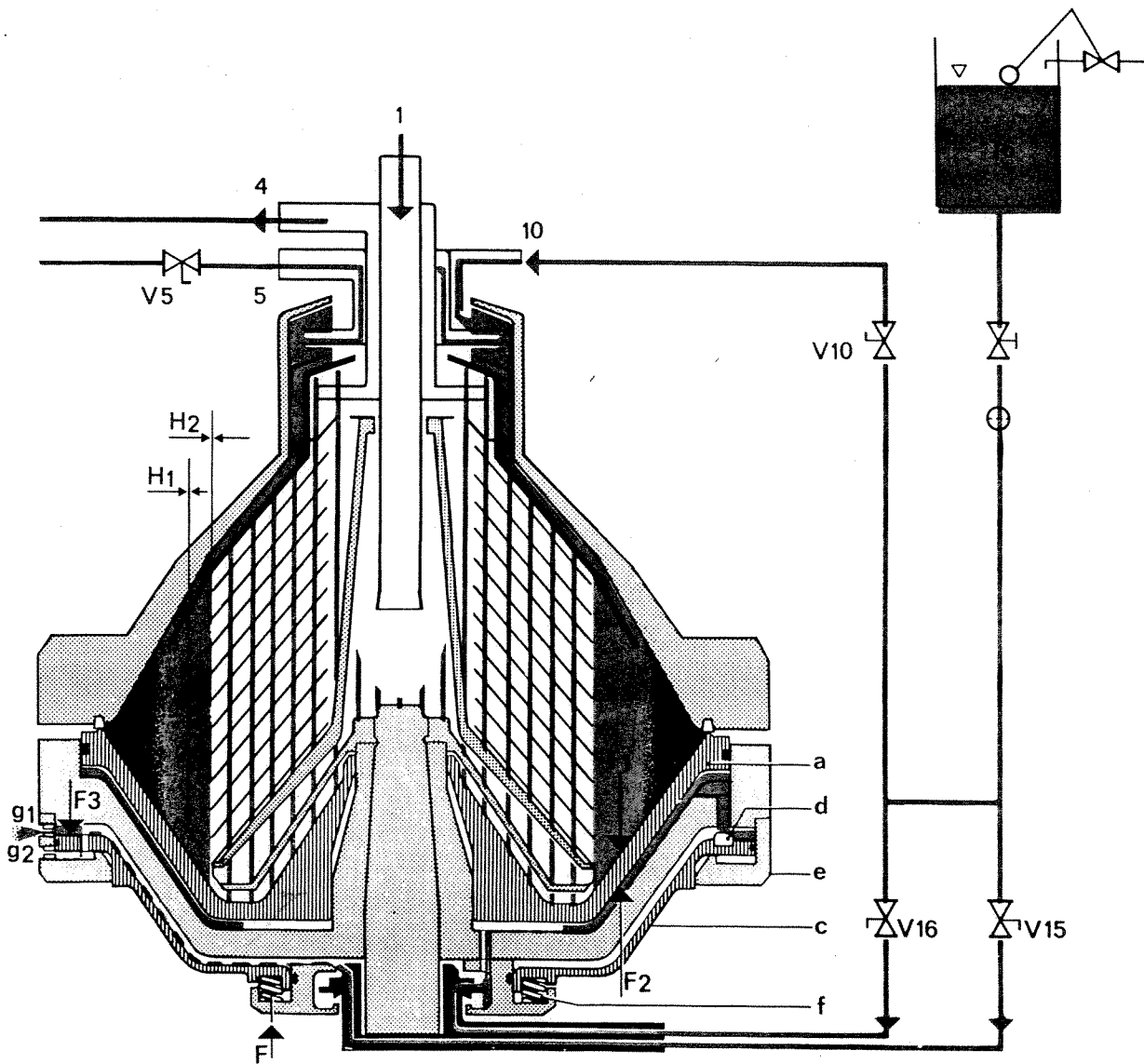


D

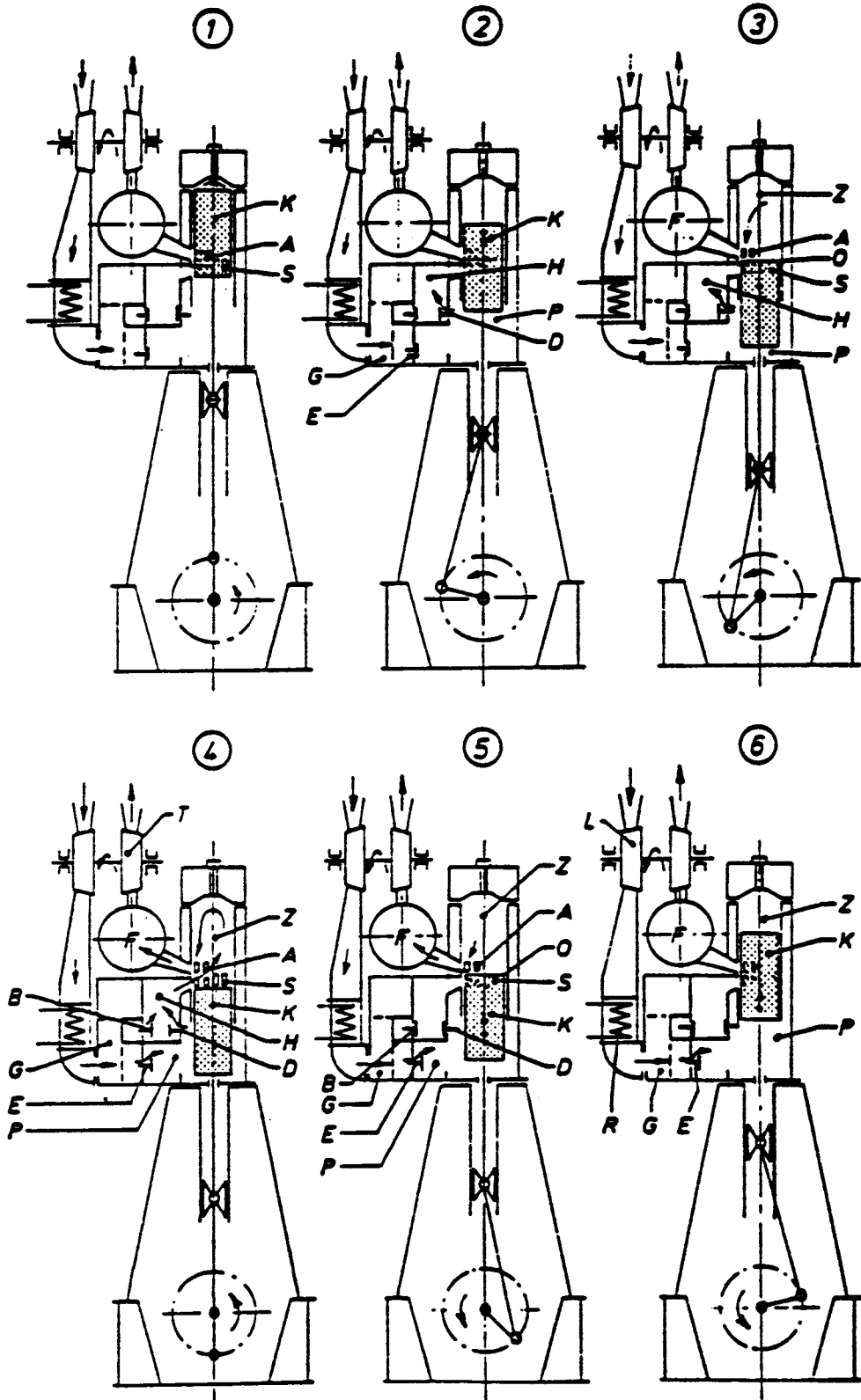
MO-0023



MO-0024

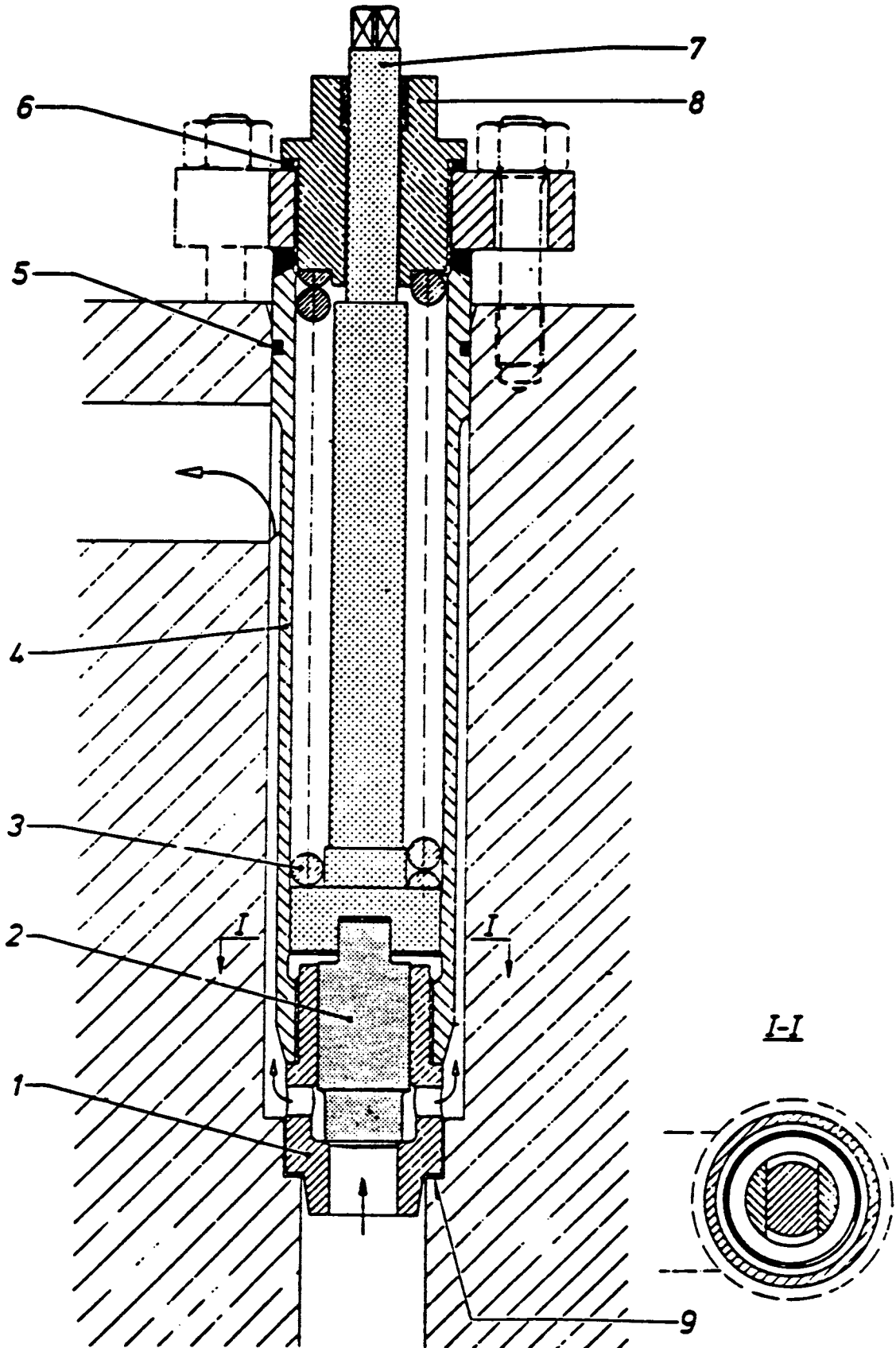


- a - sliding bowl
- c - operating slide
- V5 - water outlet
- V10 - sealing water
- V15 - opening water
- V16 - closing water

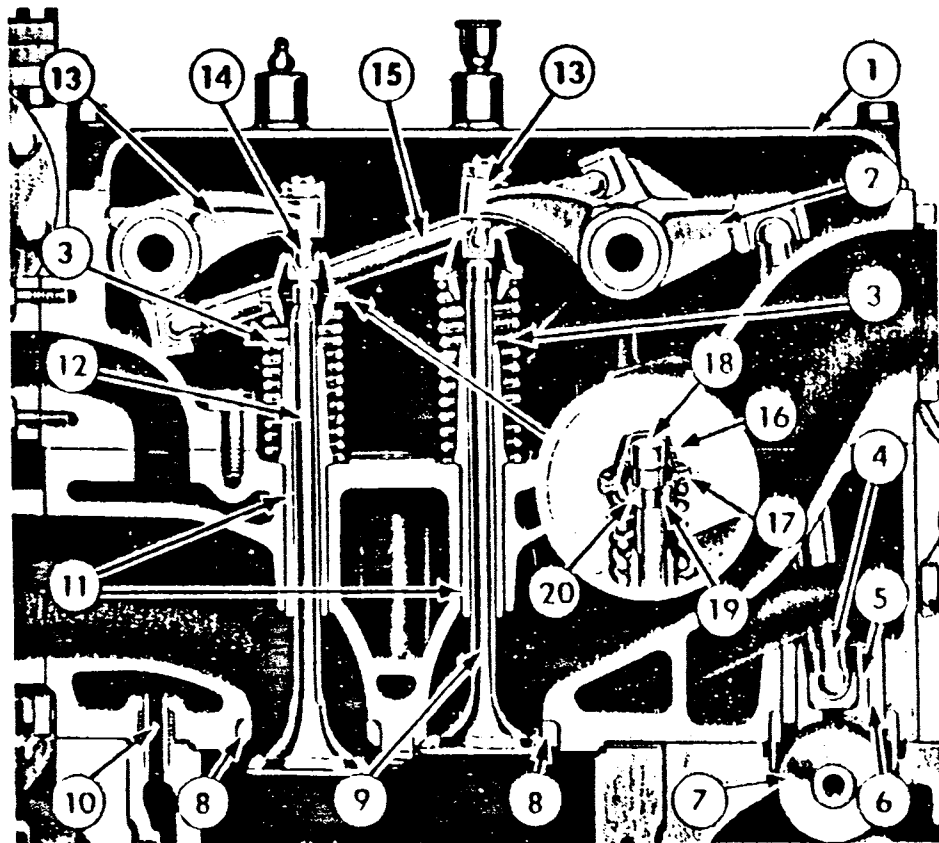


(Courtesy of New Sulzer Diesel)

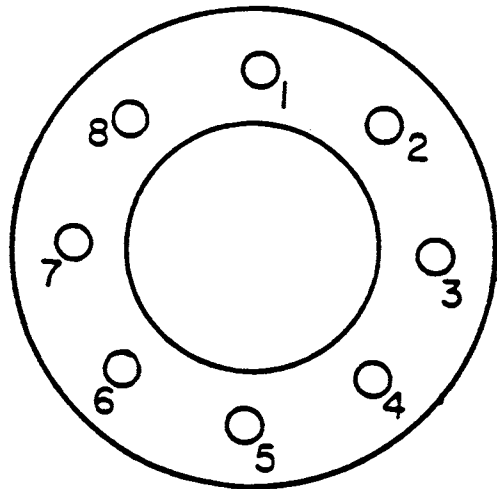
MO-0026



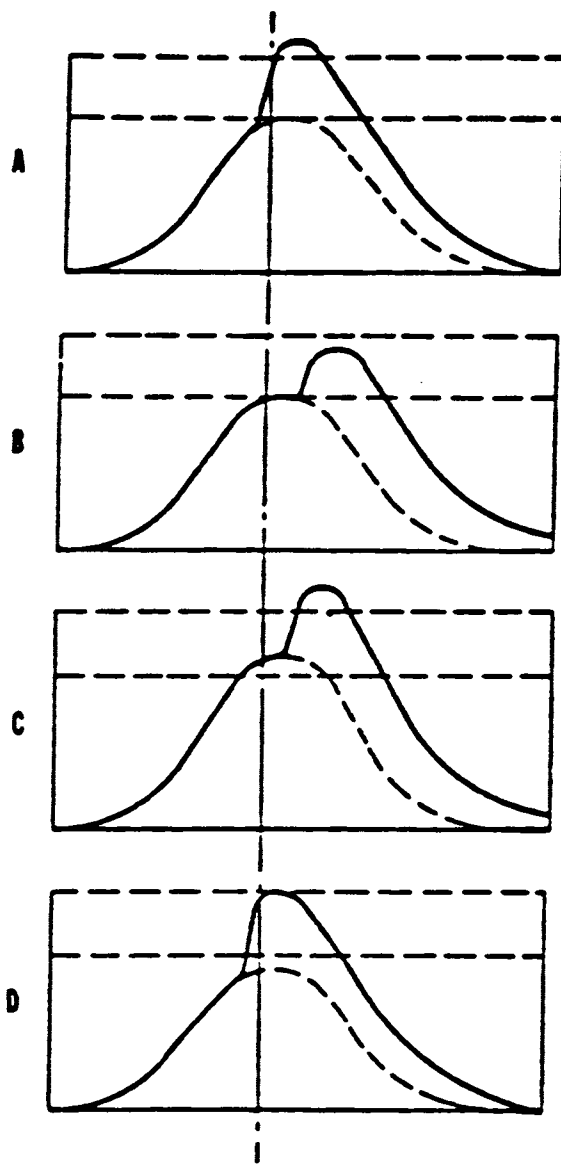
MO-0027



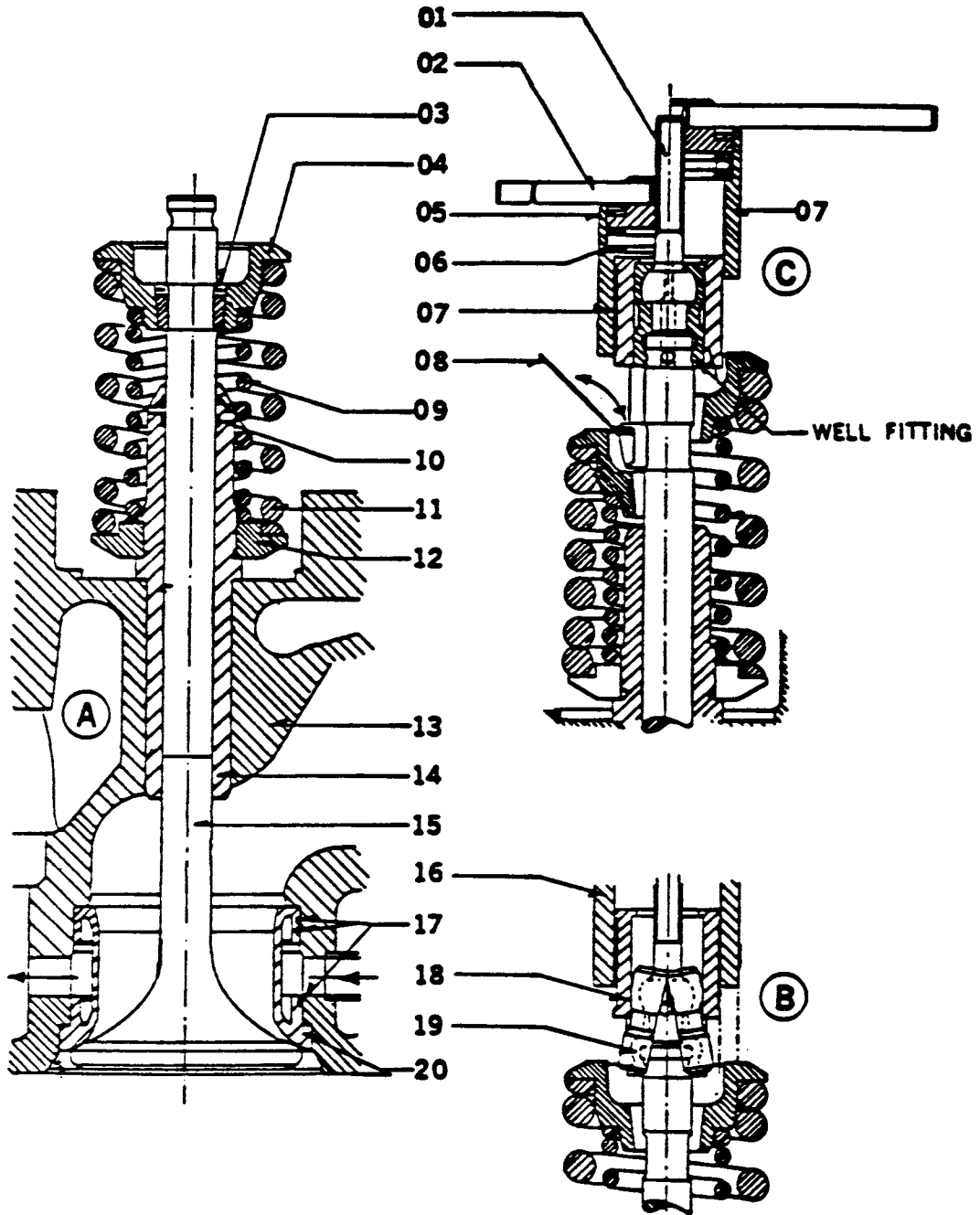
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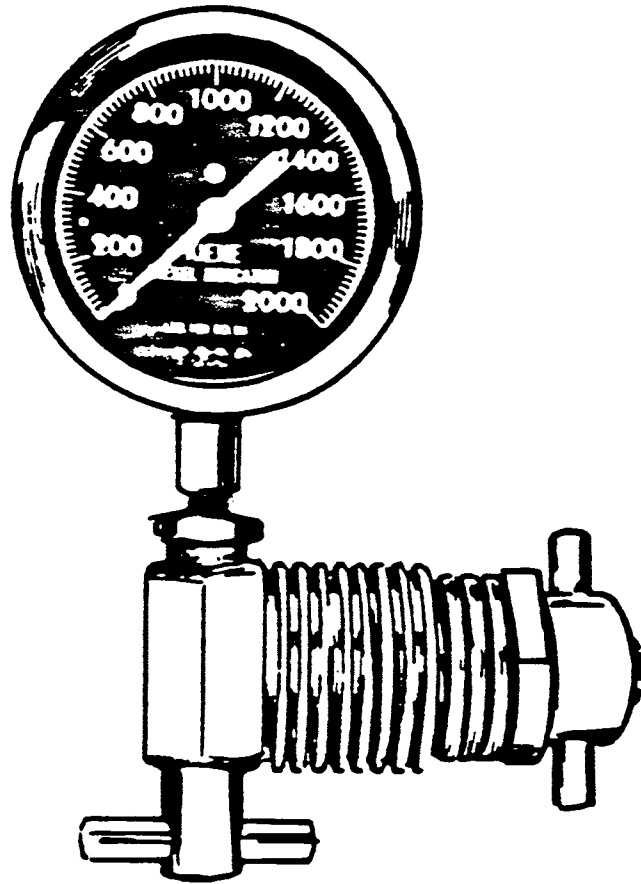
MO-0029



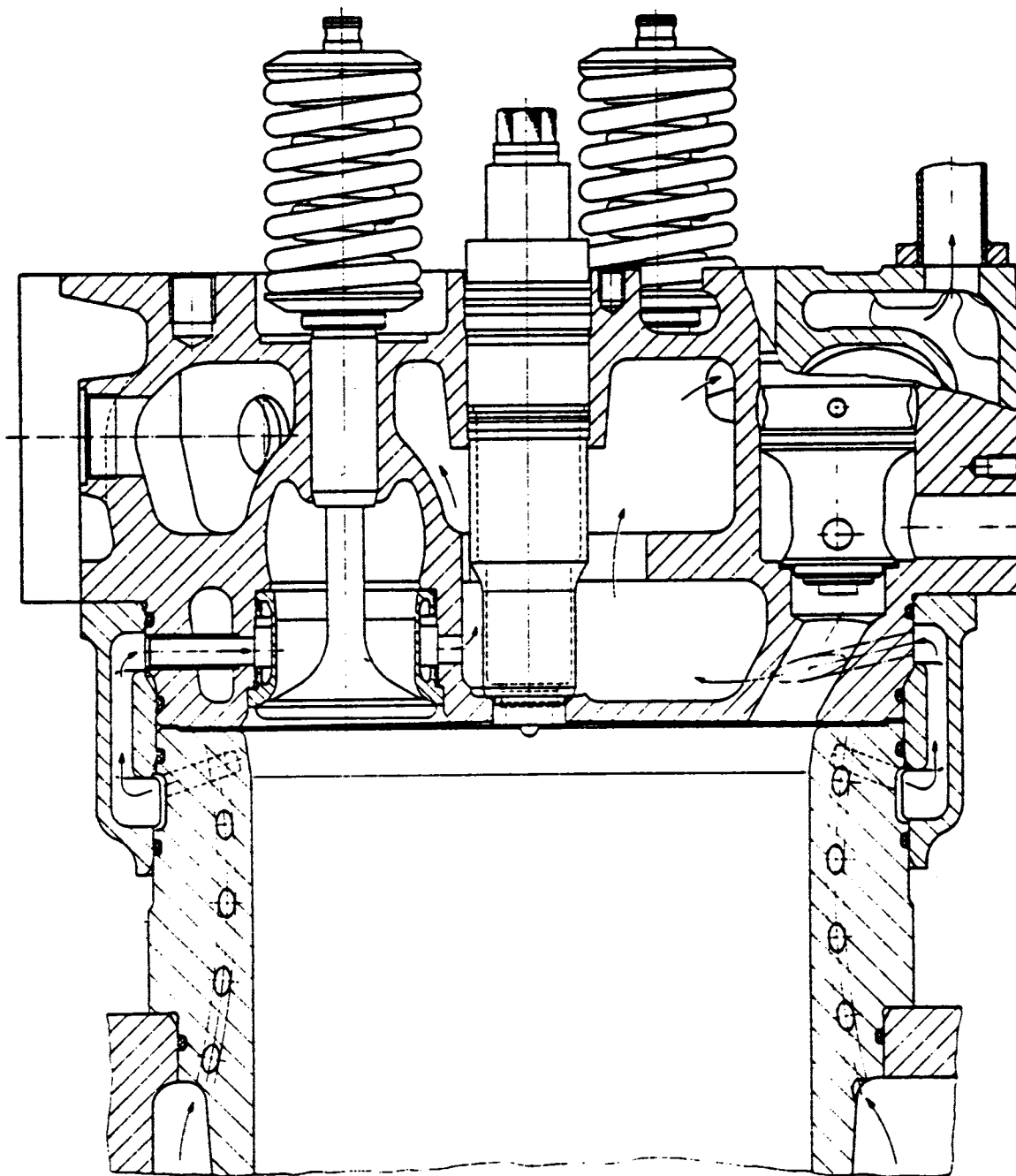
MO-0030

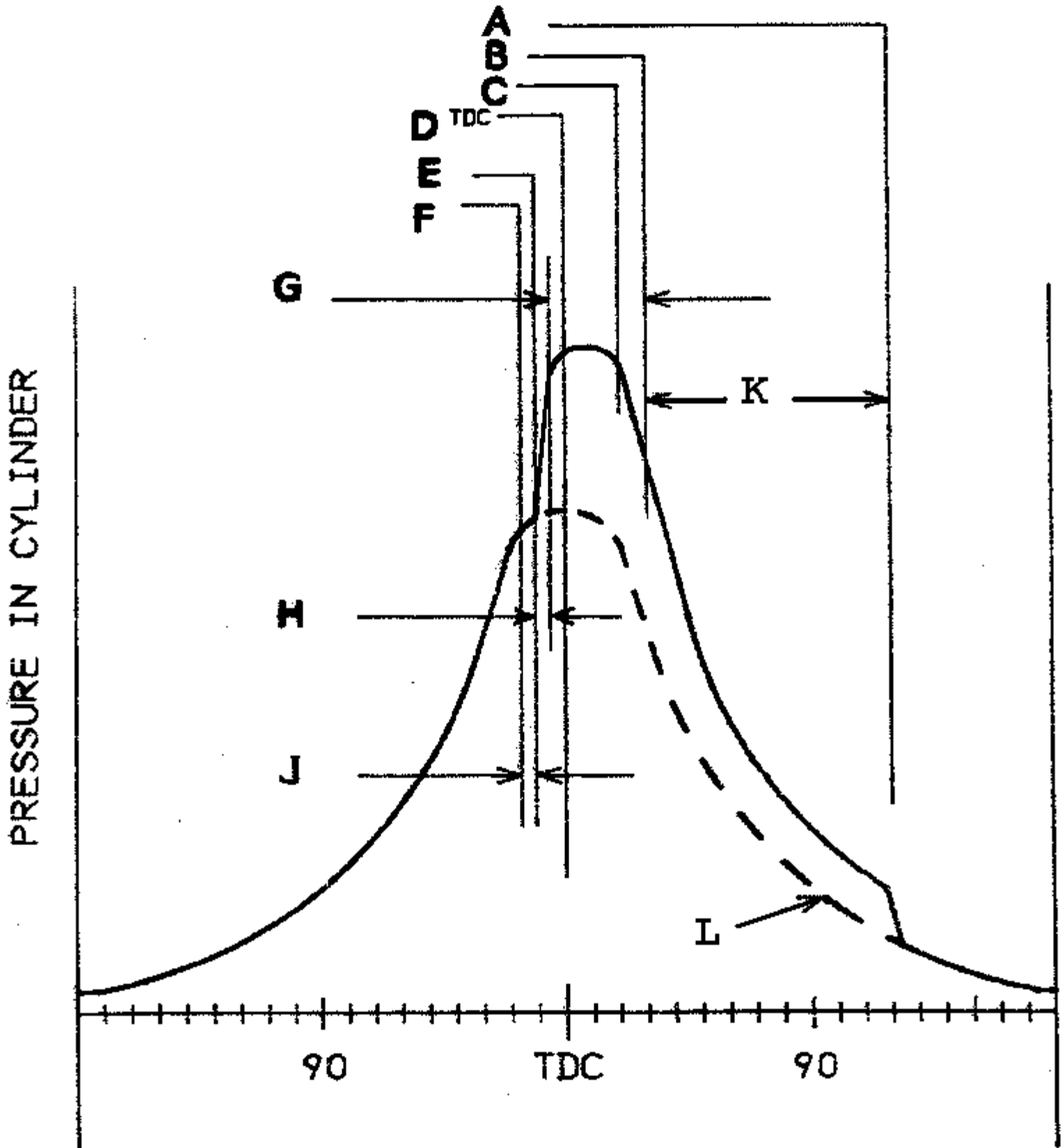


MO-0031

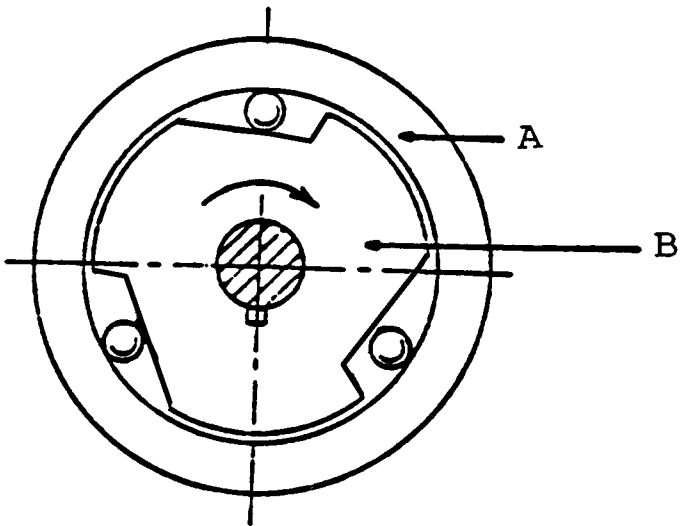


MO-0032

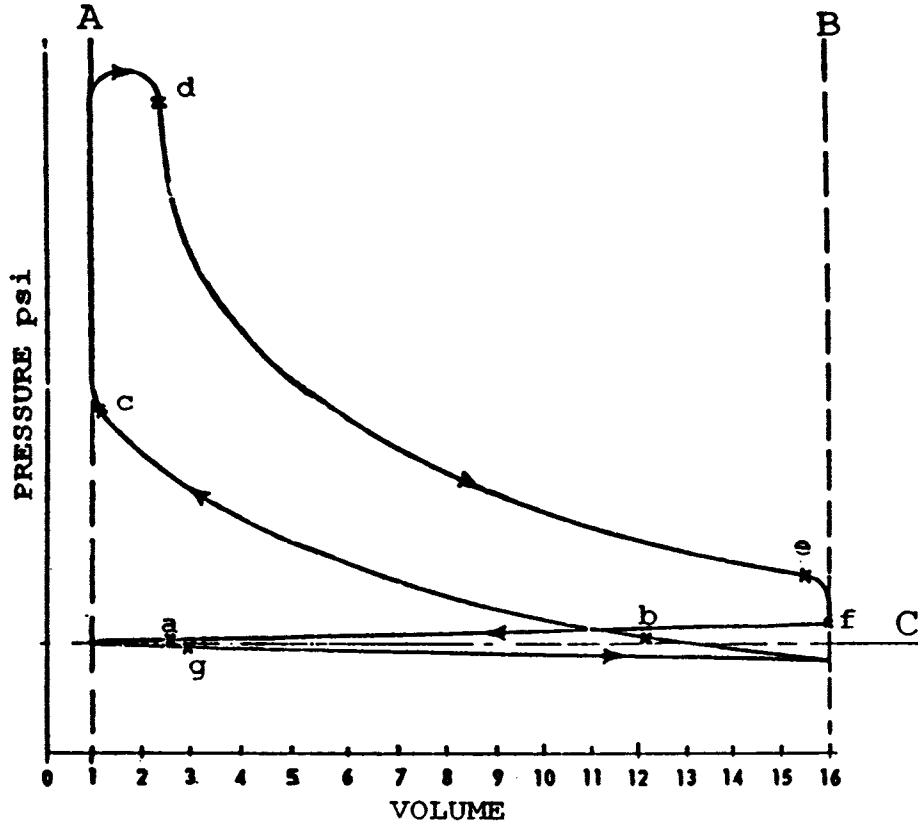




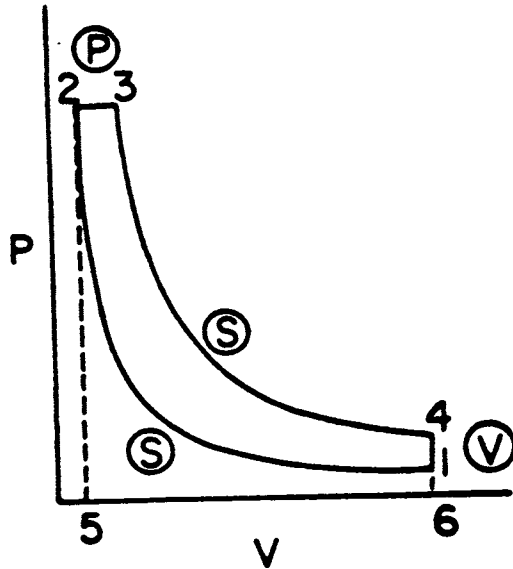
MO-0034



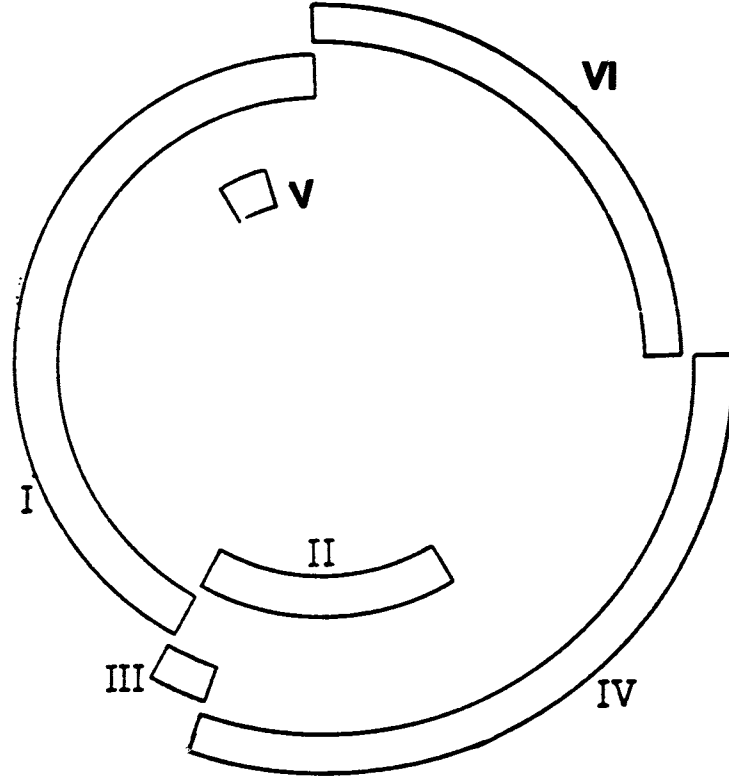
MO-0035



Pressure-volume diagram, diesel 4-stroke cycle.



MO-0037



MO-0038

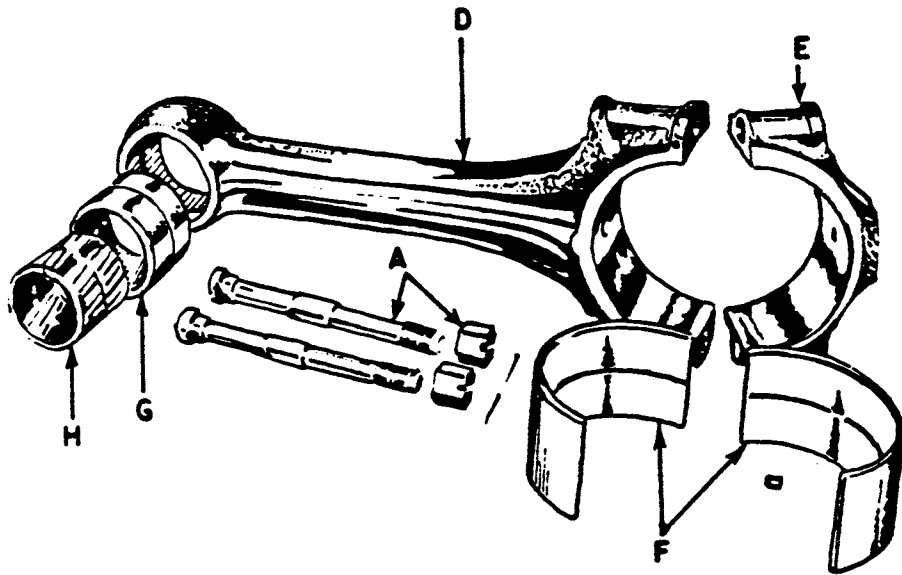
1	2	3	4	5	6
0	120	240	60	300	180

This chart gives the relative positions of fuel injection cam noses on a six-cylinder four-stroke cycle auxiliary diesel engine with a right hand rotation. At the moment indicated, #1 cylinder is at top dead center and combustion is taking place.

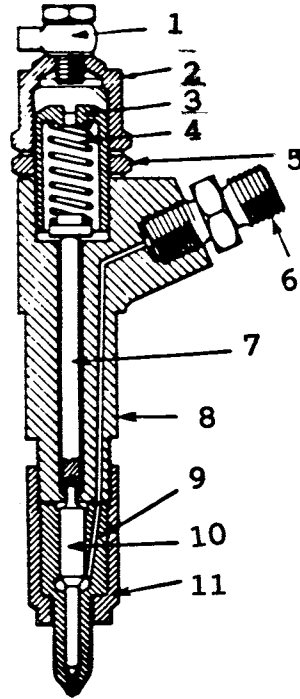
MO-0039

This information is for a two-stroke cycle marine engine and the flywheel is marked with reference to number one cylinder.

20-Cylinder	
Firing Order	Top Dead Center
1	0 DEGREES
14	27 "
9	36 "
16	63 "
4	72 "
13	99 "
6	108 "
20	135 "
3	144 "
12	171 "
10	180 "
17	207 "
2	216 "
15	243 "
7	252 "
18	279 "
5	288 "
11	315 "
8	324 "
19	351 "



MO-0041



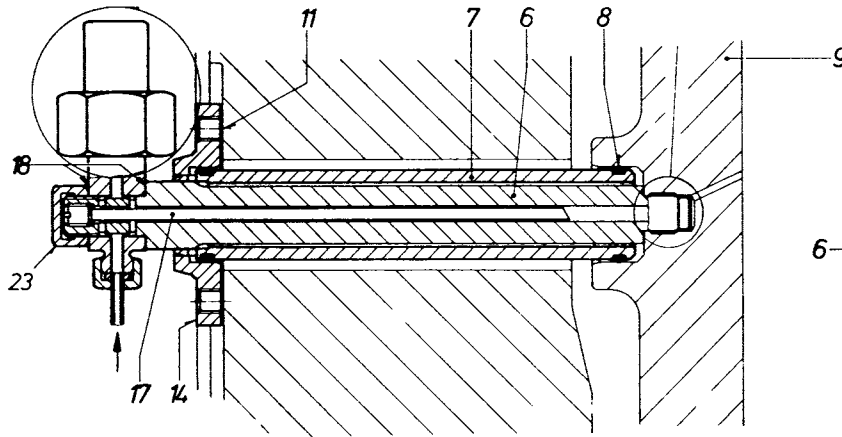


FIG. A

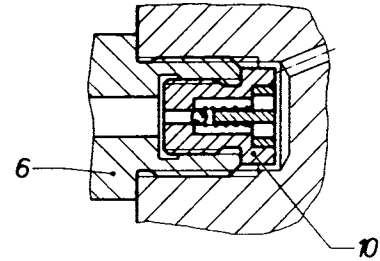


FIG. B

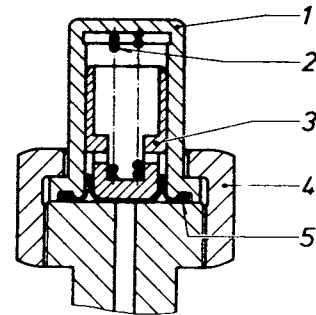
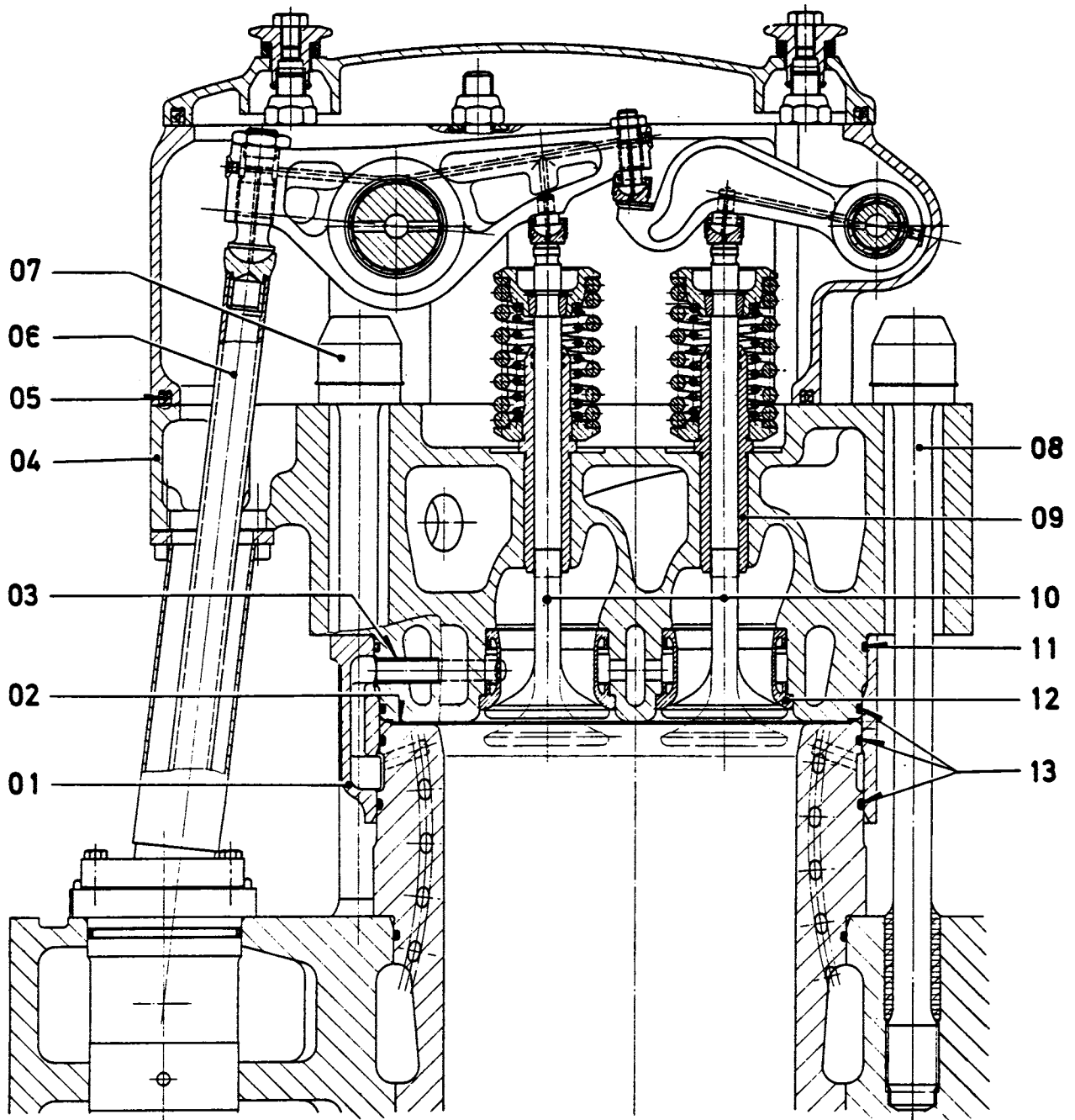
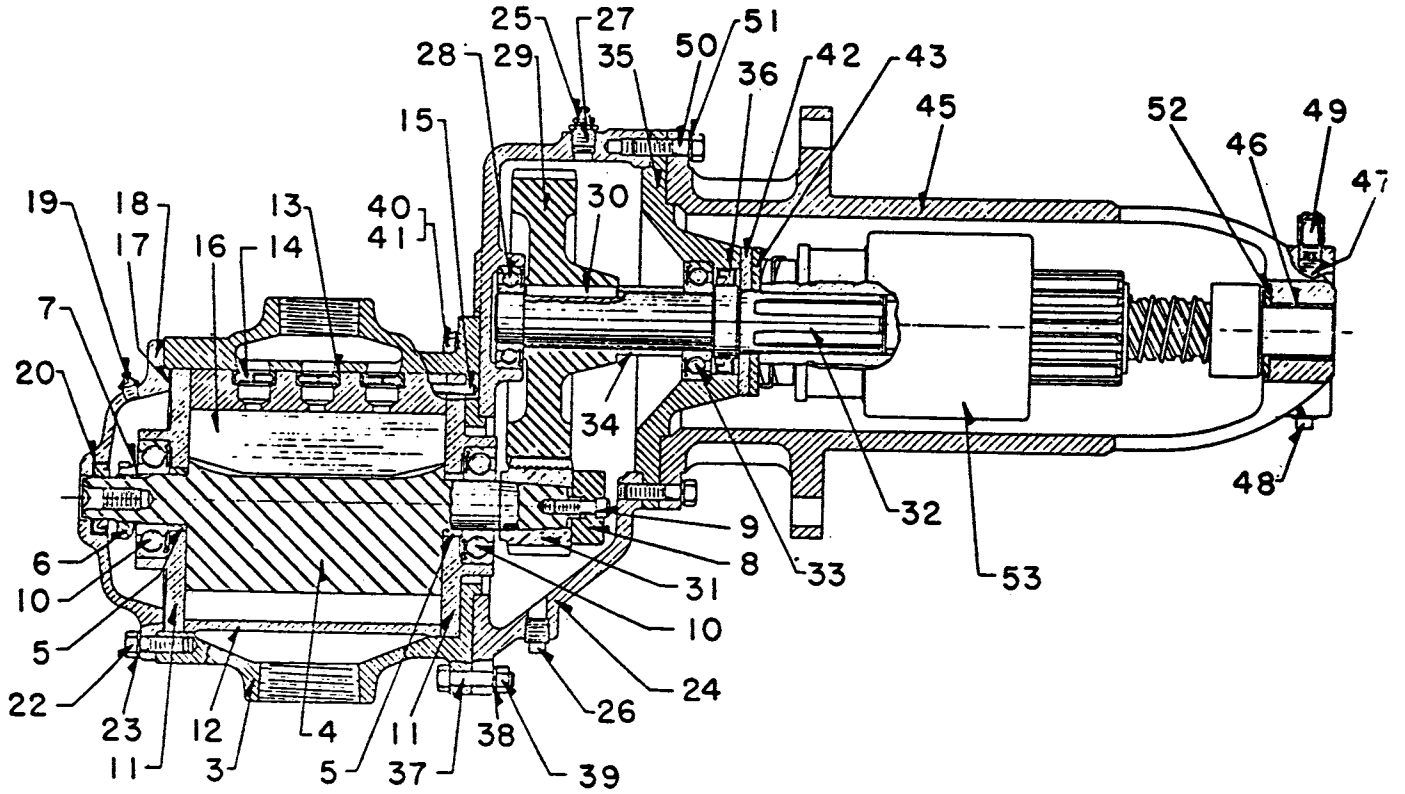


FIG. C

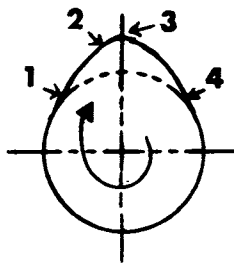
MO-0043



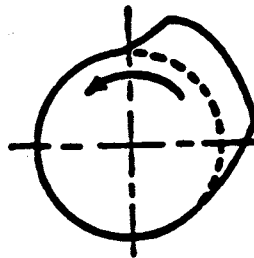
MO-0044



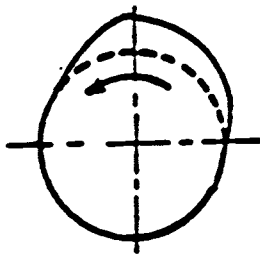
MO-0045



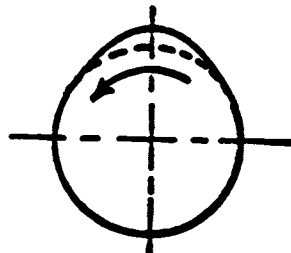
A



B

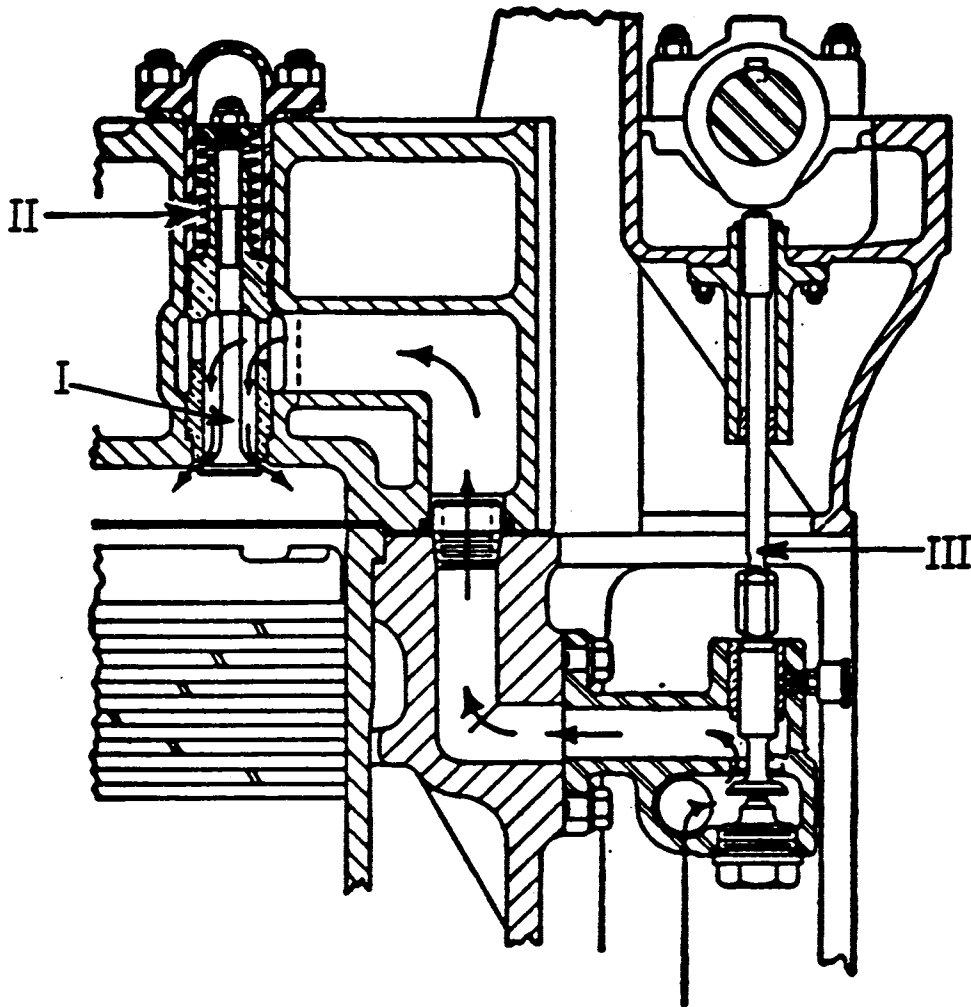


C

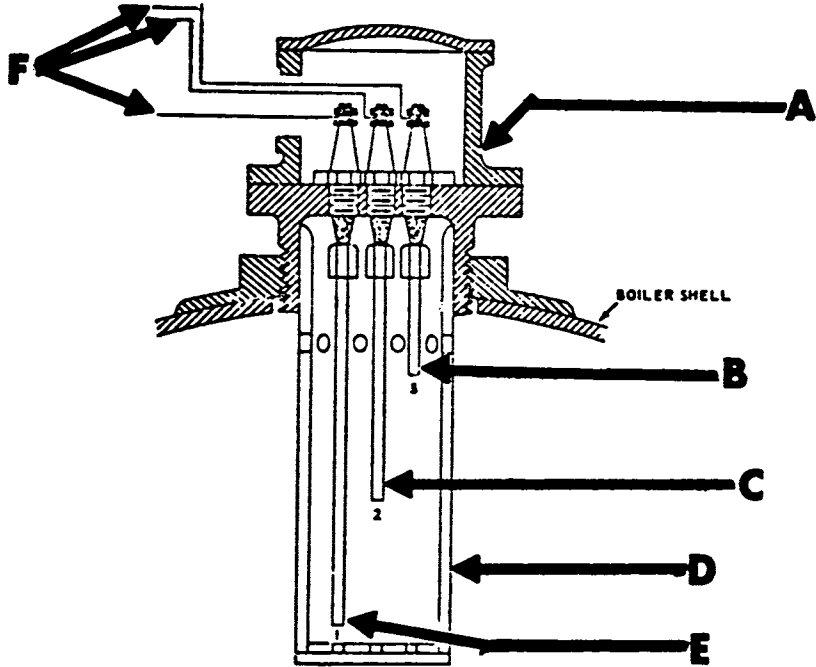


D

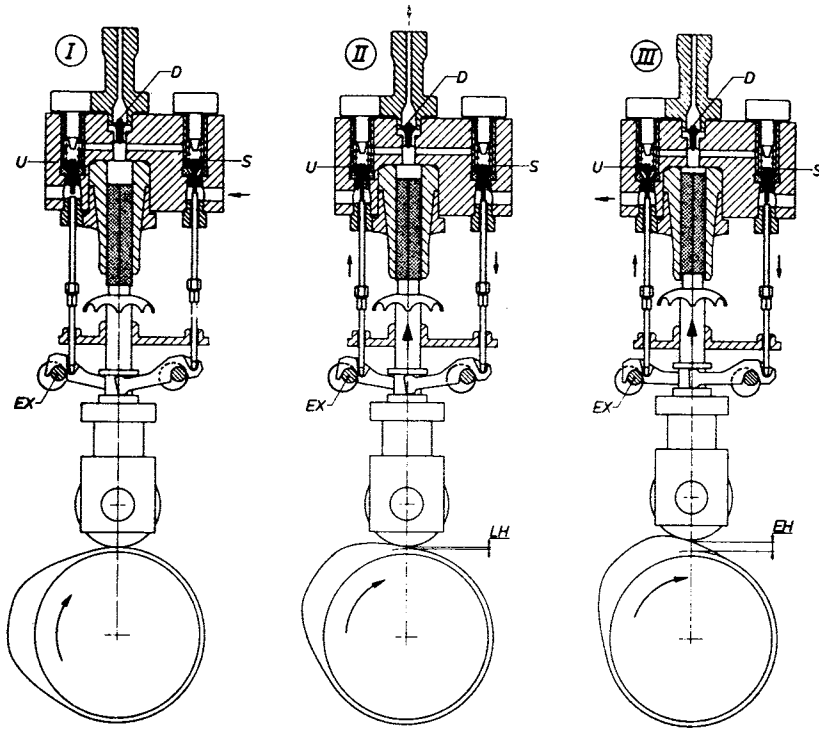
MO-0046



MO-0047



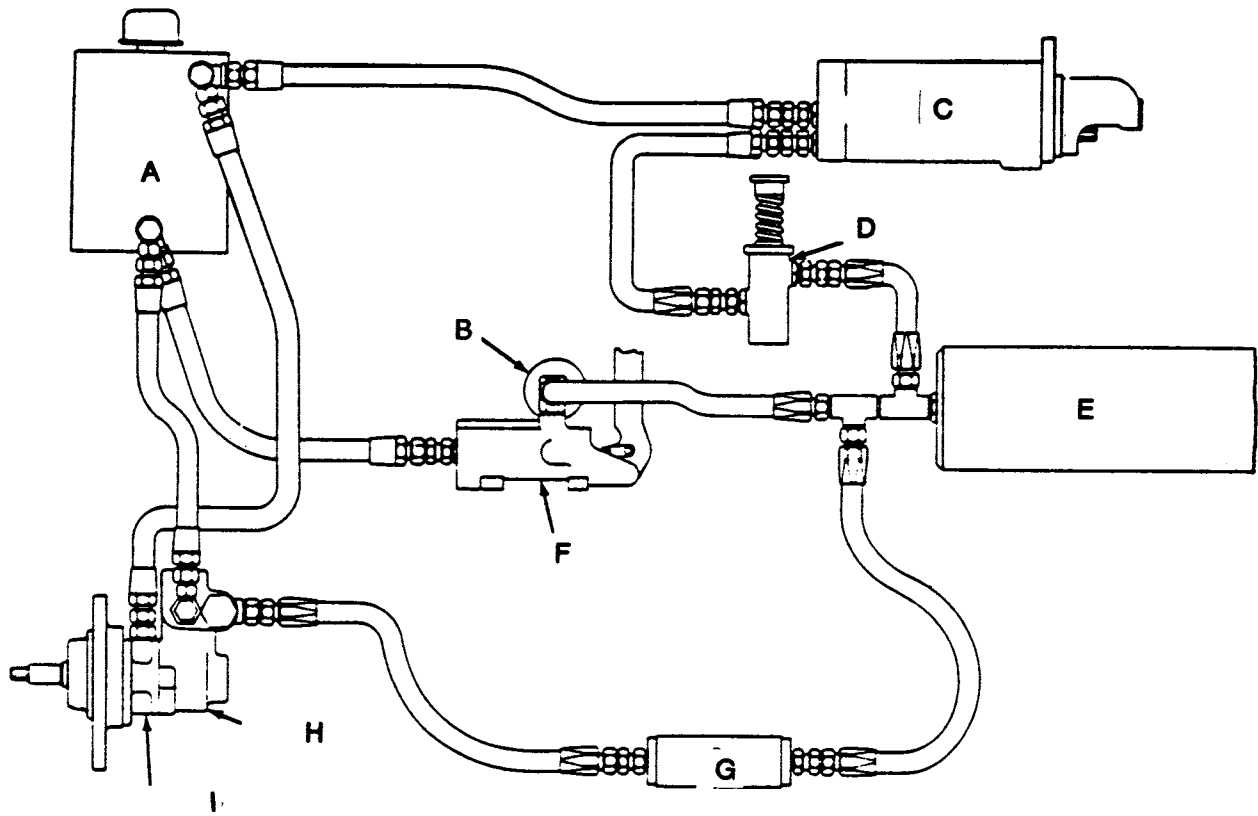
M0-0048



3-36

(Courtesy of New Sulzer Diesel)

MO-0049



MO-0050

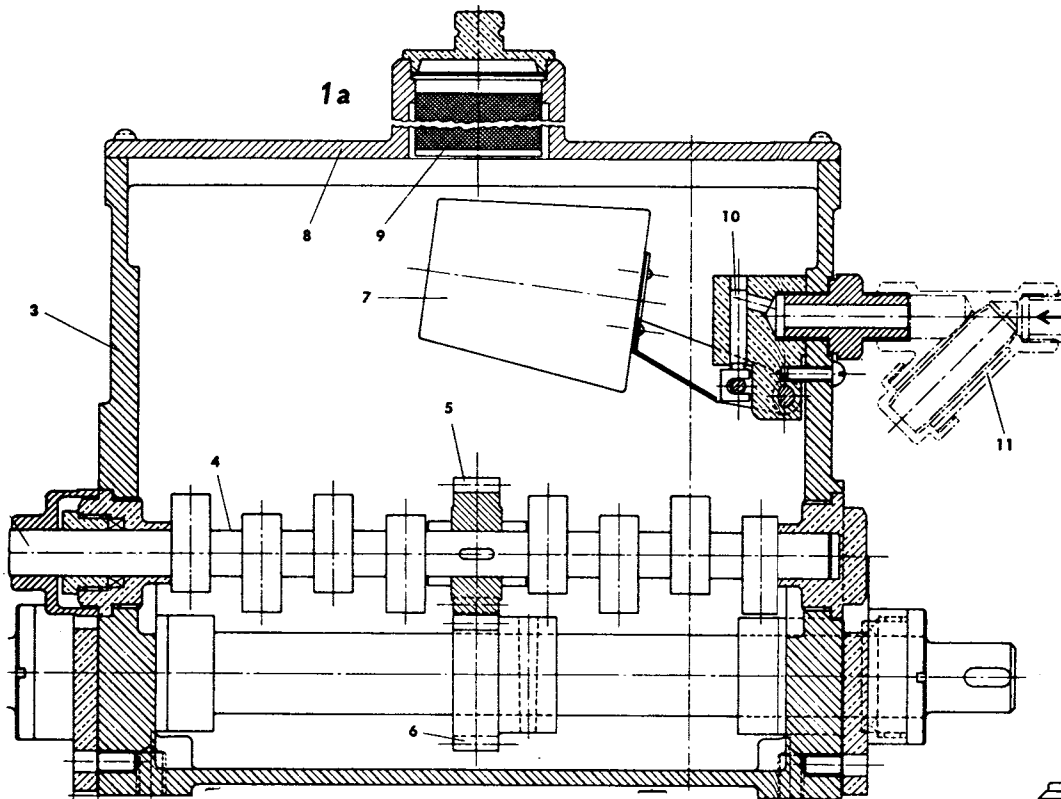


FIG. A

(Courtesy of New Sulzer Diesel)

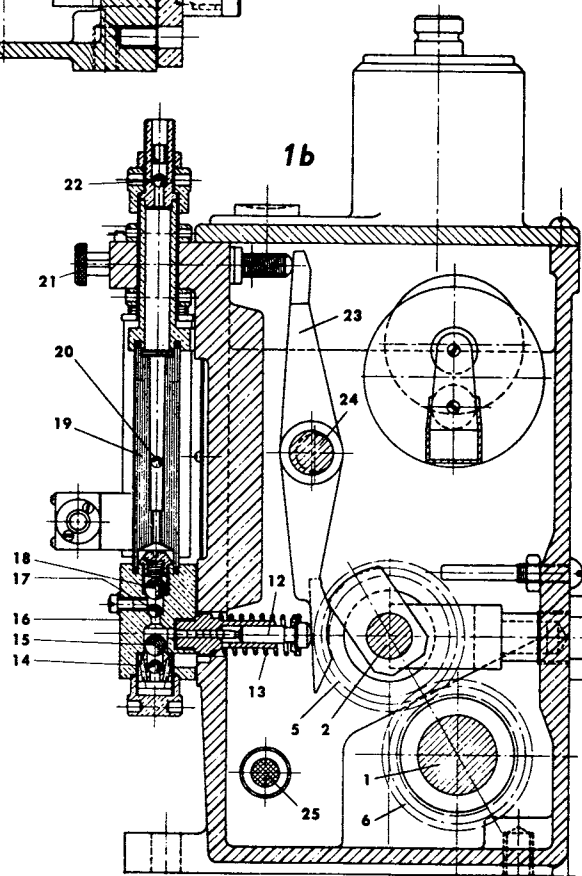
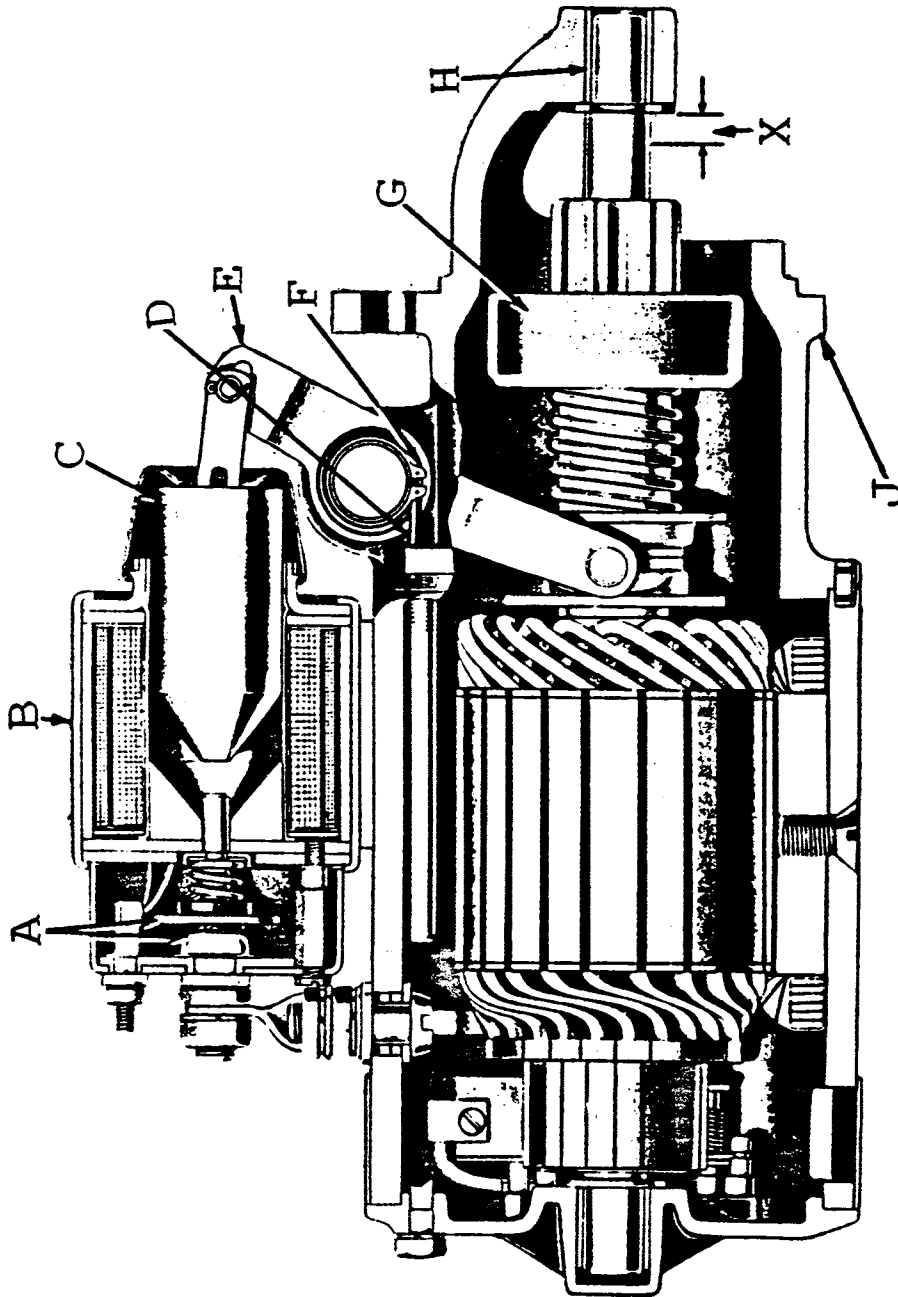
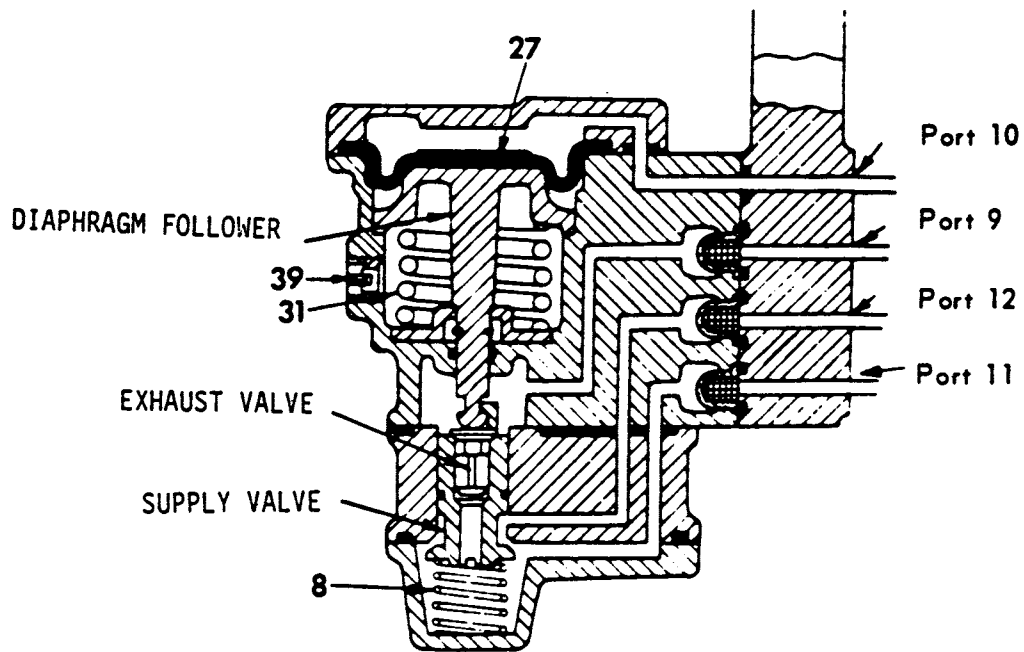


FIG. B

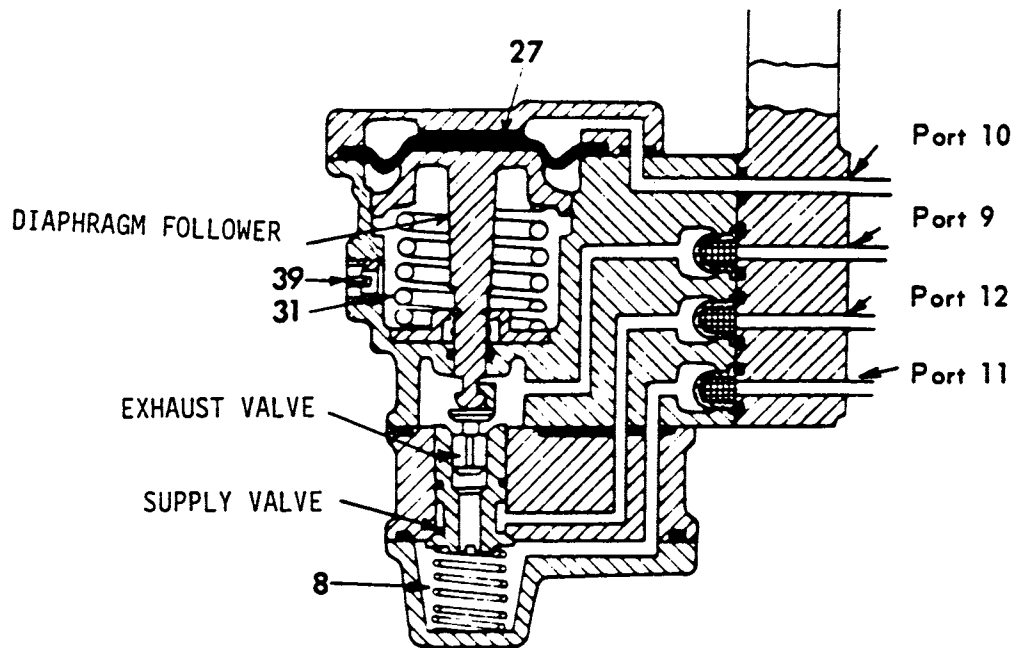
MO-0051



MO-0052



APPLIED POSITION



RELEASED POSITION

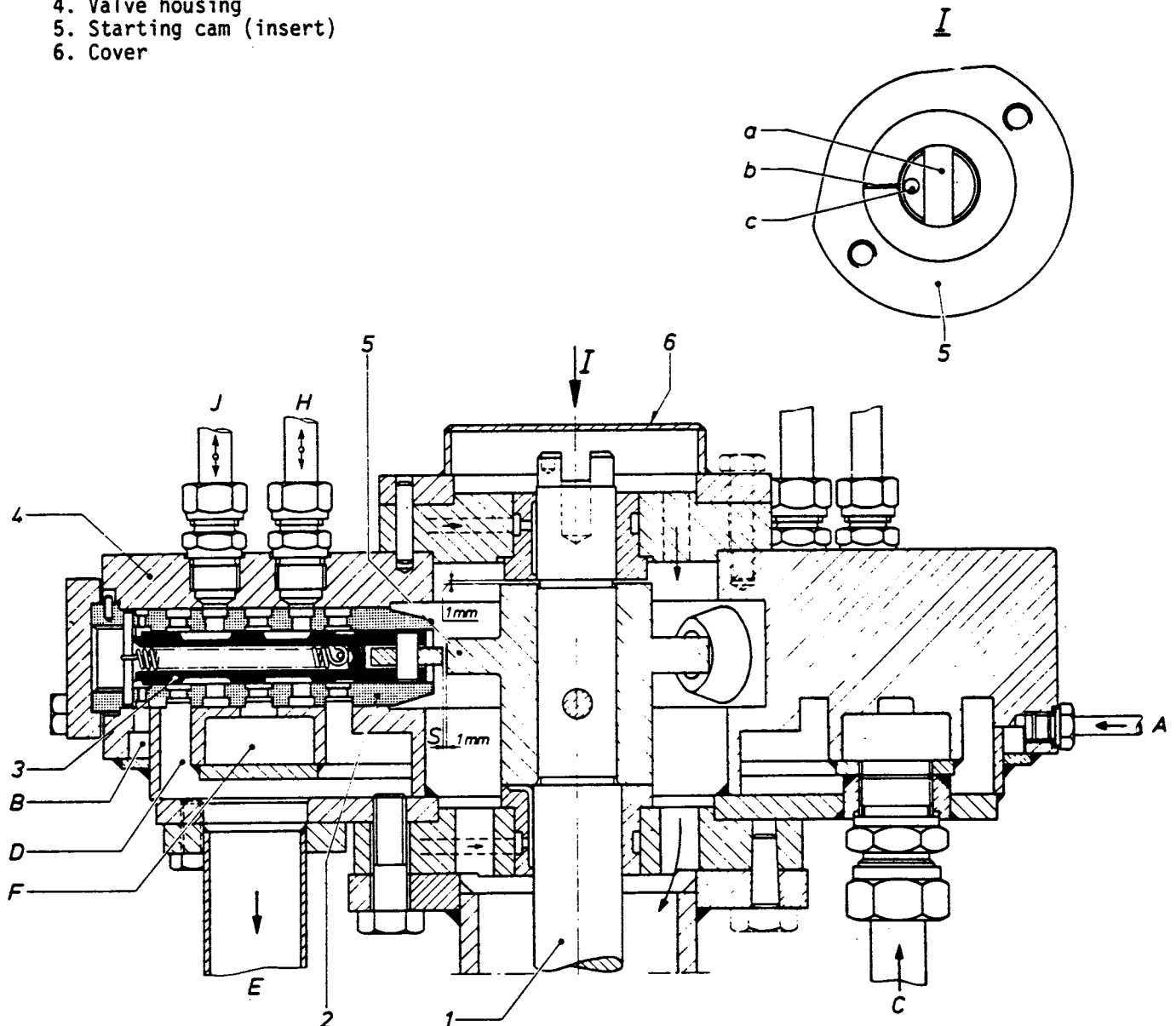
MO-0053

STARTING CONTROL AIR DISTRIBUTOR

- A. Control air pipe
- B. Annular space
- C. Air inlet
- D. Discharge space
- E. Discharge line
- F. Distribution space
- H. Closing pipe to starting air valve
- J. Opening pipe to starting air valve

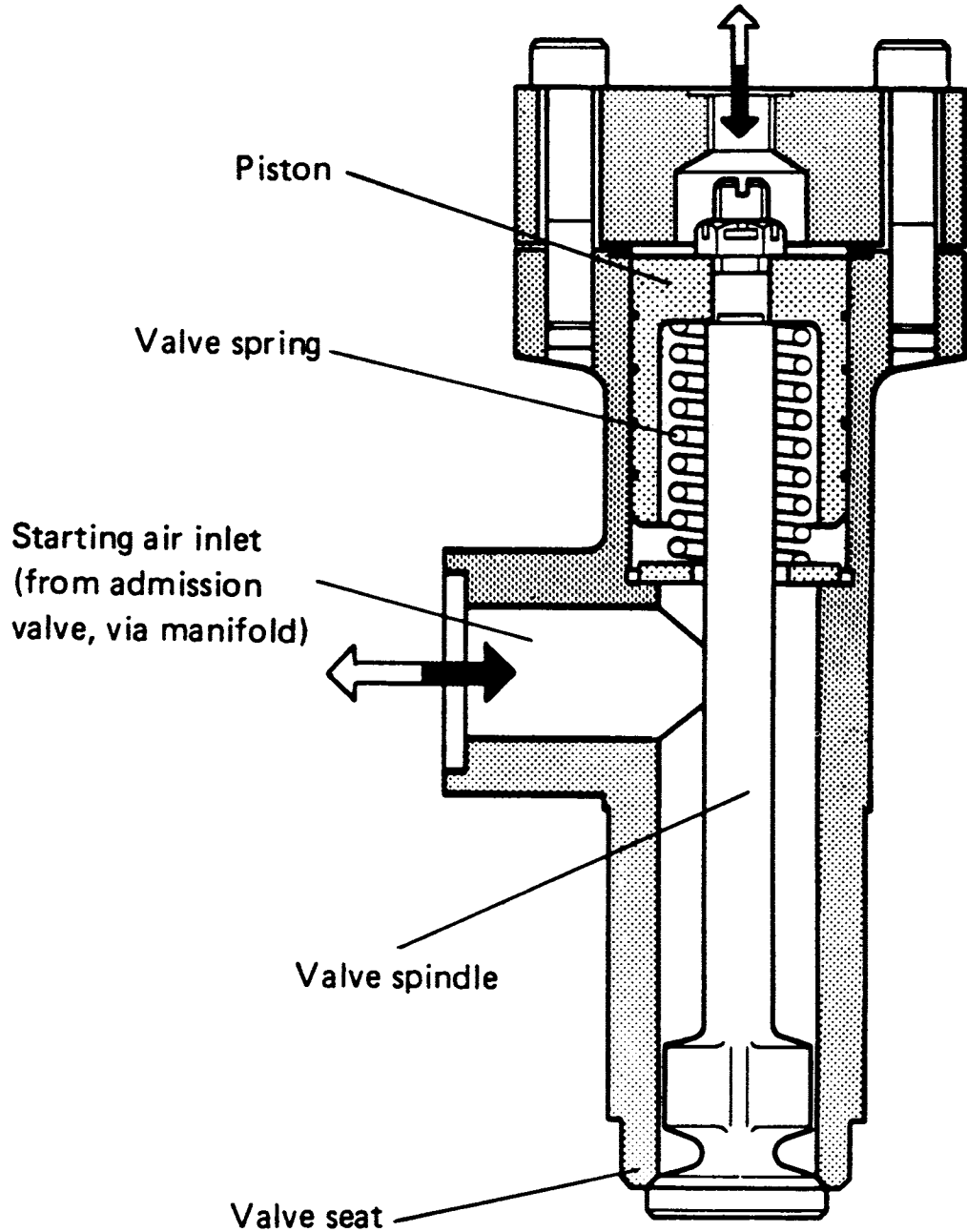
- 1. Upper shaft of vertical drive
- 2. Bush for starting control valve
- 3. Starting control valve
- 4. Valve housing
- 5. Starting cam (insert)
- 6. Cover

NOTES: The illustrated "starting control air distributor" is sectioned to show the operation of one starting control valve (3) of which there are several. These valves are arranged radially in a common plane and operated by a common starting cam (5). The air inlet (C), discharge line (E), and control air pipe (A), are common to the entire bank of starting control valves (3).



MO-0054

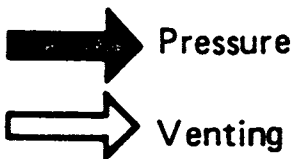
Control air inlet (from air distributor)



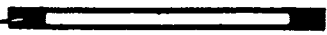
Starting air inlet
(from admission
valve, via manifold)

Valve spindle

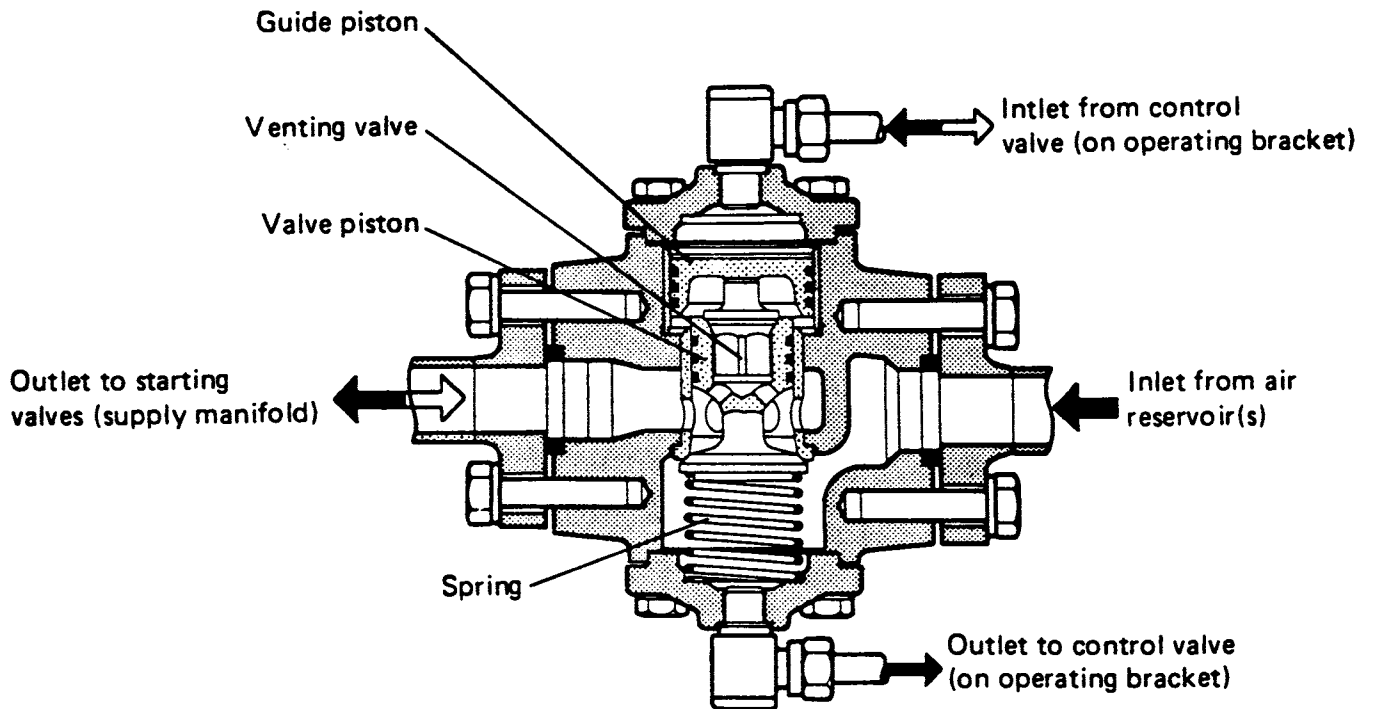
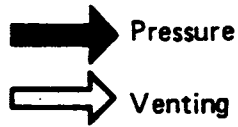
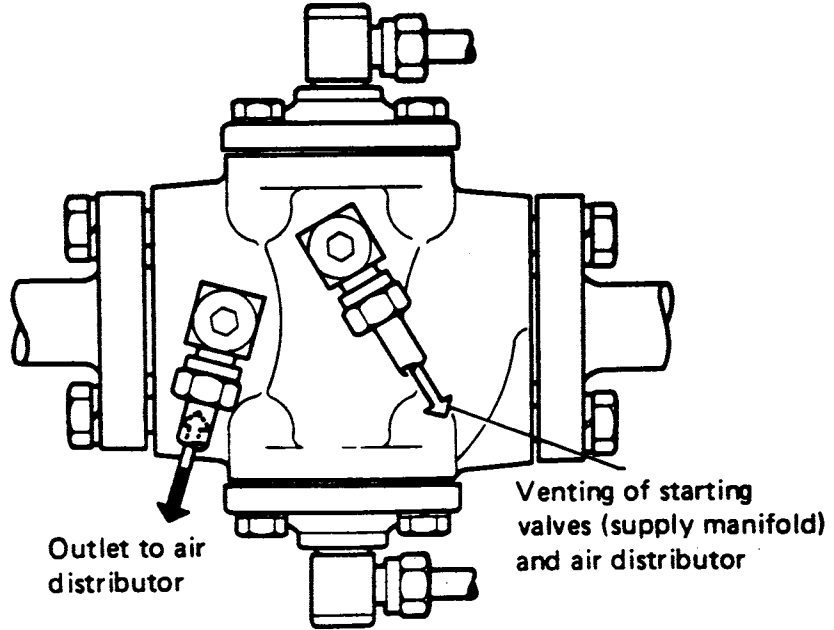
Valve seat

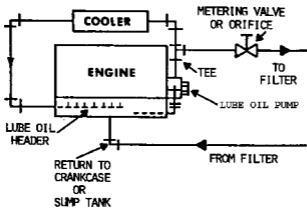


Gasket



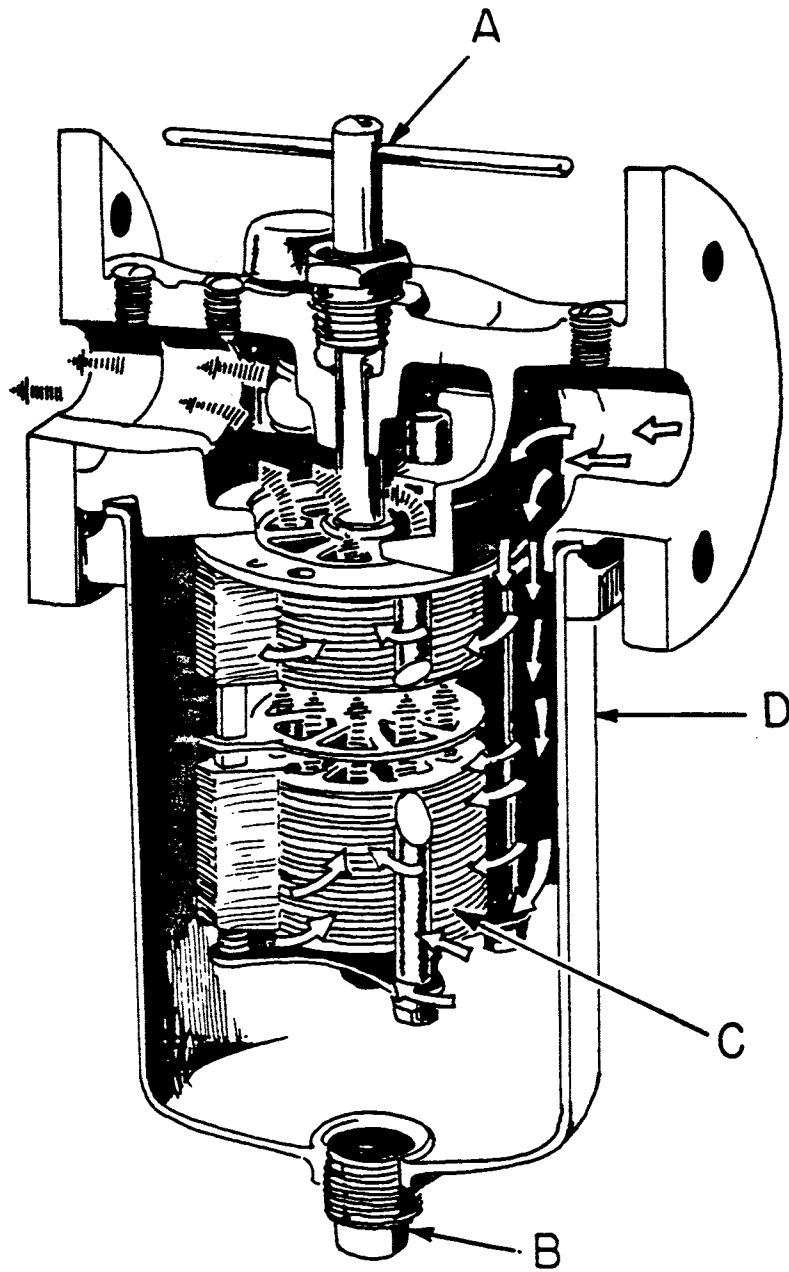
MO-0055



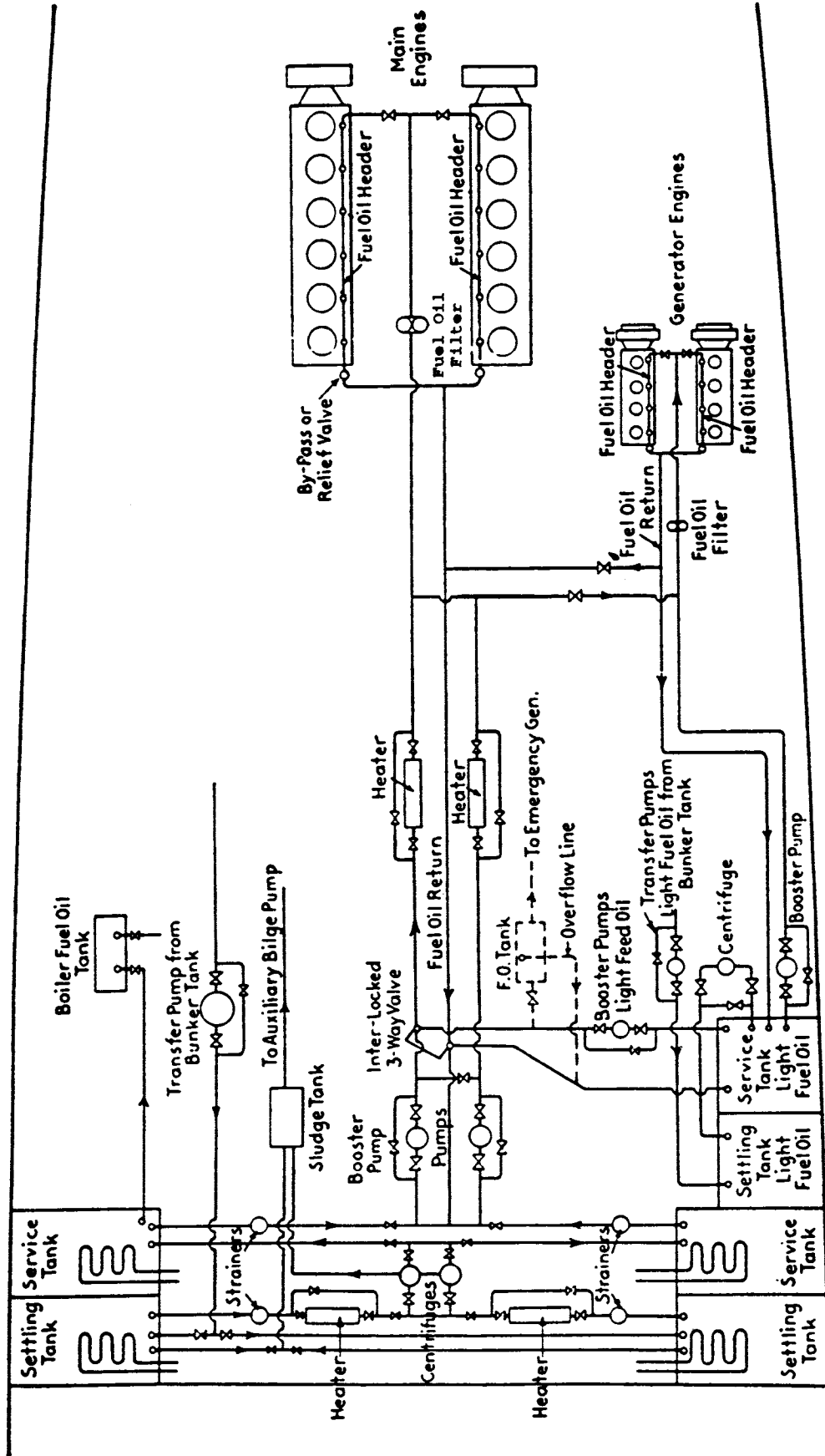


MO-0056

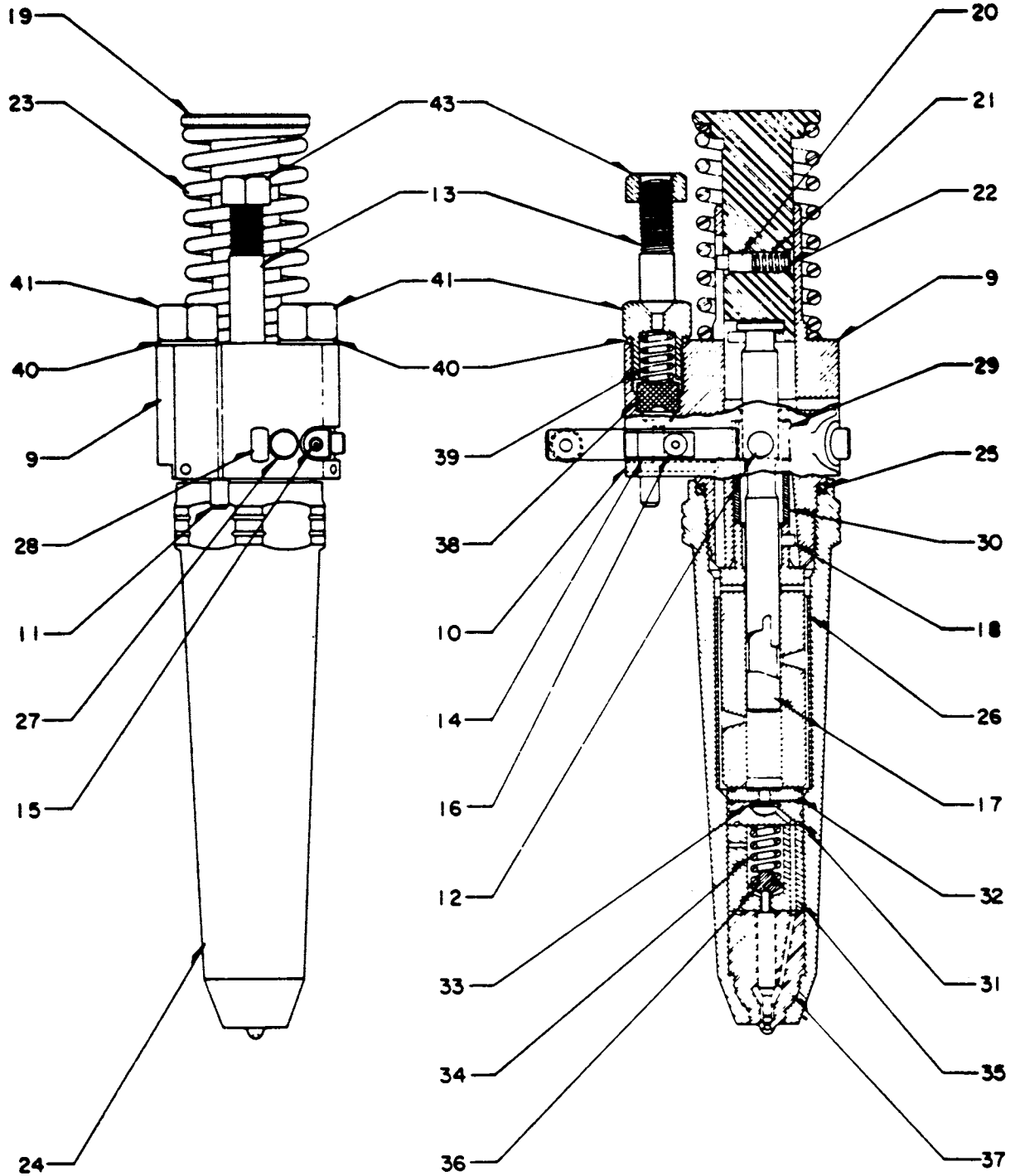
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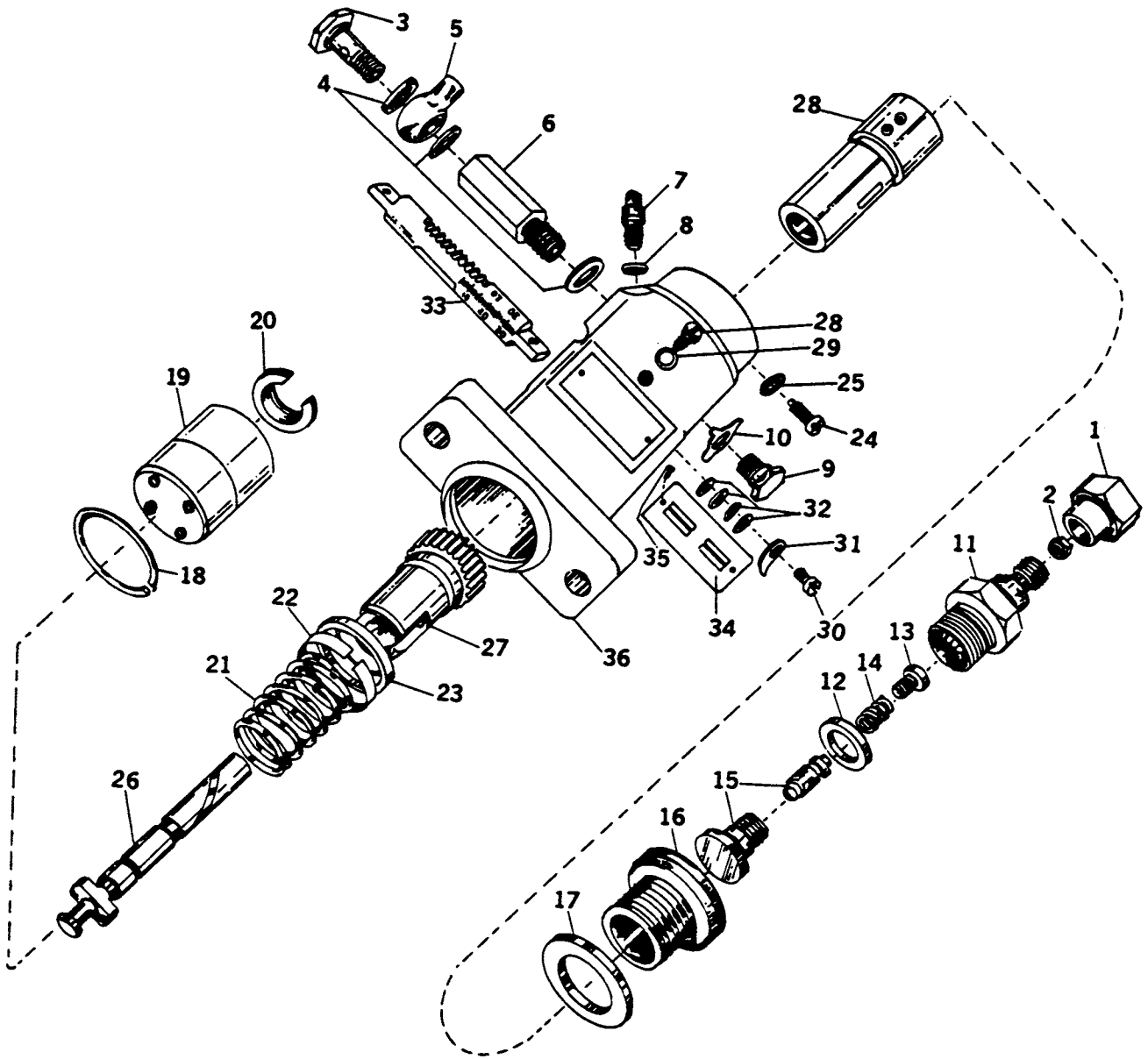
MO-0058



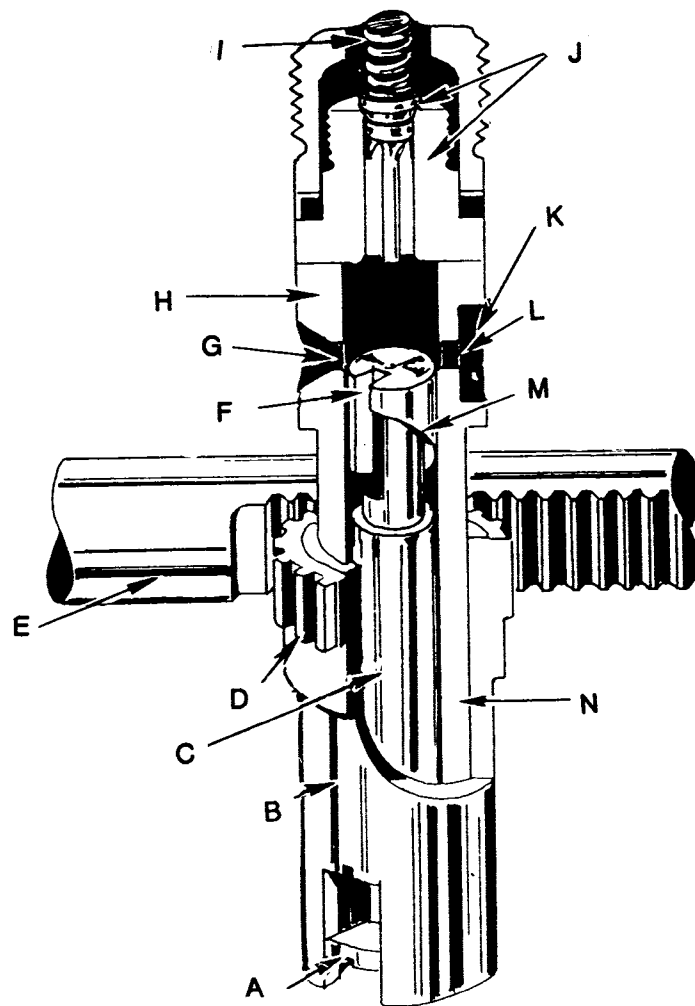
MO-0059



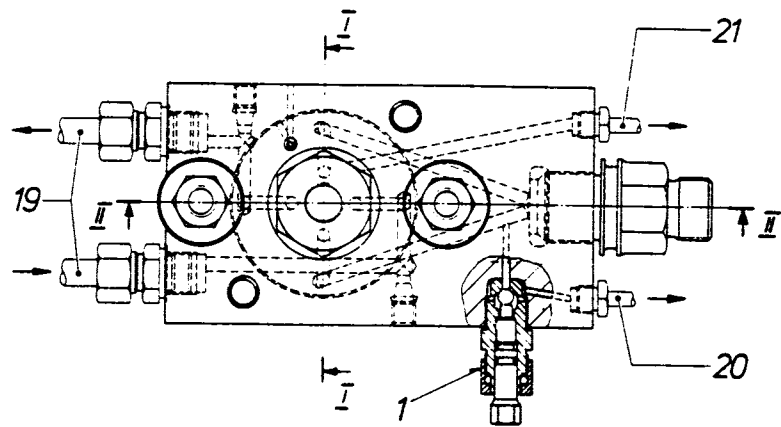
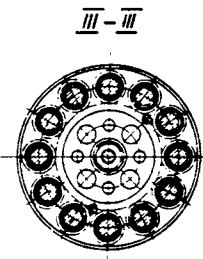
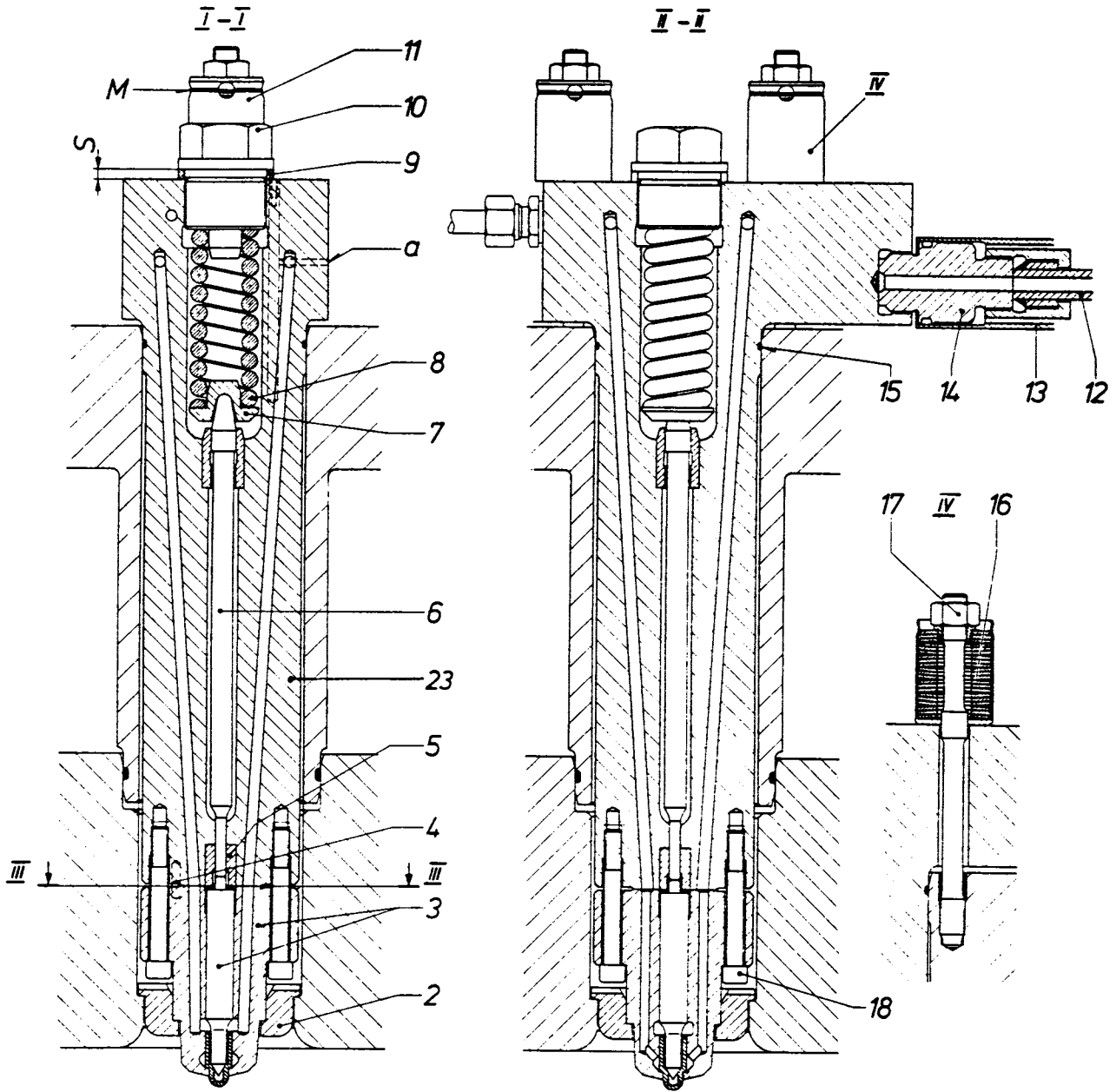
MO-0060



MO-0061



MO-0062



MO-0063

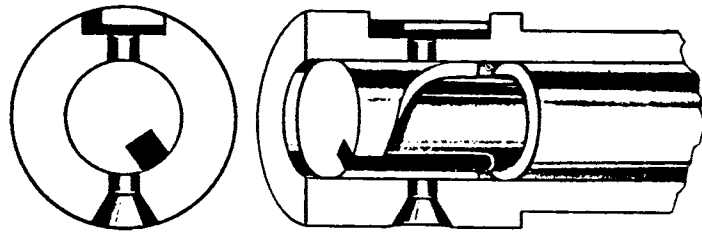


FIG. C



FIG. B

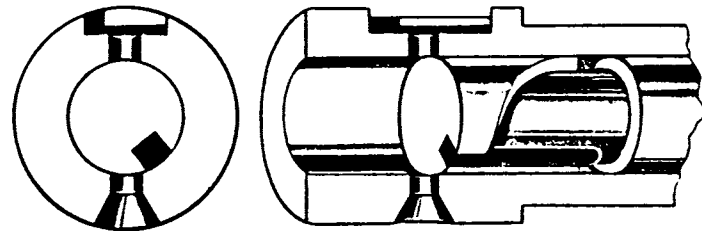
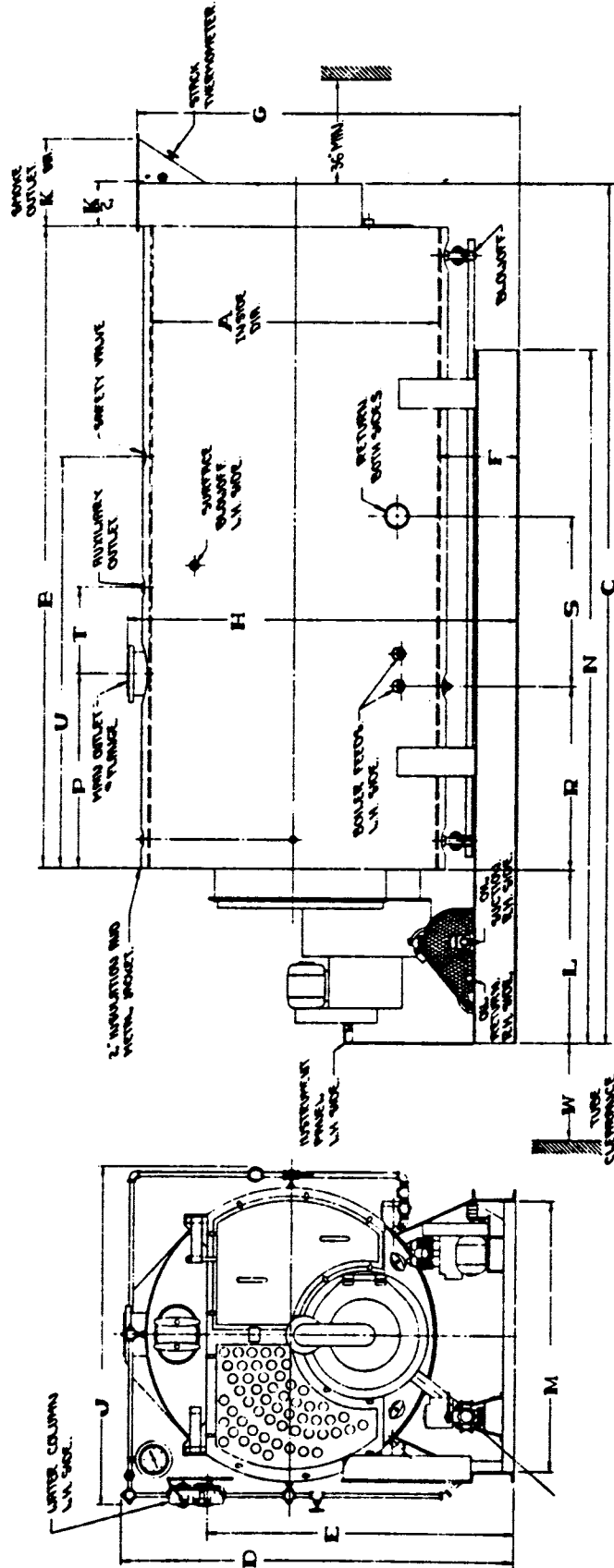


FIG. A

MO-0064

LOW PRESSURE HIGH PRESSURE
15 lbs. Steam - 30 lbs. Water 150 to 250 lbs. Steam

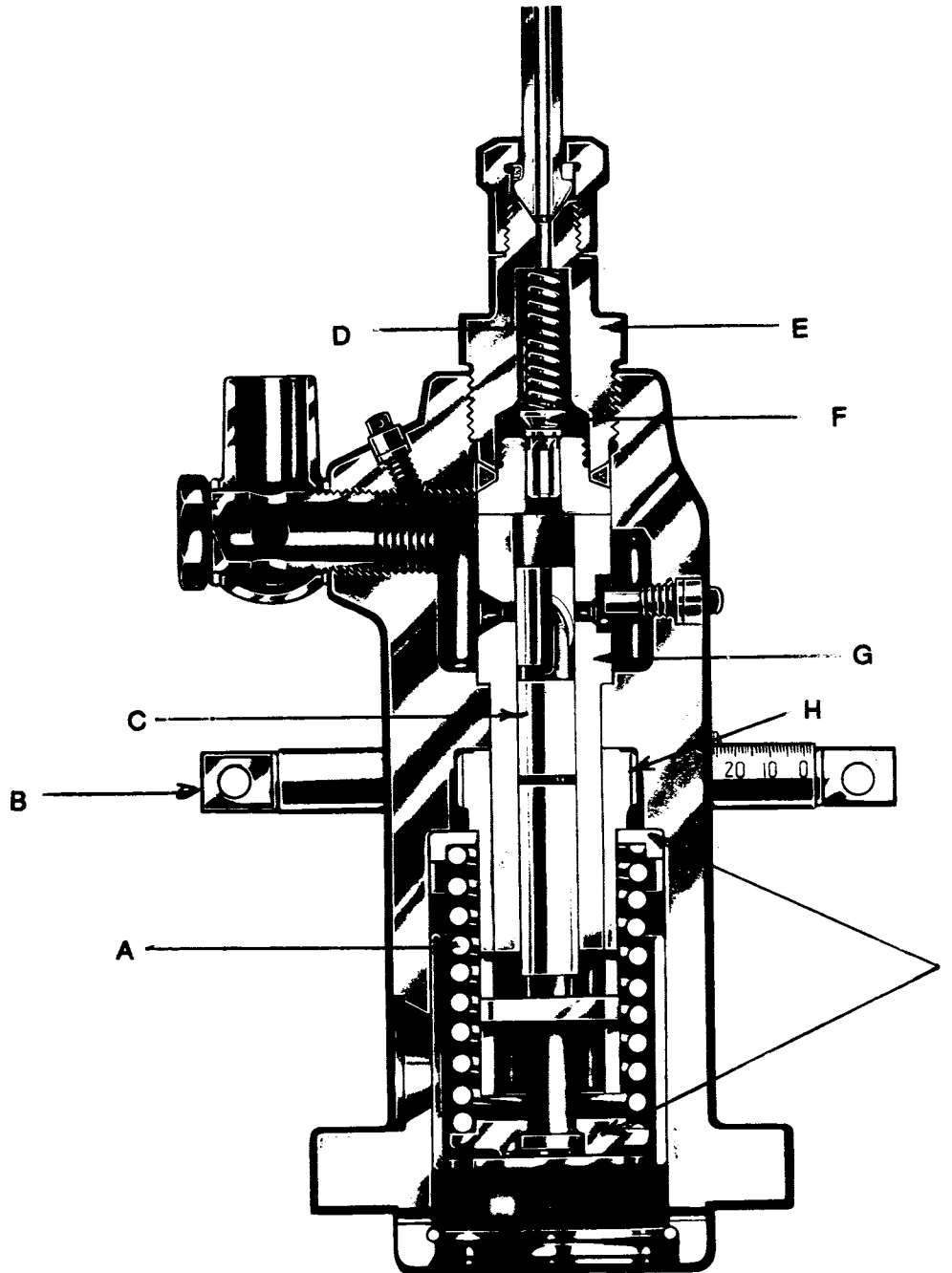


Note: Three transverse saddles, 530 thru 540.

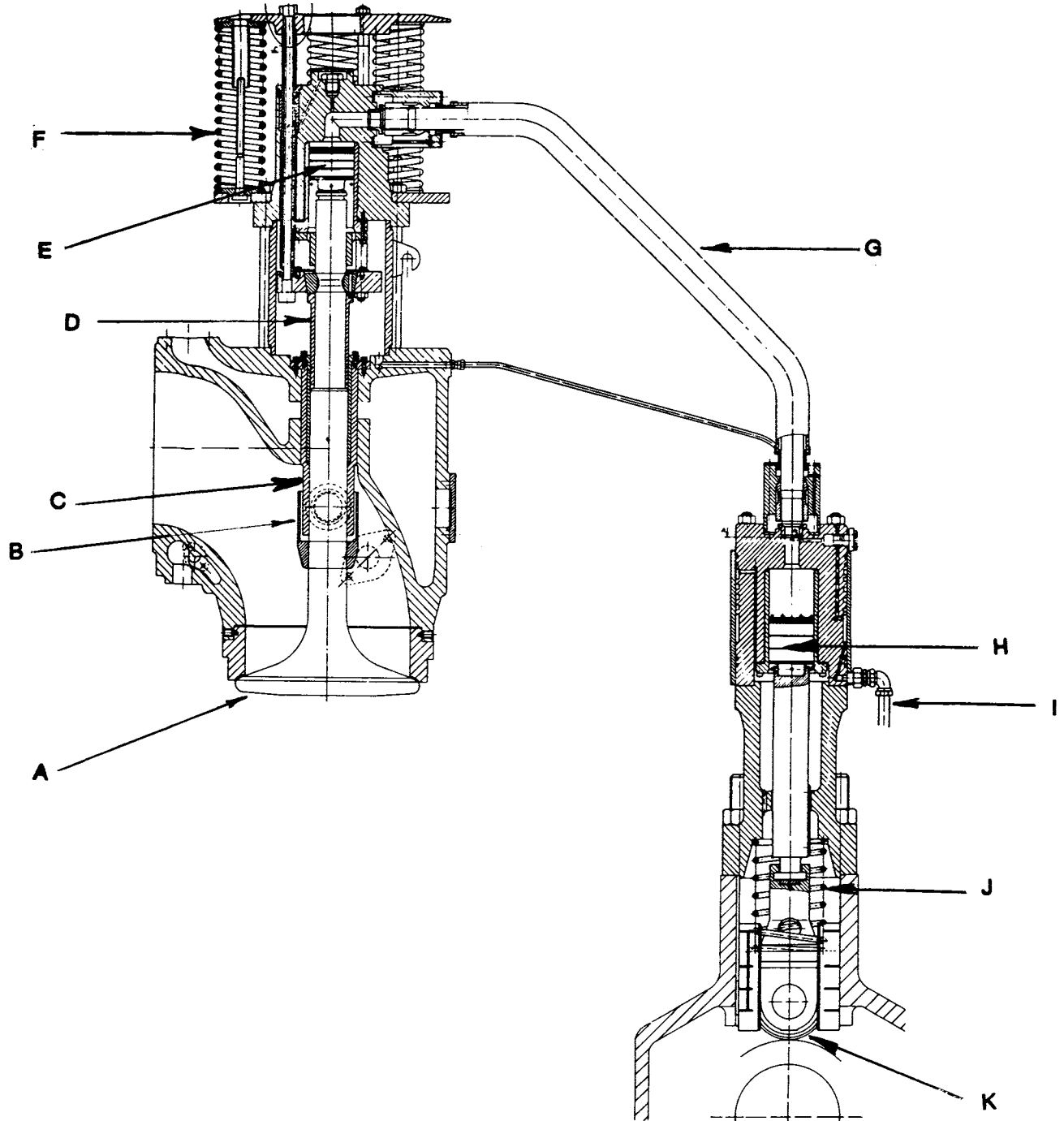
SPECIFICATIONS AND DIMENSION DATA

CATALOG NUMBER OF UNIT	510	512	514	516	518	522	524	526	528	530	534	535	536	538	540
Rating - Horsepower, Max.	75	100	125	150	200	250	300	350	400	500	600	750	900	1000	1200
- Steam Per Hour (Feed 21° F)	2585	3450	4310	5180	6900	8600	10350	12100	13800	17250	20700	25875	31050	34500	41400
- Steam Radiation EDR	1046.5	13950	17440	20925	27900	34875	41850	48825	55800	69750	83700	1046.5	125550	139500	167400
- Water Radiation EDR	16740	22320	27900	33480	44640	55800	66960	78120	89280	111600	133920	167400	200880	223200	267840
- BTU Per Hour	2511	3350	4185	5025	6695	8370	10044	11718	13392	16740	20088	25110	30132	33480	40176

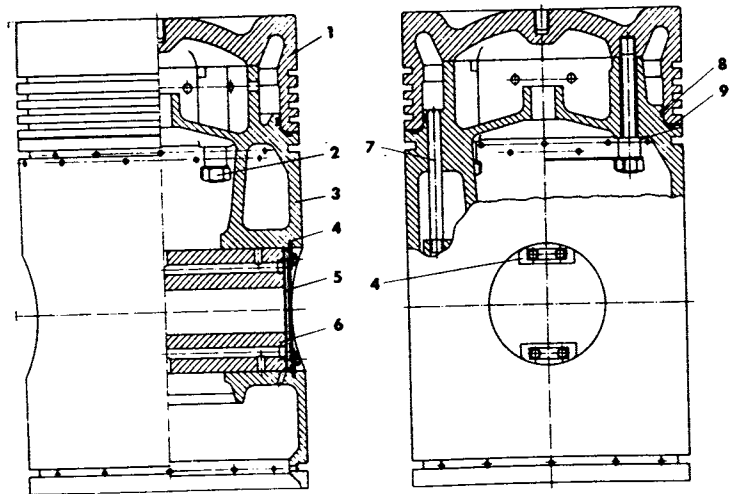
MO-0065



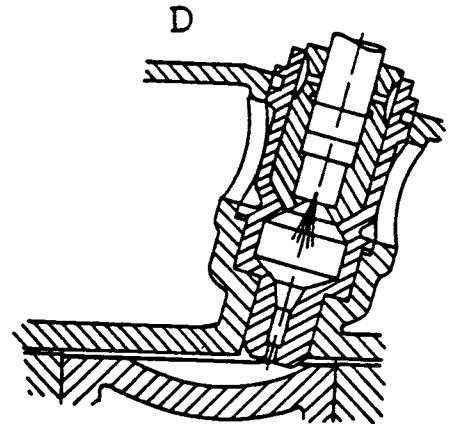
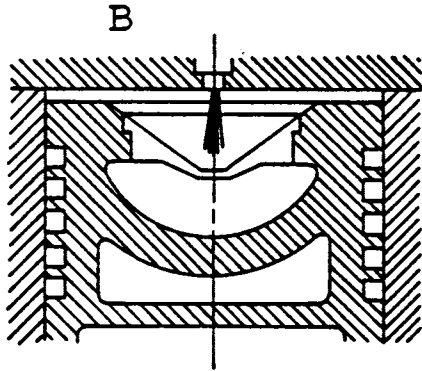
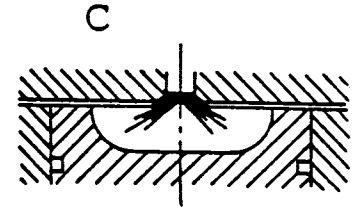
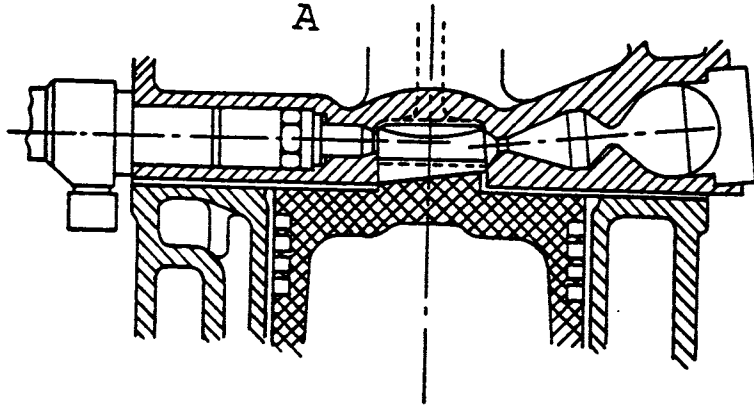
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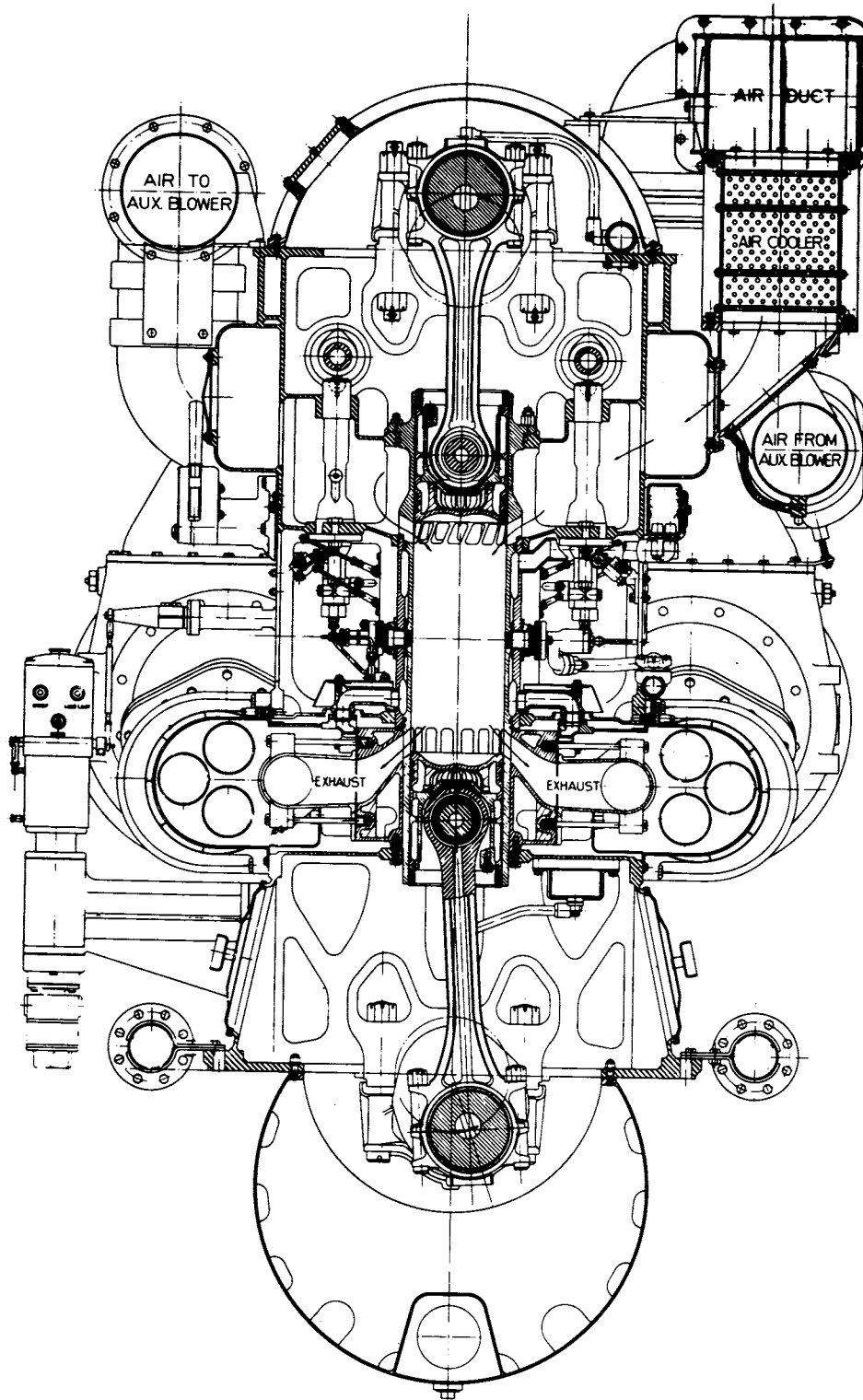
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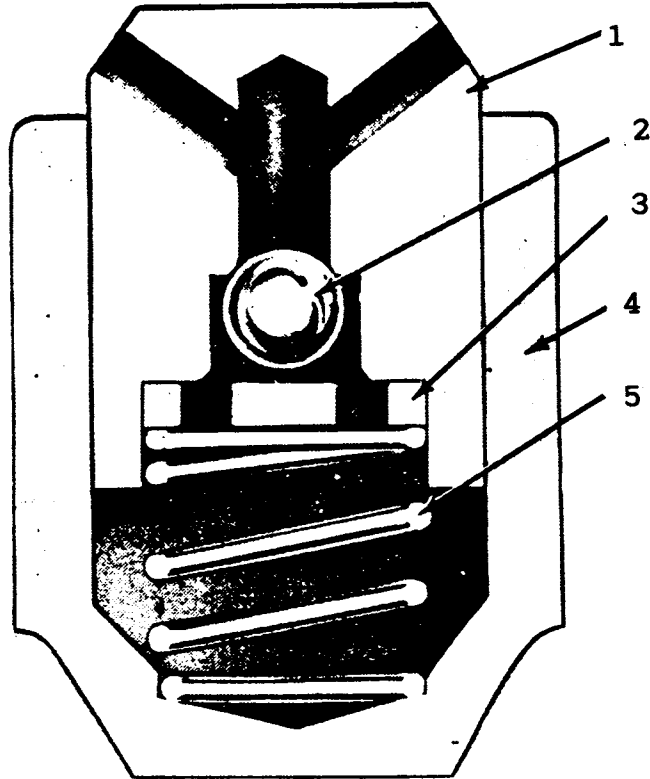
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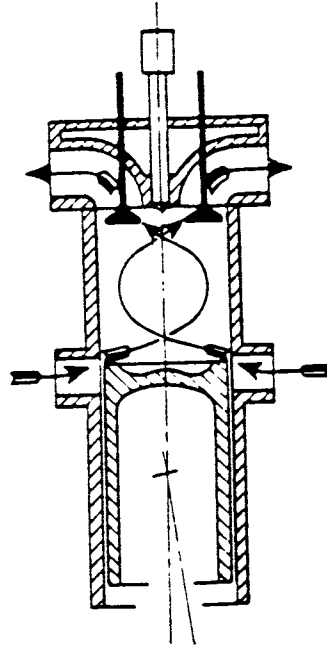
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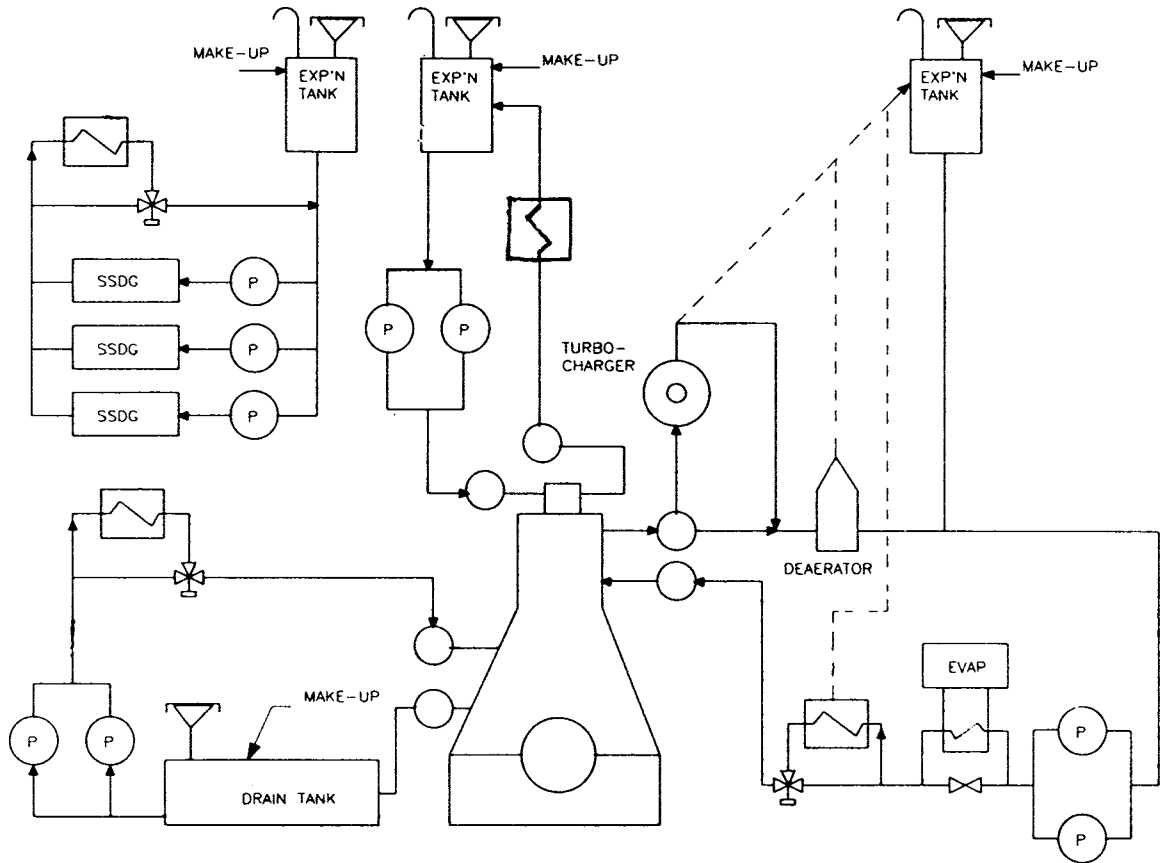
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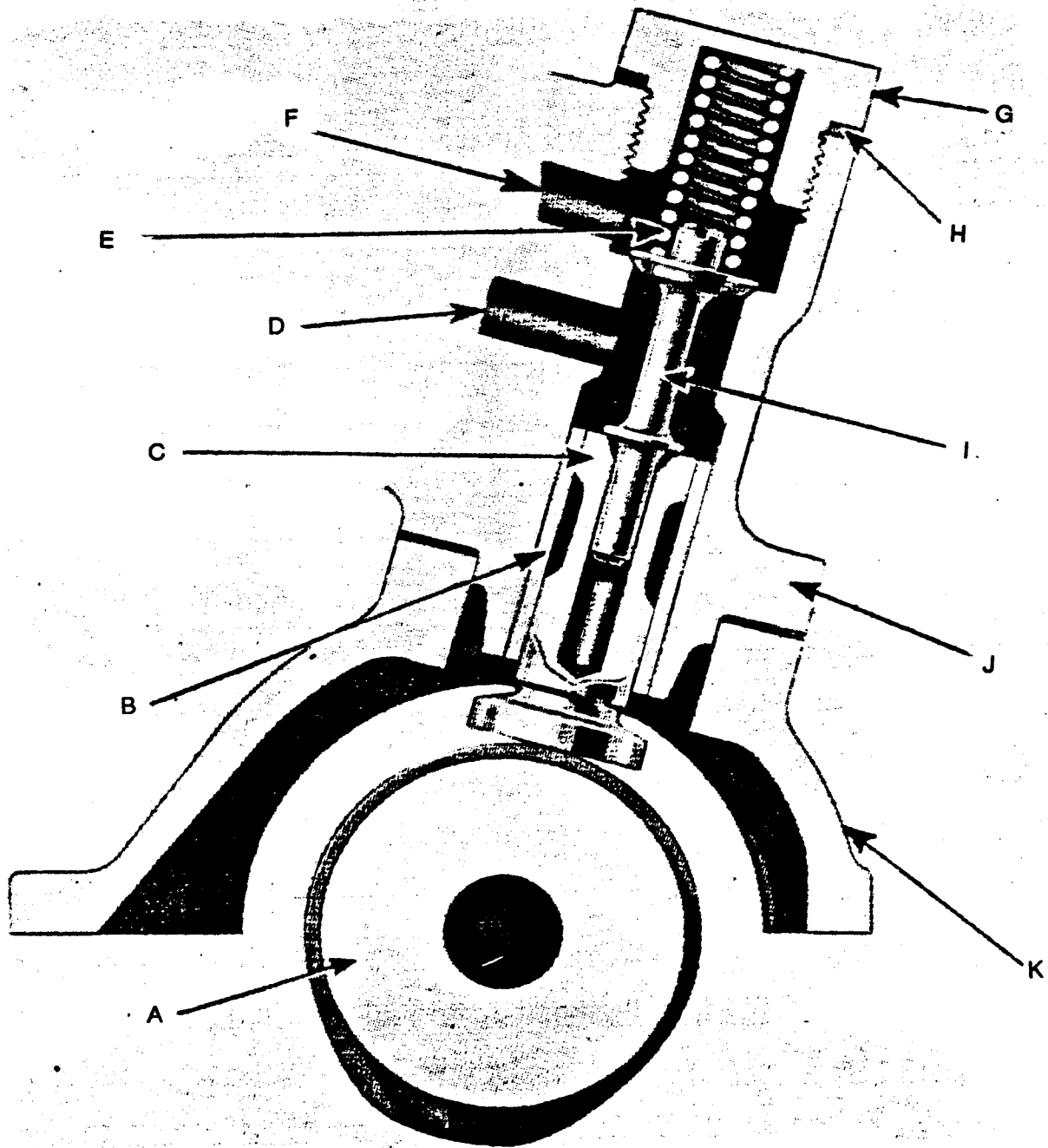
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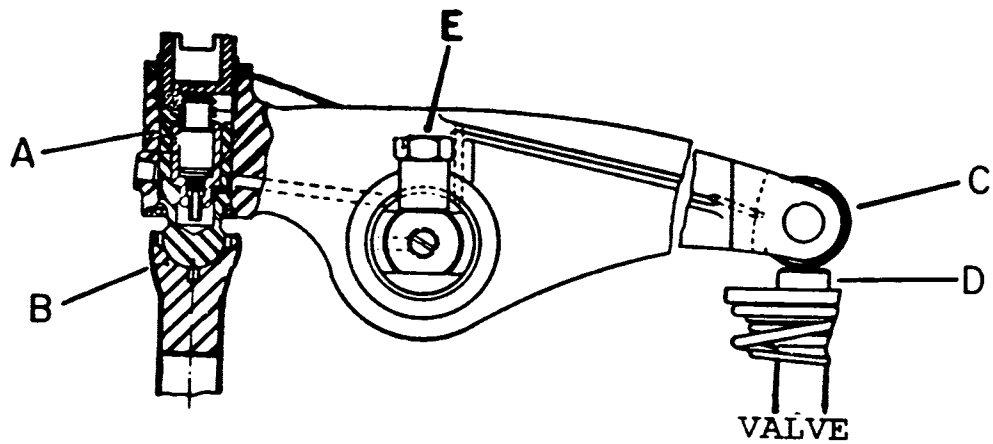
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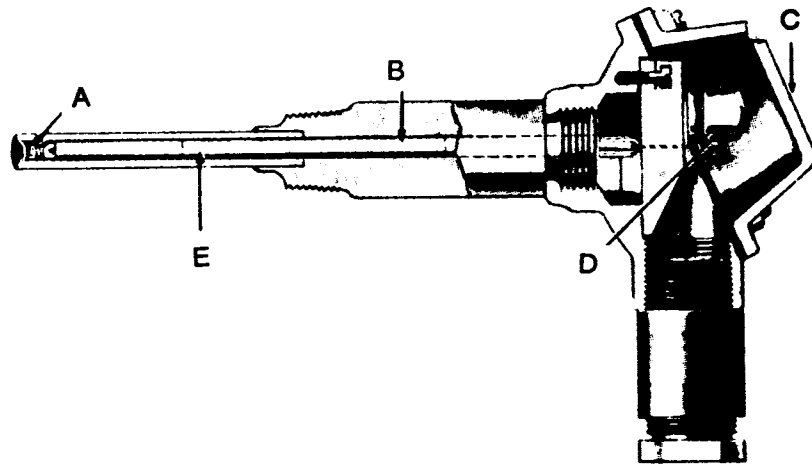
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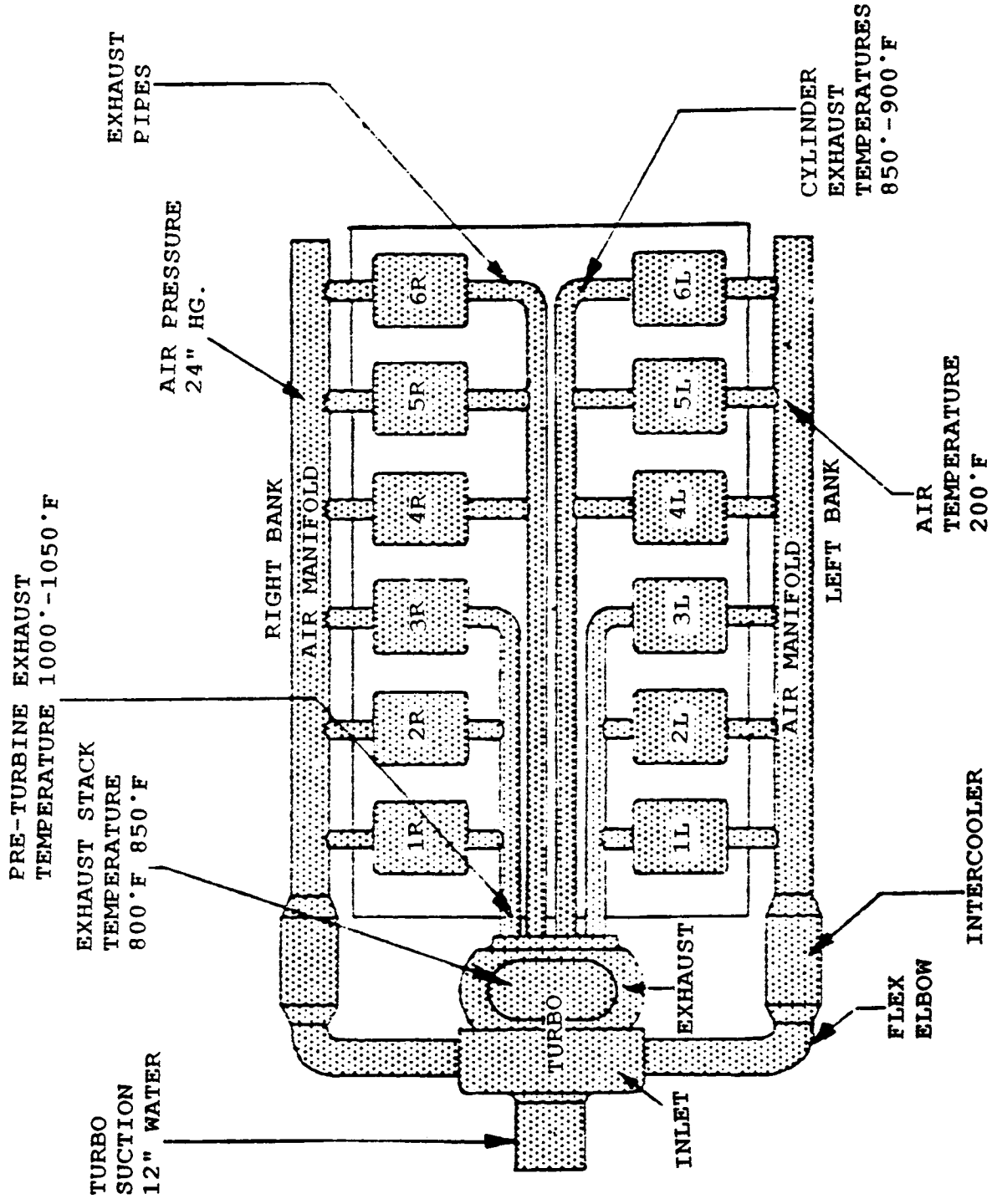


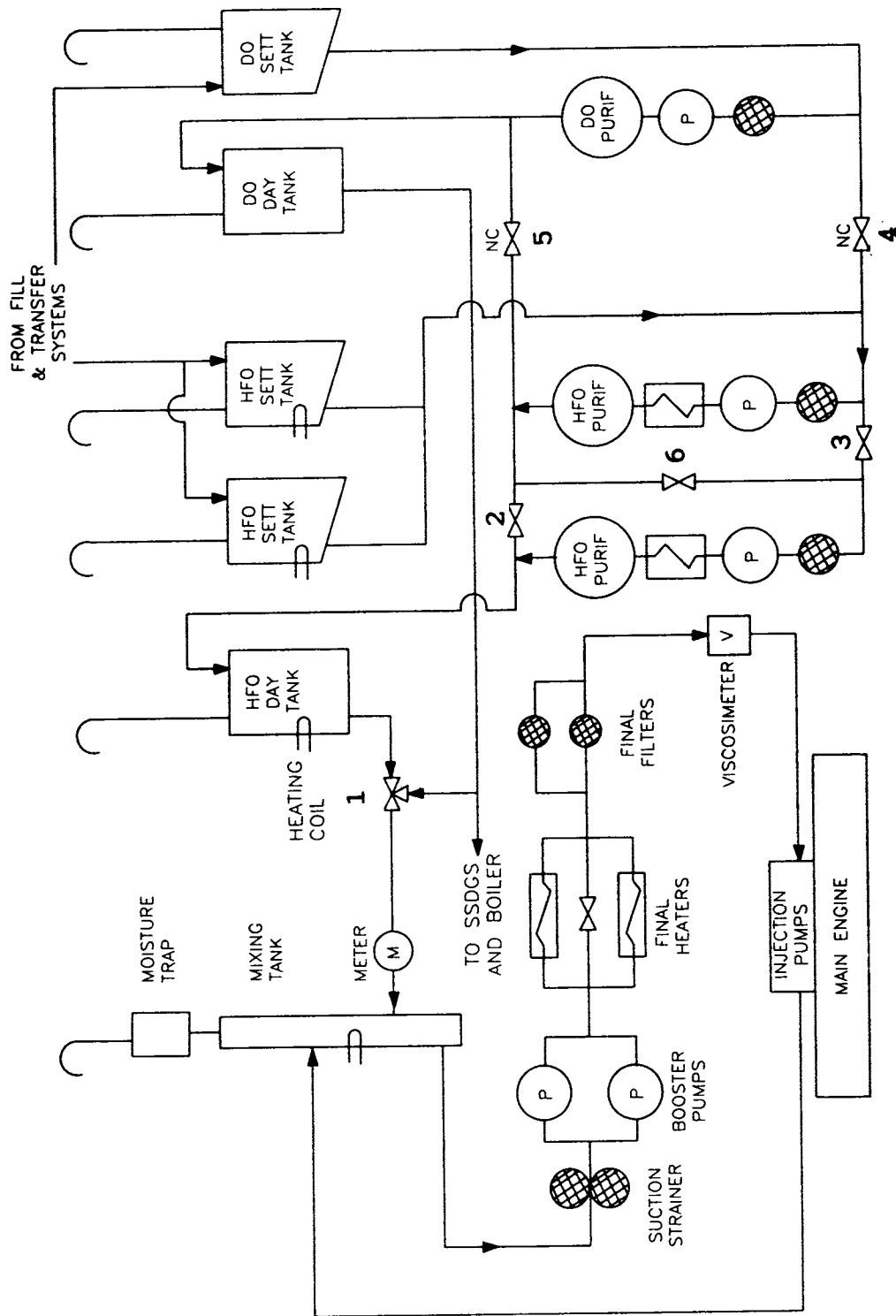
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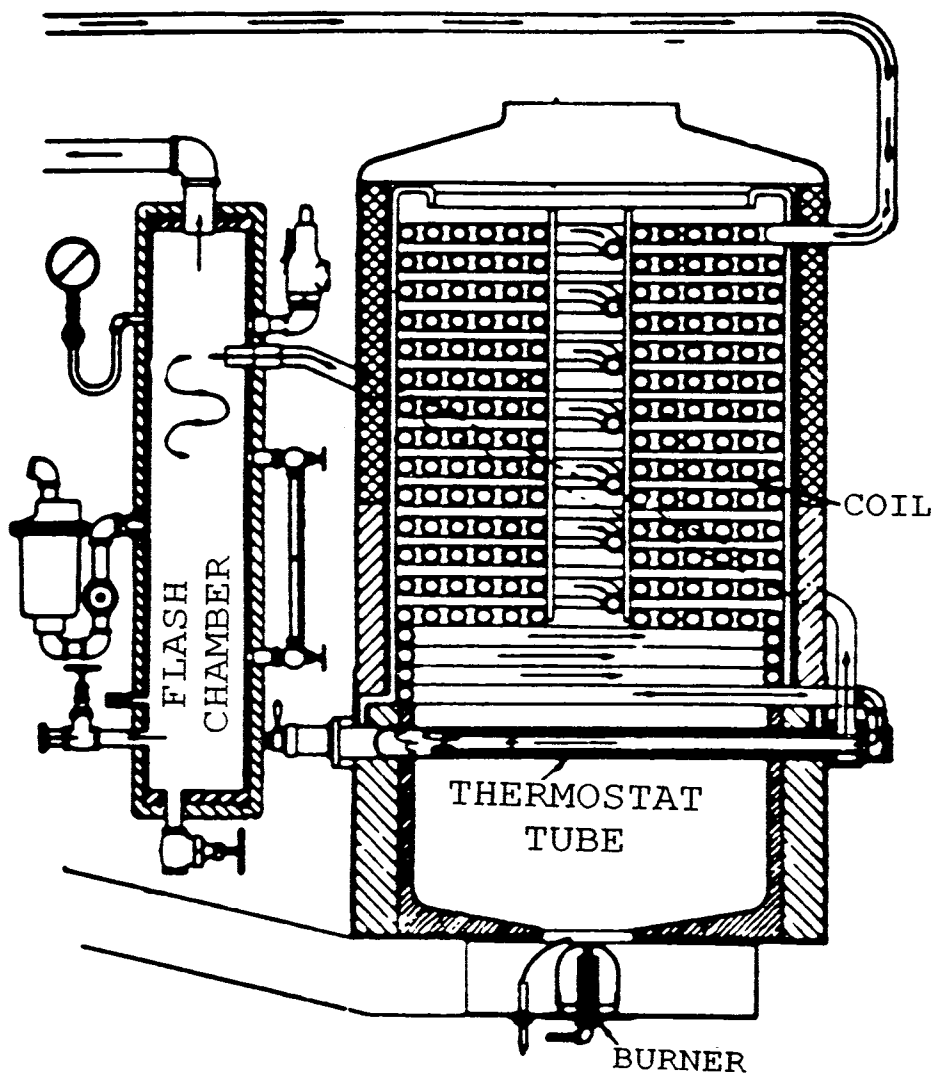
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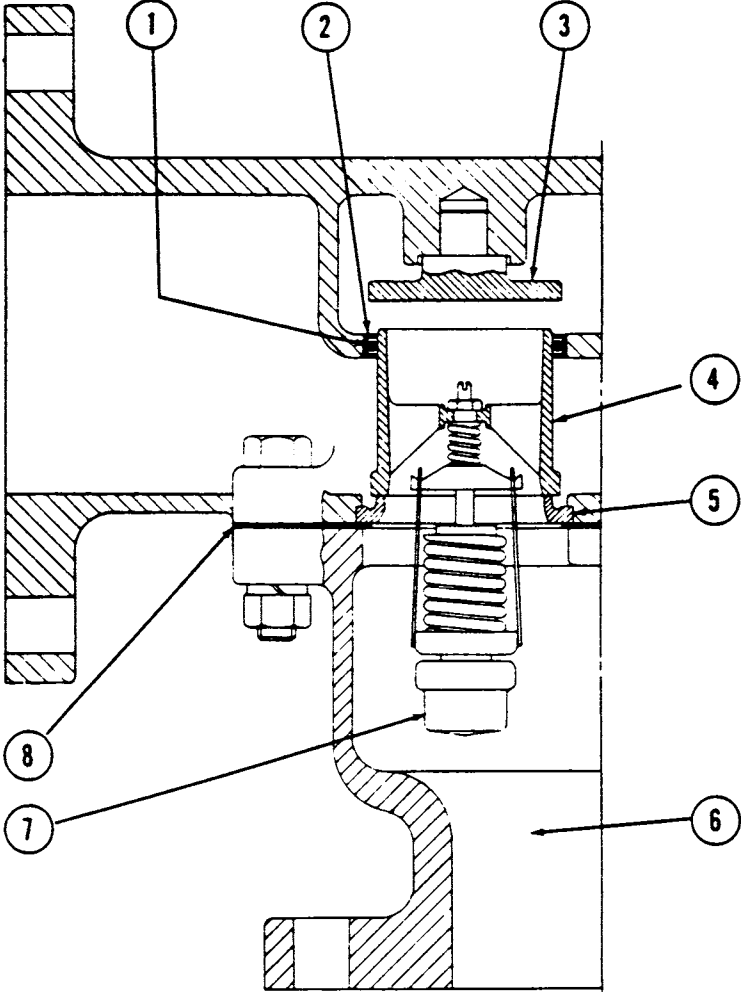




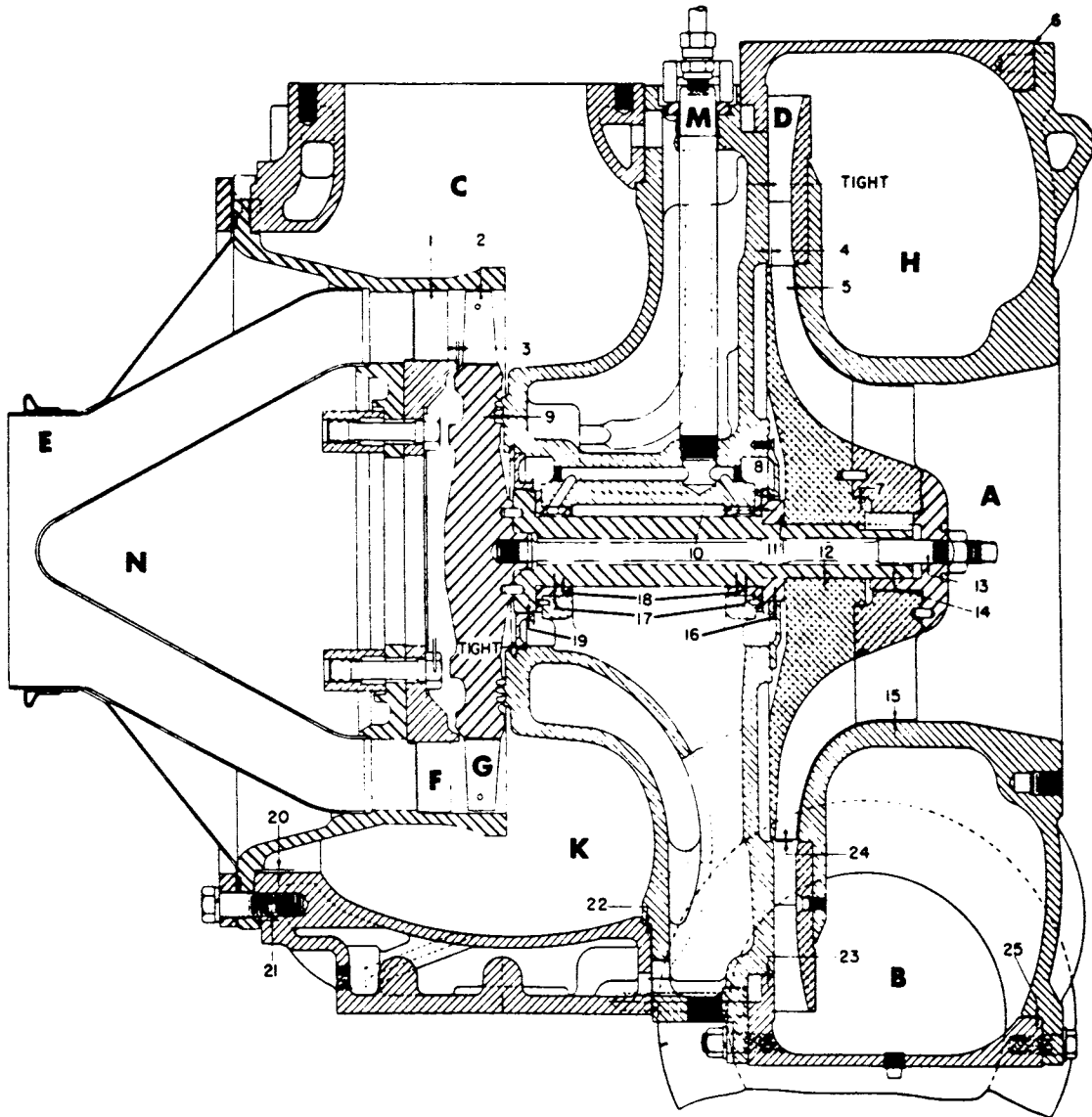
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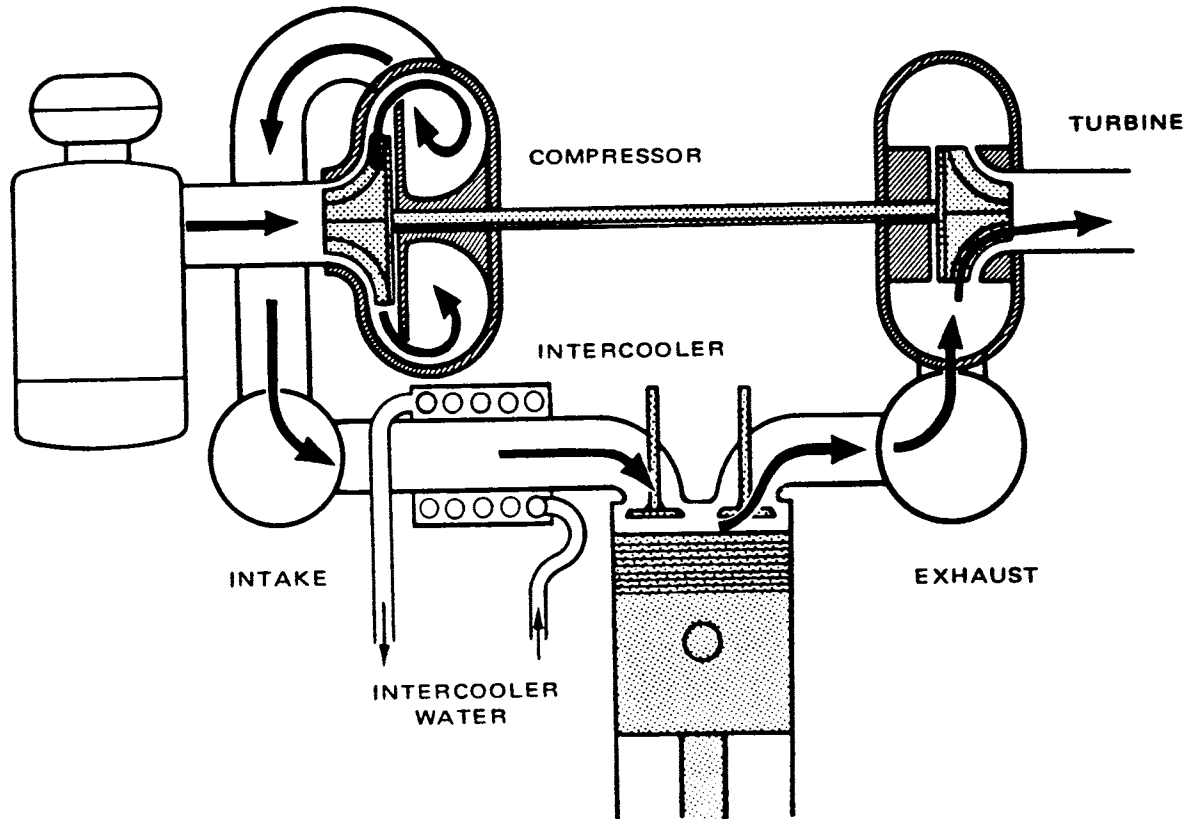
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MO-0080

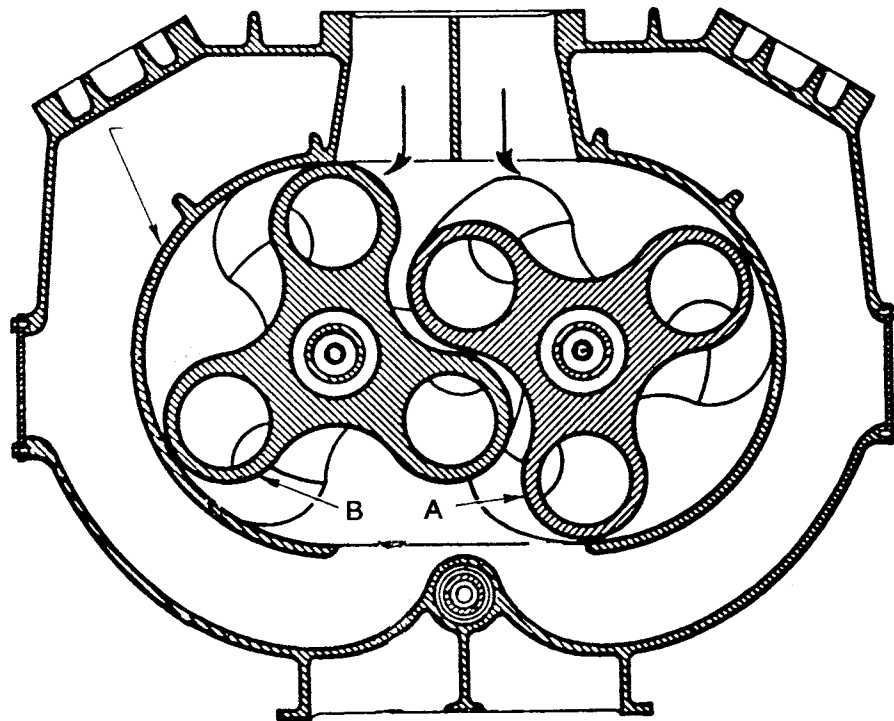


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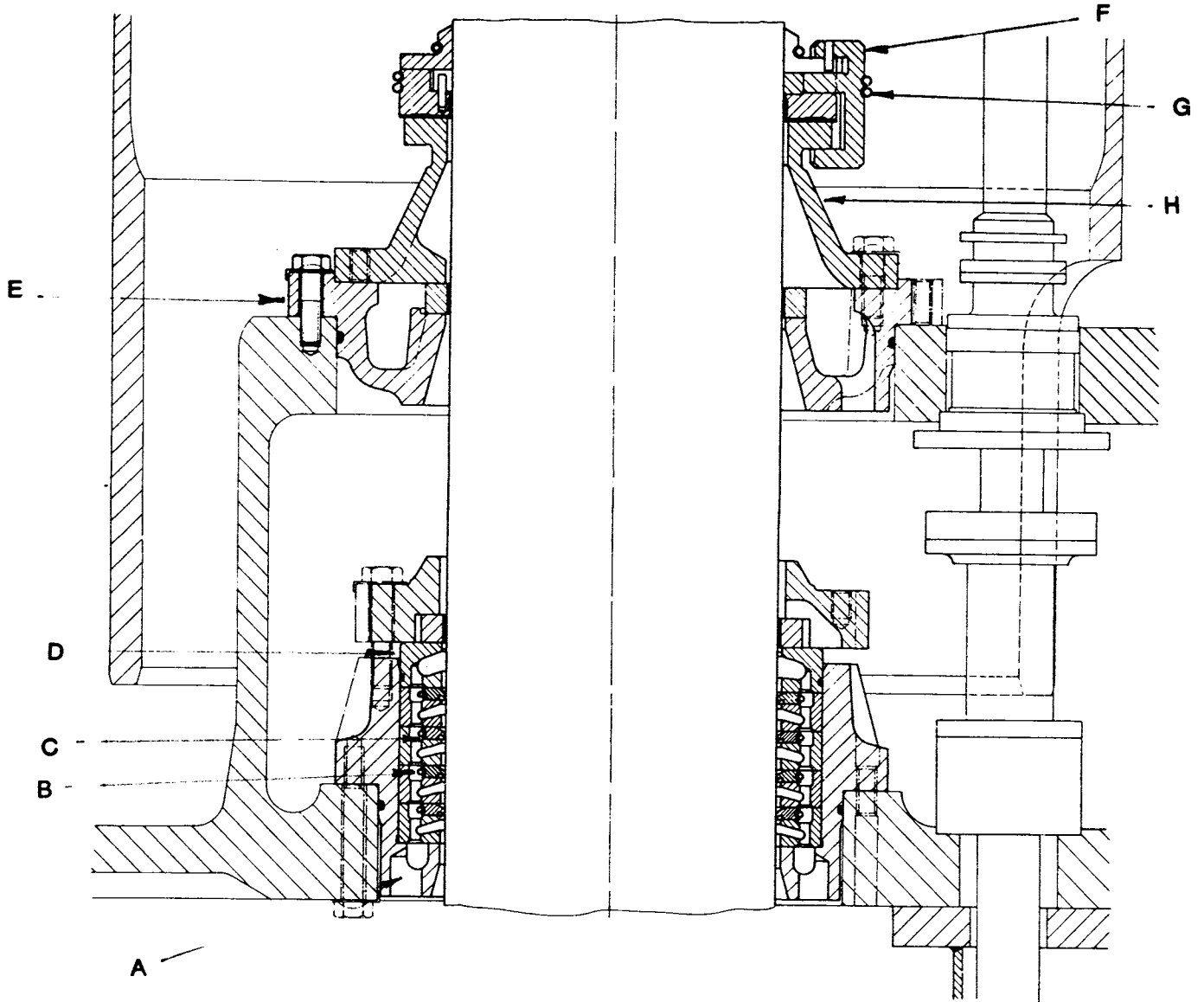


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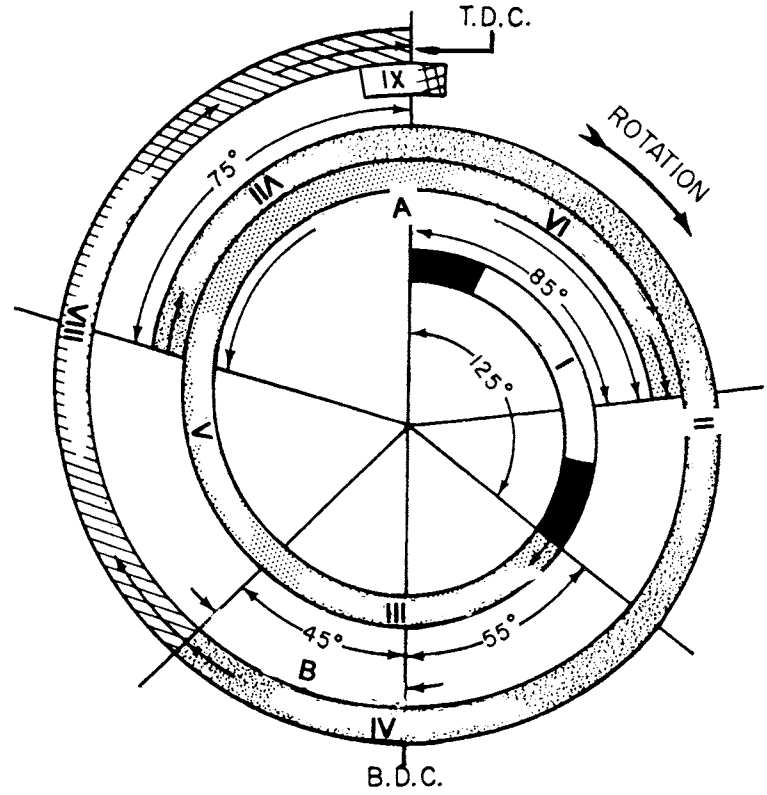
SUCTION



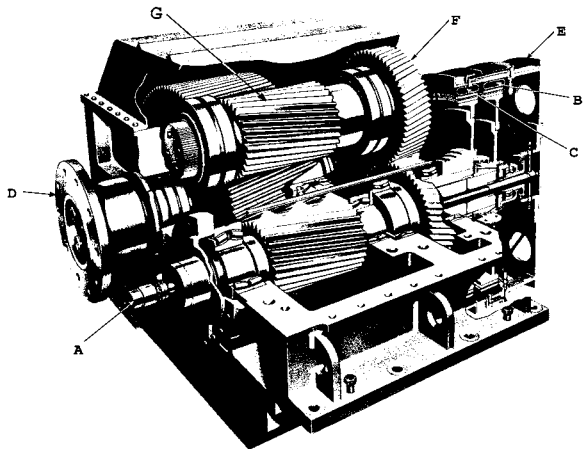
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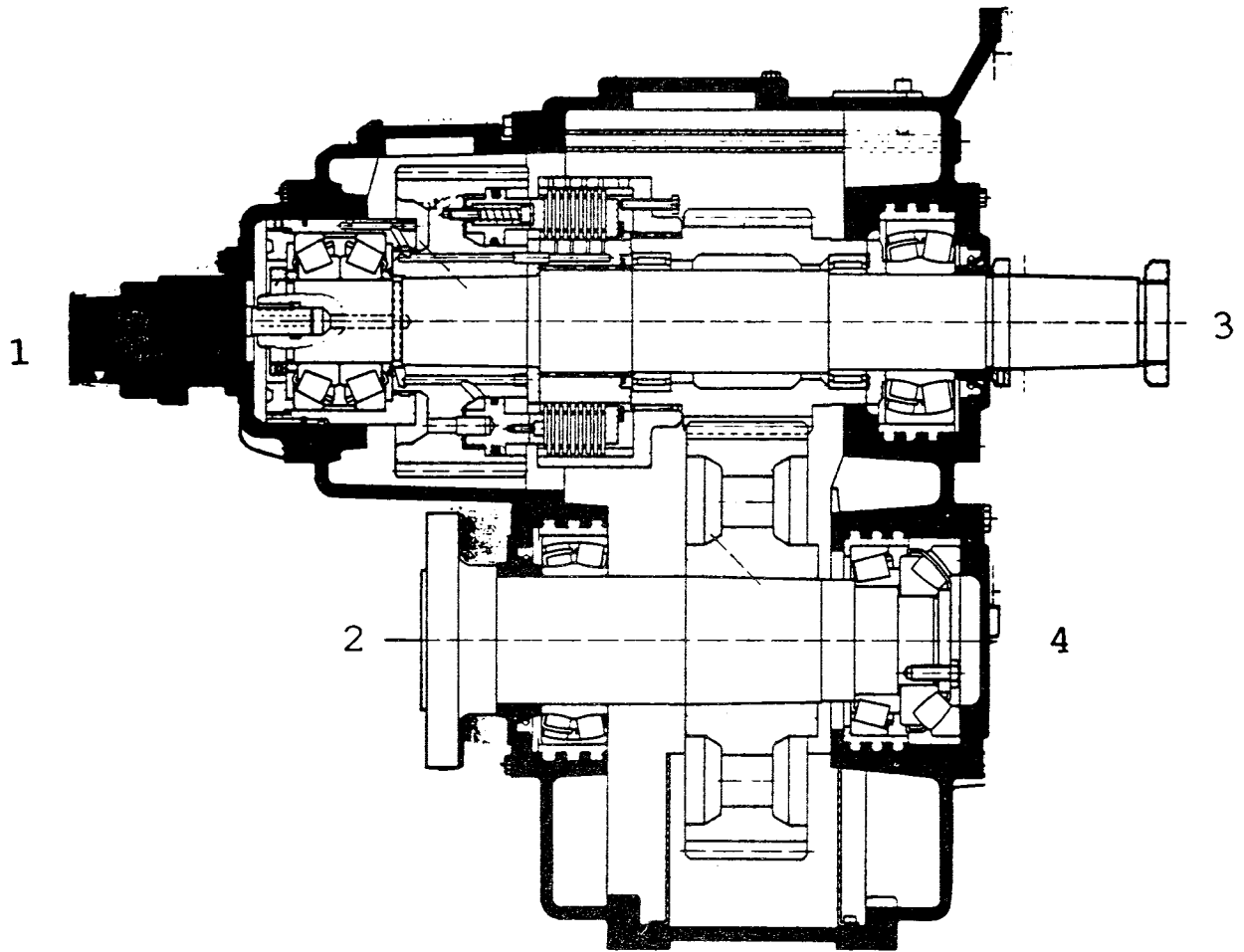


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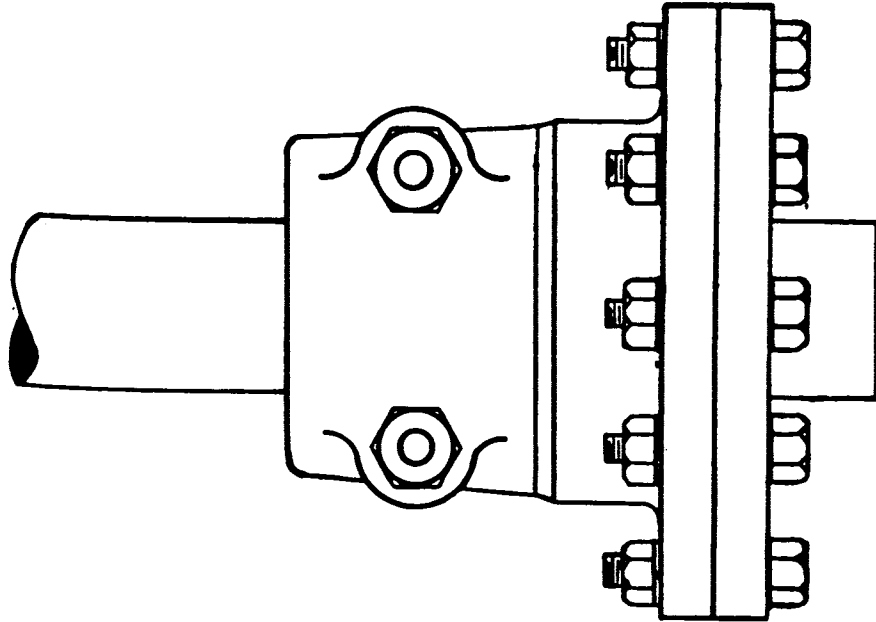


(COURTESY OF THE FALK CORPORATION)

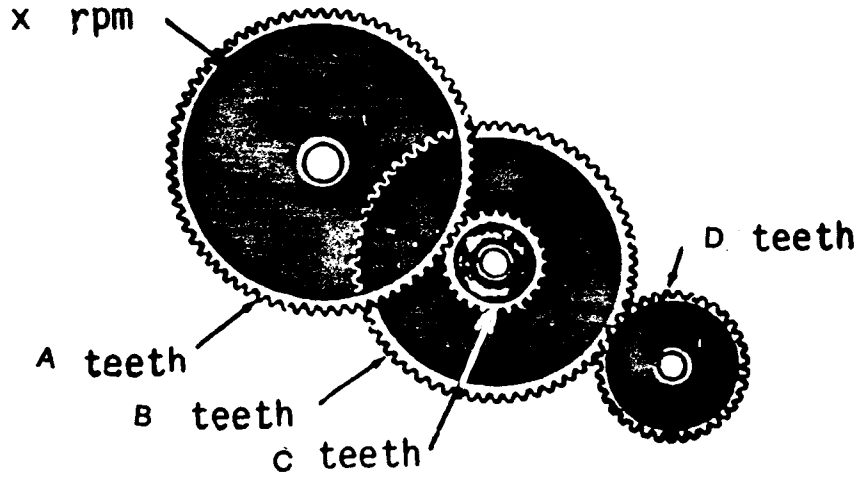
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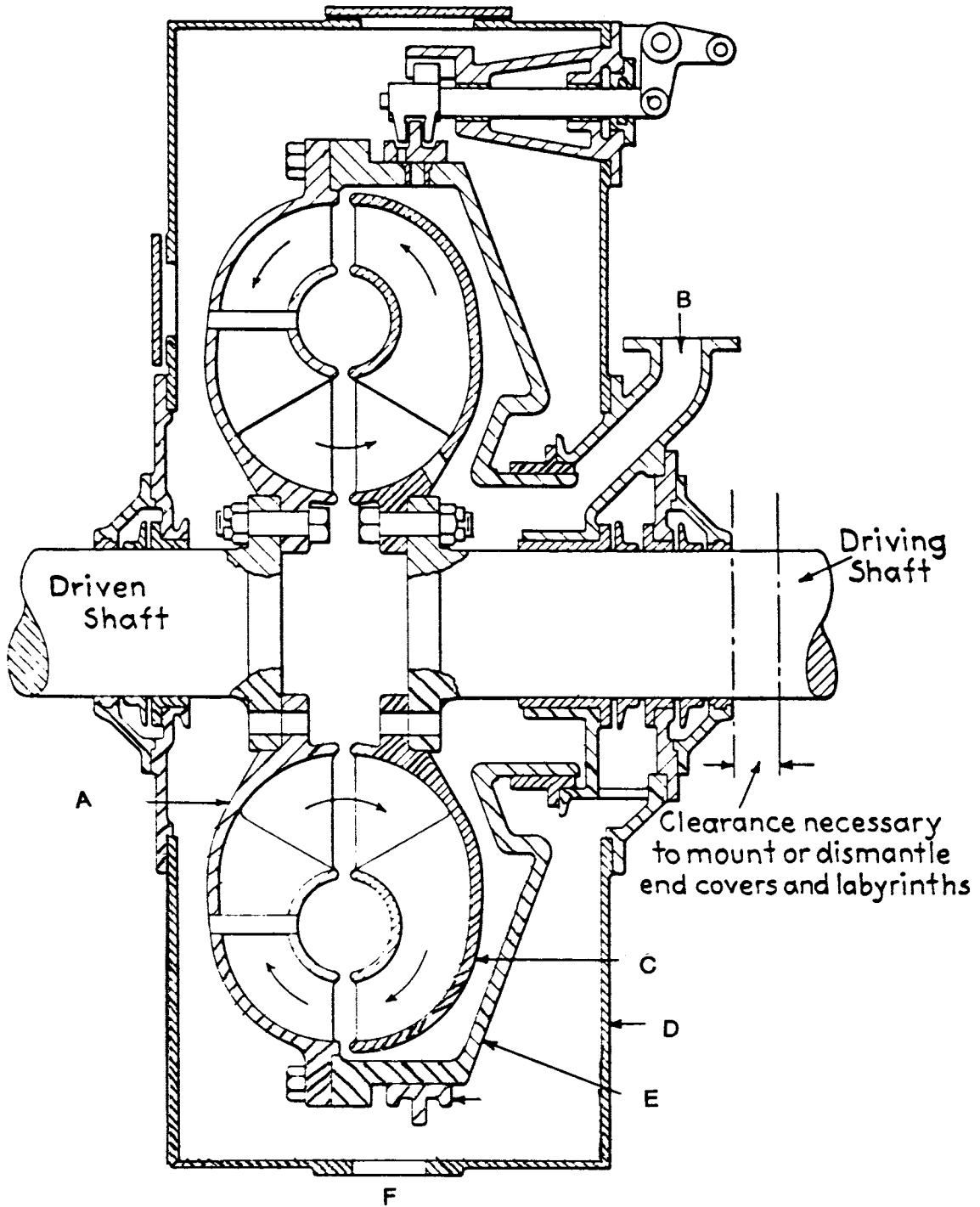
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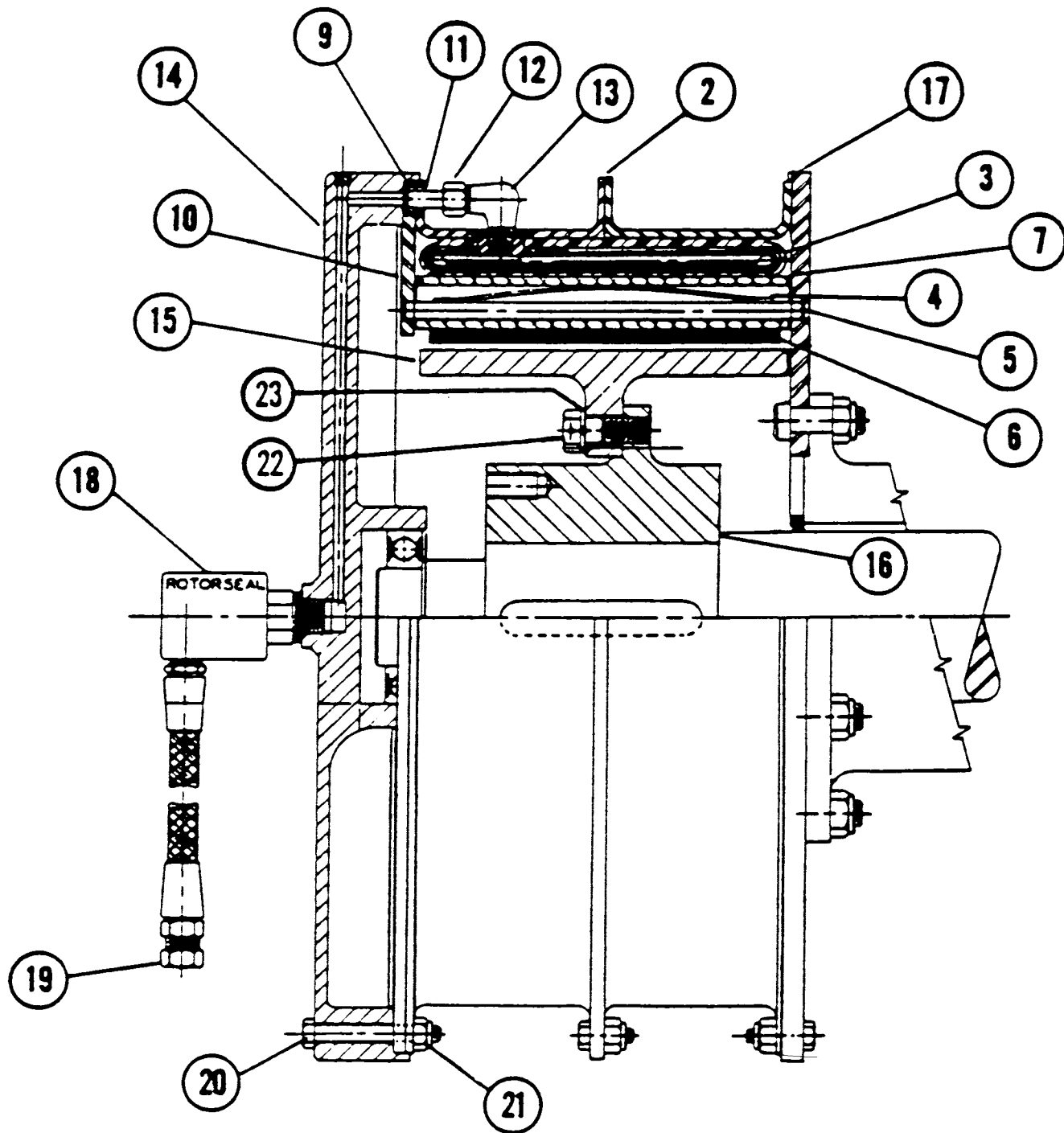
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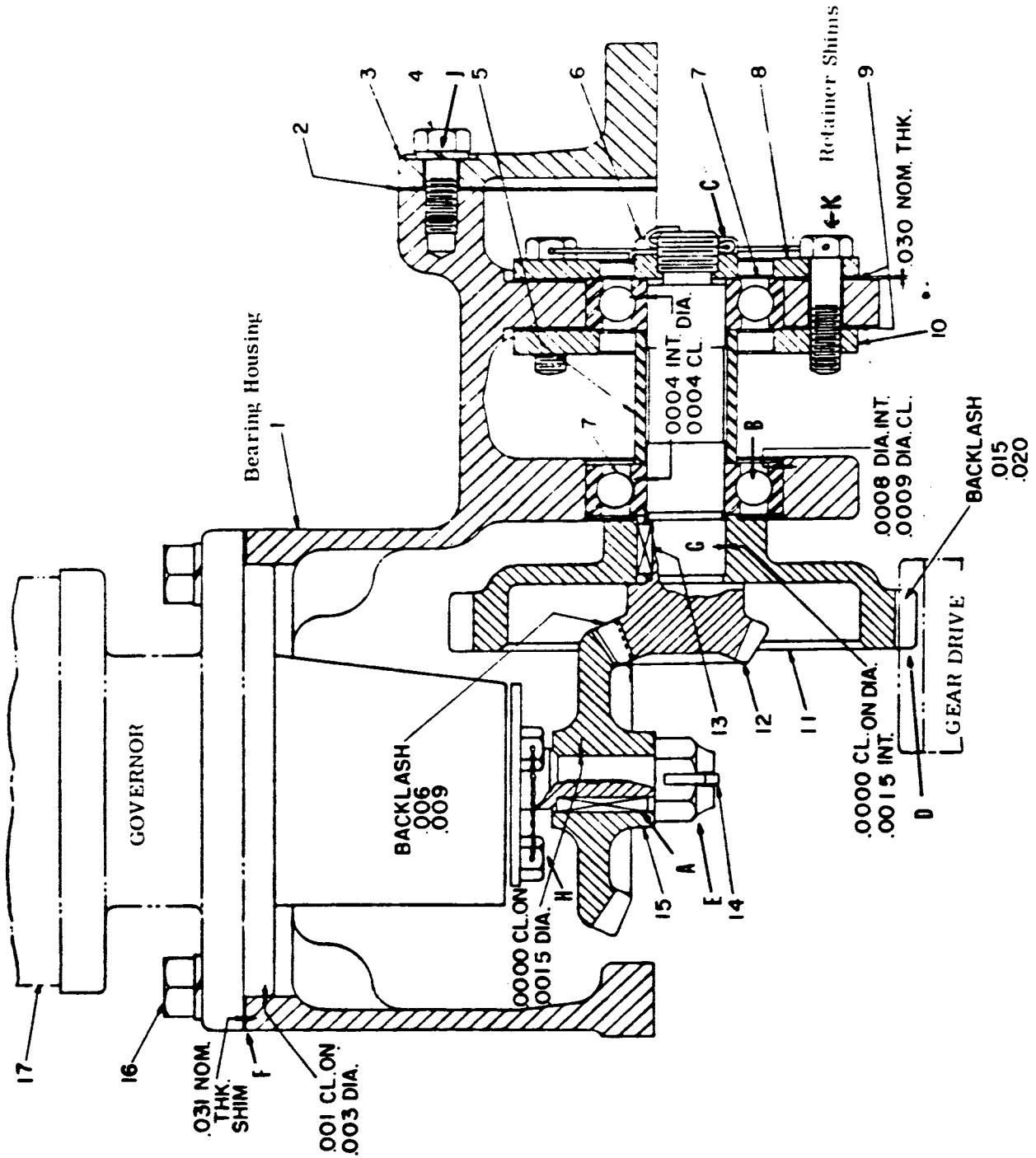


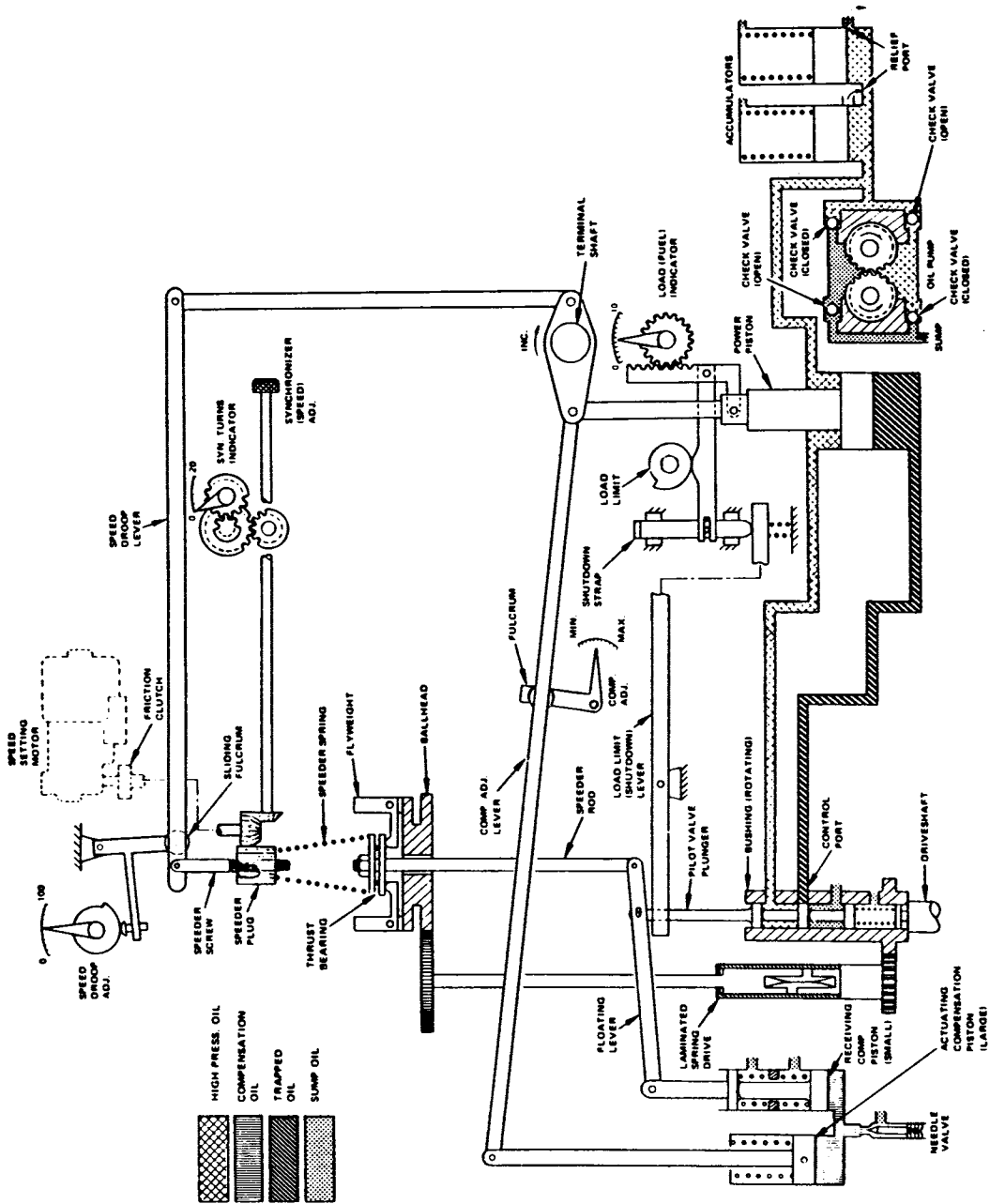
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MO-0090

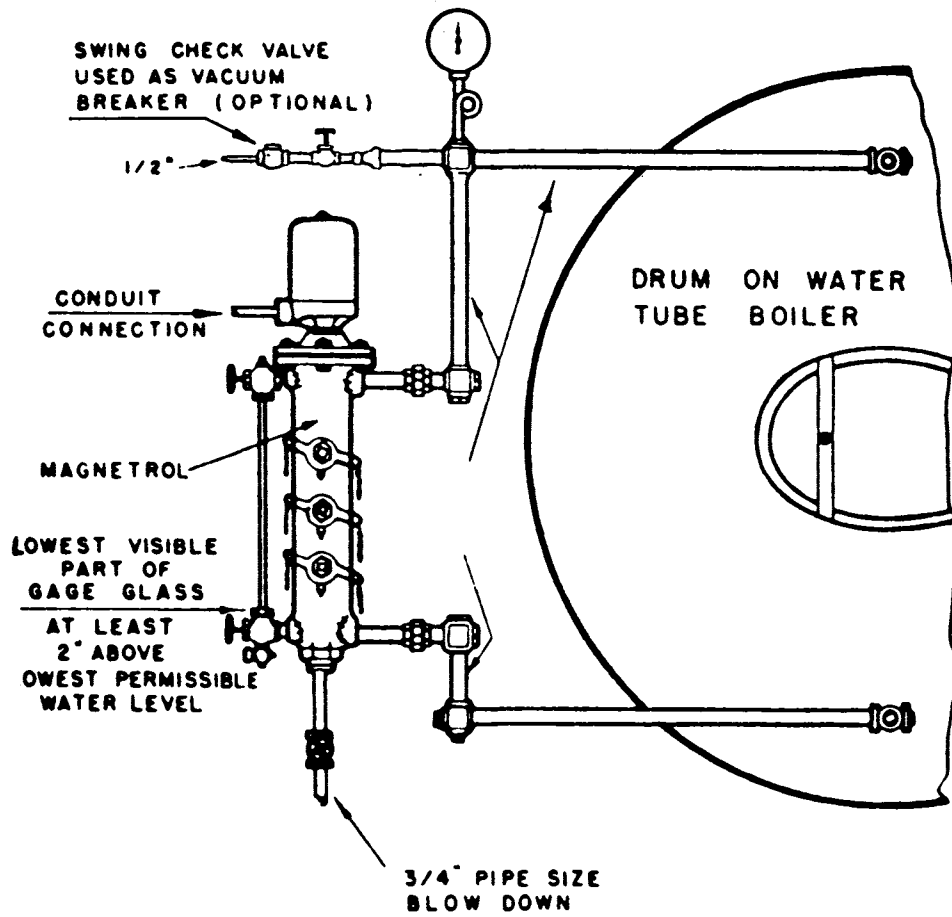


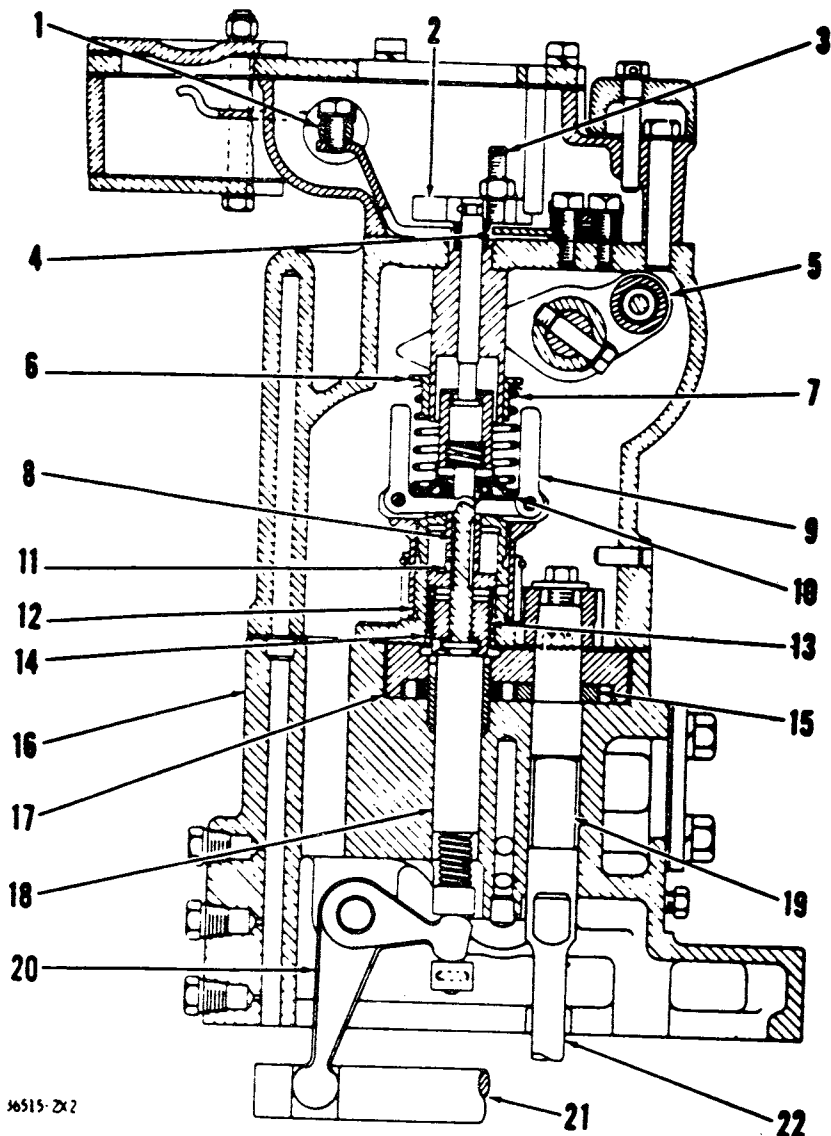




(COURTESY OF WOODWARD GOVERNOR COMPANY)

MO-0093



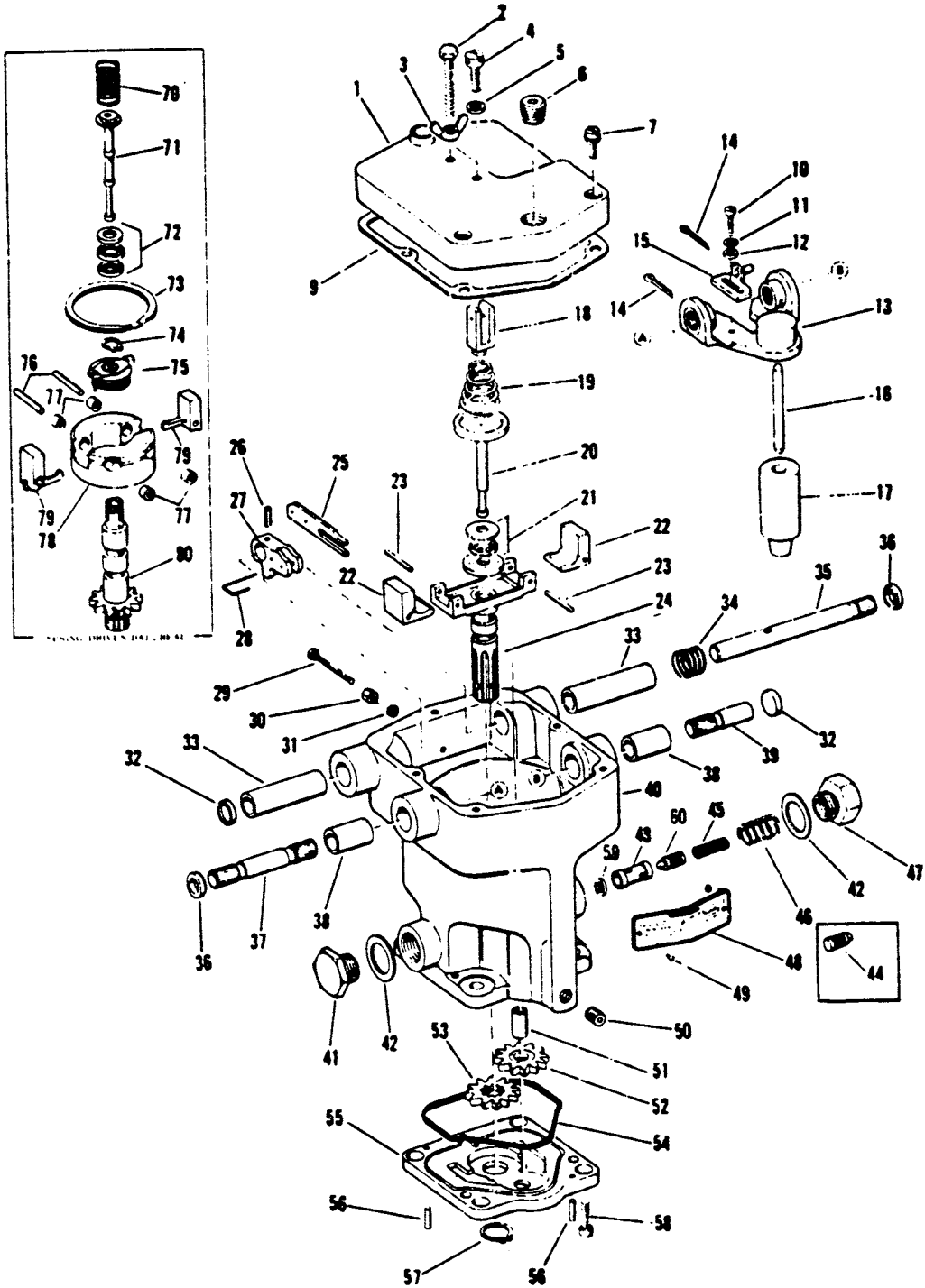


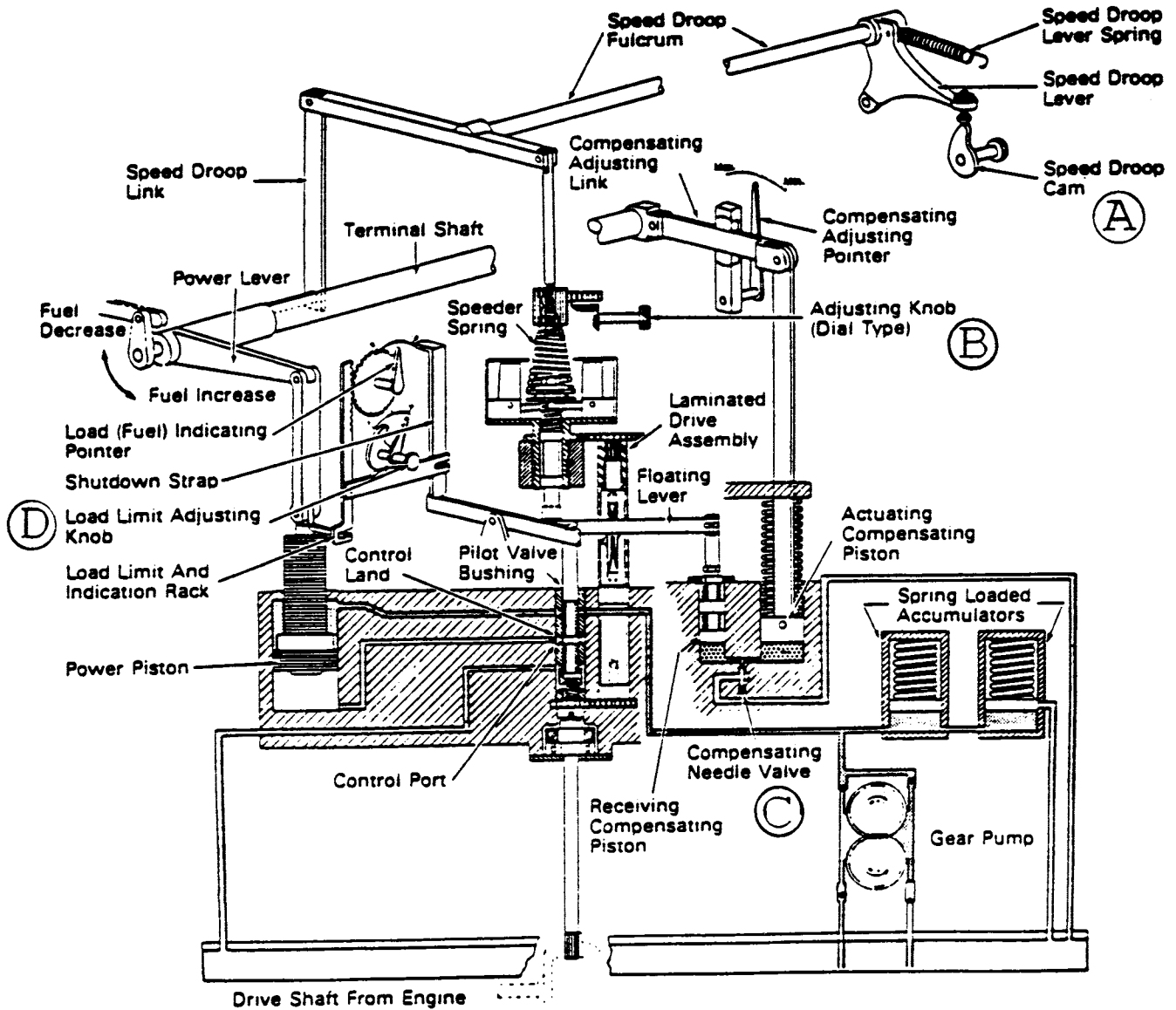
46515-2x2

GOVERNOR

1. Shutoff shaft. 2. Collar. 3. Adjusting screw. 4. Stop bar. 5. Lever assembly. 6. Seat assembly. 7. Governor spring. 8. Valve. 9. Weight assembly. 10. Seat. 11. Oil passage. 12. Cylinder. 13. Piston. 14. Sleeve. 15. Oil pump gear. 16. Governor drive housing. 17. Oil pump cover. 18. Pin assembly. 19. Shaft assembly. 20. Lever. 21. Fuel rack. 22. Drive pinion.

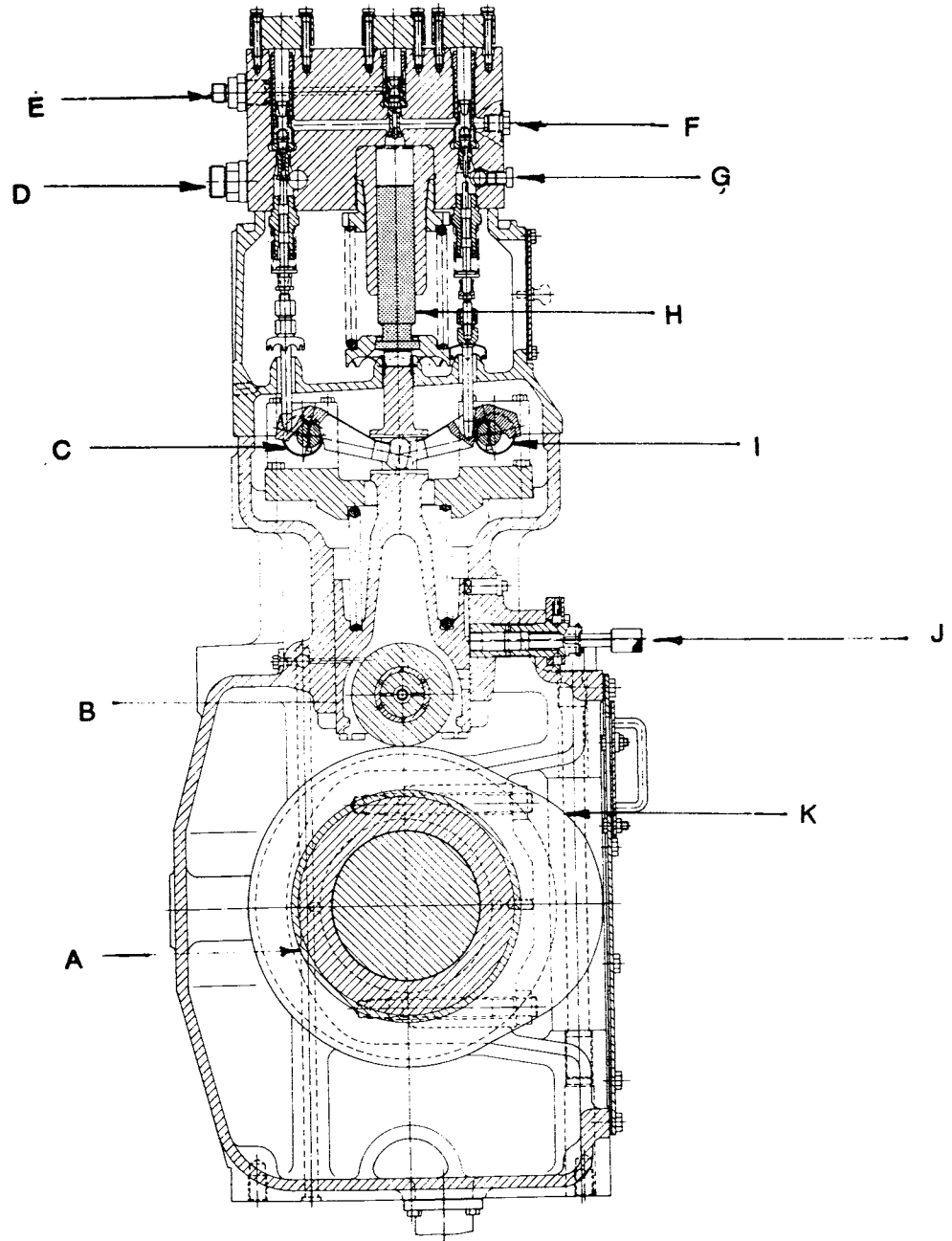
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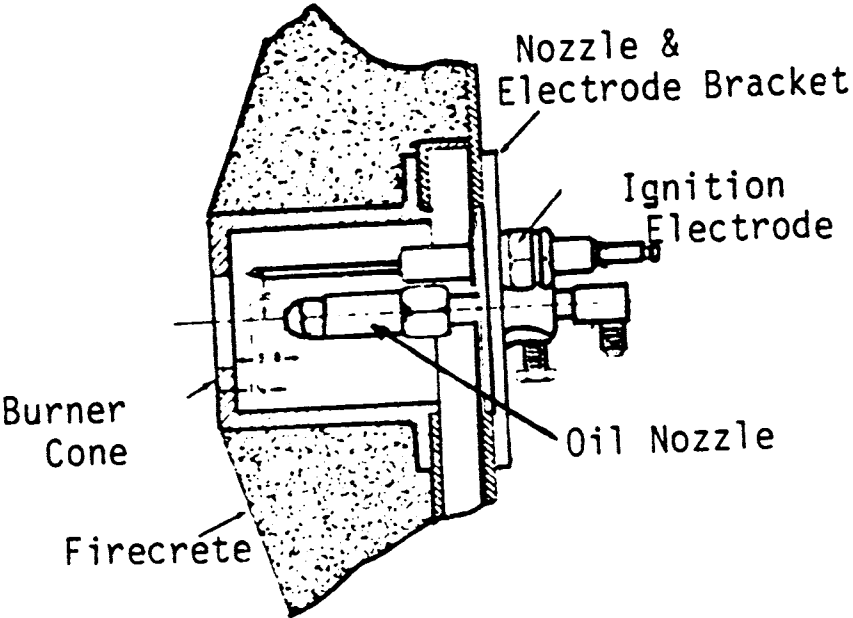


(COURTESY OF WOODWARD GOVERNOR COMPANY)

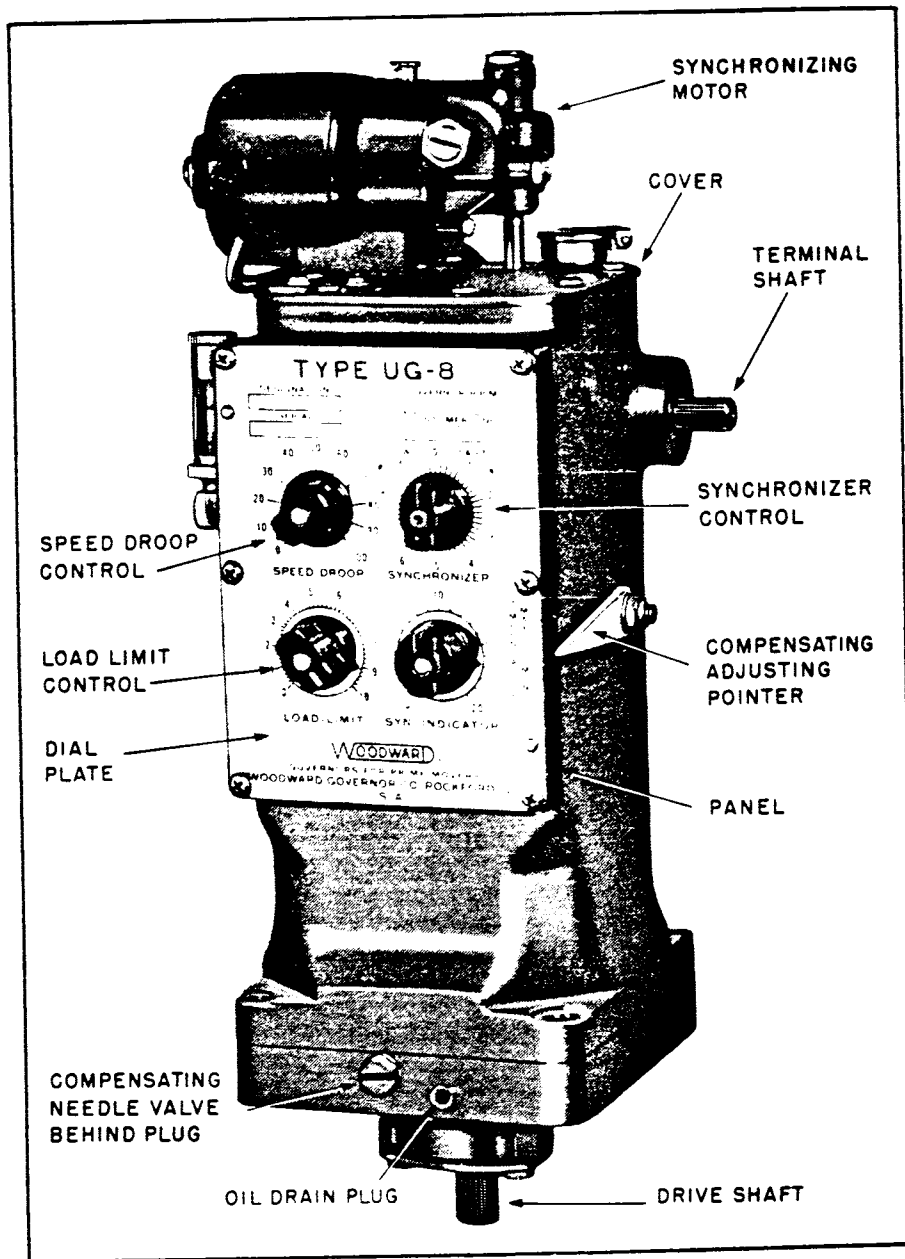
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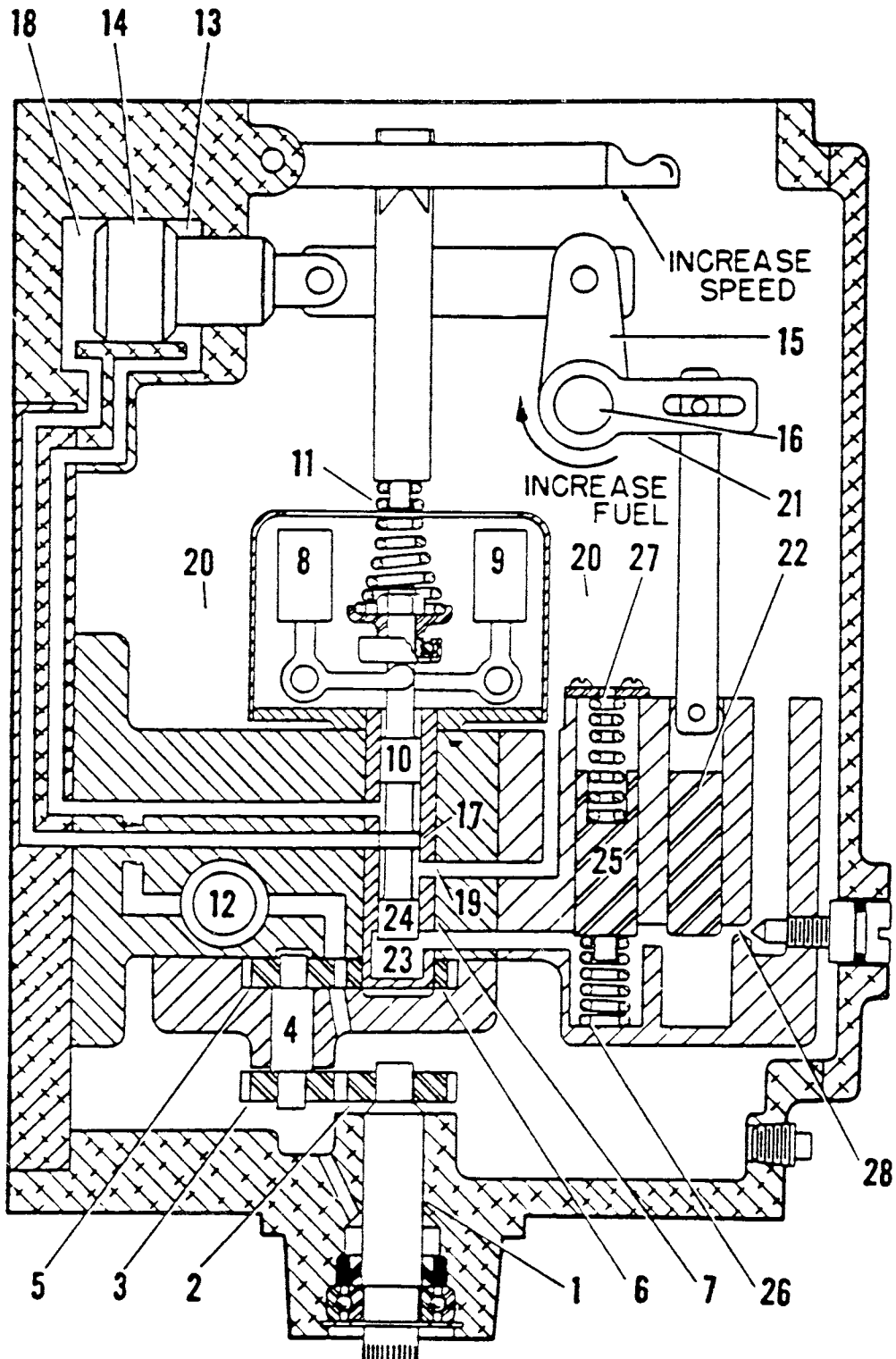


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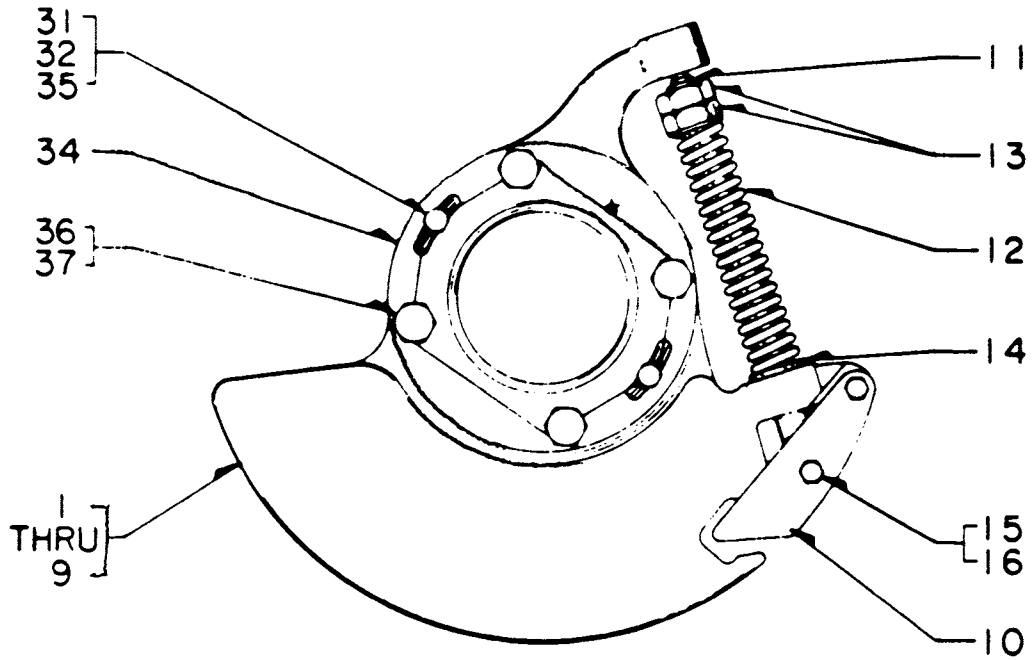


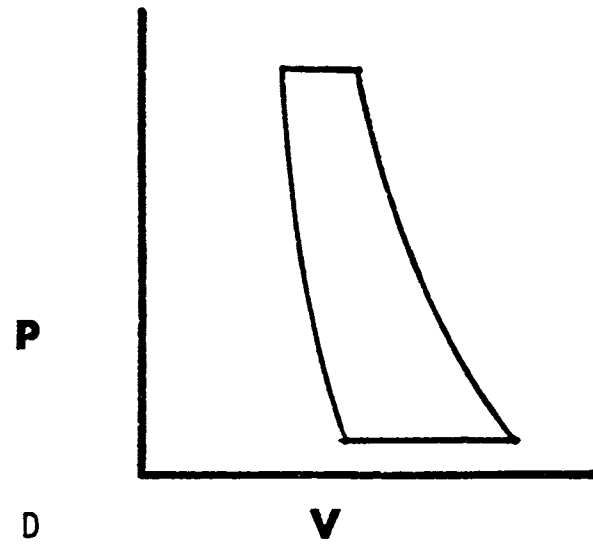
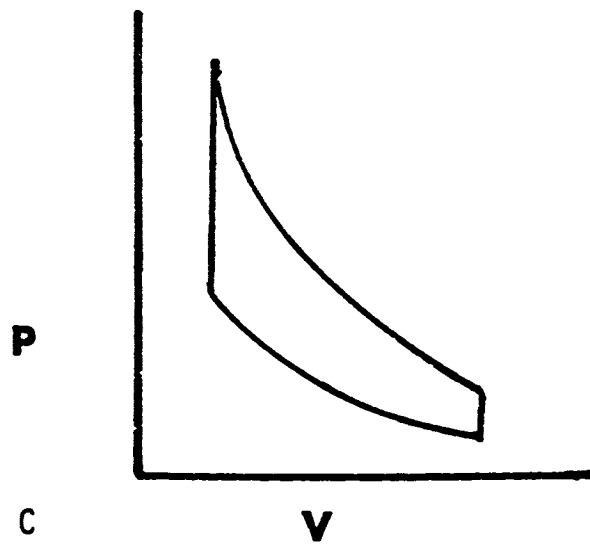
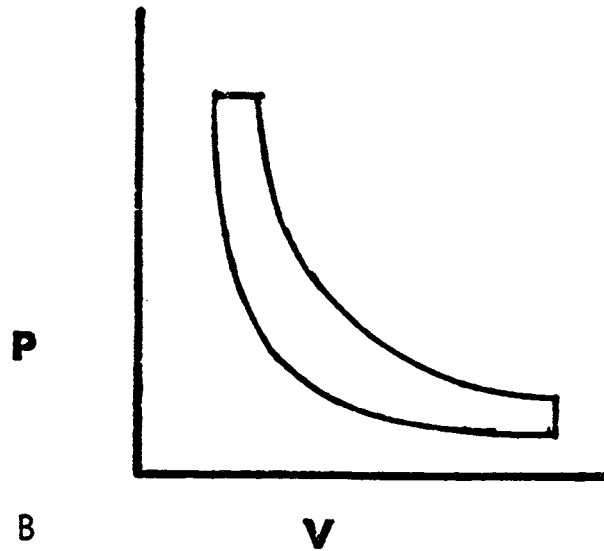
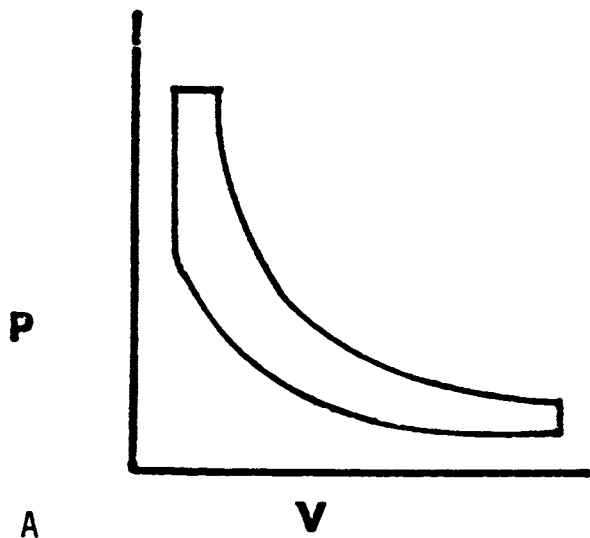
(COURTESY OF WOODWARD GOVERNOR COMPANY)

MO-01.00

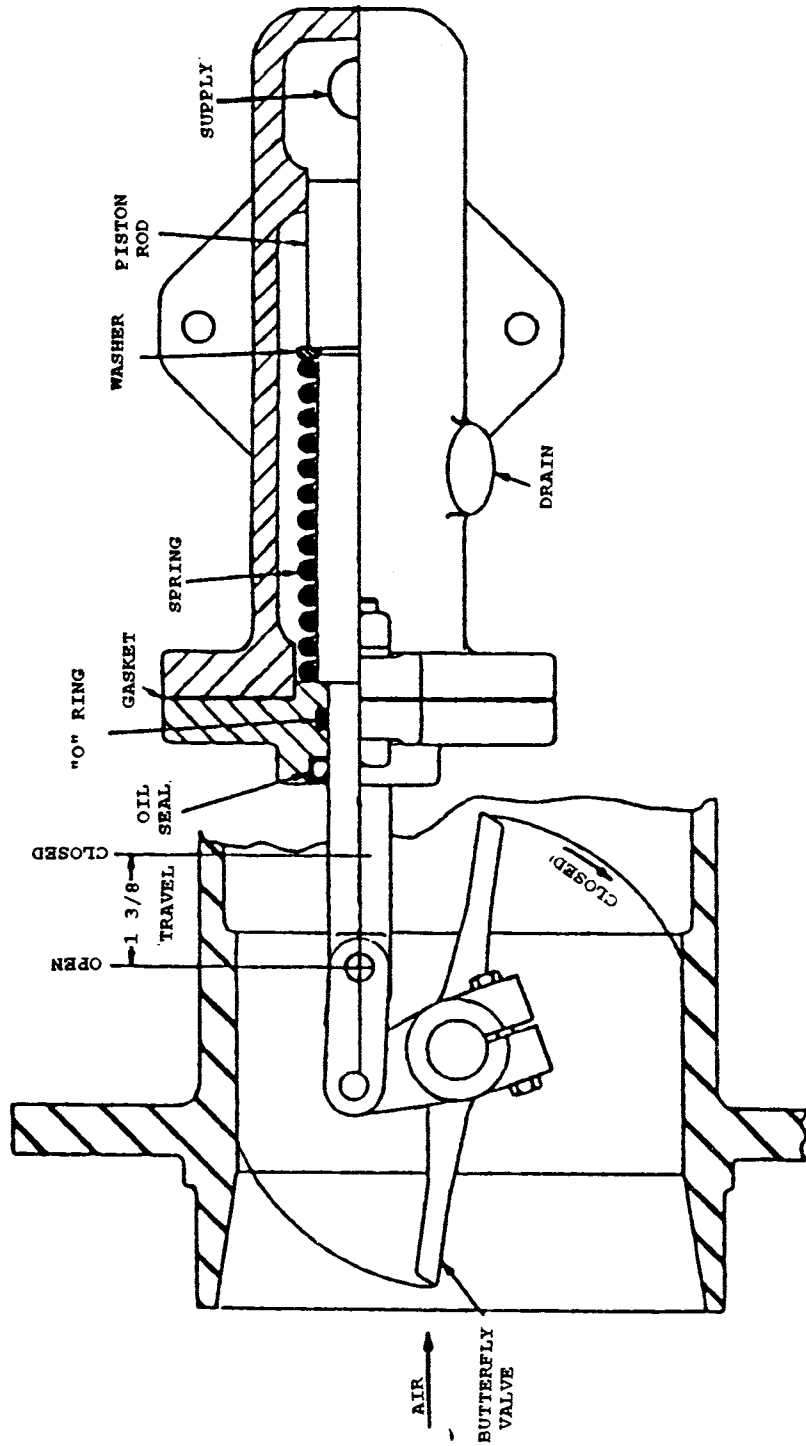


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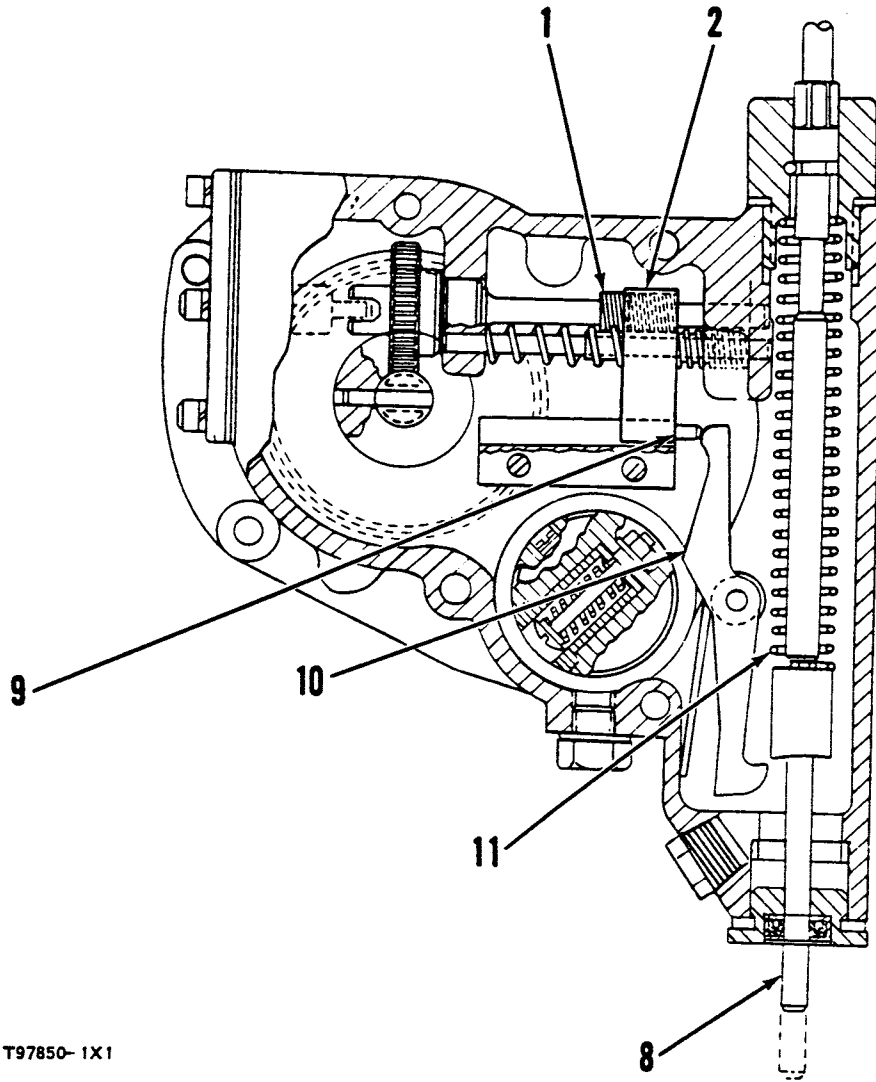




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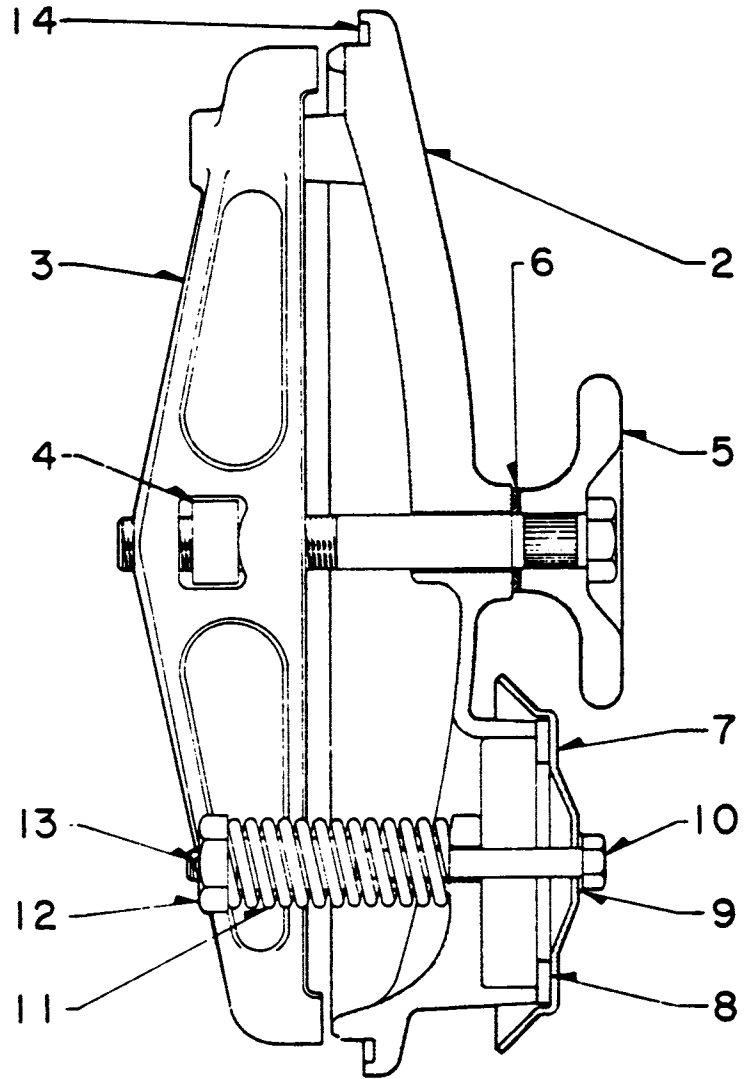


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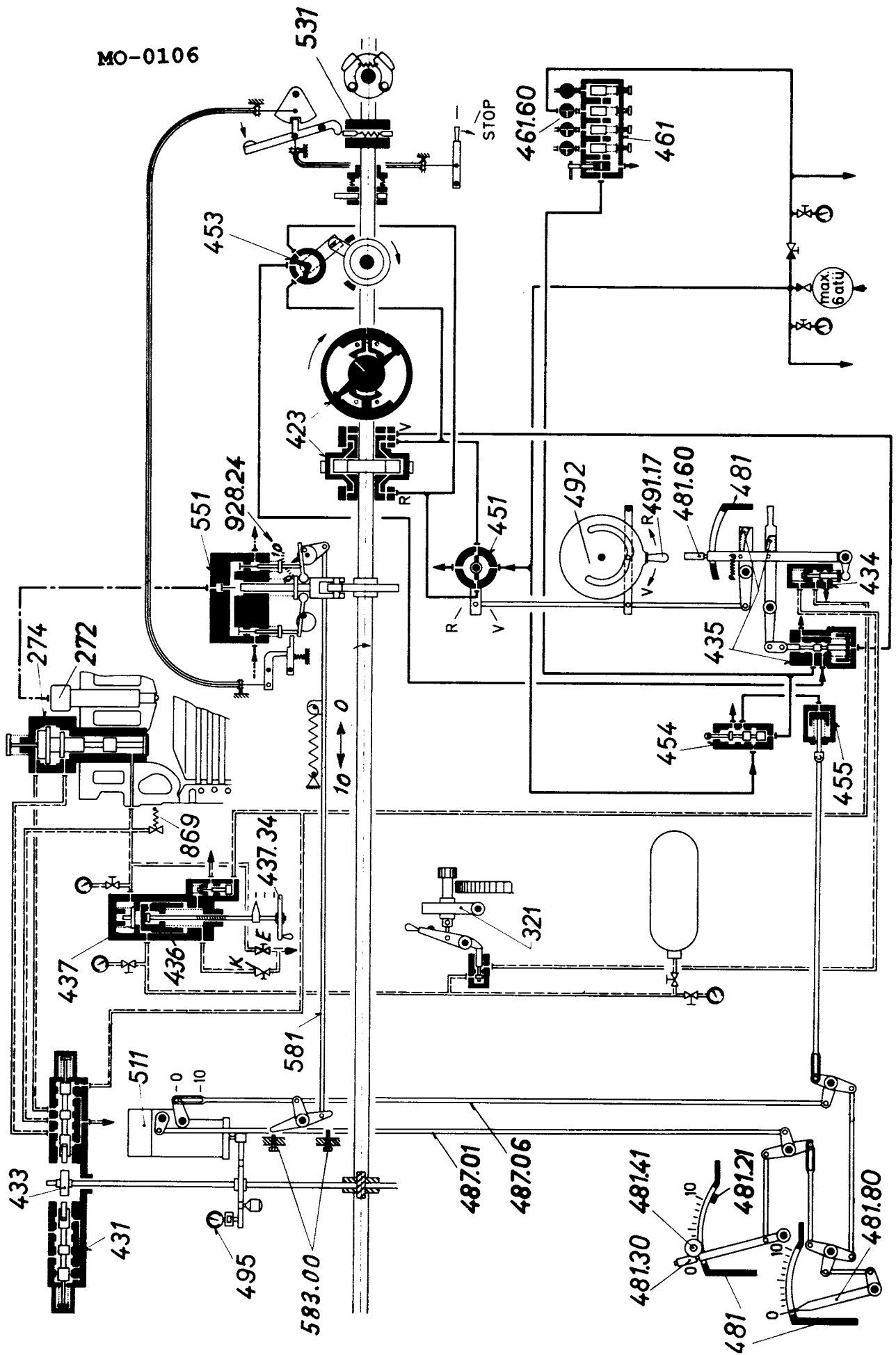


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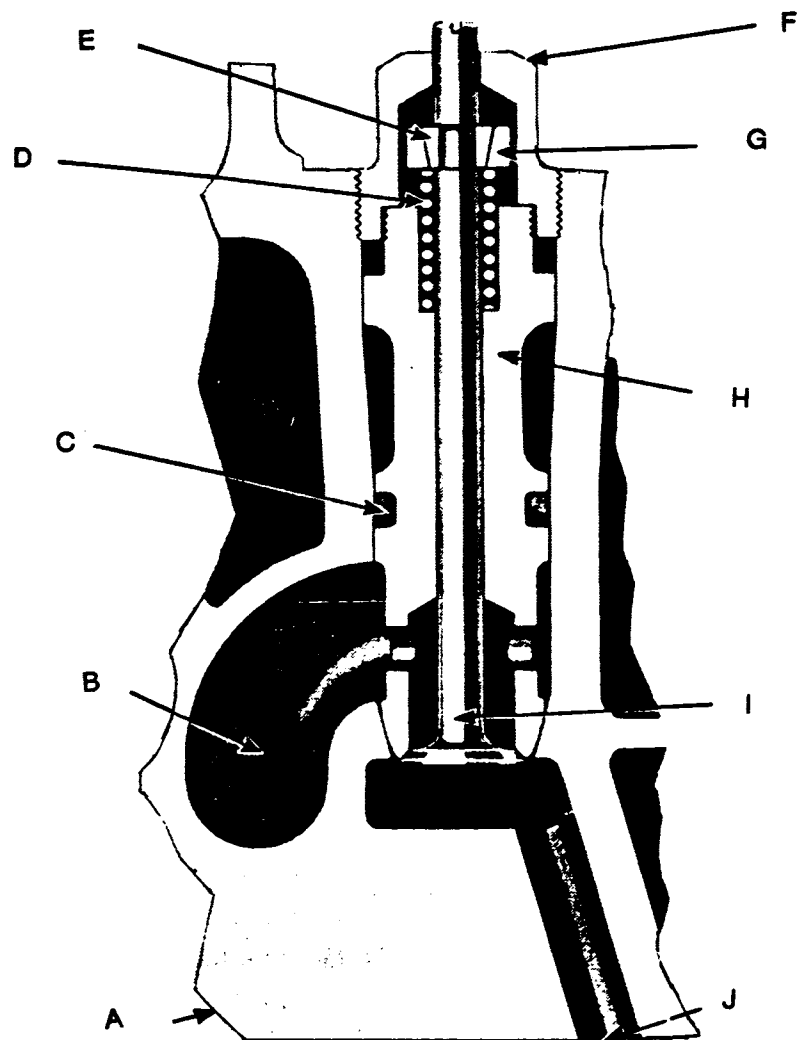
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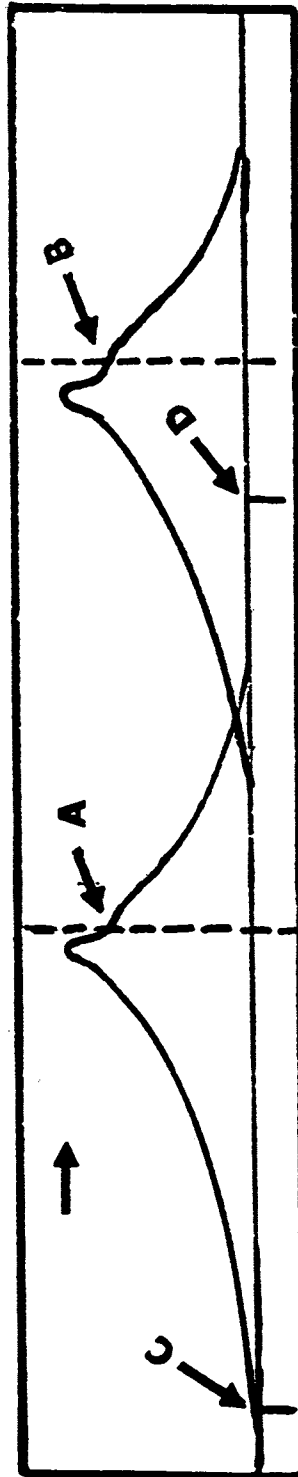
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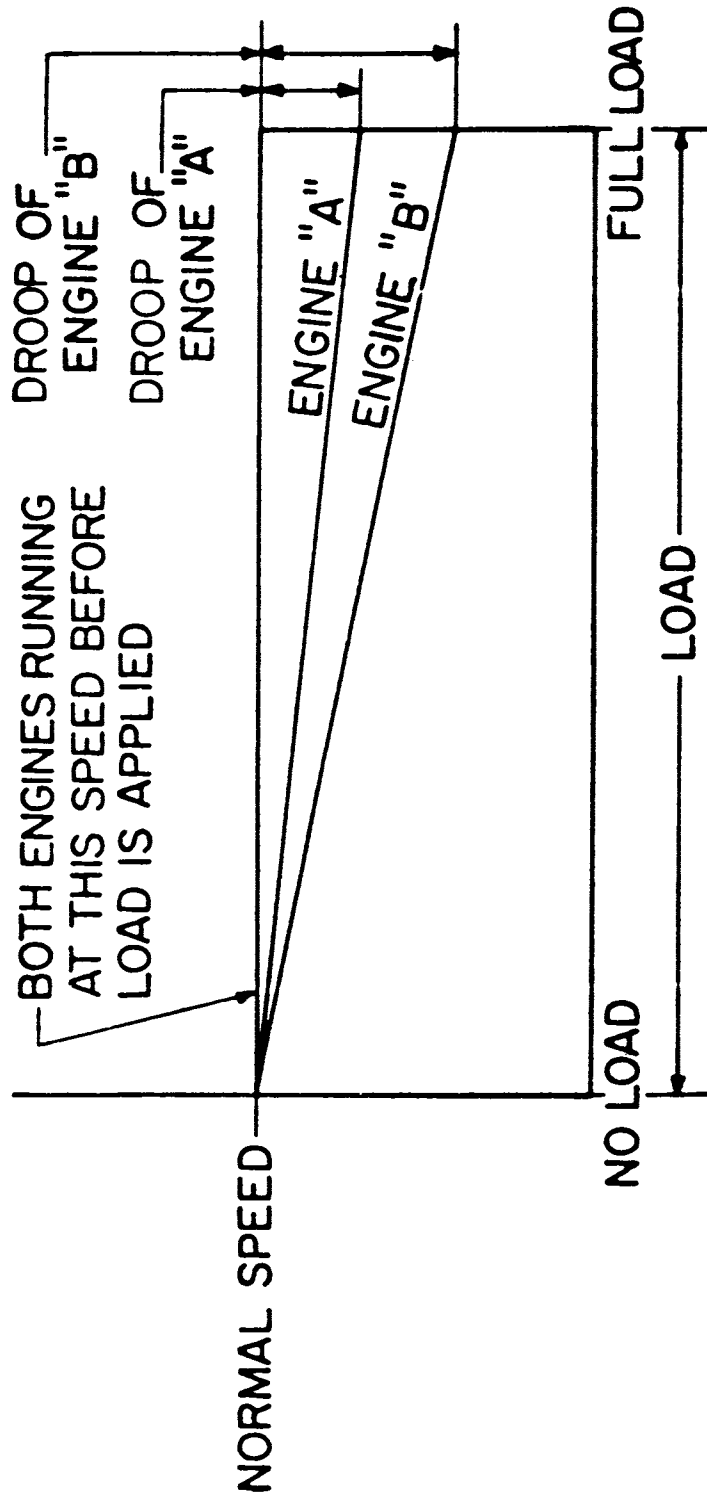


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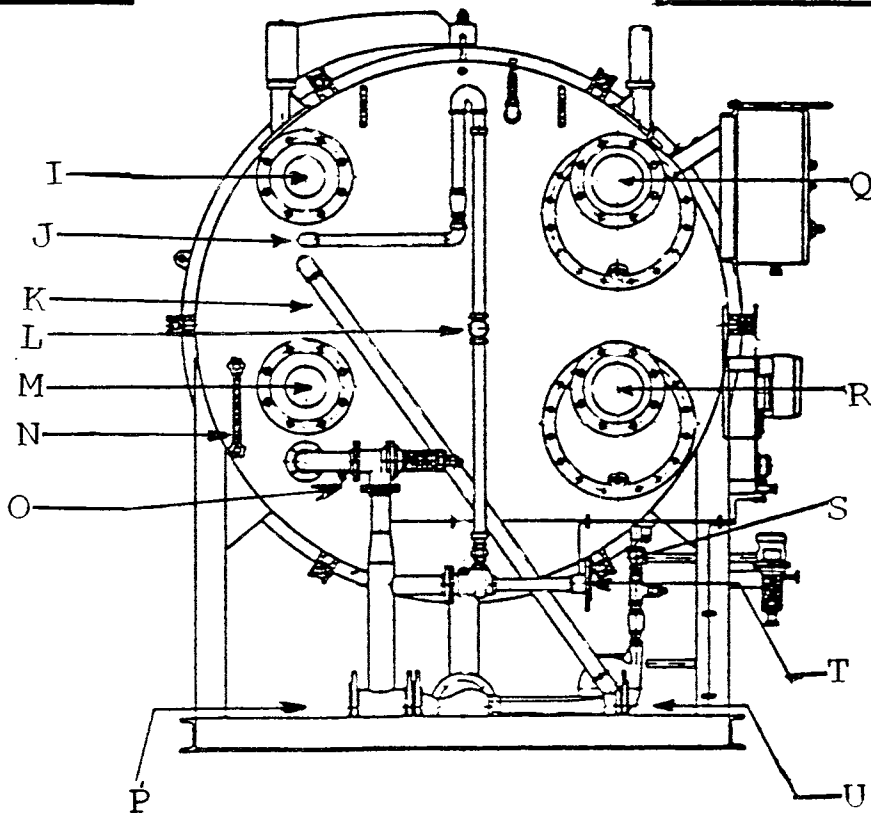
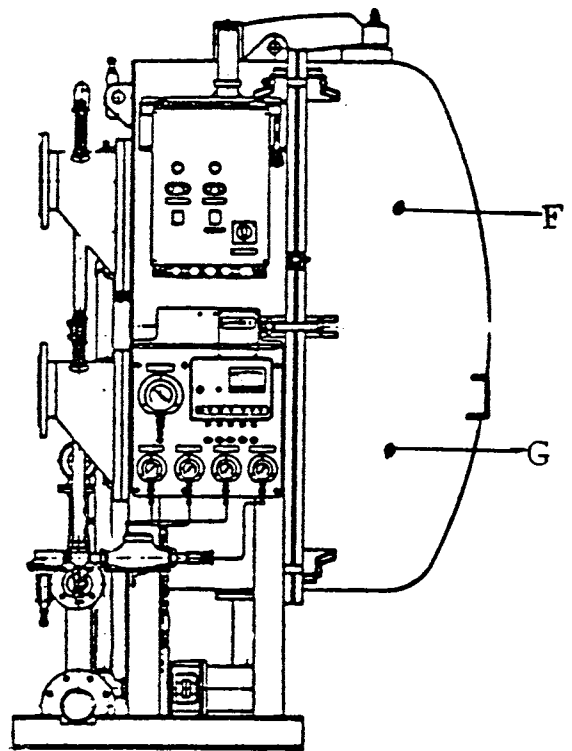
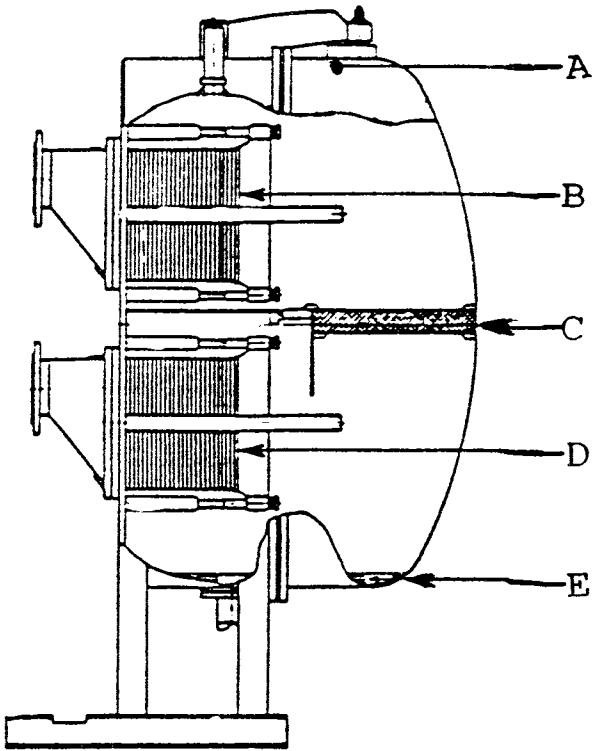


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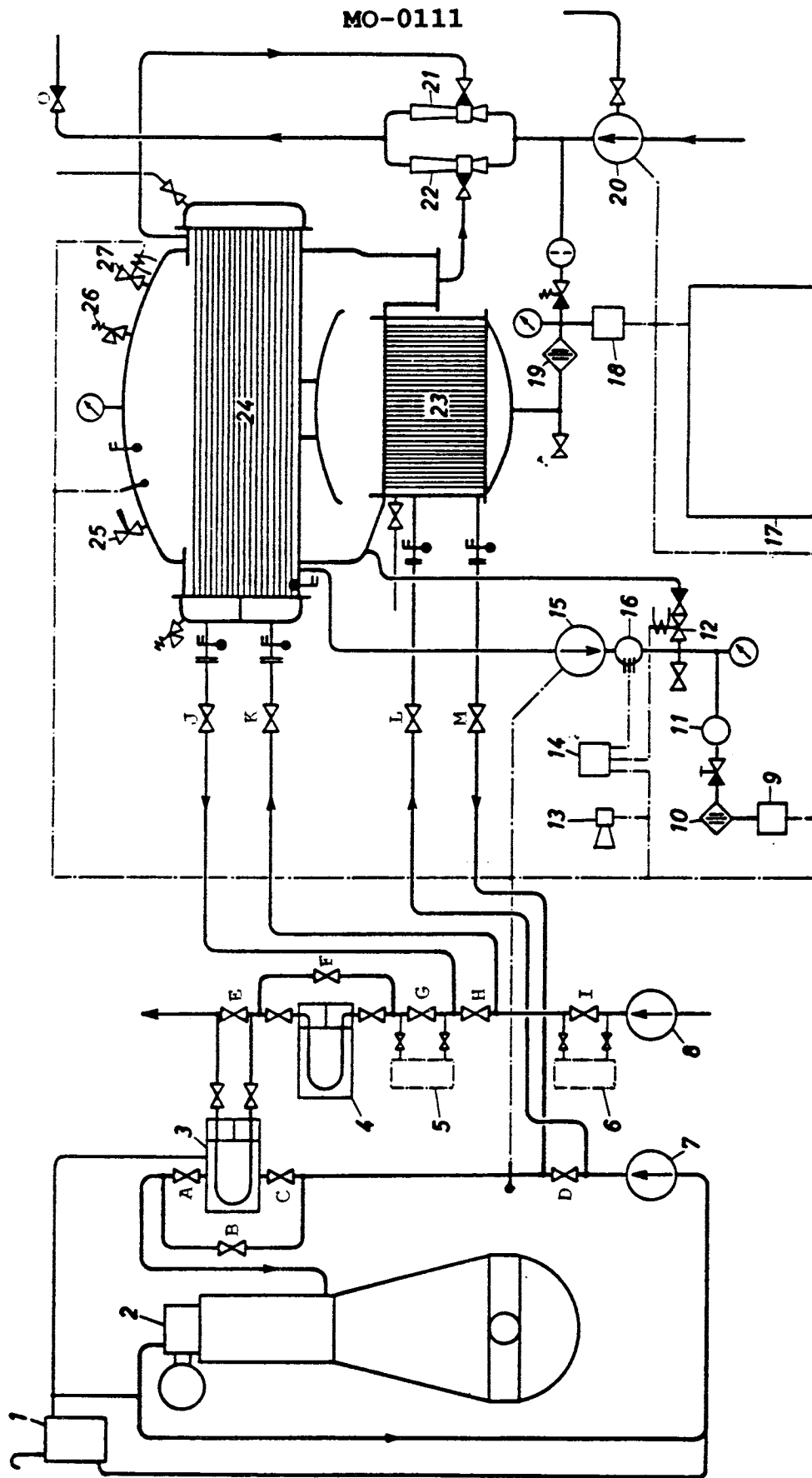




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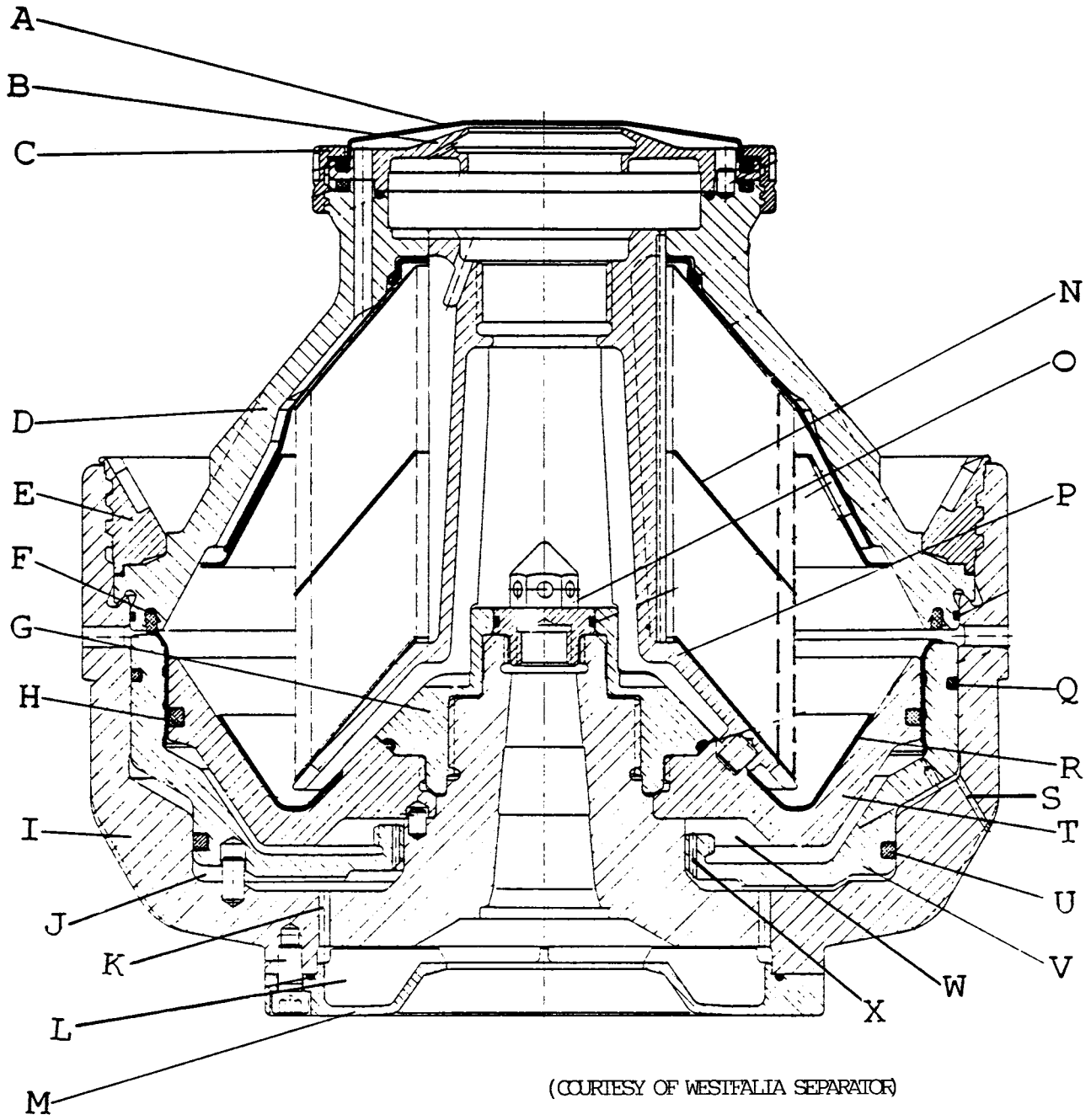
(COURTESY OF ALFA-LAVAL [MARINE AND POWER DIVISION])



MO-0111

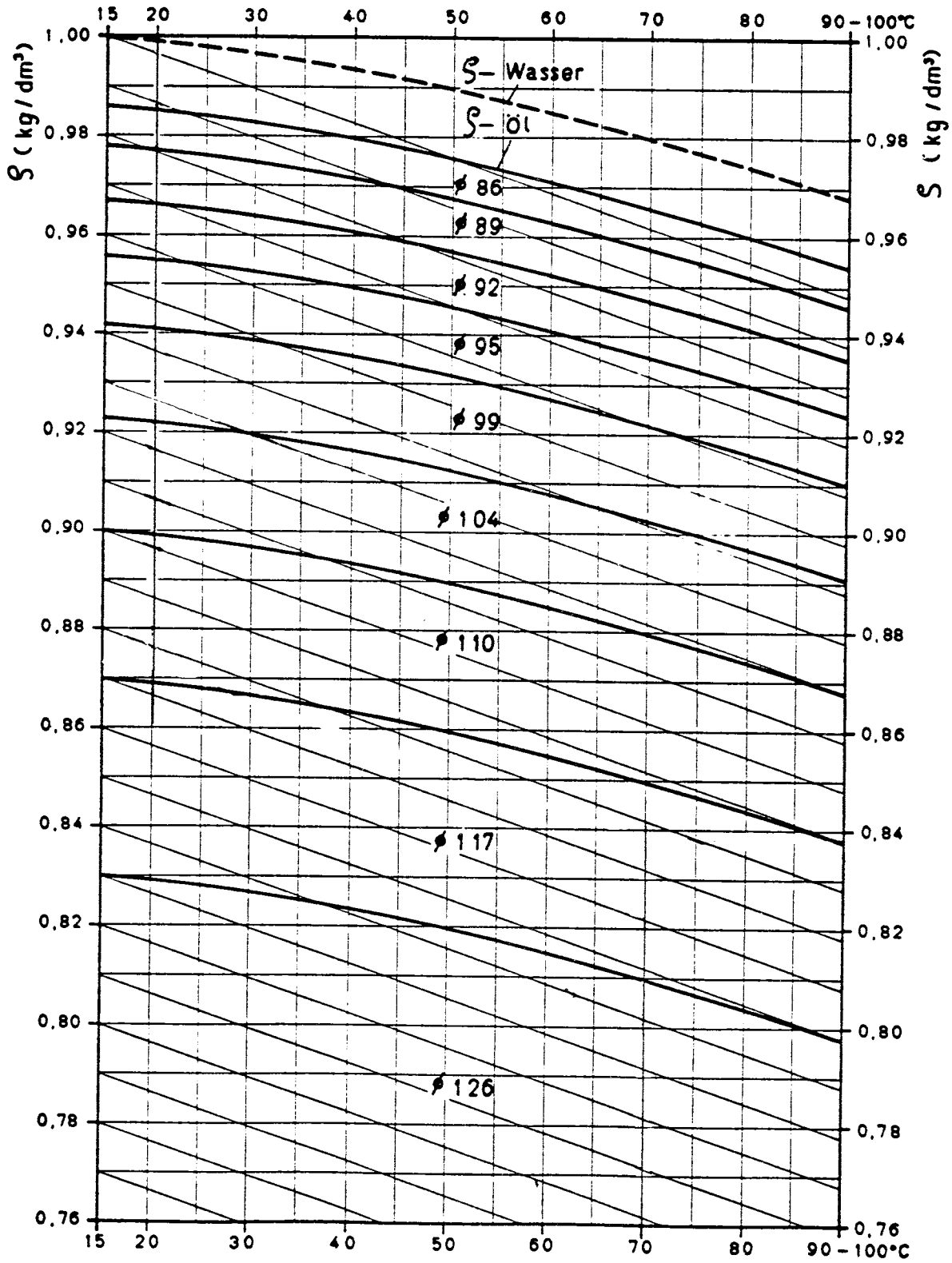
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MO-0112



(COURTESY OF WESTFALIA SEPARATOR)

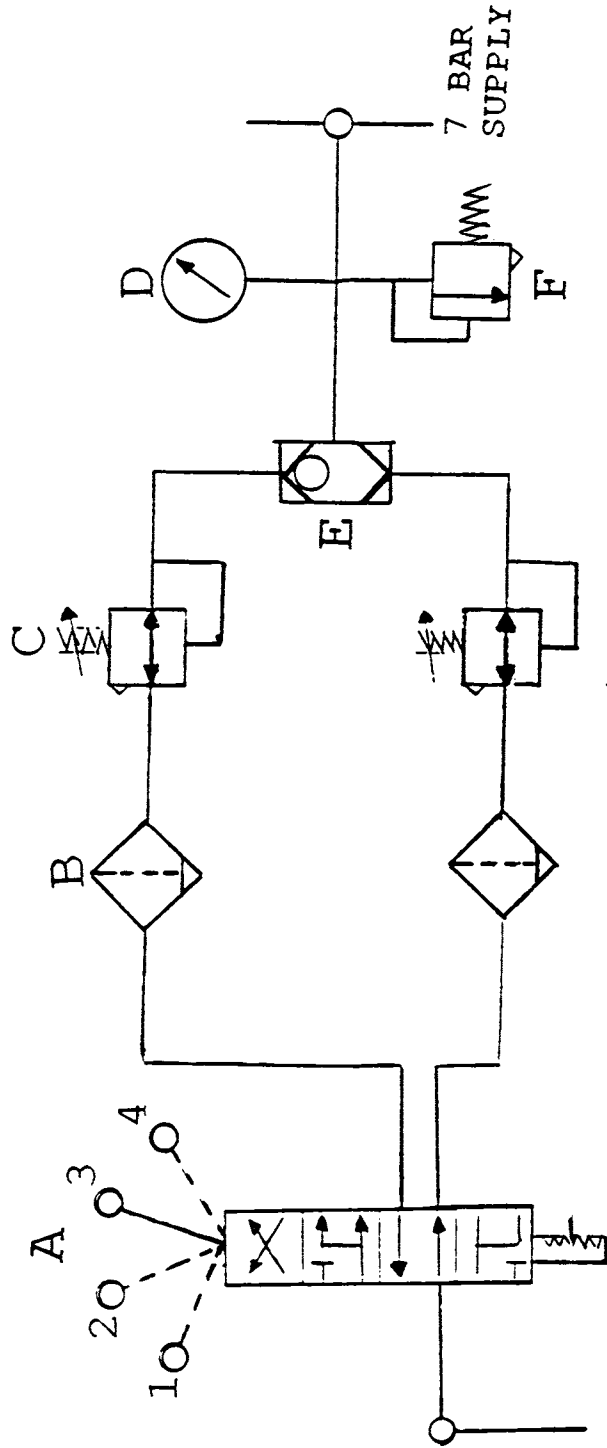
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Separating temperature

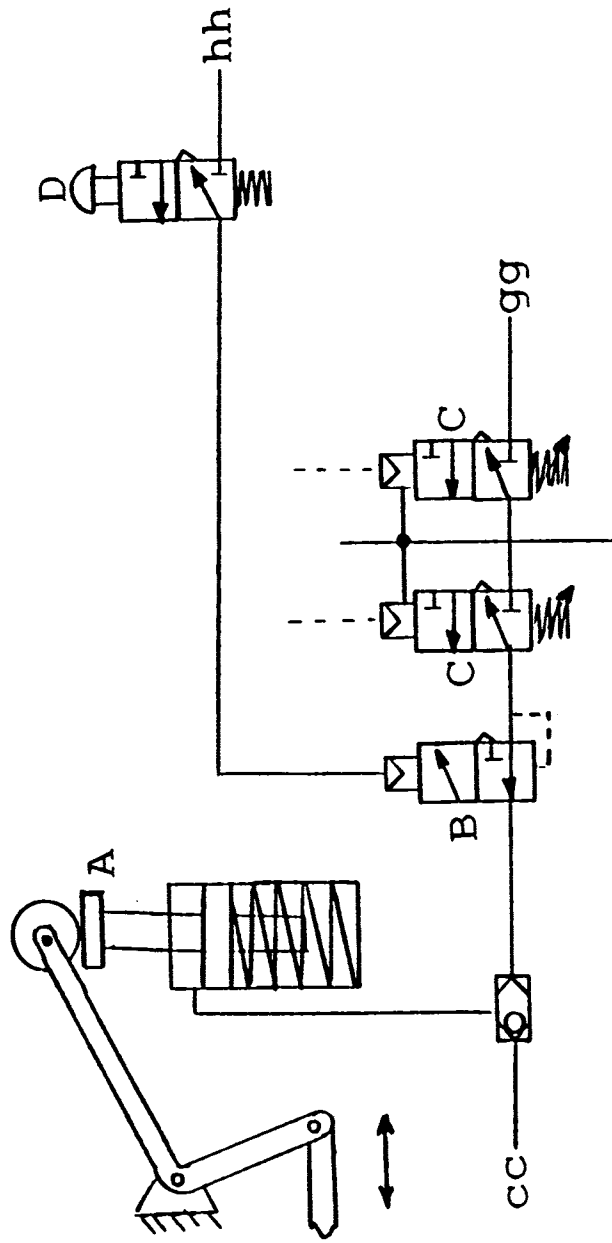
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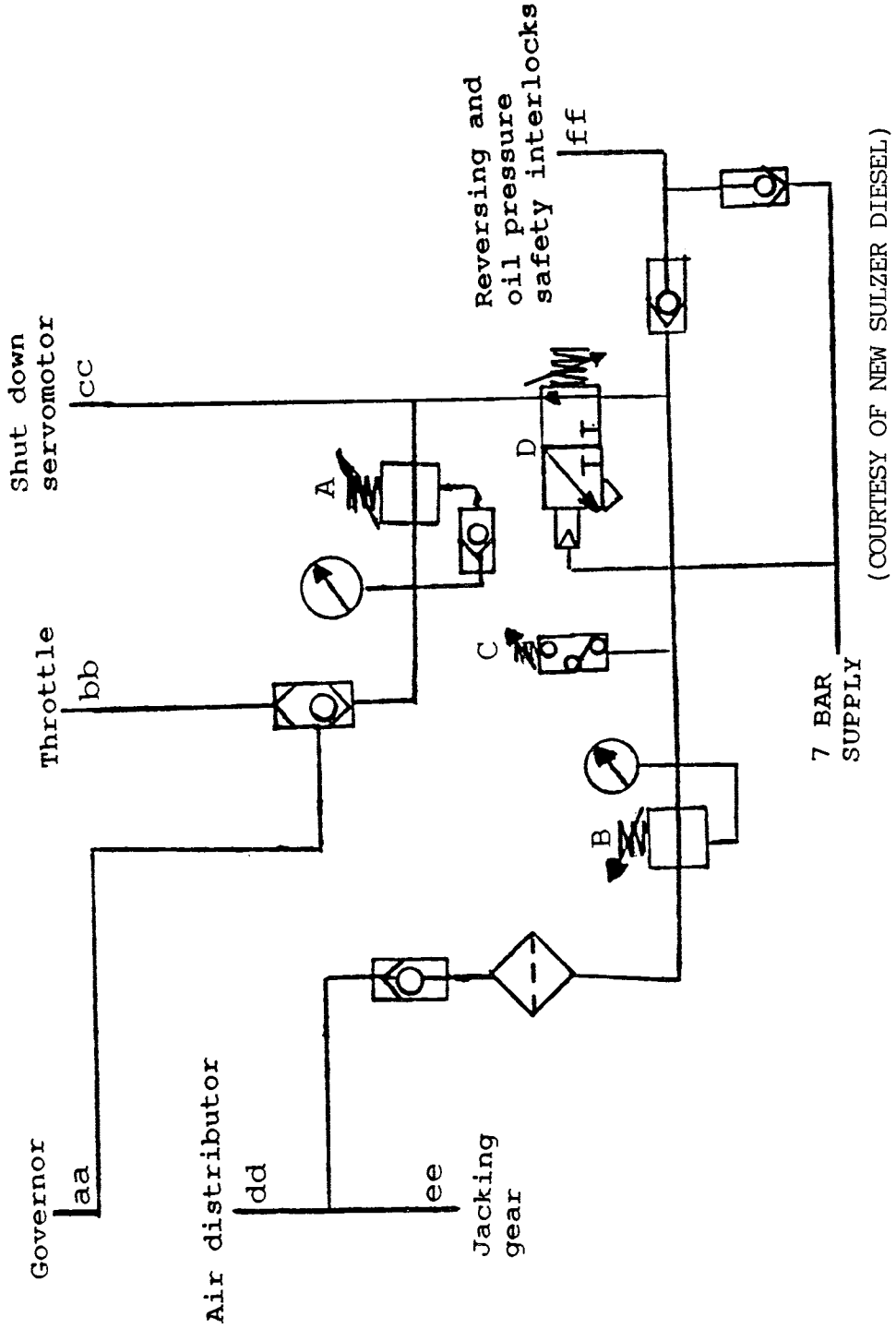


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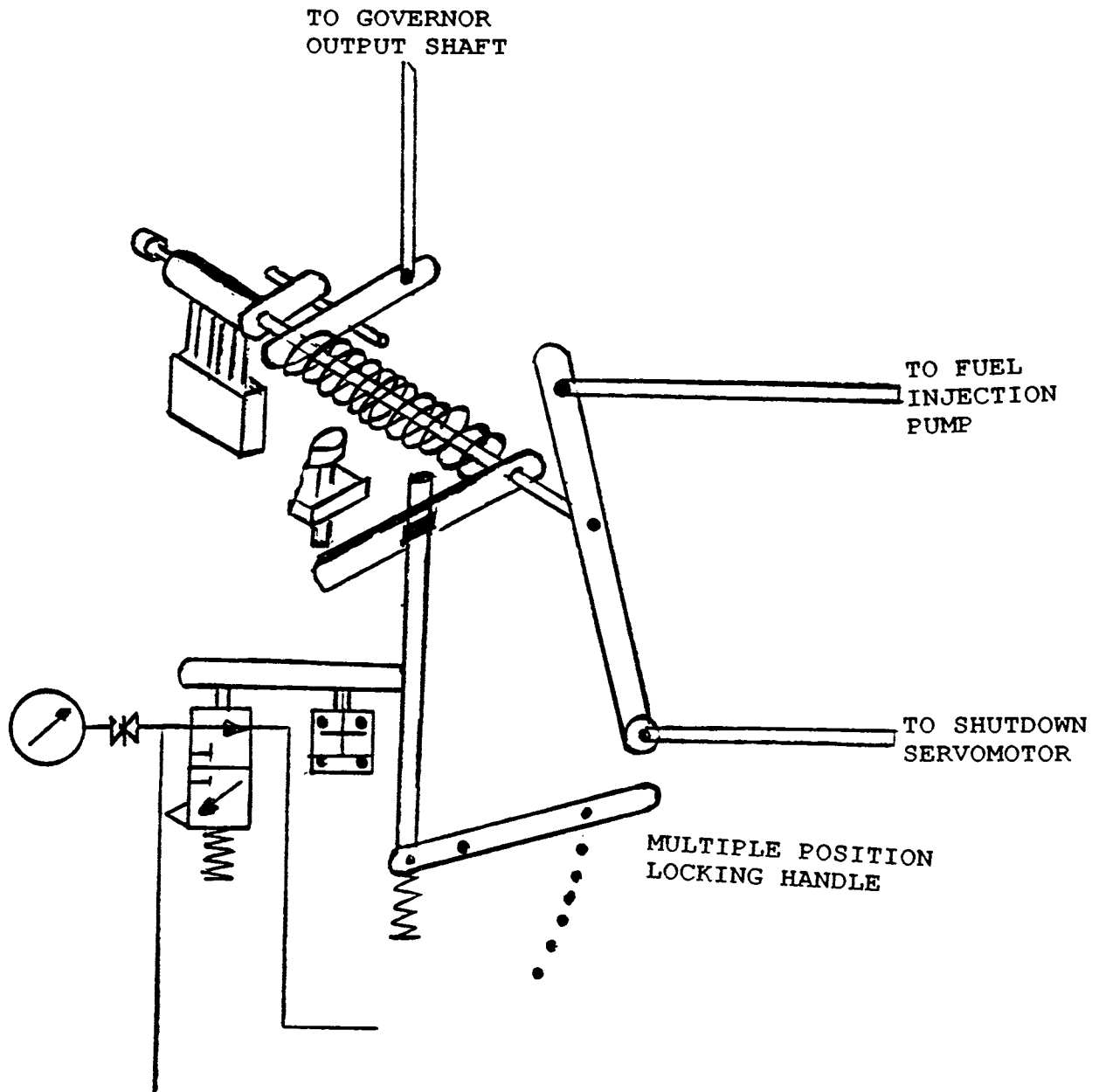
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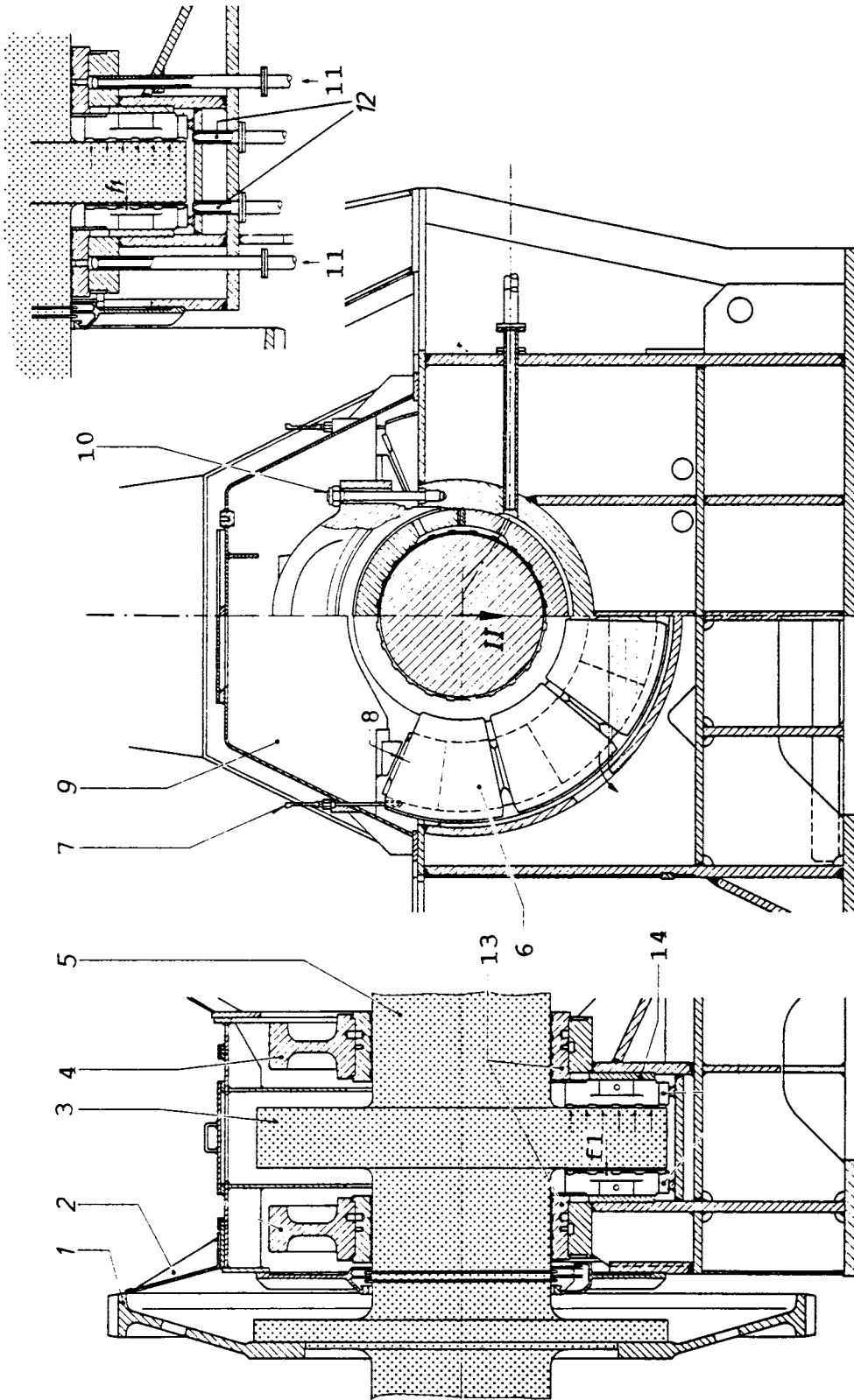


MO-0119

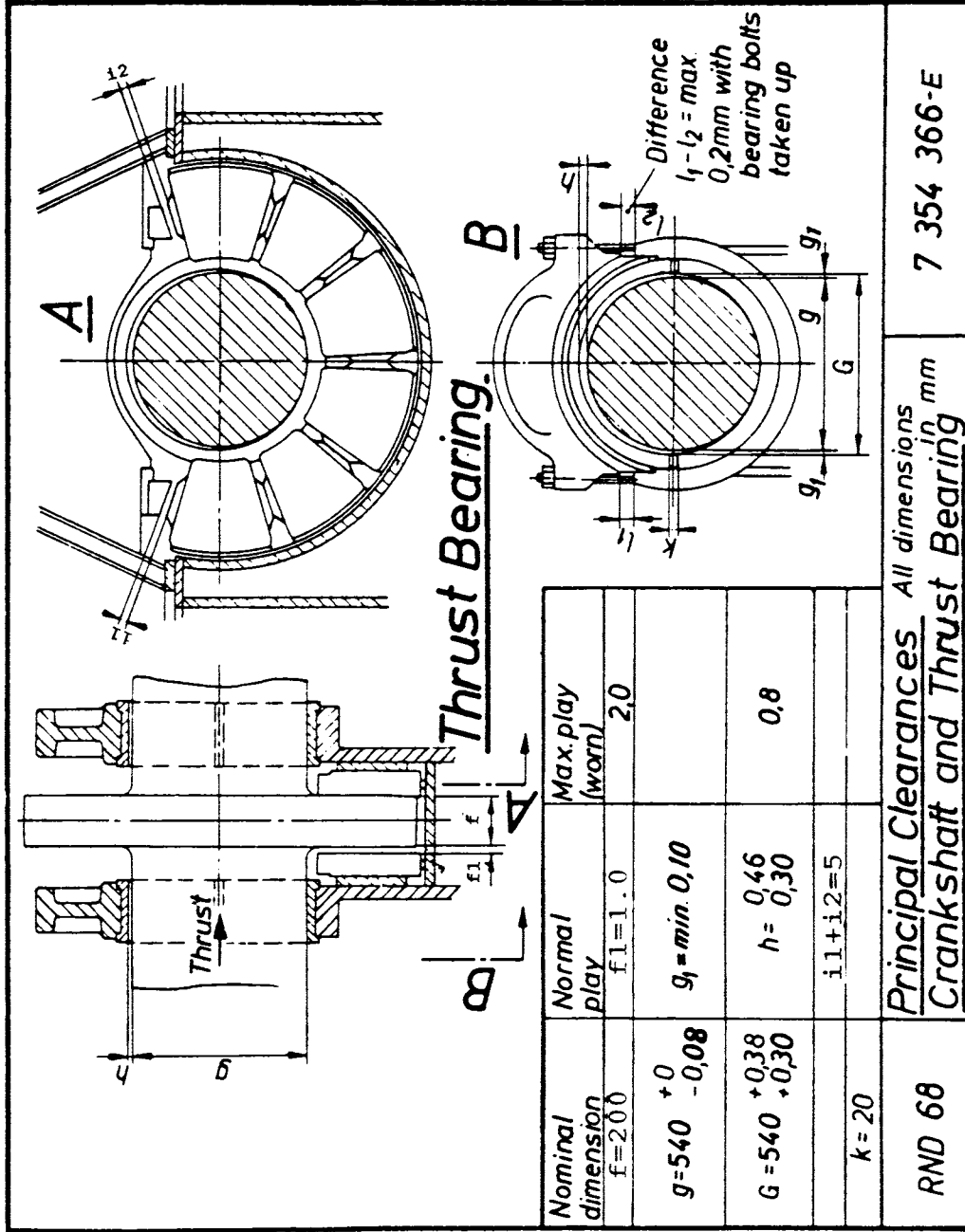


(COURTESY OF NEW SULZER DIESEL)

MO-0120

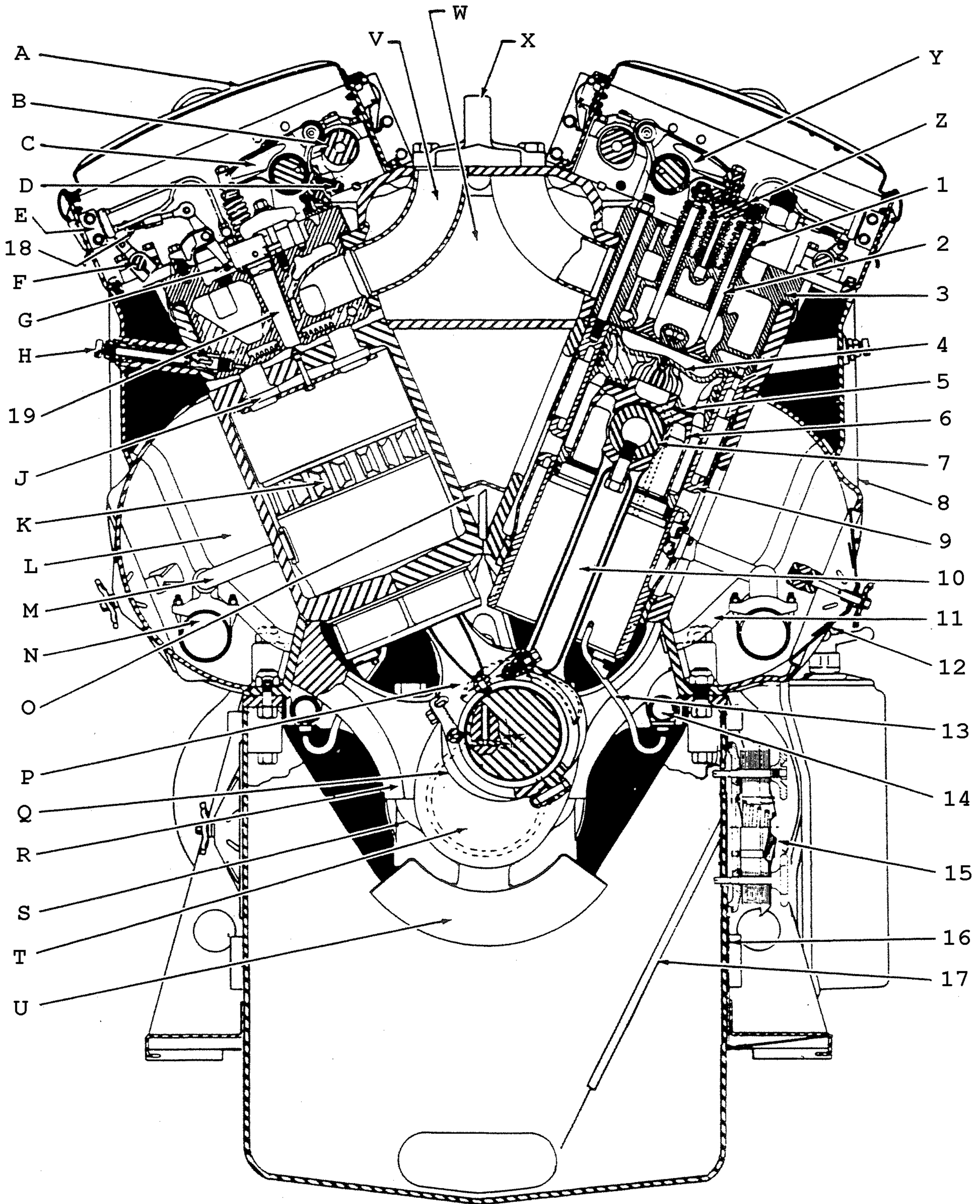


(COURTESY OF NEW SULZER DIESEL)



(COURTESY OF NEW SULZER DIESEL)

MO-0122

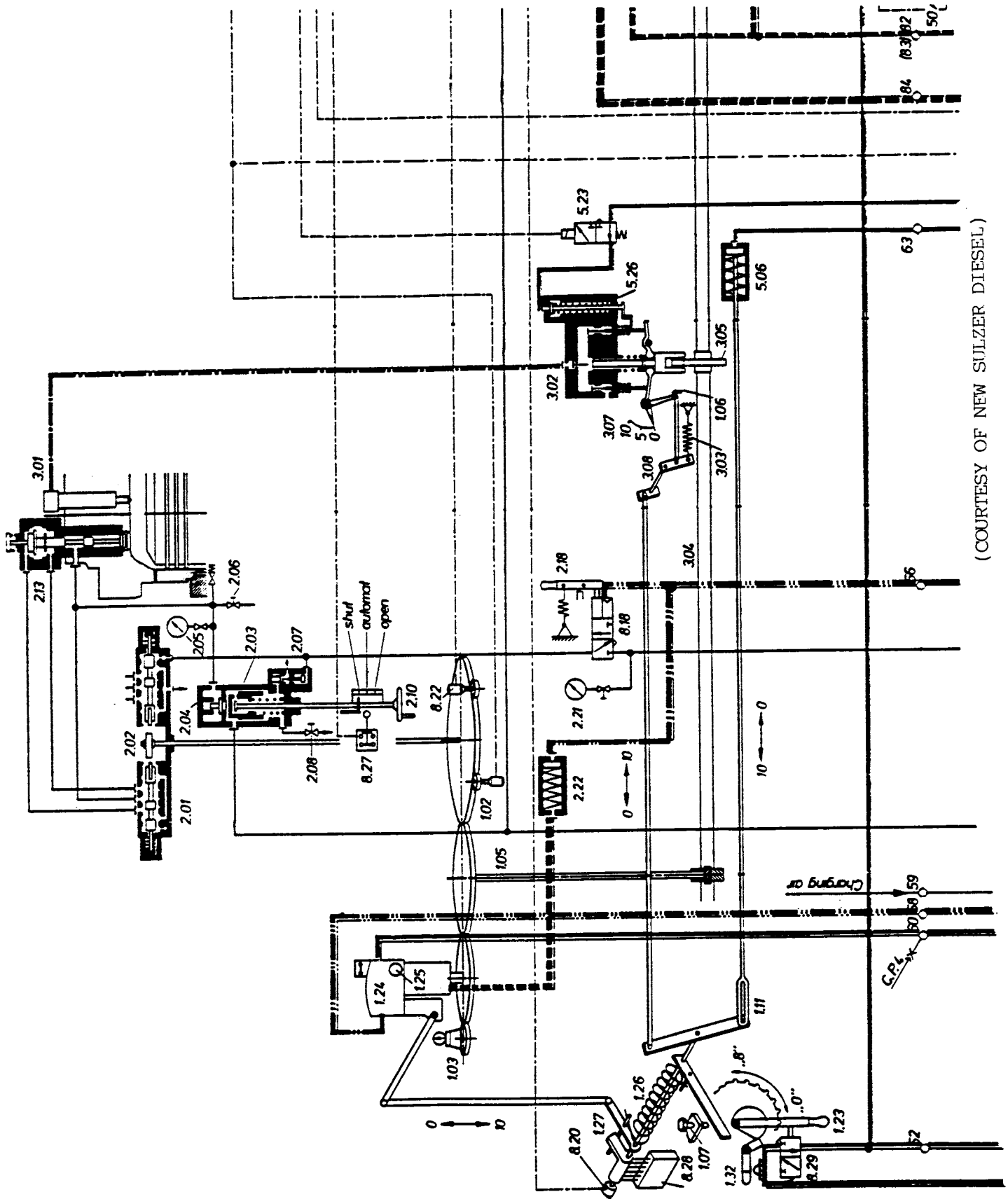


645 SERIES DIESEL ENGINE

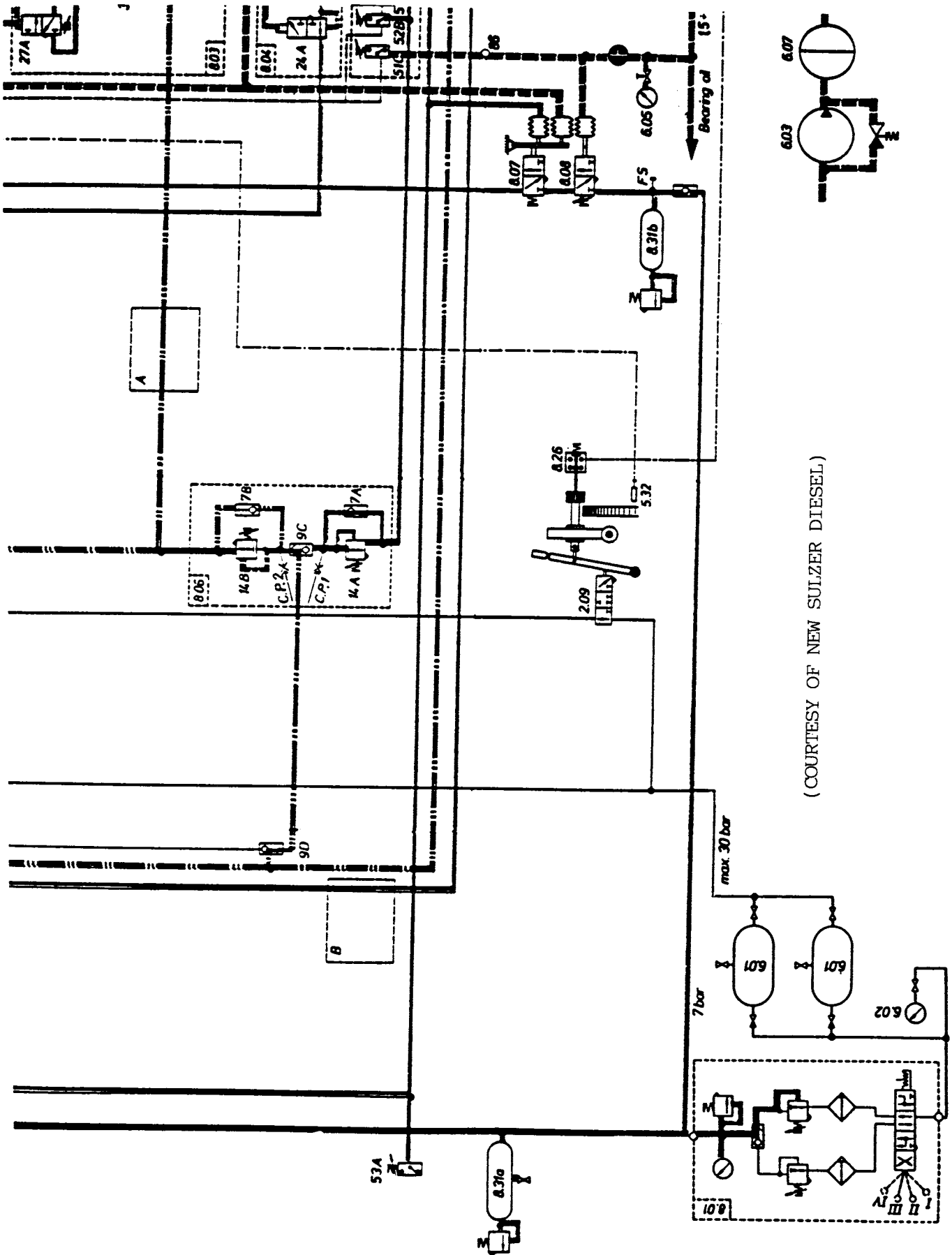
ELECTRO-MOTIVE DIVISION

GENERAL MOTORS CORPORATION

LA GRANGE, ILLINOIS, U.S.A.

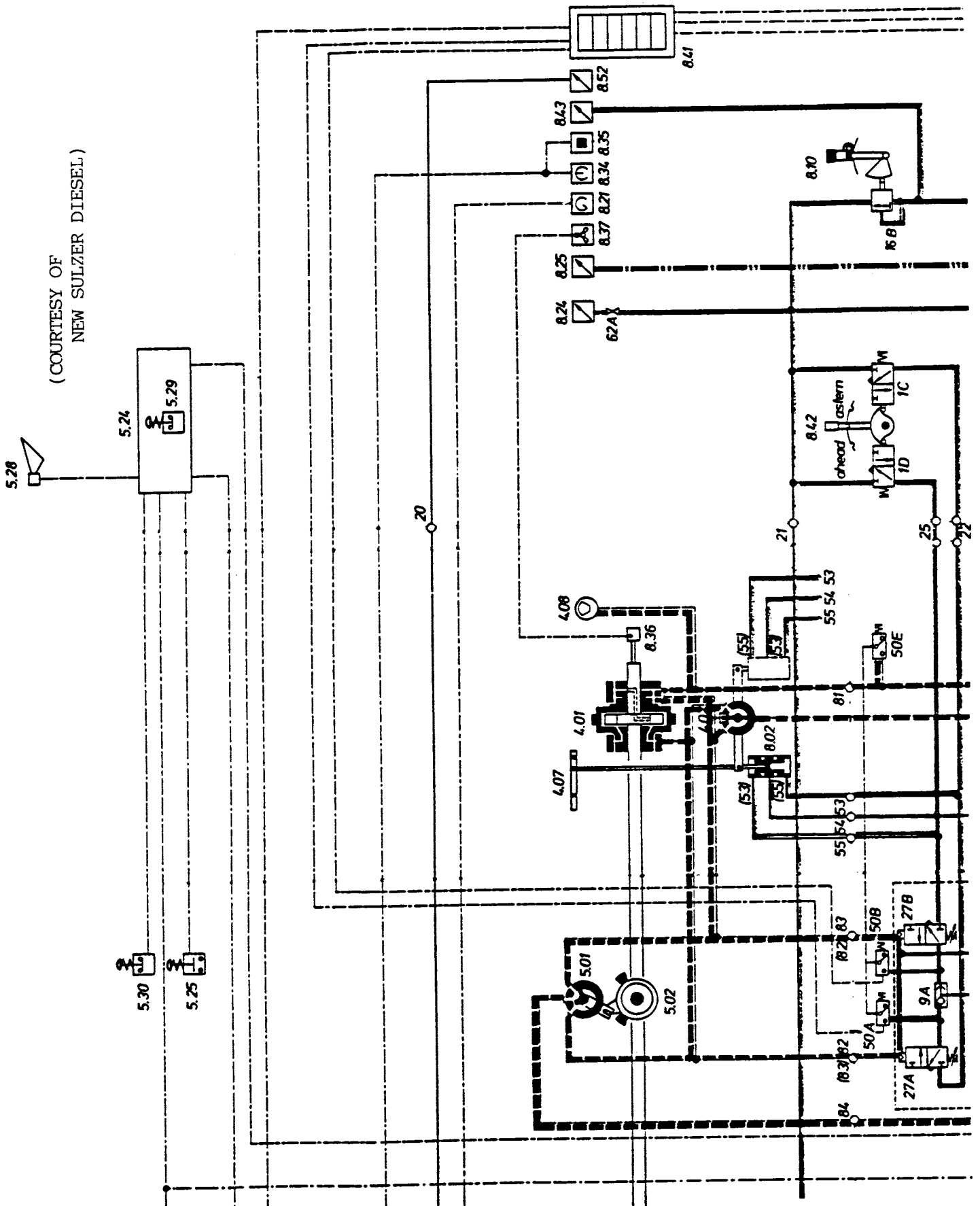


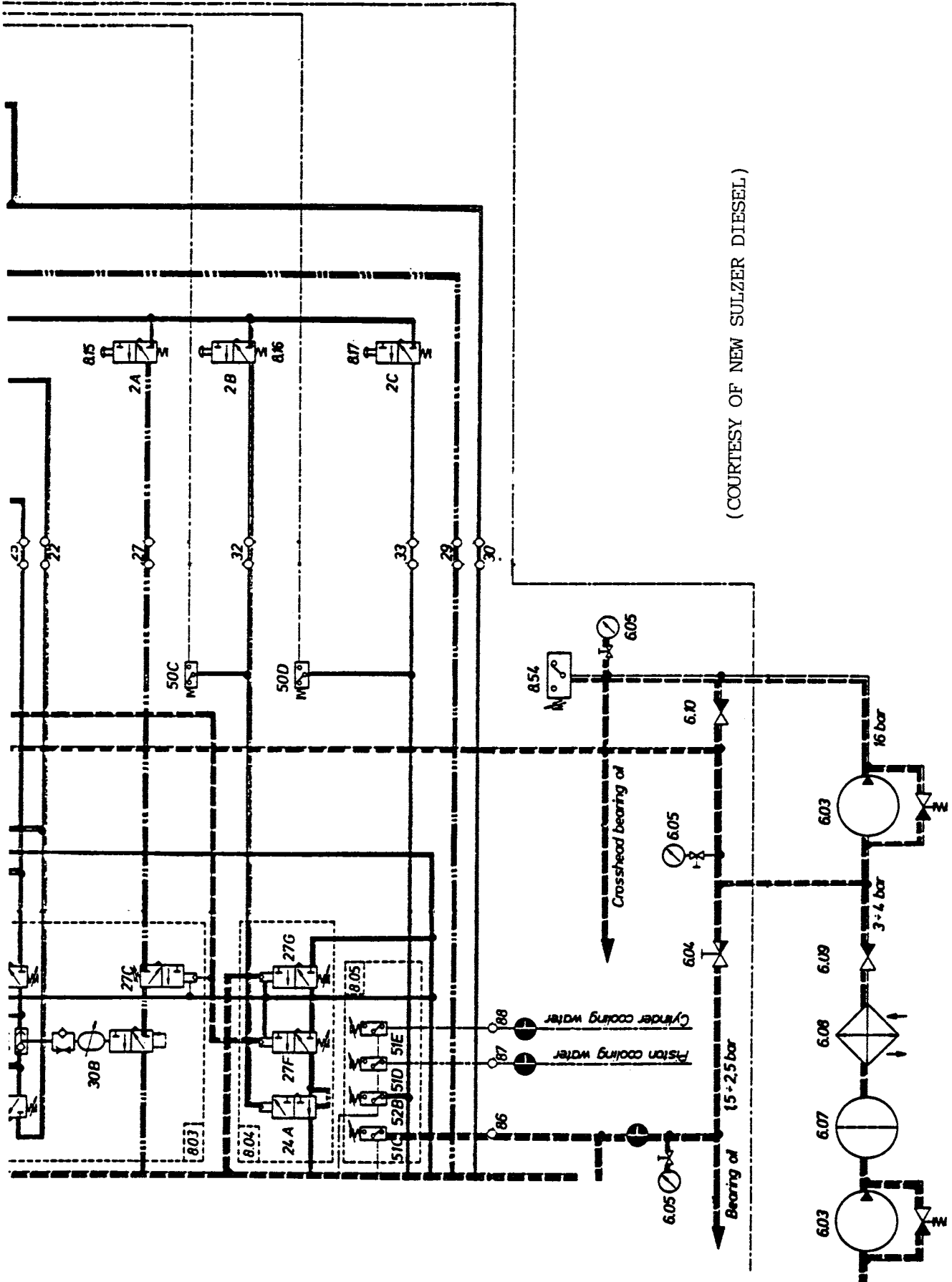
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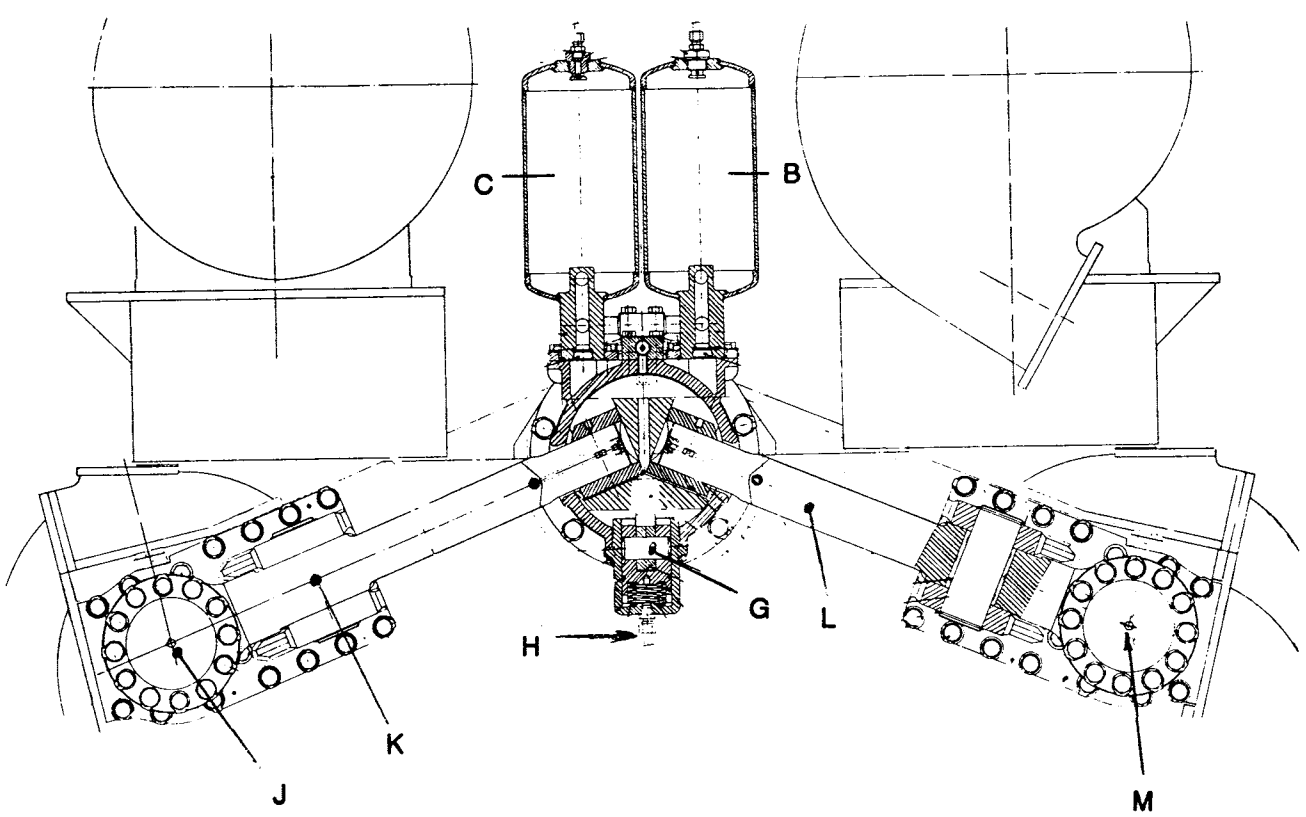
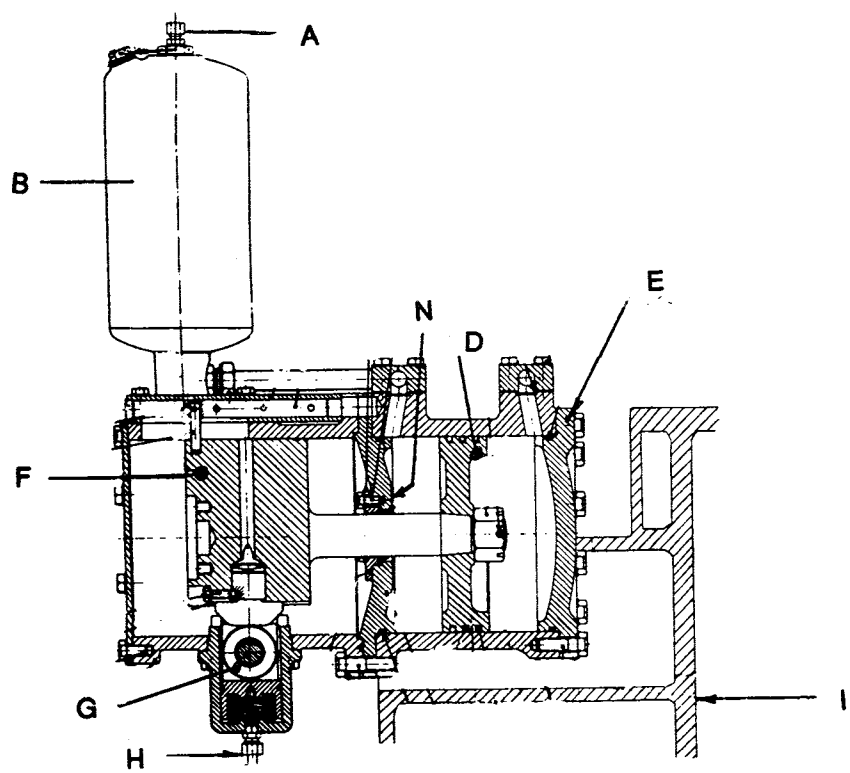
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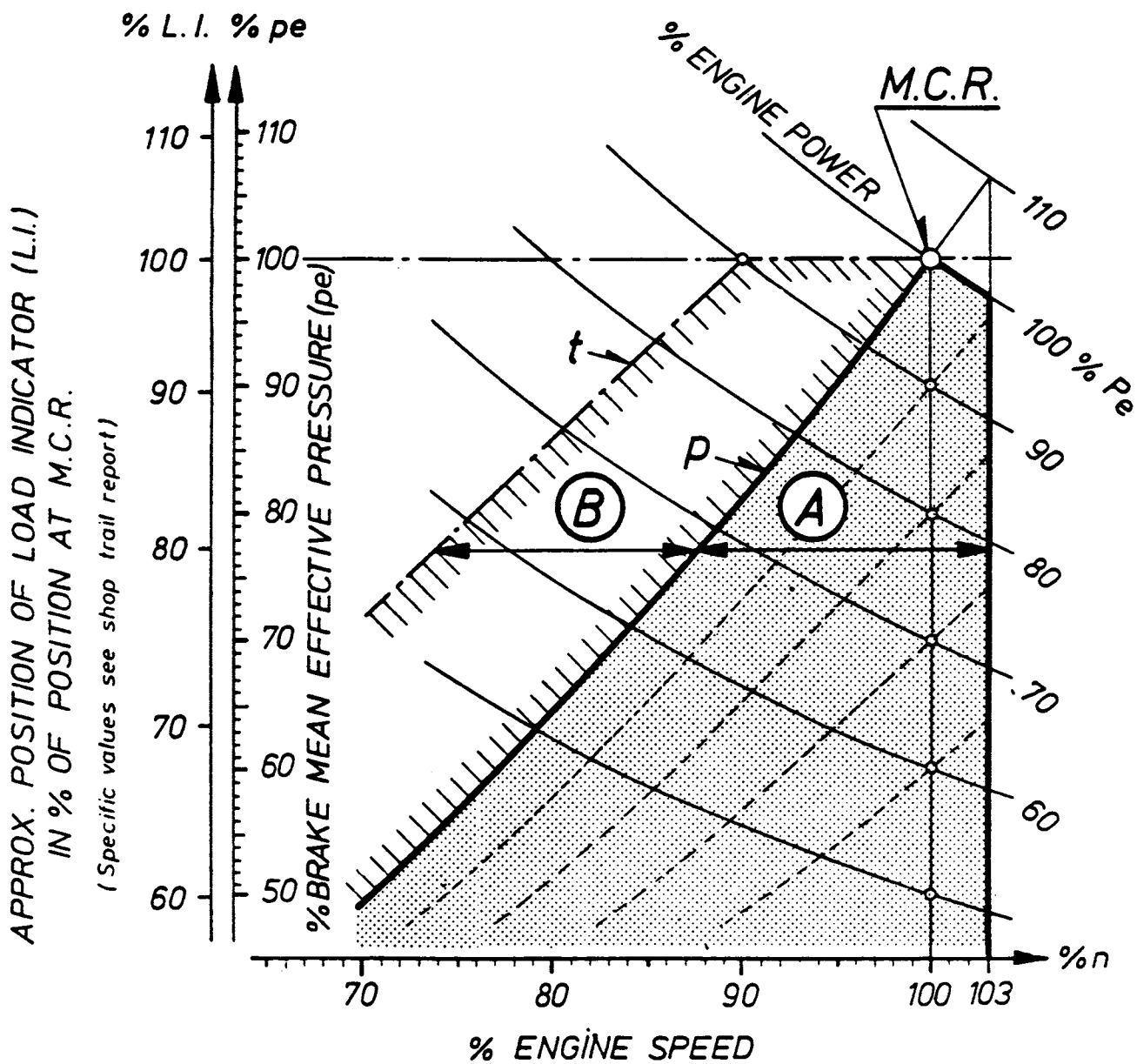


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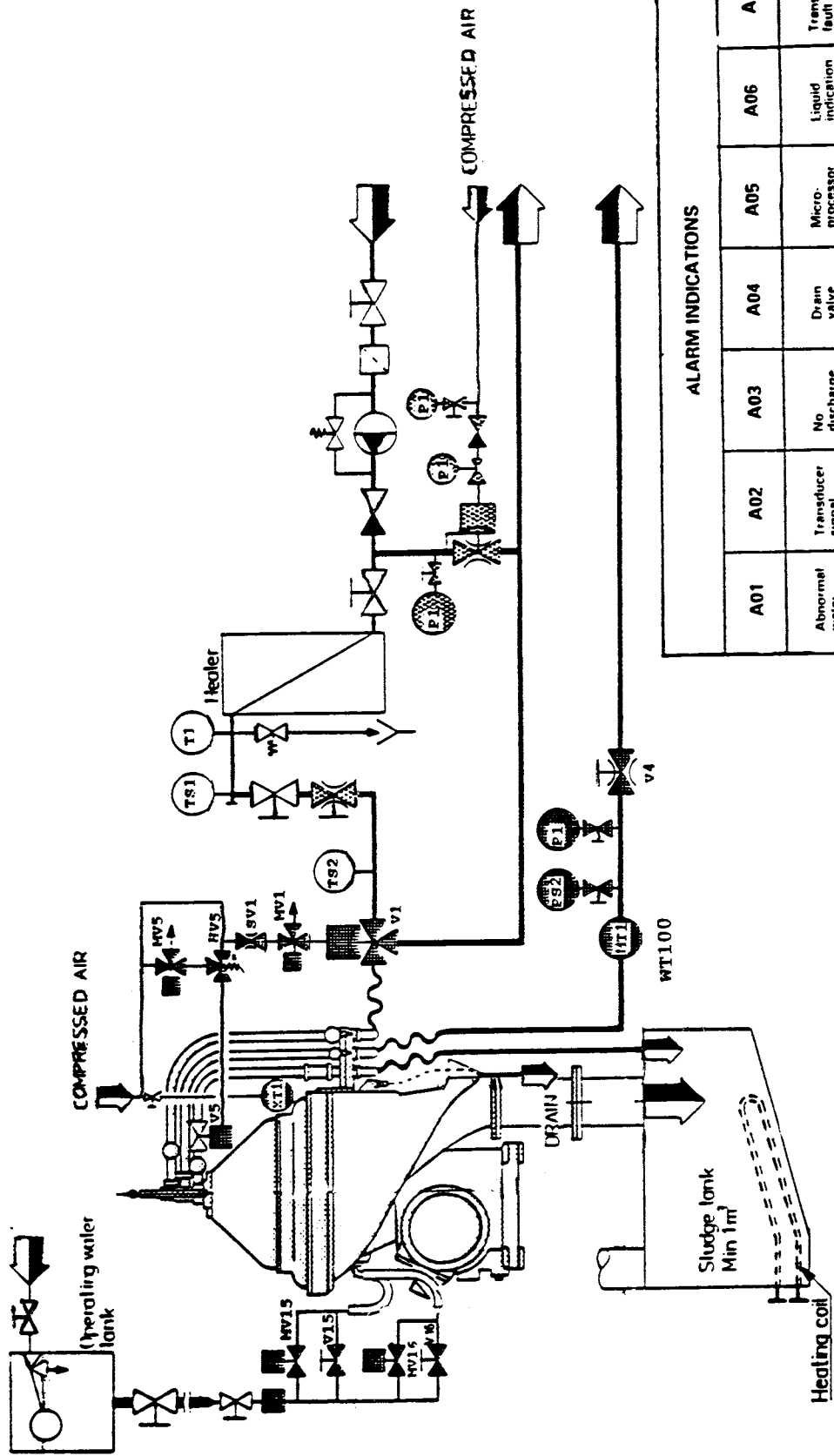
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3-109 (COURTESY OF COLTEC INDUSTRIES INC.)



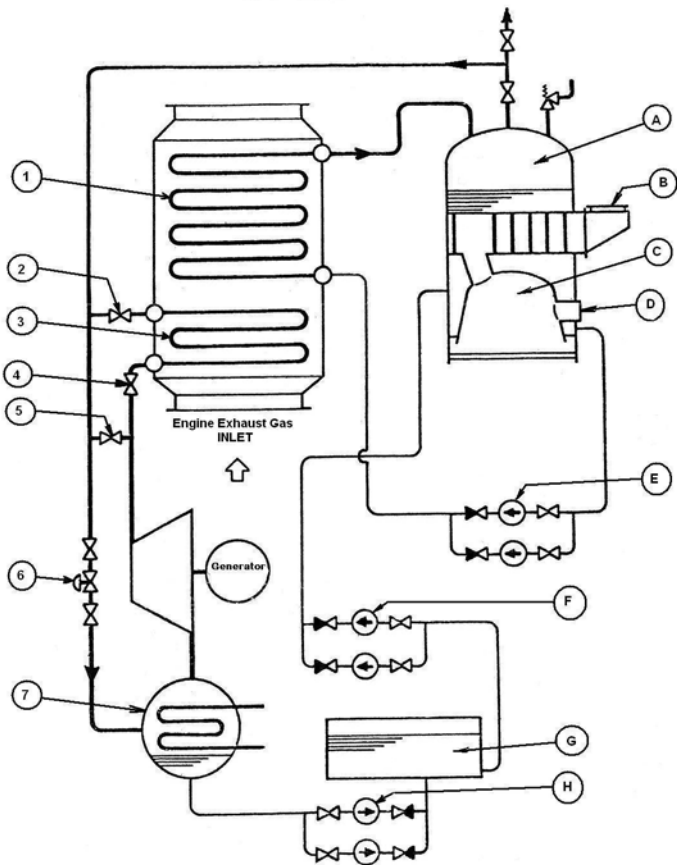
(COURTESY OF NEW SULZER DIESEL)



ALARM INDICATIONS

A01	Abnormal water content	A02	Transducer signal minimum value	A03	No discharge feedback signal	A04	Drain valve insufficient	A05	Micro-processor error	A06	Liquid indication	A07	Transducer fault
(EPC 30) ALARM INDICATIONS PROGRAM UNIT													
	Alarm from MARST I		Low pressure in oil outlet		High oil temp after preheater		Low oil temperature after preheater		Emergency stopping or vibrations		No discharge		Logically wrong signal from 1:1 separator
	Remote alarm signal only												

(COURTESY OF ALFA-LAVAL [MARINE AND POWER DIVISION])



MO-0129

