York

Y Series Reciprocating Compressor

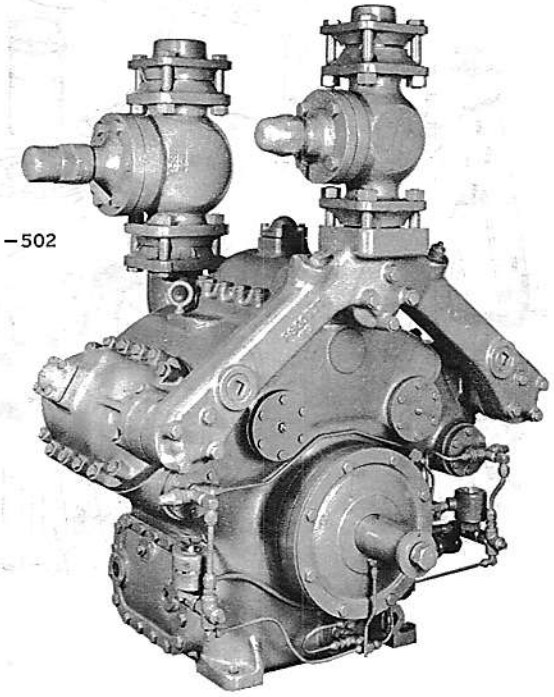
Parts / Maintenance Manual

YORK® RENEWAL PARTS

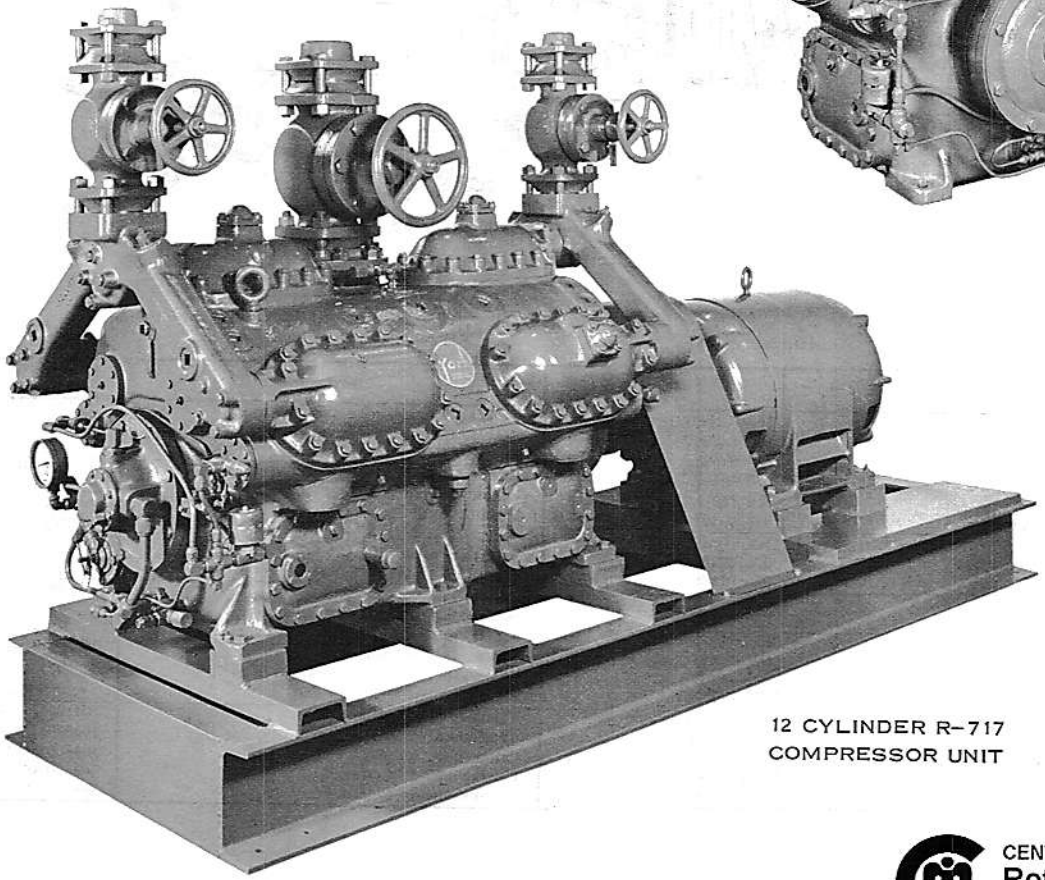
Form 180.20-RP

367

Y-53 SERIES COMPRESSOR UNITS
SINGLE STAGE 3¾" BORE V/W—OPEN TYPE
REFRIGERANTS —12, —22, —502 AND —717



6 CYLINDER R-12, -22, -502
COMPRESSOR



12 CYLINDER R-717
COMPRESSOR UNIT

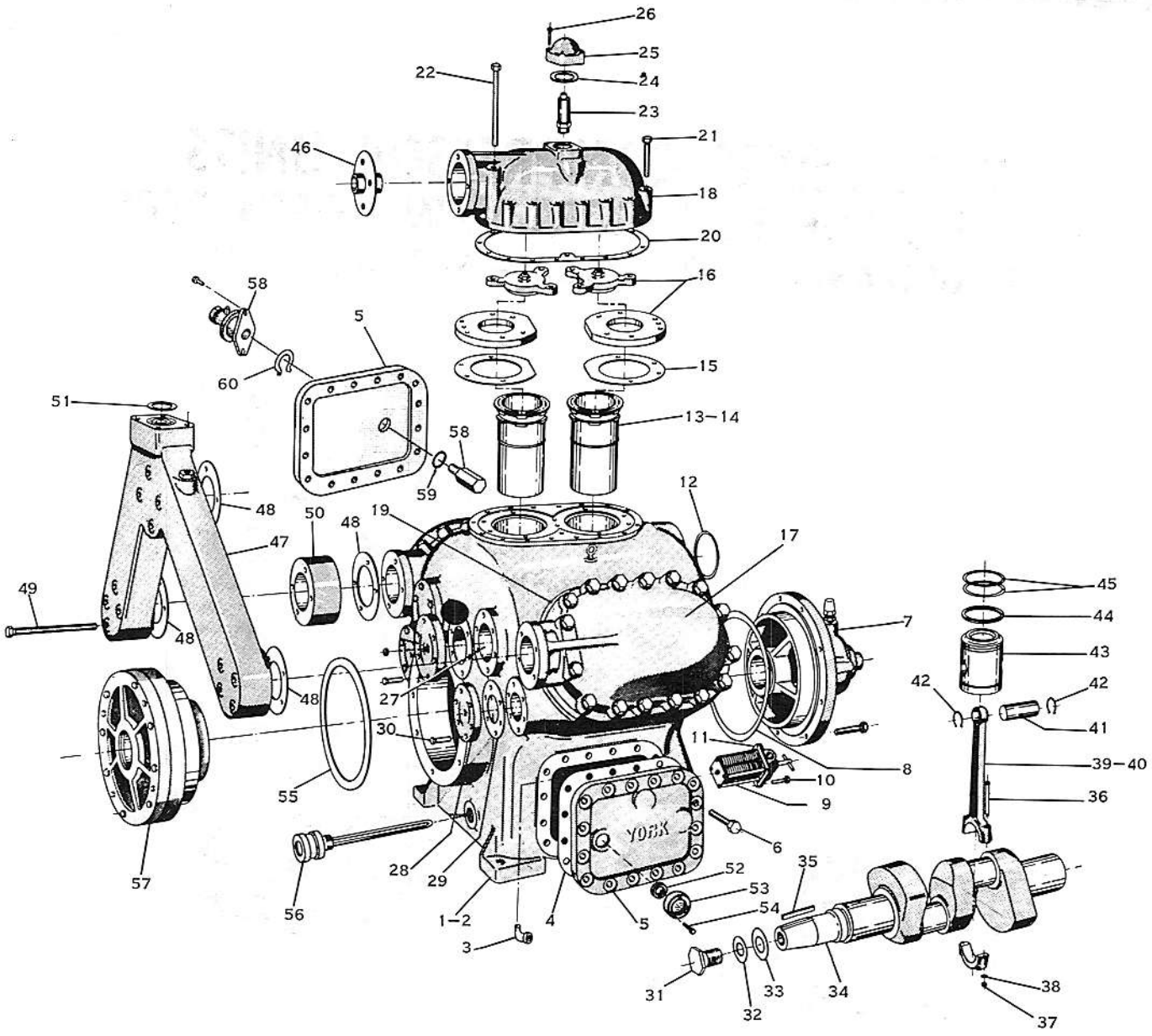


FIG. 1— Typical 3 3/4" x 3 Compressor-Exploded View

Item No.	Part Name	York Part No.
1	Compressor, Bare	See Table 1
2	Housing, Compressor, Bare	See Table 2
3	Elbow, 90° Street 3/8 NPT x 3/8 FPT.	023-01688
4	Gasket, Hand Hole Cover Plate	070-02497
5	Plate, Cover, Handhole	See Table 3
6	Screw, Cap, Handhole, Cover Plate	021-09592
7	Head, Bearing, Oil Pump and Regulating Valve	See Fig. 2
8	Gasket, Bearing Head, Oil Pump End	028-00824
9	Filter, Oil, Disc Type	026-01688
10	Screw, Cap, Oil Filter Cover	021-01538
11	Gasket, Oil Filter Cover	064-20129
12	Gasket, Suction Elbow - 4, 6, 8 Cyl.	028-00875
	Gasket, Suction Stop Valve - 12 Cyl.	028-00551
	Gasket, Suction Stop Valve - 16 Cyl.	028-00882
13	Cylinder Sleeve Assembly	See Fig. 3
14	Unloader Device	See Fig. 3
15	Gasket, Discharge Valve Plate (1 Per Cylinder)	070-03814
16	Valve Assembly, Suction and Discharge	See Fig. 4
17	Head, Compressor, Plain	064-00293
18	Head, Compressor, Relief Valve Type	064-00294

Item No.	Part Name	York Part No.
19	Gasket, Compressor Head, Plain	070-03813
20	Gasket, Compressor Head, Relief Valve Type	070-03812
21	Screw, Cap, Top Head - Short (14 Per Head)	021-01589
22	Screw, Cap, Top Head - Long	021-01600
23	Valve, Cartridge, Relief	468-09331
24	Gasket, Relief Valve Cover	028-00538
25	Cover, Relief Valve	068-02906
26	Screw, Cap, Relief Valve Cover	021-01495
27	Strainer Assembly, Suction	See Fig. 5
28	Cover, Unloader Piston	064-00358
29	Gasket, Unloader Piston Cover	070-03810
30	Screw, Cap, Unloader Piston Cover	021-01485
31	Screw, Cap, Flywheel	021-09500
32	Lockwasher, Spring, Flywheel Bolt	021-05276
33	Washer, Flat, Flywheel Bolt	364-03284
34	Crankshaft, 4 Cylinder	364-00312-001
	Crankshaft, 6 Cylinder	364-00311-001
	Crankshaft, 8 Cylinder	364-00310-001
	Crankshaft, 12 Cylinder	364-00309-001
	Crankshaft, 16 Cylinder	364-00308-001

Item No.	Part Name	York Part No.
35	Key, Crankshaft	064-00314
36	Bolt, Connecting Rod } Torque 21.6 Ft. Lbs.	064-00362
37	Nut, Connecting Rod Bolt } Torque 21.6 Ft. Lbs.	021-09932
38	Washer, Connecting Rod Bolt	064-00363
36,37, 38	Kit, Connecting Rod Bolt - Set of 2-Bolt, Nut, Washer	364-05384
39	Connecting Rod Assembly Complete - Rod, Cap, Bolt, Nut, Washer - R-12, -22, -502	364-09881
40	Connecting Rod Assembly Complete - Rod, Cap, Bolt, Nut, Washer - R-717	364-10084
41	Piston Pin	029-01507
42	Spring, Locking, Piston Pin (2 Required)	029-00274
43	Piston , Bare	064-00360
44	Piston Ring, Ventilated, Oil	029-04452
45	Piston Ring, Compression (2 Required)	029-03669
41-45	Piston Assembly	364-00364
46	Muffler, Discharge	064-06119
47	Manifold, Discharge - 4 Cylinder - (1 Required)	364-20993
	Manifold, Discharge - 6 and 12 Cylinder (1 and 2 Required)	364-20992
	Manifold, Discharge - 8 and 16 Cylinder (1 and 2 Required)	364-20991
48	Gasket, Discharge Manifold to Compressor	070-09705
49	Screw, Cap, Discharge Manifold (6 and 12 Cylinder - 4 and 8 Required - 1/2" x 5 1/2")	021-08899
49	Screw, Cap, Discharge Manifold (6 and 12 Cylinder - 4 and 8 Required - 1/2" x 5")	021-08898
	Screw, Cap, Discharge Manifold, Short (4, 6, 8, 12, 16 Cylinder - 1/2" x 3 3/4")	021-12307
50	Fill Piece, Discharge Manifold (6 and 12 Cylinder)	064-00751
51	Gasket, Discharge Manifold to Valve (4, 6 and 12 Cylinder)	028-00867
	Gasket, Discharge Manifold to Valve (8 and 16 Cylinder)	028-00869
52	Gasket, O-Ring, Sight Glass } For Flat Type Sight Glass / For Bulb Type Sight Glass See Fig. 8	028-06791
53	Glass, Oil Sight, } For Flat Type Sight Glass / For Bulb Type Sight Glass See Fig. 8	026-10797
54	Screw, Cap, Oil Sight Glass } For Flat Type Sight Glass / For Bulb Type Sight Glass See Fig. 8	021-01372
55	Gasket, Bearing Head, Seal End	028-00824
56	Heater, Crankcase, 300 Watt, 120 Volt (Nema 1)	025-09422
	Heater, Crankcase, 300 Watt, 240 Volt (Nema 1)	025-09421
57	Shaft Seal Assembly	See Fig. 6
58	Valve, Control, Capacity	See Table 4
59	Gasket, O-Ring, Capacity Control Valve	028-04754
60	Ring, Retaining, Capacity Control Valve to Coverplate	029-08659
Bearing Assembly, Center - 12 and 16 Cylinder Compressor		See Fig. 7
Glass, Oil Sight, Bulb Type		See Fig. 8
Crankcase Float Valve		See Fig. 9
Packing Internal Oil Header		See Fig. 10
Oil Strainer		See Fig. 11

TABLE 1— BARE COMPRESSORS - LESS MANIFOLDS, STOP VALVES AND BASE

Bore and Stroke	Number Cylinders	Part Number R 12, -22, -502	Part Number R-717
3 3/4 X 3	4	464-11961	464-13362
3 3/4 X 3	6	464-11962	464-13363
3 3/4 X 3	8	464-11963	464-13364
3 3/4 X 3	12	464-11964	464-13365
3 3/4 X 3	16	464-11965	464-13366

TABLE 2— COMPRESSOR HOUSING, BARE

Size Compressor	Part Number	
	R-12, -22, -502	R-717
4 Cylinder	364-04123-001	364-04122-001
6 Cylinder	364-04117-001	364-04116-001
8 Cylinder	364-04121-001	364-04120-001
12 Cylinder	364-04115-001	364-04114-001
16 Cylinder	364-04119-001	364-04118-001

NOTE:
Replacement compressor housings with the bulb type oil sight glass are not available. When a replacement compressor housing is ordered, a cover plate with sight glass assembly, York Part No. 364-18963 must be ordered also.

TABLE 3— CRANKCASE COVER PLATES

Part Name	York Part No.
Cover Plate Complete With Oil Sight Glass	364-18963
Cover Plate Complete With Capacity Control Valve, Suction Pressure Actuated	See Table 4 & 4(a)
Cover Plate Complete With Capacity Control Valve, Temperature Actuated	See Table 4 & 4(a)
Cover Plate for Float Valve	064-00296

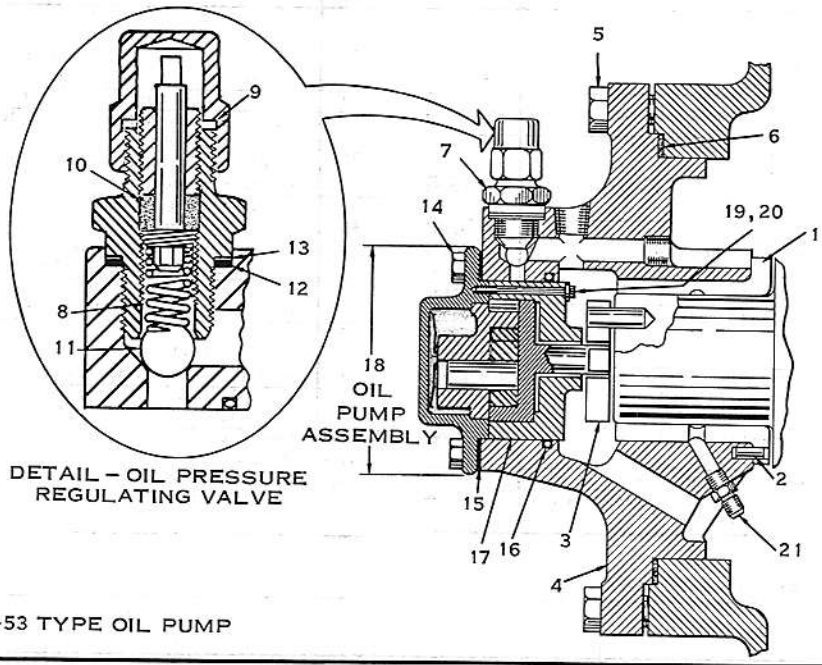
TABLE 4— CAPACITY CONTROL VALVES (NEW STYLE - SINGLE PIECE - WITHOUT MANUAL FEATURE)

Item No.	Part Name	York Part No.
1	Valve, Capacity Control (Suction Pressure Actuated)	365-13975-C-001
2	Valve, Capacity Control (Temperature Actuated)	365-13975-C-003
3	Gasket, O-Ring Valve to Coverplate	028-04754
4	Gasket, O-Ring (Plunger)	028-05175
5	Ring, Retaining (Capacity Control Valve to Coverplate)	029-08659
6	Power Assembly, Suction Pressure Actuated	025-09980
7	Power Assembly, Temperature Actuated	025-09981
8	Screw for Item 6 (2 - Required)	021-01435
9	Screw for Item 7 (2 - Required)	021-01447
10	Washer, Flat for Item 8 and Item 9 (2 - Each Required)	064-06648
11	Capacity Control Complete with Cover plate with Sight Glass:	Type Power Assembly

No. Cyl.	Suction Pressure Actuated	Temperature Actuated
4	None	367-39035-D-004
6	None	367-39035-D-004
8	367-39035-D-002	367-39035-D-004
12	367-39035-D-001	367-39035-D-003
16	367-38892-D-001	367-38892-D-002

TABLE 4 A — CAPACITY CONTROL VALVE (OLD STYLE - TWO PIECE - WITH MANUAL FEATURE)

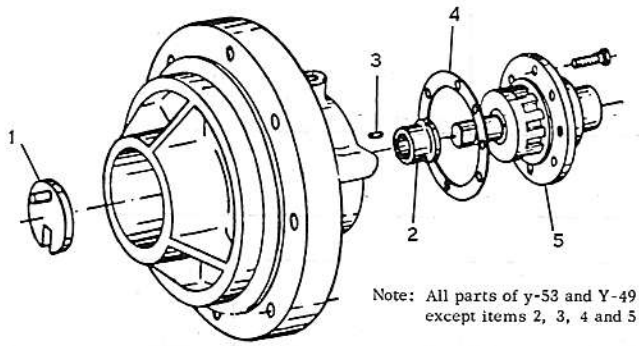
Item No.	Part Name	York Part No.
1	Valve, Capacity Control (2-Step - 4 & 6 Cylinder Compressors)	365-03256
	Valve, Capacity Control (6-Step - 8, 12 & 16 Cylinder Compressors)	365-03238
2	Gasket, Valve Body to Cover Plate	065-03233
3	Valve, Capacity Control Regulating (Power Assembly, Remote, - Suction Pressure Actuated)	025-11046



Y–53 TYPE OIL PUMP

Item No.	Part Name	York Part No.
1	Bearing, Main, Pump End	064-00331
2	Pin, Roll, Main Bearing	029-03989
3	Crank and Pin, Oil Pump	364-00325
4	Head, Bearing	364-05892
5	Screw, Cap, Bearing Head (8 Required)	021-02751
6	Gasket, Bearing Head	028-00824
7	Valve, Oil Regulating (Complete)	364-00329
8	Spring, Valve	029-00239
9	Gasket, Valve Cap	028-01256
10	Packing, Valve Stem	028-01060
11	Check, Ball	029-01853
12	Gasket, Valve Body (Fibre)	028-00852
13	Gasket, Valve Body (Copper)	070-02537
14	Screw, Cap, Pump Cover	021-01425
15	Gasket, Pump Cover	064-20109
16	Ring, "O"	028-05163
17	Insert	064-03900
18	Oil Pump Assembly (Rotor and Shaft, Idler Carrier and Pin, Idler and Bushing, Cover, Spring and Insert) Also included are "O" Ring (16), Gasket (15) and Cap Screws and Lockwashers (19) and (20)	364-05893
19	Screw, Cap, Socket Head (Insert)	021-09272
20	Lockwasher	021-05265
21	Connector, Straight, 1/4 SAE X 1/8 MPT	023-01304

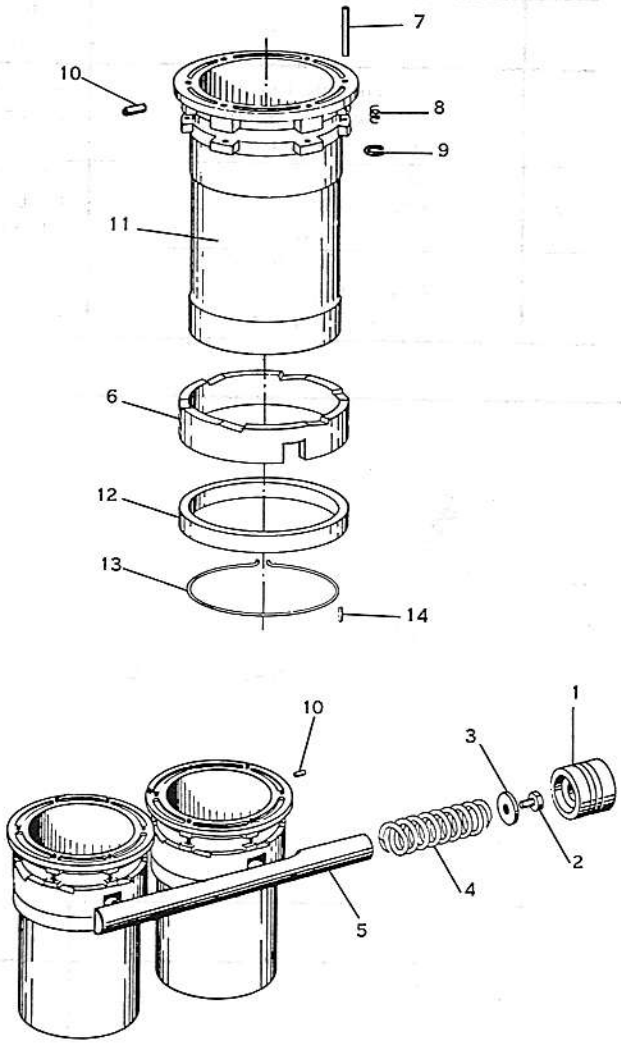
Y–49 TYPE OIL PUMP

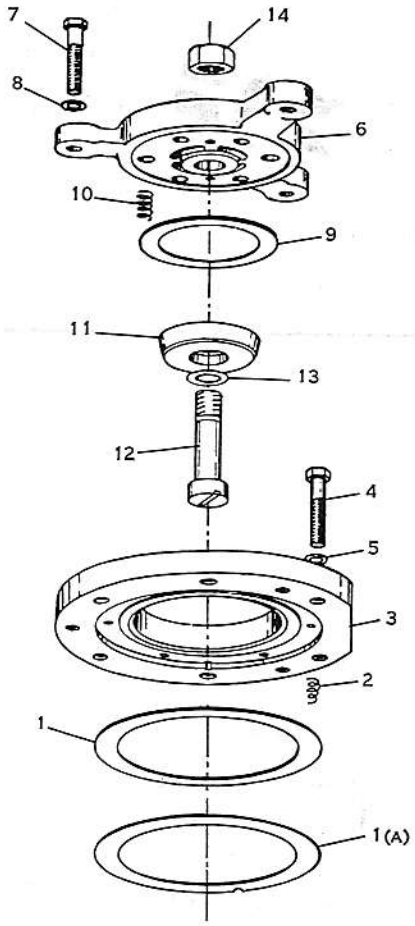


Item No.	Part Name	York Part No.
1	Crank and Pin, Oil Pump	364-00325
2	Bearing, Oil Pump	064-00322
3	Bearing pin, Oil Pump	029-03991
4	Gasket, Oil Pump	064-20109
5	Oil Pump	026-03509
1, 2 4, 5	Oil Pump, Kit	364-05056

Note: All parts of y-53 and Y-49 Oil Pumps are interchangeable except items 2, 3, 4 and 5.

FIG. 2— Oil Pump, Bearing Head and Oil Pressure Regulating Valve





Item No.	Part Name	York Part No.
1	Piston, Unloader Device	064-00357
2	Screw, Cap Push Rod	021-10650
3	Washer, Push Rod	064-00356
4	Spring, Unloader Device	029-03993
5	Push Rod	364-00353
6	Cam Ring, Left Hand	064-00346
	Cam Ring, Right Hand	064-00347
7	Pin, Lift (Set of 6)	364-06010
8	Spring Lift Pin	029-04021
9	Ring, Retaining, For Lift Pin	029-09016
10	Pin, Locating	029-03991
11	Cylinder Sleeve, Plain	064-25141
12	Support, Cam Ring	064-00348
13	Ring, Retaining	029-11357
14	Pin Roll for Retaining Ring	029-03990
6-14	Cylinder Sleeve Assembly, Left Hand	364-00344
6-14	Cylinder Sleeve Assembly, Right Hand	364-00345

FIG. 3— Cylinder Sleeve Assemblies

Item No.	Part Name	York Part No.
1	Valve Suction	064-12165
1(a)	Valve, Suction, Pin Type (Superseded)	064-02673
2	Spring, Suction Valve	029-10757
3	Valve Plate (R-12, -22, -502)	064-12179
	Valve Plate (R-717)	064-12178
4	Screw, Cap	021-12445
5	Lockwasher	021-05269
6, 9-14	Valve Assembly, Discharge (R-717)	364-00369
6, 9-14	Valve Assembly, Discharge (R-12, -22, -502)	364-00370
6	Valve Cage, Discharge (R 717)	064-00371
	Valve Cage, Discharge (R-12, -22, -502)	064-00372
7	Screw, Cap	021-12428
8	Lockwasher	021-05268
9	Valve Discharge	064-12164
10	Spring, Discharge Valve	029-04010
11	Valve Seat, Discharge	064-00374
12-14	Bolt Assembly, Valve Seat	364-02674
13	Gasket, Discharge Valve Seat	070-05819
14	Nut, Discharge Valve Bolt	021-09731

FIG. 4— Suction and Discharge Valve Assemblies

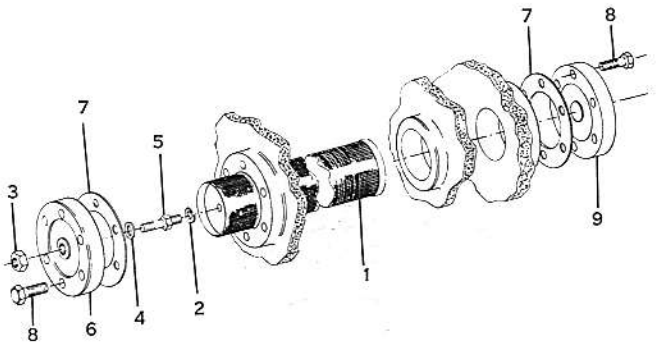
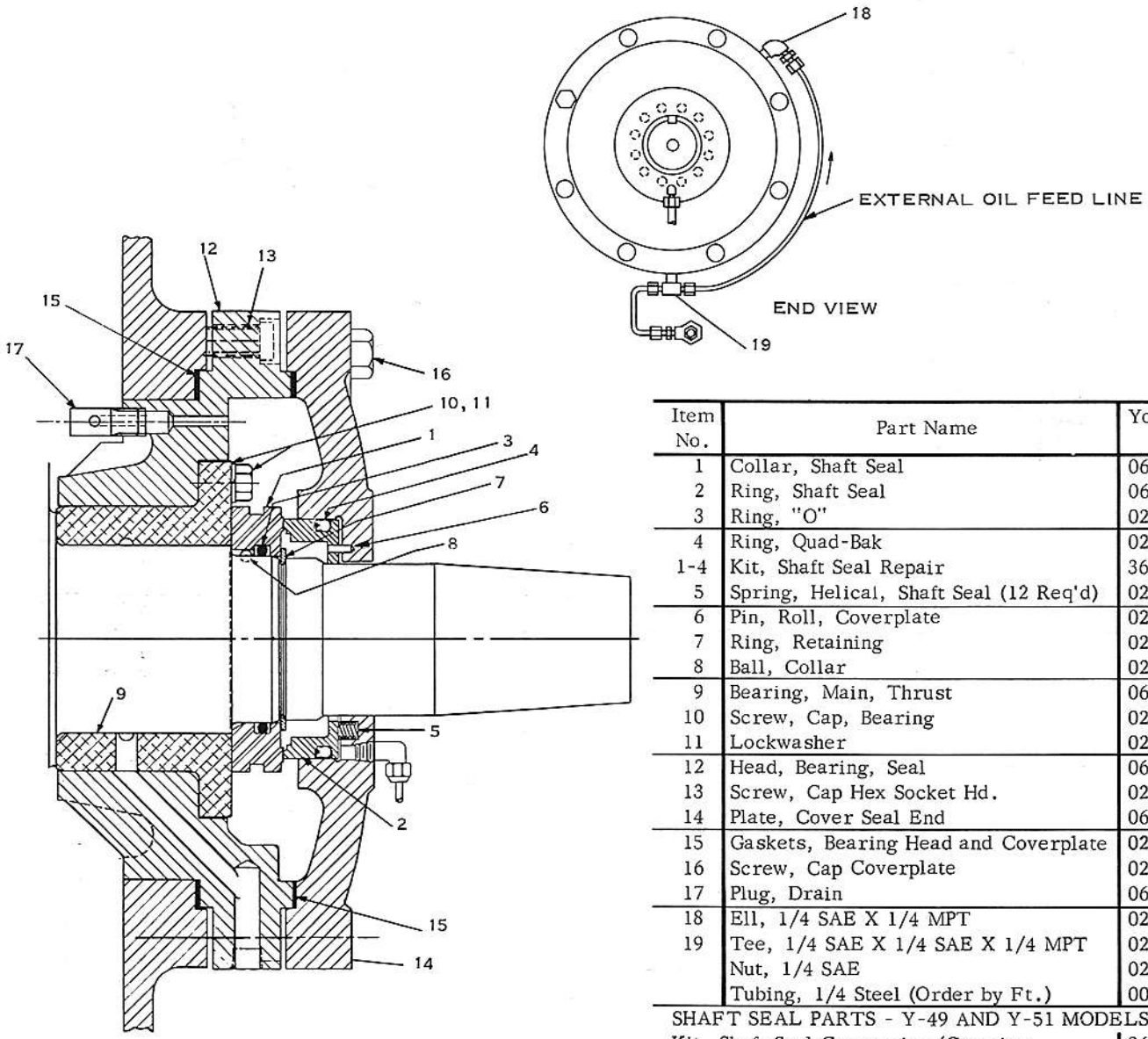


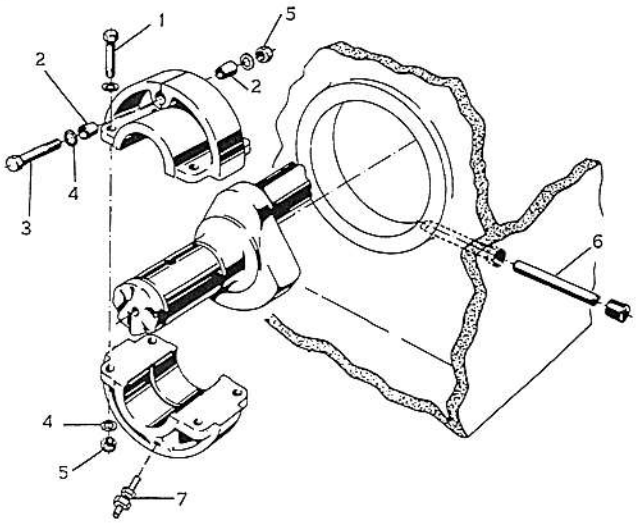
FIG. 5— Suction Strainer Assembly

Item No.	Part Name	York Part No.
1	Screen, Suction Strainer	029-03847
2	Lockwasher, Spring	021-05269
3	Nut, Strainer Cover	021-00466
4	Gasket, Stud	028-00757
5	Stud, Collar	064-00377
6	Cover, Strainer	064-00378
7	Gasket, Strainer Cover	070-03808
8	Screw, Cap	021-01483
9	Cover, Suction End	064-00379



Item No.	Part Name	York Part No.
1	Collar, Shaft Seal	064-04739
2	Ring, Shaft Seal	064-24443
3	Ring, "O"	028-07420
4	Ring, Quad-Bak	028-07898
1-4	Kit, Shaft Seal Repair	364-06577
5	Spring, Helical, Shaft Seal (12 Req'd)	029-04010
6	Pin, Roll, Coverplate	029-04290
7	Ring, Retaining	029-09214
8	Ball, Collar	029-01845
9	Bearing, Main, Thrust	064-00324
10	Screw, Cap, Bearing	021-01483
11	Lockwasher	021-05247
12	Head, Bearing, Seal	064-00292
13	Screw, Cap Hex Socket Hd.	021-02590
14	Plate, Cover Seal End	064-04722
15	Gaskets, Bearing Head and Coverplate	028-00824
16	Screw, Cap Coverplate	021-09204
17	Plug, Drain	064-24444
18	Ell, 1/4 SAE X 1/4 MPT	023-04729
19	Tee, 1/4 SAE X 1/4 SAE X 1/4 MPT	023-04100
	Nut, 1/4 SAE	021-05675
	Tubing, 1/4 Steel (Order by Ft.)	003-00235
SHAFT SEAL PARTS - Y-49 AND Y-51 MODELS		
Kit, Shaft Seal Conversion (Contains Material to Convert Y-49 or Y-51 Type Seal Assembly to Y-53 Type)		364-05434
Nut, Seal Collar Locking (2 Required)		064-00313

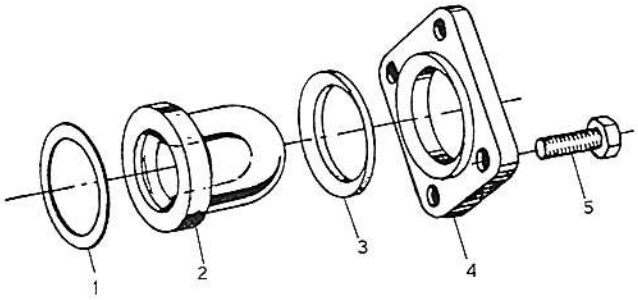
FIG. 6— Shaft Seal and Bearing Head -Y-53 Type



Item No.	Part Name	York Part No.
1	Bolt, Bearing (4 Required)	064-00321
2	Bushing, Taper (2 Required)	064-00320
3	Screw, Cap, Bearing Locking	021-01598
4	Washer (10 Required)	021-05155
5	Nut, Self Locking (5 Required)	021-13257
1-5	Bearing Assembly, Main Center (12 and 16 Cylinders)	364-00317
6	Pin, Dowel, Center Bearing	064-00322
7	Union, 1/4 SAE X 1/8 MPT	023-01304

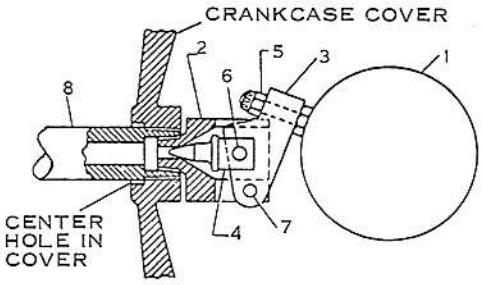
Note: Torque for bearing bolts (Item 1) - 60 Ft. Lbs. Torque for bearing locking screw (Item 3) - 20 Ft. Lbs.

FIG. 7— Center Main Bearing - 12 and 16 Cylinder Compressors



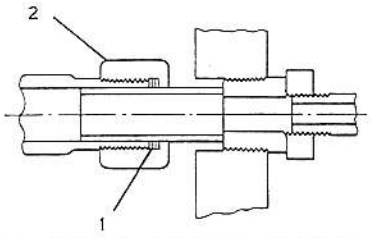
Item No.	Part Name	York Part No.
1	Gasket, Sight Glass	028-00778
2	Sight Glass	026-03992
3	Packing, Sight Glass	028-01519
4	Packing Grand, Sight Glass	064-00302
5	Cap Screw	021-01477

FIG. 8— Oil Sight Glass - Bulb Type



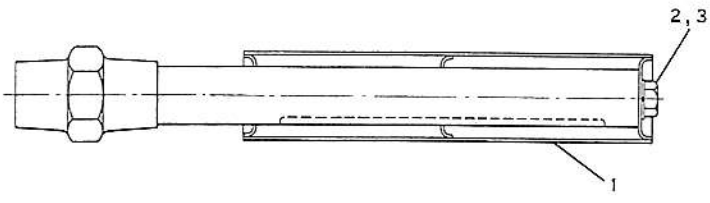
Item No.	Part Name	York Part No.
1	Float Ball	022-00530
2	Valve Body	068-04541
3	Lever	068-04542
4	Valve	068-04545
5	Nut, Self-Locking	021-09610
6	Pin, Valve	068-01549
7	Pin, Lever	068-04544
8	Pipe Nipple, Special	068-04546
1-8	Float Valve Assembly	468-04540

FIG. 9— Crankcase Float Valve



Item No.	Part Name	York Part No.
1	Packing, Oil Header (3 Req'd)	065-00656
2	Nut, Packing, Oil Header	064-00397

FIG. 10— Packing - Internal Oil Header



Item No.	Part Name	York Part No.
1	Strainer, Oil	029-05340
2	Screw, Cap, Oil Strainer	021-01361
3	Lockwasher	021-05289

FIG. 11— Oil Strainer

MISCELLANEOUS

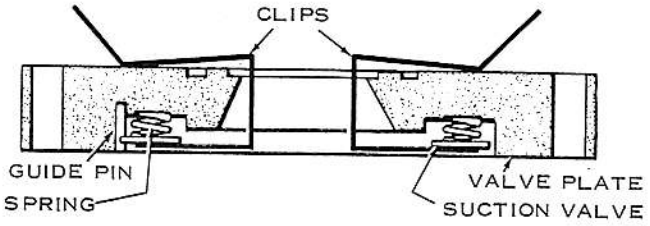
COMPRESSOR GASKETS, COMPLETE SET

Size Compressor	York Part No.
4 Cylinder	364-06361
6 Cylinder	364-06362
8 Cylinder	364-06363
12 Cylinder	364-06364
16 Cylinder	364-06365

Part Name	York Part No.
Valve, 3-Way, for Unloader Cover	022-01278
Gauge, Compressor Oil Pressure	026-12667
Valve, Solenoid, Unloader - 115V	025-09704
Valve, Solenoid, Unloader - 208/230V	025-09705

SPECIAL TOOLS

Part Name	York Part No.
Spanner Wrench - Shaft Seal Nut - Y-49 and 53 Type Shaft Seals	041-04136
Socket Wrench, Relief Valve	068-02913
Funnel Ring - for Compression of Piston Rings When Installing Piston	064-00240



Part Name	York Part No.
Retaining Clip, Suction Valve	064-03447

FIG. 12— Suction Valve Retaining Clip

Subject to Change Without Notice
Printed in U. S. A.
PPC 1M 171 .20 Code: S(EFG) - R - Int.
Form 180.20-RP Supersedes: Form 180.20-RP Coded 460 (3W-F-RP)

DESCRIPTION

GENERAL

The 3-3/4 X 3 V/W compressor units are available for use with remote condensing equipment (either water cooled condensers or economizers) in capacities ranging from 5 through 195 tons of refrigeration for both single stage and booster applications.

These units combine vibration free, quiet and efficient operation with reduced floor area and head room. Static and dynamic balance permits upper floor mounting without special foundations.

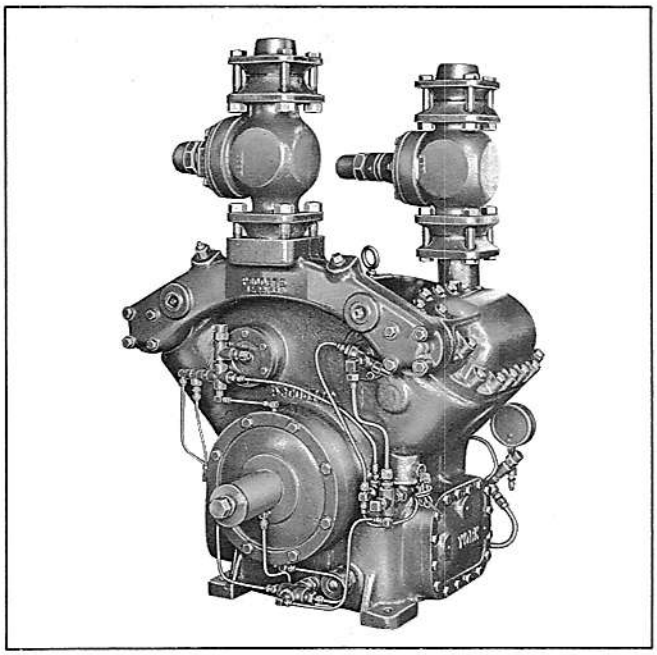


Fig. 1 - Four Cylinder Freon Compressor

Each standard compressor unit is furnished with a single compressor mounted on a base with belt drive and guard (or flexible coupling), oil separator (for ammonia), crankcase heater (for Freon), oil failure switch, stop valves, high pressure cutout, gauges and gauge board.

The 3-3/4 X 3 compressor units are made in 4, 6 and 8 cylinder sizes for the V-Belt drive and 4, 6, 8, 12 or 16 cylinder sizes for direct drive.

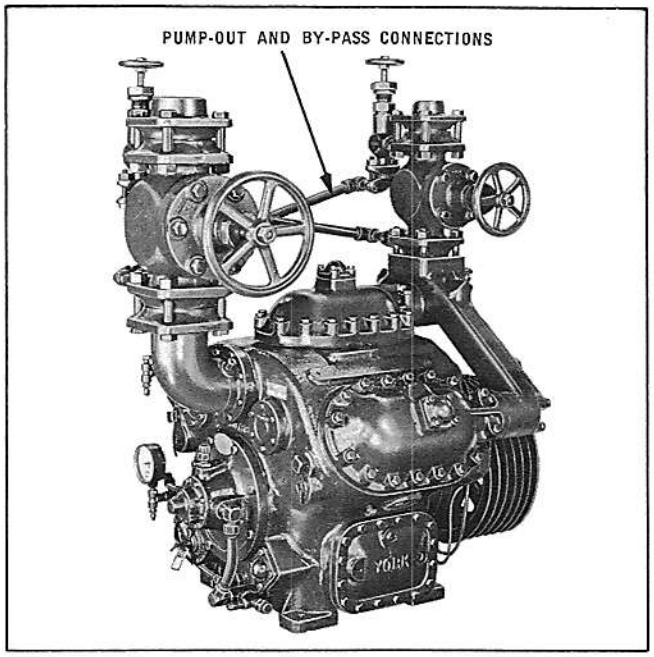


Fig. 2 - Six Cylinder Ammonia Compressor

Figs. 1 through 4 show the general appearance of the compressors used on these units, while Figs. 5 through 10 show the overall dimensions and connections.

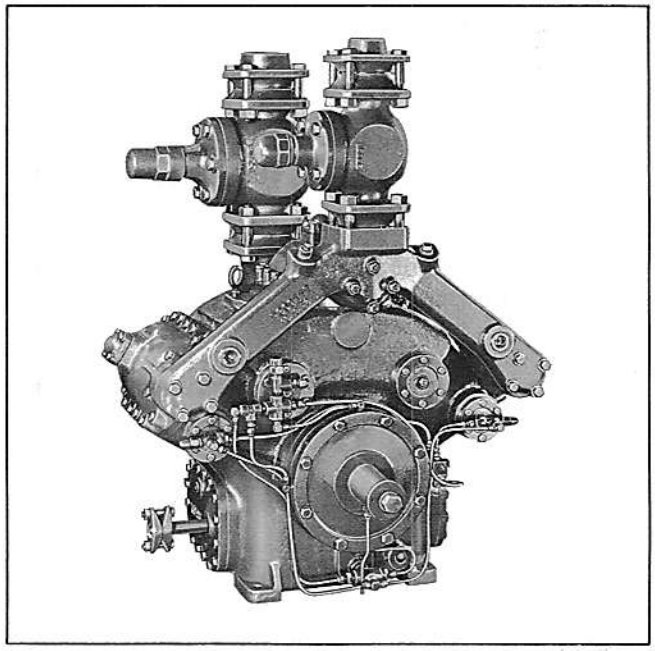
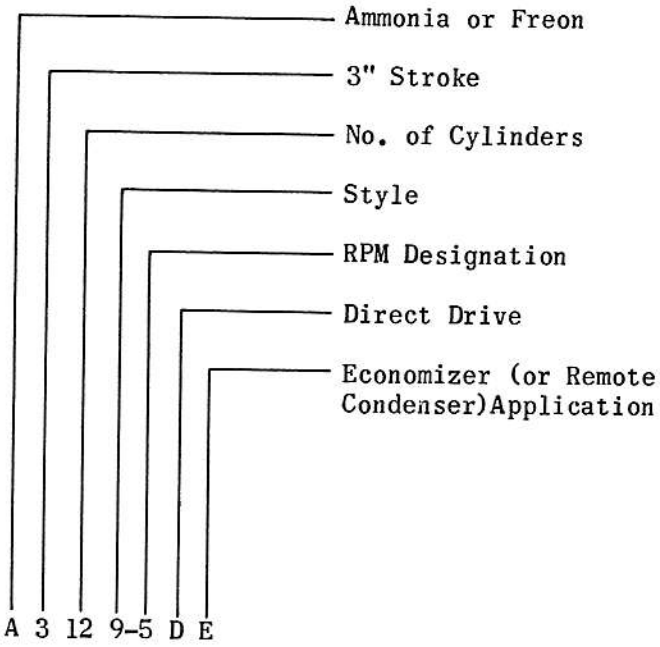


Fig. 3 - Six Cylinder Freon Compressor

V/W COMPRESOR UNITS
FREON AND AMMONIA
3-3/4 X 3

DESCRIPTION

NOMENCLATURE



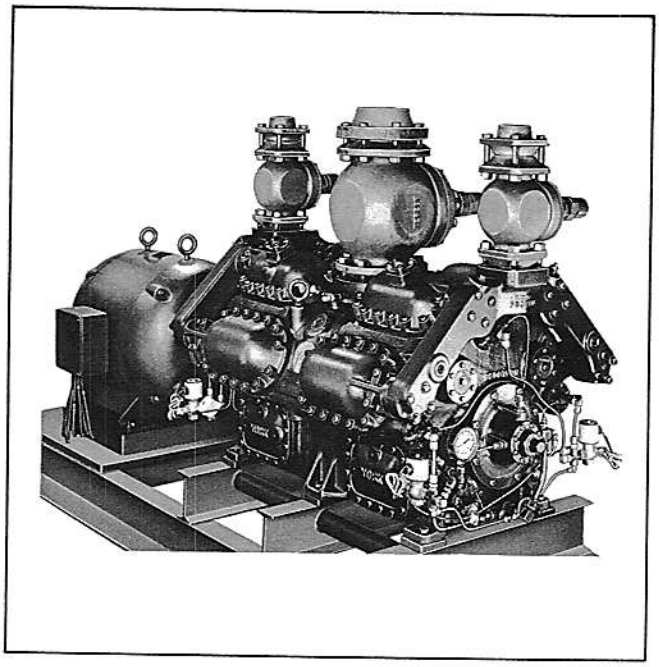


Fig. 4 - Sixteen Cylinder Freon Compressor

SPECIFICATIONS

STANDARD COMPRESSOR UNIT

Housing - Close grained iron casting. Contains cylinders, crankcase, suction strainers and relief valves; equipped with hand hole plates and oil sight glass. Removable cast alloy iron sleeves are fitted into the cylinders. Integrally cast water passages in ammonia housing to keep working parts of compressor cool.

Pistons - Cast iron plug type pistons with chrome plated compression rings and ventilated oil rings.

Suction and Discharge Valves - Ring plate type of stainless steel with cast iron retaining plate.

Connecting Rods - Aluminum alloy with reinforced crank pin end. Produced by full permanent mold process. Drilled for oil distribution to the piston pins.

Crankshaft - Cast iron, counter-weighted and balanced to minimize vibration.

Shaft Seal - Single, spring loaded, balanced seal, simple in design and using no diaphragms. Cast iron seal collar with carbon seal ring.

Bearings - Sleeve type load and thrust bearings of aluminum alloy.

Lubrication - All bearing surfaces and the shaft seal are pressure lubricated by a geared pump equipped with an external disc type oil filter in pump discharge, a pressure gauge and a regulating valve.

Suction Strainers - Strainers, the bodies of which are recessed in the compressor housing, are equipped with two thicknesses of 35 mesh wire screen. Each strainer is lined at the factory with a cloth bag. This cloth bag is used to protect the compressor

SPECIFICATIONS

on initial start up. It is then removed and retained for future use after piping changes or additions.

Crankcase Oil Heater (Freon Only) - An insert-type 300 watt crankcase oil heater complete with junction box and cover is furnished installed on each compressor. The connection is 3/4" pipe thread and the steel sheath is approximately 12" long. Available for either 110 or 220 volts.

Pressure Relief Valve - Standard, spring loaded, ball check type which allows discharge gas to escape into suction gas passages. These valves are set to open at 250 psi differential.

Oil Level Indicator - Oil sight glasses are installed so that the oil level may be readily observed.

Capacity Reducers - Capacity reducers, including steel tubing, orifices and hand operated stop valves are incorporated as standard. When so specified, the compressor is fitted with solenoid valves to allow for automatic capacity reduction.

Thermometers (Ammonia Only) - A thermometer is furnished for insertion into the discharge manifold. A thermometer well is provided at the suction connection on 4, 6 and 8 cylinder sizes.

Controls and Gauge Board - A high pressure cutout is furnished with each compressor for remote mounting. Also a gauge board with high and low pressure gauges is furnished with each compressor.

Compressor Connections - Hand wheel type suction and discharge stop valves and welding flanges for connecting into system are mounted on the ammonia compressors. Freon compressors have seal cap valves.

Drive - Either V-belt drive or flexible coupling for direct drive.

Steel Base or Soleplate - Structural steel base with motor rails and belt guard or soleplate with bolts and dowel pins for mounting on concrete foundation.

Oil Failure Switch - Pressure differential manual reset type which responds to pressure difference between oil pressure and suction pressure. Stops motor on reduced oil pressure.

ACCESSORIES

Discharge Line Oil Separator (Freon Only) Separators are furnished complete with float. Furnished as standard for ammonia.

Crankcase Oil Level Float - Floats to be used with parallel operation of compressors. All compressors have hand hole covers adapted for use of these floats.

Oil Receiver - Available when required.

Automatic Capacity Reduction - Solenoid valves, necessary tubing and fittings are available to give automatic control of capacity reduction. The solenoid valves may be operated by either a thermostat or a suction pressure control.

Gas and Oil Equalizing Connections - All compressors have cover plates tapped for use of equalizing connections.

Vibration Isolators - Vibration isolator springs are available for upper floor mounting or any other mounting where vibration must be kept to a minimum.

Pumpout and Bypass Connections - Necessary valves, fittings and pipe for cross connections are available when ordered.

Gauge Board With L.P. Cutout - Made for 4-1/2" suction and discharge pressure gauges and high and low pressure cutouts. Gauges and low pressure cutout included with board.

Motors and Starters - Motors and starters are available when ordered.

V/W COMPRESSOR UNITS
FREON AND AMMONIA
3-3/4 X 3

PHYSICAL DATA

TABLE 1
COMPRESSOR DATA—DIRECT OR BELT DRIVEN

COMPRESSOR		4 Cyl.	6 Cyl.	8 Cyl.	12 Cyl.	16 Cyl.
Cylinders	Bore	3¾"	3¾"	3¾"	3¾"	3¾"
	Stroke	3"	3"	3"	3"	3"
Pistons	No. Compression Rings	2	2	2	2	2
	No. "Vent. Oil" Rings	1	1	1	1	1
	Pin Diameter	1"	1"	1"	1"	1"
	Pin Length	2¾"	2¾"	2¾"	2¾"	2¾"
Valves per Cylinder	Suction	1	1	1	1	1
	Discharge	1	1	1	1	1
Connecting Rods	℄ to ℄—Crank and Wrist Pin	10"	10"	10"	10"	10"
Crankshaft	Number of Bearings	2	2	2	3	3
Size of Main Bearings	Seal End	3¼"x3"	3¼"x3"	3¼"x3"	3¼"x3"	3¼"x3"
	Center Bearing	.....	.....	.....	3¼"x4⅜"	3¼"x4⅜"
	Pump End	2⅝"x3¼"	2⅝"x3¼"	2⅝"x3¼"	2⅝"x3¼"	2⅝"x3¼"
Crank Pin	Diameter	2⅜"	2⅜"	2⅜"	2⅜"	2⅜"
	Length	1¾"	2⅝"	3½"	2⅝"	3½"
Shaft Keyway	Width	½"	½"	½"	½"	½"
	Depth	¼"	¼"	¼"	¼"	¼"
Oil Charge	Gallons	4	5	5	12	12

TABLE 2
UNIT DATA—DIRECT OR BELT DRIVEN

UNIT MODEL NUMBER	PIPING CONNECTIONS			OVERALL DIMENSIONS			MAX. OPERATING WEIGHT
	Suction		Discharge	Length With Motor	Width	Height	(No Motor) Pounds
	Freon	NH_3					
3049-2BE	2½"	2½"	2½"	69"	39¼"	46½"	1600
3049-3BE	2½"		2½"	69"	39¼"	46½"	1600
3049-4BE	2½"		2½"	69"	39¼"	46½"	1600
3049-5BE	3"		2½"	69"	40⅛"	46½"	1600
3049-5DE*	3"		2½"	75¼"	30½"	48 11/16"	1500
3069-3BE	3"		2½"	76"	43 9/16"	49½"	1750
3069-4BE	3"		2½"	76"	43 9/16"	49½"	1750
3069-5BE	4"		2½"	76"	43 9/16"	49½"	1750
3069-5DE*	4"		2½"	82 5/16"	34½"	52¼"	1640
3089-4BE	4"	3"	3"	76"	45"	48½"	1850
3089-5BE	4"		3"	76"	45"	48½"	1850
3089-5DE*	4"		3"	87 1/16"	34½"	51¼"	1740
3129-3DE*	5"	4"	Two 2½"	104⅜"	38"	58⅞"	3280
3129-5DE*	5"		Two 2½"	105¼"	38"	58⅞"	3280
3169-5DE*	6"		Two 3"	105 7/16"	38⅜"	57⅞"	3480

* Direct drive.

PHYSICAL DATA

TABLE 3—V-BELT DRIVE DATA—FREON

UNIT	COMPRESSOR			MOTOR			V-BELT				DRIVE PKG
Model Number	R.P.M.	Flywheel		R.P.M.	Pulley		No.	Section	Nom. Inside Length	Max. Drive bhp	Part Number
		Dia.	Face Width		Dia.	Face Width					
F-3049-2BE	720	16″ 16″	5½″ 5½″	1450 1750	8⅛″ 6⅞″	5½″ 5½″	7 7	B B	97″ 97″	25.1 22.2	64-4434S 64-2021S
F-3049-3BE	950	16″ 16″	6⅜″ 6⅜″	1450 1750	10¾″ 9⅛″	6⅜″ 6⅜″	6 6	C C	96″ 96″	50.4 39.0	64-4496S 64-2022S
F-3049-5BE	1190	16″ 16″	6⅜″ 6⅜″	1450 1750	13″ 11⅛″	6⅜″ 6⅜″	6 6	C C	96″ 96″	62.4 57.0	64-4444S 64-2023S
F-3049-7BE	1400	12″ 12″	6⅜″ 6⅜″	1450 1750	11⅝″ 9¾″	6⅜″ 6⅜″	6 6	C C	90″ 96″	55.7 45.0	64-4435S 64-2024S
F-3049-9BE	1750	12″ 12″	6⅜″ 6⅜″	1450 1750	14⅜″ 12″	6⅜″ 6⅜″	6 6	C C	90″ 90″	62.4 61.2	64-4436S 64-4450S
F-3069-5BE	1170	16″ 16″	6⅜″ 6⅜″	1450 1800	13″ 10⅞″	6⅜″ 6⅜″	6 6	C C	96″ 96″	62.4 56.6	64-4444S 64-612S
F-3069-6BE	1305	12″ 12″	6⅜″ 6⅜″	1450 1800	10⅞″ 9⅛″	6⅜″ 6⅜″	6 6	C C	90″ 90″	50.4 40.0	64-4437S 64-2025S
F-3069-8BE	1575	12″ 12″	6⅜″ 6⅜″	1450 1800	13″ 10⅞″	6⅜″ 6⅜″	6 6	C C	90″ 96″	62.4 55.0	64-4438S 64-2026S
F-3069-9BE	1750	12″ 12″	6⅜″ 6⅜″	1450 1800	14⅜″ 12″	6⅜″ 6⅜″	6 6	C C	90″ 90″	62.4 61.2	64-4436S 64-4450S
F-3089-5BE	1170	16″ 16″	6⅜″ 6⅜″	1450 1800	13″ 10⅞″	6⅜″ 6⅜″	6 6	C C	96″ 96″	62.4 56.6	64-4444S 64-612S
F-3089-7BE	1440	12″ 12″	6⅜″ 6⅜″	1450 1800	11⅞″ 10″	6⅜″ 6⅜″	6 6	C cog. C cog.	90″ 90″	80.6 66.2	64-4439S 64-2027S
F-3089-9BE	1750	12″ 12″	6⅜″ 6⅜″	1450 1800	14⅜″ 12″	6⅜″ 6⅜″	6 6	C cog. C cog.	90″ 90″	87.4 85.6	64-4440S 64-4451S

PHYSICAL DATA

TABLE 4—V-BELT DRIVE DATA—AMMONIA

UNIT	COMPRESSOR			MOTOR			V-BELT				DRIVE PKG
		Flywheel			Pulley						
Model Number	R.P.M.	Dia.	Face Width	R.P.M.	Dia.	Face Width	No.	Section	Nom. Inside Length	Max. Drive bhp	Part Number
A-3049-2BE	750	16″	5½″	1450	8⅜″	5½″	7	B	97″	25.1	64-4441S
		16″	5½″	1750	7½″	5½″	7	B	97″	24.0	64-609S
A-3049-3BE	875	16″	6⅜″	1450	10″	6⅜″	6	C	96″	43.2	64-4442S
		16″	5½″	1750	8¼″	5½″	7	B	97″	27.2	64-610S
A-3049-4BE	1015	16″	6⅜″	1450	11⅜″	6⅜″	6	C	96″	53.3	64-4443S
		16″	6⅜″	1750	9½″	6⅜″	6	C	96″	42.8	64-611S
A-3049-5BE	1170	16″	6⅜″	1450	13″	6⅜″	6	C	96″	62.4	64-4444S
		16″	6⅜″	1750	10⅞″	6⅜″	6	C	96″	52.4	64-612S
A-3069-3BE	875	16″	6⅜″	1170	12⅛″	6⅜″	6	C	105″	51.5	64-614S
		16″	6⅜″	1450	10″	6⅜″	6	C	96″	43.2	64-4442S
		16″	6⅜″	1750	8⅜″	6⅜″	6	C cog.	96″	58.8	64-4447S
A-3069-4BE	1015	16″	6⅜″	1170	14″	6⅜″	6	C	105″	60.0	64-615S
		16″	6⅜″	1450	11⅜″	6⅜″	6	C	96″	53.3	64-4443S
		16″	6⅜″	1750	9½″	6⅜″	6	C cog.	96″	62.5	64-4449S
A-3069-5BE	1170	16″	6⅜″	1450	13″	6⅜″	6	C cog.	96″	87.4	64-4445S
		16″	6⅜″	1750	10⅞″	6⅜″	6	C cog.	96″	79.2	64-4448S
A-3089-4BE	1015	16″	6⅜″	1170	14″	6⅜″	6	C	105″	51.5	64-614S
		16″	6⅜″	1450	11⅜″	6⅜″	6	C cog.	96″	75.0	64-4446S
		16″	6⅜″	1750	9½″	6⅜″	6	C cog.	96″	62.5	64-4449S
A-3089-5BE	1170	16″	6⅜″	1450	13″	6⅜″	6	C cog.	96″	87.4	64-4445S
		16″	6⅜″	1750	10⅞″	6⅜″	6	C cog.	96″	79.2	64-4448S

DIMENSIONS

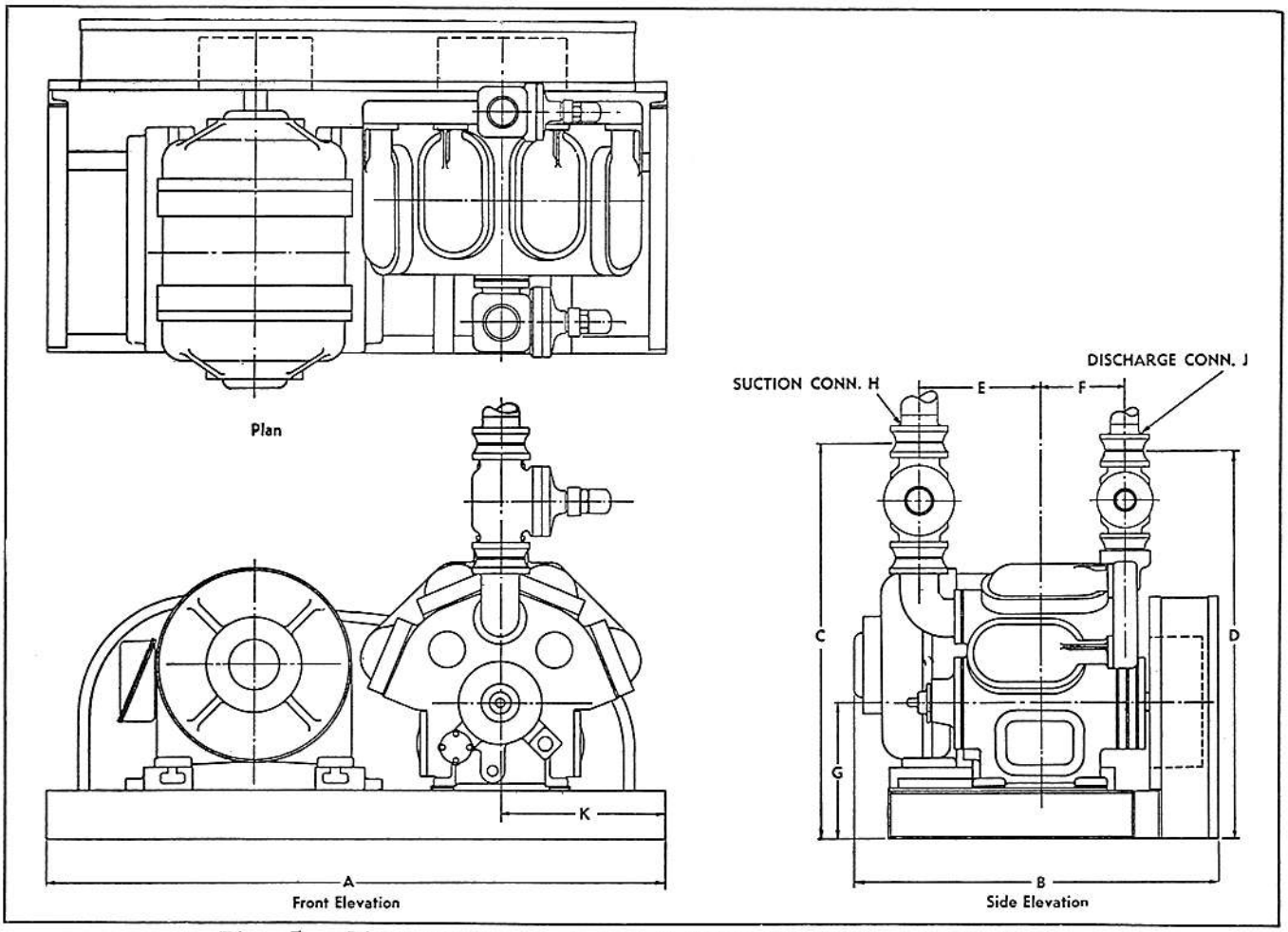


Fig. 5 - Dimensions - 4, 6 and 8 Cylinder Freon - Belt Drive

UNIT MODEL NUMBER	DIMENSIONS—Inches									
	A	B	C	D	E	F	G	H	J	K
F-3049-2BE	69	38 5/8	44	46 1/2	14	10 15/16	15 3/4	2 1/2	2 1/2	20 1/2
F-3049-3BE	69	38 5/8	44	46 1/2	14	10 15/16	15 3/4	2 1/2	2 1/2	20 1/2
F-3049-5BE	69	39 3/16	45 1/4	46 1/2	14 1/4	10 15/16	15 3/4	3	2 1/2	20 1/2
F-3049-7BE	69	39 3/16	45 1/4	46 1/2	14 1/4	10 15/16	15 3/4	3	2 1/2	20 1/2
F-3049-9BE	69	39 3/16	45 1/4	46 1/2	14 1/4	10 15/16	15 3/4	3	2 1/2	20 1/2
F-3069-5BE	69	40 11/16	44 7/8	48 1/8	14 1/2	10 15/16	15 3/4	3	2 1/2	20 1/2
F-3069-6BE	69	40 11/16	47 1/4	48 1/8	14 7/8	10 15/16	15 3/4	4	2 1/2	20 1/2
F-3069-8BE	69	40 11/16	47 1/4	48 1/8	14 7/8	10 15/16	15 3/4	4	2 1/2	20 1/2
F-3069-9BE	69	40 11/16	47 1/4	48 1/8	14 7/8	10 15/16	15 3/4	4	2 1/2	20 1/2
F-3089-5BE	69	41	47 1/2	46 3/8	14 7/8	10 15/16	15 3/4	4	3	20 1/2
F-3089-7BE	69	41	47 1/2	46 3/8	14 7/8	10 15/16	15 3/4	4	3	20 1/2
F-3089-9BE	69	41	47 1/2	46 3/8	14 7/8	10 15/16	15 3/4	4	3	20 1/2

Space needed for removing crankshaft from either end of compressor is—

33 1/8"—centerline of compressor to wall.

V/W COMPRESSOR UNITS
FREON AND AMMONIA
3-3/4 X 3

DIMENSIONS

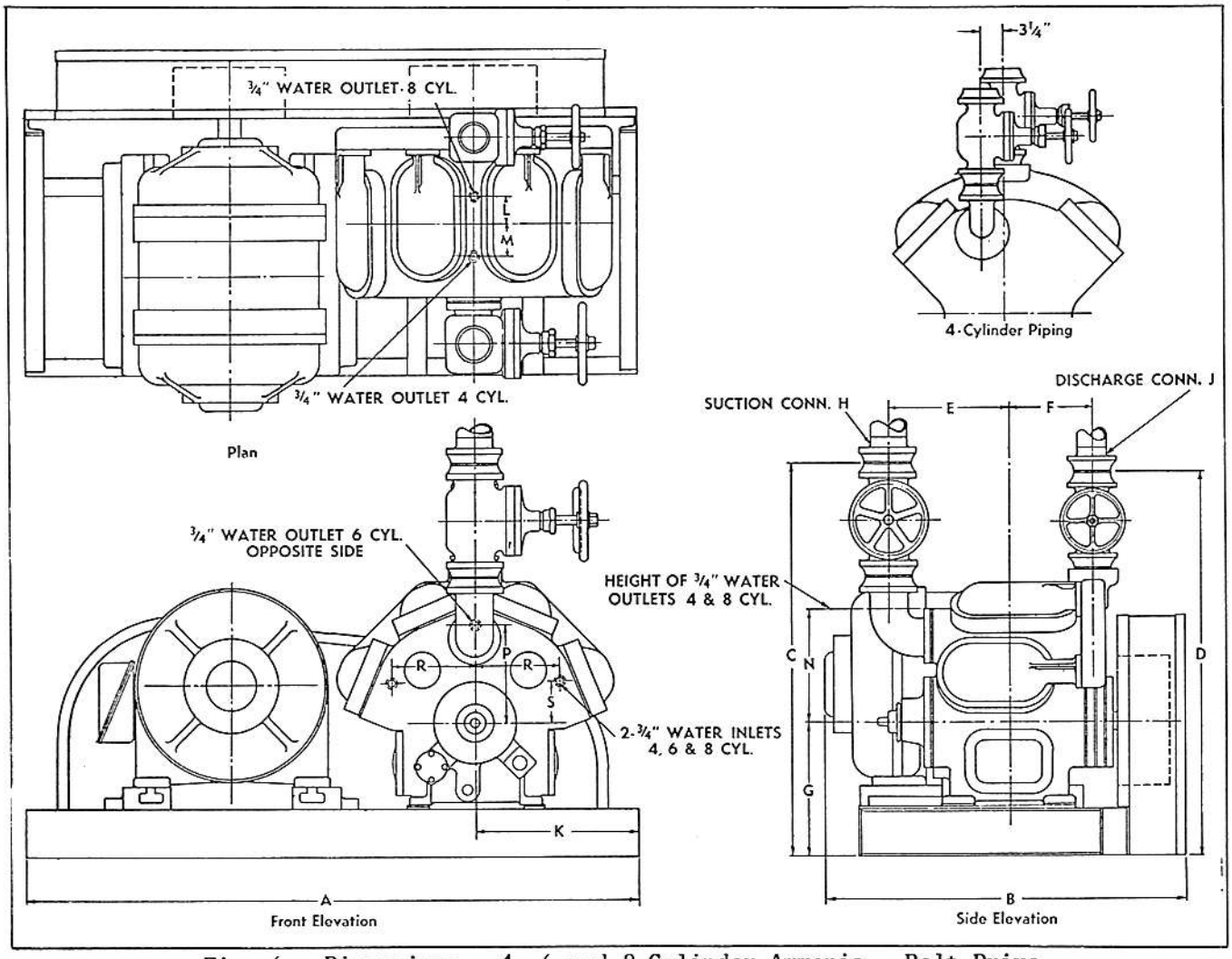


Fig. 6 - Dimensions - 4, 6 and 8 Cylinder Ammonia - Belt Drive

UNIT MODEL NUMBER	DIMENSIONS—Inches															
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S
A3049-2BE	69	39¼	44	46½	14	10⁵⁄₁₆	15¾	2½	2½	20½	—	5¾	14¾	—	7⅝	8⅞
A3049-3BE	69	39¼	44	46½	14	10⁵⁄₁₆	15¾	2½	2½	20½	—	5¾	14¾	—	7⅝	8⅞
A3049-4BE	69	39¼	44	46½	14	10⁵⁄₁₆	15¾	2½	2½	20½	—	5¾	14¾	—	7⅝	8⅞
A3049-5BE	69	40⅛	45¼	46½	14¼	10⁵⁄₁₆	15¾	2½	2½	20½	—	5¾	14¾	—	7⅝	8⅞
A3069-3BE	76	43⅜	46¼	49½	14½	12⅛	16¾	2½	2½	20½	—	—	—	12	10½	5
A3069-4BE	76	43⅜	46¼	49½	14½	12⅛	16¾	2½	2½	20½	—	—	—	12	10½	5
A3069-5BE	76	43⅜	48½	49½	14⅞	12⅛	16¾	2½	2½	20½	—	—	—	12	10½	5
A3089-4BE	76	45	48½	47⅜	14⅞	10⁵⁄₁₆	16¾	3	3	20½	3⅜	—	14⅜	—	10⅜	5⅛
A3089-5BE	76	45	48½	47⅜	14⅞	10⁵⁄₁₆	16¾	3	3	20½	3⅜	—	14⅜	—	10⅜	5⅛

Space needed for removing crankshaft from either end of compressor is—

33⅛"—centerline of compressor to wall.

DIMENSIONS

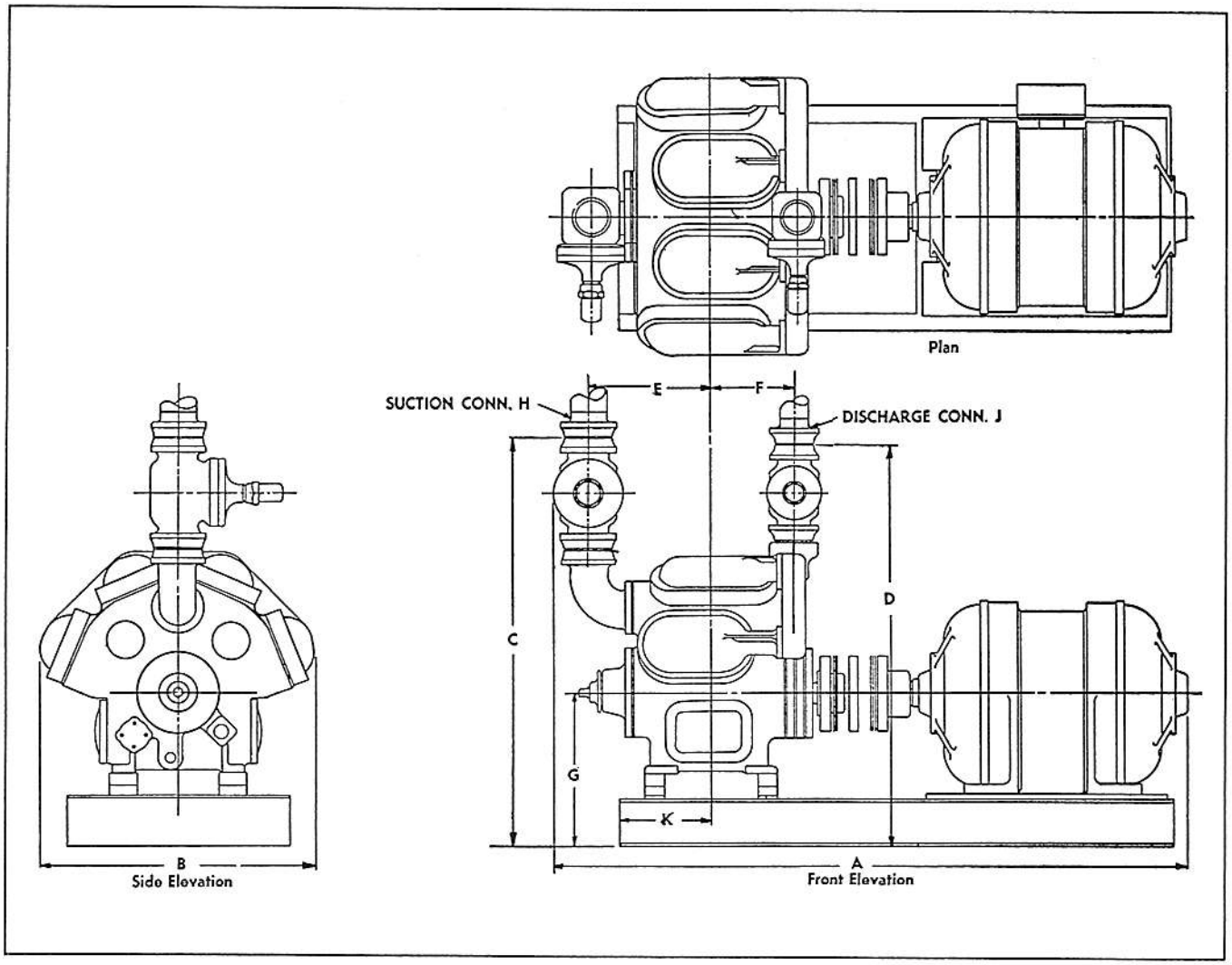


Fig. 7 - Dimensions - 4, 6 and 8 Cylinder Freon - Direct Drive

UNIT MODEL NUMBER	Max. HP	DIMENSIONS—Inches										
		A	B	C	D	E	F	G	H	J	K	RPM
F3049-5DE	25	75 5/16	30 1/2	47 3/8	48 11/16	14 1/4	10 15/16	17 7/8	3	2 1/2	11 3/8	1170
F3049-9DE	40	75 5/16	30 1/2	47 3/8	48 11/16	14 1/4	10 15/16	17 7/8	3	2 1/2	11 3/8	1750
F3069-5DE	40	76 13/16	34 1/2	48 7/8	52 1/4	14 1/2	12 1/16	19 3/8	3	2 1/2	11 3/8	1170
F3069-9DE	50	76 13/16	34 1/2	51 1/4	52 1/4	14 7/8	12 1/16	19 3/8	4	2 1/2	11 3/8	1750
F3089-5DE	50	82 5/16	34 1/2	51 1/4	50 1/8	14 7/8	10 15/16	19 3/8	4	3	11 3/8	1170
F3089-9DE	75	87 1/16	34 1/2	51 1/4	50 1/8	14 7/8	10 15/16	19 3/8	4	3	11 3/8	1750

Space needed for removing crankshaft from either end of compressor is—

33 1/8"—centerline of compressor to wall.

V/W COMPRESSOR UNITS
FREON AND AMMONIA
3-3/4 X 3

DIMENSIONS

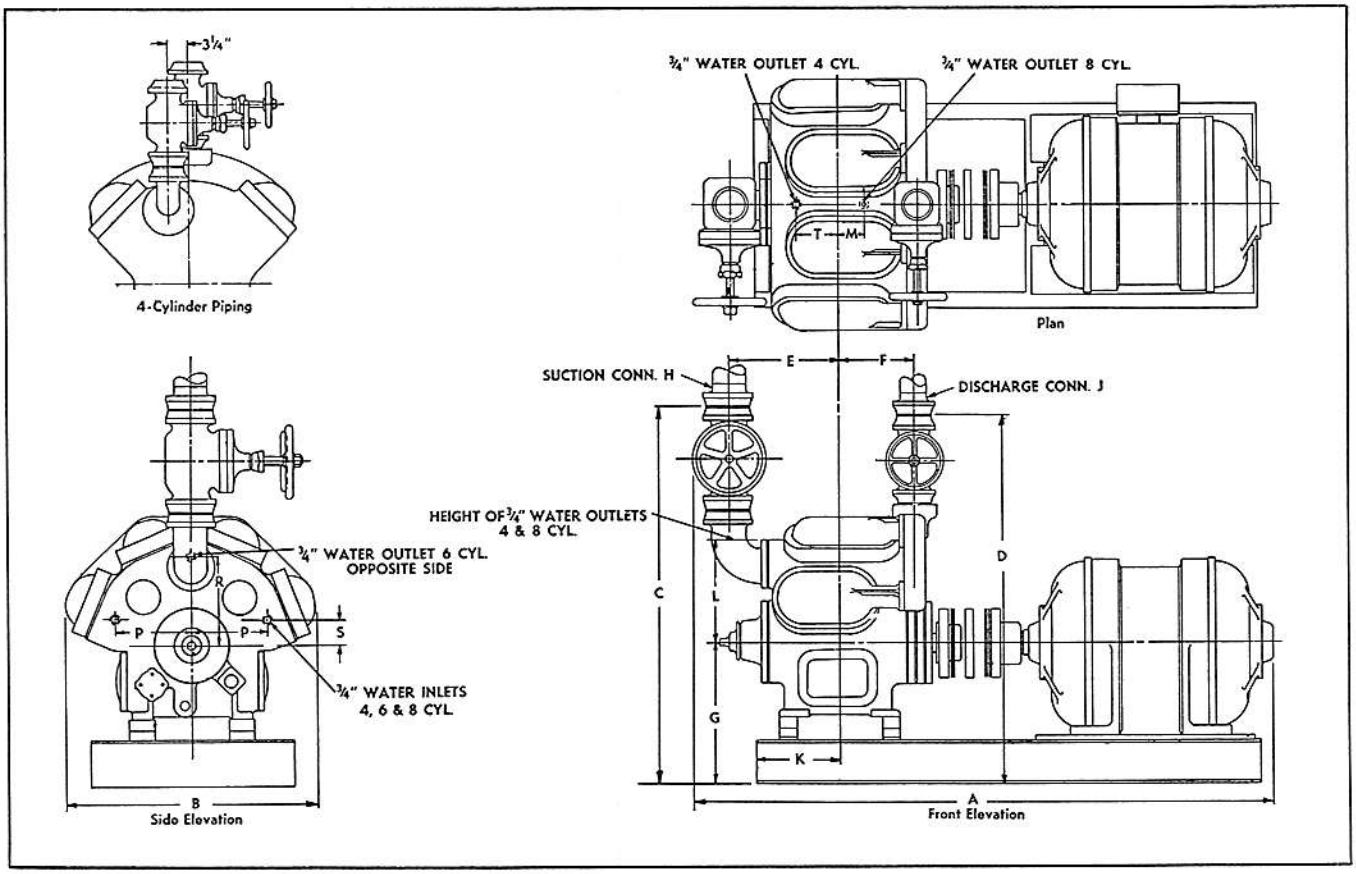


Fig. 8 - Dimensions - 4, 6 and 8 Cylinder Ammonia - Direct Drive

UNIT MODEL NUMBER	Max. H.P.	DIMENSIONS—Inches															
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T
A3049-5DE	40	75¼	30½	47⅜	48⅛	14¼	10⅝	17⅞	2½	2½	11⅜	14¾	—	—	7⅝	—	8⅞	5¾
A3069-5DE	60	82⅝	34½	51¼	52¼	14⅞	12⅛	19⅜	2½	2½	11⅜	—	—	—	10½	12	5	—
A3089-5DE	75	87⅛	34½	51¼	50⅛	14⅞	10⅝	19⅜	3	3	11⅜	14⅜	3⅜	—	10⅜	—	5⅛	—

Space needed for removing crankshaft from either end of compressor is—

33⅛"—centerline of compressor to wall.

DIMENSIONS

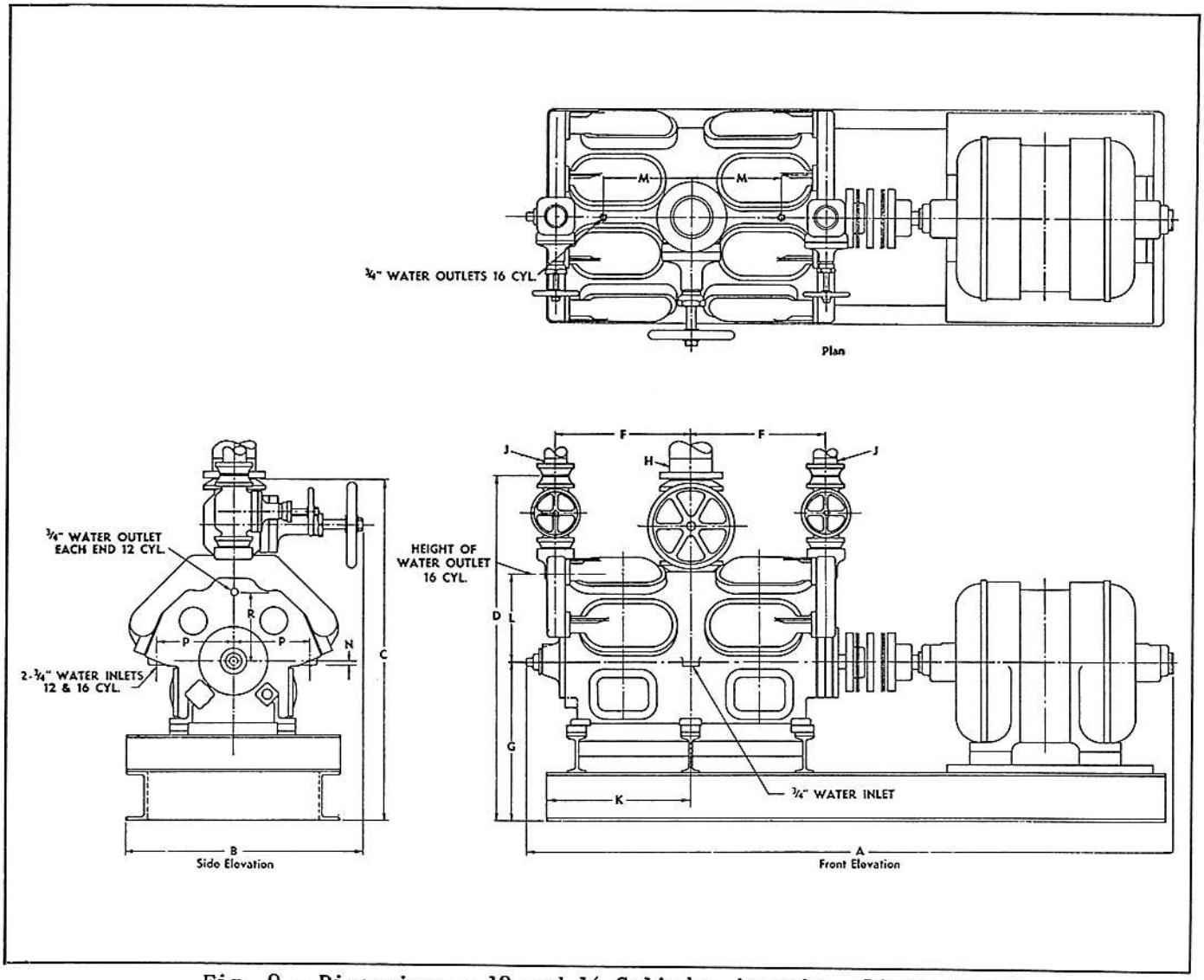


Fig. 9 - Dimensions - 12 and 16 Cylinder Ammonia - Direct Drive

UNIT MODEL NUMBER	Max. H.P.	DIMENSIONS—Inches															
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T
A3129-3DE	100	104⅜	38	56⅞	58⅞	—	23⅜	26⅛	4	2½	23½	—	—	—	11½	12	—	—
A3129-5DE	125	105¼	38	56⅞	58⅞	—	23⅜	26⅛	4	2½	23½	—	—	0	11½	12	—	—
A3169-5DE	150	105⅞	38⅜	57⅛	56¾	—	22⅛	26⅛	4	3	23½	14⅜	14½	5/16	12½	—	—	—

Space needed for removing crankshaft from either end of compressor is—

66½"—centerline of compressor to wall.

V/W COMPRESSOR UNITS
FREON AND AMMONIA
3-3/4 X 3

DIMENSIONS

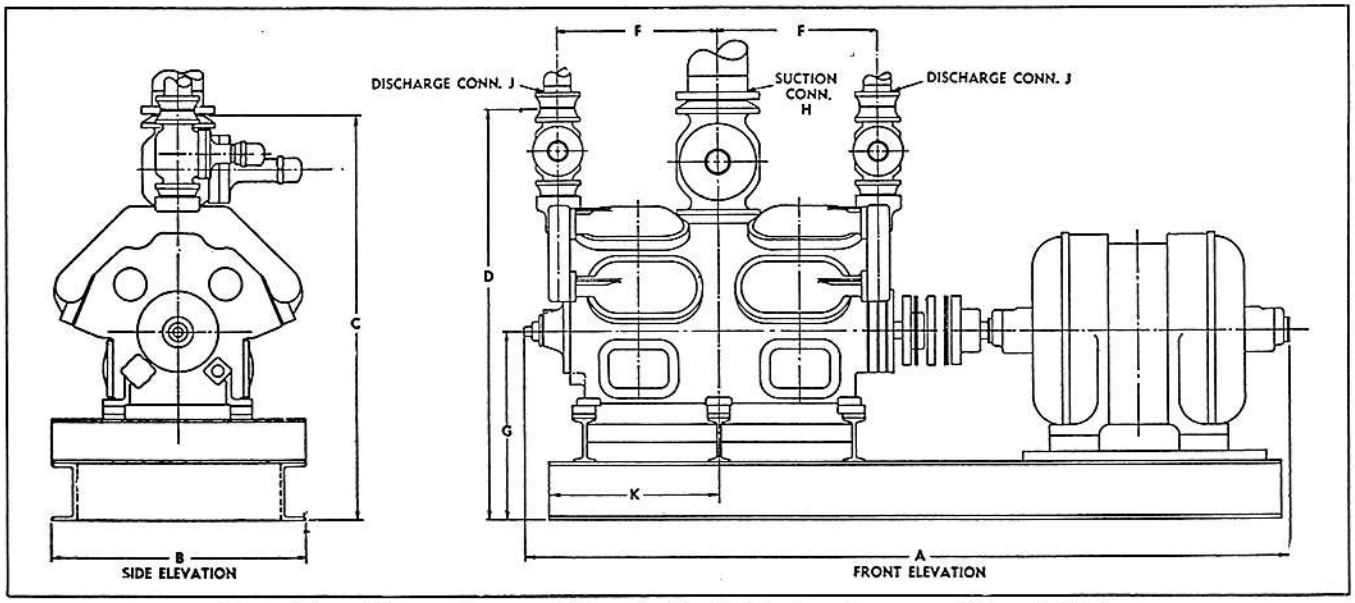


Fig. 10 - Dimensions - 12 and 16 Cylinder Freon - Direct Drive

UNIT MODEL NUMBER	Max. HP	DIMENSIONS—Inches									
		A	B	C	D	F	G	H	J	K	RPM
F3129-5DE	75	101½	35	56⅞	58⅞	23 3/16	26⅛	5	2½	23½	1170
F3129-9DE	100	101½	35	56⅞	58⅞	23 3/16	26⅛	5	2½	23½	1750
F3169-5DE	100	104	35	57⅞	56¾	22 1/16	26⅛	6	3	23½	1170
F3169-9DE	150	105 7/16	35	57⅞	56¾	22 1/16	26⅛	6	3	23½	1750

Space needed for removing crankshaft from either end of compressor is—

66½"—centerline of compressor to wall.

INSTALLATION

GENERAL

Before installing one of these compressor units, it must be realized that these are precision built, high speed machines. The importance of cleanliness during installation cannot be over-emphasized. Dirt, scale, rust and any other foreign matter must be removed from the entire system before the compressor is operated. The smallest particles of foreign matter can score pistons, cylinder liners, bearings and seal surfaces, and must be prevented from reaching these parts.

A closely woven cloth bag is installed in each suction strainer of every new compressor as an added precaution to prevent dirt from reaching the moving parts. NOTE: These bags, are not designed for permanent system cleaning and must be removed after the initial operating period. Therefore, do not depend on the cloth bags to do a permanent cleaning job. The system must be cleaned before operation.

The system, into which one of these compressor units is to be installed, must be designed to prevent heavy or prolonged liquid slop-over back to the compressor.

Other precautions which must be observed in installing these compressor units, may be found in Instruction 2D, GENERAL INSTRUCTIONS, FREON SYSTEMS or 2A AMMONIA SYSTEMS .

INSPECTION

As soon as it is received, the unit should be inspected for any damage done in transit. If damage is evident, it should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing

at once (See Instruction 2F).

HANDLING

All of the units are shipped on skids which should not be removed until the apparatus has been placed in its approximate location. Care must be taken not to damage the external oil piping on the compressor when moving the unit. Shipped in a carton attached to the skid are a shaft seal collar nut spanner wrench, a high pressure cutout, oil failure switch, discharge gas thermometer (ammonia), funnel ring and 3 Allen set screw wrenches. The gauge board is shipped in a separate box.

For removing the crankshaft from either end of the compressor the space needed from the center line of the compressor to the wall is:

4 Cylinder	32-3/8"
6 & 8 Cylinder	33-1/8"
12 & 16 Cylinder	66-1/2"

LOCATION

The unit should be located in a dry and well lighted room, with sufficient space around it to allow room for inspection or service. See Table 2 for the overall dimensions of these units.

The unit should be located in a space having natural ventilation to dissipate the heat given off by the compressor and motor.

If sufficient ventilation is not available, it may be necessary to add forced ventilation to prevent excessive bearing temperatures and over-heating of the motor.

When the compressor unit is to be installed in a location where noise is an important factor, all primary sources of noise should be eliminated upon installation.

FOUNDATION AND MOUNTING

Ground - If the unit is to be located on an earth floor it should be placed on a level concrete slab 6" to 8" thick. (See Fig. 11).

Basement - Remove a portion of the basement floor so that a concrete base can be poured resting on the ground, extending 6" to 8" above the basement floor and having sufficient space on all sides to install corkboard. (See Fig. 11) If this method of isolating the compressor unit cannot be used, place the unit on a level concrete slab 6" to 8" thick and the use of spring type isolators are recommended. (See Fig. 11)

Upper Floor - For upper floor mounting, spring type isolators are available when ordered. Fig. 12 shows the three spring assembly used for the 12 and 16 cylinder units and the single spring assembly used for 4, 6 and 8 cylinder units. Do not use corkboard under these units.

The standard location for the isolator assemblies is shown by Fig. 14. These locations are satisfactory for most installations but on occasion it may be necessary to move the assemblies to compensate for heavier or lighter loads at the motor end.

All compressor unit bases have additional holes drilled at the factory to allow relocating the isolator assemblies.

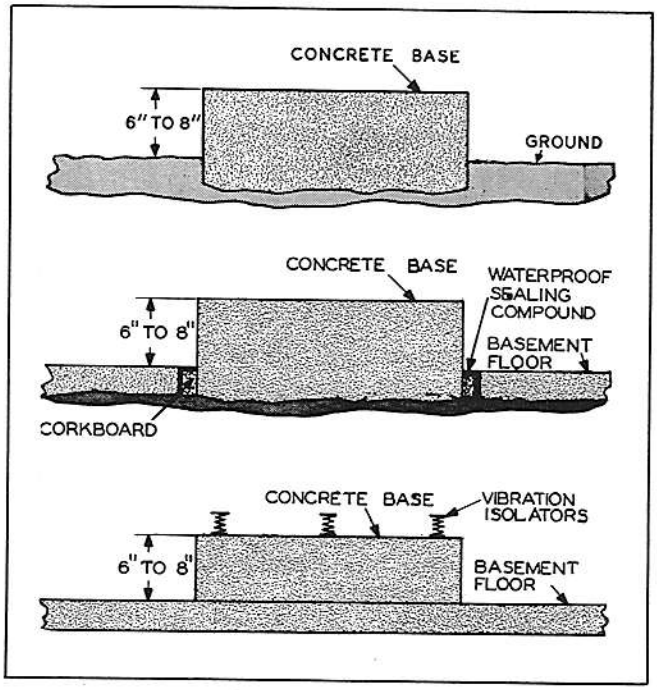


Fig. 11 - Suggested Compressor Unit Foundation

INSTALLATION

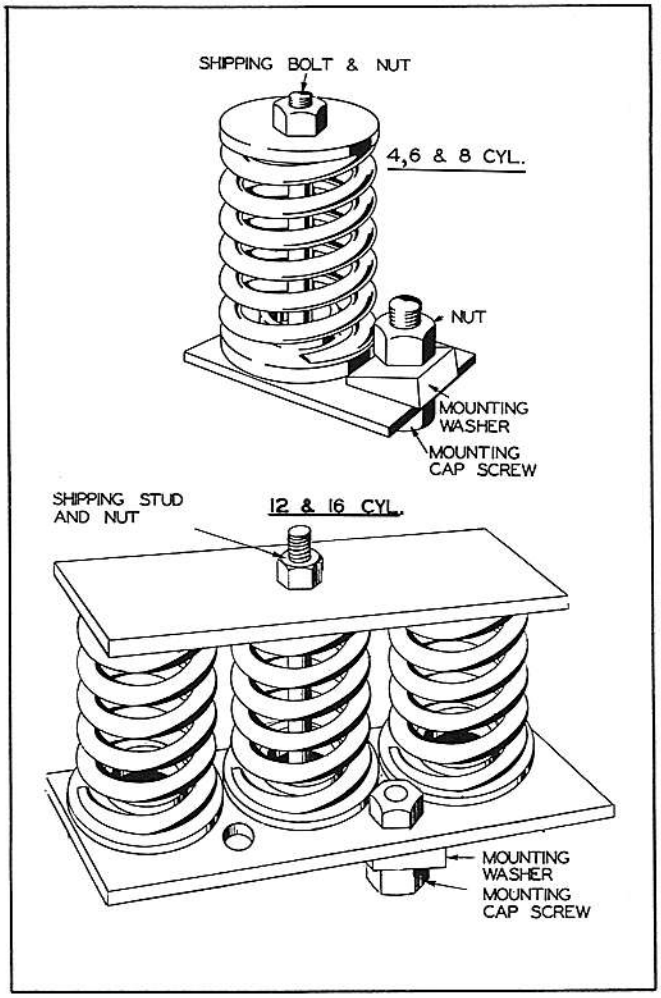


Fig. 12 - Vibration Isolator Assemblies

Holes are provided in the bottom plate of the isolator assemblies to bolt them to the floor if desired.

Each isolator spring is designed to carry 330 lbs. when compressed to a working length of 2-13/16".

Since it is not known what weight motor will be used, the maximum number of springs that should be required are furnished when ordered. On some installations not all springs will be required.

Fig. 13 shows the method of applying these isolator spring assemblies to each side of the base on the 12 and 16 cylinder units. The procedure is as follows:

(a) Determine the number of springs required so that each spring will support its approximate design load, keeping in mind that an even number of springs must be used to support the base evenly on opposite sides.

(b) Raise the compressor unit 6" off the floor.

(c) Remove the mounting washer, mounting cap screw and shipping stud nut from the isolator unit. (See Fig. 13)

(d) Insert the shipping stud through the hole in the compressor unit base. See Fig. 14 for the suggested location of the isolator assemblies.

(e) Place the mounting washer on the shipping stud and fasten the isolator unit to the base with the shipping stud nut. (See Fig. 13) Be sure the springs are properly seated.

(f) Lower the unit so that the isolator assemblies take the full weight.

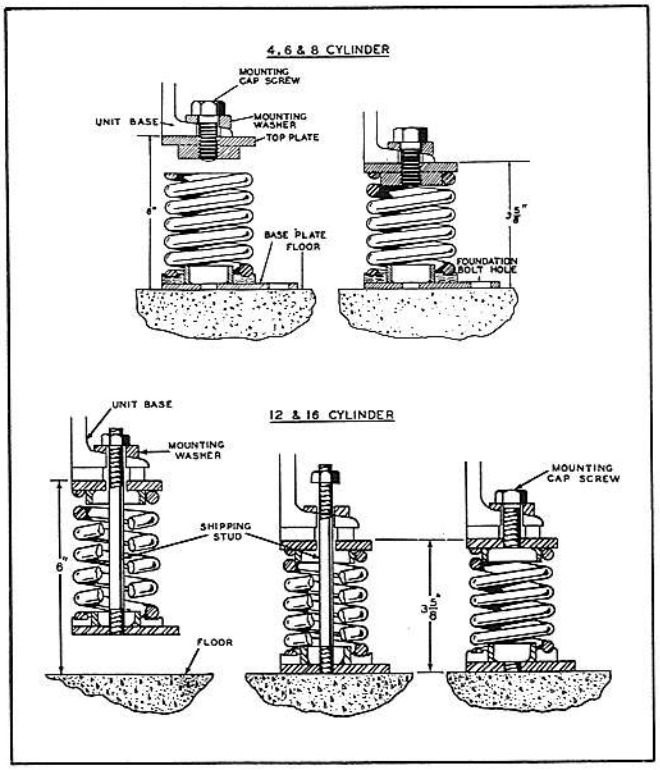


Fig. 13 - Applying the Vibration Isolator

INSTALLATION

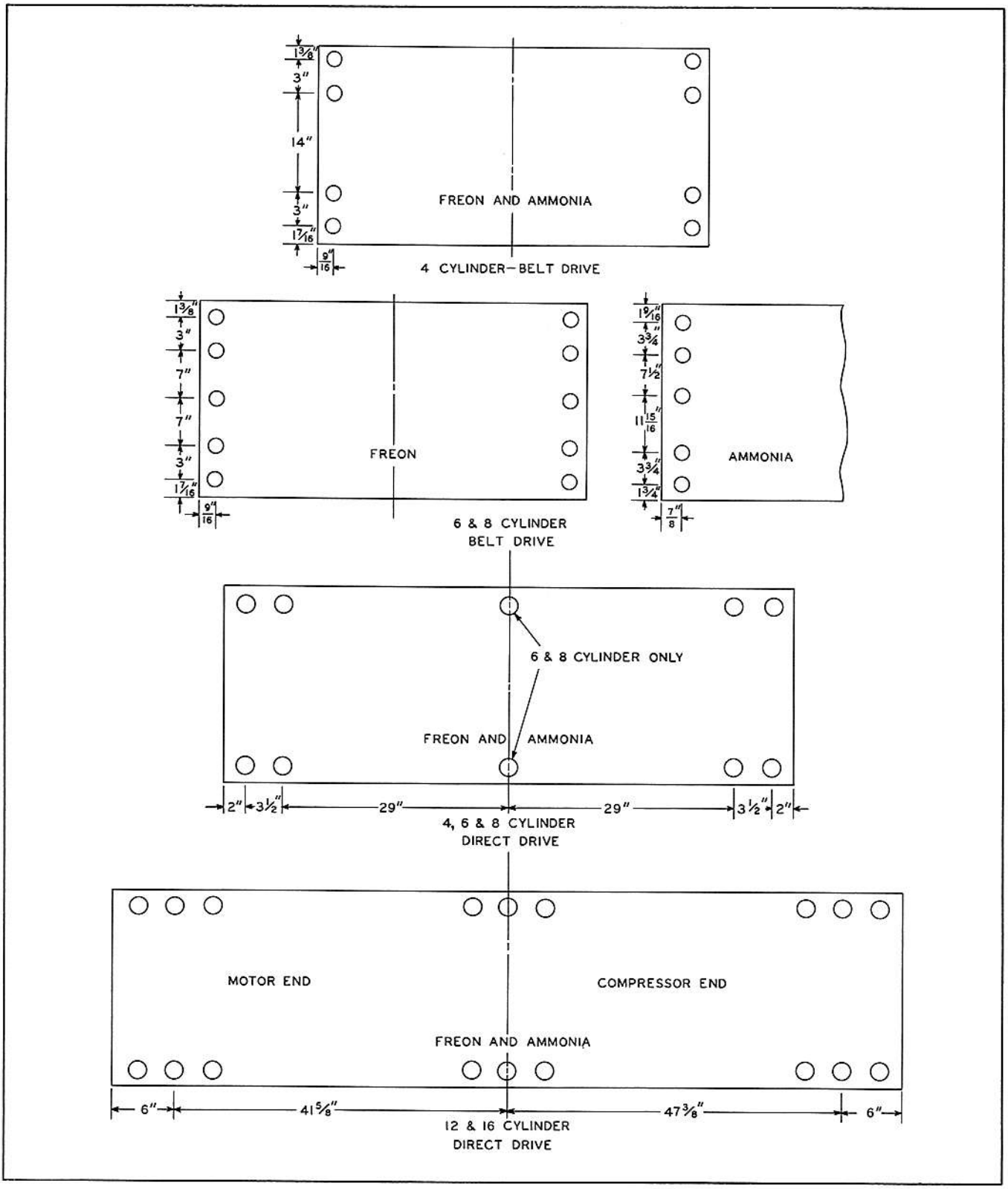


Fig. 14 - Suggested Location of Vibration Isolator Assemblies

(g) Level the unit base by shifting the spring assemblies to another hole if necessary.

(h) After the unit base has been leveled, measure the distance from the floor to the bottom of the unit base. This distance should be 3-5/8" for each spring. If it is less add springs, if more remove springs. The unit should now be level and the distance from the floor to the unit base should be 3-5/8" at all springs.

(i) Remove the shipping studs and nuts and install the mounting washer and cap screw. (See Fig. 13)

(j) The isolator assemblies may be lagged to the floor if desired.

The application of isolators to the 4, 6 and 8 cylinder compressor units is similar to that for the 12 and 16 cylinder except as follows:

(a) Only single spring assemblies are used. (See Fig. 12)

(b) Fig. 14 should be used to determine the primary location of the spring assemblies.

(c) The shipping bolt, mounting washer and cap screw must be removed before applying these isolators. (See Fig. 12)

(d) After the unit has been raised 6" from the floor, the top plate should be bolted to the unit base using the mounting washer and cap screw. (See Fig. 13)

(e) Before lowering the unit, place the spring and base plate directly below each top plate. Be sure the springs are properly seated when lowering the unit.

(f) The distance from the floor to the bottom of the unit base should be 3-5/8" at each spring assembly to obtain the approximate loading of 330 lbs. on each spring. (See Fig. 13)

REFRIGERANT CONNECTIONS

Before shipment from the factory, these compressors are given a preliminary test run, and charged with the proper amount of oil. To insure absolute cleanliness, it is important to keep the suction and discharge service valves closed during installation, until the final connections have been made.

Discharge Line Oil Separator

On a modern compact compressor such as this, the oil capacity of the crankcase is limited and oil must be added frequently to offset that which leaves the compressor and is not returned. For this reason, it is recommended that a discharge line oil separator, an oil receiver and a crankcase float valve be installed. With this arrangement oil may be added to the receiver through its charging connection. This receiver acts as a reservoir which auto-

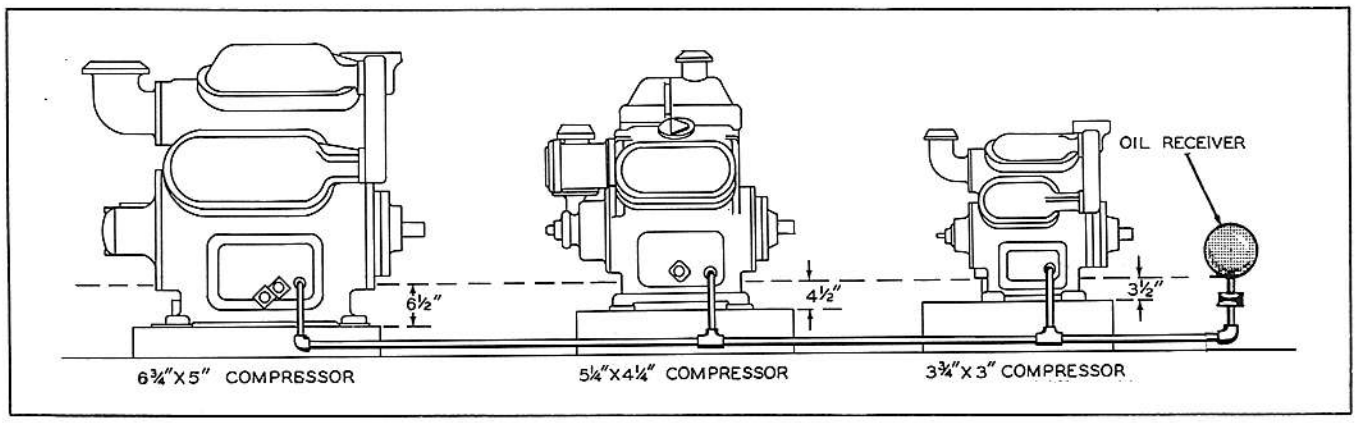


Fig. 15 - Oil Return Arrangement

INSTALLATION

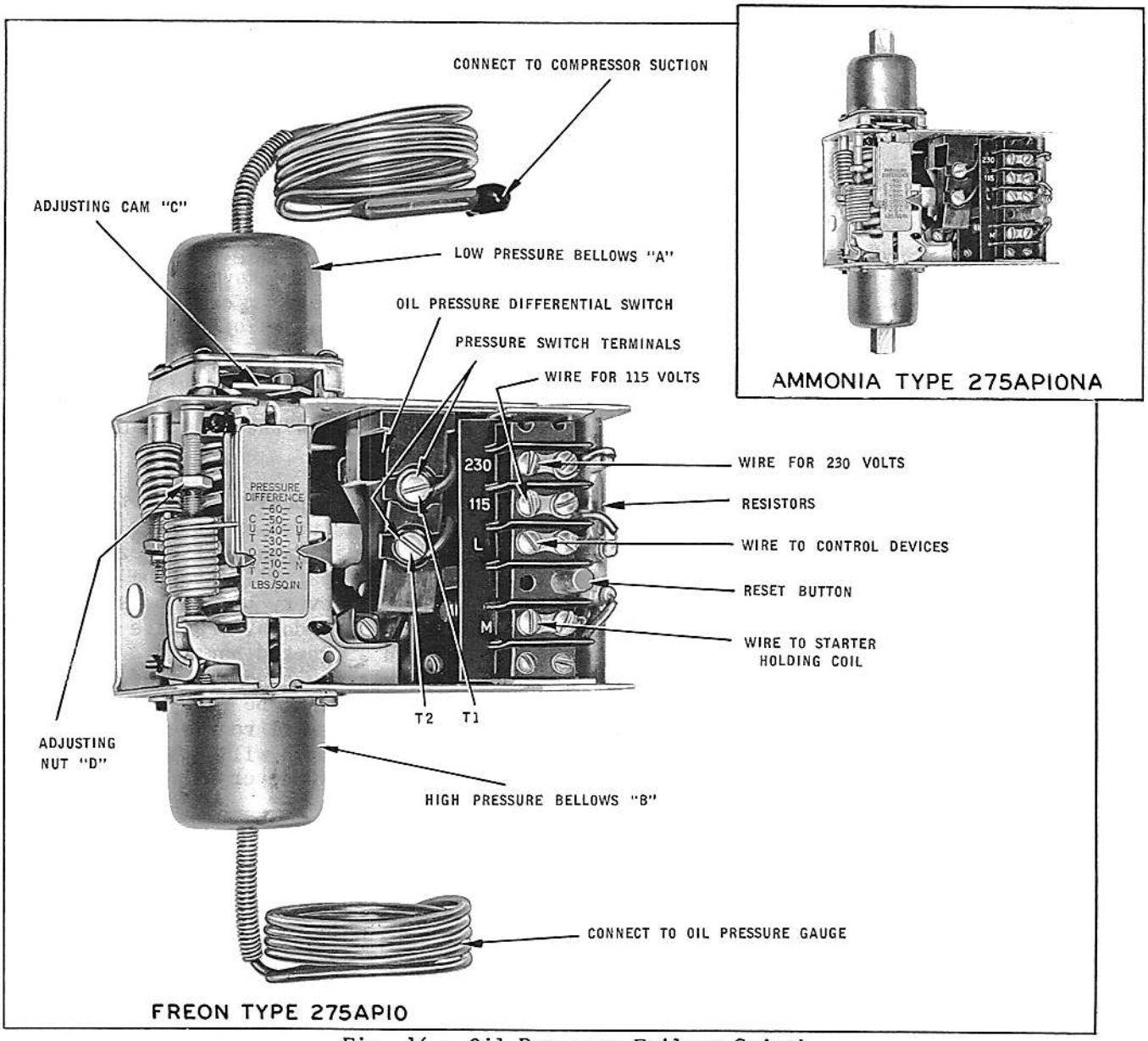


Fig. 16 - Oil Pressure Failure Switch

matically keeps the crankcase filled to the correct level.

Fig. 15 shows the arrangement of oil return using an oil receiver. The elevation of the oil receiver is important. During operation the static head plus a small pressure difference forces oil into the crankcase. If the crankcase float should stick open, and the compressor is stopped, the pressures will equalize and the oil in the crankcase and in the receiver will seek the same level. This level must be low enough to prevent damage to the compressor when starting up.

NOTE: Where compressors are mounted on vibration isolators, FLEXIBILITY MUST BE PROVIDED in the oil line to each crankcase float.

OIL PRESSURE FAILURE SWITCH

The Penn Type 275AP10 Freon oil pressure failure switch (See Fig. 16) operates on the difference between suction pressure and

INSTALLATION

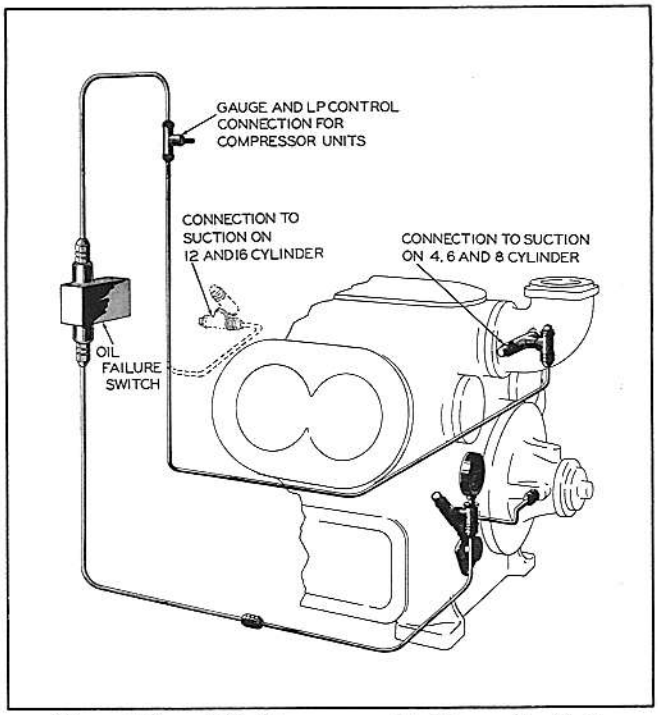


Fig. 17 - Oil Pressure Failure Switch Connections

oil pressure and is furnished with each Freon compressor. It is shipped loose and should be mounted on a wall or other convenient location, close to the compressor, with 1/4" O.D. tubing extending from the oil pressure gauge to the bottom or high pressure bellows capillary and 1/4" O.D. tubing from the upper or low pressure bellows capillary to the suction side of the compressor. (See Fig. 17) Wire as shown in Fig. 18.

The ammonia oil failure switch, is furnished with all ammonia units shown in the insert of Fig. 17, is the type 275 AP1ONA and is similar to the Freon switch. Steel tubing must be run direct to the bellows connections.

CRANKCASE FLOAT

Fig. 39 shows a cross section of a compressor hand hole cover with the crankcase float installed.

One hand hole cover on each compressor is drilled and tapped to receive this float.

NOTE: The shipping plugs in this cover are put in with white lead only. If the tapped holes are not to be used, the plugs should be removed and put back in using litharge and glycerine.

WATER JACKET PIPING (Ammonia only)

All water connections in and out of the compressor water jackets are tagged. (See Figs. 6, 8 and 10) The piping to the compressor jackets should have a stop valve to control the supply in order to maintain a water temperature out of the jacket at approximately 95°F.

Provision should be made in the inlet water lines to drain the water jackets during shutdowns.

NOTE: This is especially important when the compressor is used on booster application when there is danger of freeze-up. It is essential that all water be drained from the jackets every time a booster compressor is shut down. Failure to do this can result in a cracked housing. As most ammonia systems are hand operated, the drain valves can also be hand valves, but automatic systems will require the use of solenoid valves which will operate to drain the water jacket whenever the compressor motor is shut down.

PRESSURE CONTROLS AND GAUGE BOARDS

Mount the gauge board and pressure controls on a wall or other convenient location close to the unit and install the gauges. Run lines from the 1/4" fpt connections on the suction ell and the discharge manifold to the gauges. Insert a tee in these lines to the gauges and run lines to the pressure controls. Use 1/4" steel pipe or cold drawn, seamless steel tubing, annealed suitable for bending, expanding and flaring.

NOTE: On the 12 and 16 cylinders compressors, the suction gauge connection is in the housing close to the suction stop valve. The discharge gauge line should be run from a tap in the common discharge main before the oil separator. The high pressure cutout line should be run from one compressor discharge manifold only.

INSTALLATION

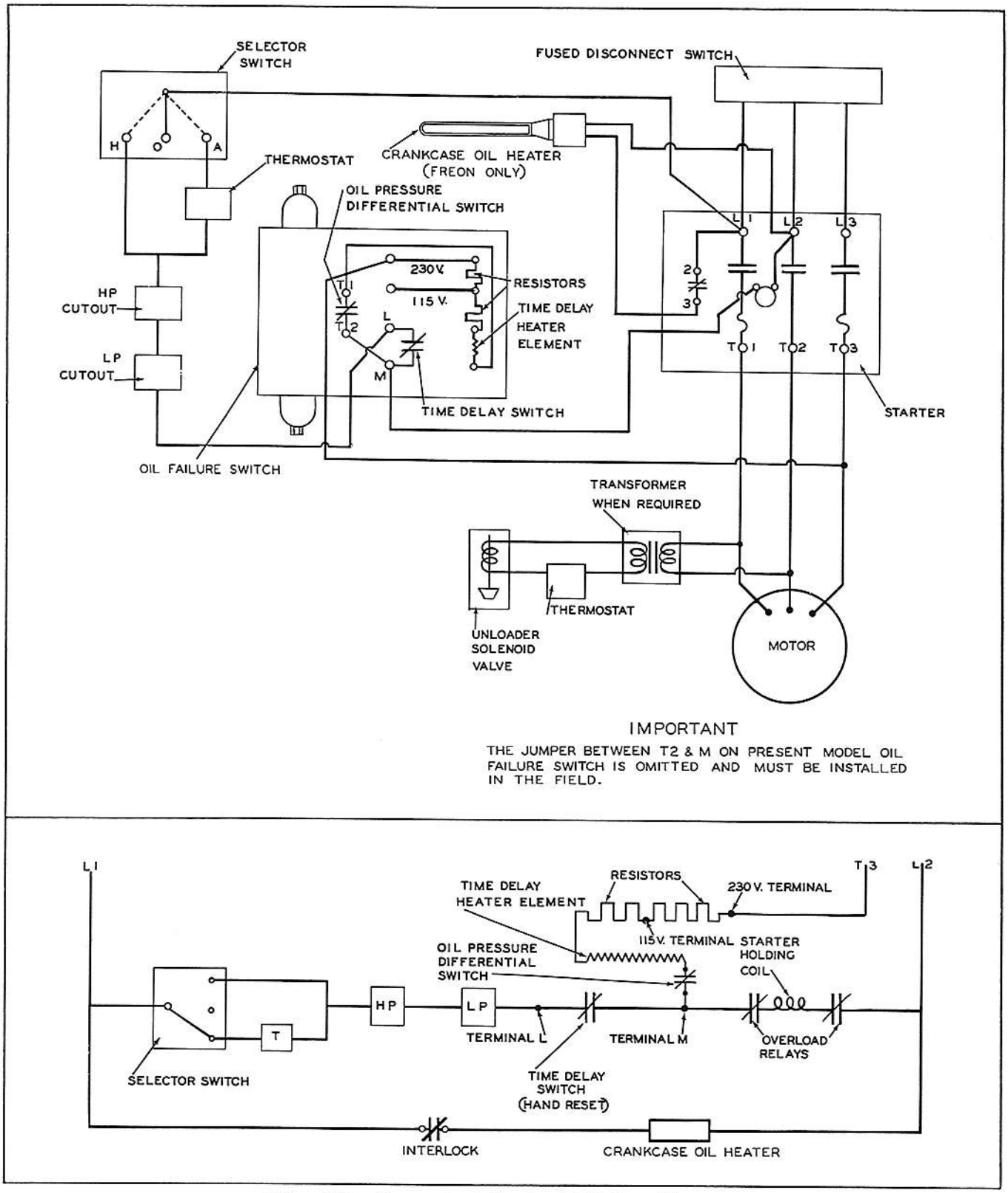


Fig. 18 - Suggested Control Wiring Diagram

INSTALLATION

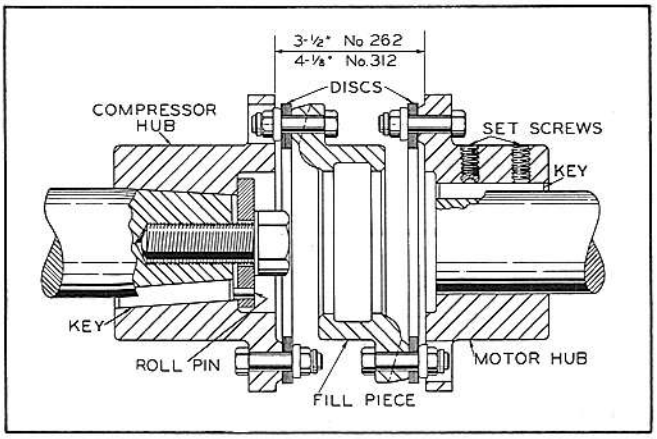


Fig. 19 - Flexible Coupling - Type AMR

FLEXIBLE COUPLING

When these compressors are direct connected to a synchronous motor or other prime mover, a flexible coupling is used. The coupling is flexible, but this does not mean that its alignment is negligible, in fact, the better the initial alignment, the smoother, the unit will run.

The Thomas Type AMR is furnished in two sizes: 262 AMR with maximum motor half bore of 2-5/8" and 312 AMR with maximum bore of 3-1/8".

Fig. 19 illustrates the application of this coupling to the 3-3/4 X 3 compressor. Note that the 3/8" thick washer is held from turning by a roll pin projecting into the coupling keyway space.

The following procedure is recommended when installing the Type AMR flexible coupling.

(a) Apply the motor half coupling to the motor shaft (the coupling is shipped in three parts). Be sure the coupling slides freely on the shaft. Line the coupling so that it is flush with the end of the shaft, key it and lightly tighten the key set screws.

(b) Place the compressor half on the shaft, key it and apply the 3/8" thick washer, and the cap screw with its lockwasher. Drive the roll pin into the coupling keyway space.

NOTE: Be absolutely certain that there is no dirt on the taper of the shaft or coupling bore.

(c) Place the motor on the base so that the distance between the couplings is 3-1/2" for the 262 AMR or 4-1/8" for the 312 AMR. (See Fig. 19) If a sleeve bearing motor is being used, determine its magnetic center and place the rotor in this position.

(d) Secure parallel alignment from the face of the compressor half coupling to the face of the motor half coupling by means of an inside micrometer. Check at four points moving the motor as necessary.

(e) Clamp a dial indicator to the motor half coupling with its pointer against the outer periphery of the compressor half coupling. Rotate the motor shaft observing any fluctuations of the indicator.

(f) Move the motor and shim until the indicator is stationary when revolving the shaft one full turn.

(g) Recheck the parallel alignment to be sure that it was not disturbed by operation (f).

(h) When the alignment is complete, bolt the motor in place and dowel pin both the compressor and motor.

(i) Rotate the motor shaft so that its keyway is 180° from the compressor shaft keyway.

(j) Loosen the motor coupling set screws so that the coupling is free to slide on the shaft.

(k) Remove all bolts from the center assembly and bolt the discs to the two coupling hubs.

(l) The center fill piece may now be bolted in place.

(m) Check to be sure the rotor is on its magnetic center. Tighten the motor half coupling set screws.

(n) Apply the coupling guard to prevent accidents.

INSTALLATION

CONTROL WIRING

A suggested control wiring diagram is shown in Fig. 18. This shows one automatic capacity reduction solenoid and a limit thermostat in the starter control circuit.

NOTE: Before wiring the unloader solenoids for automatic capacity reduction refer to Table 5, 6, 7 or 8 and Fig. 28 for the proper unloading sequence of the cylinders.

With the two compressors in parallel, a time delay relay should be used, to prevent the second compressor from starting until the first compressor has come up to speed.

The crankcase oil heater used on Freon compressors must be electrically connected so it is energized when the compressor is stopped. Two recommended methods are given as follows:

(a) For 2 or 3 wire control change the normally open interlock in the compressor motor starter to normally closed and feed the heater by this N.C. contact.

(b) In case it is too difficult to add the interlock in the field, use a normally closed control relay, connected in parallel with the starter holding coil so the relay will close when the starter opens. Use an Allen-Bradley Bulletin 700 Type C-01 control relay or equal.

Testing the Wiring Connections

CAUTION: After it has been installed, the time delay switch should be tested, to assure that wiring is properly connected. To make this test proceed as follows:

(a) Pull the disconnect switch and remove the cover from the control.

(b) Connect a jumper between the pressure switch terminals. (See Fig. 16)

(c) Close the disconnect switch and start the compressor. The time delay switch should stop the compressor in approximately 45 seconds.

NOTE: If the oil pressure failure switch does not stop the compressor, check to see if there is a wire connecting T2 to M inside the oil failure switch. If this wire is missing and the switch is wired according to the wiring diagram given in Fig. 18, it will be necessary to install one before the oil failure switch can operate.

(d) After testing, remove the jumper, replace the control cover, and close the disconnect switch. Wait about 5 minutes for the heater to cool and then depress the reset button.

V-BELTS

To insure long life and satisfactory operation of the V-belts, the motor pulley and flywheel must be in exact alignment and belts must be under proper tension.

(a) Preparatory to aligning the drive, find the magnetic center of the motor. This may be done by running the motor idle and measuring from a fixed point on the shaft to some fixed point on the motor frame. This distance must be maintained during the procedure of alignment.

(b) Loosen up the bolts holding the motor to the base.

(c) Move the motor on the base forward far enough for the belts to slip over the pulley and flywheel without stretching.

(d) Proceed with the alignment, keeping in mind that the face of the motor pulley must be parallel with the face of the flywheel, that the belt grooves must be in alignment, and that the motor must be on its magnetic center.

To align the belt grooves, place a straight edge on the outer face of the flywheel, extending over to the far edge of the motor pulley, measure the distance from the straight edge to the groove in the flywheel, then set the pulley on the motor shaft so that the distance from the straight edge to the groove is the same as the distance from the straight edge to the groove in the flywheel. With this distance fixed, drive the key into the motor pulley and

tighten up the set screw on the key.

(e) Then by means of the slotted holes for adjustment on the motor base, move the motor back until the belts are reasonably tight. To have the proper tension, a belt should have about one inch "sag" when applying thumb pressure half way between the pulley and the flywheel. When this condition is obtained, tighten the bolts holding the motor to the base.

SYSTEM EVACUATING, TESTING AND CHARGING

To evacuate a new system (condenser, evaporator, and pipe connections) preparatory to testing and charging, we recommend the use of a vacuum pump. Do not use a new compressor for evacuating purposes.

For evacuating, testing and charging of these systems refer to Instructions 2A, 2D and 2D-1.

LIMITATIONS

(a) Minimum compressor speed is 600 rpm.

(b) Maximum compressor speed is 1800 rpm for Freon, 1200 rpm for ammonia.

(c) Operating differential must never exceed 225 psi. The standard internal relief valves are set to relieve discharge to suction at 250 psi differential.

(d) Maximum discharge temperature is 375°F.

(e) Belt drives are not to exceed 75 HP. The 75 HP motors must have ball bearings.

(f) Maximum absolute pressure ratio is limited to 9.5.

INITIAL OPERATION

Before operating the compressor for the first time:

(a) Open the main suction and discharge stop valves and all other system valves except drain and purge valves.

(b) Charge a quart of clean York compressor oil into the shaft seal oil space with a hand oil pump connected to the seal oil charging valve shown in Fig. 22.

(c) Disconnect the oil pipe on the discharge side of the oil filter and connect a hand oil pump to this pipe. Pump oil to flush the bearings while turning the crankshaft by hand.

(d) Check the crankcase oil level to see that it is halfway in the crankcase bulls eye.

(e) After starting the compressor, always make sure the oil pump is functioning properly as shown by the pressure gauge in the oil supply line. The oil pressure must be higher than the suction pressure, by a minimum of 35 to 40 psi on start-up at the pump.

If the oil pressure does not build up, screw in the oil pressure regulating valve stem. The oil pressure is increased by screwing in, and decreased by screwing out on the stem. (See Fig. 35)

NOTE: The oil pressure gauge should never show an oil pressure of less than 30 psig because it takes this much pressure to actuate the unloader pistons.

(f) After the first hour of initial operation, inspect the suction strainer bags. If the bags have collected dirt, they should be replaced or cleaned and put back inside the strainer screens.

(g) Periodically inspect the strainer bags for the next ten hours during which time the compressor must be operating at full load conditions. The number of inspections during these ten hours will depend upon the amount of dirt collected at each inspection. When the bags are found to be free from dirt they may be removed from the strainer screens. (See SUCTION STRAINERS)

CAUTION: Hasty removal of the cloth bag is not recommended nor should the bag be allowed to remain in the strainer indefinitely. Capacity tests can not be run until the bags have been removed.

OPERATION AND ADJUSTMENT

SUCTION STRAINERS

These compressors are equipped with suction strainers as follows:

4 Cylinder - one strainer
6 & 8 Cylinders - two strainers
12 & 16 Cylinders - four strainers

The strainers, the bodies of which are in recesses in the compressor housing, are equipped with two thicknesses of 35 mesh wire screen. Each of these strainers is fitted at the factory with a cloth bag as an added precaution to entrap dirt and other fine particles of foreign matter which may be swept into the compressor with the suction gas. (See Fig. 38)

REMOVING THE STRAINER CLOTH BAG (See Fig. 38)

4, 6 & 8 Cylinder Compressors - After the compressor has been pumped out, remove the suction end strainer cover located on the pump end of the compressor. By removing this cover the cloth bag can be removed without disturbing the strainer screen. The cloth bag is held in place by a retaining spring. Remove the retaining spring and the cloth bag. If the cloth bag contains dirt, replace or clean it with an approved safety solvent, inspect it for holes and place it in the suction strainer again.

When the bag is found to be free of dirt remove it, and the retaining spring. Replace the suction end strainer cover. Retain the bag for future use.

NOTE: Before turning the job over to the customer, examine the metallic screen to see if it needs cleaning.

12 & 16 Cylinder Compressors - To remove the cloth bags from these compressors, it will be necessary to first remove the suction strainers. (See STRAINER SCREEN under MAINTENANCE AND SERVICE). After the strainer assemblies have been removed, the procedure for removing the cloth bag is the same as described for the 4, 6 and 8 cylinder compressors.

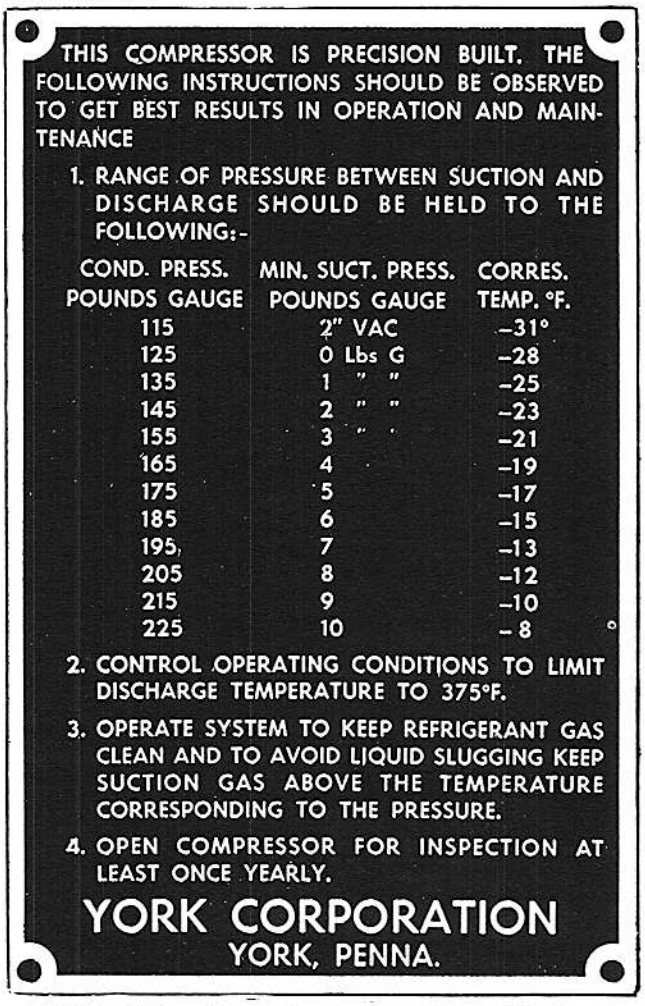


Fig. 20 - Ammonia Instruction Plate

AMMONIA INSTRUCTION PLATE (Fig. 20)

Each of the ammonia compressors is supplied with an instruction plate which is attached to one of the cylinder heads. This plate recommends the condensing pressure, suction pressure, and the corresponding temperatures of the suction gas. The maximum limit given on this plate insures a compression ratio of 9.5 or less, and notes that the maximum discharge temperature is 375°F.

DIRECTION OF ROTATION

The compressor is designed for rotation in either direction. Fig. 24 shows the position of the crescent for counter-clockwise rotation of the shaft when viewed from the pump end. The oil flows from right to

left. If the crankshaft is turned clockwise the crescent automatically rotates 180° and the oil continues to be pumped from right to left.

PUMP OUT AND BYPASS CONNECTIONS

When so specified, pumpout and bypass connections are assembled to the compressor at the factory. Fig. 21 shows compressors with these pumpout and bypass connections installed.

OIL CIRCULATING SYSTEM (See Figs. 22 & 23)

The gear oil pump, located on the rear end of the compressor and driven by the crankshaft, takes oil from the Vortex eliminator (with its screen) in the crankcase, and forces it through the oil filter to the oil header, extended through both ends of the crankcase and sealed at each end by a packing ring to prevent leakage. Oil for the main and thrust bearings is supplied through orifices from this header.

Drilled oil ways in the shaft conduct the oil to the crank pins. Drilled passages in the connecting rods conduct the oil from the crank pin bearings to the wrist pin in each piston.

The oil supply line to the thrust bearing also supplies oil to the radial grooves to lubricate the shaft thrust surfaces, on each end of this bearing. An oil line on the outside of the compressor, conducts oil from the oil filter to the seal chamber, keeping it filled during operation. This insures a flooded seal.

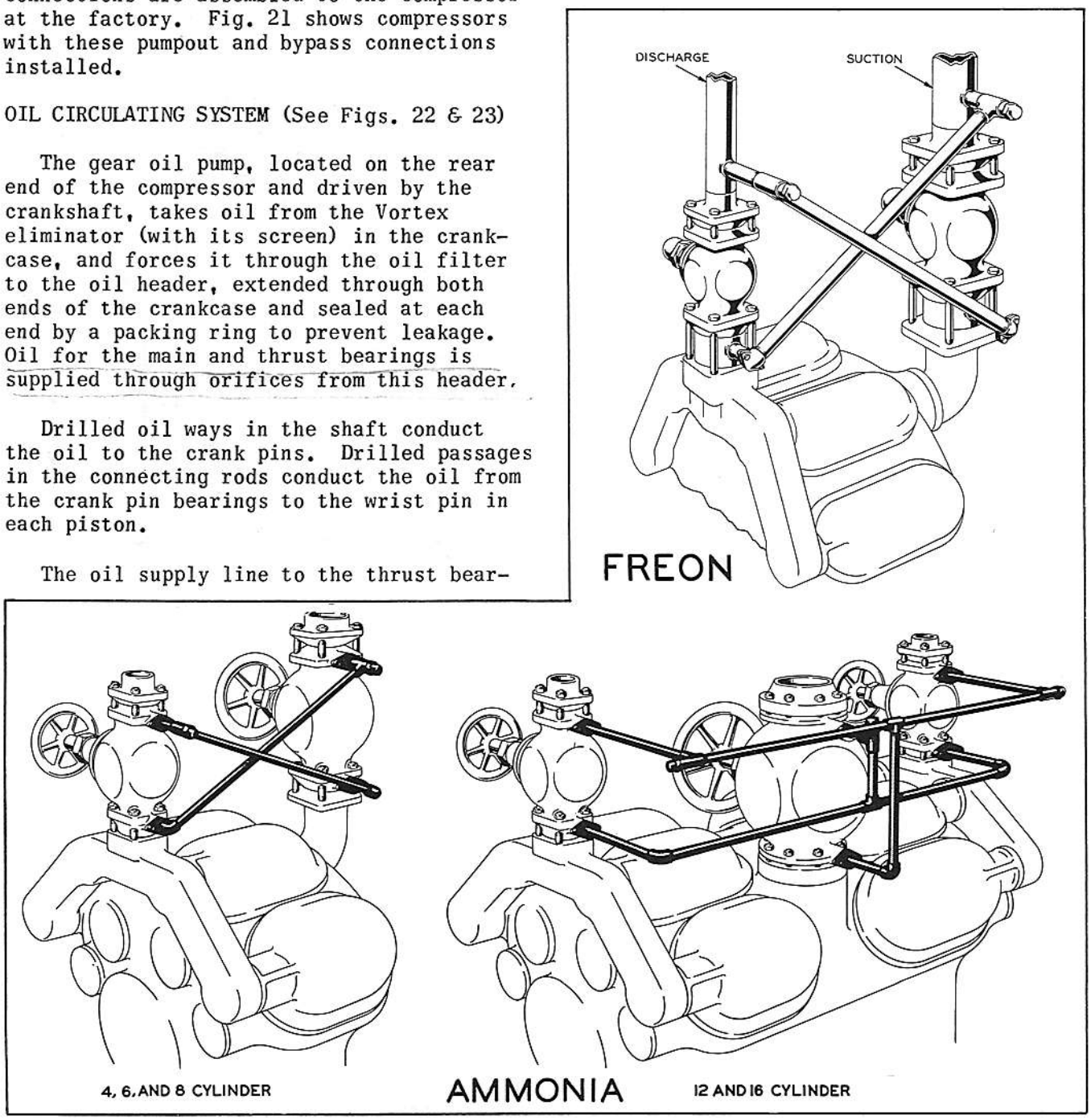


Fig. 21 - Pump-out and By-Pass Connections

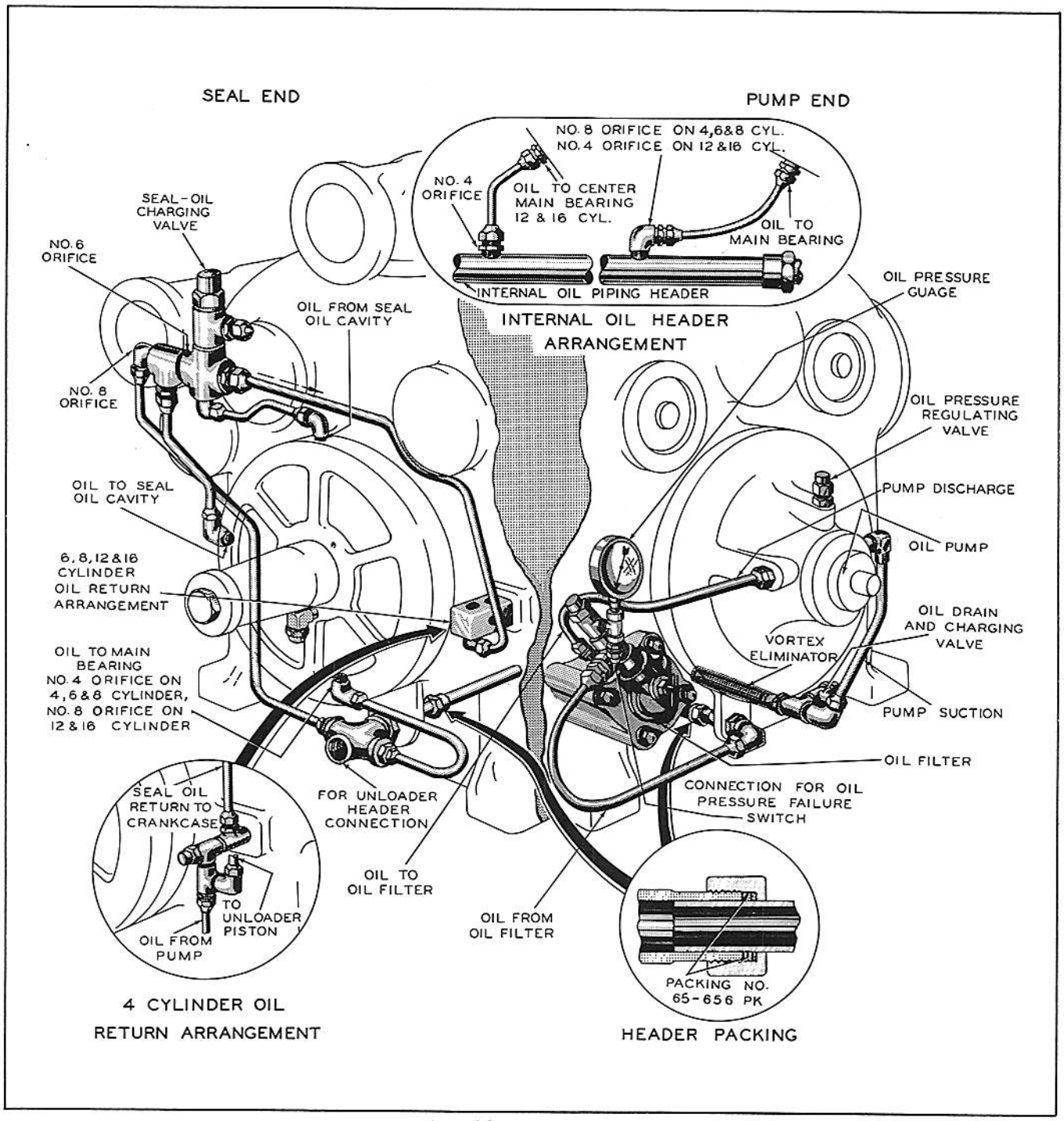


Fig. 22 - Oil Piping

A seal oil drip connection, open to the atmosphere is provided. Five to 10 drops of oil per minute during operation is permissible. If more than 10 drops per minute, the seal parts should be inspected.

Center Main Bearing - 12 and 16 Cylinder

Oil to the center main bearing is supplied through a No. 4 orifice from a connection in the oil header, near the vertical center line in the crankcase.

OPERATION AND ADJUSTMENT

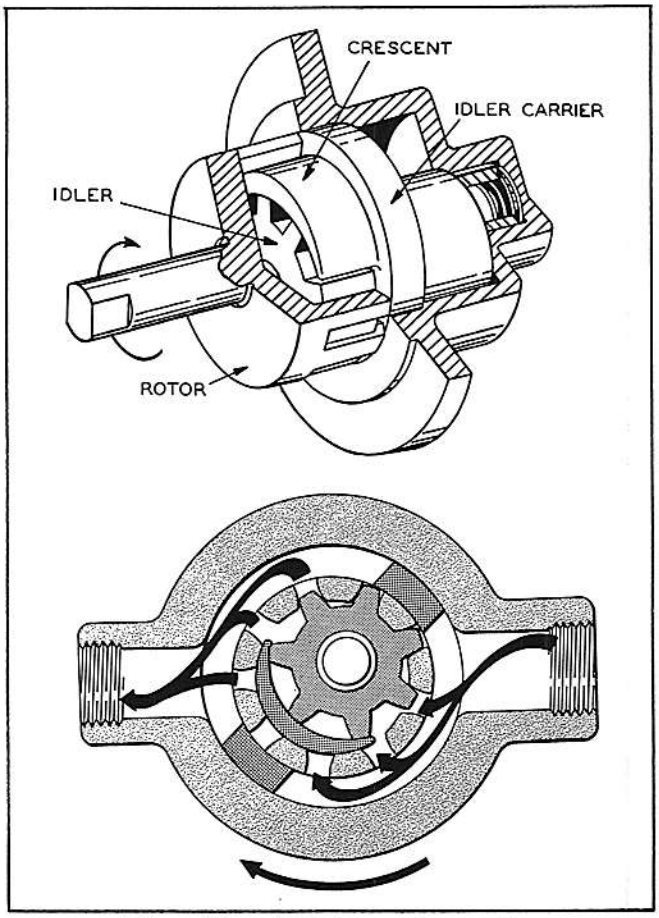


Fig. 23 - Oil Pump Operation

OIL PUMP OPERATION

The oil pump is of the "internal gear" type with the rotor (See Fig. 23), being actuated by a drag crank driven by the compressor shaft. Thus the driving power is applied to the rotor, and transmitted to the idler with which it meshes. The space between the outside diameter of the idler and the inside diameter of the rotor is sealed by a crescent shaped projection cast integrally with the idler carrier.

As the idler teeth come out of mesh with the rotor teeth, increase in volume creates a partial vacuum. Oil rushes into the pump to fill this vacuum, and occupies the voids between the idler and the rotor teeth. When the teeth mesh, the oil is forced from these spaces, and out the discharge side of the pump.

Fig. 35 shows a sectional view of the pump end of the compressor.

CRANKCASE OIL HEATER (See Fig. 24)

On Freon compressors a concentration of Freon collects in the crankcase during shutdown and on start-up this Freon leaves the crankcase, taking with it a large volume of oil. In many cases the loss of oil is so great that the oil pump loses its prime and cannot pump sufficient pressure in an allowable time for the oil pressure failure switch to cut in. Therefore, the compressor shuts down shortly after start-up. The purpose of the crankcase oil heater is to prevent this.

This heater will be in operation when the compressor is shut down. The continual heat in the compressor crankcase will prevent Freon accumulation there and eliminate any problem of compressor shut down due to high Freon concentration in the oil.

The insert-type 300 watt crankcase oil heater has a watt density of 14 watts per sq. in. Therefore, there is no chance for oil carburization on the 12" steel sheath inside the crankcase. The electrical terminals should be horizontal so that the entire header is submerged in oil.

OIL FILTER

The disc type oil filter is provided with a ball check which will open when the pressure drop through the oil filter is 15 lbs. or more. Therefore, if the oil filter becomes plugged oil will by-pass the filter and go directly to the filter outlet.

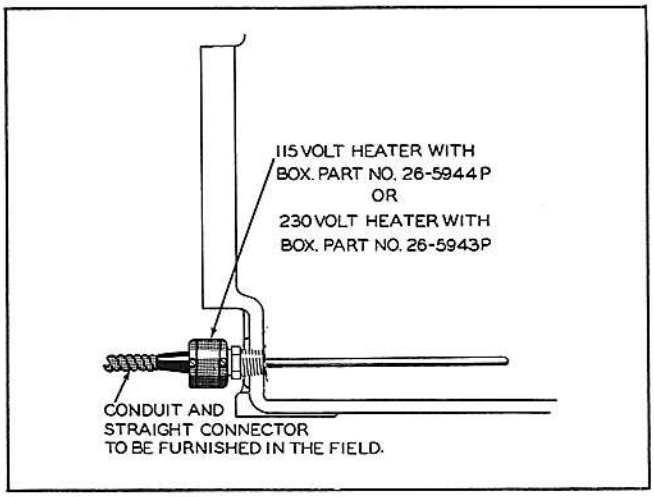


Fig. 24 - Crankcase Oil Heater

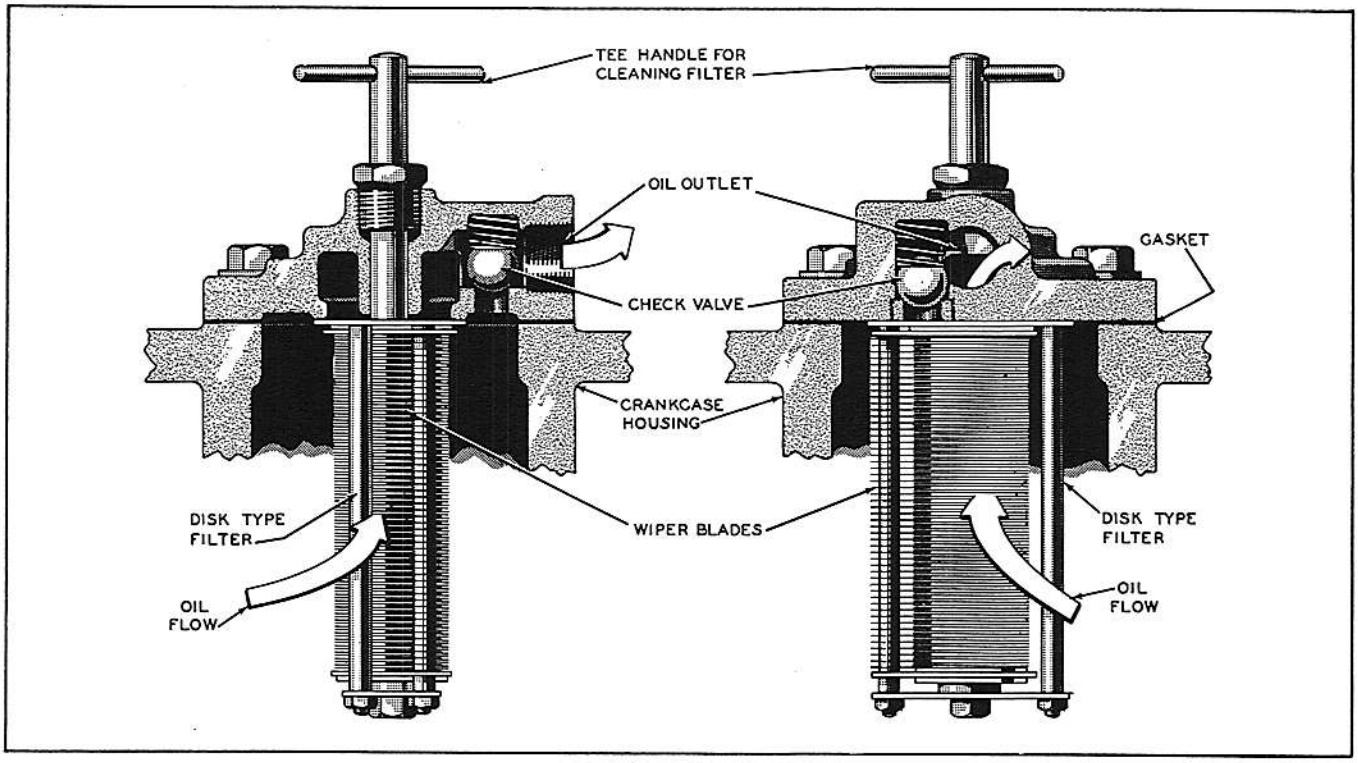


Fig. 25 - Oil Filter

NOTE: The ball check is a safety device only. Particular attention should be given to the cleanliness of the oil filter so the ball check will not have to function.

The oil filter (See Fig. 25) removes foreign matter from the oiling system and must be removed and cleaned after the compressor has operated about 30 days. Cleaning is recommended every six months thereafter. The tee handle should be turned at least one full revolution daily to prevent plugging with foreign matter removed from the oil. The handle may be turned in either direction.

If the handle turns hard, through occasional neglect, rotate the cartridge back and forth until the handle can be turned through a complete revolution. NOTE: Never use a wrench or any other tool to turn a filter which has becomme plugged. The cartridge may be removed from the housing and washed in an approved safety solvent. Do not try to disassemble the cartridge and exercise care not to damage the cartridge discs or cleaner blades.

COMPRESSOR OIL LEVEL

It is sometimes difficult to check the actual oil level by observation, except as below outlined, because of the indeterminate amount of refrigerant which may be mixed with the oil. The greater the amount of refrigerant in the mixture, the higher the apparent oil level will be. The amount of refrigerant in the mixture will be greater after a prolonged shut-down period. Therefore a check of the oil level immediately after a prolonged shut-down is worthless as far as determining the actual working level is concerned. Such a check will generally indicate a level higher than the normal oil level.

The ideal time for checking the oil level is after a prolonged period of operation, because then there will be the least amount of refrigerant mixed with the oil. During the period of operation, the refrigerant will be pumped out of the oil until only the normal quantity remains in solution.

The compressor is equipped with a glass bullseye for checking the quantity of oil, being located on the pump end of the compressor.

OPERATION AND ADJUSTMENT

THE OIL LEVEL IN THE COMPRESSOR IS CORRECT WHEN LIQUID OIL CAN BE SEEN AT THE CENTER OF THE BULLSEYE.

If the level is checked with the compressor in operation, foam will sometimes exist on top of the oil depending upon the quantity of refrigerant in the crankcase. It is always advisable to check the oil level after the compressor has been in operation at least 1/2 hour or after the crankcase feels warm to the hand.

The compressor can be operated safely as long as the oil level remains in sight in the bullseye. In fact, it is not unusual for this level to drop to the bottom of the bullseye or slightly lower, especially when first starting up after a prolonged shutdown. This is due to the accumulated refrigerant being pumped out of the oil. When this happens, the compressor should be watched carefully to be sure that oil is returning from the evaporator or evaporators and that the crankcase oil level is building up to normal. DO NOT OPERATE THE COMPRESSOR CONTINUOUSLY WITH LOW OIL LEVEL.

CAUTION: Do not remove oil from the crankcase because of an apparent high level unless you know that too much oil had previously been added.

If the oil level, checked as above, is lower than the bottom of the bullseye, add oil.

UNLOADER MECHANISM OPERATION

Fig. 26 shows the unloader piping for capacity control. Oil pressure to operate the capacity unloader mechanism is taken from the internal oil header to a three way valve on each unloader cover. With the valve in the closed position, pump oil pressure is exerted on the unloader piston. (See Fig. 27) As the unloader piston moves, the cam ring turns allowing the unloader pins to drop. The suction valve drops to

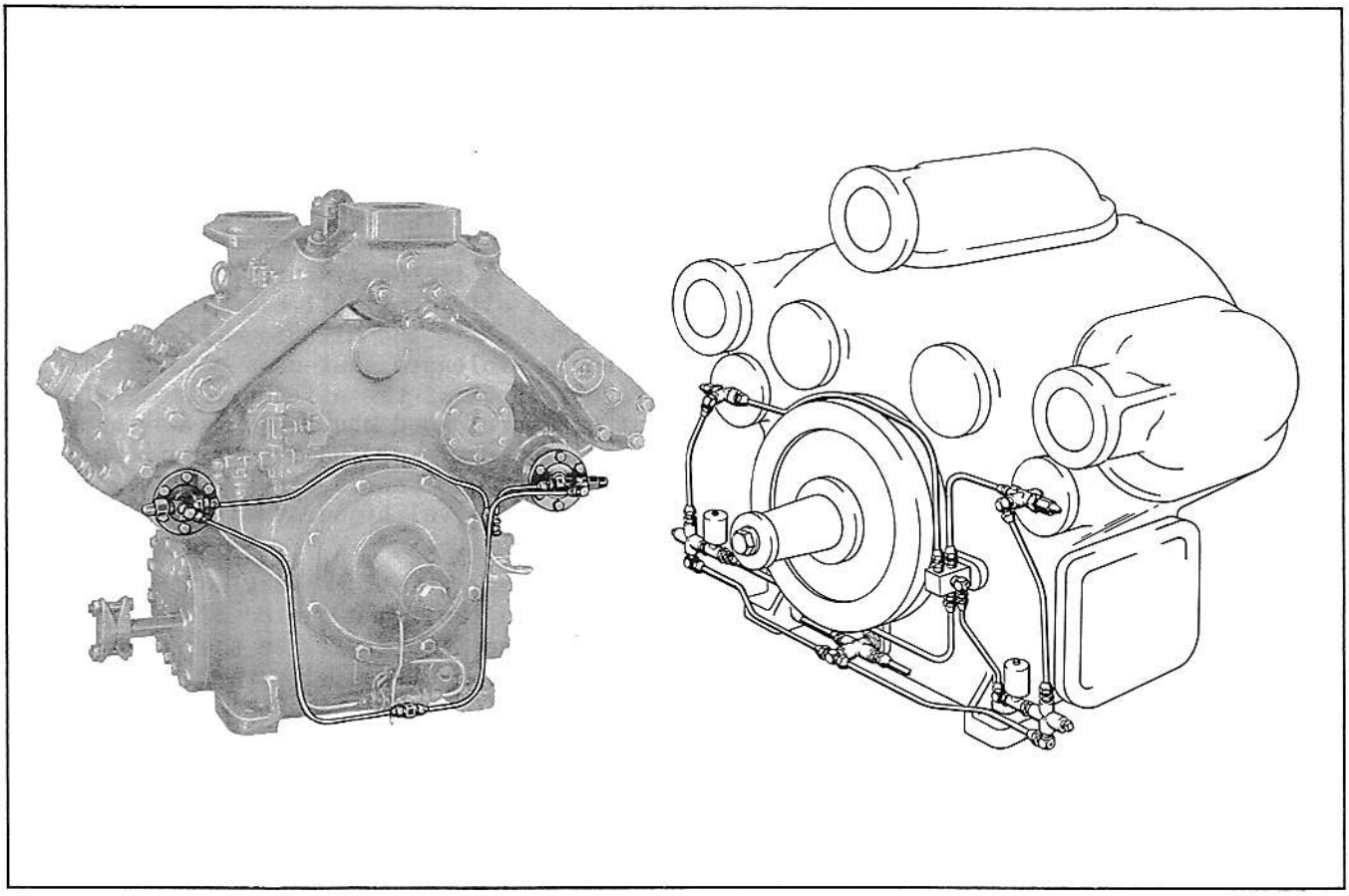


Fig. 26 - Unloader Oil Piping

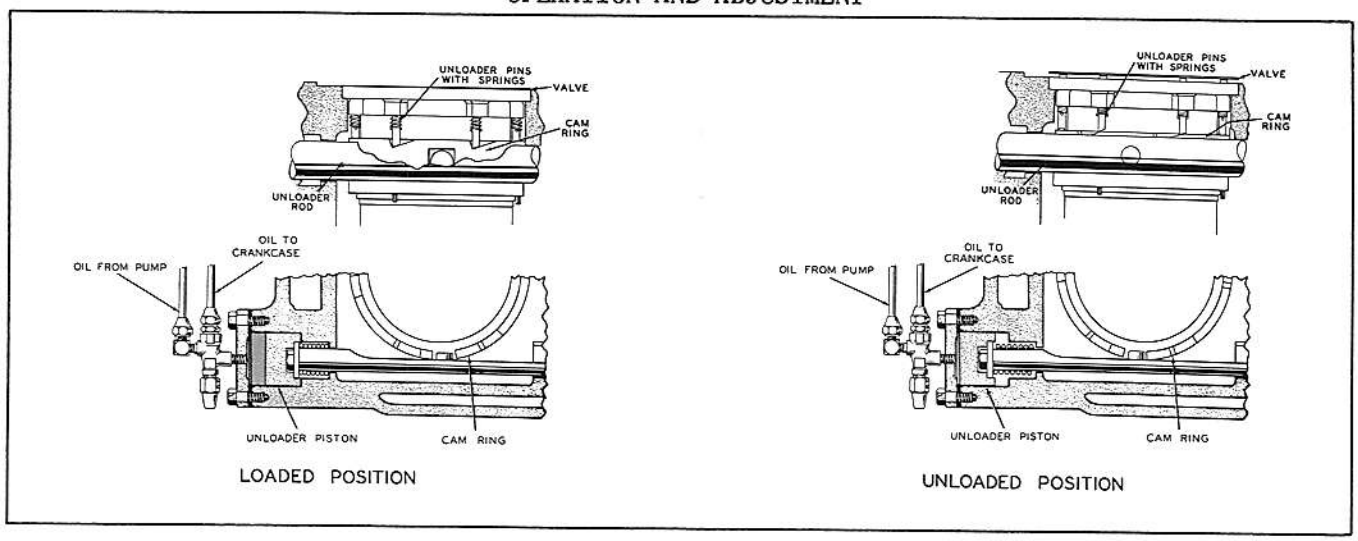


Fig. 27 - Unloader Mechanism

its seat and the cylinders are loaded.

When the three way valve is open (back seated), oil is relieved to the crankcase and the unloader piston spring returns the valve to the unloaded position.

During shutdown the cylinders are always unloaded. On start-up oil pressure of 30 psig overcomes the unloader piston spring tension, actuating the unloader mechanism so that the cylinders operate under full capacity.

Automatic Capacity Reduction

All compressors are furnished as standard with a hand relief line valve for each pair of unloaded cylinders. Where automatic capacity control is required, a solenoid valve, operated by a temperature or pressure control switch, is installed in the oil line before the three way valve. When a solenoid valve is used the three way valve must be left closed at all times. Compressors will be equipped for automatic unloading only if specified when ordered.

Tables 5, 6, 7 and 8 show the various arrangements of automatic capacity reduction, the number of steps, the number of solenoids, increments in capacity, unloader sequence and at the bottom of each table the proper manual unloading sequence.

These tables should be used with Fig. 28 to determine the location of the cylinders to be unloaded. Fig. 28 shows the proper numbering of the cylinders and cylinder sleeves that are right hand, left hand or plain.

Care must be taken when arranging a compressor for automatic capacity reduction so that the torque of the compressor will remain as smooth as possible. Failure to observe the proper sequence of unloading, as given in Tables 5, 6, 7 and 8 reading from left to right, may cause rough running of the compressor, loss of belt life and possible infractions of power company rules.

Unloader pistons are located on both ends of the 12 and 16 cylinder compressors. Unloader pistons on the 4, 6 and 8 cylinder compressors are confined to one end.

The 16 cylinder compressor is composed of 4 pairs of cylinders on each end. Three of these pairs are arranged for capacity reduction.

For an example of how to use tables 5, 6, 7 or 8 to determine the proper sequence of unloading, assume we have a 16 cylinder compressor. It has four solenoids, two on each end. One solenoid on each end controls 2 pairs or four cylinders and the other solenoid on each end controls 1 pair of cylinders. We want a capacity variation of

V/W COMPRESSOR UNITS
FREON AND AMMONIA
3-3/4 X 3

OPERATION AND ADJUSTMENT

TABLE 5

16 CYLINDER
AUTOMATIC UNLOADER SEQUENCE
TOTAL POSSIBLE CAPACITY VARIATION FROM 100% TO 25%

Number of Steps	Number of Solenoids	Increments in Capacity And Unloading Sequence of Cylinders					
		87-1/2%	75%	62-1/2%	50%	37-1/2%	25%
1	1	7&8					
1	1		(3&4 7&8)				
1	2			1&2(3&4 7&8)			
1	2				(3&4 7&8)(11&12 15&16)		
1	3					1&2(3&4 7&8)(11&12 15&16)	
1	4						1&2(3&4 7&8)9&10(11&12 15&16)
2	2	7&8	3&4				
2	2	1&2		(3&4 7&8)			
2	2		(3&4 7&8)	1&2			
2	2		(3&4 7&8)		(11&12 15&16)		
2	3	7&8			3&4(11&12 15&16)		
2	3			(3&4 7&8)15&16	11&12		
2	3	1&2				(3&4 7&8)(11&12 15&16)	
2	3		(3&4 7&8)			1&2(11&12 15&16)	
2	3			1&2(3&4 7&8)		(11&12 15&16)	
2	3				(3&4 7&8)(11&12 15&16)	1&2	
2	4	1&2					(3&4 7&8)9&10(11&12 15&16)
2	4		(3&4 7&8)				1&2 9&10(11&12 15&16)
2	4			(3&4 7&8)9&10			1&2(11&12 15&16)
2	4				(3&4 7&8)(11&12 15&16)		1&2 9&10
2	4					1&2(3&4 7&8)(11&12 15&16)	9&10
3	3	7&8	3&4	1&2			
3	3	7&8	3&4		(11&12 15&16)		
3	3	7&8		(11&12 15&16)	3&4		
3	3		(3&4 7&8)	15&16	11&12		
3	3	1&2		(11&12 15&16)		(3&4 7&8)	
3	3		(11&12 15&16)	1&2		(3&4 7&8)	
3	3		(3&4 7&8)		(11&12 15&16)	1&2	
3	4	7&8	3&4			1&2(11&12 15&16)	
3	4	7&8		(11&12 15&16)		1&2 3&4	
3	4			(3&4 7&8)15&16	11&12	1&2	
3	4	1&2	9&10				(3&4 7&8)(11&12 15&16)
3	4	1&2		(11&12 15&16)			(3&4 7&8)9&10
3	4	1&2			(3&4 7&8)9&10		(11&12 15&16)
3	4	1&2				(3&4 7&8)(11&12 15&16)	9&10
3	4		(3&4 7&8)	9&10			1&2(11&12 15&16)
3	4		(3&4 7&8)		(11&12 15&16)		1&2 9&10
3	4		(3&4 7&8)			(11&12 15&16)1&2	9&10
3	4			(3&4 7&8)9&10	1&2		(11&12 15&16)
3	4			(3&4 7&8)9&10		(11&12 15&16)	1&2
3	4				(3&4 7&8)(11&12 15&16)	1&2	9&10
4	4	7&8	3&4	15&16	11&12		
4	4	7&8	3&4	1&2		(11&12 15&16)	
4	4	7&8	3&4		(11&12 15&16)	1&2	
4	4	7&8		(11&12 15&16)	3&4	1&2	
4	4		(3&4 7&8)	15&16	11&12	1&2	
4	4	1&2	9&10		(3&4 7&8)		(11&12 15&16)
4	4	9&10		(3&4 7&8)	1&2		(11&12 15&16)
4	4	9&10		(3&4 7&8)		(11&12 15&16)	1&2
4	4		(3&4 7&8)	9&10	1&2		(11&12 15&16)
4	4		(3&4 7&8)		(11&12 15&16)	1&2	9&10
4	5	7&8	3&4	9&10			1&2(11&12 15&16)
4	5	7&8	3&4		(11&12 15&16)		1&2 9&10
4	5			7&8(11&12 15&16)	3&4	1&2	9&10
5	5	7&8	3&4	15&16	11&12	1&2	
5	5	7&8	3&4	9&10	1&2		(11&12 15&16)
5	5	7&8		(11&12 15&16)	3&4	1&2	9&10
5	5		(11&12 15&16)	7&8	3&4	1&2	9&10
6	6	7&8	3&4	15&16	11&12	1&2	9&10
Manual Unloading		7&8	3&4	15&16	11&12	1&2	9&10

NOTE: Pairs of Cylinders Inside Parentheses are Controlled by One Solenoid

OPERATION AND ADJUSTMENT

TABLE 6
12 CYLINDER COMPRESSOR
AUTOMATIC UNLOADING SEQUENCE
TOTAL POSSIBLE CAPACITY VARIATION IS FROM 100% TO 33-1/3%

Number of Steps	Number of Solenoids	Increments In Capacity And Unloading Sequence of Cylinders (See Fig.28)			
		83-1/3%	66-2/3%	50%	33-1/3%
1 1 1 1	1 1 2 2	5&6	(1&2 5&6)	(1&2 5&6) 11&12	(1&2 5&6) (7&8 11&12)
2 2 2 2	2 2 2 2	5&6 11&12	1&2 (1&2 5&6) (1&2 5&6)	(1&2 5&6) 11&12	(7&8 11&12)
2 2 2	3 3 3	5&6	(1&2 5&6)	5&6(7&8 11&12)	1&2(7&8 11&12) 7&8 11&12 1&2
3 3 3 3	3 3 3 3	5&6 5&6 5&6	1&2 1&2 (7&8 11&12)	11&12 (7&8 11&12) 5&6	(7&8 11&12) 1&2 1&2
4	4	5&6	1&2	11&12	7&8
Manual Unloading		5&6	1&2	11&12	7&8

NOTE: Pairs of Cylinders Inside Parentheses are controlled by One Solenoid

TABLE 7

8 CYLINDER COMPRESSOR
AUTOMATIC UNLOADING SEQUENCE
TOTAL POSSIBLE CAPACITY VARIATION IS FROM 100% TO 25%

Number of Steps	Number of Solenoids	Increments in Capacity And Unloading Sequence of Cylinders (See Fig. 28)		
		75%	50%	25%
1 1 1	1 1 2	1&2	(1&2 5&6)	(1&2 5&6) 7&8
2 2 2	2 2 2	1&2 7&8	5&6 (1&2 5&6)	(1&2 5&6) 7&8
3	3	1&2	5&6	7&8
Manual Unloading		1&2	5&6	7&8

NOTE: Pairs of Cylinders Inside Parentheses are Controlled by One Solenoid

TABLE 8

6 CYLINDER COMPRESSOR AUTOMATIC UNLOADING SEQUENCE
TOTAL POSSIBLE CAPACITY VARIATION IS FROM 100% TO 33-1/3%

Number of Steps	Number of Solenoids	Increments In Capacity And Unloading Sequence of Cylinders (See Fig.	
		66-2/3%	33-1/3%
1 1 2	1 1 2	1&2 1&2	(1&2 5&6) 5&6
Manual Unloading		1&2	5&6

NOTE: Pairs of Cylinders Inside Parentheses are Controlled by One Solenoid

OPERATION AND ADJUSTMENT

from 100% to 25% in four steps; or increments in capacity of 75% to 50% to 37-1/2% to 25%. Looking at table 5 we find with four steps and four solenoids at 75% capacity, the control device (thermostatic or suction pressure) should actuate the opening of the solenoid controlling the unloading of cylinders 3 & 4 and 7 & 8 shown in Fig. 28. For further reduction to 50% capacity, the solenoid controlling cylinders 11 & 12 and 15 & 16 should be energized. At 37-1/2% capacity reduction, the solenoid controlling cylinders 1 & 2 should be energized and at 25 % capacity reduction the solenoid controlling cylinders 9 & 10 should be energized. When the load increases the cylinders will be put back into operation in the reverse order of the unloading sequence.

OIL PRESSURE FAILURE SWITCH

The Penn Type 275AP10 oil pressure failure switch (see Fig. 16) is an oil pressure differential switch plus a time delay switch. It operates on the difference between the suction pressure and oil pressure. When the compressor is started, the normally

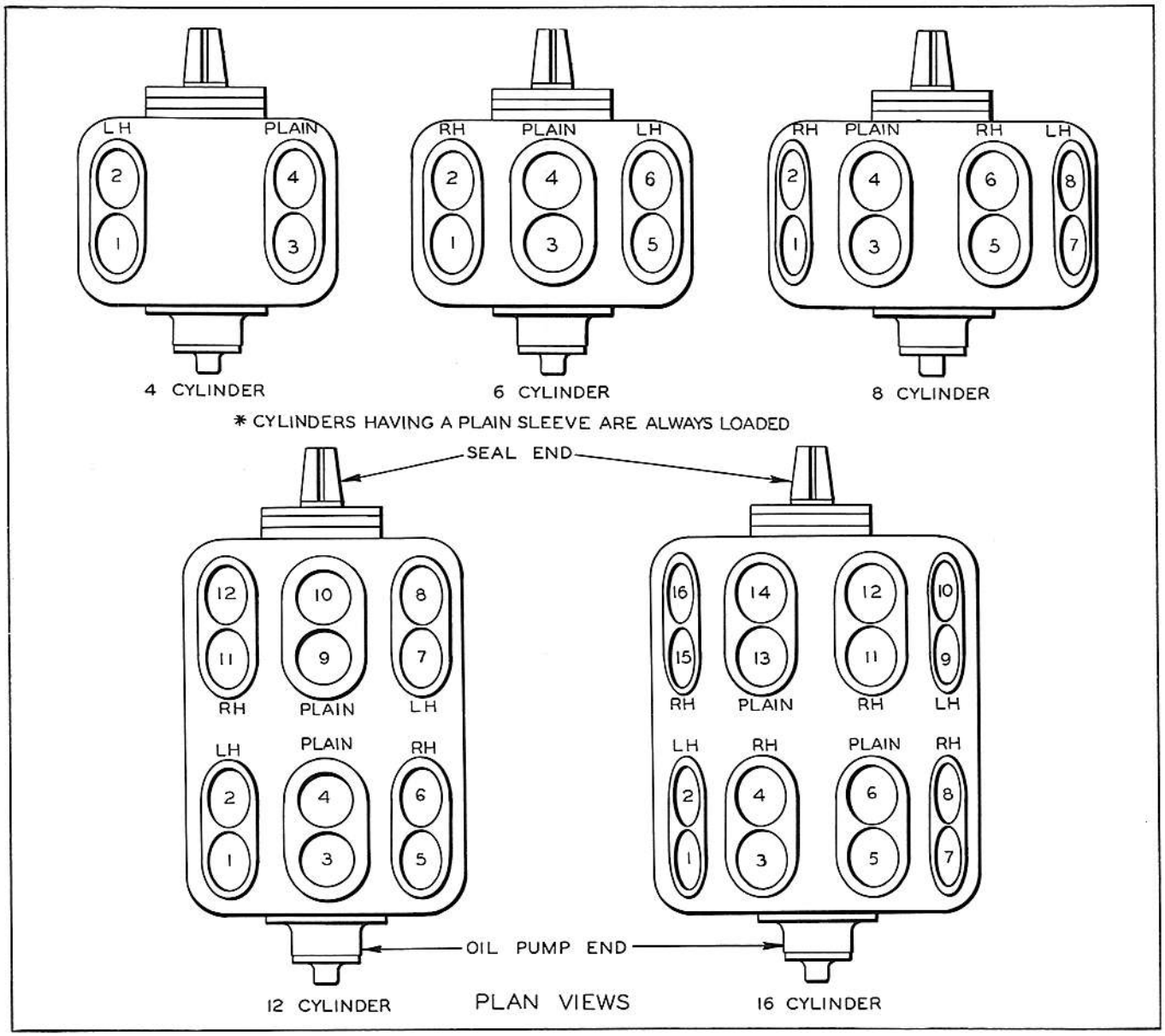


Fig. 28 - Method of Numbering Cylinders and Unloader Designations

OPERATION AND ADJUSTMENT

closed time delay switch is energized. If the oil pressure does not build up to 18 psig above the suction pressure in 90 seconds, the time delay switch trips to stop the compressor. The compressor cannot be restarted until the reset button on the control is manually reset. NOTE: Wait 5 minutes for the heater to cool before depressing the reset button.

If the oil pressure rises to above 18 psig differential in approximately 90 seconds after the compressor starts, the time delay heater element is automatically de-energized and the compressor continues to operate normally.

If the oil pressure should drop below 10 psig differential during the running cycle, the time delay heater element is energized and, unless oil pressure returns to 10 psig differential within approximately 90 seconds, the compressor will be shut down.

Time Delay - The time delay device is a trip-free, bimetal, manual reset type wired as an integral part of the oil failure switch. It is factory adjusted for approximately 90 seconds and should not be changed in the field.

This unit is completely compensated to assure uniform timing under all ambient temperatures. (Timing is affected only by variations in voltage).

The time delay resistors in the oil failure switch are the same for either 115V or 230V A.C. or D.C. service.

Adjustments - The oil failure switch incorporates a direct reading, visible calibrated scale indicating the cut-in and cut-out points. The switch is factory set to cut out at 10 psig and to cut in at 18 psig above the suction pressure. Changes in the settings are made by adjusting cam "C" (Fig. 16) and nut "D".

Turning cam "C" clockwise (viewed from top) raises both cut-in and cut-out settings, and turning cam "C" counter-clockwise lowers both settings.

Turning adjusting nut "D" clockwise (viewed from top) lowers the cut-out setting, and turning adjusting nut "D" counter-clockwise raises the cut-out settings.

SERVICE

GENERAL

Before dismantling a compressor for repairs, observe the following precautions:

(a) Be sure the faulty operation of the plant is caused by the compressor and not some other part of the plant.

(b) Dismantle only the part of the compressor necessary to correct the fault.

(c) Never open any part of a compressor which is under a vacuum; be sure there is some pressure inside as indicated by a reading above zero on the gauge. If the compressor is opened while under a vacuum, air will be drawn in with moisture. This moisture laden air will come in contact with machined parts which have been exposed to Freon and rapid corrosion will result. Freon is an excellent cleaning agent and will remove any natural protective coating of the iron or steel seaving the raw metal exposed.

(d) Internal machined parts of the compressor such as valves, pistons, shaft seal, crankshaft, etc., must be immediately protected from the compressor. Coat the parts with oil and wrap them in clean paper.

CYLINDER HEADS

When dismantling a compressor, notice should be taken of the cylinder heads before they are removed from the housing.

Before removing the heads it would be well to mark each one and its position on the housing. Also certain heads are equipped with relief valves and these heads must be replaced correctly, so that the relief gas passage will line up between the head, gasket, and housing. These pressure relief valves are spring loaded, ball check type which allows the discharge gas to escape back to the suction. These valves are set to open at 250 psi differential.

When reassembling a head, be sure to line it up with manifold first, and bolt it

snugly before bolting the head to the compressor housing.

To simplify stocking of renewal parts, only the head gasket with the relief port is available. It may be used for plain heads as well as those with the relief valve.

DISCHARGE VALVE ASSEMBLY (Fig. 29)

The discharge valve assembly has a ring plate type discharge valve (9) of stainless steel with a cast iron valve cage (6). The valve is pinned by two hardened guide pins (11) on the inside diameter to prevent rotation, and rests on six springs (10) which are seated in the valve cage. The discharge valve bolt (13) and self-locking nut (15), hold this entire assembly intact so that it is easily assembled to the top of the suction valve plate. The correct lift of the valve is insured in the design of the cage. Each cage is stamped with the letter "A" or "F" (Ammonia or Freon).

Cap screw (7) with washer (8) bolts the discharge valve assembly in place on the compressor suction valve plate.

Fig. 30 shows the correct position for the valve cage assemblies when mounted on the suction valve plates. The four discharge ports must be oriented so that their center lines will be 45° from the horizontal. This will mean the discharge valve guide pins being in a line perpendicular to the wrist pins and the crankshaft, resulting in the least amount of wear.

SUCTION VALVE ASSEMBLY Fig. 29

The suction valve assembly consists of a ring plate type valve (1) of stainless steel, six suction valve springs (2), cast iron valve plate (3), and the cap screws (4) and washers (5).

The correct lift of the valve is insured in the design of the valve plate. Each valve plate is stamped with the letter "A" or "F" (Ammonia or Freon).

(a) For assembly, place the valve plate less discharge valve cage bottom up, insert the six valve springs in the recesses in the plate, and place the ring plate valve on the springs. A NOTCH IN THE VALVE MUST CORRESPOND TO THE GUIDE PIN IN THE VALVE PLATE FOR CORRECT POSITIONING. This pin prevents the valve from rotating during operation.

(b) So that the valve plate with its valve in place may be inverted for assembly to the compressor, make two sheet metal clips as shown by Fig. 31.

(c) Slip the clips through the I.D. of the valve plate (180° apart) and over the valve so that the springs are compressed and the valve is held in its recess.

(d) Place the assembled valve plate in position on the housing with the copper gasket beneath. CAUTION: Before replacing the low lift Ammonia valve plates on the unloading cylinders, it will be necessary to make sure the unloading pins are down, or in the loaded position. One man may accomplish this by removing the unloader cover plate and placing a wooden block between it and the unloader piston. Tighten the unloader cover plate bolts until the unloader pins are depressed or in the loaded position. If the unloader pins are not depressed, damage to the suction valve will result when the suction valve plate bolts are tightened. After the suction valve plate bolts are tight, be sure to remove the wooden block used to depress the unloader pins. This procedure is not necessary on Freon compressors.

(e) Tighten the cap screws hand tight and remove the steel clips to allow the suction valve to snap down into position.

(f) Tighten the cap screws and assemble the discharge valve cage.

If it becomes necessary to replace the suction valve guide pin, order new pins, 64-368PK and proceed as follows:

(a) Drill an 1/8" hole from the top of the valve plate if not already there.

(b) Use a drift pin in this hole to drive out the worn guide pin.

(c) Drive in the new guide pin.

SERVICE

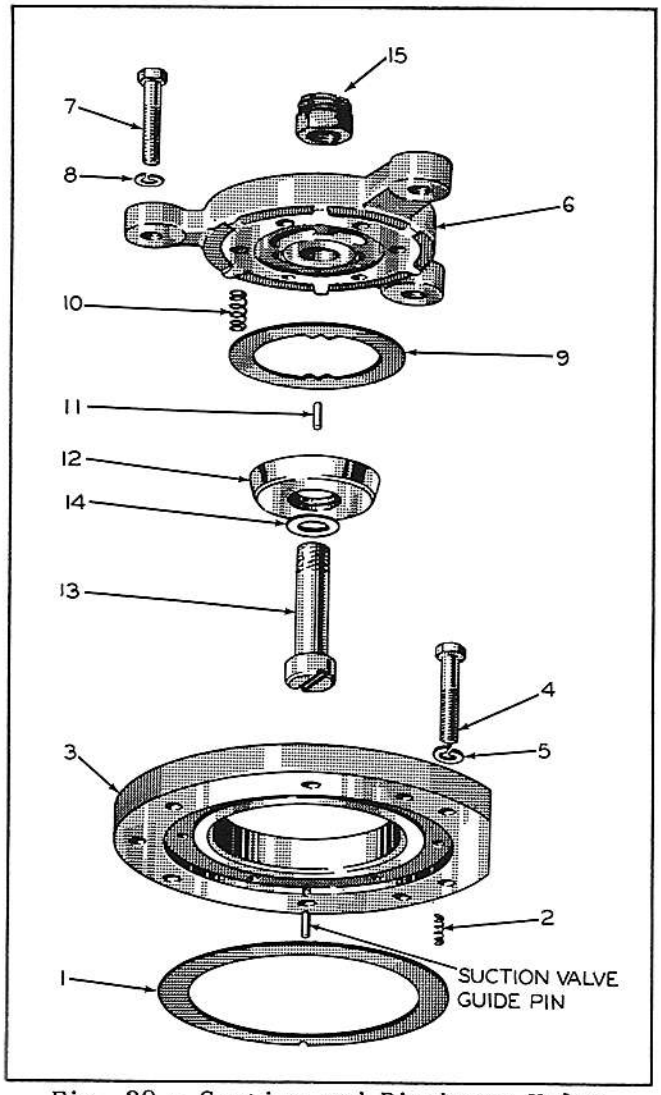


Fig. 29 - Suction and Discharge Valve Assembly

PARTS LIST, Fig. 29

Ref. No.	Item
1	Suction Valve, Ring Plate
2	Suction Valve Spring
3	Valve Plate & Guide Pin Freon Ammonia
4	Valve Plate Cap Screw
5	Valve Plate Washer
6	Discharge Valve Cage Freon Ammonia
7	Discharge Valve Cage Cap Screw
8	Discharge Valve Cage Washer
9	Discharge Valve, Ring Plate
10	Discharge Valve Spring
11	Discharge Valve Guide Pin
12	Discharge Valve Seat
13	Discharge Valve Seat Bolt
14	Discharge Valve Seat Gasket
15	Discharge Valve Seat Nut
13-15	Bolt Assembly
6,9-15	Complete Discharge Valve Assembly Freon Ammonia

CAPACITY REDUCTION

The method of capacity reduction is accomplished by means of unloader pistons which operate from oil pressure. When the machine is not in operation each bank of cylinders equipped with capacity reduction unloads completely, thereby eliminating the necessity of a starting by-pass or a special motor to overcome high starting torque. Another advantage of this type of capacity reduction is its very low penalty on brake horsepower per ton at partial capacities.

When the compressor is not in operation the unloader mechanism, which is operated

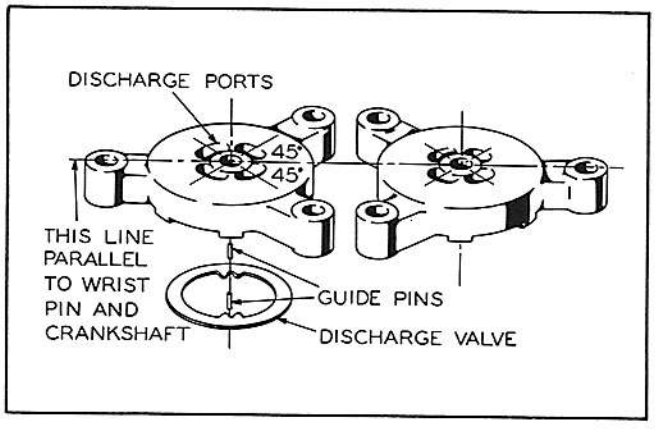


Fig. 30 - Spacing of Discharge Valve Cages

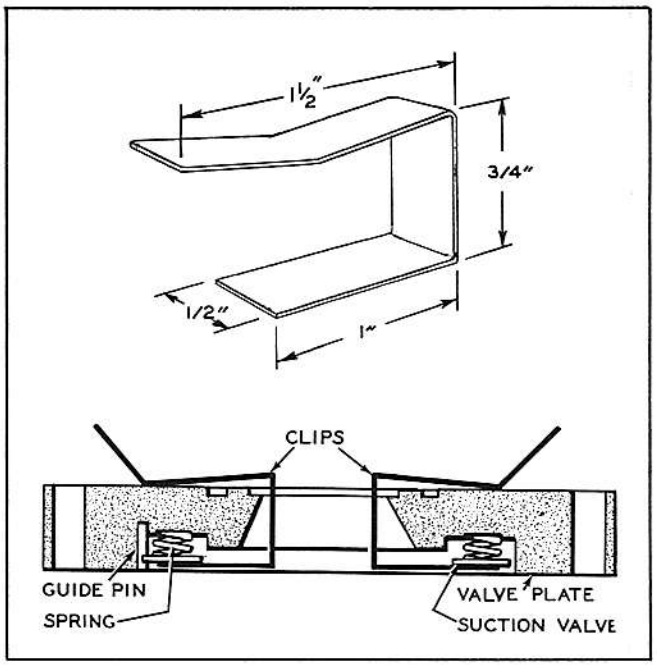


Fig. 31 - Clips Applied to Suction Valve Plate

by oil pressure, is in the position shown in Fig. 32. The unloader spring (4) pushes the unloader piston (1) and the unloader rod (5) back, thereby rotating the cam rings (6) so that the lift pins (7) are raised on the cams. These lift pins raise the compressor suction valves compressing the suction valve springs. The unloader remains in this position until the compressor is started and the oil pressure reaches approximately 30 psi, at which point the pressure pushes the unloader piston back against the unloader spring. This motion is transmitted to the cam ring which rotates and lowers the lift pins, allowing the suction valve to act as a normal valve.

The lift pins (7) are beveled with a 15° taper on the end riding on the cam ring (6) so that the pin will have full contact with the cam. The lift pin spring (9) is compressed when the cylinder is unloaded and keeps the lift pin in contact with the cam ring when the cylinder is loaded again. This spring is kept in place by a roll pin (10) through the lift pins which also prevents the pin from rotating so that the beveled end does not get out of contact with the cam.

Each unloader cylinder sleeve is locked to the housing with a pin (8) to keep it from rotating out of position. These cylinder sleeves (11) are fitted with a loose fit so that they may be removed in the field. To remove these sleeves, first remove the unloader piston cover and remove the piston and rod carefully so that the unloader piston, under tension from the spring, does not fly out. Ease out the sleeve. When replacing the cylinder sleeve, the cam ring (6) must be turned so that its slot is centered under the lift pin at point

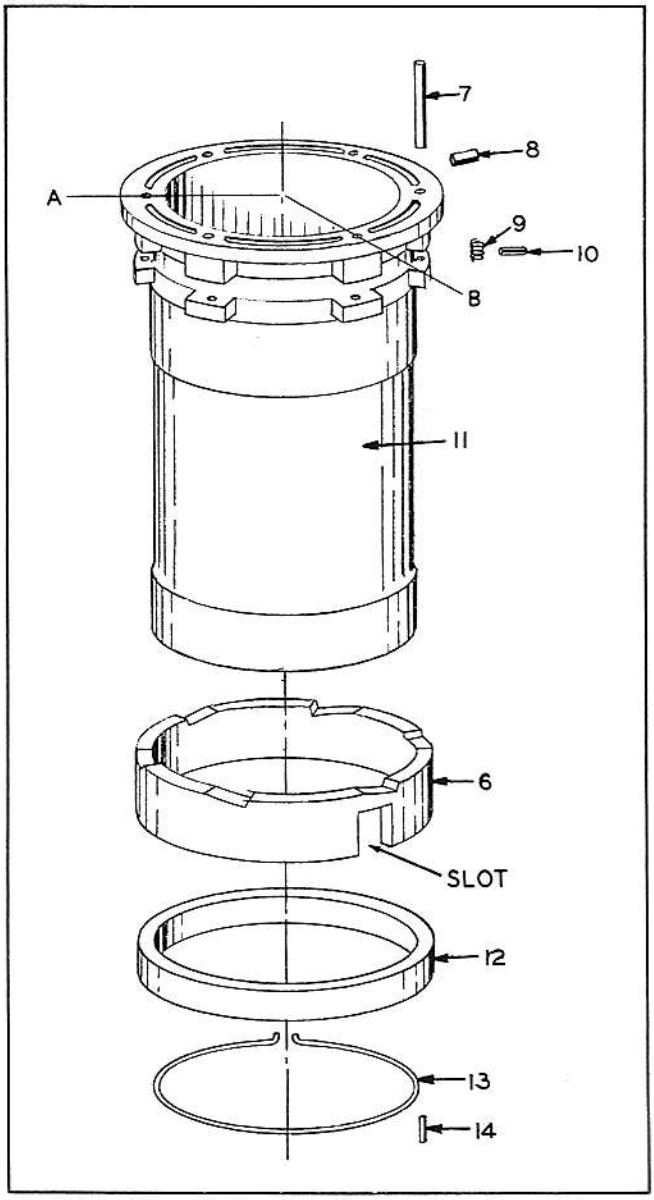


Fig. 32 - Unloader Mechanism Assembly

SERVICE

PARTS LIST, Fig. 32

Ref. No.	Item
1	Unloader Piston
2	Hex Head Cap Screw
3	Push Rod Washer
4	Unloader Device Spring
5	Push Rod
6	Cam Ring (Left Hand)
6	Cam Ring (Right Hand)
7	Lift Pin (Set of 6)
8	Locating Pin
9	Lift Pin Spring
10	Roll Pin
11	Cylinder Sleeve, Bare
12	Cam Ring Support Ring
13	Retaining Ring
14	Locking Pin
6-14	Unloader Sleeve Assembly (L.H.)
6-14	Unloader Sleeve Assembly (R.H.)

A (See Fig. 32). This pin is opposite the locating pin (8). The exception to this is the inside pair of unloading cylinders on the 8 and 16 cylinder compressors and the one pair on the four cylinder. Locate the slot below point B for these locations. Before replacing the unloader piston plate push in on the unloader piston with the hand and observe both cylinders to see that the unloader mechanism is working properly.

It must be noted that the unloaders are designated as either right or left hand. R. H. or L. H. stamped on cam ring. Actually all parts of the unloader device are interchangeable with the exception of the cam rings which have the cams sloped in opposite directions. The hand is determined by the position of the unloader rod in respect to the cylinders when one is looking from the end of the compressor facing the unloader piston. When the unloaders are to the left of the cylinder, they are designated as left-hand, and those with the unloaders to the right are designated as right-hand.

Fig. 28 shows the method of numbering the cylinders and determining right or left-hand unloader mechanisms. In ordering replacement parts it is necessary to designate the cylinder numbers with left or right hand unloader mechanism.

You will note that the only difference between the L.H. and R.H. sleeve assemblies is the cam ring (6). It is important, however, when converting a L.H. to a R.H. or vice versa, the lift pins must be rotated 180° so that the beveled ends will make full contact with the cam ring. This conversion should only be made in the case of emergency, should the proper sleeves not be immediately available.

At the bottom of Tables 5, 6, 7 and 8 is found the proper sequence for manually unloading the cylinders. (To unload, open the relief line valves shown in Fig. 26).

PISTONS AND CONNECTING RODS

Install the pistons with connecting rods, making sure that they are in the proper cylinders. The piston rings must be free in the grooves and ring gaps rotated 120° from each other to insure best compression and to prevent excessive oil usage. Check the wrist pins and the wrist pin locking springs. Install all connecting rod caps, with nuts finger tight at first, then proceed to tighten each connecting rod cap separately. Match the numbers stamped on the rod and cap. Rotate the shaft after each separate connecting rod is tightened, to determine if binding occurs.

SHAFT SEAL

The shaft seal is a single, spring loaded, balanced seal, simple in design, and using no diaphragms. (See Figs. 33 and 34) A cast iron shaft seal collar with rubber "O" ring is secured to the crankshaft by a steel ball and two locking nuts, thereby rotating with the crankshaft. A carbon shaft seal ring with rubber "O" ring, loaded by 8 small helical springs, is locked to the cover plate by a roll pin, therefore this assembly is stationary. The lateral movement of the shaft seal ring allows the contact surfaces of the carbon ring and cast iron collar to always be in contact. The lapped contact surfaces are separated by a film of oil. This oil, slightly above crankcase pressure, is supplied by the oil

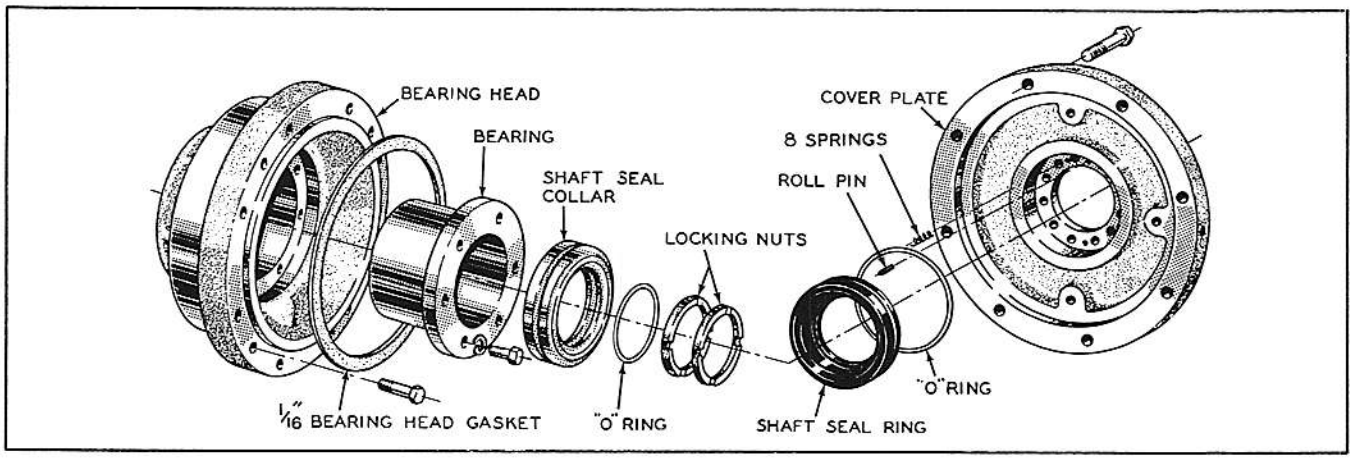


Fig. 33 - Exploded View of Shaft Seal

pump and floods the cavity between the cover plate and bearing head. The two rubber "O" rings perform an important function in sealing off possible leak paths along the shaft and through the cover plate so they must be carefully handled and properly applied.

Seal Leakage

The shaft seal cover plate is fitted with an ell to lead any oil which may pass through the seal to a can, so as to keep it away from the motor or belt wheel.

The rate of leakage and condition of the oil from the seal drip indicates the effectiveness of the seal. In operation, the shaft seal surfaces should pass enough oil to assure a film between. Five to ten drops per minute oil drip can pass thru, either because of too great pressure (seal tension) or too smooth surfaces, the surfaces roughen themselves until an oil film can be retained, and then start to wear smooth again. If the seal has roughened itself, the first oil out of the drip may be darker, but clear clean oil should come out after about 2 days running. If the oil continues to appear dark, then the seal is being scored either by grit or scale, or a crack on the collar surface is shaving the carbon ring. Unless this stops within a week or 10 days and drip returns to normal, the seal will have to be replaced or repaired before failure occurs.

A compressor in automatic operation, or any compressor on starting, may leak up to 20 drops of oil per minute during the first minute of running, but should reduce to tightness and normal oil drip in a short time. The seal should not be condemned for this action, it is caused by falling pressure and formation of gas in the oil chamber of the seal.

PARTS LIST, Fig. 34

Item No.	Quan.	Part
1	1	Cover Plate
2	8	Hex Head Cap Screws
3	1	Shaft Seal Collar
4	1	Shaft Seal Ring
5	1	"O" Ring - 3-1/4" O.D.
6	1	"O" Ring - 4-1/8" O.D.
7	8	Helical Spring
8	1	Bearing Head Gasket 1/16"
9	1	Locking Ball
10	2	Locking Nuts
11	1	Roll Pin
12	1	Thrust Bearing
13	6	Cap Screws
14	6	Washers

SERVICE

If the leakage is normal with the compressor running there should be no leakage during shutdown.

Liquid in the crankcase oil will cause excessive boiling and foaming on falling pressure. The oil in the seal chamber may foam out faster than it can be replaced, causing dry surfaces and carbonizing of the oil on them. If they are not scored too severely, the surfaces will clean themselves of the carbon and wear to tightness again.

The shaft seal is a flooded type seal, therefore, it is necessary to have the shaft seal oil space completely filled with oil. This is automatically accomplished during continuous or intermittent operation but during prolonged shut down periods it will be necessary to insure a flooded seal before start up.

Seasonal operated compressors, should be watched carefully for shaft seal leakage during shutdown. An empty quart can should

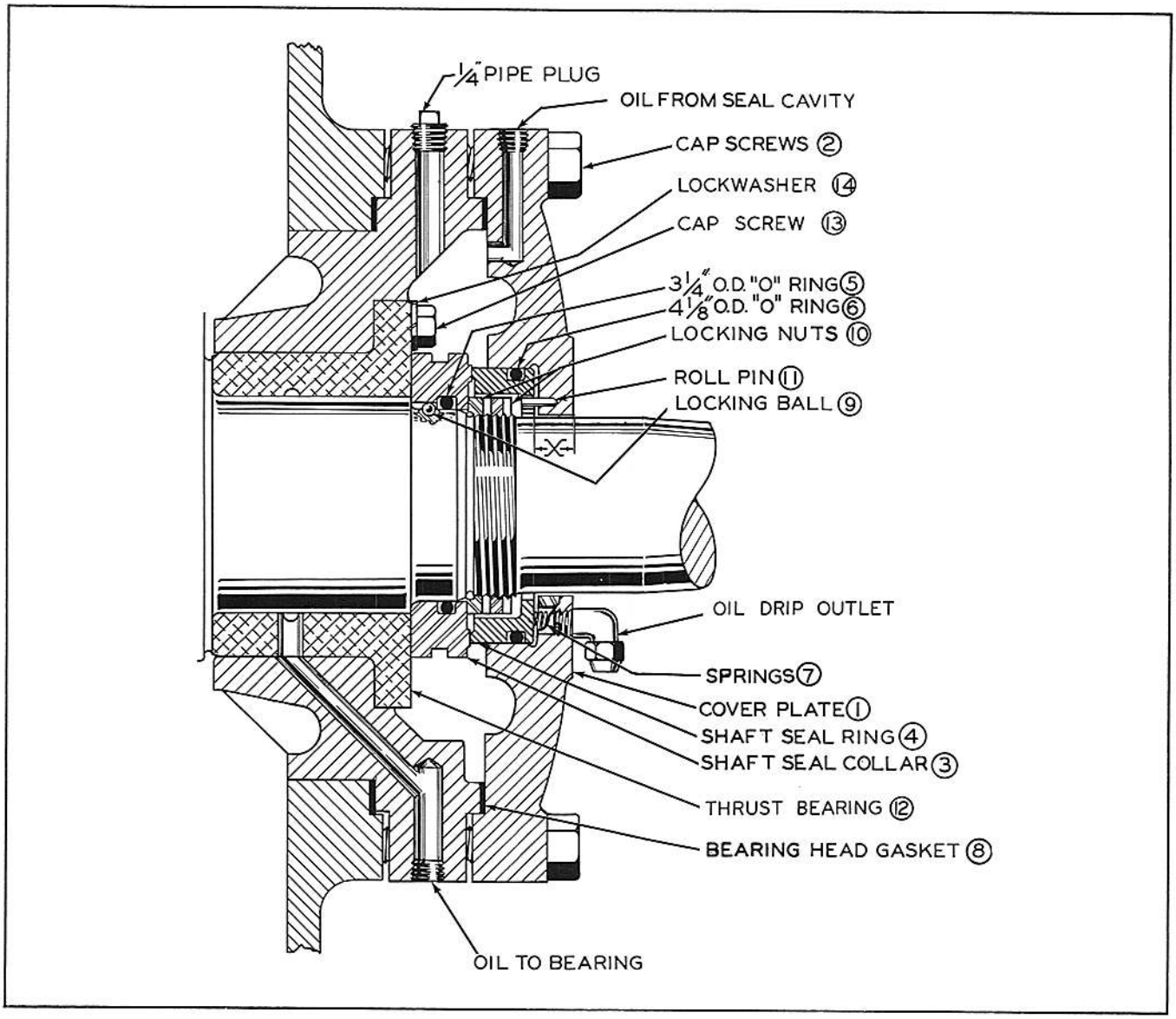


Fig. 34 - Sectional View of Shaft Seal

be placed under the seal drain tube during the off season. Before the compressor is started for its normal running period, the can should be checked to determine the amount of seal leakage.

An equal quantity of clean oil should be charged into the shaft seal by a hand oil pump attached to the oil charging valve.

Replacing Shaft Seal

If the leakage of the seal is excessive, the seal should be replaced. To replace the shaft seal proceed as follows:

(a) Pump down the compressor, close stop valves, vent crankcase to atmosphere and remove the beltwheel or flexible coupling hub from the crankshaft.

(b) Loosen the cover plate cap screws to allow the oil to drain from the seal cavity.

(c) Remove the oil lines from the side and top of the cover plate and then remove the cover plate, and shaft seal ring as one unit (See Figs. 34 and 35)

(d) Examine the running faces of the shaft seal ring and the seal collar for dirt, grit, scratches, cracks or excessive wear.

(e) If the faces show any of the items just mentioned, the worn part or parts need replacing.

(f) Remove the seal ring and 8 springs from the cover plate.

(g) Remove the two locking nuts, the seal collar and its locking ball. Do not pry from the back of the seal collar, Use the groove provided or jack it off with the bearing jack screws. (See Thrust Bearing - Seal End for procedure)

(h) Clean all parts to be re-used in an approved safety solvent as well as the entire seal cavity.

PARTS LIST, Fig. 35

Ref. No.	
1	Main Bearing
2	Main Bearing Pin
3	Oil Pump Drag Crank
4	Main Bearing Head with Plugs & Fitting
5	Main Bearing Head Cap Screw
6	Pressure Regulating Valve
6a	Valve Spring
6b	Valve Cap Gasket
6c	Valve Stem Packing
6d	Valve Check Ball
6e	Valve Body Fibre Gasket
6f	Valve Body Copper Gasket
9	Oil Pump Insert
10	"O" Ring Packing
11	Oil Pump Insert Cap Screw
12	Lockwasher
13	Oil Pump Gasket
14	Oil Pump
15	Oil Pump Cap Screw
9, 10, 11, 12, 13 & 14	Oil Pump Kit

SERVICE

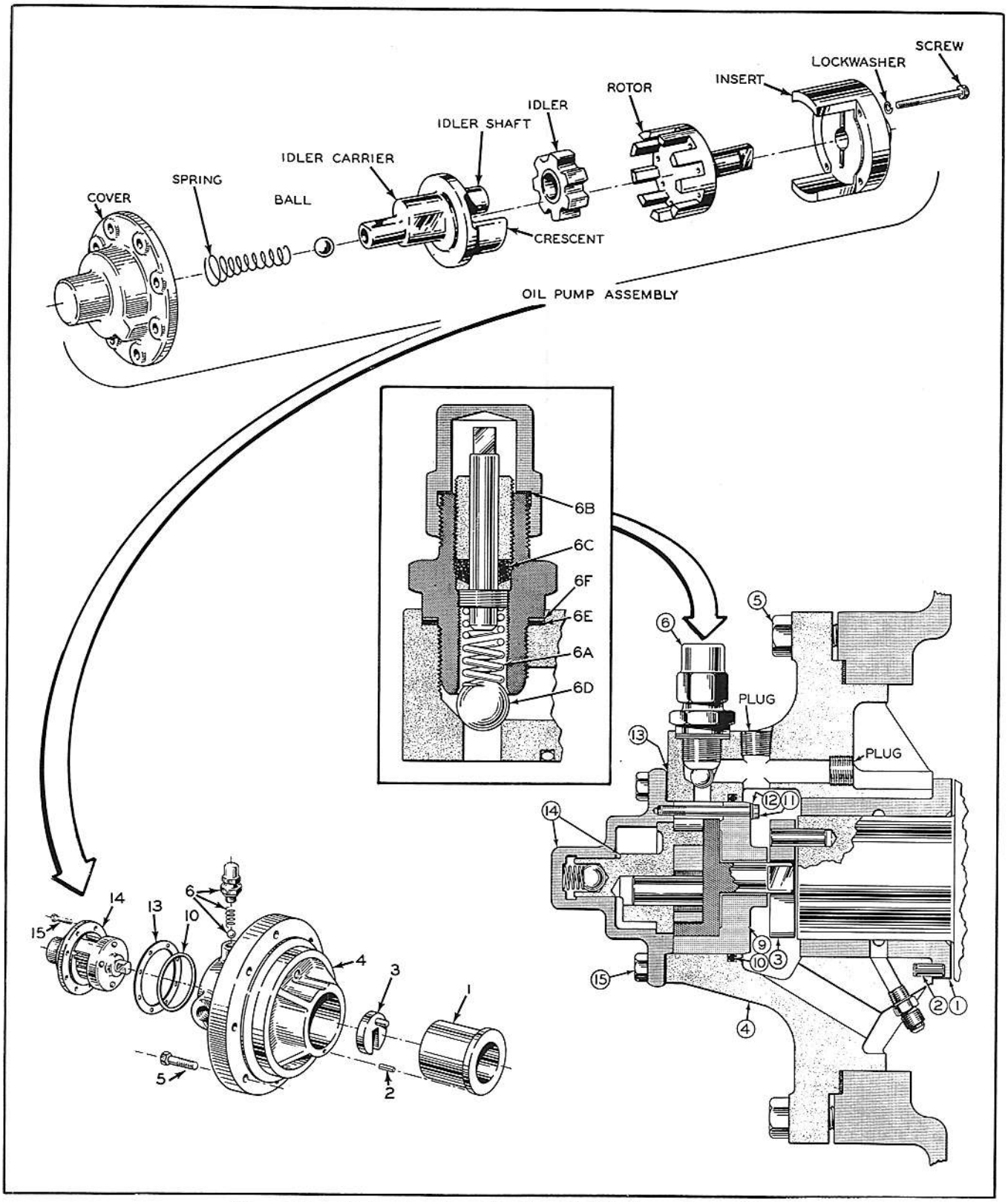


Fig. 35 - Main Bearing Head and Oil Pump Assembly

NOTE: Even careful examination may fail to detect cuts in the "O" rings, so when repairing a shaft seal it is good practice to replace them.

(i) Be certain at this time that the clearance on the thrust bearing does not exceed .006". Excessive shaft end play can be responsible for seal failure. (See CHECKING SHAFT THRUST CLEARANCE)

(j) Place the 3-1/4" O.D. "O" ring (5) in its recess in the shaft seal collar (3). Pull the crankshaft all the way toward the seal end and install the shaft seal collar (3) making sure that it is locked to the shaft by the locking ball and its thrust side is bearing against the shoulder of the shaft. Apply the original collar nut and locking nut, pulling them up tight. Be certain the thrust clearance remains the .003"-.006" originally allowed. Push the shaft toward the pump end.

(k) Place cover plate on a horizontal surface with the spring holes face up. Place the 8 springs (7) in their sockets.

(l) Place the 4-1/8" O.D. "O" ring (6) in its recess in the shaft seal ring (4) and place this assembly in the cover plate (1) being cautious not to cut or jam the "O" ring. Be sure that the locking pin in the cover plate enters its proper hole in the shaft seal ring and that the springs are properly seated. Depress the shaft seal ring to be sure that it is free to move. Place a 1/16" bearing head gasket (8) on the cover plate assembly.

(m) Make sure the contact surfaces of the shaft seal collar (3) and shaft seal ring (4) are free from all foreign particles. Apply oil to these surfaces.

(n) Assemble the cover plate assembly, with gasket in position, to the bearing head using the cap screws (2). Draw the bolts up evenly and tightly.

(o) After the assembly is complete measure "X" (distance from outside of cover plate to shaft seal ring) thru the 9/64" hole in the cover plate using a micrometer depth gauge. This dimension should be .612 +/- .012.

(p) Reconnect the oil lines to the side and top of the cover plate (1).

(q) Since this is a flooded type seal, it will be necessary to fill the seal oil cavity with oil. Charge one quart of oil into the seal-oil charging valve.

(r) Be sure all oil line joints are properly made, then reassemble the coupling or belt wheel.

The compressor is now ready for operation. Keep a close check on the seal for a short period. Do not be alarmed if there is no sign of oil drip at all for the shaft seal leakage is relatively low. Only 10 to 15 drops per day might be observed at the elbow (9) on the face of the cover plate. A piece of drain tubing may be attached to the elbow if desired.

REPLACING THE OIL PUMP

The oil pump (Fig. 35) is designed so that all moving parts are housed in a single unit.

To replace the oil pump proceed as follows:

(a) Pump down the compressor, close stop valves and vent crankcase to atmosphere.

(b) Remove the oil pump (14) by removing cap screws (15).

(c) Dismantle oil pump assembly using an Allen wrench to back out cap screws (11). Remove in turn the insert, rotor, idler, idler carrier crescent, spring and ball.

(d) Remove the "O" ring (10) and the drag crank (3).

(e) Clean and oil all parts.

(f) Renew parts as necessary reversing the above steps. Use care not to damage the "O" ring.

SERVICE

MAIN AND THRUST BEARINGS

All main bearings are sleeve type and of aluminum alloy.

The thrust bearing is designed to take the shaft thrust in both directions. Radial oil grooves are milled on both ends for lubricating the thrust surfaces.

Main Bearing - Pump End (See Fig. 35)

The following procedure is recommended when replacing pump end main bearings:

(a) Arrange blocking under shaft in crankcase.

(b) Disconnect the oil lines at the oil pump end.

(c) Remove the oil pump assembly and the bearing head with the bearing in place.

(d) Remove the sleeve bearing from the bearing head.

(e) Clean all parts with approved safety solvent. Blow out oil ways with dry air or nitrogen.
NOTE: Do not use linty rags for drying parts.

(f) Install a new bearing into the bearing head and reassemble to the compressor. Pin (2) keeps bearing from turning.

(g) Inspect the oil pump assembly and assemble it to the compressor.

(h) Connect up the oil piping and remove the blocking under shaft.

Thrust Bearing - Seal End (See Fig. 34)

(a) Remove the flywheel or coupling hub.

(b) Remove the shaft seal assembly and the shaft seal collar lock nuts from the shaft.

(c) Remove the shaft seal collar, making sure the steel ball for locking the seal collar to the shaft is not lost or misplaced. (See Replacing Shaft Seal for procedure to remove the seal collar.)

(d) Support the shaft with blocks inside the crankcase and remove the bearing.

To do this, remove the six cap screws from the thrust bearing (12) and use these screws in the tapped holes in the bearing to jack it out.

This will force the seal collar loose. Use care not to lose the locking ball (9).

In jacking off the seal collar, take up the slack and then tap the end of the shaft. Repeat until the seal collar may be pulled off. Do not force the jack screws which would pull the whole shaft and spring the connecting rods.

(e) Remove the bearing head and clean all parts with cleaning solvent. Do NOT use rags for WIPING, BLOW out moisture and foreign matter with dry air or nitrogen.

(f) Do not install a bearing into the housing. To prevent possible damage to bearing the following procedure is recommended:

1. Replace the bearing head, without the aluminum bearing in place.

2. With the bearing head in place slip the aluminum bearing over the shaft, into the housing. Care should be exercised to prevent scoring or upsetting metal on the thrust ends and load surfaces. Upset metal on the bearing surfaces, and high rotating shaft speeds might start scoring of the bearing surface and shaft journal. Be certain the oil hole in the bearing is at the bottom. (Remove blocking from under the shaft).

3. With washers and cap screws tighten the bearing in place against the seating surface.

4. The shaft seal collar with the "O" ring are assembled and installed on the shaft with the steel locking ball in place.

5. Use the Spanner wrench to lock the shaft seal collar nuts.

6. Replace the seal and the belt wheel (or coupling).

Checking Shaft Thrust Clearance

(a) The shaft must be pushed tight against the inside thrust surface. Pull the shaft toward the drive end.

(b) Measure the clearance (see Fig. 34) between the thrust side of the seal collar and aluminum bearing thrust face with the feeler gauge. Minimum clearance .003", maximum clearance .006".

(c) Alternate method for checking Thrust clearance:
Mount dial indicator against the end of the shaft and pry shaft toward pump end, set dial indicator at zero and pry shaft toward drive end and record the dial indicator readings. They should be (.003") to (.006"). If exceeded install new bearing.

Center Main Bearing 12 & 16 Cylinder (Only)

Made of aluminum alloy, with spider type shell, cast in one piece and split vertically at the top and provided with wedge type bolt for expanding and locking bearing into position in the housing bore. (See Fig. 36)

The following procedure is recommended for replacing the center main bearing in the 12 and 16 cylinder compressor:

(a) Drain the crankcase oil and disconnect the oil piping.

(b) Remove the top heads, suction valve cages, suction valve plates and suction valve rings.
NOTE: Do not drop suction valve springs in cylinders.

(c) Remove the connecting rod caps.

PARTS LIST, Fig. 36

Ref. No.	Item
1-8	Bearing Assembly Center
3	Bushing, Center Bearing
6	Dowel Pin, Center Bearing

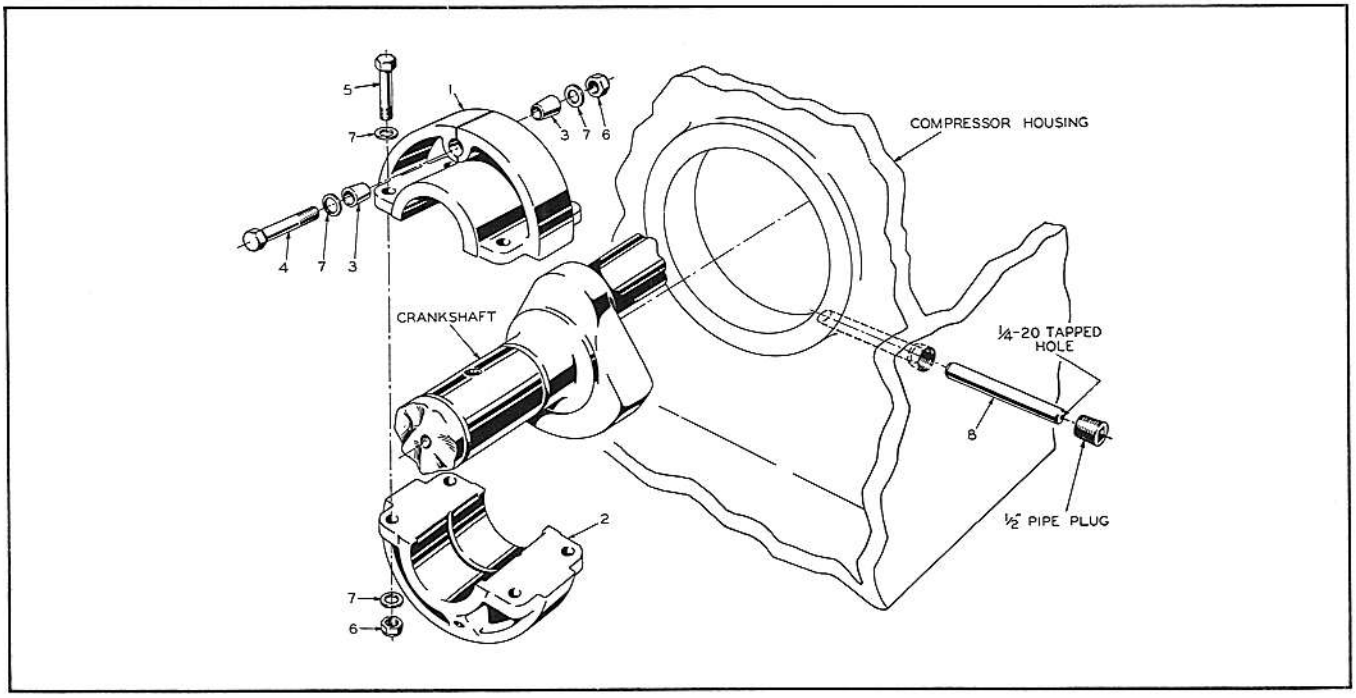


Fig. 36 - Center Main Bearing (12 and 16 Cylinder Only)

(d) Remove the piston with connecting rod assemblies and replace the connecting rod caps to prevent mix-up.

(e) Remove the pump end bearing head assembly with oil pump.

(f) Remove the coupling hub from the shaft.

(g) Remove the shaft seal assembly.

(h) Remove the drive end bearing and bearing head.

(i) Remove the tapered wedge bolt from the top of the center bearing to free the bearing from the crankcase bore.

(j) Remove the center main bearing dowel pin, covered by 1/2" pipe plug, from the side of the compressor.

(k) The center main bearing, with the crankshaft, must be removed from the compressor as an assembly. It requires two men to move the shaft out of the compressor housing, through the pump end.

(l) Rest the shaft on wood blocks and remove the center bearing from the shaft.

(m) Examine and clean shaft journals and crank pins. Hone where necessary to smooth scratches or scored areas if any.

(n) Install a new main bearing to center journal on the shaft, and replace the shaft with the bearing mounted on the shaft into the compressor.

(o) With the center bearing and shaft in proper location in the compressor bore and aligned with the dowel pin hole, insert the dowel pin and tap lightly. Replace the 1/2" plug using litharge to close access hole.

(p) Replace the main and thrust bearings, and pull all cap screws tight.

(q) Tighten the wedge bolt through the center main bearing to expand the bearing into the housing bore.

NOTE: Connect the oil line to feed center main bearing making sure connections are tight.

WARNING: When replacing one new main bearing, it is important to inspect all main bearings to determine the amount of wear. The changing of one main bearing may require the changing of all main bearings to maintain accurate shaft alignment.

(r) Proceed to re-install oil pump assembly, check the thrust clearance .003" to .006", install the shaft seal assembly and adjust the tension.

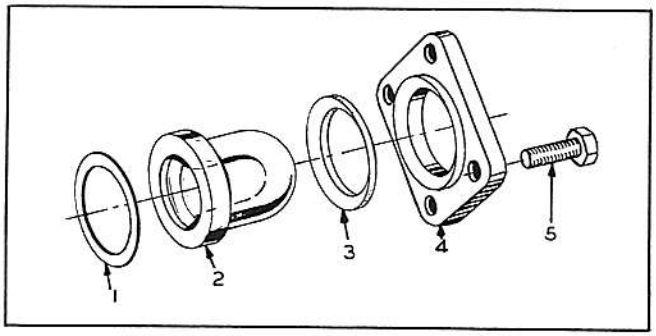


Fig. 37 - Oil Level Sight Glass

PARTS LIST Fig. 37

Ref. No.	Item
1	Oil Sight Glass Fibre Gasket
2	Oil Sight Glass
3	Oil Sight Glass Rubber Packing
4	Oil Sight Glass Packing Gland
5	Oil Sight Glass Cap Screw

OIL LEVEL SIGHT GLASS (Fig. 37)

The crankcase oil level sight glass is located at the oil pump end of the compressor to indicate the oil level. Correct oil level is half way up the bullseye. When installing the sight glass, extreme care must be used to center the bulb with a feeler gage and draw the cap screws evenly, to prevent undue strain and resulting breakage.

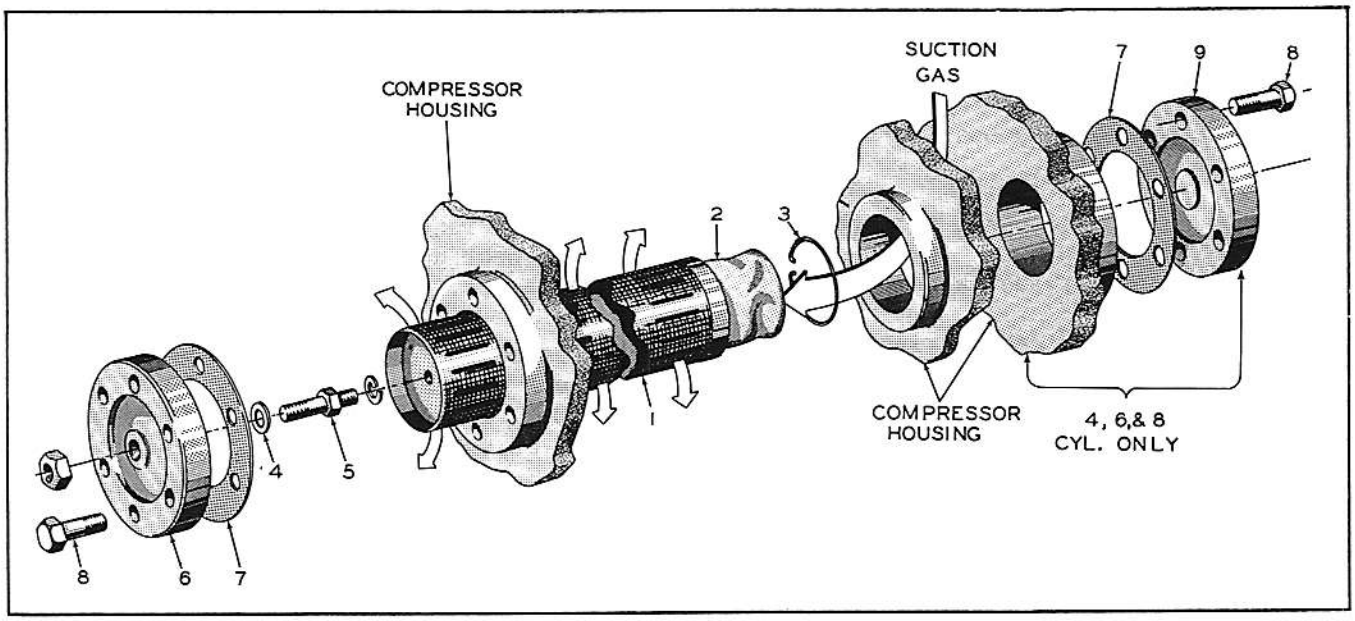


Fig. 38 - Suction Strainer Assembly

PARTS LIST, Fig. 38

Ref. No.	Item
1	Strainer Screen
2	Strainer Bag
3	Retaining Spring
4	Cover-To-Stud Gasket
5	Stud
6	Discharge End Cover
7	Gasket
8	Cap Screw
9	Suction End Cover

SUCTION STRAINER

The strainer assemblies can be removed from the suction or the discharge end of the 4, 6 and 8 cylinder compressors. On the 12 and 16 cylinder they can be removed in one way, from the discharge ends. NOTE: Whenever possible remove the strainer assembly from the discharge end of the 4, 6 and 8 cylinder compressors.

To remove the strainer assembly from the discharge end of the following procedure is recommended: (See Fig. 38)

(a) Pump out the compressor.

(b) Remove any tubing that may be in front of the strainer cover.

(c) Remove the bolts (8) from discharge end strainer cover (6). NOTE: Do not remove the nut located in the center of this cover.

(d) Remove the strainer assembly from the compressor housing.

(e) If it is necessary to replace the strainer screen, remove the cover nut, cover, gasket, stud and lockwasher (4, 5, 6 and 7). NOTE: Upon reassembly make sure the cover-to-stud gasket is in its proper place.

(f) When replacing the strainer be sure it enters the hole in the compressor housing. Forcing the strainer in by use of the cover cap screws will collapse it.

Belt driven 4, 6 and 8 cylinder compressors may present some difficulties (because of the flywheel) in the removal of the strainer assembly from the discharge end. To remove the strainer from the suction end refer to Fig. 38 and proceed as follows:

(a) Pump out the compressor.

(b) Remove the suction end strainer cover (9).

(c) Remove the discharge end cover nut, cover (6) and cover-to-stud gasket (4).

SERVICE

CAUTION: The cover-to-stud gasket (4) must be removed before the strainer is pulled through the compressor housing or it may be lost inside the compressor suction compartment.

(d) The strainer screen can now be removed from the suction end of the compressor housing.

(e) Upon reassembly, insert the strainer screen in the suction end of the compressor housing, after it appears at the discharge end attach the cover-to-stud gasket (4), discharge end strainer cover (6) and the cover nut.

(f) Bolt both end strainer covers (6 and 9) to the compressor housing.

CRANKCASE FLOAT VALVE

An installed view of the crankcase float valve is shown by Fig. 39.

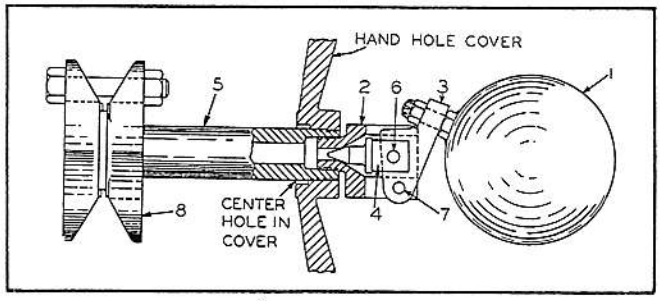


Fig. 39 - Crankcase Float Valve

PARTS LIST, Fig. 39

Ref. No.	Item
1	Float Ball
2	Valve Body
3	Float Lever
4	Float Valve
5	Pipe Nipple
6	Pin
7	Pin
8	3/4" Oval Flanges, gasket, bolts & nuts
1-8	Float Valve Assembly

MANUFACTURING TOLERANCES

Piston	Diam.-Top	3.741	± .005
	-Bottom	3.745	+ .001 - .000
	Wrist Pin Hole	1.0000	+ .0003 - .0000
Cyl. Diam.		3.7500	+ .0005 - .0000
Wrist Pin Diam.		1.0000	+ .0000 - .0003
Connecting Rod	Wrist Pin Hole	1.0005	+ .0003 - .0000
	Crank End Hole	2.3760	+ .0005 - .0000
	Crank End Width	.87450	+ .0005 -
Crankshaft	Seal End & Center	3.2500	+ .0005 -
	Pump End	2.6270	+ .0005 -
	Crank Pin	2.3750	+ .0005 -
	Width Between Cheeks 4 Cyl.	1.763	± .002
	Width Between Cheeks 6&12 Cyl.	2.640	± .002
	Width Between Cheeks 8&16 Cyl.	3.515	± .002
Bearings	Seal End & Center	3.2555	+ .0005 - .0000
	Pump End	2.6315	+ .0005 - .0000

REPLACEMENT PARTS

The compressors have a factory number stamped on the compressor housing.

The factory number is stamped on top of the compressor housing directly above the suction connection on 4, 6 and 8 cylinder compressors.

SERVICE

The factory number is stamped on the compressor housing directly above the publicity plate (left hand side facing the seal end) on the 12 and 16 cylinder compressors.

When ordering replacement parts for any compressor be sure to specify the following:

(a) Name of part.

(b) Part number.

(c) Factory number or serial number of compressor.

(d) Quantity of parts required.

REPAIR PARTS STOCK LIST

Table 9 lists the recommended quantity of repair parts that should be held in stock to enable good service on these compressors. These quantities are based on the number of compressors installed.

TABLE 9

Repair Part	Compressors Installed		
	1 to 10	11 to 25	26 And Up
Complete Seal Assem. - Y51	3	5	7
Seal Collars	3	5	7
Lead Gaskets	6 Sets	10 Sets	10 Sets
Connecting Rod Assembly	6	10	10
Piston Assembly	6	10	10
Compression Rings	3 Machine Sets	5 Machine Sets	7 Machine Sets
Ventilated Oil Rings	3 Machine Sets	5 Machine Sets	7 Machine Sets
Cylinder Sleeves	6	10	10
Suction & Disch. Valve Assembly	3	5	5
Suct. & Disch. Valve Ring Plates	3 Machine Sets	5 Machine Sets	7 Machine Sets
Suction Valve Plate Gaskets	6	12	16
Oil Pump Assembly	1	2	3
Oil Pump Gaskets	4	6	6
Bearings - Main & Thrust	2 Sets	2 Sets	2 Sets
Center Bearing Assy.-12 & 16 Cyl.	1	1	1
Main & Thrust Bearing Head Gaskets	4	6	6
Head Gaskets	12	24	36
Discharge Manifold Gaskets	12	18	18
Hand Hole Cover Gaskets	8	12	16

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