



Series 500 Boilers

Burner Section

**Service Manual
Sizes 175 thru 350 HP
All Fuels**

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BURNERS – CONTROLS

All burners on the 500 Series Boilers are completed as individual assemblies, including linkage, Modutrol motor, motors, fans, fuel valves, and all necessary components, including the control panel (junction box) and are bolted onto the burner adapter, or removed in the same manner. The burner adapter is bolted to the boiler.

All burner assemblies are listed with their control system. So that the proper unit can be determined, refer to General Assemblies for proper instruction.

TO CHECK OIL NOZZLE

1. Turn off electrical power supply and fuel supply to unit.
2. Disconnect fuel and air lines at nozzle.
3. Remove (4) bolts holding nozzle pipe assembly.
4. Slide nozzle assembly out of ignitor drawer.
5. Nozzles should be cleaned as described in this section.
6. Follow dimensions and setting shown on assembly in this section when replacing nozzle.
7. Reassemble parts removed in reverse procedure.

TO CHECK IGNITOR ASSEMBLY

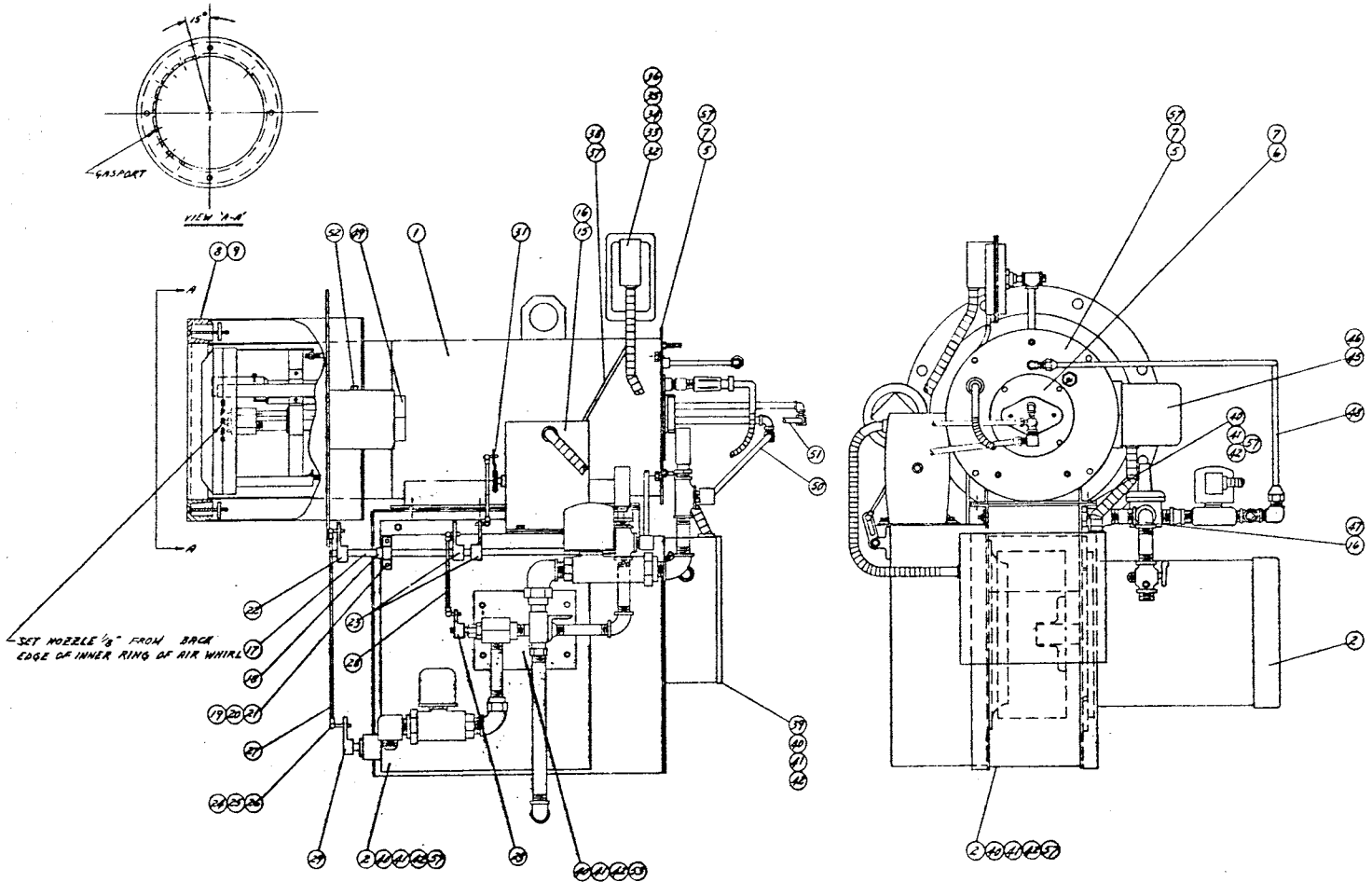
1. Follow procedure above to remove nozzle assembly.
2. Disconnect flame scanner.
3. Disconnect gas pilot line.
4. Disconnect buss bar.
5. Remove (8) retaining screws and slide out ignitor drawer.
6. Use care in replacing electrode so that it is not cracked.
7. Follow dimension shown on ignitor drawer assembly in this section when adjusting electrode.
8. Reassemble parts removed in reverse order. Replace any gaskets which are damaged.

REMOVAL & INSTALLATION OF BURNER ASSEMBLY

The entire burner can be removed as a unit as follows:

1. Turn off all power and fuel supply lines.
2. Remove and tag any wiring which would restrict the removal of the burner.
3. Disconnect all fuel lines (unions and/or flare fittings).
4. Remove the nuts holding the burner mounting plate to the burner adapter.
5. Place a rope or chain through the lifting lug on top of the burner. Attach to a suitable hoist or lift truck.
6. Be careful to remove the burner unit from the burner adapter in a straight line to prevent damage.
7. Replace all gaskets before replacing the burner unit. Insert in a straight line to prevent damage.
8. Coat all studs with grease or anti-seize lubricant.
9. Tighten the nuts evenly to assure proper alignment and a tight seal.
10. Replace power and fuel lines.
11. If necessary, the burner adapter may be removed after removing the burner assembly. Remove nuts holding the adapter spool to the boiler. Support the adaptor spool and slide out of furnace.
12. Replace adapter spool and insert burner as described above.

BURNER ASSEMBLY (201087)
SERIES 564 **175 thru 225 HP**
#2 OIL **YS7000** **PRESSURE ATOMIZING**



PARTS LIST FOR BURNER ASSEMBLY (201087)
 SERIES 564 . 175 thru 225 HP
 #2 OIL YS700 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2		Damper – Blower – Motor Assembly	201095
3			
*4			
*5	1	Ignitor Drawer Assembly	191642
6	1	Nozzle Pipe Assembly	192170
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	3	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	6	Ball and Socket Joints, 1/4"	066728
25	16	Nut, Hex., 1/4" - 28NF	053679
26	14	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	2	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30			
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in This Manual

PARTS LIST FOR BURNER ASSEMBLY (201087)
 SERIES 564 175 thru 225 HP
 #2 OIL YS7000 PRESSURE ATOMIZING

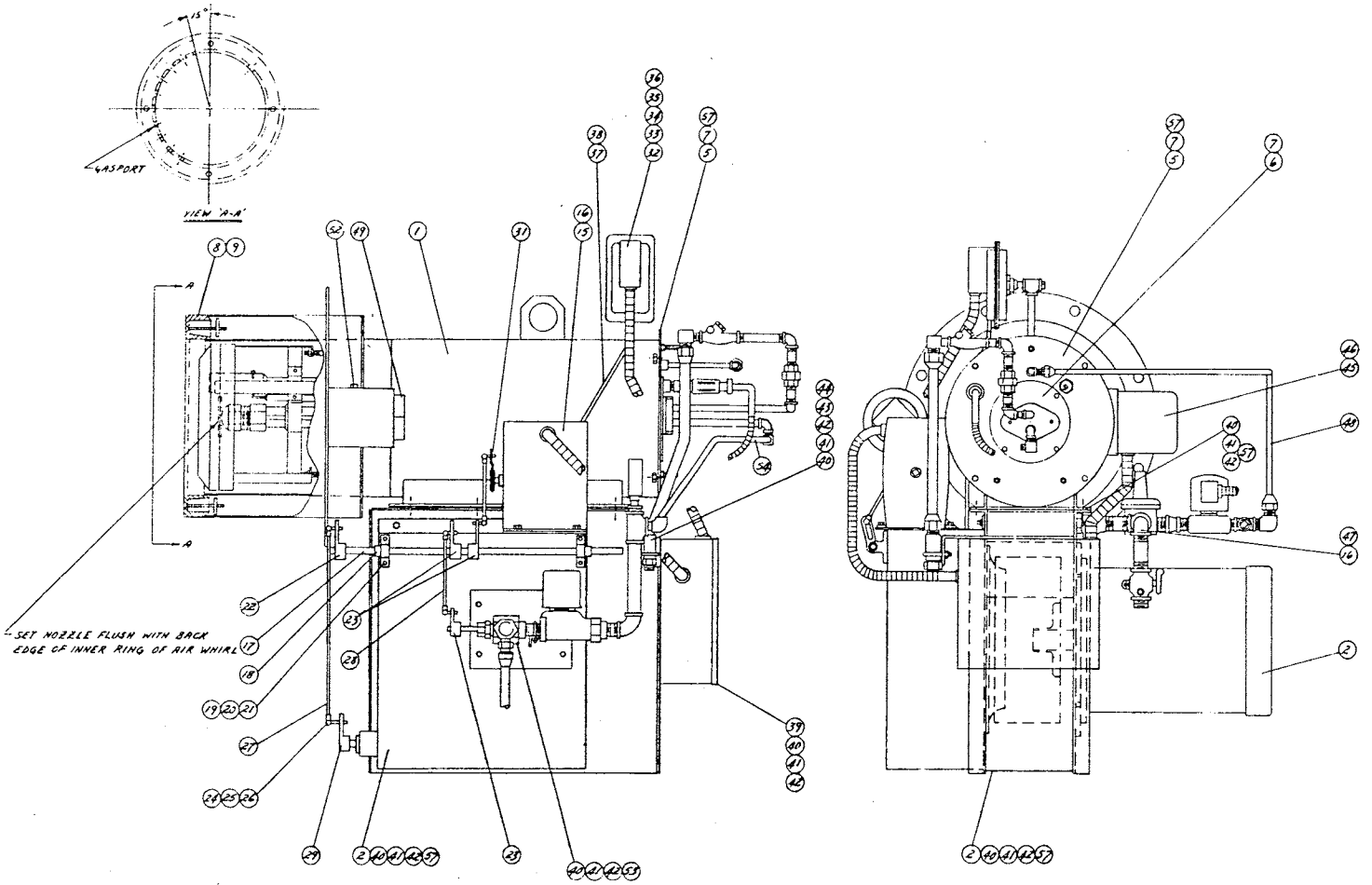
Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	13	Nut, Hex., 3/8" 16NC2	053682
42	13	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43			
44			
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	1	3" Pipe Plug	051002
50	1	Supply to Nozzle Tubing Assembly	192179
51	1	Nozzle Return Line Tubing Assembly	192180
52	1	Plug, 1/4" IPS	050220
53	1	Oil Metering Arrangement	192175
54	1	Oil Tubing Assembly	191864
55			
56	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (201081)

SERIES 564 175 thru 225 HP

#2 OIL YS 7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201081)

SERIES 564 175 thru 225 HP

#2 OIL YS 7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2		Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	191650
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	3	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	6	Ball and Socket Joints, 1/4"	066728
25	16	Nut, Hex., 1/4" - 28NF	053679
26	14	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	2	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30			
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in This Manual

PARTS LIST FOR BURNER ASSEMBLY (201083)

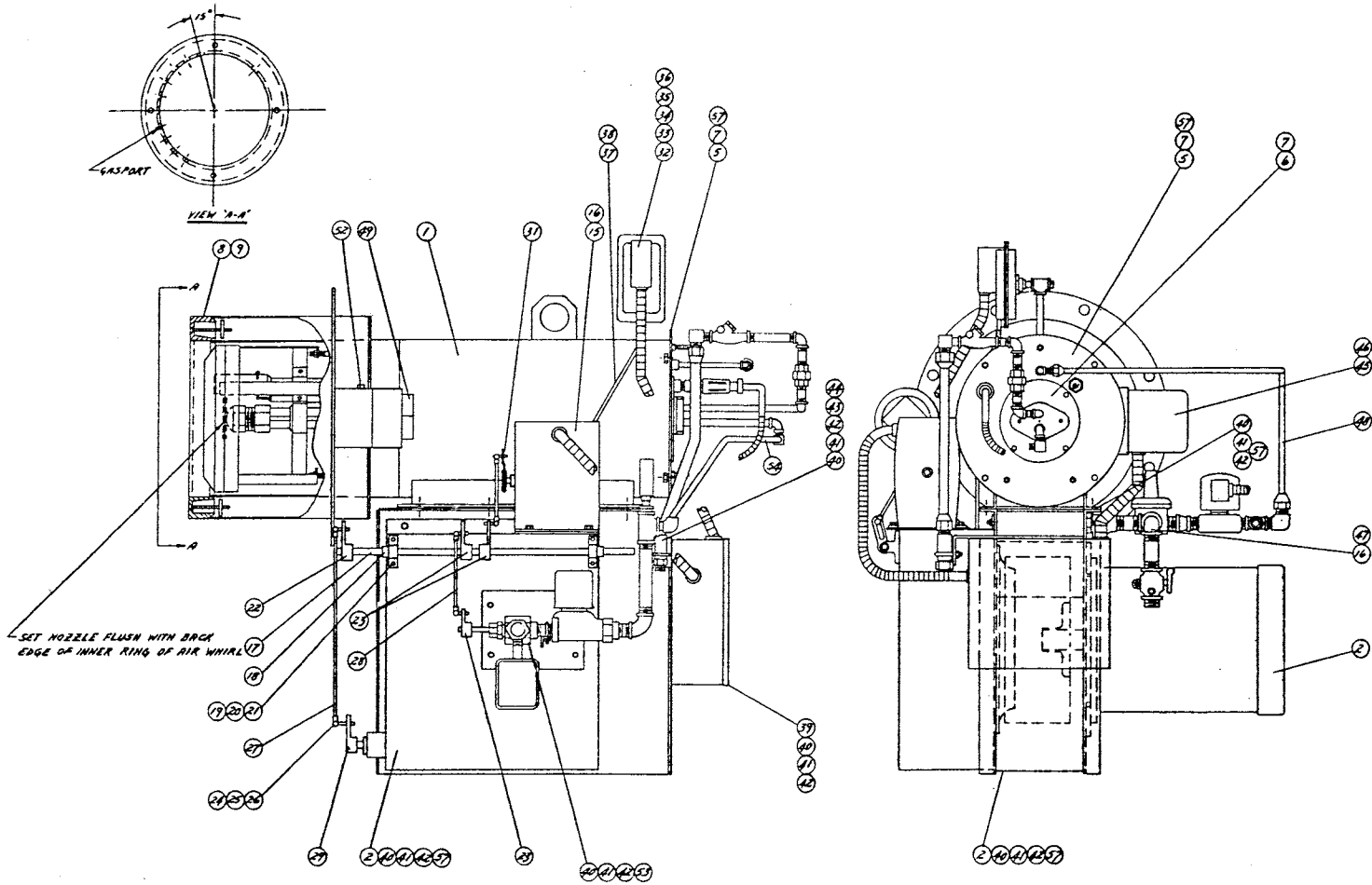
SERIES 564 175 thru 225 HP

#2 OIL YS 7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43	1	Support Bracket	191850
44	1	U-Bolt, 2"	051812
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	1	3" Pipe Plug	051002
50			
51			
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	191860
54	1	Oil Tubing Assembly	191864
55			
56	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (201083)
SERIES 564 175 thru 225 HP
#5 OIL YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201083)

SERIES 564 175 thru 225 HP

#5 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	191650
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	3	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	6	Ball and Socket Joints, 1/4"	066728
25	16	Nut, Hex., 1/4" - 28NF	053679
26	14	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	2	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30			
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in This Manual

PARTS LIST FOR BURNER ASSEMBLY (201083)

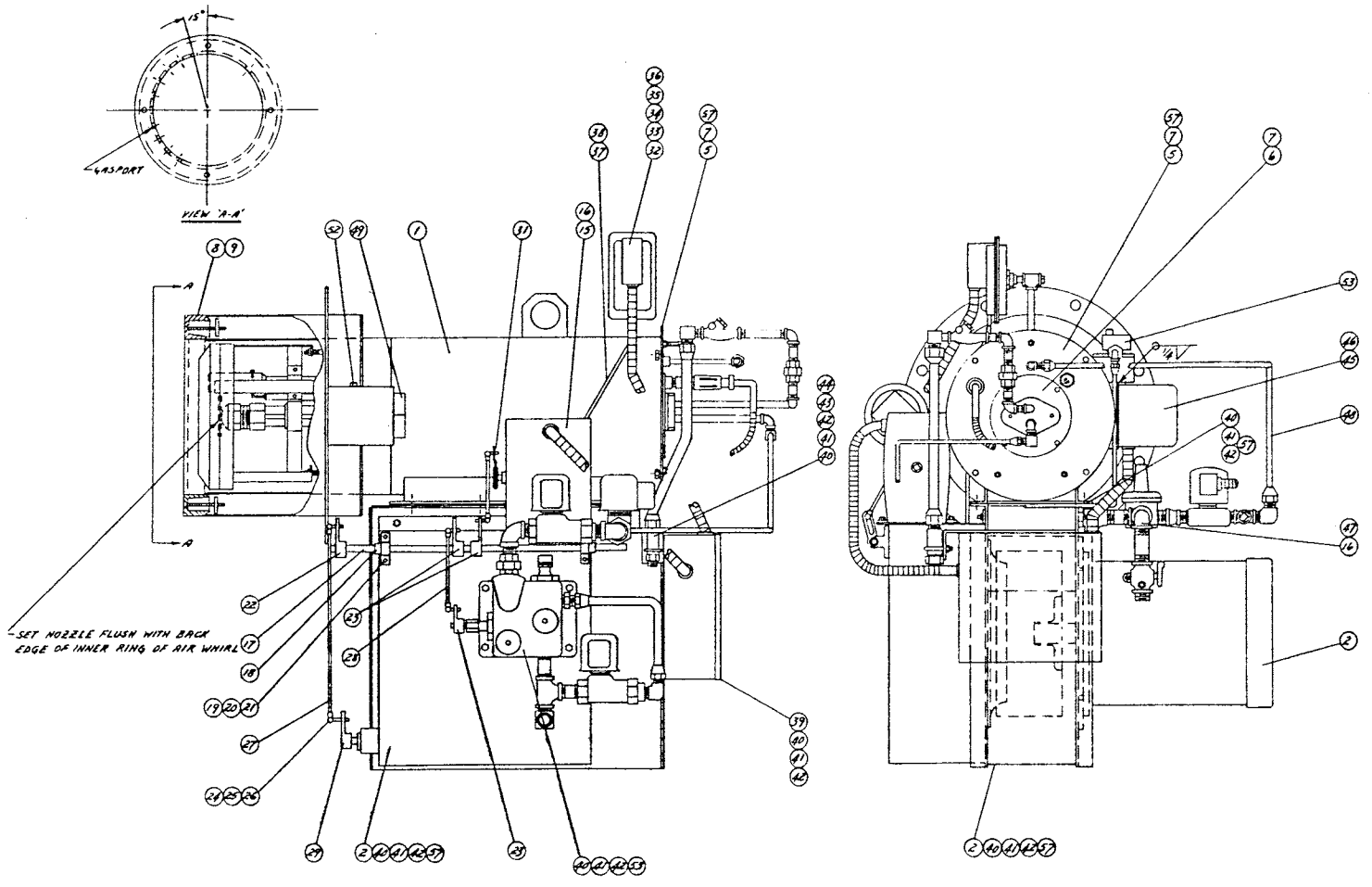
SERIES 564 175 thru 225 HP

#5 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43	1	Support Bracket	191850
44	1	U-Bolt, 2"	051812
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	1	3" Pipe Plug	051002
50			
51			
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	191884
54	1	Oil Tubing Assembly	191864
55			
56	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	051968
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

*Additional Parts Breakdown Included in This Manual

BURNER ASSEMBLY (201085)
SERIES 564 175 thru 225 HP
#6 OIL YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201085)

SERIES 564 175 thru 225 HP

#6 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	191650
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	3	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	6	Ball and Socket Joints, 1/4"	066728
25	16	Nut, Hex., 1/4" - 28NF	053679
26	14	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	2	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30			
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in Manual

PARTS LIST FOR BURNER ASSEMBLY (201085)

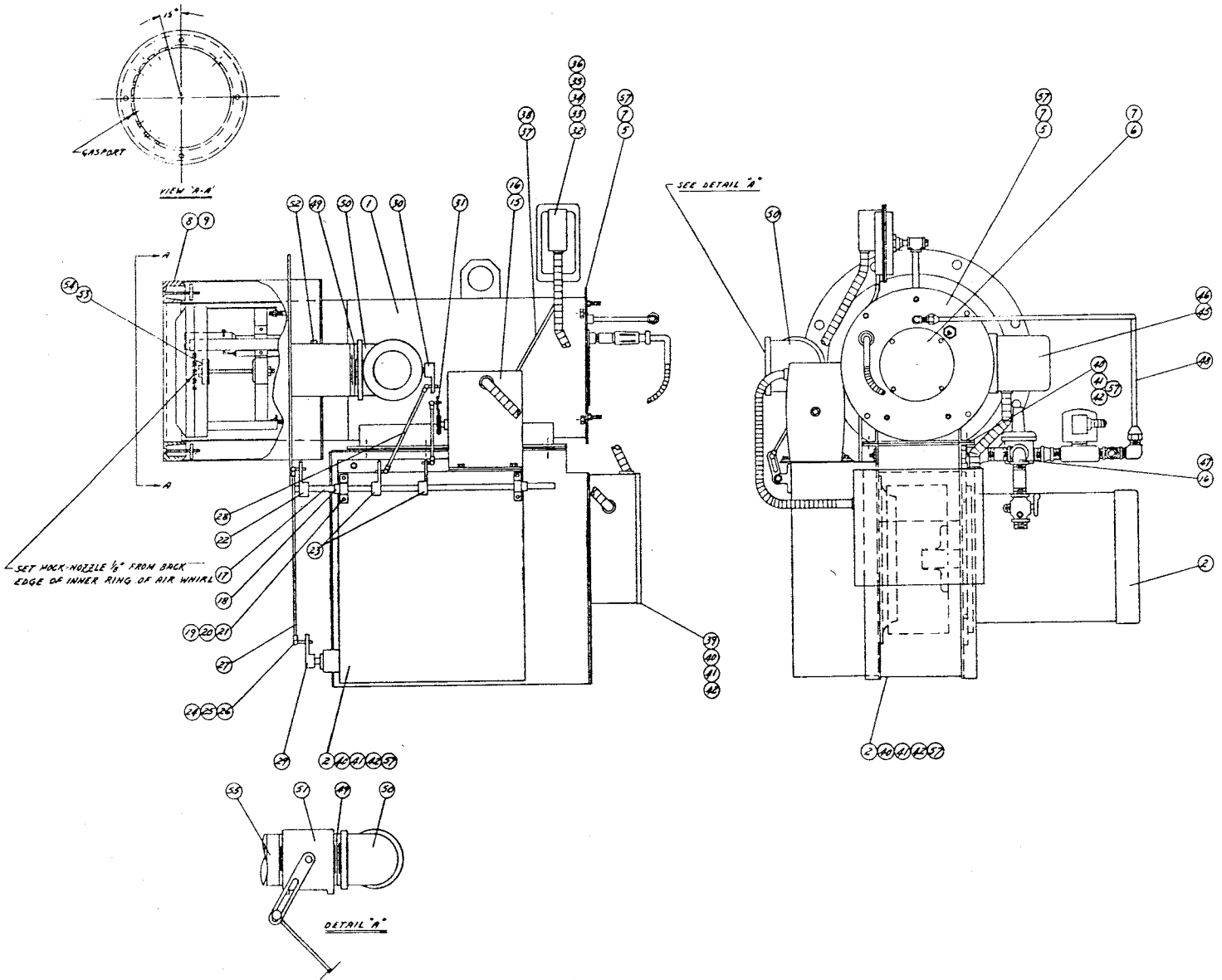
SERIES 564 175 thru 225 HP

#6 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43	1	Support Bracket	191850
44	1	U-Bolt, 2"	051812
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
*47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	1	3" Pipe Plug	051002
50			
51			
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	191944
54			
55			
56	1	Strainer, Simplex, 2-1/2" (Shipped Loose)	051968
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

*Additional Parts Breakdown Included in This Manual

BURNER ASSEMBLY (201088)
 SERIES 564 175 thru 225 HP
 GAS YS7000



PARTS LIST FOR BURNER ASSEMBLY (201088)

SERIES 564 175 thru 225 HP

GAS YS7000

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Ignitor Drawer Access Plate	192192
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	2	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	8	Ball and Socket Joints, 1/4"	066728
25	18	Nut, Hex., 1/4" - 28NF	053679
26	16	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	2	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in This Manual

PARTS LIST FOR BURNER ASSEMBLY (201088)

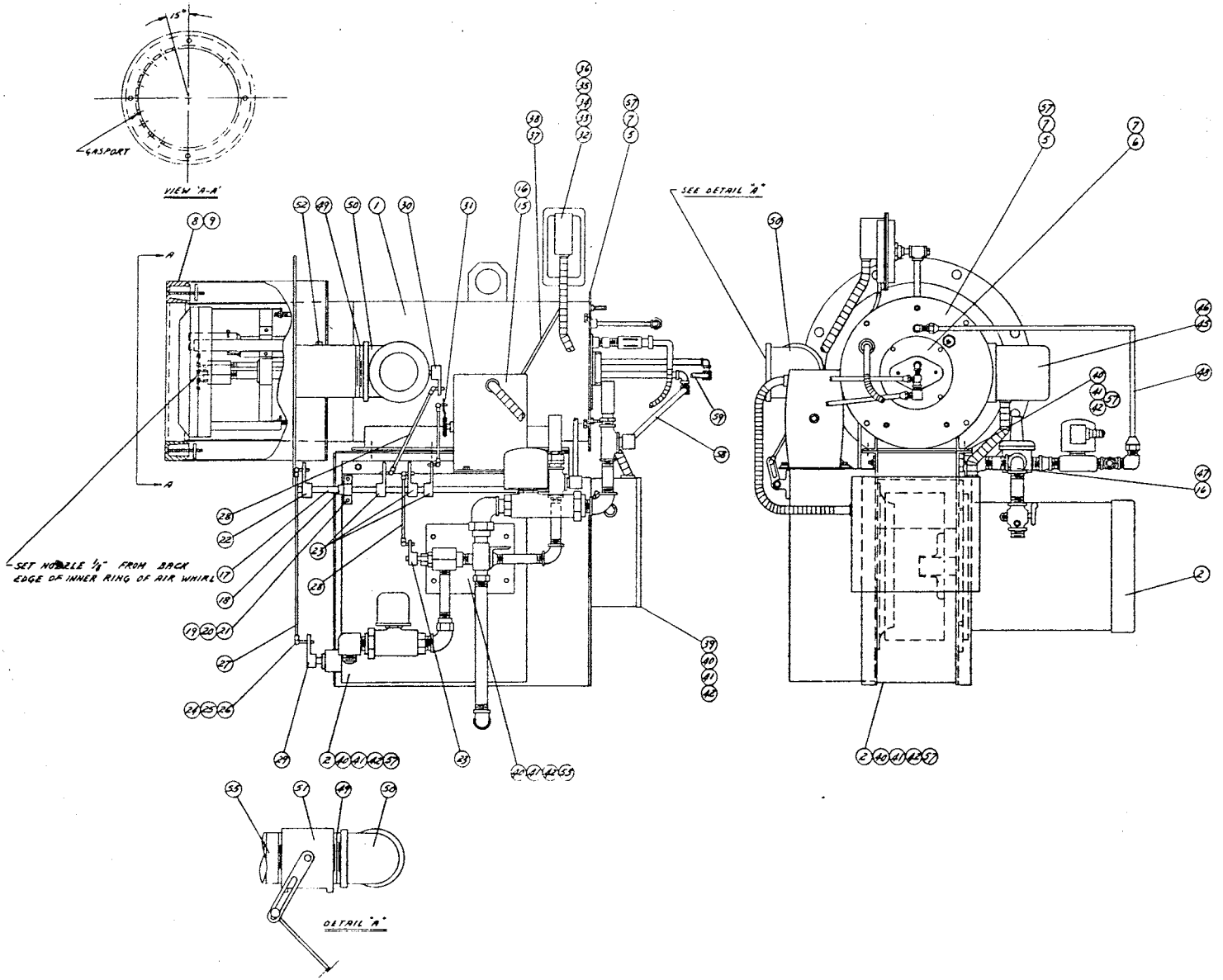
SERIES 564 175 thru 225 HP

GAS YS7000

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	10	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	10	Nut, Hex., 3/8" 16NC2	053682
42	10	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43			
44			
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
*47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	2	3" Close Nipple	056550
50	1	3" Elbow	051922
51	1	Valve, Butterfly, 3" Eclipse #12BV-A	057383
52	1	Plug, 1/4" IPS	050220
*53	3	Screw, Set, 1/4" 20NC2 x 1/4" Lg.	050607
54	1	Mock Nozzle Assembly	199493
*55	1	Main Gas Piping Arrangement	191863
56			
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

*Additional Parts Breakdown Included in This Manual

BURNER ASSEMBLY (201086)
SERIES 564 175 THRU 225 HP
N2 YS7000 PRESSURE ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201086)

SERIES 564 175 thru 225 HP

N/2 YS7000 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	192170
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	4	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	8	Ball and Socket Joints, 1/4"	066728
25	18	Nut, Hex., 1/4" - 28NF	053679
26	16	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	3	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

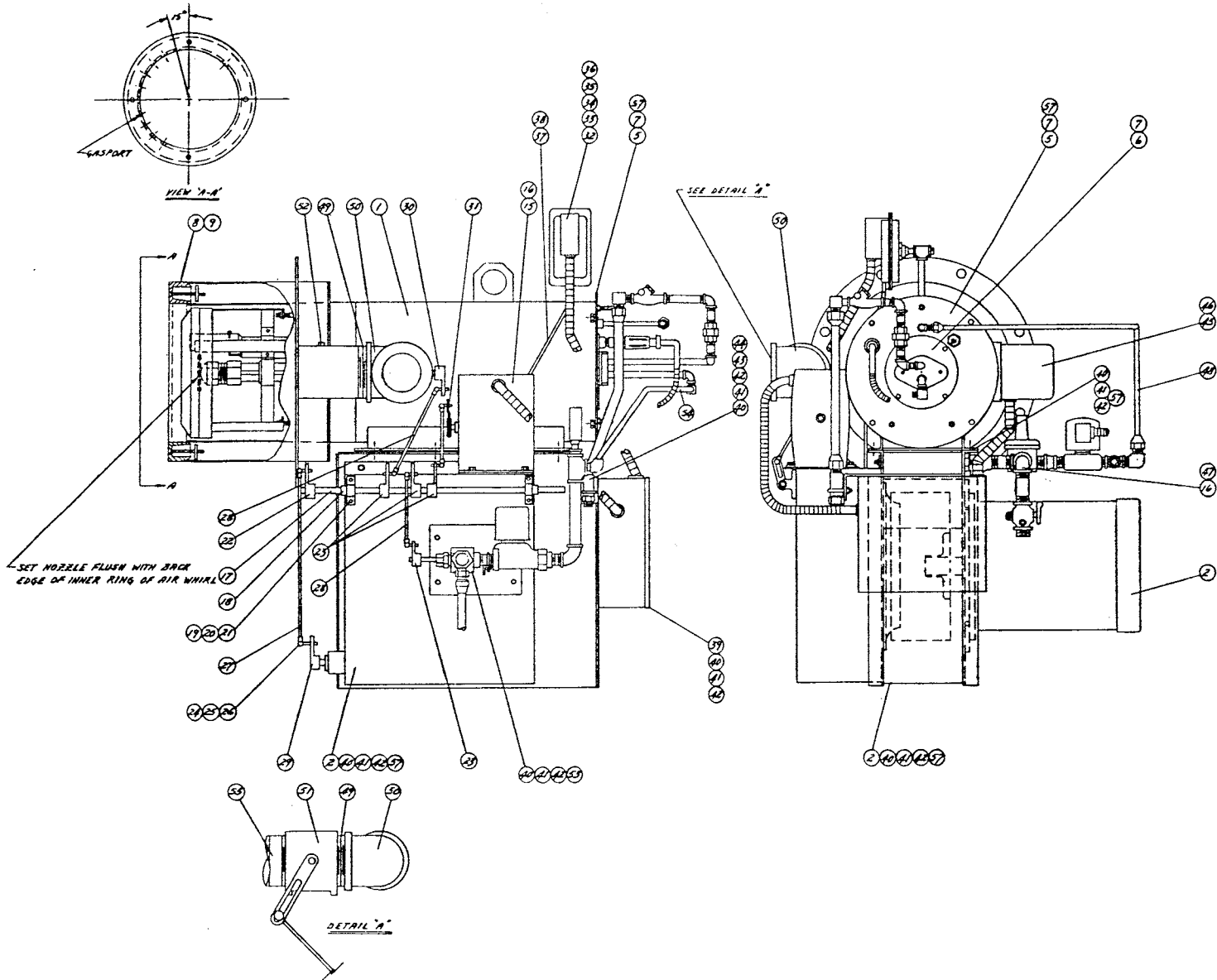
*Additional Parts Breakdown Included in Manual

PARTS LIST FOR BURNER ASSEMBLY
 SERIES 564 175 thru 225 HP
 N/2 YS7000 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43			
44			
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
*47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	2	3" Close Nipple	056550
50	1	3" Elbow	051922
51	1	Valve, Butterfly, 3" Eclipse #12BV-A	057383
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	192175
54	1	Oil Tubing Assembly	191864
55	1	Main Gas Piping Arrangement	191863
56	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850
58	1	Supply to Nozzle Tubing Assembly	192179
59	1	Nozzle Return Line Tubing Assembly	192180

*Additional Parts Breakdown Included in This Manual

BURNER ASSEMBLY (201080)
SERIES 564 175 THRU 225 HP
N2 YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201080)

SERIES 564 175 THRU 225 HP

N2 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	191650
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	4	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	8	Ball and Socket Joints, 1/4"	066728
25	18	Nut, Hex., 1/4" - 28NF	053679
26	16	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	3	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in This Manual

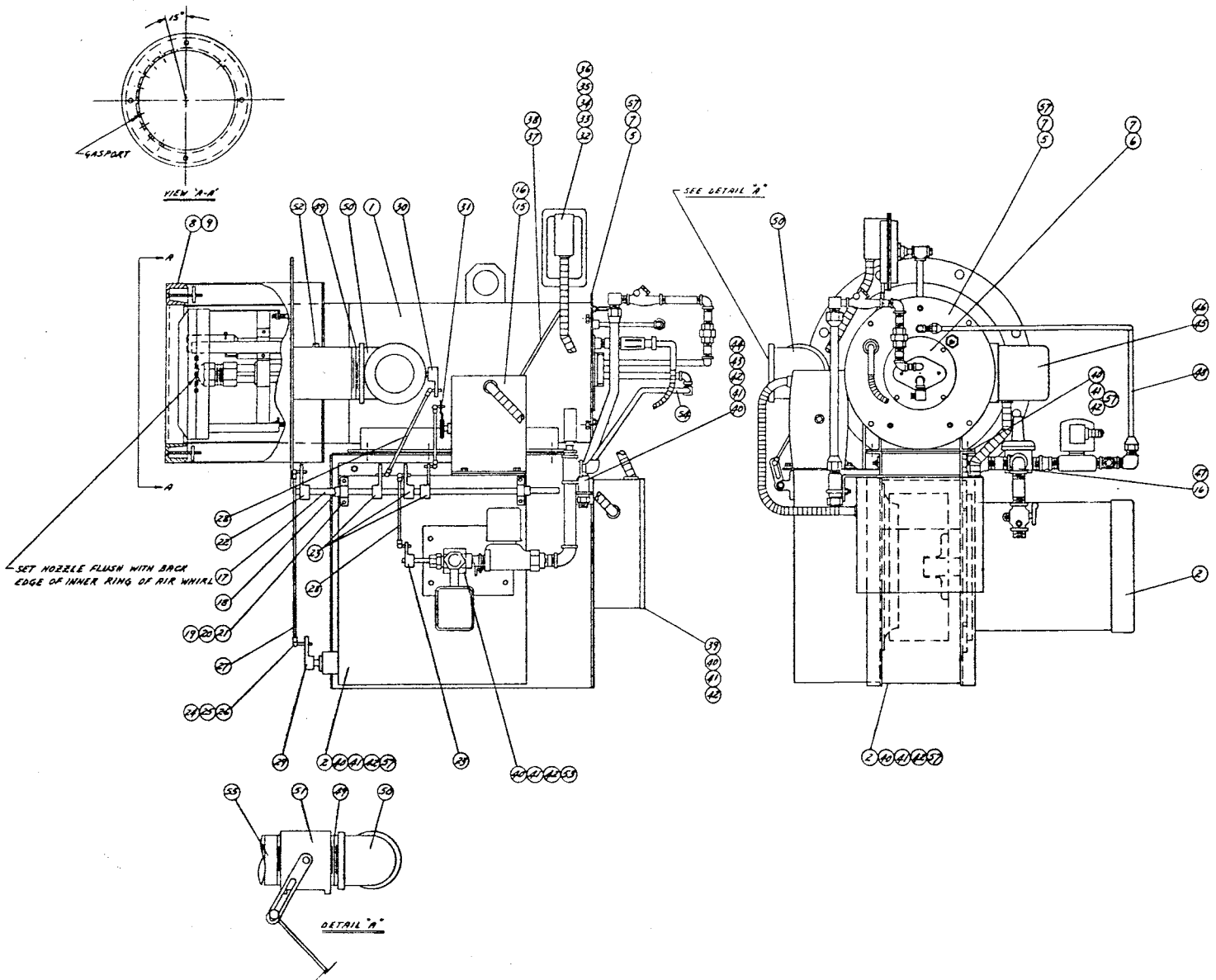
PARTS LIST FOR BURNER ASSEMBLY (201080)

SERIES 564 175 THRU 225 HP
 N2 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43	1	Support Bracket	191850
44	1	U-Bolt, 2"	051812
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
*47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	2	3" Close Nipple	056550
50	1	3" Elbow	051922
51	1	Valve, Butterfly, 3" Eclipse #12BV-A	057383
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	191860
54	1	Oil Tubing Assembly	191864
*55	1	Main Gas Piping Arrangement	191863
56	1	Strainer, Simple, 1-1/4" (Shipped Loose)	050977
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (201082)
SERIES 564 175 THRU 225 HP
N5 YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201082)

SERIES 564 175 THRU 225 HP
 N5 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	191650
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	4	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	8	Ball and Socket Joints, 1/4"	066728
25	18	Nut, Hex., 1/4" - 28NF	053679
26	16	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	3	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

*Additional Parts Breakdown Included in This Manual

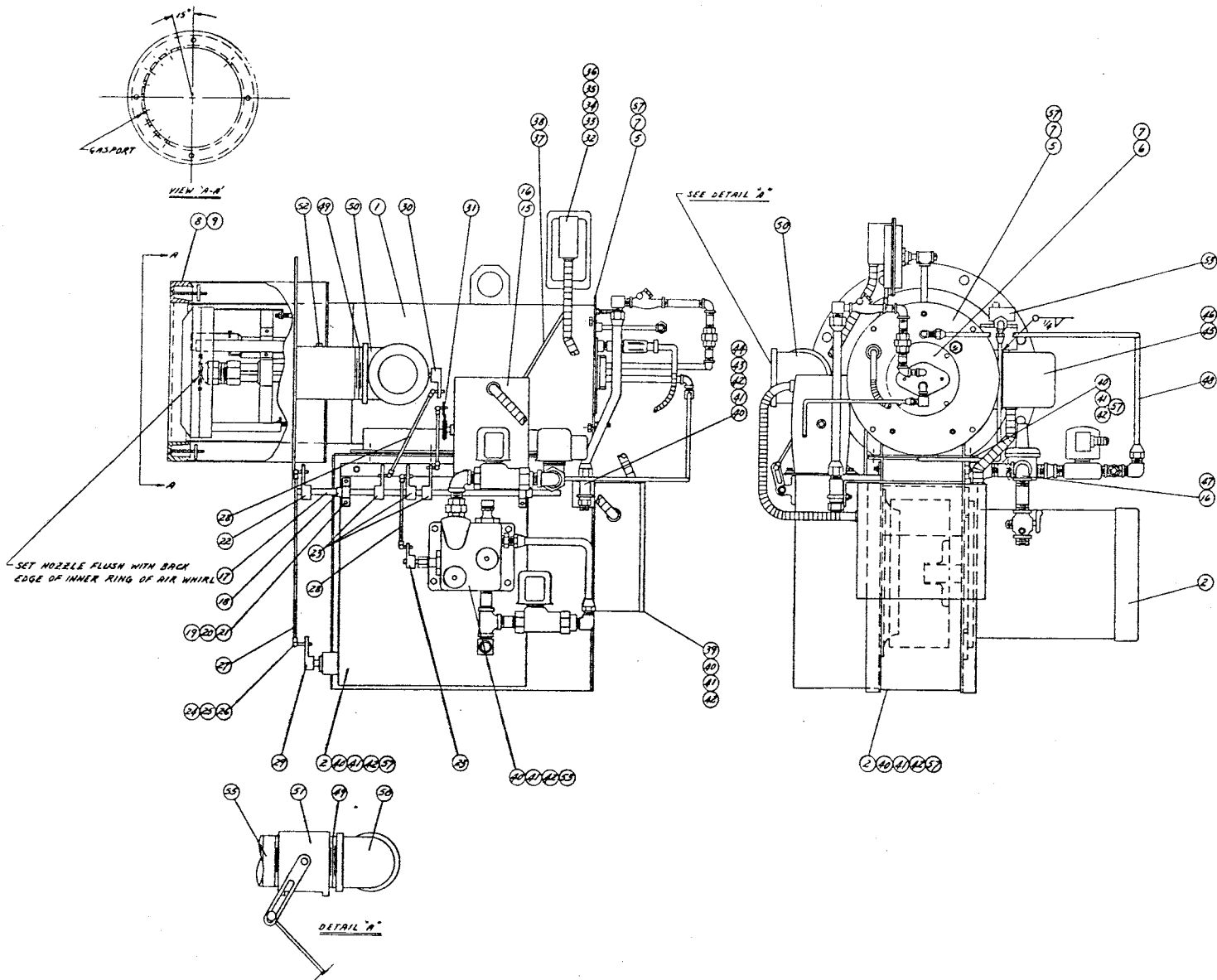
PARTS LIST FOR BURNER ASSEMBLY (201082)

SERIES 564 175 THRU 225 HP
 N5 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43	1	Support Bracket	191850
44	1	U-Bolt, 2"	051812
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
*47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	2	3" Close Nipple	056550
50	1	3" Elbow	051922
51	1	Valve, Butterfly, 3" Eclipse #12BV-A	057383
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	191884
54	1	Oil Tubing Assembly	191864
55	1	Main Gas Piping Arrangement	191863
56	1	Strainer, Simple, 2-1/2" (Shipped Loose)	051968
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (201084)
 SERIES 564 175 THRU 225 HP
 N6 YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (201084)

SERIES 564 175 THRU 225 HP
 N6 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	201089
*2	1	Damper – Blower – Motor Assembly	201095
3			
4			
*5	1	Ignitor Drawer Assembly	191642
*6	1	Nozzle Pipe Assembly	191650
7	8	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
8	1	Orifice Plate	191656
9	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
10			
11			
12			
13			
14			
15	1	Modutrol Motor, Honeywell M941C-1014	102854
16	6	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
17	1	Linkage Jack Shaft, 7/16" x 19" Lg.	191848
18	2	Jack Shaft Collar	056756
19	2	Bearing Block	024179
20	4	Screw, Machine, #10 x 3/8" Lg.	105172
21	4	Washer, Lock #10	105156
22	1	Metering Arm, 7/16" x 5-7/8" Lg.	024178
23	4	Metering Arm, 7/16" x 4-1/4" Lg.	118391
24	8	Ball and Socket Joints, 1/4"	066728
25	18	Nut, Hex., 1/4" - 28NF	053679
26	16	Washer, Flat, #10	059934
27	1	Linkage Rod, 1/4" x 12-1/4" Lg.	034273
28	3	Linkage Rod, 1/4" x 5" Lg.	041574
29	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
30	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
31	1	Crank Arm, Honeywell #106013A	069800
32	1	Air Switch, Cleveland DFS-CO	068587
33	1	Bushing, Reducing, 1/4" x 1/8"	050280
34	1	Tee, 1/8" IPS	050347
35	1	Pipe Plug, 1/8" IPS	050774

* Additional Parts Breakdown Included In This Manual

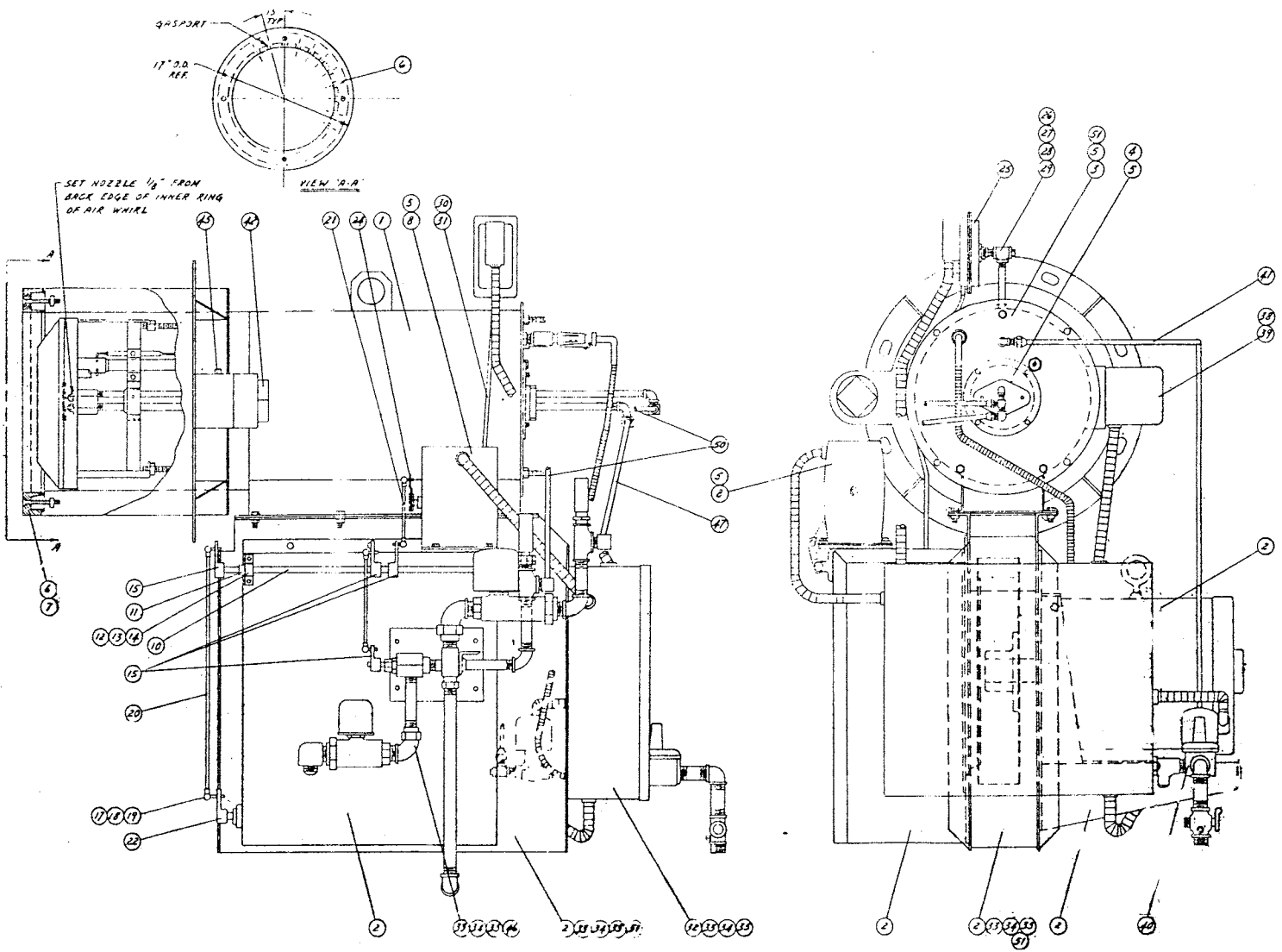
PARTS LIST FOR BURNER ASSEMBLY (201084)

SERIES 564 175 THRU 225 HP
 N6 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Nipple, 1/8" IPS x 2-1/2" Lg.	058566
37	1	Air Switch Tubing	191849
38	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
39	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
40	13	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
41	15	Nut, Hex., 3/8" 16NC2	053682
42	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432
43	1	Support Bracket	191850
44	1	U-Bolt, 2"	051812
45	1	Transformer	054671
46	1	Gasket, Transformer	032441
*47	1	Gas Pilot Train Assembly	201841
48	1	Gas Tubing Assembly	201842
49	2	3" Close Nipple	056550
50	1	3" Elbow	051922
51	1	Valve, Butterfly, 3" Eclipse #12BV-A	057383
52	1	Plug, 1/4" IPS	050220
*53	1	Oil Metering Arrangement	191944
54			
*55	1	Main Gas Piping Arrangement	191863
56	1	Strainer, Simples, 2-1/2" (Shipped Loose)	051968
57	7.25'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199034)
SERIES 576 250 THRU 350 HP
#2 OIL YS7000 PRESSURE ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199034)
 SERIES 576 250 THRU 350 HP
 #2 OIL YS7000 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197421
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	4	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	6	Ball and Socket Joints, 1/4"	066728
18	16	Nut, Hex., 1/4" - 28NF	053679
19	14	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	2	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23			
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

PARTS LIST FOR BURNER ASSEMBLY (199034)

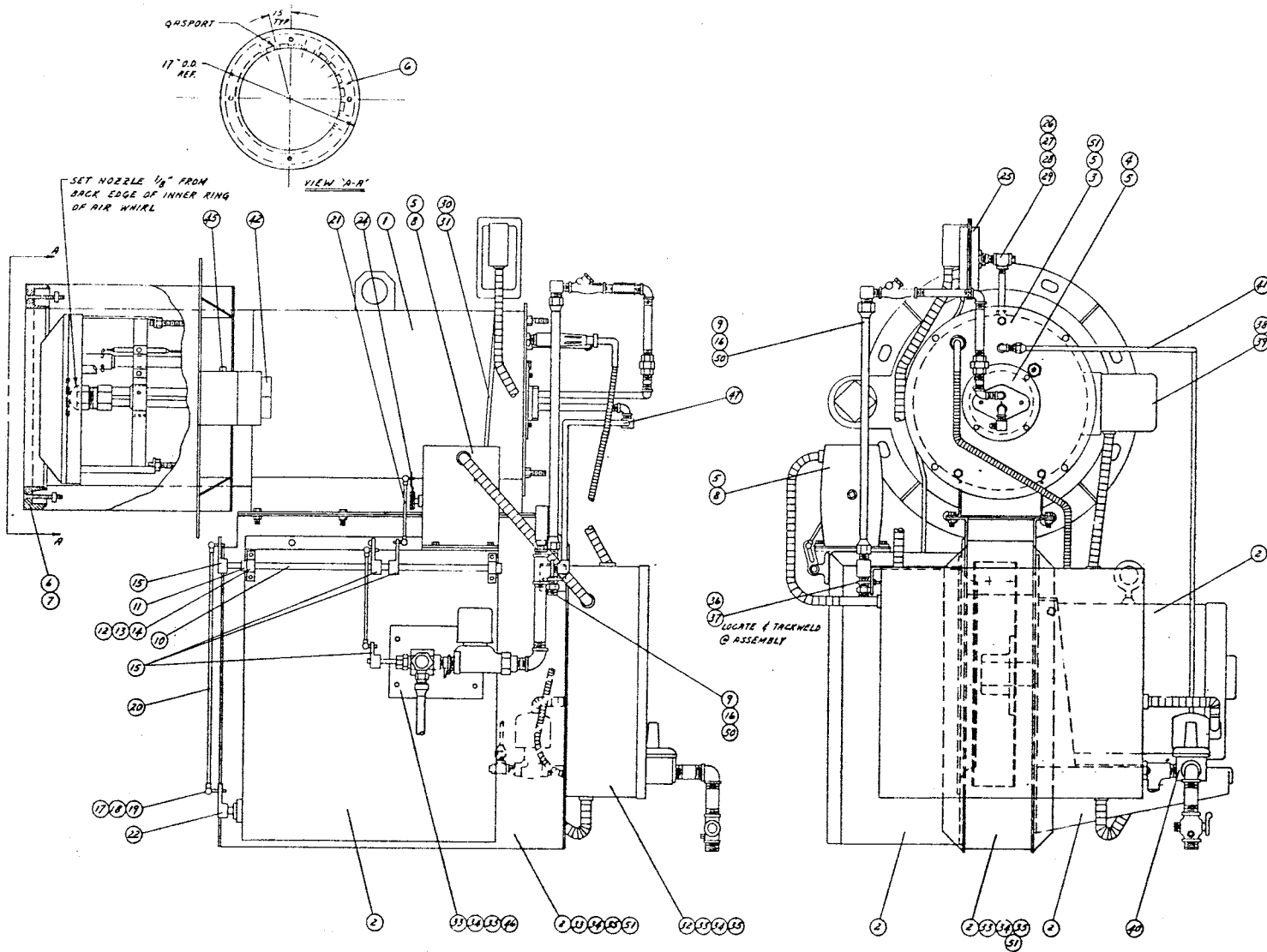
SERIES 576 250 THRU 350 HP

#2 OIL YS7000 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1 -1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	1	Pipe Plug, 3"	051002
43			
44			
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	197425
47	1	Oil Tubing Assembly	191864
48			
49	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
50	1	Nozzle Return Line Assembly	192180
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199028)
SERIES 576 250 THRU 350 HP
#2 OIL YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199028)

SERIES 576 250 THRU 350 HP

#2 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197364
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	4	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	6	Ball and Socket Joints, 1/4"	066728
18	16	Nut, Hex., 1/4" - 28NF	053679
19	14	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	2	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23			
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

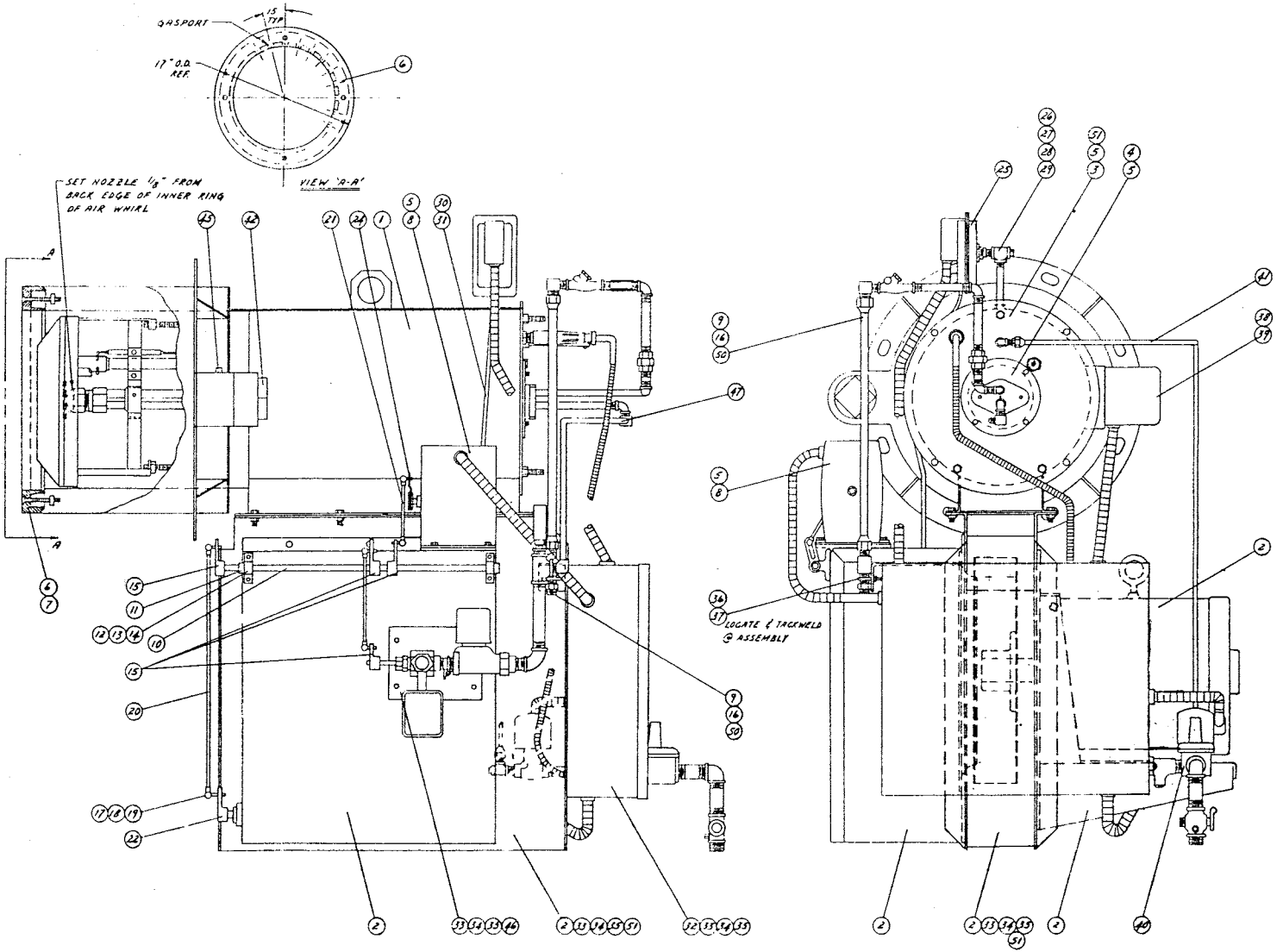
PARTS LIST FOR BURNER ASSEMBLY (199028)

SERIES 576 250 THRU 350 HP
#2 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1 -1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	1	Pipe Plug, 3"	051002
43			
44			
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	191860
47	1	Oil Tubing Assembly	191864
48			
49	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
50	1	Nozzle Air Line Tubing Assembly	197422
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199030)
SERIES 576 250 THRU 350 HP
#5 OIL YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199030)

SERIES 576 250 THRU 350 HP

#5 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197364
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	4	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	7	Ball and Socket Joints, 1/4"	066728
18	16	Nut, Hex., 1/4" - 28NF	053679
19	14	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	2	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23			
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

PARTS LIST FOR BURNER ASSEMBLY (199030)

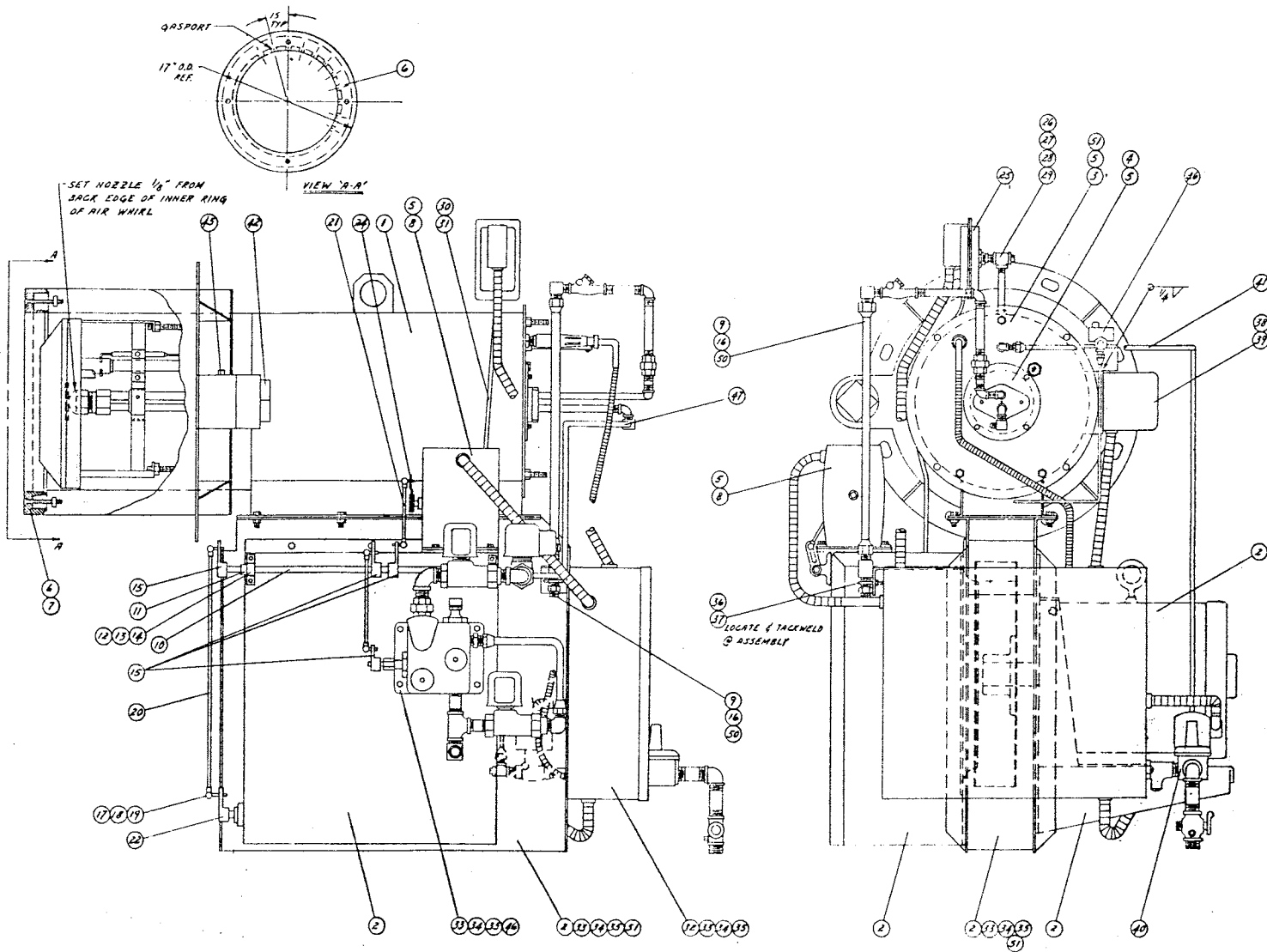
SERIES 576 250 THRU 350 HP

#5 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1 -1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	1	Pipe Plug, 3"	051002
43			
44			
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	191884
47	1	Oil Tubing Assembly	191864
48			
49	1	Strainer, Simplex, 2-1/2" (Shipped Loose)	051968
50	1	Nozzle Air Line Tubing Assembly	197422
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199032)
 SERIES 576 250 THRU 350 HP
 #6 OIL YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199032)

SERIES 576 250 THRU 350 HP

#6 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197364
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Flat #10	105156
15	4	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	6	Ball and Socket Joints, 1/4"	066728
18	16	Nut, Hex., 1/4" - 28NF	053679
19	14	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	2	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23			
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

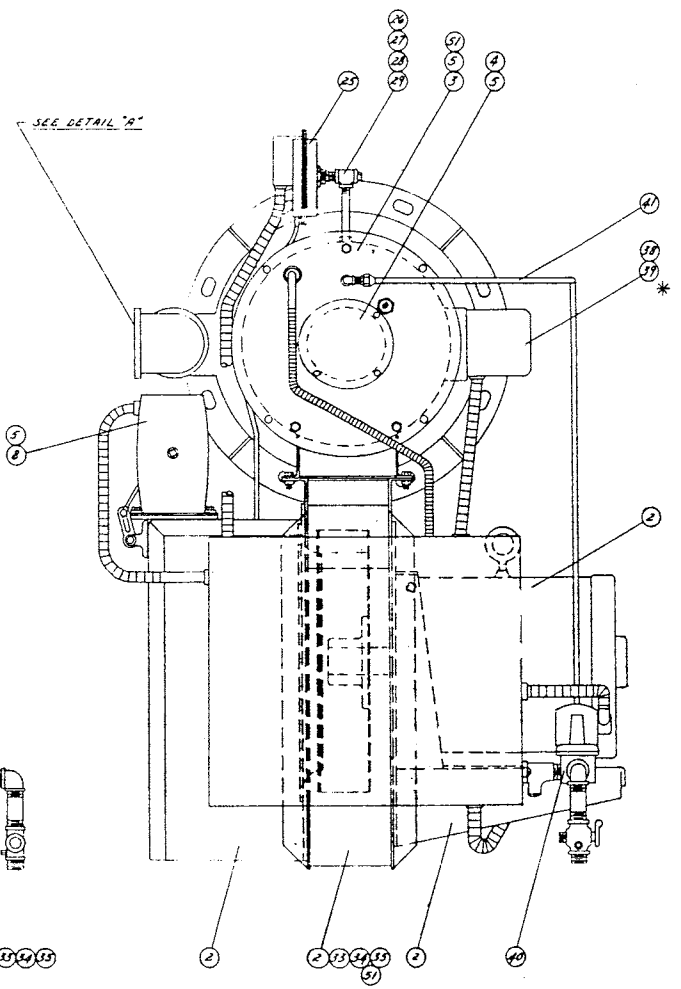
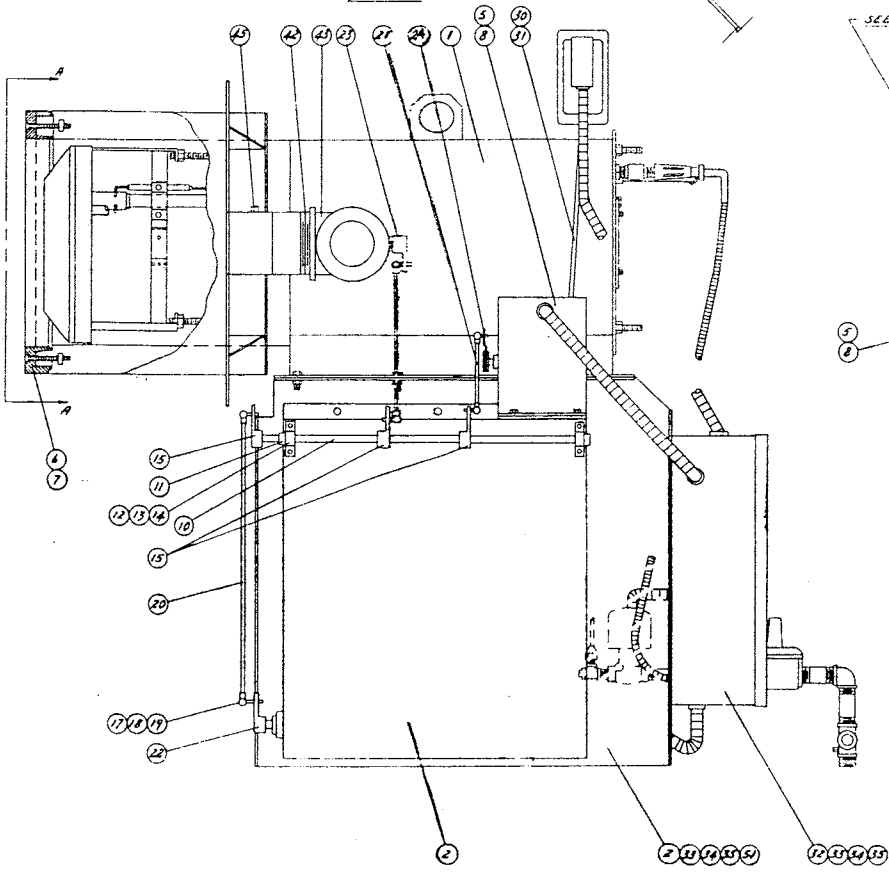
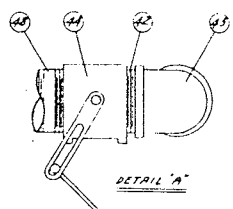
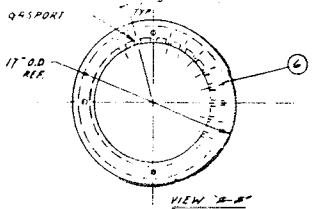
PARTS LIST FOR BURNER ASSEMBLY (199032)

SERIES 576 250 THRU 350 HP
 #6 OIL YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1 -1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	1	Pipe Plug, 3"	051002
43			
44			
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	191944
47	1	Oil Tubing Assembly	191864
48			
49	1	Strainer, Simplex, 2-1/2" (Shipped Loose)	051968
50	1	Nozzle Air Line Tubing Assembly	197422
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199035)
 SERIES 576 250 THRU 350 HP
 STR. GAS YS7000



PARTS LIST FOR BURNER ASSEMBLY (199035)

SERIES 576 250 THRU 350 HP

STR. GAS YS7000

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Ignitor Drawer Access Plate	192192
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collars	056756
12	2	Bearing Blocks	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	3	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16			
17	8	Ball and Socket Joints, 1/4"	066728
18	18	Nut, Hex., 1/4" - 28NF	053679
19	16	Washer, Flat, #10	059934
20	1	Linkage Rod, 16" Lg.	003632
21	2	Linkage Rod, 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	8	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	10	Nut, Hex., 3/8" 16NC2	053682
35	15	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

PARTS LIST FOR BURNER ASSEMBLY (199035)

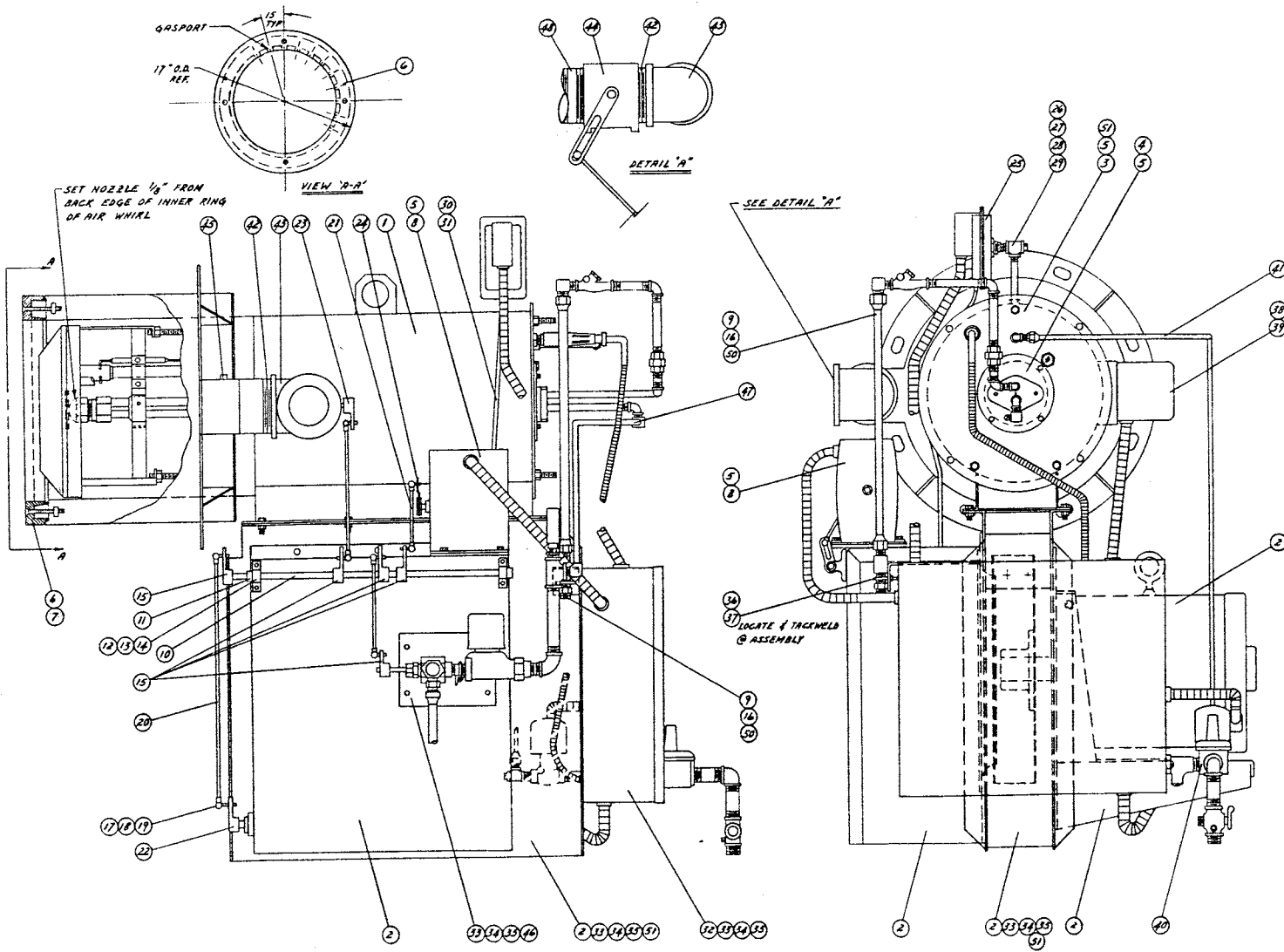
SERIES 576 250 THRU 350 HP

STR. GAS YS7000

Ref. #	# Rqd.	Part Name	Part #
36			
37			
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	2	Nipple, Close, 3"	056550
43	1	Elbow, 3"	051922
44	1	Valve, Butterfly, 3", Eclipse #12BV-A	057383
45	1	Plug, 1/4" IPS	050220
46			
47			
*48	1	Main Gas Piping Arrangement	197431
49	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
50			
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199027)
SERIES 576 250 THRU 350 HP
N2 YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199027)

SERIES 576 250 THRU 350 HP

N2 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197364
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	5	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	8	Ball and Socket Joints, 1/4"	066728
18	18	Nut, Hex., 1/4" - 28NF	053679
19	16	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	3	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

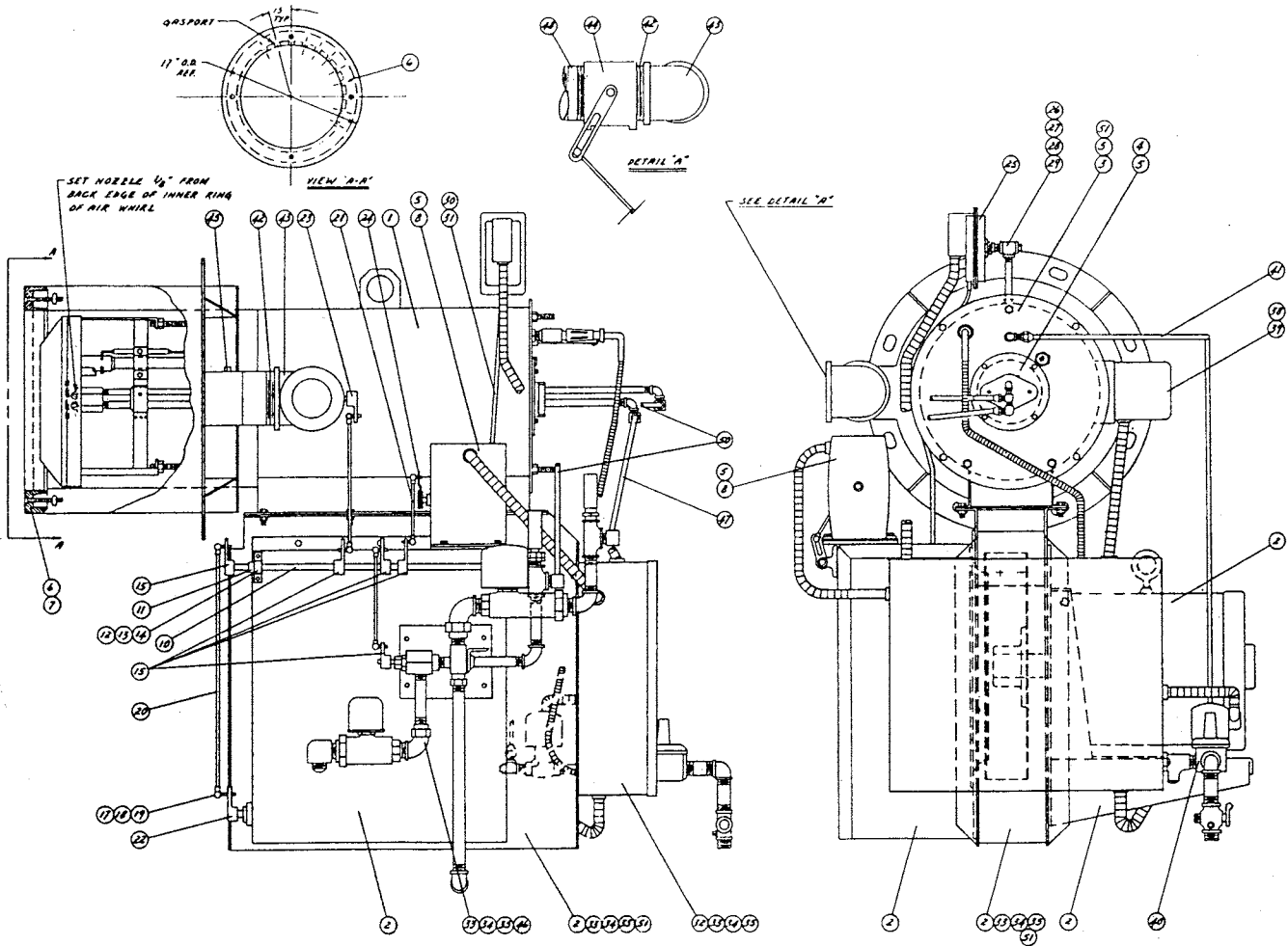
PARTS LIST FOR BURNER ASSEMBLY (199027)

SERIES 576 250 THRU 350 HP
N2 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1-1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	2	Nipple, Close, 3"	056550
43	1	Elbow, 3"	051922
44	1	Valve, Butterfly, 3", Eclipse #12BV-A	057383
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	191860
47	1	Oil Tubing Assembly	191864
*48	1	Main Gas Piping Arrangement 250 HP (UL & FM)	197430
	1	Main Gas Piping Arrangement 250 HP (IRI)	197431
	1	Main Gas Piping Arrangement 300 & 350 HP	197431
49	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
50	1	Nozzle Air Line Tubing Assembly	197422
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199033)
SERIES 576 250 THRU 350 HP
N2 YS7000 PRESSURE ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199033)

SERIES 576 250 THRU 350 HP

N2 YS7000 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197421
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	14	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	5	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	2	Coupling, Whole, 3/4" IPS	051344
17	8	Ball and Socket Joints, 1/4"	066728
18	18	Nut, Hex., 1/4" - 28NF	053679
19	16	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	3	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

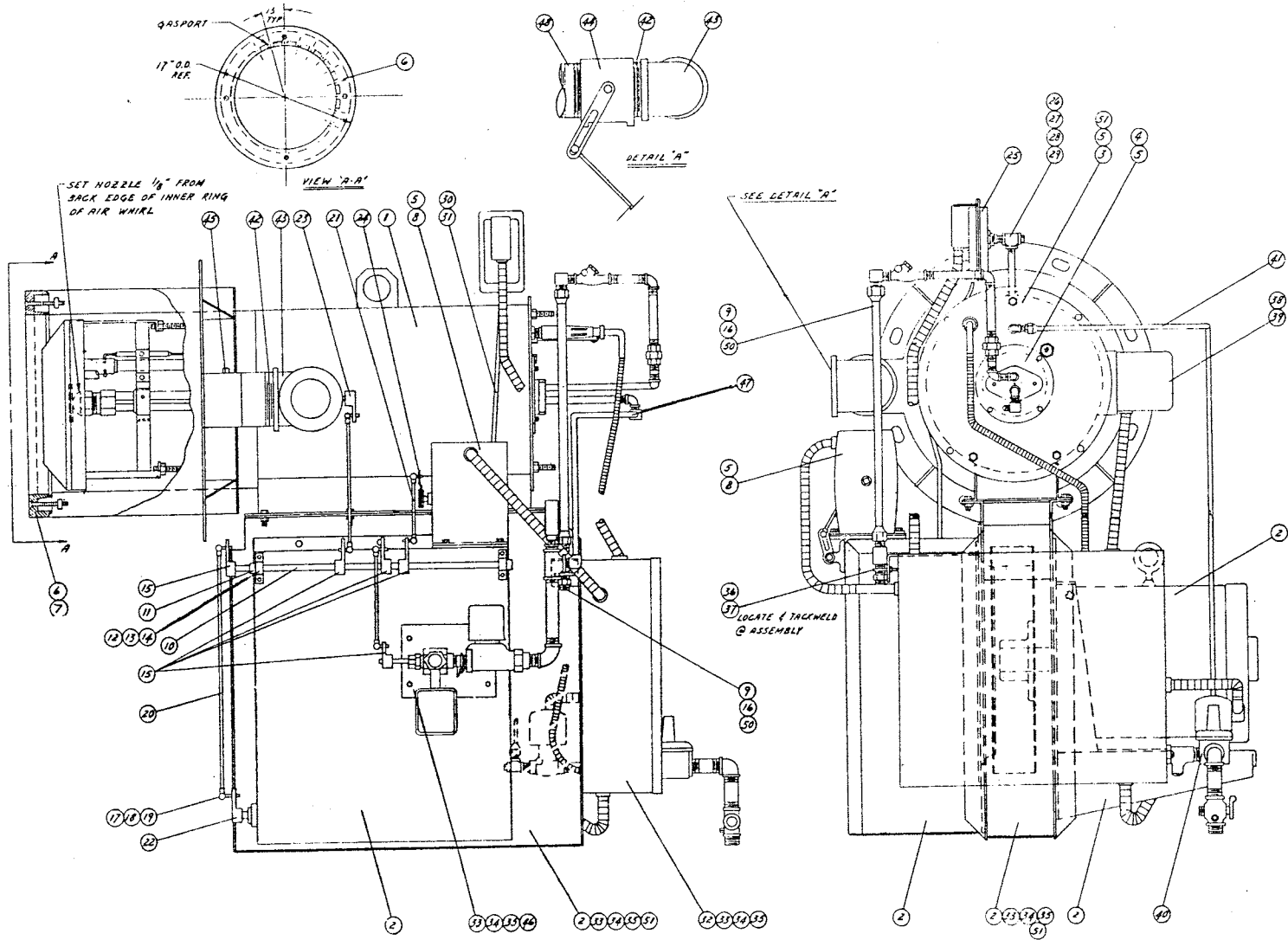
* Additional Parts Breakdown Included In This Manual

PARTS LIST FOR BURNER ASSEMBLY (199033)
 SERIES 576 250 THRU 350 HP
 N2 YS7000 PRESSURE ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1-1/2"	051492
38	1	Transformer – LEEW	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	2	Nipple, Close, 3"	056550
43	1	Elbow, 3"	051922
44	1	Valve, Butterfly, 3", Eclipse #12BV-A	057383
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	197425
47	1	Oil Tubing Assembly	191864
*48	1	Main Gas Piping Arrangement 250 HP (UL & FM)	197430
	1	Main Gas Piping Arrangement 250 HP (IRI)	197431
	1	Main Gas Piping Arrangement 300 & 350 HP	197431
49	1	Strainer, Simplex, 1-1/4" (Shipped Loose)	050977
50	1	Nozzle Return Line Tubing Assembly	192180
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199029)
SERIES 576 250 THRU 350 HP
N5 YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199029)

SERIES 576 250 THRU 350 HP

N5 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197364
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	5	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	8	Ball and Socket Joints, 1/4"	066728
18	18	Nut, Hex., 1/4" - 28NF	053679
19	16	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	3	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Box (10" x 10" x 4" Pull Box)	061797
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

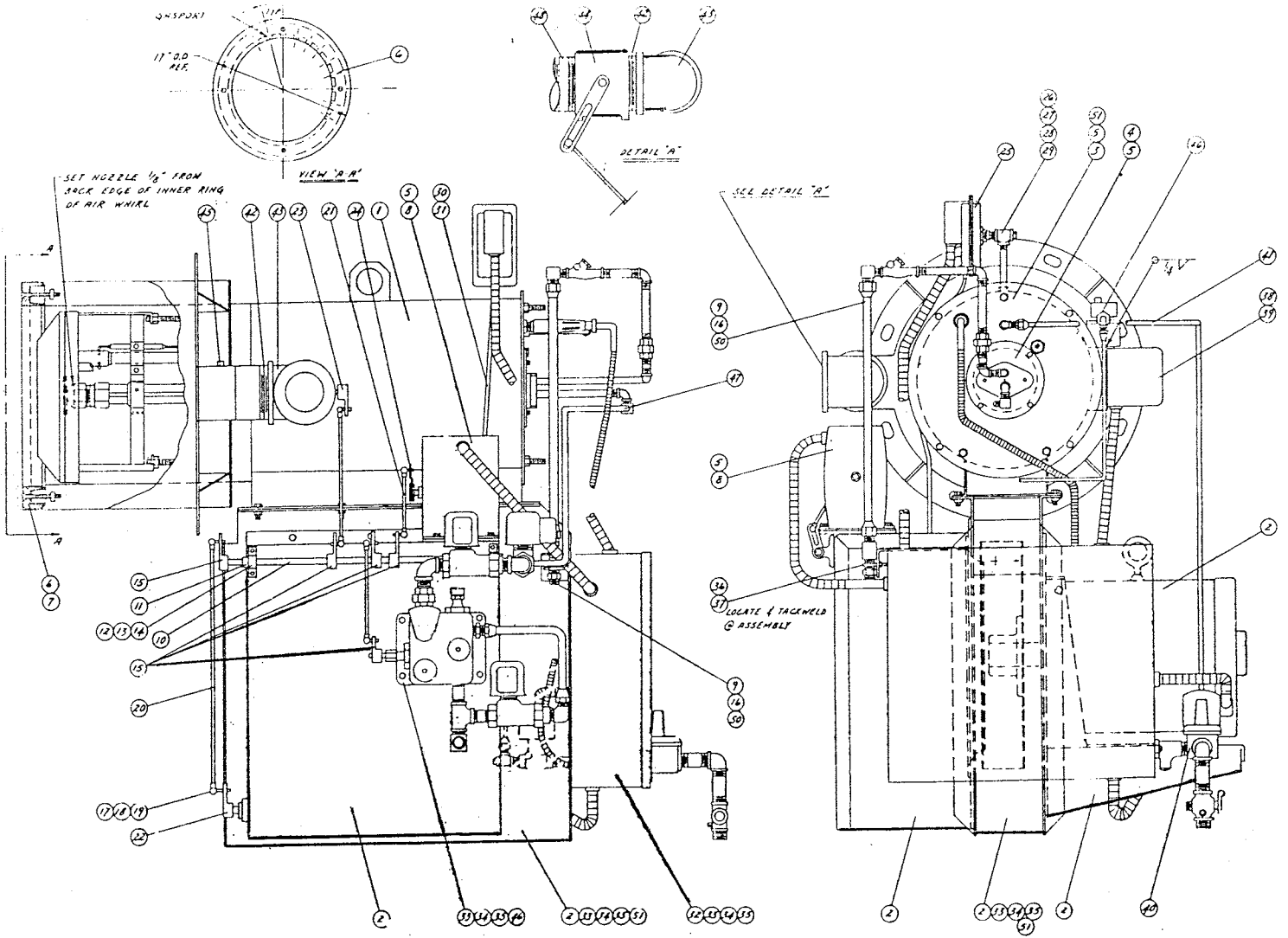
PARTS LIST FOR BURNER ASSEMBLY (199029)

SERIES 576 250 THRU 350 HP
 N5 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1-1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	2	Nipple, Close, 3"	056550
43	1	Elbow, 3"	051922
44	1	Valve, Butterfly, 3", Eclipse #12BV-A	057383
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	191884
47	1	Oil Tubing Assembly	191864
*48	1	Main Gas Piping Arrangement 250 HP (UL & FM)	197430
	1	Main Gas Piping Arrangement 250 HP (IRI)	197431
	1	Main Gas Piping Arrangement 300 & 350 HP	197431
49	1	Strainer, Simplex, 2-1/2" (Shipped Loose)	051968
50	1	Nozzle Return Line Tubing Assembly	197422
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

* Additional Parts Breakdown Included In This Manual

BURNER ASSEMBLY (199031)
SERIES 576 250 THRU 350 HP
N6 YS7000 AIR ATOMIZING



PARTS LIST FOR BURNER ASSEMBLY (199031)

SERIES 576 250 THRU 350 HP
 N6 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
1	1	Burner Tube Assembly	199037
*2	1	Damper – Blower – Motor Assembly	199043
*3	1	Ignitor Drawer Assembly	197343
*4	1	Nozzle Assembly	197364
5	14	Screw, Machine, Pan Head, 1/4" 20NC2 x 1/2" Lg.	105179
6	1	Orifice Plate	197365
7	4	Screw, Mach., Slotted Flat Hd., S/S Type 309, 1/4" - 20NC2 x 2-1/2" Lg.	109817
8	1	Modutrol Motor, Honeywell M941C-1014	102854
9	2	Connector, Str., 3/4" IPS x 3/4" SAE, WH #48x12A	050656
10	1	Linkage Jack Shaft, 7/16" x 23" Lg.	197388
11	2	Jack Shaft Collar	056756
12	2	Bearing Block	024179
13	4	Screw, Machine, #10 x 3/8" Lg.	105172
14	4	Washer, Lock #10	105156
15	5	Metering Arm, 7/16" x 5-7/8" Lg.	024178
16	1	Coupling, Whole, 3/4" IPS	051344
17	8	Ball and Socket Joints, 1/4"	066728
18	18	Nut, Hex., 1/4" - 28NF	053679
19	16	Washer, Flat, #10	059934
20	1	Linkage Rod, 1/4" x 16" Lg.	003632
21	3	Linkage Rod, 1/4" x 8" Lg.	022645
22	1	Metering Arm, 1/2" x 5-7/8" Lg.	189286
23	1	Metering Arm, 5/16" x 4-1/4" Lg.	022665
24	1	Crank Arm, Honeywell #106013A	069800
25	1	Air Switch, Cleveland DFS-CO	068587
26	1	Bushing, Reducing, 1/4" x 1/8"	050280
27	1	Tee, 1/8" IPS	050347
28	1	Pipe Plug, 1/8" IPS	050774
29	1	Nipple, 1/8" IPS x 4" Lg.	060975
30	1	Air Switch Tubing	197373
31	1	Connector, Compression, Male, 1/8" IPS x 1/4" Tube, W-H #69x4	053209
32	1	Control Panel Assembly	197615
33	12	Screw, Machine, 3/8" 16NC2 x 3/4" Lg.	105184
34	14	Nut, Hex., 3/8" 16NC2	053682
35	19	Washer, Lock, Int. Ext. Tooth, 3/8"	057432

* Additional Parts Breakdown Included In This Manual

PARTS LIST FOR BURNER ASSEMBLY (199031)

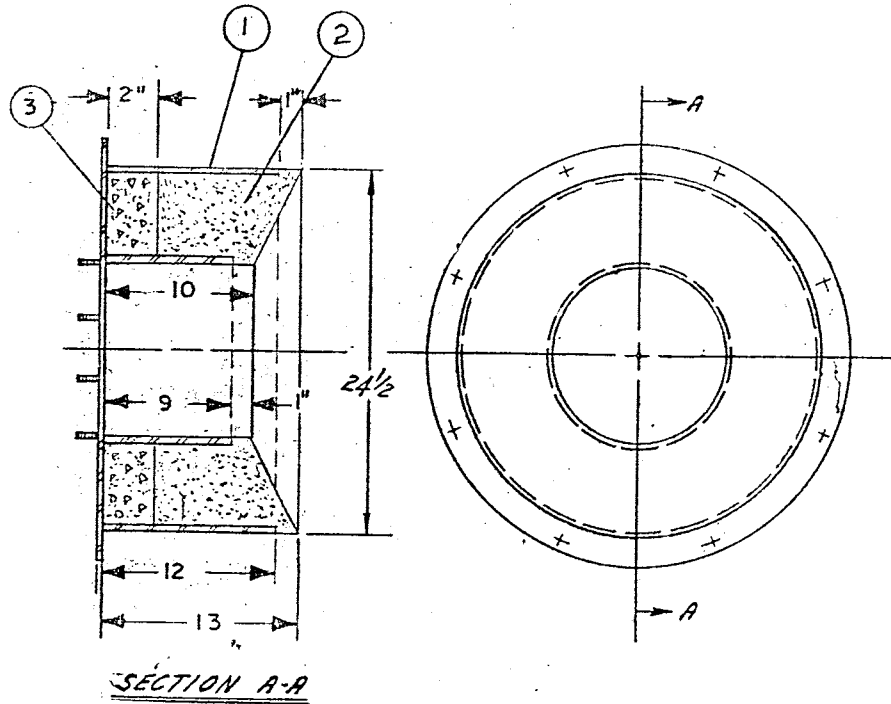
SERIES 576 250 THRU 350 HP

N6 YS7000 AIR ATOMIZING

Ref. #	# Rqd.	Part Name	Part #
36	1	Support Bracket	198533
37	1	U-Bolt, 1-1/2"	051492
38	1	Transformer	054671
39	1	Gasket, Transformer	032441
*40	1	Gas Pilot Train Assembly	197371
41	1	Gas Tubing Assembly	197387
42	2	Nipple, Close, 3"	056550
43	1	Elbow, 3"	051922
44	1	Valve, Butterfly, 3", Eclipse #12BV-A	057383
45	1	Plug, 1/4" IPS	050220
*46	1	Oil Metering Arrangement	191944
47	1	Oil Tubing Assembly	191864
*48	1	Main Gas Piping Arrangement 250 HP (UL & FM)	197430
	1	Main Gas Piping Arrangement 250 HP (IRI)	197431
	1	Main Gas Piping Arrangement 300 & 350 HP	197431
49	1	Strainer, Simplex, 2-1/2" (Shipped Loose)	051968
50	1	Nozzle Return Line Tubing Assembly	197422
51	3.5'	Tape, Sponge Rubber, Watertight, 3/16" x 1/2"	100850

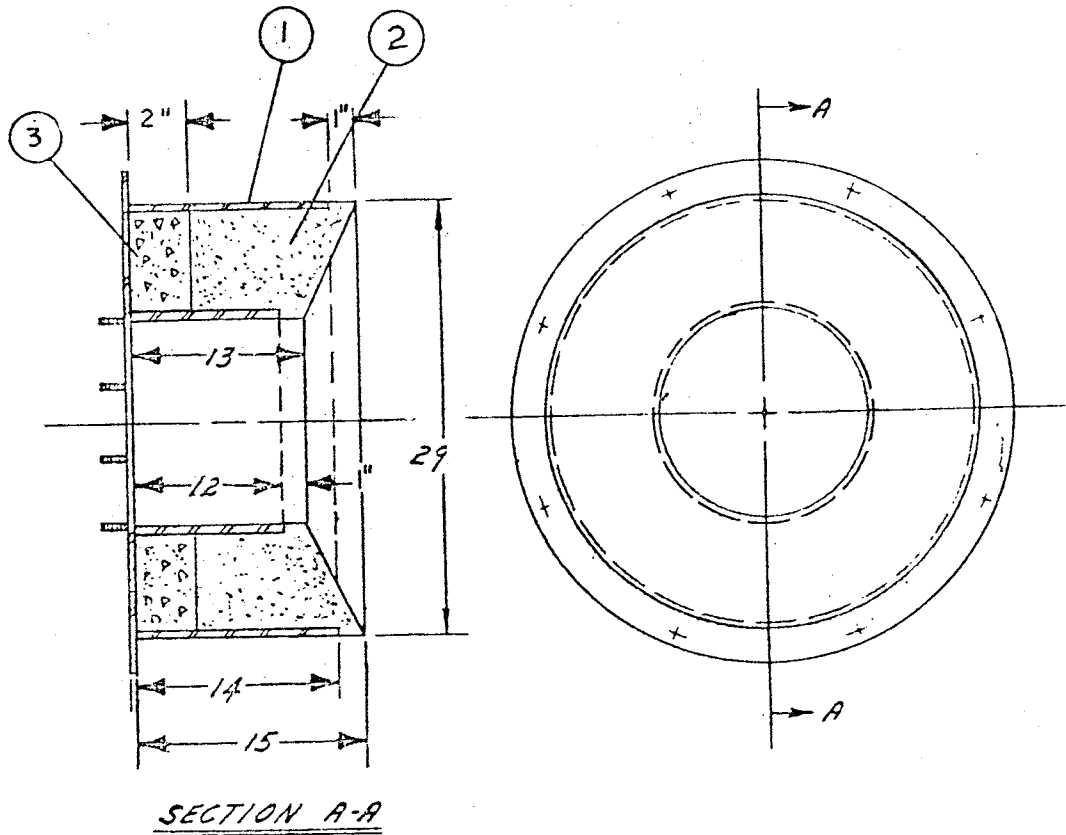
* Additional Parts Breakdown Included In This Manual

BURNER ADAPTER (192213)
 SERIES 564 175 THRU 225 HP



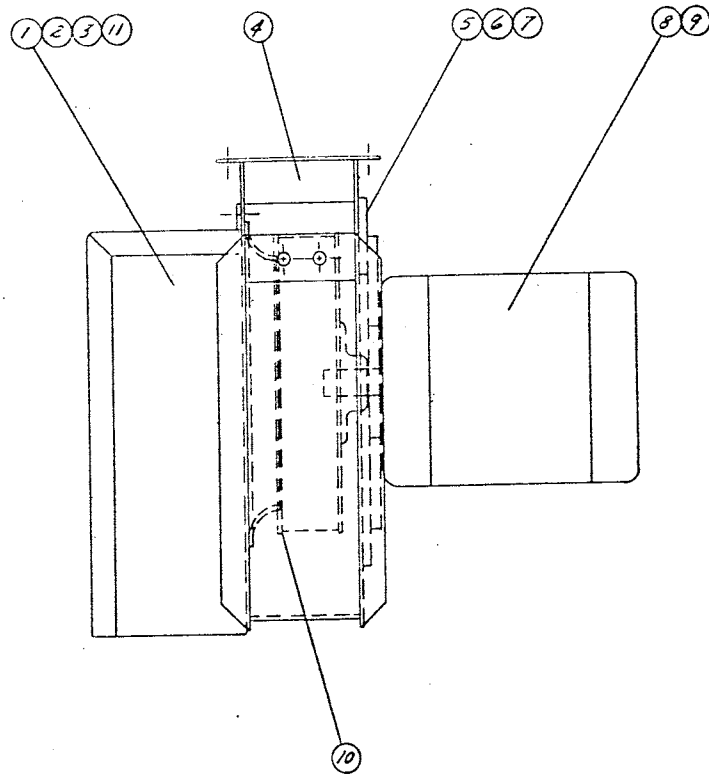
Ref. No.	No Req'd	Part Name	Part No.
1	1	Plate and Tube Weldment	192214
2	290#	Refractory, Hydrocon 70	109505
3	1	Insulation Block	197465
4	9#	Stainless Steel Slivers	108717

BURNER ADAPTER (197437)
SERIES 576 250 THRU 350 HP



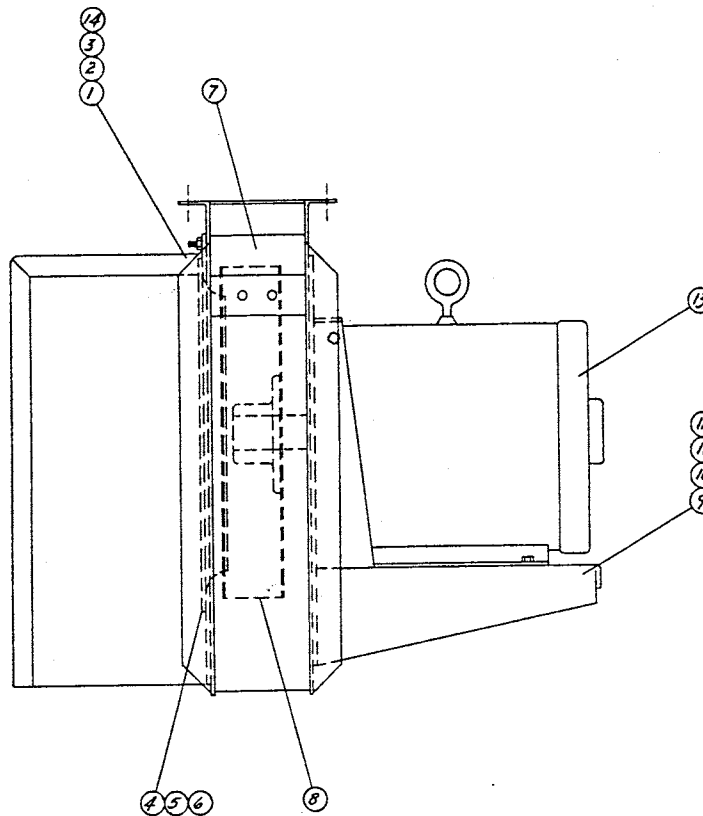
Ref. No.	No Req'd	Part Name	Part No.
1	1	Plate and Tube Weldment	197483
2	400#	Refractory, Hydrocon 70	109505
3	1	Insulation Block	197483
4	12#	Stainless Steel Slivers	108717

DAMPER – BLOWER – MOTOR ASSEMBLY
SERIES 564 175 THRU 225 HP



Ref. No.	No. Req'd	Part Name	Part No. 60 Hz	Part No. 50 Hz
		Assembly Number	201095	201114
1	1	Air Damper Assembly	191444	201115
2	5	Nut, Hex., 1/4" 20NC2	058567	058567
3	5	Washer, Lock, Int. Ext. Tooth 1/4"	108169	108169
4	1	Blower Housing Assembly	201096	201122
5	1	Motor Mounting Plate	191657	201181
6	6	Washer, Lock, Int. Ext. Tooth 3/8"	057432	057432
7	6	Screw, Cap, 3/8" 16NC2 x 1-1/4"	105123	105123
8	1	Motor, 10 HP, 3450 RPM, Fr. #213TC	109430	109430
9	4	Screw, Cap, Hex Hd., 1/2" 13 NC2 x 1" Lg.	105128	105128
10	1	Blower Wheel, R1162-450S, 1-3/8" Bore	109429	
	1	Blower Wheel, Janair, 15 x 2		109748
11	()	Tape, Sponge Rubber, Watertight, 1/4" x 1"	105364	105364
			(8.5)	(7.0)

DAMPER – BLOWER - MOTOR
SERIES 576 250 THRU 350 HP

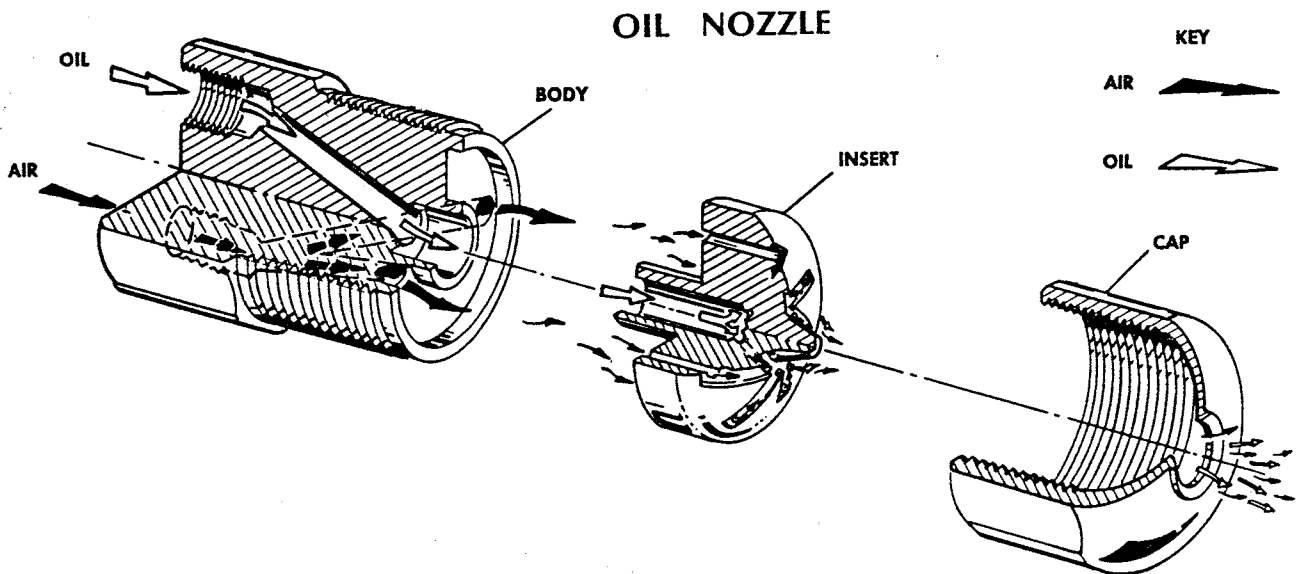


Ref. No.	No. Req'd	Part Name	Part No. 60 Hz	Part No. 50 Hz
		Assembly Number	199043	199060
1	1	Air Damper Assembly	197332	197332
2	5	Nut, Hex., 3/8" 16NC2	053682	053682
3	5	Washer, Lock, Int. Ext. Tooth 3/8"	105158	105158
4	1	Air Inlet Ring	197372	197372
5	6	Screw, Machine #10 x 3/8"	105172	105172
6	6	Washer, Lock, #10	105156	105156
7	1	Blower Housing Assembly	199044	199061
8	1	Blower Wheel (16-1/2" x 3")	109609	
	1	Blower Wheel (16-1/2" x 4")		109773
9	1	Motor Mount Assembly	197366	199067
10	1	Front Motor Bearing Lube Tube Assembly	198649	198649
11	8	Nuts, Hex., 1/2"	053689	053689
12	8	Washer, Lock, 1/2"	105159	105159
13	1	Motor, 20 HP, 3450 RPM, Fr. #254T	105897	
	1	Motor, 25 HP, 2880 RPM, Fr. #256T		105586
14	7'	Tape, Sponge Rubber, Watertight, 1/4" x 1"	105364	105364

NOZZLE TIPS

The oil burning nozzle prepares the oil for burning by properly atomizing the fuel. Therefore, this assembly should be properly adjusted and cleaned. When the assembly is removed, careful note should be made of the dimensions and returned as per drawing provided. A detail of the nozzle is provided below which describes the air and oil passages. When cleaning and taking the nozzle apart, do not force the tip out of round by means of large wrenches. Instead, soak nozzles in light oil or oil solvent.

To clean nozzle, make sure main disconnect switch is pulled on the oil burner. Drain oil at drain plug in nozzle line. Break lines at nozzle assembly, remove screw and withdraw assembly.



FULLY MODULATED LIGHT OIL (#2) BURNERS USING PRESSURE ATOMIZATION

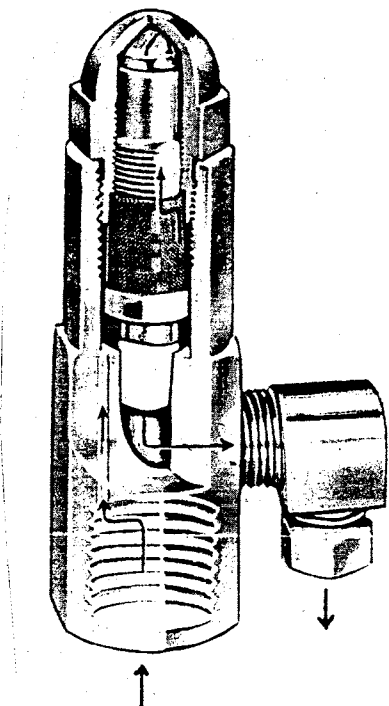
Pressure atomized light oil burners are provided with full range modulation.

This is accomplished by using a bypassing nozzle which produces a variable firing rate by bypassing fuel from the nozzle swirl chamber.

The nozzles are rated and stamped with the capacity when operating at 100 PSI with the bypass closed. With the bypass opened, the firing rate will decrease. These nozzles may be operated at supply pressures in excess of 100 PSI. At this increased nozzle pressure, the nozzle will deliver a greater quantity of fuel.

The variable pressure needed to change the firing rate is accomplished with a modulating metering oil valve on the return line, connected to a linkage and operated by a modulating motor which also controls the blower air damper.

The oil flow of the nozzles is controlled by a solenoid valve in the supply line and a safety solenoid in the return line prevents back flow from the return line.



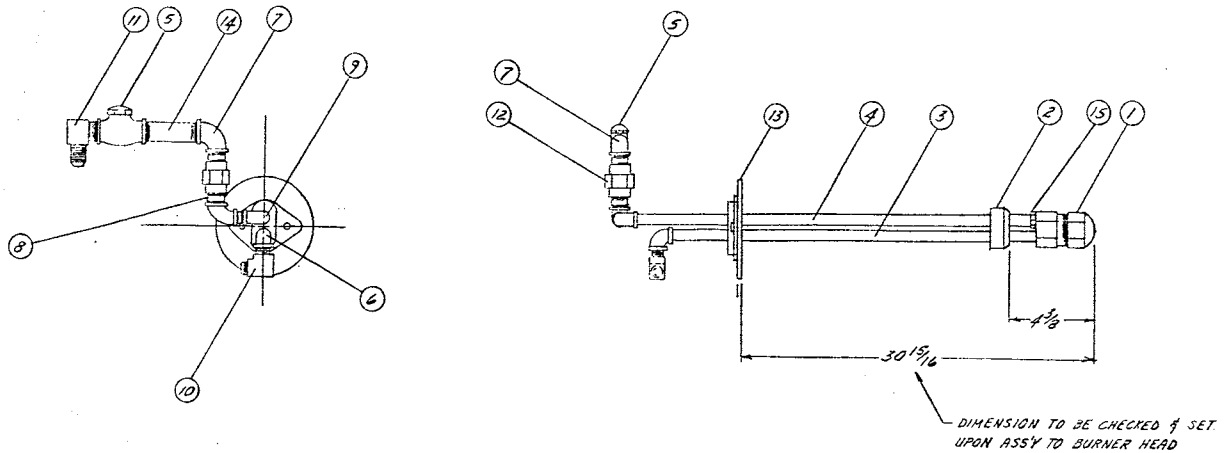
F-80-BPS Nozzle

***TYPICAL PRESSURE SETTINGS**

Size	Pump Pressure	Return Pressure	
		High	Low
175, 200, 225 HP	160 PSI	110	35
250, 300, 350 HP	200 PSI	155	55

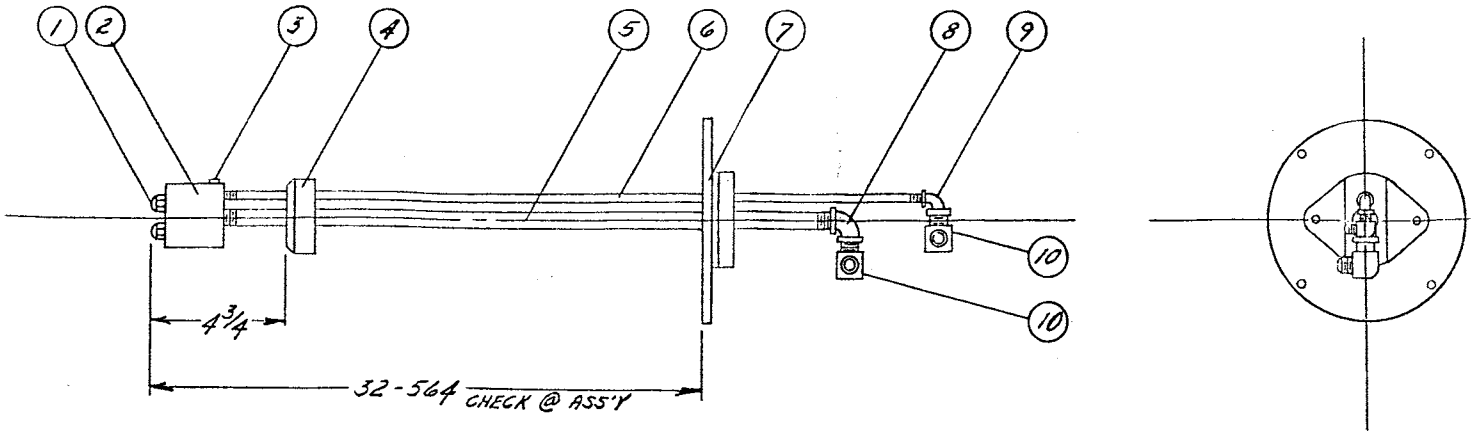
***THESE ARE AVERAGE AND WILL VARY SLIGHTLY FROM INSTALLATION TO INSTALLATION**

NOZZLE PIPE ASSEMBLY (191650)



Ref. No.	No Req'd	Part Name	Part No.
1	1	Nozzle, Monarch C169-WA	057254
2	1	Nozzle & Pipe Support	191651
3	1	Nipple, Black 1/4" IPS x 35" Lg.	157608
4	1	Nipple, Black 1/4" IPS x 36-1/2" Lg.	157607
5	1	Valve, Swing Check, 1/2" IPS	051960
6	1	Elbow 90°, 1/4" IPS	052435
7	2	Elbow 90°, 1/2" IPS	051290
8	3	Nipple, Short, 1/2" IP	051003
9	1	Elbow, Reducing, 1/2" x 1/4" IPS	052005
10	1	Elbow, Male, 1/4" MPT x 3/8" SAE, Brass. W-H #49 x 6	051543
11	1	Elbow, Male, 1/2" MPT x 3/4" SAE, Brass. W-H #49 x 12	051600
12	1	Union, 1/2" IPS	051005
13	1	Nozzle Pipe Plate Assembly	191652
14	1	Nipple, 1/2" IPS x 4"	050705
15	1	Bushing, Hex., 3/8" x 1/4" IPS	050839

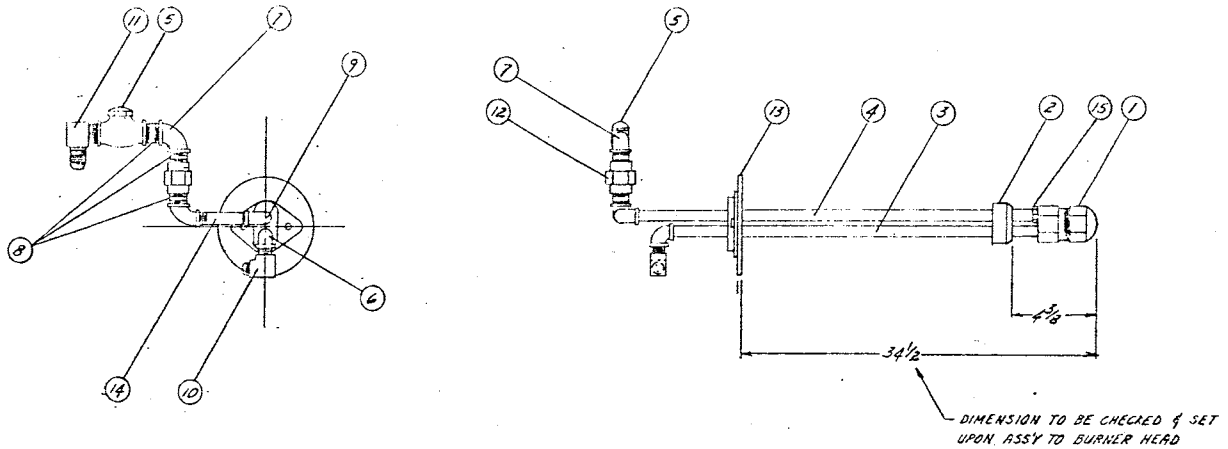
NOZZLE PIPE ASSEMBLY (192170)



Ref. No.	No. Req'd	Part Name	Part No.
1	*	Nozzle	See Chart
2	1	Nozzle Cluster	138429
3	1	Plug, Pipe, Slotted Brass, 1/8" IPS	107244
4	1	Nozzle & Pipe Support	192171
5	1	Nipple, Black 1/4" IPS x 35" Lg.	157608
6	1	Nipple, Black 1/8" IPS x 37" Lg.	160940
7	1	Nozzle Pipe Plate Assembly	192172
8	1	Elbow 90°, 1/4" IPS	052435
9	1	Elbow, Reducing, 90°, 1/4" x 1/8" IPS	063223
10	2	Elbow, Male, 90°, 1/4" MPT x 3/8" SAE, Brass. W-H #49 x 6	051543

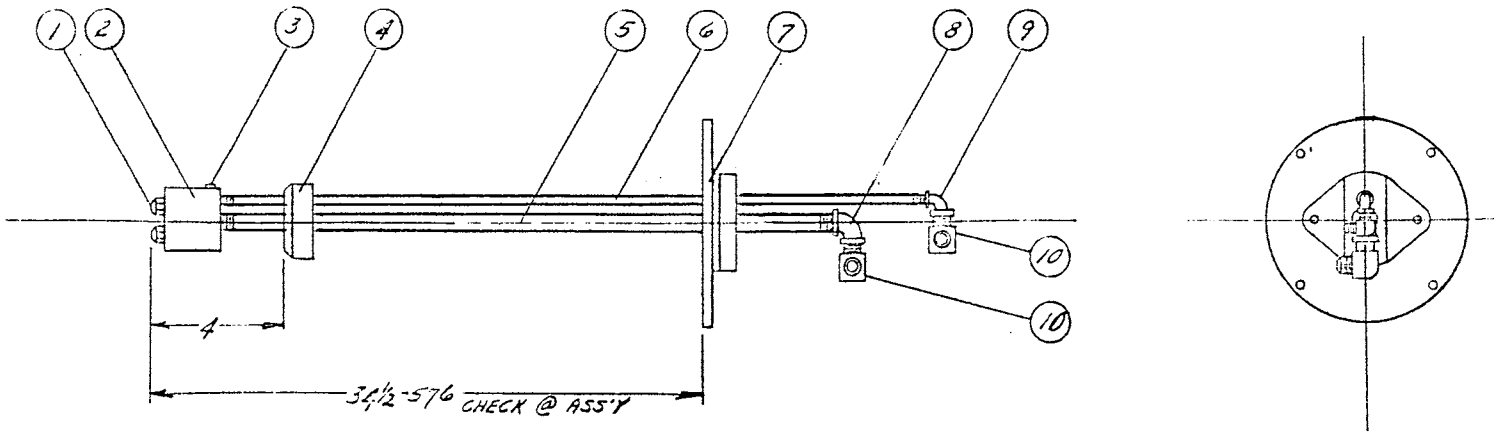
Boiler HP	Assembly	Nozzle*	Part No.
175	192170	2 – 15.3 GPH x 80°, F80 BPS	106709
		1 – 13.8 GPH x 80°, F80 BPS	106708
200	192185	1 – 15.3 GPH x 80°, F80 BPS	106709
		2 – 21.5 GPH x 80°, F80 BPS	107127
225	192186	3 – 19.5 GPH x 80°, F80 BPS	107155

NOZZLE PIPE ASSEMBLY (197364)



Ref. No.	No Req'd	Part Name	Part No.
1	1	Nozzle, Monarch C169-WA	057254
2	1	Nozzle & Pipe Support	191651
3	1	Nipple, Black 1/4" IPS x 35" Lg.	157608
4	1	Nipple, Black 1/4" IPS x 36-1/2" Lg.	157607
5	1	Valve, Swing Check, 1/2" IPS	051960
6	1	Elbow 90°, 1/4" IPS	052435
7	2	Elbow 90°, 1/2" IPS	051290
8	3	Nipple, Short, 1/2" IP	051003
9	1	Elbow, Reducing, 90°, 1/2" x 1/4" IPS	052005
10	1	Elbow, Male, 1/4" MPT x 3/8" SAE, Brass. W-H #49 x 6	051543
11	1	Elbow, Male, 1/2" MPT x 3/4" SAE, Brass. W-H #49 x 12	051600
12	1	Union, 1/2" IPS	051005
13	1	Nozzle Pipe Plate Assembly	191652
14	1	Nipple, 1/2" IPS x 4" Lg.	050705
15	1	Bushing, Hex., 3/8" x 1/4" IPS	050839

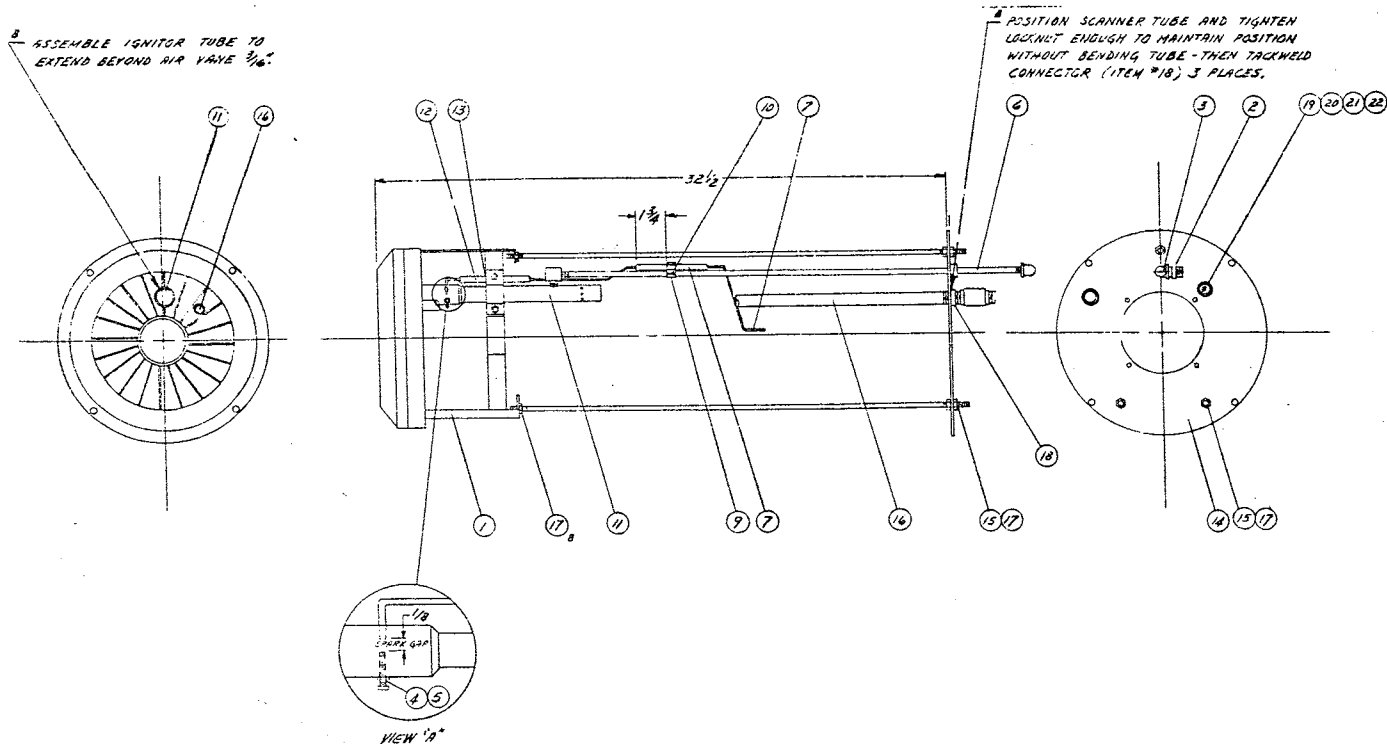
NOZZLE PIPE ASSEMBLY (197421)



Ref. No.	No. Req'd	Part Name	Part No.
1	*	Nozzle	See Chart
2	1	Nozzle Cluster	138429
3	1	Plug, Pipe, Slotted Brass, 1/8" IPS	107244
4	1	Nozzle & Pipe Support	192171
5	1	Nipple, Black 1/4" IPS x 35" Lg.	157608
6	1	Nipple, Black 1/8" IPS x 37" Lg.	160940
7	1	Nozzle Pipe Plate Assembly	192172
8	1	Elbow 90°, 1/4" IPS	052435
9	1	Elbow, Reducing, 90°, 1/4" x 1/8" IPS	063223
10	2	Elbow, Male, 90°, 1/4" MPT x 3/8" SAE, Brass. W-H #49 x 6	051543

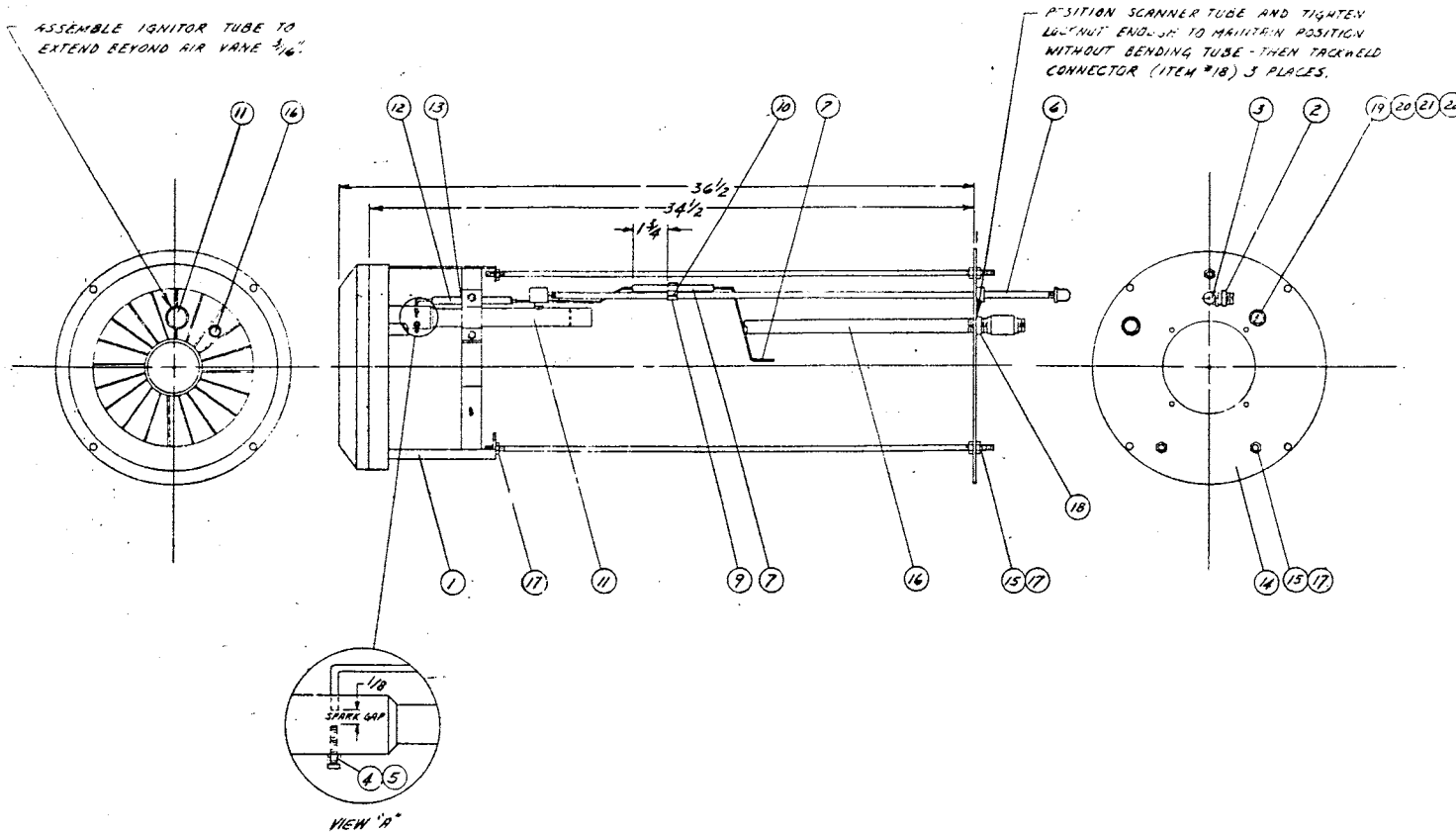
Boiler HP	Assembly	Nozzle*	Part No.
250	197421	3 – 21.5 GPH x 80°, F80 BPS	107127
300	197423	1 – 24.0 GPH x 80°, F80 BPS	107128
		2 – 21.5 GPH x 80°, F80 BPS	107127
350	197424	2 – 24.0 GPH x 80°, F80 BPS	107128
		1 – 28.0 GPH x 80°, F80 BPS	107129

IGNITOR DRAWER ASSEMBLY (191642)



Ref. No.	No. Req'd	Part Name	Part No.
1	1	Burner Head Assembly	191575
2	1	Connector, 3/8" x 1/2" SAE	051550
3	1	Elbow, Reducing 1/4" x 3/8", 90°	051754
4	1	Screw, Stainless Steel #10 x 1"	109408
5	1	Nut, Hex #10	054174
6	1	Nipple 1/4" IPS x 27" Lg.	147643
7	1	Buss Bar Assembly	194461
8	1		
9	1	Scanner Support	159558
10	3	Set Screw, Soc. Hd. 1/4" 20NC x 1/4" Lg.	050609
11	1	Ignitor Tube Assembly	191643
12	1	Electrode Assembly	191644
13	2	Clamp Sleeve	027282
14	1	Access Cover Assembly	191645
15	3	Support Rod	191647
16	1	Fireye, Sight Tube Assembly	191648
17	9	Nut, Hex. 3/8" x 16	053682
18	1	Connector, 1/2" EMT Raintight Long Style	057176
19	1	Bushing, Conduit 1/2" (Plastic)	064516
20	1	Peepsight Glass	047910
21	1	Nipple, 1/2" Close	050650
22	3	Locknut, Conduit	050810

IGNITOR DRAWER ASSEMBLY (197343)

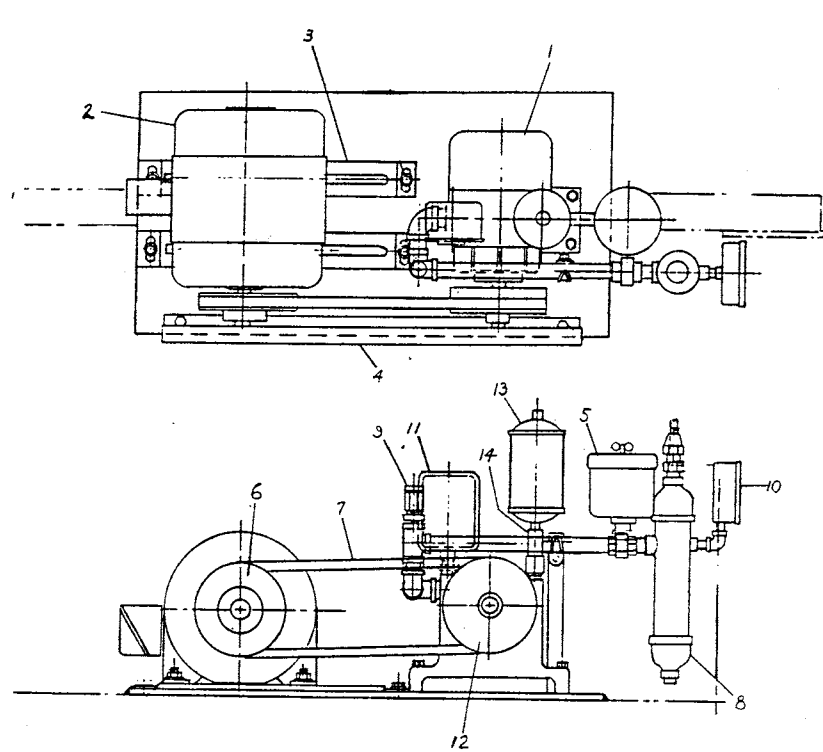


Ref. No.	No. Req'd	Part Name	Part No.
1	1	Burner Head Assembly	197344
2	1	Connector, 3/8" x 1/2" SAE	051550
3	1	Elbow, Reducing, 90°, 1/4"x 3/8",	051754
4	1	Screw, Stainless Steel #10 x 1" Lg.	109408
5	1	Nut, Hex #10	054174
6	1	Nipple 1/4" IPS x 27" Lg.	147643
7	1	Buss Bar Assembly	197358
8	1		
9	1	Scanner Support	159558
10	3	Set Screw, Soc. Hd. 1/4" 20NC x 1/4" Lg.	050609
11	1	Ignitor Tube Assembly	191643
12	1	Electrode Assembly	191644
13	2	Clamp Sleeve	027282
14	1	Access Cover Assembly	197359
15	3	Support Rod	197361
16	1	Fireeye, Sight Tube Assembly	197362
17	9	Nut, Hex. 3/8" x 16NC2	053682
18	1	Connector, 1/2" EMT Raintight T & B #5121	057176
19	1	Bushing, Conduit 1/2" (Plastic)	064516
20	1	Peepsight Glass	047910
21	1	Nipple, 1/2" Close	050650
22	3	Locknut, Conduit	050810

COMPRESSOR ARRANGEMENT (152181)

SERIES 564 175 THRU 225 HP

#2, #5, #6, N2, N5 & N6



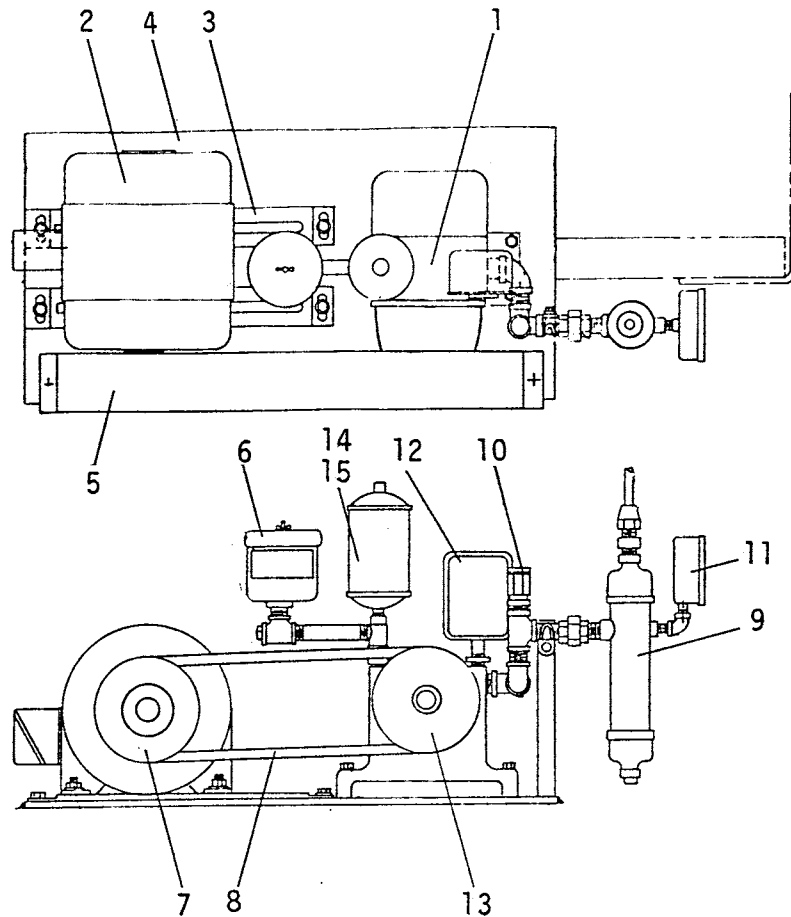
Ref. No.	No Req'd	Part Name	Part No.
1	1	Air Compressor, Gast #2065 (C.C.W.)	068269
2	1	Motor, 1-1/2 HP, Fr. #145T, 3 Phase	105790
3	2	Motor Adjusting Rail Assembly	125684
4	1	Belt Guard	161317
5	1	Air Filter Assembly	087879
6	1	Pulley, Motor, 4.0 to 5.0 VPS, 1 Groove, 7/8" Bore	054163
7	1	V-Belt, Gates, #2420	055540
8	1	Oil Accumulator Assembly	095128
9	1	Valve, Relief, Gast, #AA-600-3/8	051613
10	1	Gauge, Pressure, U.S. Fig. #631-S	059319
11	1	Pressuretrol, Honeywell L404B-1056	058091
12	1	Pulley, Gast, #AB-140 3/4" Bore	064278
13	1	Oil Reservoir, Gast #AA-960-A-1	054082
14	1	Lubricator, Pressure, Gast, #AA-95A-3/4	054085

NOTE: for 50 cycle operation arrangement, #152182 use motor pulley 5.4 to 6.5, Item 6 - #102695 & belt #2440 Item 7 - #050518

COMPRESSOR ARRANGEMENT (199089)

SERIES 576 250 THRU 350 HP

#2, #5, #6, N2, N5 & N6



Ref. No.	No Req'd	Part Name	Part No.
1	1	Air Compressor, Gast #2565 (C.C.W.)	100905
2	1	Motor, 2 HP, Fr. #145T, 3 Phase	106022
3	2	Motor Adjusting Rail Assembly	125684
4	1	Compressor Mounting Plate	202410
4	1	Belt Guard	200522
5	1	Air Filter Assembly	069308
6	1	Pulley, Motor, 4.0 to 5.0 VPS, 1 Groove, 7/8" Bore	054163
7	1	V-Belt, Gates, #2420	055540
8	1	Oil Accumulator Assembly	095128
9	1	Valve, Relief, Gast, #AA-600-3/8	051613
10	1	Gauge, Pressure, U.S. Fig. #631-S	059319
11	1	Pressuretrol, Honeywell L404B-1056	089091
12	1	Pulley, Gast, #AB-140 3/4" Bore	064278
13	1	Oil Reservoir, Gast #AA-960-A-1	054082
14	1	Lubricator, Pressure, Gast, #AA-95A-3/4	054085

NOTE: for 50 cycle operation arrangement #199090, use motor pulley 5.4 to 6.5, Item 7 - #102695 & belt #2440 Item 8 - #050518

CONSTRUCTION

Your rotary air pump is a precision product with a few thousandths of an inch clearance at the ends and top of the rotor. The vanes take up their own wear and should last from 5,000 to 25,000 hours operation depending upon the application. Protect your pump against the entrance of dirt, lubricate it, and you will receive years of trouble-free service.

LUBRICATION

Use Violube (#100188), the blue tinted compressor oil available exclusively from York-Shipley.

To Fill and Operate Reservoir:

- 1) While pump is running, insert slender spout of oil can through filler hole and downward at a 45° angle through either of the two side holes in filler opening. If possible, have spout extend clear of center post so oil won't run into air equalizer hole in post.
- 2) To avoid reaching air equalizer hole, do not fill above bottom of top flange.
- 3) Leave cap off a few minutes while pump is running after filling so any oil will be sucked out of equalizer passage.
- 4) Replace and tighten filler cap.

OIL FEED CONTROL

The simple gravity system depends upon keeping air equalizer passage open and on the choice of wicks (smokers' pipe cleaners). A slow feed with a double wick is twice as fast with a single wick. Standard feed is a double wick on a small (4 oz.) cup, and a single wick on a large 8 oz. cup, so one filling lasts equally long. Time may vary from 50 to 200 hours operation depending on the application. Above wick selection is changed on special applications. Improper feed may be caused by an oil-filled equalizer passage, loose filler cup, or defective wick. Change wicks if they appear defective.

TO CHANGE WICK

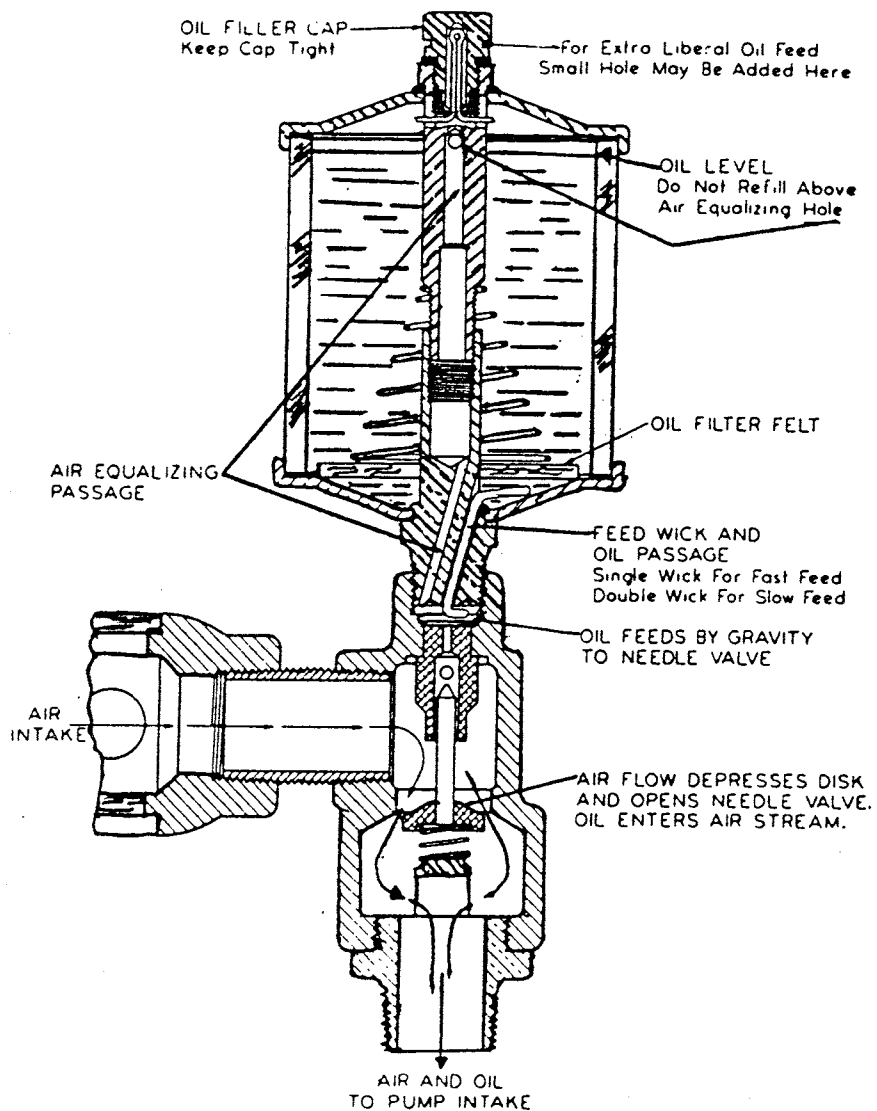
- 1) Unscrew oil reservoir from lubricator casting and pull old wick out of bottom using pliers.
- 2) Insert new wick (if double, insert double end first) from bottom until you feel it touch the strainer felt.
- 3) Cut end off about 1/8" longer than the bottom of the oil cup. **BE SURE WICK IS IN CENTER AND NOT SIDE HOLE.**

TO CHANGE WICK (CONT.)

- 4) Bend end at 90° away from side hole.

Even though bearings receive oil at all times directly from the pumping chamber, it is suggested that 5-10 drops of oil be added in bearings each time the oil reservoir is filled. **NEVER REPLACE BEARING OILERS WITH GREASE CUPS OR USE GREASE IN THIS COMPRESSOR.**

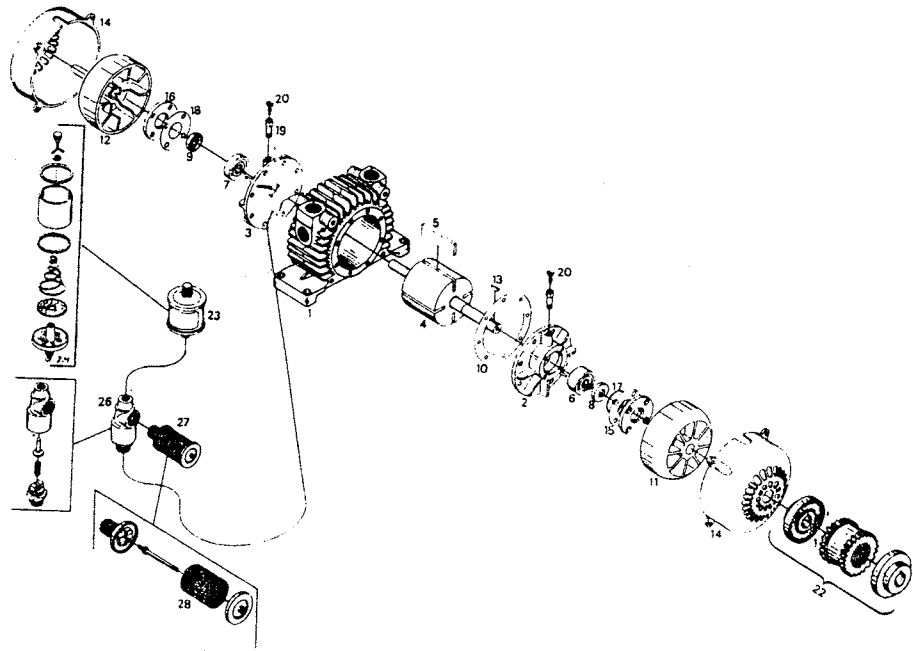
SECTIONAL VIEW OF AUTOMATIC LUBRICATOR



IMPORTANT: Use Violube (#100188) The Blue Tinted Compressor Oil Available Exclusively from York-Shipley.

AIR COMPRESSOR

#2065 & 2565



Ref. No.	Description	Part Qty.	Compressor 2065-PB	Compressor 2565-P19
1	Body	1	AC101E	AC101F
2	End Plate, Drive	1	AA852	AA847
3	End Plate, Dead	1	AA853	AA848
4	Rotor Assembly	1	AC843A	AC840
*5	Vane	4	AA8B	AA750D
*6	Bearing, Drive End	1	AA735	AA735
*7	Bearing, Dead End	1	AA755D	AA755D
*8	Shaft Seal, Drive End	1	AC848	AC848
*9	Shaft Seal, Dead End	1	AC849	AC849
*10	Body (Spacer) Gasket	1	AH567	AH567
11	Cooling Fan, Drive End †	1	AC326C	AC326C
12	Cooling Fan, Dead End †	1	AC326B	AC326B
13	Coupling Key	1	AB136D	AB136D
14	Fan Guard	2	AC102B	AC102B
15	End Cap, Drive End	1	AA856	AA856
16	End Cap, Dead End	1	AG466	AG466
*17	"O" Ring	1	AC808	AC808
18	End Cap Gasket	1	AG467	AG467
19	Oiler Body	2	AA10	AA10
20	Oiler Cap	2	AA11B	AA11B
22	Coupling Assembly	1	AE543B	AE543B
23	Oil Reservoir	1	AA960-1	AA960-1
*24	Feed Wick	1	AA973	AA973
26	Pressure Lubricator	1	AA95A	AA95A
27	Intake Filter Assembly	1	AC435	AC435
*28	Cartridge	2	AC393	AC393

Use K295 Service Kit for model 2065 compressor

Use K296 Service Kit for model 2565 compressor

*Indicates parts included in Service Kit

†When ordering fans – corresponding retainer ring (Drive AC448 or Dead AC447) must also be ordered.

Units manufactured prior to September 1977 utilized copper tubes. When corresponding or ordering spare parts, please give complete model and serial number.

DISASSEMBLY #2065 & #2565 COMPRESSOR

Remove the unit from mounting. Clean the exterior – work on a bench.

Remove pulley.

Remove fan guard.

Remove fan.

File any burrs caused by set screws on shaft before attempting to remove end plate.

NEVER remove the drive end plate, unless it must be replaced.

Remove four (4) screws from end cap.

Remove end cap. Make sure nicks have been removed. They will damage lip of seal.

Remove eight (8) hex bolts.

Attach end plate puller to hub of end plate.

Remove end plate.

Exercise care with paper gasket.

Vanes can now be removed for inspection or replacement.

Interior of pump can be cleaned out. Use care that rotor or body are not nicked with sharp tools.

Flush out with kerosene, gasoline or carbon tetrachloride.

If rotor needs to be replaced, return to manufacturer for complete overhaul.

ASSEMBLING #2065 & 2565 COMPRESSOR

This is a precision pump—treat it accordingly.

See that parts are clean, free from nicks, and that vanes move freely in rotor slot. The smallest chip will bind the rotor and damage it. Remember there is only .002 of an inch clearance between the top of rotor and body bore. Use micrometer to check this clearance if necessary.

If drive end plate has been removed, place drive end plate on rotor, revolve, and listen for smooth metal to metal sound. Inspect for nicks if end plate is scratched. Oil return should be clean (open) to bearing.

Slip double row "bearing" on shaft and press into position with Arbor press so the end plate maintains approximately 1/32" clearance between face end of plate and end of rotor. Do not press bearing tight to shoulder.

ASSEMBLING #2065 & 2565 COMPRESSOR (CONT.)

Place body on two blocks about 3" thick to clear shaft for assembly of rotor and end plate with intake to your left. Affix necessary gaskets. Insert rotor into body, screw bolts into position (but only snug them), turn pump over, line rotor so it is due center with approximately .002 clearance between top of rotor and body. Shifting of rotor can be obtained by tapping the end plate. To move rotor up, tap bottom of end plate. To move it down, tap on top, do likewise right and left. (Rotor must be in center.)

To assure clearance, place thumb of left hand on end of shaft and rest of fingers on body pressing rotor towards top of body, and turning rotor with right hand. Test this on 360° as all segments of rotor should have approximately .002 clearance.

If there is friction on top of the body, bring rotor down until friction is removed. Turn pump over and fasten the bolts down tight.

Turn compressor over, insert vanes so the file cut on under edge is in the bottom of rotor slot; see that vanes are free and that rotor turns freely. If vanes are too long, they will bind.

Add remaining thickness of gaskets. Use a little oil to make them stick.

Place dead end plate on body over dead end shaft, tighten bolts same as drive end. Press single row bearing so that it has 1/32" clearance by feel. (This creates a free-floating rotor.) Replace dowel pins to align end plate.

The inner race fits tight on shaft; the outer race is free-floating in end plate hubs.

Attach end plate puller to dead end with 4 screws that are used to hold end caps. Turn puller screw down until it contacts end of shaft. Draw up tight, then slacken. Turn rotor; again draw puller screw up tight, secure all end plate bolts. Tap with hammer on bolt heads. This will locate rotor. Now draw hex screws up tight.

Remove puller and spin rotor to insure clearance. Lift shaft and turn. Push down on shaft and also turn from side to side. This will detect any high spots or improper alignment.

If the rotor is touching the drive end plate when it is revolved by hand, use a piece of brass and tap lightly and quickly on the dead end of the rotor shaft. This will locate rotor. Repeat until free and properly lined up.

Repeat procedure in locating dead end of rotor. With a piece of brass, tap lightly and quickly on the drive end of the rotor shaft.

ASSEMBLING #2065 & 2565 COMPRESSOR (CONT.)

Press seals into end caps and attach. Attach fan, guard and pulley. Give compressor ample amount of light oil so it is well lubricated. (Full tablespoon is ample.)

If all parts are carefully treated and cleaned, properly lined up and with the correct clearance, there should be no difficulty.

Drain oil absorber whenever required. Do not reuse this oil. Clean all fittings. The slightest amount of grit will cause problems.

See that all fittings on intake sides are secure. Leakage will allow vacuum to drop.

All fittings must be secure on exhaust or a loss of pressure will result.

NOTE: DRIVE END is the long end of the shaft where the power unit is attached. The DEAD END is the short end of the shaft opposite the end that has fan only.

CLEANING

Intake filter felts may be washed in solvent. Stop pump first as otherwise dirt may be sucked in. FLUSHING OF PUMP WITH KEROSENE IS MOST BENEFICIAL SEVERAL TIMES A YEAR. Permit several tablespoons to be drawn into intake while pump is running AFTER REMOVING FILTER. A more thorough flushing can be done by disconnecting the air pressure line and removing the bearing oil caps. With the pump running restrict the intake and feed the kerosene directly into the bearing oilers. Remember to disconnect the pressure line. Immediately re-lubricate with a shot of oil.

SERVICING

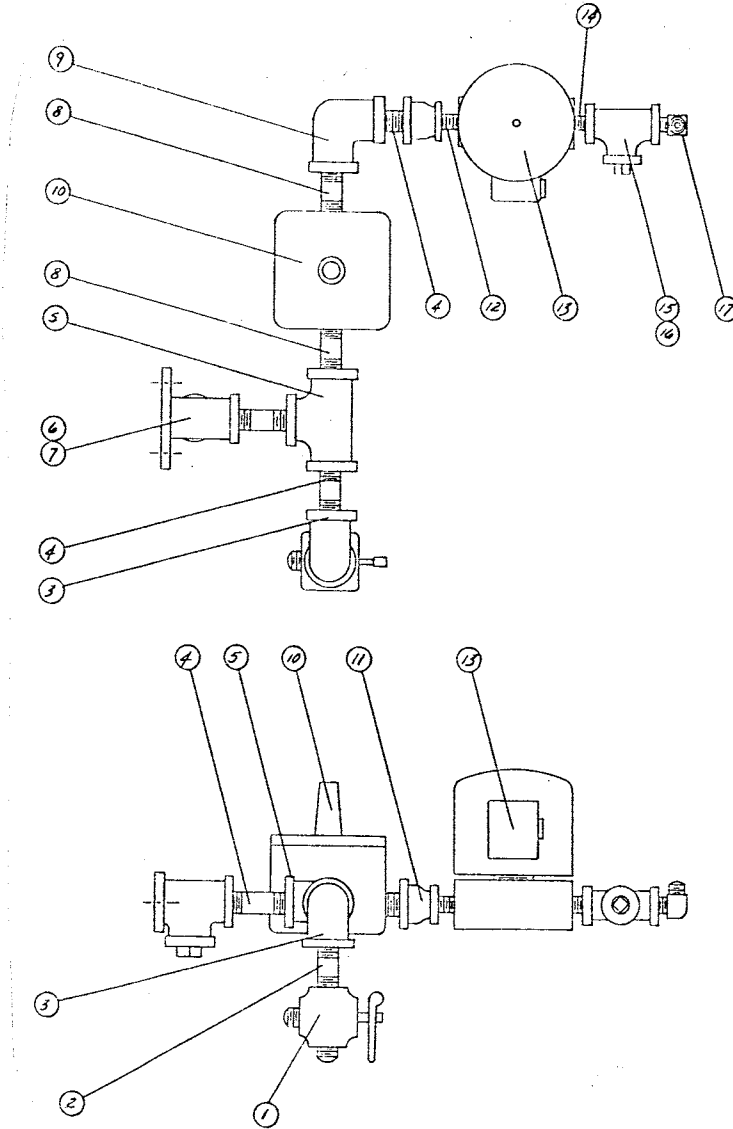
Most failure to build up pressure is due to leaks in pipelines, a dirty filter, a defective gauge, or sluggish vanes. Vanes may stick in the slots of the rotor due to lack of oil, too much oil, or too heavy oil. See "CLEANING". An experienced mechanic may remove the end plate opposite to the drive shaft end to clean or replace the vanes. The original gaskets are onion skin paper. Thicker paper will greatly reduce pump efficiency.

INSPECTION

Do this regularly to prevent expensive repairs. Occasionally examine shaft for side or end "play" by moving it manually while the pump is idle. Do not be alarmed if pump temperatures reach 150° to 250° when running continuously. If pump or motor shows evidence of overheating or excessive noise, stop immediately until repairs are made. It is quickest and cheapest to remove pump from base and return it to the factory for repair. Try to have a spare compressor on hand at all times.

PILOT GAS TRAIN ARRANGEMENT (201841)

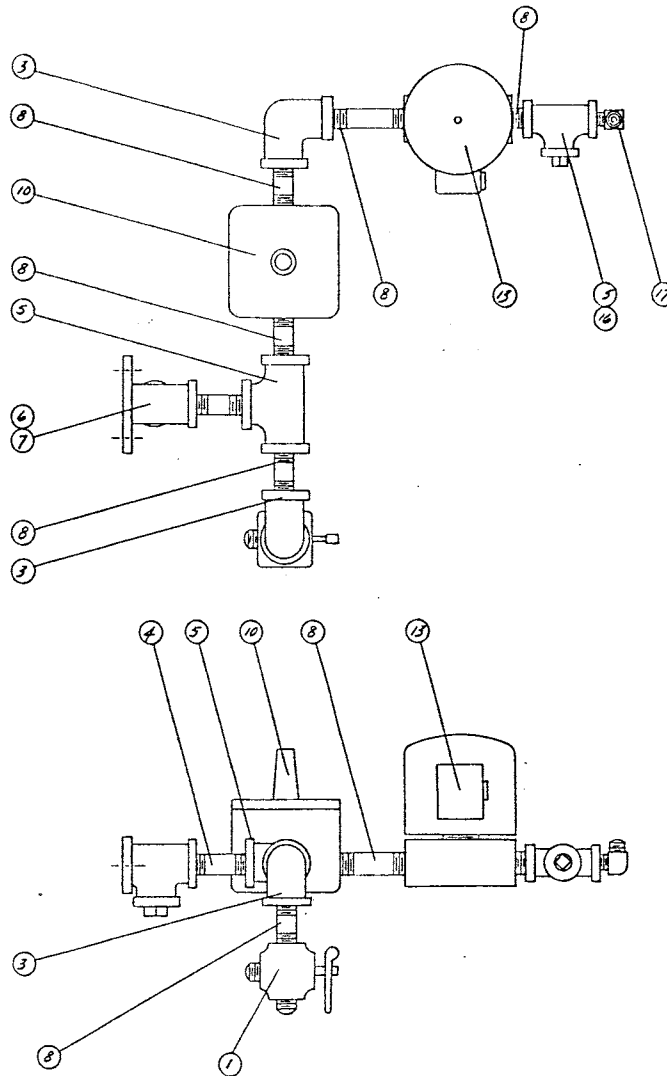
SERIES 564 175 THRU 225 HP



Ref. No.	No Req'd	Part Name	Part No.
1	1	Valve, Shut-Off, 1/2" IPS	064730
2	1	Nipple, 1/2" x 2" Lg.	050886
3	1	Elbow, 1/2" IPS	050270
4	3	Nipple, Close, 1/2" IPS	050650
5	1	Tee, 3/4" x 1/2" x 1/2" IPS	051438
6	1	Elbow, Drop, 1/2" IPS	063313
7	1	Plug, 1/2" IPS	050647
8	2	Nipple, Short, 3/4" x 2" Lg.	050771
9	1	Elbow, Reducing, 3/4" x 1/2" IPS	050643
10	1	Regulator, Pressure, Maxitrol R500S	102305
11	1	Reducer, 1/2" x 3/8" IPS	050514
12	1	Nipple, 3/8" IPS x 1-1/2" Lg.	050807
13	1	Valve, Gas, G.C. K3A532	106847
14	1	Nipple 3/8" IPS x 1" Lg.	050799
15	1	Tee, 3/8" IPS	051703
16	1	Plug, 3/8" IPS	064486
17	1	Connector, Str., 1/2" SAE x 3/8" IPS	051609

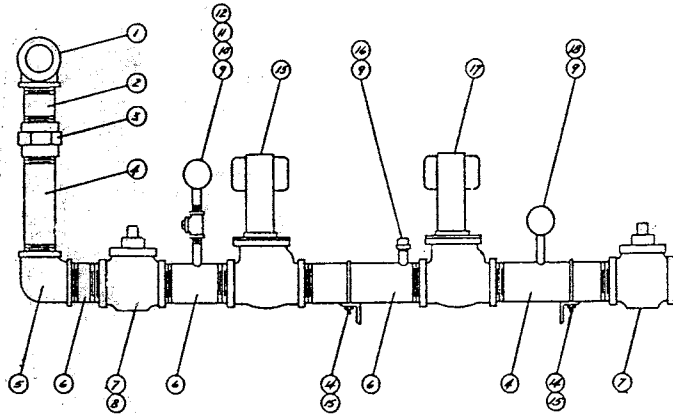
PILOT GAS TRAIN ARRANGEMENT (197371)

SERIES 576 250 THRU 350 HP



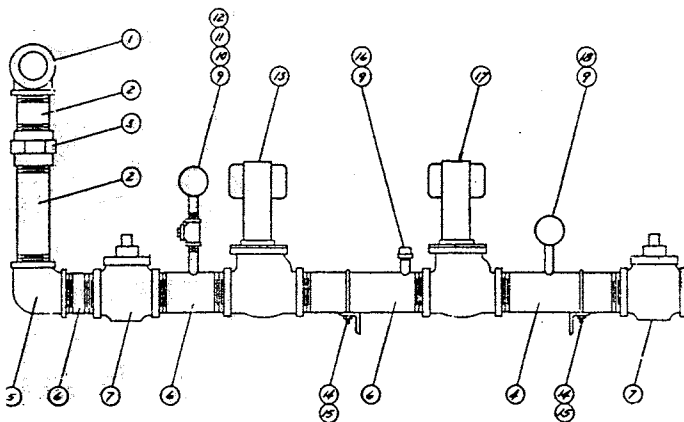
Ref. No.	No Req'd	Part Name	Part No.
1	1	Valve, Shut-Off, 3/4" IPS	064732
2			
3	2	Elbow, 3/4" IPS	050138
4	1	Nipple, Close, 1/2" IPS	050650
5	2	Tee, 3/4" x 3/4" x 1/2" IPS	051588
6	1	Elbow, Drop, 1/2" IPS	063313
7	1	Plug, 1/2" IPS	050647
8	6	Nipple, Short, 3/4" x 2" Lg.	050771
9			
10	1	Regulator, Pressure, Maxitrol R500S	102305
11			
12			
13	1	Valve, Gas, 3/4" IPS, G.C. K3A552	068028
14			
15			
16	1	Plug, 3/4" IPS	050171
17	1	Connector, Str., 1/2" SAE x 1/2" IPS	051251

MAIN GAS PIPING ARRANGEMENT (191863)
FOR FV-60 BURNER
SERIES 564 175 THRU 225 HP



Ref. No.	No. Req'd	Part Name	Part No.
1	1	Elbow, Reducing, 3" x 2"	102800
2	1	Nipple, 2" IPS x 18-1/2" Lg.	062213
3	1	Union, M.I., Ground Joint, 2" IPS	056682
4	2	Nipple, 2" IPS x 6" Lg.	063843
5	1	Elbow, 90°, 2"	051808
6	3	Nipple, 2" IPS x 8" Lg.	059713
7	2	Valve, Plug, Lubricated, 2"	069325
8	2	Handle, Lubricated Plug Valve	068509
9	4	Nipple, 1/4" x 2" Lg.	050886
10	1	Tee, 1/2"	051092
11	1	Plug, 1/2"	050647
12	1	Switch, High Pressure, Honeywell C645B-1039	108494
13	1	Valve, Hydramotor 2", G.C. H117AKF26V16	106138
14	2	U-Bolt, 2"	051812
15	2	Support	113002
16	1	Cap, Pipe, 1/4" IPS	051350
17	1	Valve, Hydramotor 2", G.C. H117AK112	102022
18	1	Switch, Low Pressure, Honeywell C645A-1055	108493

MAIN GAS PIPING ARRANGEMENT (197430)
FOR FV-100 BURNER
SERIES 576 250 HP - UL & FM



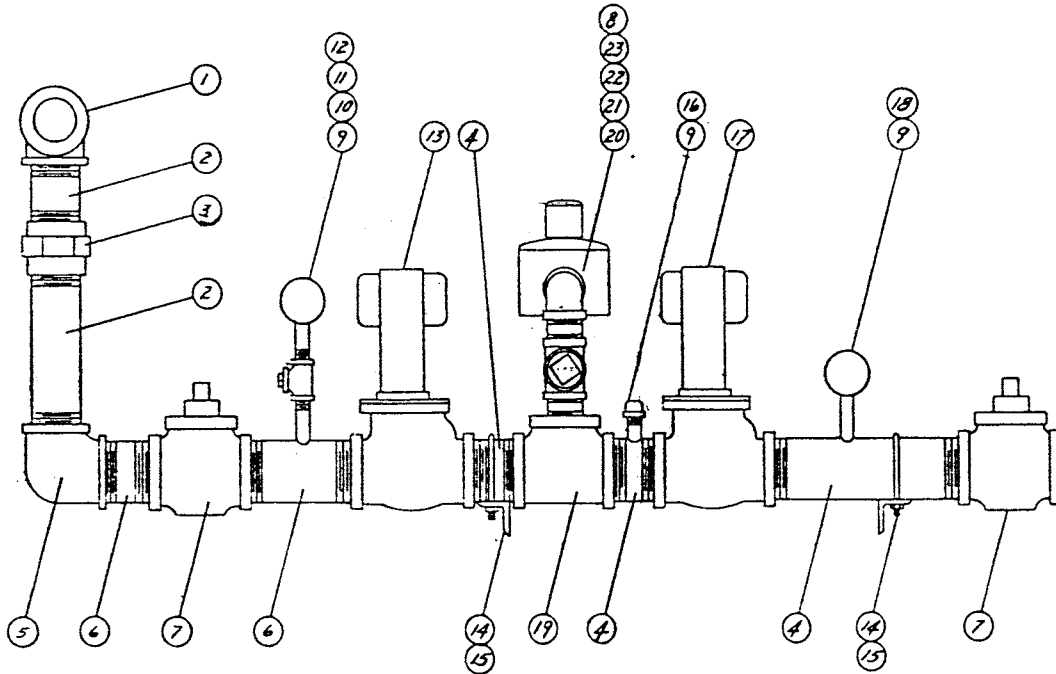
Ref. No.	No. Req'd	Part Name	Part No.
1	1	Elbow, Reducing, 3" x 2-1/2"	056657
2	2	Nipple, 2-1/2" IPS x 20-3/4" Lg.	059090
3	1	Union, M.I., Ground Joint, 2-1/2" IPS	056683
4	1	Nipple, 2-1/2" IPS x 6" Lg.	051893
5	1	Elbow, 90°, 2-1/2"	051808
6	3	Nipple, 2-1/2" IPS x 8" Lg.	061481
7	2	Valve, Plug, Lubricated, 2-1/2"	065724
8			
9	4	Nipple, 1/4" x 1-1/2" Lg.	050144
10	1	Tee, 1/2"	051092
11	1	Plug, 1/2"	050647
12	1	Switch, High Pressure, Honeywell C645B-1039	108494
13	1	Valve, Hydramotor 2-1/2", G.C. H117AKF26V16	107152
14	2	U-Bolt, 2-1/2"	065439
15	2	Support	113002
16	1	Cap, Pipe, 1/4" IPS	051350
17	1	Valve, Hydramotor 2-1/2", G.C. H117AK112	102024
18	1	Switch, Low Pressure, Honeywell C645A-1055	108493

MAIN GAS PIPING ARRANGEMENT (197431)

FOR FV-100 BURNER

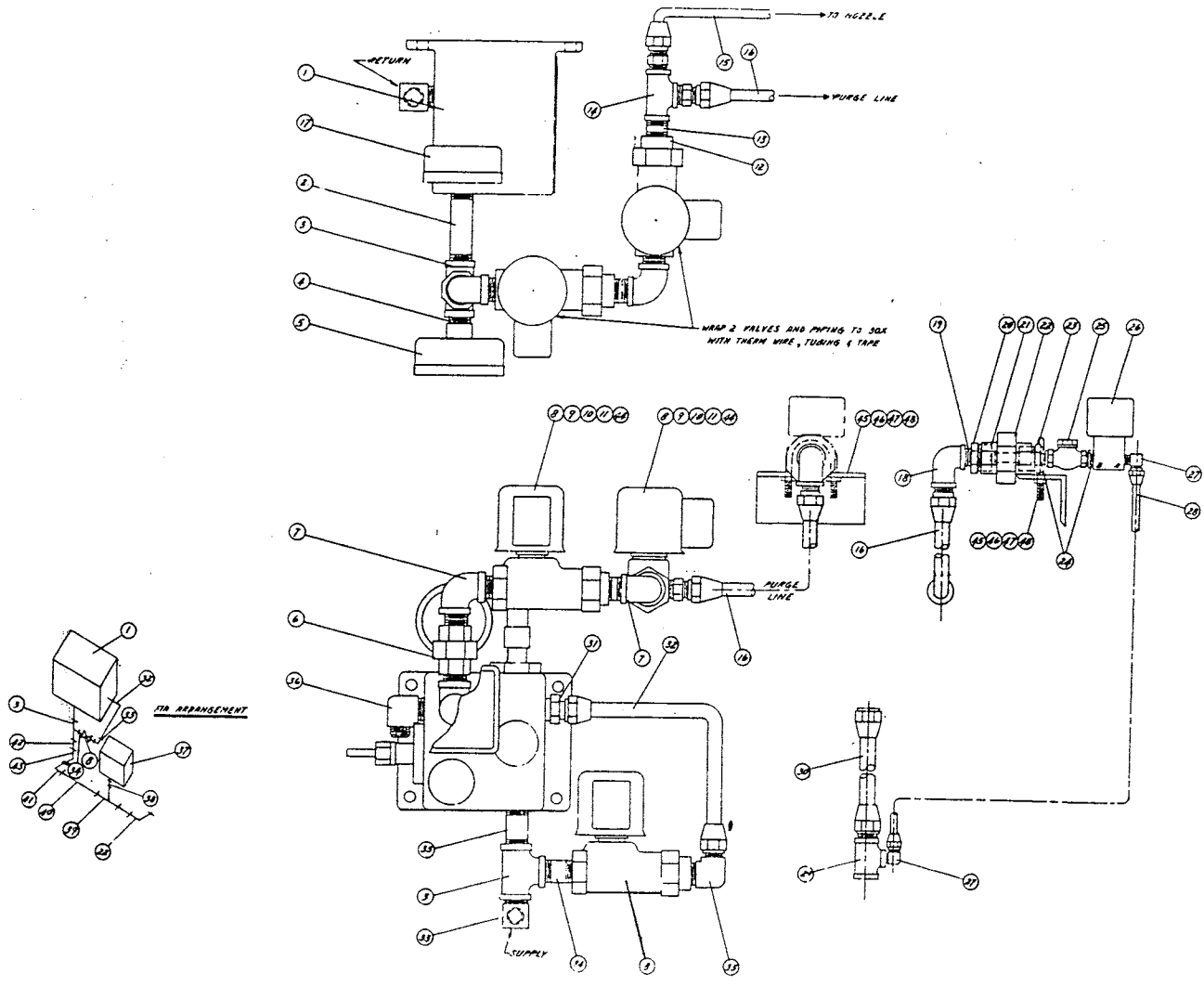
SERIES 576 250 HP – IRI

300 & 350 HP – UL, FM & IRI



Ref. No.	No. Req'd	Part Name	Part No.
1	1	Elbow, Reducing, 3" x 2-1/2"	056657
2	2	Nipple 2-1/2" IPS x 30-3/4" Lg.	059090
3	1	Union, M.I., Ground Joint, 2-1/2" IPS	056683
4	3	Nipple, 2-1/2" IPS x 6" Lg.	051893
5	1	Elbow, 90°, 2-1/2"	051907
6	2	Nipple, 2-1/2" IPS x 8" Lg.	061481
7	2	Valve, Plug, Lubricated, 2-1/2"	065724
8	1	Valve, Vent, 1-1/4", Asco I8215A63	102852
9	4	Nipple, 1/4" x 1-1/2" Lg.	050144
10	1	Tee, 1/2"	051092
11	1	Plug, 1/2"	050647
12	1	Switch, High Pressure, Honeywell C645B-1039	108494
13	1	Valve, Hydramotor, 2-1/2", G.C. H117AKF26V16	107152
14	2	U-Bolt, 2-1/2"	065439
15	2	Support	113002
16	1	Cap, Pipe, 1/4" IPS	051350
17	1	Valve, Hydramotor, 2-1/2", G.C. H117AK112	102024
18	1	Switch, Low Pressure, Honeywell C645A-1055	108493
19	1	Tee, Reducing, 2-1/2" x 2-1/2" x 1-1/4"	102958
20	3	Nipple, Short, 1-1/4"	051212
21	1	Tee, 1-1/4"	056659
22	1	Plug, Pipe, 1-1/4"	050772
23	1	Elbow 90°, 1-1/4"	056649

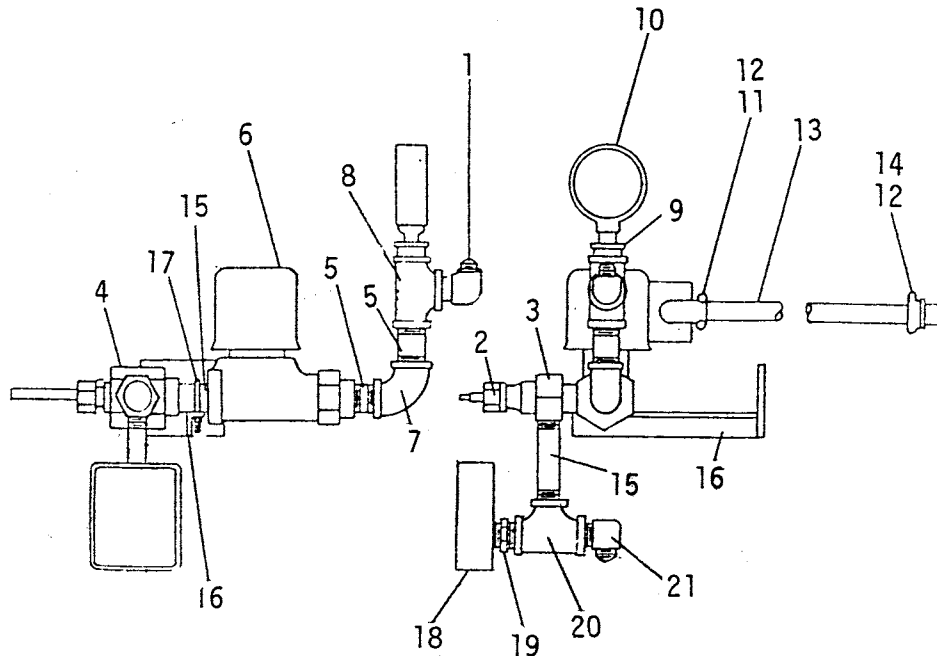
OIL METERING ARRANGEMENT (191944)



PARTS LIST FOR OIL METERING ARRANGEMENT (191944)

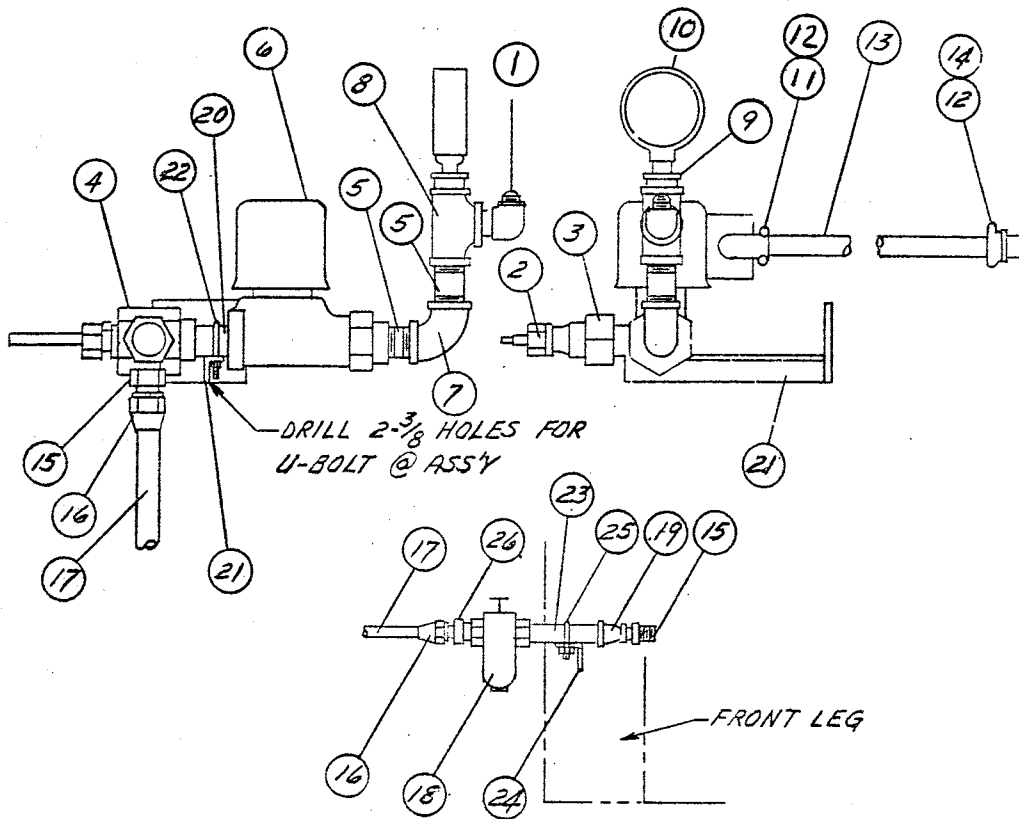
Ref. No.	No Req'd	Part Name	Part No.
1	1	Viscosity Compensator Assembly	112988
2	1	Nipple, 1/2" x 3-1/2" Lg.	050776
3	2	Tee, 1/2" IPS	051092
4	3	Nipple, Close, 1/2" IPS	050650
5	1	Temperature Gauge, 60° - 260°, 3-1/2", Fig. #64	069262
6	1	Union, 1/2" IPS	051005
7	2	Elbow 90°, 1/2" IPS	051270
8	3	Valve, Oil Solenoid, N.C., G.C. #K-10AB-281	050657
9	16'	High Temperature Tape	057192
10	5'	Celetex Tubing	061585
11	16'	Wire, Therm., #18 Gauge TWS	052600
12	1	Bushing, Hex., 1/2" IPS x 3/8" IPS	052471
13	1	Nipple, Close, 3/8" IPS x 1" Lg.	050799
14	1	Tee, 3/8" IPS	057703
15	1	Supply Line Assembly, 3/8" O.D.	191945
16	1	Purge Tubing Line Assembly, 3/8" O.D.	191946
17	1	Gauge, Pressure 0 to 200#, 2" Dia., 1/4" Bottom Connection	068600
18	1	Elbow, Reducing 90°, 1/8" x 3/8" IPS	051587
19	4	Nipple, Close, 1/8" IPS	061680
20	1	Bushing, Hex., 3/4" IPS x 1/8" IPS	064538
21	1	Union, Female Gr. Joint, 3/4" IPS	051004
22	1	Oil Nozzle, Monarch 1.75 GPH x 60°, Type R	061133
23	1	Nozzle Adaptor	115522
24	2	Bushing, Reducing, 1/4" x 1/8" IPS	050281
25	1	Valve, Ball Check, 1/4" IPS	106921
26	1	Valve, Solenoid, 2 Way, N.O., Asco #8262B31	105491
27	2	Elbow, Male, 1/8" IPS x 1/4" SAE, W-H #49 x 4	051244
28	1	Air Compressor Tubing Assembly, 1/4" O.D.	191947
29	1	Tee, Reducing, 3/4" x 3/4" x 1/4"	060580
30	1	Nozzle, Air Line Tubing Assembly, 3/4" O.D.	191948
31	1	Connector, Straight, 1/2" IPS x 5/8" SAE	051097
32	1	High Fire Tube Assembly, 5/8" O.D.	142356
33	2	Elbow, 90°, 1/2" IPS x 5/8" SAE	051326
34	1	Nipple, 1/2" IPS x 1-1/2" Lg.	051008
35	1	Nipple, 1/2" IPS x 2-1/2" Lg.	050658
36	1	Elbow, 90°, 1/2" IPS x 3/4" SAE, W-H #49-12	051600
37	1	Low Oil Pressure Control, Honeywell L404V-1046	101878
38	1	Nipple, 1/4" x 1-1/2" Lg.	050144
39	1	Tee, 1/2" x 1/2" x 1/4"	103478
40	1	Nipple, 1/2" x 2-1/2" Lg.	050653
41	1	Nipple, 1/2" x 4" Lg.	050705
42	1	Nipple, 1/2" x 1-1/2" Lg.	051008
43	2	Elbow, 90°, 1/2"	051720
44	1	Transformer	101565
45	2	Nuts, Hex., 3/8" 16NC-2	053682
46	2	Washer, Lock, Int. Ext. 3/8"	057432
47	1	U-Bolt, 2"	051812
48	1	Purge Support Angle	191961

OIL METERING ARRANGEMENT (191884)



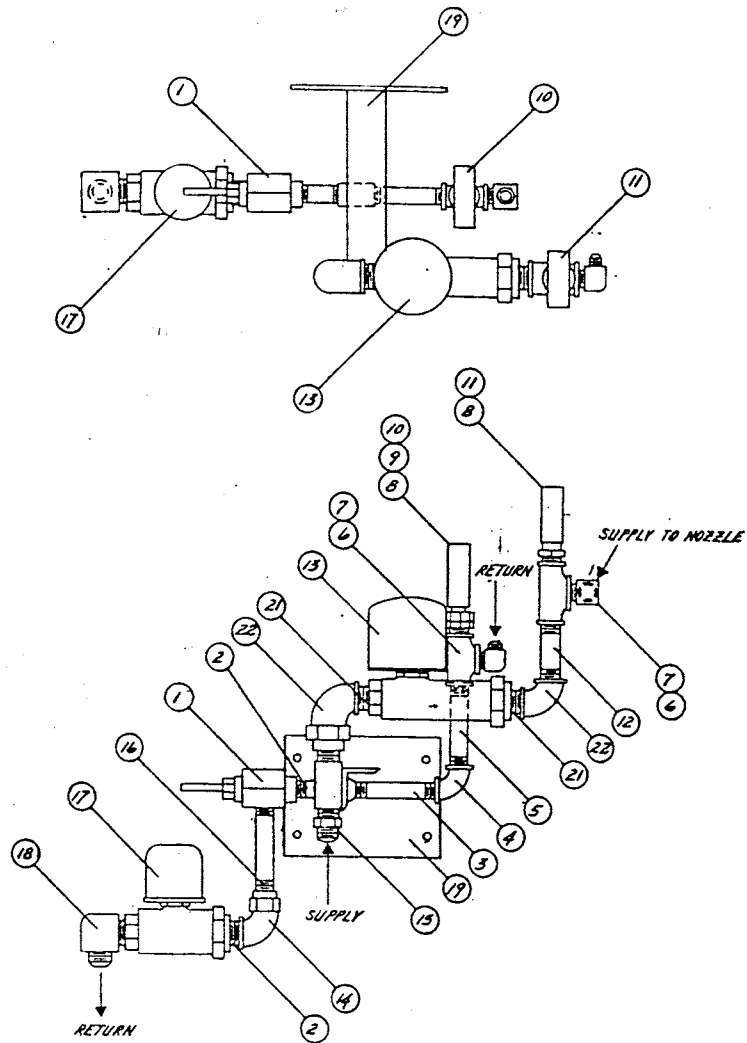
Ref. No.	No. Req'd	Part Name	Part No.
1	1	Fitting, 90°, 1/4" IPS x 3/8" SAE	051543
2	1	Tailpiece Valve Assembly	007464
3	1	Valve Body	070133
4	1	Hi-Lo Metering Valve	007510
5	2	Nipple, Short, 1/2" IPS	051008
6	1	Valve, Oil, Solenoid K10AB281	050657
7	1	Elbow 90°, 1/2" IPS	051270
8	1	Tee, 1/2" x 1/2" x 1/4"	103478
9	1	Bushing, Reducing, 1/2" x 1/4"	059979
10	1	Gauge, Pressure, 2-1/2", 0-30#, Fig. 1000	059319
11	1	Connector, BX, 90°, 3/8"	053262
12	2	Bushing, Anti-Short, 3/8"	050033
13	1	Conduit, Flexible, 3/8" x 9" Lg.	053269
14	1	Connector, BX, Str. 3/8"	050030
15	2	Nipple, 1/2" IPS x 3-1/2" Lg.	050776
16	1	Support Angle Assembly	191861
17	1	U-Bolt, Conduit, 1/2", MU-054	059189
18	1	Gauge, Temp., 3-1/2", 60° - 260°	069262
19	1	Bushing, 3/4" x 1/2"	051602
20	1	Tee, 1/2" x 3/4" x 1/2"	052072
21	1	Elbow, Male, 1/2" IPS x 5/8" SAE	051326

OIL METERING ARRANGEMENT (191860)



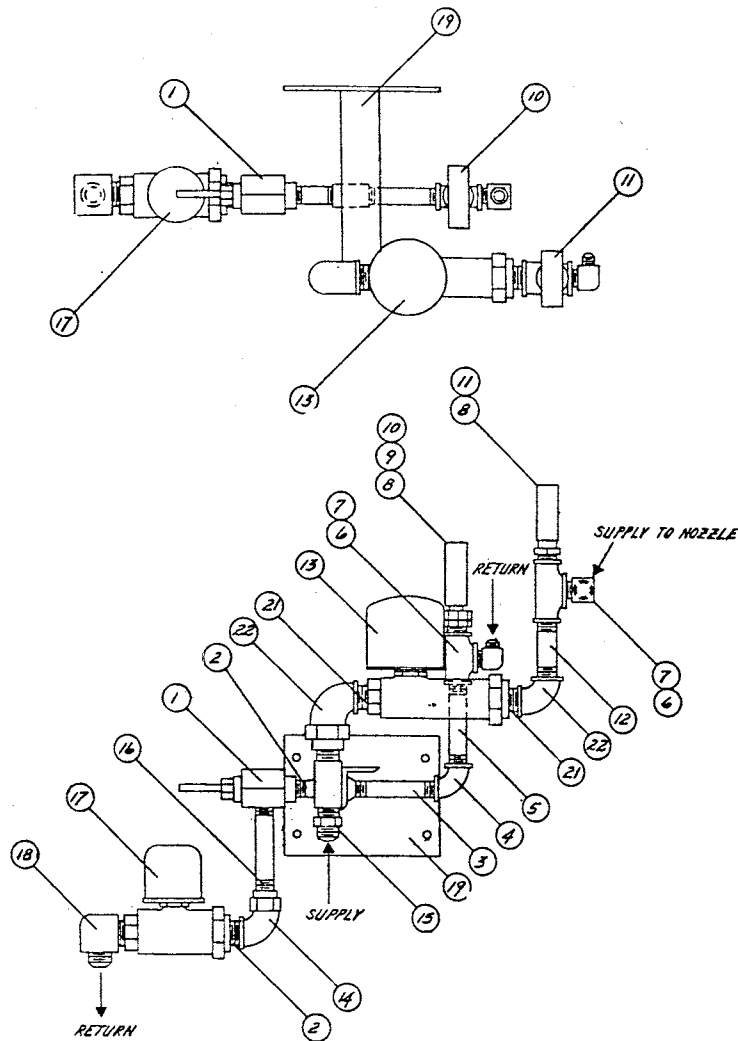
Ref. No.	No. Req'd	Part Name	Part No.
1	1	Connector, 90°, 1/4" IPS x 3/8" SAE	051543
2	1	Tailpiece Valve Assembly	007464
3	1	Valve Body	070133
4	1	Hi-Lo Metering Valve	007510
5	2	Nipple, Short, 1/2" IPS	051008
6	1	Valve, Oil, Solenoid, G.C. K10AB281	050657
7	1	Elbow 90°, 1/2" IPS	051270
8	1	Tee, 1/2" x 1/2" x 1/4"	103478
9	1	Bushing, Reducing, 1/2" x 1/4"	059979
10	1	Gauge, Pressure, 2-1/2", 0-30#	059319
11	1	Connector, BX, 90°, 3/8"	053262
12	2	Bushing, Anti-Short, 3/8"	050033
13	1	Conduit, Flexible, 3/8" x 9" Lg.	053269
14	1	Connector, BX, Str. 3/8"	050030
15	2	Connector, Male 1/2" IPS x 5/8" SAE	051097
16	2	Nut, Flare 5/8" SAE	050978
17	1	Tubing, Copper 5/8" O.D. x 72" Lg.	053712
18	1	Strainer, 3/4" IPS (Mtd. On Leg)	065220
19	1	Coupling, Reducing 3/4" x 1/2"	052169
20	1	Nipple, 1/2" IPS x 3-1/2" Lg.	050776
21	1	Support Angle Assembly	191861
22	1	U-Bolt, Conduit, 1/2"	059189
23	1	Nipple, 3/4" x 4" Lg.	051083
24	1	Strainer Support Angle	118392
25	1	U-Bolt, Conduit, 3/4"	067111
26	1	Connector, Male, 3/4" IPS x 5/8" SAE	068528

OIL METERING ARRANGEMENT (192175)



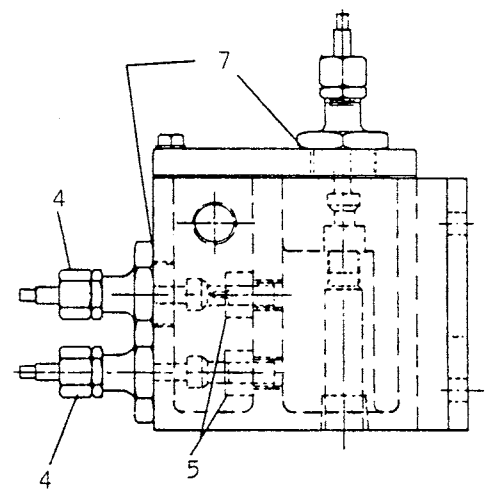
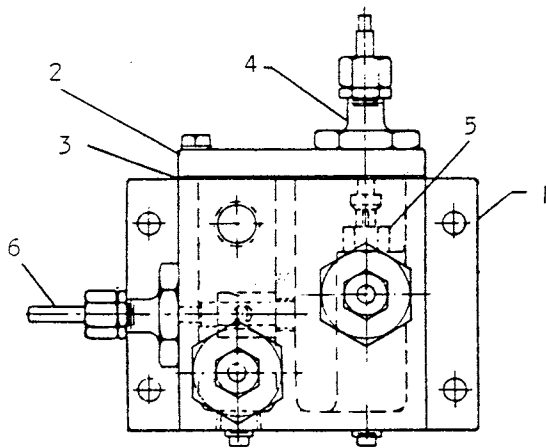
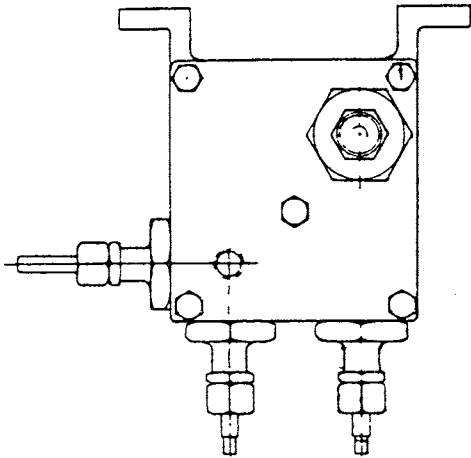
Ref. No.	No. Req'd	Part Name	Part No.
1	1	Hi-Lo Metering Valve	128452
2	5	Nipple, Close, 1/2"	050650
3	1	Nipple, 1/2" x 3-1/2" Lg.	050776
4	2	Elbow 90°, 1/2" IPS	051270
5	1	Nipple, 1/2" x 3-3/4" Lg.	051025
6	2	Tee, 1/2" x 1/2" x 1/4" IPS	103478
7	2	Fitting, 90°, 1/4" x 3/8" SAE	051543
8	2	Bushing, Reducing, 1/2" x 1/4"	059979
9	1	Snubber, #25B, 1/4" N.P.T., Male, 1/4" N.P.T. Female	067304
10	1	Gauge, Pressure, 0-160#, 2-1/2"	051089
11	1	Gauge, Pressure, 0-300#, 2-1/2"	066855
12	1	Nipple, 1/2" x 2-3/4" Lg.	051009
13	1	Valve, Solenoid 1/2", G.C. K10AB335	107165
14	2	Elbow, Union, 1/2" IPS	050645
15	1	Connector, Str., 1/2" IPS x 1/2" SAE	051251
16	1	Nipple, 1/2" x 7" Lg.	051086
17	1	Valve, Solenoid, 1/2", G.C. K10AB281	050657
18	1	Elbow, Male, 1/2" IPS x 3/8" SAE	056737
19	1	Metering Arrangement Support Assembly	192176

OIL METERING ARRANGEMENT (197425)



Ref. No.	No. Req'd	Part Name	Part No.
1	1	Hi-Lo Metering Valve	128452
2	2	Nipple, Close, 1/2"	050650
3	1	Nipple, 1/2" x 3-1/2" Lg.	050776
4	1	Elbow 90°, 1/2" IPS	051270
5	1	Nipple, 1/2" x 3-3/4" Lg.	051025
6	2	Tee, 1/2" x 1/2" x 1/4" IPS	103478
7	2	Fitting,, 90°, 1/4" x 3/8" SAE	051543
8	2	Bushing, Reducing, 1/2" x 1/4"	059979
9	1	Snubber, #25B, 1/4" N.P.T., Male, 1/4" N.P.T. Female	067304
10	1	Gauge, Pressure, 0-160#, 2-1/2"	051089
11	1	Gauge, Pressure, 0-300#, 2-1/2"	066855
12	1	Nipple, 1/2" x 2-3/4" Lg.	051009
13	1	Valve, Solenoid 3/4", G.C. K10AD1037	106200
14	1	Elbow, Union, 1/2" IPS	050645
15	1	Connector, Str., 3/4" IPS x 3/4" SAE	050656
16	1	Nipple, 1/2" x 7" Lg.	051086
17	1	Valve, Solenoid, 1/2", G.C. K10AB281	050657
18	1	Elbow, Male, 1/2" IPS x 5/8" SAE W-H #49 x 10	051326
19	1	Metering Arrangement Support Assembly	197426

VISCOSITY COMPENSATOR ASSEMBLY (112988)

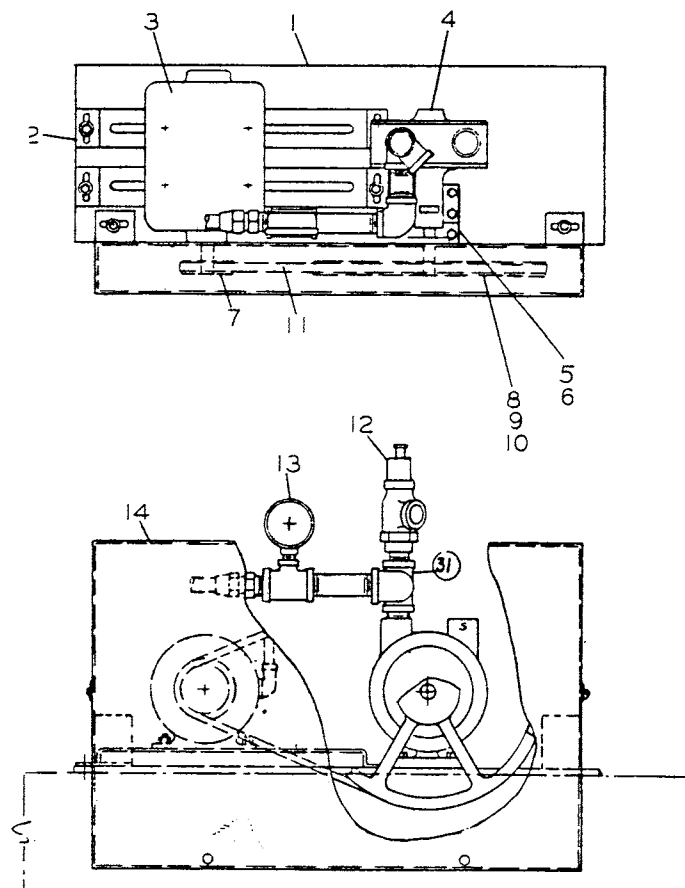


Ref. No.	No. Req'd	Part Name	Part No.
1	1	Housing	112454
2	1	Cover	112462
3	1	Gasket, Cover	112989
4	3	Inlet Valve Assembly	035694
5	3	Valve Seat	035676
6	1	Metering Valve Assembly	035697
7	4	Gaskets	035698

OIL PUMP SET ARRANGEMENT (143520)

SERIES 564 175 THRU 225 HP

#2 & N2 THREE PHASE MOTOR



Ref No.	No. Req'd	Part Name	Part No.
1	1	Pump and Motor Base	154259
2	2	Motor Adjusting Rail Assembly	125684
3	1	Motor 3/4 HP, 1800 RPM, #56 Fr., 3 Phase	051375
4	1	Pump, Tuthill #2CGx737 Style A	064956
5	1	Bearing Bracket	085688
6	1	Bearing, Fafnir #S7KDD	069051
7	1	Motor Sheave 3.0" O.D. "A" Sect. 5/8" Bore	068492
8	1	Pump Sheave 6.0" O.S. "A" Sect. 1 FA-60	056928
9	1	5/8" FT Bushing	061977
10	1	#7 Woodruff Key	056474
11	1	V-Belt #2350	052059
12	1	Relief Valve Fig. 200A 100# Spring	103108
13	1	Pressure Gauge 2-1/2" 0-160#	051089
14	1	Belt Guard Assembly	158780

OPTIONAL SINGLE PHASE ARRANGEMENT #143505

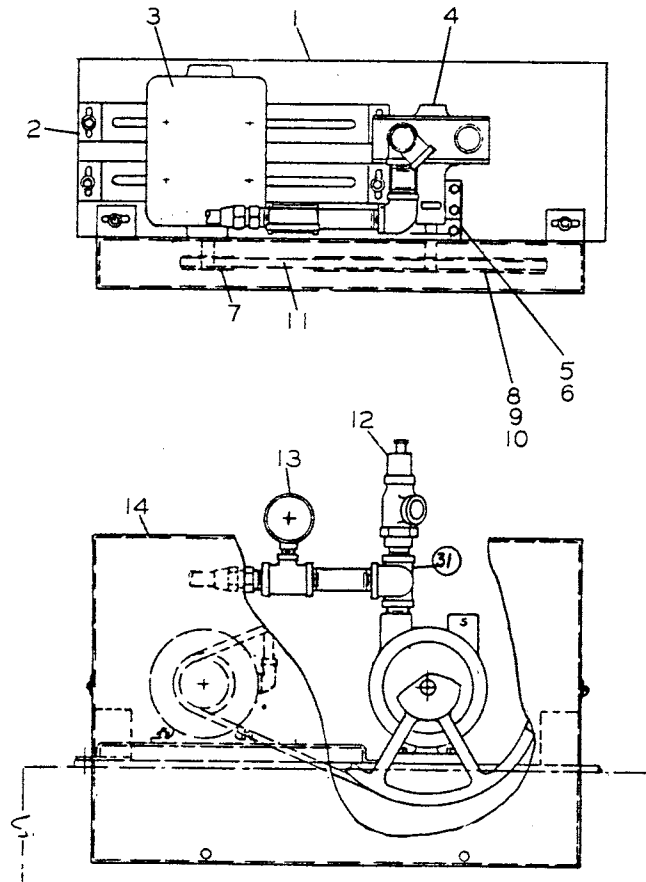
1 - MOTOR, 1 PHASE, 3/4 HP, Fr. 56 #104780

For breakdown on parts for pump set, see page 95.

OIL PUMP SET ARRANGEMENT (113472)

SERIES 564 175 THRU 225 HP

#5 & N5 THREE PHASE MOTOR



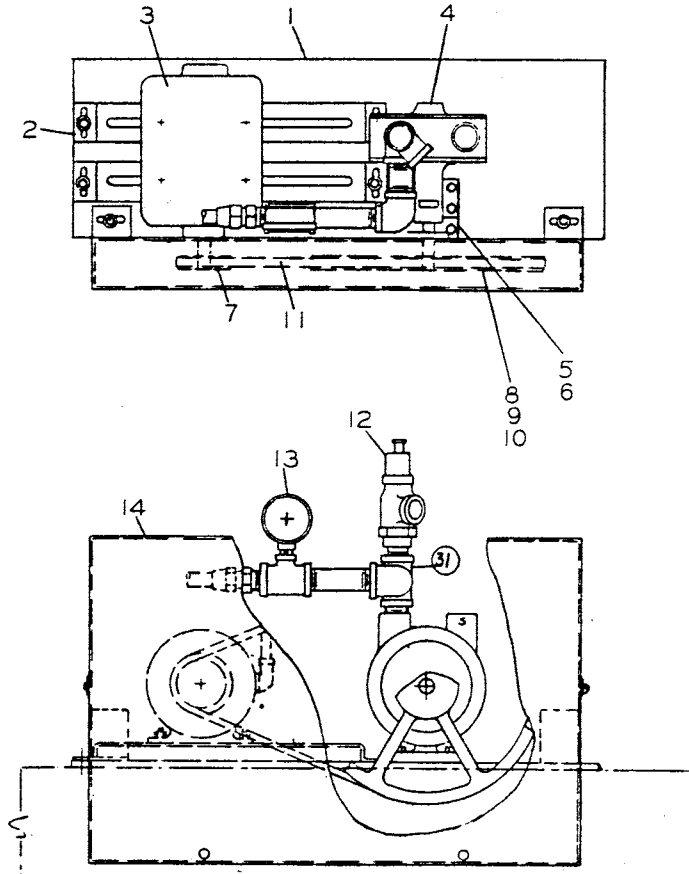
Ref No.	No. Req'd	Part Name	Part No.
1	1	Pump and Motor Base	154259
2	2	Motor Adjusting Rail Assembly	125684
3	1	Motor 1/2 HP, 1800 RPM, #56 Fr., 3 Phase	052378
4	1	Pump, Tuthill #2CGx737 Style A	064956
5	1	Bearing Bracket	085688
6	1	Bearing, Fafnir #S7KDD	069051
7	1	Motor Sheave 3.3" O.D. "A" Sect. 5/8" Bore	068904
8	1	Pump Sheave 12.05" O.D. "A" Sect.	061949
9	1	5/8" FT Bushing	061977
10	1	#7 Woodruff Key	056474
11	1	V-Belt #2480	064519
12	1	Relief Valve Fig. 200A 100# Spring	103108
13	1	Pressure Gauge 2-1/2" 0-160#	051089
14	1	Belt Guard Assembly	158780

OPTIONAL SINGLE PHASE ARRANGEMENT #111480

1 - MOTOR, 1 PHASE, 1/2 HP, Fr. 56 #068648

For breakdown on parts for pump set, see page 95.

OIL PUMP SET ARRANGEMENT (154853)
SERIES 576 250, 300, 350 HP
#2 & N2 THREE PHASE MOTOR



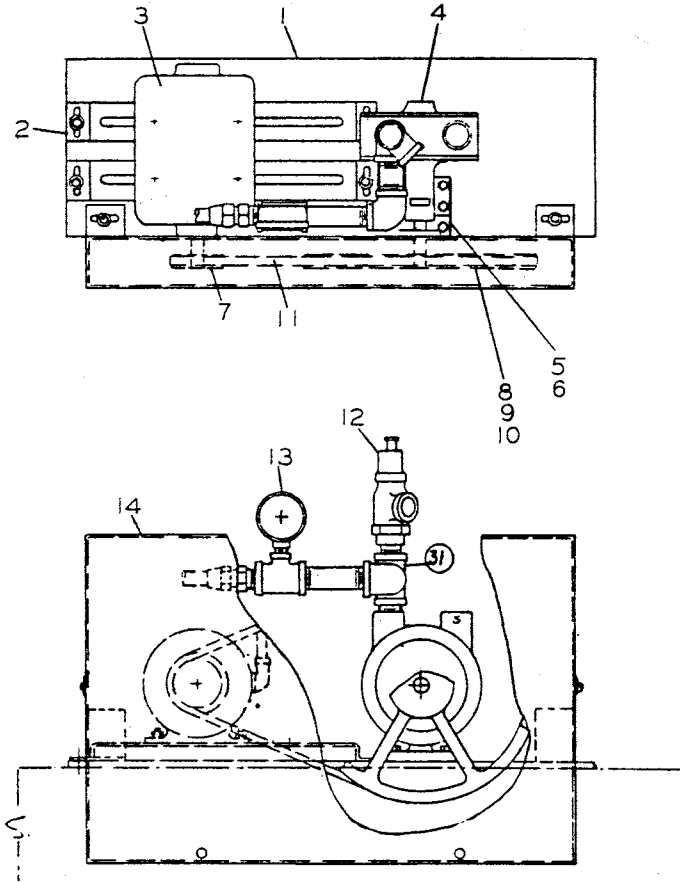
Ref No.	No. Req'd	Part Name	Part No.
1	1	Pump and Motor Base	151604
2	2	Motor Adjusting Rail Assembly	125684
3	1	Motor 1 HP, 1800 RPM, 3 Phase	104360
4	1	Pump, Tuthill #3CGx737 Style A	059914
5	1	Bearing Bracket	085693
6	1	Bearing, Fafnir #S8KDD	069052
7	1	Motor Sheave 3.0" O.D. "A" Sect. 7/8" Bore	068493
8	1	Pump Sheave 6.0" O.D.- 1 FA-60	056928
9	1	3/4" FT Bushing	061978
10	1	#7 Woodruff Key	056474
11	1	V-Belt #2350	052059
12	1	Relief Valve Fig. 200A 100# Spring	103108
13	1	Pressure Gauge 2-1/2" 0-160#	051089
14	1	Belt Guard Assembly	158780

OPTIONAL SINGLE PHASE ARRANGEMENT #154148

1 - MOTOR, 1 PHASE, 1800 RPM #104932

For breakdown on parts for pump set, see page 95.

OIL PUMP SET ARRANGEMENT (152180)
SERIES 576 250, 300 & 350 HP
#5 & N5 THREE PHASE MOTOR



Ref No.	No. Req'd	Part Name	Part No.
1	1	Pump and Motor Base	151604
2	2	Motor Adjusting Rail Assembly	125684
3	1	Motor 3/4 HP, 1800 RPM, #56 Fr., 3 Phase	051375
4	1	Pump, Tuthill #3CGx737 Style A	059914
5	1	Bearing Bracket	085693
6	1	Bearing, Fafnir #S8KDD	069052
7	1	Motor Sheave 3.3" O.D. "A" Sect. 5/8" Bore	068904
8	1	Pump Sheave 12.05" O.D. "A" Sect.	061949
9	1	3/4" FT Bushing	061978
10	1	#7 Woodruff Key	056474
11	1	V-Belt #2480	064519
12	1	Relief Valve Fig. 200A 100# Spring	103108
13	1	Pressure Gauge 2-1/2" 0-160#	051089
14	1	Belt Guard Assembly	158780

OPTIONAL SINGLE PHASE ARRANGEMENT #152179

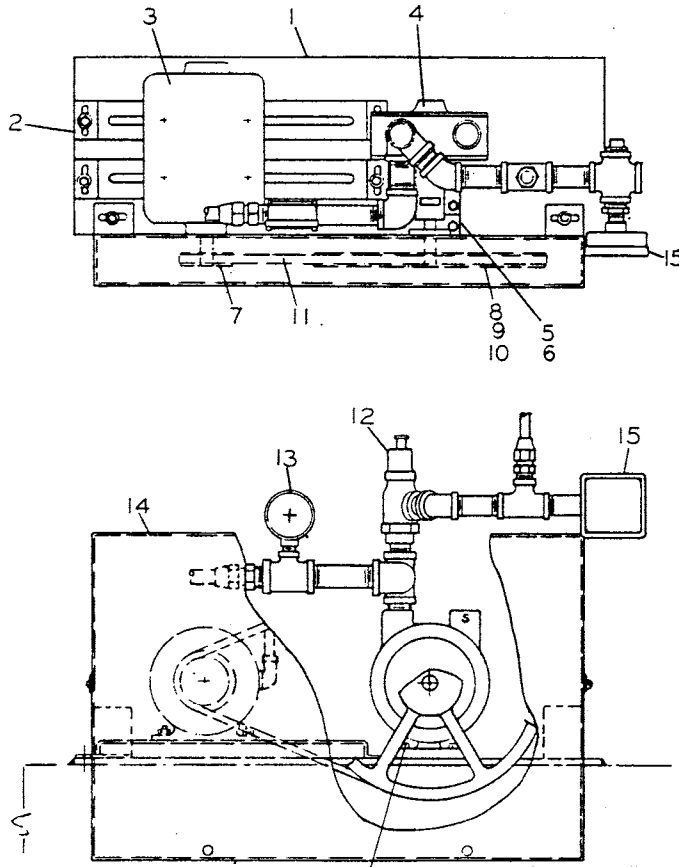
1 - MOTOR, 1 PHASE, 3/4 HP, 1800 RPM #104780

For breakdown on parts for pump set, see page 95.

OIL PUMP SET ARRANGEMENT (113474)

SERIES 564 175, 200 & 225 HP

#6 & N6 THREE PHASE MOTOR



Ref No.	No. Req'd	Part Name	Part No.
1	1	Pump and Motor Base	154259
2	2	Motor Adjusting Rail Assembly	125684
3	1	Motor 1/2 HP, 1800 RPM, #56 Fr., 3 Phase	052378
4	1	Pump, Tuthill #2CGx737 Style A	064956
5	1	Bearing Bracket	085688
6	1	Bearing, Fafnir #S7KDD	069051
7	1	Motor Sheave 3.3" O.D. "A" Sect. 5/8" Bore	068904
8	1	Pump Sheave 12.05" O. D. "A" Sect. 1 FA-60	061949
9	1	5/8" FT Bushing	061977
10	1	#7 Woodruff Key	056474
11	1	V-Belt #2480	064519
12	1	Relief Valve Fig. 200A 100# Spring	103108
13	1	Pressure Gauge 2-1/2" 0-160#	051089
14	1	Belt Guard Assembly	158780
*15	2	Temp. Gauge 3-1/2", Fig. 64, 60° to 260°	069262

* 1 Gauge shipped loose for field installation.

OPTIONAL SINGLE PHASE ARRANGEMENT #111483

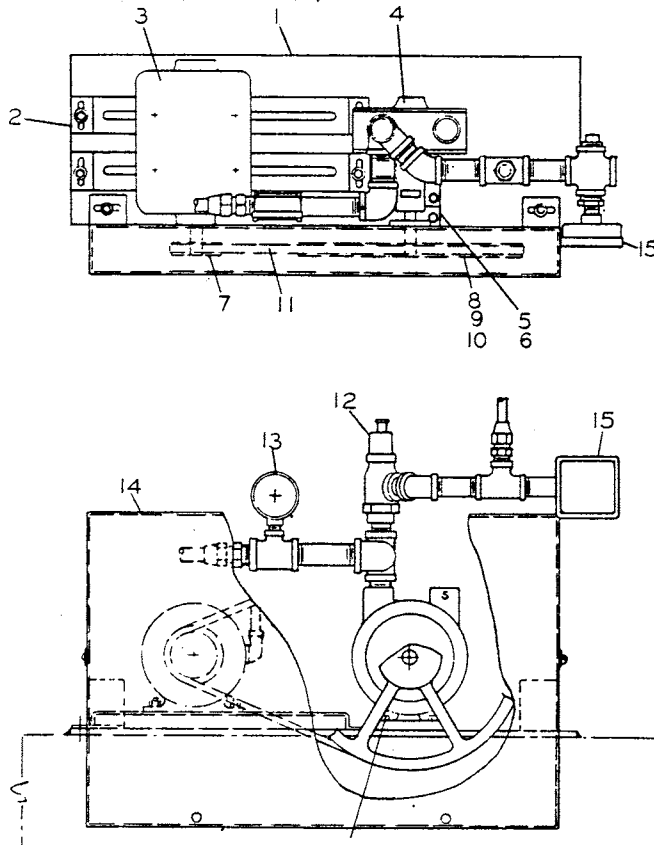
1 - MOTOR, 1 PHASE, 1/2 HP, Fr. 56 #068648

For breakdown on parts for pump set, see page 95.

OIL PUMP SET ARRANGEMENT (151606)

SERIES 576 250, 300 & 350 HP

#6 & N6 THREE PHASE MOTOR



Ref No.	No. Req'd	Part Name	Part No.
1	1	Pump and Motor Base	151604
2	2	Motor Adjusting Rail Assembly	125684
3	1	Motor 3/4 HP, 1800 RPM, #56 Fr., 3 Phase	051375
4	1	Pump, Tuthill #3CGx737 Style A	059914
5	1	Bearing Bracket	085693
6	1	Bearing, Fafnir #S8KDD	069052
7	1	Motor Sheave 3.3" O.D. "A" Sect. 5/8" Bore	068904
8	1	Pump Sheave 12.05" O. D. "A" Sect.	061949
9	1	3/4" FT Bushing	061978
10	1	#7 Woodruff Key	056474
11	1	V-Belt #2480	064519
12	1	Relief Valve Fig. 200A 100# Spring	103108
13	1	Pressure Gauge 2-1/2" 0-160#	051089
14	1	Belt Guard Assembly	158780
*15	2	Temp. Gauge 3-1/2", Fig. 64 60° to 260°	069262

* 1 Gauge shipped loose for field installation.

OPTIONAL SINGLE PHASE ARRANGEMENT #151605

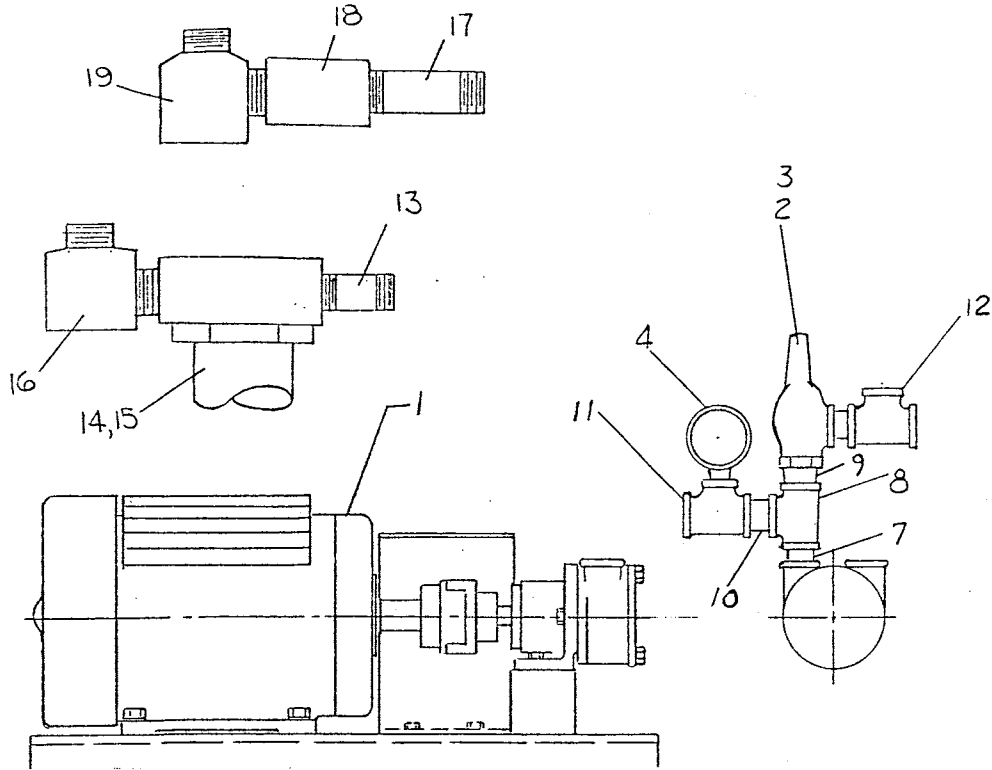
1 - MOTOR, 1 PHASE, 3/4 HP, 1800 RPM #104780

For breakdown on parts for pump set, see page 95.

OIL PUMP SET ARRANGEMENT (143535)

SERIES 564 175 THRU 225 HP

SERIES 576 250 THRU 350 HP



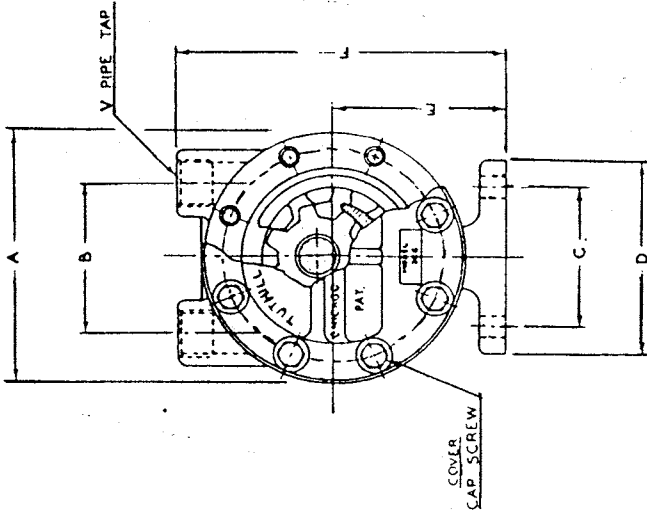
Ref No.	No. Req'd	Part Name	Part No.
*1	1	Pump Set -Consists of:	143531
	1	Oil Pump, Tuthill #2LA	107948
	1	Pump Foot, OL-81	107243
	1	Motor, 1-1/2 HP, 230-460/3	105790
	1	Coupling, Pump Half, Lovejoy L-090 7/16"	064328
	1	Coupling, Spider, Lovejoy #8491	056794
	1	Coupling, Motor Half, Lovejoy L-090 7/8"	103880
	2	Coupling Guard	162258
	1	Support Stand	162257
2	1	Valve, Relief, 3/4"	051015
3	1	Spring, Relief Valve, #B4432-14	108042
4	1	Gauge, Pressure 0-300#	066855
**5	1	Starter 16BE32AF	108031
6	1		
7	1	Nipple, 1/2" x 2-1/2" Lg.	050653
8	1	Tee, 3/4" x 1/2" x 3/4" IPS	051708
9	1	Nipple, Close, 3/4" IPS	040796
10	1	Nipple, 3/4" x 1-1/2" Lg.	050797
11	1	Tee, 3/4" x 3/4" x 1/4" IPS	060580
12	1	Tee, 3/4" IPS	050873
13	1	Nipple, Short, 3/4" x 2" Lg.	050771
14	1	Cartridge, Micro-Klean #44153-01	107093
15	1	Filter, 300 PSI, Cuno, 3/4" CT-101-44153-01	107094
16	1	Fitting, Tube, 90°, 3/4" IPS x 3/4" SAE	050656
17	1	Nipple, 3/4" x 3" Lg.	051026
18	1	Coupling, Whole, Ex. Heavy 3/4" IPS	051344
19	1	Fitting, Tube 90°, 3/4" IPS x 3/4" SAE	050656

* OPTIONAL SINGLE PHASE PUMP SET 143536 Substitute Single Phase Motor 105109 Fr. # 145T

**In Control Panel

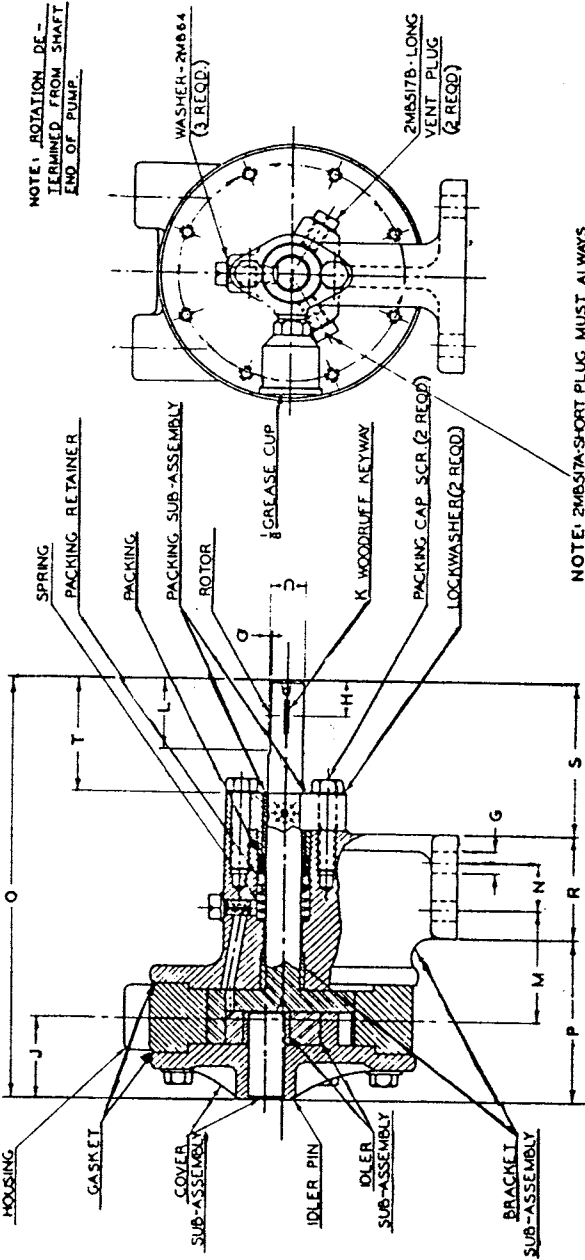
For breakdown on parts for pump set, see page 95.

GENERAL ASSEMBLY OF OIL PUMP (AIR ATOMIZATION)

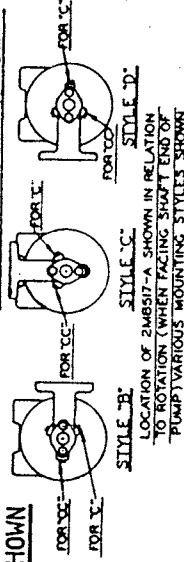


Pump Size	Stamp Tag	Tag No.
2	2CIG	#825
3	3CIG	#825
4	4CIG	#825

Symbol "C" indicates fixed land packed type.
 Symbol "G" indicates spring loaded packing.



NOTE: 2MB517A SHORT PLUG MUST ALWAYS BE ON SUCTION SIDE OF PUMP



NOTE: 2MB517-A SHOWN IN RELATION TO ROTATION (WHEN FACING SHAFT END OF PUMP) VARIOUS MOUNTING STYLES SHOWN

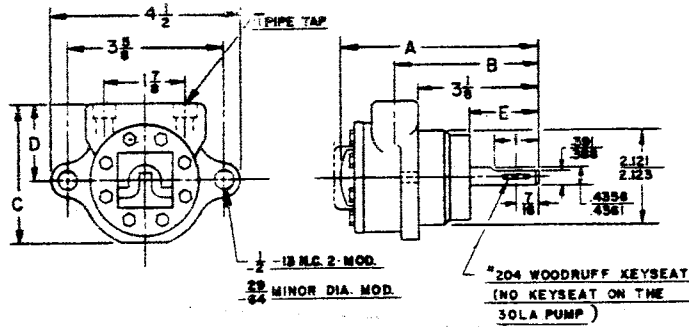
2CIG-CC PUMP STYLE 'A' MOUNTING SHOWN

Pump Size	Bracket Sub-Assembly		Cover Sub-Assembly		Idler Sub-Assembly		Packing Sub-Assembly		Housing	Rotor	Gasket	Spring	Packing Retainer	Packing	Gland Cap Screw	Cover Cap Screw	Grease Cup	Lock-washer			
	Bracket	Bush.	Cover	Idler Pin	Idler	Bush.	*Gland	*Bush.													
2CIG	5-7/32	3-1/8	2-1/2	3-1/2	3	6-11/16	25/64	21/32	1-1/2	#606	1-1/4	1-15/16	7/8	7-9/16	2-15/16	1/16	1-7/8	2-3/4	2-1/16	5/8	1-11-1/2
3CIG	6-5/8	4-1/8	3	4	3-7/8	8-3/4	29/64	21/32	1-3/32	#606	1-1/4	2	1-1/4	8-17/32	3-15/32	1/16	2-1/4	2-13/16	1-25/32	3/4	1-1/4 - 1-1/2
4CIG	6-1/2	4-1/8	3	4	3-7/8	8	29/64	21/32	2-5/16	#606	1-1/4	2-11/32	1-1/4	9-7/32	4-5/32	1/16	2-1/4	2-13/16	1-25/32	3/4	1-1/2 - 1-1/2

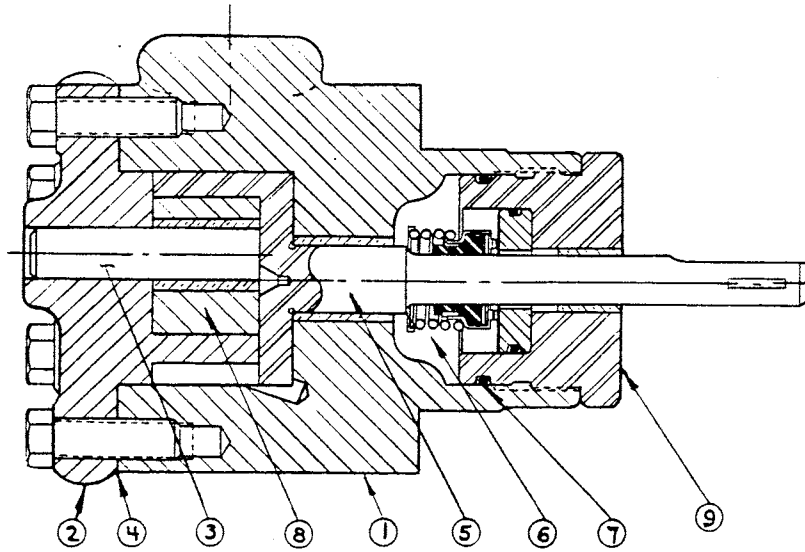
Pump Size	Bracket Sub-Assembly		Cover Sub-Assembly		Idler Sub-Assembly		Packing Sub-Assembly		Housing	Rotor	Gasket	Spring	Packing Retainer	Packing	Gland Cap Screw	Cover Cap Screw	Grease Cup	Lock-washer						
	Bracket	Bush.	Cover	Idler Pin	Idler	Bush.	*Gland	*Bush.																
2CIG	2CG20	2M71	2M6	2M35	2M3	2M5	2M32	2M33	2CG7	2CG41	2CG70	2CG22	2CG24	2MB4	2CM73-O.S.	2CG92	2CG94	2CG94	2CG94	P101-3	P101-3	P100-2	P100-1	P100-4
3CIG	3CG20	3M71	3M6	3M35	3M3	3M5	3M32	3M33	3CG7	3CG41	3CG70	3CG22	3CG24	3MB4	3CG73	3CG92	3CG94	3CG94	3CG94	P101-3	P101-3	P101-1	P101-1	P100-4
4CIG	3CG20	3M71	4M6	4M35	4M3	4M5	4M32	4M33	3CG7	3CG41	3CG70	4CI022	4CG24	3MB4	3CG73	3CG92	3CG94	3CG94	3CG94	P101-3	P101-4	P101-4	P101-1	P100-4

GENERAL ASSEMBLY OF OIL PUMP (PRESSURE ATOMIZATION)

DIMENSIONAL
DATA AND
PUMP RATINGS



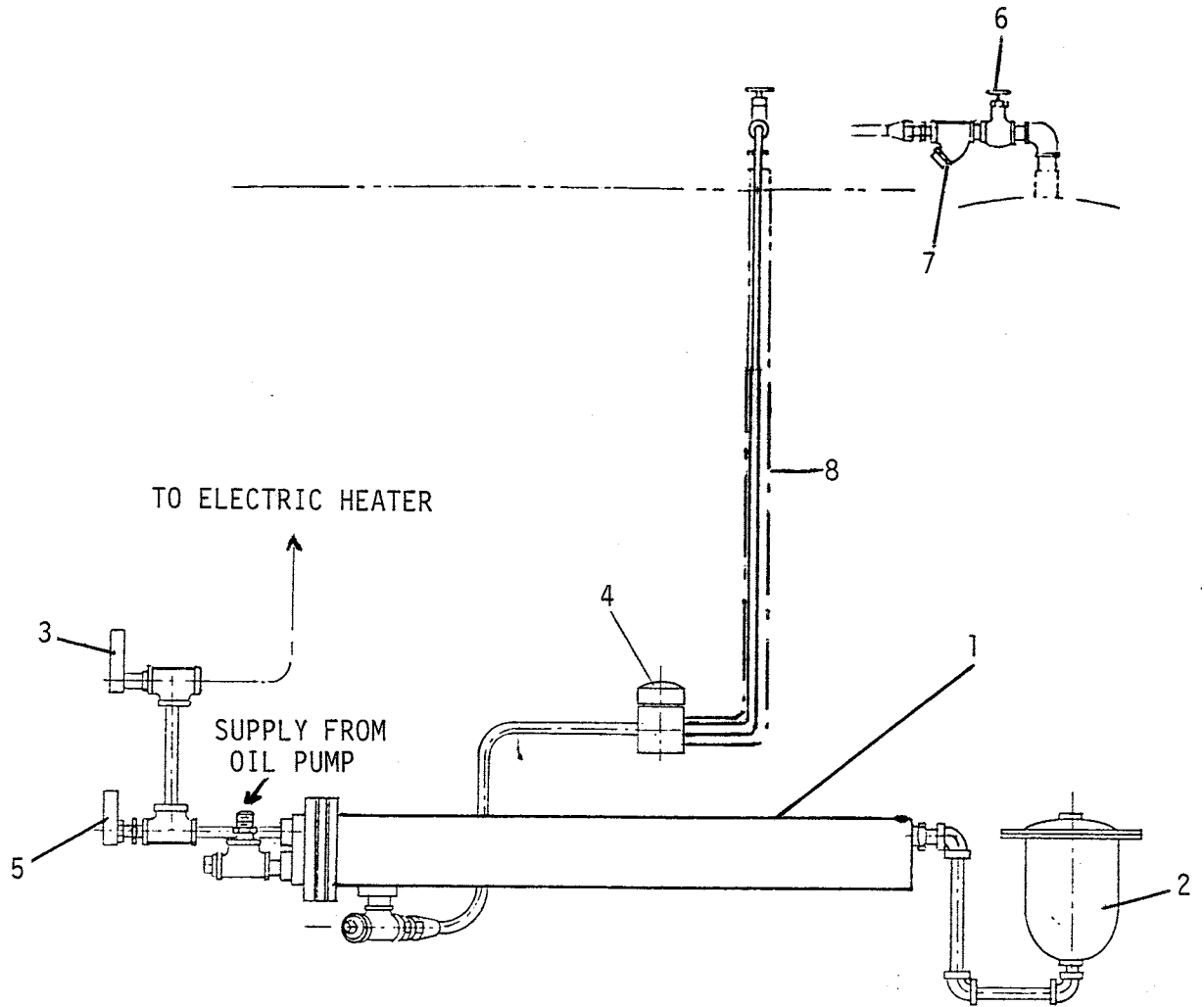
PUMP MODEL	NOMINAL CAPACITY GPM		PUMP DIMENSIONS					
	3600 RPM	1800 RPM	A	B	C	D	E	T
30LA	.9	.5	5-5/32	3-29/32	3-3/32	1-11/16	1-9/16	3/8-18
00LA	2.1	1.0	5-3/8	3-29/32	3-3/32	1-11/16	1-7/8	1/2-14
0LA	3.7	1.8	5-3/8	3-29/32	3-3/32	1-11/16	1-7/8	1/2-14
1LA	6.3	3.2	5-3/4	3-29/32	3-3/32	1-11/16	1-7/8	1/2-14
2LA	11.8	6.2	6-3/8	4-21/32	3-21/32	2	1-1/2	1/2-14



SERIES 2LA PUMP PARTS LIST

Item No.	Part Description - All Models	Size 2 - Part No.
1	Housing Assembly	2LA2
	Cover Assembly	2L6
2	Cover	2L35
3	Idler Pin	2L31
4	Cover Gasket	2RFD34
5	Rotor	2LA24
6	Seal Assembly (Buna N)	1LA9
7	O-Ring (Buna N)	P701-34-37
8	Idler Gear	2L32-1
9	Housing Plug Assembly	2LA11

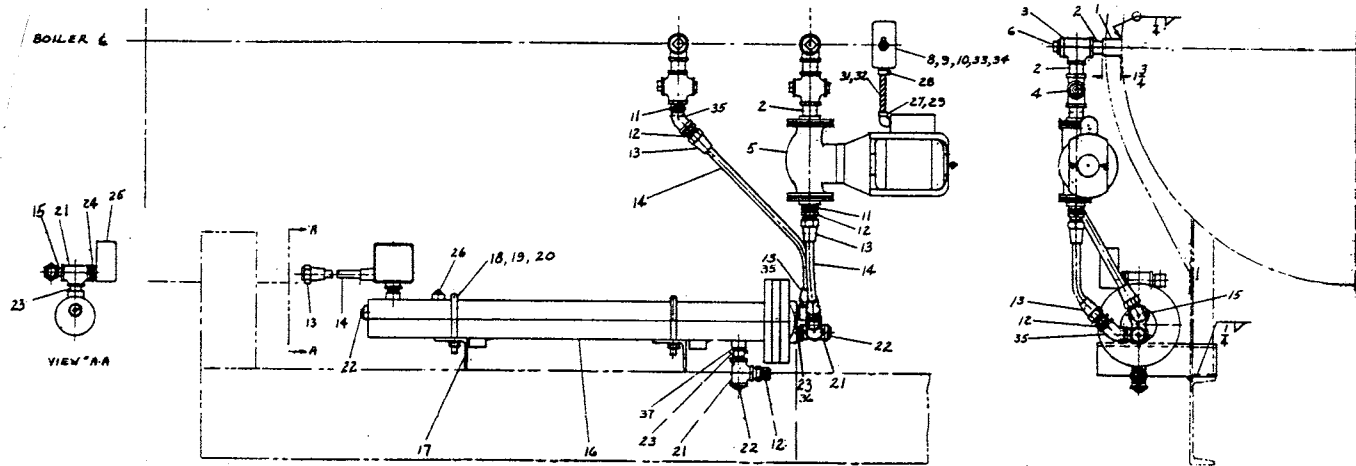
STEAM HEATER ARRANGEMENT (132857)
USED ON SPH BOILERS ONLY
SERIES 564 & 576 175 THRU 350 HP
#6 AND N6



PARTS LIST FOR STEAM HEATER ARRANGEMENT (132857)
 USED ON SPH BOILERS ONLY
 SERIES 564 & 576 175 THRU 350 HP
 #6 AND N6

Ref. No.	No. Req'd	Part Name	Part No.
1	1	Steam Oil Preheater, Alstrom #6ST70	066150
2	1	Trap, Expansion, Armstrong	104611
3	1	Gauge, Temperature, 3-1/2", 60° – 260°, Fig. 64	069262
4	1	Solenoid Valve 1/2", G.C. #S211AHO2T2DG1	061267
5	1	Aquastat, Honeywell L4006A-1017	053112
6	1	Valve, Globe, 1/2"	052409
7	1	Strainer, Screwed, 1/2" IPS, Type 250	052514
8	1	Sleeving, Braided Syntherm 1/16" Wall x 1/2" ID x 5/8" OD (10 Ft.)	109747

HOT WATER HEATER ARRANGEMENT (111484)
USED ON SPL & SPW BOILERS ONLY
SERIES 564 175 HP
#6 & N6



Part No.	No. Req'd	Part Name	Part No.
1	2	1" IPS E.H. Whole Coupling	051114
2	5	1" IPS x 2" Lg. Nipple	051142
3	2	1" IPS Tee	052448
4	2	1" IPS Sq. Hd. Cock Valve	101140
5	1	1" B & G Circulator 115/60/1 H-100	063769
6	2	1" IPS Plug	065385
7			
8	1	2-1/8 x 2-1/8 x 4-1/8 #2022 Outlet Box	051535
9	1	2-1/8 x 4-1/8 Outlet Box Cover #21	051536
10	1	Toggle Switch - SPST #82600	061280
11	2	1" IPS x 3/4 IPS Hex Bushing	050858
12	4	3/4 IPS x 3/4 SAE Str. Male Conn.	050656
13	6	3/4 Flare Nut	051360
14	10 ft.	3/4 O.D. Copper Tubing	053213
15	2	3/4 IPS x 3/4 SAE x 90° Male Conn.	052457
16	1	Hot Water Heater OH-424	066150
17	2	Heater Mounting Angle	095272
18	2	4" U-Bolt	052053
19	4	3/8 16NC-2 Hex Nut	050023
20	4	3/8 Lockwasher	050229
21	3	3/4 IPS Tee	050873
22	3	3/4 IPS Pipe Plug	050171
23	3	3/4 IPS x 2" Lg. Nipple	050771
24	1	3/4 IPS x 1/2 IPS Hex Bushing	051602
25	1	Temperature Gauge, 3-1/2 Fig. #64, 60° - 260°	069262
26	1	1/2 IPS Pipe Plug	050647
27	1	3/8 x 90° BX Conn.	050012
28	1	3/8 Str. BX Conn.	050030
29	2	3/8 Anti-Short Bushing	050033
30	2	1/2" Conduit Locknut	050810
31	12 in.	3/8 Flexible Conduit	053269
32	24 in.	#14 Ga. Awg. Wire	052612
33	4	Insulator	023434
34	2	#10 x 1-1/4 Lg. Self-Tapping Scr.	050541
35	1	2" x 3/4" IPS Hex Bushing	052465
36	1	1-1/4 x 3/4 IPS Hex Bushing	052502
37	2	1-1/2 x 3/4 IPS Hex Bushing	055992
38	2	3/4 x 45° Street Elbow	051077

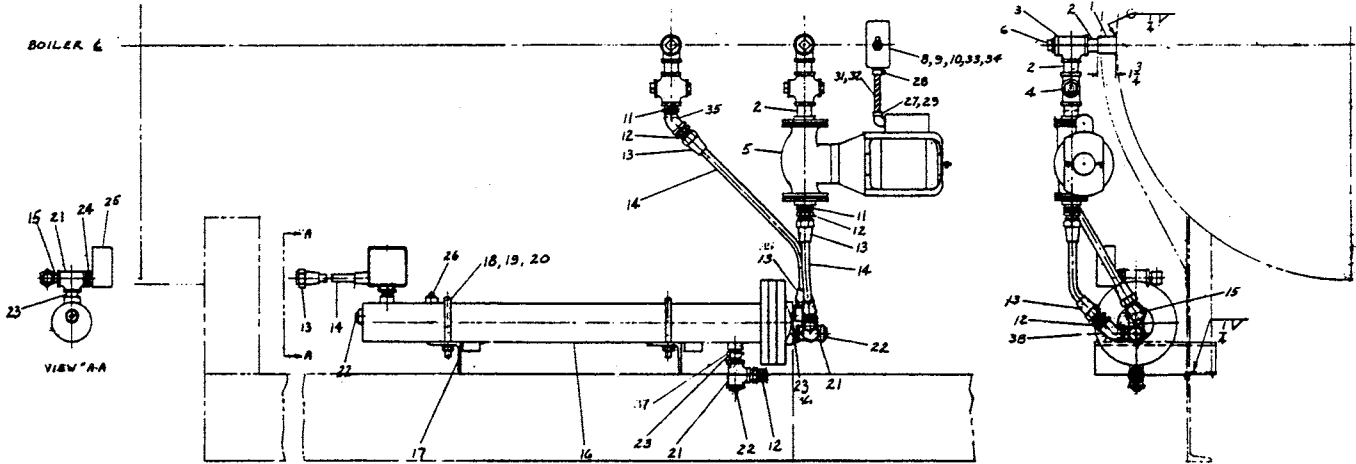
HOT WATER HEATER ARRANGEMENT (111485)

USED ON SPL & SPW BOILERS ONLY

SERIES 564 200 & 225 HP

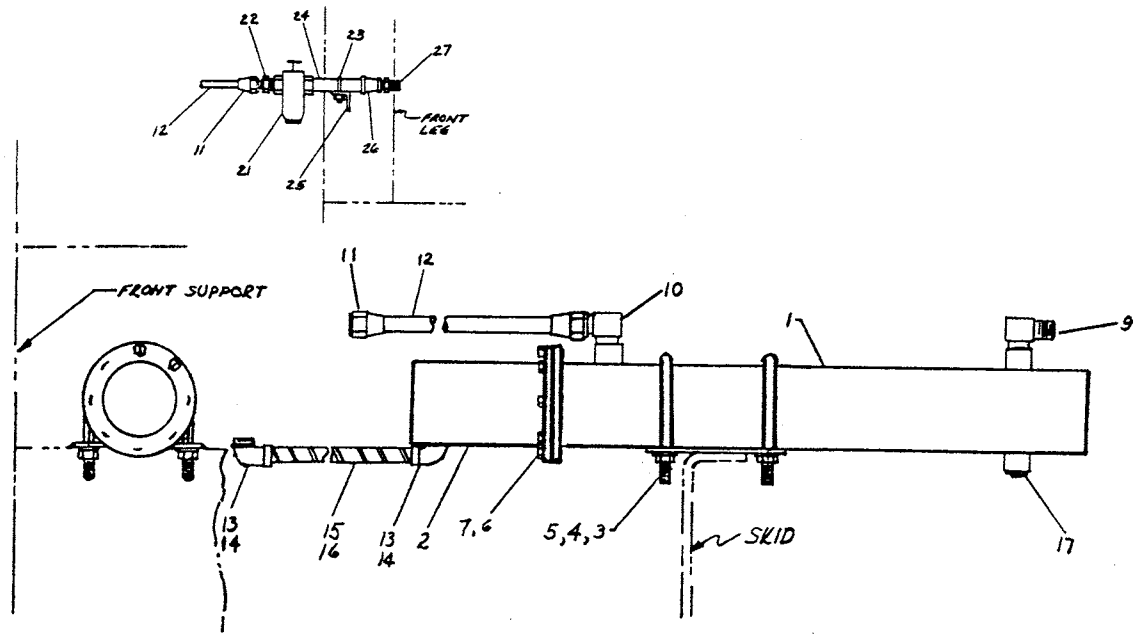
SERIES 576 250, 300 & 350 HP

#6 & N6



Part No.	No. Req'd	Part Name	Part No.
1	2	1" IPS E.H. Whole Coupling	051114
2	5	1" IPS x 2" Lg. Nipple	051142
3	2	1" IPS Tee	052448
4	2	1" IPS Sq. Hd. Cock Valve	101140
5	1	1" B & G Circulator 115/60/1 H-100	063769
6	2	1" IPS Plug	065385
7			
8	1	2-1/8 x 2-1/8 x 4-1/8 #2022 Outlet Box	051535
9	1	2-1/8 x 4-1/8 Outlet Box Cover #21	051536
10	1	Toggle Switch - SPST #82600	061280
11	2	1" IPS x 3/4 IPS Hex Bushing	050858
12	4	3/4 IPS x 3/4 SAE Str. Male Conn.	050656
13	6	3/4 Flare Nut	051360
14	10 ft.	3/4 O.D. Copper Tubing	053213
15	2	3/4 IPS x 3/4 SAE x 90° Male Conn.	052457
16	1	Hot Water Heater OH-436	066304
17	2	Heater Mounting Angle	095272
18	2	4" U-Bolt	052053
19	4	3/8 16NC-2 Hex Nut	050023
20	4	3/8 Lockwasher	050229
21	3	3/4 IPS Tee	050873
22	3	3/4 IPS Pipe Plug	050171
23	3	3/4 IPS x 2" Lg. Nipple	050771
24	1	3/4 IPS x 1/2 IPS Hex Bushing	051602
25	1	Temperature Gauge, 3-1/2 Fig. #64, 60° - 260°	069262
26	1	1/2 IPS Pipe Plug	050647
27	1	3/8 x 90° BX Conn.	050012
28	1	3/8 Str. BX Conn.	050030
29	2	3/8 Anti-Short Bushing	050033
30	2	1/2" Conduit Locknut	050810
31	12 in.	3/8" Flexible Conduit	053269
32	24 in.	#14 Ga. Awg. Wire	052612
33	4	Insulator	023434
34	2	#10 x 1-1/4 Lg. Self-Tapping Screw	050541
35	1	2" x 3/4" IPS Hex Bushing	052465
36	1	1-1/4 x 3/4 IPS Hex Bushing	052502
37	2	1-1/2 x 3/4 IPS Hex Bushing	055992
38	2	3/4 x 45° Street Elbow	051077

ELECTRIC HEATER ARRANGEMENT (111454)
SPL-SPH-SPW SERIES 564 175, 200 & 225 HP - #5 & N5
SPL-SPH SERIES 564 175, 200 & 225 HP - #6 & N6



Part No.	No. Req'd	Part Name	Part No.
1	1	Electric Preheater Case Assembly	095626
2	1	Heater Element (See Chart)	
3	2	3" U-Bolt	051925
4	4	3/8 - 16NC-2 Hex Nut	050023
5	4	3/8 Lockwasher	050229
6	8	1/4 - 20NC-2 x 3/4 Lg. Hex Hd. Cap Screw	051179
7	8	1/4 Lockwasher	050046
8	1	Support Plate	151607
9	2	1/2 IPS x 3/4 SAE Male 90° Conn.	051599
10	2	1/2 IPS x 5/8 SAE Male 90° Conn.	051326
11	4	5/8" Flare Nut	050978
12	3 ft.	5/8" O.D. Copper Tubing	053712
13	2	3/8" x 90° BX Connector	050012
14	2	3/8" Anti-Short Bushing	050033
15	3 ft.	3/8" Flexible Conduit	053269
16	4 ft.	#14 Ga. AWG Wire	052612
17	1	1/2" IPS Pipe Plug	050647
18	1	3/8 Conduit Clamp	050523
19	2	Conduit Insulator	023434
20			
21	1	Strainer, 3/4" IPS	065220
22	1	3/4" IPS x 5/8" SAE Male Conn.	068528
23	1	3/4" Conduit U-Bolt	067111
24	1	3/4" IPS x 4" Lg. Nipple	051083
25	1	Strainer Support Angle	118392
26	1	3/4" x 1/2 Red. Coupling	052169
27	1	1/2" IPS x 5/8" SAE Male Conn.	051097

Model	Heater Element	Part No.	Arrangement No.
5000 Watt Heater Arrangement	ADF-5-230-20	059284	111454

ELECTRIC HEATER ARRANGEMENT (111457)

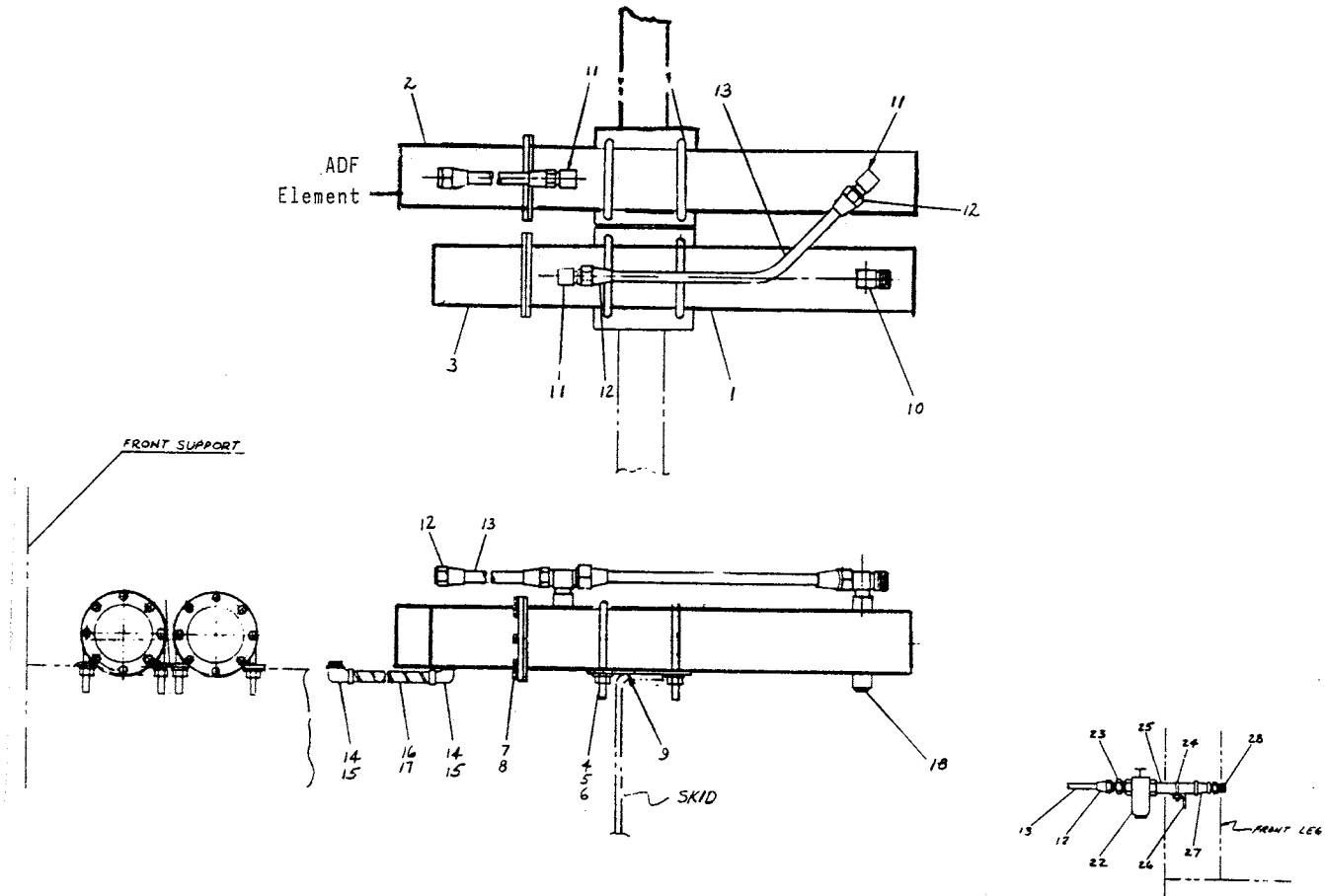
SPL-SPH SERIES 576 250 HP - #5, N5, #6 & N6

SPL-SPH SERIES 576 300 & 350 HP - #6 & N6

ELECTRIC HEATER ARRANGEMENT (123370)

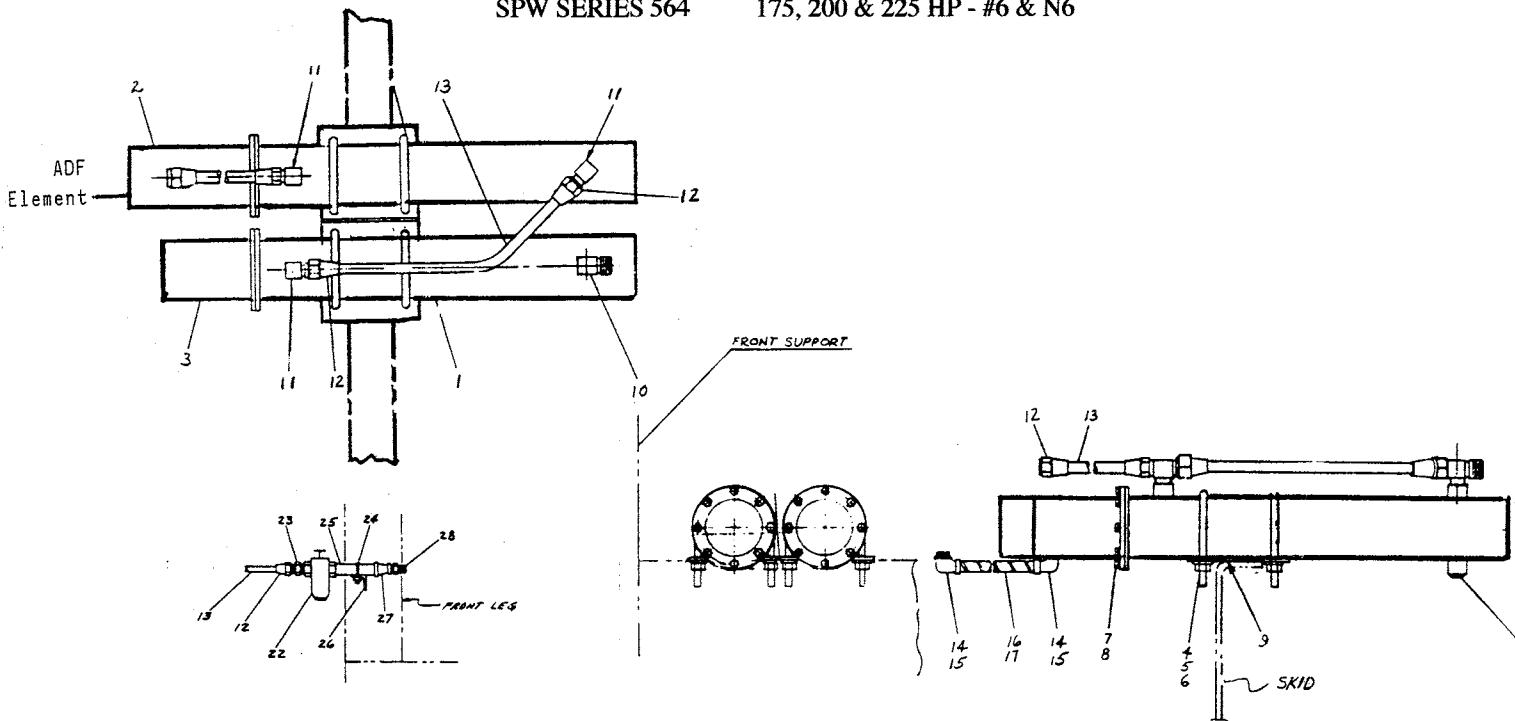
SPL-SPH-SPW SERIES 576 300 & 350 HP - #5, N5

SPW SERIES 576 250 HP - #5 & N5



Ref. No.	No. Req'd	Part Name	Part No.	Ref. No.	No. Req'd	Part Name	Part No.
1	2	Electric Preheater Case Assembly	095626	18	2	1/2" IPS Pipe Plug	050647
2	1	Heater Element (See Chart)		19	2	3/8" Conduit Clamp	050523
3	1	Heater Element (See Chart)		20	4	Conduit Insulator	023434
4	4	3" U-Bolt	051925	21	1	Strainer, 3/4" IPS	065220
5	8	3/8" - 16NC-2 Hex Nut	050023	22	1	3/4" IPS x 5/8" SAE Male Conn.	068528
6	8	3/8" Lockwasher	050229	23	1	3/4" Conduit U-Bolt	067111
7	16	1/4" - 20NC-2" x 3/4" Lg. Hex Hd. Cap Screw	051179	24	1	3/4" IPS x 4" Lg. Nipple	051083
8	16	1/4" Lockwasher	050046	25	1	Strainer Support Angle	118392
9	2	Support Plate	151607	26	1	3/4" x 1/2" Red. Coupling	052169
10	2	1/2" IPS x 3/4" SAE Male 90° Conn.	051599	27	1	1/2" IPS x 5/8" SAE Male Conn.	051097
11	5	1/2" IPS x 5/8" SAE Male 90° Conn.	051326				
12	6	5/8" Flare Nut	050978				
13	4-1/2 ft.	5/8" O.D. Copper Tubing	053712				
14	4	3/8" x 90° BX Connector	050012				
15	4	3/8" Anti-Short Bushing	050033				
16	6 ft.	3/8" Flexible Conduit	053269				
17	8 ft.	#14 Ga. AWG Wire Silicone Rubber Insulation	102354				
				Model	Heater Element	Part No.	Arrgt. No.
				3000 Watt	AF-3-230-18	050800	111457
				Heater Arrgt.	ADF-3-230-18	055126	
				4000 Watt	AF-4-230-20	101278	123370
				Heater Arrgt.	ADF-4-230-20	065469	

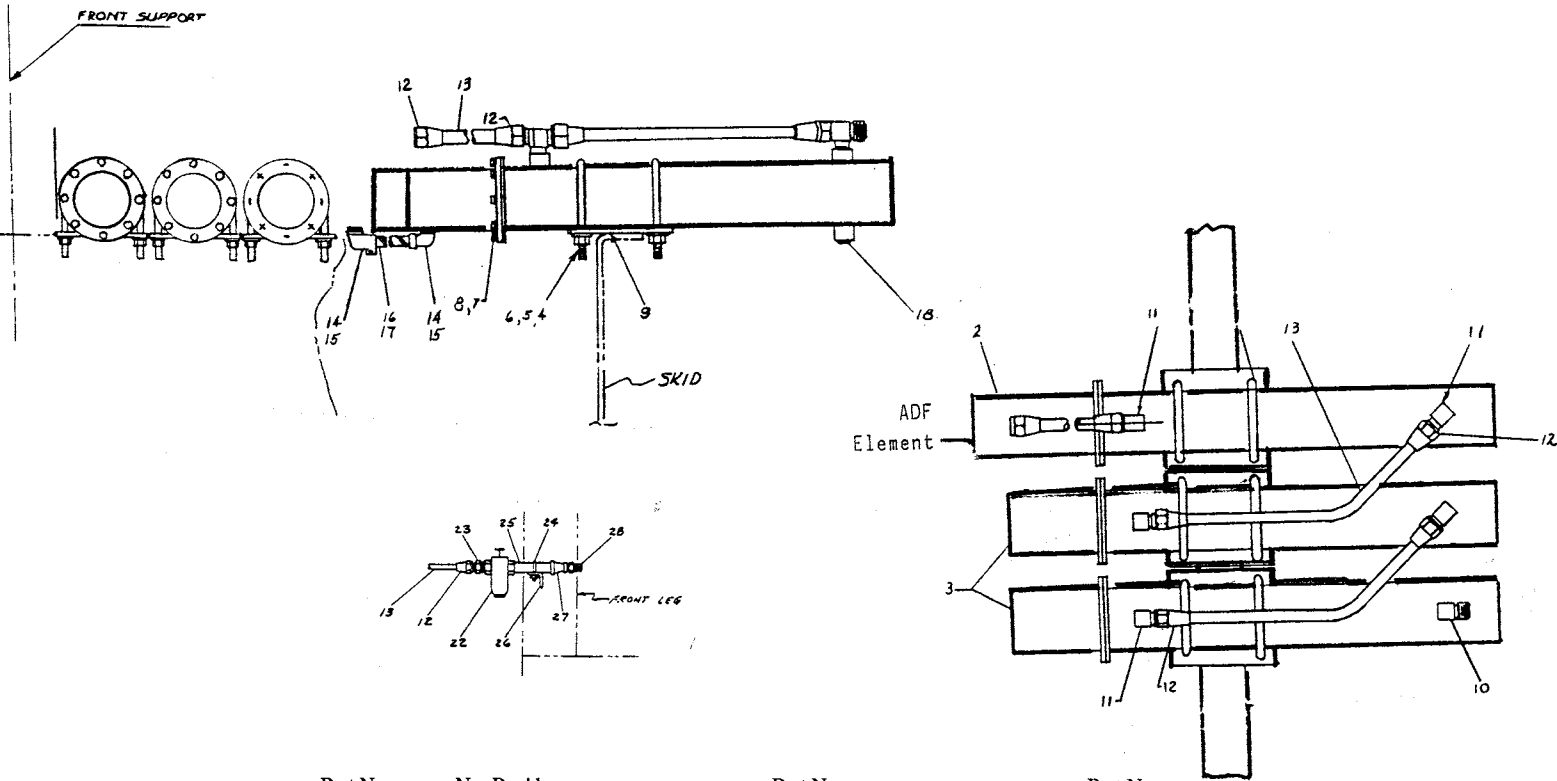
ELECTRIC HEATER ARRANGEMENT (111455)
SPW SERIES 564 175, 200 & 225 HP - #6 & N6



Part No.	No. Req'd	Part Name	Part No.
1	2	Electric Preheater Case Assembly	095626
2	1	Heater Element (See Chart)	
3	1	Heater Element (See Chart)	
4	4	3" U-Bolt	051925
5	8	3/8" - 16NC-2 Hex Nut	050023
6	8	3/8" Lockwasher	050229
7	16	1/4" - 20NC-2 x 3/4 Lg. Hex Hd. Cap Screw	051179
8	16	1/4" Lockwasher	050046
9	2	Support Plate	151607
10	1	1/2" IPS x 3/4" SAE Male 90° Conn.	051599
11	3	1/2" IPS x 5/8" SAE Male 90° Conn.	051326
12	4	5/8" Flare Nut	050978
13	4-1/2 ft.	5/8" O.D. Copper Tubing	053712
14	4	3/8" x 90° BX Connector	050012
15	4	3/8" Anti-Short Bushing	050033
16	6 ft.	3/8" Flexible Conduit	053269
17	8 ft.	#14 Ga. AWG Wire Silicone Rubber Insulation	102354
18	2	1/2" IPS Pipe Plug	050647
19	2	3/8" Conduit Clamp	050523
20	4	Conduit Insulator	023434
21			
22	1	Strainer, 3/4" IPS	065220
23	1	3/4" IPS x 5/8" SAE Male Conn.	068528
24	1	3/4" Conduit U-Bolt	067111
25	1	3/4" IPS x 4" Lg. Nipple	051083
26	1	Strainer Support Angle	118392
27	1	3/4" x 1/2" Reducing Coupling	052169
28	1	1/2" IPS x 5/8" SAE Male Conn.	051097

Model	Heater Element	Part No.	Arrangement No.
5000 Watt	AF-5-230-20	050827	
Heater Arrangement	ADF-5-230-20	059284	111455

ELECTRIC HEATER ARRANGEMENT (111456)
SPW SERIES 576 250, 300 & 350 HP - #6 & N6



Part No.	No. Req'd	Part Name	Part No.
1	3	Electric Preheater Case Assembly	095626
2	1	Heater Element (See Chart)	
3	2	Heater Element (See Chart)	
4	6	3" U-Bolt	051925
5	12	3/8" - 16NC-2 Hex Nut	050023
6	12	3/8" Lockwasher	050229
7	24	1/4" - 20NC-2 x 3/4" Lg. Hex Hd. Cap Screw	051179
8	24	1/4" Lockwasher	050046
9	3	Support Plate	151607
10	2	1/2" IPS x 3/4" SAE Male 90° Conn.	051599
11	7	1/2" IPS x 5/8" SAE Male 90° Conn.	051326
12	8	5/8" Flare Nut	050978
13	7-1/2 ft.	5/8" O.D. Copper Tubing	053712
14	6	3/8" x 90° BX Connector	050012
15	6	3/8" Anti-Short Bushing	050033
16	9 ft.	3/8" Flexible Conduit	053269
17	12 ft.	#14 Ga. AWG Wire Silicone Rubber Insulation	102354
18	3	1/2" IPS Pipe Plug	050647
19	3	3/8" Conduit Clamp	050523
20	6	Conduit Insulator	023434
21			
22	1	Strainer, 3/4" IPS	065220
23	1	3/4" IPS x 5/8" SAE Male Conn.	068528
24	1	3/4" Conduit U-Bolt	067111
25	1	3/4" IPS x 4" Lg. Nipple	051083
26	1	Strainer Support Angle	118392
27	1	3/4" x 1/2" Reducing Coupling	052169
28	1	1/2" IPS x 5/8" SAE Male Conn.	051097

Model	Heater Element	Part No.	Arrangement No.
4000 Watt	(2) AF-4-230-20	101278	111456
Heater Arrangement	(1) ADF-4-230-20	065469	

CONTROL PANEL ARRANGEMENTS
SERIES 564 175 THRU 225 HP
SERIES 576 250 & 300 HP

Fuel Arrangement	#2 Oil		#5 Oil		#6 Oil		Gas		N2		N5		N6	
	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.
Switch, SPST	1	061280	1	061280	1	061280	1	061280	1	061280	1	061280	1	061280
Switch, 3PDT									1	050975				
Switch, 4PDT														
Transformer, A172D-1089	1	057068	1	057068	1	057068	1	057068	1	057068	1	057068	1	051288
Manual Starter, 11CB3B					1	107826								057068
Starter, 16BE32AF	3	108031	3	108031	2	108031	1	108031	3	108031	3	108031	2	107826
Control, YS7000	1	109798	1	109798	1	109798	1	109798	1	109798	1	109798	1	108031
Amplifier, R7248A-1004	1	108627	1	108627	1	108627	1	108627	1	108627	1	108627	1	109798
Program Module YS720G-1205	1	109802	1	109802	1	109802	1	109802	1	109802	1	109802	1	108627
Base, Q520A-1089	1	108079	1	108079	1	108079	1	108079	1	108079	1	108079	1	109802
Detector, C7015A-1092	1	101383	1	101383	1	101383	1	101383	1	101383	1	101383	1	108079
Switch, SPDT	1	100947	1	100947	1	100947	1	100947	1	100947	1	100947	1	101383
									1	100947	1	100947	1	100947

SERIES 576 350 HP

Fuel Arrangement	#2 Oil		#5 Oil		#6 Oil		Gas		N2		N5		N6	
	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.	No. Req'd	Part No.
Switch, SPST	1	061280	1	061280	1	061280	1	061280	1	061280	1	061280	1	061280
Switch, 3PDT									1	050975				
Switch, 4PDT														
Transformer, A172D-1089	1	057068	1	057068	1	057068	1	057068	1	057068	1	057068	1	051288
Manual Starter, 11CB3B					1	107826								057068
Starter, 16BE32AF	2	108031	2	108031	1	108031	1	108031	2	108031	2	108031	1	107826
Starter, 16BE32AF	1	108033	1	108033	1	108033	1	108033	1	108033	1	108033	1	108033
Control, YS7000	1	109798	1	109798	1	109798	1	109798	1	109798	1	109798	1	109798
Amplifier, R7248A-1004	1	108627	1	108627	1	108627	1	108627	1	108627	1	108627	1	108627
Program Module YS720G-1205	1	109802	1	109802	1	109802	1	109802	1	109802	1	109802	1	108627
Base, Q520A-1089	1	108079	1	108079	1	108079	1	108079	1	108079	1	108079	1	109802
Detector, C7015A-1092	1	101383	1	101383	1	101383	1	101383	1	101383	1	101383	1	108079
Switch, SPDT	1	100947	1	100947	1	100947	1	100947	1	100947	1	100947	1	101383
									1	100947	1	100947	1	100947

Gas
Sizing Gas Header from Meter to Boiler
175 through 350 HP Steam-Pak

Fig.1

Size, Series, & HP	Max. Firing Rate CFH	Req'd Pressure at Unit (See Notes) Std. – FM -IRI
564-175	7328	15.5" WC
564-200	8315	17.5" WC
564-225	9421	22.0" WC
576-250	10,468	13.5" WC
576-300	12,562	18.5" WC
576-350	14,670	24.0" WC

Unit Firing Rates (CFH 1000 BTU/Cu Ft. .55 to .65 Sp.G Gas) & Required Pressure at the Unit. (See Notes)

Approximate Conversion
13.9" WC = 8 oz./sq. in. = .5 psi

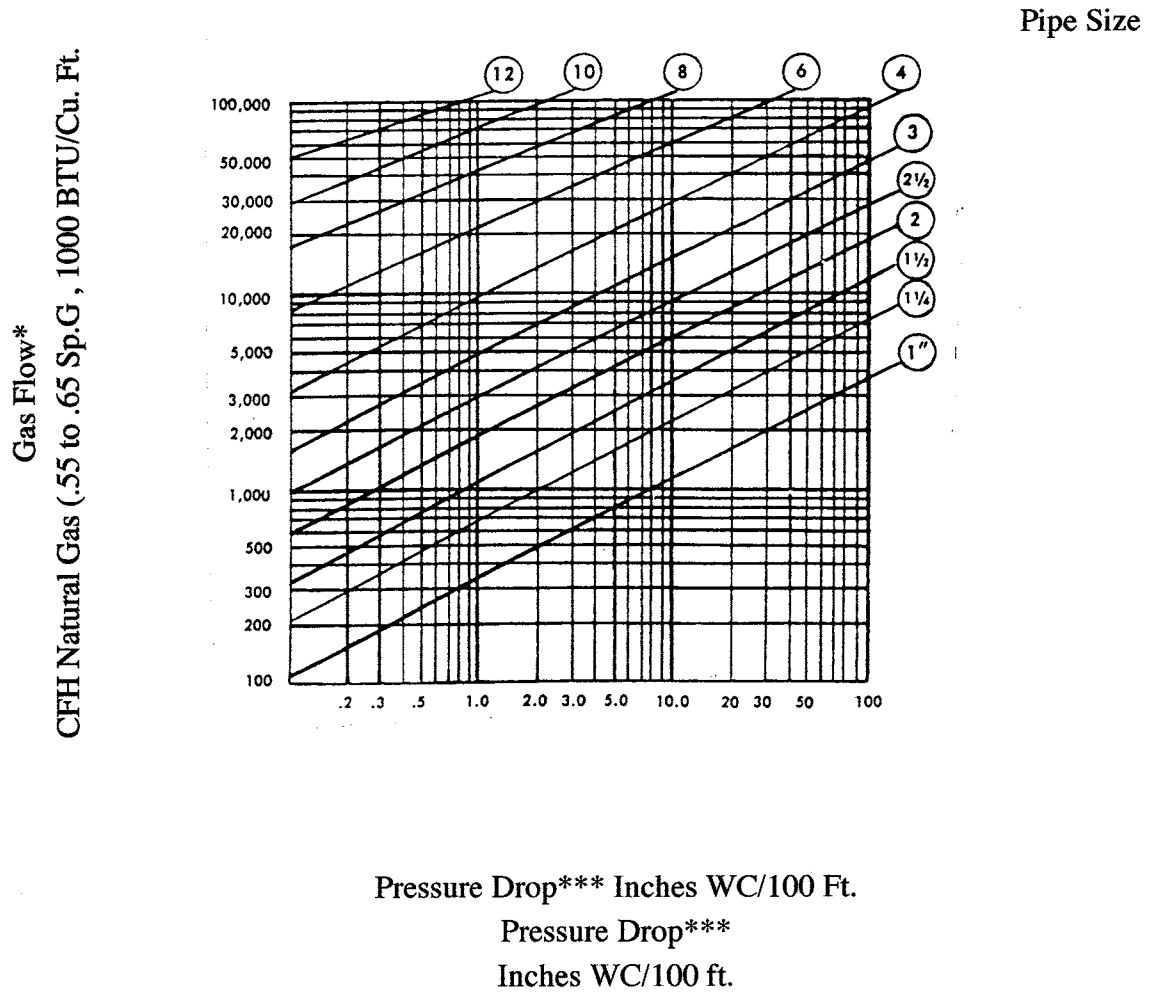
Notes:

1. For gas with BTU/cu. ft. other than 1000, determine CFH by multiplying CFH shown in Fig. 1 by the ratio of (1000/actual BTU/cu. ft.)
2. When BTU/cu. ft. is less than 1000, multiply the required pressure at the unit shown in Fig. 1 by the ratio of (1000/actual BTU/cu. ft.)². If total pressure required is not available, consult the factory for increased gas train sizes available.
3. For gas or Sp.G other than .55 to .65, divide the allowable line pressure drop/100 eq. ft. by the ratio of (Actual Sp.G/.6).

Fig. 2

Equivalent Length for Fittings in Feet											
Pipe Size (IPS)	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12
Std. Tee thru Side	5.5	7.5	9.0	12.0	14.0	17.0	22.0	33.0	43.0	55.0	65.0
Std. Ell	2.7	3.7	4.3	5.5	6.5	8.0	12.0	16.0	20.0	26.0	31.0
45° Ell	1.2	1.6	2.0	2.5	3.0	3.7	5.0	7.5	10.0	12.0	15.0
Globe Valve	27.0	40.0	43.0	45.0	65.0	82.0	120.0	170.0	240.0	290.0	340.0
Gate Valve	0.6	0.8	0.9	1.2	1.4	1.6	2.2	3.5	4.5	5.5	7.0
Plug Cock	3.0	4.0	5.5	7.5	9.0	12.0	16.0	27.0	39.0	51.0	65.0

Fig. 3
 Pipe Size Required for Gas Flow & Pressure Drop/100 Eq. Ft.



* For gas with BTU/cu. ft. other than 1000, determine CFH by multiplying CFH shown in Fig. 1 by the ratio of (1000/actual BTU/cu. ft.)

*** For gas or Sp.G other than .55 to .65, divide the allowable line pressure drop/100 eq. ft. by the ratio of (Actual Sp.G/.6).

Sizing Gas Header from Meter to Boiler

Sizing the gas line from the utility service at the meter to the gas pressure regulator at the boiler can be important in cases where the gas pressure available limits the pressure drop to a low value. The following sizing method will prove helpful in sizing this line for single or multiple boiler installations.

- Step #1. Determine the gas flow rate (CFH) by adding the CFH inputs (Fig. 1) of all units being supplied by the header line. (Note factor for gas with BTU/cu.ft. other than 1000.)
- Step #2. Determine the highest pressure required at any one unit being supplied by the header line. This would be the inlet pressure requirement shown on page 112. (Note pressure requirements will change if BTU/cu.ft. is less than 1000. Note factor.)
- Step #3. Determine available pressure drop through the header to supply the quantity of gas by subtracting pressure found in Step #2 from the gas pressure available at the utility meter. (This information will be supplied by the utility).
- Step #4. Determine the estimated equivalent length of header piping to the most distant unit by adding 25% to the actual length of straight pipe involved to allow for all fittings and valves in the line.
- Step #5. Divide (Step #4) answer by 100.
- Step #6. Calculate the pressure drop available in the header per 100 ft. of pipe by dividing (Step #3) by (Step #5).
- Step #7. Refer to (Fig. 3). Locate the gas flow rate (Step #1) on the left side of the chart and draw a horizontal line to the right. Locate the available pressure drop per 100 ft. (Step #6) along the bottom of the chart and draw a line vertically upward. The location of the intersection of the lines will determine the pipe size of the header line (where the intersection falls between pipe sizes use the larger size).
- Step #8. Step #4 may now be repeated using from (Fig. 2) the actual straight pipe equivalent for the pipe size fittings as determined in (Step #7) in place of the 25% estimate. Steps 5, 6, 7, 8 can then be repeated to check the original estimated condition.

Unit Feeder Sizes

The size of the piping from the gas header piping to each unit gas regulator in a multiple unit installation should be sized from Fig. 3 using the max. gas flow for the individual unit and the pressure drop per 100 ft. found in Step #6. In no case should the pipe size be smaller than the unit gas pressure regulator pipe size. See gas pressure regulator requirements.

Sample Problem

What size gas header should be run to handle two 300 HP hot water boilers with a single 175 HP high pressure steam boiler? The boilers are to be furnished to meet FM requirements. The gas is natural, .6 Sp.G and 1000 BTU/cu. ft.

Step #1. Determine the maximum gas flow rate of all units using Fig. 1; $2 \times 12,500 + 7,328 = 32,328$ CFH.

Step #2. Determine that the highest pressure required at any one unit for FM requirements (Fig. 1) is 23" WC.

Step #3. The gas company indicates that gas pressure of up to 2 psi will be available after their meter. The available pressure drop to push the quantity of gas through the header is then 2 psi = 55.6" - 23" WC (Step #3) = 32.6" WC.

Step #4. From the plans it is determined that the length of straight pipe in the header to the most distant boiler is 200 ft. The allowance for fittings etc. would then be 200 ft. x .25% = 50 ft. or a total length straight pipe distance of 200 ft. + 50 ft. = 250 ft.

Step #5. Divide 250 ft. (Step #5) by 100 = 2.5.

Step #6. The pressure drop available in the header per 100 ft. of pipe is then 32.6" WC (Step #3) divided by 2.5 (Step #6) = 13.04" WC/100 ft.

Step #7. Referring to Fig. 3 and locating the intersection of 32,328 CFH (Step #1) and 13.04" WC/100 ft. (Step #6) we find that a 4" IPS pipe might be satisfactory.

Step #8. Now that a good estimate of the pipe size required has been made, go back to Step #4. It has been established that the header will contain - 2 tees, 1 standard elbows and a gate valve. For 4" pipe (Step #7) the equivalent length of these is $(2 \times 22) + (1 \times 12) + 2.2 = 58.2$ ft.

Step 4A. The new equivalent length of pipe is $200 + 58.2 = 258.2$ ft.

Step 5A. Divide 258.2 ft. (Step #4A) by 100 = 2.582 ft.

Step 6A. The new pressure drop available in the header per 100 ft. of pipe is now 32.6" WC (Step #3) divided by 2.582 (Step #5A) = 12.62" WC/100 ft.

Step 7A. Referring to Fig. 3 and locating the intersection of 32,328 CFH (Step #1) and 12.62" W.C./100 ft. (Step #6A) we find that a 4" IPS pipe is the actual requirement.

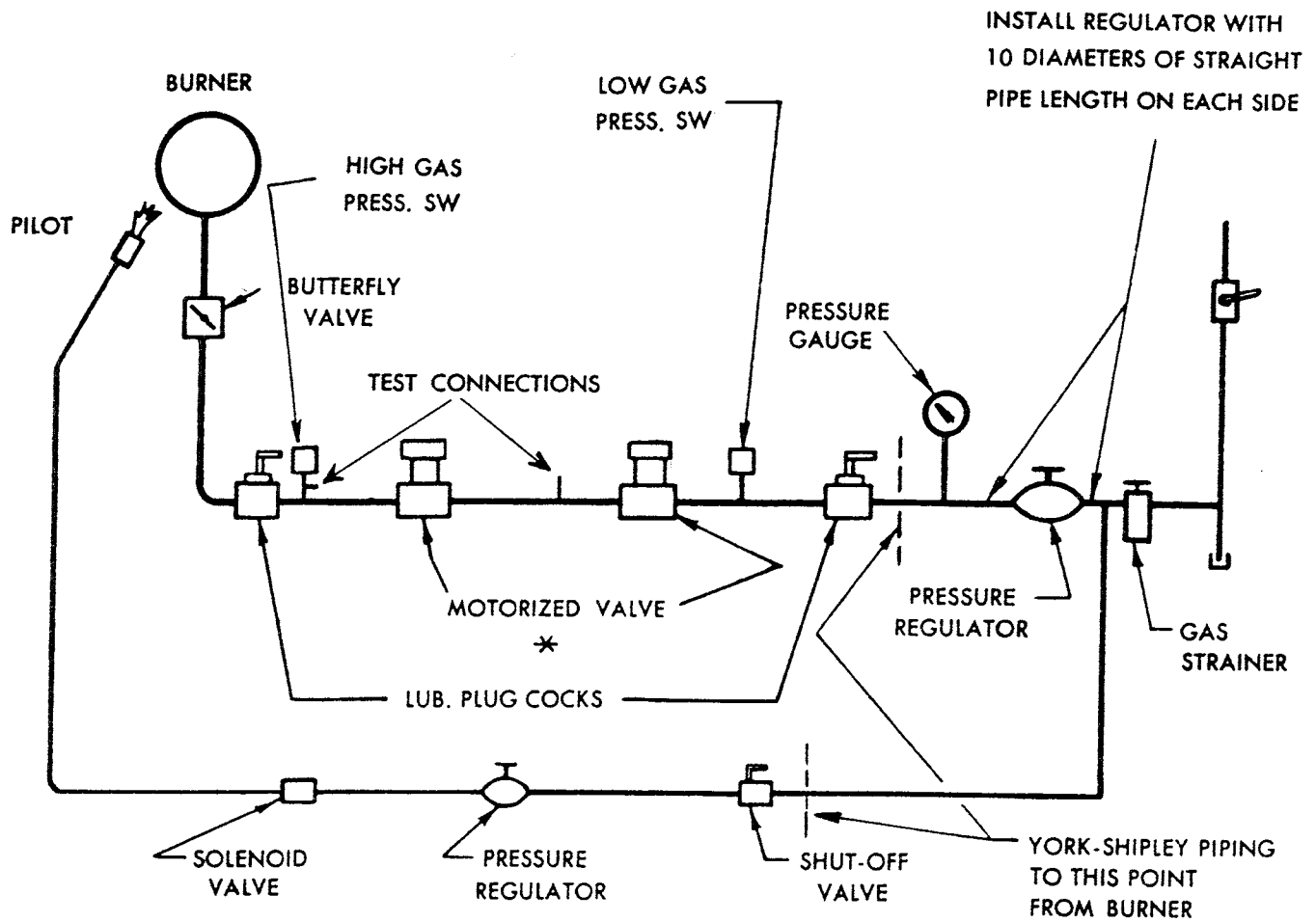
Gas Pressure Regulator Requirements For 175 through 350 HP
 (Chart is for Natural Gas .55 to .65 Sp.G only, 1000 BTU/cu. ft.)

13.9" WC = 8 oz./sq. in. = .5 psi

Boiler Size Series & HP	CFH Firing Rate	UL, FM & IRI			
			Pressure Required		Regulator Size & Model
			Inlet	Outlet	
564-175	7330	Std	17.0	15.5	2-1/2" RV-110
		Low	10.0	9.0	4" RV-131
		High	1 psi	23.5	2-1/2" #210G
564-200	8315	Std	20.0	17.5	2-1/2" RV-110
		Low	10.5	9.5	4" RV-131
		High	1-1/2 psi	29.5	2-1/2" #210G
564-225	9425	Std	25.0	22.0	2-1/2" RV-110
		Low	11.5	10.5	4" RV-131
		High	5 psi*	36.5	2-" #166-5
576-250	10,470	Std	16.5	13.5	2-1/2" RV-110
		Low	9.5	8.5	4" RV-131
		High	1-1/2 psi	27.5	2-1/2" #210G
576-300	12,565	Std	23.0	18.5	2-1/2" RV-110
		Low	12.0	10.5	4" RV-131
		High	5 psi*	42.0	2" 166-5
576-350	14,680	Std	1-1/2 psi	24.0	2-1/2" #210G
		Low	14.5	12.5	4" RV-131
		High	5 psi*	50.5	2" 166-2

*When available pressure exceeds 5 psi with any regulator, use dual regulation.

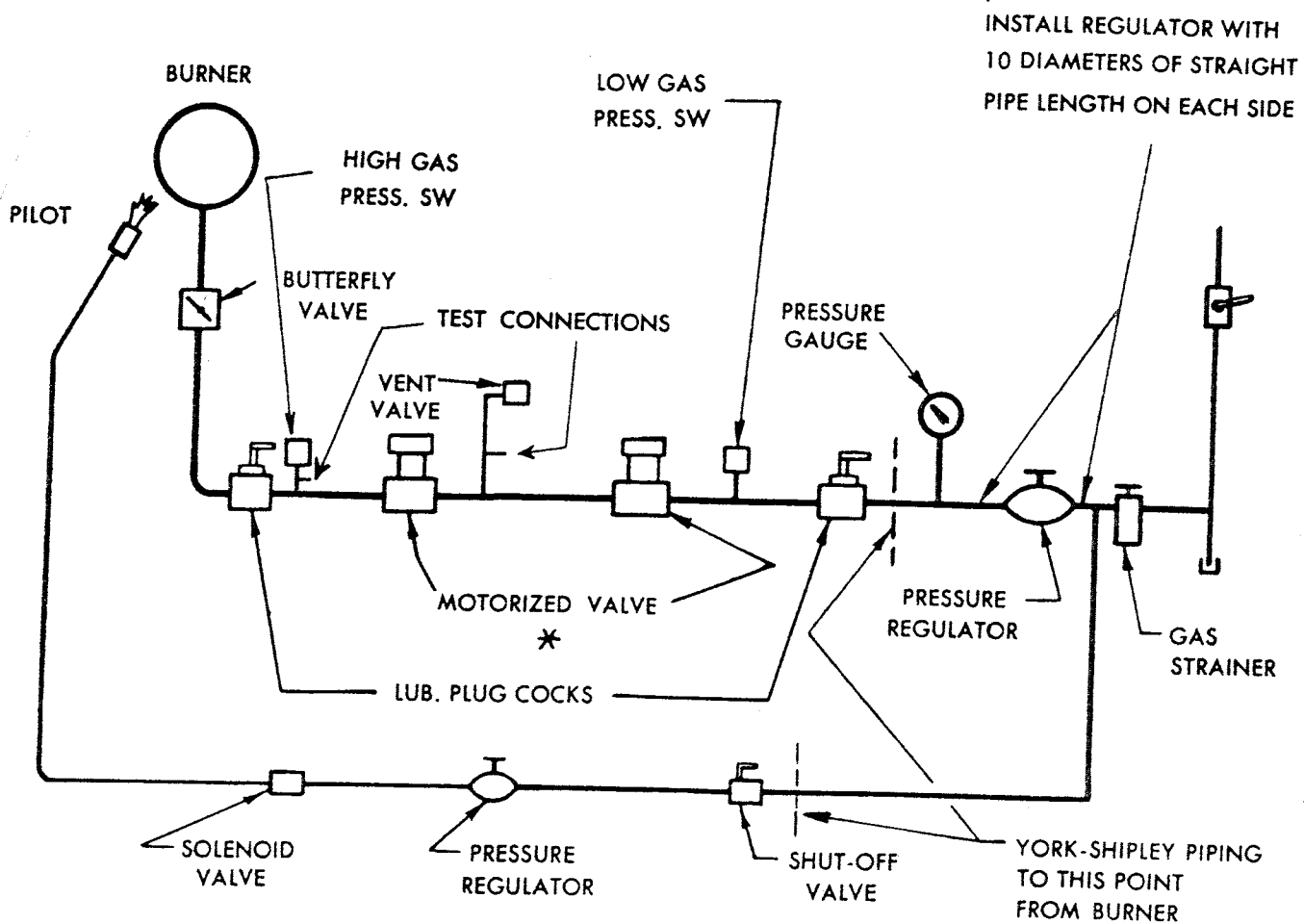
Schematic Gas Piping Arrangement
 175 thru 250 HP, UL & FM



*Proof of Closure Feature on one Valve.

Schematic Gas Piping Arrangement

175 thru 350 HP – IRI
300 thru 350 HP – UL & FM



*Proof of Closure Feature on one Valve.

Light Oil
40 SSU Max. @ 100° F - 85 SPG

Maximum allowable run and suction and return line sizing for Steam-Pak Boilers 175 through 350 HP #1 and #2 oil burning units.

Line sizing (175 through 350 HP)

For all light oil Steam-Pak units in this size range use 1" IPS pipe for both suction and return lines.

Maximum allowable pipe run (175 through 350 HP.)

To determine the maximum allowable pipe run from the pump suction to the bottom of the fuel oil tank for various lifts and all size units use the chart below.

175 THROUGH 350 HP.

Total Lift (Ft.)*	Allowable Run (Ft.)**
0	250
1	250
2	250
3	250
4	250
5	250
6	250
7	250
8	250
9	225
10	200
11	175
12	150
13	125
14	100
15	75

* To determine "total lift" for all units add 1-1/2 ft. to the vertical distance from the boiler room floor to the bottom of the fuel oil tank.

** If the actual run exceeds the maximum allowable run an auxiliary pump set must be used.

**Fuel Pump Location & Suction & Return Line Sizing
 For Steam-Pak 500 Series #5 Oil Burning Units
 Specify #5 Oil Burner for #4 & Cold #5 Oil
 (18 to 28 API, 50 to 150 SSU @ 100° F Max. Vis.)**

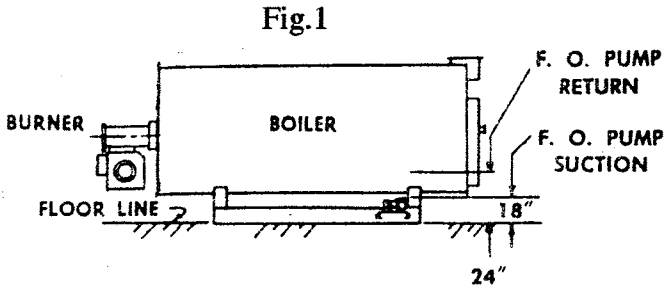


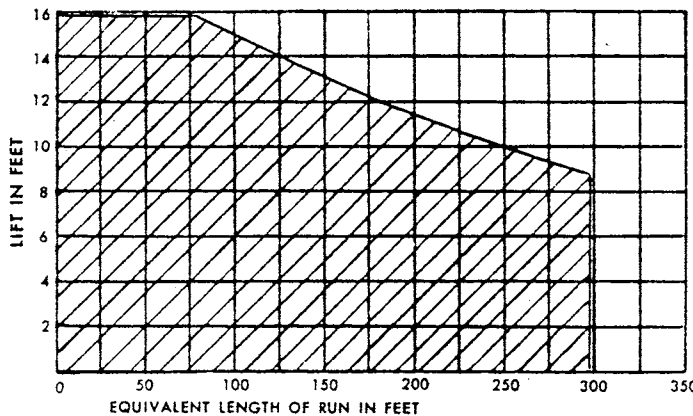
Fig 2

Boiler Size (BHP)	Individual Suction	Individual Return
175 through 350	2" IPS	2" IPS

Fig. 3

Pipe Size	Equivalent Ft. of Straight Pipe			
	Elbow	Tee	Gate Valve	Swing Check
2" IPS	6	12	3	15

Fig. 4
 Based on 15" Hg Vac. & 150 SSU Vis.
 140° F Maximum Recommended Temp.



Safe Pump Operation Area Chart

Instructions for Sizing Fuel Lines

- Step #1 From boiler size (HP) determine required suction and return line size. (Fig. 2)
- Step #2 From plans, determine straight length of pipe run (both horizontal and vertical) from pump suction connection (Fig. 1) to the bottom of the fuel oil tank.
- Step #3 Determine the number and type of fittings in the length of run (Step #2) and convert these into a length of straight pipe. (Fig. 3)
- Step #4 Obtain equivalent length of run by adding Step #2 to Step #3.
- Step #5 From plans, determine the vertical distance from the bottom of the fuel oil tank to the boiler room floor.
- Step #6 Obtain the total lift by adding 1-1/2 ft. (Fig. 1) to Step #5.
- Step #7 Referring to Fig. 4, locate the intersection of the "Lift in Feet" (Step #6) and the "Equivalent Length of Run" (Step #4). If the intersection falls within the shaded area, the pump location on the unit is satisfactory.

If the Intersection Falls Outside the Shaded Area:

- Step # 1A Using Fig. 4, determine the maximum equivalent length of run for the lift in Step #6.
- Step #2A Subtract the equivalent length of fittings (Step #3) from the maximum equivalent length of run for lift involved (Step #1A). The resultant length is the maximum straight pipe distance from the bottom of the tank to the pump suction (horizontal and vertical).
- Step #3A Remove the pump set from the boiler and relocate so that straight pipe distance does not exceed the value in Step #2A.

Sample Problems

Problem #1 What size suction and return line must be used on a #4 oil, 200 HP, 500 Series Steam-Pak? Where should the pump set be located?

Step #1 From Fig. 2, a 200 HP boiler requires a 2" IPS suction and a 2" IPS return line.

Step #2 From the plans it is determined that the straight length of pipe run both horizontal and vertical is 150 ft.

Step #3 Again from the plans it is determined that the length of run contains 3 ells, 2 gate valves, and one swing check valve. Fig. 3 shows that each 2" IPS ell is equivalent to 6 ft. of straight pipe, each gate valve equals 3 ft. of straight pipe and the swing check equals 15 ft. of straight pipe. The total is then $(6 \times 3) + (3 \times 2) + 15 = 39$ ft.

Step #4 The equivalent length of run is then 150 ft. (Step #2) + 39 ft. (Step #3) = 189 ft.

Step #5 From the plans, the vertical distance from the boiler room floor to the bottom of the fuel tank is found to be 8.5 ft.

Step #6 The total lift is then 8.5 ft. + 1.5 ft. (Fig. 1) = 10 ft.

Step #7 Fig. 4 shows the intersection of 10 ft. of lift and 189 ft. of equivalent length of run to fall within the shaded area.

Conclusion: The use of 2" suction and return lines is required. The standard factory mounted location on the left rear of the unit is acceptable.

Problem #2 Solve Problem # 1 if the lift in Step #5 had been found to be 12.5 ft.

Step #1 From Fig. 2, a 200 HP boiler requires a 2" IPS suction and return line.

Step #2 Since the vertical lift is 4 ft. greater, the new straight length of pipe run, both horizontal and vertical will be 150 ft. + 4 ft. = 154 ft.

Step #3 The equivalent straight run for the fittings involved would not change = 39 ft.

Step #4 The equivalent length of run is then 154 ft. (Step #2) + 39 ft. (Step #3) = 193 ft.

Step #5 The lift is now 12.5 ft. from the bottom of the fuel tank to the boiler room floor.

Step #6 The total lift is then 12.5 ft. + 1.5 ft. (Fig. 1) = 14 ft.

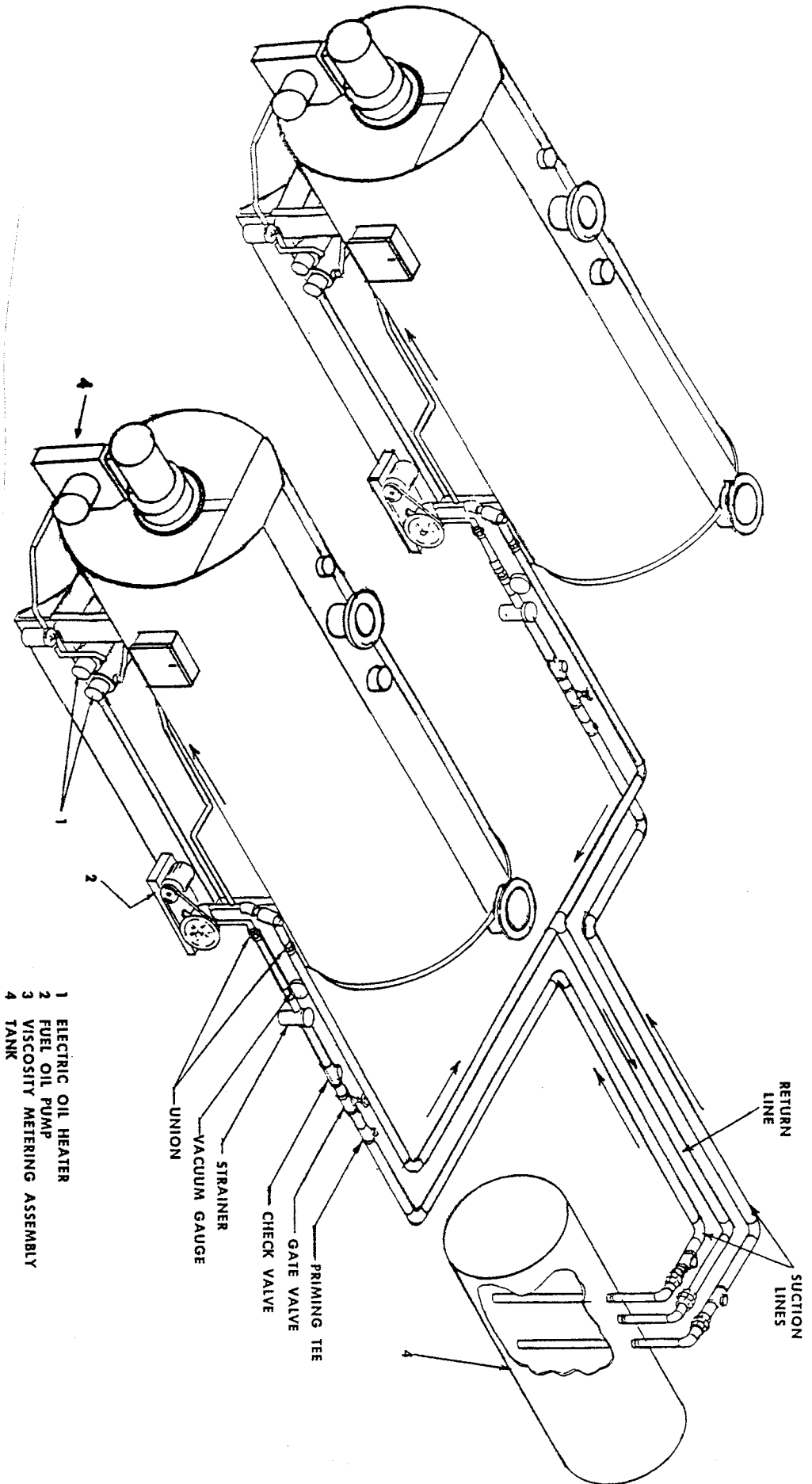
Step #7 Refer to Fig. 4 and locate the intersection of 14 ft. of lift (Step #6) and 193 ft. "Equivalent Length of Run" (Step #4). It falls outside the shaded area, therefore the pump location on the unit is not satisfactory.

Step #1A Using Fig. 4, determine that the maximum equivalent length of run for 14 ft. of lifts is 125 ft. of equivalent straight pipe. (If a location can be found which requires a lesser lift, then a correspondingly longer equivalent length can be used.)

Step #2A Subtract the equivalent length of fittings, 39 ft. (Step #3) from the maximum equivalent length of run for the lift involved – 125 ft. (Step #1A). $125 \text{ ft.} - 39 \text{ ft.} = 86 \text{ ft.}$ The maximum run of straight pipe from the pump suction to the bottom of the tank suction cannot exceed 100 ft. (horizontal and vertical).

Step #3A The pump set must be unbolted from its standard location and moved nearer the tank so that the linear distance in Step #2A is not exceeded.

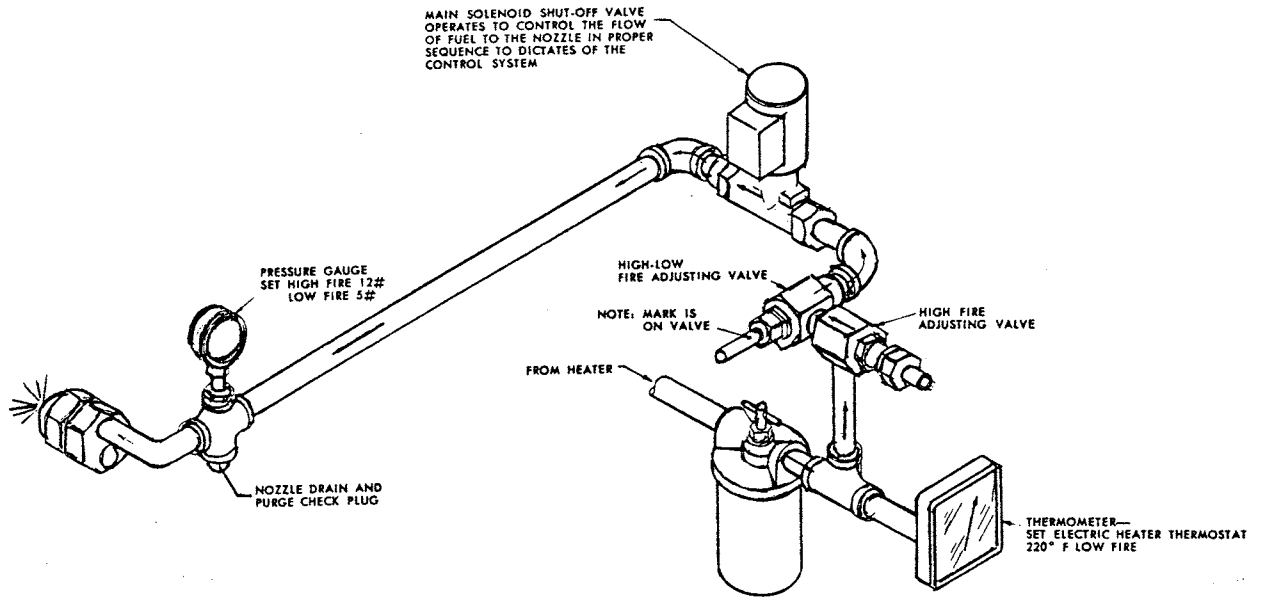
500 Series #4 & #5 Cold Fuel Oil System
Single or Duplex



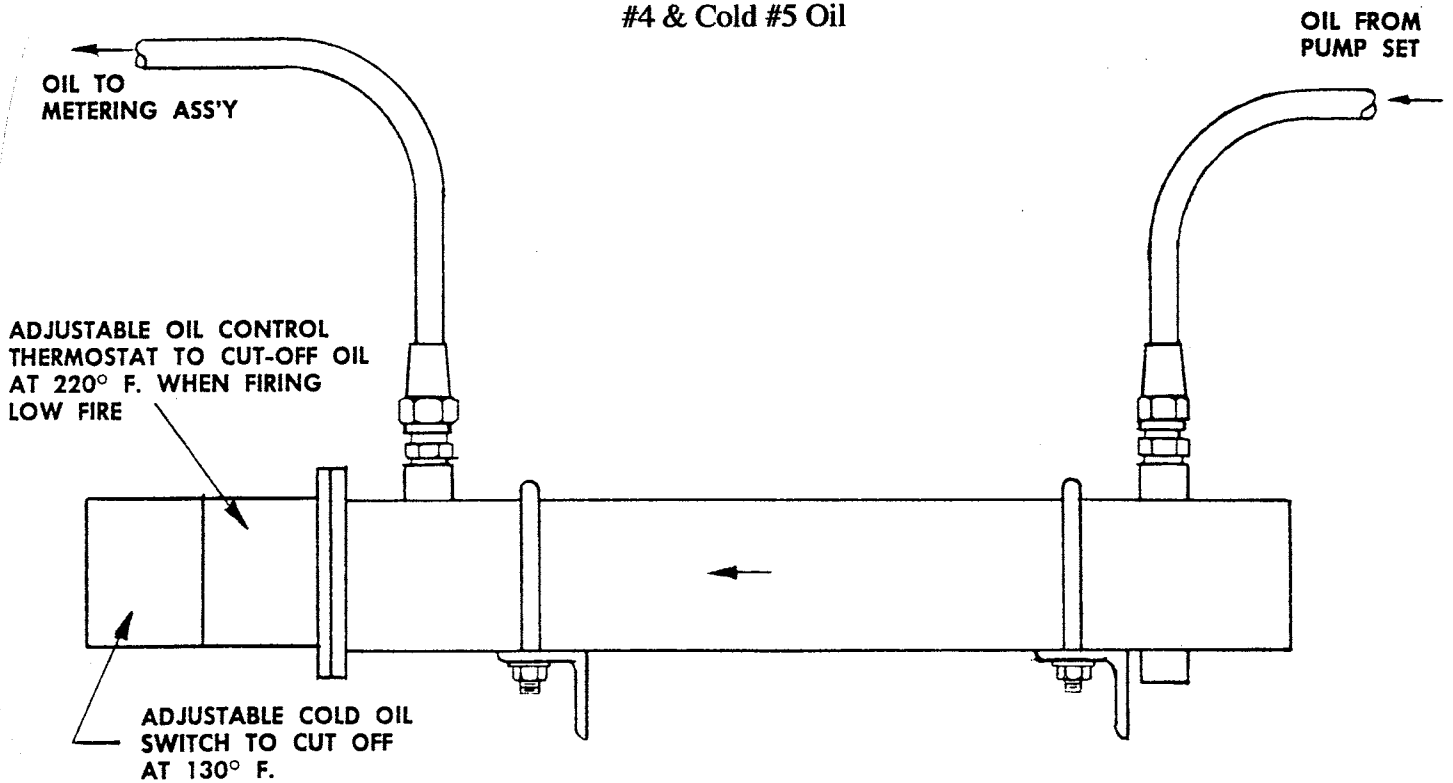
- 1 ELECTRIC OIL HEATER
- 2 FUEL OIL PUMP
- 3 VISCOSITY METERING ASSEMBLY
- 4 TANK

UNION
STRAINER
VACUUM GAUGE
CHECK VALVE
GATE VALVE
PRIMING TEE
RETURN LINE
SUCTION LINES

Metering Assembly for #4 & Cold #5 Oil



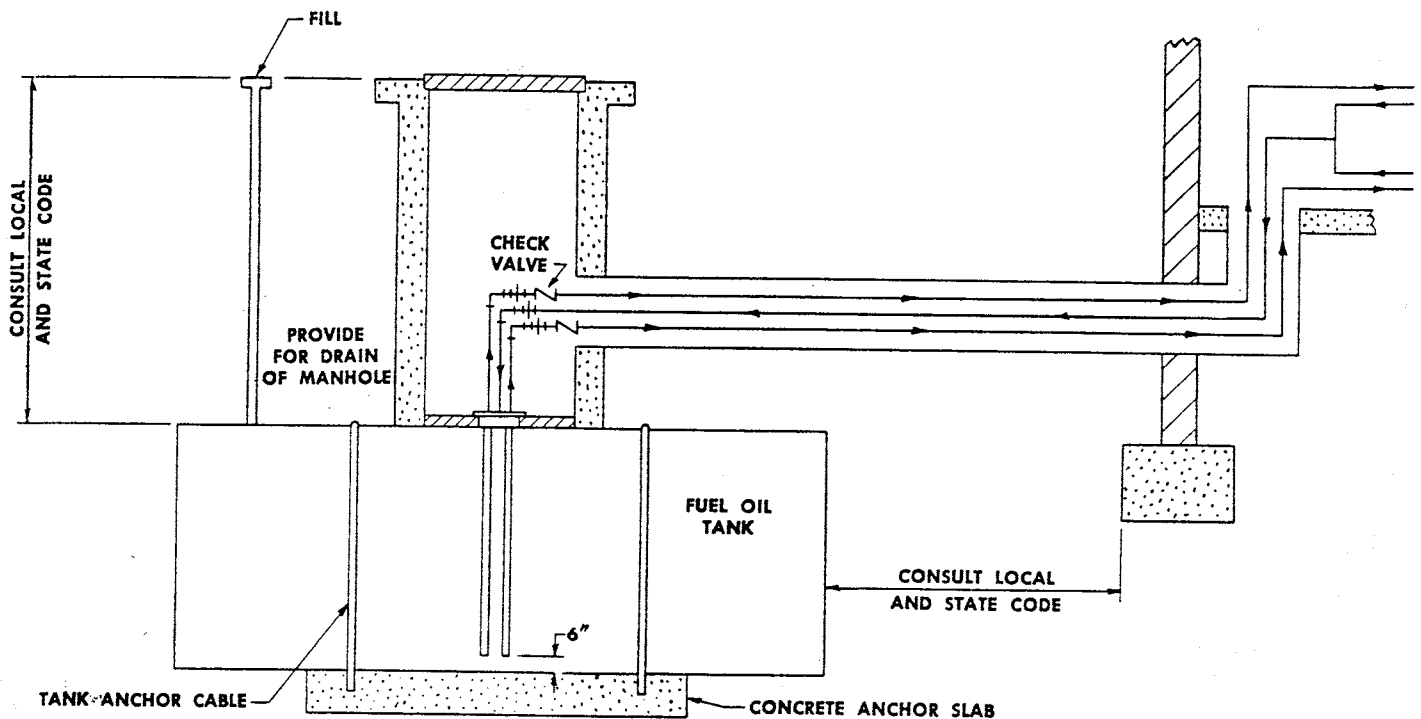
Electric Fuel Oil Heater (Mounted on Unit Only) #4 & Cold #5 Oil



Electric Heater Capacity #4 & #5 Oil

Size Unit HP	SPL-SPH-SPW
175-225	5000 watts
250	2-3000 watts
300 & 350	2-4000 watts

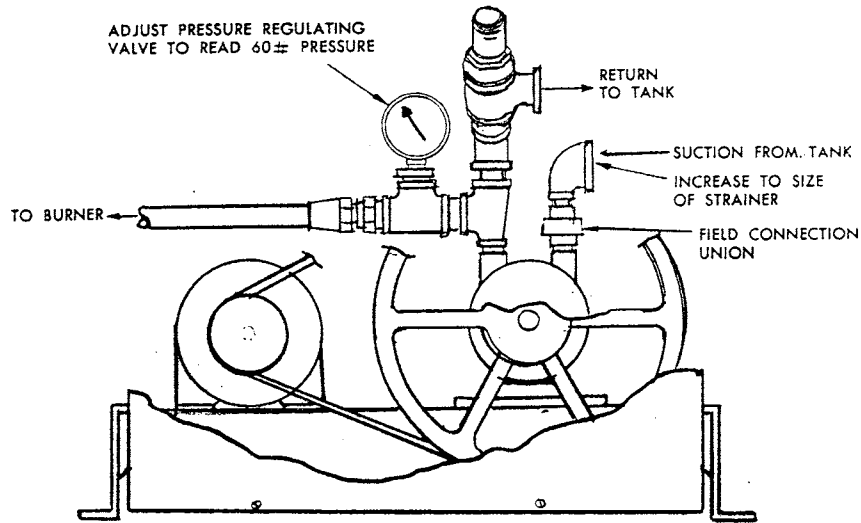
Fuel Oil Tank Piping For #4 & Cold #5 Oil



Note:

1. Test suction and return lines by sealing off tank and boiler piping and subjecting closed system to 125 lbs. inert gas pressure. Remove source of gas and allow system to remain full for a period of no less than 8 hours. Pressure gauge should be installed in closed system before subjecting to pressure. If pressure remains at 125 psi for test period, it is assumed system is tight.
2. Positively do not use cast iron fittings in fuel oil piping. Check all pipe threads for overcutting.
3. Run outside lines well below frost line.
4. Protect outside lines below driveways with reinforced concrete slab. Be careful with heavy machinery used during construction and in vicinity of pipe runs.
5. Install tank vent high enough to eliminate source of objectionable odors. Terminate tank vent within sight of tank fill. Use full sized tank fill pipe.
6. Use as few elbows and other fittings as possible. Straight runs are preferable.
7. Pitch lines up from tank to burner or remote pump set.
8. Run suction and return lines full sized to within 2 feet of burner pump connection.
9. To size lines and locate pump set, see "Fuel Pump Locations & Suction & Return Line Sizing" information.

Fuel Oil Pump Assembly for #4 & Cold #5 Oil



Single Unit Fuel Oil Pumps Mounted on Unit

Fuel oil pumps are required to transport the fuel oil from the storage tank to the burner and return excess oil to the storage tank. The suction vacuum must be kept as low as possible as the capacity of all fuel pumps drop as the vacuum increases. Maximum should be 15" Hg at the pump. The tank installation should be as close to the burner as Code will allow, and the suction and return lines planned to reduce friction.

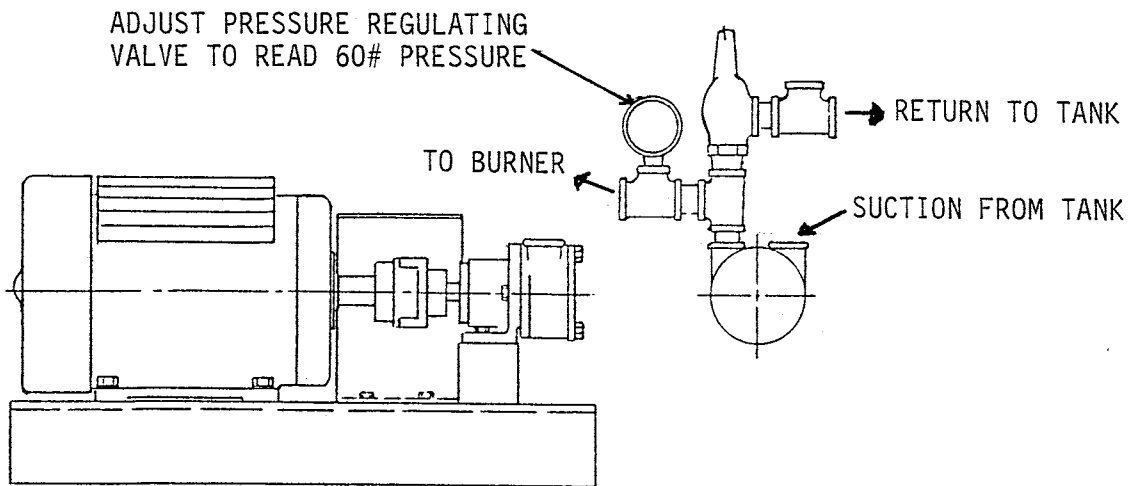
#2 Oil (Air Atomized)

Pump Set Size	Boiler Size – SPL, SPW, SPH	RPM	GPH	Size Pump	HP Motor	Relief	Strainer	Pressure Gauge
150	175	865	150	2C1G	3/4	1"	1-1/4"	0 to 160
150	200	865	150	2C1G	3/4	1"	1-1/4"	0 to 160
150	225	865	150	2C1G	3/4	1"	1-1/4"	0 to 160
300	250	865	300	3C1G	1	1"	1-1/4"	0 to 160
300	300	865	300	3C1G	1	1"	1-1/4"	0 to 160
300	350	865	300	3C1G	1	1"	1-1/4"	0 to 160

#4 & Cold #5 Oil

Pump Set Size	Boiler Size – SPL, SPW, SPH	RPM	GPH	Size Pump	HP Motor	Relief	Strainer	Pressure Gauge
150	175	475	150	C2	1/2	1"	2-1/2"	0 to 160
150	200	475	150	C2	1/2	1"	2-1/2"	0 to 160
150	225	475	150	C2	1/2	1"	2-1/2"	0 to 160
300	250	475	300	C3	3/4	1"	2-1/2"	0 to 160
300	300	475	300	C3	3/4	1"	2-1/2"	0 to 160
300	350	475	300	C3	3/4	1"	2-1/2"	0 to 160

FUEL OIL PUMP ASSEMBLY FOR #2 OIL PRESSURE ATOMIZED



Pump Set Size	Boiler Size – SPL, SPW, SPH	RPM	GPH	Size Pump	HP Motor	Relief	Strainer	Pressure Gauge
-	175 thru 350	1800	370	2LA	1-1/2	3/4"	1-1/4"	0 to 300

The 500 Series #6 Oil Burner & System
Specify #6 Oil Burner For "Hot" #5 Oil & #6 Oil
(7 to 22 API, 300 SSF @ 122° F Max. Viscosity)

Of all the liquid and gaseous fuels, commercial grade #6 oil has always been the most troublesome to utilize. The problems stem from the fact that #6 oil is a residual oil i.e. what is left over after most of the lighter hydrocarbons have been extracted. There are few limitations in specifications as to how "bad" #6 oil can become. In fact, in recent years, with new methods of cracking the heavier end to produce more profitable hydrocarbons, #6 oil has become even more troublesome. Installations which previously handled #6 oil can no longer cope with the present grade #6 oils and inefficient, smoky fires result, increasing down time and maintenance costs.

Heavy #6 oil must be heated to ship, heated to store, heated to pump and heated to burn. It requires an elaborate fuel transportation system and a dedicated maintenance program to keep it burning.

Why, then, are #6 oil systems still installed? The fact is that #6 oil, when used by a volume buyer, is difficult to beat economically. First, the cost per gallon of #6 oil is about one half that of lighter grades. Secondly, the heating value of #6 oil is greater than the same quantity of lighter oil. These two economy points can easily underwrite the additional expenses outlined above if a large enough quantity of fuel is burned each year.

We should now recognize several facts:

1. #6 oil has always been difficult to handle.
2. #6 oil is becoming even more difficult to burn.
3. #6 oil installations are more costly than others.
4. #6 oil installations require dedicated maintenance.
5. #6 oil systems can pay for themselves under the right conditions.

York-Shibley, after extensive research and analysis, has evolved a #6 oil handling and burning transportation system to meet these requirements. This system involves the storing, transporting, conditioning, and burning of #6 fuel oil. As only those items on the boiler can be controlled by York-Shibley, much of the systems must, of course, be installed in the field. Therefore the complete success of this system depends on the entire installation. **It is urged, therefore, that this system be included in plans and specifications to insure the most efficient, trouble-free and serviceable installation possible.** While the items required and supplied as standard equipment on all 500 Series #6 oil Steam Paks cost more, the portion of the system supplied by the contractor actually costs less than older type systems.

York – Shipley #6 Oil System Explanation

The York-Shipley #6 oil handling and burning system, insofar as what it attempts to accomplish, is not new. What is new, is the increased controllability, the elimination of objectionable aspects, and the degree of success with which the problem is met.

1) Starting at the tank, a tank heater must be supplied for each burner on the installation. This heater is a combination suction bell, air vent, and stub heater. In the York-Shipley system, the only time it acts as a heater is on initial start-up and after prolonged shut down. Most of the time, it performs as a suction bell, i.e. trapping heated returning oil and adding oil to make up for that which was burned. The vent at the top of the heater allows any air brought back with the returning oil to escape into the top of the tank to be vented to the atmosphere. This heater should be supplied by the contractor and mounted in an 8 inch threaded opening in the top of the tank located at the closest point to the burner. The heater must be so sized that it will reach to within 6" of the tank bottom. A means of access to the connection is required and all prevailing codes and regulations should be noted and complied with.

2) The oil and preheating piping from the tank to the pump suction is a most important link in the #6 oil system. The fuel oil suction and return lines must be sized properly to insure satisfactory pump operation. (See fuel pump location and line sizing information.) These lines must be provided with a means of heating for cold starts since #6 oil will congeal in these pipes at low temperatures and become unpumpable. Since these lines contain heated oil, they should be wrapped together and insulated, and protected from moisture.

3) An auxiliary heat system should be provided on all installations. The purpose of this system is to provide heat after a period during which the oil has cooled below a pumpable temperature. The period may have been planned or otherwise. If a system is planned to be in operation on a 24 hour basis, it is obviously most important to get it back into operation quickly in the event of an unforeseen shut down. The heating lines should trace as much of the suction and return lines as possible both inside and outside the building. Systems using electrically heated pipes, and water or steam from an independent source are also acceptable.

4) Continuous circulation of the #6 fuel oil is a necessity at all times. Even when the unit is off the line or in a standby capacity, the oil must be circulated in its piping so that the unit can be started with no difficulty. The York-Shipley #6 oil system goes farther than most circulation systems by circulating hot oil right up to the first fuel shut off valve. The York-Shipley self contained pump is manually started. It is mounted and tested on the unit, but when required by existing conditions of lift and run (see fuel pump location and line sizing information) can be unbolted and located in close proximity to the tank. Note the standard gauges and simple field connections.

5) Any system burning #6 oil must provide for heating the oil – up to 230° in some cases – so that it can be atomized and burned. York-Shipley installs auxiliary heaters on all #6 oil units. A steam type heater with a temperature actuated trap to control oil temperature is used on high pressure steam units and a below the water line heater with a circulator is used on the low pressure steam and hot water units. These heaters are adjusted to raise the oil temperature within several degrees of the required burning temperature. A double shell, decontamination type heater can be supplied on water or low pressure steam units when required or desired.

6) Because the burning temperature is critical, electric heaters with sensitive thermostats are provided to give the fuel the final temperature boost needed for efficient burning and accurate metering of the fuel. Because the oil is constantly being circulated through the heaters, residue build-up, which causes electric heater burnout is eliminated. Hot water units, in which the temperature may vary down to 170°, require a greater electric heater reserve than the steam units.. These heaters also include a safety switch which will not allow the unit to operate if the fuel temperature is below a safe level.

7) The arrangement of valves and piping which form the heart of the York-Shipley #6 oil system is provided at the burner. At first glance, this arrangement appears complex, but upon inspection its functioning becomes apparent.

a) In the “off fire” condition, the heated oil from the electric heater passes through the nozzle strainer. Its path is blocked by the closed, manually operated, “original start up” valve (D) and the solenoid operated “firing by-pass” valve. The oil then must flow through the manually adjusted “non-firing” needle valve (B), which is regulated to pass enough heated oil back to the tank heater to maintain 140° F. at the suction connection on the pump when the unit is not firing, i.e. this amount of heated oil compensates for the heat loss from the piping.

b) In the “on fire” condition, the heated oil from the electric heater passes through the nozzle strainer. Its path is blocked by the closed, manually operated “original start up” valve (D), but a parallel path of oil flow is obtained when the solenoid operated “firing by-pass” valve (A) opens, allowing flow around the “non-firing” valve (B), to the “firing” needle valve (A). This manually adjusted valve is regulated to maintain 140° F. at the suction connection on the pump when the unit is firing at its low fire rate and compensates for the cooler make up oil being pulled from the tank. The “fire adjusting” valve (C), being located upstream from the “firing” valve (A), will further regulate the amount of oil returning in proportion to the amount of oil burned i.e. made up from the tank.

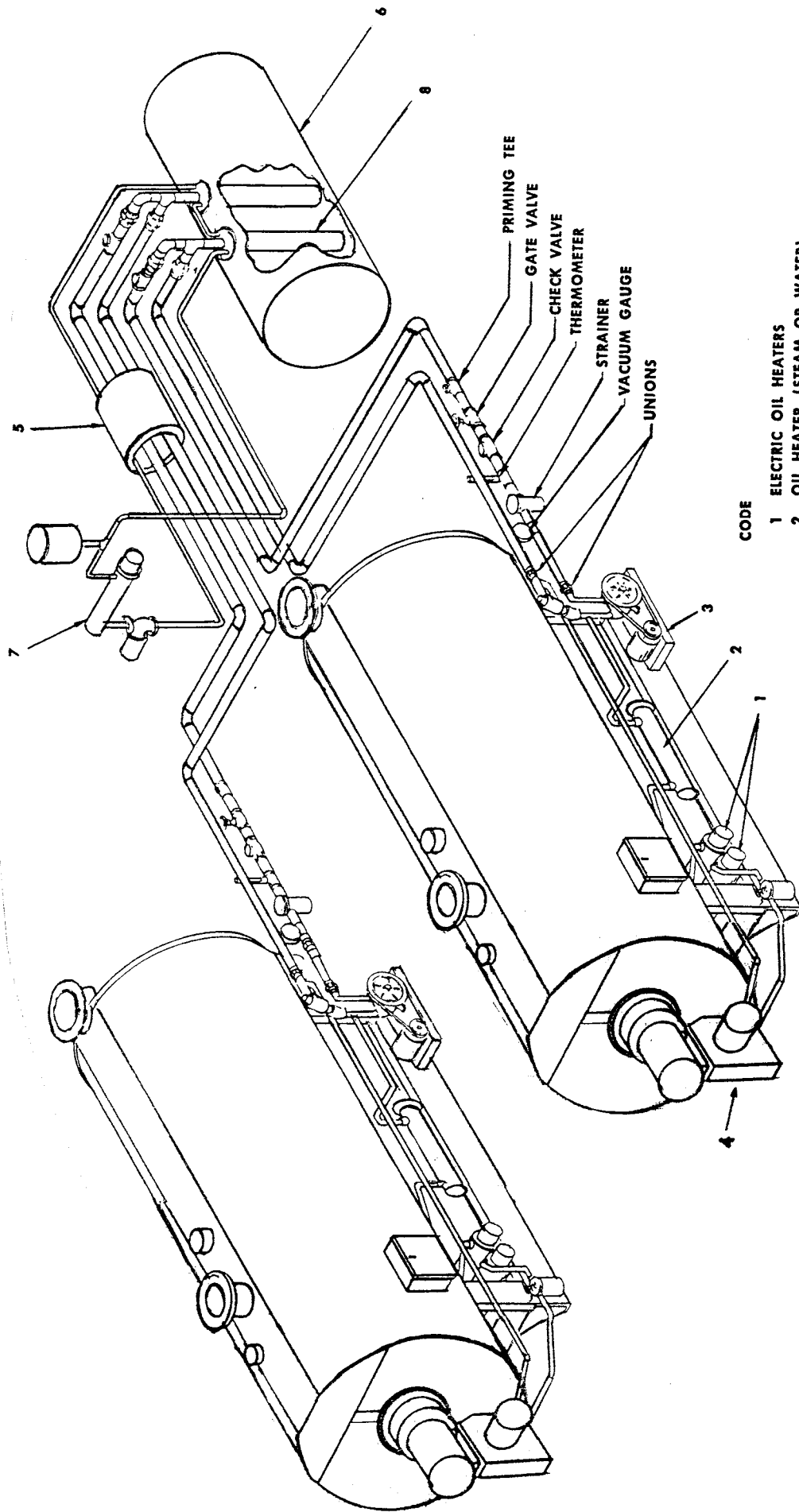
c) Dual nozzle shut off valves are provided to insure tight shut off of the oil to the nozzle.

- d) A nozzle air purge is provided to exhaust the nozzle and all oil piping on the nozzle side of the shut off valves of oil after each firing cycle. The air purge blows the oil into the combustion chamber, York-Shipley's system purges the oil through an orifice, a solenoid purge valve, and a check valve. This system results in a gradual purging, with complete combustion of the purged oil.
- e) All areas in which continuous circulation or air purging cannot be accomplished are heated electrically.

It is felt that this is the surest way to insure customer satisfaction and eliminate many of the problems heretofore considered inherent in #6 oil systems. Keep in mind that there is no substitute for a good maintenance program to go along with a good system.

The following page illustrates the above described system, which is York-Shipley's preferred #6 oil system. However, there may be times when it is desired to use common pumps for multiple boiler installation.

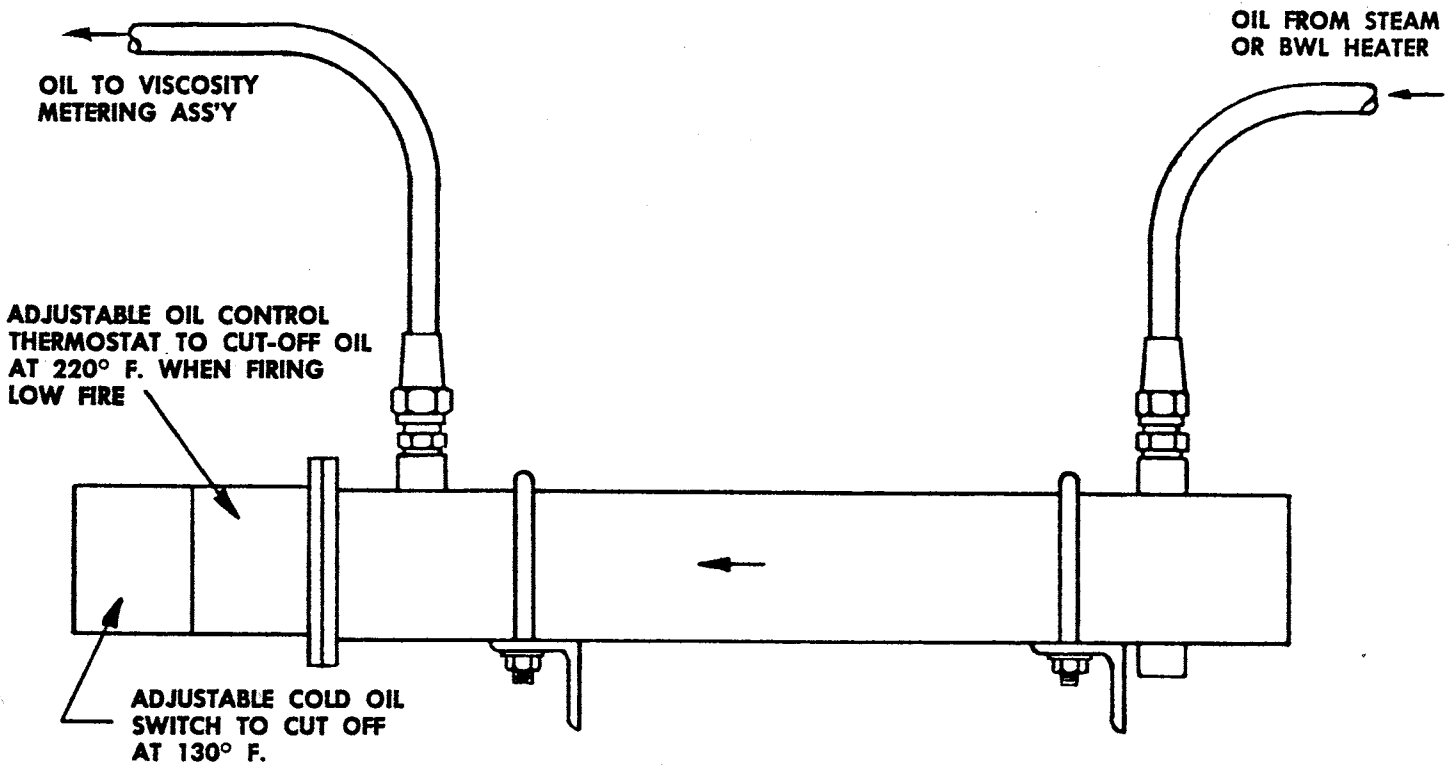
500 SERIES #6 FUEL OIL SYSTEM
Single or Duplex



CODE

- 1 ELECTRIC OIL HEATERS
- 2 OIL HEATER (STEAM OR WATER)
- 3 FUEL OIL PUMP
- 4 VISCOSITY METERING ASSEMBLY
- 5 PIPE COVER & INSULATION
- 6 TANK
- 7 AUXILIARY HEAT SYSTEM
- 8 TANK WELL

ELECTRIC FUEL OIL HEATER - MOUNTED ON UNIT ONLY - #6 OIL



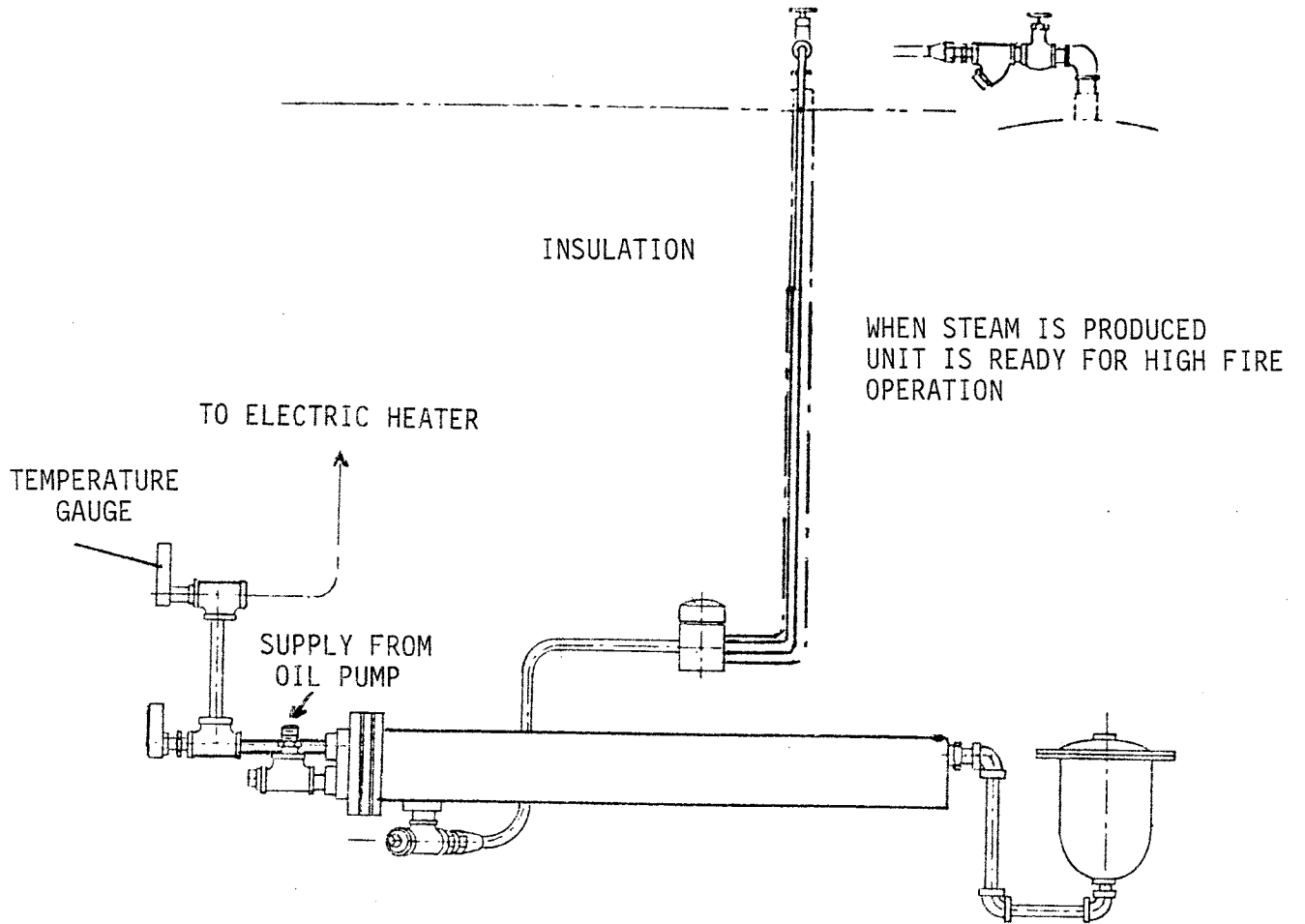
Purpose:

To heat the fuel oil at the start and to assist movement of the fuel oil from the storage tank to the burner. The electric heater is also used when the fuel oil is circulated between the storage tank and the metering valves to level off operating fuel temperature while burning. The suction line of the system is adjusted to 140° by the non-fire valve from heat supplied by the electric heater, until the system is balanced out – 140° suction – 220° electric heater outlet temperature. The heater is also adjusted for 130° low oil switch for safety. Establish low fire in the boiler and let operate until water temperature in the boiler reaches 190° F. While operating on low fire, adjust the firing oil system heating valve to suction temperature of 140° F.

Electric Heater Size #6 Oil

Size Unit	Model SPW – Water Operation 70° Design Rise	Model SPL-SPH – Steam Operation 35° Design Rise
175	2-5000	5000
200	2-5000	5000
225	2-5000	5000
250	3-4000	2-3000
300	3-4000	2-3000
350	3-4000	2-3000

Steam Fuel Oil Heater - Mounted on Unit Only
#6 or Hot #5 Oil SPH Units

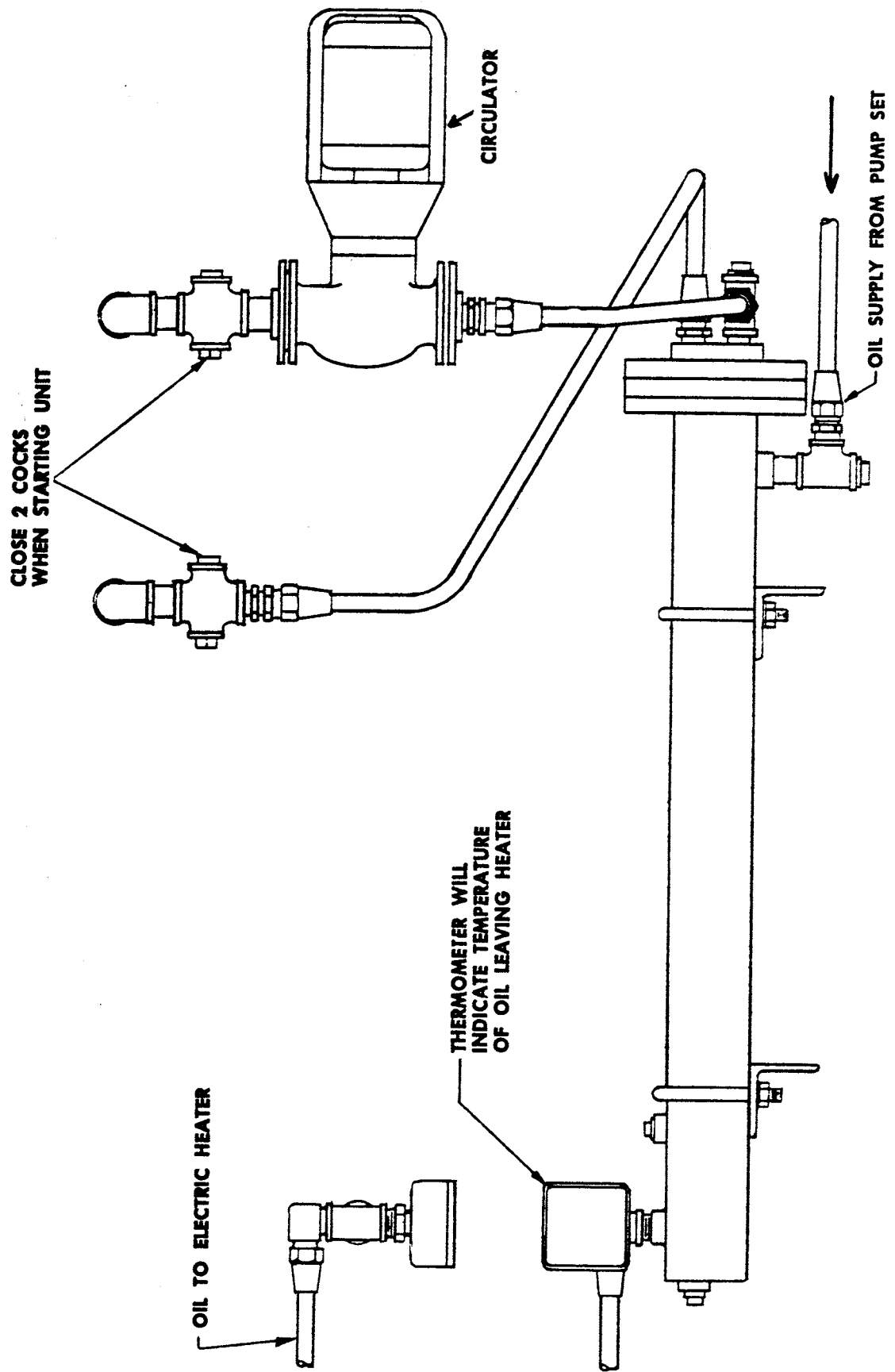


Below-the-Waterline Heater – Mounted On Units Only
(#6 Oil or Hot #5 Oil, SPL or SPW Units)

The below-the-waterline heater is needed to assist the electric heater in raising the temperature of the fuel oil. The boiler water is circulating through the heater at all times that the fuel pump assembly is circulating oil in the system. There are no thermostats to operate the circulator. The required temperature of the fuel oil is greater than the water or steam temperature, so the electric heater is used to raise the fuel oil to the desired temperature. When boiler reaches 190° F., cocks are left open and circulation is started, unit is ready for high fire adjustment.

Unit SPL-SPW	GPH Heated Fuel Oil	Size Circulator	Boiler Taps	Cocks	Drain Plugs
175	150	1"	1"	1"	3/8"
200	150	1"	1"	1"	3/8"
225	150	1"	1"	1"	3/8"
250	300	1"	1"	1"	3/8"
300	300	1"	1"	1"	3/8"
350	300	1"	1"	1"	3/8"

Below the Waterline Fuel Oil Heater – Mounted on Unit Only
#6 or Hot #5 Oil, SPL or SPW Units



#6 Oil Single Unit Fuel Oil Pumps Mounted On Unit

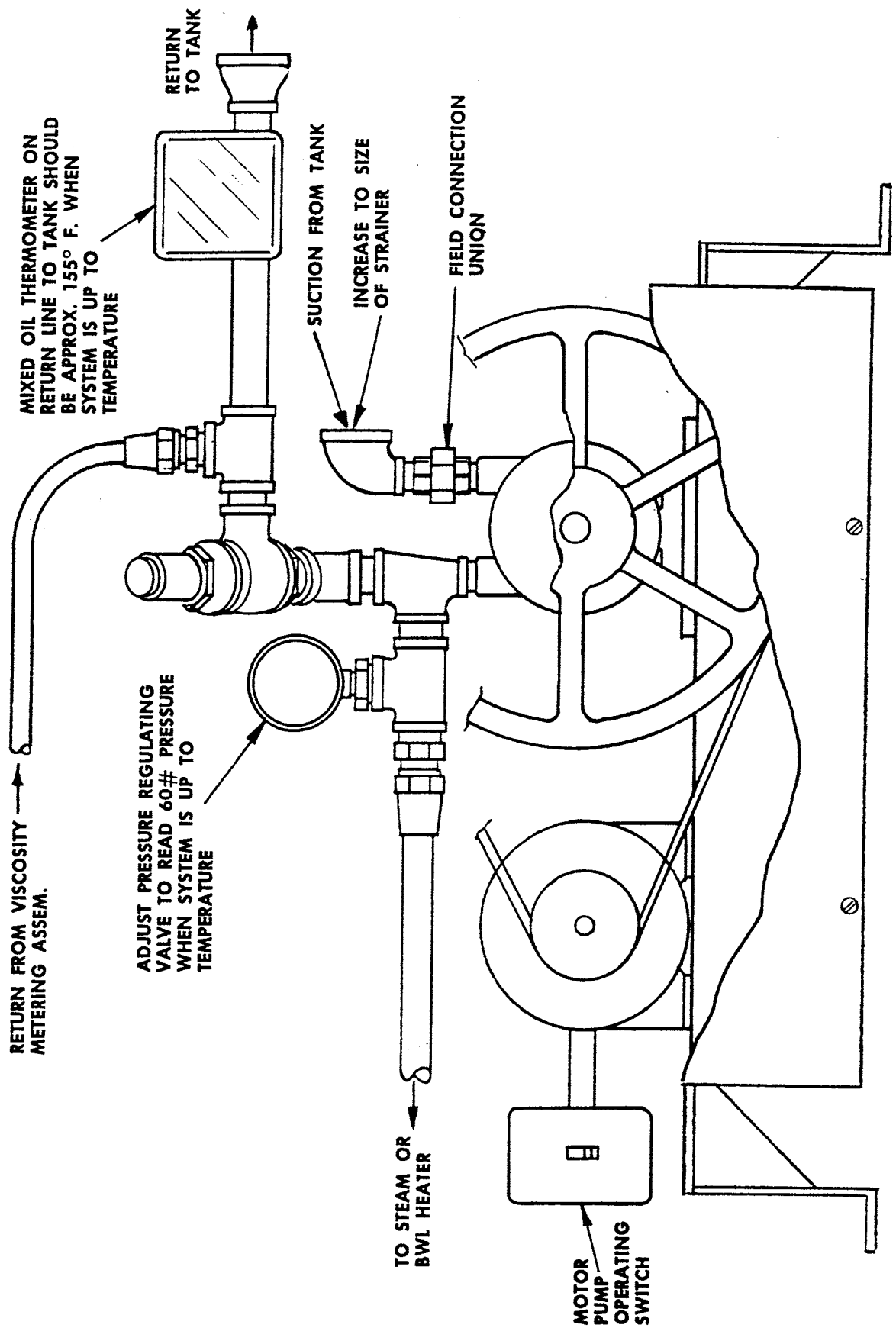
Fuel oil pumps are required to transport the fuel oil from the storage tank to the burner and return heated oil to the storage tank to maintain even temperature in the hot well within the tank and suction line.

The suction temperature should be maintained at approximately 130° to 140° F. The vacuum must be kept as low as possible, as the capacity of all fuel pumps drop as the vacuum increases—maximum should be 15" HG at the pump. The tank installation should be as close to the burner as Code will allow and the suction and return lines planned to reduce friction and well covered to reduce heat loss. The tank hot well must be carefully installed and selected to assist the pump in the maintenance of a heated suction line.

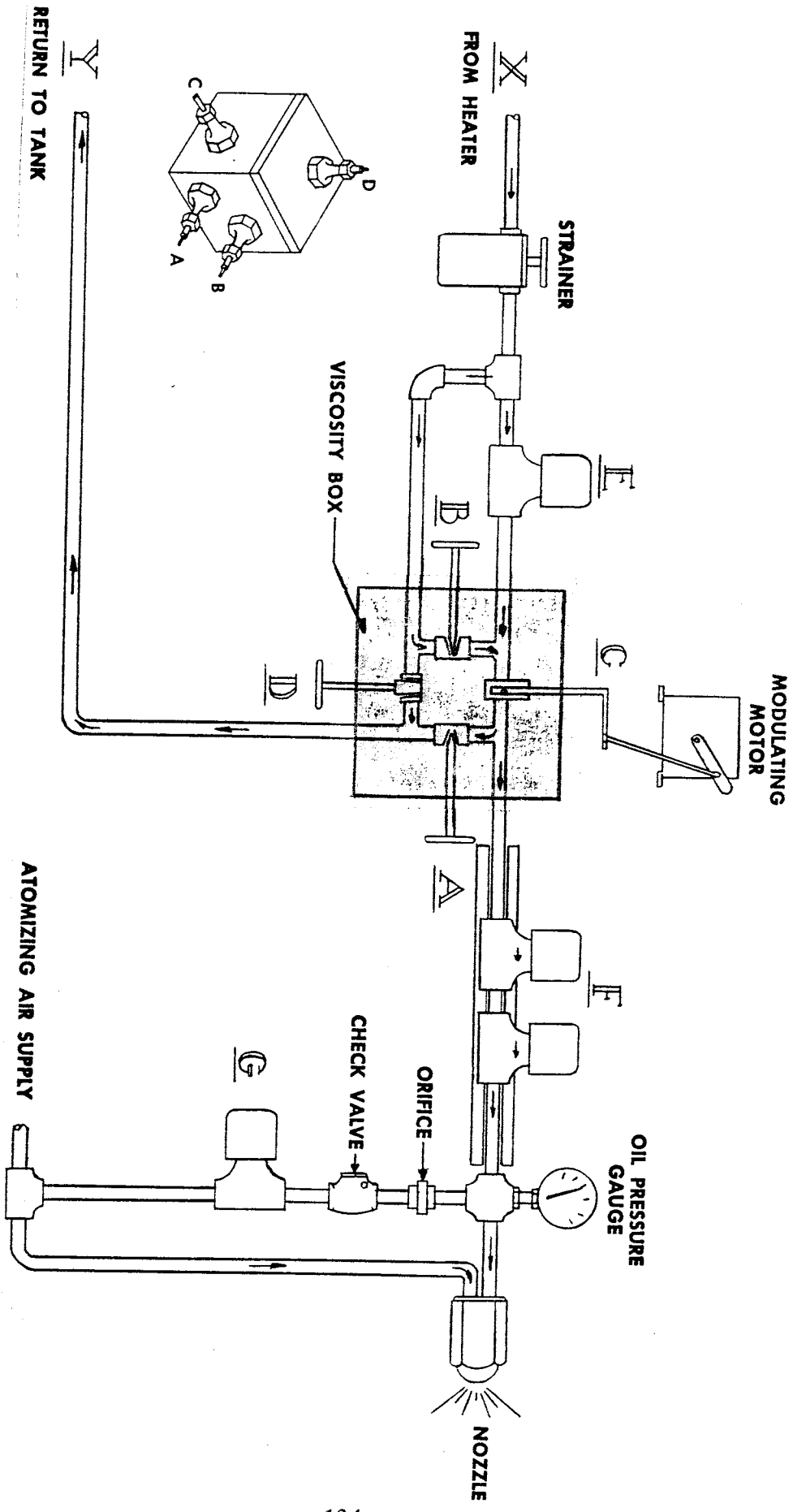
Fuel Oil Pumpset Single Unit

Pump Set Size	Boiler Size SPL SPW, SPH	RPM	GPH	Size Pump	HP Motor	Relief	Strainer	Pressure Gauge
150	175	475	150	C2	1/2	1"	2-1/2"	0 to 160
150	200	475	150	C2	1/2	1"	2-1/2"	0 to 160
150	225	475	150	C2	1/2	1"	2-1/2"	0 to 160
300	250	475	300	C3	3/4	1"	2-1/2"	0 to 160
300	300	475	300	C3	3/4	1"	2-1/2"	0 to 160

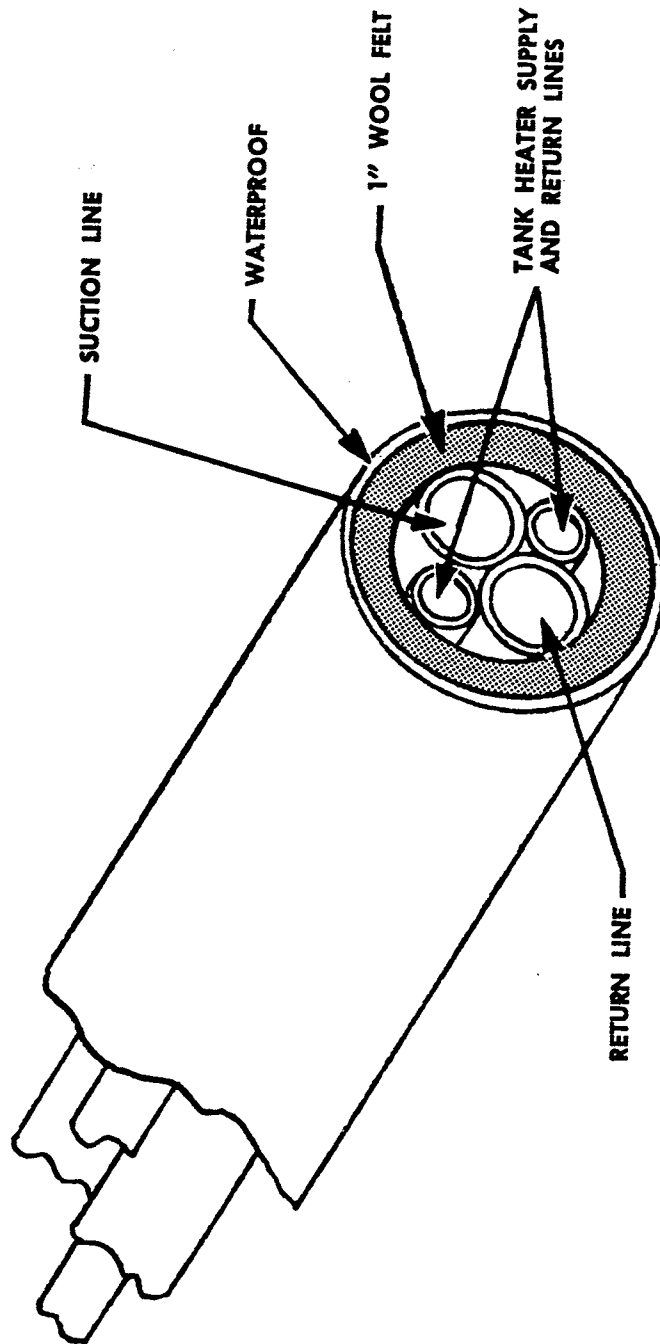
Fuel Oil Pump – Mounted on Unit
 #6 Oil With Continuous Oil Circulation



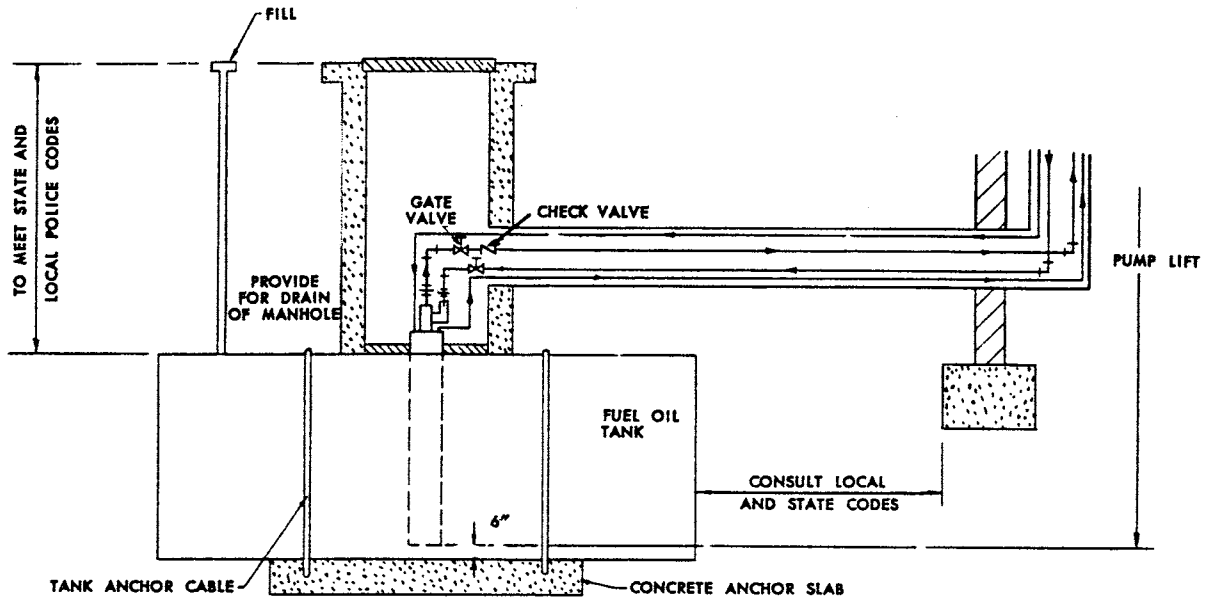
6 Oil Viscosity Metering Assembly



Detail of Insulating & Wrapping Tank Heater



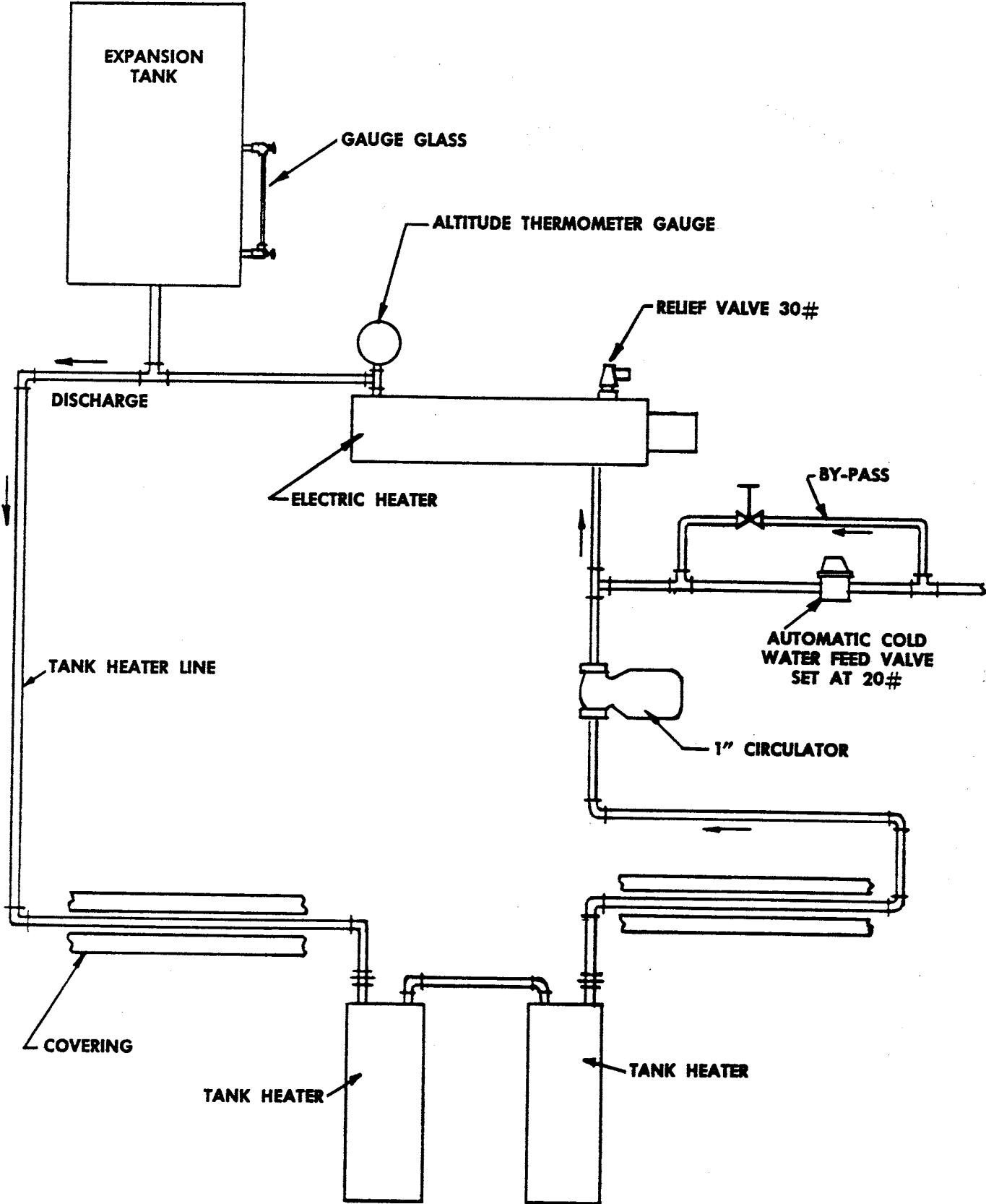
Fuel Oil Tank Piping #6 or Hot #5 Oil



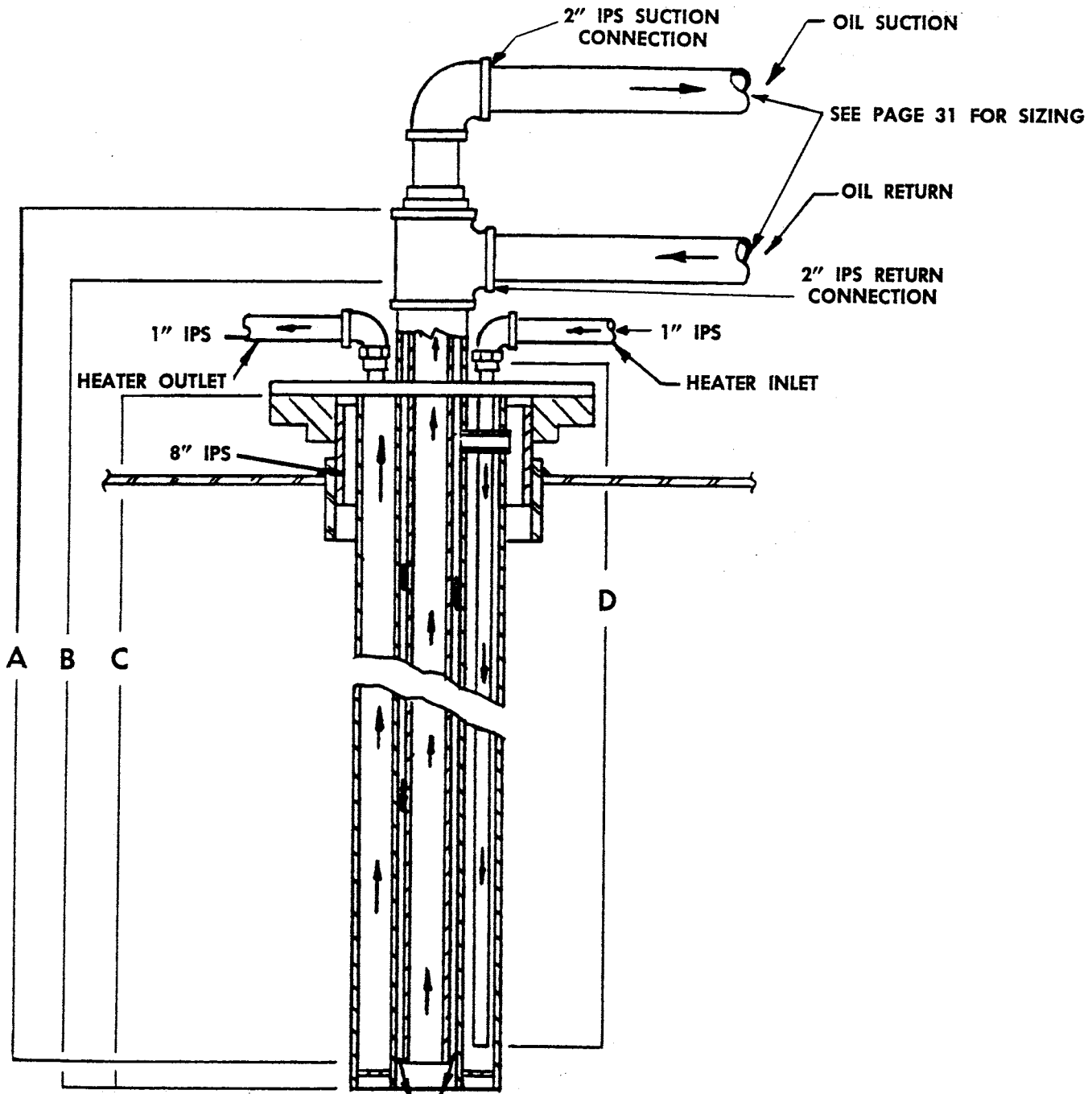
Note:

1. Test suction and return lines by sealing off tank and boiler piping and subjecting closed system to 125 lbs. inert gas pressure. Remove source of gas and allow system to remain full for a period of no less than 8 hours. Pressure gauge should be installed in closed system before subjecting to pressure. If pressure remains at 125 psi for test period, it is assumed system is tight.
2. **Positively do not** use cast iron fittings in fuel oil piping. Check all pipe threads for overcutting.
3. Run outside lines well below frost line.
4. Protect outside lines below driveways with reinforced concrete slab. Be careful with heavy machinery used during construction and in vicinity of pipe runs.
5. Install tank vent high enough to eliminate source of objectionable odors. Terminate tank vent within sight of tank fill. Use full sized tank fill pipe.
6. Use as few elbows and other fittings as possible. Straight runs are preferable.
7. Pitch lines up from tank to burner or remote pump set.
8. Run suction and return lines full sized to within 2 feet of burner pump connection.
9. To size lines and locate pump set, see "Fuel Pump Locations & Suction & Return Line Sizing" information.

Auxiliary Heat for Starting #6 Oil Units



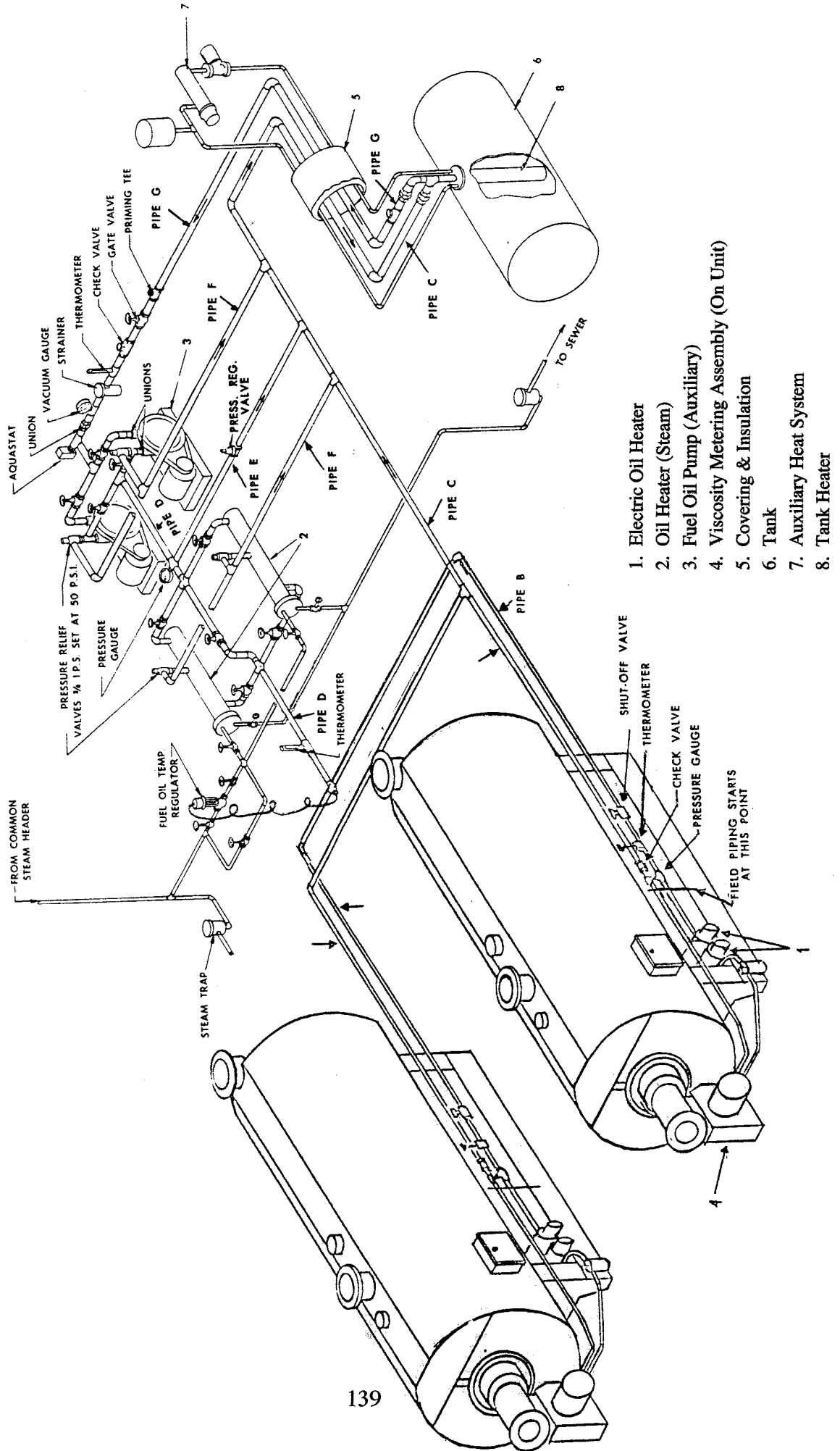
Tank Heater – Hot #5 and #6 Oil



Reference Chart

Tank Diameter	"A"	"B"	"C"	"D"
6'-0"	6'-4"	6'-1-3/4"	5'-10"	5'-11"
7'-0"	7'-4"	7'-1-3/4"	6'-10"	6'-11"
8'-0"	8'-4"	8'-1-3/4"	7'-10"	7'-11"
8'-6"	8'-10"	8'-7-3/4"	8'-4"	8'-5"
10'-0"	10'-4"	10'-1-3/4"	9'-10"	10'-11"
10'-6"	10'-10"	10'-7-3/4"	10'-4"	11'-5"

**500 Series Fuel Oil System
For Multiple Units with Common Pump
#6 Oil & Hot #5 Oil**



1. Electric Oil Heater
2. Oil Heater (Steam)
3. Fuel Oil Pump (Auxiliary)
4. Viscosity Metering Assembly (On Unit)
5. Covering & Insulation
6. Tank
7. Auxiliary Heat System
8. Tank Heater

Pipe Size Chart
Heated #5 Oil - #6 Oil

	1 Unit	2 Units	3 Units	4 Units
A. Return from Burner	2"			
B. Supply to Burner	2"			
C. Return to Tank**	2-1/2"	2-1/2"	3"	3"
D. Pump Discharge to Burner	2-1/2"	2-1/2"	3"	3"
E. Regulating Valve	1-1/2"	2"	2-1/2"	2-1/2"
F. Relief Safety Valve	1/2"	3/4"	1"	1"
G. Suction Line*	2"			

*Refer to Chart IV for safe lift and length of suction line.

*2" pipe size used with flow rates not to exceed 250 GPH pump set.

2 1/2" pipe size used with flow rate of 250 GPH to 500 GPH pump set.

3" pipe size used with flow rate of 500 to 1100 GPH pump set.

** Maximum back pressure or static head pressure in the return line – 5 psi.

Pump Set Flow Rate #4, #5, #6 Oil (Single Units)

Boiler Size 175 to 225 HP 150 GPH Standard Capacity

Boiler Size 250 to 350 HP 300 GPH Standard Capacity

Pump Set Flow Rate #5, #6 Oil – Heated (Multiple Units)

Example: Total Firing Rate – GPH x Factor = Size of Pump Set

4 – Boilers @ 100 GPH = 400 x 2.25 = 900 GPH

Example: Heater Capacity for Multiple Units

Total Firing Rate –

4 – Boilers @ 100 GPH = 400 x 1.25 = 500 GPH to 200° F

Pipe Size Chart

Non-Heated #4, & #5 Oil – Omit Oil Heater (#2) Covering
Detail (#5) Auxiliary Heating (#7), Tank Well, (#8) & Pipe A

	1 Unit	2 Units	3 Units	4 Units
A. Return from Burner				
B. Supply to Burner	1-1/4"			
C. Return to Tank**	1-1/2"	2"	2-1/2"	2-1/2"
D. Pump Discharge to Burner	1-1/2"	2"	2-1/2"	2-1/2"
E. Regulating Valve	1-1/4"	1-1/2"	2"	2"
F. Relief Safety Valve	1/2"	3/4"	1"	1"
G. Suction Line	1-1/2"	1-1/2"	2"	2"

*Refer to Chart IV for safe lift and length of suction line.

**Maximum back pressure or static head pressure in the return line – 5 PSI

Pump Set Capacity for Multiple Units #4, #5 Oil – Not Heated

Example: Total Firing Rate GPH x Factor = Size of Pump Set

$$4 - \text{Boilers @ } 100 \text{ GPH} = 400 \times 1.50 = 600 \text{ GPH}$$

Fuel Pump Location & Suction & Return Line Sizing For Steam-Pak 500 Series Hot #5 & #6 Oil Burning Units

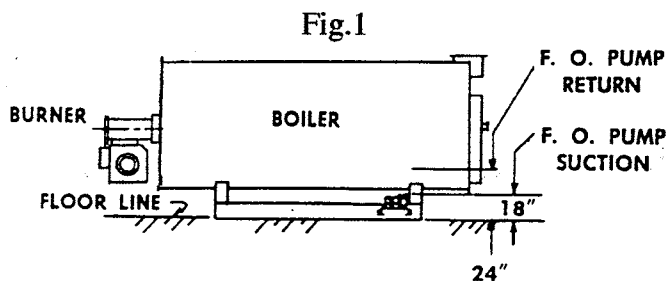


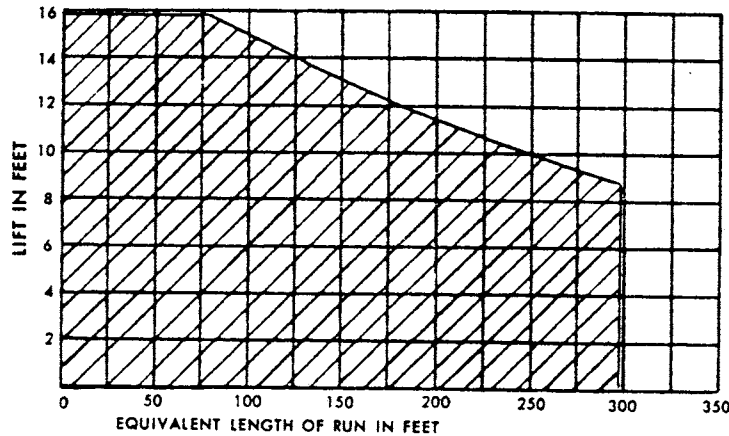
Fig 2

Boiler Size (BHP)	Individual Suction	Individual Return
175 through 350	2-1/2" IPS	2-1/2" IPS

Fig. 3

Pipe Size	Equivalent Ft. of Straight Pipe			
	Elbow	Tee	Gate Valve	Swing Check
2-1/2" IPS	8	16	4	17

Fig. 4
 Based on 15" Hg Vac. & 2000 SSU Vis.
 140° F Maximum Recommended Temp.



Safe Pump Operation Area Chart

Instructions for Sizing Fuel Lines

- Step #1 From boiler size (HP) determine required suction and return line size. (Fig. 2)
- Step #2 From plans, determine straight length of pipe run (both horizontal and vertical) from pump suction connection (Fig. 1) to the bottom of the fuel oil tank.
- Step #3 Determine the number and type of fittings in the length of run (Step #2) and convert these into a length of straight pipe. (Fig. 3)
- Step #4 Obtain equivalent length of run by adding Step #2 to Step #3.
- Step #5 From plans, determine the vertical distance from the bottom of the fuel oil tank to the boiler room floor.
- Step #6 Obtain the total lift by adding 1-1/2 ft. (Fig. 1) to Step #5.
- Step #7 Referring to Fig. 4, locate the intersection of the "Lift in Feet" (Step #6) and the "Equivalent Length of Run" (Step #4). If the intersection falls within the shaded area, the pump location on the unit is satisfactory.

If the Intersection Falls Outside the Shaded Area:

Step # 1A Using Fig. 4. determine the maximum equivalent length of run for the lift in Step #6.

Step #2A Subtract the equivalent length of fittings (Step #3) from the maximum equivalent length of run for lift involved (Step #1A) The resultant length is the maximum straight pipe distance from the bottom of the tank to the pump suction (horizontal and vertical).

Step #3A Remove the pump set from the boiler and relocate so that straight pipe distance does not exceed the value in Step #2A.

Sample Problems

Problem #1 What size suction and return line must be used on a #6 oil, 300 HP, 500 Series Steam-Pak? Where should the pump set be located?

Step #1 From Fig. 2, a 300 HP boiler requires a 2" IPS suction and a 2-1/2" IPS suction and 2-1/2" IPS return line.

Step #2 From the plans it is determined that the straight length of pipe run both horizontal and vertical is 150 ft.

Step #3 Again from the plans it is determined that the length of run contains 3 ells, 2 gate valves, and one swing check valve. Fig. 3 shows that each 2-1/2" IPS ell is equivalent to 8 ft. of straight pipe, each gate valve equals 4 ft. of straight pipe and the swing check equals 17 ft. of straight pipe. The total is then $(8 \times 3) + (4 \times 2) + 17 = 49$ ft.

Step #4 The equivalent length of run is then 150 ft. (Step #2) + 49 ft. (Step #3) = 199 ft.

Step #5 From the plans, the vertical distance from the boiler room floor to the bottom of the fuel tank is found to be 8.5 ft.

Step #6 The total lift is then 8.5 ft. + 1.5 ft. (Fig. 1) = 10 ft.

Step #7 Fig. 4 shows the intersection of 10 ft. of lift and 199 ft. of equivalent length of run to fall within the shaded area.

Solution: The use of 2-1/2" suction and return lines is required. The standard factory mounted location on the left rear of the unit is acceptable.

Problem #2 Solve Problem # 1 if the lift in Step #5 had been found to be 12.5 ft.

Step #1 From Fig. 2. an 80 HP boiler requires a 2" IPS suction and return line.

Step #2 Since the vertical lift is 4 ft. greater, the new straight length of pipe run, both horizontal and vertical will be 150 ft. + 4 ft. = 154 ft.

Step #3 The equivalent straight run for the fittings involved would not change = 49 ft.

Step #4 The equivalent length of run is then 154 ft. (Step #2) + 49 ft. (Step #3) = 203 ft.

Step #5 The lift is now 12.5 ft. from the bottom of the fuel tank to the boiler room floor.

Step #6 The total lift is then 12.5 ft. + 1.5 ft. (Fig. 1) = 14 ft.

Step #7 Refer to Fig. 4 and locate the intersection of 14 ft. of lift (Step #6) and 203 ft. "Equivalent Length of Run" (Step #4). It falls outside the shaded area, therefore the pump location on the unit is not satisfactory.

Step #1A Using Fig. 4, determine that the maximum equivalent length of run for 14 ft. of lifts is 125 ft. of equivalent straight pipe. (If a location can be found which requires a lesser lift, then a correspondingly longer equivalent length can be used.)

Step #2A Subtract the equivalent length of fittings, 49 ft. (Step #3) from the maximum equivalent length of run for the lift involved – 125 ft. (Step #1A). 125 ft. – 49 ft. = 76 ft. The maximum run of straight pipe from the pump suction to the bottom of the tank suction cannot exceed 76 ft. (horizontal and vertical).

Step #3A The pump set must be unbolted from its standard location and moved nearer the tank so that the linear distance in Step #2A is not

FUEL OIL, ITS SPECIFICATIONS AND OTHER RELATED SUBJECTS

There has been much discussion on the specifications of the various grades of available fuel oil, the discussions involving the point of fuel specifications, viscosities, and available heat content. The following deals with this subject in relation to the York-Shipley product.

The grades available are identified by their respective number as assigned by the U.S. Department of Commerce. Numbers 1, 2, 3, 4, 5 & 6 cover all ranges currently available. Any grade of fuel oil, from #1 to #6 may be found in the range of commercial and industrial applications.

Heavy Fuel Oil may mean:

A. Residual fuel oil, called #6 if used on land, or bunker oil if used on shipboard.

B. Fuel oil intermediate in quality between #6 and house heating distillate fuel. Although these intermediate fuels are not necessarily all blends of #2 and #6, they can be considered so for purposes of understanding them.

COMMERCIAL STANDARDS

Number 5 fuel has a dual set of specifications which are known as "Cold #5" and "Hot #5". "Cold" means that the fuel does not need to be preheated to be burned, while "Hot" means that it does need to be heated to be burned.

HEAT OF COMBUSTION OF FUEL OIL

Heat of combustion is defined as the available amount of heat energy per unit mass. We will use the gallon as the unit of mass and the BTU as the measurement of heat energy or heat of combustion. The heat of combustion of any fuel oil will be a function of the relative amounts of carbon and hydrogen it contains. This relativity in turn determines the gravity of the fuel. Consequently, heat of combustion varies greatly with the gravity of the fuel. The following table shows the heat of combustion in comparison with API gravity and density of the fuel.

TABLE 1 – HEAT CONTENT OF FUEL OILS

# Fuel	Deg. API Gravity	#/Gal. Density	BTU/Gal. Heat of Combustion
#6	7 to 22	8.5 to 7.7	156,600 to 146,300
#5 (Hot)	14 to 22	8.1 to 7.7	152,000 to 146,300
#5 (Cold)	18 to 28	7.9 to 7.4	149,400 to 143,100
#2	28 to 40	7.4 to 6.9	143,100 to 135,800

The table shows that the lower the API the greater the heat content of the fuel, and the higher the density the greater the heat content. The values shown are for pure hydrocarbons. If substantial amounts of sulfur, water or sediment are present, corrections should be made.

#6 FUEL OIL

#6 fuel may not be an undiluted refining residue. Some residual products are so viscous that they could not be conveniently handled in tanker compartments tank cars or truck transports. In that case they are cut back with sufficient distillate fuel to reduce their viscosity to a point at which handling becomes practical.

Only a few broad standards are imposed on #6 fuel oil. Fuel oil marketers and buyers may, and usually do, impose additional limits on the properties of their products and also make the limits of the standard more restrictive. Even so, #6 oil is fundamentally what is left after all lighter and higher cost products are obtained from the crude. It must sell for a low price. It must be offered "as is". Except perhaps for cutting for viscosity. If it receives any further treatment, it ceases to be a price product—in other words, it ceases to be #6 oil.

Refineries differ materially as to the refining equipment installed. Crudes differ. Refineries manufacture motor fuel, solvent naphthas, kerosene and light distillates to closely controlled limits. This means that variations resulting from equipment, process and crudes come out in magnified form in the residual #6 oil.

Although there are wide swings in the quality of #6 fuels, as between different refineries, the product coming from one refinery will not usually vary greatly from one shipment to another. Over long periods of time, the refinery may add new equipment, or operate on crude from a new source, and may manufacture a #6 of quite different quality. These changes, however, can be foreseen some time in advance.

A realistic approach to the subject of #6 quality forgets government standards and examines instead actual inspection of product as it is offered on the market. Such an approach would show something along the lines of the following table:

TABLE 2 - APPROXIMATE RANGE OF #6 OIL QUALITY

Gravity Deg. API	7 to 22
Pour Point, Deg. F.	+15 to +85
Viscosity, SSF at 122° F.	30 to 300
Conradson Carbon, % by Weight	5 to 14
Sulfur, % by Weight	0.5 to 3.5
Water by Distillation, % by Volume	Trace to 1.0
Sediment, by Extraction, % by Weight	Trace to 1.0
Ash, % by Weight	Trace to 0.5

It is evident from the foregoing table that anyone who uses #6 fuel should know the source of the product – a subject to be covered later in this article. In many ways, #6 quality is a local problem. A low-priced product cannot be shipped very far, except by water; high freight costs would make it a high cost product at the destination, and again it would not be a competitive #6 if it carried a high price tag.

INTERMEDIATE FUEL OILS

Some #4 and #5 oils are blended at refineries, but there is considerable field blending, with the result that variety in characteristics is great. The ranges can be set down in the following tables:

TABLE 3 - APPROXIMATE RANGE OF #5 (HOT) FUEL OIL

Gravity Deg. API	14 to 22
Pour Point, Deg. F.	-10 to +80
Viscosity, SSF at 122° F.	20 to 40
Conradson Carbon, % by Weight	3.0 to 8.0
Sulfur, % by Weight	0.5 to 2.0
Water and Sediment, % by Volume	Trace to 1.0
Ash, % by Weight	Trace to 0.1

TABLE 4 – APPROXIMATE RANGE OF #4 (COLD #5) FUEL OIL

Gravity Deg. API	18 to 28
Pour Point, Deg. F.	-20 to +20
Viscosity, SSF at 100° F.	50 to 150
Conradson Carbon, % by Weight	1.0 to 6.0
Sulfur, % by Weight	0.2 to 1.5
Water by Distillation, % by Volume	Trace to 0.5
Ash, % by Weight	Trace to 0.05

There is a substantial volume of #2 fuel oil (domestic heating oil) used in commercial and industrial heating. It is of additional interest in this connection because it is also used for blending with #6.

TABLE 5 – APPROXIMATE RANGE OF #2 FUEL OIL QUALITY

Gravity Deg. API	28 to 40
Pour Point, Deg. F.	-20 to +5
Viscosity, SSF at 100° F.	32 to 40
Conradson Carbon Residue on 10% Bottom, % by Weight	0.05 to 0.35
Sulfur, % by Weight	0.2 to 0.9
Water and Sediment, % by Weight	Nil to 0.1
Ash, % by Weight	Nil to 0.02

BLENDING OF FUELS

Blending of #6 and #2 fuels to make a #4 and #5 fuel must be done under certain conditions to be effective and lasting. If improperly done, the blending may not be permanent and the two components may stratify. When the blend is supplied to a burner, there may be alternate slugs of #2 and #6, a condition that can only result in unsatisfactory operation.

Two conditions must be provided in successful blending: (1) heat, and (2) agitation. The usual blending temperature for #2 is 100° F, and in some cases as high as 120° F. The blending tank should first be filled with the #6 component, with the #2 at an approximate temperature of 160° F added afterward. Agitation can be provided by pumping from the bottom of the tank and discharging to the top.

Not every #2 fuel is compatible with any #6. If blending is done at the refinery, the refiner avoids incompatible stocks. Field blenders who may not have all the details may run into difficulties in this respect.

For better understanding of the heat content of various grades of fuels, at various densities and gravities, the following table has been prepared:

TABLE 6 – GRAVITIES, DENSITIES AND HEATS OF COMBUSTION OF FUEL OILS

Values for 10 to 49 Deg. API reprinted from the Bureau of Standards Miscellaneous Publication #97,

"Thermal Properties of Petroleum Products".

Gravity @ 60/60 F		Density @ 60° F	Total Heat of Combustion (at Constant Volume)			Net Heat of Combustion (at Constant Pressure)		
Deg. API	Specific Gravity	Lb./Gal.	BTU/Lb.	BTU/Gal @ 60° F	Cal per G	BTU/Lb.	BTU/Gal @ 60° F.	Cal. Per G
5	1.0366	8.643	18,250	157,000	10,140	17,290	149,400	9,610
6	1.0291	8.580	18,330	157,300	10,180	17,340	148,800	9,650
7	1.0217	8.518	18,390	156,600	10,210	17,390	148,100	9,670
8	1.0143	8.457	18,440	155,900	10,240	17,440	147,500	9,700
9	1.0071	8.397	18,490	155,300	10,270	17,490	146,900	9,720
10	1.0000	8.337	18,540	154,600	10,300	17,540	146,200	9,740
11	0.9930	8.279	18,590	153,900	10,330	17,580	145,600	9,770
12	0.9861	8.221	18,640	153,300	10,360	17,620	144,900	9,790
13	0.9792	8.164	18,690	152,600	10,390	17,670	144,200	9,810
14	0.9725	8.108	18,740	152,000	10,410	17,710	143,600	9,840
15	0.9659	8.053	18,790	151,300	10,440	17,750	142,900	9,860
16	0.9593	7.998	18,840	150,700	10,470	17,790	142,300	9,880
17	0.9529	7.944	18,890	150,000	10,490	17,820	141,600	9,900
18	0.9465	7.891	18,930	149,400	10,520	17,860	140,900	9,920
19	0.9402	7.839	18,960	148,800	10,540	17,900	140,300	9,940
20	0.9340	7.787	19,020	148,100	10,570	17,930	139,600	9,960
21	0.9279	7.736	19,060	147,500	10,590	17,960	139,000	9,980
22	0.9218	7.686	19,110	146,800	10,620	18,000	138,300	10,000
23	0.9159	7.636	19,150	146,200	10,640	18,030	137,700	10,020
24	0.9100	7.587	19,190	145,600	10,660	18,070	137,100	10,040
25	0.9042	7.538	19,230	145,000	10,680	18,100	136,400	10,060
26	0.8984	7.490	19,270	144,300	10,710	18,130	135,800	10,070
27	0.8977	7.443	19,310	143,700	10,730	18,160	135,200	10,090
28	0.8871	7.396	19,350	143,100	10,750	18,190	134,600	10,110
29	0.8816	7.350	19,380	142,500	10,770	18,220	133,900	10,120
30	0.8762	7.305	19,420	141,800	10,790	18,250	133,300	10,140
31	0.8708	7.260	19,450	141,200	10,810	18,280	132,700	10,150
32	0.8654	7.215	19,490	140,600	10,830	18,310	132,100	10,170
33	0.8602	7.171	19,520	140,000	10,850	18,330	131,500	10,180
34	0.8530	7.128	19,560	139,400	10,860	18,360	130,900	10,200
35	0.8498	7.085	19,590	138,800	10,880	18,390	130,300	10,210
36	0.8448	7.043	19,620	138,200	10,900	18,410	129,700	12,230
37	0.8398	7.001	19,650	137,600	10,920	18,430	129,100	10,240

TABLE 6 (CONT.) – GRAVITIES, DENSITIES AND HEATS OF COMBUSTION OF FUEL OILS

Gravity @ 60/60 F		Density @ 60° F	Total Heat of Combustion At Constant Volume)			Net Heat of Combustion (at Constant Pressure)		
Deg. API	Specific Gravity	Lb/Gal.	BTU/Lb.	BTU/Gal @ 60° F	Cal per G	BTU/Lb.	BTU/Gal @ 60° F.	Cal. Per G
38	0.8348	6.960	19,680	137,000	10,940	18,460	128,500	10,260
39	0.8289	6.920	19,720	136,400	10,950	18,480	127,900	10,270
40	0.8241	6.879	19,750	135,800	10,970	18,510	127,300	10,280
41	0.8203	6.839	19,780	135,200	10,990	18,530	126,700	10,300
42	0.8155	6.799	19,810	134,700	11,000	18,560	126,200	10,310
43	0.8109	6.760	19,830	134,100	11,020	18,580	125,600	10,320
44	0.8063	6.722	19,860	133,500	11,030	18,600	125,000	10,330
45	0.8017	6.684	19,890	132,900	11,050	16,620	124,400	10,340
46	0.7992	6.646	19,920	132,400	11,070	18,640	123,900	10,360
47	0.7927	6.609	19,940	131,900	11,080	18,660	123,300	10,370
48	0.7823	6.572	19,970	131,200	11,100	18,680	122,800	10,380
49	0.7839	6.536	20,000	130,700	11,110	18,700	122,200	10,390

IMPURITIES IN FUEL OILS

The impurities in #5 and #6 oil are generally sulfur and vanadium. As mentioned, the amounts of these that are present depend on the amount of yield of gasoline. Any refining method that results in higher yields of gasoline and lower yields of residual oil will accentuate the concentration of these harmful impurities in the #6 oil.

An additional impurity is ash content, which is troublesome but not harmful.

VANADIUM is present in residual fuel oil and in the crude oil as a soluble compound, sometimes referred to as a porphyrin. During the process of combustion, it is oxidized to one of five oxides: V_2O , V_2O_2 , V_2O_3 , V_2O_4 or V_2O_5 , of which the last is the most important.

Vanadium Pentoxide, V_2O_5 , is reddish-yellow in color. While it is seldom observed to have this appearance in slag formations in boilers, there have been reddish deposits observed on diesel engine piston heads, which upon analysis revealed an equivalent to 93% V_2O_5 . The color of slag formations from oil fired boilers is generally from gray to black, but with some brownish overtones. Analysis of these deposits frequently indicates the presence of an equivalent to 60%. Slag at the time of removal from a cold boiler is a complex formation containing many of the other ash forming constituents from the fuel oil, the air, and metals from the boiler surfaces. Examination of some slag formations removed

from the superheater tubes and hangers, indicates that the entire mass had been in a molten state and flowed like lava. It is, of course, in the molten state that V_2O_5 causes corrosive attacks by fluxing with the protective oxide layer on the steel. In this state it also soaks into porous refractory, causing extensive damage.

SULFUR is present in all grades of fuel as shown by tables 2, 3, 4 and 5. Sulfur dioxide or sulfur trioxide, formed by the combustion of sulfur in fuels, are the principle corroding substances in flue gases. They become active whenever sufficient moisture is present for the formation of sulphurous or sulfuric acid, and they lower the dew points of the flue gases appreciably.

If allowed to persist over any length of time, this acid will harm the boiler tubes or metallic surfaces. This is a very important consideration, especially in those industrial applications where the boiler water temperatures are kept low enough to be below the dew point temperatures of the flue gases.

The accumulation of ASH in flues, breeching and the boiler proper has been a subject of much discussion, especially in heavier oil installations. A case was reported in which ships in transatlantic service, each firing four marine boilers with approximately 10,000 barrels of fuel oil per round trip, experienced slag and ash accumulation which amounted to more than 1-1/2 tons on the floor of each boiler.

Considering what we know from the tables, if a customer were to burn 30,000 gallons or 240,000 lbs. of #6 fuel in one year, then under maximum conditions under the CS12-48 specifications it would be possible for the customer to accumulate 1,200 lbs. of the ash.

VANADIUM POISONING – The toxicity of vanadium to humans has been long recognized. The symptoms of vanadium poisoning include a greenish-black discoloration of the tongue and teeth, a metallic taste in the mouth, irritation of the throat and nasal passages with sneezing and an irritating cough, and also a skin irritation where sweating occurs. This poisoning, often referred to as "black tongue" usually clears up within 48 hours after withdrawal from the boiler, although discoloration of the tongue and teeth may persist for 4 – 5 days. The minimum protection for the boiler worker should consist of a coverall secured at wrist and ankle, gloves and boots, and a hood with an external source of air, to cover the face

FLASH AND FIRE POINTS

The flash point of an oil is the temperature to which it has to be heated to for sufficient flammable vapor to be driven off and flash when brought into contact with a flame. The fire point is the higher temperature at which the oil vapors will continue to burn when ignited. In general, the open flash point is 30° F. higher than the closed flash, and the fire point is some 50 – 70 °F. above this flash point.

Flash and fire points depend on the nature of the original crude oil, the viscosity, and the method of refining. For the same viscosities and degree of refinement, the paraffinic oils are higher than the naphthenic flash and fire points.

The flash point of an oil is important with regard to safety in handling and storage. The distillation characteristics determine whether or not the oil can be completely evaporated in some types of burners, and whether cracking will be likely to occur prior to combustion. A low pour point and low water content are necessary for handling and outdoor storage in cold climates. Sediment should be low to prevent clogging of strainers. Carbon residue is related to the rate of accumulation of unburned material in some types of burners. A low viscosity allows the fuel oil to flow through supply lines readily and to be broken up into small droplets in atomizing type burners. The sulfur content is of importance because undesirable compounds of sulfur may be formed in certain industrial processes.

Some of these characteristics of a fuel oil are required to lie within certain limits for each of the grades of fuel oil. Some fuel oils do not fall into any of the grade classifications because failure to comply with all the requirements of one grade does not automatically place the fuel oil in the next lower grade, unless it meets all of the requirements of the lower grade. The following table is based on the "Pensky-Martens" method in Standard Laboratory testing for flash points.

TABLE 7 – FLASH POINTS OF FUEL OILS

#2	100 or legal
#4	130 or legal
#5	130 or legal
#6	150 or legal

The flash point, instrument, and method for determining minimum flash point shall be those legally required for the locality in which the oil is sold. In the absence of legal requirements, the minimum flash point shall be determined in accordance with the standard test for flash point by means of the Pensky-Martens closed tester, ASTM designation: D93-46.

TABLE 8 – FLASH POINTS OF FUEL OILS

Fuel	Min. °F	Max. °F.	Avg. °F
#2	130	160	148
#4	150	180	160
#5	150	200	170
#6	170	200	180

FUEL OIL PROPERTIES VERSUS REFINERY LOCATION

As mentioned previously, the properties of the fuels will vary according to the refinery location. Tables 9, 10, 11, and 12 represent an actual check of a major fuel oil supplier. Note that while the ash remains fairly constant in all four refineries, the sulfur and vanadium pentoxide vary widely.

TABLE 9
REFINERY A – EAST COAST #6 FUEL OIL PROPERTIES

Gravity: °API	14.2	14.3	13.9	14.2	14.0
Viscosity, Furol 122° F.	157.3	151.7	155.7	148.4	154.0
Flash, P-M: °F.	240	220	225	196	250
Pour: °F.	+5	+30	+40	+25	+15
Sulfur, B; %	3.37	3.23	2.89	3.24	3.39
Water by Distillation: % by Weight	trace	trace	trace	trace	trace
Water & Sediment	0.2	0.2	0.2	0.2	0.2
Sediment: % ASTM D 473-48T	0.06	0.05	0.06	0.08	0.10
Carbon Residue	11.76	11.83	11.72	13.09	12.34
Ash: % by Weight of Fuel Oil	0.049	0.046	0.054	0.055	0.06
Fusion Point: °F.	1090	1110	1085	1085	1120
Total Vanadium as V ₂ O ₅ : % of Total Ash	12.3	10.5	22.6	13.8	7.9
Total Vanadium as V ₂ O ₅ : % of Total Oil	0.0060	0.0048	0.0122	0.0076	0.0047
Total Vanadium as V ₂ O ₅ : PPM of Oil	64	48	122	76	47
As V: PPM of Oil	34	27	68	43	26
BTU/lb., Gross, Calculated	18,300	18,320	18,360	18,320	18,290
BTU/gallon., Gross, Calculated	148,010	148,100	148,800	148,160	148,120

TABLE 10
REFINERY B – EAST COAST #6 FUEL OIL PROPERTIES

Gravity: °API	14.3	12.9	12.6	12.3	14.0	12.5	12.6	12.3
Viscosity, Furol 122° F.	137.2	173.2	173.5	187.5	115.4	170.3	171.2	196.2
Flash, P-M: °F.	150	230	210	240	285	225	215	225
Pour: °F.	+15	+50	+35	+30	+20	+45	+35	+30
Sulfur, B; %	2.53	2.75	3.17	3.45	2.88	3.28	3.35	3.61
Water by Distillation: % by Weight	trace	trace	trace	trace	trace	trace	trace	trace
Water & Sediment	0.15	0.1	0.2	0.2	0.4	0.1	0.2	0.1
Sediment: % ASTM D 473-48T	0.04	0.06	0.07	0.05	0.05	0.06	0.05	0.06
Carbon Residue	10.2	13.7	11.9	12.99	11.83	10.78	11.19	11.3
Ash: % by Weight of Fuel Oil	0.033	0.043	0.041	0.041	0.051	0.039	0.040	0.034
Fusion Point: °F.	1145	1100	1115	1140	1145	1145	1125	1150
Total Vanadium as V ₂ O ₅ : % of Total Ash	38.4	59.8	62.8	43.1	26.2	39.0	36.6	35.9
Total Vanadium as V ₂ O ₅ : % of Total Oil	0.0127	0.0257	0.0257	0.0177	0.0134	0.0152	0.0146	0.0122
Total Vanadium as V ₂ O ₅ : PPM of Oil	127	257	257	177	134	152	146	122
As V: PPM of Oil	71	144	144	99	75	85	82	68
BTU/lb., Gross, Calculated	18,430	18,430	18,270	18,214	18,210	18,260	18,240	18,200
BTU/gallon., Gross, Calculated	148,950	149,750	149,390	149,272	147,450	149,400	149,180	149,150

TABLE 11
REFINERY C – MIDWEST #6 FUEL OIL PROPERTIES

Gravity: °API	12.3	12.0	11.7	11.4	11.7	12.3	12.6	11.5	11.7	11.8
Viscosity, Furol 122° F.	125.7	141.3	150.2	155.4	149.1	102.9	93.4	134.4	137.0	103.6
Flash, P-M: °F.	245	230	235	230	240	255	225	225	235	240
Pour: °F.	+10	+15	+30	+25	+20	+20	+25	+25	+25	+10
Sulfur, B; %	0.82	0.89	0.82	0.83	0.81	0.84	0.75	0.83	0.80	0.79
Water by Distillation: % by Weight	trace	trace	trace	trace	trace	trace	trace	trace	trace	trace
Water & Sediment	0.15	0.15	0.1	0.15	0.2	0.2	0.25	0.20	0.40	0.1
Sediment: % ASTM D 473-48T	0.04	0.04	0.05	0.08	0.05	0.05	0.06	0.06	0.05	0.06
Carbon Residue	11.2	10.5	10.7	10.0	12.25	10.16	10.14	10.74	12.1	10.8
Ash: % by Weight of Fuel Oil	0.027	0.029	0.026	0.035	0.026	0.022	0.021	0.028	0.024	0.024
Fusion Point: °F.	1185	1280	1210	1190	1225	1205	1210	1105	1110	1235
Total Vanadium as V ₂ O ₅ : % of Total Ash	13.3	12.3	18.9	9.2	15.0	13.6	12.0	12.6	14.5	13.0
Total Vanadium as V ₂ O ₅ : % of Total Oil	0.0036	0.0036	0.0049	0.0032	0.0039	0.0030	0.0025	0.0035	0.0035	0.0033
Total Vanadium as V ₂ O ₅ : PPM of Oil	36	36	49	32	39	30	25	35	35	33
As V: PPM of Oil	20	20	27	18	22	17	14	20	20	18
BTU/lb., Gross, Calculated	18,610	18,580	18,590	18,570	15,580	18,600	18,620	18,570	18,560	18,600
BTU/gallon., Gross, Calculated	152,510	152,580	152,960	153,130	152,900	152,420	152,270	153,030	152,750	152,920

TABLE 12
REFINERY D – SOUTHWEST #6 FUEL OIL PROPERTIES

Gravity: °API	14.0	14.4	14.8	13.2	16.0	15.3	15.2	14.9
Viscosity, Furol 122° F.	87.1	91.8	82.5	106.0	69.2	66.6	77.2	84.9
Flash, P-M: °F.	220	188	235	210	230	250	220	208
Pour: °F.	+10	+10	0	+5	+10	+5	+15	+20
Sulfur, B; %	1.03	1.15	0.97	1.22	0.83	1.19	1.19	0.94
Water by Distillation: % by Weight	trace	0.1	0.1	trace	0.1	trace	0.2	trace
Water & Sediment	0.02	0.2	0.15	0.2	0.2	0.2	0.2	0.5
Sediment: % ASTM D 473-48T	0.06	0.06	0.06	0.09	0.06		0.07	0.05
Carbon Residue	8.28	8.93	7.57	8.69	7.27	7.65	7.26	6.96
Ash: % by Weight of Fuel Oil	0.051	0.038	0.034	0.086	0.082	0.067	0.0048	0.059
Fusion Point: °F.	1165	1130	1195	1330		1195	1160	1220
Total Vanadium as V ₂ O ₅ : % of Total Ash	1.6	4.9	0.8	1.5	0.9	1.9	2.6	1.8
Total Vanadium as V ₂ O ₅ : % of Total Oil	0.0008	0.0019	0.0003	0.0013	0.0007	0.0013	0.0012	0.0011
Total Vanadium as V ₂ O ₅ : PPM of Oil	8	19	3	13	7	13	12	11
As V: PPM of Oil	5	11	2	7	4	7	7	6
BTU/lb., Gross, Calculated	18,640	18,630	18,670	18,580	18,740	18,670	18,640	18,660
BTU/gallon., Gross, Calculated	150,970	150,430	150,420	151,310	149,740	149,830	149,760	150,190

LUBRICATION PROCEDURES AND REQUIREMENTS FOR STEAM-PAK MOTORS

A. Ball Bearing (identified by plugged grease ports)

1. To add grease periodically:
 - a. Check grease level in bearings each month adding grease only if necessary. Too much grease may be just as damaging as too little. Housing should be at least 1/3 full, but never more than 2/3 full.
 - b. When greasing use only a hand operated pressure gun.
 - c. Wipe clean the plugged hole and the regions around hole and relief plug. (GE motors use pressure fitting.)
 - d. Remove both filler plug and relief plug to prevent a pressure build-up.
 - e. Free relief hole of hardened grease.
 - f. Add grease with motor running until it is expelled through the relief hole.
 - g. Run motor for several minutes with relief plug removed to expel excess grease and relieve pressure which may have been built up.
 - h. Clean and replace relief plug.

2. To clean and re-grease:
 - a. Bearings should be cleaned and re-greased once a year.
 - b. Follow through on Section 1, items c, d, and e.
 - c. Replace relief plug and fill housing with solvent with motor running. After 10 minutes, drain off solvent. Repeat this process until solvent comes out clear. If carbon tetrachloride is used for flushing, rinse housing with small amounts of light mineral oil.
 - d. Follow through on Section 1, items f, g and h.

3. Motors with special characteristics:
 - a. High speed motors (3450 RPM) should be greased every six months.
 - b. Motors 7-1/2 HP or greater should use at least one ounce of grease every six months.
 - c. Westinghouse pre-lubricated ball bearings provide adequate lubrication for at least five years. At the end of five years, the shield on the outer end of the bearing should be removed and the grease examined. If grease is discolored and has a bad odor, bearings should be cleaned and re-packed with grease. If not, shield may be replaced and the bearings put back into service for several years.

B. Sleeve Bearings (Usually identified by spring capped oil fill)

1. Periodic oiling:
 - a. Check oil on sleeve bearing once a month.
 - b. To add oil, motor should be stationary. A false oil level is shown when motor is running. It may be high or low, depending on direction of rotation. Always fill to near the top of housing.

LUBRICATION PROCEDURES AND REQUIREMENTS (CONTINUED)

- c. Always wipe up surplus oil. Exterior oil is sign of a leak. If found, determine cause and correct.

2. To clean and re-oil sleeve bearings:

- a. Bearings should be cleaned and re-oiled every six months. However, if oil is dirty and emulsified before this time, clean more often.
- b. To clean bearings, flush through filler cap with drain plug removed.
- c. After draining, seal threads of drain plug with an oil sealing compound and refill the oil reservoir.

3. Motors with special characteristics.

- a. High speed motors (3450 RPM) should be re-oiled every 3 months.
- b. Motors 7-1/2 HP or greater should be re-oiled every 3 months.

C. Lubricants for Ball Bearings

1. Gould Motors:

- a. Fractional Horsepower motor bearings: pre-lubricated no further lubrication necessary.
- b. Integral Horsepower motor bearings: Re-lubricate with Non-Fluid Oil Corp G-60 or Chevron SRI #2 grease unless otherwise stamped on the nameplate.

2. G. E. Motors:

- a. G. E. Grease Specification D6A2C5 - General Electric Co., Schenectady, N.Y.
- b. A grease with following characteristics:
 1. ASTM worked consistency 270-290 with minimum change over range of operating temperatures.
 2. Melting point preferably above 150^o C.
 3. Freedom from separation of oil and soap.
 4. Freedom from abrasive matter and acidity.

3. Westinghouse Motors:

- a. Use Westinghouse 53701RY grease unless a special grease is specified on the nameplate.
Some equivalent greases are:
 - Chevron SRI-2 - Standard Oil of California
 - Premium RB - Texaco, Inc.
 - Unirex N2 - Exxon
 - Dolium R - Shell Oil Company
 - Rykon Premium - American Oil
- b. Lubricate 1800 RPM approximately every two years & 3600 RPM every year.

LUBRICATION PROCEDURES AND REQUIREMENTS (CONTINUED)

4. Marathon Motors:

- a. Frame 56 Motor Bearings: Sealed lubricated bearings require no attention. (Five year life.)
- b. All Other Frame Sizes: Alvania #2, Shell Oil Company or equivalent. Relubricate approximately every two and one-half years.

5. Reuland Motors:

- a. Reuland Motors feature lifetime lubricated, sealed ball bearings, grease packed and sealed by the bearing manufacturer.

6. Baldor Motors:

- a. For motors 1/8 to 7-1/2 HP relube every five years. For motors 10 to 40 HP, relube every three years.
- b. Frame 215T and smaller motor bearings: Alvania #2, Shell Oil Company or equivalent.
- c. Frame 254 and larger motor bearings: Dolium R, Shell Oil Company or equivalent.

D. Lubricant for sleeve bearings

1. G.E. Motors:

- a. SAE 10 viscosity turbine oil for motors up to 1/2 HP.
- b. SAE 20 viscosity turbine oil for motors 1/2 HP and larger.

2. Westinghouse Motors:

- a. PD-2268 Westinghouse specification number.
- b. SAE 10 viscosity for motors up to 1/2 HP.
- c. SAE 20 viscosity for motors 1/2 HP and larger.

3. Marathon Motors:

- a. Re-oil with SAE No. 10 oil for every 2000 hours of motor operation.

NOTE: NEVER LUBRICATE COMMUTATORS. NEVER OVERLUBRICATE.

STARTING INSTRUCTIONS FOR SERIES 500 BOILERS
SPHV – SPLV – SPWV
175 THRU 350 HP – ALL FUELS

NOTE: For use with standard controls only as follows:

Fuel	Boiler Horsepower	Controls Used
#2 Oil	175 thru 350	YS7000
#5 Oil	175 thru 350	YS7000
#6 Oil	175 thru 350	YS7000
Gas	175 thru 350	YS7000
Gas/#2 Oil	175 thru 350	YS7000
Gas/#5 Oil	175 thru 350	YS7000
Gas/#6 Oil	175 thru 350	YS7000

Following is a description of the motor components used with the burner:

STANDARD MODULATION MOTOR USED

The modulation motor is the standard Honeywell M941 motor. This will be the modulation motor referred to in the following instructions. The modulation motor is electrically powered to the high fire position, and electrically returned to the low fire position. The motor is automatically operated from the proper modulation control.

END SWITCH

The end switch is located on the end of the modulation motor. It contains one SPDT switch, which is adjustable over a range of 360°. The SPDT switch is used to prove low fire start. (Note: one side of the SPDT switch used only).

TO PROVE LOW FIRE STARTS

When using YS7000 control, the low-fire-start end switch will close in the low fire position of motor arm. Circuit is now closed for a normal starting cycle at low fire.

BLOWER SAFETY SWITCH

The blower safety switch is in the main fuel electric supply line. Should the blower not deliver air to the windbox for any reason, the blower safety switch should open, causing a unit using the YS7000 to lock out on safety shutdown.

HEAVY OIL PUMP SET

On #6 oil units, the pump set should run continuously when operating and when on standby.

On #6 oil units, the below-water-line-heater circulator should run continuously when operating and when on standby.

STARTING THE UNIT

After making all connections to the unit, it is ready for operation. The following is the procedure for putting the unit into its normal operating cycle:

A. CHECK ROTATION OF MOTORS AND FILL BOILER

1. Turn off all electric supply to unit and close all gas cocks to unit.
2. On SPH units (when feedwater pump is used)

Throw electric supply line switch to feedwater pump ON.

The pump will start. Check pump for proper rotation (see arrow on pump housing). When feed pump motor stops running, the water level should be at the center try-cock of the water column.

On SPL units - Fill boiler to center of gauge glass.

On SPW units - Fill boiler and heating system.

3. ON SPL & SPH units- push the manual reset button on top of the low water cutoff control (if manual reset type used).
4. The unit is ready for checking the rotation of the blower, compressor, and oil pump motors with emergency switch off. Close electric supply line switches to blower, compressor, oil pump set and control circuit. Put fuel valve switch to OIL position.
5. Close emergency switch to ON and then OFF. When motors start, rotation of blower should be clockwise when facing shaft end of motor. On oil units the compressor should rotate with the arrow indicator as seen on top of compressor housing. Note: All three motors, blower, compressor and oil pump set can be checked now by opening and closing the emergency switch.
 - a) When motors are of the 3 phase type and operating in the wrong rotation, this rotation can be reversed by interchanging any two of the main feed lines to the motor starter.

- b) When motors are of the single phase 110V or 220V type, a wiring change will have to be made internally at the motor junction box. (See instruction on inside of junction box coverplate.)

6. Checking rotation of oil pump sets and below-water-line heater circulator.

- a) On #6 oil units, turn on electric supply to pump set. Rotation should be with arrow on pump housing. (Note: This pump set will run continuously in the "on fire" and "standby" condition - NEVER CYCLED.) On #2 and #5 oil units, the fuel pump cycles with the burner.
- b) On SPL & SPW units with a below-water-line heater: Turn on electric supply to circulator. Circulator will start. Check motor rotation with arrow on pump housing. (Note: This circulator will run continuously in the "on fire" and "standby" condition—NEVER CYCLED.)

This completes the necessary motor and pump rotation check.

B. CHECK CONTROLS AND COMBUSTION (GAS OR GAS SIDE OF #2, #5, & #6 OIL COMBINATION UNITS.) (REFER TO WIRING DIAGRAM SUPPLIED WITH UNIT).

1. Using YS7000 control system:

- a) With emergency switch off and fuel changeover switch on GAS, cut off electric supply line switches to the blower and control circuit. Hold modulation motor in low fire position by disconnecting blue wire. Hook up microamp meter to YS7000. Check the prove low fire start switch, making sure it is set to just close at lower end of end switch travel and just open as motor starts to modulate to high fire.
- b) Purge main and pilot gas lines of air.
- c) Open main and pilot gas line cocks.
- d) Close electric supply line switches to unit. Turn emergency switch to ON. Assuming that all interlocks are closed, the control will move to the ignition-trial position. Check gas pilot flame. If a good solid flame is obtained, voltage meter should read 2-1/4 to 5 microamps and steady. If pilot adjustment is necessary, place the test/switch in test position. After a good pilot and signal is obtained, the control will move to the flame ON position. Once main flame has been established, the control will move to the RUN position. Burner will now operate until a limit circuit opens. With modulation motor in low fire position, check the low fire combustion, recording the information, then connect the blue wire. Motor will modulate to high fire position, Check the high fire combustion, recording the results. If low and high fire

gas rates and CO₂ are as required, the combustion check is completed. If CO₂ and gas rates are not as required, readjust linkage arms as necessary.

2. Checking safety lockout time and scanner reaction time: Refer to Honeywell Bulletin #66-2003-2 for safety checks and additional information on control operation.

Unit is now ready for normal gas operation and cycling.

#6 OIL FIRED UNIT OR #6 SIDE OF COMBINATION UNIT

1. Using YS7000 system:

- a) With fuel changeover switch on OIL, emergency switch OFF, close electric supply line switches to compressor motor, blower motor and control circuit.
- b) Open suction and return shut-off valve to fuel oil tank. Fill oiler on air compressor with proper oil. (See detailed instructions on compressor lubrication.)
- c) Fill auxiliary heat system (for heating the oil suction bell) with water, start circulator, turn on electric heater and set temperature for 140°.
- d) Fill oil strainer with light oil for priming the pump and fuel oil system.
- e) On the below-water-line heater, close the square headed cocks in the circulating lines with circulator turned off. (This step is not necessary with a steam to oil heater, which uses an adjustable thermo trap.)
- f) Open wide valves "A" & "B", disconnect linkage to valve "C". Line the drilled hole in stem of valve "C" with inlet side of valve opening. Valve will be wide open in this position. Open valve "D" wide (hand valve).
- g) Start oil transfer pump re-priming the suction strainer until a constant oil pressure can be maintained on discharge line. When priming is complete, set relief valve on transfer pump discharge for 50 lbs. pressure.
- h) Crack open the flare nut on discharge line, on top of electric heater, allowing air to escape from electric heater. When oil appears light in flare nut, heater is now primed full of oil. Turn on electric heater supply switch. When temperature at transfer pump suction reaches 120° to 140°, cut off auxiliary heater and circulator. Close valve "D" tight. (Note: Valve "D" should only be opened on cold oil start ups. Keep closed tight during all other operations.)

Adjust valve "B" (off fire valve) to maintain 140 ° at transfer pump suction. Adjust electric heater temperature for 220 °. Allow sufficient time for the temperature to level out.

Hook up linkage arm on valve "C" (modulation valve). Set for low fire firing rate.

NOTE: When setting up fires on all boilers, always refer to the start-up sheet supplied with the unit. These sheets contain actual data obtained when the boiler was tested at the factory.

2. Light main flame and check combustion.

- a) Set modulation motor on close position (low fire hold). Hook up microamp meter to YS7000 control. Open pilot gas line cock. Adjust "A" valve to two turns open from the closed position.
- b) Turn emergency switch to ON position. Assuming that all interlocks are closed, the control will move to the ignition-trial position. Observe microamp reading. If a good solid gas pilot flame is burning, meter should read 2-1/4 to 5 microamps and steady. Adjust the pilot gas regulator pressure if a good pilot is not observed (use test switch). Control will continue to flame on, fuel nozzle solenoid valve will close, main flame should light on low fire. Once main flame has been established, the control will move to the RUN position. Burner continues to fire until heat demand is satisfied or the limit circuit is opened. While firing at low fire, the nozzle solenoid valves are open, allowing oil to pass over temperature gauge through valve "C" to the nozzle solenoids. Also some oil passes back through valve "A" (which is now set at two turns open on a trial basis) to the return line. While firing at low fire, set valve "A" to maintain 140 ° oil at transfer pump suction line (turn valve counterclockwise to increase temperature; turn clockwise to decrease temperature at pump suction, turning valve approximately 1/4 turn on each trial setting until temperature is obtained.) When valve "A" is set on proper temperature and firing rates on high to low fire, no "A" valve adjustment should be made without rechecking firing rate and CO₂ from high to low fire. Turn emergency switch to OFF position (limit shut-down occurs). Operating controls open, fuel valve is de-energized and the following solenoid valve action takes place. Nozzle solenoid valves close, solenoid firing bypass valve closes, solenoid purge valve opens purging lines from nozzle back through return line to tank. This completes firing cycle at low fire.

Turn emergency switch to ON position (limit circuit closes). Allow unit to operate through normal operation. When main fire lights at low fire, allow boiler water temperature to rise to 190°, open square-headed cocks on water circulating lines of below-water-line heater. Turn circulator manual operated switch ON (circulator is to run continuously). On units with steam headers, adjust control to maintain proper oil temperature at outlet of below-water-line heater (190° to 200° F). Set modulation motor on high fire. (Attach blue wire.) Motor arm will start modulating to high fire flame. Check high fired combustion. Reset linkage as per start-up sheet supplied by factory. Set CO₂ low to high fire; on oil 9 to 12%.

3. Check safety lockout time and reaction time as described under "Gas Firing."

Unit is now ready for normal operation and cycling on #6 oil.

#2 & #5 OIL FIRED UNIT OR #2 & #5 OIL SIDE OF COMBINATION UNIT

1. Using YS7000 system:

- a) With fuel changeover switch on OIL, emergency switch OFF, close electric supply line switches to compressor motor, blower motor, oil transfer pump motor and control circuit. Set modulation motor on low-fire position.
- b) Open suction and return shut-off valve to fuel oil tank. Fill oiler on air compressor with proper oil. (See detailed instructions on compressor lubrication.)
- c) Start fuel pump blower and compressor. Prime the suction strainer until a constant oil pressure can be maintained on discharge line. When priming is completed, set relief valve on pump discharge for 50 lbs. pressure.
- d) Fill oil strainer with light oil for priming the pump and fuel oil system.
- e) Crack open the flare nut in discharge line on top of electric heater, allowing air to escape from electric heater. When oil appears, tighten flare nut. Heaters are now primed and full of oil. Turn electric heater supply switch to ON position (#5 oil only).

NOTE: When setting up fires on all boilers, always refer to start-up sheet supplied with the unit. These sheets contain actual data obtained when the boiler was tested at the factory. Turn fuel valve switch to OFF. Blower, compressor and oil pump will stop.

- f) Check prove-low-fire start end switch on the modulation motor, making sure switch just closes at lower end of motor arm travel, and opens on minimum, differential setting on switch.
- g) Hook up microamp meter to YS7000 control. Open pilot gas cock. Prime air from gas line.

2. Light main flame and check combustion.

- a) Assuming that all interlocks are closed, turn emergency switch to ON position. The control will move to the IGN-TRIAL position. Observe microamp reading. If a good solid gas pilot flame is burning, meter should read 2-1/4 to 5 microamps and steady. Adjust the pilot gas regulator pressure if a good pilot is not observed (use test switch). Control will continue to flame on, main fuel nozzle solenoid will open. Main flame should light on low fire. Once main flame had been established, the control will move to the RUN position, but will not go

off low-fire since the blue wire is removed. Burner continues to fire until heat demand is satisfied or the limit circuit is opened. While firing at low fire set electric heater (#5 only) for 130° to 150° (see start up sheet). Check the low-fire combustion record for the results. Set modulation motor to high fire. Motor arm will modulate to high fire flame. Check the high-fire combustion and record the results. If high and low fire combustion are correct, set, CO₂ low to high fire on oil – 9 to 12%.

Adjusting High Fire Boilers

When operating on high-fire, start closing high-fire valve until a slight pressure occurs on nozzle oil pressure gauge, then open until pressure is normal.

3. Check safety-lockout time and reaction time as described under "Gas Firing".

Unit is now ready for normal operation and cycling on oil.

BEFORE LEAVING THE JOB THE FOLLOWING CHECKS SHOULD BE MADE:

LOW WATER CUTOFF OPERATION CHECK – SPH & SPL UNITS

While unit is firing, open the boiler blowdown valve and allow the water level to drop until the low water cut-off shuts the unit down. Repeat this operation at least five (5) times. Note: Do not drain water below the lower nut in gauge glass.

SAFETY VALVE POP TEST – ON SPH & SPL UNITS

While the unit is in operation, close down on the steam main outlet valve and increase the setting of the pressure limit control to exceed the setting marked on the body of the safety valve. The safety valve should "pop" within three pounds (3 lbs.) of its marking. Note: Be sure the pressure stamped on the nameplate on the front cover is not exceeded by more than a few pounds. Reset the pressure control to the original setting.

PRESSURE LIMIT SHUTDOWN – ON SPH & SPL UNITS

While unit is firing, close down the steam main outlet valve and allow the steam pressure to build up until the setting of the pressure limit control is exceeded. This will shut the entire unit down. At the time of shutdown, check the control setting against the pressure gauge reading. They should be in agreement within 2 or 3 pounds.

TEMPERATURE LIMIT SHUTDOWN – ON SPW UNITS

While unit is not firing, set the hot water operating control above the setting of the hot water limit control and allow the unit to run until the setting of the limit control is exceeded. This will shut the unit down.

RELIEF VALVE OPENING TEST – SPW UNITS

While unit is in operation, increase the water pressure to exceed the setting marked on the body of the relief valve (30 psi). The opening point of the relief valve must not exceed the 30 psi setting. However the relief valve may open at 28 psi.

NOTE: Be sure that the pressure stamped on the nameplate is not exceeded.

CHECK OF LINKAGES

Make sure all set screws and nuts are tight on the air-oil control linkages.

CHECK OF BURNER HEAD

Make sure all set screws in the burner and nozzle holder are tight and that the electrodes and gas ignition torch are well locked in position.

BELT TENSION AND PULLEYS

After the initial starting runs of a day or two are completed, check the belts for tightness and check the set screws on all pulleys and couplings.

CHECK OF LINES FOR LEAKAGE

Go over all water, steam and oil lines for leaks while the unit is running. Shut the unit down and inspect the connections to the burner head also. Check the handholes and manholes for leakage.

CAUTION: DO NOT DRAIN BOILER OR PULL FEEDWATER PUMP SWITCH WHILE BOILER IS HOT AS HOT REAR REFRACTORY MAY CAUSE TUBE LEAKAGE.

BEFORE LEAVING

Make sure all valves, switches and controls are in operating position.

MAKE SURE ADEQUATE PROVISION HAS BEEN MADE TO SUPPLY FRESH AIR TO THE BOILER ROOM.

CHECK ALL BOLTS, NUTS, WEDGE PINS, ETC., TO BE SURE THE FRONT AND REAR COVERS ARE TIGHT AND NOT LEAKING.

For periodic Service & Maintenance, refer to the operating card supplied with the unit.