York

Liquid Ammonia Pump Model IT

Parts Manual
&
Installation, Operation and Maintenance Manual

CENTRAL ICE MACHINE COMPANY
Refrigeration Supplies

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RENEWAL PARTS

File: ACCESSORIES and SUPPLIES Catalog - Section K-7
SERVICE/AMMONIA EQUIPMENT Manual-
Auxiliary Equipment Section

Supersedes: Form 17K3-RP coded 460

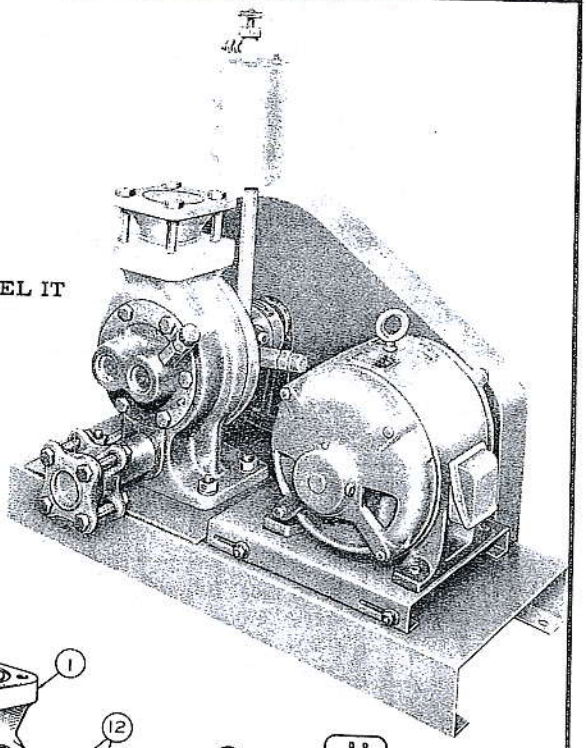
IM-A&S(I-A-RPD)-Assoc. S(1-3-5) - Int.

563

Form 285.05-RP
(17K-3-RP

LIQUID PUMPS—MODEL IT
AMMONIA, REFRIGERANTS -12 AND -22

LIQUID PUMP MODEL IT



EXPLODED VIEW

REPLACEMENT PUMP INSERT ASSEMBLY

Ref. No.	Part Name	Part Number
	Pump assembly, ammonia[1]	70-14940
	Pump assembly, Refrigerant-12, -22[1]	70-16458
1	Body, pump	70-10211
2, 3, 4	Head, insert and seal body[2]	70-12701
5	"O" ring, seal, pump head to pump body, ammonia	28-3234
5	"O" ring, seal pump head to pump body, R-12, R-22	28-5409
6	Screw, cap, 5/8" x 4-1/4"	21-1650
7	Gasket, cap screw	28-3233
8	Ferrule (2 required)	70-14441
9	Bearing, roller (4 required)	29-6833
9A - 9B	Aluminum seal bushings (4 required)	70-12314
10	Fitting, grease	70-5668
10A	Valve, check	70-15970
11	Gear, pump (2 required)	29-6085
12	Key, pump gear, 3/16" sq. x 2-3/8" lg.	70-5680
	Key, flywheel	68-367
13	Shaft, idler	70-10217
14	Shaft, drive	70-10216
15	Gasket, seal body to pump body	70-10224
16	Screw, cap, hex head	21-1625
17	Reservoir, oil, with charging valve and equalizer	70-14473
18	Valve, oil charging	68-59
See Below	Shaft seal assembly, ammonia	70-11767
See Below	Shaft seal assembly, R-12, R-22	70-16459
26	Ring, spring retaining	64-5711
27	Spring, 4 required	29-4010
28	Ball, locating	29-1845
29	Gasket, seal cover to seal body	70-10223
30	Cover, seal	70-10214
31	Bearing, ball	29-6165
32	Cover, bearing	70-10226
33	Lockwasher, spring, 1/4"	21-5289
34	Cap screw, socket head, 1/4"	21-2580
35	Ring, spring, ball bearing retaining	29-7055
36	Plug	70-10225
37	"O" ring, plug sealing, ammonia	28-5164
37	"O" ring, plug sealing, R-12, R-22	28-5410
38	Ring, spring, plug retaining	29-6167
39	Pin, dowel, 1/4"	41-1104
40	Pump Insert Assembly, replacement, ammonia[3]	270-11726
40	Pump Insert Assembly, replacement, R-12, R-22[3]	270-16457
41	Nut, reservoir oil sight glass	65-53
42	Washer, oil sight glass	65-52
43	Glass, oil sight	26-2634
44	Gasket, oil sight glass (inside)	70-2399
	Heater, 230V	70-11004
	Heater, 115V	70-11707
	Grease, 5 pound can[4]	70-12712

[1] Bare pumps, less base, drive, etc.
[2] Three items machined as companions. Not interchangeable separately.
[3] Exchange insert assemblies.
[4] Suitable for any operating temperature.

Replacement Shaft Seal Kit Consists of:	
Quantity	Item
2	Screw, Seal Removal
2	Rings, Seal
2	Collar, Shaft Seal
4	Roll Pins
7	"O" Rings
1	Ball, Locating
1	Gasket, Seal Cover
3	Spacers, Steel

Recommended Renewal Parts Stock List quantities are based on average conditions of equipment operation and parts availability. Extremes in either of these classifications should temper your thinking in determining quantities to be stocked

Recommended Renewal Parts Stock List		
Part Name	Stock Quantity per Number of Pumps in Operation	
	1-10	11-25
Pump Insert Assembly	1	2
Shaft Seal Kit	2	3
"O" Ring, Pump Head to Body	1	2
Bearing, Ball	1	2
Bearing, Roller	4	8
Gear, Pump	2	4
Aluminum Seal Bushing	4	8
Shaft, Idler	1	2
Shaft, Driven	1	2
Key, Pump Gear	2	4
Spring, Seal	8	12
Grease, 5 lb. can	3	6

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(17K-3-RP)

YORK DIVISION OF BORG-WARNER CORPORATION BORG WARNER

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Supersedes: Instruction 17K-3, coded 356

IM - Assoc. S(1) - Int.

YORK Engineered Machinery Service

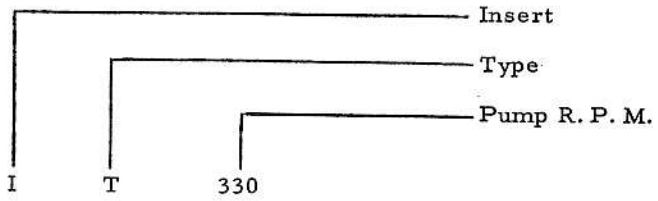
INSTRUCTIONS

1060

Form 285.05-NM1 (17K-3)

YORK LIQUID AMMONIA PUMP MODEL IT

NOMENCLATURE



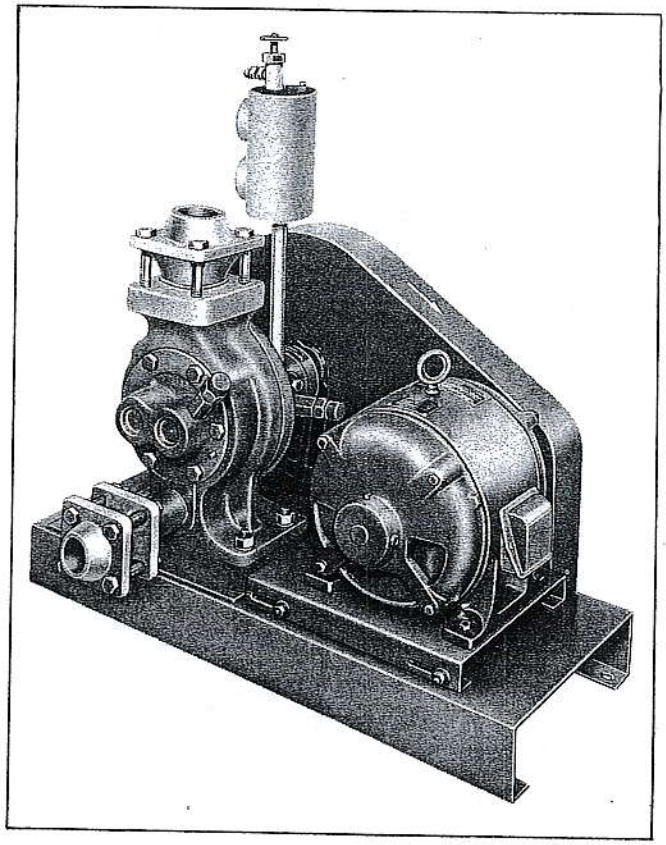


Fig. 1 - Insert Type Liquid Pump

GENERAL

Insert Type Liquid Pumps are self contained units consisting of a pump and motor (optional) mounted on a common steel base. Each unit is equipped with a V-belt drive and belt guard (See Fig. 1). The suction connections of early units were made up with a 3" pipe nipple and a threaded companion flange instead of having the companion flange cost integrally with the pump body.

These pumps are designed for use in recirculating systems, in pumping liquid from low pressure traps to high pressure receivers or in transferring liquid at condensing pressure from one receptacle to another. Insert type pumps are capable of pumping liquid against pressure differentials up to 225 psi.

The same basic pump is used for all applications. Capacity of the pump (gpm) depends upon the pressure differential against which the pump is expected to operate and the speed of the pump.

Note: This instruction covers only Ammonia application. A few Model IT pumps have been applied on Refrigerant-12 and Refrigerant-22 installations. For Refrigerant-12 or -22 application data refer to factory. For renewal parts refer to Instruction 17K-3-RP which covers both Ammonia and R-12, R-22 pumps.

SPECIFICATIONS

Pump - Horizontal, rotary gear type consisting of pump housing and removable pump insert. All moving parts are contained in the pump insert.

Housing - High grade cast iron.

Gears - Drive and idling gears machined from Meehanite.

Shafts - Drive and driven shafts of hardened steel.

Bearings - Two roller bearings on each shaft to absorb radial load and one deep grooved, grease sealed ball bearing on outboard end of drive shaft to absorb axial load.

Shaft Seal - Mechanical type consisting of two close grained cast iron collars each rotating against a stationary, centrifugally cast phosphor bronze ring. Seal tension exerted by means of springs between the rotating collars.

Base - Formed steel construction, designed for use with NEMA standard motors. Each base equipped with adjustable motor mounting plate to provide for belt tension adjustment.

Drive - V-belt type with cast iron pulleys. Equipped with belt guard.

Lubrication - Roller bearings grease lubricated by means of ball check adapters with standard Alemite pin type fittings.

Outboard ball bearing grease sealed - permanently lubricated. Shaft seal lubricated by means of a vertical oil reservoir shipped separately for field installation on top of the seal body.

Accessories

Motors and Starters - Motor and either manual or magnetic starter furnished when specified.

Heater - Immersion type, for use in the seal chambers of pumps operating with liquid of -40°F., or

lower to assure proper seal lubrication at low operating temperatures. Sixty watt heaters are available for 115V or 230V service.

PHYSICAL DATA

The following physical data is common to all Model I T pumps, since the same basic pump is used (with various drives) on all models. Fig. 2 shows the dimensions of these pumps and TABLE 1 shows drive data.

PIPING CONNECTIONS

Suction 3" - Discharge 2"

NOMINAL OVERALL DIMENSIONS

Refer to Fig. 2 - Dimensions

APPROXIMATE WEIGHT

Less motor and starter - 400#

PUMP GEARS

Length - 2-3/4"
Diameter - 3-1/4"

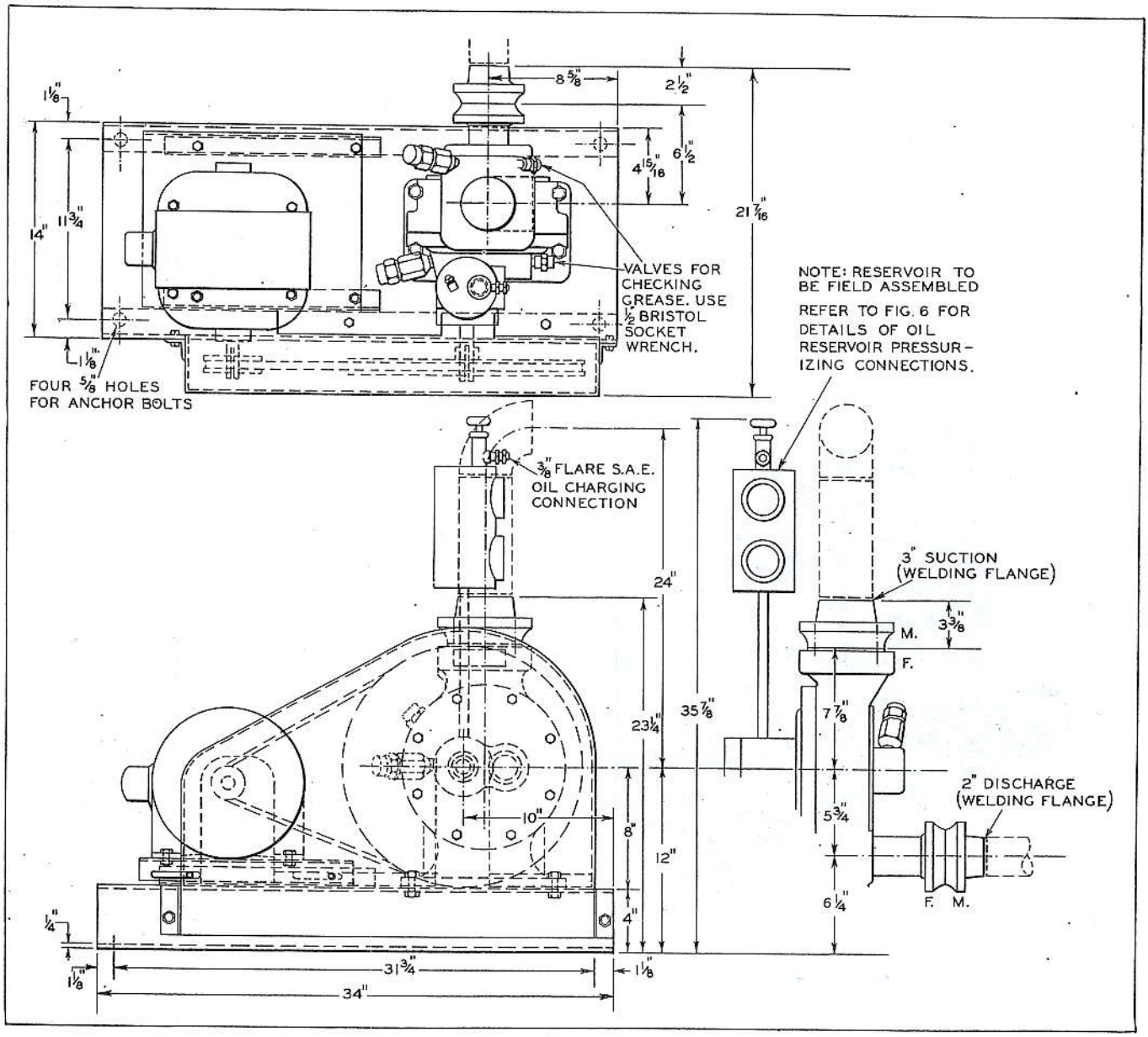


Fig. 2 - Dimensions

TABLE 1 - DRIVE DATA

	Pump Unit	IT-1	IT-1	IT-1	IT-1	IT-3	IT-1	IT-1	IT-3	IT-4	IT-2	IT-2	IT-4	IT-2
	Drive Number	1	2	3	4	5	6	7	8	9	10	11	12	13
MOTOR	Motor H. P.	1	1	1-1/2	1-1/2	1-1/2	2	2	2	2	3	3	3	5
	Motor R. P. M.	1725	1725	1140	1725	1725	1140	1725	1725	1725	1140	1725	1725	1725
	Frame Number	182	182	184	184	184	213	184	184	184	215	213	213	215
	Pump R. P. M.	300	498	330	498	766	330	498	766	1000	330	498	1000	498
MOTOR PULLEY	Nominal O. D.	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	Catalog No.	1VP40	1VP50	1VP50	1VP50	2VP50	1VP50	1VP50	2VP50	2VP50	2VP50	2VP50	2VP50	2VP50
	Turns Open	2-1/2	1-1/2	1-1/2	1-1/2	2	1-1/2	1-1/2	2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
	Bore	7/8	7/8	7/8	7/8	7/8	1-1/8	7/8	7/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8
	Key Seat	3/32 x 3/16	3/32 x 3/16	3/32 x 3/16	3/32 x 3/16	3/32 x 3/16	1/8 x 1/4	3/32 x 3/16	3/32 x 3/16	3/32 x 3/16	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4
	Keyway For	3/16 x 3/16 x 1-1/2	3/16 x 3/16 x 1-1/2	3/16 x 3/16 x 1-1/2	3/16 x 3/16 x 1-1/2	3/16 x 3/16 x 1-1/2	1/4 x 1/4 x 2	3/16 x 3/16 x 1-1/2	3/16 x 3/16 x 1-1/2	3/16 x 3/16 x 1-1/2	1/4 x 1/4 x 2	1/4 x 1/4 x 2	1/4 x 1/4 x 2	1/4 x 1/4 x 2
PUMP PULLEY	Nominal O. D.	16.0	16.0	16.0	16.0	10.0	16.0	16.0	10.0	8.0	16.0	16.0	8.0	16.0
	Catalog No.	BK160	BK160	BK160	BK160	2BK100	BK160	BK160	2BK100	2BK80	2TB154	2TB154	2BK80	2TB154
	Bore	15/16	15/16	15/16	15/16	15/16	15/16	15/16	15/16	15/16	15/16	15/16	15/16	15/16
	Key Seat	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4	1/8 x 1/4
	Key Size	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4	1/4 x 1/4 x 1-3/4
BELTS	Quantity	1	1	1	1	2	1	1	2	2	2	2	2	2
	Section	B	B	B	B	B	B	B	B	B	B	B	B	B
	Inside Length	60	60	60	60	48	60	60	48	45	60	60	45	60
	Catalog No.	5L630	5L630	5L630	5L630	5L510	5L630	5L630	5L510	5L480	5L630	5L630	5L480	B60HY-T
	Belt Centers	13.8	13.8	13.8	13.8	14.9	13.8	13.8	14.9	14.15	13.8	13.8	14.15	13.8

MOTOR PULLEYS

CATALOG NO.	BORE	PART NUMBER
1VP40	7/8"	28-5695
1VP50	7/8"	28-5691
1VP50	1-1/8"	28-5694
2VP50	7/8"	28-5693
2VP50	1-1/8"	28-5229

PUMP PULLEYS

CATALOG NO.	BORE	PART NUMBER
BK160	15/16"	28-5238
2BK100	15/16"	28-5242
2BK80	15/16"	28-5241
2TB154	Less Bushing	28-5567*

* Use Bushing No. 28-5587

BELTS

CATALOG NO.	BELT SET PART NO.	QUAN. PER SET
5L480	28-5709	2
5L510	28-6159	1
5L630	28-4320	1
5L630	28-5258	2
B45HY-T	28-4445	2
B60HY-T	28-5702	2

INSTALLATION

PIPING ARRANGEMENTS

Three basic piping arrangements are generally used with these pumps, depending upon the differential pressure against which the pump must operate and the type of low pressure receiver used (See Fig. 3, 4 and 5).

Fig. 3 illustrates the piping arrangement for a liquid recirculating system, where the pump operates against a small pressure differential with a horizontal low pressure receiver. In a recirculating system, the coil remains flooded at all times during operation, since the pump circulates much more liquid than is actually evaporated.

Fig. 4 illustrates the piping for these pumps when they are used with vertical low pressure receivers in either a recirculating system or a transfer system. In a transfer system, the pump is used to pump low pressure liquid ammonia from the low pressure receiver to a high pressure receiver or liquid line.

Fig. 5 shows the piping arrangement which should be used when the pump is used with a vertical low pressure receiver which is equipped with a liquid cooling coil or when the low pressure receiver is also being used as an interstage gas cooler.

INSTALLING THE PUMP

These pumps should be rigidly mounted on a level concrete foundation.

To insure satisfactory performance from these pumps, the following conditions should be observed during installation (See Figs. 3, 4 and 5):

(a) The refrigerant being pumped is at or near its boiling point, therefore, the absolute pressure at the pump suction must not be less than the absolute pressure at the surface of the liquid in the vessel from which the pump gets its supply. If the pressure at pump suction is less than the pressure corresponding to the temperature of the liquid, flash gas will form and the pump may become gas bound resulting in loss of capacity, noisy operation and short pump life.

No suction lift is permitted.

(b) To assure that the suction line static liquid head is sufficient to overcome any suction line drop and prevent formation of flash gas, the center line of the pump shaft must be located a minimum of 24" below any horizontal run of suction line for pressure differentials less than 150 lbs/sq. in. For pressure differentials in excess of 150 lbs/sq. in., the absolute minimum is 48".

It is desirable to increase these absolute minimum heads where space permits. At low temperature levels, it is necessary to increase at least 18" for every 10° below -40° F.

The work done by the pump shows up as an increase in the temperature of the liquid at the pump discharge. Some of this liquid leaks back through the clearance passages in the pump. This action results in gas at the inlet to the pump unless there is sufficient liquid subcooling in the liquid at the pump suction. This liquid subcooling can only be effectively achieved by the static head of the liquid in the pump suction line rather than by the combined height of the line and level in the suction trap.

When a pump is new the clearances are so small that the leakage back thru them will usually not be enough to cause any trouble. However, as the pump wears over a period of time this leakage increases and more gas flashing is likely to occur in the suction. This eventually can become enough so the pump will handle no liquid at high differentials. This is why it is important to adhere to the minimum suction heads indicated above.

(c) Horizontal runs of pump suction line should be as short as possible, not exceeding 3 feet and using a minimum number of fittings to insure free flow.

(d) The lines to and from the pump should be run so that no traps are formed. If traps are unavoidable, the low points must be provided with oil drain valves.

(e) Valves in the lines to and from the pump should be installed with their stems in the horizontal position to avoid the possibility of forming gas traps.

(f) A 1/4" drain connection with stop valve should be welded into the lowest point of the pump discharge connection (between the pumps and the discharge stop valve) to serve as a purge connection if it becomes necessary to open the pump for repairs (See Figs. 3, 4 and 5).

(g) A suction strainer must not be used in the pump suction line to avoid pressure drop.

(h) When these pumps are used with a vertical receiver having liquid cooling coils or if the receiver is also used as an interstage gas cooler, the pump should be connected as shown in Fig. 5.

(i) All shells should be thoroughly cleaned before making connections to insure against scale or dirt entering the pump.

End clearance is particularly critical in transfer pumps. This clearance should be .0005" minimum to .002" maximum. The effect of dirt in the system causes cutting and increased end clearance. This results in liquid bypassing from discharge to suction. The capacity falls off and eventually the pump fails to deliver.

The pump suction connection inside horizontal shells should be protected against the entrance of scale or dirt by extending the connection about 1" above the inside shell surface. Refer to Fig. 3.

(j) If the pump is expected to cycle on and off, as it does when controlled by float switches, a check valve should be installed in the pump discharge line close to the pump to prevent high pressure liquid from backing up through the pump during off cycles.

(k) The oil reservoir for seal lubrication is shipped separately for field installation. Fittings as

shown in Fig. 6 are included to hookup the reservoir for pressurization from a higher pressure gas supply, at least 15 lbs./sq. in. in excess of the pressure in the suction trap.

Gas from the higher pressure source is fed into the oil reservoir thru a No. 2 orifice fitting as shown in Fig. 6. The pressure on the oil pot is relieved by means of the relief line which relieves through a relief valve into the low pressure receiver. A stop valve should be installed in this relief line at the low pressure receiver to make isolation of the pump possible when required.

If the inboard pump seal fails, it will be evidenced by rapid loss of oil from the pot. If the outboard seal fails, it will be evidenced by oil traces outside the pump and loss of oil from the pot. The correction is to replace the seal.

LIMITATIONS

(a) Pumps cannot handle suction lift.

(b) The critical 24" minimum submergence (for pressure differentials below 150 lbs.) and 48" (for pressure differentials above 150 lbs.) above the center line of the pump shaft must occur in the vertical 3" suction line to the pump without reference to the liquid level in the surge drum itself. Every reasonable effort should be made to provide more than the minimum submergence. Increase this minimum submergence 18" for each 10° F below -40° F. Valve in horizontal suction line to pump must be installed with stem horizontal.

If the horizontal run of pump suction line is longer than 3 feet, a 1-1/4" gas relief line must be provided at the point where the liquid turns down into its 24" minimum drop into the pump.

It is obvious that the formation of a vortex at the entrance to the pump suction line should be avoided, since bubbles from the vortex could be carried into the pump. Also, it is well known that a stream of liquid falling on a liquid surface will mechanically entrain bubbles and carry them more or less deeply below the liquid surface. It is important that both sources of bubbles in the pump suction line be avoided.

(c) Suction line must be 3" diameter. Neither larger or smaller.

(d) Suction strainer must not be used.

(e) Minimum operating temperature is -90° F.

(f) Maximum pressure differential is 225#.

INSULATION

The low pressure receiver and all ammonia piping should be insulated for the temperature of the ammonia being handled.
It is not necessary to insulate the pump itself. A pump which frosts up will gradually build up an effective frost or ice insulation. Pump repairs are simplified since it is much easier to remove the frost or ice than conventional insulation. A drip pan may be installed under the pump if desired.

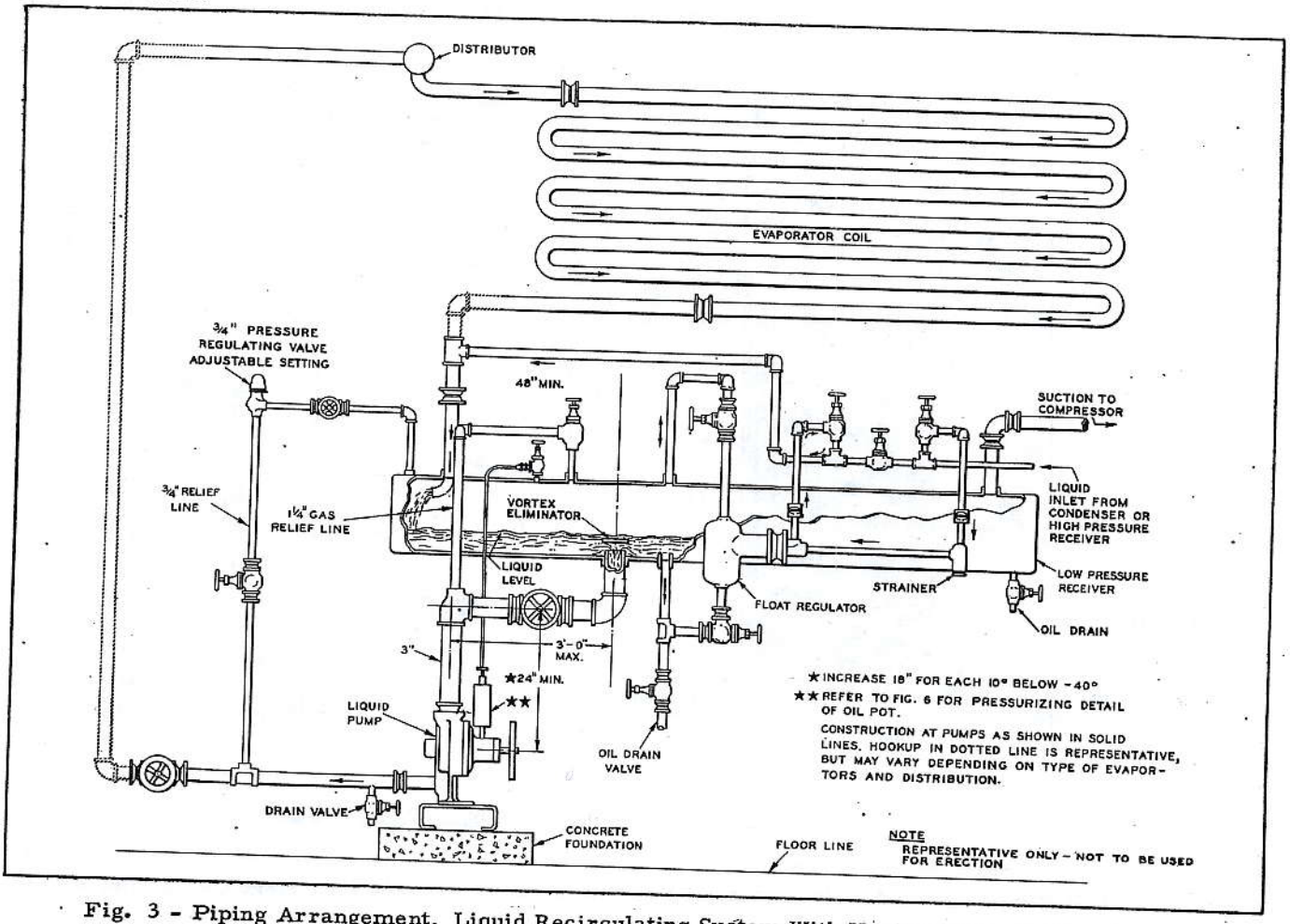


Fig. 3 - Piping Arrangement, Liquid Recirculating System With Horizontal L. P. Receiver

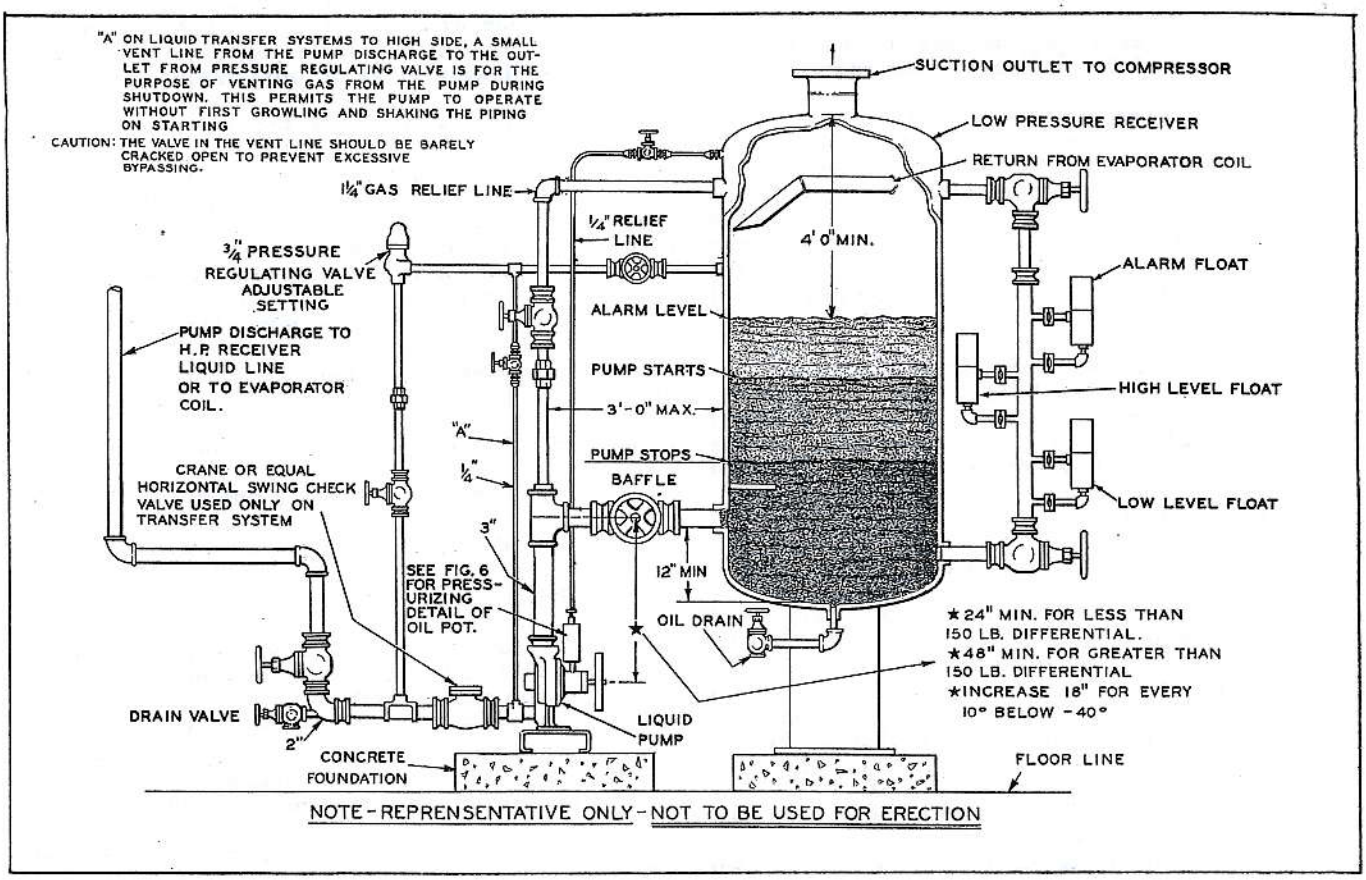


Fig. 4 - Piping Arrangement, Liquid Recirculating or Transfer System With Vertical L. P. Receiver

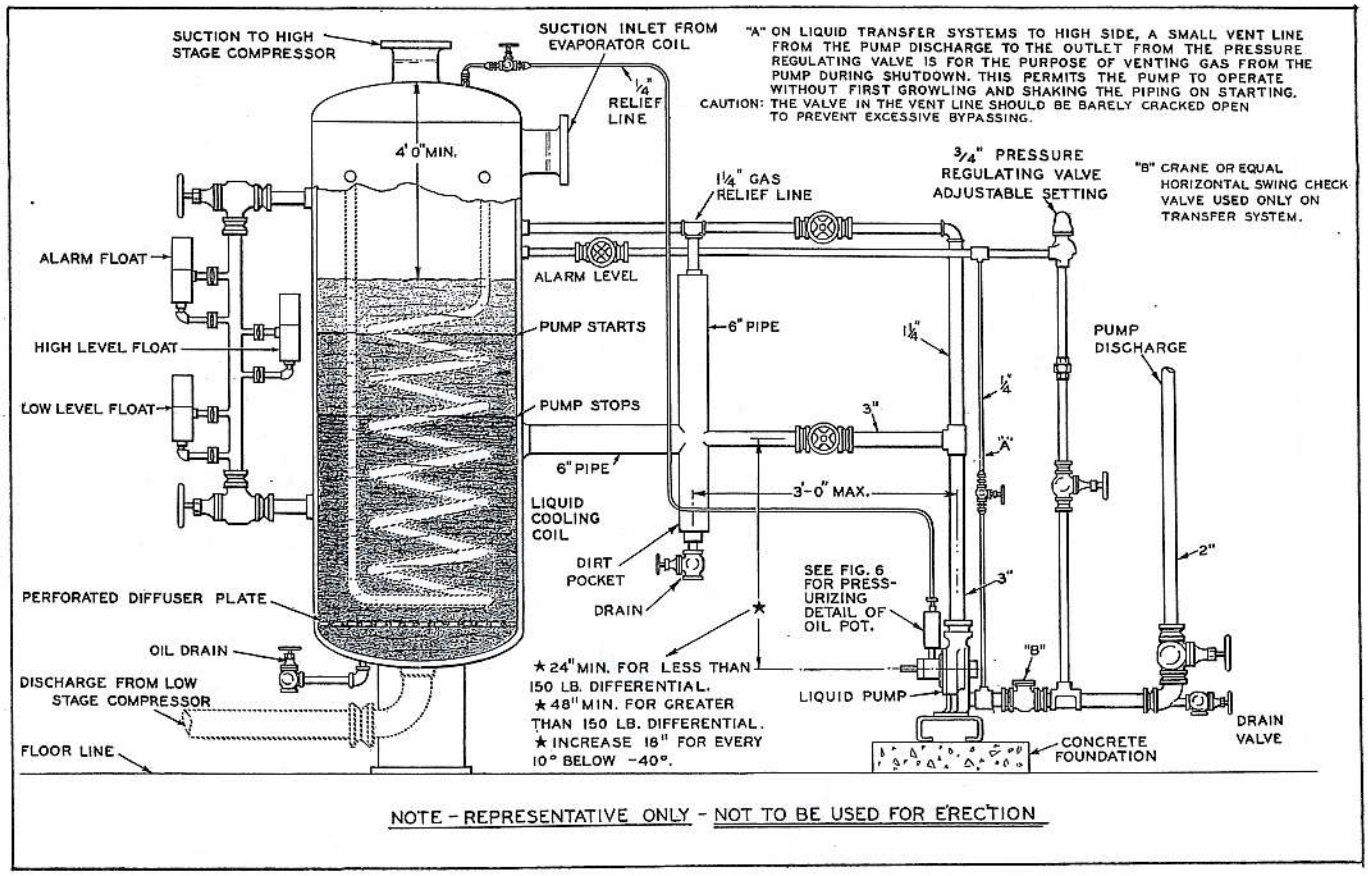


Fig. 5 - Piping Arrangement, When Vertical L. P. Receiver is Used As Interstage Gas Cooler or Liquid Cooler

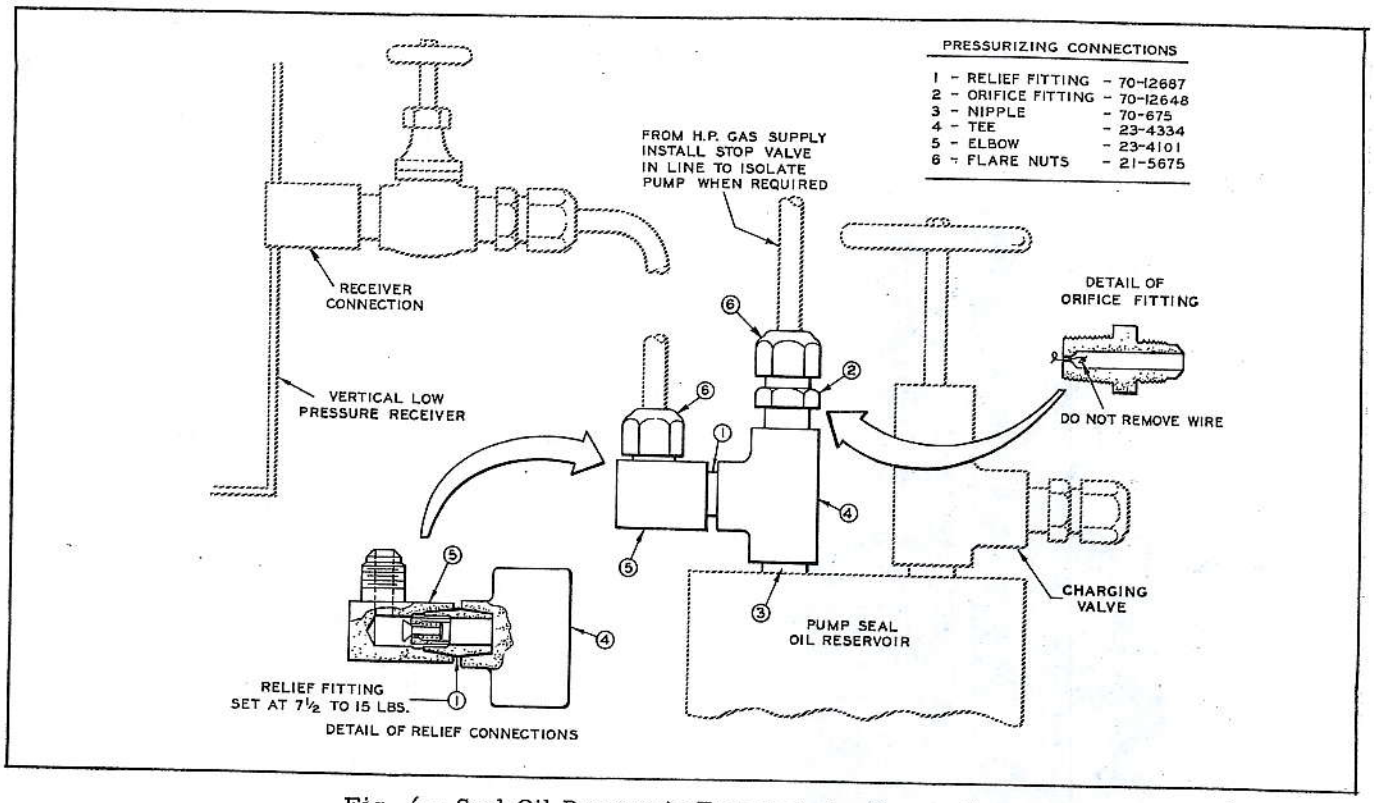


Fig. 6 - Seal Oil Reservoir Pressurizing Connections

ELECTRICAL CONTROLS

When a motor and starter are furnished, the motor is a general purpose, squirrel cage type and the starter may be either manual with start-stop push button or magnetic with hand-off-automatic switch. Fig. 16 shows the wiring for a magnetic starter.

To prevent loss of liquid seal in the low pressure receiver due to sudden load demands, Alco or Magnetrol reverse acting float switches are generally used to control the liquid level in the low pressure receiver by making the circuit to the pump motor on a rise in liquid level and breaking the pump motor circuit when the liquid level in the low pressure receiver falls to the minimum level (See Figs. 4 and 5).

Successful operation of these float switches depends upon properly located connections between the low pressure receiver and the floats. Figs. 4 and 5 shows a method of connecting float switches; a 2" liquid riser (with short nipples spaced in accordance with the liquid levels to be maintained) is installed vertically on the outside of the receiver. The float connections (nipples) must be carefully located in accordance with the drawings for the specific installation. Fig. 16 shows the wiring diagram for this method of pump control. All wiring and electrical connections must conform to local and national electrical codes.

OIL HEATER

If these pumps are to be used at temperatures of -40°F., or lower, a 60 watt immersion type oil heater is available for field installation in the plugged, horizontal connection in the seal housing (See Figs. 7 and 8). These heaters are available for either 115 or 230 volt application.

These heaters are equipped with connection boxes and their elements are enclosed by means of 1/2" pipe fittings to facilitate installation.

When used, the heater should be electrically energized at all times while the pump is operating. It may also be energized during pump shutdown periods if necessary.

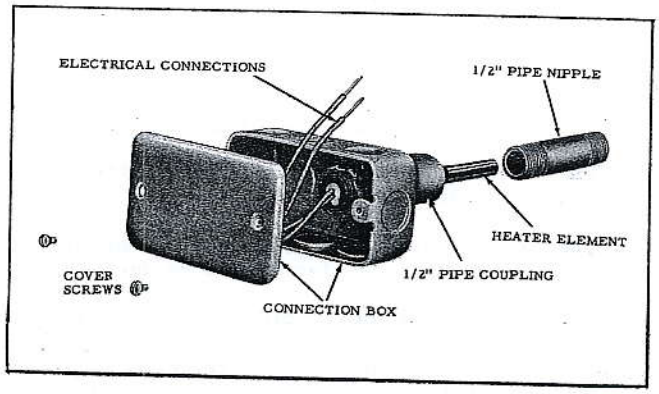


Fig. 7 - Seal Oil Heater

LUBRICATION

Before shipment, the roller bearings of these pumps are packed with TEXACO ALLTEMP grease. This lubricant is suitable for all applications regardless of operating temperature levels.

TEXACO ALLTEMP grease is available in five (5) pound cans, identified by Part No. 070-12712.

Each roller bearing housing is fitted with a ball check adapter and a standard Alemite fitting for lubrication purposes, Fig. 8. Once a month grease should be applied to these bearings with a grease gun.

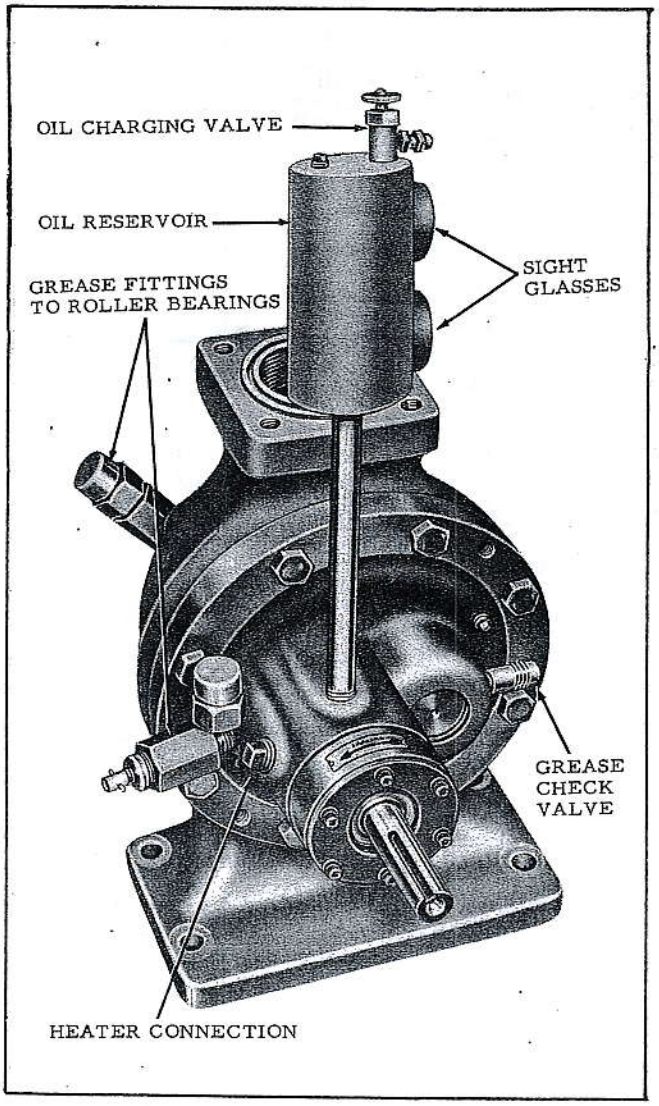


Fig. 8 - Liquid Pump Lubricating Points

The outboard ball bearing is grease sealed and requires no attention.

The pump motor bearings should be lubricated in accordance with manufacturer's recommendations.

The shaft seal is lubricated by means of an oil reservoir, with sight glasses, mounted above the seal housing (See Fig. 8). The oil receiver is pressurized with gas from a high pressure source. Refer to Fig. 6 for pressurization details.

If the oil level in the reservoir falls to the bottom sight glass, the reservoir should be charged with oil until the oil level covers 3/4 of the top sight glass.

For ammonia pumps operating at -15°F or higher, charge the reservoir with York Ammonia Compressor Oil "A". For ammonia temperatures below -15°F, use Gulf Paramount 37 oil, or Sunisco 3G.

To charge the oil reservoir with oil, refer to Fig. 8 and proceed as follows using the hand oil charging pump (Part No. 70-10654FL):

(a) Connect the pump discharge to the charging valve on top of the reservoir but do not tighten the connection.

(b) Insert the pump suction connection into the can of oil and purge the air from the pump connections by means of a few strokes of the pump handle until oil appears at the charging valve. Then tighten the charging valve connection.

(c) Open the charging valve and pump oil into the reservoir until the top sight glass is 3/4 covered.

(d) Close the charging valve and disconnect the pump.

OPERATION

PREPARATION FOR OPERATION

Before starting the pump for the first time or after a long idle period, check the following points:

(a) Using a straightedge across the faces of the pump and motor pulleys, be sure the two pulleys are properly aligned.

(b) Check the belt tension. The belts should be tight enough to prevent slipping without excessive strain on the bearings.

(c) Be sure the pump is properly lubricated as outlined under LUBRICATION.

(d) Be sure the motor is correctly wired so that the direction of pump rotation is in accordance with directional arrow on the pump seal cover. The pump will not function if its direction of rotation is reversed.

PRINCIPLE OF OPERATION

Pump

These pumps consist basically of two horizontal gears mounted side by side within a suitable housing (See Fig. 9). One gear, mounted on the driven shaft, drives the other gear which is mounted on the idler shaft. Liquid fills the space above the rotating gears. As the gears rotate, liquid is carried by the teeth of both gears around the outside of the gear chamber (in spaces between gear teeth and gear chamber) to the discharge side of the pump. As the gears go into mesh, the liquid is forced into the pump discharge connection.

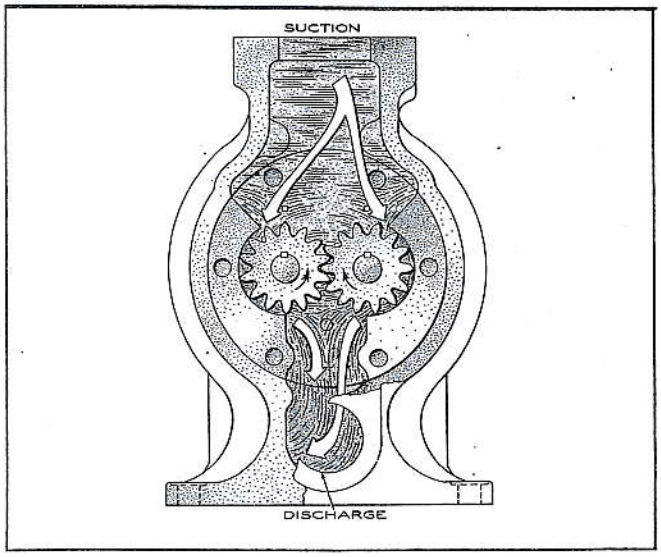


Fig. 9 - Liquid Flow Through Pump

TABLE 2 lists the capacity (G. P. M.) and the required horsepower of each pump for various pressure differentials and pump speeds. Actual pump capacities will depend upon system conditions and pump wear.

TABLE 2 - PUMP DATA

Pressure Differential psi	GPM	FOR NH3 TEMPERATURES Above -10°F. Pump Model No.	Motor H. P.	Below -10°F. Pump Model No.	Motor H. P.
20	15	IT-1-330	1	IT-1-330	1
20	20	IT-1-498	1	IT-1-498	1½
20	35	IT-3-766	1½	IT-3-766	2
20	45	IT-4-1000	2	IT-4-1000	3
10	15	IT-1-330	1	IT-1-330	1
50	15	IT-1-330	1	IT-1-330	1½
100	14	IT-1-330	1½	IT-1-330	2
150	14	IT-1-330	2	IT-2-330	3
225	13	IT-2-330	3	IT-2-330	3
10	22	IT-1-498	1	IT-1-498	1½
50	22	IT-1-498	1½	IT-1-498	2
100	21	IT-1-498	2	IT-2-498	3
150	21	IT-2-498	3	IT-2-498	5
225	20	IT-2-498	5	IT-2-498	5

DRAINING THE LOW PRESSURE RECEIVER

Once a week during operation, the oil should be drained from the low pressure receiver. This will also keep the receiver clear of any scale which might otherwise be picked up by the pump, causing damage to pump bearings and gears.

MAINTENANCE AND SERVICE

TROUBLE ANALYSIS

The following paragraphs outline the conditions which should normally be checked before dismantling the pump, if operating difficulties are encountered:

(a) Be sure the system piping to and from the pump is in accordance with the steps outlined under INSTALLATION.

(b) Be sure the liquid level control and the float switches (if used) are operating properly.

(c) Check the pump rotation to be sure it is correct in accordance with the directional arrow on the pump seal cover.

(d) In a high differential pressure system (transfer system), if the pump should rotate backward after the control has stopped the pump, it is an indication that the check valve in the pump discharge line is sticking in the open position.

(e) If the pump operates satisfactory initially and then gradually loses capacity, it is an indication that dirt in the system is cutting the pump.

PURGING

Before opening the pump to make repairs, be sure to close the pump suction and discharge stop valves and the oil reservoir pressurization line valves; then purge the remaining liquid from the pump through the drain connection installed in the pump discharge line (See Figs. 3 and 4).

REPLACING THE SHAFT SEAL

If the shaft seal leaks refrigerant to the atmosphere or if the oil level in the oil reservoir suddenly drops, a leaking shaft seal is indicated and the entire assembly should be replaced (See Fig. 10).

If it becomes necessary to replace the shaft seal assembly, refer to Fig. 10 and proceed as follows:

(a) Drain the liquid from the pump as outlined under PURGING.

(b) Remove the belt and pump pulley.

(c) Carefully open the oil charging valve on top of the oil reservoir to vent the reservoir. Then remove the plug in the bottom of the seal body and drain the oil into a container.

(d) Remove the six socket head cap screws which secure the bearing cover and seal cover to the pump body and pull the bearing cover off the end of the shaft.

(e) Remove the roller bearing retaining ring by carefully springing the ring out of its groove in the shaft. Then pull the seal cover (with roller bearing and gasket) away from the pump. The outside seal ring gasket and the outside seal ring (with "O" ring) will come with the seal cover.

(f) Then pull the outside seal coller (with "O" ring), the spring retaining ring (with 4 springs, 2 pins and locating ball) and the inside seal collar off the shaft.

(g) Remove the inside seal ring (with "O" ring). The inside seal ring is seated (by means of its "O" ring) in the seal body. There are two drilled and tapped holes in this seal ring to receive threaded rods (No. 10-32NF). The seal ring can be removed using the rods as pullers. See Fig. 10.

(h) Thoroughly clean the inside of the seal body and the surface of the pump shaft.

(i) Coat the new seal parts with new oil and install the new parts following the above procedure in reverse. Mark the inside of the seal housing to permit lining up the hole in the seal ring with the locking pin so that the pin slips into the hole in the seal ring. Be sure the two guide pins in the spring retaining ring are engaged in their holes in the inner and outer seal collars. Be sure the locating ball is seated in its socket in the shaft before installing the spring retaining ring.

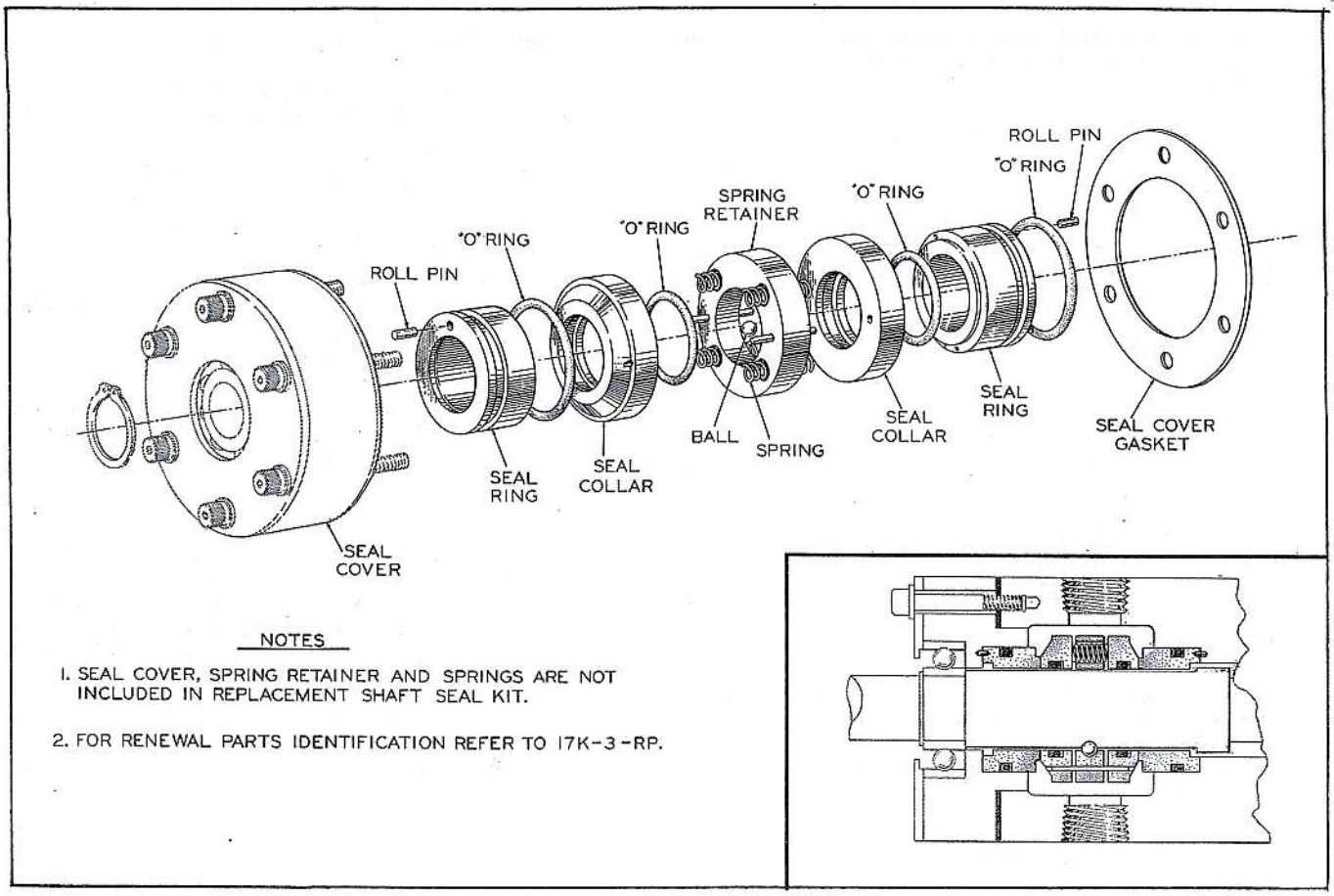
(j) Fill the oil reservoir with new oil, as outlined under LUBRICATION, before operation.

REPLACING THE PUMP INSERT ASSEMBLY

A complete pump insert (consisting of seal body, pump head, shaft seal, pump gears and bearings) is available for replacement purposes (See Fig. 11). If it becomes necessary to replace the entire pump insert, refer to Figs. 11 and 12 and proceed as follows:

(a) Remove the belt guard, belt and pump pulley.

(b) Close the pump suction and discharge stop valves and carefully drain the liquid from the pump as outlined under PURGING.



NOTES

1. SEAL COVER, SPRING RETAINER AND SPRINGS ARE NOT INCLUDED IN REPLACEMENT SHAFT SEAL KIT.

2. FOR RENEWAL PARTS IDENTIFICATION REFER TO 17K-3-RP.

Fig. 10 - Replacement Shaft Seal Assembly

(c) Open the oil charging valve on top of the oil reservoir to vent the reservoir, remove the pipe plug under the seal body and drain the oil from the seal chamber and reservoir. Then remove the oil reservoir.

(d) Remove the bearing grease fittings and the oil heater (if used).

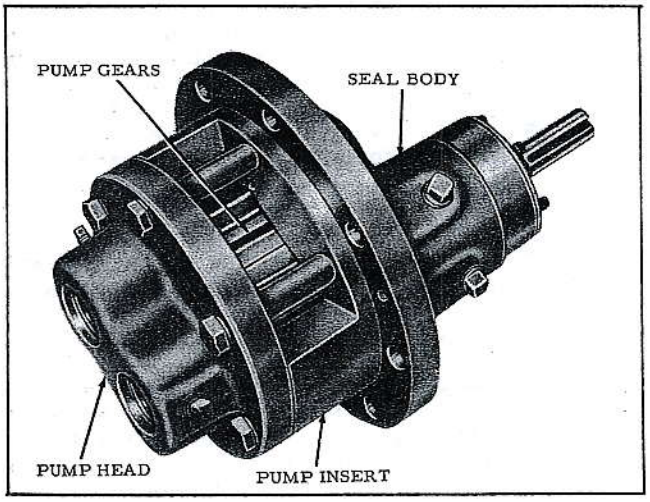


Fig. 11 - Replacement Pump Insert Assembly

(e) Remove the eight cap screws which secure the seal body to the pump body.

(f) Using a 5/8" jack screws in the jack screw holes provided in the seal body flange, jack the entire pump insert away from the pump body until the insert is clear of the sealing "O" ring in the pump body (See Fig. 12).

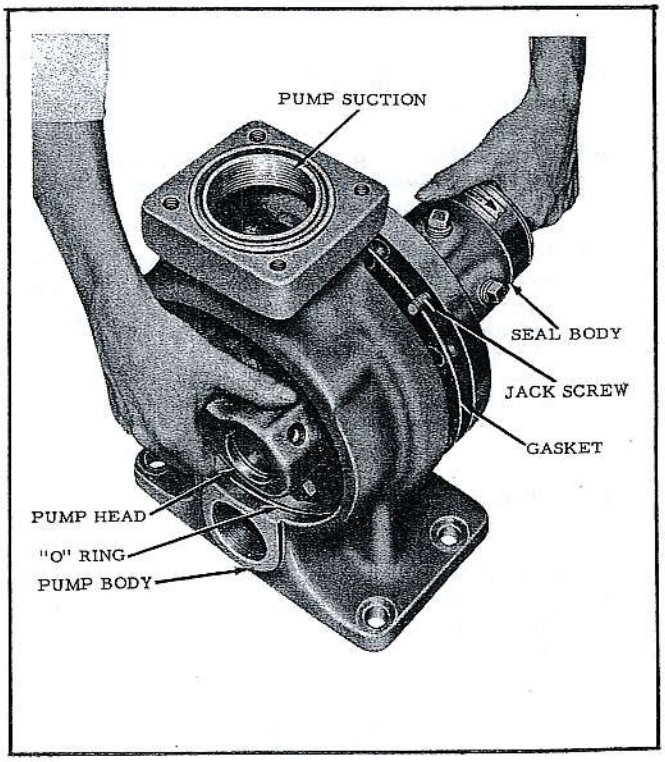


Fig. 12 - Removing Pump Insert Assembly

(g) Install the new "O" ring in its groove inside the pump body using a little bearing grease in the groove to assist holding the ring in the groove.

(h) Install the new pump insert assembly in the pump body following the above procedure in reverse order. The leading edge of the pump head is chambered to facilitate entering the pump head into its sealing "O" ring without pinching the "O" ring between the pump head and the pump body (See Figs. 11 and 12).

It is very important that the "O" ring is not cut or pinched during the assembly of the insert. If the "O" ring is damaged, leakage will result. The "O" ring should be coated with grease to hold it in place when assembling the insert.

It will assist, if when sliding the assembly over the "O" ring, a steady push is given to the insert and lightly tap the back side of the suction flange.

REPLACING PUMP GEARS, SHAFTS & BEARINGS

If it is more desirable to repair the pump locally than to replace the entire pump insert assembly, individual parts may be replaced as necessary.

To dismantle the entire pump, refer to Figs. 12, 13, 14 and 15 and proceed as follows:

(a) Remove the pump insert assembly from the pump body as outlined under REPLACING THE PUMP INSERT ASSEMBLY.

(b) Remove the shaft seal assembly as outlined under REPLACING THE SHAFT SEAL ASSEMBLY.

(c) Remove the six 5/8" cap screws which secure the pump head to the seal body and carefully pull the pump head and insert away from the seal body (See Fig. 14).

NOTE: Before separating the pump head, insert and the seal body, the three pieces should be match marked to assure reassembling these pieces in their original positions.

(d) Lift the shafts and gears out of the pump. The drive shaft must be pulled out through the seal end of the pump. The pump gears are keyed to their respective shafts with a sliding fit. Fig. 15 shows an exploded view of the pump with all parts dismantled.

(e) The roller bearings, two in the seal body and two in the pump head, are pressed into place in their housings. An aluminum seal ring is also pressed into a position located between the pump gear and the roller bearings to seal the bearings from foreign material which may be carried through the pump with the liquid. See Fig. 13. A plug with "O" ring and retaining ring seals the openings at each end of the idler shafts and one end of the drive shaft.

To replace the roller bearings remove the plug retaining rings and remove the plugs using 1/4" tapped hole provided for insertion of a pull rod. Press out the worn bearings and the aluminum seal rings. Press new seal rings into place so that face of aluminum seal ring is approximately 1/16" from inside surface of seal body or pump body. Press new bearings into place so that end of bearing will just butt against seal ring. See Fig. 13.

NOTE: Aluminum seal rings were not included in pumps produced prior to January, 1959. Seal rings should be added to these pumps at time of bearing replacement.

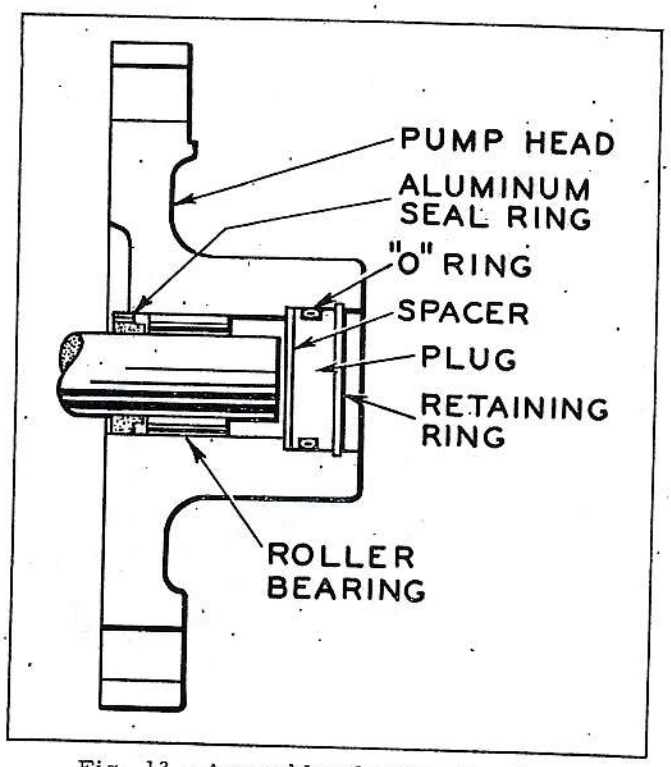


Fig. 13 - Assembly of Roller Bearing and Bearing Seals

(f) The ball bearing at the seal end of the drive shaft is pressed into its seat in the seal cover and is secured by means of a retaining ring which grips the shaft (See Fig. 10). If it is necessary to replace this bearing, it is only necessary to press the worn bearing out of the seal cover and press the new bearing into place until it is seated in the seal cover.

(g) While the pump is dismantled, thoroughly clean the inside of the pump using an approved safety solvent.

(h) Slide the two shafts into their respective roller bearings in the seal body. The drive shaft must be inserted from the seal end.

(i) Install the new gears (with keys) on their shafts. The new gears are identical - either gear may be installed on either shaft. When the original gears are reinstalled, they should be match marked so that they are reinstalled in their original positions.

(j) Reassemble the pump insert and the pump head to the seal body. Be sure that the pump head and seal body are assembled with the two gas relief ports above the shaft centers and the single gas relief port below the shaft centers (See Fig. 14). The pump insert must be assembled between the seal body and the pump head with its suction inlet (large opening) toward the top (See Fig. 14). Dowel pins are provided between the seal body and pump insert and between the pump insert and the pump housing to aid in

locating these three parts with respect to each other. Before tightening the cap screws which hold the pump insert together, be sure the two ferrules are in place over the two cap screws which pass through the suction inlet opening. (See Figs. 11 and 15). These ferrules prevent the pump head from being drawn up tight enough to bind the pump gears.

(k) Install the pump insert assembly into the pump body (See REPLACING THE PUMP INSERT ASSEMBLY).

(l) Install the shaft seal assembly as outlined under REPLACING THE SHAFT SEAL ASSEMBLY.

(m) Lubricate the pump as outlined under LUBRICATION.

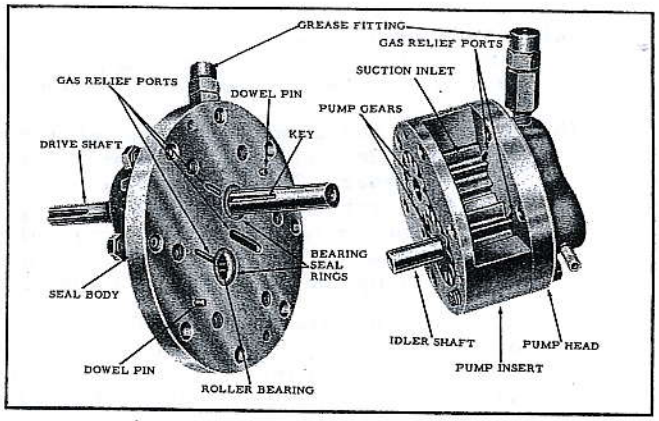


Fig. 14 - Dismantling Pump Insert Assembly

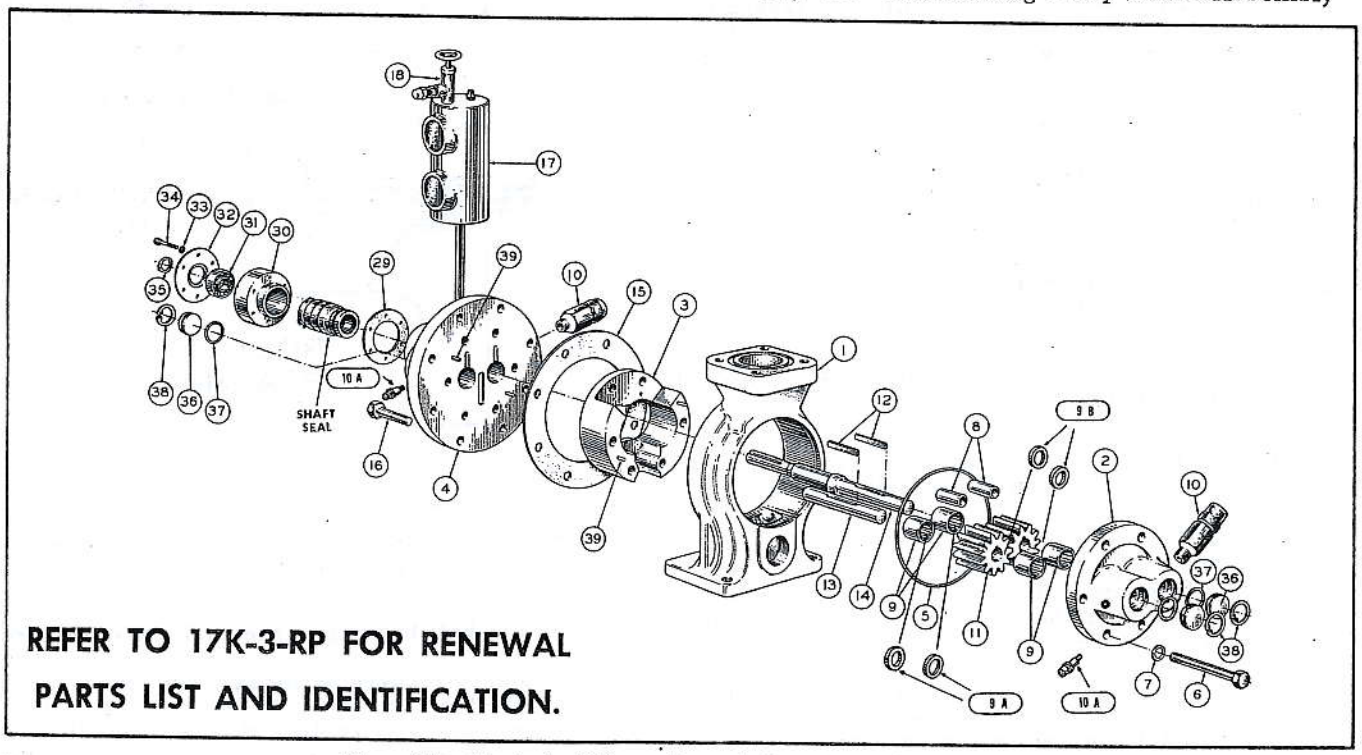


Fig. 15 - Exploded View, Insert Type Liquid Pump

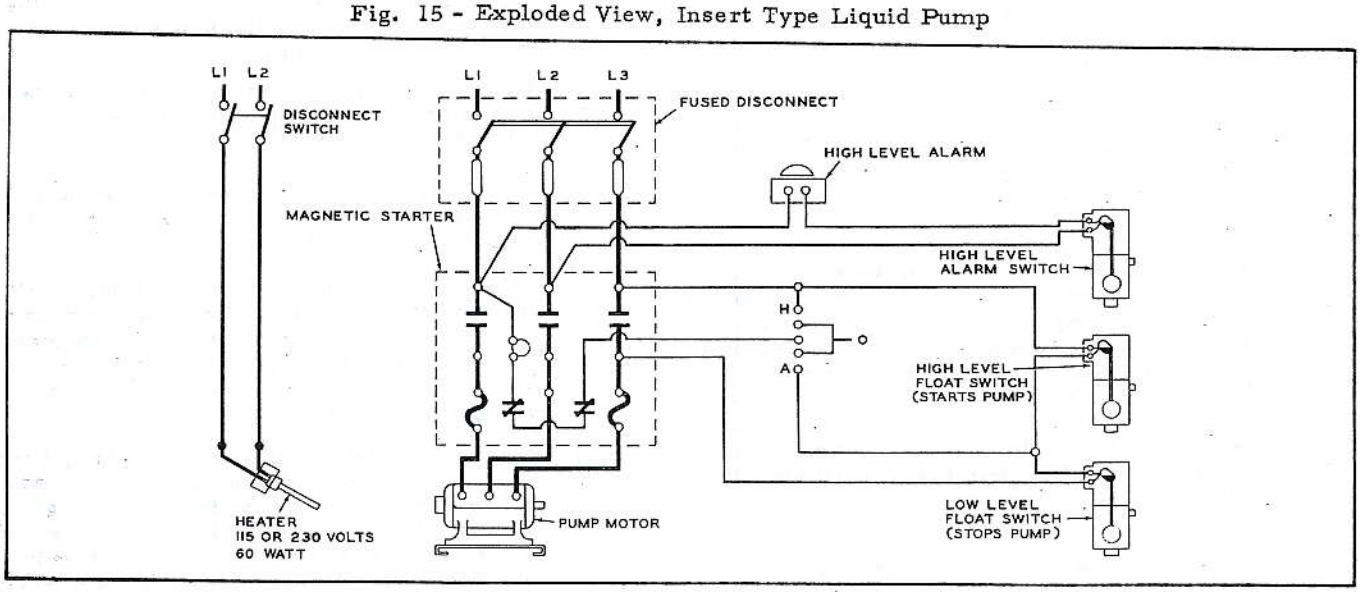


Fig. 16 - Wiring Diagram For Automatic Pump Control

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