Chicago Pump® type VOS and VPM non-clog pumps

Frames: LL4, OL4, LM4, OM4, OMC6, LMC6, OS6, LS6, LSC8, OS8, LS8, OSC10, OLC10, LLC10 and OLC12

UPON RECEIPT OF PUMP EQUIPMENT: Check carefully to see that all equipment has been received and is in good condition. If parts are missing, report details immediately to Chicago Pump. If pump is damaged in shipment, note extent of damage on the freight bill and bill of lading and inform the Transportation Company. Do not leave the unit exposed to construction or weather hazards where pump, may be mechanically damaged or motor and ball bearings become wet. This pump is well designed, skillfully built, and rugged, but must be given the same careful attention that is accorded any precision machine.

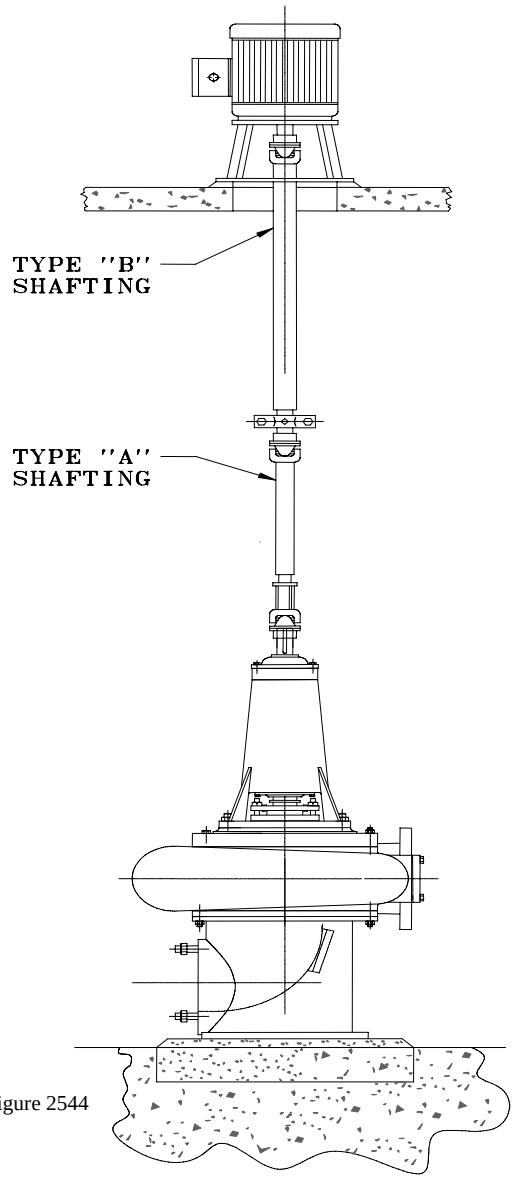

Figure 2544

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INSTALLATION

LOCATION: Both pump and motor should be located in a clean, dry place where it will be accessible for inspection or repair and protected against floods. A motor driven unit should be installed in a ventilated spot. A pump should be set as near the source of water supply as possible so that pipe connections are as short, simple, and direct as can be arranged. When units are large the need for head room or hoist facilities should also be considered.

FOUNDATION: For permanence and quiet operation, it is important that a pump unit be firmly bolted to a substantial foundation. A properly engineered foundation should:

1. Be constructed of concrete with at least 6 cu. ft. per 100 lb. of pump unit.
2. Be at least 6 in. greater in length and width than the sub-base.
3. Be deep enough to bury the anchorage used.
4. Be "rooted" in a solid concrete floor by one of the following means:
   (a) When the concrete is newly poured, cast a shallow pit in the floor using a box form, or
   (b) leave reinforcement bars protrude above the floor level;
   (c) gouge out holes in an existing concrete floor.

The recommended anchorage system is illustrated in Fig. 2543 whereby anchor bolts are shouldered on loose fitting sleeves of pipe embedded in the concrete foundation. This arrangement permits bolt adjustment to conform accurately with sub-base holes after concrete is poured. Sleeves used should be approximately 2½ diameters larger than the bolts, and bolts should be long enough to permit the base to be raised 3/4 to 1 in. for grouting. The Figure illustrates one method for holding foundation bolts in position when pouring concrete into the form. The cross boards must be accurately drilled and spaced so that anchor bolts line up with the sub-base bolt holes. Plug top and bottom of the sleeves with oakum, as illustrated, before placing foundation bolts into the form. Make certain that sleeves are held rigidly against the square plates and that foundation bolts are accurately located to match sub-base holes before pouring the concrete.
After concrete is poured and properly set, the cross boards are removed and the pump unit is ready to be mounted, leveled and grouted.

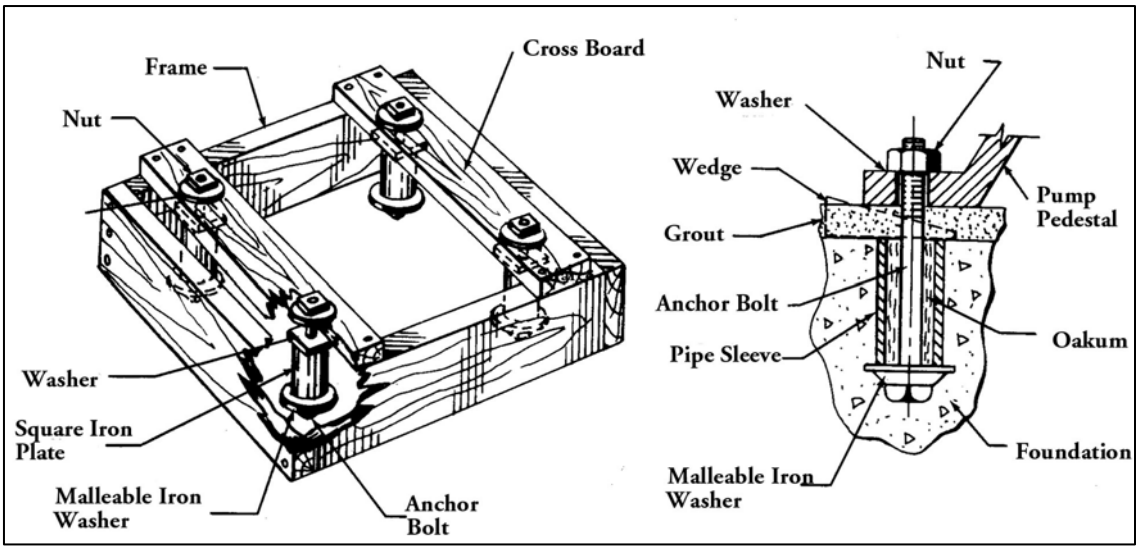


Fig. 2543- A recommended system of foundation Construction

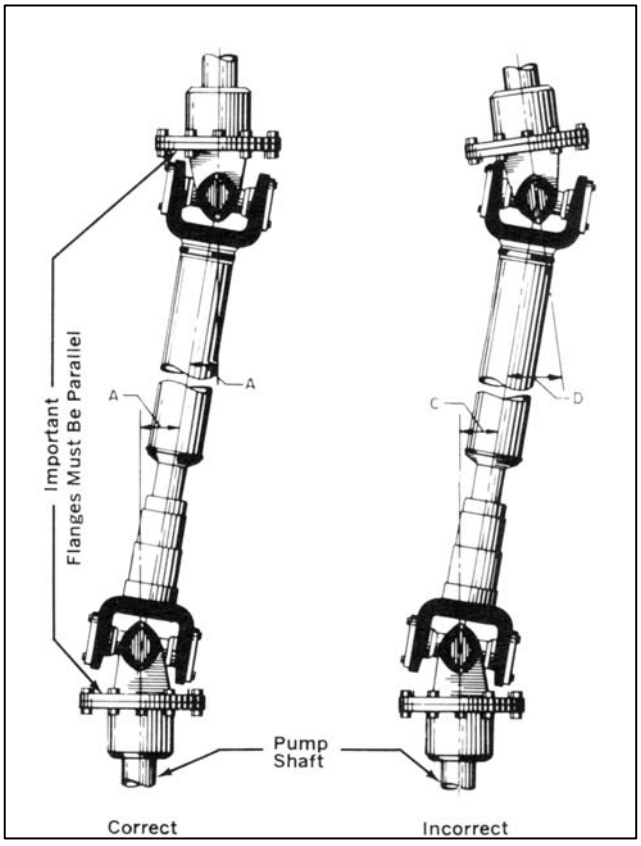
***SETTING THE PUMP*:** Set pump on the foundation over the anchor bolts, but do not bolt down. Raise the pump unit 1" and level carefully for grouting by driving wedges under the pedestal. For leveling pump, place level on face of pump coupling half and face of pump discharge flange.

GROUTING THE PUMP: After pump is raised and leveled pour a good quality grout under the pedestal and allow it to set; to prevent distortion, do not tighten down the nuts on the foundation bolts until the grout has properly hardened.

PIPING:

To obtain a well designed pipe system, note the following piping recommendations:

1. Make pipe connections to the pump so that there is no pipe strain upon the unit. Support the weight of piping on suitable concrete piers or on supporting pipes with flanged feet.
2. When running a pipe line through a concrete wall leave a generous, grooved, square hole and grout the pipe in only after pump unit is set and all final connections have been made.
3. Pipe lines should not be smaller in size than the connections on the pump, and where runs are long they should be at least a size or two larger.
4. In the suction pipe line include a gate valve near the pump, and employ flexible pipe connections (see Fig. 2089) for ease in making final connections and to prevent pipe strain due to settling of concrete.
5. On the discharge line include a suitable swing check valve and a gate valve near the pump. Note it is common practice, where space does not permit, to mount swing check valve in a vertical position.
6. Provide for drainage of the dry basin by means of an automatic sump pump.
7. The water seal connection (25) on the pump packing should be connected to a clear water supply having a pressure approximately 3 to 5 pounds greater than the discharge pressure of the pump. It should be noted that, as a precaution against contamination, health boards do not permit connecting the water seal line of a sewage pump directly to the city supply. A small water seal pumping unit is commonly used to meet health department requirements and at the same time provide positive seal pressure on the pump packing. Economical consumption of water may be obtained by installing a solenoid valve between the discharge of the seal water pump and the seal water connection at the sewage pump. The solenoid valve should be wired to the circuit of the sewage pump so that it will open when the sewage pump operates. When clear water for sealing is not available, a grease seal (Fig. 2893) may be substituted (see paragraph on lubrication).
8. Install a drain pipe from the connection at packing box drip pocket to the sump. To be readily cleanable; include a union in the line near the pump.



TYPE VOS PUMPS:

To install Universal Joint Shafting: (See Fig. 2544, page 1).

When installing universal joint shafting, always place the "A" section (with the slip spline) at the bottom, with spline next to the pump. When more than one section is provided, the order of connection is evident from the connection fittings provided and from the installation drawing; the opposite shafting ends are fixed to the pump and motor shafts by means of keyed couplings held with set screws. Connect the shaft sections and align them approximately, fixing the shafting temporarily but firmly to the bearing support beams by clamping the intermediate guide or steady bearings to the beams with a sufficient number of "C" clamps. Caution ! One side of the intermediate bearing housing has a drilled drainage hole. Be sure when installing that bearing is installed properly to provide drainage of top side of bearing. When all sections are joined, align each section separately with a level as accurately as possible, starting from the bottom and using metal shims behind the steady bearings where necessary. Although universal joints will compensate for considerable misalignment, for maximum efficiency it is desirable to obtain as exact alignment as possible. (See Fig. 1 and Fig. 2 for proper method of installation.)

In making final adjustments, the slip spline should be spaced as near as possible to the mid-point of its slip or end play. Steady bearing are of the self-aligning type, perfect leveling of the bearings is not necessary; and since steady bearings are not provided to stand end-thrust, the shafting weight should be taken by the motor bearings. When alignment is completed, drill holes in. the bearing supports and bolt bearings in place. Remove "C" clamps.

SETTING AND ALIGNING THE MOTOR ASSEMBLY: (See Fig. 2544). The motor is mounted on a tripod. Set the tripod over the floor hole; position the universal shafting to the motor coupling, setting the motor assembly so that it is level and the shafting alignment below is maintained.

IMPORTANT: The motor must support the weight of the line shafting. The motor coupling half is in a fixed position to carry the weight of the line shaft (see Fig. 2544, page 1). You will note that the coupling half has been provided with two set screws located 90^0 apart. One set screw is directly over the keyway and locks the key in place. The other set screw has been located to line up with a drilled or spotted point on the motor shaft. This set screw MUST seat itself firmly into the cavity provided.

CONTROLS: Different types of motors may be used depending upon size or service of the pump and the electrical currents available at the pump location. Since motors may be direct current or single-phase or three-phase alternating current, they may vary considerably according to the system of winding employed, and are specific as to current requirements; a discussion of controls covering all types would be lengthy and is therefore not attempted. In general, always provide a fused or circuit breaker protected disconnect switch in the motor circuit. In addition, a particular system of controls must be used, according to motor characteristics and application, which will satisfy the following requirements:

1. Provide adequate protection against such exigencies as high inrush starting current, low voltage, release and overload protection.
2. Complies with local electrical code requirements and local power company regulations.
3. Is adapted to the make of motor and application of the PUMP.
4. Is safe and convenient for operation or for shutting down to repair pump or motor.
5. Employ high quality equipment with sufficiently high ratings for any reasonable emergency.

WIRING: Connect the electric service to the controls and make inter-control electrical connections according to wiring instructions accompanying the switches and motor, using conduit and wire sizes as required by local power companies.

Be sure current characteristics of voltage and frequency indicated on the motor nameplate are the same as service provided.

ROTATION: Check rotation of the motor; see that it turns in the direction indicated by the rotation arrow on pump casing (28) ; if incorrect refer to motor manufacturer's instructions for reversing.

AUTOMATIC FLOAT CONTROL REGULATION: To maintain prime, the float control mechanism should be so regulated that the water level in the wet basin never falls below the level of the top of the pump discharge casing (28). When regulating the high water limit, submergence of the drainage inlet should be avoided.

MECHANICAL ALTERNATOR: When a mechanical alternator is used, refer to Fig. 4, for proper installation and setting.

FUSE RECOMMENDATIONS: Be certain fuses are installed and comply in size with the National Electric Code and Local Code recommendations. In general, fuses are sized approximately 200% of the motor ampere rating shown on the motor nameplate; however, fuse size may vary from 150% to 300%, depending on the type of motor.

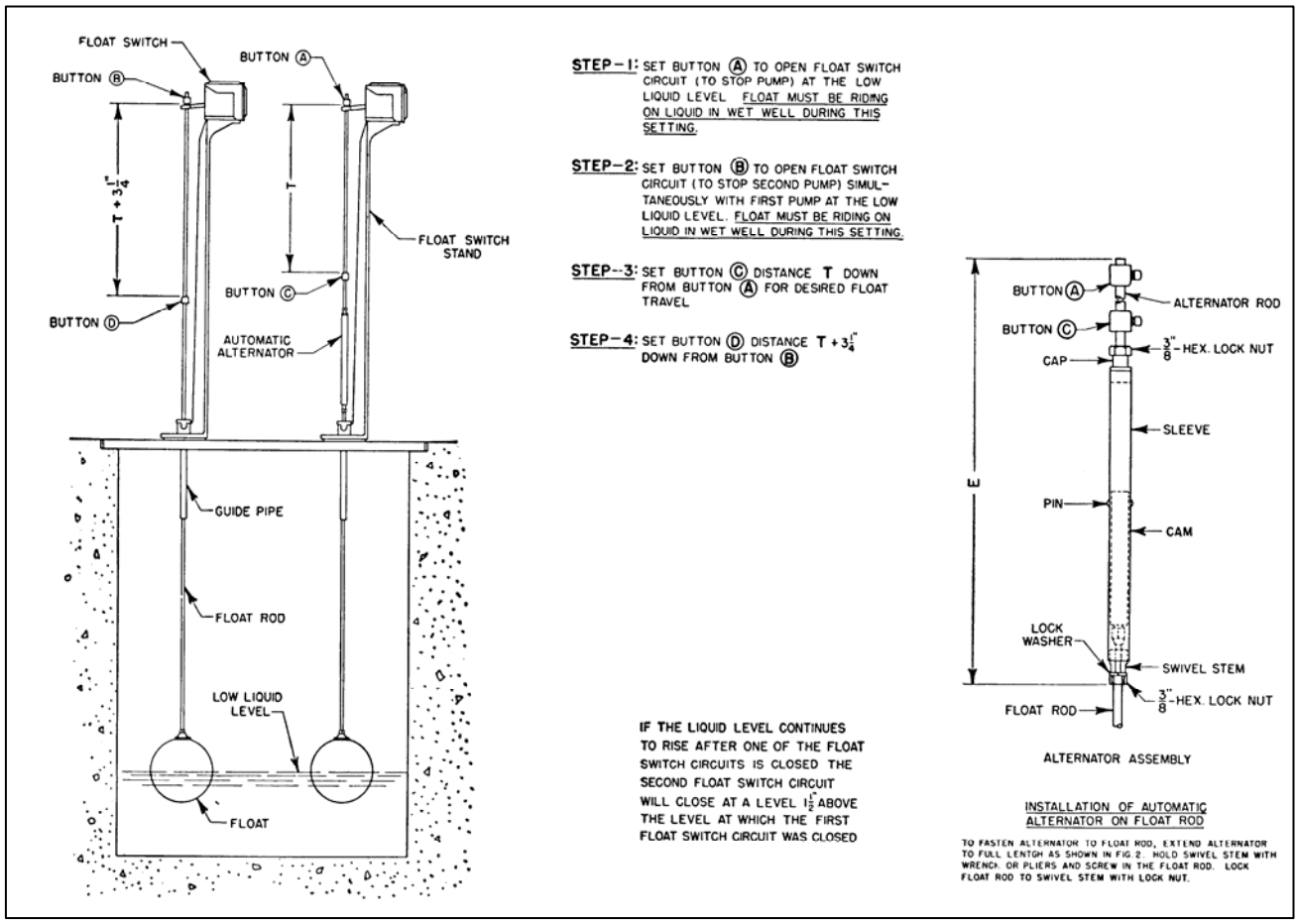


Figure 4 – Installation of Mechanical Alternator

LUBRICATION

MOTOR LUBRICATION: Lubricate the motor according to motor manufacturer's instructions, avoiding over lubrication.

PUMP LUBRICATION:

1. **Ball Bearings**-The pump has two sets of ball bearings lubricated separately through Alemite fittings located on the pump housing. In general pump bearings should be lubricated every six months. Avoid over lubrication. Use a high grade grease equal in consistency to the following: Citgo Lithium EP-2.

2. **Grease Seals**-See Fig. 2893. When a grease seal is substituted for a water seal it is very important that grease pressure be constantly maintained on the packing. When a spring loaded grease cup is used for this purpose the cup must be kept loaded at all times with Grease. It is imperative that grease be forced through the packing at a rate of about 1 oz. per day.

TYPE VOS PUMPS:

Steady or Intermediate Guide Bearings : See Fig. 2544. Steady bearings are provided with Alemite fittings for grease lubrication and should be lubricated with grease having the same consistency as the lubricant recommended for the pump. Steady bearings ordinarily need greasing only once every six months.

Universal Joint Couplings: See Fig. 2544. Universal joint bearings and slip splines are provided with Alemite fittings for grease lubrication, and may be lubricated with the same grease recommended for steady bearings. They need greasing only rarely, once a year usually being sufficient. Caution: Pull motor disconnect before lubricating.

OPERATION

CHECK THE FOLLOWING ITEMS BEFORE STARTING UNIT:

1. Be sure all equipment has been lubricated as per lubrication instructions.
2. Turn the shaft by hand to see that it rotates freely. If it sticks or turns with difficulty refer to the "Repairs" section of these instructions.
3. Verify that current characteristics of voltage and frequency on motor nameplate coincide with the service provided.
4. Verify that all thermal units are closed and the HOA switch (when used) is on "off" position.
5. Verify that gate valves on the suction and discharge lines are open.

STARTING: To start the pump throw in the motor disconnect switch. The pump will not operate unless the float switch is closed. If a selector switch is used the pump may be run independent of float control by turning it to "on" or manual position.

AFTER STARTING THE UNIT:

1. See that shaft rotates in the direction indicated by the rotation arrow on the pump casing and that pump is delivering water.
2. See that all pipe connections are tight and the check valves functioning.
3. Note operation of automatic control mechanism, observing a complete start-stop cycle; see that the liquid level control starts and stops pump properly as wet basin fills and is emptied by the pump. Check high-low water level adjustment
4. Observe the open line shafting, check for vibrating or "whipping".
5. See that there is the desired water leakage from stuffing box (refer to paragraph "4", under "Maintenance" for details).
6. See that bearings (7 and 14) do not overheat due either to over or under lubrication.
7. Observe operation of pump closely for the first day and at regular intervals for two weeks. A new machine is frequently stiff or initial control regulation may be incorrect; therefore the unit should be watched to note performance. (See "Periodic inspection".)

MAINTENANCE:

1. Lubrication-At regular intervals lubricate motor, pump, steady bearings and universal shaft joints as per lubrication instructions.
2. Grease Seal-To be effective grease seals must maintain constant and sufficient grease pressure upon the packing. (See paragraph "2" under "Pump Lubrication".)
3. General Cleanliness-Keep the interior and exterior of motor and controls free from moisture, oil and dirt. When necessary blow out their interiors using a bellows. When switch contacts show signs of wear or pitting they should be replaced.
4. Stuffing box-Occasionally observe the packing glands (23) for leakage. A slight leakage of seal water, say 20 drops per minute (large pumps may require more) from the stuffing box when pump is running acts as a lubricant and also keeps packing (24) cool and in good condition. If serious leakage is noted tighten the two gland nuts (49) evenly a few turns only; do not draw glands too tight. After adjusting packing glands turn the shaft by hand to be sure it rotates freely. If serious leakage will not stop, refer to "Repairs" instructions for packing renewal.

PERIODIC INSPECTION: To insure the best operation of the pump make a systematic inspection at least once a week:

1. See that automatic float control responds to rising water level in the basin.
2. See that unit starts when the float switch makes contact and that pump shuts off at the low water level.
3. See that motor comes quickly up to speed and maintains constant rotation rate.

LOCATING TROUBLE

IF PUMP FAILS TO OPERATE:

1. Check fuses, circuit-breakers, and thermal units, see if blown, tripped or loose. Before replacing a burnt fuse be sure cause for blowing is determined and corrected. Before resetting a tripped thermal unit allow it to cool.
2. Be sure the shaft rotates, try turning by hand. If it is stuck or unusually stiff see that pump is not clogged; that motor, pump or steady bearings are not worn, dry or jammed by corrosion; that the shaft is properly aligned; and that packing glands (23) are not too tightly or unevenly adjusted.
3. See that switch contacts are not corroded, shorted or terminal connections broken anywhere in the circuit.
4. See if the automatic liquid level control mechanism is - functioning.
5. See if motor is shorted or burnt, or if brushes (when present) are stuck or worn.
6. See that wiring hook-up and service provided are correct and that all switches are set for operation.

IF NO WATER IS DELIVERED:

1. See if the water level is so low that pump is not primed.
2. Check pump to see if it is air bound by venting casing at plug (26).
3. Check whether the suction pipe or inlet is clogged or gate valve closed.
4. See whether the gate valve in discharge line is shut or check valve is jammed.
5. Check discharge head, see if beyond pump rating.
6. See if pump rotation is reversed.
7. See if the impeller is badly worn.
8. See if the motor speed is too slow.
9. Determine if check valve is checking in the proper direction.

IF NOT ENOUGH WATER IS DELIVERED:

1. See if there are air leaks in the suction line or stuffing box.
2. See if motor speed is too slow. .
3. See if the discharge head is higher than anticipated.
4. See if the impeller is worn or plugged up.

IF FUSES BLOW OUT:

1. Check fuse rating used to that advised under "Fuse Recommendations".
2. Turn shaft by hand to see that it rotates freely. If it sticks or turns with difficulty see paragraph "2" under LOCATING TROUBLE.
3. Check wiring and controls. Test for loose connections.
4. See that controls are not worn or arcing.
5. See that motor is not grounded or partially burnt out.
6. Observe if motor is overheating from overload or lack of proper ventilation.
7. See if fuse location is in hot ambient condition.

Fig 2089

REPAIRS

IF PUMP REQUIRES CLEANING: Handholes are provided both in the volute of the discharge casing (28) and in the suction pedestal (61). By closing suction and discharge gate valves, draining the pump and removing the handhole cover cap screws (57 and 59), easy access to the pump interior is possible.

TO DISMANTLE THE PUMP:

1. Open the electric circuit, close all gate valves on suction, discharge and water-seal lines. Drain the pump of water by removing the casing drain plug (58) or lower gauge connection plug (35).
2. Disconnect the bottom end of the lowest shaft section at a flange or yoke (See Fig. 2544 and shafting instructions). The bottom or "A" section of universal joint shafting is easily swung aside to permit pump removal. Where more than one shaft section is used the remaining sections need not be disturbed.
3. Disconnect suction and discharge piping at the pump flange connections, break the water seal line at the nearest union, and disconnect similarly drip-pocket drain and dry basin drainage lines when used.
4. When extension grease lines are present, disconnect lines serving the pump.
5. Release pump pedestal anchor bolts.
6. The pump is now free and may be dismantled on the spot or hoisted from its location.
7. Remove the gland nuts (49), clamps (22), and glands (23). To remove glands on large type units the bolts and nuts holding gland halves together must first be removed. Pick out the rings of packing (24) and the water seal ring (53) noting carefully the number of packing rings used above and below the water seal ring.
8. Remove pedestal nuts (33A) separating suction pedestal (61) from the discharge casing (28). The pump is thus freed from its mount.
9. Hoist or lift pump off the pedestal, and lay it on its side.
10. Using an Allen wrench, remove the impeller hollow head set screw (31) when furnished, and holding the shaft at the coupling end, remove the impeller screw (30).
11. Remove the discharge casing (28).
12. Remove the pump coupling (retain coupling key-1), and releasing screws (40) remove the bearing cap (38) and bearing cage (41-when present).
13. To remove the impeller (32) insert a long cap screw in place of the impeller screw (30), turn it in as far as it will go. Loosen bearing cap (38) by loosening the cap screws (40). This will allow the impeller to rest against the casing cover (52), also it will prevent chipping the ball bearing (7). Tap on the screw with a hammer to jar the impeller loose. Remove cap screw and slip off the impeller. Retain the impeller key (29).
14. Release casing nuts (27), also bearing cap screws (50), when present. Remove casing cover (52) and bearing housing (43). Retain the water seal ring (53) and deflector ring (48)
15. Unscrew the shaft nuts (6) and pull off the upper bearing (7). Retain the spacer shims (42) under it.
16. Unscrew cap screws (45) and remove the lower bearing retaining plate (20), when present, allowing it to drop down.
17. Pull the shaft (37) out of the bearing housing from the bottom end.
18. If necessary the lower bearing (14) may be removed, but be sure to mark its exact location on the shaft.
19. Clean all parts with kerosene before replacing.

TO ASSEMBLE THE PUMP: To rebuild the pump reverse the above procedure, but observe the following precautions:

1. File off all burrs made on machined surfaces.
2. Grease all paper gaskets and use only .012 inch Manila paper. Gaskets are used at the following points:
   (a) Under bearing cap (38)-paper.
   (b) Between bearing cage (41-when present) and bearing housing (43)-paper.
   (c) Between casing cover (52) and discharge casing (28)-paper.
   (d) Between discharge casing (28) and suction pedestal (61)-paper.
   (e) Under handhole covers rubber.
3. When felt washers (2, 10, 12, or 19) or grease seals (5 or 16) show signs of wear, replace them.
4. Be sure to set on the lower bearing retaining plate (20, when used), water seal ring (53), and deflector ring (48) before mounting the casing cover (52).
5. Replace spacer shims (42) under the upper bearing (7). The proper clearance between impeller and casing suction face (below it), when impellers are open type, is .010" to .020"; when impellers are closed type the recommended bottom (butt) clearance is .005" to .010". Clearance adjustment is made by varying the shimming (42) under the upper ball bearing (7) ; increasing shim thickness reduces clearance.

6. When wearing rings are used the proper clearance between them is .011".
7. Replace the packing (24). Use only the proper size soft, square, woven asbestos, graphite impregnated packing cut into individual rings; dip them in oil before inserting. Be sure the water seal and packing rings are replaced in the order they were originally found so that the water seal ring (53) is aligned with the water or grease seal inlet (25). The spliced ends of the packing rings should be staggered to insure a perfect seal.

ORDERING PARTS: When ordering supplies always furnish pump number indicated on nameplate attached to the pump. State quantity, item number, name or description of part.

PARTS LIST

1.	Coupling key	27A.	Casing nut	50A.	Bearing housing stud
2.	Felt washer	27B.	Casing stud	50B.	Bearing housing nut
3.	Felt washer retaining plate	28.	Discharge casing	52.	Casing cover
4.	Retaining wire	28K.	Discharge casing gasket	53.	Water seal ring
5.	Grease seal	29.	Impeller key	54.	Drip pocket drain (plug)
6.	Shaft nut	30.	Impeller screw	55.	Discharge gauge connection (plug)
7.	Upper ball bearing	31.	Impeller set screw (when furnished)	56.	Discharge handhole cover
10.	Grease seal	32.	Impeller	56B.	Handhole cover gasket
11.	Top washer plate	33A.	Pedestal nut	57.	Handhole cover cap screw
12.	Felt washer	33B.	Pedestal stud	58.	Discharge casing drain (plug)
13.	Bottom washer plate	35.	Suction gauge connection (plug)	59.	Suction cover cap screw
14.	Lower ball bearing	36.	Suction handhole cover	61.	Suction pedestal
15.	Bearing collar set screw	37.	Shaft	62.	Grease line (not shown)
16.	Grease seal	38.	Bearing cap	66.	Impeller wear ring (not shown)
17.	Retaining wire	38E.	Bearing cap gasket	67.	Pedestal wearing ring (not shown)
18.	Retaining plate	39.	Upper grease fitting	68	Motor half coupling
19.	Felt washer	40.	Bearing cap screw	69	Coupling set screw
20.	Bearing retaining plate	40C.	Lock washer	70	Coupling sleeve
20B.	Bearing retaining plate gasket	41.	Bearing cage	71	Pump half coupling
21.	Shaft sleeve	42.	Spacer shims	72	Motor pedestal
22.	Packing gland clamp	43.	Bearing housing	73	Motor adapter ring
23.	Packing gland	44.	Lower grease fitting		
24.	Packing	45.	Retaining plate cap screw		
25.	Water seal connection (plug)	47.	Packing gland bolt		
26.	Vent plug	48.	Deflector ring		
		49.	Packing gland nut		

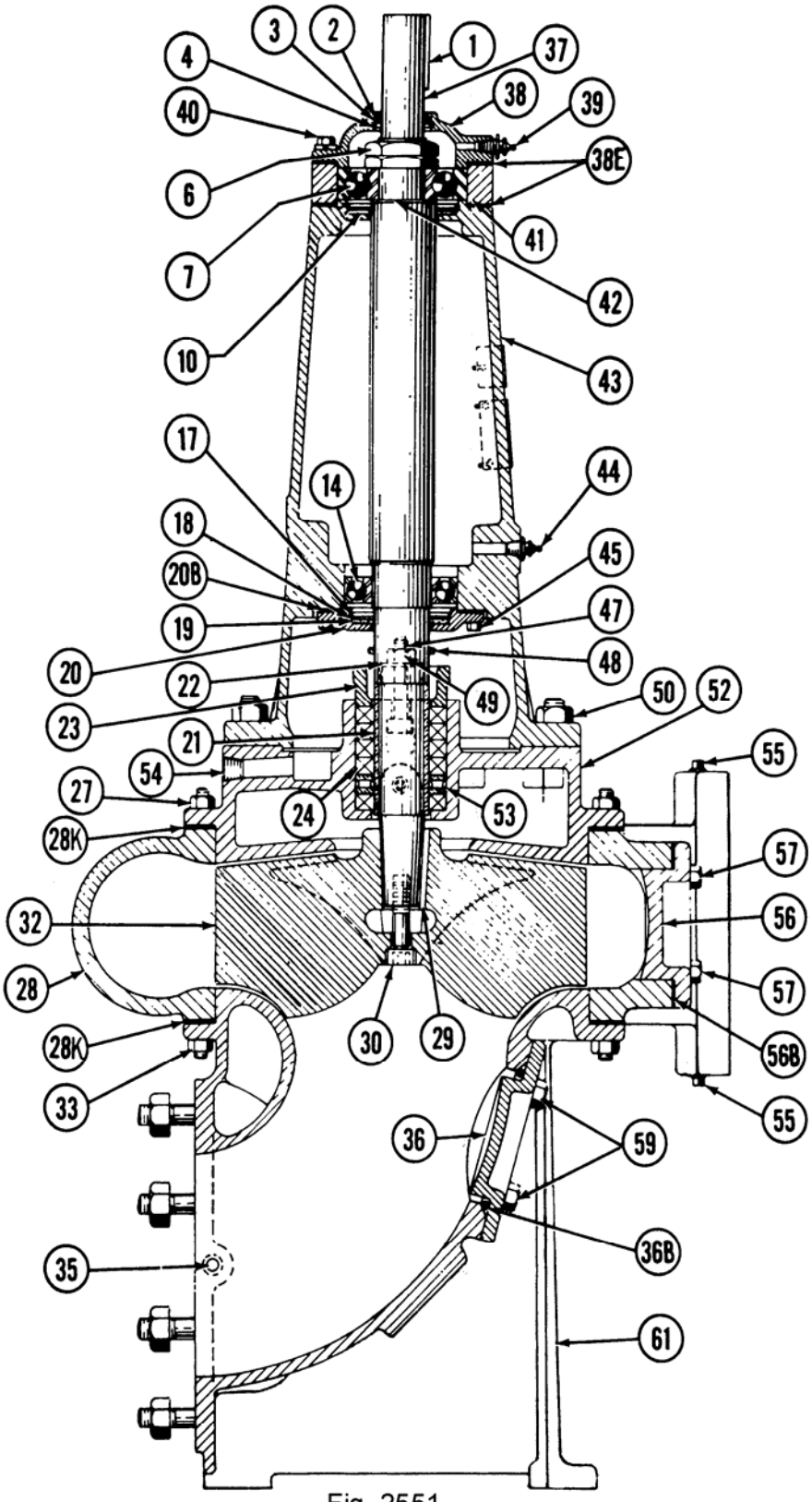


Fig. 2551

Pump Frames: LL4,OL4, LM4, OMC6, LMC6, OS6
LS6, LSC8, OS8, LS8 and OSC10

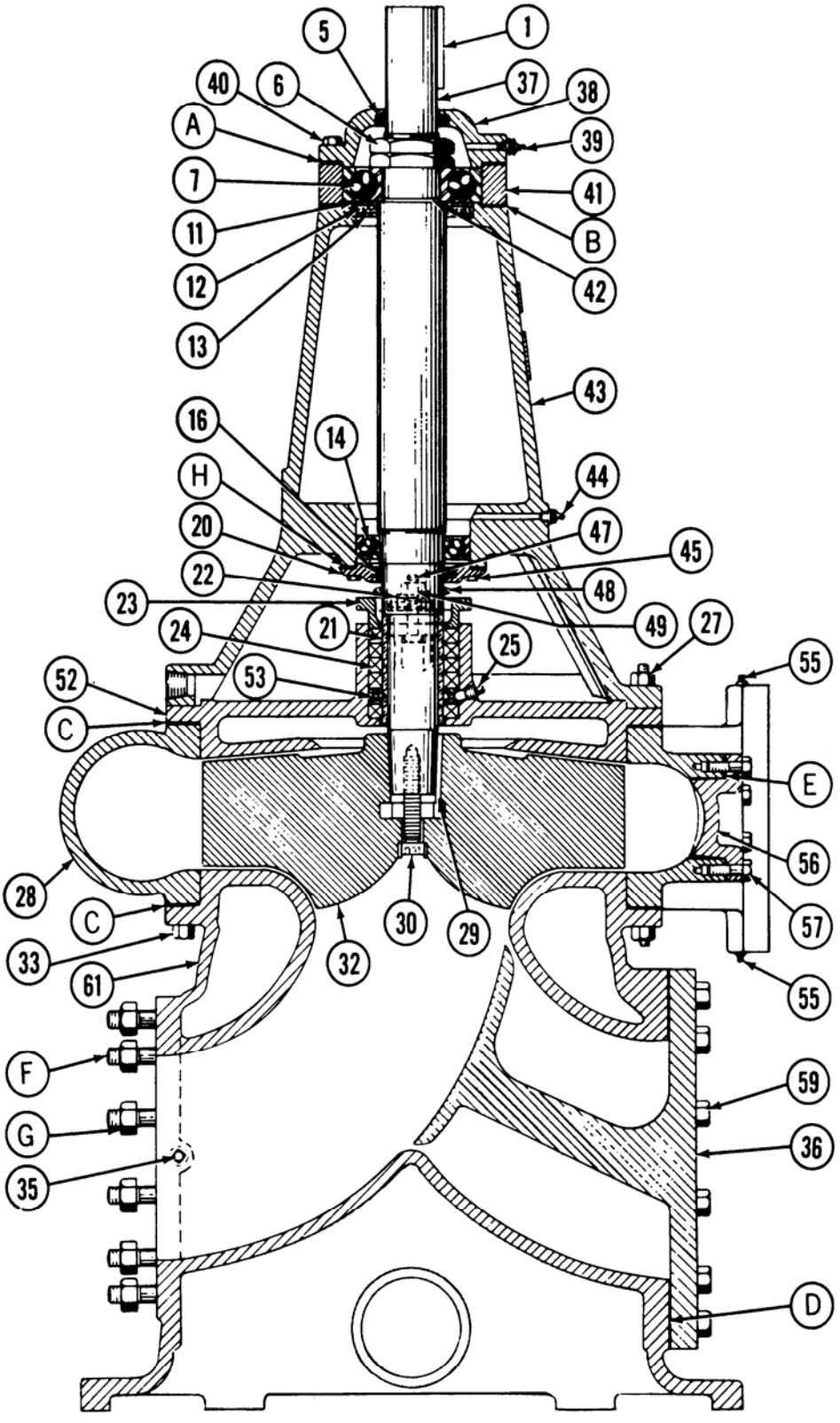


Fig. 2547

PUMP FRAMES: OLC10, LLC10, LL10 & OLC12

	GASKET IDENTIFICATION
A.	Bearing cap gasket
B.	Bearing cage gasket
C.	Discharge casing gasket
D.	Suction handhole cover gasket
E.	Discharge casing handhole gasket
F.	Suction studs
G.	Suction stud nut
H.	Retaining plate gasket

Type VPM (Vertical Pedestal-Mounted) Pumps

GENERAL DIRECTIONS: Vertical pedestal non-clog pumps have the same general design as do vertical open-shaft pumps, with the exception that they employ machined pedestals to support the motors and are connected to meters through flexible couplings. The preceding general facts concerning vertical open shaft pumps therefore apply as well to these units.

PARTS LIST: Figures 2547 and 2551 with related parts list for open-shaft pumps en pages seven and eight apply equally to pedestal mounted pumps. Additional items are listed below.

FLOODING: When pedestal-mounted pumps are installed in basins, suitable means for manual, or preferably automatic, drainage should be provided.

MOUNTING THE MOTOR AND SETTING THE COUPLING: Motors are normally shipped unmounted to prevent damage in transit. The meter coupling, if net installed at the factory, should be temporarily installed en the motor shaft. This coupling must be drilled and tapped at two locations, 90° apart, with one set screw hole at the shaft key. At the ether location, an indentation or flat must be made in the meter shaft to assure proper seating of the set screw. Place the coupling disc en the pump half coupling. The meter and meter pedestal or adapter ring are provided with self-aligning tongue-and-groove surfaces. Clean both surfaces before mounting the meter, and check that the meter face fits snugly en the pedestal, then fasten the motor belts.
Adjust the coupling to allow metal to metal clearance of about 3'1g " to 1/8". Coupling sleeves should net be pressed too tightly between the coupling faces. If insufficient clearances are provided, the couplings may strike causing noise. Tighten the meter coupling set screws. Two set screws at each location, one en top of each ether, should be used.