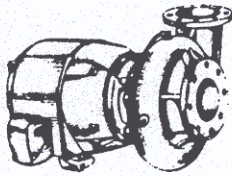




GRISWOLD INDUSTRIAL PUMPS



OWNER'S MANUAL INSTALLATION INSTRUCTIONS E, F & G SERIES CENTRIFUGALS

These instructions have been provided so that the user can derive the optimum performance from his centrifugal pumps. Particular attention must be paid to the instructions pertaining to piping, so that the pump will be able to perform the job for which it was selected. Faulty installation may not only prevent the pump from functioning properly, but also may cause serious damage.

INSTALLATION

MOUNTING THE PUMP: Close-coupled Pumps (Fig. 1) are assembled into a rigid unit which requires a minimum of preparation for mounting. Nevertheless, this type of pump should be bolted down securely; otherwise it may shift its position enough to cause the pump case to crack. The

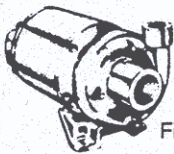


Figure 1

close-coupled pump can be mounted in any position. However, when the pump is mounted in other than a horizontal position, the pump motor must be located above the pump so that if leakage should occur, the dripping liquid will not enter and possibly damage the motor. Pumps which are close-coupled to engines must be mounted horizontally, because the engine's fuel and lubricating systems will not function properly in any other position.

PUMP FOUNDATION

It is absolutely necessary to provide a perfectly flat, horizontal mounting surface. Where such a surface (finished concrete floor, or steel, or wood deck) exists, it should be possible to achieve final adjustment by bolting the base plate directly to this surface and using shims under pump or motor to correct any misalignment.

A pump foundation must be constructed when a flat mounting surface does not exist. In addition to providing a substantial mounting surface, the foundation, when designed to elevate the pumping unit above floor level, may be helpful in protecting pump and driver from flooding and from alignment-destroying jolts by hand, trucks, etc.; and also helps to minimize vibration.

A concrete foundation should be poured after base plate bolts have been accurately located. Bolts should be inserted in pipes or sleeve having diameter 2 or 2 1/2 times as large as the bolt diameter. These sleeves will permit slight adjustment of bolts to compensate for inaccuracies in location of bolts or base plate holes. Anchor the bolts at the lower end of sleeves by means of large washers. The foundation should be sturdy enough to support the weight of the pump without deflection or vibration, and large enough to exceed the length and width dimensions of the base plate by 3 or 4 inches. The top surface should be fairly rough and irregular, so that grout will adhere to it properly.

Set pumping unit on unfinished foundation, using metal wedges having a thickness of 1" to 1 1/2" (available from tool supply houses, or readily made from rectangular steel bar stock) under the edge of the base near each foundation bolt. Bases which are long and narrow should be supported by additional wedges at the mid-point. Wedges should be placed so that the base clears the foundation by 3/4" to 1".

PIPING

Never allow pump to carry weight of piping. Both suction and discharge piping should be supported independently, at a point near the pump. Piping must be installed carefully so that it will not be necessary to force it into place when connecting to the pump. In unusually long discharge lines, and in lines which are subject to wide temperature ranges, slip joints or other flexible connectors should be used to compensate for elongation of the pipe due to pressure or temperature. Flexible connectors also are helpful as a means of preventing transmission of noise and vibration. Consult tables showing friction losses in pipe when selecting pipe sizes.

SUCTION PIPING: The pump should be installed as close to the source of liquid as possible. When high suction lifts (15 feet or more), hot liquids, or intricate suction piping are involved, a careful check must be made to be sure that the pump's required net positive suction head (NPSH) will be met. The suction line should be as short, large, and simple as practical; it should be placed so that it rises gradually toward the pump, and so that the pump suction is at the highest point in the suction line. Use as few fittings as possible, and utilize smooth, long-radius fittings where space permits. **Avoid attaching an elbow directly to the pump suction;** use a length of straight pipe or an eccentric reducer to provide proper entry of liquid into pump. Do not use throttling valves or orifices in suction line. They may cause cavitation which can seriously damage the pump. If a gate valve must be used in the suction line, locate it so that its stem extends horizontally or downward. This will help to eliminate air pockets and leakage of air through the valve packing. If a footvalve is required to keep the pump primed, the cross-sectional areas of its passageways should be 1 1/4 to 2 times the area of the suction pipe. A strainer, if required, should have 3 to 4 times the area of the suction pipe; otherwise, excessive friction loss will be caused.

It is especially important that suction piping, on pumps which operate at a high suction lift, be absolutely free from leaks. If air is drawn in the suction line through any leaks, the pump capacity

will be reduced, and serious difficulties in maintaining prime may result. When the suction line draws liquid from an open sump, its lower end should be submerged sufficiently so that air is not drawn into the line by vortex action. A flared suction bell placed on the end of a vertical suction line will help to compensate for lack of submergence. A square steel plate, attached to the suction pipe, or a square floating collar around the vertical pipe, also will help to suppress vortex action.

DISCHARGE PIPING: Discharge piping is not as critical as suction piping, but care should be exercised in sizing and laying out pipe so that unnecessary frictional losses are avoided. As in suction piping, the number of fittings should be minimized, and abrupt changes in direction and size of piping should be avoided.

A gate valve should be installed in discharge line; it will be of assistance when priming the pump, and will permit service to be performed on the pump without having to drain the discharge line and any connected vessels. It is advisable to install a check valve in the discharge line, between the pump and gate valve; in a system operating at high discharge heads and with a footvalve on the suction line, the check valve protects the pump from pressure surges which occur when the pump is stopped. In pressure systems without a footvalve, the check valve prevents reverse rotation of the pump and loss of pressure in the discharge line if the pump stops. For systems with very high discharge heads (above 80 psi.) a non-slam check valve should be used.

RECIRCULATION LINE

Large E, F & G series pumps, whether equipped with packing or a mechanical seal, are provided with a recirculation line which allows high pressure fluid from the pump volute to flow to the seal chamber. This introduction of higher pressure liquid into the seal chamber acts as a seal, preventing air from leaking into the pump when suction pressure is below atmospheric pressure. To prevent damage to the recirculation line during shipment of the pump, it is usually shipped loose. All

necessary fittings are attached to the line. Merely insert the line into the tapped openings in the volute and seal chamber and tighten the fittings.

If the pump is being used in a system that exerts substantial positive pressure (more than 10 p.s.i.) on the pump suction, it may be advisable to substitute a longer recirculation line which will connect the seal chamber to the pump inlet; this will permit seal chamber pressure to be approximately equal to suction pressure and thus reduce the amount of pressure which must be withstood by the packing or mechanical seal.

MOTORS AND CONTROLS

Larger single-phase motors (either close-coupled or general purpose) and all three-phase motors must be provided with a manual starter which incorporates overload protection. For overload protection as well as automatic operation (in conjunction with a float or pressure switch), a magnetic starter must be used.

Electric wiring to the motor should be sized in accordance with applicable codes or handbooks. Undersized wires will cause a voltage drop which may result in damage to the motor. Be certain the current characteristics of the electrical supply are in agreement with those required by the motor. Instructions for connecting the motor leads of a dual voltage, so that it will run on the desired voltage, appear in the cover of the motor conduit box.

PROTECTIVE CONTROLS: If there is any possibility that a pumping system will allow the pump to run dry (loss of prime, empty tank, etc.) the pump must be protected by an automatic control. Contact the factory for assistance in selecting loss-of-prime switches, low liquid level shut-off controls, etc.

START-UP

Centrifugal pumps (except self-priming models) must be primed (filled with liquid) before they start pumping. For pumping systems which have a foot-valve on the end of the suction line, the easiest way to prime the pump is to fill suction line, pump and enough of the discharge system to

establish a liquid level one or two feet above the top of the pump case. Any air trapped in the pump case should be allowed to escape by removing the top plug (E, F, and G Series) until a steady stream of liquid flows from the opening. Turn the pump shaft by hand so that any air trapped within the impeller is allowed to escape. Wait several minutes for air to escape from any nearly-horizontal runs of suction pipe. Replace plug and prepare to start pump.

Correct direction of rotation is assured when pump is furnished complete with single-phase motor. These drivers are selected so as to impart correct rotation to pump. It is very important, however, to check for correct rotation when three-phase motors are furnished, or when drivers of any type are supplied by others. Check rotation of three-phase motors by turning on power for only an instant, so that pump turns just a few revolutions (prolonged operation of pump in the wrong direction may damage it). Note whether shaft rotation is in agreement with direction arrow on pump case. If direction is wrong, obtain opposite rotation by interchanging any two of the three wires, either at the motor or starter. Close gate valve in discharge line and start pump. Open valve gradually to half-open position, after driver attains operating speed. If pump fails to function after a few seconds of operation, stop it and allow it to remain idle for several minutes. Add more priming liquid if needed, open air vent (or remove top plug) briefly, to permit any accumulated air to escape. Re-start pump; if it still fails to function, stop it and repeat priming and air-bleeding procedure.

If repeated attempts at starting the pump are unsuccessful, check for leaks in footvalve, suction piping or pump stuffing box. **Do not permit pump to run for more than a few seconds unless it remains full of liquid and is discharging properly; prolonged operation of an unprimed pump can cause severe damage to rotating parts.** A discharge pressure gauge, mounted at the pump discharge will indicate the pressure being developed by the pump, and thus will assist in determining whether the pump is operating properly. When proper pump opera-

tion is obtained, and if the discharge line remains full at all times, the discharge gate valve can be opened fully and allowed to remain open until the pump must be serviced or reprimed.

For pumping systems which are especially large or which do not incorporate a footvalve, and yet must be primed in order to overcome a suction lift condition, other methods of priming are available. Hand-operated or motor (or engine) driven vacuum pumps can be used to evacuate air from pump case and suction piping; the vacuum pump must be capable of lifting the priming liquid to a level above the pump case, and in a reasonable length of time. The discharge line must have a check or gate valve located near the pump, in order to limit the volume of air to be removed.

Pumps equipped with stuffing box should be checked for proper adjustment. This adjustment must be made while pump is running; gland should be tightened so that a very slight leakage (6-10 drops per minute remains). This leakage lubricates the packing and helps to prevent excessive wear on shaft (or shaft sleeve) and packing. Pumps furnished with mechanical shaft seals require no adjustment.

If the pump must be shut down, after initial startup, while exposed to below freezing weather, protect it and connected piping from damage by draining the system completely, or by introducing a corrosion-inhibiting anti-freeze into the system.

LUBRICATION - PUMPS

The rotating parts of the centrifugal pump (impeller, shaft, seal elements, etc.) are lubricated by the liquid being pumped. No additional lubrication is required. **DO NOT START OR RUN PUMP DRY.**

REPAIRS

PACKED PUMPS (See Fig. 4 and 4a): Pumps with packed stuffing box should be adjusted when leakage becomes excessive, by tightening the packing gland nuts evenly. Never tighten them so severely that the leakage through the

packing is stopped entirely. Always have the pump running while making this adjustment. When leakage cannot be controlled by additional tightening, remove packing gland and add one ring of packing. Replace gland and make final adjustments while pump is running. When packing has been added in this manner once or twice, it is advisable to remove all packing the next time service is required. To remove old packing, either loosen gland and run pump briefly so that pump pressure will force the packing rings out, or use packing removal tools (obtained from tool supply houses).

Add four rings of new packing so that the ring butt joints are 180 degrees from each other. This type of packing, suitable for temperature up to 200 degrees F., is available in ring form (six rings per set) from our branches and factory. We also can furnish special packing (Teflon, etc.) for use in pumps which are handling solvents and corrosive liquids.

The useful life of pump packing is shortened considerably when the shaft sleeve is worn. It should be inspected, and replaced if necessary, in accordance with instructions below.

PUMPS EQUIPPED WITH SHAFT SEALS: Seal adjustments are not required; the seal is lubricated by the liquid being pumped (unless a special provision has been made for an external supply of cool or clean water to the seal). "See Recirculation Line Instructions". Occasionally, a new seal may leak slightly during its first hour of operation, but unless the seal is faulty or the installation has been done incorrectly, this leakage will stop. When leakage occurs after the pump has been used for a long time, a seal must be replaced.

The shaft seal for pump service is a precision product which must be handled with care. Do not drop the brittle carbon sealing washer or seat face, and do not scratch their lapped surfaces. Damage and consequent seal malfunction are almost certain to occur if these parts are mishandled. The pump case, impeller, and bracket must be removed from driver or frame mounted unit in order to replace the shaft seal. Complete instructions for dismantling pump and removing impeller can be found in applicable paragraphs below.

FIGURE 4

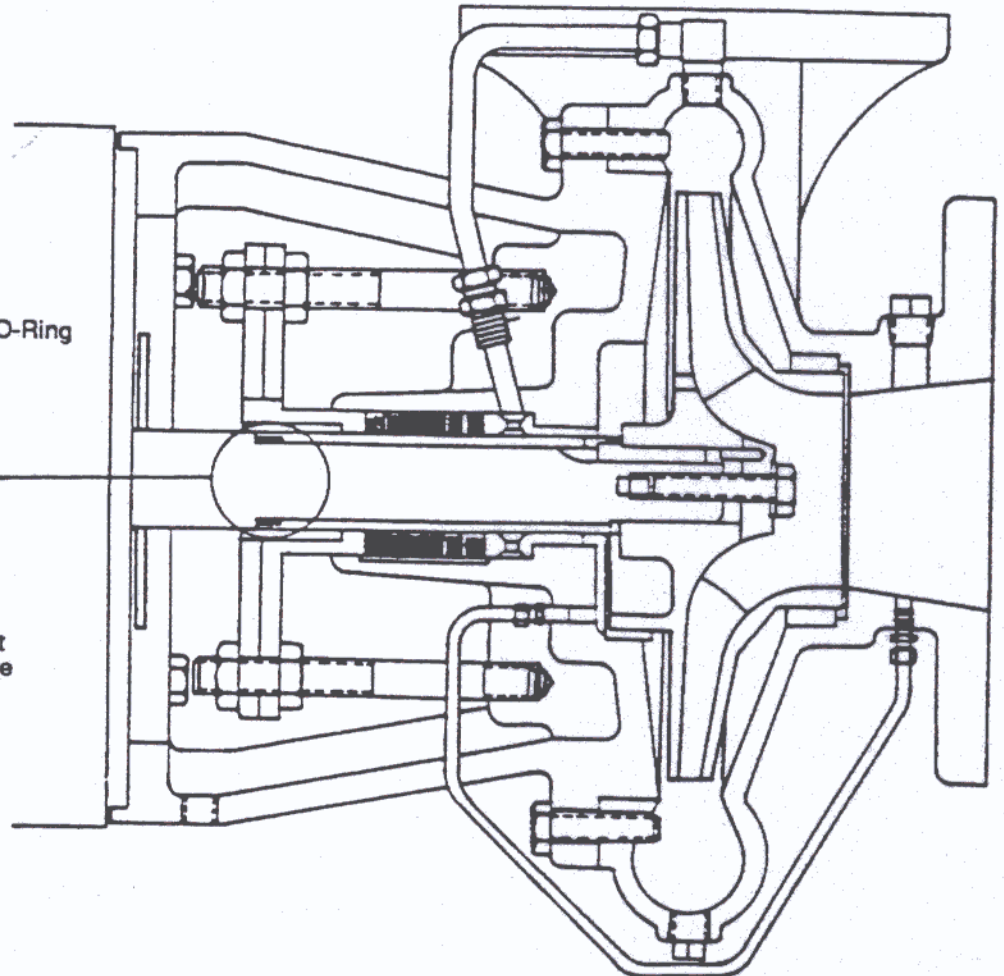
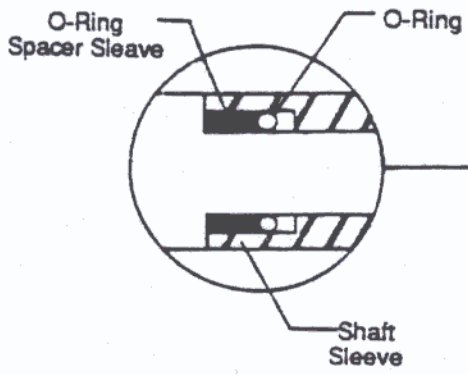
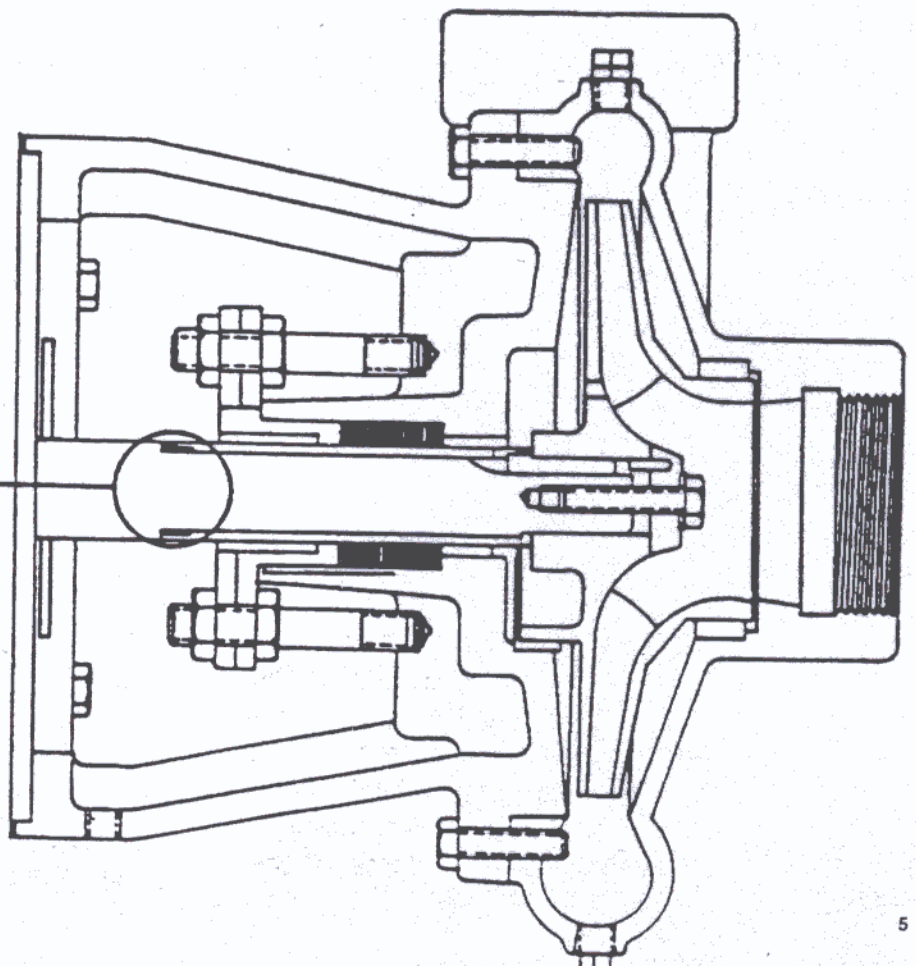
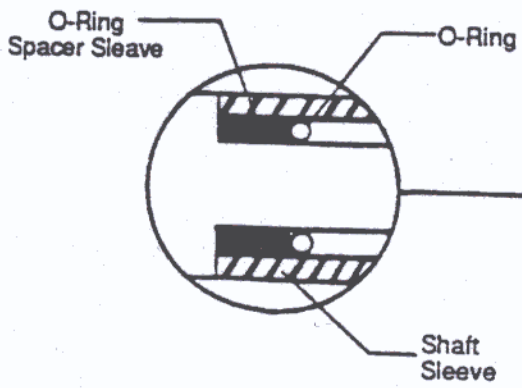
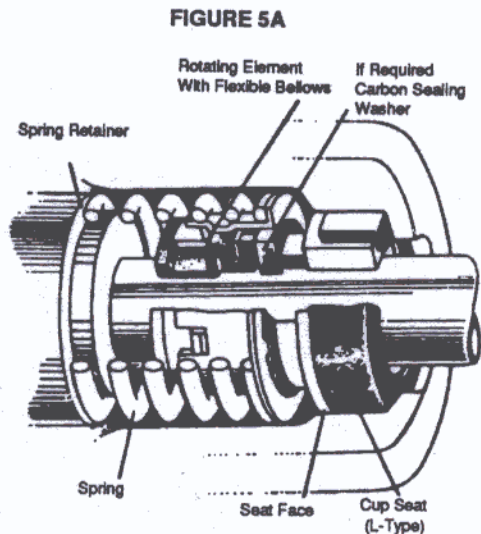


FIGURE 4A



When replacing a shaft seal (see Fig. 5A) new shaft seal assembly is required. Individual parts are not available. Slide the rotating portion of the old seal assembly (consisting of carbon sealing washer, rubber bellows, metal parts and spring) off the pump shaft or sleeve after the impeller has been removed. Sometimes, the rubber driving ring of the seal assembly grips the shaft or shaft sleeve so firmly that the bracket must be used as a puller to remove seal assembly.



Press the old cup seat and ring face out of the bracket. Lubricate the outside diameter of the new rubber cup seat with light oil; press the cup seat with seat face into the bracket cavity, making certain that it is seated squarely in cavity. If the seat and ring cannot be pressed into place with the fingers, cover the lapped seat face with the cardboard ring which is packed with each new seal assembly, and tap seat and ring into place by using a light mallet with a piece of wood, placed squarely against the seat face. Inspect pump shaft to see that it is clean and smooth. Use emery cloth to polish the shaft if it is scored, or replace shaft sleeve if pump is equipped with separate sleeve. Then wipe the shaft clean, and give it a thin coating of light oil. Slide the rotating portion of the seal assembly onto the shaft, with the carbon washer facing the floating seat in the bracket. Be extremely careful when sliding the rubber portion of the seal onto the shaft; otherwise, the rubber bellows will be damaged and leakage will occur. Push only against the rubber rear face of element assembly when sliding it onto the shaft. Concentration of force of the

rubber surface can be facilitated by using a sleeve which fits over the shaft, and butts up squarely against the back of the seal assembly. Once the assembly is on the shaft, the force being required to push it along the shaft is greatly reduced. Be sure to anticipate this reduction so that the carbon washer will not be fractured by being slammed against the seat face. Before sliding the carbon washer up against the seat face, make certain that the lapped faces are absolutely clean. Wipe both faces with light oil (never use grease), and then slide seal components together. Place seal spring on shaft (this applies only with larger seals (Fig 5A) whose springs are an integral part of the seal assembly). Replace impeller washer and impeller, and reassemble pump.

TO DISMANTLE AND REASSEMBLE PUMP

Remove capscrews which fasten pump case to bracket. Separate case from bracket; do this gradually and carefully to avoid damage to these parts and to attempt the salvage of the assembly o-ring. This o-ring will be re-usable if not torn, and if kept immersed in water until reinstalled in the pump. However, recommended practice is to install a new o-ring each time the pump is reassembled. With small, close-coupled pumps (under 5 HP), it usually is more practical to leave the case connected to suction and discharge piping, remove mounting bolts, and slide bracket, impeller, and motor assembly away from the case. When dismantling the "E" series pump for repair, it sometimes is necessary to remove only the front portion of the case (suction flange); therefore, the discharge piping need not be disturbed.

Impellers on the "E", "F", and "G" pumps slide onto the end of the shaft and are locked in place by a key, impeller lockscrew adapter, lock washer, and capscrew. A lock nut instead of the cap screws is used on 50, 60, 75 and 100 HP pumps.

To remove impeller from shaft, unscrew cap screw, (or lock nut after unscrewing set screw, if locked by set screws, or heat up the lock nut by torch to about 300 degrees F. and then apply 300 ft. lbs. of loosening torque, if locked by Loctite). These parts have standard, right hand thread. It may take considerable tapping with a lead ham-

mer, dousing with penetrating oil, and possible application of heat (by means of a torch) to start the impeller off the shaft. Extreme care must be exercised when striking the impeller, especially if it is cast iron, in order to avoid breakage.

Behind this keyed-on type of impeller is an impeller washer (spacer) and the shaft sleeve. To inspect or remove the shaft sleeve, first remove the pump bracket from driver or frame. If the sleeve is so rough and scored that it cannot be smoothed out with emery cloth, it should be replaced. A rough sleeve can shorten packing life drastically; on pumps equipped with shaft seals, a rough sleeve surface will permit leakage between the sleeve and the seal's rubber driving ring. To remove the sleeve strike the rear edge of sleeve with hammer and chisel until the sleeve moves forward enough to permit the application of bearing puller. Heating the sleeve with a torch will assist in this removal operation. Before replacing the sleeve, clean up the shaft with fine emery cloth. Wipe the shaft thoroughly, apply a thin film of grease to the shaft and place a new shaft sleeve gasket or o-ring and o-ring spacer sleeve on the shaft; then slide the sleeve into place. Put the impeller key in place with its gib-head engaging the shaft sleeve. Replace impeller washer and impeller. Replace lock screw adapter, lock washer and capscrew (lock washer and lock nut with set screws for 50, 60, 75 and 100 HP pumps or Loctite locked nut for 40 GB4 (40 GM4) and 50 GB4 (50 GM4) pumps. Assembly of Loctite locked nut should be done as follows: (a) clean and dry thread of shaft and nut; (b) apply Loctite-242 medium strength to both matching threads portion; (c) apply 250 ft. lbs. of tightening torque on nut; (d) remove excess Loctite and allow 60 minutes for curing time before use. Recommended tightening torque for cap screw of 3/8" and 1/2" sizes are 35 ft. lbs and 80 ft. lbs. respectively and 250 ft. lbs. for lock nuts.

Replaceable wear rings are provided if specified in "E", "F" and "G" pump cases and in the larger "E" and "G" pump brackets. When these are worn so that their inside diameter exceeds the outside diameter of the impeller eye by more than .035-.040", they should be replaced in order to restore peak performance. To remove a worn ring, cut in one or two places with a chisel, and pull it out

of the case or bracket. Tap the new ring into place with a lead or plastic hammer; tap gently around its entire circumference so that the ring enters the case or bracket squarely. Be sure that it is seated firmly. If the new ring can be chilled in a freezer or ice bath, it will fit into place more easily.

The pressure breaker, located in the bracket of stuffing box models of "E", "F" and "G" pumps helps to reduce pressure in the stuffing box. If its inside diameter has become more than .060" larger than the pump shaft diameter, it should be driven out of the bracket and replaced. If it is not being replaced, its recirculation holes should be inspected; the holes must be open so that the pressure-equalizing function of the recirculating line is unrestricted. The recirculation line should also be checked to see that it is not clogged.

SERVICING MOTORS, ENGINES, ETC.

Servicing and replacement parts for motors, engines and other drivers are most readily obtainable from authorized repair stations which have been established by the motor and engine manufacturers. We will furnish the name and address of your nearest applicable repair station if you are unable to locate it in the telephone book or other directories; please give make and model of motor, engine or other driver so that we can determine the correct repair station.

REPLACEMENT PARTS

Whenever parts are needed for pump or frame unit, please give the pump model number, specification letter, and pump serial or unit number. This information is stamped in the nameplate space marked "pump model number". The nameplate normally is attached to the pump bracket. Only after this information is supplied can the correct replacement parts be ascertained.