

GOULDS PUMPS

Installation, Operation and Maintenance Instructions



Model 3171

Goulds Pumps



Pump Safety Tips

Safety Apparel:

- Insulated work gloves when handling hot bearings or using bearing heater
- Heavy work gloves when handling parts with sharp edges, especially impellers
- Safety glasses (with side shields) for eye protection, especially in machine shop areas
- Steel-toed shoes for foot protection when handling parts, heavy tools, etc.
- Other personal protective equipment to protect against hazardous/toxic fluids

Coupling Guards:

- Never operate a pump without a coupling guard properly installed

Flanged Connections:

- Never force piping to make a connection with a pump
- Use only fasteners of the proper size and material
- Ensure there are no missing fasteners
- Beware of corroded or loose fasteners

Operation:

- Do not operate below minimum rated flow, or with suction/discharge valves closed
- Do not open vent or drain valves, or remove plugs while system is pressurized

Maintenance Safety:

- Always lock out power
- Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, or disconnecting piping
- Use proper lifting and supporting equipment to prevent serious injury
- Observe proper decontamination procedures
- Know and follow company safety regulations

Observe all cautions and warnings highlighted in pump *Installation, Operation and Maintenance Instructions*.

FOREWORD

This manual provides instructions for the Installation, Operation, and Maintenance of the Goulds Model 3171 Vertical Sump Pump. This manual covers the standard product plus common options that are available. For special options, supplemental instructions are supplied. **This manual must be read and understood before installation and start-up.**

The design, materials, and workmanship incorporated in the construction of Goulds pumps makes them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by correct application, proper installation, periodic inspection, condition monitoring and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of installing, operating, and maintaining these pumps.

Goulds shall not be liable for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this manual.

Warranty is valid only when genuine Goulds parts are used.

Use of the equipment on a service other than stated in the order will nullify the warranty, unless written approval is obtained in advance from Goulds Pumps.

Supervision by an authorized Goulds representative is recommended to assure proper installation.

Additional manuals can be obtained by contacting your local Goulds representative or by calling 1-800-446-8537.

THIS MANUAL EXPLAINS

- **Proper Installation**
- **Start-up Procedures**
- **Operation Procedures**
- **Routine Maintenance**
- **Pump Overhaul**
- **Trouble Shooting**
- **Ordering Spare or Repair Parts**

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SAFETY

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DEFINITIONS

This pump has been designed for safe and reliable operation when properly used and maintained in accordance with instructions contained in this manual. A pump is a pressure containing device with rotating parts that can be hazardous. Operators and maintenance personnel must realize this and follow safety measures. Goulds Pumps shall not be liable for physical injury, damage or delays caused by a failure to observe the instructions in this manual.

Throughout this manual the words **WARNING**, **CAUTION**, and **NOTE** are used to indicate procedures or situations which require special operator attention:



WARNING

Operating procedure, practice, etc. which, if not correctly followed, could result in personal injury or loss of life.



CAUTION

Operating procedure, practice, etc. which, if not followed, could result in damage or destruction of equipment.

NOTE: Operating procedure, condition, etc. which is essential to observe.

EXAMPLES



WARNING

Pump shall never be operated without coupling guard installed correctly.



CAUTION

Throttling flow from the suction side may cause cavitation and pump damage.

NOTE: Proper alignment is essential for long pump life.

GENERAL PRECAUTIONS



WARNING

Personal injuries will result if procedures outlined in this manual are not followed.

- NEVER apply heat to remove impeller. It may explode due to trapped liquid.
- NEVER use heat to disassemble pump due to risk of explosion from trapped liquid.
- NEVER operate pump without coupling guard correctly installed.
- NEVER operate pump beyond the rated conditions to which the pump was sold.

- NEVER start pump without proper prime (sufficient liquid in pump casing).
- NEVER run pump below recommended minimum flow or when dry.
- ALWAYS lock out power to the driver before performing pump maintenance.
- NEVER operate pump without safety devices installed.
- NEVER operate pump with discharge valve closed.
- NEVER operate pump with suction valve closed.
- DO NOT change conditions of service without approval of an authorized Goulds representative.

GENERAL INFORMATION

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PUMP DESCRIPTION

The Model 3171 is a Vertical Submerged Bearing Sump and Process Pump.

The Model is based on three bearing frames with 17 hydraulic sizes. The S/ST group has identical bearings with a slightly different shaft on the impeller end for the S and ST. The M/MT group is identical in all aspects for the power end. The MT is used to denote the fact that the liquid end is common with an S group unit, but has been modified slightly to accept a larger shaft. Groups are as follows:

S/ST	9 pump sizes
M/MT	8 pump sizes

NOTE: 2 are common with S group sizes.

L	2 pump sizes
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NOTE: Each pump has a choice of two different discharge pipes giving four combinations.

Casing: The casing is tangential discharge and self-venting. The casing, with its integral bearing retainer, is precision bored to insure permanent alignment between the column casing, suction cover, and bearing at all times. The suction cover bolts are all tapped into raised bosses to insure generous metal thickness at all points in the casing.

Impeller: The impeller is fully open and keyed to the shaft and held by a self-locking cap screw to insure positive locking and prevent damage from reverse rotation. Impellers are spin-balanced (single plane) to ISO G6.3 to insure smooth operation. The impeller is provided with back vanes to reduce the axial thrust and prevent the entrance of solids.

Strainer: The strainer is a flat plate strainer to maximize draw down in a given sump depth. Openings are sized to prevent the entrance of large solids commonly ending up in open sumps.

Discharge Elbow: The elbow is designed for maximum hydraulic performance. Special design allows for fitting the pumps into the minimum possible opening. Threaded connection to the discharge pipe

allows the pipe to be changed without removing the pump from the sump.

Column Pipe: Column pipe has flanged connections, accurately machined to insure true parallelism and accurately maintain steady bearings concentric with the shaft.

Shaft: Standard design uses a one-piece shaft to insure accurate alignment. The shaft is precision ground, polished, and straightened to keep vibration and deflection to a minimum. Standard bearing spans keep the shaft well below first critical speed for all sizes.

Bearings: The thrust bearing is a grease-lubed double row angular contact ball bearing. It is shouldered and locked to the shaft and the housing enabling it to carry all of the thrust loads and some of the radial load. All fits are precision machined to industry standards. The steady bearings are press fit sleeve bearings. Fits are designed for optimum life under all operating conditions.

Seals: The standard 3171 has three seals.

- An upper labyrinth seal is used to exclude dirt and water from the thrust bearing.
- A lower grease seal is used below the thrust bearing to contain the grease and exclude any possible contamination.
- A carbon Teflon[®] casing collar is installed immediately behind the impeller in the casing to minimize recirculation back to the sump, thereby maximizing hydraulic efficiency.

Motor Support: Motor supports are cast construction and precision machined to maintain proper alignment between the motor and pump shaft with minimal shimming. Motor supports are designed for vertical C-face motors as standard. P-Base supports are available upon request as well as IEC adapters.

Direction of Rotation: Rotation is clockwise looking down on the pump shaft.

NAMEPLATE INFORMATION

Every pump has a Goulds nameplate that provides information about the pump. The tag is located on the motor support. When ordering spare parts, you will need to identify the pump model, size, serial number,

and the item number of the required parts. Part numbers can also be found on the Repair Parts Data Sheet supplied with the original pump data package.

GOULDS PUMPS, INC.
SLURRY PUMP DIVISION
ASHLAND, PA. 17921

MODEL SERIAL NO.

GPM FT. HD.
RPM IMP. DIA.
S.G. MAX. ALLOW. PRESS. PSI

CAUTION: SEE INSTRUCTION MANUAL BEFORE OPERATION.
MADE IN U.S.A.

Fig. 1

RECEIVING THE PUMP

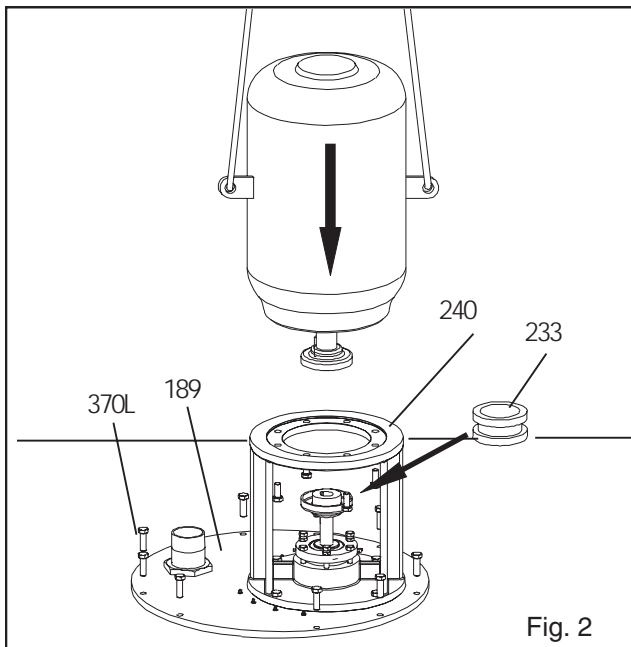
Inspect the pump as soon as it is received. Carefully check that everything is in good order. Make notes of damaged or missing items on the receipt and freight bill. File any claims with the transportation company as soon as possible.

STORAGE REQUIREMENTS

Short Term: (Less than 6 months) Goulds normal packaging procedure is designed to protect the pump during shipping. Upon receipt, store the pump(s) in a covered and dry location.

Long Term: (More than 6 months) Preservative treatment of the bearings and machined surfaces is required. Rotate shaft several times every three months making sure that the shaft does not stop in the same place as it may develop a sag. Refer to driver and coupling manufacturers for their recommended long term storage procedures. Store in a covered dry location.

NOTE: Long term storage treatment can be purchased with initial pump order.



HANDLING

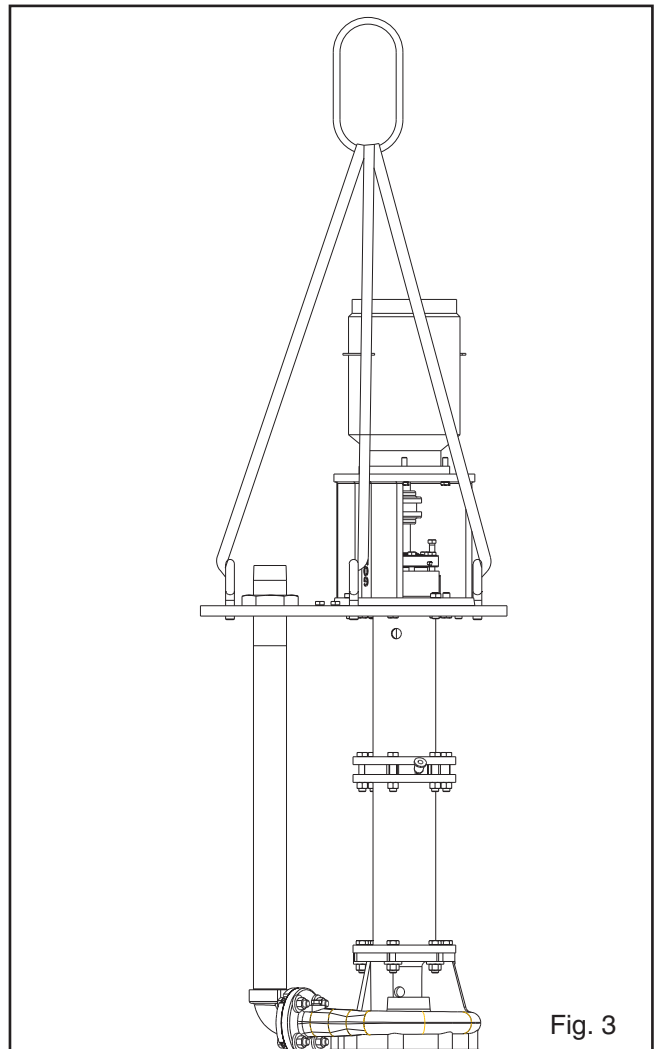


WARNING

Pump and components are heavy. Failure to properly lift and support equipment could result in serious physical injury or damage to pumps. Steel toed shoes must be worn at all times.

Use care when moving pumps. Lifting equipment must be able to adequately support the entire assembly. Position the pump where it can be handled without dragging the casing on the ground or moving the lifting equipment while the pump is off the ground. Use the lifting lugs supplied with the unit and suitable slings to lift the entire pump to a vertical position. A tag line should be attached to the casing end to prevent the pump from swinging and possibly causing damage or injury. Lower the unit into the sump. The motor should then be hoisted into position using the lifting lugs on the motor and a suitable sling (Figs. 2, 3).

2



INSTALLATION

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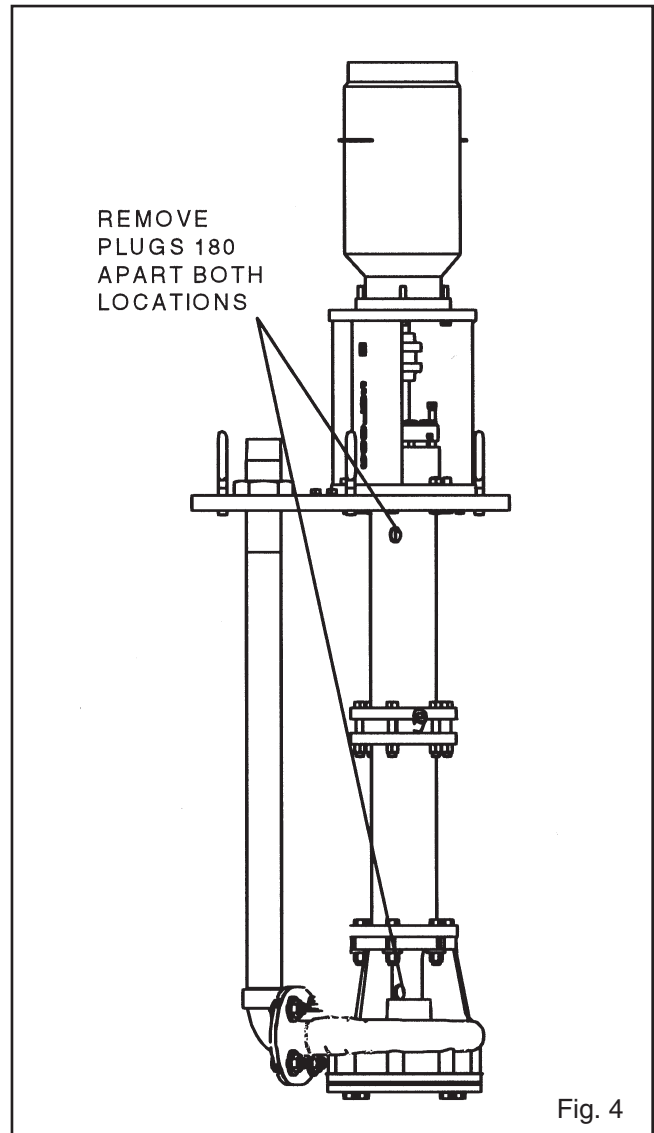
INSPECTION

1. Remove all equipment from shipping containers.
2. Completely clean the underside of the support plate and both sides of the optional pit cover (if supplied).
3. Remove any grease from machined surfaces if applicable.



CAUTION

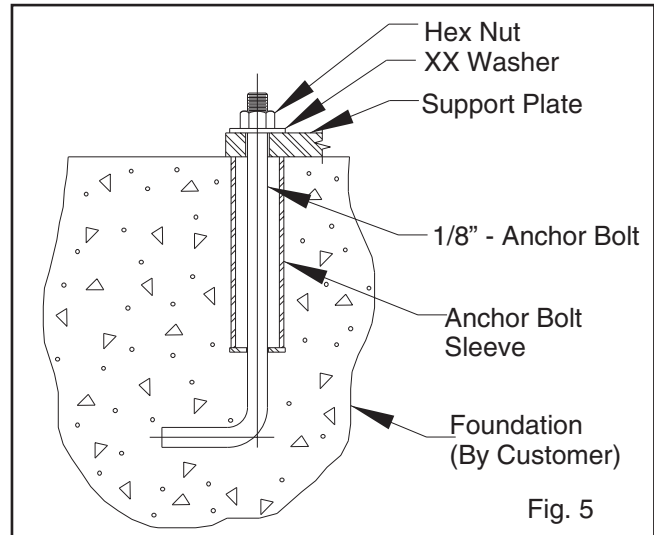
Remove plastic shipping plugs from the vent holes in the head column and casing. Refer to Fig. 4 for locations.



SITE/FOUNDATION

The pump should be located where there is adequate space for installation, operation, maintenance, and inspection. Make sure there is adequate overhead clearance for installing and removing the pump. There should be at least 1/2" clearance between the sides of the pump and any portion of the pit.

Vertical sump pumps are normally bolted to a concrete sump or steel tank. The supporting structure must provide a permanent rigid support for the pumping unit(s) to eliminate any possible vibration. Support plates and/or pit covers are not normally grouted in place. The location and size of the mounting bolt holes are shown on the pump outline drawing provided with the pump data package. If anchor bolts are to be poured into the concrete, we recommend a sleeve type as shown in *Fig. 5* to allow for adjustment.



WHEN PIT COVER IS USED

If access to the bottom of the pit cover is not possible during the installation process, the pump (less motor), support plate and pit cover must be assembled and installed as a unit.

1. The pit cover must be installed perfectly level to insure that the pump remains plumb when installed.
2. Carefully lower pit cover on to foundation bolts.
3. Using as long a level as practical, level the pit cover in all directions with shims or wedges.
4. Hand tighten the anchor bolts, check the level and re-shim if necessary.
5. Tighten all anchor bolts in a star pattern to avoid distorting the support plate.
6. If access to the bottom side is possible, carefully lower the pump and support plate onto the pit cover.
7. Install all bolts finger tight.
8. Check level on support plate and shim if necessary.
9. Tighten all bolts in a star pattern to avoid distorting the support plate.

Vapor-Proof Option

The vapor-proof option includes machined, gasketed fits between the support plate/pit cover and the pit cover/foundation. These gaskets must be installed to insure emissions performance. The pit cover should be bolted to a metal sole plate with a machined surface to insure an air tight seal.

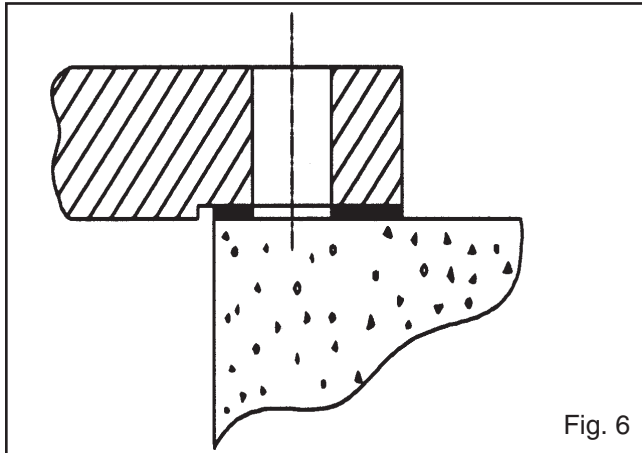
NO PIT COVER

Standard Support Plates

1. Carefully lower the pump and support plate onto the foundation bolts.
2. Level the support plate in all directions using shims and wedges.
3. Hand tighten the anchor bolts, check the level and re-shim if necessary.
4. Tighten all anchor bolts in a star pattern to avoid distorting the support plate.
5. Assure the support plate is level.

Vapor-Proof Option

The support plate/foundation fit is a gasketed fit. The support plate should be bolted to a metal sole plate with a machined surface to insure an air tight seal. Refer to Fig. 6 for standard layout.



Tank Flange Support Plates

1. Mating flange on the tank must be level. Very minor adjustments can be made with gasket material between the two flanges.
2. Install all bolts finger tight.
3. Tighten all bolts in a star pattern to avoid any distortion of the support plate.

Vapor Proof Option

A gasket is supplied for installation between the two flanges to insure an air tight fit.

MOTOR INSTALLATION AND COUPLING ALIGNMENT

The Model 3171 is designed to be used with NEMA Vertical C-face motors. P-Base motor adapters, and IEC motor adapters are available as options.

Installation

1. Install both coupling halves prior to mounting the motor. Refer to the coupling manufacturers instructions.
2. Using the lifting lugs on the motor, carefully lower the motor onto the pump and align the bolt holes.
3. Install the bolts finger tight.
4. Before the coupling is connected, the motor should be wired and the direction of rotation checked. A rotation arrow is located on the motor support. Correct rotation for the 3171 is clockwise looking down from the driver at the impeller.

Alignment of Flexible Coupling



WARNING

Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.

Alignment of the pump and motor is of extreme importance for trouble-free mechanical operation. Straight edge alignment by an experienced installer proves adequate for most installations. For disc couplings and applications where it is felt that alignment to tighter tolerances is desirable, use dial indicators. Standard dial indicator procedures would apply.

Straight Edge Alignment

1. Check for coupling alignment by laying a straight edge across both coupling rims at four points 90° apart.
2. Move motor until straight edge rests evenly at each position. Repeat procedure until correct alignment is achieved.
3. Install flexible sleeve between the hubs per the manufacturers directions included with the pump data package.
4. Tighten all motor bolts.

PIPING

General

Guidelines for piping are given in the “Hydraulic Institute Standards” available from: Hydraulic Institute, 9 Sylan Way, Parsippany, NJ, 07054-3802 and must be reviewed prior to pump installation.

1. All piping must be supported independently of, and line up naturally with, the pump’s discharge pipe.
2. Piping runs should be as short as possible to minimize friction losses.
3. DO NOT connect piping to pump until the anchor bolts have been tightened.
4. Carefully clean all pipe parts, valves and fittings prior to assembly.
5. Isolation and check valves should be installed in the discharge line. Locate the check valve between the isolation valve and the pump in order to permit inspection of the check valve. The isolation valve is required for inspection of the pump and flow regulation. The check valve prevents pump damage due to reverse flow through the pump when the driver is turned off.
6. Increasesers, if used, should be installed between the pump and check valve to minimize friction losses through the check valve.
7. Cushioning devices should be used to protect the pump from surges and water hammer if quick closing valves are installed in the system.
2. Suction piping should never be a smaller diameter than the pump suction.
3. The pump should never be throttled on the suction side.
4. Separate suction lines are recommended when more than one pump is operating from the same source of supply.
5. Suction pipe must be free of air pockets.
6. Suction piping must slope upwards to the pump.
7. All joints must be air tight.
8. A means of priming the pump must be provided. For outside tank mount and dry pit, this is usually accomplished by allowing the fluid level inside the tank/pit to rise above the casing level. In tailpipe applications, the casing must be submerged prior to starting the pump.
9. For outside tank mount and dry pit applications, an isolation valve should be installed in the suction line at least two pipe diameters from the suction to permit closing the line for pump inspection and maintenance. Isolation valve must be kept fully open during operation.
10. The entrance to the suction pipe must be kept adequately submerged below the free liquid surface to prevent vortices and air entrainment.

Suction Piping - For Optional Dry Pit, Outside Tank Mount, and Tailpipe Applications ONLY

NPSH_A must always exceed NPSH_R as shown on Goulds performance curve received with order. Reference Hydraulic Institute standard for NPSH and pipe friction values needed to evaluate suction piping.

1. The general requirement for the 3171 is to install an elbow at the pump. Long radius elbows are recommended. If an elbow can be eliminated or moved further from the suction, it would be recommended to do this.

Outside Tank Mount Only

The outside tank mount option has a column assembly that allows the fluid coming through the lower bushings to flow up through the column and back through the connection at the top of the column back to the tank. The pipe at the top of the pump column must be connected back to the source tank to prevent fluid from entering the thrust bearing.

OPERATION

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PREPARATION FOR START-UP

The following options may be supplied with your pump. Refer to the original data package to see which options apply.

External Bearing Flush

There are five 1/4" NPT pipe plugs on the standard support plate for connection of up to five flush lines. Pumps with more than five bearings will have one for each bearing. Pumps with less than five bearings will still have five plugs, but only the required number will be connected to a bearing. Remove the plugs from the holes that are connected to flush lines. An external source of clean water capable of delivering 1-2 GPM to EACH bearing should be connected to the taps.

NOTE: The flush must be turned on prior to starting the pump and left on until the pump turns off.

Grease Lubricated Bearings

Grease lubricated bearings will have zerk fittings installed for each bearing. Bearings are pre-lubricated at the factory. Unscrew the fittings and confirm there is adequate grease in the line. Replace the fitting and add grease if necessary.

Sealed Bearings

Sealed bearings have a lip seal installed above and below the bearing to exclude grit from the bearing (Fig. 7). Sealed bearings use a spring loaded grease cup to lubricate the bearings (See Appendix V). The bearings are prelubricated at the factory, but the grease cups ship in a separate box to prevent shipping damage. The grease cups should be filled with grease and screwed into the taps that are connected to the bearings. They should be refilled with fresh grease as needed. Frequent inspection after startup is recommended to check usage and establish the best relubrication interval.

4

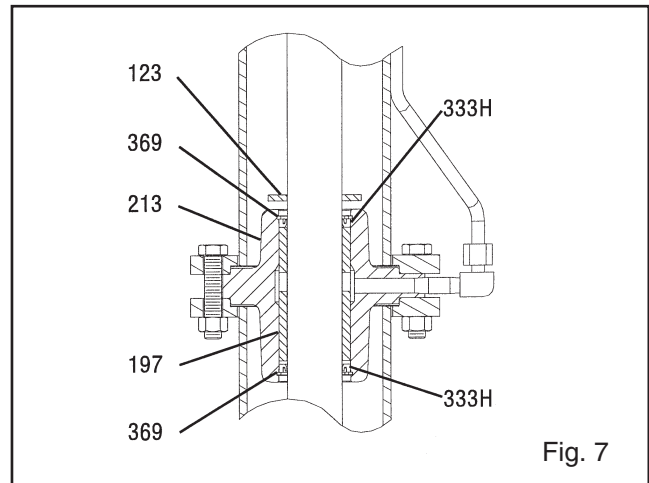


Fig. 7

Packed Upper Stuffing Box

An upper stuffing box is installed for high temperatures and vapor proof construction. The standard configuration is packed. Since no fluid is in the column to lubricate the packing, the packing is grease lubed. The packing is installed at the factory prior to shipment. A screw type grease cup is provided for the packed box. Fill the cup with grease and give the cap several turns to force grease into the packing. Fresh grease should be installed on a regular basis to insure constant lubrication for the packing. Frequent inspection after startup is recommended to check usage and establish the best relubrication interval.

Mechanical Seal Upper Stuffing Box

A mechanical seal is frequently supplied on upper stuffing box applications. The seal is installed and set at the factory. Cartridge seals may still have the setting clips installed and should be removed. Refer to the seal manufacturers guidelines for any special requirements for the particular seal provided. Some require oil lubrication from a bottle oiler, some are dry running, some may require external flush plans. Do not allow the seal to run dry unless it is specifically designed for this.

Steam Jacket Pumps

The steam jacketed connections are located on the support plate. Connect the steam in line to an appropriate source of steam. The steam out/condensate return connections should be made as dictated by the installation requirements. A suitable trap should be used.

Float Controls

A variety of different float controls can be supplied by Goulds. Refer to the float control installation instructions provided with the controls for proper installation procedure. Procedures for some of the more common controls are provided in *Appendix I*.

Checking Rotation

Rotation should have been checked prior to coupling alignment and installation. Refer to page 15 Section 3 if this has not been done.

Check Impeller Clearance

The pump efficiency is maintained when the proper impeller clearance is set. The clearance is set at 0.015" off of the suction cover at the factory, but could change due to piping attachment. Refer to procedure on setting impeller clearance (see Section 5 - Preventive Maintenance).

Priming

Never start the pump until it has been properly primed. The pump casing should be fully submerged prior to starting the pump.



CAUTION

Do not run the pump dry, as this may damage the pump and/or steady bearings.

For Dry Pit/Outside tank mount units:

1. Suction supply line must have adequate fluid head to prime the pump.
2. Slowly open the suction valve.

Starting The Pump

1. Before the pump is started, the external bearing flush (if specified) must be started.
2. Make sure the pump shaft is freely rotating.
3. Partially open the discharge valve.
4. Start driver.
5. Slowly open discharge valve until the desired flow is obtained.



CAUTION

Observe pump for high vibration levels, bearing temperature, and excessive noise. If normal levels are exceeded, shut down, and resolve.

OPERATION

General Considerations

Always vary capacity with a regulating valve in the discharge line.

Driver may overload if the pumpage specific gravity is greater than originally assumed or the rated flow rate is exceeded.

Always operate at or near the rated conditions to prevent damage resulting from cavitation or recirculation.

Operating At Reduced Capacity



CAUTION

Operating a vertical sump pump near shut-off or with a discharge valve closed will damage the pump.

Damage occurs from:

- *Unbalanced radial loads* — subjects the shaft to abnormal deflection causing accelerated lower steady bearing wear.
- *Increased vibration levels* — affects bearings, seals, and noise.

- *Cavitation* — causes damage to the internal surfaces of the pump.
- *Heat Build-Up (Dry Pit, Outside Tank Mount)* — vaporization of the fluid can cause rotating parts to score and seize.

When operating at reduced capacities cannot be avoided, a simple method of relieving the pump of undue strain is to extend a bypass line from the pump discharge back to the sump or tank. A throttle valve or orifice plate should be placed in the bypass line and sufficient flow returned to allow the pump to operate near its rated point. The bypassed liquid should always be returned to the source of supply and discharged below the liquid level to avoid air entrainment.

Final Alignment / Clearance Check

1. Run the unit under actual operating conditions for a sufficient length of time to bring the pump and driver up to operating temperature.
2. Check alignment and impeller clearance while the unit is still hot per the appropriate procedures.
3. Re-install coupling guard.

PREVENTIVE MAINTENANCE

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GENERAL COMMENTS

A routine maintenance program can extend the life of your pump. Well maintained equipment will last longer and require fewer repairs. Accurate records should be kept as they will identify trends and help pinpoint potential causes of problems.

MAINTENANCE SCHEDULE

ROUTINE MAINTENANCE

- Bearing lubrication
- Discharge Pressure
- Temperature Monitoring
- Vibration Analysis
- Seal Monitoring (when applicable)

ROUTINE INSPECTIONS

- Check for unusual noise, vibration and thrust bearing temperature.
- Check float controls for proper setting and operation.
- Inspect pump and piping for leaks.
- Check grease for thrust bearing. Refer to *Table 1* for lubrication intervals.
- Grease steady bearings if applicable, adjust grease cups if supplied.

3 MONTH INSPECTIONS

- Check anchor bolts for tightness.
- If pump has been left idle, check carbon steel shafts (if applicable) for rust and seizing by rotating the shaft several turns. Replace if required.
- Ball Bearing Grease should be changed at least every 3 months (2000 hours) or more often (*See Table 1*) if there are any adverse conditions which may contaminate the grease. Grease should be injected while turning the shaft until fresh grease comes out.
- Check shaft alignment and realign if necessary.

ANNUAL INSPECTIONS

- Check the pump capacity, pressure and power. If pump performance does not satisfy your process requirements and the process requirements or piping system have not changed, the pump should be disassembled, inspected, and worn parts should be replaced. If there is no sign of wear, a system inspection should be done.

Table 1				
Lubricating Intervals in Operating Hours				
Group	Below 1800 RPM	1800 RPM	3000 RPM	3600 RPM
S/ST	2000	2000	1200	750
M/MT	2000	1800	800	450
L	2000	1200	N/A	N/A

MAINTENANCE OF BALL BEARINGS / GREASE LUBRICATED STEADY BEARINGS

The Model 3171 comes with a grease lubricated duplex thrust bearing. The bearing is pre-lubricated at the factory. Regrease the bearing per the schedule in *Table 1*.

RE-GREASE PROCEDURE

NOTE: *When regreasing, there is a danger of impurities entering the bearing housing. The grease, greasing device, and fittings must be clean.*

1. Wipe dirt from grease fittings.
2. Check relief port 180° from fitting to make sure it is open.
3. Fill the grease cavity through the fitting until fresh grease comes out the relief hole.
4. Ensure the relief port closes.

NOTE: *The bearing temperature usually rises after regreasing due to an excess supply of grease. Temperatures will return to normal after the pump has run and purged the excess from the bearings, usually two to four hours.*

For most operating conditions, a lithium based grease of NLGI consistency No. 2 is recommended. This grease is acceptable for **bearing** temperatures of 5° F to 230° F (-15° C to 115° C). Bearing temperatures are generally about 20° F (18° C) higher than the bearing housing outer surface.



CAUTION

Never mix greases of different consistency (NLGI 1 or 3 with NLGI 2) or different thickener. For example, never mix a lithium based grease with a polyurea based grease.

The original grease from the factory is a lithium based NLGI 2. *Table 2* lists some various manufacturers compatible greases.

Table 2	
Mobil	Mobilith AW2
Amoco	Amolith EP2
Ashland	Multilube EP2
Exxon	Unirex N2
Shell	Alvania EP LF2
Unocal	Unoba EP2
Chevron	Dura-Lith EP NLGI2

Temperature extremes (either high or low) may require a different grease.

NOTE: *If it is necessary to change the grease type or consistency, the bearing must be removed and all the old grease eliminated from the housing and bearing.*

IMPELLER CLEARANCE SETTING



WARNING

Lock out driver power to prevent accidental startup and physical injury.

DIAL INDICATOR METHOD

1. Remove coupling guard.
2. Remove coupling if required.
3. Set indicator so the indicator button contacts either the shaft end or the face of the pump coupling hub (Fig. 8).
4. Loosen jam nuts (415) on jack bolts (370D). Back off jack bolts several turns.
5. Turn all locking bolts (370C) in several turns until impeller contacts the suction cover (182). Turn shaft to insure contact has been made.
6. Set dial indicator at zero.
7. Tighten the jam bolts (370D) and loosen the locking bolts (370C) to move the impeller away from the suction cover until the dial indicator shows that a 0.015" clearance has been obtained.
8. Tighten the jam nuts (415) and the locking bolts evenly.
9. Check the shaft for free rotation.
10. Replace coupling.
11. Replace coupling guard.

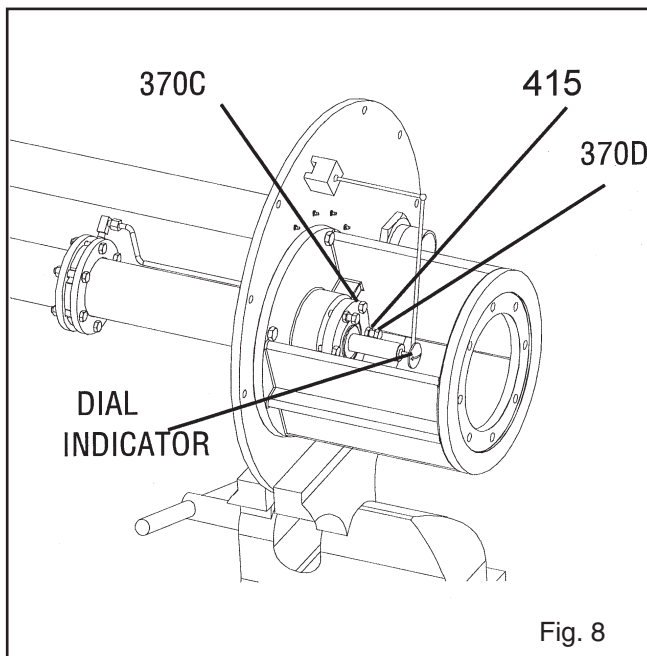


Fig. 8

FEELER GAUGE METHOD

1. Remove coupling guard.
2. Remove coupling if required.
3. Loosen jam nuts (415) on jack bolts (370D). Back off jack bolts several turns.
4. Turn all locking bolts (370C) in several turns until impeller contacts the suction cover (182). Turn shaft to insure contact has been made.
5. Loosen locking bolts (370C) until a 0.015" feeler gauge can be inserted between the underside of the bolt head and the bearing shell (134) See Fig. 9.
6. Tighten jack bolts (370D) evenly until the bearing shell (134) is tight against the locking bolts. Make sure all bolts are tight. Tighten jam nuts (415).
7. Check the shaft for free rotation.
8. Replace coupling.
9. Replace coupling guard.

Both of the above methods set the impeller 0.015" away from the suction cover, giving the required clearance for ambient temperatures. For high temperatures, it is recommended that this procedure be repeated after bringing the pump up to temperature prior to start-up.

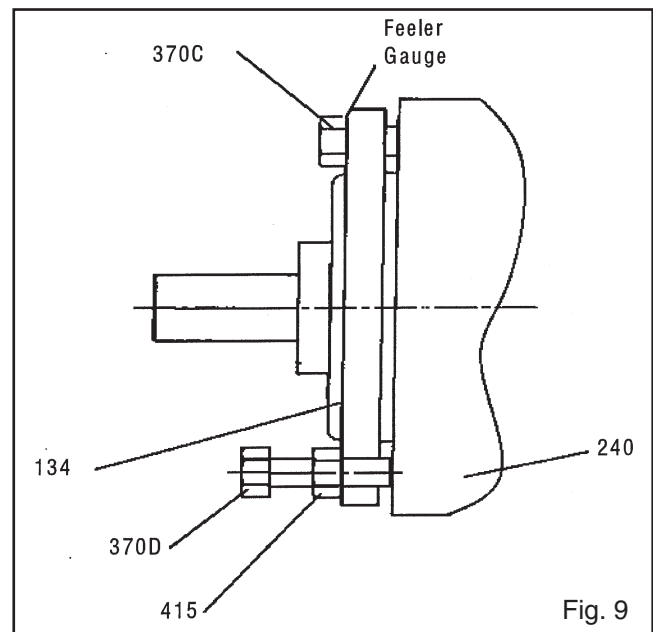


Fig. 9

TROUBLESHOOTING

Problem	Probable Cause	Remedy
No Liquid delivered.	Pump not primed.	No liquid in pit. Fill pit above casing. On dry pit units, casing and suction pipe must be completely filled.
	Discharge head too high.	Check total head, particularly friction loss.
	Speed too low.	Check motor speed.
	Wrong direction of rotation.	Check rotation.
	Impeller, discharge pipe, strainer completely plugged.	Remove obstructions or backflush.
	Suction pipe problems (where applicable).	Check suction lift, it may be too high. Line may be plugged.
	Inadequate NPSH available.	Check NPSH available and required.
Pump not producing rated flow or head.	Impeller, discharge pipe, or strainer partially plugged.	Remove obstructions or backflush.
	Wrong direction of rotation.	Check rotation.
	Discharge head higher than anticipated.	Check total head, particularly friction loss.
	Worn or broken impeller.	Inspect and replace if necessary.
	Suction pipe problems (where applicable).	Check suction lift, it may be too high. Line may be plugged.
	Speed too low.	Check motor speed.
	Air or gasses in liquid.	Increase submergence, rearrange piping to prevent entrained air.
	Inadequate NPSH available.	Check NPSH available and required.
Pump starts then stops running.	Float controls misadjusted.	Check float controls.
	Air or gasses in liquid.	Increase submergence, rearrange piping to prevent entrained air.
	Strainer plugged.	Check sump for large items that the pump may be picking up. Bearings run hot.
	Air leak in suction line (where applicable).	Repair leak.
Bearings run hot.	Improper alignment.	Realign pump and driver.
	Improper lubrication.	Check lubricant for suitability and level.
Pump is noisy or vibrates.	Foundation not rigid.	Tighten hold down bolts, stiffen foundation.
	Improper pump / driver alignment.	Align shafts.
	Partially clogged impeller causing unbalance.	Backflush pump to clean impeller.
	Binding, loose, broken rotating parts.	Inspect and replace as required.
	Bent shaft.	Straighten or replace.
	Worn bearings.	Inspect and replace as required.

TROUBLESHOOTING

Problem	Probable Cause	Remedy
Pump is noisy or vibrates, cont'd	Discharge piping or suction piping not anchored or properly supported.	Anchor and support per Hydraulic Institute standards.
	Pump is cavitating.	Correct system problem.
Motor requires excessive power.	Head lower than rating. Pump is pumping too much liquid.	Install throttle valve or trim impeller.
	Liquid heavier than expected.	Check specific gravity and viscosity.
	Rotating parts binding.	Check internal wear parts for proper clearances.
	Speed too high.	Check motor.

DISASSEMBLY & REASSEMBLY

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REQUIRED TOOLS

- Wrenches
- Screwdriver
- Lifting Sling
- Rubber Mallet
- Induction Bearing Heater
- Bearing Puller
- Brass Drift Punch
- Snap-Ring Pliers
- Torque Wrench with Sockets
- Allen Wrenches
- Dial Indicator
- Micrometer
- Cleaning Agents
- Feeler Gauges
- Hydraulic Press

DISASSEMBLY

6



WARNING

Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.



WARNING

The 3171 may handle hazardous and/or toxic fluids. Skin and eye protection are required. Precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.



WARNING

Lock out power supply to driver motor to prevent accidental startup and physical injury.

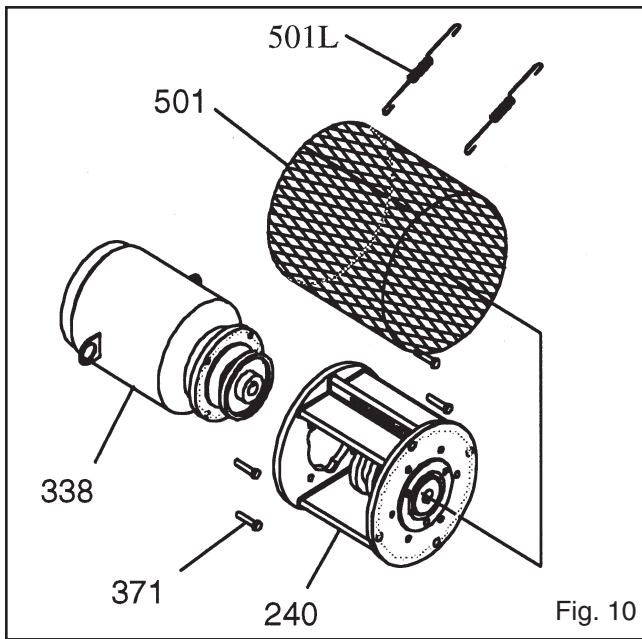
1. Shut off all valves controlling flow to and from pump.



WARNING

Operator must be aware of pumpage and safety precautions to prevent physical injury.

2. Drain liquid from piping, flush pump if necessary.
3. Disconnect all auxiliary piping.
4. Remove coupling guard.
5. Disconnect coupling.
6. Remove motor bolts (371) (Fig. 10).
7. Place sling on motor lifting lugs and remove motor.
8. Remove support plate anchor bolts.
9. Attach eyebolts to the support plate.



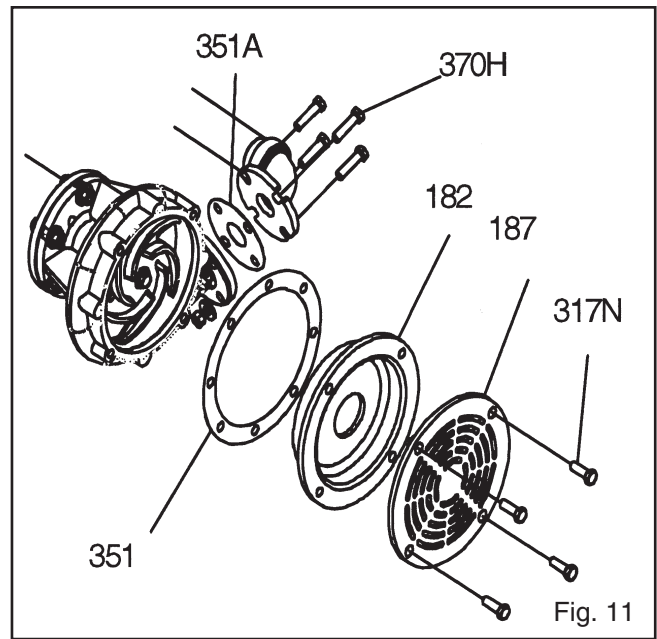
10. Using slings of suitable capacity, lift pump from the sump. Refer to *Installation* section for proper handling procedure.



WARNING

Always use equipment adequate to lift the pump. Follow the equipment manufacturers safe operating guidelines.

11. Lay the pump horizontally on proper supports where there is sufficient clearance to disassemble the pump.
12. Remove the strainer (187) by removing bolts (317N) (Fig. 11).
13. Remove suction cover (182).



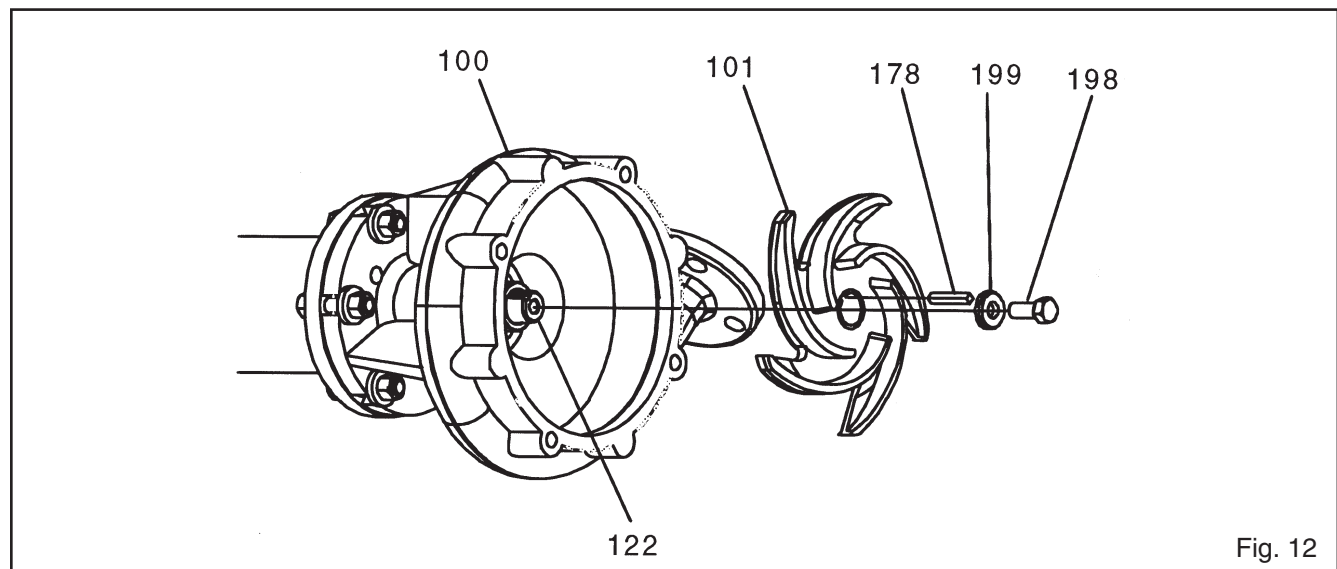
14. Remove suction cover gasket (351) and discard. Replace the gasket during reassembly.
15. Remove discharge elbow-casing bolts (370H).
16. Disconnect any steady bearing flush tubing (190).

Removal of Impeller



WARNING

When removing impeller, wear heavy work gloves to prevent cutting hands on the sharp edges of impeller vanes.

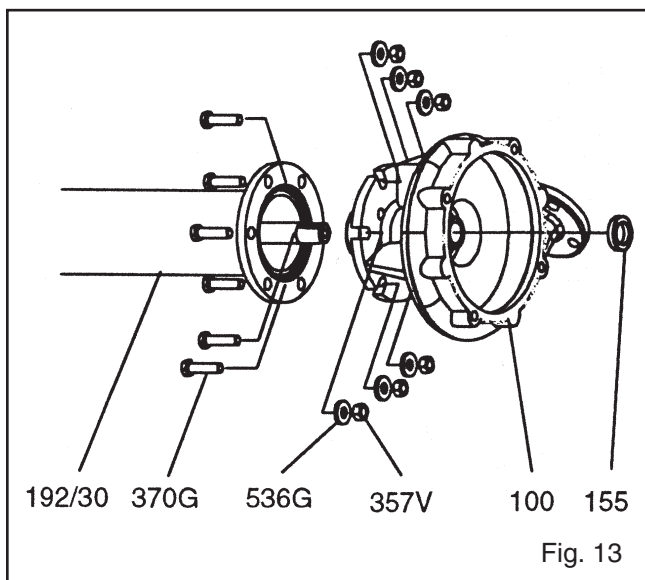


17. Remove impeller screw (198) and impeller washer (199).
18. Remove impeller (101) from shaft (122) (Fig. 12). Save key (178) for reassembly unless it is damaged. Removal can best be accomplished in one of two ways.
 - 18a. Loosen locking bolts (370C) and jam nuts (415). Tighten jacking bolts (370D) until impeller is pushed off the shaft (see Fig. 9 page 23), or
 - 18b. Use a suitable puller that clamps the outside edge of the impeller and pushes against the shaft.
19. Remove column to casing bolts (370G) and remove casing (100) from column (Fig. 4). Remove casing/discharge elbow gasket (351A) and discard.

L Group Only

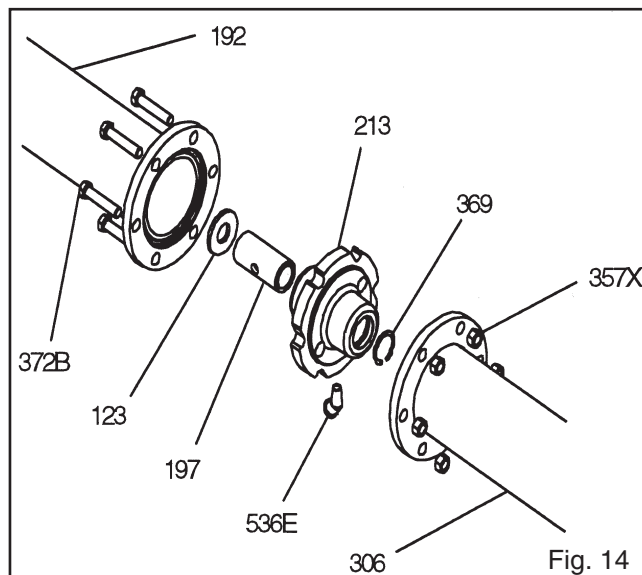
- 19a. Remove casing (100) to adapter (108) bolts. Remove casing. Do not remove casing collar (155) at this time. (Not shown)
- 19b. Remove adapter (108) to column bolts. Remove adapter. Do not remove steady bearing (197) at this time.

NOTE: It is recommended that all column connections and motor support be match marked prior to disassembly to insure correct positioning of these parts during reassembly.



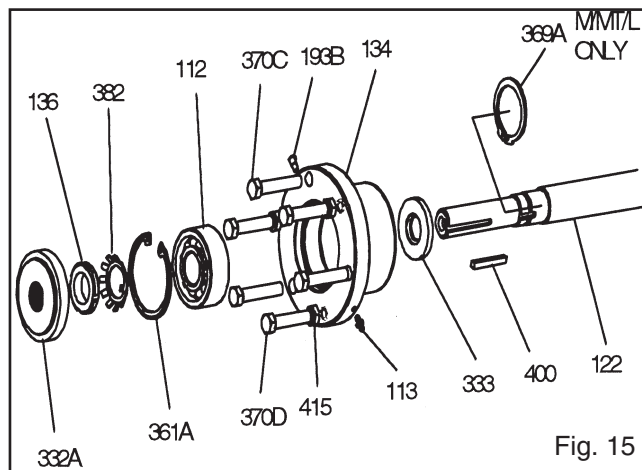
Column Disassembly

If your pump has no intermediate steady bearings (only one column section), you will not have any column extension (306) or steady bearing housing (213). Go to Step 21.



20. Remove column to steady bearing housing bolts (372B). Starting at the casing end of the pump, remove column extensions (306), steady bearing housings (213), and deflectors (123) one at a time. While removing column sections, support the shaft to prevent bending. There is usually no need to remove the head column (192). Do not remove steady bearings at this time. Refer to inspection procedures prior to removal.

21. Remove pump half coupling hub (233) and key.



22. Remove locking bolts (370C) and slide bearing shell (134) assembly with shaft out through the motor support (240).



CAUTION

Two people should handle any shaft over 9' long as improper handling can bend a shaft.

- Remove labyrinth seal (332A). A screwdriver is required to pry the seal from the bearing shell (134).

NOTE: It is recommended that the labyrinth seal be replaced every time the pump is inspected.

- Remove bearing retaining ring (361A). Slide bearing shell (134) off the bearing and shaft.

- Remove locknut (136) and lockwasher (382).
- Using a suitable bearing puller, remove bearing (112).

NOTE: Save bearing for inspection.

- Set the shaft on a table where it is adequately supported.



CAUTION

Two people should handle any shaft over 9' long as improper handling can bend a shaft.

- There is usually no need to tear the pump down any further unless parts are known to be bad.

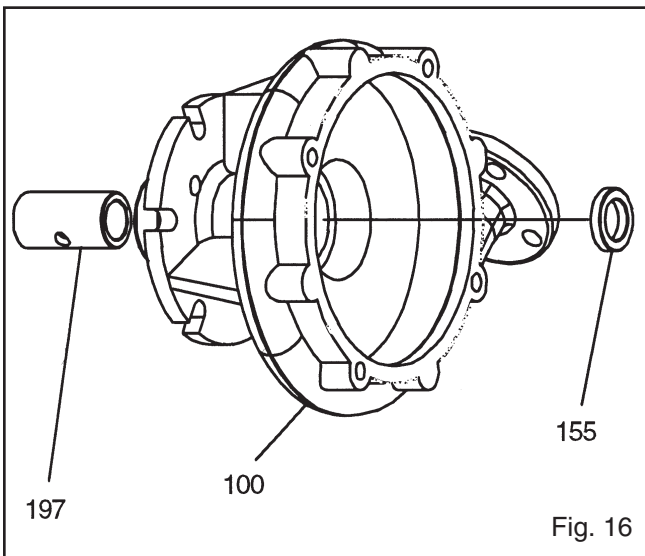
INSPECTIONS

Parts for the Model 3171 must be inspected to the following criteria before they are reassembled to insure the pump will run properly. Any part not meeting the required criteria should be replaced.

Casing and Suction Cover

- The casing (100) and suction cover (182) should be inspected for excessive wearing or pitting. They should be replaced if they exceed.
 - Localized wear or grooving greater than 1/8 in. (3.2mm) deep.
 - Pitting greater than 1/8 in. (3.2mm) deep.

- Inspect casing gasket seat surfaces for irregularities.
- Check I.D. of casing collar (155) and steady bearing (197) per the dimensions in *Table 3*. If I.D. is greater than allowable, remove snap ring (369) and use a suitable hydraulic press to remove these items for replacement. If sealed bearings have been provided, lip seals (333H) must be removed also.
- Inspect casing-to-column connection area for any cracks or excessive corrosion damage. Replace if any of these conditions exist.



**Table 3
Steady Bearing Tolerances**

Bearing Material	Bearing I.D. (pressed in place)			Housing Bore			Running Clearance (1/2 diametrical clearance)		
	S/ST	M/MT	L	S/ST	M/MT	L	S/ST	M/MT	L
Carbon	1.132-1.134	1.633-1.635	2.258-2.260	1.621-1.623	2.121-2.123	2.994-2.996	0.0055-0.0035	0.006-0.004	0.0065-0.004
Bronze	1.129-1.131	1.629-1.631	2.256-2.258	1.621-1.623	2.121-2.123	2.994-2.996	0.004-0.002	0.004-0.002	0.0055-0.003
Fluted Elastomer	1.126-1.130	1.627-1.632	2.253-2.257	1.621-1.623	2.121-2.123	2.994-2.996	0.0035-0.0005	0.0045-0.001	0.005-0.004
Rulon	1.132-1.134	1.633-1.635	2.258-2.260				0.0055-0.0035	0.006-0.004	0.0065-0.004
Casing Collar	S/ST	M/MT	L	S/ST	M/MT	L	S/ST	M/MT	L
	1.183-1.190	1.678-1.685	2.299-2.306	1.811-1.813	2.243-2.245	3.243-3.245	0.0335-0.029	0.031-0.0265	0.029-0.0245

NOTE: Bearing I.D. prior to pressing into housing will be slightly larger to allow for I.D. shrinkage after it is pressed in place.

Impeller

1. Inspect impeller (101) vanes for damage. Replace if grooved deeper than 1/16" (1.6mm) or if worn evenly more than 1/32" (0.8mm).
2. Inspect back pumpout vanes for damage. Replace if worn more than 1/32" (0.8mm).
3. Inspect leading and trailing edges of the vanes for pitting, erosion or corrosion damage.

Column Sections

1. Inspect column section(s) (306, 192) for any cracks or excessive corrosion damage. Replace if any of these conditions exist.

Steady Bearing Housings

1. Check I.D. of steady bearing (197) per the dimensions in *Table 3*. If I.D. is greater than allowable, remove snap ring (if used) (369) and use a suitable hydraulic press to remove this item for replacement. If sealed bearings have been provided, lip seals (333H) must be removed also.
2. Check bore of steady bearing housing (213) per *Table 3*. If bore is excessive, replace.

Shaft

1. Check the thrust bearing fit. If it is outside the tolerance in *Table 4*, replace the shaft (122).

**Table 4
Thrust Bearing Fits**

Group	Shaft O.D.	Shell I.D.
S/ST	0.9848 / 0.9844	2.4416 / 2.4409
M/MT	1.5755 / 1.5749	3.5442 / 3.5433
L	2.1660 / 2.1655	4.7253 / 4.7240

2. Check the steady bearing areas. If more than 0.002" of wear exists, replace the shaft.
3. Check the shaft straightness. If any of the values exceed the values in *Table 5*, replace the shaft.

**Table 5
Shaft Runout Tolerances**

Group	Coupling End	Shaft Body	Impeller End
All	0.002"	0.0005"/ft.	0.005"

1. Inspect bearing shell (134) bore according to the dimensions in *Table 2*, and replace if dimensions exceed values found in *Table 2*.
2. Remove lower grease seal (133). It is always recommended that the seal be replaced at every overhaul.
3. Visually inspect for cracks and pits. Pay particular attention to the snap ring groove.

Ball Bearing

1. Ball bearing (112) should be inspected for contamination and damage, the condition of the bearing will provide useful information on operating conditions in the bearing shell. Lubricant condition should be noted. Bearing damage should be investigated to determine cause. If cause is not normal wear, it should be corrected before the pump is returned to service.

DO NOT RE-USE BEARINGS.

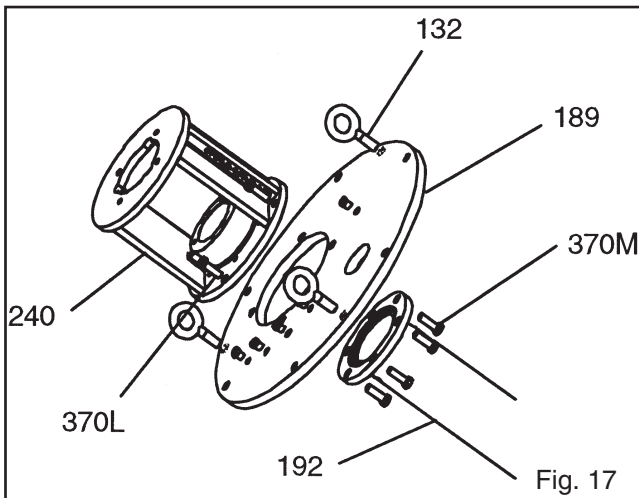
Motor Support

1. Inspect motor support (240) for any cracks or excessive corrosion damage. Replace if any of these conditions exist.

Reassembly

Assembly of Motor Support, Head Column and Support Plate

1. Attach motor support (240) to support plate (189) with bolts (370J).
2. Attach head column (192) to motor support with bolts (370M). Vent holes should be closer to the motor support.



Optional With Stuffing Box Design

1. Attach stuffing box (221) to support plate (189) with bolts (370L).
2. Attach motor support (240) to stuffing box with bolts (370J).
3. Attach head column (192) to stuffing box with bolts (370M). Vent holes should be closer to the motor support.

Assembly of Rotating Element



CAUTION

Shafts can be damaged by improper handling. Extreme care should be taken at all times. It is recommended that shafts over 9' long be handled by two people at all times to prevent possible bending.

1. Install retaining ring (369A) on shaft (122).

NOTE: S/ST groups do not use the 369A retaining ring.

2. Install thrust bearing (112) on shaft.

NOTE: There are several methods for installing bearings. The recommended method is to use an induction heater that heats as well as demagnetizes the bearing.

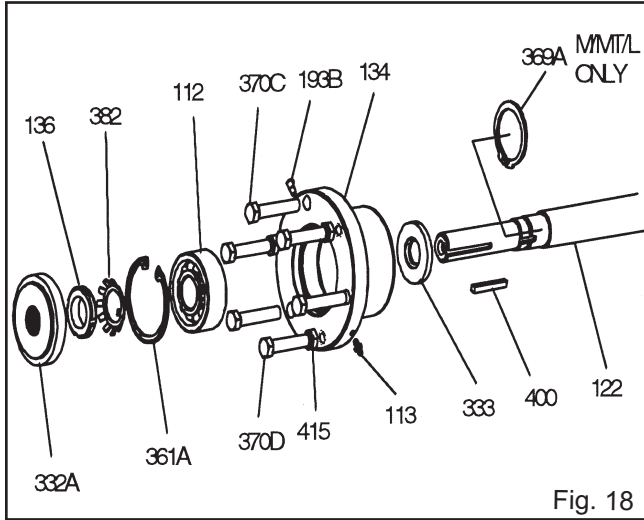


WARNING

Use insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.

3. Install lockwasher (382) on shaft (122). Place tang of lockwasher in keyway of shaft.
4. Thread locknut (136) onto shaft. Tighten locknut until snug. Bend any tang of the lockwasher into one of the slots on the locknut. Tighten the locknut if necessary to align a lockwasher tab with a locknut slot.
5. Press grease seal (333) into bearing shell (112).
6. Slide bearing shell onto pump end of shaft and over the bearing.
7. Insert retaining ring (361A) in bearing shell groove keeping flat side against bearing.
8. Slide labyrinth seal (332A) over coupling end of shaft. Press into bearing shell until it is flush.

9. With the support plate in a vertical position, slide the shaft horizontally through the motor support. Support the shaft and column with suitable stands.
10. Install hold down bolts (370C) and jacking bolts (370D) with jam nuts (415).



Assembly of Column (when required)

When intermediate steady bearings are required, there will be additional column extensions (306) and steady bearing housings (213) required.

1. Prepare the steady bearing housing assembly(s) if required. Remove snap ring (369) if used. Using a hydraulic press, press out old steady bearing (197). Press in new steady bearing. Snap ring (369) is no longer required due to the fits. If your pump has these, it is not necessary to put them back in. The snap ring is still used on sealed bearings. Refer to Fig. 7 if you have this option.

NOTE: The steady bearing does not have to be centered exactly nor do the holes in the bearing have to line up with the holes in the housing. There is a recessed area on the inside of the housing (213) that allows lubricants to find the opening in the bearing.

2. Slide casing assembly onto shaft. Seat casing flange against column flange. Make sure discharge nozzle is aligned with the discharge pipe hole in the support plate. Install bolts (371G).
3. Add a film of oil to the shaft and place the impeller key (178) and impeller (101) on the shaft.

4. Make sure all of the bearing shell bolts (370C, 370D) are completely backed off. Install the impeller washer (199) and impeller screw (198). Tightening the impeller screw will seat the impeller on the shaft. The impeller screw has a nylon insert to lock it in place. Do not exceed the following torque values when tightening the impeller screw:

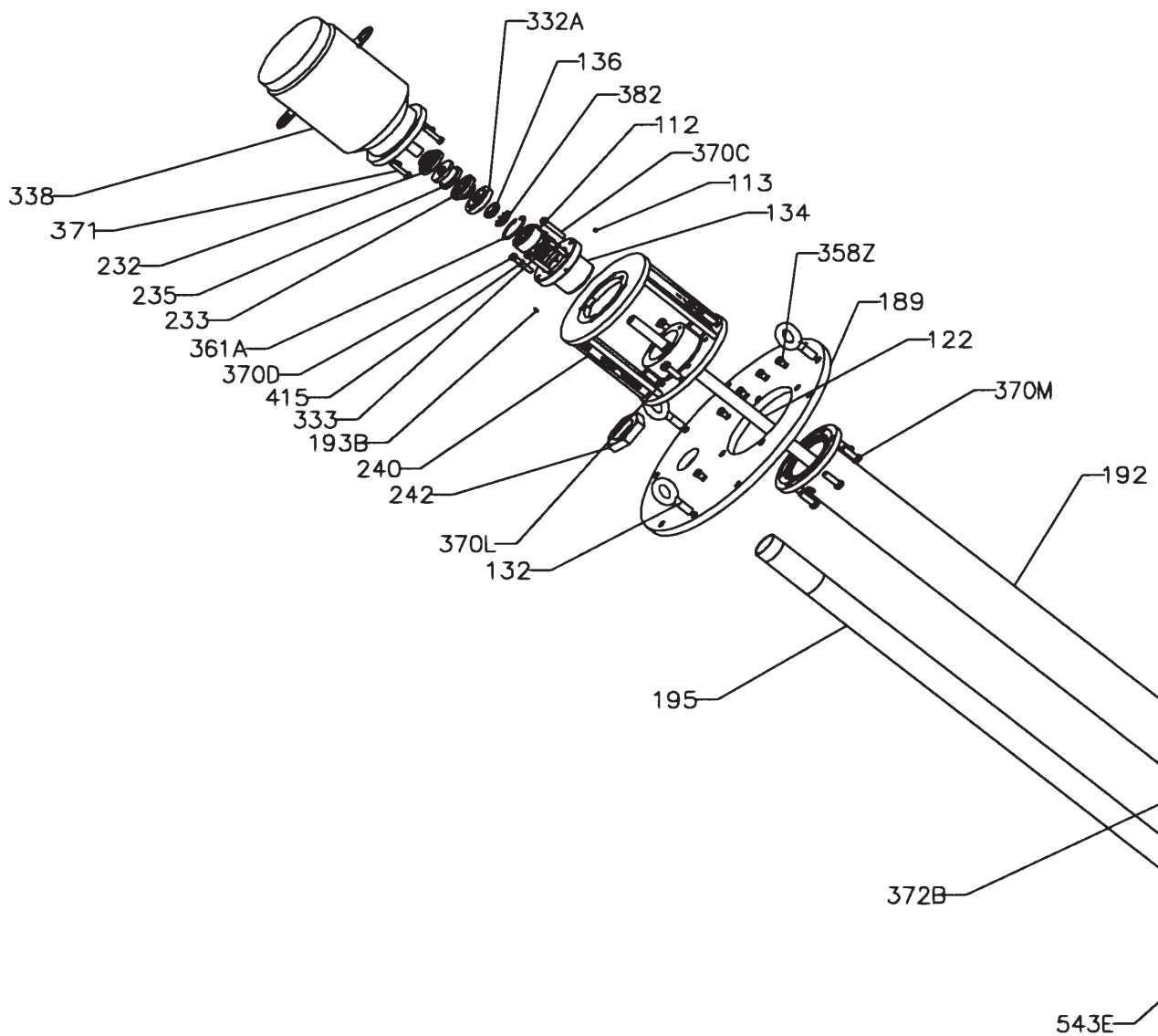
S/ST Group	500 in. lb.
M/MT, L Groups	900 in. lb.

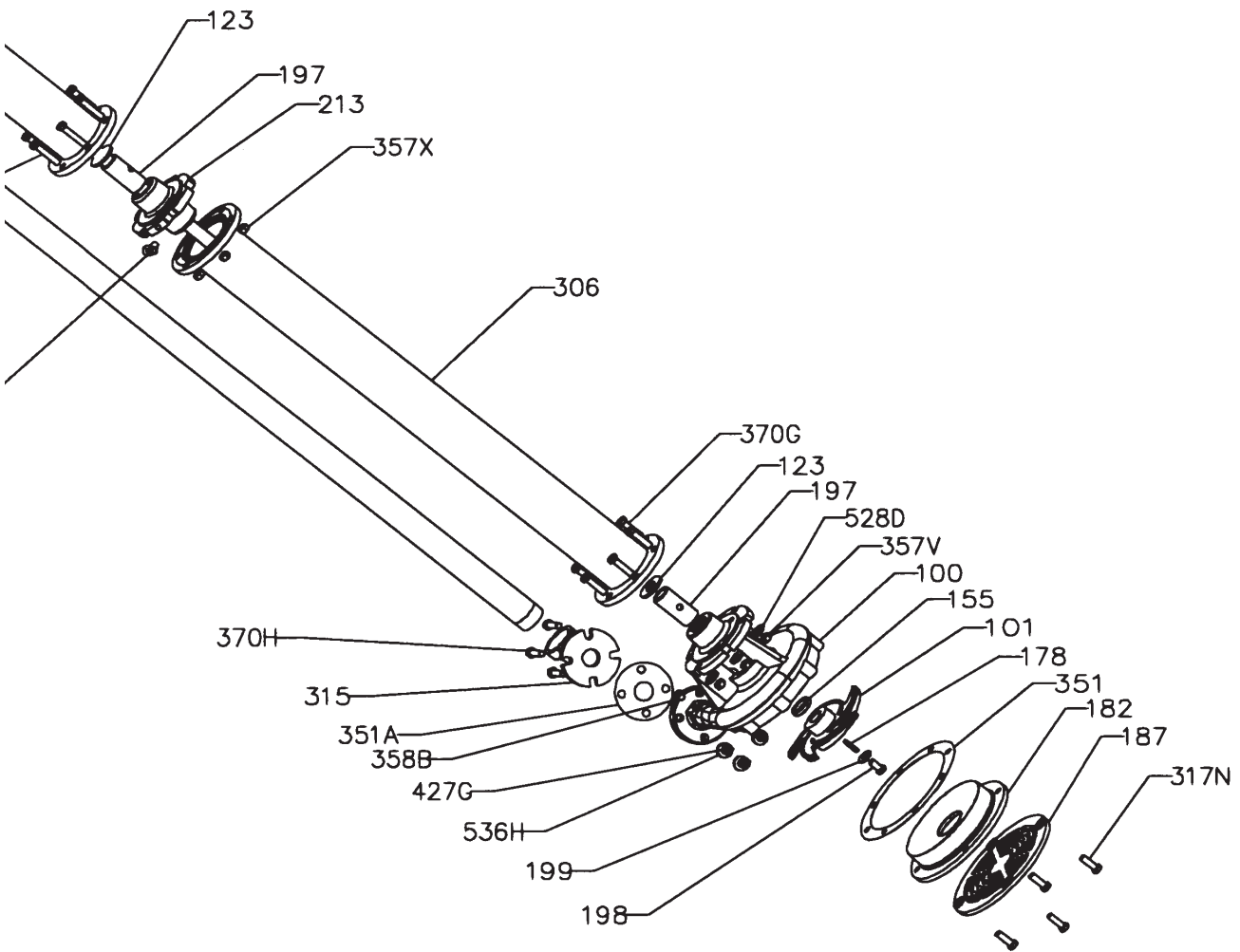
5. Install suction cover gasket (351).
6. Install suction cover (182).
7. Install strainer (187) with bolts 317N.

NOTE: Alloy strainers have extra heavy spacer washers (533) between the strainer and the suction cover. If the unit is supplied with a lower float control guide arm (366), an extra long bolt is used on this hole.

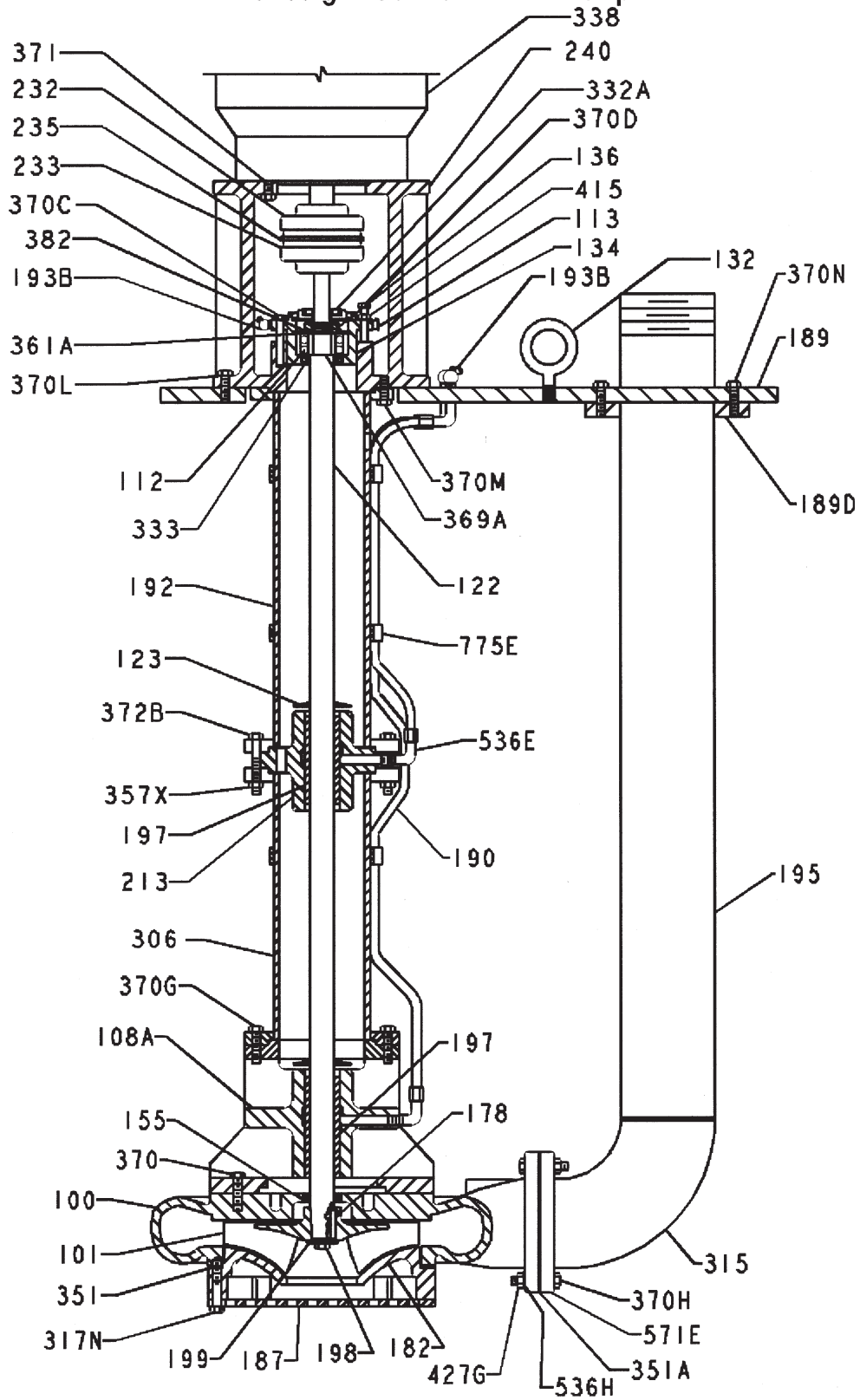
8. Check the axial travel of the impeller using the impeller adjustment procedure. If the travel is less than 0.030", extra gaskets (351) should be added to obtain the minimum travel.
9. Install discharge elbow gasket (351A) and discharge elbow (315) using bolts (370H). Accurate alignment of the elbow is critical to insure there is unobstructed flow through the connection.
10. Install discharge pipe (195), pipe nuts (242) and flange (195S if used). Make sure the pipe nuts are tight and that no strain has been placed on the pump. Rotate shaft by hand to assure there is no binding.
11. Connect all auxiliary piping.
12. Replace the pump half coupling hub (233).
13. Lubricate the pump bearings.
14. Follow directions in *Sections 2 and 3 for Installation and Operation.*

Model 3171





Redesign Sectional L Group



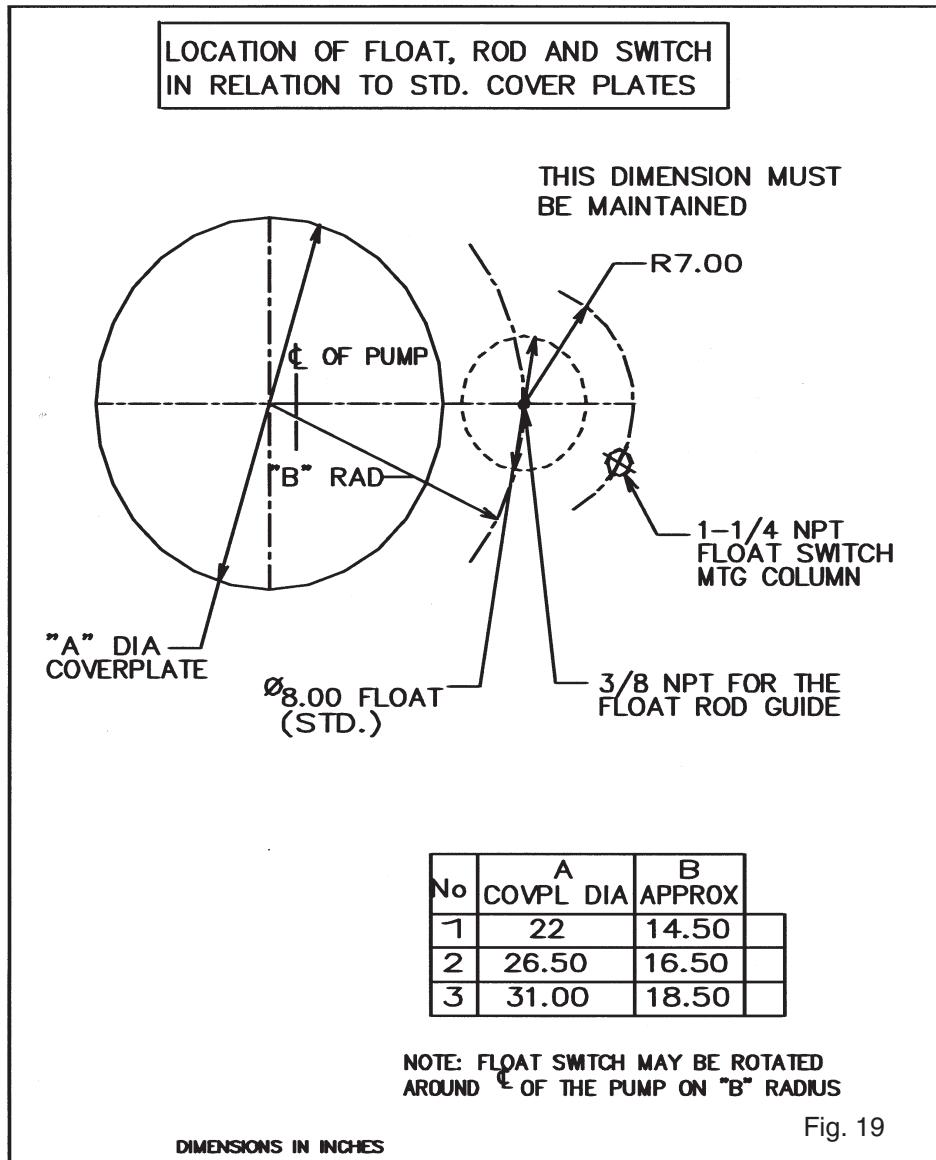
Appendix I

Float Controls

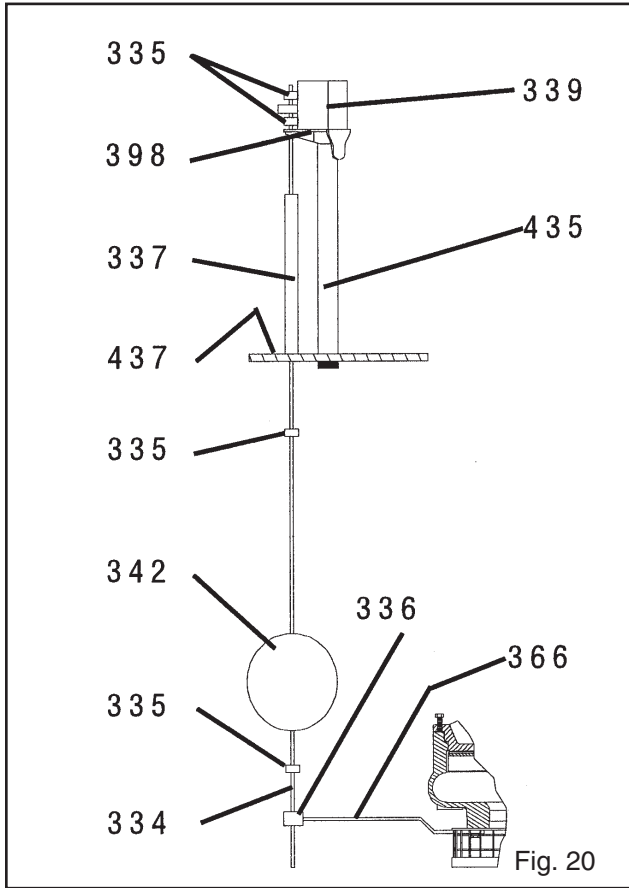
Square D 9036 Simplex and 9038 Duplex

A single float and rod assembly is used with the 9036 float switch on a simplex unit or the 9038 duplex alternator. Refer to manufacturers wiring diagram for correct wiring of the switch. See *Fig. 1* for the basic mechanical layout.

1. If a pit cover is supplied by Goulds with the pumps, the holes for the float switch support pipe (435) and the upper rod guide (337) will be located and installed by the factory. If the pit cover is to be supplied by others, it will be necessary to locate, drill, and tap the holes prior to installing the switch. See *Fig. 19* for the hole size and locating procedure.



2. Attach the lower guide arm (366) and the float rod guide (336) to the correct suction cover bolt (based on layout) prior to installing the pump in the sump.
3. Thread the float switch support pipe (435) and the upper rod guide (337) into the pit cover.
4. Attach float switch bracket (398) to the float switch support pipe.
5. Install the float rod (334), collars (335), and float (342) as shown in *Fig. 20*.



The on and off levels are controlled by adjusting the collars (335). As the liquid level rises, the float rises to contact the upper collar and the upward movement of the float rod causes the mechanical switch inside the control to close, completing the circuit to the starter. Operation continues until the liquid level drops low enough for the float to contact the lower collar. This pulls the rod down opening the switch and turning off the pump.

The Square D 9038 duplex alternator is installed the same as above. The difference is in the operating sequence. The first pump will start as the water level rises allowing the float to contact the upper collar. When the water level drops down and shuts off the first pump, a lever arm inside the control mechanically

switches to the second pump and it will come on for the next cycle.

Should the first pump fail to keep up with demand, or not come on at all, a continued rise in the level will turn both pumps on. Both pumps will run until the low water level is reached. Should both pumps be unable to keep up with the demand, an optional high water alarm switch can be supplied in the alternator to close a switch if the water level rises past the second pumps on level. This switch can be wired into a customer supplied alarm horn or light.

APEX High Level Alarm

The APEX high level alarm is an independent device used to sense fluid level and close a switch activating a separate alarm. The switch is mounted on a pipe above the support plate (*Fig. 21*). The pipe must extend into the sump 4-6" below the required actuation point. As the liquid level rises in the pipe, trapped air causes bellows inside the switch to inflate and trips a micro switch. The switch can then activate a light, horn, relay, solenoid valve, or other electric device.

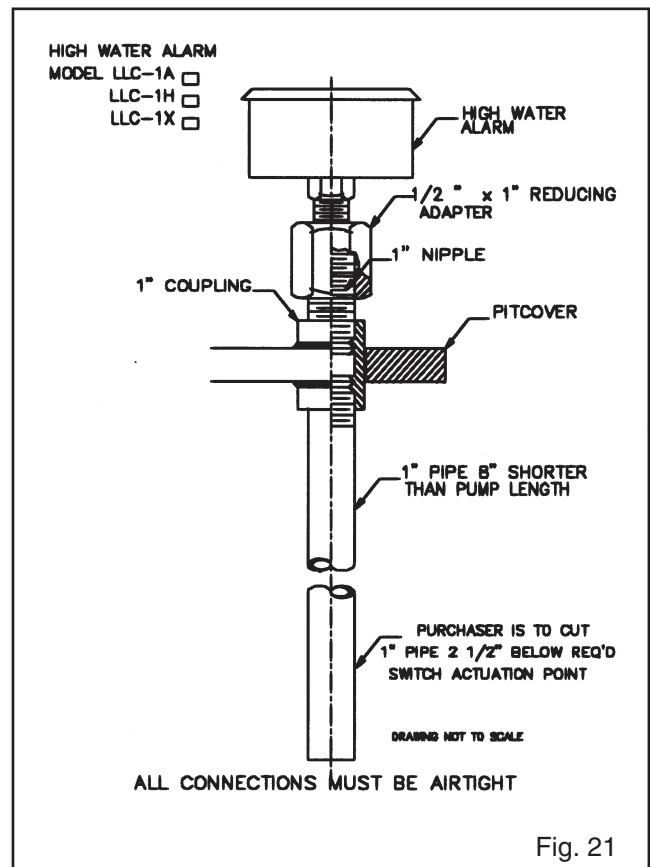


Fig. 21

Magnetrol Displacer Type Liquid Level Switch

These switches offer a wide choice of control and alarm configurations. They are ideally suited for vapor proof installations as there are no external moving parts to seal. The switch is closed by a magnetic seal inside a sealed tube. Switch operation is controlled by the buoyancy of weighted displacers suspended on a spring. As liquid level rises, the resulting change in buoyancy forces moves the spring upwards. The spring movement causes a magnetic sleeve to attract a pivoted magnet, closing the actuating switch. Refer to manufacturer-supplied installation guide for proper switch setting and installation.

Float Ball Switches

Float balls are individual switches that are used in multiple configurations to control the pump circuit. They are suspended in the sump to the desired control level. When the fluid level rises to the float ball, the switch begins to float. The float is either anchored to a pipe or weighted, allowing the switch to tilt when the fluid continues to rise. the tilting of the float closes a switch that can be used to turn the pump on, activate a high level alarm, or control any other electrical device.

Appendix II

Upper Stuffing Box and Vapor Proof Construction

The Model 3171 is normally a sealless design. When temperatures exceed 180° F., it is necessary to move the thrust bearing away from the heat source in the sump. This is accomplished by adding the upper stuffing box. Air is then allowed to circulate around the bearing keeping it cool. The upper stuffing box is

also used to minimize vapor emissions when handling controlled substances. Proper installation and maintenance of a vapor proof pump along with the correct sealing device can give you vapor retardant installations.

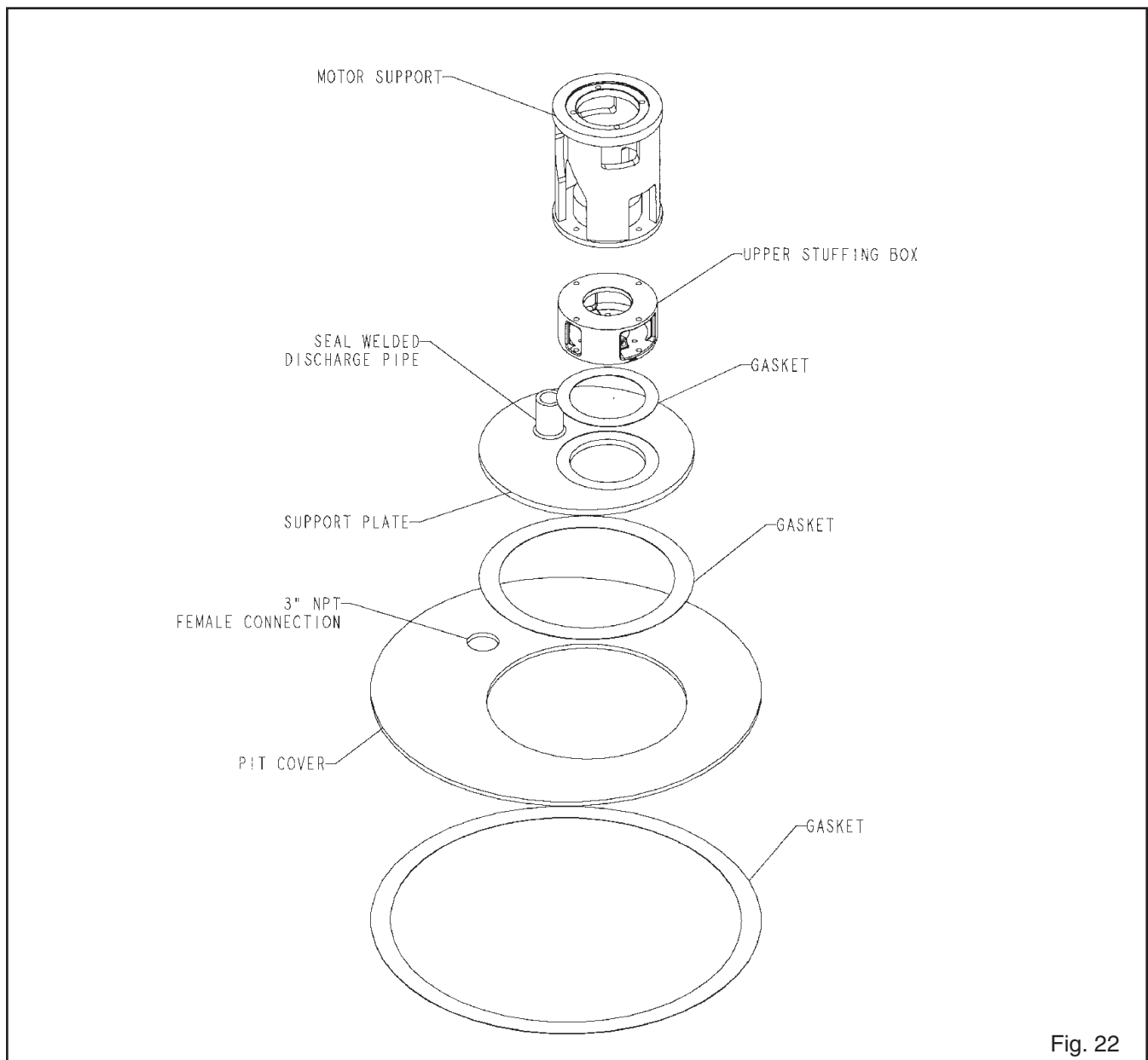


Fig. 22

Packed Stuffing Box

The stuffing box is packed at the factory. The packing is lubricated by a grease cup supplied with the pump.

1. Fill the grease cup with any lithium based #2 grease.
2. Install the grease cup on the tapped opening on the stuffing box.
3. Turn the cap on the grease cup several turns to inject grease into the packing.
4. Make sure gland nuts are finger tight.

Operation and Maintenance

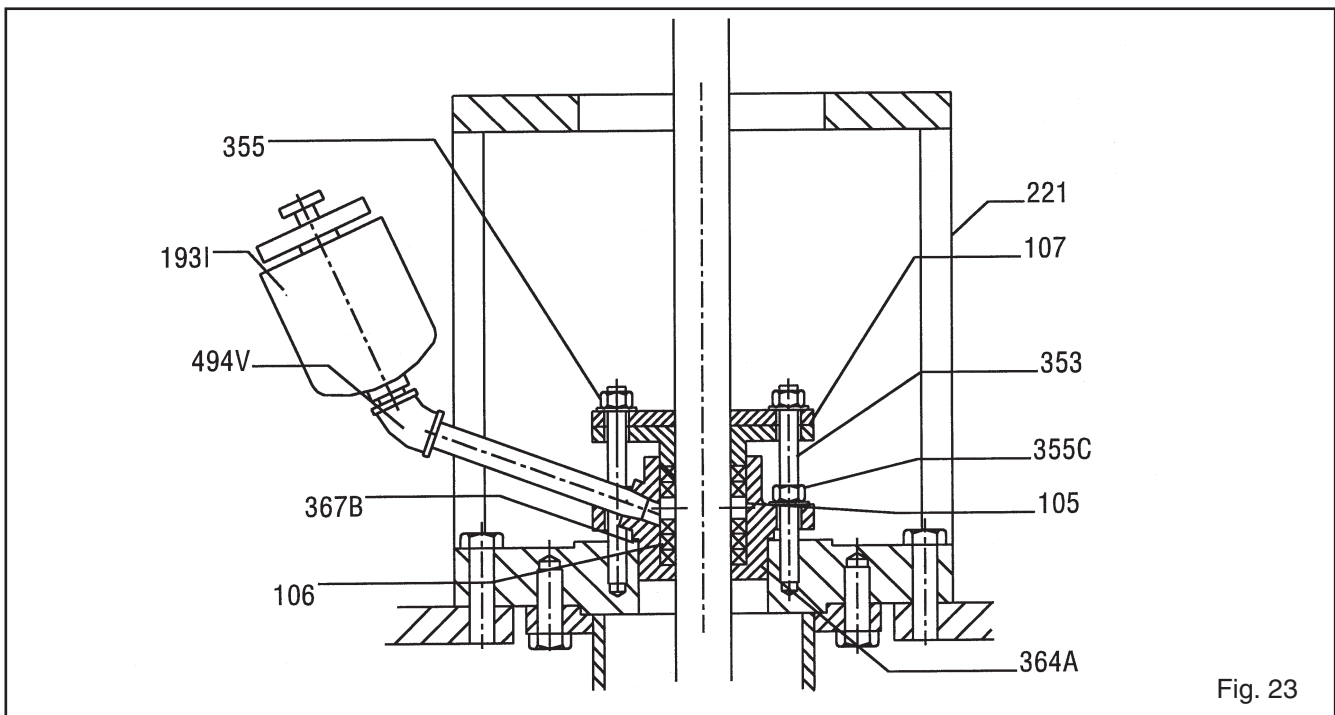
1. Keep the grease cup full of grease at all times.
2. Periodically make several turns on cap on the grease cup injecting fresh grease into the stuffing box. Lubrication interval will vary depending upon the temperature and gland tightness. Experience will dictate the best interval for your service. Start by checking the pump daily, and extend the interval as required until you are comfortable that the proper maintenance interval has been achieved.
3. Do not over tighten the gland as this will lead to shaft damage. The pump is sealing only vapors so finger tight is adequate.

Packing Replacement

1. Should it become necessary to replace the packing, the sequence is three rings of packing, lantern ring and then two rings of packing followed by the gland.

Mechanical Seals

When mechanical seals are furnished, a manufacturers reference drawing is supplied with the pump data package. This drawing must be kept for future use when performing maintenance and adjusting the seal. If oil lubed seals are supplied, the seal faces must be lubricated by oil at all times.



Appendix III

Steam Jacketed (Molten Sulfur) Construction

Installation

1. Prior to installing the pump in the sump, familiarize yourself with the location of the steam lines. There are three connections above the support plate. Two steam connections, and one condensate return connection. The condensate return connection is connected to the bottom of the discharge pipe jacket. The steam connections are connected to the tops of the column and discharge jackets. The steam lines can be connected in one of two ways:
 - 1a. Both lines can be used as steam in. This would be the preferred method.
 - 1b. One line can be used as steam in, with the second line being used as a feed through to additional pumps. This method should be used only if absolutely necessary as it will be difficult to control the steam at subsequent pumps.
- . Prior to installing the pump, check the fittings for leaks. The jackets are hydrotested by the factory at 100 psi prior to shipment, however,

tube fittings may become loose in transit. Use plant air or high pressure water. If using air to check for leaks, use a soap solution at each joint and look for air bubbles.



WARNING

Use proper safety precautions when dealing with high pressure air / water.

3. Minimum recommended steam pressure is 35 psi. Less than ideal conditions will require higher pressure steam to keep the correct temperature.
4. Follow the procedures for the standard construction unit.

Operation

1. After the pump is brought to temperature for the first time, shut the unit down temporarily and re-adjust the impeller clearance. See Section Four. Cold clearance is set at the factory prior to shipment.

Refer to the IOM for all operating procedures.

Appendix IV

Enclosed Line Shaft

The enclosed line shaft design lends itself extremely well for applications where abrasives are present in the pumpage, or when a bearing lubricant other than the pumpage is required.

The main feature of this modified design is a positive lubrication system for all bearings requiring a minimum of lubrication fluid due to the bushing located at the bottom of the column adapter housing directly above the impeller.



WARNING

The fluid must run continuously to insure flow out of the column at all times. If the flush stops, the fluid in the sump can back up into the column contaminating the bearings.

The lubricant is injected at the lubrication line connection on the top of the support plant and, via a short tube, enters the column directly below the

support plate. The fluid is also injected into the lantern ring in the stuffing box for packing lubrication. The lubricant is forced down the column, passing through each bearing until it reaches the floating bushing. The floating design allows the bushing to follow shaft runout, thus eliminating excessive wear on the shaft or bushing.

Leakages (flows) across the bushing for certain pressure differentials are shown below. Higher pressures will result in higher leakages.

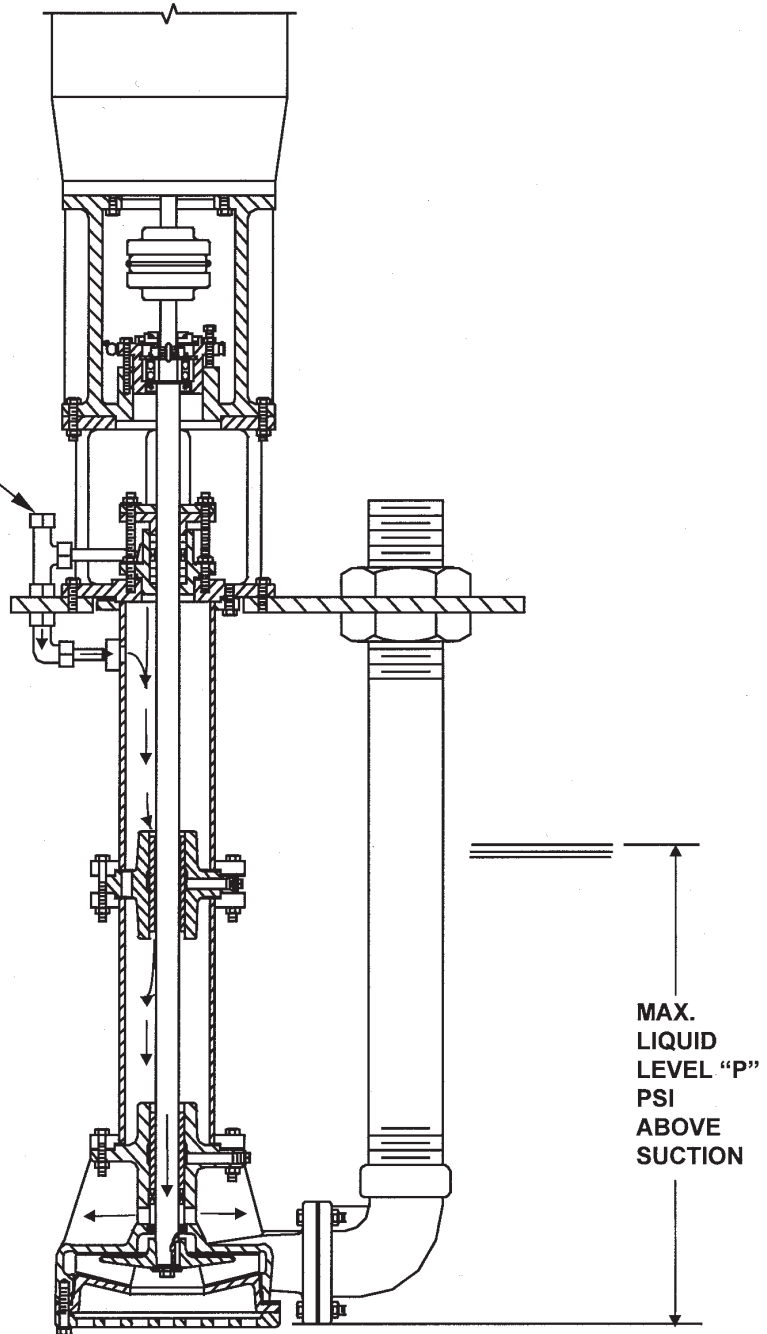
Pressure Differential (PSI)	Approximate Leakage (GPM)
3	0.30
5	0.44
7.5	0.60

Standard materials of construction of the floating bushing are 18-8 stainless steel housing and spring with a glass filled Teflon[®] bushing. Flush tubing is steel as standard.

FLUSH INLET
CONNECTION 1/4
PRESSURE =
3 PSI + "P" PSI

POSITIVE FLOW
MUST BE
MAINTAINED AT
ALL TIMES

PSI	APPROX. LEAKAGE
3	0.03 GPM
5	0.44 GPM
7.5	0.60 GPM



APPENDIX V

Grease Cup Operating Instructions

The spring operated auto grease cups, for the sealed bearing option, are designed to maintain a constant lubrication to the intermediate pump bearings fixed to the vertical pump housing. The center stem will protrude out of the housing when the cup is full and will gradually move down into the housing as the grease is used. Once the wing nut has been threaded against the stem zerk fitting and the bottom of the wing nut is resting on the cap of the grease cup, the grease reservoir is empty and has to be refilled.

Filling the housing

1. The grease cup can be filled in place.
2. Turn the wing nut clockwise until the center stem is raised all the way and the wing nut will not turn any further.
3. Fit a pressurized grease gun to the top zerk fitting and pump the grease cup full until a small amount of grease starts to come out of the side vent of the housing indicating the cup is full.
4. Unthread the wing nut to energize the grease cup allowing the internal spring pressure to push grease into the bearing lube line.
5. If the stem recedes into the housing immediately and the bearing has been previously purged, remove the top of the grease cup by unthreading the top lid and inspect the plunger for defects. If all the grease is found on the reverse, (or back side) of the plunger, it is defective and has to be replaced.

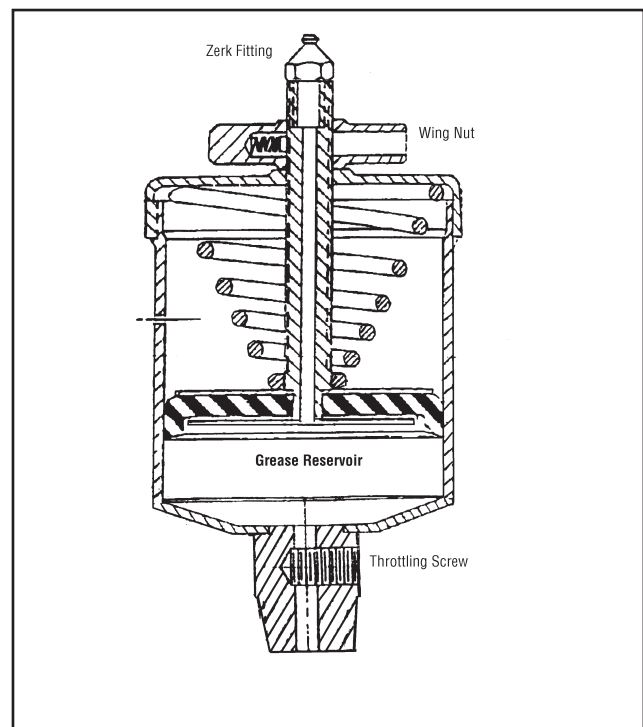
Adjusting the flow

1. There are two ways to adjust the flow of grease in the automatic grease cup.
 - a.) Unthreading the wingnut completely against the zerk fitting of the center stem will allow the full grease cup to be used as required. Any throttling of the amount of grease used should then be done by unlocking the hex nut of the throttling screw and turning the slotted screw clockwise approx. $\frac{1}{2}$ turn at a time and relocking the hex nut and monitoring the stem movement. When the grease in the grease cup is completely consumed in 1-2 weeks of

- b.) Leave the throttling screw locked open and back off the wingnut several turns for every 2-3 days of operation. This will provide a more precise amount of grease to the bearings independent of changing operating temperatures and surrounding conditions., but will require a more controlled maintenance schedule to make sure this is done on a regular basis and is NOT the preferred method.

Grease type

1. For normal operating temperatures 50 to 150 deg. F, a #2 Lithium based grease is acceptable. Synthetics can be used if consulted with factory.
2. Extreme cold conditions may require the use of a # 1 grease to allow adequate flow into the bearings.



Standard Parts List With Materials of Construction

Item	Qty. Per Pump	Part Name	All Iron	Bronze Fitted	Carbon Steel	CD4 Fitted	316SS	Alloy 20	Hast. B	Hast. C
100	1	Casing	1000	1000	1212	1216	1203	1204	1217	1215
101	1	Impeller	1018	1101	1212	1216	1203	1204	1217	1215
112	1	Thrust Bearing	Double Row Angular Contact							
122	1	Shaft	2205				2216	2221	2263	2264
123	*	Deflector	EPDM							
134	1	Bearing Shell	1000							
136	1	Bearing Locknut	Steel							
155	1	Casing Bushing	Carbon Filled PTFE (Teflon®)							
178	1	Impeller Key	2229					2230	2247	2248
182	1	Suction Cover	1000	1212	1216	1203	1204	1217	1215	
187	1	Strainer	1000	3211			1204	1217	1215	
189	1	Support Plate	3201							
190	*	Flush Tubing	As Specified							
192	1	Head Column	6501			6545		6506	6519	6548
193B	1	Grease Fitting	Carbon or as specified							
195	1	Discharge Pipe	6501			6506		6519	6548	
197	*	Steady Bearings	Carbon or As Specified							
198	1	Impeller Screw	2229					2230	2247	6548
199	1	Impeller Washer	2229					2230		
213	*	Steady Bearing Housing	1000			1203		1204	1217	1215
240	1	Motor Support	1000							
242	2	Pipe Nut	1000				1203	1204	1217	1215
306	*	Column Extension	6501			6545		6506		
315	1	Discharge Elbow	1000	1212	1216	1203	1204	1217	1215	
332A	1	Labyrinth Seal	Carbon Teflon®							
333	1	Lip Seal	Nitrile Lip Seal							
333H	2/Brg.	Lip Seal	Nitrile				Viton®			
351	1	Gasket - Suction Cover to Casing	Nitrile Acrylic							
351A	1	Gasket - Discharge Elbow to Casing	Nitrile Acrylic							
361A	1	Retaining Ring - Thrust Bearing	Steel							
369	*	Retaining Ring - Steady Bearing	PH15-7MO Stainless					C-20	Hastelloy	
369A	1	Retaining Ring - Shaft	M/MT, L Groups Only. Steel							
370C	3	Clamp Bolt - Bearing Shell	2210							
370D	3	Jack Bolt - Bearing Shell	2210							
370G	6	Bolt - Column to Casing	2210			2229		2230	2247	2248
370H	4	Bolt - Elbow to Casing	2210			2229		2230	2247	2248
370L	4	Bolt - Motor Adapter to Support Plate	2210							
370M	6	Bolt - Head Column to Motor Support	2210			2229		2230	2247	2248
371	4	Bolt - Motor to Motor Support	2210							

*** Quantity dependent upon pump length and speed.
Nuts and Washers are omitted for clarity.**

Material Code Cross Reference	
Goulds Code	ASTM Number
1000	A48 CL25B Cast Iron
1018	A536-84 60-42-10 Ductile Iron
1101	B584 Silicon Brass
1203	A743 CF8M 316 Stainless
1204	A743 CN7M Alloy 20
1212	A216 WCB Carbon Steel
1215	A494-90 CW6M C1,1 Hastelloy C
1216	A890 1A CD4MCuN
1217	A494 N-7M Hastelloy B
2205	C1045 Carbon Steel Ground and Polished
2210	A108 Gr1211 Carbon Steel
2216	A276 316 Stainless Ground and Polished
2229	A276-91A Stainless
2230	B743 20CB3 Carpenter 20
2247	B335 Type B-2 Hastelloy B
2248	B574 C-276 Hastelloy C
2263	B335 B-2 Hastelloy B Ground and Polished
2264	B574 C-276 Hastelloy C Ground and Polished
3201	A283 Grade D Carbon Steel Plate
3211	A240 316 Steel Plate
6501	A53 Type F Carbon Steel Schedule 40 Pipe
6506	B464 C20CB3 Carpenter 20 Schedule 40 Pipe
6511	Red Brass Pipe SPS
6519	B622 Hastelloy B Schedule 40 Pipe
6545	A312 316L Stainless Steel Schedule 40 Pipe
6548	Hastelloy C C-276 Schedule 40 Pipe

HOW TO ORDER

When ordering parts call
1-800-446-8537
or your local Goulds Representative

EMERGENCY SERVICE

Emergency parts service is available
24 hours/day, 365 days/year . . .
Call 1-800-446-8537

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