

Peerless Pump Company

Vertical Turbine Pumps Enclosed Line Shaft Construction

Installation, Operation And Maintenance Instructions

Read this entire manual

before attempting to install, operate, adjust, service, repair or disassemble this pump. Instructions are also included for installing and operating a water level testing system using air pressure. Proper installation and maintenance of this pump will contribute to maximum efficiency and a long, trouble-free life. Before starting the installation, review the entire procedures given in this manual, omitting those sections which do not apply to the particular pump to be installed. Then, refer to it step by step during the actual procedure. Failure to read and comply with installation and operating instructions will void the responsibility of the manufacturer and may also result in bodily injury as well as property damage.

This bulletin is intended to be a permanent part of your pump installation and should be preserved in a convenient location for ready reference. If these instructions should become soiled, obtain a new copy from Peerless Pump. Include the pump model and/or serial number with your request.

NOTICE

Peerless Pump Company cannot be held responsible for inadequate performance of or damage to a pump or for injury to personnel due to any of the following causes.

- A. Installation of the pump in a well which is unsuitable as tested by the procedure described in Section 2 of this manual.
- B. Installation of the pump on an inadequate

foundation as described in Section 4 of this manual.

- C. Air or gas in the well. If there is evidence of air or gas, consult your Peerless Pump dealer.
- D. Erosion of pump parts by sand in the water (sand cutting).
- E. Restarting of a pump whose impellers are packed with sand (sand locked).
- F. Failure to adhere to the warnings and cautions which are outlined in this manual.

WARNING

The pumps described by this manual are specifically designed for pumping water, and must not be used to pump any other fluid, particularly combustible fluids.

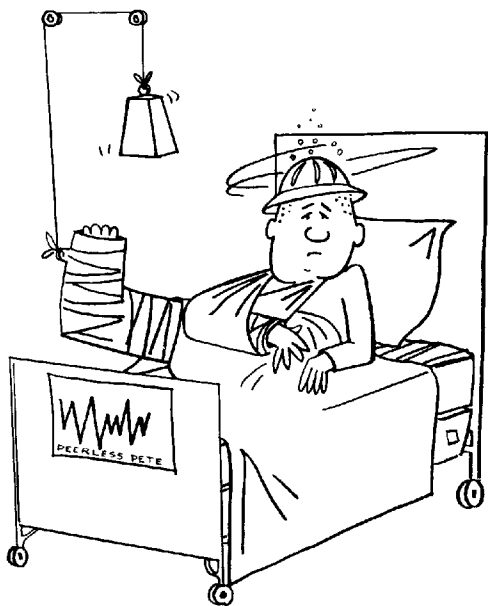
These pumps must not be installed in any manner except as specified herein, and must not be operated at speeds, capacities, pressures or temperatures other than those stipulated for in the purchase order.

Lubricants which can contaminate the water to be pumped or which are soluble in water must not be used in these pumps.

ANY VIOLATION OF THESE WARNINGS MAY RESULT IN SEVERE PROPERTY DAMAGE OR GRAVE PERSONAL INJURY.



IMPORTANT SAFETY PRECAUTIONS



"Pump Parts. . .May Easily Cause Personal Injury If Dropped Or Carelessly Handled."

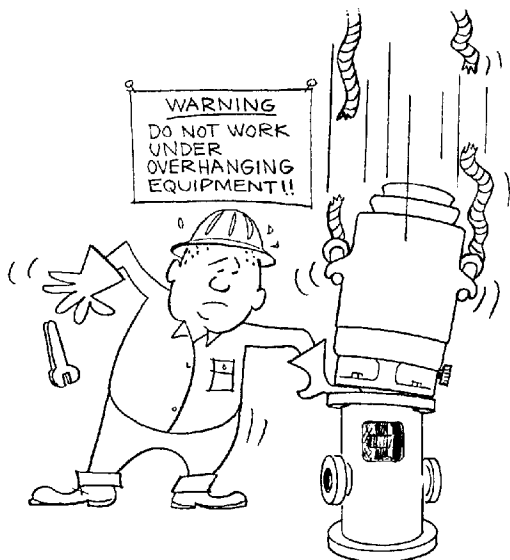
Before opening the conduit box of an electric motor, be certain that the current to the motor is shut off. An electrical shock from contact with live motor leads can be fatal.

The driver cover must be in place when the pump is in operation. Rotating parts below this cover could cause grave personal injury if exposed.

Petroleum-base cleaning solvents are flammable. Smoking by personnel in the vicinity of these solvents is extremely hazardous and must not be permitted.

Pump parts, and tools and rigging equipment used in installing pumps, are heavy and may easily cause personal injury if dropped or carelessly handled. The normal precautions and safety rules associated with the erection of heavy machinery, in regard to manual lifting, use of power equipment, and handling of tools, must be observed in the installation of this pump.

Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in event of sling or hoist failure. Disregard of this warning could result in grave personal injury.



"Disregard Of This Warning Could Result In Grave Personal Injury."

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INTRODUCTION

This manual gives detailed instructions for installing, adjusting, operating, servicing, and disassembling Peerless Vertical Turbine Pumps. In addition, instructions are included for installing and operating a water level testing system using air pressure.

Proper installation and maintenance of this pump will contribute to maximum efficiency and long, trouble-free life. Before starting the installation, review the entire procedure given in the manual, omitting those sections which do not apply to the particular pump to be installed. Then refer to it step by step during the actual procedure. Retain the manual for future use in solving maintenance problems.

NOTICE

Peerless Pump, a Sterling Pump Company, cannot be held responsible for inadequate performance of or damage to a pump or for injury to personnel due to any of the following causes.

Installation of the pump in a well which is unsuitable as tested by the procedure described in Section 2 of this manual.

Installation of the pump on an inadequate foundation.

Air or gas in the well. If there is evidence of air or gas, consult your Peerless Pump dealer.

Erosion of pump parts by sand in the water (sand cutting).

Restarting of a pump whose impellers are packed with sand (sand locked).

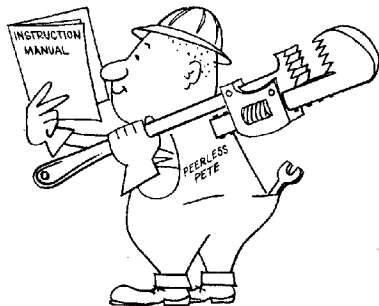
WARNING

The pumps described by this manual are specifically designed for pumping water, and must not be used to pump any other fluid, particularly combustible fluids.

These pumps must not be installed in any manner except as specified herein, and must not be operated at speeds, pressures or temperatures other than those stipulated in the applicable catalog or drawing.

Lubricants which can contaminate the water to be pumped or which are soluble in water must not be used in these pumps.

VIOLATION OF THESE WARNINGS MAY RESULT IN SEVERE PROPERTY DAMAGE OR GRAVE PERSONAL INJURY.



"Read Carefully ... it will simplify your job."

SECTION 1

MATERIALS AND EQUIPMENT REQUIRED

The materials and equipment necessary for installation will vary with the size of the pump and the type of installation. The following list is offered only as a guide.

A. Bulk Material

Thread compound

Lubricating oil (such as automotive engine oil)

Grease (see Table 14-1)

Turbine oil (see Table 14-2 and 14-3)

Solvent, petroleum-base (such as gasoline, kerosene, or distillate)

Grouting material

B. Rigging Equipment

Mobile power hoist – or a derrick, lifting windlass, and blocks
 Sling
 Elevator clamp (2)
 Clamp – to attach dragline block to edge of pipe
 Capstan Drive (cat head and catline) for making threaded joints (optional)
 Tail rope – size and length as required
 Timbers – size and length as required to support pump parts suspended in the well
 Special clamping tool (see Fig. 7-4) – optional

C. Hand Tools

Chain tongs (2)
 Pipe wrench (2)
 Pipe cutter or hacksaw
 File
 Wire brush
 Pliers
 Wire cutters
 Pocket knife
 Wrenches, open-end, and box or socket
 Clean rags
 Apron (wood or metal) – to protect top of bowl unit or column section
 Set of mechanic's hand tools

SECTION 2

CHECKING THE WELL

Before any attempt is made to install the pump, the well should be carefully checked to determine that the casing is of the proper diameter, depth and straightness. A suggested method of doing this is to lower into the well a pipe which is the same diameter as the bowl unit of the intended pump and $1\frac{1}{2}$ times the length

of the bowl unit. If this test pipe can be lowered into the well to the required depth, it may be assumed that the well is suitable for the pump. **Do not install the pump in a well into which the test pipe cannot be lowered to the required depth.**

SECTION 3

DEVELOPING THE WELL

A. Developing the well and freeing it from sand is part of the well driller's job, and should be done with a test pump reserved for this service.

B.

NOTE

If a test pump is not available and there is no alternative except to use the new pump, raise

the impellers at least $\frac{3}{16}$ inch above their normal running position. (See Section 15 for method of adjusting impellers.) Once started, the pump must not be stopped until the water is free of sand.

Despite these precautions, the pump may still be damaged by sand cutting.

C. If, for any reason, the pump is stopped while pumping water containing sand, the pump may become "sand locked." Sand locking is the condition that occurs when the clearances between impellers and bowls are packed with sand which settles in the bowl unit as the pump stops rotating and the water drains back into the well.

CAUTION

If a sand locked pump is restarted, severe damage may result.

D. If a pump is accidentally stopped while pumping sandy water, sand locking may be overcome by the following procedure.

1. As soon as the pump shaft stops rotating, raise the impellers to their top position. (See Section 15 for method of adjusting impellers.)

2. Alternately raise and lower the impeller a small amount to loosen the trapped sand.

3. Rotate the shaft alternately clockwise and counter-clockwise by applying a wrench to the drive coupling. This too has the effect of loosening the sand, permitting it to fall back into the well.

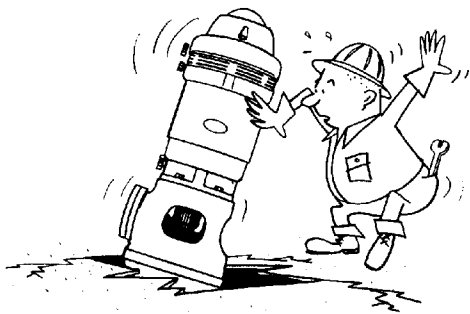
4. If a separate water supply is available, flush the pump with clear water.

E. If all attempts at freeing the impellers fail, it will be necessary to pull the pump. The obstruction can then be cleared by backflushing or, if necessary, by disassembling the bowl unit.

SECTION 4

BUILDING THE FOUNDATION

A. It is strongly recommended that a substantial concrete foundation be built around the well before the pump is installed. The original pump shaft alignment will last only as long as the foundation supports the pump in a stable position. If the pump discharge head has a protrusion below the base which is wider than the well casing, the top of the casing must be far enough below the foundation surface to clear such a protrusion. In this case, a dam must be provided around the well casing about one inch above the foundation to retain the grout which will later be poured between the discharge head and the foundation. (See Fig. 4-1.) If the well casing is wider than any protrusion of the discharge head below the base, the casing itself can be used as a dam for the grout.



"--On a foundation rigid enough to support the entire weight--."

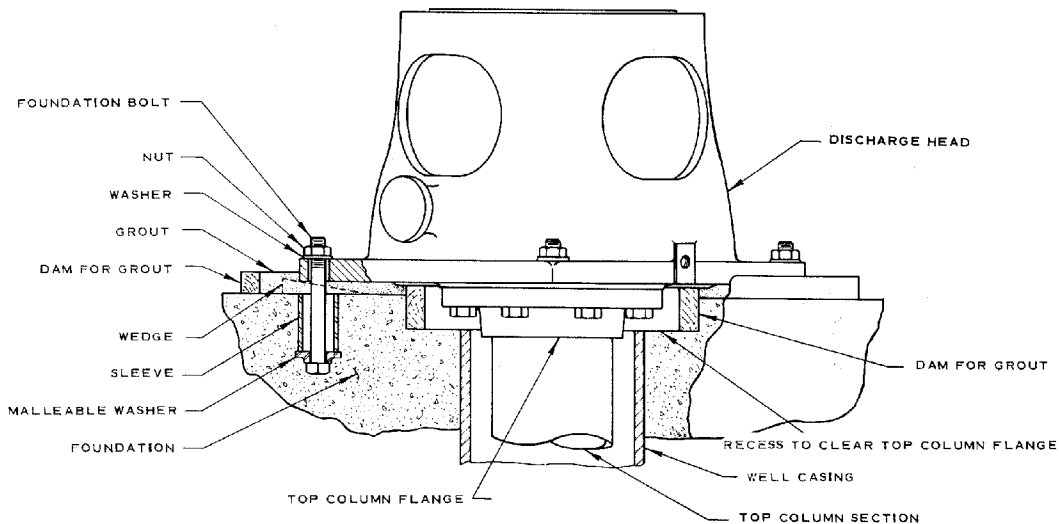


Fig. 4-1. Foundation And Grouting Details.

B. The thickness of the foundation must be adequate for inherent stiffness, and the ground area sufficient to provide a stable footing. The minimum thickness and ground area are determined by two factors:

1. The firmness of the supporting earth, considering adverse effects of rain and flooding.
2. The total weight of the complete pumping unit when full of water. **Total load on foundation = Weight of all parts + Weight of water in column.** Tables 4-1, 10-1 and 15-2 may be used for reference in figuring the size of the foundation.

C. Structural foundations when properly constructed are satisfactory for some installations. A combination of structural members and concrete may also be satisfactory in some cases. However, foundations made up of structural members (steel or wood) spread on unstable soil are definitely not satisfactory. They are certain to shift or warp, causing misalignment which will result in damage to the pump.

Table 4-1. Approximate Weight Of Water-Filled Pump Column.

Nom. Pipe Size	Schedule	Wt. per Ft. of Pipe	Wt. of Water Per Ft. of Pipe	Total Wt. Per Ft.*
3	40S	7.58	3.0	10.6
4	40S	10.79	5.0	15.8
5	40S	14.62	8.0	22.6
6	40S	18.97	12.0	31.0
8	30	24.70	20.0	44.7
10	30	34.24	23.0	57.2
12	30	43.77	48.0	91.8
14	30S	54.57	57.0	111.6
16	30S	62.58	76.0	138.6
18	30	82.06	97.0	179.1
20	30X	104.13	120.0	224.1
24	30X	125.49	177.0	302.5

*Multiply the appropriate figure by the total length of the column, and add the weight of the shafting, tubing, discharge head, bowl unit and the driver to obtain the total load on the foundation.

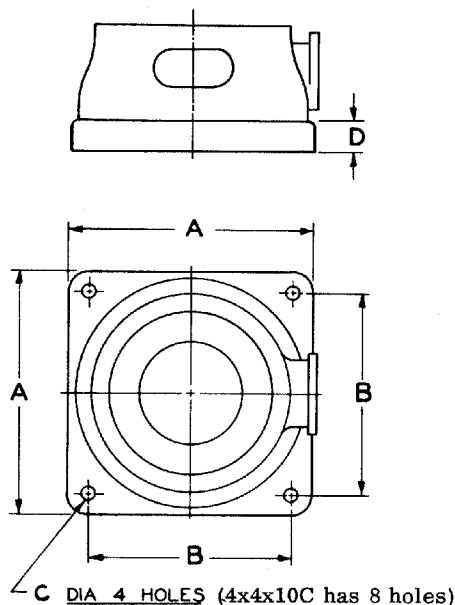
D. Foundation bolts (hold-down or anchor bolts) are not required for pumps with discharge pressures less than 10 psi and column lengths greater than 50 feet, when driven by a motor or steam turbine or through a right-angle gear unit. Pumps with column lengths of 50 feet or less, or discharge pressures of 10 psi or more, and all pumps which are belt-driven, should be anchored by sleeve-type, or equivalent, foundation bolts. (See Fig. 4-1.) Sleeve-type bolts are recommended because they allow some flexibility in the final positioning of the discharge head. They are also convenient in that the discharge head need not be removed after having once been set, as is necessary when drilled-type fasteners are used. The correct bolt diameter and length can be determined by referring to Fig. 4-2, which gives the pertinent dimensions for all the discharge head sizes. It is recommended that a template be made for accurately locating the foundation bolts. See Fig. 4-2 for the correct spacing. Some pumps are provided with

a sole plate which fits between the discharge head and the foundation. In this case, the foundation bolts must align with the holes in the sole plate rather than those in the discharge head.

NOTE

Be sure to position the foundation and locate the foundation bolts so that the discharge head will be in accurate alignment with the discharge piping.

E. Observe the usual rules of good workmanship in regard to mixing, pouring, working, and curing of concrete foundations. Allow the foundation to cure at least 48 hours before starting the pump installation.



Discharge Head Size	A SQ.	B	C DIA.	D
4x4x10C	13-1/2 ①	11-3/4BC	7/8	1-1/8
6x6x12	15	13-1/4	3/4	3/4
6x8x16½	20	18	1"	1-1/4
8x8x12	17	15	7/8	1"
8x8x16½	20	18	1"	1-1/4
8x8x16½G	18	16	1"	1"
10x10x16½	20	18	1"	1-1/2
10x10x20				
12x12x20	23	21	1"	1-3/4
14x14x24½	28	25	1"	1-3/4
16x16x30½	38	32	1"	3-1/2

① 4x4x10C has a round base

Fig. 4-2. Dimensions For Bolting To Foundation.

SECTION 5

UNLOADING THE PARTS

A. For a relatively short pump it may be convenient to install the column, tube, and shaft sections directly from the transporting vehicle. This might be true for example of a pump with a column of less than ten sections. The sections can be prepared for installation without removing them from the truck which delivered them. If the truck can be backed-in close to the hoisting rig, the sections can be hoisted directly from the truck bed. (See Fig. 5-1.)

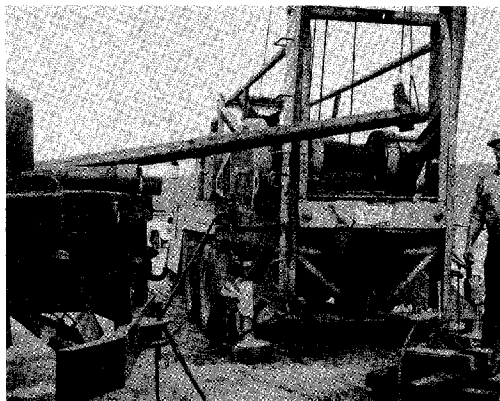


Fig. 5-1. Unloading Pump Column Section Directly From The Truck.

B. When a longer pump is installed, it will be necessary to unload the parts from the transporting vehicle. Clear a large area around the well as a working space for laying out the pump parts to prepare them for installation. Arrange timbers parallel on the ground in the cleared area to support the pump columns and shafts as shown in the background in Fig. 7-7.

C. Before unloading pump parts from the transporting vehicle, or during the unloading process, take inventory of the shipment to ensure that the parts received match the list of parts on your order. If the shaft sections were shipped crated, one end of the crate may be opened for a count. Leave the rest of the crate intact to protect the shaft sections during unloading.

D. It is strongly recommended that the pump parts which are too heavy to be lifted by hand be lifted from the transporting vehicle with a suitable hoist. If this is impossible, they may be unloaded by slowly and **carefully** skidding down an incline. Lifting chains or cables must not be allowed to contact machined surfaces. If the shaft sections were shipped crated, they should be unloaded from the vehicle in the crate and not be uncrated until ready for installation. Parts which are provided with lifting lugs, lifting ears, or eye bolts must be lifted by these points only.

CAUTION

Column, tube, and shaft sections must be handled with extreme care. These parts are machined to achieve precision alignment. If dropped, sprung or otherwise mistreated, misalignment, poor performance and ultimate failure will result. Shafts are especially sensitive to abuse. Bent or damaged shafts must not be used. Doing so is certain to result in pump failure.

E. Certain extra-long relatively small diameter bowl units are shipped attached to skids bearing this special notation:

"Caution - do not remove this protective skid until the bowl unit is in a vertical position, ready to be lowered into the well. Retain this skid for use when removing the bowl unit from the well."

It is very important that this precaution be observed in handling these units.

SECTION 6

PREPARING THE PARTS FOR INSTALLATION

A. The hoisting rig should now be set up. The installation instructions given in this manual are based upon the use of a mobile power-operated hoist such as that shown in Fig. 7-1. This affords the greatest convenience for pump installation. If any other hoisting arrangement is used, it will be necessary for the installer to interpret these instructions to suit the requirements of his equipment.

B. All of the pump parts were carefully inspected before leaving the factory, but may have become soiled or damaged in shipping and handling. Therefore, all parts must be inspected by the installer to ascertain that they are clean and undamaged before installing them in the well. Check all column, tube, and shaft sections to be sure that they have not been bent, and that machined surfaces are not marred in any way, especially the butting surfaces at the ends and the screw threads. A procedure for testing shaft straightness is specified in Part K.

C. If the shaft sections were received crated, they should be removed from the crate at this time. Lay the shaft sections across the parallel timbers previously placed on the ground (Section 5, Part A). Wash off the rust-inhibiting oil from the threads with petroleum-base solvent and wipe thoroughly clean and dry. Clean the shaft couplings if necessary and store them in a clean container until ready for use.

D. Tube sections are furnished in two different lengths: ten feet and twenty feet. The ten-foot sections are made up of two parts, each five feet long, coupled by an externally threaded tube bearing. The twenty-foot sections consist of four parts, five feet long, or three parts, each 6'8" long. These also are coupled by tube bearings. Each complete tube section is furnished with an additional tube bearing threaded into the upper end for one-half its length. (See Fig. 6-1.)

E. The pump column sections are furnished with threaded ends and are usually shipped with a coupling attached to one end. Inspect the coupling for correct thread engagement: one-half its length. If the couplings are not already attached, they are packed separately.

Lubricate the thread at one end of each column section, using ordinary automotive engine oil or thread compound, and screw on the couplings to their proper engagement.

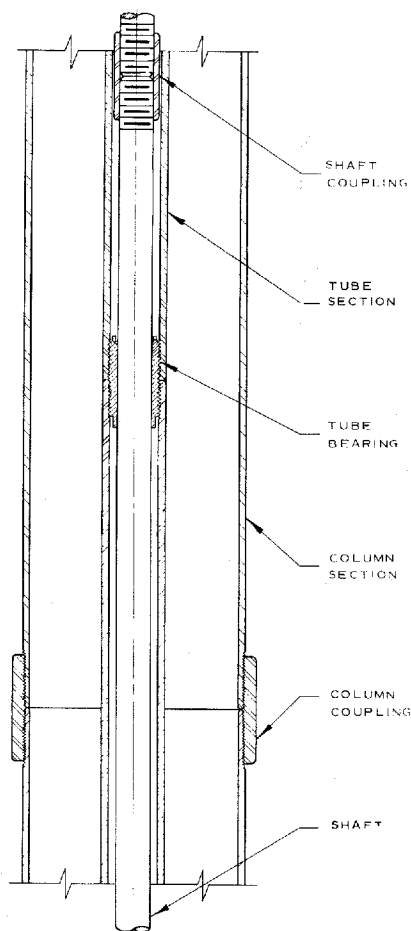


Fig. 6-1. Sectional View Through Enclosed Lineshaft Column.

F. Most of the total length of the pump is made up of column, tube, and shaft sections which are a standard ten or twenty feet in length. The top column section, top tube section, and top shaft section can be easily identified because in some respects they are different from the standard sections. The top shaft section has a keyseat and an extra-long thread at one end, and the top tube section has an external thread at the upper end. The tube section just below the top tube is shorter than standard — usually 3'-4". The top column section is never fitted with a coupling, since the upper end screws directly into the discharge head or into a special flange.

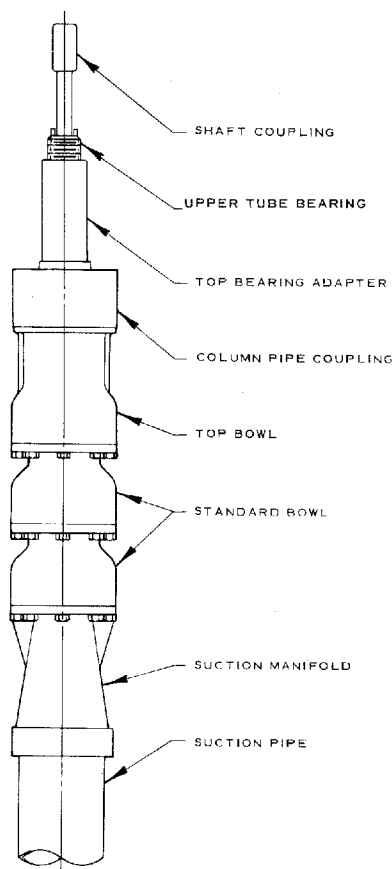


Fig. 6-2. Enclosed Lineshaft Bowl Unit.

G. Remove the shaft coupling and upper tube bearing from the pump bowl unit. (See Fig. 6-2.) Plug the oil groove in the lower tube bearing with a medium-weight waterproof grease. A list of recommended greases is given in Table 14-1. If the bearing has a longitudinal hole parallel to the bore, plug that with grease also. Pack the top bearing adapter tube approximately half-full with the same grease. This will prevent loss of lubricating oil into the well and entry of well water into the enclosing tube. Replace the bearing and the coupling.

H. Check the total length of the pump bowl unit, suction pipe, and strainer (if furnished) to see whether the hoist clearance is sufficient to handle these assembled parts as a unit. If the clearance is sufficient, assemble the strainer to the suction pipe, and the suction pipe to the bowl unit. Lay this assembly across the timbers, close to the well, ready for installation.

J. If the assembled strainer, suction pipe and bowl unit are too long to be handled by the hoist, the strainer and suction pipe will be installed first, and then the bowl unit, separately. If a strainer is furnished, attach it to the suction pipe and lay this assembly across the timbers, close to the well, ready for installation.

K.

CAUTION

When inserting the shaft and tube sections into the column sections, take care not to bend the shaft, damage the threads or scrape the bearings.

L.

The standard column, tube, and shaft sections will now be prepared for hoisting. Insert one of the shaft sections through the bearings in one of the tube sections. Next, insert the assembled shaft and tube through a column section, with the tube bearing at the same end as the column coupling. This end is the upper end. Arrange the shaft, tube, and column sections so that the lower end of the shaft protrudes about a foot beyond the lower end of the tube, and the lower end of the tube protrudes about a foot beyond the lower end of the column. This will make them convenient for tying later. Assemble all of the standard column, tube and shaft sections, except the top sections, in this manner and arrange them on the parallel timbers, next to the bowl unit, with the coupling ends nearest the well.

M. If an air line is to be installed with the pump, 1/4-inch galvanized pipe or 1/4-inch OD copper or plastic tubing should be used. When piping is to be installed, use pipe lengths which are the same length as the pump column sections. Each pipe should be fitted with a coupling at one end, the thread well lubricated with thread compound to ensure an air-tight seal.

N. Copper tie wires approximately 1/8-inch diameter will be needed to attach the airline to the pump. These should be pre-cut to sufficient length so they can be looped around the air line, twisted, looped around the pump column, and twisted again, with wire to spare.

Place the pre-cut tie wires and the pipe or tubing in a clean area adjacent to the well so that the air line installation can proceed along with the pump installation.

O. Place two short lengths of heavy timber on the foundation, one on each side of the well casing, to support the bowl unit and column sections as the joints are being made.

P. Before proceeding with the actual installation, check to see that all the parts have been prepared per the instructions of Parts A through N.

SECTION 7

INSTALLING THE BOWL UNIT AND COLUMN

CAUTION

When making up threaded joints, start the joint by hand to verify that the threads are properly engaged before applying a wrench or a power drive. If cross-threading is suspected, break the joint immediately and repair the damaged external threads with a file. Clean the threads thoroughly before re-making the joint. If the threads are too deformed to repair with a file, replace the damaged part. If coupling threads are damaged, replace the coupling.

CAUTION

Never attempt to handle or lift the bowl unit by the shaft protruding from the upper end. This could result in bending of the shaft.

If the suction pipe and bowl unit have not been pre-assembled, start the pump installation at Part A. If the suction and bowl unit have been pre-assembled (with or without a strainer), start the pump installation at Part B.

A. For the case where the suction pipe and bowl unit have not been pre-assembled:

1. Securely fasten an elevator clamp near the top of the suction pipe approximately two feet below the threads. This position will prevent distortion at the threads and will permit easy make-up of the joint. Attach a sling to the elevator clamp and pass the looped end over the hoist hook. (See Fig. 7-1.) While a workman supports the lower end of the suction pipe (and strainer, if used), hoist it into position over the well.

2. When an air line is used, it should be tied to the suction pipe so that the bottom of the air line is approximately two feet above the bottom of the suction pipe. Using the pre-cut tie wires, attach the air line to the suction pipe in two places a few inches

apart. Loop the wire around the air line, twist it, loop it around the pump, and twist it again. Use a heavy pair of pliers, pulling the wire taut when making the loops, and twisting it tightly to obtain a rigid attachment. Above this, attachments will be made at intervals of ten feet.

3. Carefully lower the suction pipe into the well until the elevator clamp rests on the supporting timbers. Remove the sling.

4. Fasten a second elevator clamp to the upper end of the bowl unit, just below the column pipe coupling. (See Fig. 6-2.) Attach the sling to the eleva-

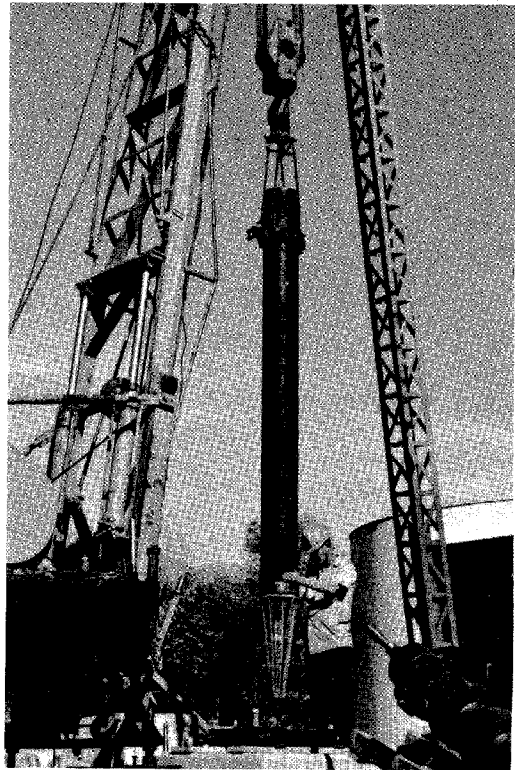


Fig. 7-1. Suction Pipe Hoisted Over Well.

tor clamp and to the hoist hook as before. When hoisting the bowl unit the lower end should be guided by a dragline (sand line) which is pulled by the hoist. The dragline may be passed through a pulley (traveling block) hooked onto a sling which is wrapped around the bowl unit. (This arrangement is shown in Fig. 7-5 applied to a column pipe.) If a power-operated dragline is not available, the lower end must be guided manually to prevent dragging and possible damage.

Hoist the bowl unit directly over the top of the suction pipe. (See Fig. 7-2.) Lubricate the threads at the upper end of the suction pipe with thread compound or engine oil. Carefully lower the bowl unit until the threads can be engaged by hand. Use chain tongs as shown in Fig. 7-3 to complete the joint.

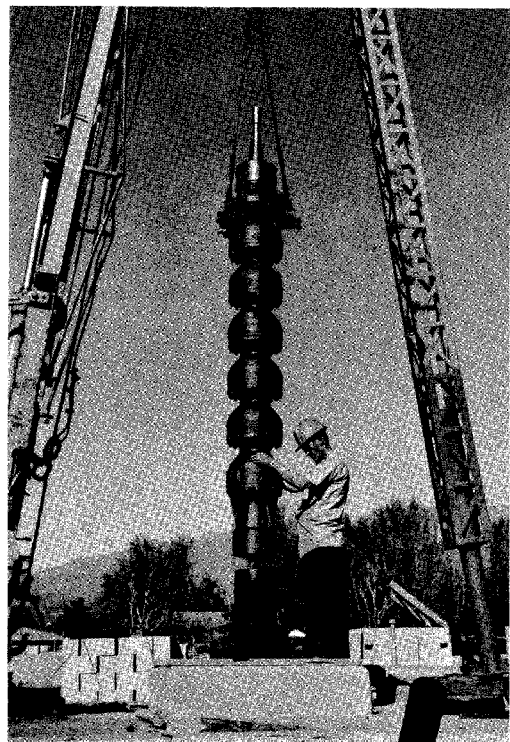


Fig. 7-2. Bowl Unit Suspended Over Suction Pipe.

5. When an air line is being installed, tie it to the bowl unit at intervals of ten feet. If the bowl unit is too short for this spacing, make just one attachment, at the top of the bowl unit.

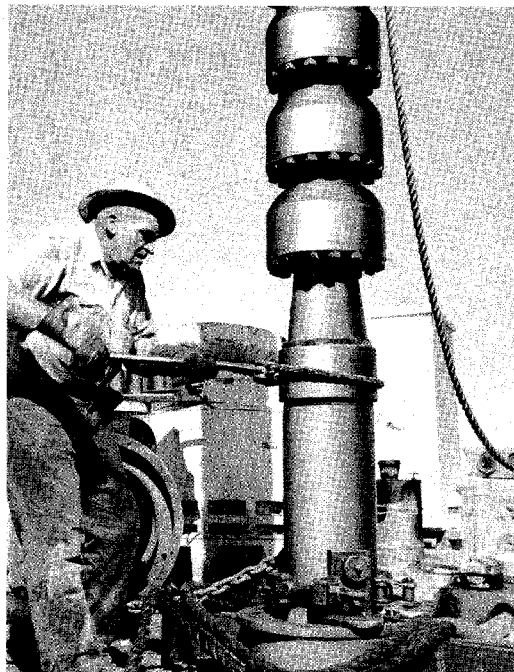


Fig. 7-3. Installing The Bowl Unit On The Suction Pipe.

6. Raise the entire assembly a few inches and remove the lower elevator clamp. Carefully lower the assembly into the well until the upper elevator clamp rests on the supporting timbers. Place over the top of the bowl unit a specially made wood or metal apron which covers the opening and fits closely around the top bearing adapter. Wrap a clean rag tightly around the impeller shaft, above the bearing. (See Fig. 7-6.) This will prevent entry of foreign matter into the bearing and bowl unit. Continue the pump installation procedure at Part C.

B. For the case where the suction pipe and bowl unit have been pre-assembled:

1. Securely fasten an elevator clamp to the bowl unit just below the column coupling. Attach a sling to the elevator clamp and pass the looped end over the hoist hook. (See Fig. 7-2.) The lower end of the suction pipe should be guided by a dragline (sand line) which is pulled by the hoist. The dragline may be passed through a pulley (traveling block) hooked onto a sling which is wrapped around the suction pipe. (This arrangement is shown in Fig. 7-5 applied

to a column pipe.) If a power-operated dragline is not available, the lower end must be guided manually to prevent dragging and possible damage.

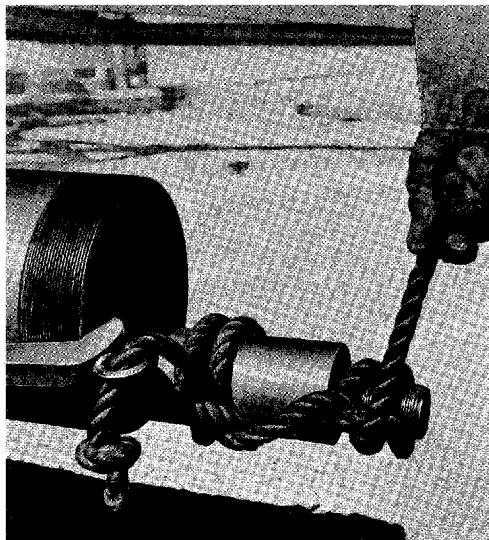
2. When an air line is used, it should be tied to the suction pipe and bowl unit assembly so that the bottom of the air line is approximately two feet above the bottom of the suction pipe. Using the pre-cut tie wires, attach the air line to the suction pipe in two places a few inches apart. (The method of making the attachment is described in the next paragraph.) Above this, attachments will be made at intervals of ten feet. If the bowl unit is too short for this spacing, tie the air line near the top of the bowl unit.

3. Apply the tie wire in the following manner. Loop the wire around the air line, twist it, loop it around the pump, and twist it again. Use a heavy pair of pliers, pulling the wire taut when making the loops, and twisting it tightly to obtain a rigid attachment.

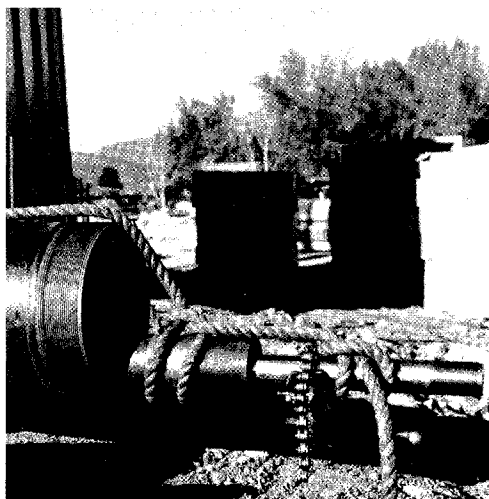
4. Carefully lower the assembly into the well until the elevator clamp rests on the supporting timbers. Place over the top of the bowl unit a specially made wood or metal apron which covers the opening and fits closely around the top bearing adapter. Wrap a clean rag tightly around the impeller shaft, over the bearing. (See Fig. 7-6.) This will prevent entry of foreign matter into the bearing and bowl unit.

C. Roll the first column section (shaft and tube sections inside) into position for hoisting, and fasten an elevator clamp to the upper end, just below the coupling. Attach the sling to the clamp and to the hoist hook as before. Fasten the tube and shaft sections to the column section with a suitable rope (called a "tail rope.") Take a clove or timber hitch about two feet up from the lower end of the tube section and a reverse double half hitch around the lower end of the shaft in the threaded area, to prevent slipping. The remainder of the rope will be used for manually maintaining tension on the knots during hoisting.

If desired, the attachment to the column section can be made with a deep-throated clamp. (See Fig. 7-4.) Take care that the clamp screw does not bear against the threads.



(a) Tail Rope Attached To Column With A Clamp.



(b) Tail Rope Tied To Column. (Chain Clamp Fastened To Shaft Is An Extra Safety Feature To Prevent Dropping Of Tube.)

Fig. 7-4. Column, Tube, And Shaft Sections Prepared For Hoisting.

D. When hoisting the column section, the lower end should be guided by a dragline (sand line) which is pulled by the hoist. A traveling block for the dragline may be clamped to the lower end of the column section. (See Fig. 7-5.) Take care that the clamp screw does not bear against the threads. If a power-operated dragline is not available, the lower end must be guided manually. Hoist the column section over the well.

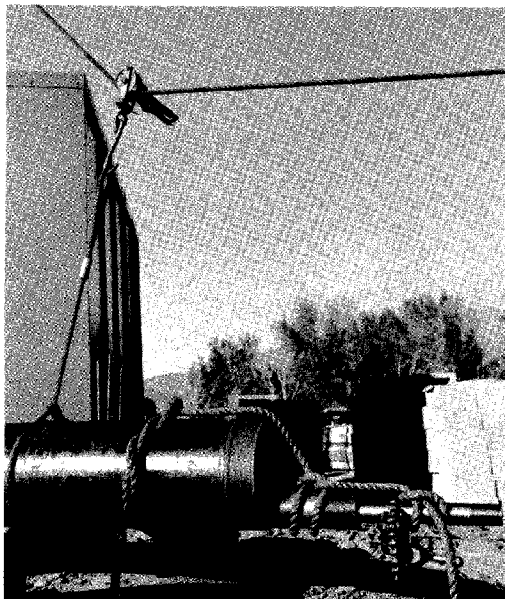


Fig. 7-5. Shaft And Tube Tied To Column. Dragline And Traveling Block Attached To Lower End Of Column By Means Of Sling.

CAUTION

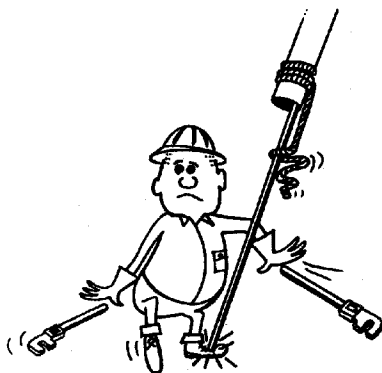
Tension must be maintained on the tail rope while hoisting, to prevent the tube and shaft sections from slipping out.

When the column is in a vertical position, remove the drag line block and clamp.

E.

NOTE

The shaft threads are left hand.



"Tension must be maintained on the tail rope while hoisting. . ."

Carefully lower the column section until the lower end of the shaft section rests squarely on the impeller shaft coupling. Untie the tail rope from the shaft section. Clean the shaft section threads and lubricate them with engine oil. Start the shaft section thread into the coupling by hand; then use a pair of pipe wrenches to screw the joint tight, butting the bottom of the shaft section firmly against the top of the impeller shaft. (See Fig. 7-6.)

CAUTION

Do not strike the coupling with a hammer to assist in making the joint tight. This creates local stresses which may cause cracking of the coupling when torque is applied during pump operation.

File smoothly any burrs which may have been raised on the shaft section or coupling, and wipe off all metal chips with a clean rag. Remove the rag which was protecting the bearing and wrap it tightly around the top bearing adapter.

F. Carefully lower the column section until the lower end of the tube section rests squarely on the bearing. Untie the tail rope or remove the special clamp. Clean the threads on the outside of the bearing and lubricate them with engine oil. Start the tube section thread over the bearing thread by hand; then use a pair of pipe wrenches or chain tongs to screw the joint tight, butting the end of the tube firmly against the upper end of the top bearing adapter. (See Fig. 7-7.) Remove the rag and apron which were protecting the top of the bowl unit.

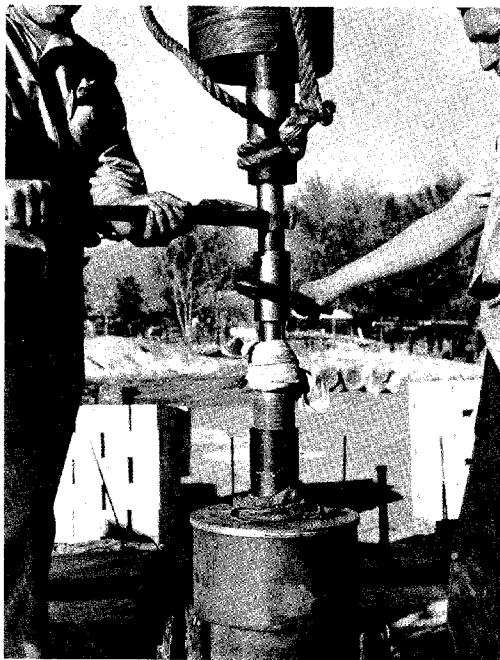


Fig. 7-6. Making The Shaft Joint. Note Protective Apron And Rags Placed Over Bowl Unit And Tube Bearing.



Fig. 7-7. Using Chain Tongs To Make A Tube Joint.

G. Clean the threads at the lower end of the column section and lubricate them with thread compound or engine oil. Lower the column section and engage it with the coupling by hand. This joint may be tightened by means of a suitable hemp rope and a capstan drive (cat head and cat line), or by the use of chain tongs. (See Fig. 7-8.) The end of the column section must be butted tightly against the top of the bowl unit.

H. Raise the column a few inches and remove the lower elevator clamp. Add another length of air line pipe or uncoil some additional tubing and tie it securely to the column. Lower the unit into the well, stopping, if necessary, to tie the air line (ten-foot intervals). When the upper elevator clamp comes to rest on the support timbers, remove the sling. Place the protective apron over the top of the column coupling and around the protruding tube. Wrap a clean rag tightly around the shaft, over the bearing.

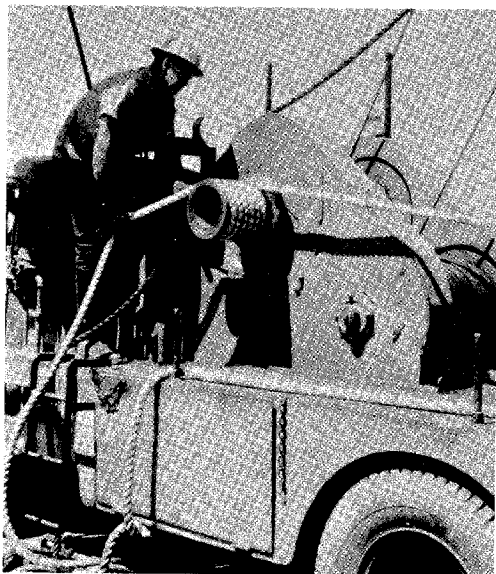
J.

CAUTION

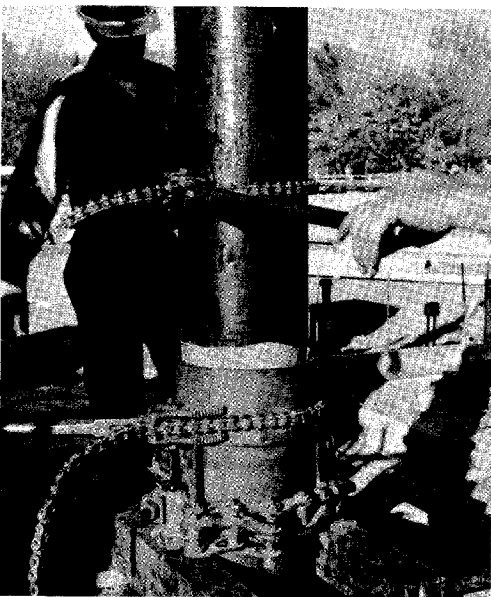
If for any reason the site is left unattended before the installation is complete, all openings must be covered to prevent entry of children, animals, stones or other foreign objects, either by accident or by vandalism. Use unbreakable covers which cannot be removed without tools.

K. Install the remaining standard-length column, tube, and shaft sections in the same manner. When each new shaft section is suspended over the pump, ready to be installed, clean and lubricate the thread at the upper end of the shaft section already in the pump. Attach a coupling to the lubricated thread, screwing it on for one-half its length. A fine wire inserted in the drilled hole at the center of the coupling can be used as a gauge to determine when the coupling is correctly positioned. Be sure to remove the wire after installing the coupling.

L. The column installation procedure will be interrupted at certain intervals to prelubricate the tube bearings and to install tube stabilizers. Prelubrication is necessary to ensure proper lubrication of the bearings



(a) Using Capstan Drive And Rope (Cat Head And Cat Line).



(b) Using Chain Tongs.

Fig. 7-8. Making A Column Joint.

during the start-up period. When 100 feet of column has been installed, remove the bearing at the top of the tube section and pour one quart of light machine oil into the tube. Use only oils approved for use in this pump. (See Table 14-2.) Replace the bearing in the tube in its correct position, exactly one-half of its length engaged in the tube. Repeat this procedure for each additional 100 feet of column, and again before installing the top tube section. Take care not to spill oil into the column, as it will deteriorate the rubber stabilizers.

M. Tube stabilizers are provided for centering the shaft-enclosing tube in the column. They have a cylindrical hub which fits tightly over the tube and three spokes which bear against the inside wall of the column. The number of stabilizers required and their location in the column is given in Table 7-1.

N. To install the stabilizer, wet the stabilizer ID or the tube OD with water, soap suds, or liquid clay, and push the stabilizer over the tube. Complete the installation by driving with a heavy mallet. (See Fig. 7-9.) The top of the stabilizer should be slightly below the top end of the column section.

Table 7-1. Location Of Tube Stabilizers.

Length of Pump Column	Install Stabilizer at Top of Column Sections No:
To 40 ft	None
50 - 80 ft	4
90 - 120 ft	4, 8
130 - 160 ft	4, 8, 12
170 - 200 ft	4, 8, 12, 16
210 - 240 ft	4, 8, 12, 16, 20
250 - 280 ft	4, 8, 12, 16, 20, 24

O. If it should become necessary to remove a stabilizer, loosen the stabilizer hub from the tube by prying in several places with a blunt moistened screwdriver; then grasp the spokes and pull out.

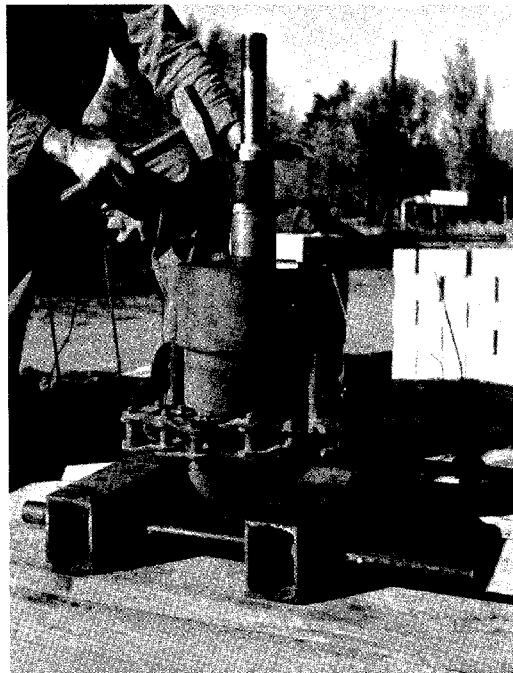


Fig. 7-9. Installing A Stabilizer.

SECTION 8

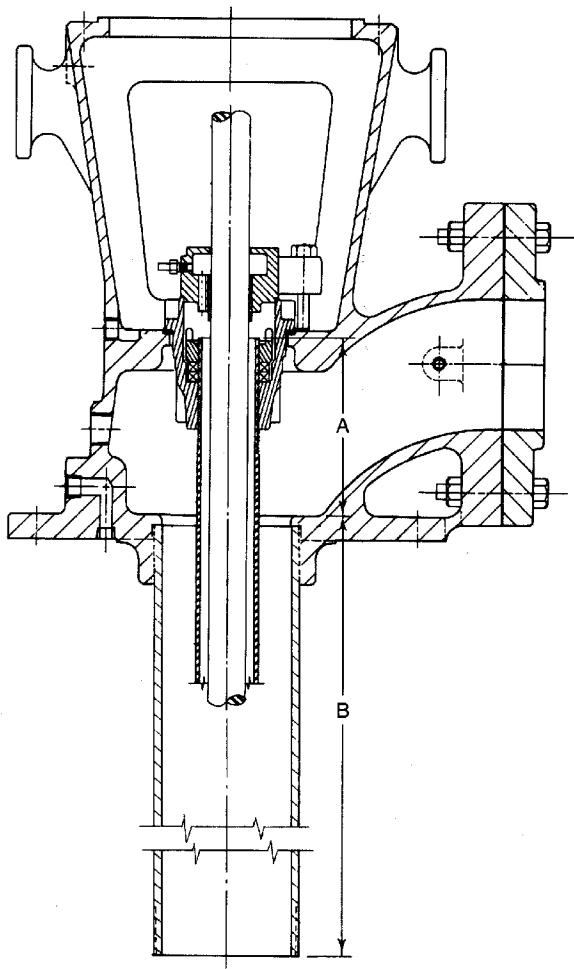
INSTALLING THE DISCHARGE HEAD

WARNING

These are definite load limitations for the eyebolts or lifting lugs of cast discharge heads. See Table 8-1. Exceeding these loads may result in failure of the discharge head, serious damage to other parts of the pump, and grave injury to nearby personnel.

Table 8-1. Load Limitations For Eyebolts Or Lifting Lugs Of Standard Cast Iron Discharge Heads.

Discharge Head Size	Part Number	Load Applied	
		Gradually	Suddenly
4x4x10C	2633099	13,500	3,400
6x6x12	2626278	24,000	6,000
6x8x16½	2618962	37,500	9,400
8x8x12	2628669	37,500	9,400
8x8x16½	2615803	37,500	9,400
10x10x16½	2617836	37,500	9,400
10x10x20	2629786	37,500	9,400
12x12x20	2617891	37,500	9,400
14x14x24½	2618026	53,000	13,250
16x16x30½	2621857	53,000	13,250



A. With the pump and all the standard-length column and shaft sections installed in the well, the next step is to prepare the discharge head, top column section, and top shaft for installation.

B. There are two types and many sizes of discharge heads. The 4 x 4 x 10C or smaller sizes are threaded to receive a threaded top column section. (See Fig. 8-1.) The 6 x 6 x 12 and larger sizes are fitted with a bolted-on flange (the top column flange) which receives a threaded top column section. (See Fig. 8-2.)

Fig. 8-1. Discharge Head Assembly—4x4x10C
Integral Oil Reservoir Shown.

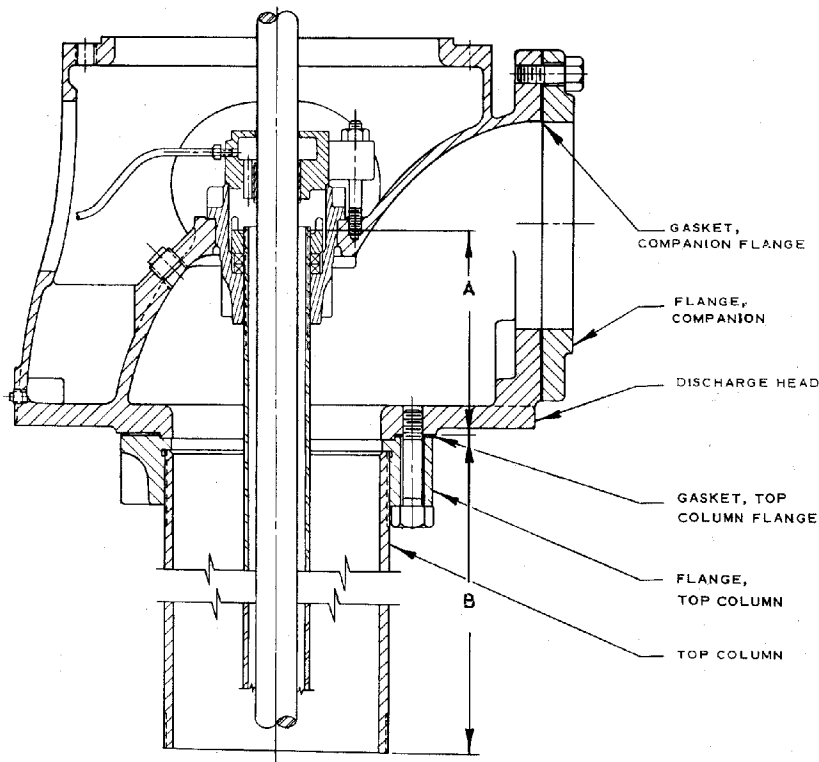


Fig. 8-2. Discharge Head Assembly. 6x6x12 Or Larger.

NOTE

The size designation of the discharge head is given in raised numbers cast on the side, just below the driver mounting surface, or on the top surface of the base.

C. The discharge head is sometimes shipped from the factory assembled with the driver. If it is received assembled, place the assembly on a clean work surface near the well. If the driver is supplied with an oil-cooling system, remove the tubing and fittings from the discharge head and store them in a clean container. Remove the driver, tube nut, packing container and the top column flange and set them aside on a clean surface. If the discharge head has become soiled in shipping and handling, clean it thoroughly, inside and outside.

D. Some pumps are provided with a sole plate which fits between the discharge head and the foundation. In this case, check the mounting surface at the top of the sole plate for possible damage or uncleanness. Remove any burrs and clean the surface thoroughly. Mount the discharge head on the sole plate, and fasten it with the bolts or cap screws provided.

E. The method of installing the top column section varies with the type of discharge head used.

1. For a 4 x 4 x 10C. or smaller discharge head (Fig. 8-1):

Lubricate the threads at one end of the top column section, using engine oil or thread compound, and screw it into the mating threads in the discharge head.

2. For a 6 x 6 x 12 or larger discharge head (Fig. 8-2):

Lubricate the threads at one end of the top column section, using thread compound or engine oil, and screw it into the top column flange until it butts firmly against the shoulder in the flange.

F. The top tube section consists of three distinct pieces of tubing coupled by means of two shaft bearings. The lower tube is a standard 5'-0" length; the middle tube is similar to a standard tube except for its length, 3'-4". The upper tube can be identified by the external thread at the top end. The two lower pieces should be butted tightly together, but the upper piece should be left loose enough to be removed easily. Carefully measure the overall length of the assembled top tube section, deducting an amount for the looseness of the top piece, if necessary. Make a note of this dimension. In most installations, it will be necessary to cut the top tube section to suit the job. The measurements, will be used to determine the amount to be cut off.

G. Lay a straight edge across the top of the last installed standard tube section (not including the bearing) and measure its "stick-up" above the top of the column section (not including the coupling). (See Fig. 8-3.) This should be approximately ten inches. Add the actual measurement to the overall length of the three-piece top tube assembly.

H. On 4 x 4 x 10C or smaller discharge heads, measure the distance from the upper surface of the discharge head base to the lower end of the top column section (Dimension B, Fig. 8-1).

J. When a 6 x 6 x 12 or larger discharge head is used, measure the distance from the upper surface of the top column flange to the lower end of the top column section (Dimension B, Fig. 8-2).

K. To the dimension taken per Part H or J, add Dimension A from Table 8-2. Dimension A is illustrated in Fig. 8-1 and 8-2.

L. The total length of the top tube assembly and the stick-up (Parts F and G) should not exceed the sum of Dimensions A and B by more than 1/2 inch. If the difference is greater than 1/2 inch, the upper end of the top tube section must be cut off to keep within the 1/2-inch limit.

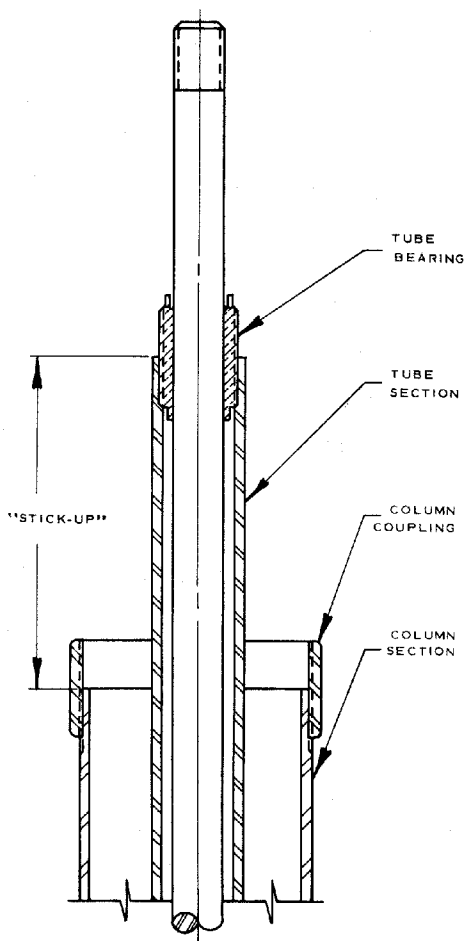


Fig. 8-3. "Stick-Up" Of Tube Section Above Column Section.

M. Remove the upper piece of the top tube assembly and cut off the necessary amount of tube. Do this on a convenient workstand away from the pump. File the cut smooth, and file the thread at the new end so it will engage easily. Clean the tube thoroughly, inside and outside; then screw it back in place and tighten it securely.

Table 8-2. Dimension "A" For Various Discharge Head Sizes.

Discharge Head Size	Dim. A (inches)	Discharge Head Size	Dim. A (inches)
4x4x10C	5	8x8x16½G	10-1/2
6x6x12	6-1/4	10x10x16½	9-3/8
6x8x16½	7-3/8	10x10x20	9-3/8
8x8x12	7-3/8	12x12x20	11-1/4
8x8x16½	7-3/8	14x14x24½	11-3/4
		16x16x30½	10

N. Clean the top shaft section and insert it into the reassembled top tube section, with the keyed, threaded end of the shaft upward. Insert the shaft and tube into the top column section, which has already been assembled with the discharge head (size 4x4x10C or smaller) or with the top column flange (size 6 x 6 x 12 or larger). Tie the lower ends of the shaft and tube sections to the column section with the tail rope, or clamp them with a special tool, as before. (Section 7, Part C.) When tying the shaft, wrap the rope around the threads to prevent slipping. Hoist the entire assembly over the well. If the discharge head is attached to the top column section (size 4x4x10C or smaller), lift the assembly by the lifting eyes on the discharge head. If the discharge head is not yet attached (size 6 x 6 x 12 or larger), lift the assembly by means of an elevator clamp fastened about a foot below the top column flange.

CAUTION

When lifting the discharge head or the top column section, take care not to bump the protruding top shaft section against the hoist hook. This could result in bending of the shaft.

O. Install the top shaft, tube, and column sections in the same manner as for standard sections. (See Section 7, Parts E, F, and G.) Raise the entire assembly a few inches and remove the lower elevator clamp. If an air

line is being installed, secure additional piping or tubing to the column. Lower the unit into the well until the upper elevator clamp comes to rest on the supporting timbers, and remove the sling.

P. When a 6 x 6 x 12 or larger discharge head is being used, it should be installed at this time, in the following manner:

1. Grease both sides of the top column flange gasket (Fig. 8-2). Stick it in place on the lower surface of the discharge head, aligning the air line hole in the discharge head.
2. Attach the sling to the lifting ears on the discharge head, and hoist the discharge head over the well.

CAUTION

When lowering the discharge head to the pump column, take care not to bump or scrape the top shaft section protruding above the column. This could result in bending of the shaft.

Lower the discharge head slowly, carefully aligning the vertical hole in the center of the discharge head with the top shaft so that there will be no bumping or scraping as the shaft and then the tube enters and passes through the hole. Hold the discharge head at a point just above the top column flange and, if an air line is used, rotate the discharge head as necessary to align the air line hole in the head with a similar hole in the flange. If no air line is being installed, rotate the discharge head so that the air line holes do **not** align and will be sealed by the discharge head until the studs enter the holes in the top column flange, and the discharge head is firmly seated in place. (See Fig. 8-2.) Install the hex nuts on the studs to complete the installation.

3. Raise the entire unit and remove the elevator clamp from the top column.

Q. After the discharge head is installed, always use the lifting ears cast on opposite sides of the head for hoisting the top column section or the entire pump. In the absence of lifting ears, pass the slings through the hand holes in the discharge head, taking care that the slings do not interfere with the shaft.