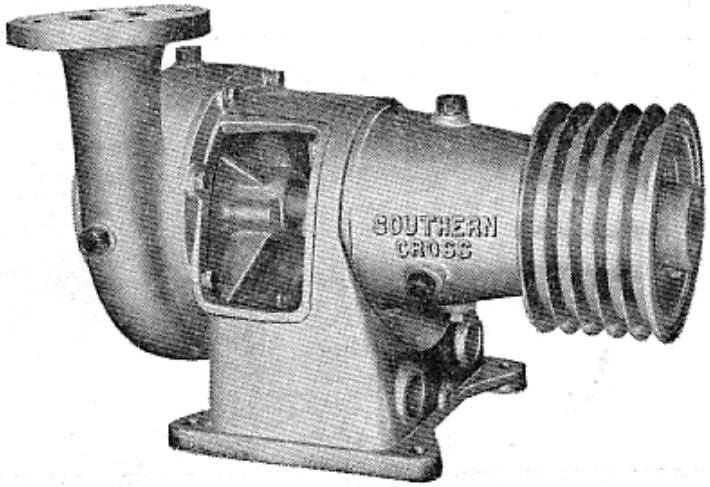
SOUTHERN CROSS



INSTRUCTION MANUAL

NE... NF... NG... NH... PATTERN

HORIZONTAL SHAFT

CENTRIFUGAL PUMPS

MANUFACTURED IN AUSTRALIA
BY
TOOWOOMBA FOUNDRY PTY. LTD.
TOOWOOMBA, QUEENSLAND 4350

Although a Centrifugal Pump is a simple means of lifting water, and the installation may appear to be a simple task, failure to observe the recommendations set out in this manual may result in unsatisfactory operation.

Therefore, read the instructions in this manual carefully before installing and operating the pump.

IMPORTANT!

Do Not Run The Pump Dry —

The faces of the mechanical seal may be severely damaged if the pump is ever run dry.

1733A|600
10|77McD&R.

INSTALLATION — OPERATION

AND

MAINTENANCE INSTRUCTIONS

FOR

SOUTHERN CROSS

HORIZONTAL SHAFT

CENTRIFUGAL PUMPS

"NE" PATTERN - (Close Coupled)

"NF" PATTERN - (Close Coupled and Pedestal)

"NG" PATTERN - (Close Coupled and Pedestal)

"NH" PATTERN - (Close Coupled and Pedestal)

MANUFACTURED IN AUSTRALIA
BY
TOOWOOMBA FOUNDRY PTY. LTD.

INSTALLATION

All unpainted parts of the impeller and body are greased to prevent rusting in storage, and, in cases where there would be objection to traces of grease in the initial discharge from the pump, the pump should be flushed out before use.

LOCATION

When installing a Centrifugal Pump, always remember that the closer the Pump is placed to the source of supply, the better will be its performance. To ensure maximum capacity, select a site permitting the use of the shortest and most direct suction pipe, and smallest possible vertical lift.

Reference should be made to the performance curves in order to determine the maximum permissible suction lift. The suction lift must include an allowance for friction loss in the suction pipe and fittings.

NOTE: If the impeller diameter is stamped on the nameplate, it is not standard, and the pump performance will differ from the performance curve sheet supplied. The pump supplier can supply this information.

DIRECTION OF ROTATION

The Pump is designed to run in an anti-clockwise direction, when viewed from the suction end of the Pump. Before installing, check rotation of the driving machine to ensure that Pump will be driven in the correct direction.

To correct the direction of rotation of an electric motor driven pump, interchange any two of the motor leads.

FOUNDATION

Set Pump on a firm foundation. A concrete block is best, but suitable steel or timber bases may be used. The Pump may be installed with flanged joints or barrel unions in suction and discharge pipes so that the Pump can be removed as a unit, if required. The design of the Pump, however, allows the body of the Pump to be left in position, with suction and discharge pipes undisturbed, while the remainder of the Pump is removed for maintenance. If installing a Pump in this manner, holding down bolts or setscrews must be removable to allow the Pump base or motor and back-plate to be withdrawn. If masonary anchors are used to attach the Pump to an existing concrete base or floor, anchors must be kept flush with or below the surface of the concrete.

The Pump must be supported firmly, independently of connecting pipes, and the shaft must be free to turn after holding down bolts or set-screws have been tightened down and the pipes connected.

PUMP DRIVES — PEDESTAL PUMPS

The Pump may be driven by a belt drive (flat or V-belt) or direct coupled to the driving machine by means of a flexible coupling.

Pulley: Place the key supplied into the keyway of the pump shaft and fit the pulley, so that the grubscrew hole at right angles to the pulley keyway coincides with the flat section on the pump shaft. Tighten grubscrews securely.

Important: Check tightness of pulley locking screws after the first ten hours' running.

Flexible Coupling: The flexible coupling should be fitted and aligned in accordance with the coupling manufacturer's instructions. Failure to correctly align the coupling may result in early bearing failure.

SUCTION PIPING

DO—

- ★ Make Suction Piping as short and straight as possible.
- ★ Keep suction lift as low as possible.
- ★ Use larger Suction Piping than that for which pump is screwed (if possible).
- ★ Make certain Suction Piping is perfectly free from air leaks.
- ★ Install Suction Piping to connect to Pump without strain.

DON'T—

- ★ Use sharp angle bends or elbows.
- ★ Operate Pump with suction lift (including friction) greater than shown on the performance curves.
- ★ Use smaller Suction Piping than recommended.
- ★ Allow Suction Piping to rise above pump unless Pump is below the lowest source of supply.

The installation of Suction Piping must be carried out with extreme care, as incorrectly laid Suction Piping will cause endless trouble and inconvenience.

A bend must not be placed directly at the Pump suction flange. Fit a straight pipe, at least twice its diameter in length, between the bend and the Pump. Where convenient, it is recommended that this straight pipe be made 18 inches long.

If reducing sockets are required, fit them in the vertical line.

If the same size pipe, for which the suction flange is screwed, is to be used, it may be installed horizontally.

Suction Piping should have a continual fall from the Pump to the source of supply, when there is a suction lift.

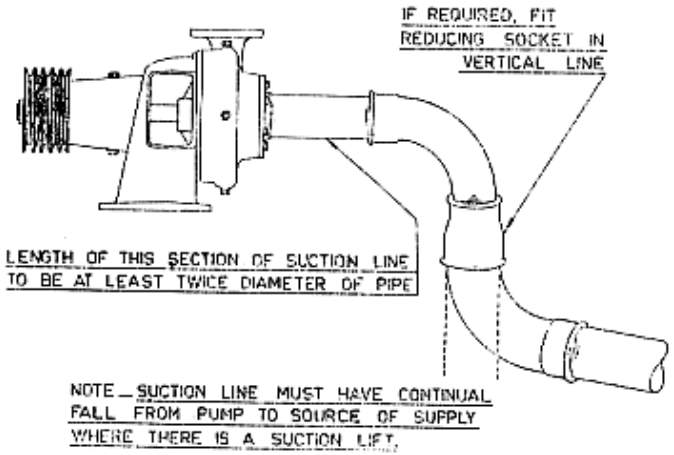
Make sure that all joints, whether flanged or screwed, are absolutely airtight, by using suitable gaskets or jointing compound and bolting or screwing up evenly and tightly.

When there is a suction lift, a good type of footvalve, with a water opening of at least equal area to that of the pipe, is essential.

We recommend the use of the Southern Cross "AF" Pattern Brass Combined Footvalve and Strainer where the suction pipe is 3in. or less, and a Southern Cross Galvanised Footvalve and Strainer, Mark HC-H, for 4in. suction pipe.

Make sure the footvalve is installed about three feet below the low level of the water to prevent the formation of whirlpools and the consequent entry of air into the suction pipe.

When the Pump is below the lowest source of supply, a Fullway Gate Valve should be fitted in the suction line close to the Pump. This enables the Pump to be serviced without draining the supply reservoir to below pump level. **This Valve must always be fully open unless the pump is being dismantled.**



"Suction Piping."

DISCHARGE PIPING

Discharge Piping of a size suitable to carry the required discharge from the Pump, without excessive friction head, should be selected.

The pipe size for which the discharge is flanged or screwed is not necessarily the correct size to use.

Always check the friction head of the installation before deciding on the size pipe to be used. As a general rule, one size larger pipe than the discharge is recommended. Never, under any circumstances, should a size of pipe smaller than the discharge be used.

If the point of discharge is some distance above the Pump, the discharge piping should rise continuously to this point. Where the discharge piping is laid over undulating ground with high points where air pockets can form, vent cocks must be placed to expel any accumulation of air which could affect the discharge capacity of the Pump.

GATE VALVE

Install a Fullway Gate Valve in the discharge piping as close as possible to the discharge flange of the Pump. It is used chiefly to control the capacity of the Pump.

It is always advisable to close the Gate Valve before stopping the Pump, so that next time the unit is required to operate, the driving engine or motor may be started free from load.

After starting, wait until the unit has gained full speed, then open the Gate Valve **gradually** until the desired quantity of water is being discharged.

A Centrifugal Pump is not harmed whilst operating against a closed discharge valve provided the Pump is not left running for more than 10 minutes. If left running for very long, the churning action of the impeller may generate sufficient heat to cause seizure and distortion of the Pump.

POSITION OF PUMP DISCHARGE

The Pump discharge may be arranged at any of seven positions, at 45°. The vertical downwards discharge position is not used. Adjustment to the required angle is made by undoing the setscrews attaching the body and turning the body to the required angle. Replace setscrews and tighten securely. Check to see that the shaft still turns freely after tightening setscrews.

GAUGE CONNECTIONS

Tapped connection holes for suction and pressure gauges are situated in the side of the suction and discharge branches of the pump body. These holes are ¼in. B.S.P. and are plugged when gauges are not used. Extension pipes may be fitted to bring gauges to a convenient position for viewing. If the gauge position is appreciably above or below the Pump centre line the gauge reading should be corrected accordingly.

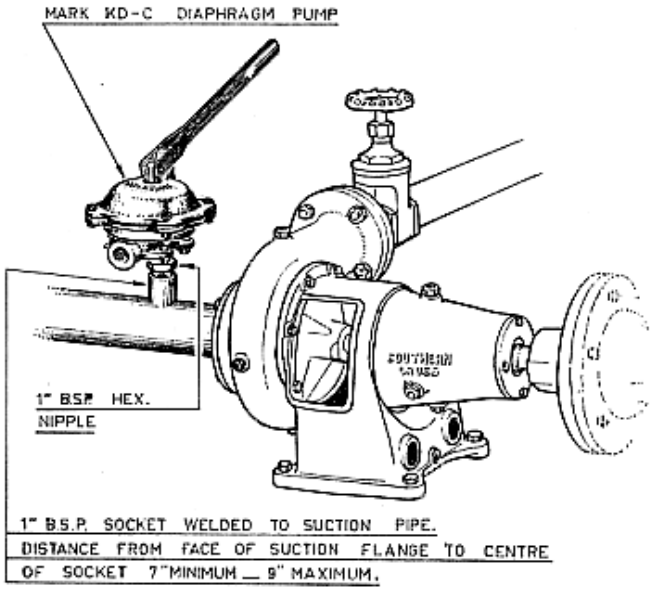
PRIMING

Do not attempt to run the Pump when empty. The Pump and suction pipe must be filled with water and the air removed from the Pump casing (primed) before starting. If run dry, certain interior parts which rely on water for lubrication will be damaged.

The following methods of priming may be used:—

(a) **Using a Hand Operated Diaphragm Pump** (Refer to Illustration):—

1. Close gate valve on discharge pipe.
2. Operate the diaphragm pump until it discharges water.
3. Start Centrifugal Pump.
4. Resume pumping with the diaphragm pump for about another two minutes.
5. Gradually open the discharge gate valve.



"Diaphragm Pump Mounted for Priming."

(b) Where the water is being pumped to a level higher than the Pump, the gate valve on the discharge pipe is closed each time just before the Pump is stopped. When the Pump has to be primed, remove the hexagon priming plug from the top of the pump and open the gate valve on the discharge pipe. When water, free from air bubbles, flows from the plug hole, close the gate valve and refit the plug. Start Pump immediately.

(c) Mount a priming funnel, priming cock and bend from one of the plug holes on the side of the pump body. Open priming cock, remove hexagon priming plug from the top of the Pump, and fill the Pump and suction pipe by pouring water into the funnel. When water, free from air bubbles, flows from the plug hole, refit plug, close priming cock, and start Pump immediately.

(d) Place a small tank close to the Pump so that the bottom of the tank is higher than the Pump. Connect a small branch pipe into the Pump discharge pipe between the Pump and the gate valve, and run it to the bottom of the tank. Fit a stop cock in this branch pipe.
To prime the Pump for the first time, close gate valve on discharge pipe and stop cock on branch pipe. Pour water into tank, remove the top priming plug from Pump, and open stop cock on branch pipe. The water will flow into the Pump and suction pipe, and when it flows from the plug hole, free from air bubbles, close the stop cock on branch pipe. refit plug, and start Pump immediately.
When the Pump is started, open stop cock on branch pipe until tank is full and then close it.

(e) Where the Pump is installed below the lowest source of supply, remove the hexagon priming plug from the top of the Pump, and open the gate valve on the suction pipe, and the water will flow in, thus priming the Pump. When water, free from air bubbles, flows from the plug hole, refit the plug and start Pump immediately.

In all cases the Pump spindle should be turned slowly to expel air trapped in the impeller.

The discharge gate valve must be kept closed until the unit has gained full speed, and then **gradually** opened.

OPERATION

STARTING

Before starting the unit:—

1. **Fill Bearing Housing with Lubricating Oil — Pedestal Pumps:** Refer Section "Lubrication", on page 8, for method of filling bearing housing and lubricating oil recommendation.
2. **Direction of Rotation:** Make sure the engine or motor will drive the Pump in an anti-clockwise direction, when viewed from the suction end of the Pump.
3. **Gate Valve on Discharge Pipe:** Close gate valve on the discharge pipe. This will allow the driving machine to be started free from load. **Do not run Pump for very long with the discharge valve closed.**
4. **Gate Valve on Suction Pipe** (if fitted): This gate valve must be fully open.
5. **Priming:** Prime Pump carefully, as previously explained. If an efficient footvalve is used, it should not be necessary to reprime the Pump before subsequent starts.
6. **Alignment:** Recheck alignment of Pump and driving machine.

The unit may now be started.

When the pump reaches full speed, open the gate valve on the discharge pipe gradually until the desired quantity of water is being delivered. If the Pump has lost its prime, stop the Pump immediately and reprime the Pump.

As more water is pumped when the gate valve is opened, the load on the engine or electric motor is increased.

If the layout of the discharge pipe is ever altered and the discharge head is reduced, the Pump will deliver a greater quantity of water. This will increase the loading on engine or electric motor, and, if necessary, the gate valve on the discharge pipe should be partially closed to reduce the loading.

NOTE: The pump bearing housing of pedestal pumps will be hot to touch while pump is running. **This is normal and is not injurious in any way.**

LUBRICATION

CLOSE COUPLED PUMPS:

The bearings of close coupled pumps have been lubricated at the factory and require no further attention.

PEDESTAL PUMPS:

Lubrication of bearings in the Pump is from an oil reservoir in the bearing housing. Check oil level daily for the first three days' running, and thereafter each week.

To Fill Oil Reservoir:

(a) Unscrew filler plug from top of bearing housing, and the oil level plug from the side of the housing.
(b) Pour oil in through the filler plug hole until oil appears at the oil level hole. Use any clean **SAE 20** lubricating oil, as recommended by a reputable oil company.
(c) Replace filler plug and oil level plug.

To Drain and Refill Oil Reservoir:

Drain oil from the bearing housing and refill with fresh oil every 1000 hours' running, as follows:—

(a) Unscrew filler plug and the drain plug, and allow oil to drain.
(b) Remove oil level plug from side of bearing housing and refit drain plug.
(c) Fill oil reservoir as shown above.

NOTE: The three plugs in the bearing housing must be fitted in their correct positions. The oil level plug is plain and the oil filler plug has two breather holes. The drain plug is magnetic and should be washed in petrol and wiped clean of any adhering material before being refitted.

PUMP OVERHAUL

When the Pump eventually requires an overhaul, proceed as follows:—

1. Remove the oil filler, oil level, and drain plugs and allow oil to drain from the bearing housing (Pedestal Pumps only).
2. Undo pulley grubscrews and remove the pulley (Pedestal pumps only).
3. If the pump body is to be left in position attached to connecting pipes, remove setscrews which attach pump body and holding down bolts or setscrews, and withdraw the pump base, or motor, backplate etc.
4. If the Pump is being removed complete, undo flanges or barrel unions on connecting pipes and holding down bolts and remove the Pump. Unscrew setscrews attaching pump body and lift off the pump body.
   NOTE: To assist in separating the body two setscrews are screwed into the tapped holes in the flange of the base or pump bracket and tightened evenly.
5. Unscrew impeller nut and remove the impeller. Lift out the impeller key and slide the moving section of the seal from the shaft, being careful not to damage the rubber sealing lip on the keyway edges.

6. Undo setscrews which attach the bearing housing to the base and lift the bearing housing and shaft from the base (Pedestal Pumps only).
7. Remove water slinger from the shaft.
8. Unscrew bearing cap setscrews and remove bearing cap, gasket, shaft, and bearings. An oil thrower, fitted on the shaft inside the bearing housing distributes oil to the bearings (Pedestal pumps only).
9. Wash bearings, shaft, and bearing housing with petrol (not kerosene), and allow to dry.
10. Inspect bearings for wear or defects, and fit new bearings, if necessary.
11. Check oil seals for wear or damage and fit new seals, if necessary.
    Note: Oil seals are fitted with the lips facing in, towards the bearings.
12. Remove the stationary section of the mechanical seal by placing a piece of wood against the back of the seal seating, and tapping it out gently.
13. Inspect body O-ring seal for deterioration or damage, and fit a new ring if necessary. Normally this part should not require replacing.
14. It is advisable to fit a new mechanical seal whenever the seal in the pump has been dismantled during an overhaul. If a used seal is refitted, leakage from the seal may occur.
15. Reassemble the Pump by reversing the dismantling procedure, paying particular attention to the following:—
    (a) When fitting the stationary section of the mechanical seal, wet the seating and press the section into position in the base.
    (b) Fit the water slinger onto the shaft before assembling the bearing housing or motor to the base or backplate.
    (c) Smear a small quantity of waterproof grease onto the shaft where the moving section of the seal operates, before fitting moving part of the seal into position.
    (d) Check both faces of the seal to make sure they are clean before fitting the impeller key and impeller to the shaft.
    (e) Ensure that body O-ring seal is properly seated and is not cut or pinched when assembling. To remove any twist from the O-ring, run a pencil or small screwdriver around under the O-ring.
16. Refit drain plug in the bearing housing and refill oil reservoir. Refit filler and level plugs (Pedestal Pumps only).

A pump which has become worn in the body, impeller, or base, or backplate may be repaired by fitting bronze wear rings. These rings, with full instructions for machining the pump parts and fitting rings. are obtainable from the nearest Southern Cross Sales Office.

ORDERING REPLACEMENT PARTS

When ordering replacement parts, please quote Name of Part required (from parts illustration), and the following information from the Pump nameplate:—

(a) Size .....

(b) Mark .....

(c) Serial Number .....
(All Digits must be shown)

(d) Impeller Diameter (only if shown) .....
(Also include "B.F." if shown, as this indicates a Back Filed Impeller.)

WEAR RINGS

Southern Cross Centrifugal Pumps are manufactured with a radial clearance of .006in.-.010in. between the adjacent sealing faces of the impeller, body and base or backplate. Should the clearances between these parts increase sufficiently, either due to the corrosive action of the liquid being pumped or wear caused by abrasive substances in the liquid, the head and delivery from the pump will decrease, according to the amount of this increased clearance.

Depending on the application of the pump, and the tolerance to the decreased output, the pump may be run for a considerable time, but it is recommended that wear rings be fitted before clearances between the parts reach a maximum of .015in. (.030in. on the diameters), to restore the pump to its original condition. These rings, with full instructions for machining the pump parts and fitting rings, are obtainable from the nearest Southern Cross Sales Office.

In restoring a pump, the sealing ring faces of the impeller are machined to one of the sizes shown in the table below, and corresponding wear rings (either .030in. or .060in. undersize) fitted into the body and base or backplate. Standard wear rings are used only when the repair includes a new impeller.

Wear Ring to be Used.	IMPELLER SEAL RING DIAMETER 1¼in. & 1½in. Pumps	2in. & 2½in. Pumps	3in. Close-coupled Pumps	3in. & 4in. Pedestal Pumps
Standard	2.503in. 2.500in.	3.503in. 3.500in.	4.503in. 4.500in.	5.503in. 5.500in.
.030in. Undersize	2.473in. 2.470in.	3.473in. 3.470in.	4.473in. 4.470in.	5.473in. 5.470in.
.060in. Undersize	2.443in. 2.440in.	3.443in. 3.440in.	4.443in. 4.440in.	5.443in. 5.440in.

PUMPS FITTED WITH EXTRAS AND ALTERNATIVES

When ordering replacement parts for a pump, all of the serial number must be quoted. The digits following the oblique stroke in the number indicate the extras or alternatives fitted to the pump. The digit "0" is included only where it is necessary to maintain the correct order of the other digits and, when used, represents the standard part.

The order in which the digits following the oblique stroke are used and the variations they represent is as follows:—

Third Digit — **Impeller:**
- 0 — Standard Cast Iron Impeller.
- 1 — Gunmetal Impeller.
- 2 — Zinc-free Bronze Impeller.

First Digit — **Shaft:**
- 0 — Standard Shaft.
- 1 — Stainless Steel Shaft (Type 431).
- 2 — Stainless Steel Shaft (Type 302).

Second Digit — **Gland:**
- 0 — Mechanical Seal (Standard).
- 1 — Packing Gland lubricated with water from the pump.
- 2 — Packing Gland lubricated from an external clean water supply.
- 3 — Grease lubricated Packing Gland.
- 4 — Mechanical Seal (Special).
- 5 — Oil Lubricated Packed Gland
- 3 — Ni-Resist Cast Iron Impeller.

Fourth Digit — **Wear Rings:**
- 0 — Standard Pump without Wear Rings.
- 1 — Gunmetal Wear Rings fitted.

Fifth Digit — **Base** (Pedestal Pump) **or Backplate** (close Coupled Pump)
- 0 — Standard Cast Iron Base.
- 1 — Gunmetal Base.
- 2 — Zinc-free Bronze Base.
- 3 — Ni-Resist Cast Iron Base.
- 4 — S.G. Cast Iron Base.

Sixth Digit — **Body:**
- 0 — Standard Cast Iron Body.
- 1 — Gunmetal Body.
- 2 — Zinc-free Bronze Body.
- 3 — Ni-Resist Cast Iron Body.
- 4 — S.G. Cast Iron Body.

Seventh Digit — **Bearings:**
- 1 — Grease packed single row, deep groove ball bearings, with two side plates.

GLAND—

Pumps are despatched from the Factory with the gland packed. Before starting the pump, tighten packing gland nuts hard, so that gland packing will be seated on the shaft. Release nuts and retighten to slightly more than finger tightness.

After starting the pump, a slight trickle from the gland when the pump is running will indicate that the gland is adjusted correctly. An over-tight gland may cause burning of the packing and scoring of the pump shaft could result.

When the pump has been in operation for a short time, it may be necessary to retighten the gland nuts as the packing beds in. Further tightening of the gland nuts may be required from time to time.

When gland nuts have been tightened to the stage where the gland enters the packing box approximately one half inch, the gland packing requires replacing. Do not insert extra rings of packing to fill the gland, but replace all of the packing.

When replacing gland packing, dismantle the pump and remove all old packing and the lantern ring. Fit two rings of packing, then the lantern ring and the remainder of the packing rings. Insert the packing into the gland one ring at a time, making sure the joints in successive rings are not together, but are on opposite sides of the shaft.

Lubrication of the packing gland is by means of water from the pump body, an external clean water supply, or by grease from a grease cup or nipple.

Lubrication From Pump: If the gland in the pump is supplied for water lubrication from the pump body, no alteration to the pump is required.

Lubrication From External Clean Water Supply: If the pump gland is to be lubricated from an external clean water supply (such as rain water tank), the gland is connected by means of copper or plastic tube and connectors to the clean water supply. The ¼in. B.S.P. hole in the side of the base is provided for connecting the clean water supply. This method of gland lubrication is recommended in installations where the water contains suspended matter which would, in time, tend to block and glaze the packing, causing early gland and shaft wear.

Grease Lubrication: A grease cup is fitted to introduce grease into the packing gland.

Before starting the pump, fill the grease cup with a waterproof water pump grease and screw it down a few turns. Each day, before starting, screw down the grease cup one turn.

TROUBLES AND THEIR CAUSES

Failure to Deliver Water:

1. Pump not properly primed.
2. Speed too low:—
   (a) If motor driven, check speed and line voltage.
   (b) If engine driven, check governor setting and engine speed.
   (c) If driven from line shaft, check shaft speed and pulley sizes.
3. Discharge head beyond Pump's rating. Check both suction and discharge heads with gauges.
4. Excessive suction lift.
5. Incorrect direction of rotation.
6. Long suction and short delivery. A minimum discharge head of approximately 5ft. will help to eliminate this trouble.
7. Impeller clogged.
8. Water has receded; footvalve not in water.
9. Obstruction in suction or discharge line:—
   (a) Valve closed.
   (b) Suction strainer clogged.
   (c) Suction foot valve stuck in closed position.

Pump Delivers a Little Water and Then Fails to Deliver More:

10. Air not all out of Pump.
11. Leaking suction pipe or joints.
12. Suction lift too great.

Too Low Pressure or Too Small Quantity of Liquid Discharged:

13. Footvalve too small or restricted by rubbish or insufficiently submerged.
14. Slight air leaks in suction piping or joints.
15. Damaged seal.
16. Excessive suction lift.
17. Impeller partially or fully clogged.
18. Speed too low. (See No. 2.)
19. Suction or discharge piping and strainers partially stopped up. (See No. 9.)
20. Suction head too high when pumping hot or volatile liquids.
21. Discharge head too high.
22. Impeller damaged.
23. Wrong impeller in Pump. Check diameter and clearances.
24. Suction and/or discharge pipes of insufficient diameter causing excessive friction loss.
25. Air or gases in liquid handled.

Pump Discharges at Surface but Fails to Deliver at Higher Discharge Point:

26. Pump speed too low.
27. Head not calculated correctly.

Hot Bearings:

28. Belt too tight or out of line.
29. Insufficient oil in bearing housing.
30. Unsupported pipes straining the Pump. A temperature uncomfortably hot to the hand is not necessarily injurious to the Pump; any sudden rise in temperature, however, should be investigated.

Power Consumption Too High:

31. Total head is lower than estimated causing too much water to be pumped. Throttle back capacity by means of gate valve on delivery side.
32. Pump speed too high.
33. Density of liquid greater than water.
34. Bent shaft.
35. Unsupported pipes straining Pump causing impeller to bind in body and cover plate. Remove belts and turn spindle by hand to check if it is free.
36. Foreign body jammed in Pump.

Excessive Vibration:

37. Misalignment. When Pump or driver becomes hot during operation, check alignment of Pump and driving member.
38. Foundation not sufficiently rigid.
39. Impeller partially clogged, causing unbalance.
40. Worn bearings.
41. Casing distorted. (See Nos. 34 and 35.)

Too Much Leakage Around Shaft:

42. Cracked or worn seal.
43. Seal faces not properly in contact.

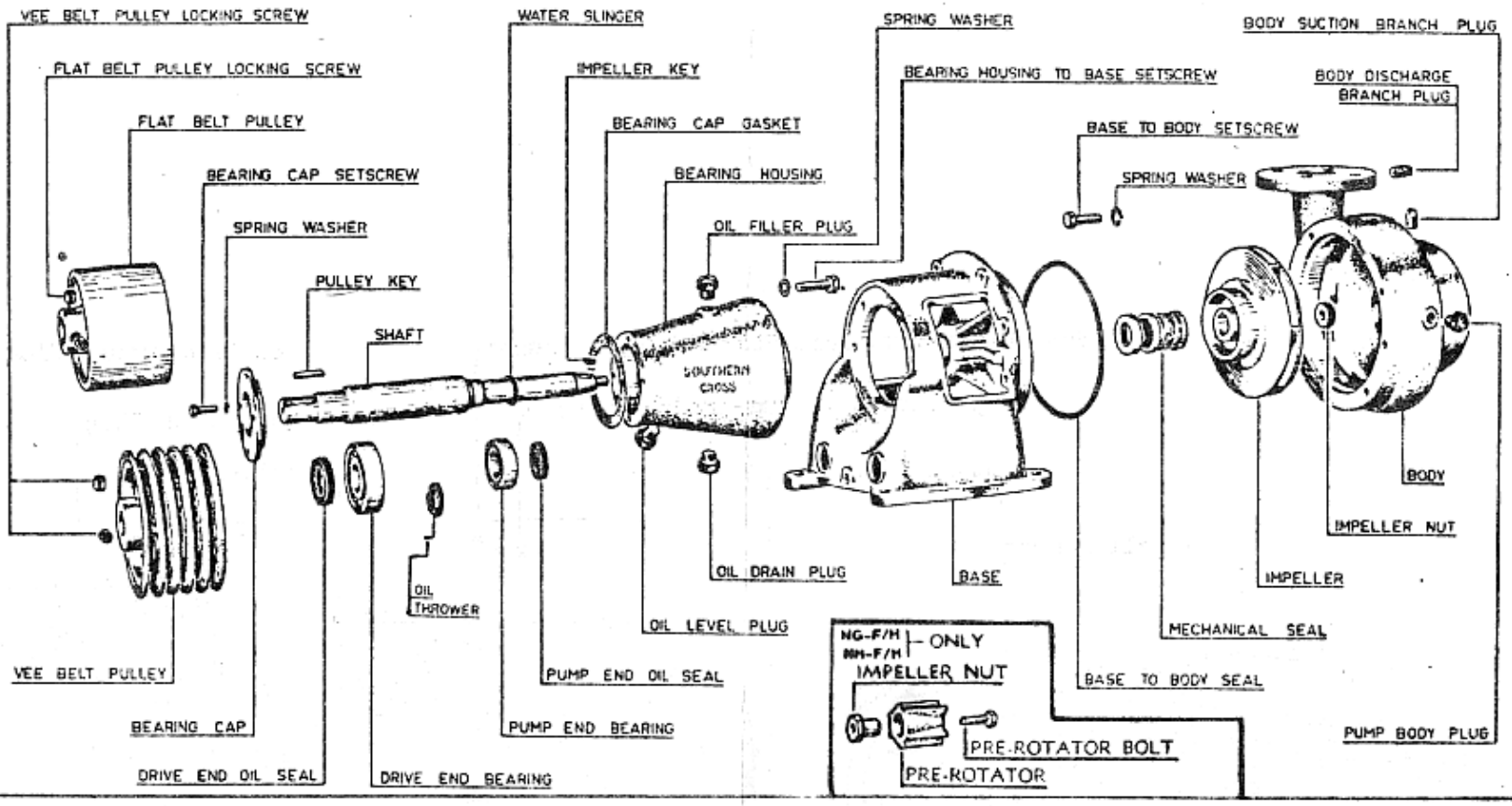
Excessive Internal Wear of Pump:

44. Cavitation from air or gases in liquid.
45. Abrasion caused by solid particles.
46. Corrosive action of liquid handled.
47. Unsupported pipes straining Pump, causing impeller to bind in body and cover plate.

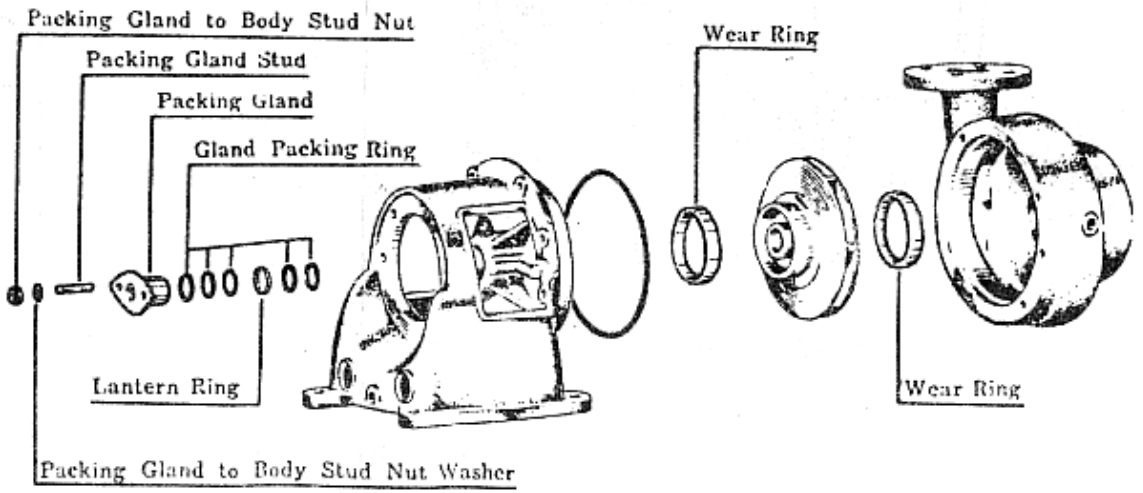
Noisy Operation:

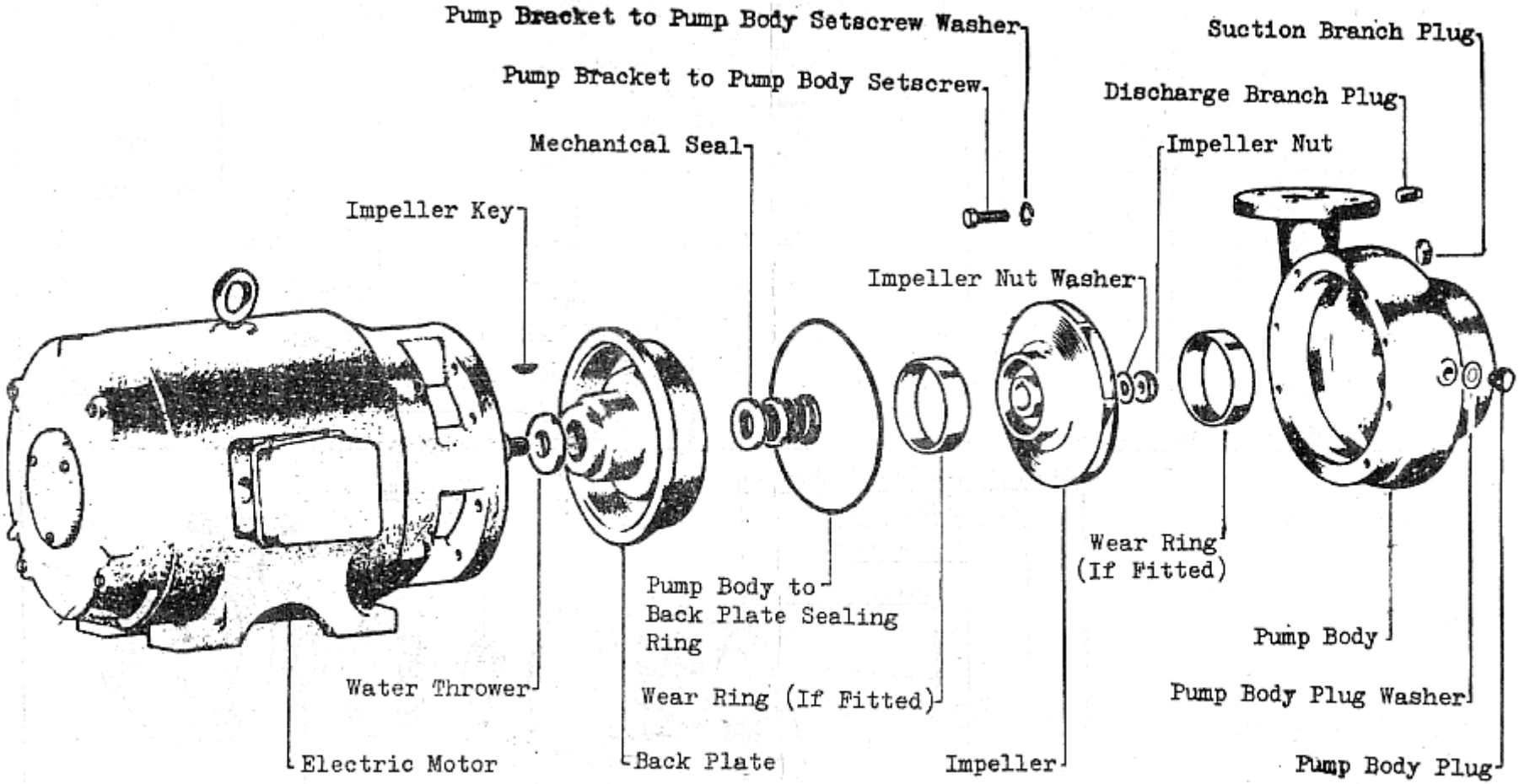
48. Foreign body jammed in impeller or body.
49. Impeller binding in body.
50. Worn or faulty bearings.
51. Pump not properly primed.
52. Cavitation caused by too high a speed or discharge valve opening too great.

PARTS ILLUSTRATION — 'NF' 'NG' 'NH' PATTERN CENTRIFUGAL PUMPS



EXTRAS AND ALTERNATIVES





'NE', 'NF', 'NG', 'NH' PATTERN CLOSE COUPLED CENTRIFUGAL PUMPS - PARTS ILLUSTRATION