

Instruction Manual for...

SOUTHERN CROSS



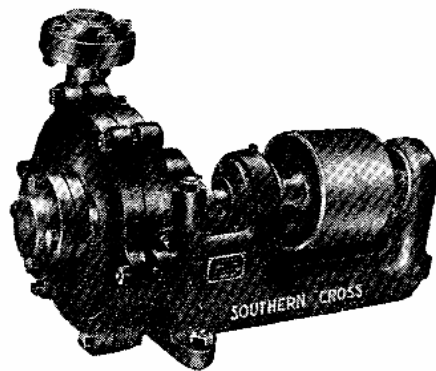
CENTRIFUGAL PUMPS

AQ PATTERN (BELT DRIVEN) — 1in., 1½in., 2in., 2½in., 4in.

AR PATTERN (BELT DRIVEN) — 1in., 1½in., 2in., 2½in.

Fig. 3065 — CENTRIFUGAL PUMPING UNIT

INSTALLATION - - OPERATION
AND
MAINTENANCE INSTRUCTIONS
FOR
" SOUTHERN CROSS "
CENTRIFUGAL PUMPS



MARK AR-E CENTRIFUGAL PUMP.

SOUTHERN CROSS Centrifugal Pumps are made in two different types: the AQ Pattern for Low and Medium heads, the AR Pattern for Medium and High heads.

These pumps are single stage, and run on Deep Groove Ball Bearings capable of carrying both radial and thrust loads, and are our standardised types of centrifugal pumps for all general purposes.

INSTALLATION

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.

Under favourable conditions at or near sea level it is possible to operate a Centrifugal Pump with a suction head of 18 feet including friction in the suction pipe. However, for practical purposes, it is recommended that the pump be kept within 12 feet of the lowest water level, and preferably closer.

The efficiency of a Centrifugal Pump drops off rapidly as the suction lift is increased.

Foundation.

The Pumping Unit will give the best results if it is set on a firm foundation. A good concrete block is best, but, failing that, a substantial log set well into the ground and free from vibration will do. If the foundation is to be of concrete, then the Unit holding down bolts are to be set in the concrete when the foundation is put down.

The Pump must be supported firmly, independently of the pipe connections, and the spindle must be free to turn by hand after the foundation bolts have been tightened down, and the pipes have been connected.

To Make Concrete Foundation.

Make a mould of the required shape and height, nailing the boards on firmly so that it will not collapse when filled with concrete.

Sink a hole 12 inches to 18 inches deep in the ground and about 1 foot larger all round than the mould.

Set the mould in position over the hole and lay two pieces of 2 inch by 1 inch timber across the top. Set the pump on these two crosspieces.

Check the position of the pump in relation to the engine or electric motor which has to drive it.

Move the two crosspieces so that they are directly under the foundation bolt holes in the pump feet, and then nail them to the mould. Recheck the position of the pump with the driving machine and then mark the positions of the foundation holes on the timber crosspieces.

At the spots marked, bore holes through the crosspieces to suit the foundation bolts supplied.

Put the washers on the bolts and hang the bolts inside the mould from the holes in the timber crosspieces. Screw the nuts down at least $1\frac{1}{4}$ inches on the bolts, i.e., the bolts will project about $2\frac{1}{4}$ inches from the top of the block.

Check to see that the top of the mould is level by trying a spirit level on it both ways

The mould is now ready to have the concrete poured into it. Mix up a batch of concrete using 4 parts stone or rubble, 2 parts sand and 1 part cement.

Fill the mould to ground level and if the mould is fairly high a few old bars or bolts should be arranged so that they project into the mould. These will act as reinforcement between the top and bottom portions of the foundation.

Fill the mould and ram it well, being sure not to disturb the mould.

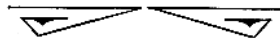
Smooth off the top of the mould with a mixture of 2 parts sand and one part cement.

Allow the concrete to stand for at least 24 hours before removing the mould. Then dampen the block and smooth off the sides with a mixture of 2 parts sand and 1 part cement.

Allow the concrete to stand another 24 hours and then put the pump in position on the block.

Loosen the nuts on the packing gland and see that the pump spindle will turn freely. Then tighten down the nuts on the foundation bolts.

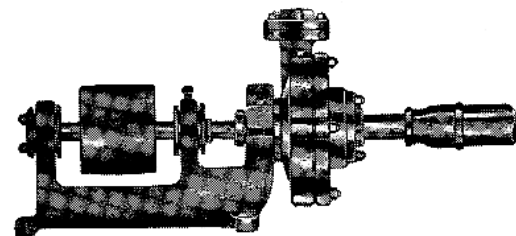
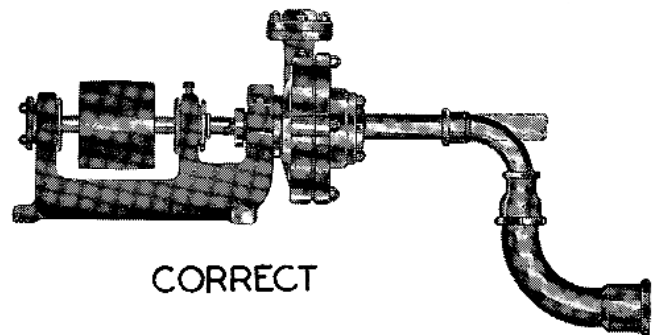
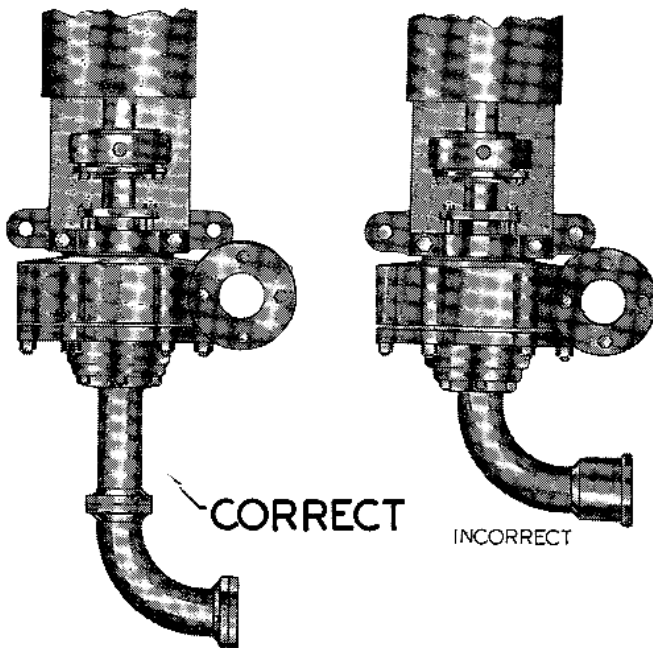
Check to see that the pump spindle still turns freely. If the spindle does not turn freely, the pump is not sitting evenly on the foundation. The foundation bolt nuts must be loosened off and the feet shimmed until the spindle will turn freely when the nuts are tightened.



Suction Piping.

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

- DON'T**—Use sharp angle bends or elbows.
- DON'T**—Try to operate pump with a suction lift of more than 18 feet (including friction).
- DON'T**—Use smaller Suction Piping than recommended.
- DON'T**—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.

The illustrations on this and the following page show some of the more common installation errors and the best methods of preventing them.

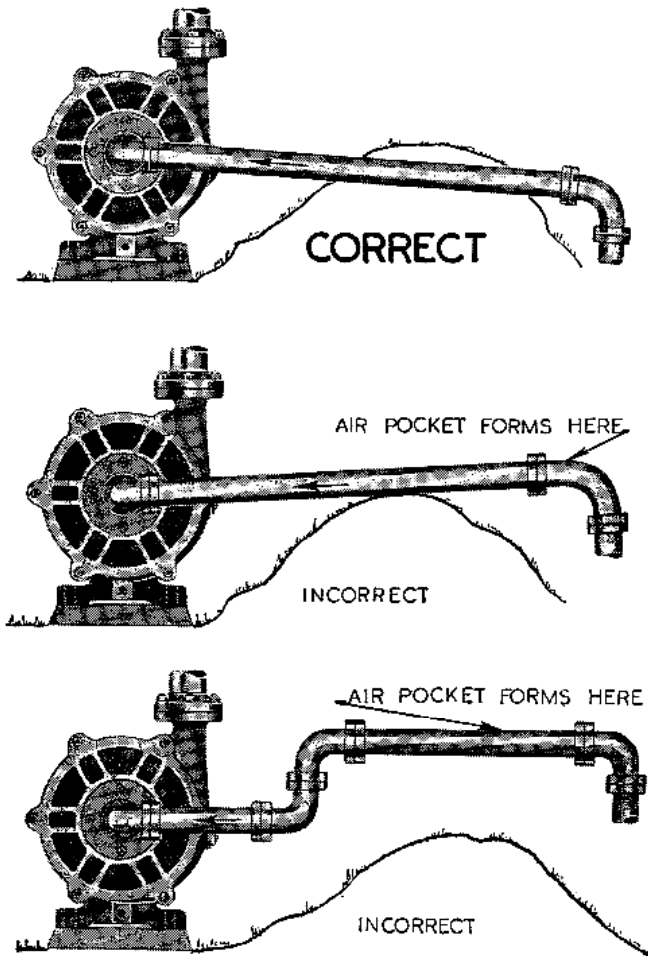
A bend must not be placed directly at the pump suction flange.

Fit a straight pipe, at least twice its diameter in length, between the bend and the pump.

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—Continued.



CORRECT AND INCORRECT METHODS OF LAYING THE SUCTION PIPING

At left are shown the correct and incorrect methods of laying Suction Piping, which is to have a continual fall from the pump to the source of supply, when there is a suction lift.

A barrel union or flanged joint is necessary in all suction lines to permit the piping to be screwed up tightly and dismantled easily for servicing the pump.

Make sure that all joints, whether flanged or screwed, are absolutely air tight, 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 foot-valve, 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 Galvanised Footvalve and Strainer where the suction pipe is over 3in. diameter.

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.**

Delivery Piping.

Delivery 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 flange is 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 flange

screwing is recommended. Never, under any circumstances, should a size of pipe smaller than the discharge flange screwing be used.

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

Delivery Piping—Continued.

GATE VALVE.

Install a Fullway Gate Valve in the delivery piping as close as possible to the discharge flange of the pump.

The Gate Valve 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 generates sufficient heat to cause seizure and distortion of the pump.

TO ELIMINATE USE OF A BEND.

The delivery branch on all pumps is easily swivelled to any desired position by loosening the bolts in the trunnion supporting the casing on some sizes of pumps, or by loosening the locknut and screw in the trunnion supporting the casing on other sizes of pumps.

After adjusting, particular care must be taken to re-tighten the trunnion and to see that the casing is pressed in as firmly as possible and held in position and that the spindle turns freely.

CONNECTING SUCTION AND DELIVERY PIPING.

Both Suction and Delivery Pipes must be supported independently of the pump so that no undue strain is placed on the pump casing. These pipes must match up to their respective flanges without pressure being applied to the bolts, to avoid distortion of the pump.

Lubrication.

BALL BEARINGS.

Southern Cross Centrifugal Pumps are fitted with Ball Bearings which are packed with sufficient grease to last for six (6) months when they leave the Factory. A grease lubricator is supplied for the centre bearing, and once every six (6) months it should be filled and screwed right down. One filling is sufficient. After greasing there may be a tendency for a certain amount of grease to work out along the shaft. This is due to overfilling and should be wiped off. For the bearing at the back end of the pump the cover can be removed and grease, equivalent to the amount of one filling of the lubricator, added. Be careful not to allow any dirt to enter the bearing while the cover is off.

Should the pump be working under very moist or bad conditions it may be necessary to wash out the bearings and bearing housings.

To do this, remove the bearing caps and wash out the bearings and bearing housings with petrol. Under no consideration use kerosene, as this will damage ball bear-

ings. When thoroughly cleaned out, allow to dry. Do not use an air jet to dry out bearings. Pack fresh grease over and between the balls, but do not fill the bearing housing full of grease as this will cause the bearing to overheat and allow grease to escape out of the housing.

Sufficient grease to half fill the housing is all that is necessary. Scrupulous care must be taken that no dirt, grit, or moisture enters the bearing housing.

Recommended greases are:—

SOUTHERN CROSS GREASE (obtainable from the nearest Southern Cross Distributor).

or if this is not available, any Ball Bearing Grease as recommended by any reputable oil company.

NOTE: No other points on the pump require lubrication.

Gland.

Pumps are despatched with the gland packed. Temperature changes may cause the packing to swell, and if the pump cannot easily be turned by hand, reset the packing and screw the gland up lightly. After the pump has been in operation a short time it will be found necessary to tighten up the gland as the packing "beds down." One or two rings of packing should be cut and inserted immediately to restore the packing to its original length. The packing must be inserted into the packing box, one ring at a time, making sure that the joints in successive rings are not together but on opposite sides of the shaft. The packing box should always be kept

filled with sufficient packing so that the gland will not enter the packing box more than approximately $\frac{1}{16}$ in.

The gland nuts must be screwed up evenly and should be little more than finger tight; a tight gland causes the packing to burn and score the pump spindle. Use only the best quality graphite type packing in the packing gland.

Where special liquids are to be pumped, we will be pleased to advise the type of packing and metals to be used.

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) Where the pump is installed below the lowest source of supply, remove the plug from the top of the pump casing and open the gate valve on the suction pipe and the water will flow in, thus priming the pump.
- (b) Remove the plug from the top of the pump casing and fill the pump and suction pipe by pouring water into the plug hole.

- (c) Where the water is being pumped to a level higher than the pump, the gate valve on the delivery pipe is closed just before the pump is stopped. On the next occasion when the pump is to be used, remove the plug from the top of the pump casing and open the gate valve and the water will flow back from the delivery pipe. Close the gate valve before starting pump.

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

When water, free from air bubbles, flows from the plug hole, the plug should be replaced and the unit started immediately. The discharge gate valve must be kept closed until the unit has gained full speed, and then **gradually** opened.

With multi-stage pumps, the casing of each stage must be primed carefully.



OPERATION

Starting.

Before starting the Unit, check the following points:—

1. **Direction of Rotation:** Make sure that the engine or motor will drive the pump in the direction indicated by the arrow on the pump casing.
2. **Gland:** Make sure that the gland is lightly and evenly adjusted and that the pump spindle revolves freely when turned by hand.
3. **Suction Piping:** Make sure that there are no air leaks in the suction piping and that the foot valve does not leak.
4. **Priming:** Prime the pump carefully, as previously explained.
5. **Gate Valve on the Discharge Line:** Close the Gate Valve on the Discharge Line. This will allow the driving machine to be started free from load.
7. **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 line **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 line should be partially closed to reduce the loading.

General.

DO—Use correct packing in gland.

DO—Inspect pump frequently.

DON'T—Run pump for very long with discharge valve closed.

DON'T—Tighten packing excessively.

DON'T—Run pump in wrong direction, as parts may become loose.

DON'T—Use suction valve, if fitted, to control pump capacity. Leave it always fully open, unless pump is being serviced.

TOTAL HEAD.

This Centrifugal Pump has been supplied to suit the particular conditions of your installation. If the installation is ever altered or the pump is shifted to a different site, the total head and its effect upon the capacity of the pump and horsepower required must be considered.

The total head is the total vertical height from the level of the water being pumped to the point of discharge at the end of the discharge pipe, plus the head due to friction in the pipe lines. Tables showing the heads to be allowed for friction are included in the back of the SOUTHERN CROSS Catalogue.

Where the Centrifugal Pump is used for a spray irrigation plant, extra head has to be allowed for the sprays and added when calculating the total head.

NOISE.

A centrifugal pump in operation is usually nearly noiseless. Sometimes, however, it will produce a rattling sound, varying in intensity. This is usually caused by the presence of air in the pump and this can be remedied by removing the vent plug at the top of the pump casing and re-priming the pump.

Noisy operation may also be caused by:

- (a) A foreign body jammed in the impeller or casing.
- (b) Pump running in wrong direction. Check with arrow on the pump casing.
- (c) Impeller fitted wrong way around after pump has been overhauled.

SELECTION TABLE FOR BELT DRIVEN PUMPS

TOTAL FEET HEAD	SIZE H.P. R.P.M.	CAPACITY G.P.M.														
		10	15	20	25	30	35	40	45	50	55	60	65	70	80	90
10	1" AQ .25 1140	1" AQ .34 1200	1" AQ .38 1300	1" AQ .48 1500	1" AQ .60 1650	1" AQ .72 1760	1" AQ .90 1800	1½" AQ .6 930	1½" AQ .64 980	1½" AQ .68 1025	1½" AQ .78 1060	1½" AQ .95 1150	1½" AQ 1.1 1190	2" AQ 1.1 1045	2" AQ 1.4 1140	
15	1" AQ .30 1250	1" AQ .38 1370	1" AQ .46 1470	1" AQ .58 1600	1" AQ .63 1740	1" AQ .84 1840	1" AQ 1.05 1930	1½" AQ .70 1010	1½" AQ .75 1060	1½" AQ .82 1100	1½" AQ .90 1135	1½" AQ 1.07 1200	1½" AQ 1.20 1230	2" AQ 1.1 1080	2" AQ 1.4 1180	
20	1" AQ .40 1460	1" AQ .50 1520	1" AQ .52 1580	1" AQ .60 1700	1" AQ .72 1840	1" AQ 1.03 1950	1" AQ 1.20 2060	1½" AQ .77 1110	1½" AQ .87 1150	1½" AQ .97 1185	1½" AQ 1.08 1220	1½" AQ 1.20 1260	1½" AQ 1.30 1280	2" AQ 1.1 1190	2" AQ 1.4 1260	
25	1" AQ .46 1600	1" AQ .55 1600	1" AQ .56 1700	1" AQ .68 1840	1" AQ .92 1940	1" AQ 1.16 2070	1" AQ 1.30 2200	1½" AQ .95 1210	1½" AQ 1.00 1230	1½" AQ 1.10 1250	1½" AQ 1.20 1280	1½" AQ 1.30 1320	1½" AQ 1.40 1350	2" AQ 1.4 1300	2" AQ 1.7 1345	
30	1" AQ .54 1700	1" AQ .60 1740	1" AQ .63 1820	1" AQ .84 1920	1" AQ 1.08 2040	1" AQ 1.26 2200	1" AR 1.55 1600	1½" AQ 1.05 1280	1½" AQ 1.12 1300	1½" AQ 1.23 1330	1½" AQ 1.30 1350	1½" AQ 1.40 1380	1½" AQ 1.50 1420	2" AQ 1.65 1400	2" AQ 1.95 1450	
35	1" AQ .58 1800	1" AQ .70 1850	1" AQ .76 1940	1" AQ 1.04 2020	1" AR 1.30 1550	1" AR 1.50 1610	1" AR 1.67 1670	1½" AQ 1.20 1370	1½" AQ 1.25 1385	1½" AQ 1.35 1400	1½" AQ 1.40 1430	1½" AQ 1.60 1480	1½" AQ 1.70 1520	2" AQ 1.85 1480	2" AQ 2.15 1500	
40	1" AQ .75 1900	1" AQ .88 1980	1" AQ 1.00 2040	1" AR 1.20 1580	1" AR 1.45 1630	1" AR 1.63 1675	1" AR 1.80 1740	1½" AQ 1.35 1445	1½" AQ 1.45 1470	1½" AQ 1.65 1500	1½" AQ 1.75 1530	1½" AQ 1.85 1580	1½" AQ 2.00 1620	2" AQ 2.10 1580	2" AQ 2.30 1620	
45	1" AR 1.12 1550	1" AR 1.13 1580	1" AR 1.15 1600	1" AR 1.35 1640	1" AR 1.52 1690	1" AR 1.74 1750	1" AR 1.90 1800	1½" AQ 1.50 1530	1½" AQ 1.65 1550	1½" AQ 1.85 1600	1½" AQ 1.95 1610	1½" AQ 2.05 1650	1½" AQ 2.20 1670	2" AQ 2.35 1660	2" AQ 2.55 1700	
50	1" AR 1.20 1630	1" AR 1.21 1650	1" AR 1.22 1670	1" AR 1.40 1725	1" AR 1.65 1750	1" AR 1.80 1800	1" AR 2.10 1870	1½" AQ 1.70 1620	1½" AQ 1.80 1650	1½" AQ 1.95 1660	1½" AQ 2.05 1675	1½" AQ 2.15 1700	1½" AQ 2.25 1720	2" AQ 2.55 1730	2" AQ 2.80 1780	
55	1" AR 1.25 1700	1" AR 1.26 1725	1" AR 1.35 1750	1" AR 1.55 1780	1" AR 1.75 1810	1" AR 2.05 1875	1" AR 2.35 1930	1½" AQ 1.80 1700	1½" AQ 1.90 1710	1½" AQ 2.00 1730	1½" AQ 2.15 1740	1½" AQ 2.25 1750	1½" AQ 2.30 1770	2" AQ 2.75 1800	2" AQ 3.00 1840	
60	1" AR 1.30 1760	1" AR 1.40 1800	1" AR 1.50 1800	1" AR 1.80 1850	1" AR 1.95 1880	1" AR 2.25 1930	1" AR 2.55 2000	1½" AQ 1.85 1750	1½" AQ 1.95 1760	1½" AQ 2.15 1775	1½" AQ 2.25 1790	1½" AQ 2.35 1800	1½" AQ 2.55 1840	2" AQ 3.00 1865	2" AQ 3.25 1890	
65	1" AR 1.35 1820	1" AR 1.60 1840	1" AR 1.70 1870	1" AR 1.95 1900	1" AR 2.10 1930	1" AR 2.45 2000	1" AR 2.65 2050	1½" AQ 1.90 1800	1½" AQ 2.10 1820	1½" AQ 2.30 1840	1½" AQ 2.40 1860	1½" AQ 2.55 1870	1½" AQ 2.70 1890	2" AQ 3.15 1925	2" AQ 3.45 1950	
70	1" AR 1.45 1860	1" AR 1.75 1900	1" AR 1.95 1920	1" AR 2.10 1965	1" AR 2.35 2000	1" AR 2.55 2055	1" AR 2.80 2100	1½" AQ 2.00 1880	1½" AQ 2.35 1890	1½" AQ 2.50 1900	1½" AQ 2.55 1910	1½" AQ 2.75 1930	1½" AQ 2.85 1950	2" AQ 3.40 1985	2" AQ 3.70 2015	
75	1" AR 1.60 1910	1" AR 1.90 1950	1" AR 2.10 1975	1" AR 2.30 2015	1" AR 2.43 2050	1" AR 2.65 2100	1" AR 2.90 2160	1½" AQ 2.30 1930	1½" AQ 2.50 1940	1½" AQ 2.65 1950	1½" AQ 2.75 1960	1½" AQ 2.90 1985	1½" AQ 3.10 2010	2" AQ 3.55 2020	2" AQ 4.00 2080	
80	1" AR 1.75 1970	1" AR 2.10 2000	1" AR 2.25 2040	1" AR 2.40 2070	1" AR 2.55 2100	1" AR 2.80 2160	1" AR 3.05 2210	1½" AQ 2.60 2000	1½" AQ 2.65 2010	1½" AQ 2.80 2020	1½" AQ 2.90 2030	1½" AQ 3.00 2050	1½" AQ 3.35 2070	2" AQ 3.85 2105	2" AQ 4.20 2140	
90	1½" AR 2.10 1600	1½" AR 2.20 1600	1½" AR 2.33 1600	1½" AR 2.45 1600	1½" AR 2.55 1600	1½" AR 2.67 1600	1½" AR 2.78 1600	1½" AR 3.00 1600	1½" AR 3.30 1665	1½" AR 3.40 1680	1½" AR 3.60 1690	1½" AR 3.90 1700	1½" AR 4.10 1710	2" AR 5.50 1720	2" AR 6.00 1725	
100	1½" AR 2.50 1730	1½" AR 2.65 1730	1½" AR 2.80 1730	1½" AR 2.95 1730	1½" AR 3.10 1730	1½" AR 3.25 1730	1½" AR 3.35 1730	1½" AR 3.50 1730	1½" AR 3.70 1740	1½" AR 3.80 1750	1½" AR 3.90 1760	1½" AR 4.30 1775	1½" AR 4.50 1785	2" AR 6.20 1800	2" AR 6.50 1805	
110	1½" AR 2.90 1810	1½" AR 3.02 1810	1½" AR 3.15 1810	1½" AR 3.30 1810	1½" AR 3.43 1810	1½" AR 3.58 1810	1½" AR 3.70 1810	1½" AR 4.00 1810	1½" AR 4.10 1820	1½" AR 4.30 1830	1½" AR 4.50 1840	1½" AR 4.90 1850	1½" AR 5.10 1860	2" AR 6.80 1860	2" AR 7.20 1870	
120	1½" AR 3.37 1890	1½" AR 3.50 1890	1½" AR 3.67 1890	1½" AR 3.83 1890	1½" AR 4.00 1890	1½" AR 4.18 1890	1½" AR 4.30 1890	1½" AR 4.50 1890	1½" AR 4.60 1895	1½" AR 4.75 1900	1½" AR 5.00 1905	1½" AR 5.20 1910	1½" AR 5.45 1920	2" AR 7.50 1920	2" AR 7.80 1935	
130	1½" AR 4.00 1960	1½" AR 4.10 1960	1½" AR 4.20 1960	1½" AR 4.30 1960	1½" AR 4.45 1960	1½" AR 4.60 1960	1½" AR 4.80 1960	1½" AR 5.00 1960	1½" AR 5.20 1965	1½" AR 5.35 1970	1½" AR 5.55 1975	1½" AR 5.75 1980	1½" AR 6.00 1990	2" AR 8.10 2000	2" AR 8.60 2012	
140	1½" AR 4.30 2050	1½" AR 4.50 2050	1½" AR 4.65 2050	1½" AR 4.80 2050	1½" AR 5.00 2050	1½" AR 5.15 2050	1½" AR 5.30 2050	1½" AR 5.50 2050	1½" AR 5.65 2060	1½" AR 5.80 2065	1½" AR 6.00 2075	1½" AR 6.20 2085	1½" AR 6.50 2095	2" AR 9.20 2140	2" AR 9.80 2160	

The abbreviation "AQ" in the table above represents "AQ" Pattern Centrifugal Pump while the abbreviation "AR" denotes "AR" Pattern Centrifugal Pump.

Thus "1½in. AQ" denotes the Mark AQ-E Pump and "2½in. AR" denotes the Mark AR-G Pump.

The ratings are based on pumping clear cold water and the heads shown include suction, discharge and friction. The horsepowers shown are the minimum required at the pump shaft.

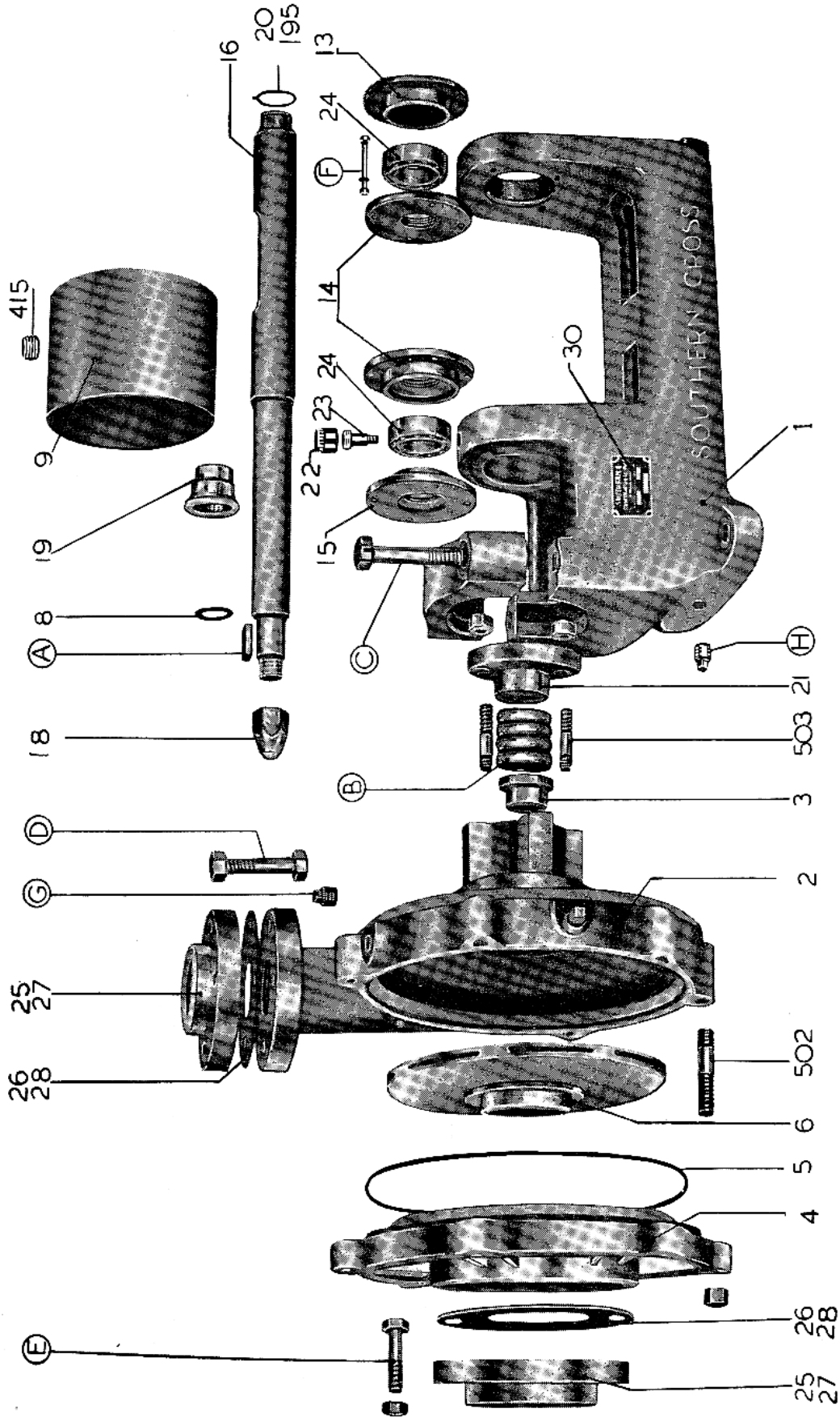
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TOTAL FEET HEAD		CAPACITY G.P.M.														
		100	110	120	130	140	150	160	180	200	225	250	275	300	325	350
10	SIZE H.P. R.P.M.	2" AQ. 1.2 1255	2" AQ. 1.6 1340	2" AQ. 1.8 1390	2" AQ. 2.1 1450	2" AQ. 2.3 1520	2" AQ. 2.8 1680	2" AQ. 3.4 1780	2 1/2" AQ. 2.1 1210	2 1/2" AQ. 2.6 1290	2 1/2" AQ. 2.8 1380	2 1/2" AQ. 3.1 1530	2 1/2" AQ. 4.3 1630	2 1/2" AQ. 5.3 1730	4" AQ. 4.3 1150	4" AQ. 5.0 1210
15	SIZE H.P. R.P.M.	2" AQ. 1.48 1305	2" AQ. 1.79 1390	2" AQ. 2.0 1440	2" AQ. 2.31 1500	2" AQ. 2.6 1600	2" AQ. 3.2 1730	2" AQ. 3.7 1850	2 1/2" AQ. 2.45 1250	2 1/2" AQ. 2.8 1340	2 1/2" AQ. 3.05 1490	2 1/2" AQ. 3.55 1600	2 1/2" AQ. 4.5 1690	2 1/2" AQ. 5.6 1790	4" AQ. 4.7 1185	4" AQ. 5.5 1240
20	SIZE H.P. R.P.M.	2" AQ. 1.74 1400	2" AQ. 1.9 1440	2" AQ. 2.1 1485	2" AQ. 2.55 1595	2" AQ. 2.9 1680	2" AQ. 3.4 1790	2" AQ. 3.95 1900	2 1/2" AQ. 2.6 1300	2 1/2" AQ. 3.0 1450	2 1/2" AQ. 3.4 1570	2 1/2" AQ. 4.0 1640	2 1/2" AQ. 4.7 1720	2 1/2" AQ. 6.0 1840	4" AQ. 5.2 1215	4" AQ. 6.1 1265
25	SIZE H.P. R.P.M.	2" AQ. 1.9 1450	2" AQ. 2.12 1500	2" AQ. 2.5 1590	2" AQ. 2.8 1670	2" AQ. 3.05 1750	2" AQ. 3.6 1830	2" AQ. 4.2 1940	2 1/2" AQ. 2.85 1430	2 1/2" AQ. 3.2 1560	2 1/2" AQ. 3.8 1615	2 1/2" AQ. 4.4 1690	2 1/2" AQ. 5.1 1785	2 1/2" AQ. 6.4 1900	4" AQ. 5.7 1245	4" AQ. 6.7 1300
30	SIZE H.P. R.P.M.	2" AQ. 2.0 1500	2" AQ. 2.35 1580	2" AQ. 2.65 1640	2" AQ. 3.00 1720	2" AQ. 3.35 1800	2" AQ. 3.8 1890	2" AQ. 4.45 1980	2 1/2" AQ. 3.1 1560	2 1/2" AQ. 3.6 1600	2 1/2" AQ. 4.2 1660	2 1/2" AQ. 4.8 1750	2 1/2" AQ. 5.7 1840	4" AQ. 5.2 1225	4" AQ. 6.2 1275	4" AQ. 7.3 1325
35	SIZE H.P. R.P.M.	2" AQ. 2.3 1580	2" AQ. 2.55 1640	2" AQ. 2.85 1710	2" AQ. 3.2 1780	2" AQ. 3.65 1850	2 1/2" AQ. 2.8 1550	2 1/2" AQ. 3.05 1570	2 1/2" AQ. 3.4 1600	2 1/2" AQ. 3.9 1650	2 1/2" AQ. 4.5 1720	2 1/2" AQ. 5.2 1800	2 1/2" AQ. 6.2 1900	4" AQ. 5.6 1260	4" AQ. 6.8 1315	4" AQ. 7.9 1355
40	SIZE H.P. R.P.M.	2" AQ. 2.50 1650	2" AQ. 2.75 1710	2 1/2" AQ. 2.60 1530	2 1/2" AQ. 2.75 1550	2 1/2" AQ. 2.90 1580	2 1/2" AQ. 3.10 1600	2 1/2" AQ. 3.25 1615	2 1/2" AQ. 3.80 1660	2 1/2" AQ. 4.20 1715	2 1/2" AQ. 4.95 1780	2 1/2" AQ. 5.55 1865	2 1/2" AQ. 6.60 1960	4" AQ. 6.60 1300	4" AQ. 7.55 1350	4" AQ. 8.40 1390
45	SIZE H.P. R.P.M.	2" AQ. 2.75 1740	2" AQ. 3.00 1795	2 1/2" AQ. 2.85 1600	2 1/2" AQ. 3.00 1615	2 1/2" AQ. 3.20 1640	2 1/2" AQ. 3.40 1655	2 1/2" AQ. 3.50 1675	2 1/2" AQ. 4.15 1715	2 1/2" AQ. 4.50 1760	2 1/2" AQ. 5.40 1840	2 1/2" AQ. 6.20 1940	2 1/2" AQ. 7.20 2025	4" AQ. 7.35 1350	4" AQ. 8.10 1385	4" AQ. 9.70 1465
50	SIZE H.P. R.P.M.	2" AQ. 3.05 1825	2" AQ. 3.35 1860	2 1/2" AQ. 3.20 1670	2 1/2" AQ. 3.35 1680	2 1/2" AQ. 3.50 1700	2 1/2" AQ. 3.70 1715	2 1/2" AQ. 3.80 1725	2 1/2" AQ. 4.40 1775	2 1/2" AQ. 5.00 1830	2 1/2" AQ. 5.85 1905	2 1/2" AQ. 6.75 2000	2 1/2" AQ. 7.60 2070	4" AQ. 8.05 1400	4" AQ. 9.40 1460	4" AQ. 10.60 1520
55	SIZE H.P. R.P.M.	2" AQ. 3.30 1885	2" AQ. 3.55 1910	2 1/2" AQ. 3.45 1735	2 1/2" AQ. 3.65 1745	2 1/2" AQ. 3.80 1760	2 1/2" AQ. 4.00 1775	2 1/2" AQ. 4.20 1795	2 1/2" AQ. 4.80 1840	2 1/2" AQ. 5.40 1890	2 1/2" AQ. 6.40 1975	2 1/2" AQ. 7.20 2045	2 1/2" AQ. 7.85 2120	4" AQ. 8.80 1455	4" AQ. 10.20 1515	4" AQ. 11.10 1560
60	SIZE H.P. R.P.M.	2" AQ. 3.50 1940	2" AQ. 3.90 1970	2 1/2" AQ. 3.80 1800	2 1/2" AQ. 3.95 1810	2 1/2" AQ. 4.10 1825	2 1/2" AQ. 4.35 1840	2 1/2" AQ. 4.55 1860	2 1/2" AQ. 5.10 1900	2 1/2" AQ. 5.90 1960	2 1/2" AQ. 6.80 2030	2 1/2" AQ. 7.60 2090	2 1/2" AQ. 8.30 2170	4" AQ. 9.70 1510	4" AQ. 10.80 1550	4" AQ. 11.65 1580
65	SIZE H.P. R.P.M.	2" AQ. 3.75 1990	2" AQ. 4.10 2030	2 1/2" AQ. 4.10 1855	2 1/2" AQ. 4.20 1870	2 1/2" AQ. 4.40 1880	2 1/2" AQ. 4.60 1900	2 1/2" AQ. 4.75 1915	2 1/2" AQ. 5.40 1960	2 1/2" AQ. 6.40 2030	2 1/2" AQ. 7.25 2080	2 1/2" AQ. 7.90 2130	2 1/2" AQ. 8.60 2200	4" AQ. 10.40 1550	4" AQ. 11.30 1585	4" AQ. 12.20 1620
70	SIZE H.P. R.P.M.	2" AQ. 4.05 2050	2" AQ. 4.35 2080	2 1/2" AQ. 4.25 1920	2 1/2" AQ. 4.40 1930	2 1/2" AQ. 4.60 1940	2 1/2" AQ. 4.90 1960	2 1/2" AQ. 5.10 1980	2 1/2" AQ. 5.80 2020	2 1/2" AQ. 6.70 2070	2 1/2" AQ. 7.55 2120	2 1/2" AQ. 8.30 2180	2 1/2" AQ. 9.30 2235	4" AQ. 11.05 1590	4" AQ. 11.80 1620	4" AQ. 12.90 1660
75	SIZE H.P. R.P.M.	2" AQ. 4.25 2100	2" AQ. 4.60 2130	2 1/2" AQ. 4.50 1975	2 1/2" AQ. 4.65 1985	2 1/2" AQ. 4.90 2000	2 1/2" AQ. 5.20 2020	2 1/2" AQ. 5.50 2035	2 1/2" AQ. 6.20 2070	2 1/2" AQ. 7.15 2120	2 1/2" AQ. 7.95 2170	2 1/2" AQ. 8.70 2220	2 1/2" AQ. 9.90 2280	4" AQ. 11.80 1635	4" AQ. 12.50 1660	4" AQ. 13.50 1700
80	SIZE H.P. R.P.M.	2" AQ. 4.50 2150	2" AQ. 4.85 2180	2 1/2" AQ. 4.85 2040	2 1/2" AQ. 5.10 2050	2 1/2" AQ. 5.35 2060	2 1/2" AQ. 5.55 2075	2 1/2" AQ. 6.00 2085	2 1/2" AQ. 6.75 2120	2 1/2" AQ. 7.60 2160	2 1/2" AQ. 8.30 2210	2 1/2" AQ. 9.10 2260	2 1/2" AQ. 10.50 2310	4" AQ. 12.40 1680	4" AQ. 13.20 1700	4" AQ. 14.30 1740
90	SIZE H.P. R.P.M.	2" AR. 6.35 1740	2" AR. 6.60 1750	2" AR. 7.00 1760	2 1/2" AR. 7.00 1660	2 1/2" AR. 7.35 1670	2 1/2" AR. 7.75 1680	2 1/2" AR. 8.00 1690	2 1/2" AR. 8.70 1710	2 1/2" AR. 9.40 1740	2 1/2" AR. 10.70 1800	4" AQ. 11.70 1710	4" AQ. 12.65 1730	4" AQ. 13.40 1750	4" AQ. 14.40 1775	4" AQ. 15.90 1820
100	SIZE H.P. R.P.M.	2" AR. 7.00 1815	2" AR. 7.30 1825	2" AR. 7.70 1835	2 1/2" AR. 7.65 1730	2 1/2" AR. 7.90 1740	2 1/2" AR. 8.30 1750	2 1/2" AR. 8.60 1760	2 1/2" AR. 9.40 1780	2 1/2" AR. 10.20 1810	2 1/2" AR. 11.80 1880	4" AQ. 13.00 1800	4" AQ. 14.00 1815	4" AQ. 15.00 1830	4" AQ. 16.10 1855	4" AQ. 17.20 1920
110	SIZE H.P. R.P.M.	2" AR. 7.60 1880	2" AR. 8.10 1895	2" AR. 8.60 1910	2 1/2" AR. 8.40 1810	2 1/2" AR. 8.70 1820	2 1/2" AR. 9.10 1830	2 1/2" AR. 9.50 1840	2 1/2" AR. 10.15 1860	2 1/2" AR. 11.20 1885	2 1/2" AR. 12.80 1955	4" AQ. 14.80 1870	4" AQ. 15.90 1890	4" AQ. 16.80 1905	4" AQ. 17.90 1930	
120	SIZE H.P. R.P.M.	2" AR. 8.30 1950	2" AR. 8.75 1960	2" AR. 9.20 1970	2 1/2" AR. 9.15 1890	2 1/2" AR. 9.40 1900	2 1/2" AR. 9.90 1910	2 1/2" AR. 10.40 1920	2 1/2" AR. 11.00 1930	2 1/2" AR. 12.20 1970	2 1/2" AR. 13.90 2035	4" AQ. 16.40 1935	4" AQ. 17.40 1950	4" AQ. 18.60 1975		
130	SIZE H.P. R.P.M.	2" AR. 9.10 2030	2" AR. 9.60 2055	2" AR. 10.30 2090	2 1/2" AR. 9.80 1970	2 1/2" AR. 10.20 1980	2 1/2" AR. 10.70 1990	2 1/2" AR. 11.20 2000	2 1/2" AR. 12.00 2010	2 1/2" AR. 13.50 2050	2 1/2" AR. 15.70 2120	4" AQ. 17.90 2000	4" AQ. 19.00 2020	4" AQ. 20.30 2050		
140	SIZE H.P. R.P.M.	2" AR. 10.30 2170	2" AR. 10.90 2200	2" AR. 11.60 2215	2 1/2" AR. 11.00 2060	2 1/2" AR. 11.30 2070	2 1/2" AR. 11.90 2080	2 1/2" AR. 12.50 2090	2 1/2" AR. 13.40 2100	2 1/2" AR. 15.10 2150	2 1/2" AR. 17.40 2210					

To enable us to help you decide what is the best centrifugal pumping plant for any particular purpose we need to know:—

- (1) The quantity of water required per hour.
- (2) The height you intend placing the pump above water level.
- (3) The length of suction pipe, and size if on hand.
- (4) The length of discharge pipe, and size if on hand.
- (5) The total vertical height from the pump to the point of discharge.
- (6) Whether or not the pump is required for spray irrigation.

A centrifugal pump should always be installed on a solid and firm foundation as near the water as possible Under no circumstances attempt a suction head of more than 18ft., including friction.



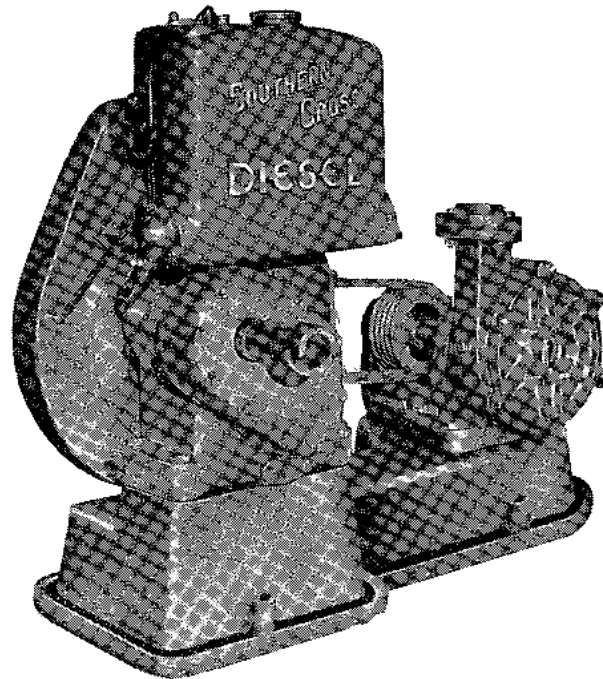
Exploded View of Pump Showing Parts and Their Numbers.

PARTS LIST FOR SOUTHERN CROSS CENTRIFUGAL PUMPS.

AQ PATTERN					AR PATTERN					No. of Off.	Name of Part.
1 1/4 in. AQ-C	1 1/4 in. AQ-E	2 in. AQ-F	2 1/2 in. AQ-G	4 in. AQ-K	1 in. AQ-C	1 1/4 in. AR-E	2 in. AR-F	2 1/2 in. AR-G			
AQ-E 1B	AQ-E 1B	AQ-F 1B	AR-E 1B	AQ-K 1B	AQ-E 1B	AR-E 1B	AR-F 1B	AR-G 1B	1	Base.	
AQ-C 2B	AQ-E 2B	AQ-F 2B	AQ-K 2B	AQ-K 2B	AQ-E 2B	AR-E 2B	AR-F 2B	AR-G 2B	1	Body.	
AQ-C 3	AQ-E 3	AQ-F 3	AR-E 3	AR-E 3	AQ-E 3	AR-E 3	AR-F 3	AR-E 3	1	Body Bush.	
AQ-C 4B	AQ-E 4B	AQ-F 4B	AQ-K 4B	AQ-K 4B	AQ-E 4B	AR-E 4B	AR-F 4B	AR-G 4B	1	Body Cover Plate.	
AQ-C 5	AQ-E 5	AQ-F 5	AQ-K 5	AQ-K 5	AQ-E 5	AR-E 5	AR-F 5	AR-G 5	1	Body Gasket.	
AQ-C 6B	AQ-E 6B	AQ-F 6B	AQ-K 6C	AQ-K 6C	AR-C 6	AR-E 6C	AR-F 6C	AR-G 6B	1	Impeller.	
AQ-C 8	AQ-E 8	AQ-F 8	AR-E 8	AR-E 8	AQ-E 8	AR-E 8	AR-F 8	AR-G 8	1	Impeller Distance Washer.	
AQ-C 9B	AQ-E 9B	AQ-F 9B	AR-E 9B	AR-E 9B	AQ-E 9B	AR-E 9B	AR-F 9B	AR-E 9B	1	Fast Pulley—Flat.	
AQ-C 11C	AQ-E 11C	AQ-F 11C	AQ-K 11B	AQ-K 11B	AQ-E 11C	AR-E 11	AQ-C 11	AR-E 9B	1	V-Pulley.	
AQ-E 13	AQ-E 13	AQ-E 13	AR-E 13	AR-E 13	AQ-E 13	AR-E 13	AR-E 13	AR-E 13	1	Blind End Bearing Cap.	
AQ-E 14	AQ-E 14	AQ-E 14	AR-E 14	AR-E 14	AQ-E 14	AR-E 14	AR-E 14	AR-E 14	2	Centre Bearing Cap.	
AQ-E 15	AQ-E 15	AQ-E 15	AR-E 15	AR-E 15	AQ-E 15	AR-E 15	AR-E 15	AR-E 15	1	Gland End Bearing Cap.	
AQ-E 16C	AQ-E 16C	AQ-E 16C	AR-E 16C	AR-E 16C	AQ-E 16C	AR-E 16C	AR-E 16C	AR-E 16C	1	Gland End Bearing Cap.	
AQ-E 18B	AQ-E 18B	AQ-E 18B	AR-E 18B	AR-E 18B	AQ-E 18B	AR-E 18B	AR-E 18B	AR-E 18B	1	Shaft.	
AQ-E 19	AQ-E 19	AQ-E 19	AR-E 19	AR-E 19	AQ-E 19	AR-E 19	AR-E 19	AR-E 19	1	Shaft Nut.	
AQ-E 20	AQ-E 20	AQ-E 20	AR-E 20	AR-E 20	AQ-E 20	AR-E 19	AR-E 19	AR-E 19	1	Water Thrower.	
AQ-E 21	AQ-E 21	AQ-E 21	AR-E 21	AR-E 21	AQ-E 21	AR-E 21	AR-E 21	AR-E 21	1	Thrust Bearing Circlip.	
AQ-C 22	AQ-E 22	AQ-C 22	AQ-C 22	AQ-C 22	AQ-C 22	AR-E 21	AR-E 21	AR-E 21	1	Packing Gland.	
AQ-C 23	AQ-C 23	AQ-C 23	AQ-C 23	AQ-C 23	AQ-C 23	AQ-C 22	AQ-C 22	AQ-C 22	1	Grease Cap.	
AQ-E 24	AQ-E 24	AQ-E 24	AR-E 24	AR-E 24	AQ-E 24	AQ-C 23	AQ-C 23	AQ-C 23	1	Grease Cup.	
---	---	---	---	---	---	AR-E 24	AR-E 24	AR-E 24	2	Bearing.	
---	---	---	---	---	---	AR-E 25	AR-E 25	AR-E 24	2	Discharge Flange.	
---	---	---	---	---	---	AR-E 25	AR-E 25	AR-E 24	1	Suction Flange.	
AQ-C 27	AR-E 27	---	AR-E 26	---	AR-C 27	AR-E 26	AR-E 26	AR-E 26	1	Discharge Flange Gasket.	
AQ-C 28	AR-E 28	---	---	---	AR-C 27	AR-E 27	---	AR-E 27	1	Suction Flange Gasket.	
AR-E 30	AR-E 30	---	---	---	AR-E 28	AR-E 28	AQ-G 27	AQ-G 27	1	Discharge Flange.	
AQ-E415B	AQ-E415B	AR-E 30	---	---	AR-E 28	AR-E 28	AQ-G 27	AQ-G 27	1	Suction Flange.	
AQ-E500	AQ-E500	AQ-E 30	---	---	AR-E 30	AR-E 30	AQ-G 28	AQ-G 28	1	Discharge Flange Gasket.	
AR-E502	AQ-E500	YE-B195	---	---	AR-E 30	AR-E 30	AR-E 30	AR-E 30	1	Suction Flange Gasket.	
AR-C503	AR-E502	YE-B415	---	---	AQ-E415B	YE-B195	YE-B195	YE-B195	1	Name Plate.	
AQ-E512	AR-C503	AQ-E512	---	---	AQ-E500	YE-B415	YE-B415	YE-B415	1	Thrust Bearing Circlip.	
---	---	---	---	---	AR-C503	AR-E502	AR-E502	AR-E502	1	Pulley Locking Screw.	
---	---	---	---	---	AQ-E512	AR-E502	AR-E502	AR-E502	1	Pulley Locking Screw Grubscrew.	
---	---	---	---	---	---	AR-C503	AR-C503	AR-E502	4-6	Body Stud.	
---	---	---	---	---	---	AQ-E512	AR-E502	AR-E502	2	Packing Gland Stud.	
---	---	---	---	---	---	---	AR-E502	AR-E502	1	Body Locking Screw.	
---	---	---	---	---	---	---	---	---	1	Body Locking Screw.	

When ordering spares, specify Pattern, Size and Number of Pump.

FIG. 3065 CENTRIFUGAL PUMPING UNIT



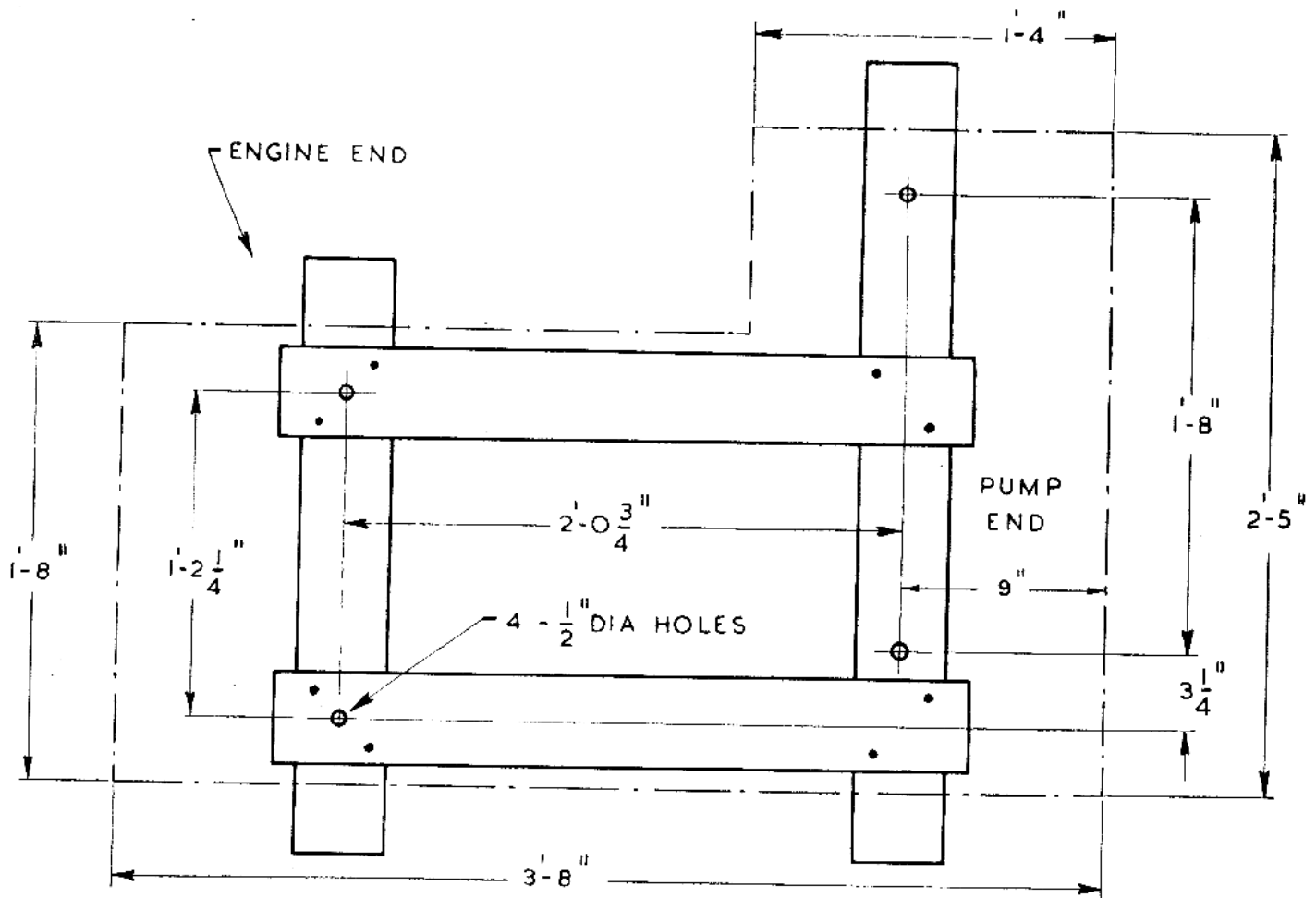
The Unit comprises a Mark ET-B Diesel Engine driving a Mark AQ-C, AQ-E, AQ-F or AR-C Centrifugal Pump by four "A" type Brammer Belts, all mounted on a Mark EM-H Cast Iron Base.

FOUNDATION FOR UNIT

To obtain the best results from this unit, install it on a firm foundation. A large concrete block with the foundation bolts set into it, makes a suitable foundation.

TO MAKE CONCRETE BLOCK

1. After deciding where the unit is to be installed, sink a hole in the ground 1 ft. to 1 ft. 6 in. deep, and to the sizes shown on the "Bolt Template" illustration on Page 15.
2. Make a wooden template to hold the foundation bolts in their positions while the concrete is being poured. (Refer illustration "Bolt Template" on Page 15). Slide the base on the template and mark the positions for the foundation bolts. Remove the base and bore $\frac{1}{2}$ inch holes through the template.
3. Place template in position over the hole in the ground. Take the foundation bolts supplied in the engine case, put large washers on them and then hang them from the template so the tops will project $3\frac{1}{4}$ inches above the concrete when the template is removed.
4. Drive in small pegs around the ends of the cross-boards to hold the template in position. Check that the template is level with a spirit level and pack under the ends if necessary.
5. Mix a batch of concrete using 4 parts sharp stone, 2 parts sand and one part cement. See that the stone and sand are clean and do not contain any clay or dirt. If they do, wash carefully before mixing. A block 1 ft. 6 inches deep will require approximately $2\frac{1}{2}$ bags of cement, $\frac{1}{4}$ yard of sand and $\frac{1}{2}$ yard of stone.
6. Fill the hole with concrete, and at the same time place old bars and bolts in for reinforcements.
7. Allow the concrete to set for 2 to 3 hours, and then carefully lift off the template, taking care not to disturb the bolts. If necessary, smooth off the top of the block with a mixture of 2 parts sand and one part cement. Allow the concrete to set for a day.

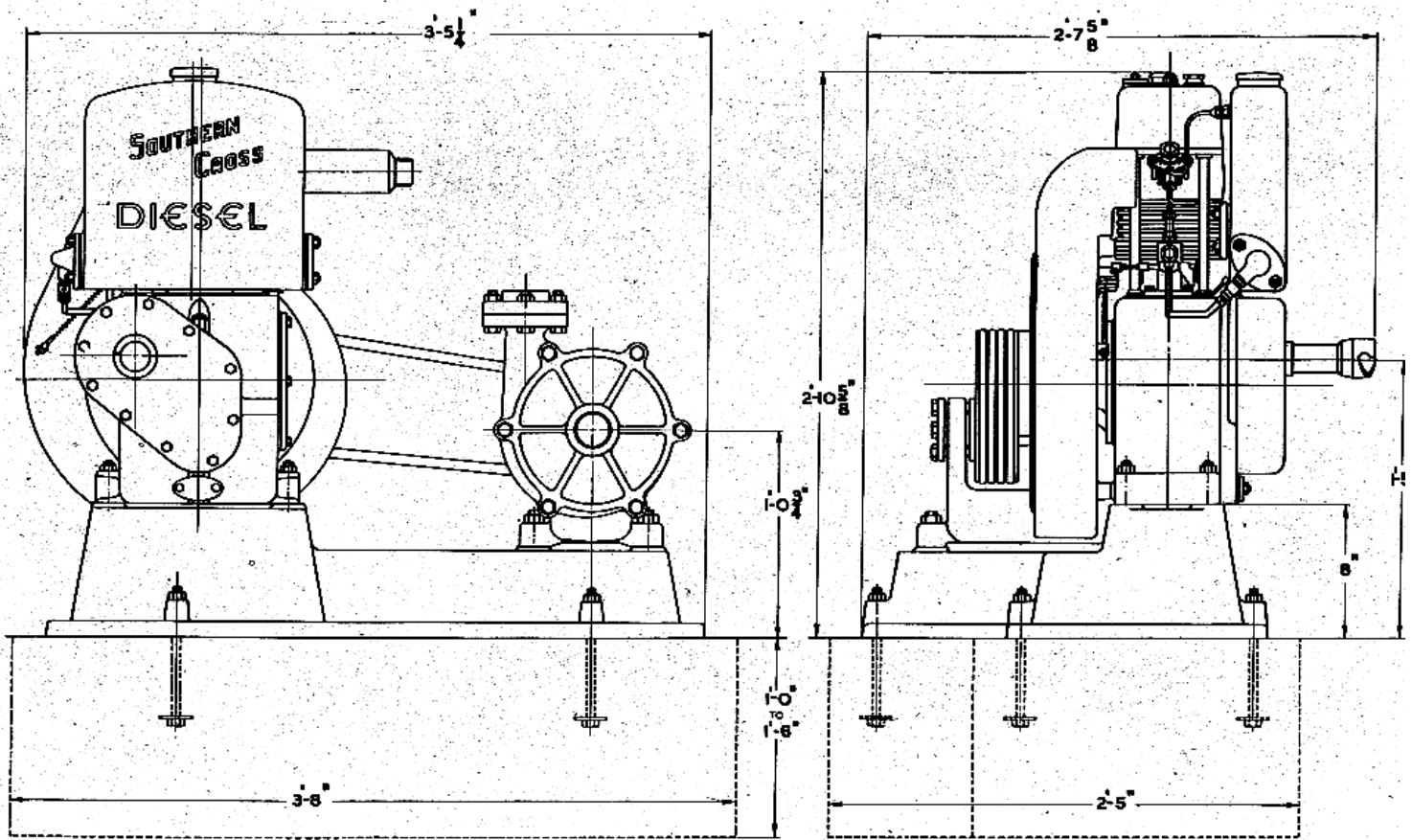


Bolt Template

ASSEMBLING UNIT

1. Lift the base into position on the concrete block and with a spirit level, check that the base is level. Where necessary, place pieces of tin under the edge of the base to level it, and then tighten down the nuts on the foundation bolts.
2. Take the studs supplied and screw them into the base, short threaded end first. To tighten the studs into the base, screw two nuts on to each stud in turn, lock them together, tighten stud using the spanner on the top nut and then unlock nuts.
3. Unscrew the cylinder head cover nut, lift off the cylinder head cover and screw on the lifting shackle. Lift the engine on to the base, remove the shackle and replace the cover and cover nut. Fit the nuts on the holding down studs and tighten them.
4. Screw the engine pulley on to the engine crankshaft and tighten, using the starting handle as a tommy bar.
5. Loosen the packing gland nuts until the pump spindle turns freely. Lift the pump on to the base and tighten down the holding down nuts. Then check to see that the pump spindle still turns freely. If the spindle does not turn freely, the pump is not sitting evenly on the base, and it may be necessary to use thin metal shims under some of the pump feet.
6. Check the pulleys with a line cord to make sure they line up and then fit the belts. Brammer belting should be installed one link short in every twelve inches of length and each belt in a set should have exactly the same number of links.

NOTE: For further installation and operation instructions for the Centrifugal Pump, refer to earlier sections of this manual.



General Arrangement of Fig. 3065 Centrifugal Pumping Unit.

