

Instruction Manual *for..*

SOUTHERN CROSS

JET PUMP

Mark LS-C

MANUFACTURED IN AUSTRALIA

BY

TOOWOOMBA FOUNDRY PTY. LTD.

AND MARKETED BY

SOUTHERN CROSS MACHINERY COMPANIES



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SOUTHERN CROSS JET PUMP

APPLICATION—This Jet Pump Unit has been selected to fulfill the requirements of a particular installation. If it is desired to alter the arrangement of the installation, it is recommended that the nearest Southern Cross Sales Office be consulted, to check the capacity and suitability of the unit for the new application.

INSTALLATION

Location

The Southern Cross Jet Pump may be installed directly over the source of water, or located in a convenient position and connected by horizontal pipes to the water supply. For convenience of servicing, it is recommended that, wherever possible, the pump should be arranged so that it is off-set from the well.

For shallow well installations, the suction depth must not exceed 20 feet, but, when an ejector is used in conjunction with the pump, the suction depth may be increased to 100 feet.

Foundation

"OVER-THE-WELL" INSTALLATION

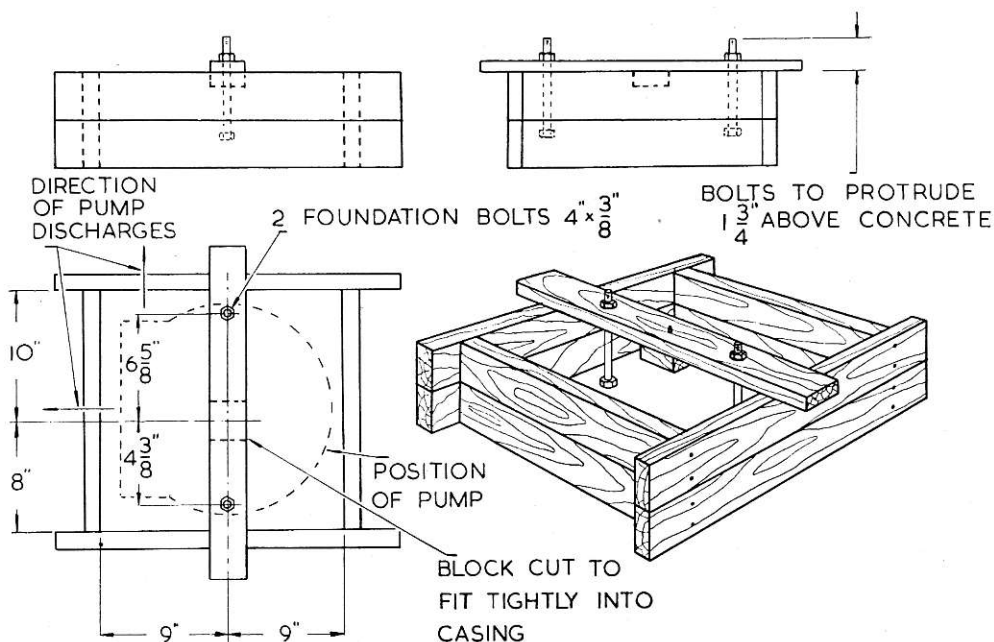
If it is decided to set the pump on a concrete base, the block must be cast around the bore casing, and foundation bolts set in the concrete.

To make the concrete foundation, proceed as follows:

- Around the casing, dig a hole approximately 20in. square, so that the casing is situated in the centre of the hole. The depth of the hole should be at least 6in. in solid compacted soil, and deeper in loose or sandy loams.
- To make the timber cross piece to support the foundation bolts, take a piece of 3in. x 1in. timber and square one end. Hold this square end inside the casing so that both corners are in contact with the inside of the casing. From the opposite side of the casing, mark where

the inside of the casing coincides with the timber. Square off across this mark and cut off. This block is a locating piece for the foundation bolt cross piece.

- On this piece of timber draw the diagonal lines to find the centre, and drive in a nail at this point.
- Place the short piece of timber in the centre of another piece of 3in. x 1in. timber, approximately 2ft. long, lining up the sides, and drive the nail right through.
- Through the point where the nail emerges, draw a centre line the length of the timber. Mark distances of $4\frac{3}{8}$ in. and $6\frac{3}{8}$ in. from the nail point across the centre line and at these two points drill $\frac{3}{8}$ in. dia. holes.
- Construct a mould 18in. square (internal measurement), with two of the sides extended. The mould should be of sufficient depth so that when the top of the mould is flush with the top of the bore casing, the bottom of the mould extends below the surface of the earth.
- Place the two foundation bolts through the foundation bolt cross piece, so that the heads of the bolts are on the same side as the locating block, and screw on the nuts until the distance from the face of the timber to the end of the bolt is $\frac{3}{4}$ in.
- Support the mould over the foundation and level the top, also check from the four corners to the top of the casing to ensure that the concrete will be flush with the top of the casing. Peg the extensions of the mould so that it will not move when the concrete is poured in.



Mould for Concrete Foundation

- (i) Place the locating block of the foundation bolt cross piece into the top of the casing, and position the cross piece so that, when the pump is mounted, it will face in the required direction for attaching piping.
- (j) Fill the mould with concrete, consisting of a mixture of 4 parts of stone or rubble, 2 parts of sand, and 1 part of cement. Arrange some steel bars in the bottom of the foundation and throughout the block to act as reinforcement. When filling the mould, ram the concrete well, being careful not to disturb the template or the mould. Make sure the concrete is well packed under the timber cross piece. When the mould is filled, smooth off the top of the concrete with a mixture of 2 parts sand and 1 part of cement, and allow the block to stand for at least 24 hours before removing the mould and crosspiece.
- (k) Next day, dampen the block and smooth off the sides of the block with a mixture of 2 parts of sand and 1 of cement.

Foundation

OFF-SET MOUNTING

The mould for the concrete base for off-set mounting is the same as for the "over-the-well" installation, but a different foundation bolt cross piece is used.

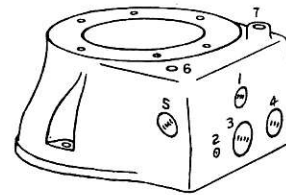
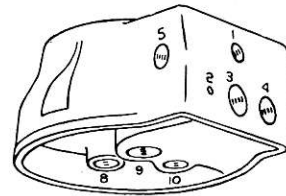
To make the foundation bolt cross piece proceed as follows:—

- (a) Nail a soft pine block, 7in. of 3in. x 1in. timber, in the centre of a 2ft. length of 3in. x 1in. timber, lining up the sides and using only one nail for attaching. From the centre, mark out a distance of 5½in. each way across the centre line of the timber and at these points drill ⅜in. diameter holes.
- (b) Place the two foundation bolts through the foundation bolt cross piece, so that the heads of the bolts are on the same side as the block, and screw on the nuts until the distance from the face of the timber to the end of the bolt is ¾in.
- (c) Nail the cross piece to the mould, so that the pump, when mounted, will face in the required direction for attaching piping.
- (d) Level the top of the mould and peg the extension of the mould so that it will not move when the concrete is poured in.
- (e) Fill the mould with concrete, consisting of a mixture of 4 parts of stone or rubble, 2 parts of sand, and 1 part of cement. Arrange some steel bars in the bottom of the foundation and throughout the block to act as a reinforcement. When filling the mould, ram the concrete well, being careful not to disturb the mould. Make sure the concrete is well packed under the timber cross piece.
- (f) When the mould is filled, smooth off the top of the concrete with a mixture of 2 parts of sand and 1 part cement, and **allow the block to stand for at least 24 hours** before removing the mould and cross piece.
- (g) Next day, dig out the pine block left in the concrete, and dampen the block. Smooth off the sides of the block with a mixture of 2 parts of sand and 1 part cement.

Piping

Details of the screwed holes into which connections are made are as shown in the illustration, "Connection Holes in Pump Base".

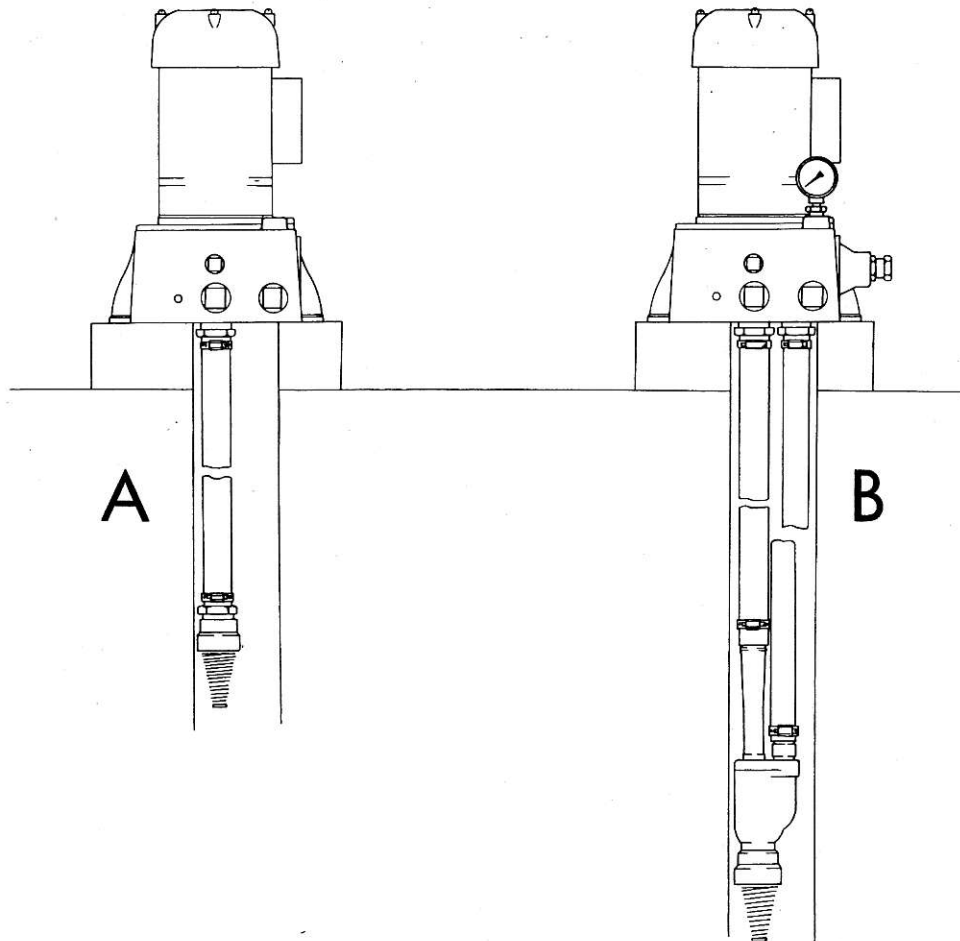
1. Discharge connection (1in. B.S.P.).
2. Suction fitting—water pressure unit (¼in. B.S.P.).
3. Suction pipe connection—off-set mounting (1½in. B.S.P.).
4. Ejector driver pipe connection—off-set mounting (1¼in. B.S.P.).
5. Discharge connection (1in. B.S.P.)—[alternative to (1)].
6. Pressure switch connection—water pressure unit (¼in. B.S.P.).
7. Pressure gauge and priming adaptor (¾in. B.S.P.).
8. (Permanently plugged.)
9. Suction pipe connection—"over-the-well" installation (1½in. B.S.P.).
10. Ejector driver pipe connection—"over-the-well" installation (1¼in. B.S.P.).



Connection Holes in Pump Base

"OVER-THE-WELL" INSTALLATION

For suction lifts up to 20ft., when an ejector is not used, the suction connection is made into the suction hole in the bottom of the pump base. On to each end of the suction pipe, fit a 1½in. end connector, and tighten the hose clips. The footvalve screws on to one end of this pipe and the other end screws into the suction hole in the bottom of the pump base. Turn the pump on its side to screw in the suction pipe. Place the footvalve end of the suction pipe in the well and feed down the pipe until the pump unit can be set on the foundation. Screw on the foundation bolt nuts, and tighten.



(A) *Shallow Well Installation*
(Up to 20ft. Suction)

(B) *Installation Incorporating an Ejector.*
(Up to 100ft. Suction)

Over the Well Installation

When an ejector is used in "over-the-well" installations, the suction connection is made into the $1\frac{1}{2}$ in. B.S.P. hole in the bottom of the pump base and the ejector driver pipe into the $1\frac{1}{4}$ in. B.S.P. hole. The lengths of polythene pipe should be run out from the coils and placed side by side. Fit the $1\frac{1}{2}$ in. and $1\frac{1}{4}$ in. end connectors on to one end of each length of pipe and tighten the hose clips.

Cut off the ejector driver pipe to the required length, so that, when installed, the ejector will be submerged below the lowest pumping level, and also that the footvalve will be at least two feet from the bottom of the well. Screw the end connectors into the base of the pump, and tighten.

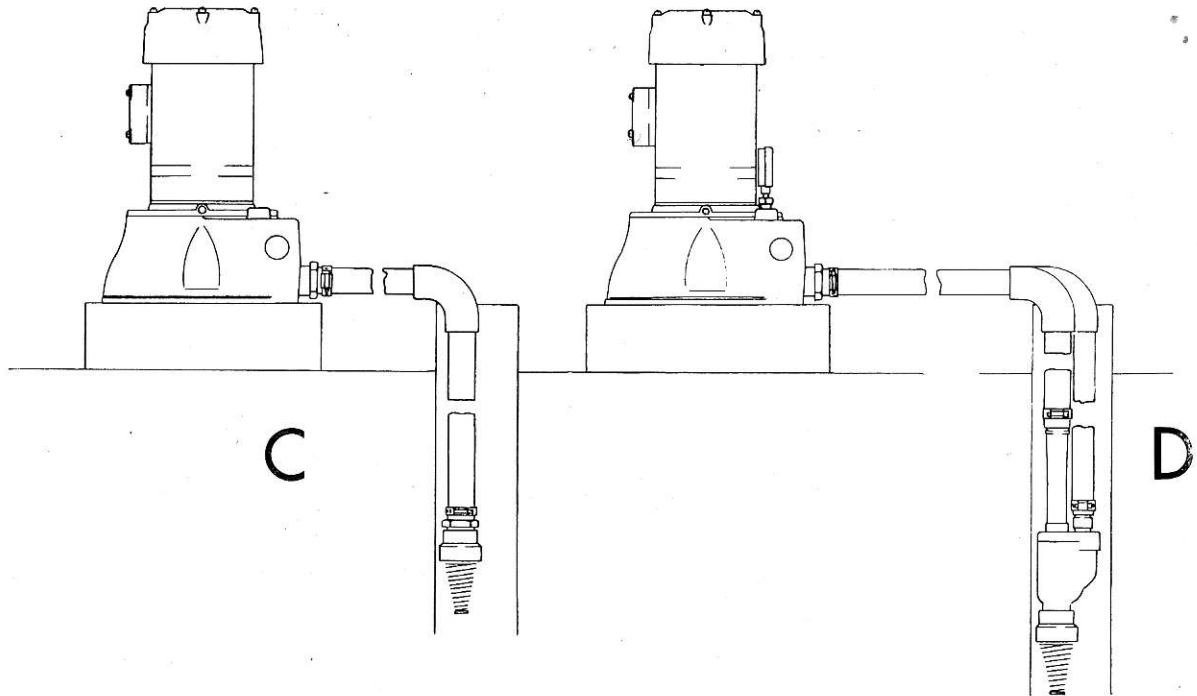
Slide the hose clips on to the pipes, and fit the $1\frac{1}{2}$ in. pipe on to the ejector venturi, so that the pipe fits over the

first three ribs, and comes up to the fourth rib. Clamp the hose clip tightly between the second and third ribs.

After checking that the two pipes are lying together, cut the ejector driver pipe to length. This pipe should be sufficiently long so that, when fitted over the first rib, and up to the second rib of the ejector driver pipe connector, the two well pipes still lie together. Fit the pipe to the ejector driver pipe and clamp the hose clip tightly between the two ribs.

Screw the footvalve on to the ejector body and tighten.

Place the ejector into the well and feed the pipes down until the pump unit can be set on the foundation. Screw on the foundation bolt nuts, and tighten.



(C) *Shallow Well Installation.*
(Up to 20ft. Suction)

(D) *Installation incorporating
an Ejector.* (Up to 100ft. Suction)

Offset Mounting Installation

OFF-SET MOUNTING INSTALLATION

In off-set mounting installation, all connections are made into the side of the pump base, the pump being connected to the well by horizontal piping. In the horizontal piping a gradual slope downwards towards the well is desirable, to eliminate air pockets. Polythene pipes should be supported over their length, either by a bank of earth or by a timber frame.

For suction lifts up to 20ft., when an ejector is not used, the suction connection is made into the $1\frac{1}{2}$ in. B.S.P. hole in the side of the pump base.

Mount the pump unit on the foundations and tighten the foundation bolt nuts. From the coil of pipe, cut off the horizontal pipe to connect the pump to the top of the well, and the well pipe of sufficient length to allow the footvalve to be submerged below the lowest pumping level when installed.

A galvanised $1\frac{1}{2}$ in. F. & F. bend is used to join the two pipes. Into the ends of the bend screw the $1\frac{1}{2}$ in. end connectors and tighten. Fit the horizontal pipe and the well pipe on to the end connectors, and tighten the hose clips. Screw the footvalve on to the well pipe connector and lower the footvalve end of the pipe into the well.

Screw a $1\frac{1}{2}$ in. B.S.P. end connector into the side of the pump base and on to this connection fit the horizontal pipe. Tighten the hose clip.

When an ejector is used in off-set mounting installations, the suction connection is made into the $1\frac{1}{2}$ in. B.S.P. hole in the side of the pump base, and the ejector driver pipe into the $1\frac{1}{4}$ in. B.S.P. hole.

Mount the pump unit on the foundation and tighten the foundation bolt nuts. The lengths of polythene pipe should be run out from the coils and placed side by side. From these pipe lengths, cut off the horizontal pipes to connect the pump to the top of the well, and the well pipes of

the required lengths, so that when installed the ejector will be submerged below the lowest pumping level, and also that the footvalve will be at least two feet from the bottom of the well.

Galvanised $1\frac{1}{4}$ in. B.S.P. and $1\frac{1}{2}$ in. B.S.P. F. & F. bends are used to join the well pipes to the horizontal pipes. Into the ends of the bends, screw the end connectors and tighten. Fit the horizontal pipes and well pipes on to the end connectors in the bends and tighten the hose clips.

Lay the pipes so that the bends coincide, and the well pipes are lying together, and fit the $1\frac{1}{2}$ in. pipe on to the ejector venturi, so that the pipe fits over the first three ribs and comes up to the fourth rib. Clamp the hose clip tightly between the second and third ribs.

Cut the ejector driver pipe to length, so that, when fitted over the first rib and up to the second rib of the ejector driver pipe connection, the two well pipes still lie together. Fit the pipe to the ejector driver pipe and clamp the hose clip tightly between the two ribs.

Screw the footvalve on to the ejector body, and tighten.

Place the ejector into the well and feed the pipes down into position.

Screw the suction and ejector driver pipe connectors into the $1\frac{1}{4}$ in. and $1\frac{1}{2}$ in. openings in the side of the pump base, and tighten. On to these connectors fit the horizontal pipes and tighten the hose clips.

Discharge Piping

In all installations, the discharge pipe is connected into one of the 1in. B.S.P. discharge holes in the side of the pump base.

Pressure Gauge

Into the $\frac{3}{4}$ in. B.S.P. hole, in the top of the pump base, screw the pressure gauge adaptor, and into this fitting screw the pressure gauge.

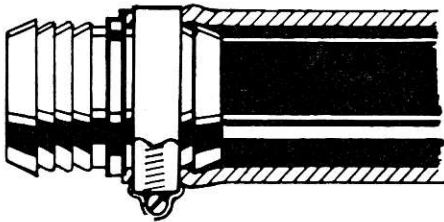
CONNECTING PIPE TO FITTINGS

When connecting polythene pipe to fittings in the installation of the pump unit, the following procedure should be adopted:—

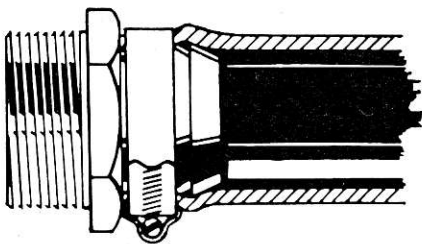
1. Cut the end of the pipe square, using a sharp knife or hacksaw.
2. Place the hose clip on the pipe and slide it back along the pipe.
3. Immerse the end 2 or 3 inches of the pipe in **boiling** water for about three minutes. Then push the softened end over the serrations of the pipe fitting.

NOTE: Hot water is not good enough—it must be boiling. If available, a handful of common salt added to the water will raise the boiling point and produce a better softening.

4. Allow the pipe to cool before sliding the hose clip into position. On pipe joiners and end connectors, there are four serrations, the end one being larger than the other three. Before tightening the clip, position it over the three parallel serrations.



Pipe Joiner



End Connector

Connecting Pipe to Fittings

5. When putting polythene pipe into fittings, on no account should pipe jointing compounds, gasket cement, detergents or petroleum lubricants be used. Pipe jointing compound should be used on all screwed threads to make air-tight joints.
6. Polythene pipe should not be installed so that it is bent into a smaller radius than that of the coil in which it was supplied.
7. Standard galvanised pipe fittings with female ends are used by screwing end connectors into the fittings. End connectors should be tightened into the galvanised fittings before connecting polythene piping.

Automatic Pressure Control Valve

The automatic pressure control valve is used in all installations incorporating an ejector. With an ejector the control valve prevents water from being discharged until the required operating pressure is reached at the commencement of each pumping cycle and when used in conjunction with a water pressure tank, the automatic pressure control valve also prevents water from syphoning from the unit, should a heavy demand require more water than is available from the unit. The control valve must be adjusted for each installation.

To fit the automatic pressure control valve in the pump body, proceed as follows:—

- (a) Unscrew the four nuts around the pressure control valve hole cover plate on the pump base and remove the spring washers and cover plate.
- (b) Fit the valve section of the pressure control valve assembly into the valve seat in the pump body, and locate the diaphragm over the four studs in the pump body.
- (c) On to the spindle section of the control valve protruding, fit the ~~inner and outer~~ valve springs.
- (d) Locate the end of the valve adjusting screw in the ~~outer~~ spring and fit the pressure control valve cover plate over the four studs in the pump body.
- (e) Replace the spring washers and nuts, and tighten.

Priming

When the installation of the jet pump has been completed, the pump and piping must be primed with water to exclude air before starting. To prime the system, proceed as follows:—

- (a) Remove the bleeder hole plug from the cover plate. On motor driven units, the bleeder hole is situated at the outside of the cover plate. On engine driven units, the bleeder hole is situated on top of the cover plate, at the breather end of the engine.
- (b) Screw out the adaptor with the pressure gauge.
- (c) Pour water into the priming plug hole until it runs from the bleeder hole free from bubbles.
- (d) Replace the bleeder hole plug, pressure gauge, and adaptor.

Electrical Connections

All electrical connections must be made by a qualified electrician, and approved by the local Electricity Supply Authority.

OPERATION

Starting

ENGINE AND ELECTRIC MOTOR DRIVEN UNITS

Jet Pump units, not fitted with an ejector, will deliver water when the motor is switched on or the engine started. To start the engine, follow the starting procedure as shown in the engine section of this manual.

IMPORTANT.—When a motor driven pump is used as a centrifugal pump without an ejector or pressure tank, the pump must have a minimum head of 30 lbs./sq. in. or a maximum discharge of 1700 gallons per hour, otherwise the motor will be overloaded.

To start a pump unit incorporating an ejector, for the first time, and to adjust the discharge, proceed as follows:

1. Screw the control valve adjusting screw inwards to close the valve.
2. Start the unit and allow the water to circulate through the installation.

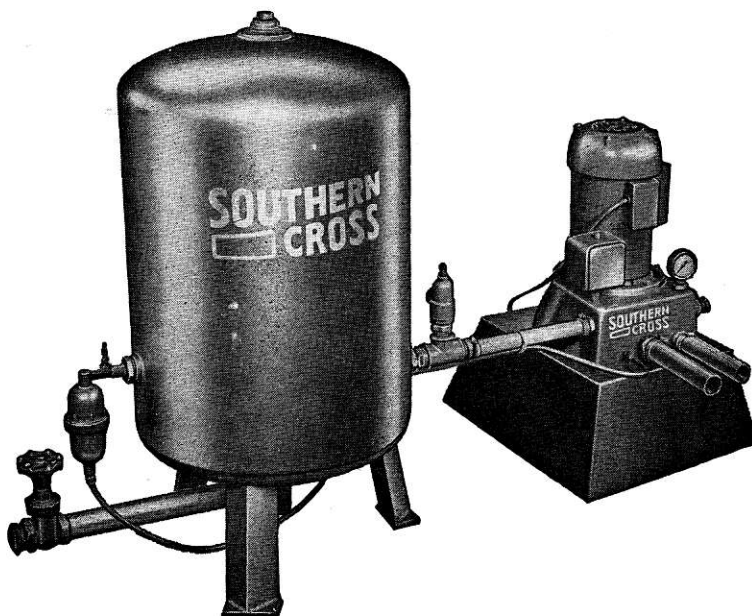
3. Screw the control valve adjusting screw outwards slowly, until the point of maximum discharge is reached.
4. Lock the control valve in this position by tightening the locknut.

Important:

A mechanical seal is fitted in the pump between the impeller and the cover plate.

The ceramic section of the mechanical seal should not be interfered with or removed from the cover plate, unless it is cracked or broken. To replace a broken seal:—

- (a) Dip the ceramic seal and its rubber seating in lubricating oil.
- (b) Press seal **gently** into position in the cover plate, keeping it square as it is being pressed in.



*A Typical Southern Cross Jet Pump Installation,
Incorporating a 30 Gallon Pressure Tank*

AUTOMATIC WATER PRESSURE UNIT

Installation

Assemble the accessories to the tank as shown on the installation diagram, using a good quality jointing compound on the screwed threads to ensure air-tightness.

A 3ft. length of polythene piping is supplied to connect the pump to the pressure tank, but this pipe may be shortened, if required, to allow the pressure tank to be installed closer to the pump.

The larger sizes of pressure tanks (30, 45, and 60 gallons) have an air charging hole (9/16in. diameter) in the side near the air volume control connection, as these tanks are used in other installations. In jet pump installations, air charging is done through the valve in the air volume control, and for this reason the hole in the pressure tank must be sealed. To do this, proceed as follows:—

- From the carton of fittings, take the $\frac{3}{4}$ in. x $\frac{1}{8}$ in. galvanised bolt, two $\frac{3}{8}$ in. galvanised washers, and two rubber sealing washers.
- On to the bolt, fit a galvanised washer and a rubber sealing washer, so that the smaller diameter of the sealing washer points away from the bolt head.
- Fit the bolt and washers through the 9/16in. hole from the inside of the pressure tank.
- Over the bolt fit the second rubber sealing washer and galvanised washer so that the smaller diameter of the sealing washer is towards the pressure tank.
- Screw on the nut and tighten securely. When screwing the air volume control into the reducing bush in the pressure tank, a spanner must be used on the hexagon section of the control valve, otherwise this assembly may be damaged if screwed in by hand.

To connect the air volume control to the pump suction, the following procedure must be adopted:—

- Unscrew the $\frac{1}{4}$ in. B.S.P. plug from the suction hole in the pump body.

- Into this hole screw the brass suction line fitting supplied with the air volume control, and tighten.
- Remove the tube locking nuts from the suction line fitting and from the bottom of the air volume control.
- On to each end of the polythene pipe, fit a tube locking nut, with the threaded section towards the end of the tube.
- Soften one end of the polythene pipe for a distance of approximately 1in., using the same method as mentioned in section, "Connecting Pipe to Fittings"—Page 5.
- Push the softened end of the tube on to the tapered section of the suction connection, up to the shoulder.
- Screw the tube locking nut tightly on to the fitting **by hand**.
- Repeat the above fitting procedure for the air volume control connection.

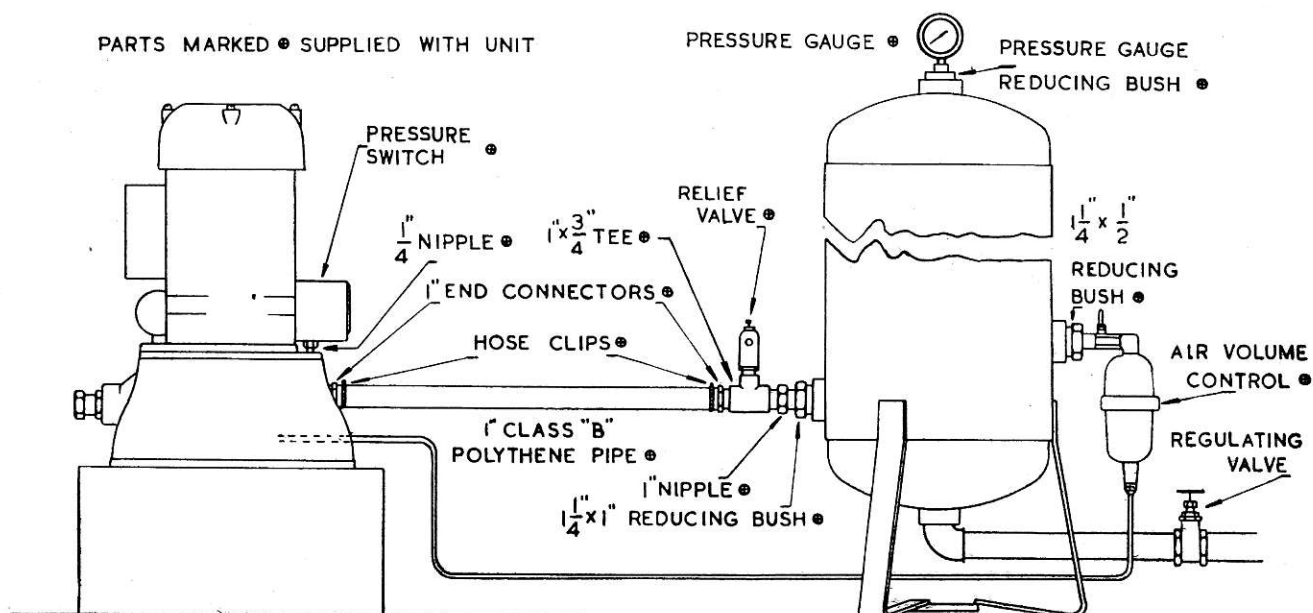
Starting

When the installation of the pressure tank is complete, allow the pump to operate with the gate valve on the discharge pipe from the pressure tank closed. When water is seen to flow into the air volume control, stop the pump.

Introduce air into the system through the air charging valve in the air volume control, using a hand pump or a small air compressor. When the pressure gauge registers the cut-in pressure—20 lbs./sq. in.—stop the air pump and disconnect.

Switch on the pump, and at the same time turn on two or three taps on the service line. Regulate the gate valve on the pressure tank discharge line so that the pressure gauge registers a slight gain in pressure. Turn off the taps.

The automatic water pressure unit is now ready for operation.



Water Pressure Tank Installation

ENGINE

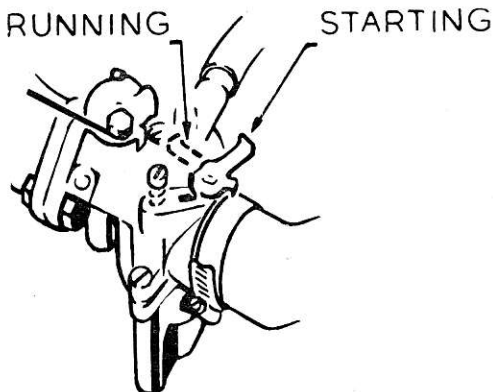
OPERATING INSTRUCTIONS

Preparing Engine for Use

1. Fill the tank with petrol—either “standard” or “super grade” can be used. **DO NOT MIX ANY OIL WITH THE PETROL.**
2. Unscrew the oil filler plug from the crankcase and pour in SOUTHERN CROSS Motor Mower Oil—S.A.E. 40—until it is up to the bottom thread in the filler hole. Replace plug.
If SOUTHERN CROSS Oil is not available, refer to Page 9 of this manual for alternative lubricating oil recommendations.

To Start Engine:

1. Shift fuel cock to “On” position. To do this, slide knurled sleeve away from fuel tank.
2. Press the ignition switch down to the “On” position.
3. Shift the choke control to the “Starting” position, as shown on the illustration below.



4. Lift the starting handle out to the winding position (see illustration) and wind the handle in an anti-clockwise direction until the starter is fully wound.
5. Fold the handle back, and press down. The engine will be cranked.
6. As soon as the engine commences to run, open the choke by turning the choke control to the “Running” position.
7. **HOT ENGINE:** If the engine has been running and is still hot, use the starting procedure shown above, except that it should not be necessary to close the choke.

To Operate:

The setting of the engine speed control lever determines the speed at which the engine will govern.

The engine speed is set at the factory, and should not be adjusted in any way.

To Stop Engine:

1. To stop the engine, raise the ignition switch to the “Off” position.
2. Shift fuel cock to “Off” position by sliding the knurled sleeve towards the fuel tank.

Failure to Start:

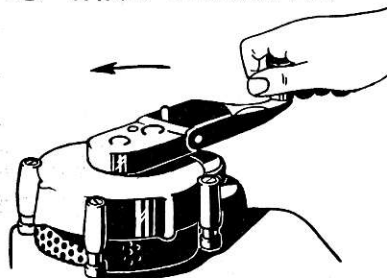
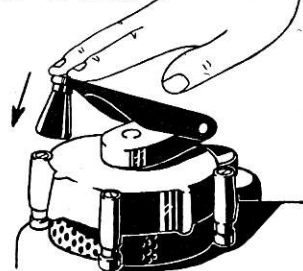
If the engine fails to start after repeated attempts have been made, using the correct starting procedure (“To Start Engine”, Page 8), this may be caused by:—

Ignition System — Fault and Remedy:

- (a) No spark at plug—check that ignition switch is in “On” position.
- (b) No spark at plug—clean and adjust spark plug gap to .025in. If still faulty, try new plug.
- (c) Magneto contacts dirty or out of adjustment—clean and set points at .012in.
- (d) Faulty ignition cable—examine for faulty insulation or loose connection and, if necessary, renew cable.

Fuel System — Fault and Remedy:

- (e) No petrol in tank—refill.
- (f) No petrol in carburettor—clean petrol strainer on fuel cock.
- (g) Jet in carburettor clogged, or dirty carburettor—dismantle and blow obstruction out of jet.
- (h) Carburettor flooding—clean float valve.
- (i) Air filter choked—unclip wire clips on the air filter and remove the end cap and filter element. Clean the element by giving the plastic ends a few gentle taps. Re-fit the element. Should it become necessary to replace the element, when ordering, specify that the element is for a Bendix Type “K” air filter.
- (j) Incorrect use of choke—see illustrations to start engine.

TO WIND STARTER**TO START**

CARE AND MAINTENANCE

Lubrication:

Once Daily or After Every 4 Hours' Use:

Remove the oil filler and check the oil level. Keep the oil level up to the bottom thread in the filler plug hole. Never remove the filler plug while the engine is running.

After Every 100 Hours' Use:

The oil in the crankcase is to be changed after the first 20 hours' use, and, from then on, after every 100 hours' use. Remove the oil filler and drain plugs, and catch the oil in a tin. When all oil has drained out, refit drain plug.

Fill crankcase to the bottom thread in the filler plug hole with fresh oil.

The recommended oil for this engine is **SOUTHERN CROSS Motor Mower Oil—S.A.E. 40**—(obtainable from the nearest Southern Cross Distributor). If Southern Cross Oil is not available, any other S.A.E. 40 Detergent Type Lubricating Oil which is recommended by any reputable oil company for service conditions classified by the American Petroleum Institute as **Service MM** may be used. S.A.E. 40 oils for MS, DG, DM, or DS Service can also be used.

Spark Plug:

Examine the plug regularly. Keep the insulator and points clean and set to the correct gap (.025in.).

Fan Screen:

Any material which lodges around the fan screen under the starter should be brushed away so the supply of cooling air to the engine is not restricted. Failure to keep the screen clean may result in the engine overheating.

Magneto:

Checking Magneto For Spark:

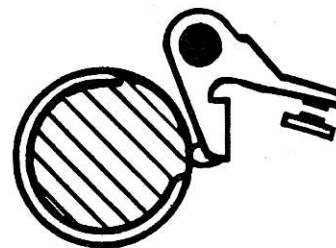
If the engine fails to start and it appears that the magneto is at fault:—

- Pull the lead from the spark plug and insert a large nail or similar metal part into the protective cap to provide an external contact. Hold this part about 1/16in. away from some unpainted portion of the frame or engine. Rotate the engine and a spark should jump this gap. If there isn't a spark:—
- Check spark plug lead to see that it is not broken and that the insulation is not faulty.
- If the lead is in good order, it will be necessary to remove the flywheel and examine the magneto.

Check Magneto Breaker Points:

To examine the magneto, proceed as follows:—

- Remove the four setscrews holding the wind-up starter in position and remove the starter. Lift off the screen.
- Undo the setscrew holding the wind-up starter cup in position and lift it off.
- Undo the screws holding the flywheel cowl in position and lift it off. It is not necessary to disconnect the fuel tank to do this.
- The flywheel is fitted on a taper and it will probably be necessary to use a puller to remove it. When the flywheel is removed, the magneto will be exposed.



- Turn the engine over until the points are fully open. (See illustration.)
- Examine the points to see if they are dirty or pitted. If they are, clean them before checking the gap. If the points are badly pitted it will be necessary to remove them and polish the contact surfaces with a fine carborundum stone.
- Test gap between points with feeler gauge. The correct gap is .012in. If the points require adjustment, slacken the larger of the two screws beside the points, then carefully turn the small screw, which is eccentric, until the correct gap is obtained. Tighten large screw.
- Reassemble the engine and check again for spark, as shown above. If there isn't a spark, or if it is weak, the engine should be taken to a recognised Electrical Service Agent to have the magneto overhauled. To remove the engine from the pump unit, undo the four nuts from the studs holding the engine adaptor plate to the pump base, and lift off the engine, adaptor plate, and impeller.

Carburettor:

Carburettor Adjustments:

The carburettor has a fixed main jet and does not require adjustment.

The air adjusting screw has been correctly set at the Factory and should not require adjustment. If this screw is altered, the idling of the engine will be affected.

Flooding:

This may be caused by dirt in the float needle valve seating. To correct this, remove the float chamber bowl from the carburettor and clean the needle valve. Also make sure that the float is not punctured.

Valve Timing:

If the engine is ever dismantled, it will be necessary to correctly re-engage the crankshaft pinion with the camshaft gear when reassembling. To do this, turn the camshaft in the normal direction of rotation until the exhaust valve has opened and has just closed. At this point it will be found that, if the camshaft gear is turned any further in the normal direction of rotation, the inlet valve starts to open, whereas, if it is turned backwards, the exhaust valve starts to open. By moving the camshaft gear backwards and forwards, and watching the "rocking" of the valves as they open, select the midway position and leave the camshaft in this position.

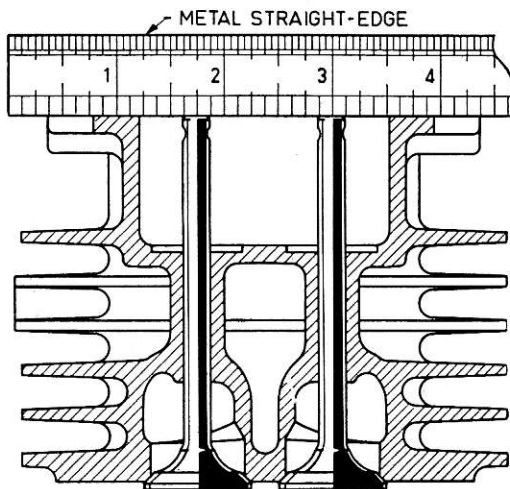
When sliding the crankshaft into position, hold it so the crankpin is at its nearest position to the cylinder. Later, when the connecting rod and piston have been refitted, recheck the timing. If the camshaft gear and crankshaft pinion are correctly engaged the valves should be at the midway "rocking" position when the piston is at the top of its stroke.

IMPORTANT: If the cylinder is removed from the crankcase, make sure the cylinder base gasket, No. 37, is refitted when the cylinder is replaced. This gasket provides the necessary clearance between the valve tappets and valves, so it must always be fitted. Never fit a gasket of different thickness, or fit more than one gasket.

Valve Grinding:

If the valves are re-ground at any time, it is important to check the length of the valve stems after grinding, as shown in the illustration below.

If the ends of the valve stems are not in line with the straight-edge, lightly grind or file them until they are. The length of the valve stems must be corrected in this manner, otherwise the necessary clearance between the valve tappets and valves will not be provided and the running of the engine may be affected.



Magneto Timing:

The magneto timing is set at the Factory and should not be altered. If the magneto is ever removed, the timing can be reset by lining up the marks at the edge of the stator plate assembly. If a new magneto is fitted, position the stator plate assembly so the points are just starting to open when the top of the piston is $\frac{1}{4}$ in. before the top of the stroke.

Wind-up Starter:

Should it ever be necessary to carry out maintenance on the wind-up starter, the following procedure should be adopted:—

To Dismantle Starter:

- (a) Unscrew the four countersunk screws around the outside edge of the starter, and lift the starter from the engine.
 - (b) Unscrew the screw in the centre of the spring hub, on the under side of the starter, and remove the handle.
 - (c) Lift out the spring hub.
 - (d) Remove the two screws holding the spring hub retainer and lift off the retainer.
 - (e) Unhook the retainer spring from the spring hub retainer and lift out the starter dog.
 - (f) Unscrew the four screws retaining the spring keeper, and lift the spring and spring keeper out of the starter body.
- (Caution:** Do not remove the starter spring from the spring case, as this could cause serious injury.)
- (g) Remove the dog pivot fastener retaining the release and off-set release dogs and lift these and the release dog spring from the handle.

To Reassemble Starter:

- (a) Replace the starter dog in the spring hub, so that the dog will pull in almost to the edge of the spring hub.
- (b) Attach the retainer spring to the retainer.
- (c) Replace the retainer on the spring hub, so that the starter dog protrudes through the retainer, and the slots in the retainer locate correctly on the spring hub. Insert the two screws, and tighten.
- (d) Place the spring keeper and spring round the spring hub, and work the looped inner end of the spring into one of the three grooves in the spring hub.
- (e) Insert the shaft section of the spring hub through the housing, guiding the looped outer end of the spring over the peg in the housing. Press down on the spring keeper and the spring hub, and these parts will locate correctly in the housing.
- (f) Replace the release and off-set release dogs and spring in the handle assembly and slide the circlip into position to retain the dogs.
- (g) Insert the inner shaft through the shaft section of the spring hub. The release dog which operates on the ratchet section of the housing must be pulled back hard against the spring so that the handle can travel into its correct position. Replace the screw in the centre of the spring hub, and tighten.
- (h) Replace the four spring keeper screws and washers around the housing.
- (i) Mount the starter on the engine and replace the four countersunk head screws, using the countersunk shake-proof washers under the heads of the screws.

OVERHAULING ENGINE:

The following instructions apply whenever the engine is being overhauled:—

1. Replace parts when worn to sizes shown below:—

Crankshaft: Crankpin size worn to 1.123in. Diam., regrind to 1.115in. Diam. and fit .010in. under-size connecting rod.

Crankpin size worn to 1.113in. Diam., regrind to 1.105in. Diam. and fit .020in. under-size connecting rod.

Connecting Rod: Big End Bearing worn to 1.129in. Diam.

Crankshaft Bearing Plate: Bearing size worn to 1.004in. Diam.

Piston: Piston Skirt measured at right angles to Gudgeon Pin worn to 2.4875in. Diam. Also piston to be repaired or replaced when side clearance on new piston ring fitted in piston grooves is .005in.

Cylinder: Bore worn to 2.505in. Diam.

Piston Rings: Fit new rings when end gap exceeds .025in. measured in bottom of cylinder bore. End gap in new piston rings fitted in new cylinder to be .006in.-.009in. (See Section, "To Fit Cords Rings".)

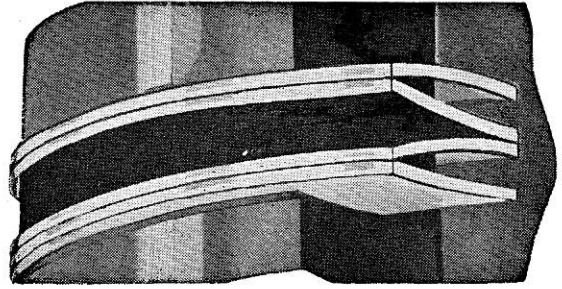
2. Adjust crankshaft end clearance to .003in. to .012in. by varying thickness of gaskets under crankshaft bearing plate.
3. Connecting Rod Setscrews and Cylinder Head Nuts should be tightened with a Tension Wrench.
Setting: 14ft. lbs. Threads to be oiled before tightening.
4. The top of the valve tappets must be flush with the machined face of the crankcase. The bottom of the valve stems must be flush with the machined face of the cylinder. The cylinder base gasket, No. 37, must be fitted between the cylinder and crankcase. Never fit gasket of different thickness or more than one gasket.
If the above points are not correct, the necessary clearance will not be provided between the valve tappets and valves.
5. Assemble governor linkage and make sure it is free before fitting governor spring.
6. Make sure tabs are turned up on Connecting Rod Setscrew Tab Washer and Lubricating Oil Dipper Setscrew Tab Washer. Always fit new tab washers when making an overhaul.

TO FIT CORDS RINGS:

When fitting rings to the piston, the Cords Rings are fitted first, and they are fitted only in the bottom ring groove in the piston. Do not fit them in any other groove.

Special care must be taken to see that the segments are fitted correctly. Each segment is "dished" or "cupped", and to determine which is the "cupped" side, place segment on a flat surface and press a finger on it at one point. If the segment remains flat, the "cupped" side is facing downwards, but if the free part of the segment rises, the "cupped" side is facing upwards. (Refer illustration, "Cupped Sides of Cords Segments".)

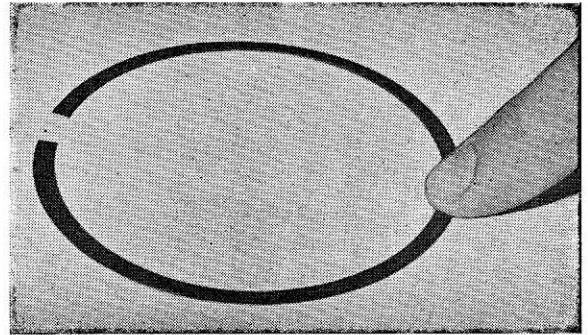
The first segment is put on with the cupping upwards, the second with the cupping downwards, the third upwards, and the fourth downwards. (Refer illustration, "Cords Segments in Piston Groove", which shows a sectional view.)



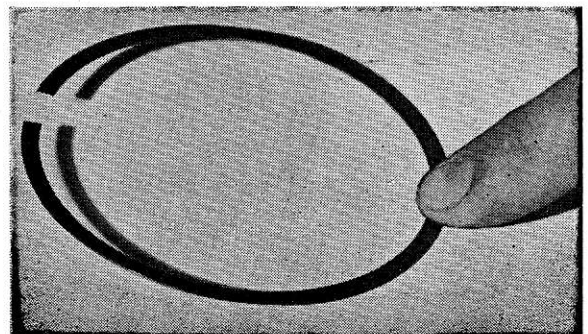
"Cords" Segments in Piston Groove

To fit Cords Segments to the piston, do not spring them open and slide them on using metal strips as for the other rings. Insert one end of the segment into the groove, allowing the remainder of the segment to lie naturally. Then simply "wind" segment into the groove. Repeat this procedure with each segment, taking care not to cross segments, and also see that the cupping is correct. All gaps in the segments should be in line with the gudgeon pin ends. Place gap in first segment over the end of the pin. Place gap in second segment over the opposite end of the pin, and alternate each succeeding gap in this manner.

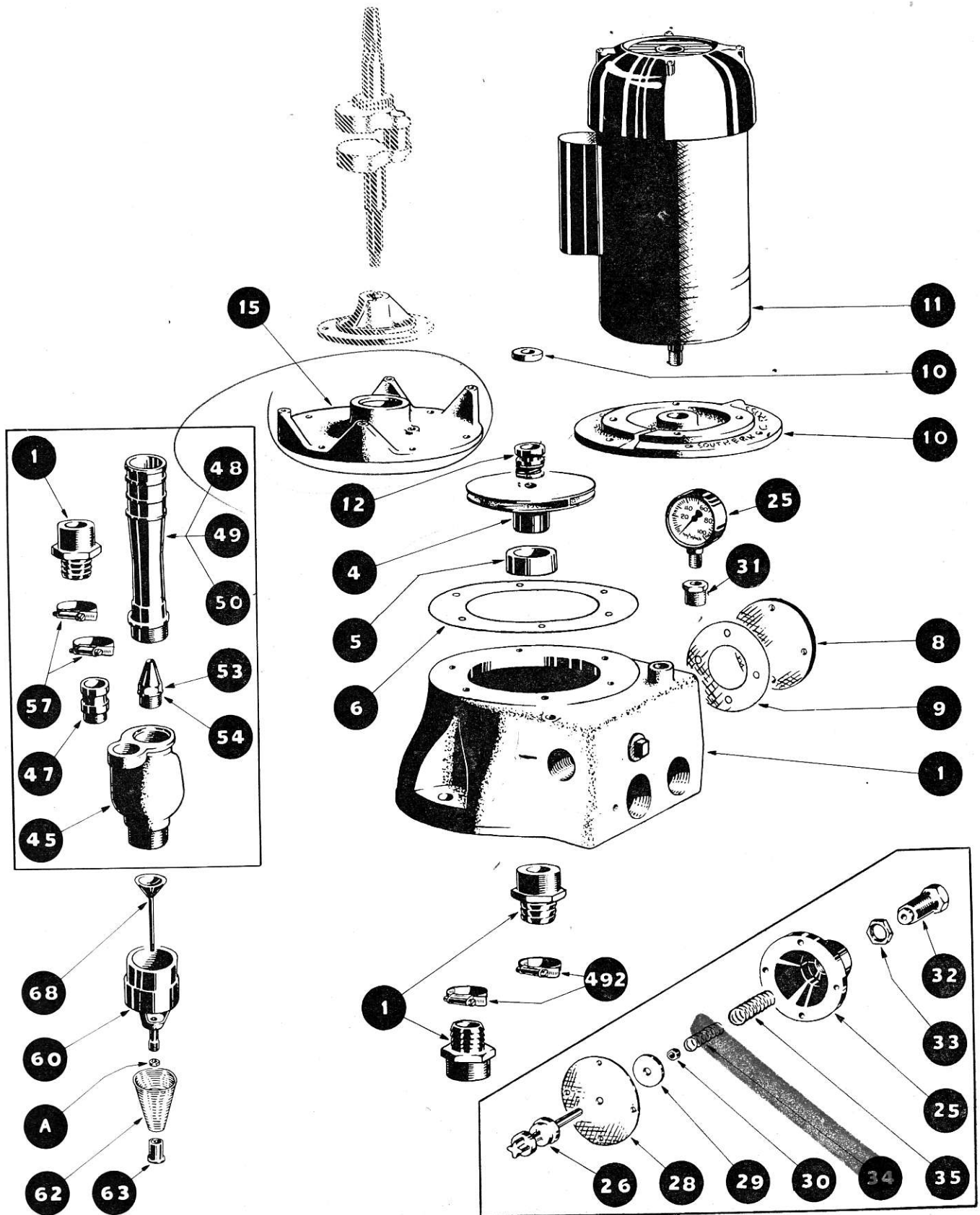
Cupped Sides of "Cords" Segments



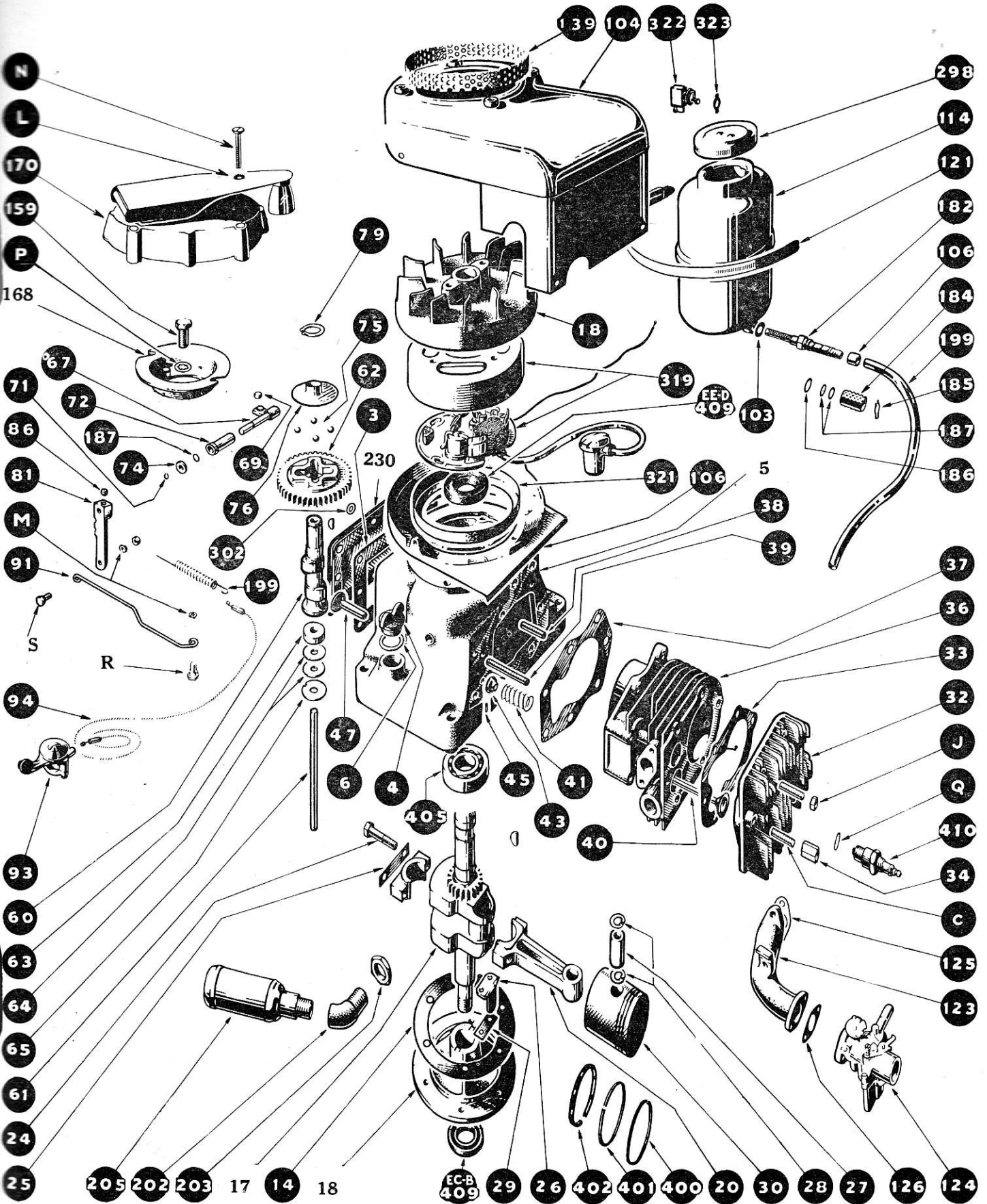
Cupped Side Downwards



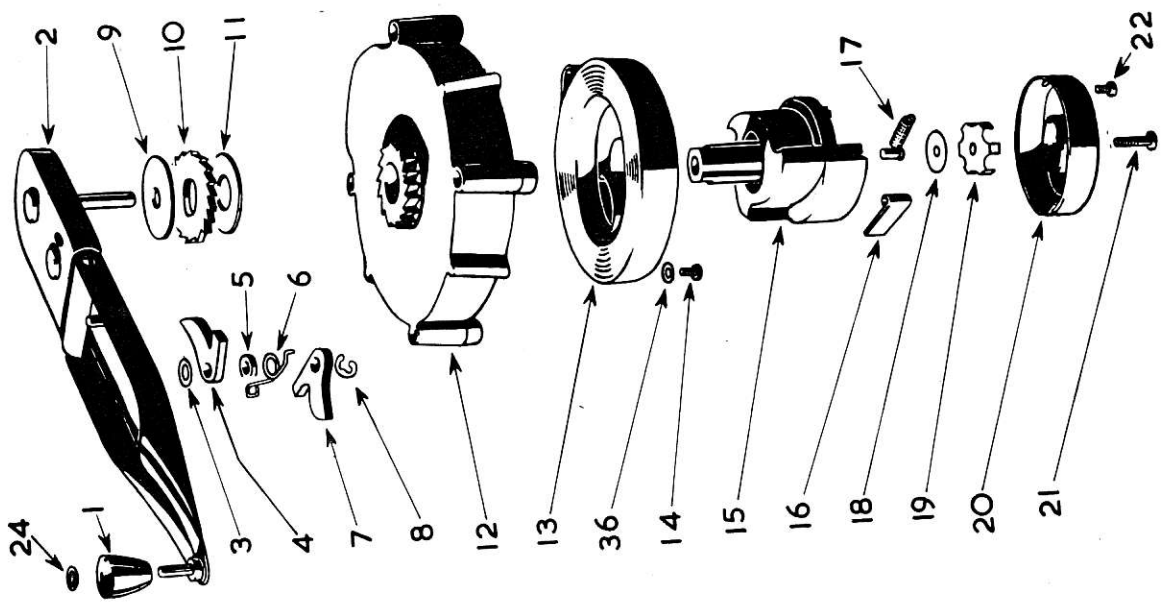
Cupped Side Upwards



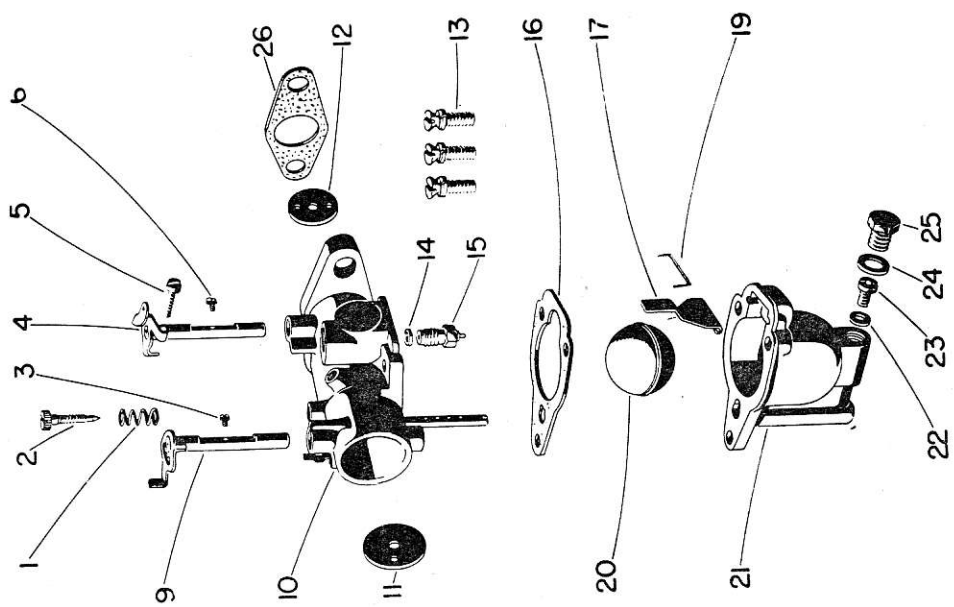
Pump Parts



Mark EC-B Petrol Engine Parts



Wind-Up Starter Parts



"Zenith" AH914 Carburettor Parts

PARTS LIST

PUMP, FOOTVALVE and STRAINER

No. off	Symbol No.	Name of Part
1	LS-C 1	Pump Body.
2	KQ-F 1	Footvalve Suction Pipe Connector.
1	LS-C 4	Pump Impeller.
1	LS-C 5	Pump Impeller Sealing Ring Bush.
1	LS-C 6	Pump Cover Plate Gasket.
1	LS-C 8	Pressure Control Valve Hole Cover Plate.
1	LS-C 9	Pressure Control Valve Hole Cover Plate Gasket.
1	HW-C 10	Water Slinger.
1	HW-C 12	Driving Shaft Seal.
1	HF-D 25	Pressure Gauge.
1	LS-C 31	Pressure Gauge Adaptor and Priming Hole Plug.
1	LS-C 60	Footvalve and Strainer Body.
1	LS-C 62	Footvalve Strainer.
1	LS-C 63	Footvalve Strainer Retaining Nut.
1	LS-C 68	Footvalve.
2	YB492B	Footvalve Suction Pipe Connection Clip.
1		Suction Pipe Hole Plug (1½in. B.S.P.).
2		Driver Pipe Hole Plug (1¼in. B.S.P.).
1		Pressure Gauge Hole Plug (¾in. B.S.P.).
1		Air Volume Control Plug (¼in. B.S.P.).
1		Pressure Switch Hole Plug (¼in. B.S.P.).
1		Priming Plug (¼in. B.S.P.).
6		Pump Body to Cover Plate Stud (1¼in. x 5/16in. — 18 U.N.C.).
4		Pressure Control Valve Cover Plate Stud (1in. x ¼in. — 20 U.N.C.).
2		Pump Foundation Bolts (4in. x ¾in. Whit.).
6		Pump Body to Cover Plate Stud Nut (5/16in. — 18 U.N.C.).
4		Pressure Control Valve Cover Plate Stud Nut (¼in. — 20 U.N.C.).
1	A	Footvalve Retaining Nut (3/16in. Whit. Brass "Nylor" No. NP/VO66).
6		Pump Body to Cover Plate Stud Washer (5/16in. x 3/32in. x 3/32in. Spring).
4		Pressure Control Valve Cover Plate Stud Washer (¼in. x 1/16in. x 1/16in. Spring).

PRESSURE TANK FITTINGS

2	KQ-D 1	Pump to Tank Pipe Connector.
1	HF-G 14	Pressure Gauge Reducing Bush.
1	HF-G 16B	Pressure Control Switch.
1	HF-G 17B	Relief Valve.
1	HF-D 25	Pressure Gauge.
2	KX-C 57	Pump to Tank Pipe Connector Clip.
1	LS-C 75	Air Volume Control Valve.
1	LS-C 76	Pump to Tank Pipe.
2	LS-C 77	Air Charging Hole Seal.
1		Pressure Tank Inlet Bush (1¼in./lin. B.S.P. Galv. Reducing Bush).
1		Air Volume Control to Pressure Tank Bush (1¼in./¼in. B.S.P. Galv. Reducing Bush).
1		Relief Valve Tee (1in./¾in. B.S.P. Galv. Tee).

PRESSURE TANK FITTINGS Cont.

No. off	Symbol No.	Name of Part
1		Tee to Pressure Tank Inlet Nipple (1in. B.S.P. Galv. Hex. Nipple).
1		Pressure Control Switch Nipple (¼in. B.S.P. Galv. Hex. Nipple).
1		Air Charging Hole Seal Bolt (¾in. x ¾in. Galv.).
2		Air Charging Hole Seal Bolt Washer (¾in. Galv. Plain).

EJECTOR ASSEMBLY and AUTOMATIC PRESSURE CONTROL VALVE

1	KQ-E 1	Pump Driver Pipe Connector.
1	LS-C 25	Pressure Control Valve Cover Plate.
1	LS-C 26	Pressure Control Valve.
1	LS-C 28	Pressure Control Valve Diaphragm.
1	LS-C 29	Pressure Control Valve Diaphragm Washer.
1	LS-C 30	Pressure Control Valve Diaphragm Nut.
1	LS-C 32	Pressure Control Valve Adjusting Screw.
1	LS-C 33	Pressure Control Valve Adjusting Screw Locknut.
1	LS-C 34	Pressure Control Valve Spring—Inner.
1	LS-C 35	Pressure Control Valve Spring—Outer.
1	LS-C 45	Ejector Body.
1	LS-C 47	Ejector Driver Pipe Connector.
1	LS-C 48	Ejector Venturi "R".
1	LS-C 49	Ejector Venturi "S".
1	LS-C 50	Ejector Venturi "T".
1	LS-C 53	Ejector Jet No. 1.
1	LS-C 54	Ejector Jet No. 2.
2	KX-C 57	Pump Driver Pipe Connector Clip (1), Ejector Driver Pipe Connector Clip (1).

ELECTRIC MOTOR DRIVE PARTS

1	LS-C 10	Electric Driven Pump Cover Plate.
1	LS-C 11	Electric Motor.
4		Electric Motor Mounting Screw (¾in. x 5/16in. — 18 U.N.C.).
4		Electric Motor Mounting Screw Washer (5/16in. x 3/32in. x 3/32in. Spring).

ENGINE DRIVE PARTS

1	LS-C 15	Engine Adaptor Plate.
1	LS-C 17	Engine Crankshaft.
1	LS-C 18	Engine Crankshaft Bearing Plate.
1	LS-C 19	Engine Speed Control Lever (not illus.).
6		Engine Crankshaft Bearing Plate to Crankcase Screw (¾in. x ¼in. — 20 U.N.C.).
4		Engine Mounting Stud (2¼in. x 5/16in. — 18 U.N.C.).
4		Engine Mounting Stud Nut (5/16in. — 18 U.N.C.).
4		Engine Mounting Stud Washer (5/16in. x 3/32in. x 3/32in. Spring).

PETROL ENGINE, MARK EC-B

No. off	Symbol No.	Name of Part	No. off	Symbol No.	Name of Part
1	EC-B 3	Crankcase Cover Plate Gasket.	1	EC-B139B	Fan Screen.
1	EF-C 4	Oil Filler Plug.	1	EC-B159B	Wind-Up Starter Cup Screw.
1	EC-B 5C	Crankcase Assembly.	1	EC-B168	Wind-Up Starter Cup.
1	EC-B 6B	Oil Filler Plug Washer.	1	EC-B170	Wind-Up Starter Assembly.
As req.	EC-B 14	Crankshaft Bearing Plate Gasket.	1	EU-C182	Fuel Stop Cock Assembly.
1	LS-C 17	Crankshaft.	1	EU-C184	Fuel Stop Cock Body Slide.
1	LS-C 18	Crankshaft Bearing Plate.	1	EU-C185	Fuel Stop Cock Body Circlip.
1	EC-B 18B	Flywheel.	1	EU-C186	Fuel Stop Cock Sealing Ring—Large.
1	LS-C 19	Engine Speed Control Lever.	3	EU-C187	Fuel Stop Cock Sealing Ring—Small (2); Governor Pad Arm Spindle Oil Seal (1).
1	EC-B 20	Connecting Rod.	1	EC-B198	Fuel Tank to Carburettor Tube Assembly.
2	EC-B 24	Connecting Rod Setscrew.	1	EC-B199	Fuel Tank to Carburettor Tube.
1	EC-B 25	Connecting Rod Setscrew Tab Washer.	1	ET-B199	External Governor Spring.
1	EC-B 26	Lub. Oil Dipper.	1	EC-B202	Silencer Elbow.
1	EC-B 27	Gudgeon Pin.	1	EC-B203	Silencer Elbow Locknut.
2	EC-B 28	Gudgeon Pin Circlip.	1	EC-B205	Silencer Assembly.
1	EC-B 29	Lub. Oil Dipper Setscrew Tab Washer.	1	EC-B215	Air Filter (not illus.).
1	EC-B 30	Piston.	1	EC-B230	Crankcase Cover Plate Assembly.
1	EC-B 32	Cylinder Head.	1	EU-C298	Fuel Tank Cap.
1	EC-B 33	Cylinder Head Gasket.	8	Y-C302	Crankcase Cover Plate to Crankcase Screw Washer.
2	EC-B 34	Cylinder Head Stud Nut—Long.	1	EC-B318	High Tension Lead Sealing Grommet (not illus.).
1	EC-B 36	Cylinder.	1	EC-B319B	Magneto.
1	EC-B 37	Cylinder Base Gasket.	1	EC-B321	Magneto Shield.
5	EC-B 38	Cylinder to Crankcase Stud—Short.	1	EC-B322	Magneto Earthing Switch.
2	EC-B 39	Cylinder to Crankcase Stud—Long.	1	EC-B323	Magneto Earthing Switch On-Off Indicator Plate.
1	EC-B 40	Valve—Inlet.	1	EE-D390	Spark Plug Spanner (not illus.).
2	EC-B 41	Valve Spring.	1	EC-B400	Piston Compression Ring—Top Groove.
1	EC-B 42	Valve—Exhaust.	1	EC-B401	Piston Compression Ring—Second Groove.
2	EC-B 43	Valve Spring Retainer.	4	EC-B402	Piston Oil Control Ring—Cords Segments for 2.500in. Dia. Bore.
2	EC-B 45	Valve Spring Retainer Pin.	1	EC-B405B	Crankshaft Main Bearing—Flywheel End.
2	EC-B 47	Valve Tappet.	1	EE-D409	Crankshaft Bearing Oil Seal—Flywheel End.
1	KX-C 57	Air Filter to Carburettor Clip (not illus.).	1	EC-B409	Crankshaft Bearing Oil Seal—Drive End.
1	EC-B 59	Camshaft Gear Key.	1	EC-B410	Spark Plug.
1	EC-B 60	Camshaft.	As req.	EC-B420	Connecting Rod (.010in. Undersize).
1	EC-B 61	Camshaft Spindle.	As req.	EC-B421	Connecting Rod (.020in. Undersize).
1	EC-B 62	Camshaft Gear.	1		Flywheel Key ($\frac{1}{2}$ in. x $\frac{1}{4}$ in. Woodruff).
1	EC-B 63	Camshaft Spacing Collar.	2		Carburettor to Carburettor Elbow Stud ($\frac{1}{8}$ in. x $\frac{1}{4}$ in. — 20 U.N.C.).
As req.	EC-B 64	Camshaft Spacing Washer.	6	C	Cylinder Head Stud ($1\frac{1}{4}$ in. x $5/16$ in. — 18 U.N.C.).
1	EC-B 65	Camshaft Thrust Washer.	2		Lub. Oil Dipper Setscrew ($\frac{1}{8}$ in. x $3/16$ in. Whit.).
1	EC-B 67	Governor Pad Arm Assembly.	6		Crankshaft Bearing Plate Setscrew ($\frac{1}{4}$ in. x $\frac{1}{4}$ in. — 20 U.N.C.).
1	EC-B 69	Governor Pad.	3		Magneto Ring to Flywheel Mounting Screw ($\frac{3}{8}$ in. x $\frac{1}{4}$ in. — 20 U.N.C.).
1	EC-B 71	Governor Pad Arm Spindle Circlip.	2		Flywheel Cowl to Cylinder Head Setscrew ($\frac{1}{2}$ in. x $5/16$ in. — 18 U.N.C.).
1	EC-B 72	Governor Pad Arm Spindle Bearing.	2		Wind-Up Starter Cup Driving Screw ($\frac{1}{8}$ in. x $\frac{1}{4}$ in. Whit. Cheese Hd. Screw).
1	EC-B 74	Governor Pad Arm Spindle Oil Seal Washer.	10		Crankcase Cover Plate to Crankcase Screw (8), Flywheel Cowl to Cowl Back Plate Screw (2) — $\frac{1}{2}$ in. x $\frac{1}{4}$ in. Whit. Cheese Hd. Screw.
4	EC-B 75	Governor Weight.	2		Carburettor Elbow to Cylinder Screw ($\frac{1}{8}$ in. x $5/16$ in. Whit. Cheese Hd. Screw).
1	EC-B 76	Governor Weight Pressure Sleeve.			
1	EC-B 79	Governor Weight Pressure Sleeve Retaining Circlip.			
1	EC-B 81B	Governor Lever.			
1	EC-B 86	Governor Lever Locking Screw.			
2	EC-B 90	Governor to Carburettor Throttle Link Pivot Ferrule (not illus.).			
1	EC-B 91B	Governor to Carburettor Throttle Link.			
1	AK-B103	Fuel Stop Cock Washer.			
1	EC-B104B	Flywheel Cowl Assembly.			
1	EC-B106B	Flywheel Cowl Back Plate.			
1	EU-C106	Fuel Tank to Carburettor Tube Ferrule.			
1	EC-B114	Fuel Tank Assembly.			
2	EC-B121	Fuel Tank Strap.			
1	EC-B123B	Carburettor to Cylinder Elbow.			
1	EC-B124B	Carburettor.			
1	EC-B125	Carburettor Elbow to Cylinder Gasket.			
1	EC-B126	Carburettor to Carburettor Elbow Gasket.			

ZENITH AH914 CARBURETTOR PARTS

No. off	Symbol No.	Name of Part	Illus. Part No.	Carburettor Part No.	No. Off	Name of Part
6		Flywheel Cowl Back Plate to Crankcase Screw (3/8in. x 3/16in. Whit. Brass Cheese Head Screw).				
4		Magneto Coil Mounting Plate Screw (1/2in. x 3/16in. Whit. Brass Cheese Hd. Screw).	1	A20022	1	Spring for Idle-Air Regulating Screw.
4	N	Wind-Up Starter to Flywheel Cowl Set-screw (2in. x 1/4in. Whit. Countersunk Head Screw).	2	A20021	1	Idle-Air Regulating Screw.
1	R	Governor to Carburettor Throttle Link Pivot Screw—Short (3/8in. x 3/8in. Whit. Brass Round Head Screw).	3	A20017	1	Choke Valve Screw.
1	S	Governor to Carburettor Throttle Link Pivot Screw—Long (1/2in. x 3/8in. Whit. Brass Round Head Screw).	4	A20052	1	Throttle Lever and Shaft Assembly.
1		Engine Speed Control Lever Clamping Screw (1/2in. x 1/4in. Whit. Round Head Screw).	5	A20014	1	Throttle Adjusting Screw.
2		Governor Lever Pivot Pin Nut (1/4in. Brass Whit. Nut).	6	A20017	1	Throttle Valve Screw.
3		Magneto Ring to Flywheel Mounting Screw Nut (1/4in. — 20 U.N.C.).	9	A20008	1	Choke Lever and Shaft Assembly.
11	J	Cylinder to Crankcase Stud Nut (7), Cylinder Head Stud Nut (4) — 5/16in. — 18 U.N.C.	10	A20048	1	Carburettor Body.
2		Carburettor to Carburettor Elbow Stud Nut (1/4in. — 20 U.N.C.).	11	A20062	1	Choke Valve.
2		Flywheel Cowl to Back Plate Screw Nut (1/4in. Whit. Simmonds' Root Nut—Part No. 1454/10).	12	A20016	1	Throttle Valve.
2		Governor to Carburettor Throttle Link Pivot Screw Washer (3/8in. Plain Brass).	13	A20041	3	Bowl to Body Screw.
1		Engine Speed Control Lever Clamp Screw Washer (1/4in. Plain).	14	A20007	1	Needle Valve Assembly Washer.
As req.		Governor Pad Arm Assembly Packing Washer (1/4in. Plain).	15	A20004	1	Needle Valve and Seat Assembly.
2		Flywheel Cowl to Cylinder Head Set-screw Washer (5/16in. Plain).	16	A20027	1	Bowl to Body Gasket.
2	M	Governor Lever Pivot Pin Washer (3/8in. x 3/64in. x 3/64in. Spring).	17	*A20035	1	Float Lever.
6		Flywheel Cowl Back Plate to Crankcase Screw Washer (3/16in. x 1/16in. x 1/16in. Spring).	19	*A20036	1	Float Hinge Pin.
3		Magneto Ring to Flywheel Mounting Screw Washer (1/4in. x 1/16in. x 1/16in. Spring).	20	A20031	1	Float Assembly.
7		Cylinder to Crankcase Stud Washer (5/16in. x 3/32in. x 3/32in. Spring).	21	A20030	1	Carburettor Bowl.
6		Wind-Up Starter Cup Driving Screw Lock Washer (2), Flywheel Cowl to Back Plate Screw Washer (2), Carburettor to Carburettor Elbow Stud Washer (2) — (1/4in. Shakeproof Washer).	22	A20038	1	Fibre Washer for Main Jet.
2		Carburettor Elbow to Cylinder Screw Washer — (5/16in. Shakeproof Washer).	23	A20037/66	1	Main Jet—Size 66.
1	P	Wind-Up Starter Cup Screw Lock Washer—(3/8in. Shakeproof Washer).	24	A20040	1	Fibre Washer for Plug Over Main Jet.
4	L	Wind-Up Starter to Flywheel Cowl Set-screw Washer—(1/4in. Countersunk Shakeproof Washer).	25	A20039	1	Plug Over Main Jet.
1		Crankcase Drain Plug (1/4in. B.S.P.).	26	A20042	1	Manifold Flange Gasket.
1	Q	Spark Plug Gasket (14 mm. Spark Plug Gasket).				

* Supplied as assembled only — A20034.

WIND-UP STARTER PARTS

Illus. Part No.	Manufacturer's Part No.	No. Off	Name of Part
		1	Starter Assembly (See Engine Parts List—Part EC-B 170).
1	GE-D129	1	Knob.
2	GE-D136	1	Handle Assembly.
3	GE-D127	1	Dog Washer.
4	GE-D116	1	Release Dog.
5	GE-D121	1	Dog Spacer.
6	GE-D117	1	Release Dog Spring.
7	GE-D128	1	Offset Release Dog.
8	GE-D120	1	Dog Pivot Fastener.
9	GE-D124	1	Ratchet Bearing.
10	GE-D108	1	Ratchet.
11	GE-D115	1	Ratchet Spacer.
12	GE-D131	1	Housing.
13	GE-D133	1	Spring Keeper Assembly.
14	GE-D144	4	Spring Keeper Screw.
15	GE-D107	1	Spring Hub.
16	GE-D103	1	Starter Dog.
17	GE-D104	1	Retainer Spring.
18	GE-D125	1	Brake Washer.
19	GE-D119	1	Brake.
20	GE-D102	1	Retainer.
21	GE-D143	1	Brake Screw.
22	GE-D142	2	Retainer Screw.
24	GE-D130	1	Knob Fastener.
36	GE-D151	4	Spring Keeper Washer.