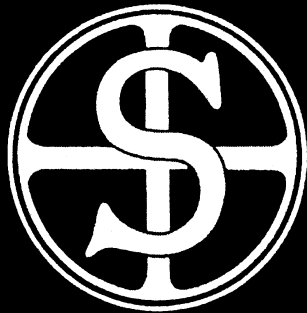


Instruction Manual for



Southern Cross

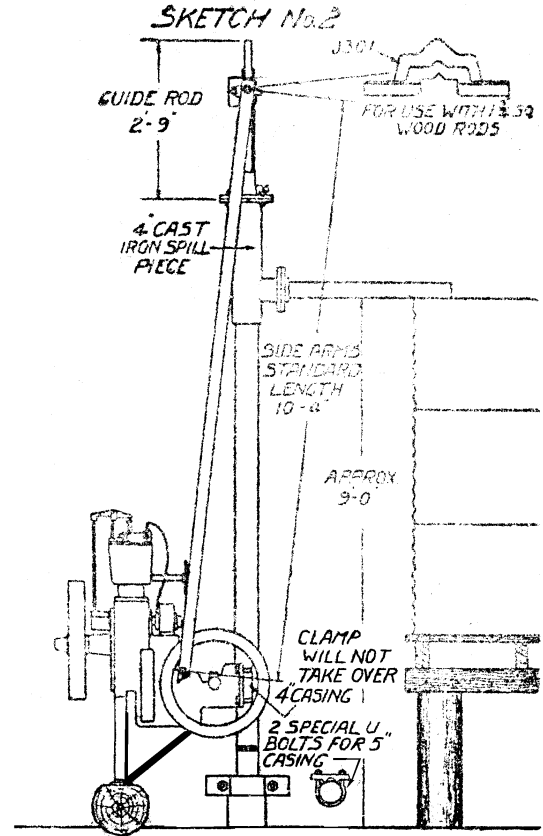
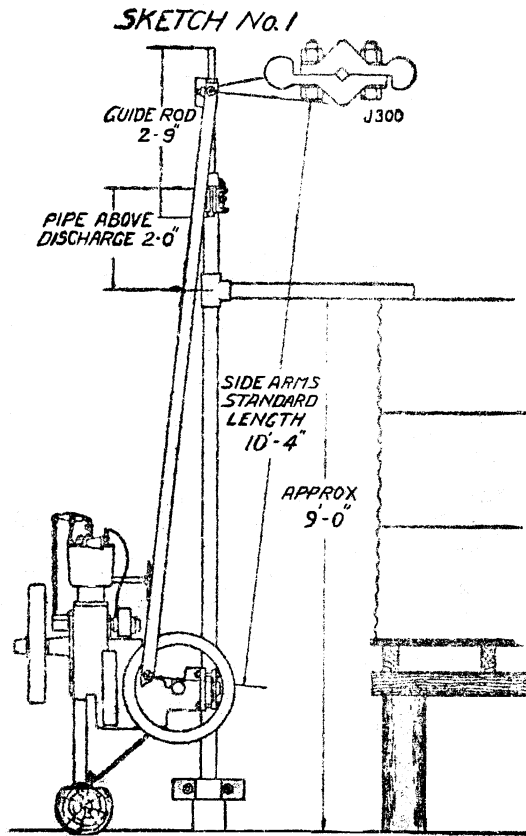
Mark J Farm Pump Engine

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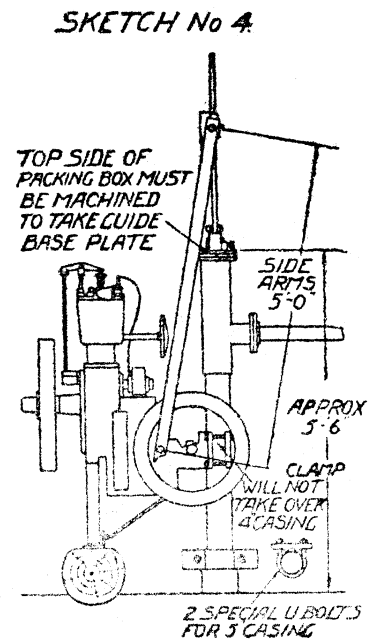
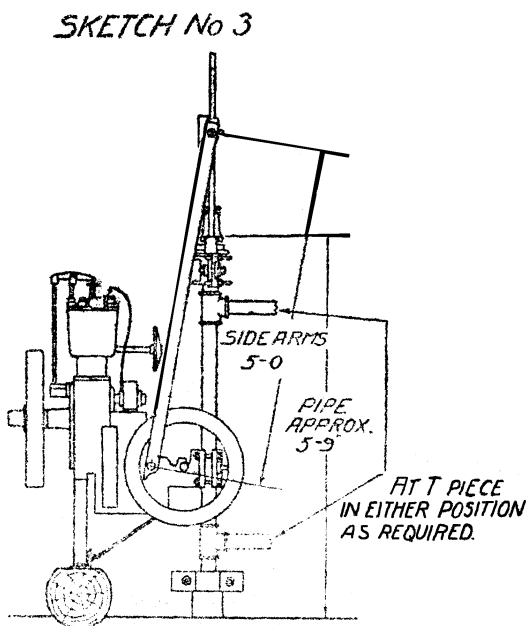
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SOUTHERN CROSS FARM PUMP ENGINE.

Page One

Arrangement of Engine for Pumping from Bore or from Well

The four sketches on the opposite page show the various methods of setting up the Farm Pump Engine to pump from a bore or well.

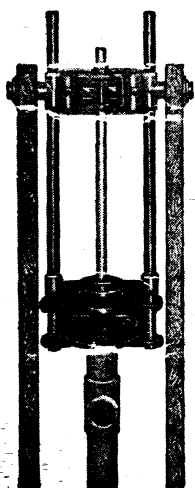


Fig. 1092.

Sketch No. 1 shows the arrangement of the engine and standard guide for clamping to pipe up to 2½ in., and delivering directly into a tank about 8 ft. high, without using a packing box. The guide rods are clamped to the pipe spill-piece above the discharge, as shown in Fig. No. 1092.

Sketch No. 2 shows the arrangement for fitting the engine to 4 in. or 5 in. casing, and delivering through a cast iron spill-piece, to the top of which are bolted the guide rods. The spill-piece is arranged to deliver directly into a tank up to 8 ft. in height. The method of attaching the guide rods is shown in Fig. No. 1093.

Sketch No. 3 shows the method of fitting an engine to pipe up to 2½ in., when a packing box is to be used. Standard guide rods are used, and are clamped to the vertical pipe immediately below the packing box. (See Fig. No. 1092.) The side arms are to be shortened and bored to suit, care being taken to see that the holes are exactly the same distance apart in each arm.

When fitting the engine to 3 in. pipe, the arrangement is as shown in sketches Nos. 2 and 4, except that instead of the cast iron spill-piece, a pipe spill-piece with tee is used. The Fig. 1093 guide is bolted to a standard pipe flange screwed to the top of the spill-piece.

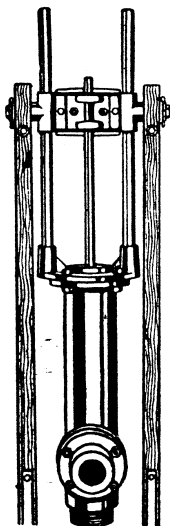


Fig. 1093.

Sketch No. 4 shows the method of attaching the engine to 4 in. or 5 in. casing, when a packing box is to be used. The discharge is taken from a cast iron spill-piece screwed to the top of the casing, and the packing box is fitted to the top of the spill-piece. The guide rods are bolted to the top of the spill-piece, as shown in Fig. No. 1093. The wooden side arms are to be shortened to a suitable length if necessary, taking care when boring the holes to see that they are exactly the same distance apart in each arm.

1 3/4 Inch Square Wood Pump Rods. — When the engine is to be coupled to 1½ in. square wood pump rods instead of the J300 clamps, a special J301 clamp is bolted to the crosshead. (See sketches Nos. 1 and 2.) The wood rod is clamped between the two pieces of angle iron supplied, which are, in turn, held between the J301 clamp and the crosshead.

Setting Up The Engine

As shown in sketches Nos. 1 to 4, the engine is to be bolted to a log foundation. A good solid log about 8 in. to 12 in. in diameter, and about 4 ft. long is required. Adze a flat on one side of the log, to form a seat for the steel foot support. Two recesses will have to be cut in the opposite side of the log for the 5 in. x 1/2 in. bolts supplied for bolting the foot support to the log. Bolt the engine to the log and dig a trench about 6 in. or 8 in. deep for the log. Then clamp the engine to the pipe or casing, and ram the log up firmly.

If the pipe to which the engine is attached is not held firmly in position such as when clamped at the top of a bore, it must be secured by some means, such as by bolting it to a 3in. x 2in. crosspiece, which is bolted to two posts.

It is most important to see that the guide rods and pipe or casing to which the engine is clamped are absolutely plumb and rigid.

Also make sure that the guide rods are correctly aligned with the bevel gearwheel shaft of the engine, i.e., that they are not twisted round the pipe.

Turn the flywheel of the engine round a few times so that the side arms move half a dozen strokes, in order to see that everything is clear.

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To Start Engine

(Using petrol to start and then changing over to run on power kerosene)

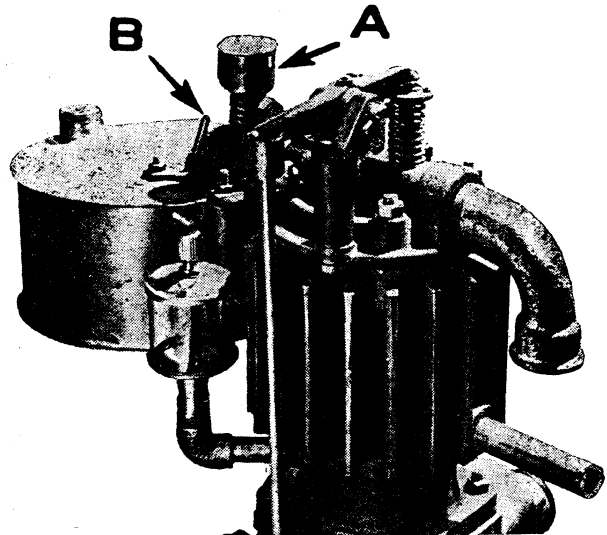
- (1) Grease and oil all parts. Fill the six grease cups with the grease supplied and screw them up a couple of turns.
Screw the sight feed lubricator into position (Refer illustration "Top Section of Engine") and fill it with Southern Cross Farm Pump Engine Oil. Raise the small lever on the top and see that the oil feeds correctly at about 10 drops a minute. When the engine warms up, the oil will probably feed more quickly, and it will be necessary to adjust the flow, by screwing the adjusting nut.

Grease the guide bars and oil the side arm bearings.

Oil the moving parts of the governor mechanism and the valve rocker.
- (2) Fill the fuel tank with power kerosene to within about half inch of the top. Cross, Mobil, C.O.R., Caltex and Atlantic Power Kerosenes are suitable fuels for this engine.
- (3) The brass petrol cup ("A" on illustration) is used for feeding petrol to the engine for starting. The petrol feeds through the needle valve stem and is sucked into the cylinder when the engine is started.
- (4) Make sure that the needle valve is closed — i.e., that the petrol cup is screwed right down without undue pressure.
- (5) Fill the cup with petrol and immediately swing the flywheel in the direction indicated by the arrow.
- (6) Do not delay after putting the petrol into the cup or the engine will be flooded with an over-rich mixture and will not start. In this case, place a finger over the jet in the bottom of the petrol cup and crank the engine until it fires. Then remove the finger.
- (7) If the engine does not start at once, screw out the petrol cup and pour the petrol out so that it will not run into the cylinder. (Refer to section, "Failure to Start" on Page 8.)
- (8) When the engine has almost used the first filling of petrol, fill the cup with petrol again.
- (9) When the petrol has lowered in the cup (after the second filling) to about $\frac{1}{4}$ inch above the jet, the engine can be changed over to run on kerosene. Open the needle valve slowly by unscrewing the petrol cup.

NOT FOR RESALE

- (10) Unscrew the petrol cup until the No. 1 mark on the cup is opposite the pointer. (Refer illustration). The exhaust should now be grey. If the cup is unscrewed too much, the engine will choke itself, due to an over-rich mixture, and will stop.
- (11) After the engine has been running for a few minutes it will warm up and the exhaust will change from grey to black. When it does, screw the petrol cup down slowly until the correct running position is found between Nos. 1 and 2, according to the load. Adjust the position until the engine makes the least number of explosions but still maintains its load.
- (12) Make sure that the engine is not exhausting black smoke as this indicates an over-rich mixture. White smoke coming from the exhaust indicates that too much lubricating oil is being fed by the lubricator.
- (13) If any difficulty is experienced in getting a new engine to run on kerosene, it is better for a new owner to run the engine on petrol for a few days until he understands the running of it.



Top Section of Engine

To Start Engine (Running Engine on Petrol only).

- (1) Grease and oil all parts as shown on No. 1, Page 2.
- (2) Fill the fuel tank with petrol instead of kerosene.
- (3) Unscrew the petrol cup to No. 1 position, hold the damper ("B" on illustration) down, and crank the engine until it starts.
- (4) Then screw the petrol cup down until the best running position is found.

To Stop Engine

- (1) Screw the petrol cup down without undue pressure.
- (2) Lower the lever on the oil sight feed lubricator and see that it stops dripping oil.

GENERAL RUNNING INSTRUCTIONS

Lubrication

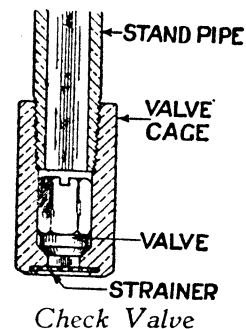
- (1) Every time the fuel tank is filled, turn the caps on the grease cups about two turns. Also make sure there is oil in the sight feed lubricator and that it is feeding correctly; i.e., 10 drops a minute. In cold weather the oil becomes thicker and special attention will be required to see that the oil feeds properly.
- (2) Grease guide rods and oil side arm bearings at least once every day.
- (3) Oil the moving parts of the governor mechanism and the valve rocker at least once a day.
- (4) The following oils are suitable for use on this engine:
Southern Cross Farm Pump Engine Oil (obtainable from the nearest Southern Cross Distributor).
 Or—
 If Southern Cross Oil is not available, any other S.A.E. 50 Engine Lubricating Oil as recommended by any reputable oil company.

Check Valve

A short stand pipe is fitted below the needle valve seat and extends down into the fuel tank. A check valve is fitted to the bottom of this pipe to keep a constant kerosene level in the pipe. (Refer illustration "Check Valve.")

If this check valve ever leaks, the performance of the engine will be affected. Providing the needle valve on the petrol cup is in the correct running position, a leaking check valve will be indicated by the following signs: (1) The engine sucks several times before an explosion occurs. (2) If the damper is held down an explosion occurs after the first suction but there is no black smoke in the exhaust.

To clean the check valve, unscrew the four nuts holding the fuel tank and remove the tank. Unscrew the valve cage from the stand pipe. After cleaning, replace the valve with the slotted end **up**, and then fill the valve cage with kerosene to test for leakage. If the valve still leaks it will be necessary to regrind the valve or replace with a new one. In reassembling, make sure the valve cage is screwed tightly to the pipe.

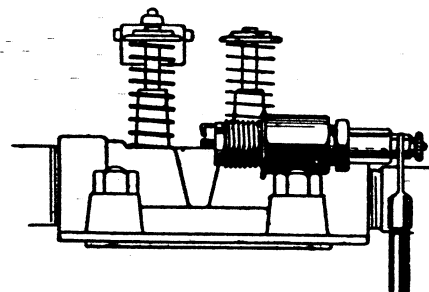


Spark Plug

(Refer also to Pages 8 and 9.)

The gap between the plug points should be from .015 to .025in. (the thickness of five or six sheets of paper or two pieces of kerosene tin). The insulator inside base of spark plug must be kept clean (free from carbon), otherwise the spark leaks through the carbon instead of jumping across the points. This makes it hard or impossible to start the engine, or makes it fire irregularly. Excessive oiling of engine and too rich a fuel mixture may deposit carbon on the insulator. Use a thin knife blade, a rag, and petrol for cleaning.

A plug will sometimes show a spark when tested outside the cylinder and yet fail to fire the engine when replaced in cylinder. This shows that the plug is "leaky," due to carbon deposit or the porcelain insulator being cracked. A "leaky" plug will spark when tested outside the cylinder and not inside, because the spark can jump through the air easier than it can jump through the compressed charge inside the cylinder, especially when the engine is cold. A good way to test for a leak through a cracked porcelain is to separate the points about $\frac{1}{8}$ in. and test outside the cylinder (Refer illustration "Testing Spark Plug") when the resistance across the points will usually cause the spark to get through the cracked or dirty porcelain.



Testing Spark Plug

A loose porcelain, due to the nut not being tightened up properly, will sometimes escape notice when plug is tested. The porcelain shifting when cable is connected will cause the point to get out of position.

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Governor

The Governor on this engine is the Hit and Miss type, i.e., the number of explosions is in proportion to the load.

The Governor controls the engine speed by holding the exhaust valve open. When the exhaust valve is held open during the suction stroke, air is drawn in through the exhaust valve instead of a fresh explosive charge being drawn in through the inlet valve and no explosion follows.

NOT FOR RESALE

When the engine is running on full load it fires two or three times, with the result that the speed increases and the Governor then lifts the exhaust valve and for a few strokes no explosion takes place.

NOT FOR RESALE

When the engine speed drops, the Governor releases the exhaust valve and the engine fires again. This process keeps the engine at its correct operating speed. On light loads it requires less explosions to keep the engine up to speed.

The Governor operates as follows:—

Refer to illustrations, "Governor Released" and "Governor Engaged" on Pages 6 and 7, which show the Governor mechanism as you would see it if you could see through the crankcase.

On the side of the detent catch block, J74, is the catch plate, J73, and the push rod, J66B, screws into the top of the catch block.

Hinged on the pin mounted on the side of the bearing plate is the detent, J71B, which is pushed under the catch plate, J73, by the Governor weight, J40, thus keeping the exhaust valve open.

The Governor weight, J40, is hinged at one end to a pin, J41, in the flywheel, and has a spring, J44, at the other end which holds the weight, J40, close to the centre.

As the speed of the engine increases, the weight, J40, is thrown away from the centre by centrifugal force and the flange B on the weight comes in contact with the tail C on the detent, J71B. This pushes the detent under the catch plate, J73 (Refer illustration "Governor Engaged") The exhaust cam has lifted the detent catch plate up till it is above the top of the detent, and as the detent is pushed over under the catch plate the detent catches it coming down and prevents the valve from closing. The catch plate is notched to prevent the detent from slipping out.

The exhaust valve is now held open until the speed of the engine drops. As it does, the Governor Spring, J44, becomes stronger than the centrifugal force which acts on the Governor Weight, and the weight is drawn in towards the centre. When the cam comes to the top again it lifts the catch plate off the detent, and if the Governor Weight is not out far enough to hold the detent in position, the two will not engage, thus releasing the detent from the detent catch plate.

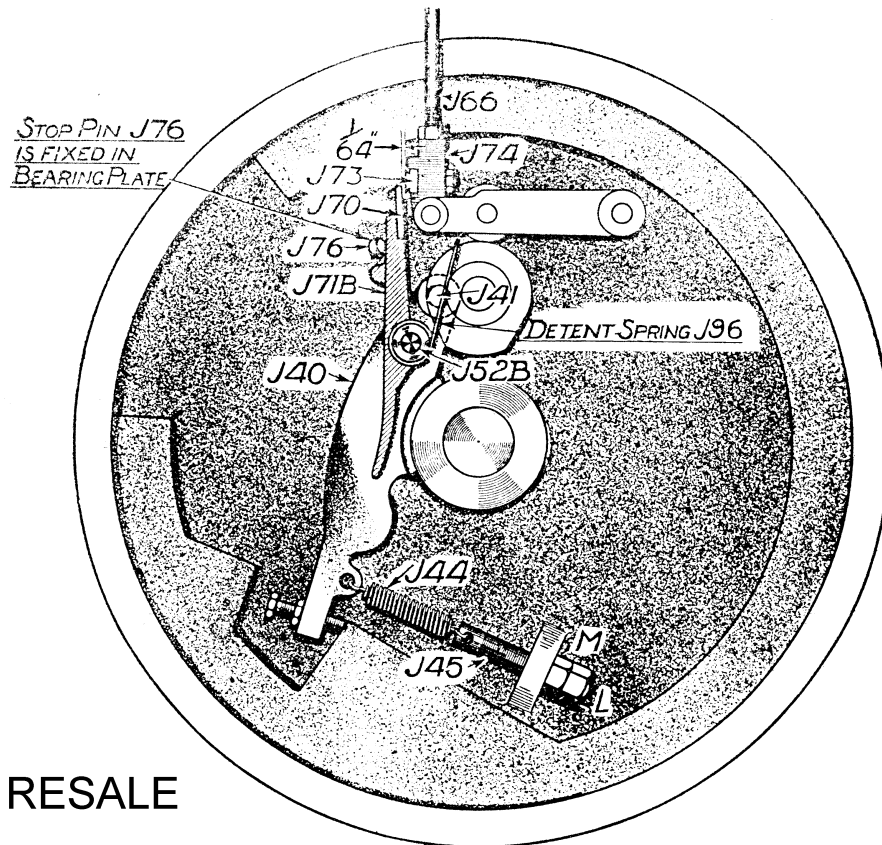
This allows the exhaust valve to work again and the engine fires once more.

The explosions increase the speed and this throws the Governor Weight out again, causing the detent, J71B, to engage in the catch plate, J73, again, thus repeating the process.

Speed Of Engine

The normal speed of the engine is 580 revolutions per minute, which will drive the pump at about 35 strokes per minute. The speed is controlled by the tension spring on the Governor Weight, which is located on the inside of the flywheel. (Refer illustration "Governor Released.")

The speed may be changed by altering the tension of the **Governor Spring, J44**. To increase the speed, increase the tension; that is, loosen the lock nut "L" on the eye bolt, then turn the inner nut "M" forward on the bolt. To decrease the speed, decrease the tension; that is, turn the inner nut backward on the eye bolt. When the speed has been adjusted, tighten up the lock nut "L." Best results are obtained if the engine is operated at normal speed.



NOT FOR RESALE

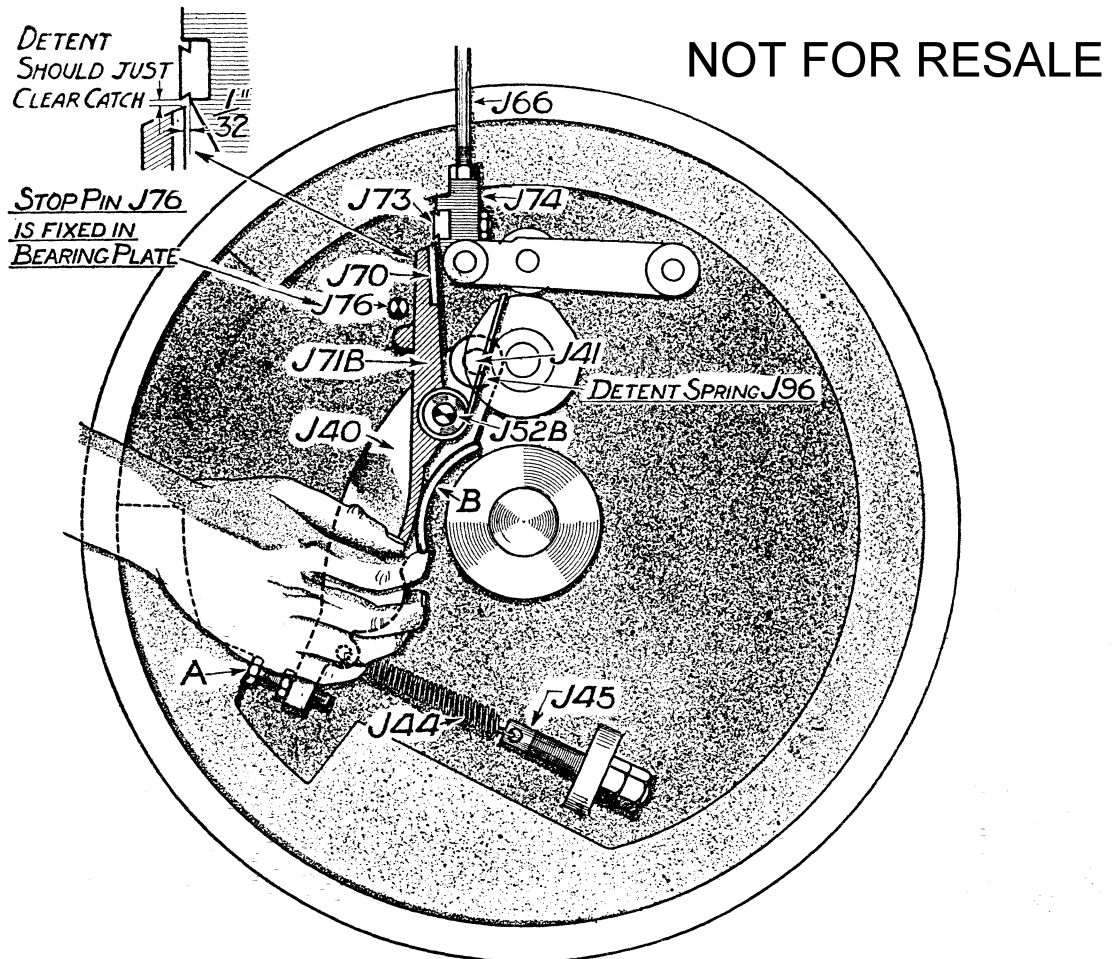
Governor — Released

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Instructions For Adjusting Governor

When the engine leaves the factory the Governor is adjusted correctly. If it is necessary at any time to check the adjustment, proceed as follows:—

When the tail of the detent, J71B, is even with the flange B on the Governor Weight, J40, and the exhaust valve is held open by the exhaust cam, the detent, J71B, can then be pushed into the catch plate, J73 (Refer illustration, "Governor Engaged.") The top of the detent should be just clear of the catch plate. If it does not enter freely, remove the detent and grind off the required amount to give proper clearance.

*Governor — Engaged*

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With the engine still in the same position press Governor Weight, J40, back until the set screw "A" bears hard against the pad of the flywheel. In this position there should be 1/32in. between the face of the detent blade, J70, and the catch block, J74. (Refer illustration above.) It is very important that this adjustment should be correct.

If it is not, adjust the set screw until it is. See that the end of the detent fits properly in the notch in the catch plate.

If the notch is worn, reverse the catch plate so as to use the other notch.

Then turn the engine until the exhaust valve is closed, and, in this position, there should be at least 1/64in. space between the end of the detent, J71B, and the detent catch plate, J73. (Refer illustration, "Governor Released.")

If it is not correct, adjust by filing the back of the detent where it contacts with the stop pin, J76.

These adjustments are very important, and, unless they are carefully carried out, the engine will not function properly.

In earlier engines the stop pin, J76, was not fitted. Instead the end of the detent swivel pin, J52, was bent down.

This bent portion located against the tail on the detent. To alter this, loosen set screw and turn pin until correct clearance is produced, then tighten set screw securely.

Revised parts can be supplied to bring engine up-to-date.

TROUBLES AND THEIR REMEDIES

Failure to Start—

Petrol jet clogged, or passage in needle valve choked. Remove petrol cup and needle valve and clean.

Too rich mixture. Hold finger over petrol jet in bottom of petrol cup until engine fires.

Faulty spark plug or magneto. See instructions re. spark plug and magneto.

Stale petrol. Petrol must be kept in airtight container.

Valve stuck.

Failure to Take Kerosene—

Not enough petrol used and engine consequently too cold.

No kerosene in tank.

Weak mixture. Choke engine by holding damper on vapouriser in horizontal position.

Needle valve not turned the correct amount.

Check valve failing to seat or strainer choked. (See Page 4.)

Kerosene jet choked. Remove petrol cup and needle valve and clear jet in vapouriser casting with fine wire.

Engine Stops.

Fuel tank empty.

Overheating.

Jet choked.

Lack of oil.

Failure of ignition. (See below.)

Overload.

Check valve failing to seat or strainer choked. (See Page 4.)

NOT FOR RESALE

Muffler

The muffler may become clogged due to the use of too much oil or a **poor grade of oil**. If it does, take the muffler off and clean it. Also clean the hole in the side of the cylinder where the muffler pipe screws in. Do this when the engine is **not** running.

Knocking

Knocking may be caused by:—

Carbon deposits on cylinder head, which occur after many days of continuous running. These deposits will build up much more quickly on light loads, and may be diagnosed more by a pinging sound than a distinct knock. Knocking from this cause is more apparent when the engine is put on a heavy load after having been running regularly on a light load. This knocking sound occurs only when the engine is working on nearly full load. To overcome this knock it is necessary to remove cylinder head and clean away the carbon deposit.

Another form of knocking may be caused by a very dirty or badly worn spark plug. This is more in the form of pre-ignition, and the knocking sound will be a very sharp one and fairly irregular.

Magneto

The magneto is gear driven from the engine crankshaft so that the magneto runs at engine speed. It gives one spark per revolution, so that an idle spark occurs on the exhaust stroke in addition to the working spark at the end of the compression stroke.

Magneto Timing

When the engine leaves the Works the magneto is correctly adjusted and timed. This adjustment should not be altered.

If for any reason the magneto is removed from the engine, it is necessary when replacing to see that the magneto gear is meshed correctly with pinion on crankshaft. To arrive at the correct position, first turn flywheel till "Spark" mark on the rim is directly opposite exhaust lever push rod.

On the magneto gear a centre punch mark will be found; turn gear till the punch mark is in line with punch mark or arrow on right-hand side of magneto (looking from the gear end), then, with these marks held in line, push magneto into place and bolt down. With breaker cover on magneto removed, see that the points just separate as the "Spark" mark on the flywheel passes the push rod.

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If the marks on magneto cannot be found, or in the case of fitting new gears, proceed as follows:—

Turn flywheel to correct position (as above described), remove cover from breaker of magneto, and turn gear in the direction that it runs, when on the engine, till the contact breakers are just parting. Holding in this position, push magneto into place. Check timing as described at the bottom of Page 8.

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Magneto—Care and Maintenance

The ball bearings in the magneto are packed with grease before assembly and need no further lubrication.

The high tension cable should be inspected occasionally, as rubber deteriorates. A timely renewal will frequently save trouble.

The contact breaker should be examined periodically, and the points checked to see that they are clean. Turn the flywheel until the points open and check that the gap is correct (.012 inch), using feeler gauges. If the gap needs adjustment, undo the two screws which hold the fixed point, adjust the gap and retighten the screws.

Do not attempt to run with a very large gap between the contact points. They wear more rapidly, and the machine will be less efficient, because the armature will not be in the best position when the circuit is broken.

About once every two months a smearing of oil should be rubbed on the surface of the steel cam and a drop put on the rocker pivot. **Do not allow any oil to get on the contact points.**

Magneto—Troubles and Their Remedies

To trace failure to start, or misfiring when running, first make certain that the trouble is not due to the vapouriser. A partially choked jet may be the fault. Then carefully examine the whole of the high tension circuit. See that the spark plug points are clean and are not set too wide.

Examine the high tension cable to see that the insulation is sound. Insulation which is burned, cracked or chafed, is a common source of trouble. See that good contact is made between the high tension pick-up screw inside the moulded cover and the high tension terminal on the coil.

Inspect the contact breaker. See that the points are set correctly (.012in.), and are **clean and smooth**, as any carbon or foreign matter between the points will give trouble. **Examine rocker arm; see that it works freely;** a swollen bush could cause trouble.

If the trouble is not corrected after making the above checks, the magneto should not be further dismantled, but should be removed from the engine and sent to the nearest Southern Cross Sales Office or qualified electrician.

Timing of Camshaft

If for any reason the timing gears are removed, be very careful to replace them correctly. Mesh the teeth so that the exhaust valve will open when the piston is at the lowest position (moving downward on the power stroke) and will close when the piston reaches the highest position (moving upward on the idle stroke); i.e., the exhaust valve remains open while the flywheel makes one-half revolution. A slight adjustment can be made by varying the length of the push rod, J66, by means of the threaded end. (Refer illustration, "Governor Released", on Page 6.)

When the **necessary** adjustments are made, be sure to tighten the lock nut so the adjustments will remain permanent.

Time of Ignition

(See Magneto Instructions.)

Loss Of Compression

May be due to many causes:—

- (a) See that the cylinder head gasket is not leaking and that all nuts on cylinder studs are screwed down tight.
- (b) That the spark plug is not leaking or blowing.
If these are quite right then remove cylinder head.
- (c) Examine valve. A good fitting valve should show a true and bright seat. Both seats and valves should be free from pits.
- (d) Having tested as above, if loss of compression still evident examine the piston and rings by removing cylinder from crankcase. If a piston ring is broken it must be replaced, or if ring shows a long brown patch on the surface it is probably bent and needs replacing. A ring worn on sides so much that it is very slack in groove in piston needs replacing. Rings should show an even polished surface, and should not need to be replaced for quite a long time—say, 3000 to 4000 hours' running.

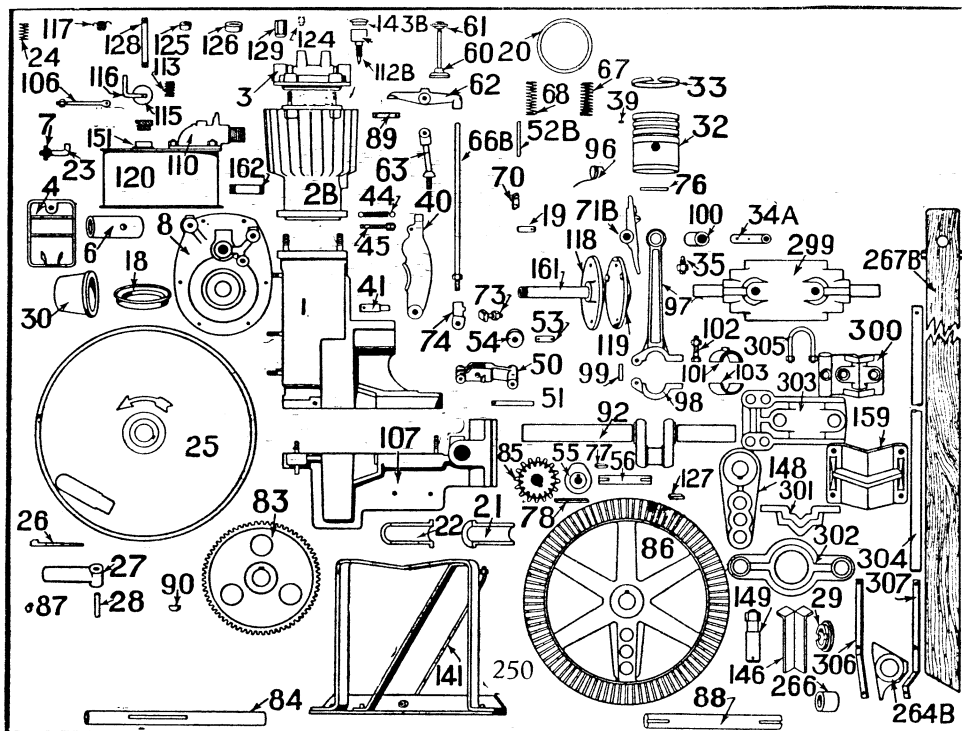


Fig. 2007.

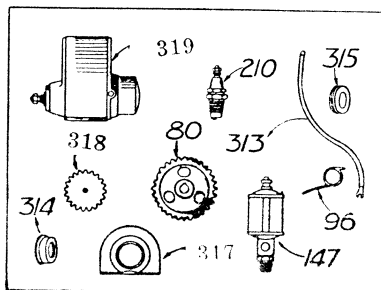


Fig. 2395.

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NOT FOR RESALE

PARTS LIST

MARK J FARM PUMP ENGINE

No. Off.	Sym. No.	Name of Part.	No. Off.	Sym. No.	Name of Part.
1	J 1C	Crankcase.	1	J118	Muffler.
1	2B	Cylinder.	1	119	Muffler Cover.
1	3	Cylinder Head.	1	120	Fuel Tank.
1	4	Crankcase Cover.	1	124	Check Valve.
2	6	Crankcase and Bearing Plate Bush.	1	125	Collar for Stand Pipe.
1	7	Nut for Crankcase Cover Clamp.	1	126	Collar for Fuel Tank.
1	8	Bearing Plate.	1	128	Petrol Stand Pipe.
1	18	Oil Retainer Ring.	1	129	Check Valve Body.
1	19	Detent Catch Pin.	1	141	Foot Support Brace Rod.
1	20	Cylinder Head Gasket.	1	PA143B	Cap for Petrol Cup.
2	21/22	Driving Shaft Bush.	1	PC143	Filling Plug for Fuel Tank.
1	23	Crankcase Cover Clamp.	1	J147	Sight Feed Lubricator.
1	24	Crankcase Cover Clamp Spring.	1	148	Pump Crank.
1	25	Flywheel.	2	149	Pump Crank Pin.
1	27	Flywheel Handle.	1	PC151	Flange for Fuel Tank Filling Plug.
1	28	Pin for Flywheel Handle.	1	AX-C158	Bearing Plate Oil Hole Felt.
2	29	Crankpin Washer.	1	J159	Main Frame Clamp.
1	30	Flywheel Key Shield.	1	161	Connecting Pipe for Muffler.
1	32	Piston.	1	162	Connecting Pipe for Cylinder Oiler.
3	33	Piston Ring.	2	AX-C185	Magneto Setscrew Washer.
1	34A	Piston Pin.	1	PC210	Spark Plug.
1	35	Piston Pin Setscrew.	1	J250	Foot Support Assembly.
3	39	Piston Ring Pin.	1	QB300	Funnel for Sight Feed Lubricator.
1	40	Governor Weight.	1	J313C	High Tension Cable.
1	41	Governor Weight Stud.	1	317B	Magneto Oil Retainer Clamp.
1	44	Governor Weight Spring.	1	318	Magneto Gear.
1	45	Governor Weight Adjusting Spring Stud.	1	319B	Magneto.
1	50	Rocker Arm.	3	J321	Main Frame Shaft Bearing Grease Cup (1).
1	51	Rocker Arm Pin.			Crankcase Shaft Bearing Grease Cup (2).
1	52B	Detent Swivel Pin.			
1	53	Cam Roller Pin.	2	J322	Crankcase Crankshaft Bearing Grease Cup.
1	54	Cam Roller.			
1	55	Cam.	1	J323	Crankshaft Bearing Grease Cup.
1	56	Camshaft.	1	325	Spring Bottom Oil Can.
2	60	Exhaust and Inlet Valves.	1	326	Cylinder Oiler Pipe Elbow.
2	61	Exhaust and Inlet Valve Nut.			
1	62	Exhaust Lever.			
1	63	Exhaust Lever Bracket.			
1	66B	Pushrod.	2	J264B	Crankpin Bearing.
1	67	Exhaust Valve Spring.	2	266	Crankpin Bearing Bush.
1	68	Inlet Valve Spring.	2	267B	Wood Pitman—10ft. 6in. long (as ordered).
1	70	Detent Blade.	2	268	Wood Pitman—5ft. 2½in. long (as ordered).
1	72	Detent Assembly.			
1	73	Detent Catch.	2	306	Fixed Pitman Strap.
1	74	Detent Catch Block.	2	307	Pitman Strap Clamp.
1	76	Detent Stop Stud.	1	327	Inner Stay for Side Arms.
1	80	Timing Gear.	1	328	Outer Stay for Side Arms.
1	83	Driven Gear.			
1	84	Driving Gear Shaft			
1	85	Bevel Pinion.	2	J 29	Crosshead Washer.
1	86	Bevel Gear.	1	J299	Crosshead.
1	88	Bevel Gear Shaft.			
1	89	Exhaust Lever Pin.			
1	92B	Crankshaft.			
2	95	Bevel Gear Spacing Washer.	1	J302	Centering Yoke.
1	96	Detent Spring.	2	J303	Pipe Centering Clamp.
1	97	Connecting Rod.	2	J304	Guide Rod.
1	99	Connecting Rod Cap Pin.	4	J305	"U" Bolt for Pipe Clamp.
1	100	Connecting Rod Bush (small end).			
1	101/103	Connecting Rod Bush (big end).	1	DJ 38B	4in. and 5in. Spillpiece Centering Flange.
1	102	Connecting Rod Clamp Bolt.	2	J304	Guide Rod.
2	106	Strap Bolt for Vapouriser.			
1	107	Main Frame.			
1	PC109	Box Spanner Lever.			
1	J110	Vapouriser.			
1	112B	Needle Valve.			
1	113	Throttle Valve Spring.			
1	115	Damper.			
1	116	Damper Handle.	1	J301	1½in. Pump Rod Clamp.
1	117	Damper Spring.	2	J146	Angle Piece for Pump Rod Clamp.

SIDE ARMS.

2	J264B	Crankpin Bearing.
2	266	Crankpin Bearing Bush.
2	267B	Wood Pitman—10ft. 6in. long (as ordered).
2	268	Wood Pitman—5ft. 2½in. long (as ordered).
2	306	Fixed Pitman Strap.
2	307	Pitman Strap Clamp.
1	327	Inner Stay for Side Arms.
1	328	Outer Stay for Side Arms.

CROSSHEAD.

2	J 29	Crosshead Washer.
1	J299	Crosshead.
		FIG. 1092 PUMP ROD GUIDE.
1	J302	Centering Yoke.
2	J303	Pipe Centering Clamp.
2	J304	Guide Rod.
4	J305	"U" Bolt for Pipe Clamp.
		Fig. 1093 PUMP ROD GUIDE
1	DJ 38B	4in. and 5in. Spillpiece Centering Flange.
2	J304	Guide Rod.

**CROSSHEAD CLAMP FOR ½in., ⅝in., ¾in.,
⅞in. or 1in. Dia.; or 1¼in. Sq. PUMP RODS.**

2	J300	Pump Rod Centering Clamp.
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**CROSSHEAD CLAMP FOR 1¼in. Sq. WOOD
RODS**

1	J301	1½in. Pump Rod Clamp.
2	J146	Angle Piece for Pump Rod Clamp.

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