J·A·P

HANDBOOK

for the

600 cc. s.v. Mark III Type 5 Engine

This Handbook has been prepared for the engine specially developed for Rotary Hoes Limited, of Horndon, Essex.

J. A. PRESTWICH INDUSTRIES LTD.,
CHELMSFORD ROAD, SOUTHGATE, LONDON, N.14, ENGLAND
Telegrams : Prestwich, Southtot, London **Telephone : FOX Lane 1101**

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Type: J.A.P. Mark III 600 c.c. side valve.

Bore: 85.7 millimetres.

Stroke: 104 millimetres.

Compression ratio: 5 to 1.

Piston material: Aluminium alloy.

Piston ring equipment:
Top: Plain compression ring, cast iron.
2nd: Plain compression ring, cast iron.
3rd: Slotted oil return ring, cast iron.

Gudgeon Pin: $\frac{13}{16}$" dia. circlip located.

Connecting rod: Steel forging.

Connecting rod bearings:
Small end: Plain phosphor bronze bush.
Big end: Caged roller bearing.

Crankshaft bearings:
Driving side: Ball bearing.
Timing Side: Needle roller $\frac{3}{16}$" dia. rollers.

Lubrication: Dry sump.

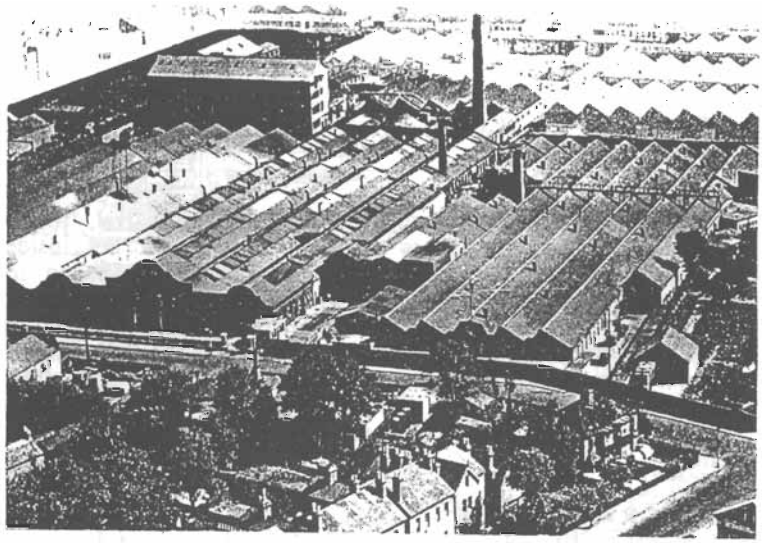
Ignition system: Magneto. Wico, type A1041 BZ.

Magneto rotation: Anti-clockwise.

Carburettor: Amal type 225, with variable main jet.

Carburettor adjustments:
Idle mixture: 1 screw.
Main mixture: 1 screw.
Idle speed: 1 screw.

Cooling: Air from fan flywheel.



An aerial view of the J.A.P. Works. Occupying five acres, the Works have been described as "the stables housing horse power, with quality and efficiency."

ABOUT OURSELVES AND OUR ENGINES

FOR more than half a century we have been making high-quality engines. Their success has been due, not only to our long manufacturing experience, but to the careful research and experimental work that has characterised the development of the J.A.P. engine.

There is not space here to tell the fascinating story of "JAP'S", of how we have come to reach the forefront of the industry; or to describe the special manufacturing processes which experience and ingenuity have given us, and which uphold our proud reputation for first-class workmanship and precision engineering.

Present-day trends in engine design are fairly clear. The obvious developments, such as the general substitution of aluminium for cast-iron as a piston material, are of less significance than the growing tendency to vary engine types and sizes to suit the conditions in which the engine will have to work. This tendency, which is well-reflected in the J.A.P. range of engines, is an undoubted move to greater efficiency and has led us to develop the 600 c.c. Mark III Engine specially for the Rotary Hoe 'Gem'.

J. A. PRESTWICH INDUSTRIES LTD.

THE CYLINDER

Note the deeper finning brought low down the barrel, which ensures good cooling. A less obvious improvement lies inside the modern J.A.P. cylinder head. This is carefully shaped to promote gas turbulence, giving higher power and improved fuel consumption. The cylinder head is detachable, being fitted to the cylinder barrel by a number of special steel bolts. The cylinder is held to the crankcase by four holding-down nuts, which screw on to studs passing through the cylinder base flange. The valve ports and chambers have been carefully designed to minimise gas friction.

THE CRANKCASE

The crankcase is cast in a die from a special aluminium alloy and is designed to ensure maximum stiffness of the walls. A feature of the crankcase is the patent J.A.P. lubrication system, which ensures a full supply of oil to all moving parts.

LUBRICATION

Complete cleanliness of the engine is ensured by the simple J.A.P. rotary valve.

A vertical passage, closed at its upper end by a horizontal sleeve, runs between the timing case and the oil box. The horizontal sleeve is rotated at engine speed by the cam wheel and blanked off at the driven end.

The inner end of this sleeve communicates with the cra... and when a slot in the sleeve comes into line with the vertic... passage, oil mist is forced through into the oil box by the descending piston. The oil mist condenses in the oil box and is returned by the crankcase vacuum to the flywheel chamber by way of a small pipe through the timing side bearing. The rotary valve is timed so that the slot begins to open 65° before bottom dead centre about the same time as the exhaust valve commences to open.

The oil pump incorporated is the J.A.P. double-acting type. One end of the plunger delivers oil from the oil tank to the engine, the other end returns the oil from the sump to the tank. The delivery plunger is the smaller in diameter ; the larger plunger is the scavenging part of the pump and maintains the ' dry sump '.

The oil enters the big end bearing by a passage in the timing side flywheel and is pumped through the crankpin to the bearing. From here the oil escapes into the interior of the crankcase and by splash system lubricates the cylinder wall and piston.

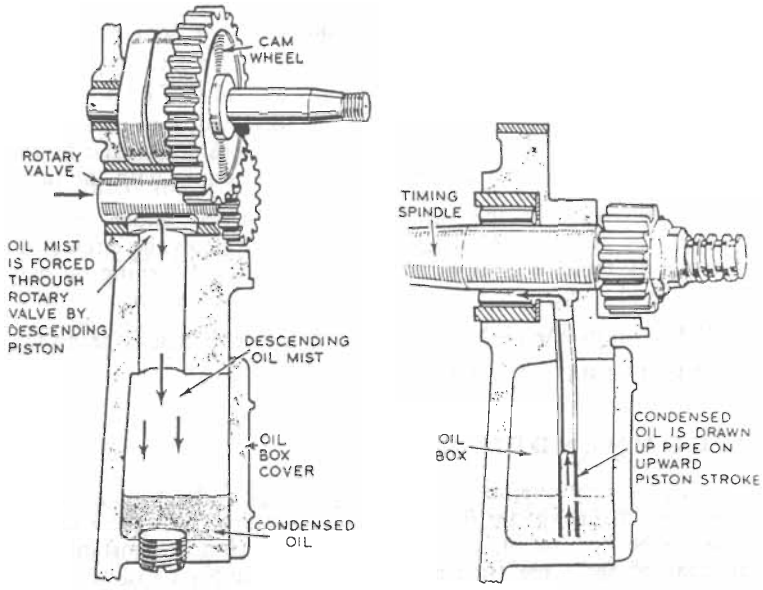


FIG. 1. CUT-AWAY VIEW SHOWING OPERATION OF THE ROTARY VALVE.

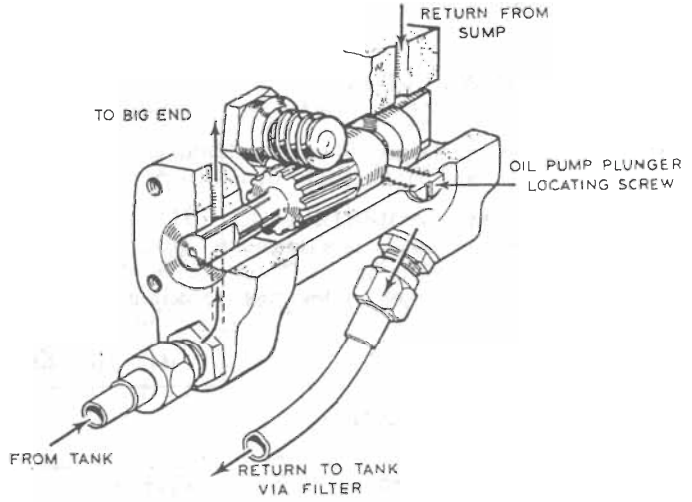


FIG. 2. THE J.A.P. DOUBLE-ACTING OIL PUMP

The driving spindle bearing is lubricated by oil splash. The timing spindle bearing is lubricated by oil splash and by oil from the oil-box.

Surplus oil inside the crankcase is diverted into the sump, which is connected by drilled passages in the crankcase and timing cover to the pump. An oil pipe connects the pump with the tank.

Oil collecting in the sump is thus returned under pressure through the filter to the oil tank, and this completes the circulation system. By removing the oil tank filler cap, the returning oil may be observed.

DAILY—Check the oil level in the tank and replenish as necessary.

AFTER EVERY 50 HOURS—Drain the tank and refill with fresh oil.

RECOMMENDED OILS

The life of any engine depends largely upon the way in which it is treated during the first few hours running. All the bearings have to be bedded in, a process which requires a constant load maintained for some time and a generous supply of oil.

Once the engine has been run in, lubrication remains of prime importance. It is no less important that the correct grade of oil should be used.

The oils we recommend are :

	ESSO	B.P.	SHELL	VACUUM	WAKEFIELD
UNITED KINGDOM					
Summer ...	Essolube 40	Energol S.A.E. 40	Shell X100 40	Mobiloil BB	Castrol XXL
Winter ...	Essolube 30	Energol S.A.E. 30	Shell X100 30	Mobiloil A	Castrol XL
OVERSEAS					
90° F. and over	Essolube 50	Energol S.A.E. 50	Shell X100 50	Mobiloil BB	Castrol XXL
32° F.— 90° F.	Essolube 40	Energol S.A.E. 40	Shell X100 40	Mobiloil BB	Castrol XXL
10° F.— 32° F.	Essolube 30	Energol S.A.E. 30	Shell X100 30	Mobiloil A	Castrol XL

THE TIMING PINION

The timing pinion has a taper and key on which the pinion is locked by a left hand threaded nut. Five key-ways are cut in the pinion taper on the ' Vernier ' system so that the use of each key-way varies the valve timing by one-fifth of a tooth. The cam levers are fitted with rollers bearing on the cams to lessen friction at

this point. The cam contours themselves are carefully calculated to obtain maximum efficiency with minimum stress.

THE PISTON

The piston is of a special aluminium alloy and it is die-cast (die-casting produces a finer grain of metal). A hollow steel gudgeon pin is fitted and is located by spring circlips in the piston bosses.

THE CONNECTING ROD

The connecting rod is a steel stamping of ample strength. The big end bearing, of the roller type, has two rows of rollers fitted in an aluminium alloy cage.

FLYWHEELS

This J.A.P. engine employs internal flywheels, and there is thus no possibility of crankshaft whip and probable fracture. The flywheels are of large diameter, and great care is taken to balance and pair each individual wheel with its fellow. All spindles are specially hardened and ground, and are a taper fit in the wheels, being secured by a locknut.

VALVE STEM

On the 600 c.c. engine the valve stem is not drilled for a cotter, but is recessed near the end. A split taper cotter lodged here bears the pressure of the valve spring collar, which has a corresponding inside taper.

CARE AND MAINTENANCE

If the engine runs indifferently, first check the compression. Good compression is essential for satisfactory running.

TO CHECK THE COMPRESSION. Make sure that the cylinder head bolts are tight and that there is no leakage from the cylinder head gasket. Turn the engine by the starting handle without lifting the exhaust valve lifter. If compression is satisfactory, considerable resistance will be felt.

CHECKING THE TAPPETS. If there is little or no resistance remove the valve box cover and make sure that the tappets are free to rotate when the piston is at the top of the compression stroke.

Tappet clearance with engine cold :

Inlet: 0.004″
Exhaust: 0.006″

If the tappets are not free, adjust them to the correct clearances. Be certain that the exhaust valve lifter is not holding up the exhaust tappet.

LOSS OF COMPRESSION AT THE VALVE SEAT. If the tappet clearances are correct when checked, the loss of compression will be occurring either at the valve seats or past the piston. For a check to be made at these points, the cylinder must be removed. (When dismantling, mark the piston to ensure correct re-assembly.)

Inspection of the valve seat may reveal a slight pitting, and in the case of the exhaust valve the valve or seating may appear burned. Fine emery powder mixed with oil should be used to grind in the seating until it is smooth and free from pit marks. When all parts have been checked for cleanliness, graphite, or engine oil, should be smeared on the valve stem before it is returned to the cylinder.

Having refitted the valve and valve spring assembly to the cylinder, assemble the cylinder to the crankcase and re-check the tappet clearance.

Take care that there is no excessive clearance between the valve stem and the tappet head. Too great a tappet clearance alters valve timing considerably and causes loss of power. The swiftly moving tappet also sets up a hammering effect on the valve seat.

LOSS OF COMPRESSION PAST THE PISTON. Check the cylinder bore and piston for seizure marks. Remove the piston rings and check the ring gap with the piston ring inserted in the cylinder bore. If the gap exceeds 0.020", new piston rings must be fitted.

If, when the cylinder is removed, heavy deposits of carbon are present, the engine needs decarbonising (see page 17).

CHECKING THE IGNITION. If the compression is correct and the engine still runs badly, check the ignition.

Remove the sparking plug. Hold the plug earthed to some part of the engine and rotate the latter by the starting handle. A spark should occur at the plug points.

Check the plug gap (0.020"–0.025"). If no spark occurs, check the magneto lead. Hold the lead about an eighth of an inch from some part of the engine and rotate the engine as before.

To check the contact breaker point gap : remove the cover plate at the opposite end of the magneto to the drive. This plate is retained by two spring clips. Adjust the points by releasing the locking screw and rotating the eccentric screw until the gap is

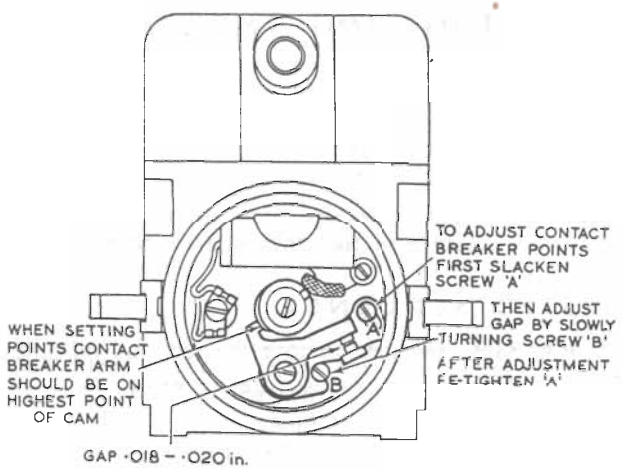


FIG. 3. ADJUSTING MAGNETO CONTACT BREAKER POINTS

0.018"–0.020", with the heel of the fibre on the highest position of the cam lift. The gap should be checked with the feeler gauge.

Check that the contact breaker spring is not broken or earthing to the magneto. Check the points for burning and replace as necessary.

When the correct setting has been obtained, tighten the locking screw and re-check the gap.

CHECKING THE CARBURETTOR. Check the supply of fuel in the tank.

Inspect the fuel pipe from the tank to the carburettor.

The carburettor is set before the engine leaves the works. If it is disturbed, the variable jet should be re-set to 1½ turns open.

If black smoke (not blue) comes from the silencer when the engine is running under normal load, the jet should be screwed in gradually until the black smoke ceases.

If black smoke is noticed when the engine is idling, the idling jet adjusting screw should be unscrewed until the smoke ceases. The engine will hunt when the mixture is rich and will run erratically or possibly stop when the mixture is weak.

To clean the carburettor jet : take out the main jet body through which the main jet adjusting screw operates. The idling jet is a very small hole drilled in the groove halfway up the jet bolt.

When starting from cold it may be necessary to flood the carburettor.

DISMANTLING THE ENGINE

Although the following has been included in this handbook for the sake of completeness, we strongly urge that, whenever possible, dismantling and re-assembling are left to your service engineer. They are not jobs for the inexperienced.

During the dismantling process, note carefully the positions of all washers and bearings so that they can be correctly replaced.

SUGGESTED SEQUENCE

1. Close all taps, and then remove the fuel and oil pipes.
2. Remove throttle and exhaust lifter controls.
3. Disconnect the air cleaner hose.
4. Unscrew (*a*) the large nut holding the exhaust silencer to the cylinder ; (*b*) the two nuts securing the silencer support to the lower crankcase clamping studs.
5. Remove silencer.
6. Support the engine with suitable blocks.
7. Remove the setscrews securing the engine to the ' Gem ' gearbox.
8. Push the ' Gem ' away from the engine.

Removed from the machine, the engine should then be placed on a bench. Next remove the carburettor by loosening the clip bolt and taking the carburettor off the inlet pipe.

Remove the cylinder cowling by taking out the screws and bolts fixing the cowling to the flywheel housing.

Remove the flywheel by taking off the nut on the main shaft (right hand thread), having first placed a tommy bar in the flywheel and rotated the flywheel until the tommy bar is in contact with the flywheel housing. (Extractor holes are provided for withdrawing the flywheel.)

Take off the nuts on the fixing studs going through the crankcase and then draw off the housing.

The engine can now be held in a vice by the crankcase lug situated under the magneto platform.

Remove the magneto drive by taking out the three screws holding the chain cover, taking care in the process not to damage the gasket. Then remove the nut holding the magneto drive sprocket (right hand thread).

Place a screwdriver behind the magneto drive sprocket and lever the sprocket off the cam shaft taper. Remove the fixing

screw from inside the timing cover and remove the four nuts round the timing chest, leaving the magneto and chain still fixed. The timing cover can now be pulled off the studs. Sometimes the exhaust lifter sticks but will come off its pin if the lever is moved up and down when the timing cover is being removed.

Removal of the timing cover exposes the cam gear. Take out the cam wheel (if the valves are closed, it can be pulled out), then remove the two cam levers, marking the exhaust lever so that they can later be replaced in the correct position.

Remove the pinion nut and pump driving worm by using a box spanner and giving the tommy bar a sharp blow with a hammer (left hand thread). There are five key-ways in the pinion, and the used key-way should be marked to make re-timing of the engine easier. The button hook shaped extractor bar should then be hooked behind the pinion and levered outwards to remove the pinion. The rotary valve will pull out quite easily.

The flywheel key on the driving side spindle should then be removed ; also the large nut on the driving spindle which locks the flywheels to the driving side bearing (right hand thread).

Remove the eight bolts holding the cylinder head to the cylinder. Remove the cylinder head and gasket.

Take off the four nuts at the base of the cylinder and draw the cylinder straight off the piston, being careful to avoid damage to the piston or connecting rod. When dismantling, mark the piston to ensure correct re-assembly.

Remove one of the circlips with the tag end of a small file shaped to go behind the circlip in the groove cut in the piston. Place the tool in position, holding the piston with the left hand, with the thumb over the gudgeon pin. Then gently push the tool away from yourself, making sure with the left thumb that the circlip does not fly. The gudgeon pin will then push out, and the piston can be taken off the connecting rod.

Remove the two tie bolts at the bottom of the crankcase, take the crankcase out of the vice and place it on the bench, taking care that no great quantity of oil is still in the case. Tap one half of the case away from the other with a mallet until the two halves can be drawn off the flywheel spindles. When taking off the driving side half of the case make sure that the seal around the spindle is not damaged.

To split the flywheels : remove one of the crank-pin nuts and give one or two hammer blows to the side face of the flywheel, at right angles to the crank-pin hole. These will loosen the flywheel from its taper. The big end can now be exposed for dismantling and inspection.

REMOVAL OF MAIN BEARINGS

The drive side main bearing is a ball race.

The timing side main bearing is a crowded roller bearing.

To remove the drive side main ball race take out the four countersunk setscrews holding the bearing retaining plate. Remove the oil seal sleeve on the other side of the bearing. The ball bearing can now be driven out of the housing. Care should be taken not to damage the oil seal.

Mark III engines prior to type 5 have crowded roller bearings in both drive and timing side ; it will be found that the outer races of these bearings are a press fit in the crankcase. These can be removed by heating the crankcase with a blow lamp. Apply the heat uniformly to obtain the even expansion of the crankcase which releases the interferences between the bearing and its housing.

When the crankcase is really hot tap the crankcase on to a wooden bench and the bearing will fall out.

When the engine has been completely dismantled in this manner all the parts should be washed in paraffin ready for inspection. Parts should be renewed as necessary, and all carbon deposit should be removed from the piston, cylinder head and valve pockets.

Compression of the valve springs and removal of the two cone pieces make it possible for the valves to be withdrawn.

RE-ASSEMBLING THE ENGINE

Cleanliness in this operation is most important.

THE CYLINDER

Grind the valves in their respective seatings with fine emery paste and oil until the valve and cylinder seatings are bedding correctly, then clean off all traces of emery by washing in paraffin and drying with a rag.

Smear a little oil on the valve stem.

When the valve spring and collars have been placed in position the valve can be put into the seat to which it was ground. Compress the spring and with a little grease on the split cone pieces to keep them in position, release the valve spring.

FLYWHEEL ASSEMBLY

FITTING NEW MAINSHAFT SPINDLES. Thoroughly dry all tapers and holding the thick part of the flywheel in a vice, fit the spindle. (The driving side spindle is keyed and has a right hand thread locking nut.)

When fitting a new timing spindle, secure the flywheel in a vice with the pinion locating pin pointing upwards towards the crankpin hole. Tap the spindle into the taper and tighten the nut (left hand thread).

Next fit the crank pin into the timing side flywheel, making sure that the oil feed hole in the flywheel is in line with oil hole in the crank pin taper. Tap the crank pin until it is right home, then tighten the nut (right hand thread). Check that the oil hole from the flywheel timing spindle boss to the crankpin roller track is completely clear by squirting oil through. Failure to do this may lead to a seized engine.

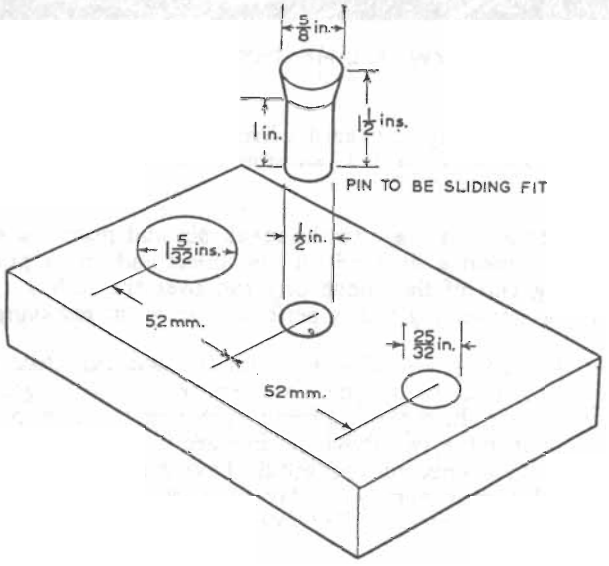


FIG. 4. STEEL BLOCK FOR ASSEMBLING FLYWHEEL

Obtain a block of steel shaped as in Fig. 4. The timing side flywheel can now be placed on the steel block with the spindle through the bore of the block and with the peg which projects

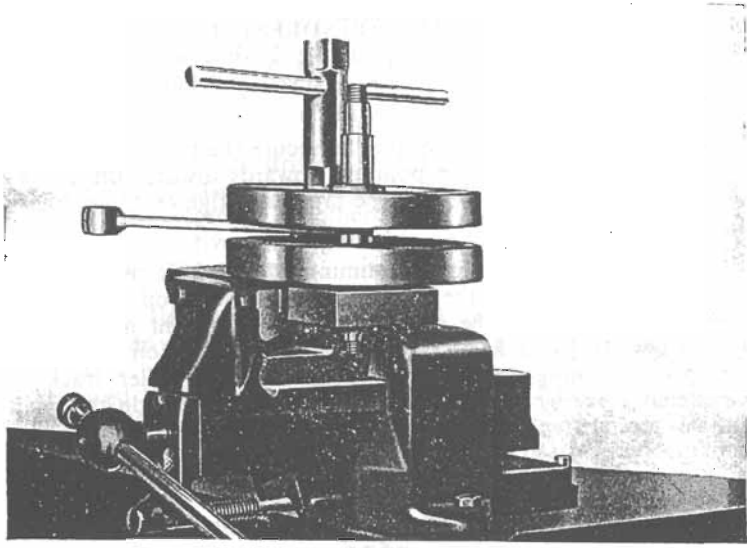


FIG. 5. FLYWHEEL MOUNTED ON BLOCK.

on top of the block against the flywheel step (bob weight). Fig. 5 shows the position of the flywheel after it has been placed on the block.

Assemble the roller cage to the crank pin and place the rollers in the slots. Smear a little oil on the rollers and crank pin, and place the big end of the connecting rod over the rollers. Make sure that the connecting rod is perfectly free when revolving.

Place the driving side flywheel with the spindle fitted, on to the crankpin, with the outside diameters set in line. Lightly tap the flywheel on to the taper and begin tightening the crankpin nut, making sure that the two flywheel rims are in line (check with a steel rule). The connecting rod should have a minimum side play of .015" and a maximum side play of .035" after the flywheels have been finally tightened. The flywheels should finally be trued up between centres.

FITTING THE FLYWHEELS INTO THE CRANKCASE.

Place the flywheels, with the driving side spindle upright, in the vice (using soft clamps), and lightly tighten the vice on to the timing side spindle. Using a mallet, tap the driving side half crankcase on to the driving side spindle, having first assembled the main bearing. This is easily done if the crankcase is heated to allow the bearing to be dropped in.

Push the distance piece on the spindle through the seal, fit the cover plate and tighten the nut holding the flywheels to the driving side ball race. Remove the flywheels from the vice and place them on the bench. Then, using a little grease, assemble the rollers in the timing side half crankcase. Place sealing compound to the joint face and slide the timing side half crankcase on to the spindle, taking care that the rollers do not fall out. Place the two bottom tie bolts through the crankcase and line the cylinder joint faces together. A slight blow on either side of the timing side half crankcase will then spring the two halves of the crankcase together. Set the cylinder face of the crankcase for alignment and tighten up the tie bolts. With one of the lugs in the vice holding the crankcase, check the flywheels to make sure that they revolve quite freely.

PISTON AND RINGS

Ascertain that the plain compression rings are fitted to the top and second grooves and the slotted oil return ring is fitted to the bottom groove of the piston, also that the slot in the piston skirt is on the exhaust side of the cylinder.

Re-assemble the piston and rings complete to the connecting rod, smearing oil into the small end bush and gudgeon pin bore of the piston.

When fitting the circlip into the piston, make sure the gap does not correspond with the slot in the piston (this makes for easier removal when dismantling). With the piston ring gaps on opposite sides of the piston, the cylinder barrel (complete with valves, tappets and cylinder base gasket) can be fitted to the crankcase. Be careful not to break the piston rings when placing the cylinder over the piston. Now tighten the cylinder base nuts diagonally.

CAM GEAR

Replace the cam gear in exactly the same position as it was before dismantling, with the inlet cam lever first, followed by the exhaust cam lever. Rotate the flywheels until the pinion locating peg in the timing spindle is vertical. Replace the timing pinion using the same key-way as was used previously.

Refit the cam wheel, holding the cam levers up with the thumb and finger of the left hand, and with the timing mark on the cam-wheel tooth corresponding with the mark on the timing pinion.

Adjust the tappets.

Rotate the engine until the piston is at top dead centre, with the inlet valve just opening.

After checking the valve timing, tighten up the nut (left hand thread) and secure the pinion, finishing with a few sharp blows on the tommy bar of the box spanner.

Replace the rotary valve with the timing mark on the face corresponding with the mark on the camwheel.

THE ROTARY VALVE

The rotary valve rotates clockwise. When it is replaced, the leading edge of the slot in the rotary valve spindle should correspond with the leading edge of the slot in the bush when the exhaust valve just begins to open. Failure to time the rotary valve correctly will cause excessive oil consumption.

Replace the distance collar on the camlever spindle and fit the timing cover, making sure that the two rubber sealing washers are in the recesses. Add a little sealing compound to the joint faces and tighten the nuts.

If new cam gear parts, unmarked for timing, are fitted, you must experiment with the various key-ways on the pinion to obtain the correct timing. Both valves should open equally with the piston at top dead centre.

Dry the camshaft taper thoroughly and place the camshaft sprocket, with the magneto chain attached, to the camshaft. Replace the camshaft nut loosely, in readiness for timing the magneto.

TIMING THE MAGNETO

Rotate the flywheel until the piston is at top dead centre with both valves closed. Then, watching the blower flywheel side, rotate the flywheel clockwise until the piston is $\frac{1}{4}$" down the stroke.

Remove the contact breaker cover from the magneto, rotate the magneto spindle in a clockwise direction (looking at the breaker points) until the breaker points just begin to open.

Press the camshaft sprocket on to the camshaft spindle and tighten up lightly. Then check. If the breaker points begin to open at $\frac{1}{4}$" before top dead centre, the timing is correct.

Tighten the camshaft nut and replace the chaincase cover and joint gasket. Check the exhaust lifter operation. The cylinder head and gasket can now be fitted, after sealing compound has been placed on the gasket, and the bolts tightened diagonally. Check compression by turning the flywheel with the sparking plug in position.

Take the engine out of the vice and place it face downwards on the bench so that the flywheel housing can be fitted to the crankcase.

After drying the taper of the driving spindle, fit the key and fan flywheel. Tighten the nut by putting a tommy bar between the fan blades and the flywheel housing.

Fit the cylinder cowl and baffle to the flywheel housing, together with the valve box cover and washer.

DECARBONISING

Thoroughly clean the engine, taking particular care round the cylinder base. Remove sparking plug, carburettor, and exhaust pipe, also exhaust lifter wire. Undo the four nuts which hold the cylinder to the crankcase. The cylinder is now free to be lifted upwards until it leaves the piston.

After removal, the inside of the piston should be filled with rag to prevent damage by the connecting rod. A good plan also is to cut pieces of rubber hose a little longer than the cylinder studs in the crankcase, and slip them over the studs. This prevents the skirt of the piston being damaged by the studs.

It is advisable to cover the crankcase opening to prevent any deposit falling inside the case before scraping the carbon from the piston.

Piston rings should not be removed unless there is carbon deposit behind them which chokes up the grooves.

The whole operation needs care and cleanliness.

If there is any necessity to remove the piston, one circlip only needs removal, and the gudgeon pin can be tapped out from the opposite side.

The valves can be removed from the cylinder, carbon scraped off the heads, and valves ground in carefully with fine emery and oil. When grinding, lift the valve off its seating frequently during the process ; this prevents deep scores.

Scrape all carbon from cylinder head and ports, and if necessary finish off with a little fine emery cloth and oil. Thoroughly clean all parts and refit valves.

Before replacing cylinder see that the piston ring slots are spaced equidistant round the piston, smear with thick oil, also bore of cylinder.

See that cylinder and crankcase faces are perfectly clean.

Gently ease cylinder on to piston, closing each ring together with the fingers just as it enters the cylinder. A little goldsize can be smeared on the cylinder base or crankcase face.

Press cylinder on to its base and rotate the engine so that both the tappets are down, and not touching the valves.

Screw on cylinder nuts finger tight, tightening up finally a little at a time diagonally across. It is important that the nuts should be evenly tightened, otherwise the base will be strained, and there is a risk of the cylinder fracturing. Adjust the tappets to the clearances shown on page 7.

DON'TS

DON'T forget to adjust the tappets.

,, have too lean a jet ; this is false economy.

,, forget to check oil level in tank.

,, fit unsuitable cheap sparking plug.

,, over-rev the engine—give it a chance to bed in.

,, forget to tighten cylinder and head according to instructions.

,, forget to inspect exhaust valve occasionally.

,, adjust exhaust lifter so that it is holding the valve off its seating.

,, forget to re-fit the rubber washers when re-assembling timing case.

,, forget to give the engine number and symbols in any enquiry, and when ordering spare parts.

,, forget we regrind cylinders and fit new pistons and rings in 24 hours.

,, forget we specialise in overhauls and repairs, and make a special charge during winter months.

,, forget it is necessary when a new half crankcase is required to return the opposite half for fitting.

,, forget the same applies to flywheels.

SPARES AND REPAIRS

A complete stock of replacement parts for the J.A.P. power unit is maintained. The repair and overhaul of customers' engines at the hands of an expert staff is a speciality.

To facilitate delivery of SPARES the following points should be observed :—

1. The engine number MUST ALWAYS be quoted, WITH ALL ITS SYMBOLS : example—$\frac{\text{UCZ/ O}}{1001/5}$ This number will be found stamped on the top front crankcase bolt lug.

2. All correspondence should be conducted under one name only ; and since, according to the usual business methods, we must be in receipt of a remittance before despatching any parts, time will be saved by sending the correct amount with the order, if not ordered C.O.D.

REPAIRS are always executed as speedily as permits. When sending an engine to us for an overhaul or repair, full instructions should always be sent in advance stating definitely whether work is to be put in hand, or whether an estimate only is required. In the latter case, the engine is stripped upon receipt, carefully examined, and a full report and estimate of cost sent. This estimate may be treated as an invoice, and a remittance to cover the amount will save any delay when the engine is ready for despatch. If an estimate has been asked for, work is not commenced until we are in receipt of definite instructions to proceed. In despatching repaired engines, unless we are instructed to the contrary, we return them by goods train, carriage paid, when an invoice will be sent for the carriage charge. In the case of urgent repairs, however, or when we have received instructions, engines are sent by passenger train, carriage paid. A further invoice is then sent for the carriage charge, or an approximate amount is included in the estimate ; and balance is returned after the account has been received from the Railway Company. If the engine has to be stripped for an estimate and the estimate is not accepted, a small charge may be made for the work entailed.

When spares for engines are ordered, a later type part may be supplied at our discretion.

The following points should be noted :—

1. In the event of damage to one side of the crankcase, the other side must be returned to us with the order, since the two halves have to be machined up together to secure correct alignment of the two cylinder faces.

2. An order for a flywheel, must always be accompanied either by a description of the marks and letters on the rim, or, if these are obliterated, by the opposite wheel to that required. All flywheels have to be balanced most carefully and paired up with each other.

We cannot supply a crankcase or crankcase half other than complete with all cylinder holding-down studs, bushes and other fittings.

4. Carriage in all cases must be paid by the customer. Packing material is free, but cases are charged for and are credited if they are returned to us in good condition, carriage paid.

5. The name of the sender should ALWAYS be attached to any parts sent in to us, quite irrespective of any correspondence that may have taken place.

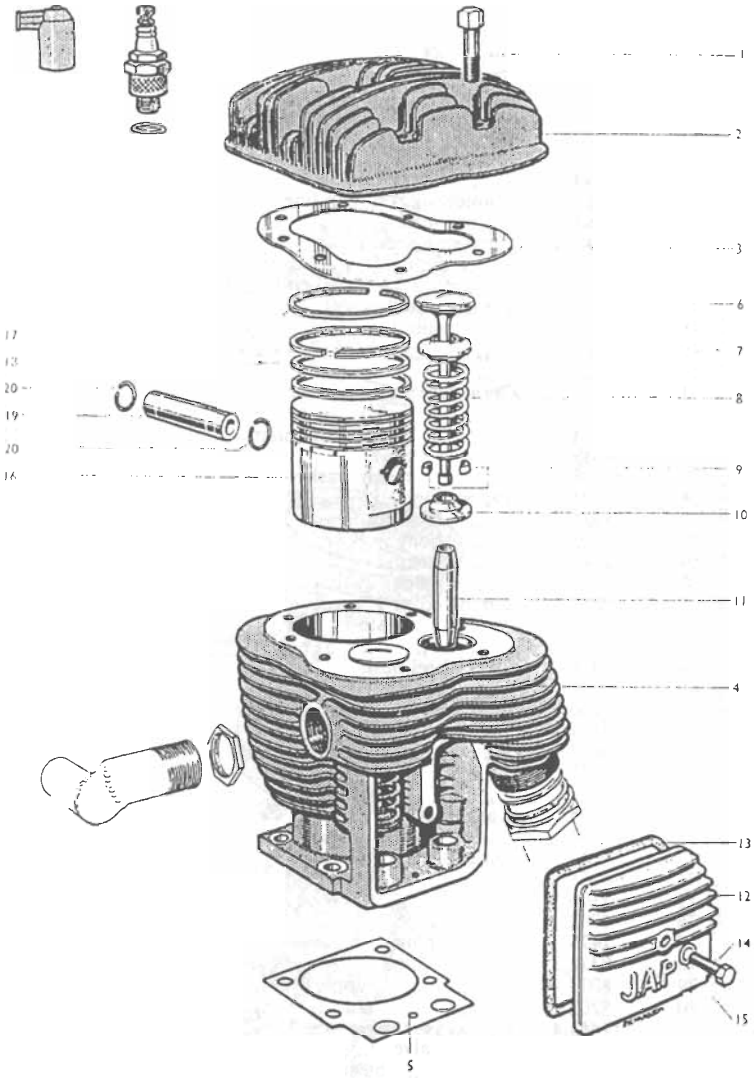
SPARE PARTS LIST AND DIAGRAMS

CYLINDER & PISTON ASSEMBLY — *Drawing No. 1*

Drawing No.	*Part No.*	*Description*	*No. off*
—	19962	Sparking plug	1
—	—	,, ,, washer	1
—	21267	,, ,, terminal cover	1
1	13706	Cylinder head bolt	8
2	12763/1	,, head	1
3	12769	,, ,, gasket	1
4	12765	,, barrel	1
5	19545	,, base gasket	1
6	7524	Valve	2
7	6272	,, collar (guide end)	2
8	6276	,, spring	2
9	7225	,, split collar	2
10	6973	,, collar (cone end)	2
11	10116	,, guide	2
12	12145	,, box cover	1
13	14186	,, ,, ,, gasket	1
14	3691	,, ,, ,, bolt	1
15	18316	,, ,, ,, ,, washer	1
16	21550	Piston	1
17	6638/2	Piston ring—Top and second groove	2
18	21551	,, ,, —bottom groove	1
19	9910	Gudgeon pin	1
20	11677	Circlip	2

FLYWHEEL & CRANKCASE ASSEMBLY — *Drawing No. 2*

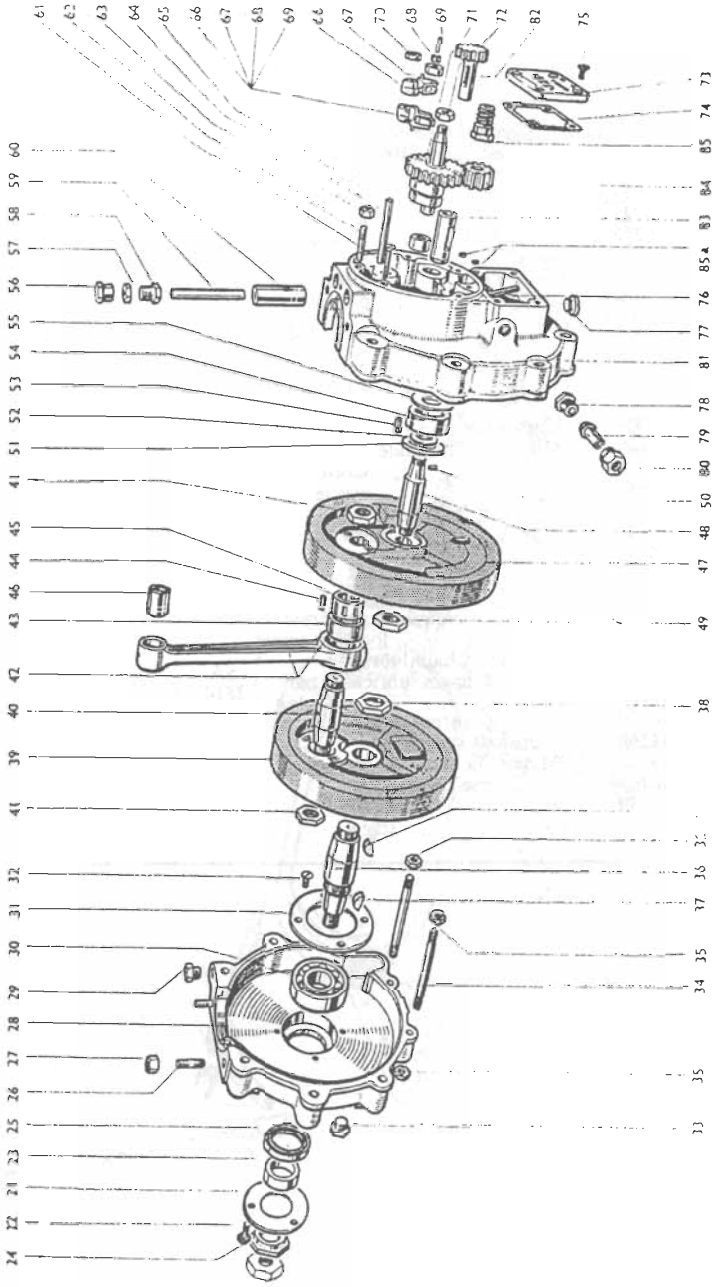
Drawing No.	*Part No.*	*Description*	*No. off*
21	19496	Crankcase oil seal retaining plate	
22	10341	,, ,, ,, ,, ,, fixing screw ...	
23	19497	,, ball bearing distance piece	1
24	19498	,, ,, ,, ,, ,, lock nut ...	1
25	19507	,, oil seal	1
26	7544	Cylinder fixing stud	4
27	303	,, ,, ,, nut	4
28	13903/5	Crankcase driving side	1
29	3730	,, top plug	1
30	19506	,, ball bearing driving side	1
31	19495	,, ,, ,, retaining plate	1
32	12314	,, ,, ,, ,, ,, screw ...	4
33	3730	,, drain plug	
34	9893	,, stud $\frac{1}{8}$"	
35	285	,, ,, $\frac{5}{16}$" nut	4



DRAWING NO 1. CYLINDER AND PISTON ASSEMBLY

FLYWHEEL & CRANKCASE ASSEMBLY—contd.

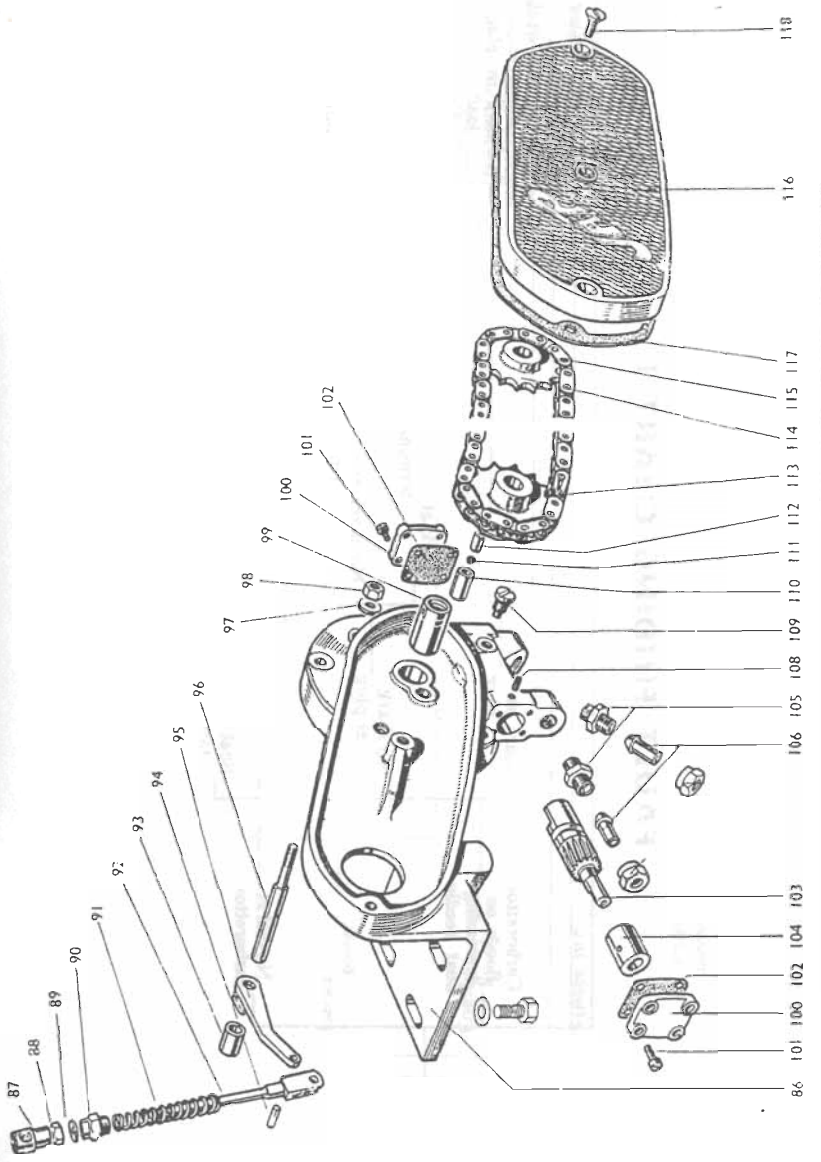
Drawing No.	Part No.	Description	No. off
36	19494	Driving spindle	
37	16668	,, ,, key	
38	7619/1	,, ,, nut (flywheel)	
39	12782/1	Driving side flywheel	
40	8493	Crankpin	1
41	3249	,, nut	2
42	11488	Connecting rod with liner	1
43	10683	Big end liner	1
44	18449	Connecting rod roller	8
45	10465	,, ,, ,, cage	1
46	6526/1	,, ,, small end bush	1
47	14012/1	Timing side flywheel	1
48	11873	,, spindle	1
49	4606	,, ,, nut (flywheel)	1
50	10635	,, ,, peg	1
51	9667/2	Crankcase thrust washer	1
52	11475/1	,, ,, ,,	1
53	9434	,, timing side roller	15
54	14013	,, liner	1
55	10878	,, recess washer	1
56	8921	Tappet top	2
57	8924	,, lock nut	2
58	8923	,, body	2
59	12348	,, stem	2
60	12703/1	,, guide	2
61	9650	Timing cover ¼" screw	1
62	6293	,, ,, stud	3
63	3574	,, ,, ,, ¼" nut	3
64	7012	Cam wheel bush	1
65	6692	,, lever pin	1
66	7430	Cam lever	2
67	9474	,, ,, roller	2
68	0897	,, ,, ,, bush	2
69	72	,, ,, ,, pin	2
70	[illegible]	,, ,, distance piece	1
71	7605	Cam wheel	1
72	7329	,, ,, nut	1
73	6616	Oil box cover	1
74	6628	,, ,, ,, washer	1
75	4106	,, ,, ,, screw	4
76	6742	,, ,, pipe	1
77	7476	,, ,, plug	1
78	8328/3	,, ,, union	1
79	8073	,, ,, ,, nipple	1
80	8203	,, ,, ,, nut	1
81	11463/4	Crankcase timing side	1
82	7411	Rotary valve	1
83	7412	,, ,, bush	1
84	7007	Timing pinion	1
85	SA2805	,, spindle nut and pump driving worm	1
85A	21508	Rubber washer	2



DRAWING NO. 2. FLYWHEEL AND CRANKCASE ASSEMBLY

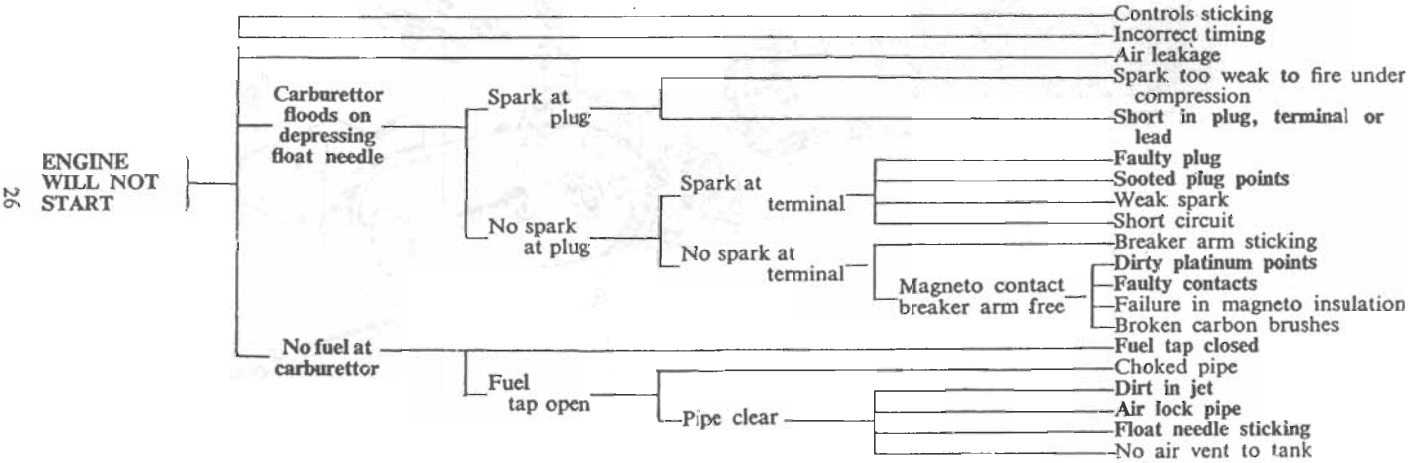
MAGNETO & OILPUMP ASSEMBLY — *Drawing No. 3*

Drawing No.	*Part No.*	*Description*	*No. off*
86	11750/1	Magneto Drive rear low position	1
87	19066	Exhaust valve lifter yolk	1
88	6045	,, ,, ,, nut	1
89	6971	,, ,, ,, washer	1
90	4821	,, ,, ,, guide	1
91	6213	,, ,, ,, spring	1
92	5821	,, ,, ,, rod	1
93	7443	,, ,, ,, distance piece	1
94	5818	,, ,, ,, pin fork end	1
95	7010/7415 SA2622	,, ,, ,, cam and lever	1
96	9718/3	,, ,, ,, pin	1
97	9308	,, ,, ,, washer	1
98	3574	,, ,, ,, nut	1
99	7008	Cam wheel bush	1
100	11449	Oil pump end plate	1
101	11450	,, ,, ,, ,, screw	1
102	11451	,, ,, ,, ,, washer	1
103	12040	,, ,, plunger	1
104	11440	,, ,, ,, bush	1
105	8328/3	,, ,, union	1
106	8073	,, ,, ,, nipple	1
107	8203	,, ,, ,, nut	1
108	21447	,, ,, plunger bush screw	1
109	12073	,, ,, ,, locating screw	1
110	12737	Magneto Chain lubricator... SA	1
111	16670	Magneto chain lubricator ball 2814	1
112	12768	,, ,, ,, plug	1
113	10070	,, sprocket	1
114	14568	Camshaft sprocket	1
115	16666	Magneto chain—53 pitches	1
116	14468	Chain case cover	1
	19330	,, ,, ,, gasket	1
	8944	,, ,, ,, screw	3

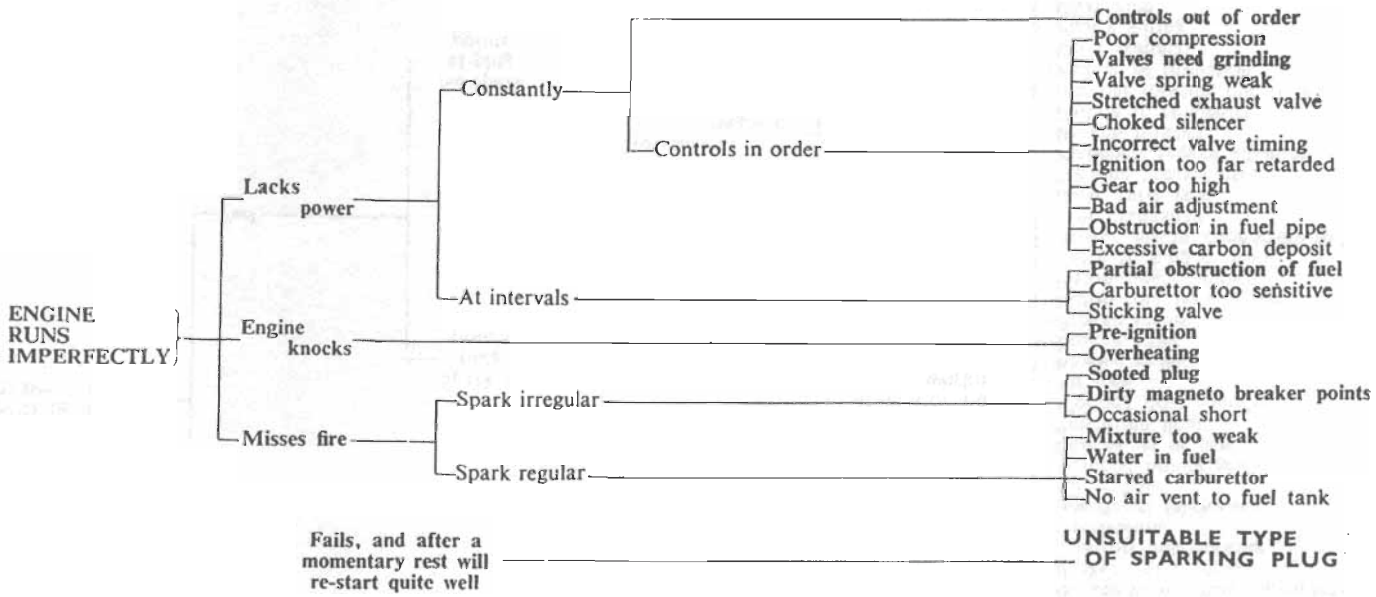


DRAWING No. 3 . MAGNETO DRIVE AND OIL PUMP ASSEMBLY

FAULT FINDING CHART I.



FAULT FINDING CHART II.



FAULT FINDING CHART III.