

**Maintenance Manual  
and Instruction Book**

FOR

**THE UNAPPROACHABLE**

**Norton**  
REGD. TRADE MARK

**MOTOR CYCLE**

**Models No. 88 & 99**

**NORTON MOTORS LIMITED**

**BRACEBRIDGE STREET, BIRMINGHAM, 6**

**ENGLAND**

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Telephone :  
ASTon Cross 3711 (P.B.X.)

Telegrams :  
"Nortomo, Birmingham."



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## DATA

		<b>Model 88</b>	<b>Model 99</b>
Cubic Capacity	... ..	490 c.c.	596 c.c.
Bore	... ..	66 mm.	68 mm.
Stroke	... ..	72.6 mm.	82 mm.
Compression Ratio	...	7.8 : 1	7.4
Sparking Plugs	K.L.G. FE 80 three point.	Lodge 2 HLN.	Champion NA 8

### IGNITION TIMING

Before top fully advanced	$\frac{1}{4}$ "	$\frac{9}{32}$ "
Magneto Points gap ...	.012"	.012"
Plug Points Gap	.022"	.022"

### VALVE TIMING

Inlet opens before T.D.C.	$\frac{1}{8}$ "	$\frac{5}{32}$ "
Inlet closes after B.D.C.	$\frac{17}{32}$ "	$\frac{5}{8}$ "
Ex. opens before B.D.C.	$\frac{17}{32}$ "	$\frac{5}{8}$ "
Ex. closes after T.D.C.	$\frac{1}{8}$ "	$\frac{5}{32}$ "

### TAPPET CLEARANCE (COLD)

Inlet ... ..	.002"	.002"
Exhaust ... ..	.003"	.003"

### AMAL CARBURETTER (Monobloc)

Type ... ..	376/19	376/17
Main jet ... ..	240	250
Throttle valve ... ..	$\frac{376}{3\frac{1}{2}}$	$\frac{376}{3}$
Needle position ...	2	3
Pilot jet ... ..	30	25
Engine sprocket solo ...	20 tooth	21 tooth

### GEAR RATIOS

1st ... ..	14.2"	13.45
2nd ... ..	8.4	8.02
3rd ... ..	5.75	5.48
Top ... ..	4.75	4.53

### CHAINS

	<b>Size</b>	<b>Tension</b>
Primary	$\frac{1}{2}$ " pitch $\times$ .305" wide	$\frac{1}{4}$ " slack movement
Rear	$\frac{3}{8}$ " pitch $\times$ $\frac{1}{4}$ " wide	$\frac{3}{4}$ " slack with weight of machine on wheels
Camshaft	$\frac{3}{8}$ " pitch $\times$ .225" wide	$\frac{1}{8}$ " slack movement
Magneto	$\frac{3}{8}$ " pitch $\times$ $\frac{5}{32}$ " wide	$\frac{1}{8}$ " slack movement

### TYRES

Tyre size front ... ..	300 $\times$ 19
Tyre size rear ... ..	3.50 $\times$ 19
Tyre pressure front ...	25 lbs.
Tyre pressure rear ...	20 lbs.

Petrol tank capacity ...	$3\frac{1}{2}$ gallons approximately
Oil tank capacity ...	5 pints approximately



## INTRODUCTION

In preparing these instructions the elementary details and preliminary information that may be necessary to the absolute novice have been omitted, on the assumption that the majority of NORTON owners are already acquainted with the elementary details of starting, driving and maintenance. In connection with the latter we would stress the advisability of cultivating the habit of routine cleaning, lubrication, examination and adjustment of your machine. By this means many minor annoyances will be avoided and major breakdowns averted, and you will acquire the pride of ownership which marks the true enthusiast.

Below is a plan view of the machine with all controls clearly indicated. A short study of this will familiarise you with the position and function of each control. It will be noticed that there is no ignition lever on the handlebar. This is not necessary, since the magneto is fitted with an automatic advance and retard mechanism which adjusts the spark setting to suit the particular engine revolutions, i.e., as the engine speed is increased, so the amount of ignition advance is also increased and vice versa. To obtain an easy start from cold, it is only necessary to turn on the petrol, very slightly flood the carburetter, close or partly close the air lever and with the throttle very slightly open, give a long swinging kick on the starter, opening the air lever to its normal running position as soon as the engine is capable of taking full air. When starting with a warm engine or even in warm weather, it is not necessary to use the air control lever.

Note that the single petrol tap has two positions and provides a reserve supply sufficient for some five miles of running.

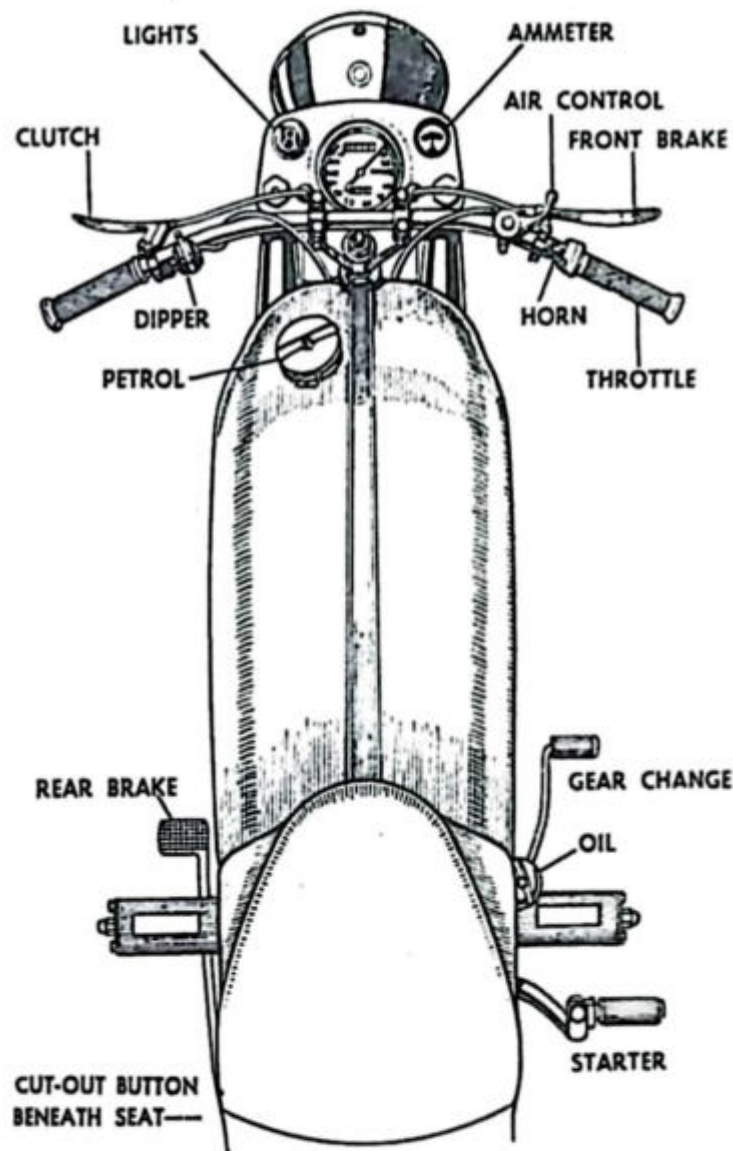


Fig. 1

Although the machine will have been greased up and all points requiring oil will have been dealt with at the works prior to the road test, it is always a safe policy to ensure that there is adequate oil in the oil tank, gearbox and oil bath chaincase. Remember to remove the level plug from the chaincase before topping up.

New machines should not be driven at more than 30-35 m.p.h. for the first 500 miles in top gear or a correspondingly slower speed in the lower gears afterwards, gradually increasing the speed until the 1,000 mile mark is reached, when it should be perfectly safe to use the machine's



full capabilities. It is advisable during the initial running-in period not to open the throttle more than one quarter or one third and to avoid "over revving" and slogging or labouring of the engine in too high a gear. The use of a running-in compound during the initial stages of the engine's life is strongly recommended. The compound, several brands of which are available and may be obtained from all Norton dealers, contains "colloidal graphite" which forms a graphoid surface on all working faces and greatly assists in preserving their high quality finish. The compound should be mixed with the lubricating oil in the proportion of one pint to one gallon of oil during running-in, but if its use is continued after this period, only half the quantity should be used. Remember that these are high efficiency engines which give of their best when running at relatively high revolutions and a change should be made to a lower gear immediately there are any signs of labouring. To obtain the best possible performance from your machine, full use should be made of the gearbox, which is quite capable of withstanding all the loads likely to be imposed upon it by normal use.

At the end of this book will be found a trouble tracing chart, reference to which will greatly facilitate the location and rectifying of any but the most unusual troubles which may be likely to cause an involuntary stop.

## CLEANING

Before attempting to polish the enamel on any part of the machine, all traces of grit adhering to the various components should be washed off, preferably with a reasonably high pressure hose. Polish the enamel periodically with a good quality wax polish. Note that chromium plating is not impervious to rust and should be wiped down when possible, after being in the rain. Wash off any road grit and clean with one of the chromium polishes available from any garage. Do NOT use ordinary metal polish.

## LUBRICATION

At the Works, Wakefield Castrol Oils have been used for many years exclusively with highly successful results; the correct grades for the models dealt with in this handbook being:—

WAKEFIELD CASTROL XXL, for Summer use.

WAKEFIELD CASTROL XL, for Winter use.

Other very suitable oils for NORTON machines are:—

SHELL-X-100-40 or B.P. ENERGOL S.A.E. 40 for Summer use.

SHELL-X-100-30 or B.P. ENERGOL S.A.E. 30 for Winter use.

MOBIL OIL "BB" for Summer use.

MOBIL OIL "A" for Winter use.

These oils should be used in engine and gearbox. For oil bath chaincase use Wakefield's "Castrolite," Shell-X-100-20, Price's Energol S.A.E. 20 or Mobiloil "Arctic." All bearings not automatically lubricated are fitted with nipples for grease gun lubrication and a good quality grease, such as Wakefield's Castrolase medium, Price's Energrease C3, Shell Retinex A or Mobilgrease M.P. should be used at these points.

Below is a lubrication chart indicating the approximate periods at which the various lubrication points should receive attention. If this chart is adhered to, excessive wear will not occur on any of the moving parts, the life of the machine will be prolonged and its performance will be considerably enhanced.

NOTE.—On a new machine, drain and flush out oil tank after 500 miles. Remove crankcase drain plug and allow to drain. Remove level indicator plug from oilbath chaincase and fill to this level.

LUBRICATION CHART

Period	Location	Lubricant	Period	Location	Lubricant
Every 200 miles.	Oil tank, top up...	Oil.	Every 2,000 miles.	Brake pedal ... ..	Grease.
Every 1,000 miles.	Control cables ... ..	Oil.		Brake shoe cam (rear sparingly) ... ..	Grease.
	Control levers ... ..	Oil.		Brake rod jaw joints ... ..	Oil.
	Brake cable "U" clip ... ..	Oil.		Speedometer driving box	Grease.
	Rear chain ... ..	Grease.		Drain and refill oil tank	Oil.
	Gearbox, top up... ..	Oil.	Every 5,000 miles.	Gearbox, drain and refill	Oil.
	Oil bath, top up... ..	Oil.		Commutator end bracket	Oil.
			Every 10,000 miles.	Telescopic forks ... ..	See para. 70
				Oil bath, drain and refill	Oil.



## THE ENGINE

### 1. ENGINE. LUBRICATION SYSTEM.

This is of the dry sump type. The oil flows from the oil tank to the pump by gravity, assisted by suction from the feed side of the oil pump, through the gears, and is forced under pressure to various parts of the engine, drains to the lowest part of the crankcase and by suction from the return side of the pump is lifted back to the oil tank.

### 2. OIL FILTERS.

There are two gauze filters in the lubrication system, the main one being attached to the adaptor screwed into the oil tank to which the oil feed pipe is connected. Clean filter when the tank is drained every two

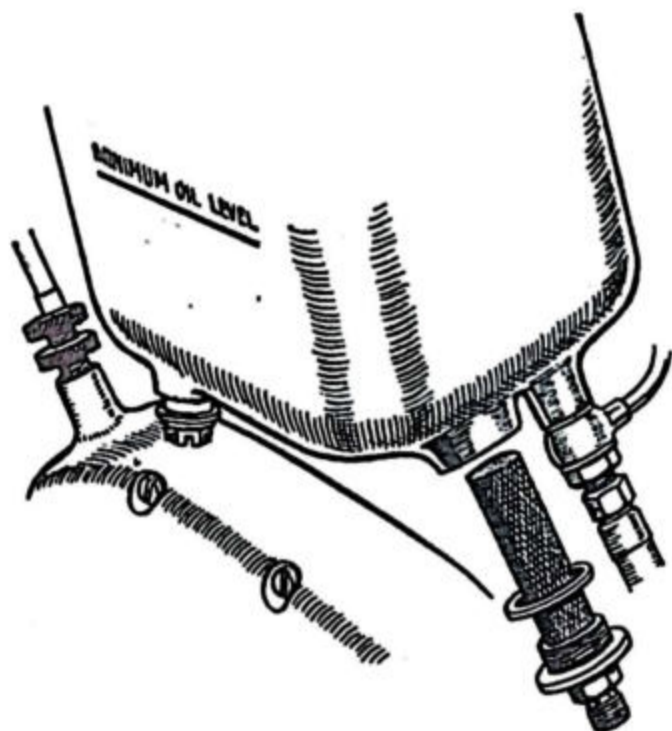


Fig. 2.

thousand miles. A small slightly dished gauze disc is incorporated in the pressure release valve clearly shown in Fig. 3. It is unlikely that this will become even partially clogged unless the main filter is damaged or the oil allowed to become heavily contaminated.

### 3. ENGINE OIL PUMP.

This is of the gear type. The pump contains two pairs of gears, one on the feed side and the other on the return side.

The gears on the return side are twice the width of those on the feed, having twice the pumping capacity. This ensures that the crankcase is free from oil when the engine is running.

To check the return of the oil to the tank,

remove the oil filler cap. The oil return pipe can then be seen. After the engine has been running for a few minutes, the oil return flow will be spasmodic, due to the greater capacity of the return gears.

### 4. OIL LEVEL.

The oil level in the oil tank should not be above three-quarters and not below half.

If the level is above the three-quarter mark, when the engine is running, the pressure built up in the oil tank by the oil return side of the pump may force the surplus oil through the air release pipe on to the road.

Always run engine for a few minutes before checking oil level. It is possible when an engine has been idle for any length of time for the oil to syphon through the return gears to the sump.

When this happens, all the oil is returned to the tank in the first few minutes that the engine is running.

When the oil level is below the half full mark there is such a small quantity of oil that it tends to over-heat.

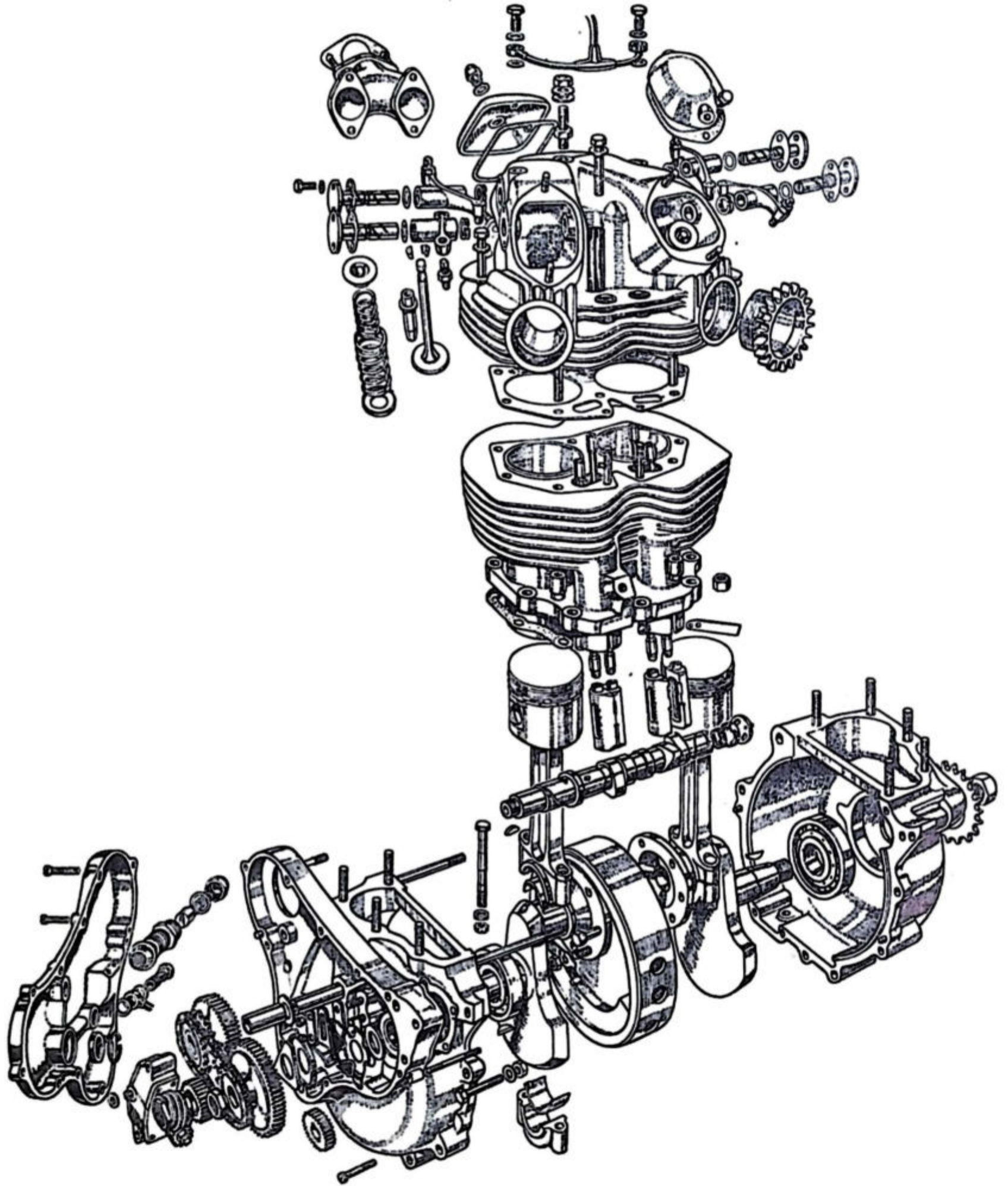
### 5. CIRCULATION OF THE OIL.

The oil pump makes an oil tight joint with the timing cover by means of a synthetic rubber washer under compression.

Oil passes from the pump through drilled oil ways in the timing cover to the hollow timing side mainshaft, an extension of which rotates in an oil seal located in the cover. The built up crankshaft (Fig. 3) is suitably drilled to convey oil under pressure to the plain big ends. Surplus oil escaping from the pressure release valve into the timing cover builds up to a pre-determined level to lubricate the gears and timing chains, afterwards draining into the sump via a drilled hole. A lead from the oil return pipe (external) conveys oil to the hollow o.h.v. rocker spindles, push rod ends and valve guides, surplus oil returning to the sump via a drilled hole in the rear of the timing side cylinder.

Pressure release valve depicted in Fig. 3. is pre-set and incapable of adjustment. A timed breather working at the inner end of the camshaft (Fig. 3) controls the crankcase pressure. Any oil escaping from this source being conducted to the rear chain.





**Fig. 3**



Removal of the filter screwed into the driving side of the sump enables the crankcase to be flushed out and the filter cleaned when the occasion arises.

#### **6. OIL PRESSURE.**

Since no pressure gauge or indicator is fitted, the only check that oil is circulating is an inspection through the oil tank filler cap. With the engine running, an intermittent stream of oil will be seen returning into the tank, the surface of the oil being covered with bubbles. In the event of it being considered necessary to check the oil pressure, the removal of the hexagon headed pin immediately below the pressure release valve unit will provide a convenient take off for a pressure gauge. It is preferable to check when the oil is hot as there is almost certain to be adequate pressure with cold oil.

With oil at normal working temperature and engine ticking over, there should be a minimum pressure of some 5lbs., which should increase progressively with rising R.P.M. The ultimate pressure being dependant on engine condition and the state of the oil.

#### **7. PETROL TANK—REMOVAL**

Ensure that the petrol tap is in the "off" position. Disconnect the petrol pipe using two spanners, holding the tap with one whilst releasing the union nut with the other.

Remove the seat by removing the two wing nuts centrally situated beneath the seat pan and lifting off the seat. This will expose the bolt which tensions the securing strap holding the tank down on the rubber pads taped to the top tubes of the frame. Removal of this bolt and bending back the strap will enable the tank to be lifted out of position.

#### **8. PETROL TANK—REFITTING**

If new rubbers have been fitted to the frame top tubes, ensure that they are well bedded down and securely taped so that there is no possibility of metal to metal contact between tank and frame. Pull securing strap into position, fit bolt and nut and tighten sufficiently tight to prevent loosening by vibration but not so tight as to overstress the tank structure. Re-fit petrol pipe using two spanners as for removal.

#### **9. CYLINDER HEAD REMOVAL.**

Remove petrol tank (para. 7). Remove carburetter, leaving it attached to the machine by the throttle cable only. Remove exhaust pipes and silencers complete as a unit from each side of the machine. Remove high tension leads

from sparking plugs and engine steady stay stud from the top of the rocker box. Disconnect oil feed pipe to rocker mechanism by unscrewing the two banjo connection bolts on the extreme top of the rocker box.

There are five bolt heads visible above the cylinder head finning and two nuts between the exhaust ports. In addition there are three nuts accessible through the cylinder finning, one beneath the inlet port and one under each exhaust port.

Removal of these nuts and bolts should enable the head to be lifted off. If the joint is tight a light blow beneath the exhaust port with a mallet or a block of wood should effectively release it. Lift the head and ensure that the gasket is either coming away clean with the head or remaining in position on top of the cylinder block. Lift the head as far as possible and obtain assistance to feed the four push rods into the head until they are clear of the cylinder block when the head may be tilted backwards and completely withdrawn.

#### **10. REMOVAL OF CARBON.**

The piston crowns will now be exposed and the engine should be rotated until the pistons are on top dead centre. Carefully scrape the carbon from the piston crown, using a blunt knife or similiar tool, taking care to avoid scratching or cutting the piston material. Deal similarly with the combustion chambers and and valve ports although these cannot be thoroughly cleaned without removing the valves

#### **11. VALVE REMOVAL.**

With the cylinder head removed, the rocker inspection covers taken off, and the stud securing the inlet rocker inspection cover also removed, the o.h.v. rockers may be rotated sufficiently clear of the valve stem to enable a normal Universal type valve spring compressor to be used for compressing the springs and removing the cotters. Each valve, together with its springs, should be carefully placed on one side so that it may be refitted in its original position.

Note that although the inlet and exhaust valves have the same head and stem diameters, they are not identical, the inlet head being curved on the underside. It is important that they should not be interchanged.

#### **12. VALVE GRINDING.**

Remove all the carbon from the valve heads and stems. Lightly smear the seat portion with medium grinding compound, place the valve in the guide and grind lightly, holding the



end of the valve stem in a hand vice or chuck. Do not revolve the valve a complete turn, but oscillate rapidly, frequently raising the valve from the seat and placing in a different position.

As soon as the grinding marks make a complete ring on valve and head, cease operations and remove all traces of grinding compound from valve, seat and port. If valves or seats are badly pitted it may be impossible to obtain a perfect seat by grinding. The seats will then have to be re-cut and the valves replaced or renewed.

### 13. VALVES—FITTING.

Thoroughly clean valves, seats and valve pockets. Fit bottom collar over valve guide (if the collar has been removed) and place the spring and top collar in position. Lubricate valve stems and insert through valve guide. Compress valve spring and fit cotters.

A little thick grease smeared on the inside of the cotters will hold them in position until the spring is released.

### 14. VALVE GUIDES—REMOVAL AND FITTING.

The valve guides are a driving fit in the cylinder head and may be tapped out of position by means of a double diameter brass punch which may also be used for fitting replacements.

The valve seats must be trued up with a cutter after fitting to ensure that the guide and seat are in correct alignment.

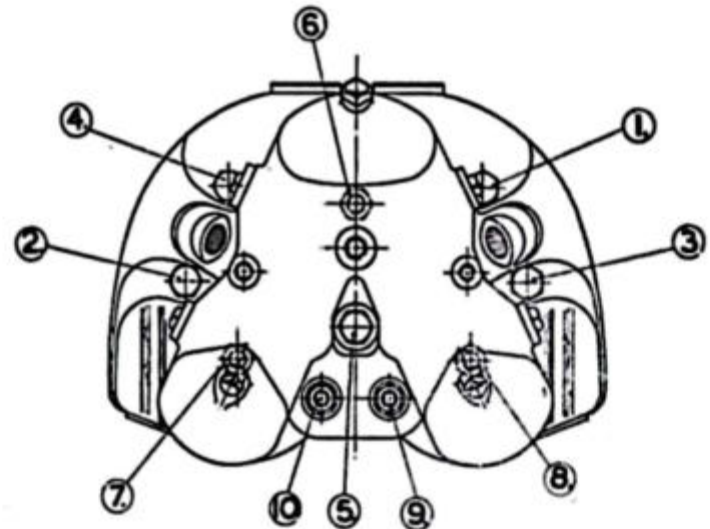
### 15. CYLINDER HEAD—FITTING.

If the cylinder head gasket has been removed, refit with the same face uppermost or renew. Rotate engine until pistons are on top dead centre. Place cylinder head on top of cylinder block and tilt it backwards whilst the pushrods are inserted into the two tunnels cast in the cylinder head. Note that the inlet push rods are longer than the exhaust, and one of each, i.e., inlet and exhaust should be inserted into the head, the long rods being nearer the centre, see Fig. 3.

Lower the head into position and allow the push rods to fall on to the tappets as the head approaches its normal location.

When the head is within about  $\frac{1}{4}$  in. of the cylinder joint face it should be supported in this position by using the two short sleeve nuts taken from beneath the exhaust ports as packing between the top fin of the cylinder block and the bottom cylinder head fin, placing them

in a horizontal position between the fins whilst the rocker ball ends are entered into the upper ends of the push rods. A piece of bent wire



**ORDER OF TIGHTENING DOWN CYLINDER HEAD NUTS & BOLTS.**

*Fig. 4.*

may be found useful for drawing the inlet push rod into position, access being obtained through the exhaust inspection apertures.

Remove temporary distance pieces and lower head on to joint face.

Ensure that rockers and push rods are in correct contact. Attach all nuts and bolts and pinch down lightly, finally tightening in the order shown in Fig. 4.

### 16. ROCKER ADJUSTMENT.

Removal of the single nut securing the inlet rocker inspection cover will provide access to both inlet rockers and enable the necessary feelers to be inserted between the rocker adjuster and the valve stem end (Fig. 5).

Rotate the engine until the particular inlet valve being dealt with is closed.

To adjust the clearance, hold the squared end of the adjuster by means of a special spanner provided and slacken the locknut. Insert a .002 in. feeler and rotate the adjuster in a clockwise direction until the feeler is just pinched, but may be still moved about fairly easily. Hold the adjuster whilst tightening the locknut and re-check with the feeler.

Rotate the engine until the other inlet valve is closed, repeat the operations and fit the inspection cover, ensuring that the paper washer is in good condition, and correctly positioned.

To adjust the exhaust rockers remove the inspection cover and proceed as already described, using a .003 in. feeler. Always re-check



with the feeler after tightening the locknut and readjust if there is any doubt about the accuracy of the original setting.

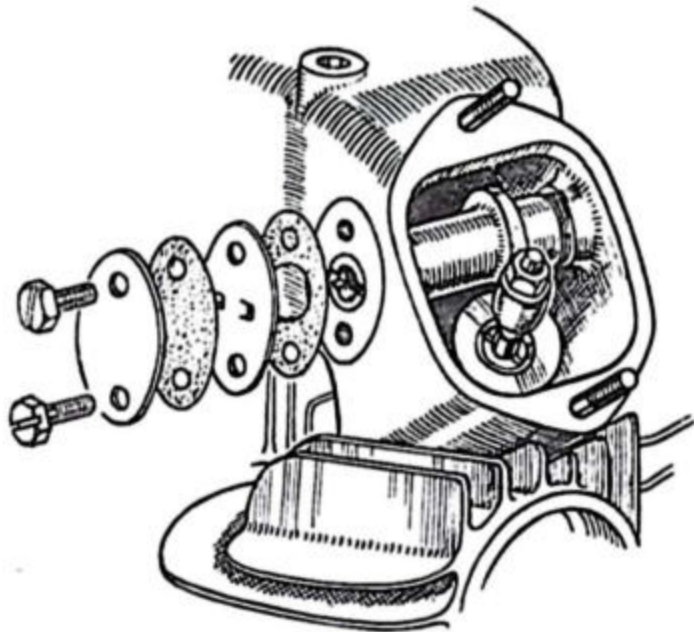


Fig. 5

#### 17. ROCKER REMOVAL & FITTING—INLET.

Remove inspection cover and cover securing stud. This latter may be withdrawn by locking two nuts on the outer end and rotating the lower of the nuts which should bring away the stud.

Remove the two bolts securing the oval cover plates over the ends of the rocker spindle holes (Fig. 5). Note that the inner of these has two projections for locating the radial position of the spindle and that the spindle has a threaded hole at its outer end. A 5/16in. x 26 thread bolt taken from some part of the machine may be used as an extractor bolt having first interposed a piece of tube or large nut between the cylinder head and the head of the bolt.

Note that the rocker hub has a spring washer at one end and a plain thrust washer at the other. These may be either carefully removed before the rocker is extracted or allowed to fall when the rocker is removed. Having withdrawn the rocker until the hub is clear of the spindle hole bosses, it is necessary to turn it upside down in order to withdraw it completely. When refitting, the operations should be reversed, placing the rocker in position, adding the plain thrust washer to the outer end of the hub and maintaining an end load on the rocker whilst the spring washer is inserted.

The end load put on by the spring washer will hold the assembly in position whilst inserting the spindle. Make sure that the oil hole in the spindle is in the right position to

mate up with the feed hole in the rocker box and that the slot across its outer end is lying horizontal. Fit paper washer to oval face by means of a smear of oil. Fit oval washer with tags engaged in spindle slot, fit another paper washer, followed by the plain oval washer and secure with two pins (Fig. 5).

#### 18. ROCKER REMOVAL & FITTING—EXHAUST.

Remove inspection cover and proceed as for inlet rocker. In the case of the exhaust rocker, its removal is quite straightforward and does not involve any inverting of the rocker. For replacement, proceed as already described.

#### 19. CYLINDER BLOCK—REMOVAL.

Remove petrol tank, para. 7.

Remove cylinder head, para. 9.

Remove dynamo by removing the three end screws, slackening the securing strap and drawing the dynamo out of position, having previously disconnected the electrical leads.

Remove the nine cylinder base nuts (seven large, two small). It is necessary to lift the block slightly before certain of these nuts can be removed completely. When lifting the block, avoid tearing the paper washer fitted to the crankcase joint.

#### 20. PISTONS—REMOVAL.

With the cylinder block removed and the pistons exposed, it will be apparent from the angular position of the valve head recesses in the piston crowns that the two pistons are not interchangeable, and if a new one is required for any reason, it will be necessary to specify whether a nearside (lefthand) or offside (right hand) is wanted.

A new piston may be fitted either way round, but having once been used, should always be replaced in the same position.

To remove a piston, first extract the gudgeon pin retaining circlips by means of a pair of sharp nosed pliers and push out the gudgeon pin. If the engine is badly carboned up it may be desirable to scrape the carbon from the narrow land outside the circlip before attempting to remove the gudgeon pin. Be sure to mark the piston so that it may be replaced in its original position.

#### 21. PISTON RING REMOVAL AND FITTING.

Unless new rings are being fitted it is not advisable to remove the carbon from the



bottom of the ring groove or the back of the ring. When fitting new rings, remove all carbon from the piston by means of an old hacksaw blade or similar tool. When the grooves have been cleaned, check the new ring in the groove. There should be a side clearance of .004in. Check also the ring end gap by inserting the ring in the cylinder bore and pushing it down with a piston to ensure that it is lying square. The gap should be :

Compression rings, .008in.—.010in.

Scraper rings, .008in.—.010in.

Check gap with feeler gauge.

## 22. PISTONS—FITTING.

Fit rings to piston, spacing the ring gaps equally round the piston circumference. Fit one gudgeon pin circlip if both have been removed for dismantling. Unless great care has been taken in the removal of the circlips, it will be advisable to fit new ones. Fit piston to connecting rod, ensuring that it is the correct way round and that the valve head recesses are lying in the right direction. When both pistons are fitted, the forward recesses should be further apart than those at the rear of the engine. When fitting the circlips, make certain that they are properly bedded in the groove.

## 23. TAPPETS—REMOVAL AND FITTING.

It is most unlikely that the tappets will require any attention until a very large mileage has been covered. They are fitted into the cylinder block and are readily accessible when the block has been removed.

Invert the cylinder block, remove the wire securing the tappet division plate screws and remove the screw nearest the tappets. This will enable the division plate to be swung out of position on the other screw. If tight, a light blow on the opposite end of the tappets will effectively release the plate.

Note that the tappets must not be interchanged either singly or in pairs, nor should they be fitted the opposite way round.

The refitting is quite straightforward, remember to rewire the division plate screws.

## 24. CYLINDER BLOCK FITTING.

Clean both joint faces and ensure that the cylinder base paper washer is in good condition and is fitted so that the oil return hole is quite clear.

Fit piston ring compressors (obtainable from service department) to pistons, ensuring that the ring gaps are approximately equally

spaced and that all are covered by the compressor. About  $\frac{1}{8}$ in. of piston should stand above the compressor. Smear the cylinder bores with oil and feed the cylinder block over the pistons forcing the piston ring compressors down the piston until they fall from the bottom of the piston skirt. Remove the compressors and lower the block to within about  $\frac{1}{2}$ in. of the joint, and replace the cylinder base nuts.

Completely lower the cylinder block and just pinch down the two nuts on either side of the block, tightening these in diagonal order. Tighten the three remaining large nuts, and finally the two  $\frac{5}{16}$ in. nuts at the front of the block.

Replace dynamo, tightening the end screws before tightening the securing strap.

## 25. TIMING COVER—REMOVAL AND FITTING.

Remove the ten cheese headed screws securing the cover which may then be withdrawn. If tight, lever gently behind the pressure release valve boss, and tap lightly with a wooden block on the opposite end of the cover. Take care not to lose the small rubber washer which forms the oil seal between the pump and the cover.

When refitting, ensure that both faces are quite clean and lightly smeared with jointing compound, preferably "Wellseal," which is non-hardening. Ensure also that the oil pump rubber sealing washer is in position. Take care not to damage the oil seal when entering the mainshaft into the cover, and do not press right home if there appears to be any obstruction. Refit all screws checking that there is a fibre washer under each head, and just pinch each one down before finally tightening each pair of opposite screws.

## 26. PRESSURE RELEASE VALVE—REMOVAL AND FITTING.

When it becomes necessary to examine the pressure release valve or clean the small filter disc with which it is fitted, it is only necessary to remove the large domed-hexagon nut above the pressure gauge banjo connection to expose the spring and pressure release valve plunger, which may be withdrawn. To remove the filter, it is necessary to remove the pressure release valve body which holds the filter in position. Thoroughly clean all components and re-assemble as follows:—Insert the gauze filter with its domed side inwards, and screw home the pressure release valve body to which the larger of the two copper



washers has been fitted. Fit the plunger and spring, and finally the nut, remembering to place the remaining copper washer over the threaded end of the body. The nut should be screwed right home.

### 27. OIL PUMP—REMOVAL AND FITTING.

Whilst the timing cover is removed, no difficulty should be experienced in removing the oil pump, which is held only by the two nuts, situated one on either side of the body.

When these are removed, the pump should be readily withdrawn from its studs. If tight, a gentle leverage may be applied behind the driving spindle.

To replace the pump clean both faces and apply jointing compound very sparingly, particularly in the vicinity of the oil holes. Fit the pump and nuts, and tighten each nut a turn at a time to ensure even tightening.

### 28. OIL PUMP.

The oil pump is of the gear type. It is not advisable to dismantle it.

When pump is removed from timing chest, test for play in the spindle by pulling and pushing the worm wheel.

Revolve spindle and place fingers on the oil holes and the action of the gears should be felt if the pump is in good condition.

When revolving pump, any foreign matter obstructing the gears will be felt. Wash out with paraffin.

A marked drop in oil pressure, or oil draining from tank to crankcase may indicate that the pump requires re-conditioning; for which operation it should be returned to the service department, who make only a small charge for this work.

### 29. TIMING SPROCKETS AND CHAINS—REMOVAL.

When removing the chains, it is necessary to withdraw the whole sprocket assembly with the chains in position. This may be accomplished without disturbing the timing chain tensioner secured to a boss in the timing chest by two nuts. Remove the nut securing the camshaft sprocket, and the pin securing the automatic advance mechanism to the magneto spindle. This latter is automatically withdrawn as the pin is removed, but the camshaft sprocket may require the use of a standard type of sprocket extractor. The intermediate gear and sprocket will, of course, readily leave the spindle. Unscrew the oil pump worm,

which has a lefthand thread, and withdraw the half-time pinion by means of a special extractor available from the spares department.

### 30. TIMING SPROCKET AND CHAINS—FITTING.

Fit oil retaining disc and triangular washer to mainshaft and fit half-time pinion key. Fit half-time pinion with the chamfered edge outside and tap home with a tubular drift. Fit steel washer to intermediate shaft and camshaft (the latter is the thicker of the two). Place the spider clutch spring on the camshaft and fit the camshaft key. Rotate engine until the marked tooth on the half-time pinion is in the top dead centre position. Smear both faces of the fibre gear which drives the dynamo, with grease, place the gear in position on the flange of the sprocket and to the other face of the gear, fit the steel friction washer locating it on the peg, protruding from the sprocket flange. The grease will hold it in position.

Rotate the camshaft till the keyway is in top dead centre position. Place the magneto chain (the narrower of the two chains) on the inner of the two sprockets on the intermediate gear and the camshaft chain on the other. Rotate the gear until the marked gear tooth is in the bottom dead centre position. This will give a marked sprocket tooth in the topmost position. The camshaft sprocket also has a marked tooth which should also be in the top position when the sprocket is meshed with the chain. The chain and sprocket assembly may now be placed loosely in position, the magneto sprocket and auto advance mechanism meshed with its driving chain and the whole assembly pushed home. Check by using the dynamo shaft hole as a window that the spider spring is located with one leg either side of the peg in the inner side of the cam sprocket flange. Check also that all marked teeth are correctly positioned, i.e. when the marked pinion and gear teeth are in mesh, both marked sprocket teeth are in the top dead centre position the intermediate sprocket tooth having just entered the chain whilst the camshaft sprocket tooth should be just about to leave the chain. Fit and tighten the oil pump worm and camshaft sprocket nut but do not fit the timing cover until the magneto has been timed (para. 31).

The chain tensioner can be fitted either before or after the chain is in position. It should be adjusted so that there is about 1/8in. whip in the top run of the chain.

### 31. MAGNETO TIMING.

For purposes of magneto timing, the off-side



or right-hand cylinder is used. Set the pistons on T.D.C., and attach a degree plate set at zero to the mainshaft.

Rotate the engine in the opposite direction to that in which it normally travels, until the degree plate registers  $31^\circ$  or  $\frac{1}{4}$ in. down the cylinder bore if a degree plate is not available. Hold the automatic advance mechanism in the fully advanced position by rotating the moving portion in an anti-clockwise direction until it is against the stop where it may be convenient to wedge it whilst dealing with the contact breaker on the opposite side of the machine. Rotate the contact breaker until the points are just about open in approximately the nine o'clock position. Insert a very thin feeler gauge or a piece of paper between the contact breaker points to obtain the position accurately at which they commence to separate. Tighten the centre pin securing the automatic advance mechanism, and check that the timing has been correctly set. Fit timing cover (para 25).

### **32. REMOVAL OF ENGINE FROM FRAME.**

The engine and gearbox assembly is intended to be removed from the frame as a unit, and for this purpose it is advisable to support the frame on a block or box to provide rather more stability than is available from a central stand. Remove the petrol tank, oil bath chaincase, the oil tank and battery, together with their platform. Remove also the engine steady stay and disconnect all cables and electric wiring likely to prevent the engine/gearbox assembly being removed when all attachments are released.

Remove the remaining bolts holding the engine/gearbox assembly to the frame and lift the assembly clear of the frame. It will probably be necessary to obtain assistance to hold the cycle steady whilst removing the unit. No difficulty should be experienced in disconnecting the engine from the gearbox or vice versa.

### **33. CRANKSHAFT—REMOVAL AND FITTING.**

Remove engine sprocket key, remove timing cover, chains, sprockets, etc. (paras. 25 and 29). Remove breather pipe from rear of driving side crankcase, and the nuts from the two top crankcase studs. Remove half-time pinion key, and camshaft sprocket key. Remove the short bolt between the top front engine plate bosses, and the two cheese-headed screws, one between the bottom bosses and the other in the corner of the sump. The timing side crankcase may now be removed by levering gently between the crank cheek and the crankcase inner wall with a tyre lever or similar tool. There may be

packing shims fitted between the crank cheek and the timing side bearings; ensure that none of these is lost.

Withdraw the camshaft, and from the bottom of the driving side camshaft bush, remove the automatic breather valve and spring. Rest the driving side half face uppermost on two wooden blocks high enough for the mainshaft to clear the bench, and rotate the crankshaft until the crankpins are in the B.D.C. position. Withdraw the crankshaft as far as possible, and tilt over until the connecting rod small end clears the tie bar cast across the driving side crankcase when the crankshaft assembly may be lifted clear. It will bring with it the inner race of the mainshaft roller bearing.

If any new parts have been fitted, or the location of the packing shims forgotten, it will be necessary to re-centralise the crankshaft when refitting. It is almost certain that some shims will be required between the driving side bearing and the crank cheek, so two shims should be placed on the mainshaft before fitting it into the driving side crankcase. Having ensured that the crankcase is right home against the bearing, take a measurement from the crankcase joint face at a point where there is no upstanding spigot to the upper side of the flywheel. This should measure  $\frac{1}{2}$ in., and whilst it is reasonably important, a rule measurement is sufficiently accurate. Shim up until this figure is obtained, and fit the timing side case. Pinch the two halves together with three bolts about equally spaced and check the crankshaft for end float. There should be .005in.—.008in. Add the necessary shims to the timing side mainshaft. Dismantle, lubricate bearings, apply jointing compound to crankcase faces and assemble fully.

### **34. BIG END BEARINGS—RENEWAL.**

The necessity for big end bearing renewal will be apparent by a thumping noise from the region of the crankcase, when the engine is pulling, and by a very low pressure—if checked. Check that the end cap and big end of the rod are marked for correct re-assembly and mark the rod and crankshaft to ensure that the rods are fitted the same way round as originally.

With a ring or box spanner and noting the pressure required, release the shakeproof nuts from the big end bolts.

Remove the nuts and washers, when a straight pull on the rod should remove the end cap. If the cap becomes wedged due to misalignment, tap carefully home and try



another pull. The steel backed bearings may be readily picked out and replaced.

Over an extremely long period, there will be no measurable wear on the crankpins, and standard size bearings will be suitable replacements. No difficulty should be experienced in fitting the replacements but care should be taken to ensure that both rod and bearings are perfectly clean when assembled.

Lightly smear the crankpin with oil and re-assemble the end caps on the rod in the same position as originally fitted. With a box or ring spanner, pull down the end cap nuts evenly and quite tightly but without sufficient pressure to cause distortion of the cap.

### **35. CRANKSHAFT—DISMANTLING AND RE-ASSEMBLY.**

After a considerable mileage has been covered, the large oil well formed in the centre of the crankshaft assembly, will tend to become partially filled with sludge and carbon deposited centrifugally as the oil passes through. It is impossible to state at what mileage this should be cleaned out as it is entirely dependent on the frequency with which the oil is changed and the general cleanliness of the engine, but obviously it will not be dealt with until the unit is due for a major overhaul.

The flywheel is held between the two crank throws by four bolts and two studs, the nuts of the latter being secured by tab washers.

Before commencing to dismantle, mark the flywheel and one crank cheek to ensure re-assembly in the original position.

Bend back the tab washers on the same side of the flywheel as the bolt nuts, remove all nuts and withdraw the four bolts. This will enable the crank throw and flywheel to be removed.

Thoroughly clean out the centre holes and the feed holes to the bearings, ensure all faces are perfectly clean and re-assemble in the reverse order, lightly pinching down each nut before finally tightening in diagonal order. Remember to re-assemble the flywheel the same way round that it was originally fitted. Lock the bolt nuts with a punch mark and reset the tab washers.

### **36. SMALL END BUSH—REMOVAL AND FITTING.**

Whilst the connecting rod is removed, it may be found desirable to renew the small end bush, although removal of the old bush and fitting of a new one can be carried out with only the cylinder barrel and pistons removed.

Obtain a bolt at least twice the length of the bush, place a washer at the head of the bolt with an outside diameter slightly less than the bush. Place the bolt in the bush and over the screwed end of the bolt, place a piece of tubing longer than the bush with an inside diameter slightly larger than the outside of the bush. Fit nut to bolt and tighten. As the nut is tightened the bush will be drawn from the connecting rod. Fit new bush in the reverse manner. Before fitting the bush to the rod, the inside diameter should be reamed to the size of the pin as, when fitted in the rod, the bush will compress slightly leaving sufficient material for truing with the reamer. Drill oil holes in the bush before reaming to size. The gudgeon pin should finally be a nice push fit in the bush.

### **37. CAMSHAFT BUSHES—REMOVAL AND REPLACEMENT.**

Considerable difficulty will be experienced in removing the camshaft bush from the driving side half-case, if sufficient wear ever occurs for renewal of these bushes to be necessary. It is most strongly recommended to return the crankcase to our service department to have this operation carried out.

### **38. MAIN BEARINGS—REMOVAL AND REPLACEMENT.**

To remove the main bearings, gently heat the case around the main bearing housing, avoiding overheating or a concentration of heat on one spot. Drop the half-case open side downwards square and true on to the bench or wooden block and the bearings (or outer race in the case of the driving side) will fall out. Replacements are more readily fitted whilst the case is still hot and should be pressed or carefully drifted home in the housing. Before fitting, it is wise to check that the replacements are a nice push fit on the mainshafts.

### **39. INTERMEDIATE GEAR SPINDLE AND BUSH—REMOVAL AND FITTING.**

To remove and re-fit the bronze bush in the intermediate gear, adopt exactly the same procedure as for the small end bush (para. 36), although the same tackle will not be suitable.

In the unlikely event of the intermediate gear spindle requiring renewal, it should be drifted out of position whilst the case is still hot from removal of the main bearings. The replacement should be set perfectly square



before pressing or drifting home. This operation should again be carried out whilst the case is sufficiently warm for the spindle to be partly inserted by hand. There is no necessity to remove the circlip from the hole into which the spindle fits either for removal or refitting.

**40. BIG END FEED OIL SEAL—  
REMOVAL AND FITTING.**

This oil seal which is fitted in the timing cover cannot be removed without damaging it beyond all further use and a replacement

should be obtained before attempting its removal. Remove the original seal by first removing the retaining circlip and inserting a screwdriver or similar tool into the centre hole, under the seal and levering on the opposite side of the boss. Repeat this procedure a few times on opposite sides of the seal. Take care not to damage the recess into which the seal fits or the face on which it seats. Carefully press or drift the replacement seal into position, the metal covered face being outwards (visible).



## THE TRANSMISSION

### 41. REMOVAL OF OIL BATH.

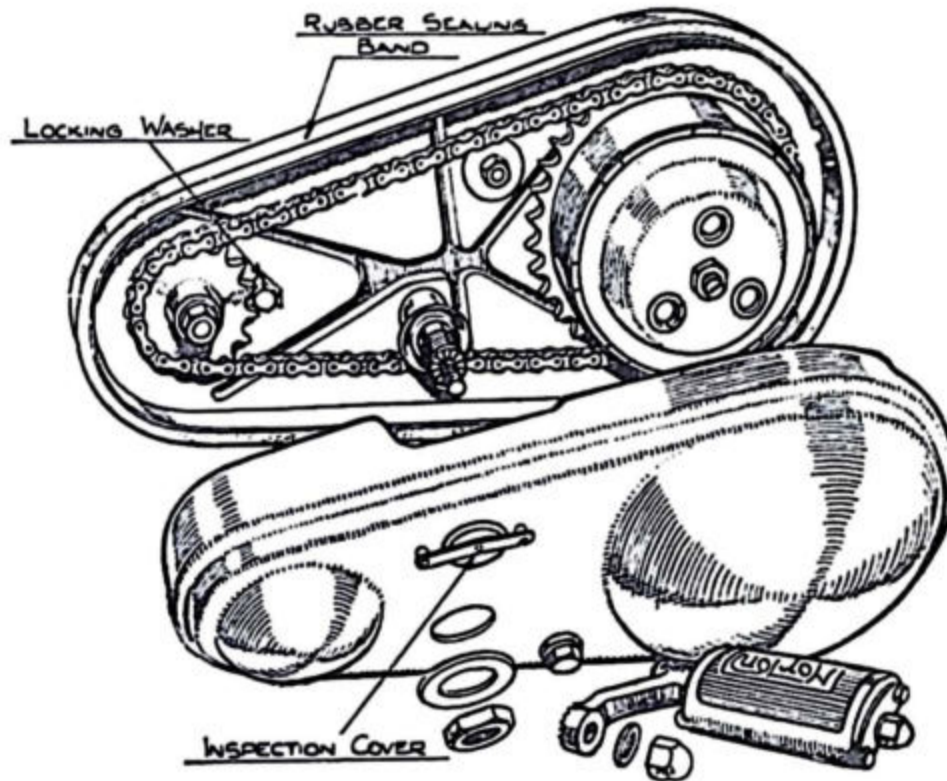


Fig. 6.

Remove the footrests, footrest rod and brake pedal.

Remove the large nut holding the outer portion of the oil bath, and remove the outer portion.

Remove clutch spring screws, springs and cups (three of each), clutch outer plate, clutch thrust pin, and clutch retaining nut.

Engage low gear and obtain assistance to hold the rear wheel while the nut is being removed.

Remove clutch body.

A special tool may be obtained for this purpose if necessary.

Remove engine sprocket (a claw-type extractor will remove this), and engine sprocket, clutch and chain can be removed together.

Remove rear portion of oil bath, held to the crankcase by bolt, to the engine plate by a nut, to the rear chain guard by a bolt, and by a nut on the gear box pivot bolt.

### 42. FITTING OF OIL BATH.

Assemble in the reverse order.

Examine rubber washer fitted round the flange of the inner portion. This must be in a good condition to retain the oil in the case.

Fill oil bath with oil to the level of the plug near the bottom of the outer portion of the oil bath.

### 43. CLUTCH—TO DISMANTLE.

Remove outer portion of the oil bath, and clutch. (Para. 41.)

A steel band is pressed round the clutch sprocket to prevent an excess of oil entering the clutch plates.

The plates can be removed with the band in position, but it must be removed to examine the driving slots in the sprocket.

Remove circlip holding clutch plates on to the body.

Remove plates.

There are six plain steel plates and five steel plates with Ferodo inserts.

Remove clutch sprocket.

Place an old gearbox main axle (if available) in a vice with the splined end above the jaws, and fit body to axle.

Remove the three screws holding the front cover plate.

Remove the cover plate, and the clutch shock absorber rubbers. (Fig 7.)

A large "C" spanner is needed to remove the rubbers. This is placed over the body and engaged in the splines, and the large rubbers compressed while the small ones are removed.

The handle of the spanner should be of such a length that the load can be taken by the user's thigh, allowing both hands to be free to remove the rubbers.

A substitute for a "C" spanner can be made



by fixing a handle to an old plain steel clutch plate.

Compress large rubbers and remove the small.

A small, sharp-pointed tool is necessary to remove the rubbers, as after use they adhere to the body.

Large rubbers are easily removed, after the small have been withdrawn.

Remove body from axle and replace in the reverse position.

Remove the three stud nuts on the back cover plate.

Back plate, roller race, back cover and body can be separated.

#### 44. EXAMINATION OF CLUTCH PARTS.

Examine clutch inserts. They should be "proud" of the plate.

Fitting of separate inserts to a plate is not advisable as the new insert would be "proud" of the remainder and take all the drive on the plate in which it had been fitted.

It is advisable, if possible, to replace plates with either new or reconditioned ones.

If all the new inserts are fitted to a plate, ensure that the inserts are level and flat and all contact the steel plates, taking their share of the drive.

Examine the drive on the plates for wear.

The plates with the inserts, drive on the outside diameter, and the plain steel, on the inside.

The splines on the body and the plain steel

plates driven by the body rarely show any sign of wear.

The tongues on the plates with inserts, driving the sprocket, may show signs of wear and they may have "cut" in to the driven part of the sprocket.

This wear obstructs the free movement of the plates when the clutch is operated.

This can be rectified by filing or grinding the tongues on the plates square. Also the edge of the driven part of the sprocket.

The only effect this will have on the clutch is a slight amount of "back-lash" when the clutch is engaged or disengaged.

Examine plain steel plates for any roughness. The back plate sometimes develops this fault.

Examine the roller race, rollers and the cage.

Examine the back cover plate face for wear by the clutch body centre.

Examine clutch shock absorber rubbers. They may have become soft or cracked.

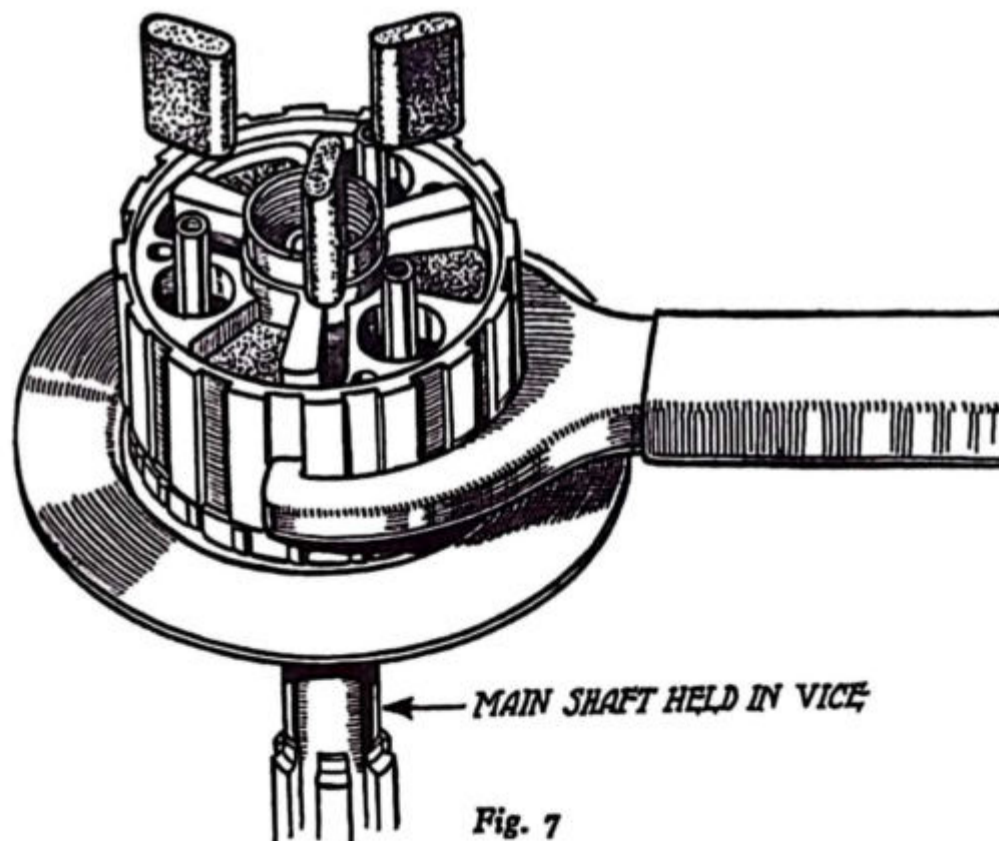
#### 45. ASSEMBLY OF CLUTCH.

Fit clutch body back cover plate to body, ensuring that the holes in the cover plate are in line with the holes in the body, and the spring studs an easy fit.

Fit clutch body centre and fit clutch large shock absorber rubbers in the position to take the drive.

Compress the rubbers in position and fit the small ones.

Fit body front cover and tighten screws.





Fit roller race on to the back cover plate, fit clutch back plate, and spring studs, fit stud nuts and tighten. Lock nuts with a centre punch.

Test roller race for freeness on its track.

Fit steel band on to the sprocket. This should not be tight enough to distort the sprocket.

Check all the clutch plates in the sprocket and on body for freeness.

Fit sprocket to body. Revolve sprocket on race to check free movement.

Fit plates to sprocket and body. Order

of fitting is — plain steel, inserts, plain, etc.

It will be noticed on examination that the plates are slightly bevelled on the one edge. Fit the bevelled edge towards the sprocket.

Revolve sprocket, ensuring that the plates are free.

Fit circlip, retaining the plates, and fit clutch to gearbox axle.

Fit clutch thrust pin, clutch outer plate, spring cups, springs, and spring pins. Tighten right home.

Fit oil bath outer portion. (Para. 42.)

## THE GEARBOX

### 46. REMOVAL FROM FRAME.

The engine and gearbox assembly is intended to be removed from the frame as a unit, having first removed the oil bath chain-case. Remove also the petrol tank, oil tank and battery, together with their platform. Remove the engine steady stay and disconnect all cables and electrical wiring likely to prevent engine/gearbox assembly being removed when all attachments are released. Remove from inside the engine plates, the nut securing the central bolt from the stand head assembly and withdraw the bolt leaving the stand attached to the frame only.

Remove the remaining bolts holding the engine/gearbox plates to the frame and lift the assembly clear of the frame. It is necessary to obtain assistance to hold the cycle steady whilst removing the engine/gearbox assembly. No difficulty should be experienced in disconnecting the engine from the gearbox or vice versa.

### 47. FITTING TO FRAME.

Reverse the order of removal operations, bolting engine and gearbox together before attempting to fit the assembly into the frame. Lower the back end of the assembly into the frame and bring the assembly forward so that one plate is outside each side of the front frame attachment. Remember to insert the tubular distance piece between engine plates when refitting footrest rod. Adjust position of gearbox by means of adjuster bolt on off-side engine plate until there is  $\frac{1}{4}$ in. to  $\frac{1}{2}$ in. up and down movement in one run of the chain. Remember that any movement of the gearbox will affect the tension of the rear chain.

### 48. CLUTCH WORM LEVER, ADJUSTMENT.

When further adjustment of the clutch cable is impossible or brings the clutch worm lever into an unsuitable position, further adjustment may be obtained at the clutch worm lever accessible through the oval cover attached to the gearbox outer cover by two screws. This oval cover also forms an outrigger bearing for the clutch worm and is a good fit in the outer cover. Should it be difficult to remove after the screws have been withdrawn, it should be tapped round until the ends stand away from the outer cover and thus provide two lips beneath which suitable levers may be inserted, but care should be taken to avoid overstraining the small cover. After slackening the cable adjuster right down, the lever may be rotated on the shank of the worm by releasing the pinch bolt and holding the shank by means of the slot machined across its end, whilst rotating the lever in an anti-clockwise direction until it is about  $45^\circ$  below the horizontal. Readjust the cable as necessary and check that when the clutch is withdrawn the angle between the cable and the worm lever is approximately a right angle.

### 49. OUTER COVER, REMOVAL AND FITTING.

Remove the kick starter crank by releasing its pinch bolt and pulling off the crank.

Remove gear indicator by unscrewing the centre bolt from the positive spindle.

Remove the gear change lever by unscrewing the pinch bolt and pulling off the lever.

Remove the seven cheese headed screws holding the cover in position and withdraw the cover carefully in order to avoid tearing



the paper washer fitted to this joint. If the joint is difficult to break, there is a point at either end which overhangs the inner cover to which careful punching may be applied.

No difficulty should be experienced when refitting, the cover screws should all be just pinched down and finally tightened in opposite pairs.

Some oil will have been lost due to the cover removal and should be replenished through the clutch worm inspection hole until oil begins to drip from the level plug hole normally plugged by the square headed level plug situated to the rear of and on the same level as the kick starter crank.

#### **50. POSITIVE FOOT CHANGE, DISMANTLING.**

With the outer cover removed the positive foot change mechanism become accessible. To dismantle, remove the two nuts securing the U section outer plate and withdraw the plate followed by the lever return spring, pawl carrier and ratchet plate. Note that there is a spacing shim fitted behind the latter. It is unlikely that the cam plate secured behind the shoulders of the two studs which carry the assembly will ever need removal, but the procedure is obvious.

#### **51. POSITIVE FOOT CHANGE, ASSEMBLY.**

Examine all parts for wear likely to result in lost movement, particularly the spindle bushes in both covers, the ends of the pawls and the pawl pin; obtain any replacements necessary and reassemble, checking first that the two studs are quite secure and placing the spacing shim on the short shaft of the ratchet plate. Remember to insert the knuckle pin visible through the aperture in the inner cover into the hole in the ratchet plate arm whilst the ratchet plate is being fitted. Spread the pawls to enter the ratchet teeth whilst pushing home the pawl carrier.

#### **52. INNER COVER, REMOVAL.**

Screw the clutch cable adjuster as far down as possible, and with a large screwdriver and moveable spanner, rotate the clutch worm lever in a clockwise direction till the cable nipple is clear of the lever and withdraw the cable from its slot in the lever. Unscrew the adjuster and the cable is completely disconnected from the gearbox.

Remove the eight nuts securing the cover and withdraw it from the studs, being careful

not to tear the paper washer fitted to the joint. The cover will bring with it the kick starter crank, clutch worm and fittings and the mainshaft bearing.

#### **53. INNER COVER, FITTING.**

Thoroughly clean the joint faces and apply a little jointing compound to each face, place the paper washer in position over the studs and against the gearbox face. Fit the cover into position. It will probably be necessary to press the kick starter pawl into its recess in the kick starter crank before the cover can be pushed right home. Fit the eight securing nuts and washers and just pinch each one, finally tightening the nuts in opposite pairs. Refit the clutch cable and adjust as described in para. 48.

#### **54. INNER COVER, DISMANTLING.**

The dismantling of the foot change mechanism having already been dealt with, only the clutch operating mechanism and kick starter remain. The clutch worm may be completely unscrewed from its nut and with the nut removed from the cover, the mainshaft bearing may be drifted out. The hardened roller in the end of the clutch worm which rubs on the clutch thrust rod may also be drifted out and a replacement fitted if necessary. Lever off the cupped pressing which covers the kick starter return spring and remove the spring, when the kick starter axle complete may be withdrawn from its bush. This will enable the pawl pin, pawl, plunger and spring to be removed. If the nose of the pawl is badly worn or chipped, it should be renewed.

It is unlikely that the kick starter bush will ever require renewal, but it may be drifted out if necessary.

#### **55. INNER COVER, ASSEMBLING.**

Examine the kick starter cam and stop pieces riveted into the cover. They should never need renewing, but may have worked loose and require re-rivetting.

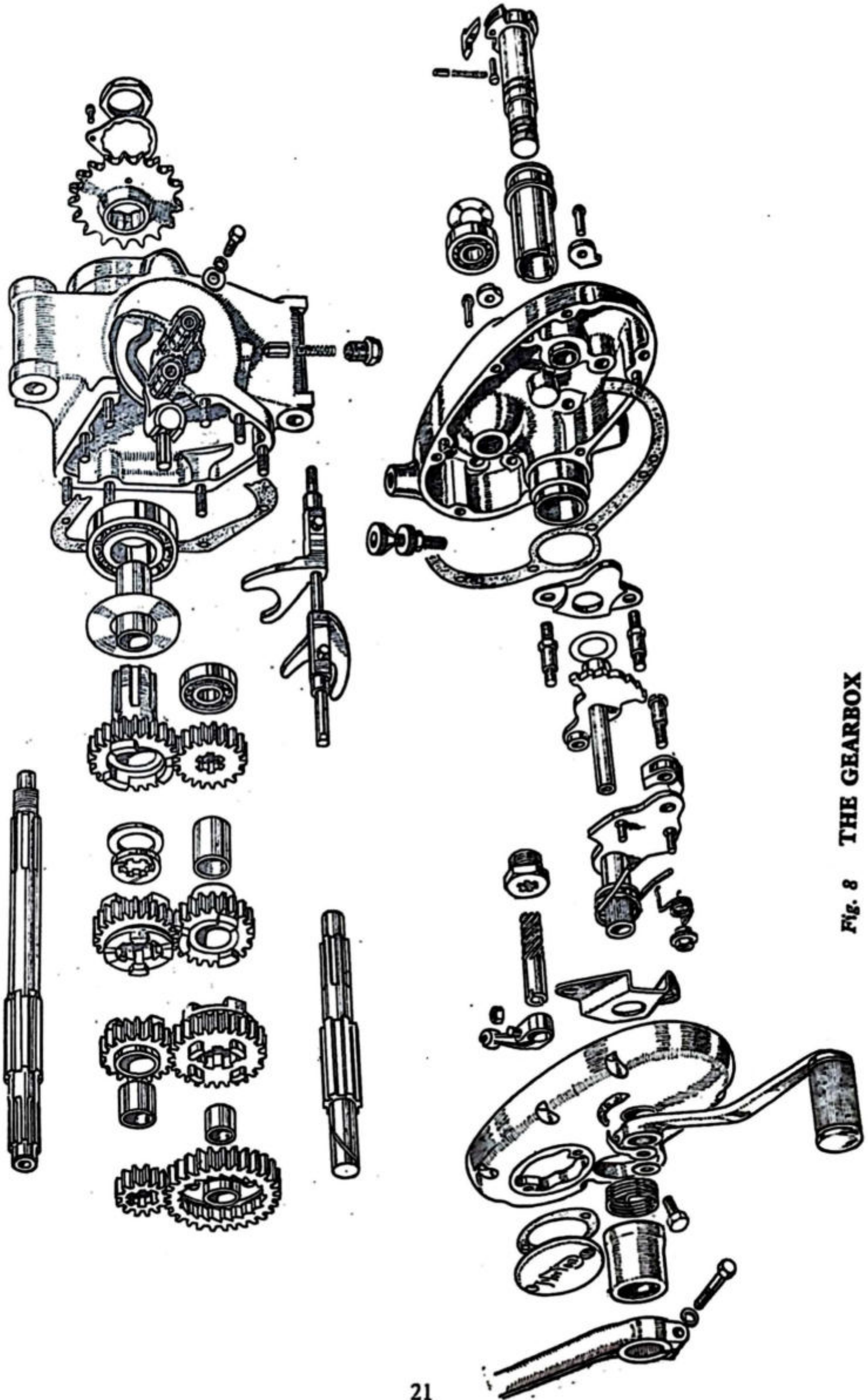
Press the kick starter axle bush, and mainshaft bush into the cover and screw home the clutch worm nut. Fit kick starter pawl, plunger and spring to kick starter axle. Remaining parts may be fitted now or after the cover is fitted to the gearbox.

When fitting the kick starter return spring, its free end which locates in one of the slots in the bush should be forced round into the second or third slot beyond its free position.

#### **56. REMOVAL OF GEARS.**

If the clutch has been removed, it will be





**Fig. 8 THE GEARBOX**



necessary to fit a short length of tubing over the end of the main axle and hold it in place with a clutch nut to retain the axle in position whilst the gears are being removed.

Remove end cover (paras. 49 and 52).

Remove the low gear and kick starter wheel—the large gear on the layshaft which has a bronze bush pressed into its centre.

Remove the small wheel from the end of the main axle.

Remove the mainshaft second gear; this is fitted with a fully floating bush. Unscrew the striker fork shaft by means of the two flats machined on its outer end and remove it together with the layshaft second gear and the striker fork.

Remove the tubular distance piece or clutch and withdraw the main axle together with the third gear and striker fork.

The bore of the main gear wheel, which still remains in position, carries 13 rollers which should be retained in position by inserting a roll of stiff paper in place of the main axle now removed. The axle will bring with it the bronze clutch thrust washer which should be examined, and if there are no grooves visible across the face which rubs on the main gear wheel, it should be renewed. Withdraw the layshaft and the two remaining gears which will expose the outer race of the layshaft roller bearing in the far end of the box. The inner race with rollers and cage will most probably come away with the layshaft. The outer race may be removed by gently heating the case and dropping it—joint face downwards—on the bench or a wooden block.

Remove axle sprocket nut, which has a left hand thread and is held with a locking washer and screw, and withdraw the main gear wheel. If the gearbox is in the frame and the rear chain in position, obtain assistance to hold the rear wheel whilst the nut is being removed.

If the gearbox is removed from the frame, the sprocket may be held by passing a length of old chain around it and holding the ends in a vice.

Examine the steel roller retaining washer and if it is badly scored or worn down, it should be renewed. The main gear wheel bearing may be drifted from the shell. Remember that there is a pen steel washer fitted either side of this bearing.

### 57. REMOVAL OF CAM PLATE.

Remove the domed hexagon nut from beneath the forward side of the gearbox. This contains the cam plate indexing plunger which will drop out when the nut is removed.

Remove the two bolts fitted with spring and plain washers visible on the forward side of the gearbox shell. These secure the cam plate and cam plate quadrant, both of which may be pushed through into the box when the bolts are removed. Both cam plate and quadrant are carried in a bronze bush. It is unlikely that these bushes will ever require renewing, but they may be readily pressed or drifted out should the necessity arise.

### 58. FITTING CAM PLATE.

Place the quadrant in position and secure it with its bolt and washers. Place the cam plate in position so that one of the end grooves in its circumference is across the centre of the indexing plunger hole in the gearbox shell and meshing its gear with the last tooth but one on the quadrant, ensuring that the correct end of the quadrant track is being used. Assemble the positive mechanism on to the inner cover (para. 51). Place cover in position and connect quadrant lever to ratchet by means of knuckle pin (para. 53).

Set positive foot change to top gear and check that the indexing plunger groove lies in the correct position to mesh with the indexing plunger when fitted. Withdraw cam plate and re-mesh as necessary until the correct position is obtained, when the cam plate bolts and washers should be fitted and tightened. Fit indexing plunger, spring and plunger bush.

### 59. FITTING GEARS INTO GEARBOX.

Drop pen steel washer (the smaller of the two) into the bottom of the bearing housing before pressing in the bearing. Fit main gear wheel bearing and layshaft bearing outer race.

Fit rollers (13) to main gear wheel, smearing the assembly with grease, and insert the paper tube to retain the rollers.

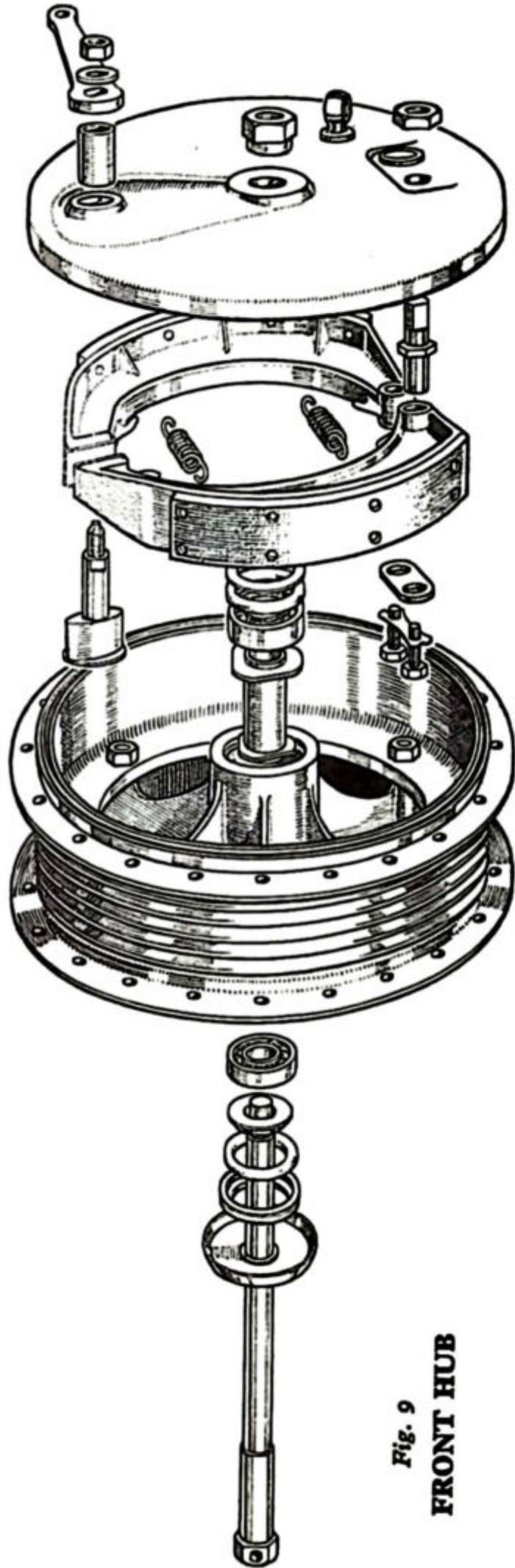
Fit large pen steel washer over the shank of the main gear wheel, press the wheel home in its bearing, fit gearbox axle sprocket, tighten the nut, fit locking washer and pin.

Fit bronze clutch thrust washer to main axle so that the face having the three oil grooves will be against the main gear wheel. Carefully remove the paper tube from the main gear and insert main axle into position.

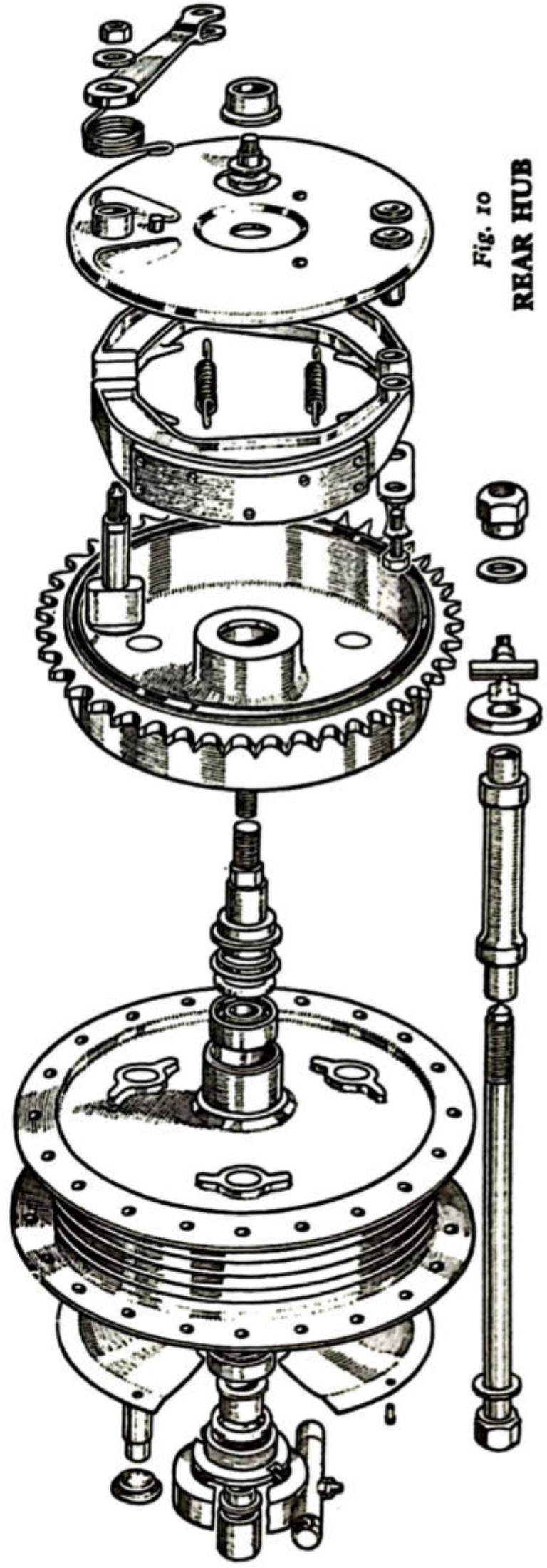
Fit distance tube in place of clutch and add clutch nut.

Fit third gear wheel (20 teeth) and top gear wheel (18 teeth) to layshaft and fit inner race with rollers and cage to end of the shaft. Grease the rollers and fit shaft into box.





**Fig. 9**  
**FRONT HUB**



**Fig. 10**  
**REAR HUB**



Set the cam plate into the second gear position, i.e. with indexing plunger in the groove next to the shallow neutral groove.

Fit striking fork to mainshaft third gear (22 teeth) and fit gear to main axle, meshing it with the layshaft gear already in position.

Fit the second fork to the layshaft second gear (24 teeth) and fit the second gear with the fork to the layshaft. The pegs on the striking forks fit into the cam plate slots.

With the gearbox in the frame, little trouble

will be experienced in holding the first fork in position. Fit the first fork in position and hold with a screwdriver or similar tool whilst the second is placed in position.

Fit striking fork shaft and screw into the case.

Fit the remaining gears.

Fit end cover (paras. 55 and 53).

Remove tubular distance piece from clutch end of mainshaft. Remember to finally refill with oil to the level plug level (para. 49).

## WHEELS AND HUBS

### 60. FRONT WHEEL, REMOVAL.

Place machine on centre stand. Detach brake cable from cam lever and cable adjuster from brake plate. Remove spindle nut from off-side of spindle. Slacken pinch bolt in near side fork end. Take the weight of the wheel in the left hand and withdraw the spindle by means of a tommy bar placed through the hole in the head of the spindle.

### 61. FRONT WHEEL, FITTING.

Re-assemble in the reverse order. Insert spindle from near side. Lock pinch bolt in near side fork end after tightening the spindle nut.

### 62. REAR WHEEL, REMOVAL.

With machine on centre stand, disconnect tail and stop lamp leads by pulling the cable either side of the rubber covered snap connection behind the number plate. Remove the end bolt from each side lifting handle, which will enable the hinged end of the mudguard to be lifted when the wheel is removed.

Disconnect speedometer driving cable.

Remove the three rubber plugs from the end of the hub and with suitable box spanner, unscrew the sleeve nuts then exposed.

Remove wheel spindle and distance piece and draw wheel off its studs.

This method of wheel removal leaves the chain and brake drum in position.

To remove wheel complete with brake drum, disconnect rear chain and remove chainguard. Remove brake rod adjusting nut, disconnect brake torque arm from frame and disconnect speedometer drive. Release wheel spindle and nut from near side stub axle, enabling wheel to be slid along the adjusting slots and removed.

### 63. REAR WHEEL, REFITTING.

Reverse dismantling operations. Fit spring

link to chain with closed end of spring facing direction of travel, ensure chain adjuster plates correctly seated and when all is tightened, check rear chain for correct tension. There should be  $\frac{1}{4}$ " slack midway between the sprockets with the weight of the machine on the wheels. Adjust rear brake as necessary.

### 64. REAR HUB, DISMANTLING.

Remove rear wheel (para. 62). Remove locking ring, felt washer and distance piece from plain side of hub.

Drift out inner sleeve, it will bring with it the single row bearing.

Using a suitable punch, knock out the bearing in the brake side of the hub, together with the peened in washer, felt washer and pen steel washer.

### 65. REAR HUB, RE-ASSEMBLING.

Pack bearings with grease, wiping off surplus.

Fit single row bearing to screwed side of hub, fit inner sleeve with the long end into the single row bearing.

Fit distance piece, felt washer and locking ring and tighten.

Press double row bearing into position on opposite side of hub, followed by the pen steel washer and dished washer. Lightly rivet the dished washer into position.

### 66. FRONT HUB, DISMANTLING.

Remove front wheel. (Para. 60.)

Remove brake plate.

Remove locking ring, felt washer and distance piece from opposite side of hub.

With suitable punch knock the bearing in the brake side further into the hub until the single row bearing drops clear.

Remove distance tube.

From this side of the hub, drift out the remaining bearing, together with the peened



in washer, felt washer and pen steel washer.

#### 67. FRONT HUB, RE-ASSEMBLING.

Pack bearings with grease.

Press single row bearing into position followed by the distance piece (with collar against the bearing), felt washer and locking ring which can be tightened up.

Insert distance tube through brake side of hub, ensuring that it is right home against the bearing just fitted.

Press double row bearing into position.

Fit pen steel washer and felt washer.

Lightly rivet remaining washer into its recess.

## BRAKES

#### 68. DISMANTLING OF THE BRAKES.

Remove brake plate from the drum.

Remove brake lever return spring from the lever.

Remove nut and washer from the cam spindle.

Remove brake lever.

Remove cam spindle from bush in the brake plate.

Tap the end of the spindle lightly until the cam is clear of the shoes.

Remove brake shoe return springs.

Remove the small pin from the end of each pivot pin and lift off the pivot pin tie plate.

Remove the brake shoes.

Cam spindle bush can be removed from the

plate after removing the nut holding bush to plate.

#### 69. ASSEMBLY OF BRAKES.

Fit cam spindle bush to plate.

Fit brake shoes. Smear a little oil on the pivot pins.

Fit ONE shoe to pivot pin.

Fit spring to the shoe fitted to the pin, near pin.

Hold second shoe near to the one fitted and fit the spring, stretch the spring and fit second shoe to pivot pin.

Fit second spring to both shoes.

Fit cam spindle to plate. Hold shoes apart with screwdriver or similar tool and allow cam to pass the ends of the shoes.

Fit tie plate over shoulders on pivot pins. Fit and tighten both pins.

## FRONT FORKS

#### 70. MAINTENANCE.

Replenish damping oil at approximately 5,000 mile intervals or whenever the normal characteristics of the forks appear to have deteriorated.

Remove the drain plug from each fork end and unscrew the filler plug from the top of each leg. It will be possible to renew the oil without removing the filler plug from the top of the damper rod. Allow oil to drain off and operate the forks a few times to eject the last drops.

Replace drain plugs.

7 ozs. of Wakefield's Castrolite, Shell X-100-20, B.P. Energol S.A.E. 20 or Mobiloil Arctic, should be poured into each fork leg.

Should a softer movement be required for any reason, a slightly less quantity should be used.

#### 71. STEERING HEAD ADJUSTMENT.

Place a wooden block or box under the

engine cradle of sufficient height to raise the front wheel clear of the ground. Place thumb of left hand on the joint between the steering head of the frame and the fork head clip.

Attempt to lift the forks with the right hand. Any movement at the head races will be readily felt.

To adjust, slacken the steering column locking nut and the pinch bolt clamping each leg into the fork crown.

Adjust by means of the nut situated on the steering column below the head clip, until all the play is removed, but the forks are still free to rotate on the head races.

Re-tighten the steering column locking nut and the pinch bolts.

#### 72. REMOVAL OF FRONT FORKS.

Release brake and clutch cables from handlebar levers. Remove handlebar clips and allow bar to rest on tank. Unscrew filler plugs and draw up the plug to expose its locknut at the



top of the damper rod. Using two spanners, release the locknut and remove the filler plugs and their washers.

The horn wire passes through the handlebar and down through steering column. Disconnect this wire from horn. Remove headlamp and allow to hang by cables.

Lift off speedo panel and allow it also to hang, having freed the front brake cable. Remove steering stop plate pin from the frame below the steering head. Remove steering column nut and dust cover and carefully withdraw the forks. Head races may be readily drifted out for replacement.

### 73. REFITTING FRONT FORKS.

Grease head races and drift into position. Soak felt washer in oil and place on top of the top race. Insert steering column through head lug, place dust cover in position, fit and adjust steering column nut.

Attach fork stop plate to frame below head lug. Pass brake cable through speedo panel. Fit panel and steering column locknut. Check that tightening the latter does not affect the fork adjustment. Readjust as necessary until the forks are free to swing to full lock in either direction without having any perceptible rock.

Pass horn wire through steering column and connect up horn; refit headlamp. Fit handlebar, checking for riding position before finally tightening. Refit brake and clutch cables into handlebar levers and adjust as necessary.

### 74. FORK LEG, DISMANTLING.

The individual legs may be dismantled either with the fork in position in the frame or otherwise. Having drained the oil, unscrew filler plug from top of leg and lift it sufficiently for an open ended spanner to be used to slacken the nut which locks the damper rod into the filler plug. Release the pinch bolt nut on the steering column lug below the head lug and pull jerkily on the fork end, when the leg should be withdrawn complete. If necessary, partly replace the filler plug and tap it smartly with mallet or hide hammer to release the leg from the taper in the head clip. Remove main spring from fork leg and the tubular cover secured by two small screws to the top of the fork end. Remove the locking ring from the mouth of the fork end which will allow the fork end to be removed from the main tube, together with the damper unit and rod, which may now be withdrawn from the fork end after removing the securing bolt, accessible across the wheel spindle hole, by means of a box spanner. Should it be considered necessary to

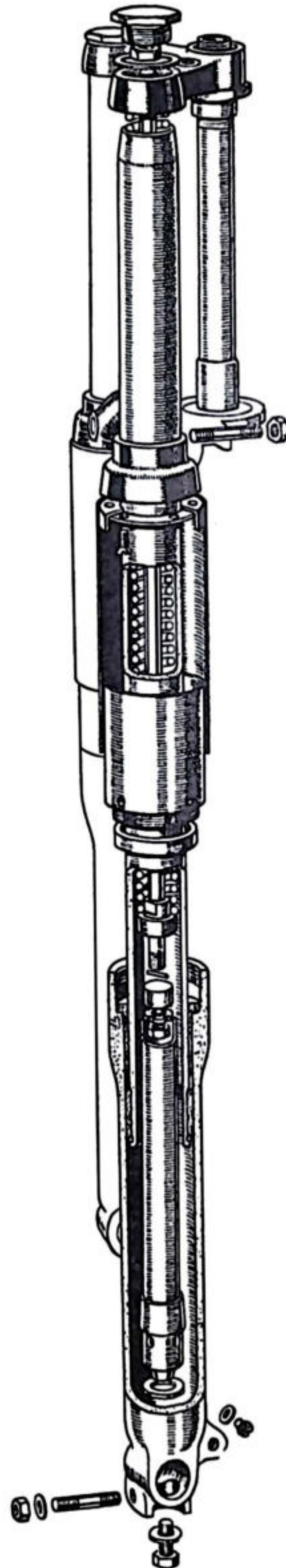


Fig. 11



further dismantle the damper unit, the top gland should be unscrewed and the rod withdrawn, after which, removal of the nut from the bottom of the rod will enable the cup, slotted washer and cross pin to be removed. No difficulty should be experienced in fitting new bushes either to the top of the fork end or the bottom of the main tube.

#### 75. FORK LEG, ASSEMBLY.

Thoroughly clean all components and lightly smear each one with oil before placing into position. Fit cross pin, cup and slotted washer to short screwed end of the damper rod. Fit and tighten securing nut. Insert this assembly into the damper body and screw home the top gland carefully holding the body in a vice whilst tightening it. Do not overtighten the vice or the body may become distorted. Place

washer in bottom of fork end. Place damper unit in position and secure with bolt. Be careful not to bend damper rod. Insert damper rod into main tube and place fork end over lower end of tube. Fit bronze bush and oil seal, ensuring that radiused edge of bore is uppermost. Fit locking ring, do not tighten sufficiently to distort metal case of seal. Lightly grease upper part of main tube and fit and secure bottom cover. Fit main spring. Replace nut on upper end of damper rod and insert main tube into position with a "pull through" if necessary. Draw up the damper rod, place filler plug washer in position and attach the rod to the filler plug, locking it in position by the nut already on the rod. Tighten filler plug to draw main rod right home in its taper. Tighten pinch bolt in crown lug. Fill each leg with a mixture of 3ozs. Castrolite and 4ozs. shock absorber fluid.

## REAR SPRINGING

#### 76. SWINGING ARM REMOVAL AND ASSEMBLY.

With the rear wheel withdrawn, remove the rear suspension units secured only by a single bolt and nut at either end. Remove the nut and washer from one end of the swinging arm bolt, withdraw the bolt, and remove the swinging arm. To renew the silent block bushes, drift out one end, remove the tubular distance piece and drift out the remaining bush. Press in replacement till the outer steel sleeve is flush with the end of the tube. Remember to replace the distance piece before inserting the second bush.

When securing the swinging arm in position in the frame, a dimension of  $11\frac{1}{2}$ in. should be taken from the hole forming the top absorber anchorage to the shock absorber anchorage hole

in the swinging arm, the arm being held in this position whilst tightening the swinging arm pivot bolt.

#### 77. REAR SUSPENSION UNITS.

These fittings embody quite complicated oil damping arrangements which are carefully set to provide the correct suspension characteristics for your machine. They are sealed and are virtually leak proof and should NOT BE INTERFERED WITH. In the unlikely event of any attention being necessary, their removal is quite simple and straightforward and they should be taken to your usual Norton dealer or the nearest Norton distributor.

No attempt whatever should be made by the normal rider to dismantle, drain or refill these units.

## HANDLEBAR FITTINGS

#### 78. AIR CONTROL LEVER.

The air control lever is shown in Fig. 13 in the position in which it should be assembled, having first greased both sides of the lever.

After fitting the adjusting nut it should be tightened to give the required tension.

To remove the control cables from the lever, open the lever as far as possible, hold the outer cable, and as the lever is closed, pull the outer cable from the lever body.

Remove nipple from the lever.

To fit the cables, fit nipple into the lever, close the lever, pull the outer cable away from the lever and fit the cable to the lever body.

#### 79. CLUTCH AND FRONT BRAKE CONTROL LEVERS.

The clutch and front brake controls are so simple as to require no instructions for their dismantling or assembly.

The pivot bolts have shoulders machined on them, allowing the nuts on the bolts to



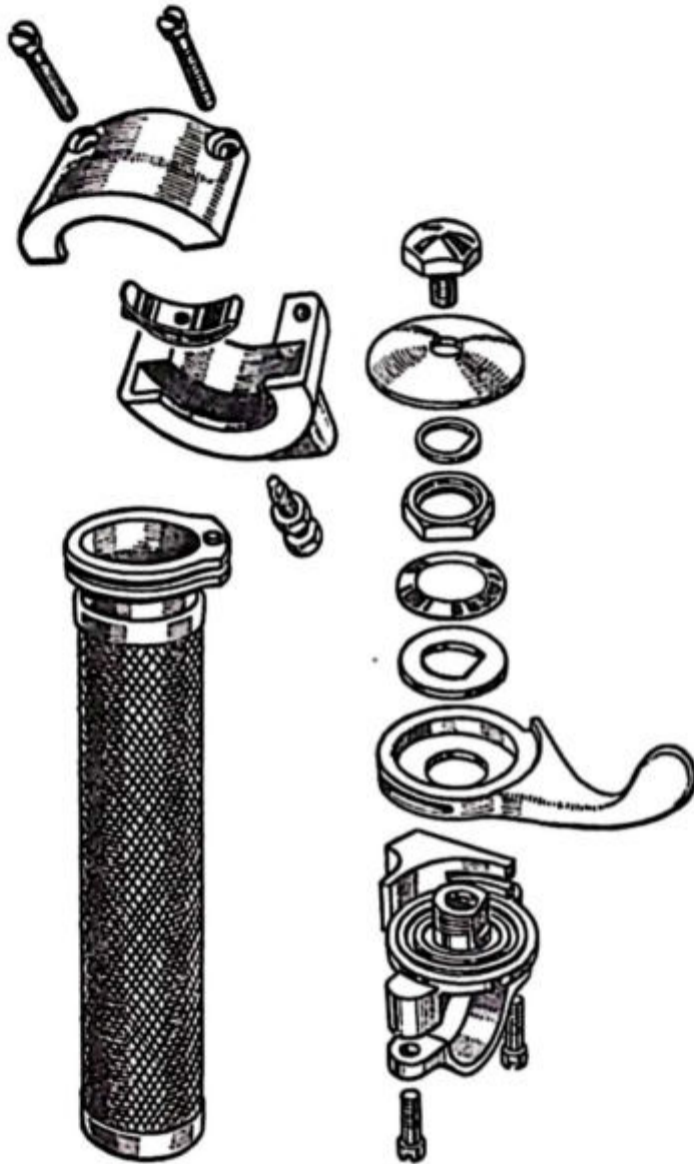


Fig. 12  
TWIST GRIP.

Fig. 13  
IGNITION AND  
AIR CONTROL.

be tightened while allowing clearance for easy movement of the lever.

To remove the clutch cable from the lever, turn the clutch operating arm on the clutch worm by other means than the cable, and the nipple can be removed from the arm, and inner and outer cables can be removed from the lever.

To remove the brake cable from the lever, remove the split cotter and pin holding the "U" clip to the brake arm, and the inner and outer cables can be removed from the lever.

Re-assemble in the reverse order.

### 80. TWIST GRIP.

The twist grip assembly is shown in Fig. 12.

To assemble the twist grip, grease the portion of the handlebar where the grip works.

Fit the sleeve to the bar.

Grease the drum on the sleeve.

Fit spring and adjuster bolt and nut to the bottom half clip.

Thread the cable through the hole in the half clip.

Fit the nipple to the drum on the sleeve.

(Sufficient length of cable can be obtained by lifting the throttle slide and holding in position by a piece of soft wood placed in the air intake.)

Fit the top half clip.

Adjust the tightness of the grip with the adjusting screw and lock in the desired position.

Dismantle in the reverse order.

## AMAL CARBURETTER

### 81. DISMANTLING OF THE CARBURETTER.

The easiest way to remove the carburetter is to turn both petrol taps off and disconnect feed pipe from carburetter, remove the two nuts securing carburetter flange and unscrew the knurled ring immediately below where the control cables enter the top of the mixing chamber body so that the slides may be withdrawn, either before or after the carburetter is removed. The air and throttle valves may be left on the cables unless it is desired to change or renew the cables or valves.

The throttle valve needle may be removed or adjusted for position by removal of the spring clip at the top of the slide.

Remove the float chamber cover by removing the three screws securing it, and withdraw the hinged float, this will enable the nylon needle which controls the flow of fuel to be withdrawn and cleaned.

Removal of the nut at the base of the mixing chamber gives access to the main jet which may be unscrewed from the jet holder which also carries the needle jet, accessible by removal of jet holder. Removal of these parts enables the jet block to be pushed or tapped out through the large end of the mixing chamber body when the jet block locating screw has been removed. This screw lies to the left of and slightly below the pilot air adjuster which is the horizontal milled headed screw equipped with restricting spring.

### 82. RE-ASSEMBLY OF CARBURETTER.

Re-assembly should present no difficulty but the following points should be watched. The washer fitted to the stub of the jet block should be in good condition, also the one fitted to the needle jet holder. When fitting throttle valve ensure that taper needle really enters the centre hole in the jet block, and throttle



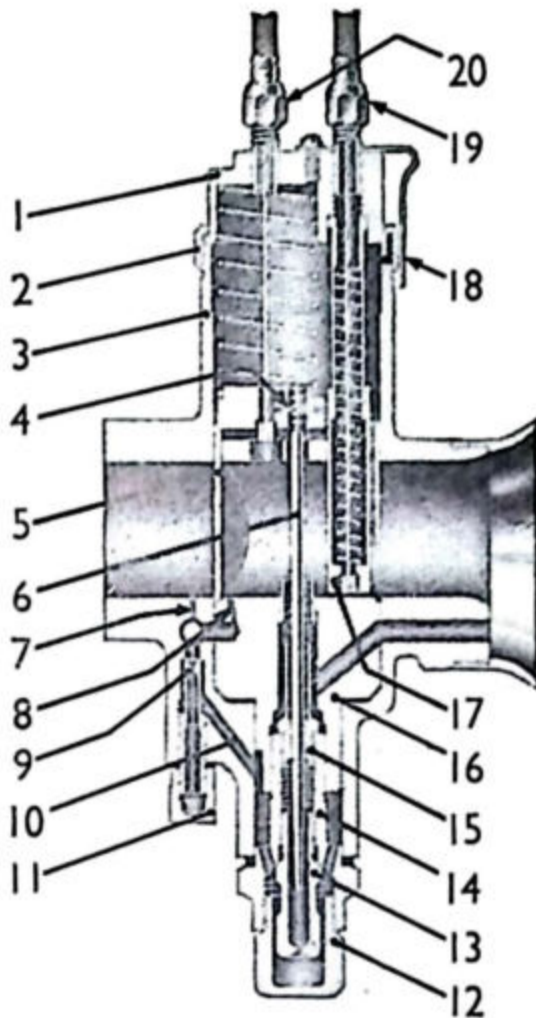


Fig. 14

Diagrammatic section through Mixing Chamber

- |                              |                               |
|------------------------------|-------------------------------|
| 1—Mixing Chamber Top.        | 14—Jet Holder.                |
| 2—Mixing Chamber Cap.        | 15—Needle Jet.                |
| 3—Carburettor Body.          | 16—Jet Block.                 |
| 4—Jet Needle Clip.           | 17—Air Valve.                 |
| 5—Throttle Valve.            | 18—Mixing Chamber Cap Spring. |
| 6—Jet Needle.                | 19—Cable Adjuster (Air).      |
| 7—Pilot Outlet.              | 20—Cable Adjuster (Throttle). |
| 8—Pilot by-pass.             | 21—Tickler.                   |
| 9—Pilot Jet.                 | 23—Banjo.                     |
| 10—Petrol feed to pilot jet. | 29—Pilot Air Adjusting Screw. |
| 11—Pilot Jet Cover Nut.      | 30—Throttle Adjusting Screw.  |
| 12—Main Jet Cover.           |                               |
| 13—Main Jet.                 |                               |

works freely when mixing chamber top cap be fitted and secured. Fit float with narrow side of hinge uppermost and ensure that side cover washer and body are clean and undamaged to obtain a petrol tight joint.

**83. CARBURETTER TUNING.**

There are four distinct phases of tuning and each must be handled separately to obtain best results for any particular set of conditions. For all these positions the air valve should be fully open, the engine should be at its normal working temperature, and the machine should be driven on a slight up gradient to ensure engine pulling the whole time.

**1st MAIN JET.**

This jet controls the fuel supply when the throttle is more than  $\frac{3}{4}$  open. With the throttle fully open and the engine pulling hard, slightly

close the air lever when there should be a slight falling off of speed indicating a reasonably correct mixture. If maximum speed is obtained before the throttle is fully open, then a larger main jet is required; similarly if there is an increase in speed with the air lever slightly closed.

**2nd SLOW RUNNING.**

Having fixed the main jet, set the throttle adjusting screw to provide fairly fast idling with the twist grip in the fully closed position and the ignition (where manually controlled) set for best slow running. Screw out the throttle adjusting screw until engine begins to falter; now adjust the pilot air screw in or out as necessary to make the engine run evenly and faster. Lower the throttle adjusting screw further to reduce engine speed until a position of the pilot air screw is found at which the engine runs evenly and steadily on the smallest throttle opening.

**3rd THROTTLE VALVE CUTAWAY.**

With the throttle valve about  $\frac{1}{4}$  open (marking the twist grip if necessary in order to readily find this position whilst riding) note whether there is any spitting (indicating weakness) or jerky running under load (indicating richness). In the former event try screwing in the pilot air screw slightly and if this is ineffective, a throttle valve having

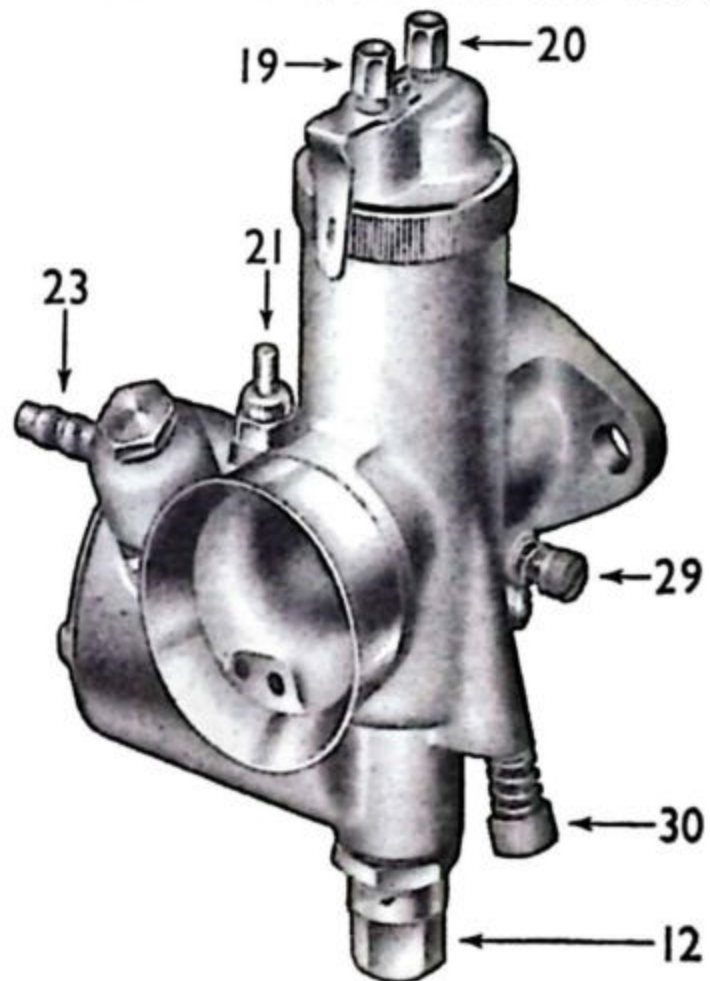
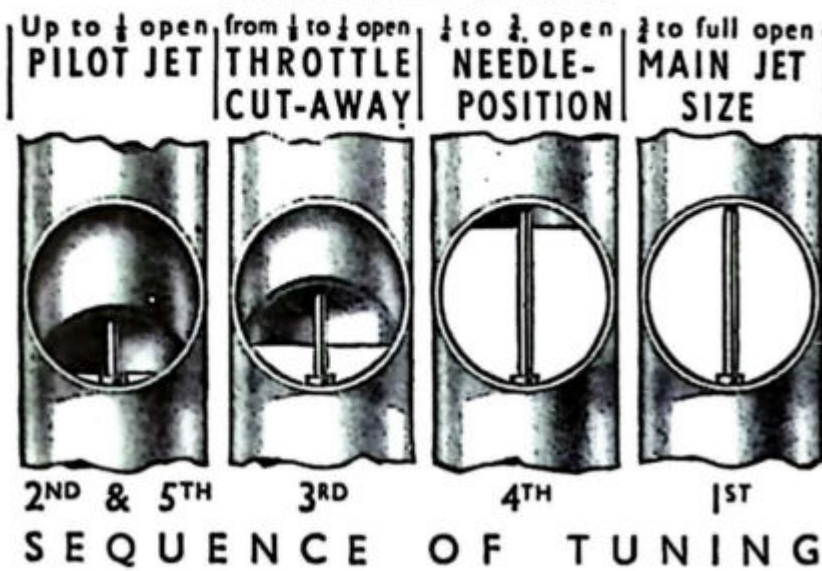


Fig. 15

General view of Carburetter



**PHASES OF AMAL NEEDLE JET CARBURETTER THROTTLE OPENINGS**



**SEQUENCE OF TUNING**

Fig. 16

less cutaway, i.e., stamped with a lower number and the reverse for jerky running.

**4th THROTTLE VALVE NEEDLE.**

With the throttle about  $\frac{3}{4}$  open and the needle in a low position try the machine for acceleration. If results are poor and partially closing the lever provides improved conditions, raise the needle a notch or two until the best position is found.

**5th RE-CHECK IDLING.**

To ensure that subsequent adjustments have not upset the condition.

**84. MAINTENANCE.**

Clean periodically by dismantling and washing in clean petrol, cleaning out all holes by blowing. Whilst dismantled examine throttle valve needle and float needle for wear and all fibre washers, renewing as necessary. Check that throttle valve is not unduly worn in the mixing chamber body.

**85. RICH MIXTURE.**

Indicated by black exhaust smoke, excessive soot on plug, lumpy running, petrol blown back from air intake.

Assuming that carburation has previously been satisfactory, suspect:—flooding due to punctured float, dirt on float needle seating or worn needle or seat. Worn throttle valve needle or needle jet, air cleaner choked.

**86. WEAK MIXTURE.**

Indicated by spitting back, poor acceleration, overheating, erratic slow running or improved performance with air lever partly shut.

Again assuming carburettor has been correctly set, suspect:—fuel blockage, either main supply or within carburettor. Worn inlet valve guide, air leaks at engine carburettor connection, worn throttle valve, loose jets.

**TYRES**

**87. MAINTENANCE.**

Always keep tyres at the correct pressures, (see data page at front of book). Remove any stones which may be embedded in the tread. Replace valve dust cap if lost.

**88. REMOVAL.**

Deflate tube by removing valve cap and core. Remove rim nut and security bolt nut if security bolt fitted. Push the beads of the cover down into the well of the rim at a point opposite to the valve. Insert a small tyre lever between the bead and the rim near to the valve. Ease the bead off the rim using a second lever inserted a short distance away. Repeat until one bead is free of the rim.

Remove security bolt and tube, and remove the second bead in a similar manner.

**89. FITTING.**

Fit rim band. Dust tube, beads and rim with French chalk. Slightly inflate tube and place within cover on top of wheel with valve in line with hole in rim. Fit the underneath bead by hand, completing the operation with levers. Thread valve and stem of security bolt through appropriate holes. Fit second bead starting opposite valve. See that security bolt and tube are not being pinched between cover and rim. Inflate. Fit rim nut and security bolt nut. Adjust pressure to manufacturers recommendation and fit dust cap.



## ELECTRICAL SECTION

### 90. ESSENTIAL MAINTENANCE.

**Battery.** Inspect the battery regularly and keep acid level to the top of the separators by adding distilled water.

**UNLESS YOU DO THIS YOUR BATTERY WILL QUICKLY DETERIORATE.**

**Wiring.** Keep all connections and terminals tight. See that the cables are clear of moving parts.

**Dynamo.** Keep brushes and commutator clean. (Para. 100.)

**Magneto.** Keep contact breaker clean. If necessary polish the contacts with fine carborundum stone or emery cloth, and afterwards wipe with cloth moistened with petrol. (Para. 97.) Occasionally check contact breaker opening using gauge on ignition spanner. (Para. 96.)

Replace high-tension cables if they become worn or perished.

**Head Lamp.** Focus head lamp after fitting new bulb. (Para. 104.)

## Ignition

### 91. MAGNETO.

The magneto is of the rotating armature pattern, and also incorporates an automatic timing control. The automatic timing control employs a driving gear carrying a plate fitted with two pins. A weight is pivoted on each pin, and the movement of the weight is controlled by a spring connected between the pivot end of the weight and a toggle lever pivoted at approximately the centre of the weight. Holes are provided in each toggle lever in which are located pegs on the underside of a driving plate secured to the magneto spindle. This plate is also provided with stops which limit the range of the control. When the magneto is stationary, the weights are in the closed position and the magneto retarded for starting purposes. As the speed is increased, centrifugal force acting on the weights overcomes the restraining influence of the springs and the weights move outwards causing relative movement to take place between the driving gear and the magneto spindle, so advancing timing. By careful design of the springs, the characteristics of the control can be arranged to conform more closely with the engine requirements than is the case with other types of control.

### 92. AUTOMATIC TIMING CONTROL.

Since this operates in the timing chest it is automatically lubricated and should run indefinitely without attention. A tight magneto chain tends to upset the normal working of the parts and there should always be at least 3/16" whip in the chain. Failure of the timing control mechanism will usually result in overheating and loss of performance.

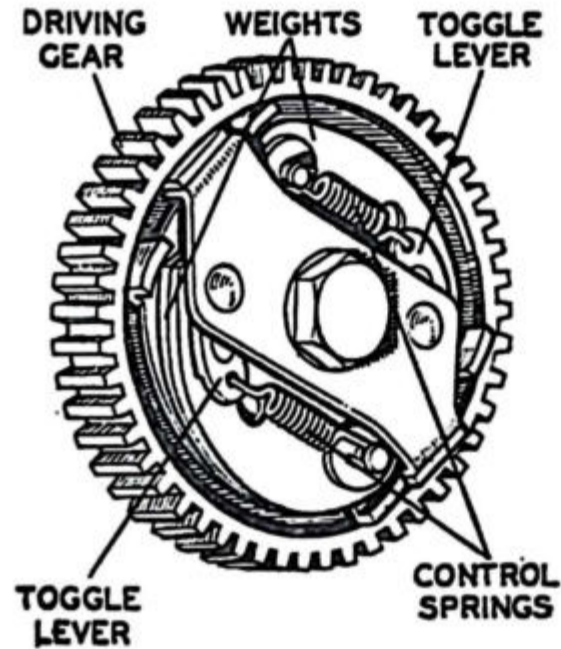


Fig. 17

### 93. LUBRICATION.

Every 3,000 miles.

The cam is supplied with lubricant from a felt pad contained in a pocket in the contact breaker housing. A small hole in the cam fitted with a wick enables the oil to find its way on to the surface of the cam. Remove the contact breaker cover and turn until the hole in the cam can be clearly seen, and then carefully add a few drops of thin machine oil. Do not allow any oil to get on to the contacts.

The contact breaker rocker arm pivot also requires lubrication, and the complete contact breaker must be removed first. Take out the hexagon-headed screw from the centre of the contact breaker and pull the contact breaker off the tapered shaft on which it fits. Push aside the rocker arm retaining spring, prise the



rocker arm off its bearing and lightly smear the bearing with Mobilgrease No. 2, or if this is not available, clean engine oil may be used. At the same time, lightly smear the contact breaker spring with clean engine oil. When replacing the contact breaker, take care to ensure that the projecting T on the tapered portion of the contact breaker face engages with the key way cut in the magneto spindle. Tighten the hexagon-headed screw with care. It must not be too slack, nor must undue force be used.

#### 94. CONTACT BREAKER—ADJUSTMENT.

Remove the contact breaker cover and rotate the engine until the contact points are fully opened, check the gap with the gauge having a

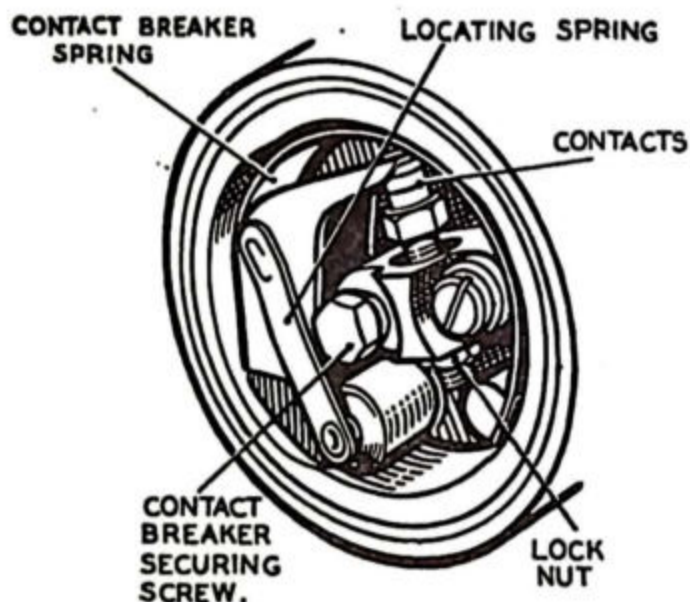


Fig. 18

thickness of .012in. The gauge should be a sliding fit between the points, and if the gap varies appreciably on the gauge, it should be adjusted. Slacken the locknut and turn the contact screw by its hexagon head until the gap is correct, finally tighten the locknut and recheck the setting.

#### 95. CONTACT BREAKER, CLEANING.

Every 6,000 miles take off the contact breaker cover and examine the contact breaker. If the points are burned or blackened, clean them with a fine carborundum stone, or with very fine emery cloth, afterwards removing any dust or dirt with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker is removed as described in the lubrication instructions. (Para. 95.)

#### 96. HIGH TENSION PICK-UP.

Remove the high tension pick-ups, wipe clean with a fine, dry cloth. The pick-up carbon brush must move freely in its holder; if it is dirty, clean with a petrol-moistened lint-free cloth.

#### 97. HIGH TENSION CABLES—REPLACEMENT.

Inspect the high tension cables and replace at any signs of perishing or cracking by suitable lengths of 7mm. rubber-covered ignition cable. To fit a new cable to a pick-up terminal, bare the end of the cable for about ¼in., thread the knurled moulded nut over the cable, thread the bare wire through the washer, removed from the end of the old cable, and bend back the strands. Finally, screw the nut into the pick-up.

## Lighting and Accessories

#### 98. DYNAMO—INSPECTION OF COMMUTATOR & BRUSHGEAR.

About once every six months remove the dynamo cover for inspection of commutator and brushes.

The brushes must make firm contact with the commutator. The brushes are held in boxes by means of springs; move the brush to see that it is free to slide in its holder. If it sticks remove it and clean with a cloth moistened with petrol. Care must be taken to replace the brushes in their original position, otherwise they will not bed properly on the commutator. If, after long service, the brushes have become worn to such an extent that they will not bear properly on the commutator, they must be replaced. Always use genuine Lucas

brushes. Brushes should be fitted by a Service Agent.

Now examine the commutator. It should be free from any trace of oil or dirt and should have a highly polished appearance. Clean a dirty or blackened commutator by pressing a fine dry cloth against it while the engine is slowly turned over by hand. If the commutator is very dirty, moisten the cloth with petrol.

#### 99. LUBRICATION.

The bearings in the dynamo are packed with grease during assembly and will last until it is necessary for the dynamo to undergo a complete overhaul.



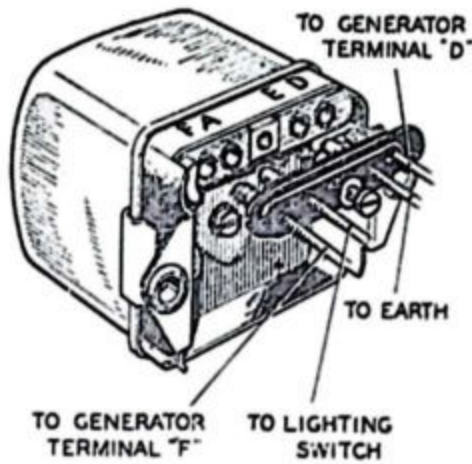


Fig. 19

**100. CUT-OUT AND REGULATOR**

This unit (Fig. 19) which is housed beneath tank, consists of the cut-out which is an automatic switch to prevent discharge of the battery when the dynamo is not charging, and the voltage regulator which controls the output of the dynamo. With a fully charged battery the dynamo is only permitted to pass a small charge to the battery, whilst with a fully discharged battery a heavy charge is passed in order to boost up the battery rapidly. Both components are accurately set and should not be tampered with or adjusted.

**101. AMMETER.**

Fitted in the general instrument panel, this instrument indicates when the current is being taken from the battery in a greater quantity than is being fed to the battery (discharge).

It also shows when the dynamo is charging and hence by means of the regulator the state of charge of the battery.

**102. BATTERY.**

When examining a battery, do not hold naked lights near the vents as there is a danger of igniting the gas coming from the plates.

Remove the vent plugs and see that the ventilating holes in each are quite clear.

Remove any dirt by means of a bent wire.

A clogged vent plug will cause the pressure in the cell to increase, due to gases given off during charging, and this may cause damage.

Make sure that the rubber washer is fitted under each vent plug, otherwise the electrolyte may leak.

**Battery—Topping-up.**

About once a month, remove the battery lid, unscrew the filler caps and pour a small quantity of distilled water into each of the cells

to bring the acid level with tops of the separators.

Acid must not be added to the battery unless some is accidentally spilled.

Should this happen, the loss must be made good with acid diluted to the same specific gravity as the acid in the cells.

This should be measured by means of a hydrometer.

**Checking Battery Condition.**

The state of charge of the battery should be examined by taking hydrometer readings of the specific gravity of the acid in the cells.

The specific gravity readings and their indications are as follows:

1.280—1.300. Battery fully charged.

About—1.210. Battery about half discharged.

Below—1.150. Battery fully discharged.

These figures are given assuming the temperatures of the acid is about 60°F.

Each reading should be approximately the same.

If one cell gives a reading very different from the rest, it may be that the acid has been spilled or has leaked from this particular cell, or there may be a short circuit between the plates.

This will necessitate its return to a Repair Depot for rectification.

Wipe the top of the battery to remove all dirt or water.

**Note.**

Do not leave the battery in a discharged condition for any length of time.

If a motor cycle is to be out of use, the battery must first be fully charged, and afterwards given a refreshing charge about every two weeks.

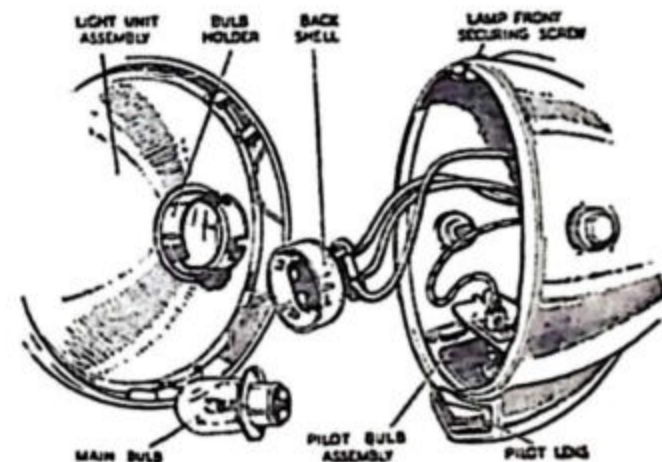


Fig. 20

Light Unit—bulb removal



### Earthing Connections.

Before disconnecting the battery, note which terminal is connected to the machine and re-connect accordingly.

### Charging.

If the previous tests indicate that the battery is merely discharged, and if the acid level is correct, the battery must be recharged from an external supply.

### 103. HEADLAMP.

The headlamp incorporates a Lucas Light Unit which embodies a "pre-focus" bulb ensuring a correct beam without any necessity for focusing.

### Setting.

Check the setting of the lamp. Stand the machine about 25ft. from a light coloured wall and adjust the headlamp position until the main driving beam is projected straight ahead and parallel to the ground, the centre of the beam being the same height as the headlamp centre.

### Bulb Replacement.

To remove the headlamp front, slacken the screw at the top of the lamp and lift off the front rim complete with light unit assembly. The pilot bulb is carried in a small metal plate in the base of the lamp body. The plate must be slid out in order to replace the bulb. To replace "pre-focus" bulbs, twist the back shell in the centre of the reflector back in an anti-clockwise direction and pull off. The bulb may now be removed from the rear of the reflector. Place the correct bulb in the holder, engage the projectors on the inside of the back shell with the slots in the bulb holder, press home and twist in a clockwise direction. To

replace headlamp front, locate the bottom of the light unit assembly in the lamp body, press into position and tighten locking screw.

### Note.

It is important that only genuine Lucas bulbs should be used as replacements, in order to ensure accurate and correct focussing.

Main bulb Lucas No. 312 6 volt

30/24 watt.

Pilot bulb Lucas No. 988 6 volt 3 watt.

### 104. TAIL, STOP AND NUMBER PLATE LAMP.

This lamp is fitted with a double filament bulb having a 3 watt filament to provide the normal rear and number plate light and an 18 watt filament controlled by the rear brake. To obtain access to the bulb, remove the two securing screws and the plastic cover.

The bulb cannot be incorrectly fitted into the holder.

The correct bulb is a Lucas No. 352, 6 volt 3/18 watt.

### 105. CABLES.

Before making any alterations to the wiring, removing the instrument panel or any instrument from the panel or exposing any bare electrical wiring, the negative lead from the battery should be disconnected from the earthing bolt in the tool tray beneath the dual seat. Most of the cables are protected by heavy braiding and are unlikely to become fractured or rubbed. A periodic examination should be made to ensure that they are still lying in a position where they will not become trapped or chafed by fork or wheel movement.

### 106. INSTRUMENT PANEL.

All leads are taken to the instrument panel

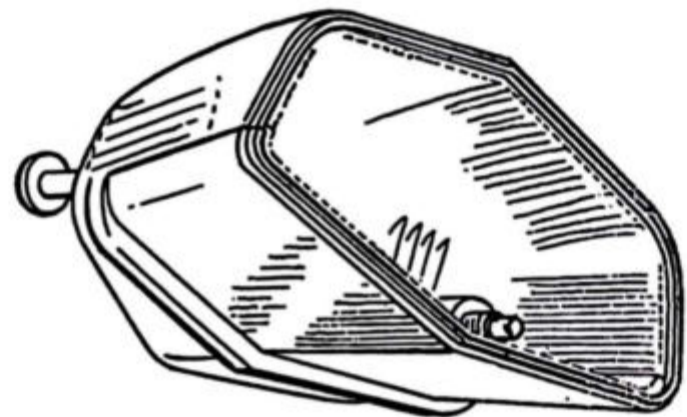
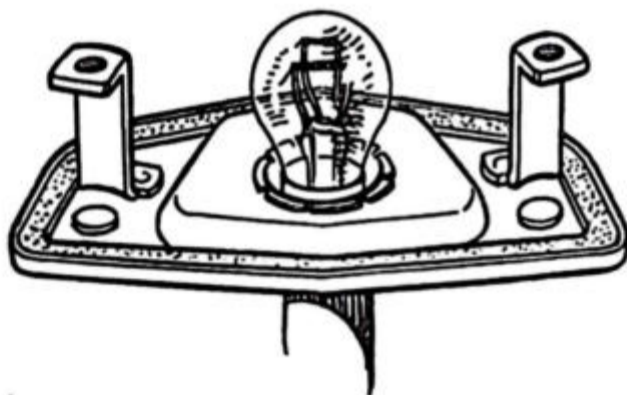


Fig. 21  
Tail, Stop and Number Plate Lamp.



carried on the upper end of the front forks and removable by first removing the handle-bar brackets, steering column nut and filler plugs allowing sufficient movement for the panel to be inverted, the cover removed and an examination to be made. To remove panel completely, the horn wire must be disconnected and the instruments removed. For wiring diagram see Fig. 20.

#### 107. HORN.

Electric horns are adjusted to give their best performance before leaving the works and will give a long period of service without any attention.

If the horn become uncertain in action, or does not vibrate, it has not necessarily broken down.

The trouble may be due to a discharged battery or a loose connection, or short circuit in the wiring of the horn.

The performance of the horn may be upset by the fixing bolt working loose, or by the vibration of some part adjacent to the horn.

To check this, remove the horn from its mounting, hold it firmly in the hand by its bracket, and press the push.

If the note is still unsatisfactory, the horn may require adjustment and should be taken to a Lucas Service Station.

#### 108. SPARKING PLUG.

Clean periodically by dismantling and removing all carbon from the electrodes. Scrape inside of plug body clean of carbon, reassemble and set gap at .015in.—.020in.



## LOCATING AND RECTIFYING POSSIBLE TROUBLES

<i>TROUBLE.</i>	<i>POSSIBLE CAUSE.</i>	<i>REMEDY</i>
<i>Inefficient Brakes. (Front or rear)</i>	Grease on lining.	Examine and wash in petrol. Do not Wash in paraffin.
	Tightness in mechanism.	Make sure that cam is free in its bearing and pedal not binding on spindle due to mud.
<i>Slipping Clutch.</i>	Cable adjusted too tightly.	Re-adjust cable until there is some movement on handle-bar lever before clutch operates.
	Inner cable too long. Clutch worm lever fouling gear box casing.	Shorten and re-adjust.
	Oil on plates (usually caused by over-filling oil bath).	Dismantle clutch plates and wash in petrol.
	Tightness in operating mechanism.	Examine, clean, and free off as necessary.
<i>Clutch Hard to Free.</i>	Clutch cable adjuster screwed right out, clutch worm lever not at correct angle and therefore not having a straight pull.	Re-set clutch worm lever to give straight pull. Shorten inner cable and re-adjust.
<i>Gear-Changing Accompanied by Excessive Noise.</i>	Slack rear chain.	Adjust as necessary.
<i>Footchange Lever hard to operate.</i>	Footchange requires greasing.	Nipple on indicator retaining screw.
<i>Failure of Footchange Lever to Return to Normal Position.</i>	Broken hairpin return spring.	Remove positive mechanism cover and front plate. Examine spring, renew as required.
<i>Steering Rolls or Wanders.</i>	Loose head adjustment.	
<i>Twist Grip Closes if Released.</i>	Tension requires adjusting.	Screw in adjuster one or two turns.
<i>Steering appears Tight on Corners.</i>	Steering damper binding, caused by bent frame anchor bracket.	Remove anchor bracket and re-set to correct angle.