

# MAINTENANCE MANUAL

AND

# INSTRUCTION BOOK

FOR

THE UNAPPROACHABLE

# Norton

REGISTERED TRADE MARK

## MOTOR CYCLE

## MODELS 16 H, BIG 4, 18 & ES 2



Telephone:  
ASTON Cross 3711  
(Private Branch Exchange)

**NORTON MOTORS LIMITED**  
BRACEBRIDGE STREET  
BIRMINGHAM 6  
ENGLAND

Telegrams:  
"Norton,  
Birmingham."

PRICE - 2/6

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# DATA

Model.	Big 4.	16 H.	18 & ES2.
Cubic Capacity ... ..	... 596 c.c. ...	... 490 c.c. ...	... 490 c.c.
Bore ... ..	... 82 m/m ...	... 79 m/m ...	... 79 m/m
Stroke ... ..	... 113 m/m ...	... 100 m/m ...	... 100 m/m
Compression Ratio ... ..	... 4.5 - 1 ...	... 4.9 - 1 ...	... 6.6 - 1
Sparking Plug ... ..	K.L.G. FE.70	K.L.G. FE.70	... K.L.G. F.70
<b>Ignition Timing.</b>			
Before top, fully advanced ... ..	... $\frac{7}{16}$ " ...	... $\frac{7}{16}$ " ...	... $\frac{5}{8}$ "
Magneto Points, gap ... ..	... .012" ...	... .012" ...	... .012"
Plug Points, gap ... ..	... .015" ...	... .015" ...	... .015"
<b>Valve Timing.</b>			
Inlet opens before top ... ..	... $\frac{11}{32}$ " ...	... $\frac{9}{32}$ " ...	... $\frac{6}{16}$ "
Exhaust closes after top ... ..	... $\frac{11}{32}$ " ...	... $\frac{9}{32}$ " ...	... $\frac{5}{16}$ "
<b>Tappet Clearance Cold.</b>			
Inlet ... ..	See para. 20 for	Engine Nos. followed	by letter Q.
Exhaust ... ..	... .002" ...	... .002" ...	Both push rods to
	... .003" ...	... .003" ...	be free to rotate.
<b>Amal Carburetter.</b>			
Type ... ..	... 276 A.T. ...	... 276 A.T. ...	... 276 A.U.
Main Jet ... ..	... 170 ...	... 160 ...	... 160
Throttle Valve ... ..	... 6/4 ...	... 6/5 ...	... 6/4
Needle Position ... ..	... Middle ...	... Middle ...	... Middle
<b>Piston Clearances.</b>			
Top of Skirt ... ..	... .007" ...	... .007" ...	... .007"
	... .006" ...	... .006" ...	... .006"
Bottom of Skirt ... ..	... .004" ...	... .004" ...	... .004"
	... .003" ...	... .003" ...	... .003"
Engine Sprocket, Solo ... ..	... 19 tooth ...	... 19 tooth ...	... 20 tooth
Engine Sprocket, Sidecar ... ..	... 17 tooth ...	... 16 tooth ...	... 18 tooth
Gear Ratios, Solo ... ..	4.9, 5.93, 8.67, 14.6	4.9, 5.93, 8.67, 14.6	4.66, 5.64, 8.24, 13.84
Gear Ratios, Sidecar ... ..	5.46, 6.62, 9.66, 16.2	5.8, 7.02, 10.3, 17.2	5.16, 6.25, 9.14, 15.3
Petrol Tank Capacity ... ..	2 $\frac{1}{4}$ galls. approx.		
Oil Tank Capacity ... ..	4 pints approximate		
Gearbox Capacity ... ..	$\frac{1}{2}$ pint approximate		
Chaincase Capacity ... ..	$\frac{1}{2}$ pint approximate		
Tyre Pressures ... ..	Front 20lbs.		Rear 23lbs.

# INTRODUCTION

In preparing these instructions the elementary details and preliminary information that may be necessary to the absolute novice has 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 familiarize you with the position and function of each control. Without wishing to become elementary a description of the best method of ensuring an easy start may not be inappropriate. With the petrol turned on, the air lever partly closed and the ignition lever in about its middle position, slightly flood the carburetter until petrol seeps (not drips) from the bottom of the carburetter mixing chamber and turn the easily starting screw (Fig. 20) in a clockwise direction. Depress the kickstarter until the resistance of compression is felt, raise the exhaust valve lifter and depress the kickstarter a further two or three inches. Release the exhaust valve lifter and allow the kickstarter to return to its normal position. Give a long swinging kick on the starter, carrying it as far round as possible. With the controls correctly set the engine should now start up.

When taking over a new machine it is only necessary to add petrol and oil to the respective tanks before use; the lubrication points having received the necessary greasing at the Works. It is advisable, however, to see that the steering damper is slackened off and adjusted to your particular requirements.

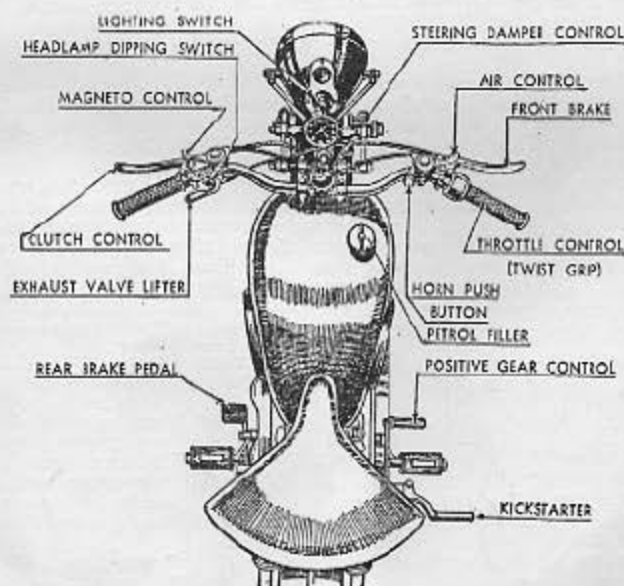


Fig. 1. Plan of machine showing controls.



New machines should not be driven at more than 35 miles per hour for the first 500 miles in top gear or a correspondingly slower speed in the lower gears. Avoid "over revving" and slogging or labouring of the engine. It is advisable during the running in period not to open the throttle more than  $\frac{1}{4}$  to  $\frac{1}{3}$ . The use of 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 agents, contains "colloidal graphite," which forms a graphoid surface on all working surfaces of the engine 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 each gallon during the running-in, but if its use is continued after this period only half the quantity should be used.

Under all usual circumstances when the machine is travelling at 25 miles per hour or over the air lever should be fully open and the ignition fully advanced, and only during starting or when the engine shows a tendency to pink should the ignition be retarded. Remember that these are high efficiency engines which give of their best when running at relatively high revolutions, and do not be afraid to change into a lower gear at the first signs of labouring. We would stress that the highest possible use should be made of the gearbox, which is quite capable of withstanding all the loads likely to be imposed on it by normal usage.

At the end of this book will be found a trouble tracing chart, reference to which will greatly facilitate the locating 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:—

TRIPLE SHELL or PRICE'S ENERGOL S.A.E. 60 for Summer Use.

DOUBLE SHELL or PRICE'S ENERGOL S.A.E. 40 for Winter use.

MOBIL OIL "BB" for Summer use.

MOBIL OIL "A" for Winter use.

These oils should be used in the engine and gearbox.

For oilbath chaincase use Wakefield's "Castrolite," Single Shell, Price's Motorine E, or Mobiloil Arctic.

All bearings not automatically lubricated are fitted with nipples for grease gun lubrication and a good quality grease, such as Wakefield Castrolase Medium, Price's Belmoline, Shell Retinax or Mobiloil Hub Grease 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 considerably enhanced.

NOTE.—On a new machine, drain and flush our 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.	
	Spring Frame Fork Ends	Grease		Brake shoe cams ... .. (sparingly)	Grease.	
Every 1,000 miles.	Control cables ... ..	Oil.	Every 5,000 miles.	Brake rod jaw joints ... ..	Oil.	
	Control levers ... ..	Oil.		Speedometer driving box	Grease.	
	Brake cable "U" clip ... ..	Oil.		Drain and refill oil tank	Oil.	
	Wheel bearings ... ..	Grease.		Steering head races ... ..	Grease.	
	Rear chain ... ..	Grease.		Saddle front pivot ... ..	Oil.	
	Gearbox, top up ... ..	Oil.		Gearbox, drain and refill	Oil.	
	Oil bath, top up ... ..	Oil.		Every 10,000 miles.	Commutator end bracket	Oil
					Telescopic forks ... ..	See para. 70
					Oil bath, drain and refill	Oil.

# THE ENGINE

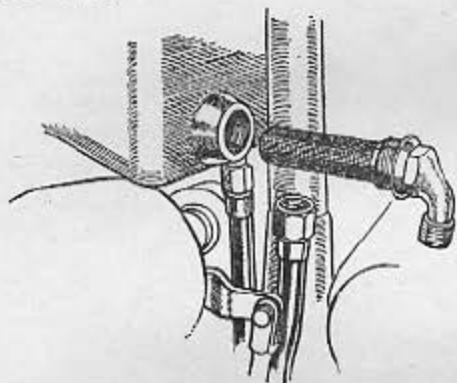
## 1. ENGINE, LUBRICATION SYSTEM.

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—that is the sludge trap—and by suction from the return side of the pump is lifted back to the oil tank.

## 2. THE FILTER.

The only filter in the oil system is of the gauze type and is fitted on the feed side of the oil circuit, attached to the adaptor screwed into the oil tank, to which the feed pipe is connected.

Clean filter, when oil tank is drained, every 2,000 miles.



OIL TANK FILTER. (Fig. 2).

## 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 will 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. THE CIRCULATION OF THE OIL.

The oil is forced from the pump,

1. To the rear wall of the cylinder.
2. To the big-end bearing.
3. To the pressure control valve.

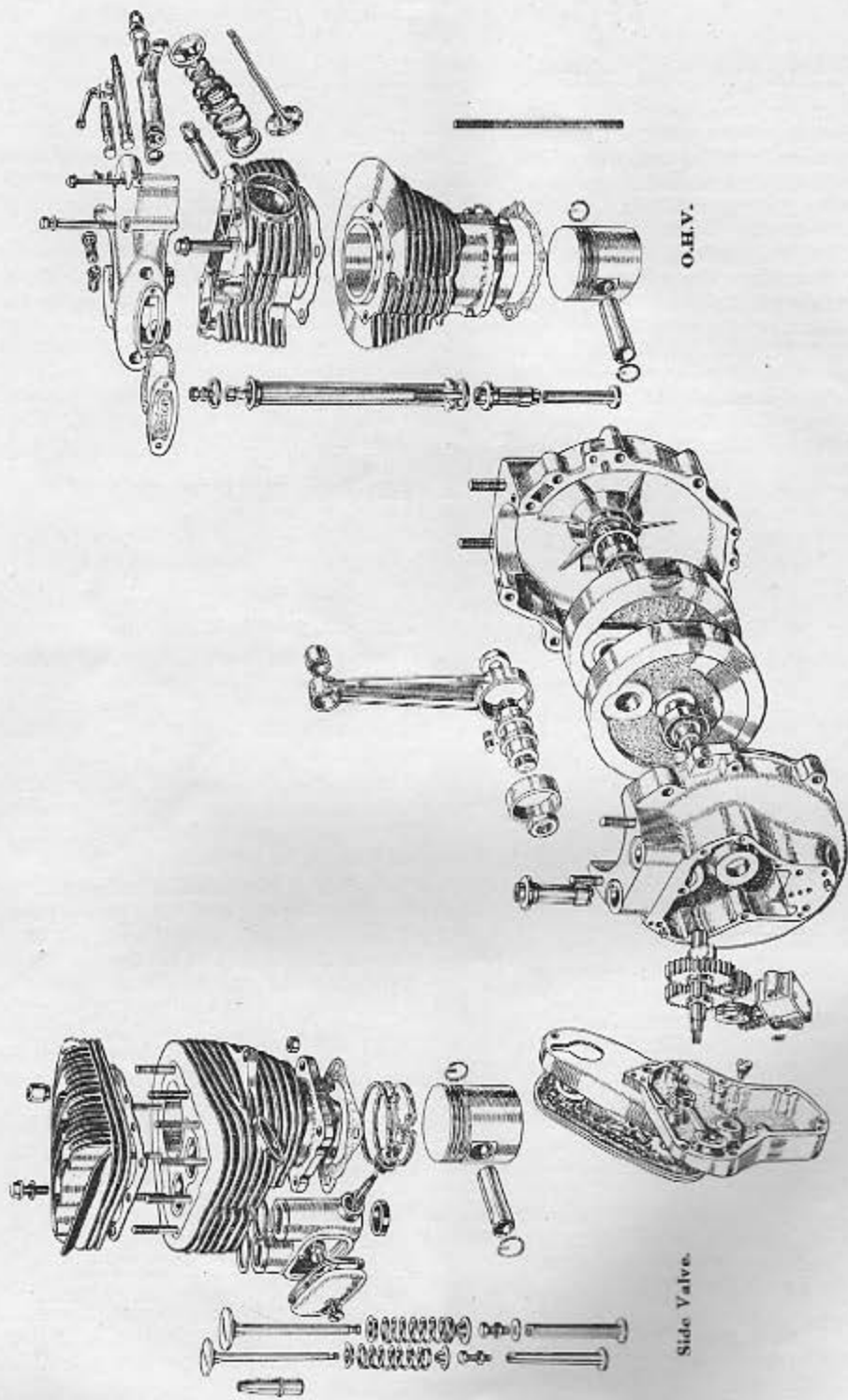
1. The oil passes through the timing panel to the mouth of the crankcase, through the base of the cylinder, up the cylinder wall and feeds the rear of the cylinder and piston.

2. The oil passes down the timing panel through the big end restriction jet, along the timing shaft, up the flywheel and is sprayed on to the roller big-end.

3. The oil pressure control valve is a spring-loaded ball, and acts as a safety valve, in the oil circuit. When the pressure of the oil lifts the ball from its seat, the oil passes the ball and is sprayed upon the timing gears. When the engine is assembled at the Works, the valve ball spring adjusting screw is screwed home and released  $1\frac{1}{2}$  threads. This is the only adjustment in the oiling system and it is not advisable to remove the ball from the valve unless it is suspected that the ball is sticking or not seating.

From the cylinder the oil drains down the sides of the crankcase and is picked up by ducts and carried to the main bearings and the timing gear bearings.

The oil collects in the timing case to such a level that the oil pump pinion is immersed, carrying oil to the half-time pinion and the timing gears.



THE ENGINE.  
Fig. 3.



On S.V. engines oil passes from the timing chest to the valve spring compartment via a longitudinal slot in the tappet guide; surplus oil being allowed to drain back into the crankcase.

On O.H.V. engines a lead is taken from the oil return pipe to a banjo fitting on the rocker box, feeding oil to the rocker shafts and ball ends. Surplus oil returns down the pushrod cover tubes to the crankcase. Excess oil from the O.H.V. valve spring chambers drains back through drilled holes in the cylinder head and barrel.

Oil is fed to the magdyno chain by passing through the inlet cam spindle bush into

the chain case. Any excess of oil accumulated in the case, drains through the breather pipe.

Crankcase pressure is also released by a valve on the driving side of the crankcase and oil mist is fed to the rear chain.

All the oil drains to the base of the crankcase to the sludge-trap, is picked up by the suction of the return side of the pump and returned to the tank.

The oil-way from the sludge-trap is situated so that any foreign matter is left in the trap. This leaves the case when the crankcase drain plug is removed and the oil drained.

## MAINTENANCE OF ENGINE

### DECARBONISING.

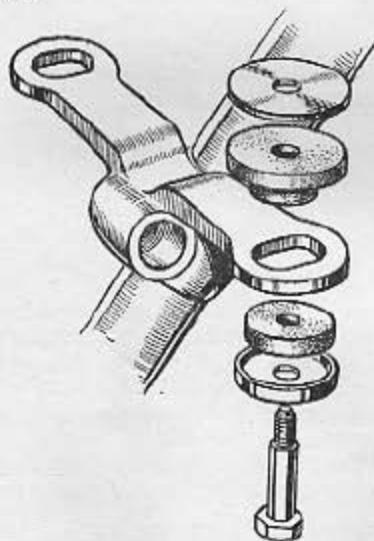
#### 6. REMOVAL OF PETROL TANK.

It is not necessary to drain tank, but make sure that the petrol tap levers are in the "Off" position, that is, with the round end of the lever pressed in.

Disconnect petrol pipes from taps. Use two spanners, holding the union nut with one, and the tap union with the other.

Remove the four bolts and washers, and the tank is free from the frame.

Four shouldered rubber washers and steel washers should be on the tank brackets.



The order in which the washers for the tank mounting should be placed. (Fig. 4).

#### 7. FITTING OF TANK.

Place the four shouldered rubber washers

on the frame tank brackets, with the steel washers above.

Place tank in position and fit cupped steel and rubber washers on to the tank bolts. (Fig. 4)

Fit bolts to tank and tighten down evenly. Ensure that the tank is clear of the frame.

Fit petrol pipes, using the two spanners as when removing.

#### 8. REMOVAL OF CYLINDER HEAD. 16H and BIG 4.

The cylinder head is held to the barrel by nine studs and nuts.

Remove sparking plug lead, spark-plug, and holding down stud nuts.

Remove cylinder head and joint washer.

#### 9. FITTING OF CYLINDER HEAD. 16H and BIG 4.

Examine joint washer. If damaged or showing any signs of blowing, replace.

Fit cylinder head, cylinder head stud nuts, and tighten down evenly.

Fit sparking plug and lead.

#### 10. REMOVAL OF CARBON.

Scrape carbon from top of piston and cylinder head.

Both are of the alloy type and care must be taken not to damage them.

Place an old piston ring at the top of the bore, and resting on top of piston. It will prevent the carbon being removed at the edge of the piston and end of the bore.

After an engine has been used for any considerable time, wear in the bore and the

rings takes place, allowing a small amount of oil to pass.

The carbon on the piston edge and the top of the bore acts as an oil seal and if removed, engine may use a little more oil till carbon is re-formed.

The carbon deposit in the valve ports and valve spring compartment cannot be removed unless the valves are removed.

Valves need NOT be removed at every de-carbonization.

#### **11. REMOVAL OF CYLINDER BARREL 16H and BIG 4.**

Remove petrol tank (see Para 6).

Cylinder barrel can be removed with or without the cylinder head in position.

Remove sparking plug and lead.

Remove carburetter, which is fitted to the induction stud by split ring and bolt.

Ease bolt and remove carburetter complete with pipes from the induction stub, when carburetter will hang on the control cables.

Remove valve cover and rotate engine till both valves are closed and piston at bottom of stroke.

Remove exhaust valve lifter control from arm by raising the arm and detaching inner cable.

This releases the return spring.

Screw out cable adjuster from cylinder barrel, and the cable is now free.

Remove exhaust valve lifter from valve chest by unscrewing the hexagon headed bush carrying the lifter spindle.

Remove cylinder base nuts and lift cylinder off crankcase supporting the valve chest which is a separate casting, with one hand. The top joint between the cylinder and valve chest is made oil tight with composition washers, the lower seals being of rubber.

A paper washer is fitted between barrel and crankcase.

With the cylinder removed the piston is exposed and the cylinder can be dealt with on the bench.

It is essential to cover the crankcase mouth with clean rag to prevent the ingress of any foreign matter.

#### **12. REMOVAL OF ROCKER BOX, CYLINDER HEAD AND CYLINDER BARREL.**

##### **O.H.V. MODELS.**

Remove carburetter attached to induction stub by split ring and bolt.

Remove exhaust pipe or complete exhaust system in one piece.

Disconnect the oil feed pipe from rocker box.

Rotate engine till both valves are seated and remove sparking plug.

Slacken the 9 rocker box securing bolts and remove those which are accessible. The three centre rear bolts must remain in the box until it is removed. Support the upper ends of the push rod cover tubes with one hand, lift the box about  $\frac{1}{4}$ " and withdraw from the cylinder head.

Remove the push rods and cover tubes together with the composition and rubber washers from either end of the cover tubes.

Keep the inlet and exhaust push rods separately for re-fitting in their original positions. Rocker box may be left suspended by exhaust valve lifter cable or completely removed.

Remove cylinder head nuts and cylinder head. If tight tap beneath inlet port with mallet or wooden block.

Revolve engine till piston is at bottom of stroke and remove cylinder barrel (this need not be done at every decarbonisation as piston top can be cleaned as S.V. models, para. 10).

Cover crankcase mouth with rag to prevent ingress of dirt or foreign matter.

#### **13. REMOVAL OF VALVES FROM CYLINDER OR HEAD.**

Compress valve springs with a suitable type of valve compressor.

When springs are compressed the valve cotters will fall from the valve stems.

Remove valve compressor.

Remove valves.

Remove valve springs and collars from valve spring compartment.

Remove carbon from underside of valve heads.

##### **DO NOT POLISH VALVE STEMS.**

Check valve stems in guides; if free, do not touch guides, unless they are badly worn.

If guides and valves show no signs of excessive wear, re-grind valve seats.

Always grind the seats when new valves are fitted.

#### **14. GRINDING OF VALVE SEATS.**

Use as little grinding compound as possible.

Place valve in guide and grind lightly, using a screwdriver or hand vice.

Do not revolve valve a complete turn, but

oscillate, frequently raising valve from seat and placing in a different position.

Do not over-grind valve seats (a wide seat is not necessary).

When seat is ground sufficiently, that is, when the marks of the grinding make a complete ring on the seat and on the valve, remove all signs of grinding paste from seat, valve and valve pockets.

If the valves or the seats are badly burnt or pitted, it may be impossible to obtain a perfect seat by grinding. The seats will then have to be re-cut, and the valves re-faced.

#### 15. FITTING OF VALVES.

Thoroughly clean valves, seats, and valve pockets. Fit valve springs and collars. Lubricate valve stems.

Fit valves into guides, compress valve springs, and fit cotters.

If the valve cotters are greased with a thick grease, the grease will hold the cotters in place until the springs are released.

#### 16. REMOVING AND RE-FITTING OF VALVE GUIDES.

Valve guides are a driving fit in the cylinder barrel or head.

To remove, tap out with a double diameter drift.

Use the drift to replace or fit new ones.

Seats must be trued-up with cutter after refitting of guides, to ensure that the guides and seats are in alignment.

#### 17. FITTING OF CYLINDER BARREL, S.V. ENGINES.

Position piston rings so that ring gaps are equally spaced.

Lubricate rings, barrel and piston.

Rotate engine until piston is near the top of its travel with the connecting rod leaning towards the front engine tube.

Fit paper washer to crankcase mouth, ensuring that cylinder feed oil hole is unobstructed.

Place rubber washers on tappet guides and composition washers on upper end of the valve spring chamber and place the latter in position on the crankcase.

Fit barrel over piston; it may be necessary to obtain assistance when entering rings into barrel and to support the valve spring chamber.

Having ensured that the valve spring chamber casting is correctly located, tighten the four cylinder base nuts evenly.

Fit exhaust valve lifter, making certain that the lifting portion is correctly positioned

beneath the washer on the tappet.

Fit exhaust valve cable adjuster and return spring and attach cable to lifter lever. Adjust tappets (para. 21).

#### 18. FITTING OF CYLINDER BARREL, CYLINDER HEAD AND ROCKER BOX.

##### O.H.V. ENGINES.

Position piston rings so that gaps are equally spaced.

Lubricate rings, barrel and piston, and rotate engine till piston is near top of stroke.

Fit paper washer to crankcase mouth, ensuring that cylinder oil feed hole is unobstructed.

Fit barrel over piston and slide right home.

Clean cylinder head joint faces and fit aluminium gasket.

Fit cylinder head and tighten head nuts evenly.

Place the three rear centre bolts in position in the rocker box and position the box on the cylinder head, having smeared the joint faces with jointing compound.

Loosely fit the remaining bolts and place the push rods and cover tubes in the positions which they previously occupied with the composition washers at the upper end and the rubber washers at the bottom.

Evenly tighten the rocker box bolts. Re-fit the remaining components.

Remove rocker cover and check push rod adjustment (para. 20-21).

#### 19. DISMANTLING & RE-ASSEMBLY OF ROCKER BOX.

##### O.H.V. ENGINES.

Whilst rocker box is removed it may be necessary to remove the rockers for examination or re-bushing. Remove the inspection cover and the rocker spindle nuts and washers, and with a soft punch against the threaded end, drift the spindles out of position.

The rockers with their washers and shims may be extracted from the box.

Remove the exhaust valve lifter by first removing the small securing screw, when the lifter may be withdrawn.

The rocker bushes are a press fit in the rockers and may be pressed or drawn out as shown in fig. 5.

Rocker ball ends and pads requiring renewing may be drifted out with a punch.

Press in new rocker ends, ensuring that the hole in the shank of the ball end is lined up with the oil hole in the rocker arm.

New rocker bushes may be pressed in or drawn into position by reversing the method of extraction illustrated.

New bushes should be reamed with  $\frac{9}{16}$ " dia. reamer after fitting.

The re-assembly of the rockers in the box may require a little patience. Fig. 3 shows clearly the position of the various parts. Note that the steel shims on either side of the spring washer are identical, the thrust washer at the opposite end being much thicker.

Obtain a bar slightly smaller than the large spindle hole and having a lead on one end. Insert this into the hole far enough to allow the shims and spring washer to be placed over it. Carefully thread the rocker into position (it may be necessary to slightly withdraw the bar to get the rocker right home), centralise the washers as nearly as possible, remove bar and insert spindle, having previously smeared it with oil.

Using soft punch tap spindle part way through rocker

Compress spring washer by means of screwdriver inserted into push rod hole and bearing on rocker arm and place thrust washer in position; the pressure of the spring washer will hold it until the spindle is knocked further home.

It is unlikely that the washer will be in true alignment with the spindle and will, therefore, be pinched between the rocker box and the shoulder on the spindle when the latter is tapped further into position. To release the washer tap the opposite end of the spindle once only.

Re-insert the screwdriver and again compress the spring washer. This will enable the thrust washer to be persuaded to drop over that part of the spindle on which it fits.

Insert tin strip or end of steel rule between rocker box and thrust washer, tap spindle fully home, remove tin strip, ensure that rocker is free to move, fit copper washer and dome nut and tighten.

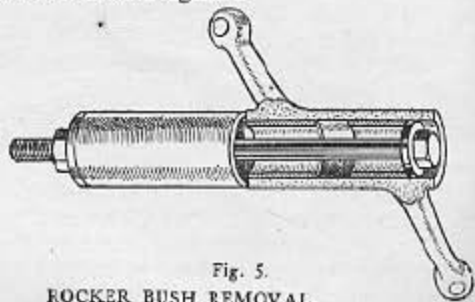


Fig. 5.  
ROCKER BUSH REMOVAL.

## 20. TAPPET OR PUSH ROD ADJUSTMENT ON MACHINES WHERE ENGINE NO. IS FOLLOWED BY THE LETTER Q.

Engines having a number followed by the above suffix are fitted with a modified cam form which requires rather more careful positioning of the cam than previously.

For both O.H.V. and S.V. engines proceed as follows:—

To adjust inlet valve clearance rotate engine till exhaust valve is just lifting. Adjust inlet tappet or push rod (para. 21). To adjust exhaust valve clearance rotate engine till inlet valve has just closed. Adjust exhaust tappet or push rod.

On S.V. engines there should be .010" clearance between tappet head and valve on inlet and exhaust.

On O.H.V. engines both push rods should be free to rotate without any up and down movement.

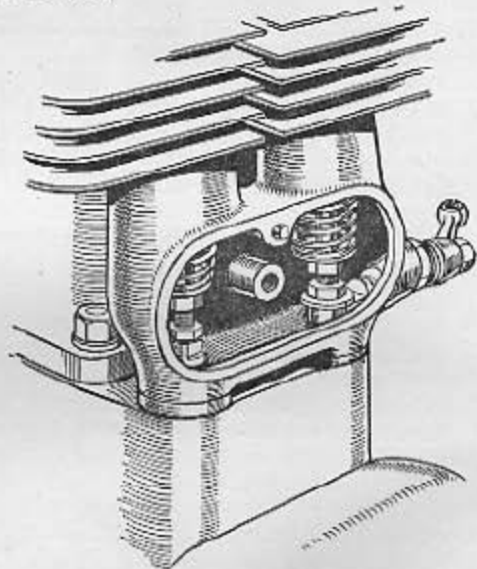


Fig. 6.

### S.V. TAPPET ADJUSTMENT.

Set clearances with engine cold.

When timing engine with these cams there should be a .017" feeler inserted between cam and crankcase rocker pad.

Adjust afterwards to correct clearance.

## 21. TO ADJUST TAPPETS OR PUSH RODS.

Release the middle hexagon—locking the nut—by placing one spanner on the bottom



hexagon—the tappet stem or push rod—and the second on the locking nut.

Turn the top hexagon—the tappet head or push rod adjuster—in the desired direction, and when the correct clearance is obtained, tighten locking nut.

Check clearance after tightening locking nut.

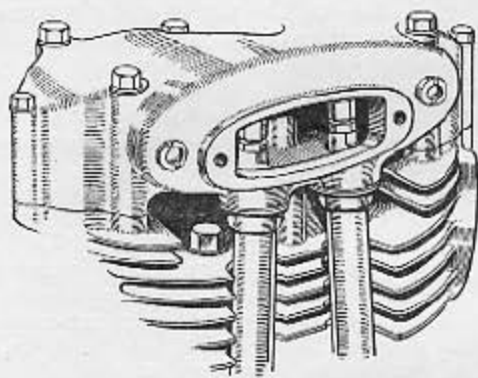


Fig. 7.

O.H.V. PUSH ROD ADJUSTMENT.

## 22. REMOVAL OF PISTON AND RINGS.

Remove cylinder barrel. (Para. 11-12.)

Remove one circlip and the gudgeon pin. Gudgeon pin is a running fit in the piston and small end bush.

Mark piston to ensure it is fitted the same way when replacing.

Remove rings from piston.

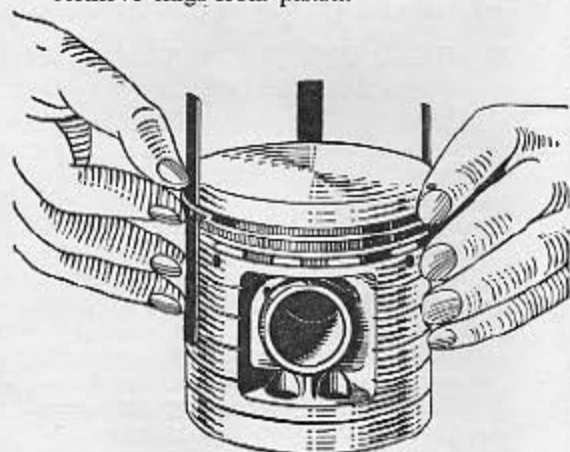


Fig. 8.

Place three thin metal strips approximately  $\frac{1}{2}$ " wide x 2" long, behind the rings equally spaced and the rings may be readily removed. (Fig. 8.)

If it is decided not to fit new rings, it is not advisable to remove the carbon from the back of the ring or the bottom of the ring groove.

If it is decided to fit new rings, the grooves in the piston should be thoroughly cleaned. A portion of a broken hack-saw blade is an ideal tool for the job.

When the grooves have been cleaned, check the new ring for size in the grooves.

There should be a side clearance of .002".

Check rings in the cylinder bore for the correct width of gap.

Place ring in bore, push ring down bore, using the piston as a guide.

The ring gap should be:

Compression ring ... .012"—.016".

Scraper ... .005"

Check gap with feeler gauge.

## 23. REFITTING PISTON.

Fit rings to piston.

Fit piston to connecting rod with the piston in the same position as before dismantling.

Fit circlip. It is advisable to always replace circlip and fit a new one.

Fit cylinder barrel. (Para. 17-18.)

## 24. REMOVING AND FITTING OF SMALL END BUSH.

If when the cylinder barrel and piston are removed it is found that the small end bush is worn it should be renewed.

Bush must be withdrawn from connecting rod.

Obtain a bolt at least twice the length of the bush, place a washer at the head of the bolt with an outside diameter less than the bush. Place bolt in bush.

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 nut is tightened, the bush will be drawn from the rod.

Care must be taken so that no strain is taken by the rod.

Fit new bush in the same manner.

Before fitting bush to rod, the inside diameter should be reamed to the size of the pin, as when fitted in the rod the bush will compress, leaving sufficient metal for true-ing with the reamer. If this is not done, too much metal will need to be taken away with the reamer.

Drill oil-holes in the bush before reaming to size.

The gudgeon pin should be a running fit in the small-end and the piston.

## 25. REMOVAL OF TIMING PANEL.

Remove magdyno chain cover held by three cheese headed screws.

Remove sprockets with chain in position. If difficulty is experienced a withdrawing tool should be obtained. The cam spindle sprocket is held by taper and key; the magdyno shaft is not keyed.

Remove panel screws and note that the top three are shorter than the bottom three. Two countersunk screws are inside the mag-chain case.

When withdrawing the panel see that the big end feed jet is not lost and that any shims fitted to the cam spindles remain in position.

Remove big end feed jet spring.

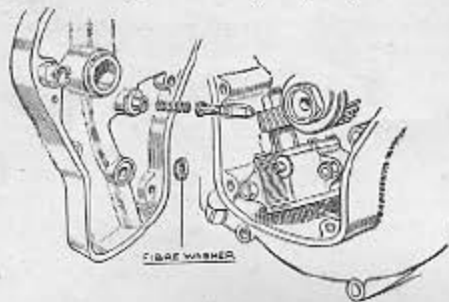


Fig. 9.

## 26. FITTING TIMING PANEL.

Clean the edges of the timing chest and the panel.

Smear the edges with gold-size or jointing compound.

Check fibre washer on the oil pump nipple, connecting pump to panel.

Place panel in position and the washer should prevent the edges of the panel meeting the case by  $1/32''$ . This ensures that when the panel pins are tightened, the washer is compressed, making an oil-tight joint.

Fit spring and jet in jet holder.

Fit panel and panel screws and tighten down evenly.

## 27. IGNITION TIMING.

Place chain and sprocket in position and tighten cam wheel sprocket nut only.

Place gearbox change-speed lever in top gear position.

Advance ignition fully.

Rotate engine by turning the rear wheel, until both valves are closed and the piston is at the top of its stroke.

The position of the piston can be ascertained by placing a thin rod into the cylinder, via the compression or sparking plug hole.

Hold rule on the top of the piston and take the reading of the rule as it leaves the cylinder.

Turn the rear wheel backwards still holding the rule on top of the piston till the rule shows the correct figure. (See data sheet.)

Remove magdyno contact breaker cover.

Turn contact breaker in clockwise direction till the points open.

Insert thin feeler gauge or thin piece of paper, between the points.

Turn the contact breaker in an anti-clockwise direction till the points hold the feeler.

Turn contact breaker in a clockwise direction till the feeler is just free, that is when the points have just commenced to open.

Place a tube over the end of the shaft and sharply tap tube, forcing sprocket on to the taper of the shaft.

Tighten down nut carefully, so as not to turn the shaft.

When nut is tightened down, check timing.

Fit contact breaker cover.

Fit magdyno chain cover.

Fit compression plug or sparking plug.

## 28. REMOVING TIMING GEARS, OIL PUMP, AND TAPPETS.

Remove timing panel (para. 25), timing gears and oil pump are now visible.

Remove oil pump nuts and withdraw oil pump from studs.

Remove oil pump worm, LEFT HAND thread.

Timing gears may now be removed ensuring that any shims fitted to either end of the spindles are not lost.

Withdraw pinion from timing shaft using, if necessary, a sprocket drawer.

Unless absolutely necessary the tappets should not be removed as it is necessary to remove the tappet guides before the tappets may be withdrawn. The tappet guides are pressed into the crankcase and may be extracted by means of a sprocket drawer.

The inlet and exhaust tappets should not be interchanged.

## 29. FITTING TAPPETS, TIMING GEAR AND OIL PUMP.

If new timing gears have been fitted then they will need checking and re-shimming for end float. When fully home in the case the side of the gear should be clear of the boss carrying the pressure release valve. Shims should be added until this condition is obtained.

Fit timing cover, pull and push on inlet cam spindle and shim up till end float is just perceptible.

End float on exhaust cam spindle can only be properly checked when crankcase halves are separated.

Tappets must be entered into tappet guides from inside timing chest **before** the guides are pressed into position.

This necessitates a tubular drift to finally force the guides home.

Tappet guides are located radially by a peg in top face of crankcase, which fits into a hole in tappet guide collar. Hole and peg should be as nearly in alignment as possible before pressing or tapping the guide into position.

Fit half-time pinion to mainshaft and rotate engine till crankpin is on T.D.C.

Fit cam gears, meshing the marked teeth with the appropriate markings on the pinion.

Fit and tighten oil pump worm, **LEFT HAND** thread, using punch or peg spanner.

Fit oil pump, ensuring that both faces are quite clean and using a minimum of jointing compound to avoid the oil holes becoming obstructed.

Check fibre washer on oil pump nipple and fit timing panel (para. 26).

Time magneto (para. 27).

## 30. 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.

## 31. OIL CONTROL VALVE.

This is fitted in a boss on the inside of the timing panel. It is an assembly of a ball,

spring and adjusting screw. The adjustment is set at the works and should not need any attention.

The control valve acts as a safety valve in the oil circuit. When the oil is cold, the oil pressure in the circuit tends to become excessively high, but the excess of pressure lifts the ball from its seat, allowing the oil to spray on to the timing gears.

If for any reason this is dismantled, the order of assembly is—ball, spring and adjuster nut.

Tighten the nut home and then screw out one and a half turns and lock with centre punch.

## 32. REMOVAL AND FITTING OF MAGDYNO.

The removal of the magdyno is simplified if the timing panel is removed.

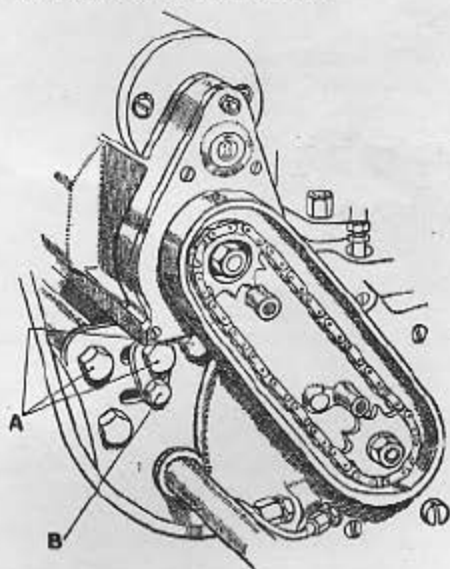


Fig. 10.

Remove timing panel. (Para. 25.)  
Remove leads from dynamo (3.), and high tension lead from sparking plug.

Remove the locking bolt marked "B" in Fig. 10.

Remove the centre bolt of the three marked "A."

Ease the nuts off the outside bolts marked "A."

Magdyno can now be removed.

Replace in the reverse order.

Do not tighten the bolts until the panel is refitted and the chain adjusted.

With the bolts slack, the magdyno can be moved in the desired direction, to correct the chain adjustment.

### 33. EXAMINATION OF THE ROLLER BIG END.

With the cylinder removed, the big-end can be examined for wear.

Rotate the flywheels until the big-end is in the topmost position.

Hold connecting rod with both hands, pull and push, and any up and down play can be felt.

#### DO NOT USE SIDE PRESSURE.

Do not mistake side float for end play.

A small amount of rock is of no importance.

If any appreciable up and down movement is present a new crankpin bearing is necessary. The dismantling of the flywheels and fitting of crankpin is a skilled job requiring equipment not normally available to the average rider. The flywheel assembly should be returned to the works for this replacement.

### 34. REMOVING ENGINE FROM FRAME.

Remove the tank (para. 6), magdyno (para. 32) and exhaust valve lifter cable.

Remove carburetter, which may be left suspended from cables, remove exhaust pipe and silencer, a "C" spanner is supplied in tool kit to fit exhaust pipe locking ring on O.H.V. model.

Remove clip bolts and nuts, and silencer bolt, and the pipe and silencer can be removed as one unit.

Remove oil pipes from the crankcase. If the oil has not been drained from the oil tank, plug the end of the feed pipe.

Remove oil bath, engine sprocket, and clutch. (Para. 41.)

Remove front and rear engine plates completely. Remove engine cradle bolts and lift engine clear of frame.

### 35. PARTING OF THE CRANKCASE HALVES.

Remove crankcase drain plug and drain any oil that may be in the sump.

Remove cylinder barrel (para. 11-12), piston (para. 22), timing gear and oil pump (para. 28).

Remove key from driving shaft.

Remove all the crankcase bolts and stud nuts, also the cheese headed screws from sump.

Crankcase halves can now be parted. Remove timing side first.

If leverage is necessary, revolve flywheels until the crankpin is at the mouth of the case, place a lever against the crankpin nut and lever outwards.

To remove the driving side of the case, lift the half of the case with the flywheels and lightly drop the end of the driving shaft on to a block of hard wood, then the case should leave the shaft.

### 36. REMOVAL OF BEARINGS FROM CRANKCASE.

It should be possible to remove the bearings from the case by tapping a shaft through the bearings, the shaft having a diameter slightly larger than the engine shaft, but small enough to pass through the bearing, should the bearing be tight in the case, without damage.

If the bearings are too tight in the housing to be removed by this method, the case should be heated round the bearing housings, when they should drop out.

Do not heat case sufficiently to destroy the temper of the bearings and do not use a concentrated flame.

### 37. FITTING OF BEARINGS TO CRANKCASE.

Test bearings, to be a sliding fit on shafts. Press the ball bearing lightly in to the driving side of the case.

Fit the spacing washer next to the ball bearing.

Press the roller bearing lightly in to driving side of the case.

### 38. ASSEMBLY OF CRANKCASE.

Fit flywheels into case, and fit and tighten all bolts.

Test for side float in the flywheels, there should be .005".

If the float is excessive, remove wheels from case.

Fit pen steel washers to the engine and timing shafts to take up the excess of float.

Fit the same thickness of washers on each shaft, keeping the wheels central in the case.



Check side float.

If the side float is correct, check connecting rod for being central in case.

There is side float in the big-end.

Place fingers on the bottom of the connecting rod and push rod towards the timing side of the case.

Measure the distance from the end of the small-end bush to the side of the crankcase mouth on the timing side.

Push rod to driving side of case and take the same measurement, from the driving side.

The two measurements should be within 1/64" of each other.

Rod can be lined up by transferring the pen steel washers on the driving and timing shafts to whichever side needs them, to obtain the correct alignment.

When the correct alignment is obtained, remove wheels from case.

Lubricate main bearings and big-end.

Smear the two edges of the case with gold-size or jointing compound.

Fit wheels into the case and tighten all bolts and nuts.

Fit timing gears (para. 29), and panel (para. 26).

### 39. FITTING ENGINE TO FRAME.

Fitting of the engine to the frame should present no difficulty.

Lift engine into cradle and insert the two cradle bolts.

Starting at rear engine plates fit all bolts loosely, working finally to the front engine plate bolt.

Tighten all nuts.

Fit clutch, oil bath, etc.

Fit and time magdyno.

### 40. REMOVING AND FITTING OF TIMING GEAR BUSHES.

When engine is dismantled it may be found that the timing gear bushes require replacement. This is not a job to be undertaken by the average owner. The timing cover and half crankcase should be despatched to our service department.

# THE TRANSMISSION

## 41. REMOVAL OF OIL BATH.

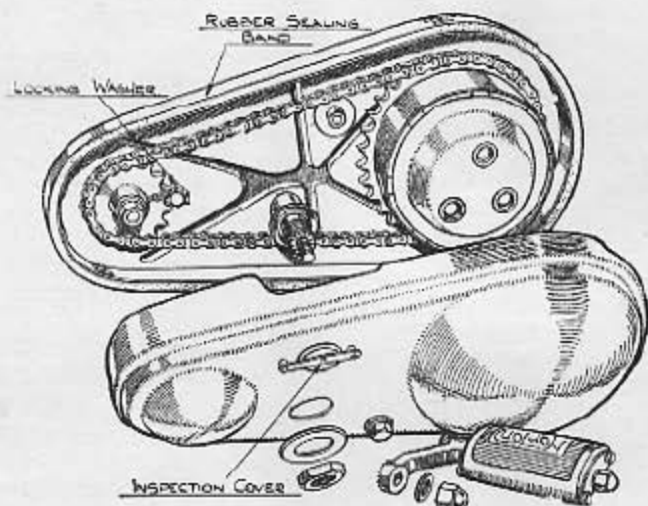


Fig. 11.

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. 12).

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.

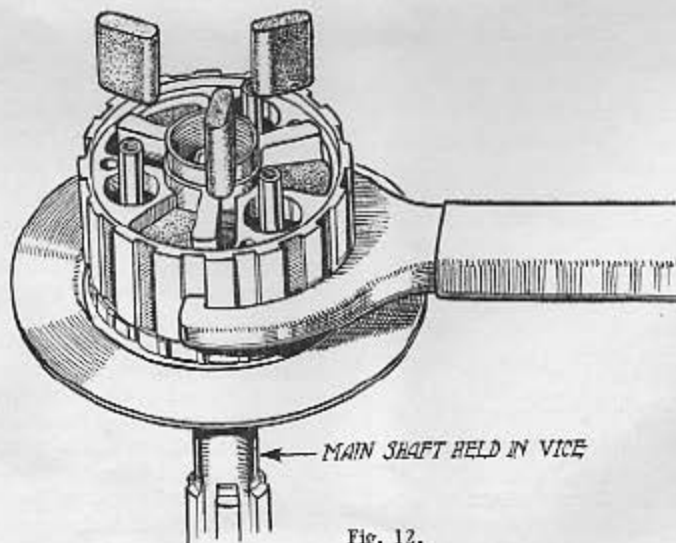


Fig. 12.

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.

Remove kick starter crank, gear indicator and gear lever.

Remove outer cover held by seven cheese head screws and release the clutch cable from the operating arm by rotating the worm with a large screwdriver.

Remove cable adjuster from inner cover.

Remove oil bath, clutch and engine sprocket. (Para. 41).

Remove rear portion of oil bath (para. 41), rear chain guard and rear chain.

Remove nut and adjuster bolt from the offside of the gear box top bolt and extract the bolt from the nearside.

Remove prop stand spring and nut from the offside of the gearbox bottom bolt, remove the nut and tap out the bolt.

The whole box may now be swung round in an anti-clockwise direction and lifted out of the frame on the offside.

#### 47. FITTING TO FRAME.

Reverse the order of removal operations, leaving the top and bottom bolts slack until the primary chain has been correctly tensioned ( $\frac{1}{8}$  in. up and down movement) by

means of the adjuster on the offside of the machine. Remember that any adjustment of the primary chain will affect 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° below the horizontal. Re-adjust 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 coverscrews 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 becomes 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 FOOTCHANGE, 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 re-assemble, 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 movable 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 footchange 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 main shaft 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.

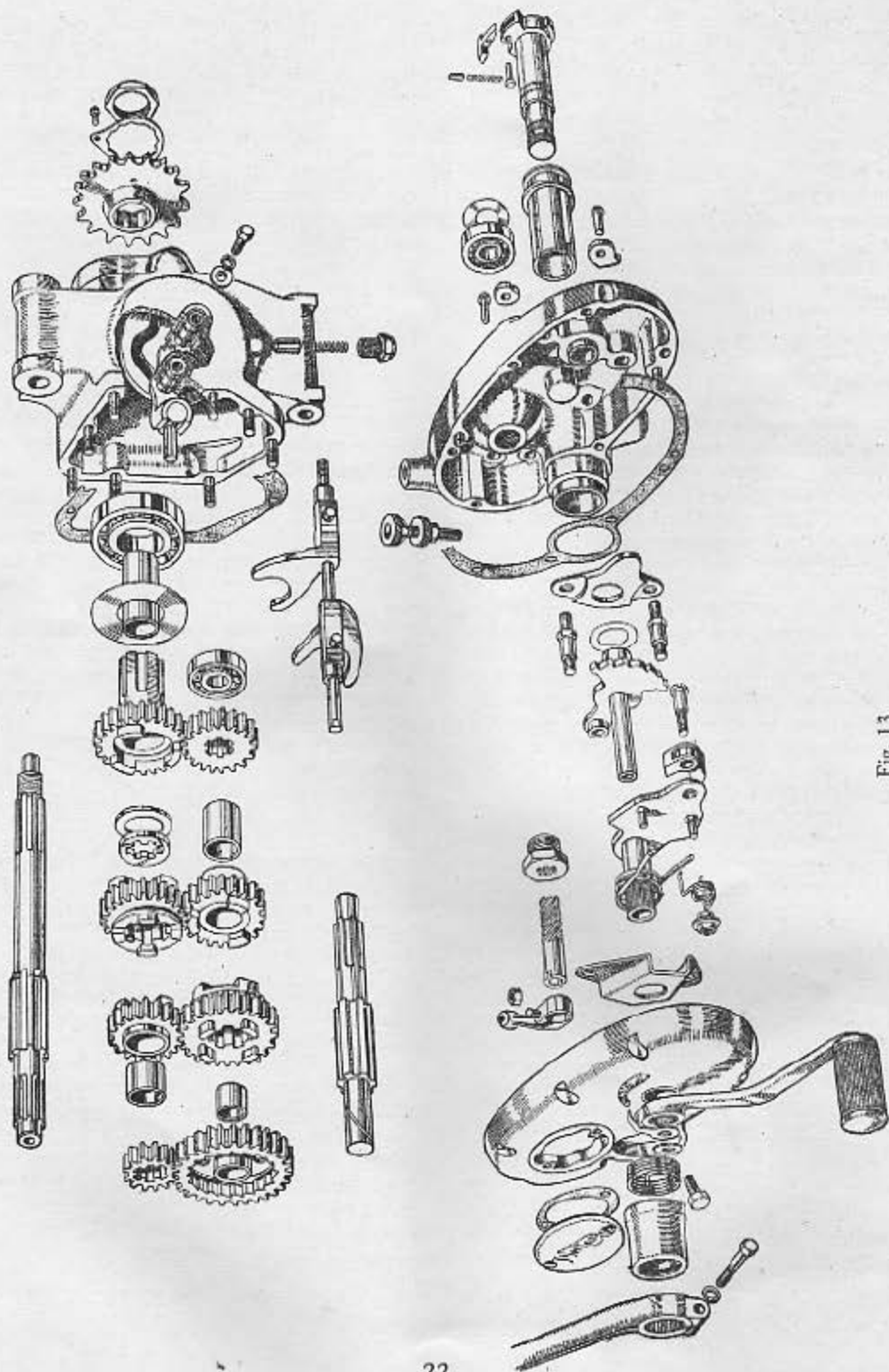


Fig. 13

### 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-riveting.

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 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 gearwheel. 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 rack 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 footchange 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.

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 screw driver 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 both stands. 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 RIGID FRAME.

Place machine on the rear stand. Roll back the rubber tube on the rear lamp lead, exposing the brass connection. Break the wire by parting the connector. Remove the tail piece of the mudguard by removing the two bolts holding it to the main portion and the two bolts at the bottom of the tail piece holding the stays.

Disconnect speedometer driving cable. Remove wheel spindle, distance piece and speedometer driving box.

Remove the hub stud nuts, draw the wheel clear of the three studs and the wheel will drop to the ground.

When the wheel has been removed by the



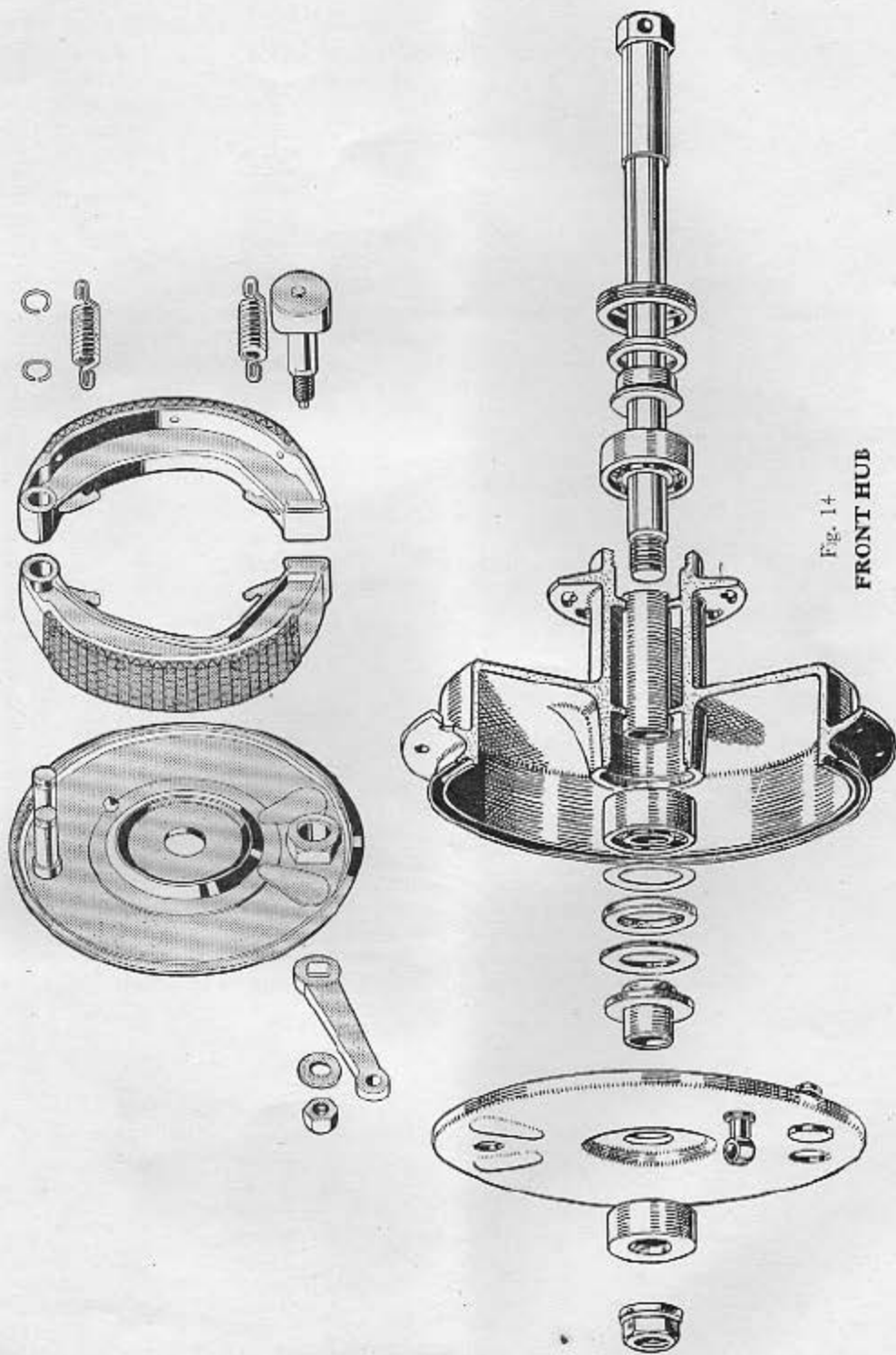
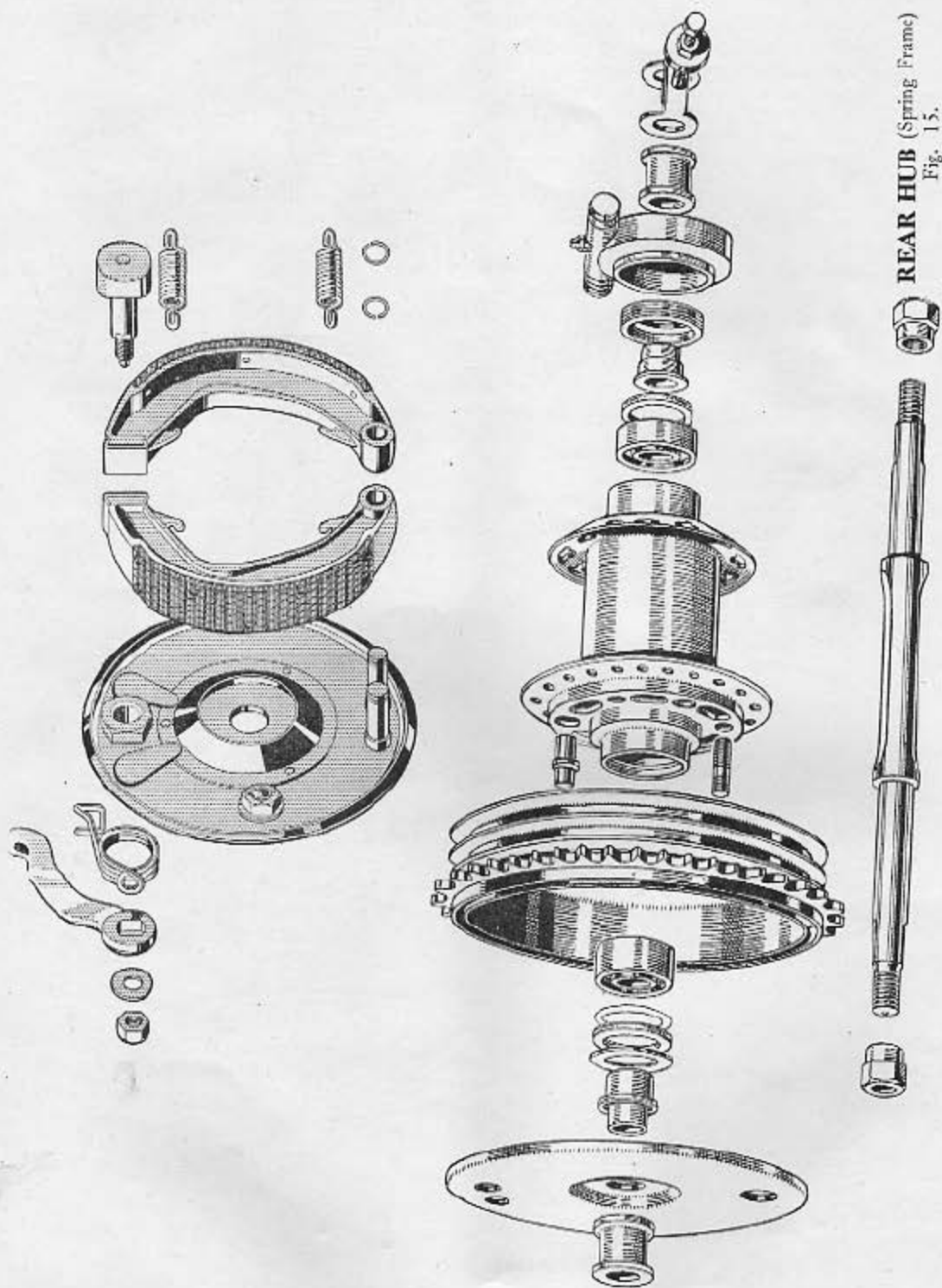


Fig. 14  
FRONT HUB



**REAR HUB (Spring Frame)**  
Fig. 15.



above method, the brake drum is left in position.

To remove the wheel complete with brake drum, remove tail piece of mudguard, rear chain, anchorage bolt holding the brake anchorage arm to the frame and ease the spindle nuts, when the wheel can be removed from the fork ends of the frame.

#### **63. REAR WHEEL, FITTING. RIGID FRAME.**

When refitting the wheel, reverse the removal operations.

Ensure that the spindle is hard against the chain adjusters.

When refitting the chain spring link ensure that the closed end of the spring faces the direction of travel of the chain.

Check rear brake.

#### **64. REAR WHEEL, REMOVAL. SPRING FRAME.**

With machine on rear stand, remove rear chain and mudguard tail piece. Disconnect tail lamp lead at the brass connection.

Remove brake rod adjusting nut. Disconnect speedometer drive. Slacken rear wheel spindle nuts and withdraw the wheel from the fork ends.

#### **65. REAR WHEEL, REFITTING. SPRING FRAME.**

See that fork ends are lying reasonably parallel. Place wheel in position ensuring that the ears of the adjusting stirrup are lying flat against the sides of the fork end and that the cupped adjuster washer is located on the small shoulder at the open end of the fork end slot.

Make sure that the anchor pad on the brake plate is entering the slot on the inside of the near-side fork end.

Fit rear chain with the closed end of the spring connecting clip facing the direction of travel of the chain.

Track up the wheel and adjust until there is  $\frac{3}{8}$ " to  $\frac{1}{2}$ " up and down movement midway between the sprockets.

**NOTE.**—It is important that this condition is obtained with the weight of the machine on the rear wheel.

Adjust brake rod as necessary. Reconnect speedometer drive.

#### **66. DISMANTLING SPRING FRAME REAR HUB.**

Remove rear wheel complete. (Para. 64.) Remove spindle nuts, adjusting stirrups,

brake plate, speedometer driving box and distance pieces.

Remove ball-race locking ring from plain side of hubshell.

Remove distance piece and felt washer. Knock out the spindle and it will bring with it the single row bearing fitted to the plain side of the hub.

Drift out the remaining bearing together with the peened in washer, the felt and pen-steel washers fitted into the brake drum side of the hubshell. Separate brake drum and hubshell if necessary.

#### **67. RE-ASSEMBLING SPRING FRAME REAR HUB.**

Re-assemble in reverse order.

Pack bearings with grease before assembly. Ensure that long end of spindle protrudes through the brake side of the hub.

#### **68. REAR HUB, DISMANTLING. RIGID FRAME.**

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 pea-steel washer.

#### **69. REAR HUB, RE-ASSEMBLY. RIGID FRAME.**

Pack bearings with grease.

Fit single row bearing to screwed side of hub.

Fit inner sleeve, the long end into the single row bearing.

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

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

#### **70. FRONT HUB, DISMANTLING.**

With machine on both stands remove front wheel. (Para. 56.)

Remove brake plate together with its inner and outer distance piece.

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.

#### 71. 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

#### 72. 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 and 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 circlips retaining shoes to the pivot pins.

Remove the brake shoes.

Cam spindle bush can be removed from the plate after removing the nut holding bush to the plate.

#### 73. 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 screw-driver or similar tool and allow cam to pass the ends of the shoes.

Fit NEW circlips to pivot pins.

This is simplified if a length of rod is obtained with the same diameter as the pivot pin.

Fit circlip to the rod.

Place a piece of tubing over the rod. Place rod at the end of the pivot pin. Tap end of tube and circlip is forced on to the pin and into the groove.

## FRONT FORKS

#### 74. MAINTENANCE.

Replenish damping oil at approximately 5,000 mile intervals.

Remove hexagon headed filler plug from top of each fork leg. Remove drain plug from each fork end. Allow oil to drain out and operate the forks a time or two to eject the last drops.

Replace drain plugs.

Refill each leg with a measured  $\frac{1}{2}$  pint of Wakefield's Castrolite, Single Shell, Price's Motorine E, Mobiloil Arctic, or Energol S.A.E. 20. Work the forks a few times to remove any air-locks.

Replace filler plugs.

#### 75. 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 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.

## 76. REMOVAL OF FRONT FORKS FROM FRAME.

This may be carried out either with or without the front wheel and mudguard in position.

Remove switch panel from headlamp.

Detach steering damper arm from frame.

Detach speedometer driving and lighting cables from speedometer head.

Remove all cables from the handlebar levers, remove handlebars.

Slacken off steering damper completely, remove steering column locking nut complete with damper knob and rod.

Remove oil filler plugs and speedometer panel.

Remove head clip and head race adjusting nut.

Withdraw forks carefully to avoid losing any head race balls.

Take care to avoid spilling any damping oil from the fork legs. If any oil is lost it will be necessary to replenish as instructed. (Para. 74.)

## 77. FITTING OF FORKS TO THE FRAME.

Examine head races and balls (17 per race).

Races are pressed into their housings and may readily be knocked out for renewal.

Note that the races fitted in the frame embody a small hole to allow the entry of grease.

Liberally grease the track in the race fitted to the bottom of the steering column and the top frame race. Place 17 balls in position in each and carefully insert the column through the frame.

Place the top race and dust cover in position and screw the adjusting nut down the column till the hexagon is finger tight against the top race.

Refit the head clip and speedometer panel, the column locking nut loosely and the filler plugs which should be tightened up.

Adjust the head races. (Para. 75.)

Refit all remaining parts and check that all bolts and nuts have been tightened.

## 78. FORK LEG, DISMANTLING.

This may be carried out with the forks in position, but before commencing the work it is advisable to obtain from our Service Department a "pull through" to facilitate removal and replacement of the main tube.

Remove front wheel. (Para. 60.)

Remove front mudguard.

Remove oil filler and drain plugs from top and bottom of fork leg and allow oil to drain off.

Slacken the pinch bolt in the crown lug.

Fork end, complete with bottom cover, springs and main tube may be withdrawn.

If difficulty is encountered the "pull-through" already mentioned should be screwed into the top of the main tube which can then be tapped out with a mallet.

Remove from the main tube the top leather washer (this may have stuck to the inside of the upper cover), the short buffer spring and main spring.

Remove the bottom cover, held to the fork end by two screws.

Remove leather washer.

Remove locking ring from top of fork end.

Withdraw fork end from main tube.

The remaining components may now be removed from the main tube.

## 79. FORK LEG, ASSEMBLY.

Thoroughly clean all components and obtain any renewals necessary.

Attach the bottom bush to the main tube by means of the securing nut.

Place fork end in position on the main tube.

Fit shouldered bush into fork end followed by the super oil seal, being very careful that the leather has its radiused side uppermost.

Screw home the locking ring and tighten sufficiently to be secure without distorting the case of the super oil seal.

Fit the smaller of the two leather washers over the locking ring followed by the main spring, the buffer spring and the remaining leather washer.

Fit bottom cover and securing screws.

Screw "pull-through" into top end of main tube and pass through crown lug and head clip.

Draw into position by means of Tommy Bar inserted across the "pull-through," and temporarily tighten the pinch bolt in the crown lug.

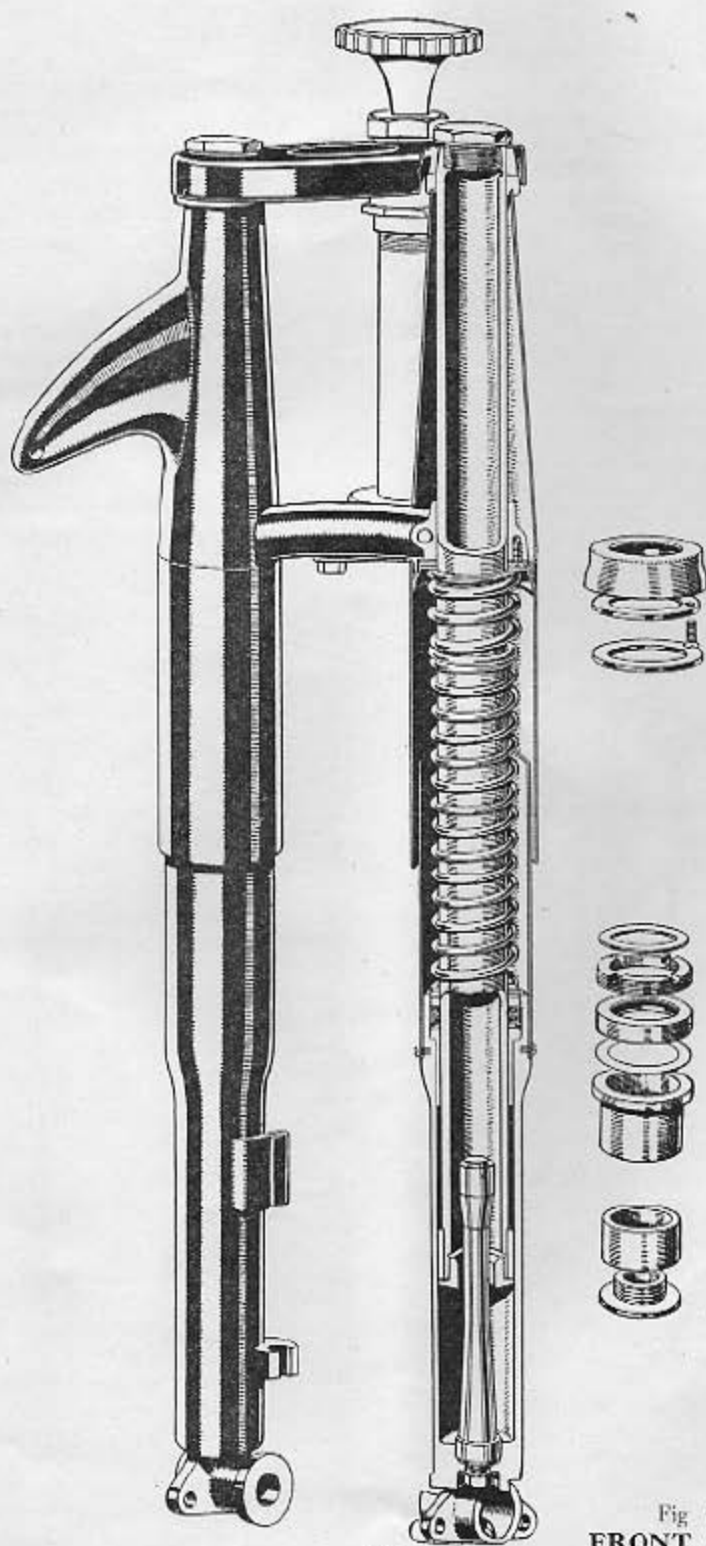
Remove "pull-through."

Fit filler plug to main tube and slacken pinch bolt. Lock main tube in position with filler plug. Re-tighten pinch bolt.

Fit drain plug to fork end.

Remove filler plug.

Replenish with oil. (Para. 74.)



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Fig 15.  
FRONT FORKS

## SPRING FRAME

### 80. DISMANTLING REAR SPRINGING.

Remove rear wheel. (Para. 64).

Slacken the pinch bolt across the top of the rear frame member.

Unscrew the locking bolt at bottom of stationary bearer rod a few turns and tap the bolt head with a hammer to release the bearer rod from its taper.

Remove bottom bolt.

Withdraw bearer rod upwards.

Insert a tyre lever or large screw driver between the frame member and the side of the top and bottom spring covers.

Lever sideways until sufficient of the central hole is exposed beyond the edge of the rear member to insert a  $\frac{1}{4}$ " or  $\frac{5}{16}$ " diameter rod fitted with suitable washers and wing nuts into the hole to prevent the assembly flying apart when completely removed from the frame.

### 81. RE-ASSEMBLY OF REAR SPRINGING.

Thoroughly clean all components and smear the bearing surfaces with oil or grease.

Fit the springs and covers to the fork ends and compress the assembly by means of the rod used during dismantling, until it is sufficiently compressed to enter the jaw of the rear member.

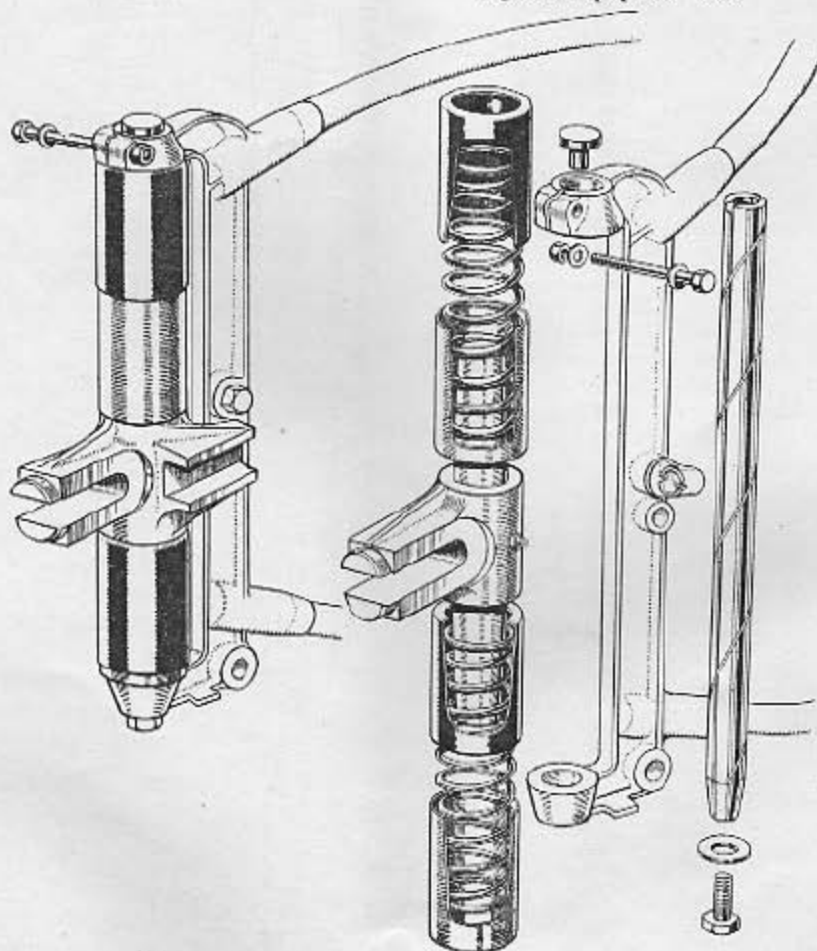
Place the assembly as far as possible into the jaw, remove the rod and tap the assembly into an approximately central position.

Smear the bearer rod with oil and insert taper end first into the upper end of the rear frame member.

Push or tap the bearer rod right home.

Fit and tighten bottom bolt.

Tighten top pinch bolt.





## HANDLEBAR FITTINGS

### 82. IGNITION AND AIR CONTROL LEVERS.

The ignition and air control levers are shown in Fig. 19 in the position in which they 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.

### 83. 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 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.

### 84. EXHAUST LIFTER LEVER.

The arrangement of the exhaust lifter lever is similar to the clutch and brake, only smaller.

To remove the cables from the lever, turn the operating arm on the exhaust lifter by other means than the cable and remove the inner cable from the arm. Remove the nipple on the other end of the cable from the lever and the nipple will pass through the large hole in the lever body.

When re-assembling, the cables must be fitted to the lever first.

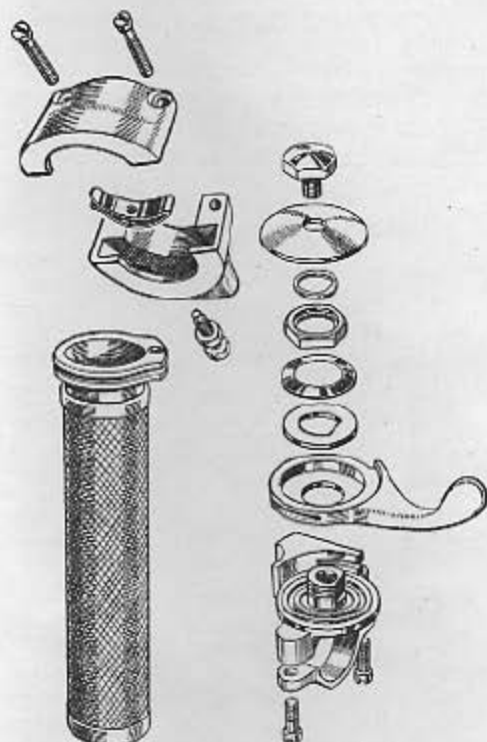


Fig. 18.

TWIST GRIP.

Fig. 19.

IGNITION AND AIR CONTROL.

### 85. TWIST GRIP.

The twist grip assembly is shown in Fig. 18.

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 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

## 86. DISMANTLING OF THE CARBURETTER.

Showing  
air valve and  
throttle closed.

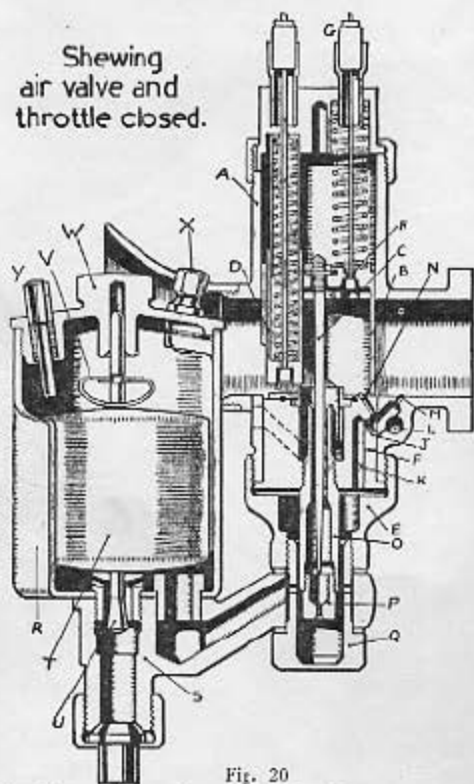


Fig. 20

- |                         |                       |
|-------------------------|-----------------------|
| A. Mixture Chamber.     | O. Needle Jet.        |
| B. Throttle Valve.      | P. Main Jet.          |
| C. Jet Needle and Clip. | Q. Float Chamber      |
| D. Air Valve.           | Holding Bolt.         |
| E. Mixing Chamber       | R. Float Chamber,     |
| Union Nut.              | S. Needle Seating.    |
| F. Jet Block.           | T. Float.             |
| G. Cable Adjusters.     | U. Float Needle.      |
| H. Jet Block Barrel.    | V. Float Spring Clip. |
| J. Pilot Jet.           | W. Float Chamber      |
| K. Passage to Pilot     | Cover.                |
| L. Pilot Air Passage.   | X. Float Chamber      |
| M. Pilot Outlet.        | Lock Screw.           |
| N. Pilot By-pass.       | Y. Tickler.           |

Remove the carburetter.

Remove the slides and needle. The slides and needle can be examined without removing the cables.

The throttle slide is the one that is drum-shaped and has the jet needle attached to it.

To remove the throttle slide from the cable, compress the spring, allowing the nipple on the end of the cable to leave the hole in which it is fitted, and on releasing

the spring allow the nipple to pass through the larger hole, and the slide is free from the cable.

To remove the air slide, compress spring as before and release nipple from the end of the slide, and the slide is free.

To remove the needle from the throttle slide, remove the spring clip at the top of the slide. The needle is normally fitted into the middle notch.

The lower the needle the weaker the mixture.

Remove the float chamber. It is held by a bolt at the base of the mixing chamber. There are two fibre washers on this bolt, one under the head and one between the float and mixing chambers.

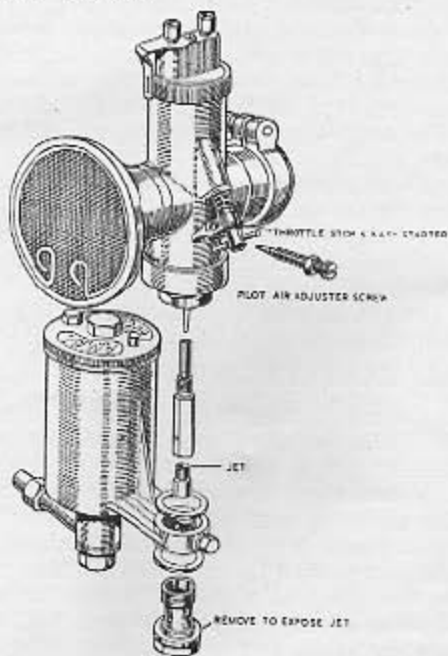
To remove the float and needle.

Release the float chamber cap locking screw and remove the cap.

Compress the spring clip on the top of the float and lift float from the chamber.

Remove the bolt at the base of the float chamber, and the needle will fall out.

On the bolt at the base of the float chamber two fibre washers are fitted in the same order as on the bolt at the base of the mixing chamber.



VIEW OF CARBURETTER.

Fig. 21

Remove the jet. The main jet is now exposed and can be removed from the needle jet.

Remove the needle jet from the jet block. Remove the jet block by removing the union nut at the base of the mixing chamber.

#### **87. RE-ASSEMBLY OF THE CARBURETTER.**

Fit needle jet to the jet block.  
Fit main jet to needle jet.  
Fit jet block to mixing chamber, located by groove and pin.

Fit mixing chamber union nut and fibre washer.

Fit float to the float chamber.  
Fit float needle through the base of the chamber and the centre of the float, compress the spring clip on the top of the float and allow the needle to enter the clip.

Release the clip and the clip will drop into the groove in the needle.

Fit the chamber top and lock with the locking bolt.

Fit the chamber to the mixing chamber. (Two fibre washers.)

Fit the bolt holding the union to the base of the float chamber. (Two fibre washers.)

Fit needle to throttle slide in middle position.

Thread cables through the mixing chamber, the throttle cable to be nearer to the cylinder barrel. The throttle cable has the shorter length of inner cable protruding from the outer cable.

Fit return springs to cables, the larger to the throttle.

Fit slides to cables.  
Fit air slide to throttle slide.

Fit slides to the mixing chamber, carefully entering the needle into the needle jet. **DO NOT FORCE.**

Fit mixing chamber top.  
Fit carburetter upright on induction stub.

#### **88. SLOW RUNNING ADJUSTMENT.**

Start engine and screw pilot air adjuster (Fig. 21) right home whilst carefully closing the throttle. The engine should now eight stroke and run heavily.

Gradually unscrew the pilot air screw; the engine speed will increase and the throttle will need further closing.

Repeat the process until by a combination of throttle and pilot air adjustment a regular even slow running is obtained.

#### **89. THROTTLE STOP AND STARTING SETTING.**

It is desirable to be able to close the twist grip completely without the engine stopping, for this purpose an adjustable throttle stop is provided (Fig. 21).

Slacken the small screw-driver headed locking pin and holding the shaped top piece against the mixing chamber body with the left thumb, rotate the adjuster until a slight increase in engine revolutions is heard.

Turn the adjuster back until the engine resumes its original speed and re-tighten the screw.

For easy starting rotate the adjustment as far as possible in a clockwise direction. This will raise the throttle slide to the best starting position. Return the adjuster to its normal position after starting.

#### **90. FLOAT CHAMBER.**

The function of the float chamber is to control the petrol in the carburetter at the correct level and anything which upsets its correct working will cause constant flooding, heavy engine running and high petrol consumption.

Dirt on the needle seating, a bent needle, a punctured float, a badly worn needle, or a carburetter not fitted upright will all give the above symptoms.

#### **91. MIXTURE ADJUSTMENT.**

The pilot air adjuster controls the mixture of air and petrol up to  $\frac{1}{4}$  throttle opening, from  $\frac{1}{4}$  to  $\frac{1}{2}$  throttle the mixture is controlled by the needle in the throttle valve. From  $\frac{1}{2}$  to full throttle the main jet is the control. Weak mixture is indicated by spitting and blue flames from the carburetter, pinking, running hot and plug points showing indications of intense heat.

To cure, raise needle in throttle valve one notch.

Rich mixture is indicated by thumpy running, black exhaust and the engine does not respond readily to throttle opening.

To remedy lower the needle.

#### **92. CARBURETTER MAINTENANCE.**

Clean regularly by dismantling and washing in clean petrol.

Clean all holes with a fine bristle.  
Renew any worn or damaged parts.

## LEGSHIELDS

### 93.

A standard set of these Legshield fittings comprises:—

- 2 Legshield Blades.
- 2 Legshield Blade Brackets.
- 2 Legshield Blade Brackets Back Plates.
- 4  $\frac{1}{2}$ " pins and nuts for above.
- 1 Horn Bracket extension plate with  $\frac{3}{8}$ " pin and nut.
- 1  $\frac{7}{16}$ " dia. rod  $24\frac{1}{2}$ " long with nuts.
- 1  $\frac{7}{16}$ " dia. rod  $23\frac{7}{16}$ " long with nuts.
- 1 Distance tube  $13\frac{1}{2}$ " long.
- 1 Distance tube  $6\frac{7}{8}$ " long.
- 1 Distance tube  $5\frac{7}{8}$ " long.
- 2 Distance tubes  $1\frac{7}{16}$ " long.
- 4 Distance tubes  $3\frac{3}{8}$ " long.
- 2 Legshield Attachment brackets for tank platform.
- 2 Thin tank rubbers.

### 94. FITTING INSTRUCTIONS.

Remove the front petrol tank bolts and slacken the rear bolts.

Remove the front tank platform top rubbers and replace with the thin rubbers supplied.

Over the rubbers place the attachment brackets so that the arm with the  $\frac{7}{16}$ " hole points downwards and is to the rear of the tank bolt. Place the plain steel washers from under the tank over the brackets and insert the front tank bolts through the middle of the three holes in the attachment brackets but do not tighten up.

Place the  $13\frac{1}{2}$ " distance tube between the legs of the attachment brackets, insert the longer of the  $\frac{7}{16}$ " dia. rods and in each end place a  $1\frac{7}{16}$ " distance tube.

Remove crankcase engine plate bolt carrying the horn and insert in its place the remaining  $\frac{7}{16}$ " rod. Attach the extension bracket to the horn and place in position on the left-hand end of the rod.

Fit the  $5\frac{1}{2}$ " distance tube next to the horn and the  $6\frac{7}{8}$ " tube on the opposite side.

Fit the legshield brackets loosely to the blades, place the  $3\frac{3}{8}$ " distance tubes between the bracket arms and fit the legshield to the rods with the deep valance on the inside, nearest the engine.

Fit the securing rod nuts. Tighten all nuts and bolts.

## TYRES

### 95. MAINTENANCE.

Keep tyres at correct pressures. See data sheet.

Examine regularly and remove any flints, etc., which may have become embedded in the tread.

Replace valve cap as soon as possible should one become lost.

### 96. REMOVAL.

Deflate tube by removing valve inner.

Remove valve nut and push the bead of the cover into the well of the rim at a point opposite the valve, and proceed to remove cover, commencing at the valve.

Remove one side completely.

Remove tube and other side of cover.

### 97. FITTING.

Lubricate with french chalk the cover beads, inner tube, and inside of rim.

Fit one side of cover, fit inner tube and inflate slightly.

Ensure that valve is protruding squarely through the rim.

Fit remaining side of cover, commencing opposite the valve and forcing the cover into the well of the rim.

Inflate to recommended pressure.



# ELECTRICAL SECTION

## 98. 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. 106.)

**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. 101.) Occasionally check contact breaker opening (using gauge on ignition spanner), (Para. 100.)

Replace high-tension cable if it becomes worn or perished.

**Head Lamp.** Focus head lamp after fitting new bulb. (Para. 111.)

## Ignition

### 99. LUBRICATION.

The cam is lubricated by a wick, contained in the contact breaker base, which must be given a few drops of thin machine oil about every 2,500 miles.

To get at the wick, remove the spring arm carrying the moving contact and withdraw the screw carrying the wick. (Fig. 21.)

When replacing the contact breaker components see that the small backing spring is fitted immediately under the securing screw and spring washer, and that the bent portion faces outwards.

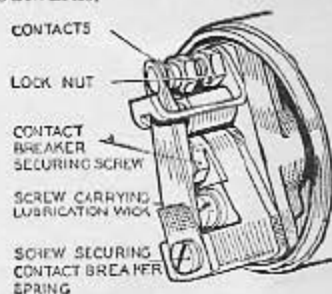


Fig. 22

### 100. CONTACT BREAKER—ADJUSTMENT.

After dismantling the contact breaker in order to lubricate, the contact setting should be checked.

Turn the engine until the contacts are fully opened and insert the gauge provided, .010 inch—.012 inch thickness, between the contacts.

The gauge should be a sliding fit.

If there is an appreciable variation from the gauge, slacken the lock nut and turn the contact screw by its hexagon head until the gap is set to the gauge.

Tighten the lock nut.

### 101. CONTACTBREAKER—CLEANING.

Remove the contact breaker cover and examine the contacts.

If they are dirty, they must be cleaned by polishing with a very fine carborundum stone or very fine emery cloth; afterwards wipe away any dirt or metal dust with a petrol-moistened cloth.

Cleaning of the contacts is made easier if the spring arm carrying the moving contact is removed as described in paragraph 99.

Examine the spring arm of the contact breaker and wipe away any rust.

Adjust as described in paragraph 100.

### 102. H.T. CABLE.

Should be 7 m/m. in diameter, rubber covered ignition cable.

The cable must be replaced if the rubber insulation has perished or shows cracks and becomes brittle.

To fit the new cable to the pick-up terminal, thread the knurled moulded nut over the lead, bare the cable for about  $\frac{1}{4}$ " , thread the wire through the metal washer

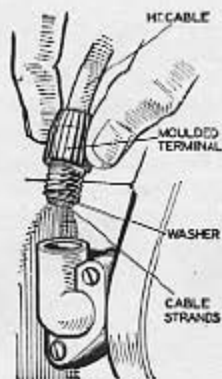


Fig. 23

removed from the old cable and bend back the strands.

## Lighting and Accessories

### 105. 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.

### 106. 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.

### 107. CUT-OUT AND REGULATOR UNIT.

This unit (Fig. 24) which is housed inside the tool box, consists of the cut-out which is an automatic switch to prevent discharge of

Finally, screw the nut into its terminal.

### 103. PICK-UP.

Examine the pick-up or high tension terminal (magneto end).

See that the carbon brush moves freely in its holder, being careful not to stretch the brush spring unduly.

While the pick-up is removed, clean the slip ring track and flanges by holding a soft cloth on the ring while the engine is slowly turned by hand.

### 104. SPARKING PLUG.

Clean periodically by dismantling and removing all carbon from the electrodes.

Scrape inside of plug body clean of carbon, re-assemble and set gap at .015" — .018".

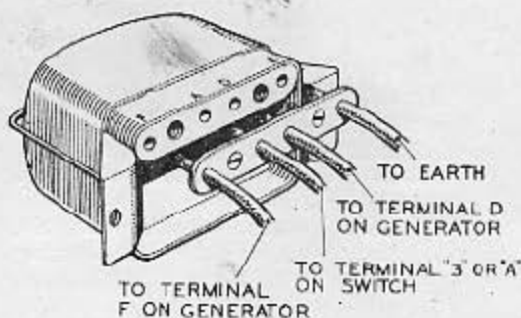


Fig. 24

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.

### 108. AMMETER.

Fitted in the switch panel of the head lamp, this instrument indicates when 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.

### 109. 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 reading 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 temperature 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.

#### 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.

#### 110. HEADLAMP.

To remove the headlamp front, slacken the securing screw at the top of the lamp. It will then be possible to detach the front rim complete with Light Unit assembly.

To replace, locate the metal tongue in the slot at the bottom of the lamp, press on the front and secure in position by tightening the screw.

#### Setting and focussing.

Stand the motorcycle in front of a light-coloured wall at a distance of about 25 ft. With the main driving light switched on, the height of the beam centre from the ground should be the same as the height of the centre of the headlamp from the ground. If necessary slacken the bolts securing the headlamp and move the lamp until the beam is projected straight ahead and parallel with the ground. The headlamp must be focussed so that the main driving light gives a uniform beam without any dark centre. If the bulb needs adjusting, remove the lamp front and reflector, as described above, and slacken the bulb holder clamping clip at the back of the reflector. Move the bulb holder backwards and forwards until the correct position is obtained, and then tighten the clamping clip.

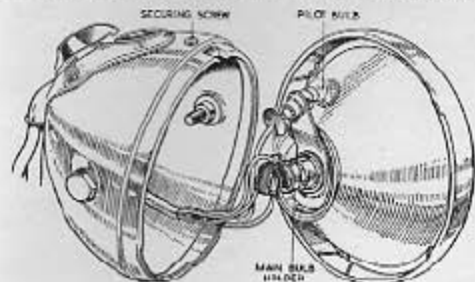


Fig. 25

#### Replacement of Bulbs.

To gain access to the bulbs, remove the front rim and light unit assembly as already described and detach the bulb holder which is held in position by two spring loaded pegs. When replacement of a bulb is necessary, it is important not only that the same size bulb is fitted, but also that it has a high efficiency and will focus in the reflector. Cheap and inferior bulbs may have a filament of such a shape that it is impossible

to focus correctly. Only Lucas genuine spare bulbs should be used and care should be taken when fitting the main bulb to insert it the correct way, i.e., with the dipped beam filament above the centre filament. To assist in this operation bulbs are marked TOP on the metal cap. Correct replacement bulbs are:—

Headlamp (main): Lucas No. 169.

6 volt, 30/30 watt.

Headlamp (pilot): Lucas No. 988.

6 volt, 3 watt.

#### 111. TAIL LAMP.

The tail lamp is fitted with a 6 volt 3 watt single contact bulb (Lucas No. 200). The portion of the lamp carrying the red glass can be removed by pushing in and turning to the left. When refitting, engage the bayonet fixing, push in and turn to the right to secure the body in position.

#### 112. CABLES.

Before making any alterations to the wiring or removing the switch from the headlamp, disconnect the positive lead at the battery to avoid the danger of short circuits.

The lead, about 1 foot long, from the positive battery terminal, is connected to the lead from the switch by means of a brass connector.

The connector is insulated by a rubber sleeve, which must be pushed back to allow the connector to be unscrewed.

Do not allow the brass connector to touch any metal part of the engine as this will short circuit the battery.

When connecting up again, pull the rubber sleeve over the connector.

#### 113. LIGHTING SWITCH.

All leads to the headlamp are taken direct to the switch, which, together with the ammeter, is incorporated in a small panel.

The panel can be removed when the three fixing screws are withdrawn.

The ends of all the cables are identified by means of coloured sleeveings.

#### 114. 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 becomes 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.



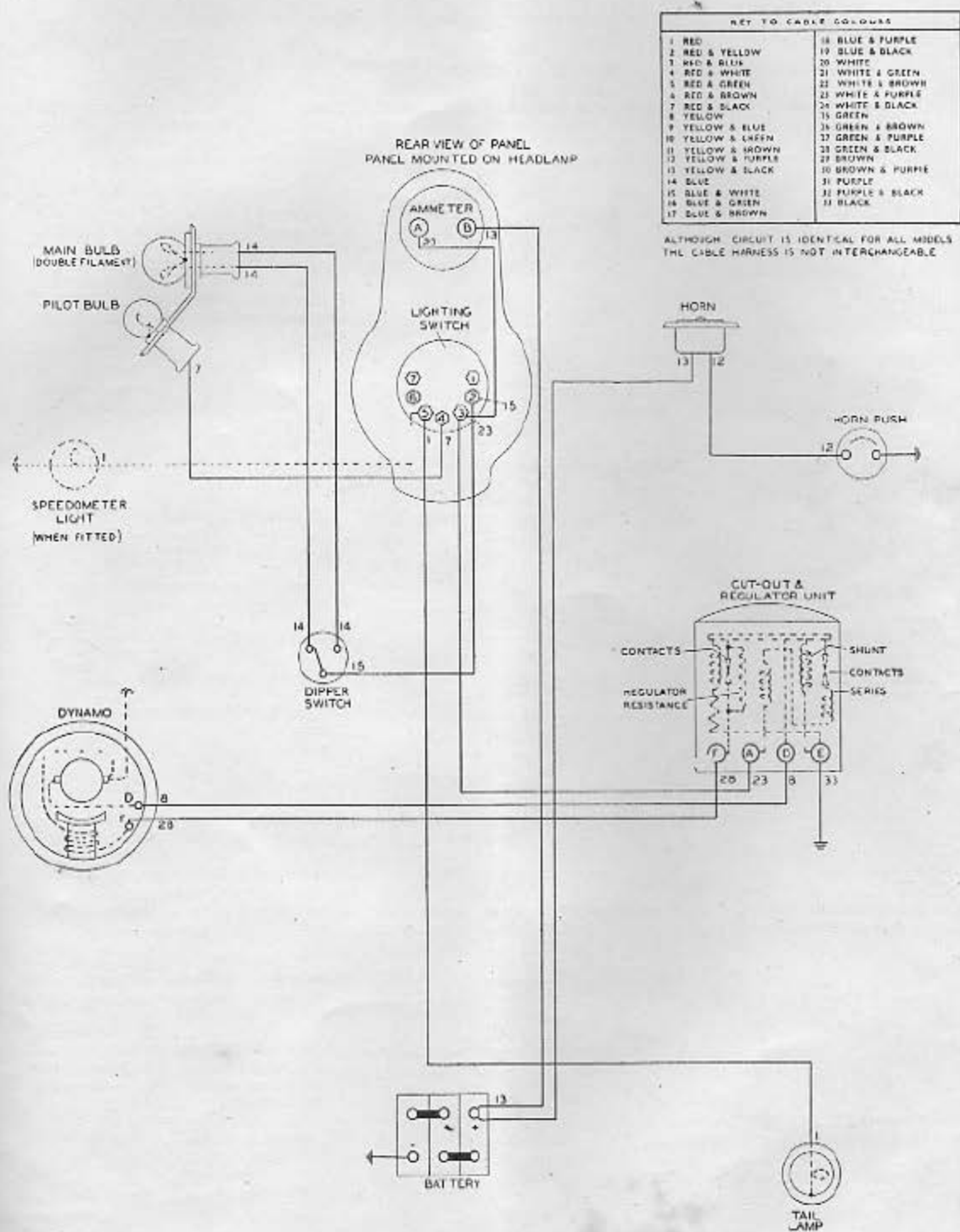


Fig. 26.  
**WIRING DIAGRAM FOR LUCAS MAGDYNO LIGHTING AND HORN EQUIPMENT.**

## LOCATING AND RECTIFYING POSSIBLE TROUBLES

TROUBLE.	POSSIBLE CAUSES.	REMEDY.
<b>Failure to Start.</b>	Faulty plug. Faulty H.T. lead. Contact breaker points dirty or out of adjustment.	Remove plug, place plug body in contact with cylinder, revolve engine. If blue spark of fair intensity occurs, plug and ignition OK.
	Pick-up brush worn or broken. Slip ring oily.	If no spark, change plug, and if still no spark, remove plug from H.T. lead, hold end of lead 1/8" from cylinder and revolve engine. In the event of there being still no spark, examine contact breaker points and check their gap. Examine pick-up brush and clean slip ring.
	Failure of petrol to reach mixing chamber.	Ensure that petrol is flowing down feed pipes. Clean carburetter.
<b>Erratic Slow Running.</b>	Broken throttle wire.	Ensure that throttle slide rises as twist grip is revolved.
	Pilot adjustment requires re-setting.	With throttle about 1/8" open and air closed, adjust pilot screw until good idling is obtained.
	Worn inlet valve guide.	Remove valve spring and test valve for side play in guide.
<b>Loss of Power.</b>	Faulty valve seats.	Examine and re-grind as necessary.
	No tappet clearance.	Check and re-set as required.
	Exhaust valve lifter holding valve off seat.	Ensure that there is some movement in cable before lever begins to lift valve.
	Front chain too tight.	Adjust.
	Loose carbon wedged on valve seat.	Can usually be removed by kicking engine over a few times.
<b>Excessive Oil Consumption.</b>	Broken piston rings.	Examine and replace as required.
	If accompanied by black smoke from exhaust, broken piston rings, worn rings or barrel.	Examine and make necessary replacements.
	Oil pump not returning.	With engine running an intermittent stream of oil should be seen upon opening oil tank filler cap.
	If unaccompanied by exhaust smoke, faulty oil pump timing cover connection.	Ensure that the necessary pressure is generated between timing cover and oil pump nipple fibre washers as instructed in para. 26.
<b>Engine Runs Harshly.</b>	Mag. chain too tight.	Adjust as in para. 32.
<b>Engine Cuts Out at Large Throttle Openings.</b>	Dirt in carburetter.	Clean and re-adjust.

## LOCATING AND RECTIFYING POSSIBLE TROUBLES

TROUBLE.	POSSIBLE CAUSES.	REMEDY.
<b>Inefficient Brakes.</b> (Front or Rear)	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.
<b>Slipping Clutch</b>	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 overfilling oil bath).	Dismantle clutch plates and wash in petrol.
	Tightness in operating mechanism.	Examine, clean and free off as necessary.
<b>Clutch Hard to Free.</b>	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.
<b>Failure to Effect Gear-Changing</b>	Gearbox control rod out of adjustment. Over revving especially from 1st to 2nd.	Re-set as instructed in para. 53.
<b>Gear-changing Accompanied by Excessive Noise.</b>	Slack rear chain.	Adjust as necessary.
<b>Footchange Lever hard to Operate.</b>	Footchange requires greasing.	Nipple on indicator retaining screw.
<b>Failure of Footchange Lever to Return to Normal Position.</b>	Broken hairpin return spring.	Remove positive mechanism cover and front plate. Examine spring, renew as required.
<b>Steering Rolls or Wanders.</b>	Loose head adjustment.	
<b>Steering Poor on Corners with tendency for Machine to Lie over too much.</b>	Loose fork adjustment.	
<b>Whistling Noise from Front Wheel.</b>	Speedo drive gear box requires greasing.	Use grease gun nipple on speedo gearbox.
<b>Twist Grip Closes if Released.</b>	Tension requires adjusting.	Screw in adjuster one or two turns.
<b>Steering appears Tight on Corners.</b>	Steering damper binding, caused by bent frame anchor bracket.	Remove anchor bracket and re-set to correct angle.

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