# INSTRUCTION BOOK

for the 346 c.c. O.H.V.

# Royal Enfield

'Made like a Gun'

"350 CLIPPER" and
"G DE LUXE"
MOTOR CYCLES

Price 2/-

## CONTENTS





# ROYAL ENFIELD
# "350 CLIPPER" AND "G DE LUXE"

## OPERATION OF THE MOTOR CYCLE

1. **Controls.** The driver should familiarise himself with the positions and method of operation of the various controls so that their use becomes instinctive. The controls are shown diagrammatically on page 4 and in most cases the method of operation is obvious. The following notes may, however, be of assistance :—

**Exhaust Lifter.** Operate by lifting lever on left handlebar to stop engine. Can also be used when descending a very steep hill having a difficult surface. If engine is hard to "kick over" when starting, the exhaust lifter can be raised momentarily to release compression.

**Gear Control.** Move up for change to lower gear. Move down for change to higher gear.

**Kick Starter.** Operate with long swinging kick.

**Neutral Finder.** To find neutral from 2nd, 3rd or Top Gear, press neutral finder lever down as far as it will go, with the clutch lifted and the machine still rolling.

**Lighting Switch.** Position L gives headlamp pilot bulb and tail light. Position H gives headlamp main bulb and tail light.

**Petrol Filler.** To open, turn anti-clockwise till catch is felt, push down and turn again anti-clockwise as far as possible, then lift off.

To close, push down and turn clockwise as far as possible.

**Petrol Tap.** Push the hexagon shaped end to open and the round end to close the tap. A reserve petrol supply is held by moving the small lever above the tap anti-clockwise. The reserve is released by moving the lever clockwise.

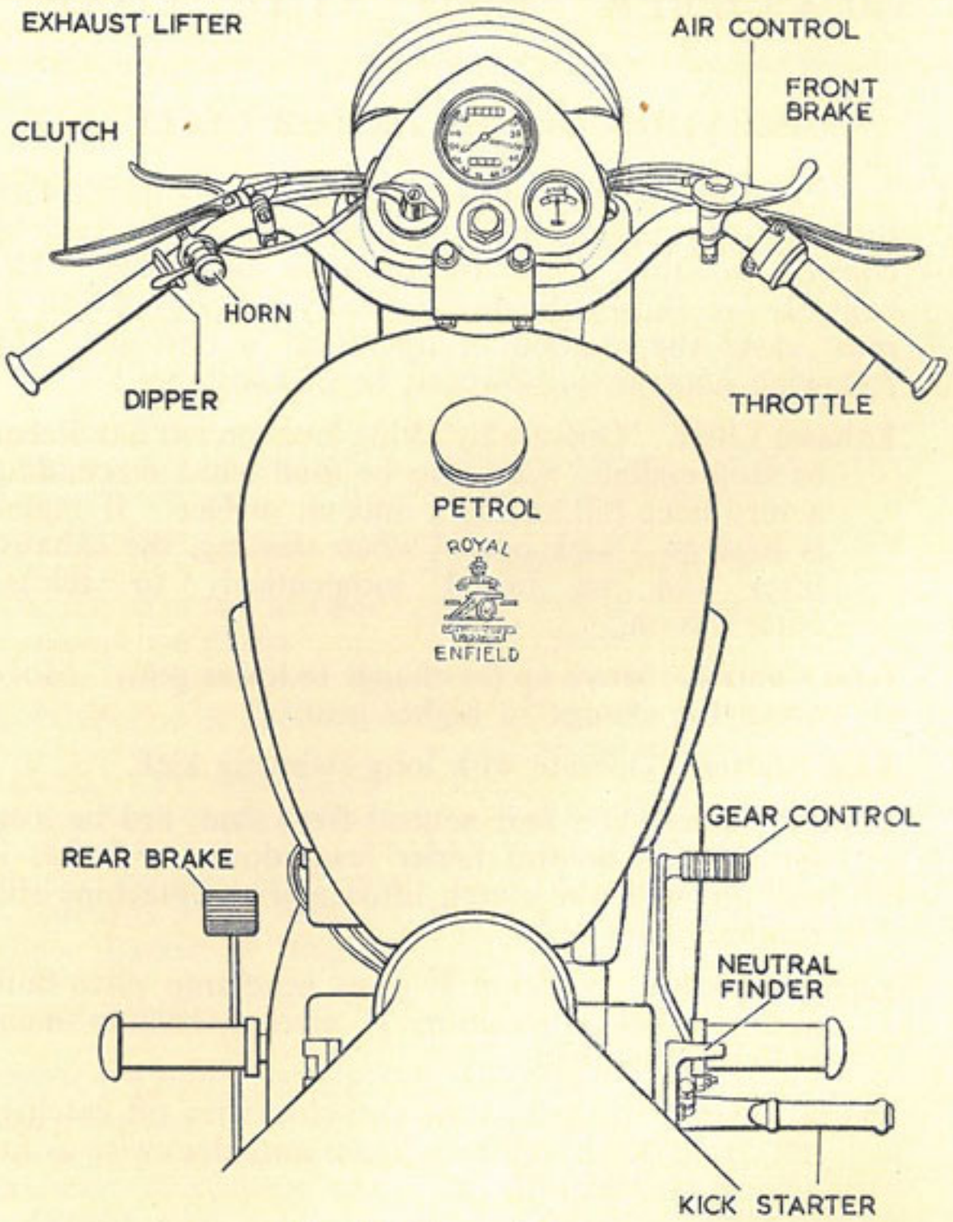


**Fig. 1.**—Control Diagram.

**The following controls are not shown in the diagram :—**

**Carburettor Tickler.** On top of float chamber. For flooding carburettor before starting from cold.

**Oil Filler.** On engine crankcase. Operates same way as petrol filler.





2. **Starting the Engine.** Fill the tank with petrol and the oil tank in the engine crankcase with oil. Always use one of the oils recommended in paragraph 7. Turn on the petrol and depress the tickler of the carburettor once or twice until petrol can be felt in the float chamber, **but do not flood the carburettor.** Place the gear control in the neutral position, close the air lever, slightly retard the ignition, open the throttle control about one-eighth, and smartly depress the kick starter. If the engine fails to fire first or second time, repeat with a slightly different throttle opening. The best position for starting will soon be found from experience. When starting a warm engine, do not flood the carburettor or the mixture will become too rich.

3. **To Start the Machine.** Pull up the clutch lever. Engage the lowest gear by pressing the foot control up as far as possible and then releasing it. Slowly release the clutch lever, at the same time accelerating the engine by opening the throttle slightly and the machine will move away without jar or jerk. When the machine has attained sufficient speed (about 10 m.p.h.) de-clutch, at the same time closing the throttle and changing to second gear by pressing the foot control downwards as far as it will go and then releasing it. Let in the clutch gradually and open the throttle again until the speed of the machine is sufficient to require a change into third gear (about 20 m.p.h.), when the foregoing operations are repeated. Finally, change up to top gear when sufficient speed has been attained in third (about 30 m.p.h.).

**Note.** The above speeds are intended only as a rough guide for making a normal get-away on a level road. When starting up a steep hill rather higher speeds should be used in the intermediate gears.

Once top gear is engaged and the machine is running at a comfortable speed, the air lever should be fully opened and the ignition fully advanced.

4. **Driving Hints.** For normal running on the level the air lever can be left fully open and the ignition fully advanced, the speed being controlled by the throttle,

but when accelerating or climbing a hill it may be necessary to retard the ignition slightly and, while the engine is cold, partly close the air lever in order to prevent "pinking" or knocking.

Never allow the engine to labour on a hill. If the machine will not climb comfortably on top gear, change down by de-clutching and moving the gear lever upwards as far as possible and then releasing it, leaving the throttle control open during the change. When in the lower gear the ignition may be advanced and the air lever opened to suit the higher engine speed. If a hill is long and steep enough to demand a change to a lower gear, it is always desirable to make this change before the engine has commenced to labour. One change low down may save two higher up and at the same time enable a faster climb to be made.

To stop the machine, close the throttle and apply the brakes. Before coming to rest find neutral by lifting the clutch and moving the neutralizing lever (with the right foot) downwards as far as it will go. All machines are set at the Works so that the engine "ticks over" when the throttle lever is shut. To stop the engine, therefore, it is necessary to raise the exhaust lifter. Alternatively the throttle stop can be set so as to allow the throttle to close completely.

An indicator is fitted to the foot-operated gear control showing which gear is engaged. To obtain neutral from bottom gear, first engage second by moving the gear control downwards, then press downwards on the neutralizing lever.

Note that the positions of the handlebars, footrests and all controls (including the gear lever and the brake pedal) are adjustable. A rider cannot have proper control of his motor cycle unless he is comfortable and the controls are conveniently situated. Riders should set the controls to suit their individual requirements.

5. **Running-in.** All Royal Enfield Motor Cycles have a special oval formed piston which minimises the risk of seizure with a new engine. Nevertheless careful running-in is highly desirable if the best results are to be obtained.





It is recommended, therefore, that a new machine should not be driven at a speed exceeding 30 m.p.h. for the first 200 miles, and, until at least 500 miles have been covered, the throttle should not be opened above half way, except for very short periods. After this distance short bursts of speed are desirable in order to hasten the bedding down of the thrust faces of the piston. Gradually increase the duration of these speed bursts until the machine will stand large throttle openings for indefinite periods. Note the importance of **progressively** increasing the work done by the engine. Running 1,000 miles at 30 m.p.h. will **not** bed down the piston to enable it to withstand continuous high speed running. Piston temperature is the important factor and this depends not only on speed and throttle opening, but also on how long that particular throttle opening has been sustained. Thus a machine after the preliminary 200 miles might stand full throttle for half a mile and yet pull up if driven at three-quarter throttle for five miles or so.

If the engine is run too long on a large throttle opening and shows the slightest tendency to pull up or seize, **lift the clutch and close the throttle.** Even if a seizure then occurs it will do little or no damage and after cooling for a minute or two the piston will free itself. If a seizure does occur, the piston should be examined by a competent mechanic to have any high spots eased down.

## LUBRICATION

6. **Lubrication of the Engine.** The lubrication is of the dry sump type and provides a positive supply of oil to the big-end, valve gear, timing gear and the rear cylinder wall.

Fig. 2 shows the paths round which the oil circulates. Oil is drawn from the reservoir A by the feed pump B through the filter C. The pump B is double-acting, the primary side being used to deliver oil through the felt filter E to the feed plug D. From the feed plug D the oil is delivered down the timing side shaft to the big-end from which it is splashed to the cylinder, piston and main bearings. The secondary side of the feed pump B

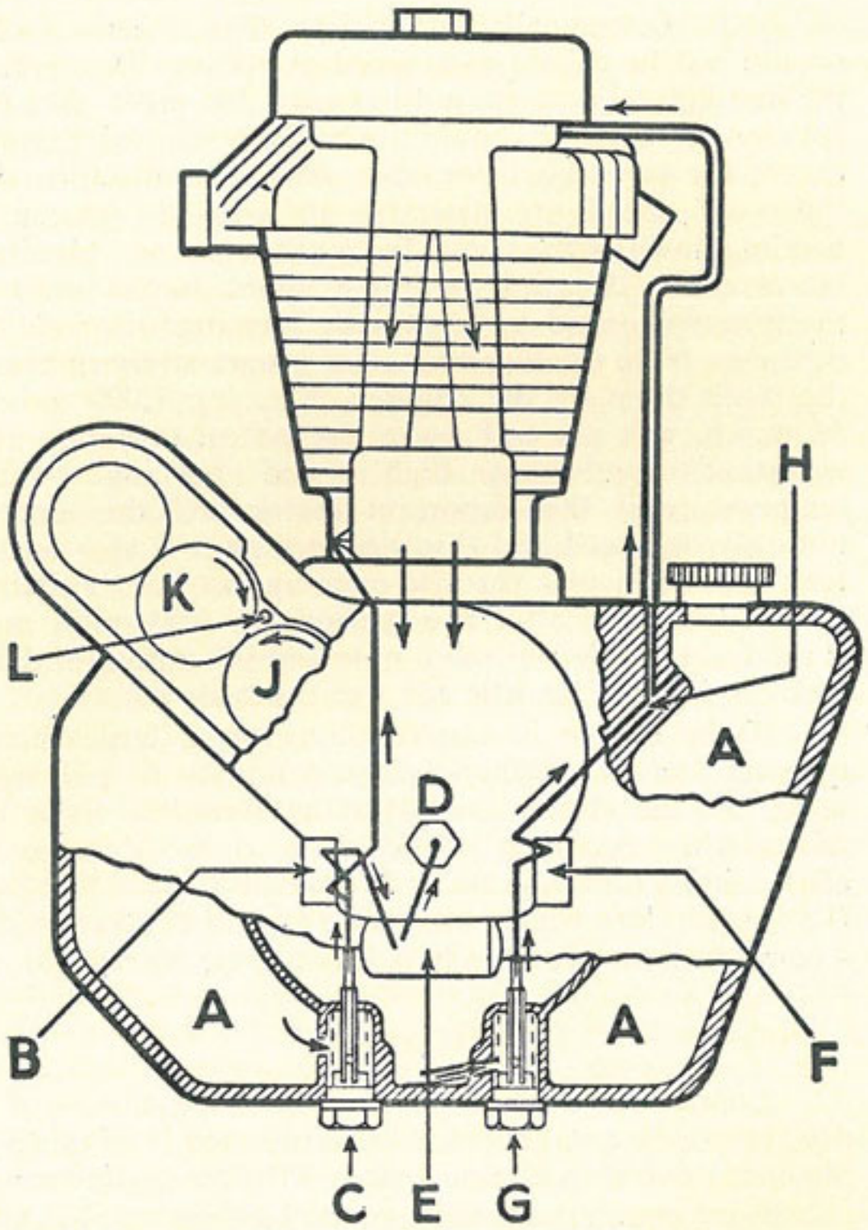


Fig. 2.

delivers a further supply to the back of the cylinder wall. Surplus oil collects in two wells at the bottom of the crankcase from which it is drawn by the return pump F through the filter G and delivered to the reservoir A. A ball valve at the point H at the outlet end of the delivery





passage (see Fig. 3) creates a pressure which forces part of the return oil up an external pipe to the overhead rocker box. From here, the oil drains down the push rod enclosure tubes and through grooves in the tappet guides to the timing case from which it is picked up by the gear wheels J and K and returned through the passage L to the reservoir A.

Fig. 4 shows the action of the double-acting feed pump. A plunger A is driven by a pin B (on the end of the cross shaft) and works in a cylinder formed in the disc C which can oscillate in its housing. The lower face of the disc has a port T communicating with the cylinder in which the plunger A works. The disc C is lapped on to its seating and is held down by a spring beneath the pump cover. The face at the bottom of the housing contains four ports W, X, Y and Z. Of these Y and Z communicate with the feed pipe from the oil reservoir, X communicates with the felt filter and oil feed plug and W with the passage leading to the cylinder wall.

As shown, the plunger A is being drawn out of its cylinder, the port T registers with Y and oil is drawn in from the reservoir. At the same time the clearance space in housing D is being decreased as the plunger is drawn out of C and in consequence oil is delivered through port W to the cylinder wall.

As the plunger reaches the outer end of its stroke, the disc C turns and, on the inward stroke, port W is covered by the disc, Z is open and T registers with X. Consequently oil is delivered through X to the big-end and is drawn in through Z from the oil reservoir.

The construction of the return pump is similar, but the arrangement of the ports is slightly different. As shown in Fig. 5 there are two ports, Y′ and Z′, in the face at the bottom of the housing. Y′ communicates with the suction passage from the wells at the bottom of the crankcase ; Z′ with the delivery passage to the oil reservoir. The lower face of the disc has three ports T′, U′ and V′, of which U′ communicates with the cylinder in which the plunger A′ works ; T′ and V′ are drilled right through to the upper face. In the

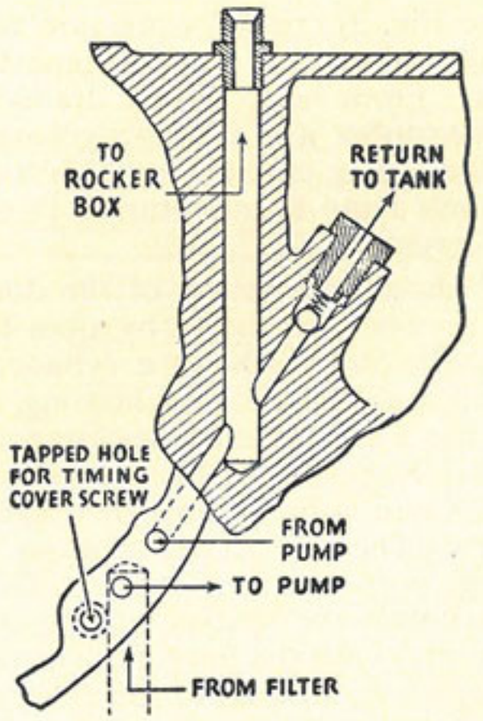


Fig. 3.

position shown, U′ registers with Y′, and V′ with Z′. Oil is being drawn in through U′ and Y′ and simultaneously is delivered through V′ and Z′. On the opposite stroke, T′ registers with Y′ ; U′ with Z′. Oil is then drawn in through T′ and Y′ and delivered through U′ and Z′.

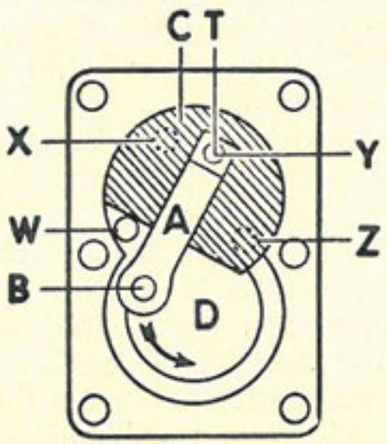


Fig. 4.—Feed.

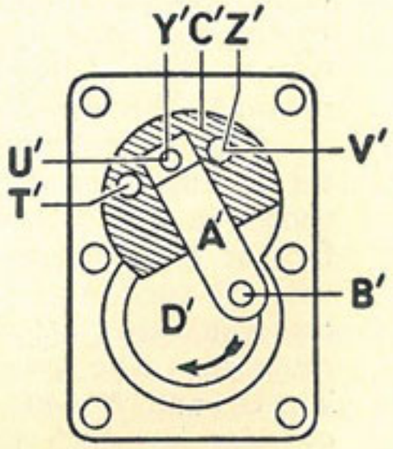


Fig. 5.—Return.





## 7. LUBRICATION ROUTINE FOR THE ENGINE.

**Never allow the oil tank to become empty. Since there is no reserve of oil in the sump, an empty tank means immediate shortage of oil to the working parts. The oil level should be kept well above the bottom of the dipstick attached to the filler cap.** By keeping a large quantity of oil in circulation, its temperature is kept low, and the oil retains its lubricating qualities for long periods. Do not, however, fill the tank within 2 inches of the top, or oil may escape past the filler cap.

We recommend the following oils for use in our engines :

| Requirements | Castrol | Mobiloil | Esso Extra Motor Oil | B.P. Energol | Shell X-100 Motor Oil |
|---|---|---|---|---|---|
| Engine (summer) | Grand Prix | D | 40/50 | S.A.E. 50 | 50 |
| Engine (winter) | XXL | BB | 40/50 | S.A.E. 40 | 40 |
| Gearbox ... ... | Grand Prix | D | 40/50 | S.A.E. 50 | 50 |
| Chains—front | Castrolite | Arctic | 20W/30 | S.A.E. 20 | 20 |
| rear ... | Grand Prix | D | 40/50 | S.A.E. 50 | 50 |
| Grease Gun | Castrolease (Heavy) | Mobilgrease (No. 4) | Esso Grease | Energrease C. 3 | Retinax A |
| Front Forks ... | Castrolite | Arctic | 20W/30 | S.A.E. 20 | 20 |

If difficulty is experienced in obtaining the grades recommended for hot climates or summer use, the alternatives for winter use or cold climates can be used. These flow freely when cold and at the same time have adequate heat-resisting properties. The importance of efficient lubrication cannot be over-estimated. The use of cheap oils is false economy and we strongly recommend the oils mentioned above, as we have found from experience that these are the most suitable for our engines. It is advisable to specify the brand as well as the grade and, as an additional precaution, oil should be bought from branded cabinets or sealed cans.

**Multi-grade Oils.** Some of the manufacturers of the lubricants in the table above offer special engine lubricants, the viscosity of which is less sensitive than usual to temperature changes. These are classed as S.A.E. 10W/30 or 10W/40 oils. Their use will facilitate starting at low temperatures but may result in an increase in the rate of oil consumption. In general these oils are of too low a viscosity for use in these single cylinder engines except for machines used exclusively for short journeys in cold weather. These oils are all of a highly detergent nature and the precautions given in paragraph 9 should be followed if a change to them is made after a long period of use on a non-detergent oil.

Castrolite and Esso Extra Motor Oil 20W/30 are of a mild multi-grade character (S.A.E. 20W/30) and have only mild detergent properties. While these oils are also too low in viscosity for general use in these engines, they can be used in winter for short journeys if difficulty is experienced with starting owing to the gumminess of the normal oils recommended for winter use. No special precautions are necessary when changing to these oils.

**During the running-in period we recommend the addition of Acheson's Colloidal Graphite to the oil in the engine.**

After the first 500 miles and subsequently about every 2,000 miles, the oil should be drained from the tank, timing-case and felt oil filter (see next paragraph). To drain the tank and sump, remove the two filter plugs C and G. (See Fig. 2.—Note that the rear plug drains the tank, the front one the sump.) The filter gauzes should be brushed with paraffin to clean them and the tank and sump swilled through with clean oil. This procedure is conveniently carried out when the engine is being decarbonised. The oil will flow more readily if the plugs are removed at the conclusion of a ride, alternatively the tank and sump may be allowed to drain overnight. Waste of oil is reduced by allowing the oil level in the tank to become reasonably low before draining.





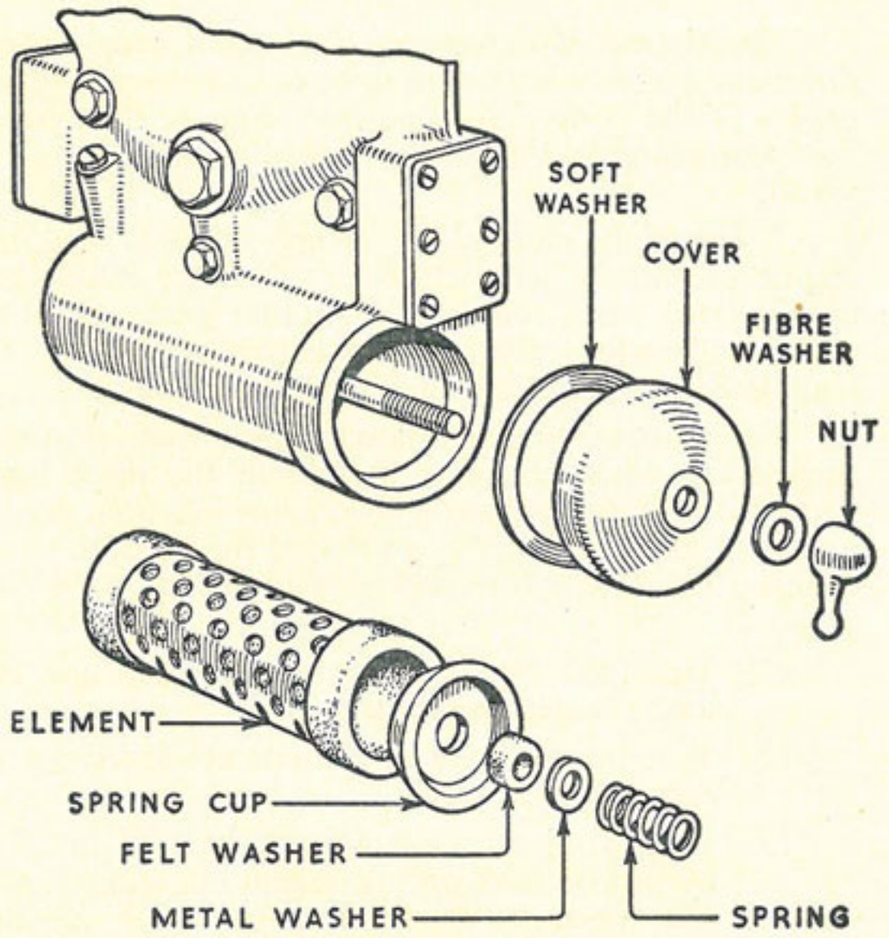


**Fig. 6.**—Detail of Felt Oil Cleaner.

To drain the oil from the timing case remove the feed plug D (see Fig. 2) and lean the machine over on its right-hand side. After draining the timing case the oil fed into it will not be returned to the tank A until the normal level in the timing case has been restored. This will cause an apparent loss of about half a pint of oil.

8. **Felt Oil Filter.** The construction of this is clearly shown in Fig. 6. The felt filter element should be cleaned by washing in petrol every 2,000 miles and in addition the element should be renewed every 5,000 miles.

9. **Detergent Oils.** Many of the oils which we recommend contain detergent additives designed to counteract ring sticking and sludge formation.

The degree of detergency varies not only between one make and another but in some cases between different grades of the same make and may even be different for the same grade and make of oil in different parts of the world.

If one of the more highly detergent oils is used in an engine containing large deposits of sludge which have accumulated when running on another grade of oil this sludge will be loosened and may cause seizure and other trouble due to blockage of filters and oilways.

For this reason the following procedure should be carried out when changing to one of the more highly detergent oils, particularly if the engine has been used on a normal grade of oil or has not had the oil drained and changed at regular intervals as recommended in paragraph 7.

(1) Drain the engine when the oil is hot and refill with the detergent oil.

(2) Run the machine at a moderate speed for not more than 50 miles.

(3) Drain the engine again when the oil is hot, flush out the oil tank with detergent oil, remove, clean and replace filters (preferably fit new felt filter element). Refill with detergent oil.

(4) When machine has run a further 100 miles check condition of filters. If clogged, repeat operation (3).

**Note.** Although the detergent additive in the oil keeps the engine clean and prevents sludge formation, it naturally becomes used up in the process. If an engine has a very low oil consumption so that "topping up" is seldom (if ever) necessary, the additive may all become used up, in which case sludge formation will occur at the normal rate. It is therefore just as important to drain the engine at regular intervals with a detergent oil as with one having no detergent additive.

Your dealer will advise you which makes and grades of oil in your country have sufficient detergency to





necessitate the above enumerated precautions being taken.

**10.** **Lubrication of the Gear Box.** The gear box should be filled to the level of the filling orifice with engine oil. On no account should heavy yellow grease be used in the gear box. The oil level should be checked every 500 to 1,000 miles.

**11.** **Lubrication of Chains.** The front chain case should be filled with oil up to the level of the overflow plug. The chain will thus be kept clean and well lubricated, giving a silent and efficient drive.

The rear chain should be lubricated at frequent intervals with engine oil or grease, and should be removed about every 2,000 miles, and after washing in paraffin should be soaked in melted tallow.

**12.** **Grease Gun Lubrication.** The rear brake pedal, gear control and speedometer drive should be greased with a grease gun every 200 miles. The clutch push rod should be removed, cleaned, and well lubricated before re-assembly.

Grease the hubs only very sparingly ; there must be no possibility of grease finding its way into the brakes, but should this inadvertently happen, remove the brake shoes, scrape the linings thoroughly, wash in petrol, clean the brake drums, and re-assemble.

**13.** **Lubrication of the Front Fork.** The telescopic front fork is automatically lubricated by the hydraulic medium which it contains.

## TROUBLE ON THE ROAD

**14.** **Royal Enfield Motor Cycles** enjoy a wonderful reputation for reliability. Trouble on the road is very unusual : nevertheless stoppages may sometimes occur and it is hoped that the following hints may help towards the speedy location of the trouble.

**15.** **Engine Stops owing to lack of Petrol.** This is the commonest form of engine stoppage. The first symptoms

are irregular firing, which is temporarily cured by closing the air lever. Make sure that there is plenty of petrol in the tank. If so, disconnect the petrol pipe at the carburettor end and turn on the tap. If a good flow of petrol occurs, the stoppage is probably in the jet itself. If the flow from the petrol pipe is restricted, the stoppage lies either in the petrol tap or the pipe itself.

16. **Engine Misfires or Stops owing to faulty Ignition.** The symptoms in this case are that the engine will not run regularly and is very hard to start. In other cases the engine may suddenly "cut out" without any warning. First see that the high tension lead has not become disconnected at either end and is not worn or burnt through, allowing the bare wire to touch some metal part of the machine. See also that the plug insulator and high tension lead are not wet.

If all the above is in order remove the sparking plug and hold it with the body touching the engine cylinder, but with the terminal clear of the machine and connected to the high tension lead. Turn the engine round by the kick starter. If a good spark is obtained at the plug points, the ignition is in order and the trouble lies elsewhere. If no spark, or a very weak spark, is obtained, remove the plug and hold the end of the high tension wire about $\frac{1}{8}$in. from a metal part of the machine and rotate the engine. If a spark is obtained from the wire, the fault lies with the sparking plug. If this is oily or sooty it can be taken apart and cleaned, but if the points are red and burnt the plug has been too hot and a new one should be fitted, preferably of the type recommended in paragraph 32. The gap between the plug points should be ·018in. to ·025in.

If the plug is satisfactory, the trouble lies in the magneto. See that the contact breaker points are clean and that they open and close properly. These should open to ·012in. If necessary, remove the contact breaker by unscrewing the centre screw and clean out the housing behind it. This should be free from oil or damp. Also





remove the carbon brush holder and clean the slip ring with rag pushed down with a piece of wood.

17. **Other Causes of Engine Stoppage.** Other possible causes of an engine stoppage are :—

(1) **Water in Carburettor.** The symptoms are usually intermittent misfiring and banging in the silencer following a heavy rainstorm.

The remedy is to clean out the float chamber and jets.

(2) **No clearance at tappets.** This is apparent by an entire lack of compression when turning over with the kick starter. The remedy is to adjust the tappets.

(3) **Sticking Valve.** In this case there is no compression and excessive tappet clearance, the valve remaining partly open. The valve may free itself on cooling, but sometimes it is necessary to dismantle the engine to free the valve.

(4) **Broken Valve.** This trouble is very rare and is usually caused by consistent over-driving of the machine and by neglect of the tappet clearances (see paragraph 26). The symptoms are that the engine "cuts out" suddenly and stops with no tappet clearance. Furthermore, it is not possible to obtain any clearance at the tappets. A valve breakage on an O.H.V. engine is likely to have very serious consequences.

(5) **Seized Piston.** This is caused by over-driving a new machine before the engine is properly "run in." The symptoms are loss of power and a tendency to "pink" followed by the engine locking up solid. An aluminium piston will always free itself if allowed to cool. If the clutch was withdrawn and the throttle closed before the final seizure the consequences may not be serious, but the cylinder and piston should be examined as soon as possible by a competent mechanic to have any score marks removed. A seizure may also occur through run-

ning with insufficient oil, in which case the consequences will be far more serious.

**18.** **Clutch Trouble.** A slipping clutch may be caused by lack of clearance in the control (see paragraph 38).

A binding clutch is caused by too much slack in the control wire. New clutches sometimes tend to bind until the inserts have bedded down dead level.

## OVERHAULING THE ENGINE

**19.** **Decarbonising.** When an engine has been in use for some time, carbon deposit forms on the piston and cylinder head and the engine must be partly dismantled to allow this deposit to be scraped off and the valves to be re-ground.

The time when decarbonising becomes necessary will be indicated by an increased tendency to "pink" and will

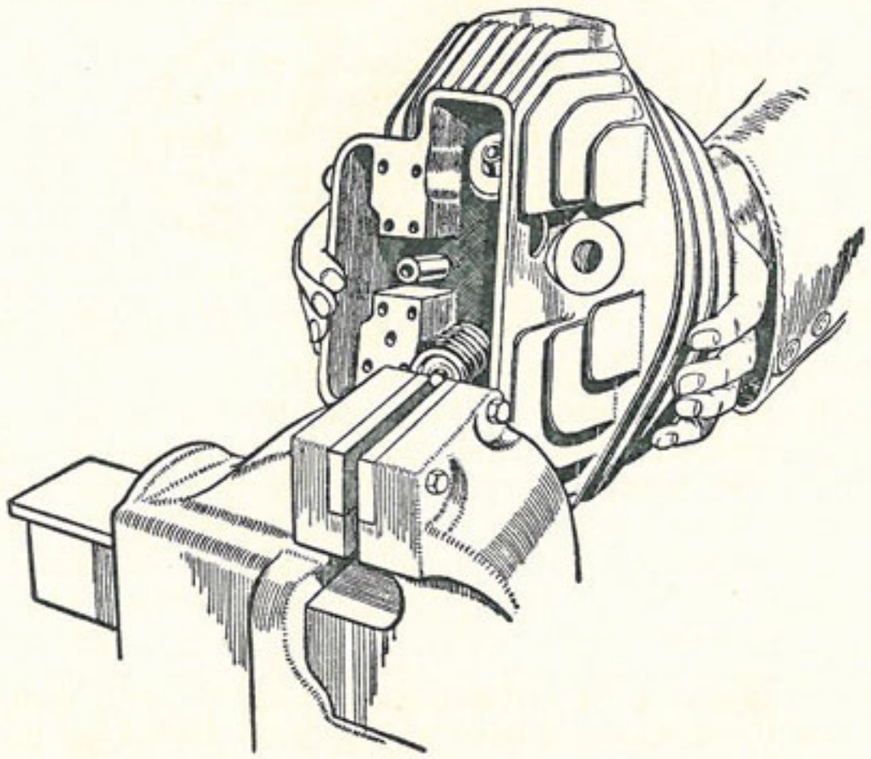

Fig. 7.—Method of Removal of Valve End Caps.





occur after approximately the first 2,000 to 2,500 miles, and subsequently at intervals of about 5,000 miles.

**20.** **Removal of Cylinder Head.** First remove the petrol pipe and the four bolts underneath the tank which secure it to the brackets and remove the tank. (If necessary the front saddle attachment bolt must be removed.) Next remove the cover over the valve gear, the carburettor, sparking plug, exhaust pipe and silencer. Remove the rocker bearing caps and rockers and lift the push rods out of their tubes (if the collar on the exhaust push rod will not clear the joint between the cylinder head and the barrel, leave this rod in position until after the head has been lifted off). The cylinder head can then be lifted off after unscrewing the four nuts which secure it to the cylinder.

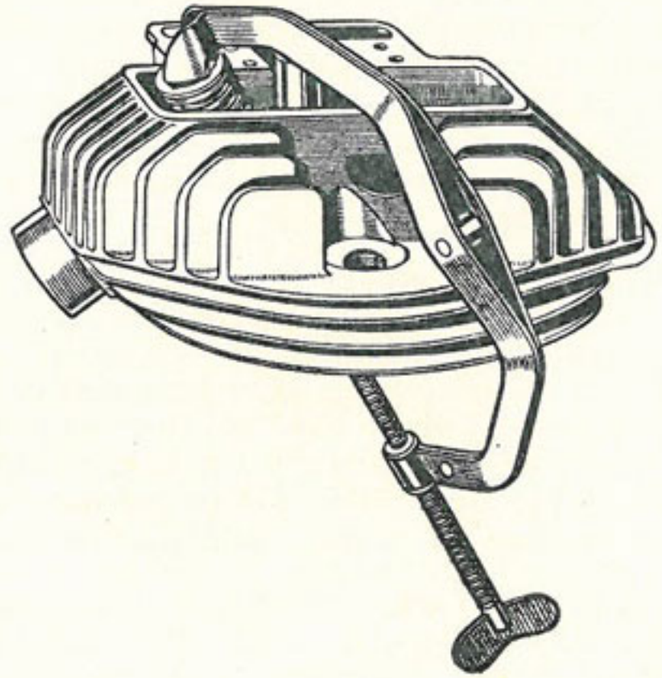

Fig. 8.

**21.** **Removal of Cylinder and Piston.** While it is not strictly necessary to remove the cylinder barrel and piston, this should preferably be done so that the condition of

the piston, rings and big-end bearing can be examined. To remove the cylinder barrel after removal of the head, unscrew the **five** cylinder base nuts (the fifth nut is inside the tappet chest between the two tappets), disconnect the exhaust lifter cable from the handlebar lever, place the piston at the bottom of its stroke and lift the barrel off. To remove the piston, push out the gudgeon pin, after removal of one of the wire retaining clips with a suitable tool (such as the tang end of a small file) and lift the piston off the rod. Mark the piston so as to ensure reassembling the same way round.

22. **Removal of Valves.** To remove the valves from the cylinder head, first lift off the hardened end caps from the valve stems. If these have stuck, they can be removed by compressing the spring slightly and gripping the end cap in a vice (see Fig. 7). Then compress the valve springs with a suitable compressor, lift out the split conical collars and release the springs, when the valve can be withdrawn. Fig. 8 shows a Terry compressor in use. Keep the split conical collars and the top spring collars paired up with their respective valves and replace in the same positions when reassembling.

23. **Removal of Carbon.** Remove carbon from the valves, ports and combustion chamber by scraping or by immersion in a solution of 4 ozs. of commercial potash to a gallon of water. Carefully remove the piston rings. Remove carbon from the ring grooves and the top of the piston by carefully scraping, taking care not to dig into the aluminium. **On no account allow potash solution to come into contact with the aluminium piston.**

24. **Grinding-in Valves.** Smear the valve seats with a little grinding compound, replace the valve in position and rotate it with a semi-rotary motion with a screwdriver, frequently lifting it off its seat and gradually working the valve round so that each point on the valve face comes into contact with each part of the seat. Continue grinding until a bright ring is obtained on both the valve and its seating.





If the valve or seats are very badly pitted and will not form good faces with a reasonable amount of grinding, the parts should be returned to the Works for new seats to be cut. Excessive grinding forms a pocket which restricts the flow of the gases.

Do not interchange the inlet and exhaust valves, as they are made of different material.

25. **Reassembly of Engine after Decarbonising.** When reassembling the engine, take great care to have all parts perfectly clean and put clean oil on the piston, particularly round the rings. The cylinder base joint must be made with a paper washer which must have a small hole in it registering with the oil feed to the back of the cylinder. The cylinder head joint may be made with the

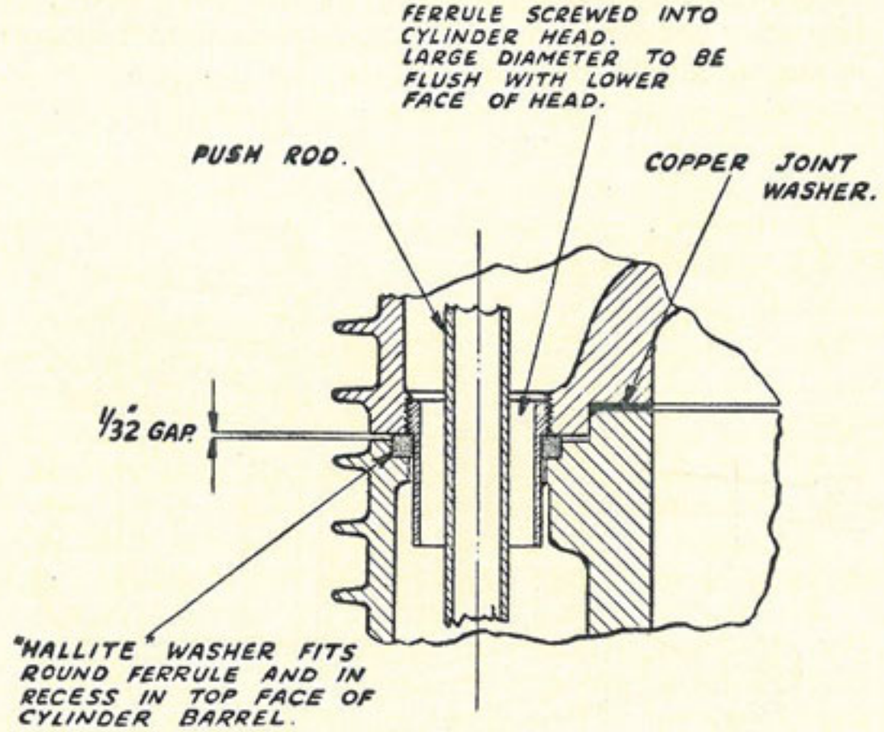


Fig. 9.—Detail of Joints in Push Rod Enclosure Tubes.

old copper washer which, however, should preferably be annealed by heating to red heat, then quenching. New Hallite washers painted with gold size or shellac

should be fitted to make the joints in the push rod enclosure tubes (see Fig. 9). When tightening down the cylinder base nuts, work diagonally from one to another to ensure pulling the base down dead level. When tightening down the cylinder head nuts put pressure first of all on the two at the push rod side of the engine so as to ensure compressing the push rod enclosure tube washers thoroughly and bringing even pressure on the copper head gasket. When replacing the valve rockers and caps put a little oil on each rocker and make sure that the rocker is free after the cap has been tightened down. If necessary, a sharp tap on the end of the rocker will usually free it.

When fitting the valves in the head do not forget to replace the caps on the ends of the valve stems. See that they are well home and square, as tappet clearance is measured at this point.

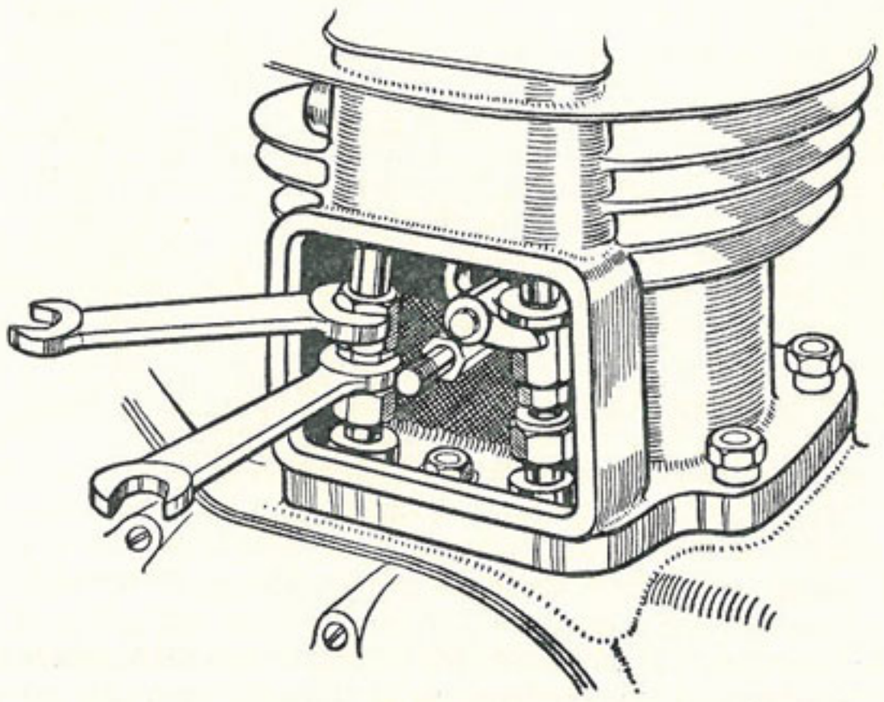

**Fig. 10.**—Adjusting Tappets.





**The cylinder head and base nuts should be checked again for tightness, after the engine has been run long enough to get it thoroughly warm.**

26. **Tappet Adjustment.** Access to the tappet adjustment is obtained by removing the inspection cover from the side of the cylinder. The exhaust tappet should have ·004in. clearance, the inlet ·002in., when the engine is cold. Owing to the ball and socket joint at the bottom of the push rods it is not possible to use feelers at these points. To check the clearance accurately the rocker box cover must be removed and the feelers applied between the caps on the ends of the valve stems and the rockers. With a little experience, however, the correct tappet clearance can be obtained by feel, the inlet push rod being just free while the exhaust has perceptible up and down clearance.

To make the adjustment (see Fig. 10) hold the push rod bottom end (top hexagon) and the locknut (middle hexagon). Unlock by turning the locknut to the left and make the adjustment by screwing the push rod cup (bottom hexagon) to the left to take up clearance or to the right to give more clearance, at the same time holding the push rod bottom end. Finally, lock up the locknut against the push rod end and check the clearance after finally tightening the locknut.

**Owing to the initial bedding down of the wearing surfaces, the tappets on new machines may require adjustment after the first few hundred miles have been run.**

27. **Engine Bearings.** The bearings fitted to all Royal Enfield engines are of adequate dimensions and, provided a plentiful supply of clean oil is kept in the tank, will give long and trouble-free service. The big end bearing consists of a special floating bush, which has been found to give better results than either ball or roller bearings for this application. The main bearings are of the caged roller type. A small amount of end float should be present in the main bearings and some "shake" may be present in the big end.

If, however, after long use, definite up and down play can be felt in the big end or main shaft bearings, it is best to send the crankcase, flywheels and connecting rod back to the Works for the worn parts to be replaced, as special appliances are necessary to ensure the correct assembly of these parts.

The gudgeon pin is fully floating and of large diameter. When the engine is cold it should be a free working fit in the small end bush and a push fit in the piston bosses.

**28.** **Removal of Engine from Frame.** Remove all external fittings such as exhaust pipe and silencer, cylinder head steady, sparking plug lead, exhaust lifter cable. Detach the petrol pipes and remove the throttle slide from the carburettor. Remove the footrests and footrest rod and the centre stand.

Have a tray to catch the oil and take off the primary chain case cover. Withdraw the engine sprocket and the clutch, having removed the chain and detach the back half of the chain case.

Support the engine on a substantial block, placed beneath it. Remove the upper and lower bolts which hold the rearmost points of the rear engine plates to the frame. Remove the front engine plate bolts and gently coax the engine from its position, complete with the gearbox and rear engine plates.

**29.** **Dismantling the Crankcase.** After the removal of the engine from the frame, drain the oil tank and remove the cylinder and piston, if not already done.

Next unscrew the timing cover screws and tap off the cover, then remove the magdyno driving pinion. This is a taper fit on its shaft and is tapped for a small extractor, which will be found in the tool kit. Now lift out the two cam wheels and the intermediate driving pinions for the magneto drive.

To remove the tappets and guides, tap the guides gently from underneath with a brass or aluminium drift.





Now loosen the magdyno securing strap and lift the complete instrument away.

Remove the timing pinion nut which has a left-hand thread. The pinion can now be drawn off the taper shaft, preferably using a sprocket drawer. If one is not available, wedge a screwdriver behind the pinion and tap the end of the shaft, but take great care not to damage the shaft or the crankcase. It is now only necessary to remove the bolts holding the two halves of the crankcase together, when these can be separated. Do not lose the rollers from the main bearings as these fall out, and do not mix bearings from each race as they are graded to ·0001in., do not attempt to separate the flywheels.

**30.** **Reassembly of Crankcase—Valve Timing.** No difficulty should be experienced with this. Take care to have all parts scrupulously clean and put some clean oil on all bearings and on the cams.

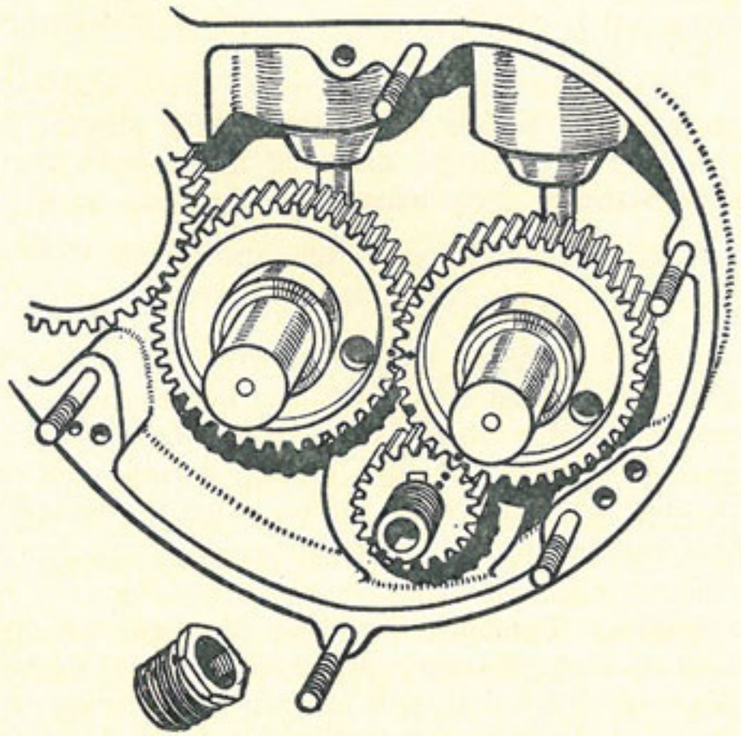

**Fig. 11.**—Valve Timing Marks.

The valve timing is marked and the cam wheels should be so assembled that the two dots on the small pinion are in line with the two on the exhaust cam wheel, while at the same time the single dot on the exhaust cam wheel is in line with the single dot on the inlet cam wheel. (See Fig. 11.)

For those who wish to check the valve timing the opening and closing points are given below :—

Exhaust opens 75° before bottom dead centre.
Exhaust closes 35° after top dead centre.
Inlet opens 30° before top dead centre.
Inlet closes 60° after bottom dead centre.

These points are all given at ·012in. tappet clearance and it is important that this clearance should be used when checking, as the first part of the valve lift is comparatively slow and a small variation in clearance considerably alters the opening and closing points. For running, set to the clearances given in paragraph 26.

The joint between the halves of the crankcase should be made with shellac, seccotine, or a similar jointing. The timing cover joint **must** be made with the special washer between the surfaces.

When replacing the tappets and guides note that the longer pair operate the exhaust valve.

If the oil pumps have been stripped down, see that they are assembled correctly—the larger plunger goes in the return pump, which is the one in front of the timing cover. Do not omit the spring washer between the pump disc and the cover plate. This is essential to the correct functioning of the pump.

**31.** **Ignition Timing.** To time the ignition, turn the engine until the piston is at the top of its compression stroke (both valves closed). Then turn the engine backwards until the piston has descended $\frac{3}{8}$in., which can be gauged by a piece of wire inserted through the plug hole.





With the engine in this position and the ignition lever fully advanced, turn the contact breaker in the direction in which it normally runs until the contact points are just beginning to break. This position can be gauged conveniently by using thin tissue paper between the points. Lock up the magdyno driving pinion in this position and the ignition will be correctly timed.

**32.** **Sparking Plugs.** The following are the plugs which we have found most suitable for these models :—

Lodge H14. K.L.G. F70. Champion L10. S.

**33.** **Lighting Set.** The dynamo on the machine will keep the battery well charged provided the proportion of night riding is not excessive and the machine is not left standing with the lights on for long periods.

The following are the correct bulbs for use in the head and tail lamps :—

**Head lamp (main light, twin filament),** 6 volt—30 and 24 watt.

**Tail lamp and head lamp pilot light,** 6 volt—6 watt.

**Speedometer light,** 6 volt—1·8 watt (·3 amp.).

When the lighting switch is in the "high" position, a finger-operated switch on the left handlebar can be used to dip the light. The speedometer is illuminated when either the main or pilot bulbs are on.

The various wires or leads in the system should be examined occasionally to make sure that they have not become disconnected or chafed. The two battery leads and the positive lead from the dynamo to the voltage regulator are particularly important. If the dynamo should cease charging, the cause may be a faulty lead. As a temporary expedient, disconnect the field circuit lead (green marking) from the dynamo. This will not make the dynamo charge but may save it from damage.

**Battery**

Batteries on many machines supplied in England, Scotland and Wales are supplied filled and charged ready for use.

Others, and batteries on machines supplied overseas, are in the "dry charged" condition. These require only filling with sulphuric acid of 1·250 density and allowed to stand for one hour before being put into service.

If an "unformed" dry battery is fitted it must be filled with acid of 1·285 density and given a long slow continuous charge of 0·8 amps. for 32 hours before being put into service. This process is necessary to form the correct chemical compounds in the battery plates, and if not carried out the battery will have a short life and a high resistance which prevent it accepting the correct rate of charge from the rectifier.

The electrolyte (acid) must be filled only to the top of the separators between the plates **in one operation** and this level must be maintained by regular additions of pure distilled water.

All lead-acid batteries slowly discharge themselves when standing and if allowed to stand in a discharged state will become sulphated and spoilt. If the machine is laid up for any length of time, therefore, the battery should be removed, charged fully and given a refresher charge every two or three weeks.

Batteries used on rectifier sets lose their charge more rapidly than others owing to a small leak through the rectifier. If it is known that the machine will not be run for several days, but the period of inactivity is insufficient to justify removal of the battery, it is a good plan to disconnect the battery earth lead, thus preventing leakage through the rectifier.

34. **Automatic Voltage Control.** The rate of charge is controlled by an automatic regulator which limits the dynamo voltage to approximately seven volts. The rate of charge is consequently high when the battery is nearly discharged and low when the battery is fully charged.





One of the advantages of this system is that it enables the machine to be run without the battery, with the lights on, without risk of burning out the bulbs.

**Note.** If the battery is disconnected for any reason the negative lead to it should be taped up, **not earthed.**

**The lighting and ignition set is fully described in a booklet issued by the manufacturers.**

35. **Carburettor.** The carburettor is correctly set at the Works, and is unlikely to require attention beyond occasional cleaning, and possibly resetting the slow running adjustment.

This adjustment is made with a small milled-head screw on the side of the carburettor. The adjustment should be made when the engine is warm and should be set so that the engine will "tick-over" evenly when the throttle is nearly closed. A throttle stop is also provided so that the throttle can be set to be slightly open when the control is shut.

Do not attempt to save petrol by fitting a smaller main jet. The main jet has no effect unless the machine is being driven at above half throttle.

If the machine uses an excessive amount of petrol look for possible leaks, check the slow running adjustment and try lowering the taper needle (held in the throttle slide) one notch. Examine also possible causes in the machine, such as brakes binding, tight or dry chains, incorrect tappet adjustment, slipping clutch, etc.

The following are the correct carburettor settings :—

Main Jet No. 130.
Throttle Valve 6/4.
Needle Clip in Middle Groove.

**Full particulars of the carburettor are given in a booklet issued by the makers.**

## TRANSMISSION

36. **Enfield Four-Speed Gear.** This gear box is very simple in operation and provided it is kept well lubricated

will give long and trouble-free service. **A special feature is that the gears are controlled by a single striking fork so that it is quite impossible to engage two gears at once no matter how much wear has taken place.**

The foot control lever is mounted directly on the box and consequently the gear cannot get out of adjustment. It may, however, be found that, after moving the gear box to tension the front chain the gear control lever is too close too, or too far from, the footrest. In this case, slacken the pin securing the lever to the operating mechanism on the box, remove the lever and replace it one serration higher or lower as required.

**A special neutralising lever** is fitted. This enables neutral to be found immediately from second, third or top gears. Forward and downward travel of this lever is limited by a stop sleeve. If the lever fails to locate neutral, loosen the hexagon-headed screw which secures the sleeve, and turn the latter. The sleeve is eccentric so that rotating it adjusts the position of the neutralising lever at the end of its travel.

**37.** **Clutch.** The clutch is of the four-plate type, with cork inserts. If clutch slip occurs first make sure that there is some slack in the control wire (see next paragraph). If this is in order, the clutch plates should be examined. To do this remove the front half of the primary chain case and unscrew the three pins near the centre of the clutch. The springs and plates may now be lifted away. If the cork inserts are worn flush with the metal or are burnt, they should be renewed. Cork clutches grip equally well whether oil or dry and wear better when oil is present so that it is best to keep the chain case supplied with oil. If the machine has been run for some time with a slipping clutch, new springs as well as new inserts may be required.

**38.** **Adjustment of Clutch Control. Important.** It is absolutely essential that there should be a small amount of free movement of the clutch operating lever on the





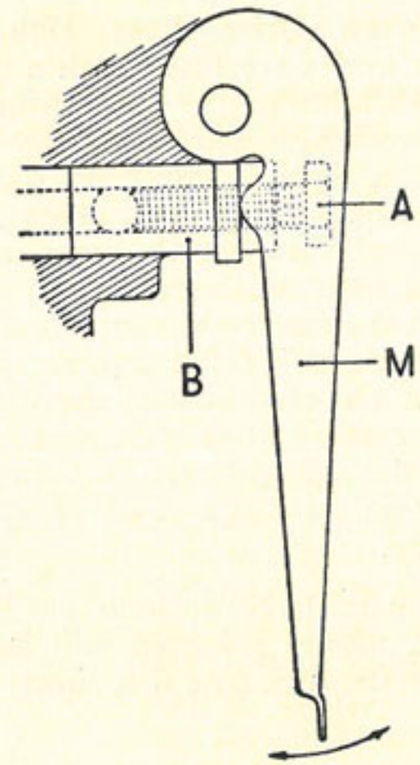


**Fig. 12.**—Lever to have $\frac{1}{16}$in. Free Movement.

gear box. (See Fig. 12.) If this is not present, part of the spring pressure will be taken by the clutch control wire instead of by the friction surfaces, clutch slip will result and the clutch inserts may be ruined.

To adjust the lever, first disconnect it from the cable and hinge it back to expose the adjusting screw A and the sleeve B. To give more clearance to the control turn the screw A to the left ; to take up clearance turn it to the right. No locknut is required as the screw and sleeve are automatically locked by the lever M when this is in position and the control wire connected.

**NOTE. Owing to the initial bedding down of the clutch friction material, it frequently happens that the clearance in the clutch control is taken up during the first few hundred miles with a new machine. This point should therefore be examined soon after delivery and adjustment made if necessary.**

**39. Patent Cush Drive Rear Hub.** These Royal Enfield motor cycles are fitted with a patent cush drive rear hub, which takes up the drive from the countershaft to the rear wheel with great flexibility and smoothness. This hub has a marked effect on the running of the machine, absorbing all engine shocks, and preventing any snatching of the driving chain, and consequently minimising the wear on the rear tyre. The drum on the driving side of the rear hub is provided with three metal vanes, and the inside of the driving sprocket has three similar vanes. On each side of the vanes in the hub is placed a block of solid rubber, and the vanes on the inside of the driving sprocket fit between these blocks. When in position there is a block of rubber and a metal vane alternately.

The only parts likely to wear are the rubber blocks and lock ring, which, however, will last a considerable time. Replace the lock ring if it shows signs of appreciable wear.

**40. Adjustment of Chains.** The front chain is adjusted by pivoting the gearbox about the lower of the two bolts holding it to the rear engine plates, after first slackening the two nuts securing it.

The rear chain is adjusted by slackening the spindle nuts and moving the two cam plates in the appropriate direction. Lock up the nuts and test the wheel and chain for alignment.

On no account should a chain be run quite tight. The primary chain should have about $\frac{1}{4}$in. up and down free movement ; the rear chain about $\frac{1}{2}$in.

After adjusting the rear chain, the rear brake operating rod may also require adjustment. Should it be necessary to remove either of the chains, it is important that, when replacing the connecting link, the spring fastening is so fitted that the split end points in the opposite direction to that in which the chain travels.





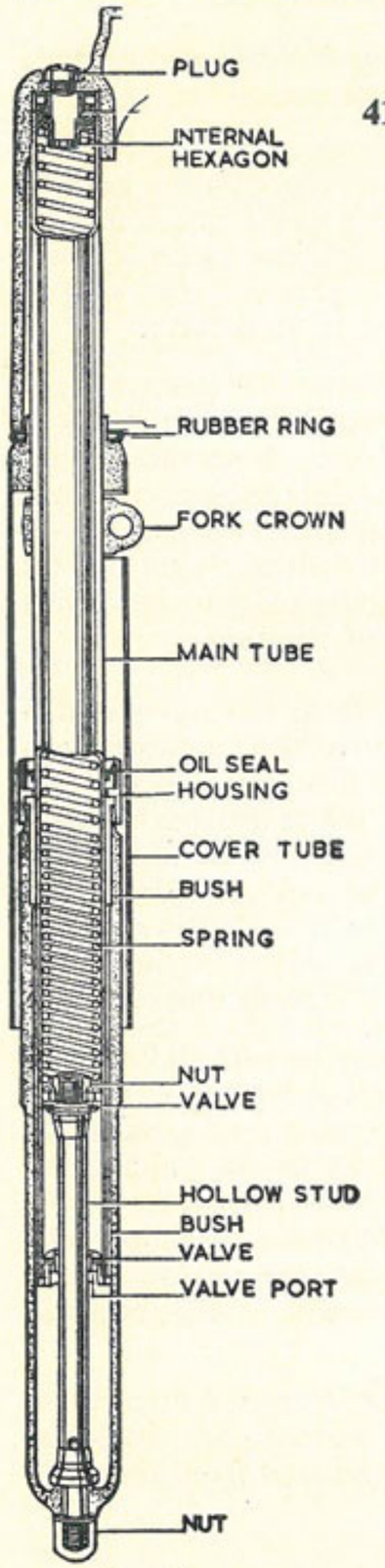


Fig. 13.

## TELESCOPIC FRONT FORK

**41. Construction.** A light alloy casting known as a "Casquette," houses the headlamp, parking lamps, ammeter, switch and speedometer.

The ammeter, switch and small lamps are held in place by rubber sleeves and the lamp glasses of the small lamps are held in rubbers which are tightened on to them by the plated rims.

Each fork leg is thrust upwards into this light casting and the main tubes are screwed into it, a key, fitting into an internal hexagon at the top of each tube, being used for the purpose. The main tubes are further secured by clamp bolts at the fork crown, and a wedge bolt holds the steering head stem at the upper end. This latter is accessible from behind the handlebar mounting.

Between the top tube covers—which are part of the "Casquette"—and the fork crown are rubber washers which allow for any variation brought about by adjustment of the head bearings.

The bottom or sliding tube encases the lower part of the main tube and has, screwed to its upper end, an oil seal housing which, besides containing the oil seal, retains the top bush in the sliding tube. Screwed into the base of the main tube is a valve port which also secures the bottom bush.

In this fork a two-phase spring is used, and it abuts against spring guides at top and bottom.

Thrusting upwards from the base of the sliding tube is a hollow spring stud which passes through the bottom valve port and has the bottom spring guide attached to its upper end by a nut. This spring guide has a ring of ports similar to those in the bottom valve port and each ring of ports is controlled by a valve plate or flap valve.

As the spring is compressed, both valve ports remain open, oil passes freely through them and no damping is achieved. Under very severe shocks, however, an oil control collar at the base of the sliding tube comes into play, trapping oil, and forming a cushion to check movement. On the rebound, both flap valves close, and oil is forced to return through very restricted passages, thus damping the rebound movement of the fork.

42. **Dismantling.** Remove the wheel, having first disconnected the brake cable. Remove the screwed plugs from the "Casquette" above the fork legs, slacken the clamp bolts which hold the main tube in the fork crown ; and then, using a special key, unscrew the fork main tube from the "Casquette." The bottom tube, main tube and all internal parts may now be withdrawn downwards. During this operation, it will, of course, be necessary to support the engine on a suitable block or box.

Remove the nut from below the bottom sliding tube and, with a tin below the fork leg to catch escaping oil, tap the hollow bolt upwards with a hammer and a soft drift. Allow the oil to drain away. Unscrew the oil seal housing from the top of the sliding tube and slide it clear of the main tube together with the top bush. The sliding tube can now be slid downwards off the main tube. Since the spring is not anchored at either end, it may be withdrawn without difficulty.

Unscrew the bottom valve port from the main tube, thus freeing the bottom bush and slide it over the lower end of the hollow stud. Remove the stud from the main





tube and, if desired, unscrew the nut from the top of the stud to remove the valve port.

43. **Steering Head Adjustment.** Undo the head clamp, which is in the form of a wedge bolt below and to the rear of the handlebar mounting and is unscrewed by a key in the internal hexagon. Unscrew, also, the two clamp bolts securing the main fork tubes. Tighten down the large hexagon above the handlebar clip until bearing play has disappeared. Do this with the weight taken off the front wheel. When adjustment is correct, tighten all clamps.

A loose steering head may give an impression of excessive engine vibration.

## REAR WHEEL SUSPENSION

44. The rear wheel fork is pivoted at its forward end, bronze bushes embracing a sleeve through which is passed a spindle. Thrust washers are inserted on either side and the assembly is secured by large nuts. Dismantling of this pivot is not a job for the ordinary user, since a special tool is needed to expand the frame.

45. **Lubrication.** There is a grease nipple in each end of the spindle and a grease gun, containing one of the brands of grease mentioned in paragraph 13 of the instruction book, should be applied periodically.

46. **Spring Boxes.** Access to the interior of the rear suspension spring boxes, for the removal of springs, can be gained by removing the units from the frame, pressing down the top cover and removing the split collar. Any further internal maintenance should be done only by the manufacturers, but rubber bushes may be renewed if necessary.

## MISCELLANEOUS

47. **Removal of Wheels. Detachable Rear Mudguard.** To facilitate tyre repairs and the removal of the rear wheel,

the rear mudguard on these machines is made quickly detachable, it being only necessary to slacken the four nuts securing the mudguard stays to the rear portion of the frame, when the mudguard can be lifted away. Having done this, remove the pin retaining the brake anchor arm and the brake adjusting wing nut, disconnect the speedometer cable, disconnect the rear chain at the spring link, loosen the spindle nuts and the wheel will slide out of the slotted fork end.

To remove the front wheel, place the machine on the stand, disconnect the front brake, remove the nuts securing the caps to the fork ends and the wheel will drop out.

**48. Removal of Tyres.** The wired-on tyres fitted are easily removed if the correct procedure is adopted. Deflate the tyre by unscrewing the inside of the valve with the key formed on the dust cap. Remove the milled locknut securing the valve to the rim. At a point opposite the tyre valve, press the walls of the tyre down into the well in the centre of the rim, and work the walls down into the well as far as possible in either direction. It will then be found possible to lever the cover off, starting at a point near the valve and working in either direction. When replacing the cover reverse this procedure, starting opposite the valve and finishing close to it with the tyre at the opposite side of the wheel pressed down into the rim. When only slightly inflated, see that the wired edges are in their proper places, not down in the well. As a check on this, examine the fine line moulded on the wall of the tyre near the rim. This should be about a quarter of an inch from the rim, all the way round.

It is not always appreciated that punctures in the rear tyre can be repaired with the wheel in position. If the puncture is caused by a nail or similar object, whose position is known, it will be found convenient to remove the mudguard, leave the wheel in position, remove one side of the cover and expose sufficient of the tube to enable the puncture to be repaired.





The following are the recommended tyre pressures :—

Front : 18lb. per sq. in. (Solo).

Rear : 22lb. per sq. in. (Solo) ; if pillion passenger carried, 34lb. per sq. in. approx.

**49. Knock-Out Spindle to Rear Wheel.** On these models a further refinement enables the inner tube to be removed completely and repaired or exchanged while the wheel is in position. If the offside spindle nut is removed, the wheel spindle can be pushed out, leaving the wheel mounted on a tubular spindle attached to the near side fork end. By springing the forks very slightly the knurled distance piece between the wheel and the offside fork end can slide out to the rear, leaving a gap through which the tube can be passed. In conjunction with the special Royal Enfield detachable mudguard, this system is of more practical value than most so-called "quickly-detachable wheels."

**50. Expanding Hub Brakes.** The expanding hub brakes are fitted with shoes lined with a special woven material, and have drums of special cast iron giving freedom from scoring. Should an excess of grease find its way from the hub bearings on to the brake linings, the brake will lose a certain amount of its efficiency. In this case the shoes and linings should be taken out and scraped to remove the grease. After re-assembly, drive with the brake "on" for half a mile or so to burn off the last traces of grease.

The rear brake is adjusted by a wing nut at the end of the brake rod, while the front brake adjustment is by means of a milled nut on the cover plate.

Royal Enfield brakes have their cam spindles mounted in the cover plates in such a manner that they are not rigidly anchored, but are free to float within a certain limit. This means that, when the brake is applied, the shoes centralise themselves and make positive contact with the drum surfaces all round. Servo action of the

trailing shoe may cause this lining to wear more rapidly than that on the leading shoe, but this is normal.

**51.** **Wheel Bearings.** The bearings of both wheels are single row, deep groove journal races. These have been proved by extensive tests to be superior to cup and cone bearings and are adequate to deal with both radial and thrust loads. They require no adjustment.

**52.** **Cleaning.** The enamelled portions of the machine are best cleaned with cold water, using a brush for the wheels. A hose pipe with a spray is the ideal, but if buckets must be used, the parts can be prevented from drying with a "smeary" finish by swilling several buckets of cold water over the machine after washing.

The engine, gear box and any other parts which are greasy should be brushed with paraffin or one of the special preparations now available.

The bright parts being finished in chromium plate need no polishing except for an occasional rub with a soft cloth. Never use metal polish on chromium plate.





## "DON'TS" FOR DRIVERS

DON'T let in the clutch with a jerk. This practice places unfair strain on the engine, transmission and tyres.

DON'T leave the brakes alone till the last moment and then have to apply them hard. This is only asking for skids and tearing miles off your tyres.

DON'T slam the throttle open suddenly. Give your machine an easy life and it will repay you.

DON'T drive on the exhaust lifter. Its purpose is to help in starting and stopping the engine.

DON'T slip the clutch to save changing gear. The clutch is for use, but this is abusing it.

DON'T be afraid of the lower gears. They also are for use. On the other hand—

DON'T race the engine in a low gear when it will readily pull a higher one. This is abuse.

DON'T try to economise in grease or oil. They are cheaper than repair bills.

DON'T neglect the essential adjustments, particularly the tappets and the clutch control. If you do—

DON'T blame the makers for the inevitable consequences.

DON'T run your tyres too soft. They are expensive, but air is cheap.

DON'T neglect to consult our Service Department at any time.

DON'T forget to switch off the ignition on a coil ignition model.


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