Reprint (2)

INSTRUCTION BOOK

FOR

ROYAL ENFIELD

LIGHTWEIGHT

MOTOR CYCLES

Models D, S and SF.

December, 1938.

Price 1/-

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Models D, S and SF.

The Enfield Cycle Co. Ltd.,

REDDITCH.

Telegrams :
"Cycles, Phone, Redditch."

Telephone :
Redditch 121 (8 lines).

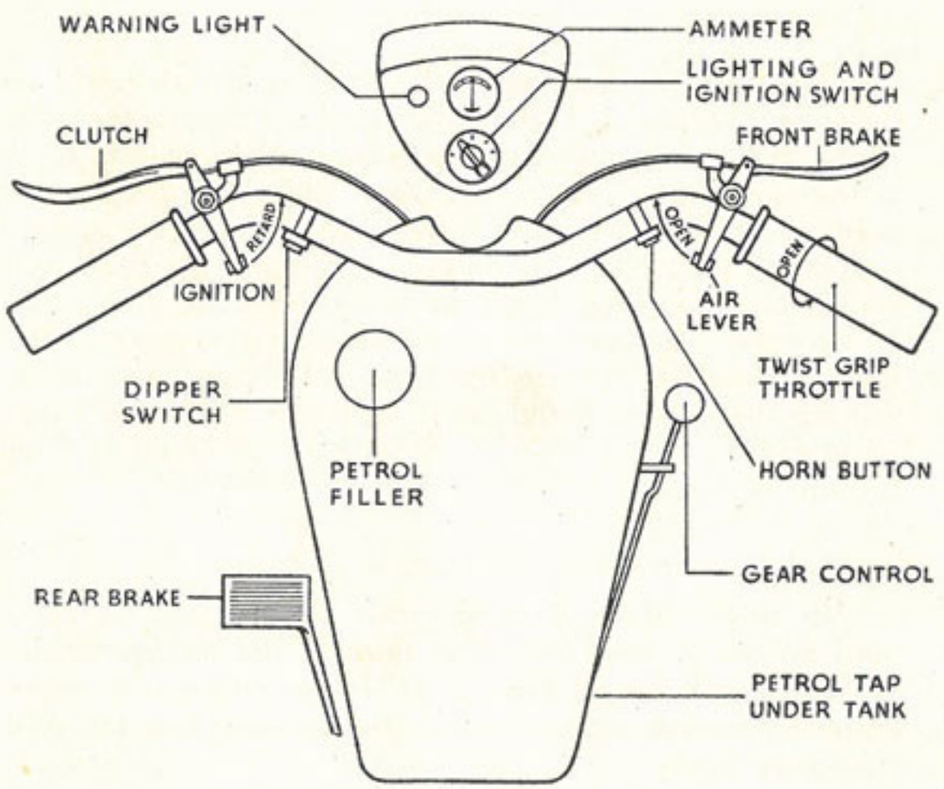
Royal Enfield Models

D, S and SF.

1 **Foreword.** The motor cycles dealt with in this booklet are lightweight utility machines similar in general design and construction. Model D has a 248 c.c. side valve engine and a three-speed gear with hand operation. Models S and SF have 248 c.c. o.h.v. engines with totally enclosed valve gear. Model S has three gears with hand operation, while Model SF has a four-speed gear with foot control, which can also be fitted to order on Model D.

All three models are normally fitted with a Miller 6-volt ignition and lighting set, but can also be supplied with Lucas Magdyno equipment.

By carefully following the instructions given in this booklet these machines will be maintained in first class condition. **If replacement parts are required we strongly advise the use of genuine Royal Enfield spares. Only by using these can a rider be sure that the parts are of the correct dimensions, and made of the finest materials, properly heat-treated and finished.**



CONTROL DIAGRAM.—MODELS D AND S.

NOTE.—Model SF has similar controls except for the gears, which are operated by a foot pedal mounted on the gear box.

When a Lucas Magdyno set is fitted there is no warning light, the switch on the lamp controls the lights only and the ignition control may pull to advance instead of retard. To check this run the engine in neutral on a small throttle opening with the ignition control set half open. Advancing the spark will speed the engine up, retarding will slow it down.

OPERATION OF THE MOTOR CYCLE.

2 **To Start the Engine.** Fill up the tank with petrol and the oil tank with oil. Turn on the petrol and depress the tickler of the carburettor until petrol overflows at the bottom of the carburettor body. Place the gear control in the neutral position, partly close the air lever, slightly retard the ignition, turn the switch to the "IG and CH" position, 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.

In the case of a new machine allow the engine to run gently until oil can be seen returning through the oil return pipe, visible through the oil filler hole. Never race a cold engine, especially in cold weather, until you are sure that the oil is circulating properly.

3 **To Start the Machine.** Pull up the clutch lever and engage the lowest gear by pulling the control lever up as far as possible (or in the case of foot control by pressing the lever 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.), partly close the throttle, de-clutch and change to second gear by moving the control lever down to the central position in the gate (or in the case of foot control by pressing the lever

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 top (or third) gear (say 25 m.p.h. with a three-speed gear or 20 m.p.h. with a four-speed). To do this repeat the foregoing operations moving the lever to the bottom of the gate in the case of the three-speed gear or as far downwards as it will go (and releasing it) in the case of the four-speed. At about 30 m.p.h. in the case of a four-speed machine, repeat the foregoing operations in order to change to top gear.

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.

As a guide to the correct positions for the ignition and air control levers the beat of the engine should be studied. If the engine is "eight-stroking," *i.e.*, firing on only every alternate firing stroke, the mixture is too rich and the air lever should be opened further. If the engine cuts out on opening the throttle the mixture is too weak and the air lever should be closed further. If the engine "pinks" (*i.e.*, a sharp metallic knock), the ignition is too far advanced or the mixture is on the weak side.

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 into the next position (or in the case of foot control, pressing the lever up as far as possible, 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, de-clutch and engage neutral gear. 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 **switch off the ignition. The warning light is a reminder to switch off** in case the engine should be stopped by accident.

Machines fitted with Magdyno ignition having no switch can be set to stop when the throttle is closed. Alternatively the engine can be stopped by retarding the ignition and then opening the throttle quickly.

An indicator is fitted to the foot operated gear control showing which gear is in use. **To obtain neutral from bottom or second gear,** move the control down or up half the amount necessary to engage the next gear.

5 **Running in.** A new machine should not be driven at a speed exceeding 25 m.p.h. in the case of a side valve, or 30 m.p.h. for an overhead valve, 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.

The necessity for progressive running-in cannot be over-emphasized. Pistons are sent out with close clearances in order to give long service with freedom from " slap." The cooling of the cylinder obviously must be unsymmetrical so that some distortion of both piston and cylinder is bound to occur. This may result in seizure if the piston is allowed to reach too high a temperature before it is properly bedded down. This bedding down can only take place within a reasonable period if the engine temperature is progressively increased. Running 1,000 miles at 30 m.p.h. will **not** bed down the piston to enable it to withstand continuous high speed running. Note that piston temperature is the important factor and that 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 system is of the dry-sump type and consists of two separate circulating

systems controlled by two double-acting oscillating cylinder pumps.

The supply of oil is carried in a separate tank between the engine plates. This has a capacity of over two pints and should always be kept well filled. The main circuit is from the tank via the connecting pipe to the primary side of the feed pump at the forward end of a cross shaft driven from the engine. This pump delivers the oil through passages leading to the big end bearing from which it is splashed to the cylinder, piston and main bearings. Surplus oil collects in a sump, or well, at the bottom of the crank case, from which it is pumped by the primary side of the return pump (at the rear of the cross shaft) back to the oil tank.

The secondary side of the feed pump is used to supply oil to the overhead rocker gear by means of an external pipe.

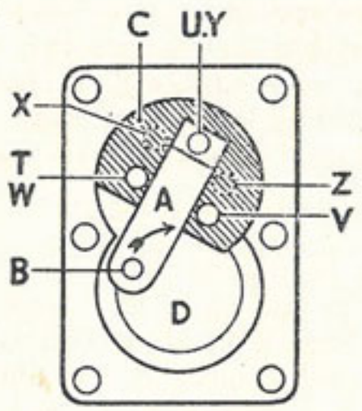


Fig.1

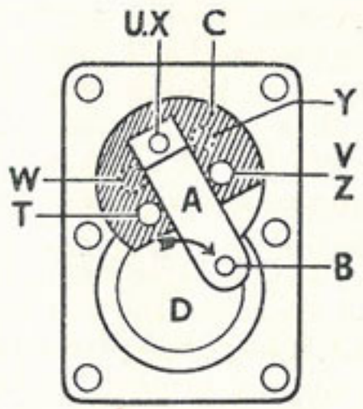


Fig.2

This oil drains down the push rod enclosure tubes to the timing case, from which it is returned by the secondary side of the return pump. In the case of the side valve, Model D, the delivery from the secondary side of the feed pump is direct to the timing case.

The action of the pumps is explained by reference to the diagram opposite which shows 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 cylindrical hole in the disc C, which can oscillate in its housing. The lower face of the disc has three ports, T, U, V, of which U communicates with the cylindrical hole in which the plunger A works ; T and V are drilled through to the upper face of the disc. The disc C is lapped on to its seating and is held down by a spring washer beneath the pump cover. The face at the bottom of the housing contains four ports, W, X, Y and Z. Of these W and X communicate with the feed pipe from the oil tank, Y communicates with passages leading to the big end, and Z with the overhead rocker gear (or timing case).

As shown in Fig. 1, the plunger A is being pushed into the disc C ; the port U registers with Y and oil is being forced to the big end. At the same time the clearance space in the housing D is being increased as the plunger is pushed into C. The port T registers with W and oil is drawn from the tank to fill up the increasing space.

Fig. 2 shows the opposite stroke. The plunger A is being withdrawn from the disc C which has swung over till the port U registers with X, thus permitting oil to be drawn from the tank into the cylindrical hole in C. At the same time the clearance space at D is being reduced so that oil is pushed through the ports V and Z to the rocker gear or timing gear.

The return pump is similar in construction, but slightly larger in capacity and is arranged to draw oil from the well or sump, at the bottom of the crankcase and from the timing gear and deliver it to the return pipe leading to the oil tank. This pipe enters the tank at the filling orifice, so that the returning oil is visible on removal of the filler cap. The oil then flows through a large gauze filter in the oil tank and a second filter protects the entrance to the pipe leading to the feed pump.

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 above the bottom of the gauze below 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 an inch of the top, or oil may escape from the vent in the filler cap.

We recommend the following oils for use in our engines :

Mobiloil D ; Golden Shell (Extra Heavy) ;
Motorine B De Luxe ; Castrol XXL ;
Essolube Racer.

In the case of machines which are used mainly for short journeys it is advisable to use a lighter oil in very cold weather and in these circumstances we recommend one of the following :

Castrol XL ; Essolube 50 ;
Mobiloil BB ; Triple Shell ;
Motorine C De Luxe.

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 use of 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.

During the running-in period only, we recommend the addition of a running-in compound containing Acheson's Colloidal Graphite to the oil in the tank.

About every 1,500—2,000 miles the oil should be drained from the tank by removing the drain plug beneath it. The filter gauge should then be brushed with petrol and the tank swilled through with petrol, followed by clean oil, allowed to drain and then refilled with fresh oil. This procedure is conveniently carried out when the engine is being decarbonised. The oil will flow more readily if the drain plug is removed at the conclusion of a ride, or the tank may be allowed to drain overnight. Waste of oil is reduced by allowing the level in the tank to become reasonably low before draining.

8 **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.

9 **Lubrication of Chains.** Both chains must be lubricated at frequent intervals with engine oil or grease. They should be removed about every 2,000 miles, and after washing in paraffin be soaked in melted tallow.

10 **Grease Gun Lubrication.** The fork spindles, rear brake pedal, and gear control spindle should be greased, with the grease gun provided, every 200 miles or once a week. The hubs should be greased very sparingly and not too often, or grease may find its way on to the brake linings.

For the fork spindles a low melting point grease, such as Castrolease (Medium), Mobilgrease (No. 2), Shell Retinax, Esso Grease or Belmoline (D) should be used. For the hubs use a high melting point grease such as Castrolease (Heavy), Mobilgrease (No. 4), Shell R.B. Grease, Esso Grease or Belmoline (C).

After using the grease gun it is an excellent practice to go over all nuts and see that they are tight.

TROUBLE ON THE ROAD.

11 **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 trouble.

12 **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 carburettor jet. If the flow from the petrol pipe is restricted, the stoppage lies either in the petrol tap, or the pipe itself.

13 **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 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, and check the connections to the battery, dynamo, coil and contact breaker, to make sure that none of these have pulled out.

If all the above are 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 (with the ignition switched on if coil ignition is fitted). 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 a type designed to stand more heat (see paragraph 29). The gap between the plug points should be ·018in. to ·025 in.

If the plug is satisfactory the trouble lies with the ignition system. See that the contact breaker points are clean and that they open and close properly. These should open between ·018in. and ·012in. If this is in order try the battery by switching on the lights, as with coil sets the ignition will not function if the battery is discharged. (If battery has run down, see paragraph 31.)

14 **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 rain storm.
The remedy is to clean out the float chamber and jets.

(2) **No clearance at tappets.** This is evidenced 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 overdriving of the machine and by neglect of the tappet clearances (see paragraph 23). 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 overdriving 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 seize up, 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 running with insufficient oil, in which case the consequences will be far more serious.

15 **Clutch Trouble.** A slipping clutch may be caused by lack of clearance in the control (see paragraph 35).

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.

16 **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 occur after approximately the first 1,000 to 1,500 miles and subsequently at intervals of about 2,000 miles.

17 **Removal of Cylinder Head.** To remove the cylinder head, proceed as follows :—

(*a*) **Side Valve Model D.** The head can be lifted straight off after removing the nuts securing it to the cylinder and swinging aside the cylinder head stay.

(*b*) **Overhead Valve Models S and SF.** First remove the petrol tank. Turn the engine until the inlet valve has lifted and remove the cover over the valve gear, the carburettor, induction pipe and cylinder head stay, exhaust pipe and silencer. Remove the rocker bearing caps and rockers and lift the push rods out of their tubes. The cylinder head can then be lifted off after unscrewing the four nuts securing it to the cylinder.

18 **Removal of Cylinder and Piston.**

(*a*) **Side Valve Model D.** Remove the silencer and exhaust pipe, also the carburettor. Unscrew the four cylinder base nuts, place the piston at the bottom of its stroke and lift the cylinder off. Push out the gudgeon pin after removal of one of the wire retaining clips and remove the piston. The inside of the piston should be marked to ensure re-assembling the same way round.

(*b*) **Overhead Valve Models S and SF.** After removal of the cylinder head unscrew the four cylinder base nuts, place the piston at the bottom of its stroke and lift the barrel off. Remove the piston and mark the inside to ensure re-assembly the same way round.

19 **Removal of Valves.**

(*a*) **Side Valve Engines.** Compress the valve spring, preferably using one of the many spring compressors on the market (the "Terry" is a suitable type). Lift out the split conical collars and release the spring, when it and the valve can be withdrawn. It is advised that the cylinder be removed, in addition to the head, before removing the valves.

(*b*) **Overhead Valve Engines.** First remove the hardened end caps from the valve stems. These should lift off, but if they have stuck, can be removed by compressing the spring slightly and gripping the end cap in a vice. Then remove the valves and springs in a similar manner to that described for the side valve engines.

20 **Removal of Carbon and Grinding-in Valves.** If desired, Model D can be decarbonised by removing the cylinder head with all other parts in position. This is a great convenience when time is pressing, but care must be taken that no carbon is allowed to get between the piston and cylinder walls. It is not recommended that the valves should be ground-in when the cylinder is in position on the machine, and for this reason it is preferable to remove the cylinder as described in paragraph 18.

To remove the carbon deposit scrape the piston top, cylinder head, ports and valves with a suitable scraper, followed by a rub with smooth emery cloth and polish the piston top with metal polish. Smear the valve seat with a little grinding compound or fine emery and oil. Replace the valve in position, and rotate it with a screw-driver, frequently lifting the valve off its seat, until a bright ring is obtained on the face of the valve, and also on the seating.

If the valves 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 will restrict the flow of the gases.

21 **Re-assembly of Parts.** Before replacing the valves, make quite sure that all trace of grinding compound has been removed from the ports.

Do not interchange inlet and exhaust valves, as these are made of different materials and the inlet valves may fail if used in the exhaust position.

After re-assembly of the valves, it is an excellent plan to test the seats by pouring petrol into the ports and watching for leakage past the valves. Not the slightest sign of moisture should be permitted.

22 Care should be taken that all parts are scrupulously clean before re-assembling. To replace the cylinder, proceed in the reverse order to that employed in taking it off. Smear the cylinder wall and piston with oil before replacing the cylinder. When tightening down the cylinder base nuts, give each a successive turn, otherwise, by screwing one home by itself, the cylinder is liable to be damaged or distorted and will not bed accurately on the crankcase. This also applies to the bolts holding down the cylinder head on the O.H.V. engines.

To ensure a gas tight joint at the cylinder head, the copper washer should be smeared with shellac varnish or a similar jointing compound.

Do not forget to fit the gudgeon pin retaining circlips before replacing the cylinder and use new circlips every time as they are liable to distortion when being removed.

The push rod ends should be greased before re-assembling. If the washers, which seal the head joint at the points where the push rod tubes pass through, have become damaged, new ones should be fitted.

23 **Clearance of Valve Stems.** The valve stems should just clear the rocker arms or tappets when the valves are closed. As a guide to the correct clearances, allow the following when the engine is cold :—

O.H.V. Engines Models S and SF	Inlet. No clearance. Tappet just free to turn.
	Exhaust. Just perceptible up and down play in tappet (·004in.).

S.V. Engine Model D	Inlet.	·004in.
	Exhaust.	·008in.

Always test valve clearances with the piston at the top of the compression stroke.

To adjust the clearances, proceed as follows :—

Remove the tappet cover from the side of the cylinder and hold the tappet by means of the locknut (middle hexagon) and the head (top hexagon). Unlock the head by turning it to the right and the locknut to the left. Now hold the tappet body (bottom hexagon) and turn the tappet head and locknut to the right or left to lengthen or shorten the tappet as required. Lock up the locknut against the tappet head and replace the tappet cover.

Running with insufficient valve clearance (most probable on S.V. engines) causes loss of power and burning and possible fracture of the exhaust valve.

Running with excessive valve clearance causes valve clatter (especially on O.H.V. engines) and may result in the fracture of either valve.

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

24 **Engine Bearings.** Roller bearings are fitted to the big end and main shaft of Royal Enfield dry-sump engines. These allow the engine to revolve more freely than plain bearings and have better wearing qualities than either plain or ball bearings. A small amount of end play should be present in these bearings and some " shake " may be present in the connecting rod. 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.

25 **Removal of Engine from the Frame.** Probably most Royal Enfield owners will never find it necessary to remove the engine from the frame, but after a long period of use it may be desired to send the engine back to the Works for an overhaul or to have new bearings fitted.

To take the engine out of the frame, first remove the exhaust pipe and silencer, chain cover, chain and all external fittings. Next remove the dynamo chain cover, dynamo (or magdyno) and chain, also the dynamo platform.

Disconnect the oil pipes, take out the bolts holding the engine in the frame and lift the crankcase forwards and upwards till it is clear of the plates.

26 **Dismantling the Crankcase.** After taking the engine out of the frame, remove the cylinder and piston if not already done.

Next unscrew the timing cover screws and tap off the cover. Now lift out the cam wheel and rockers and remove the engine sprocket nut and the timing pinion nut (the latter has a left-hand thread). Draw the sprocket and pinion off their tapers. Now remove the bolts holding the two halves of the case together, when these can be separated. Do not lose the rollers from the main bearings as these fall out. Do not attempt to separate the flywheels.

27 **Re-assembly 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.

The valve timing is marked and the cam wheels should be so assembled that the marks on the small pinion are in line with those on the cam wheel.

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

Exhaust opens 60° before bottom dead centre.
Exhaust closes 22° after top " "
Inlet opens 22° before top " "
Inlet closes 60° after bottom " "

These points are all given at ·005in. 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 23.

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 paper washer between the surfaces and it is most important that the leather washer sealing the joint in the oil passage from the feed pump, and the cork bush, in which the end of the timing shaft fits, are in good condition. There is a steel washer beneath the cork bush to prevent the oil passage being obstructed.

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 at the back of the crankcase. Do not omit the spring washer between the pump disc and the cover plate. This is essential to the correct functioning of the pump.

28 **Ignition Timing.** To time the ignition, turn the engine until the piston is at the top of the compression stroke (both valves closed). Then turn the engine backwards until the piston has descended the following distances, which can conveniently be gauged with a piece of wire inserted through the plug hole on O.H.V. engines or by removal of the cylinder head on side valve engines.

Model D, $\frac{1}{4}$in. Models S and SF (Engine Nos. up to 448), $\frac{1}{8}$in. Models S and SF (Engine No. 449 and upwards), $\frac{1}{4}$in.

With the engine in this position and the ignition lever fully advanced, turn the contact breaker cam (in the case of coil ignition) or the contact breaker (in the case of magdyno ignition) 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 dynamo (or magdyno) driving sprockets in this position and the ignition will be correctly timed.

29 **Sparking Plugs.** The following are the types of plugs in the Lodge and K.L.G. ranges, which are best suited to Royal Enfield engines :—

(*a*) For running in and ordinary touring :—
Lodge H14 or KLG 831.

(*b*) For prolonged high speed running :—
Lodge H53 or KLG 583.

30 **Lighting Set.** The battery on new machines is sent out charged ready for use.* 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.

*For Export the battery is supplied dry and uncharged. Before use, it must be filled with Sulphuric Acid of density 1·280 and charged for 70 hours at a rate of 0·75 amps.

The warning light on coil ignition sets shows when the ignition is switched on. This light goes out when the engine speed is such that the dynamo starts to charge. If the warning light bulb should burn out, the running of the machine is not affected, but the bulb should be replaced as soon as possible by one of the correct type, otherwise the absence of a warning may result in the ignition being left " on " when the engine is stopped.

The correct bulbs are 8 volt ·1 amp.

If bulbs of lower voltage **or amperage** are used they will burn out very quickly.

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

Head lamp (main light, twin filament)	
Coil ignition Sets	6 volt—18 and 18 watt
Magdyno Sets	6 volt—24 and 24 watt
Tail lamp and head lamp pilot light	6 volt—3 watt

When the lighting switch is in the " high " position, a finger-operated switch on the left handlebar can be used to dip the light.

If a machine fitted with coil ignition is to be left with the lights on, use the " PK " position of the switch. This switches on the pilot and tail lights **without** the ignition.

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 by pulling out the two-pin plug on top of the dynamo (on coil

ignition sets) or by disconnecting the green marked lead from the dynamo (on magdyno sets). This will not make the dynamo charge but may save it from damage.

The acid level in the battery should be maintained at $\frac{1}{4}$in. above the top of the plates by the addition of distilled water at regular intervals. **Regular attention to the battery and wiring will ensure the satisfactory working of both lights and ignition.**

31 **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. This enables a machine fitted with coil ignition to be started even if the battery is completely discharged, as, by disconnecting the battery and pushing the machine hard in bottom gear, sufficient current can usually be obtained from the dynamo to start the engine, after which the battery can be connected up while the engine is running.

Note. If the battery is disconnected the positive lead to it should be taped up, **not** earthed.

The lighting and ignition set is fully described in a booklet issued by the manufacturers, a copy of which we will forward on request.

32 **Carburettor.** The carburettor is correctly set at the works, and is unlikely to require attention beyond occasional cleaning, and possibly re-setting 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 :—

Model D ...	... Main jet 75, Needle in No. 3 groove.
Models S and SF	... Main jet 75, Needle in No. 2 groove (Counting from the top).

Full particulars of the carburettor are given in a booklet issued by the makers, a copy of which we will supply on request.

TRANSMISSION.

33 **Enfield Three and Four Speed Gears.** These gear boxes are very simple in operation and provided they are 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 nor how much the control is out of adjustment. All gears are engaged by dog-clutches, ensuring an easy change under all conditions.

If the hand control on the three-speed gear box requires adjustment, owing to the box having been moved to tension the

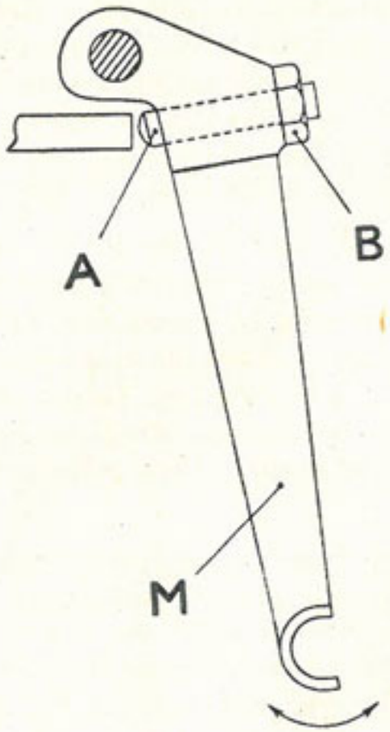
primary chain, proceed as follows : Engage second gear, disconnect the control rod at the upper end, place the control lever centrally in the middle position in the gate, turn the fork end on the control rod to the right or left to lengthen or shorten the rod as required to bring the holes in line with that in the lever and couple up the rod to the lever.

The foot control lever on the four-speed gear is mounted directly on the box and consequently 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 to 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.

34 **Clutch.** The clutch is of the two-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 chain cover 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. If the machine has been run for some time with a slipping clutch, new springs as well as new inserts may be required.

35 **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 gear box. (See illustration on next page). 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, loosen the locknut B and turn the adjusting screw A until the lever M has a little free motion (about $\frac{1}{16}$in.) then lock up the nut B.



Lever to have about
1/16" free movement.

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.

36 **Patent Cush Drive Rear Hub.** All Royal Enfield motor cycles are fitted with a patent cush drive rear hub, which takes up the drive 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 driving sprocket fit between these blocks. When in position there is a block of rubber and a metal vane alternately.

This cush drive hub is so simple that adjustment is seldom necessary. The only parts likely to wear are the rubber blocks, which, however, will last a considerable time.

37 **Adjustment of Chains.** The front chain is adjusted by pivoting the gear box 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 wheel spindle nuts, then adjusting the nuts at the end of the rear fork ends, which vary the position of the wheel spindle. Take care to adjust both nuts equally.

The dynamo (or magdyno) chain is adjusted by tilting the dynamo (or magdyno) platform about the rear of the two bolts securing it to the engine plates after loosening the nut on the front bolt.

On no account should a chain be run quite tight. The primary and dynamo chains 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 cable 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 is behind the direction in which the chain travels.

MISCELLANEOUS.

38 **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 rear chain at the spring link, loosen the spindle nuts and the wheel will slide out of the slotted fork ends.

To remove the front wheel, disconnect the brake control, loosen the spindle nuts, lift the front of the machine, spring the forks slightly open and the wheel will drop out.

39 **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 both directions. 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.

40 **Expanding Hub Brakes.** All Royal Enfield expanding hub brakes are fitted with brake shoes lined with a special woven material, which it will be found has long-wearing qualities, does not score the drums and seldom requires renewing. 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 cable, while the front brake adjustment is by means of a milled nut towards the bottom of the front fork.

41 **Wheel Bearings.** The bearings of both wheels are single row, deep grooved 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.

42 **Front Forks.** Side play in the front fork links is taken up as follows :—Release the nuts on the fork spindles and adjust the latter with the squares provided on their ends. Each spindle is provided with a right- and left-hand thread, which will open or close the fork links as required. The left-hand threads are on the off-side of the machine and the locknuts are loosened by turning in the direction of the arrows on the bottom fork links. The top rear shackle pin is adjusted by unscrewing the locknut (near side) and adjusting the pin as required, finally locking up the locknut.

43 **Ball Head.** All Royal Enfield motor cycles are designed with ball heads of ample dimensions which rarely require attention. If on inspection, however, it is found, when lifting at the handle bars, that a small amount of play has developed, this should immediately be taken up. To adjust the ball head release the pin through the ball head clip, and adjust the nut on the top of the steering stem, which holds the ball head clip in position, until all play has disappeared.

When testing for play in the head, take the weight off the front wheel by placing a suitable box underneath the crankcase.

44 **Cleaning.** The enamelled portions of the machine are best cleaned with cold water, using a brush for the wheels. A hose pipe 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.

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.

A DOZEN "DON'TS" FOR DRIVERS.

DON'T let in the clutch with a jerk. This practice places unfair strains 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 forget to switch off when stopping a machine with coil ignition.

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.

MOTOR CYCLE GUARANTEE.

Reprinted from our current Motor Cycle Catalogue.

The following is a copy of the Guarantee given by Dealers in Royal Enfield Motor Cycles :—

We give the following Guarantee with our Motor Cycles, Motor Cycle Combinations and Sidecars, which is given in place of any implied conditions, warranties or liabilities whatsoever, statutory or otherwise, all such implied conditions, warranties and liabilities being in all cases excluded. Any statement, description, condition or representation contained in any catalogue, advertisement, leaflet or other publication, shall not be construed as enlarging, varying or over-riding this guarantee.

In the case of machines (*a*) which have been used for " hiring out " purposes or (*b*) any motor cycle and/or sidecar used for any dirt track, cinder track, or grass track racing or competitions or any competition of any kind within an enclosure for which a charge is made for admission to take part in or view the competition or (*c*) machines from which the trade mark, name or manufacturing number has been removed, no guarantee of any kind is given or is to be implied.

WE GUARANTEE, subject to the conditions mentioned below, that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, but this guarantee is to extend and to be in force for six months only from the date of purchase, and damages for which we make ourselves responsible under this guarantee are limited to the free supply of a new part in exchange for the part of the motor cycle, motor cycle combination or sidecar which may have proved defective. We do not undertake to replace or refix, or bear the cost of replacing or refixing, such new part in the motor cycle, motor cycle combination or sidecar. We undertake, subject to the conditions mentioned below, to make good at any time within six months any defects in these respects. As motor cycles, motor cycle combinations and sidecars are easily liable to derangement by neglect or misuse, this guarantee does not apply to defects caused by wear and tear, misuse or neglect. The term " misuse " shall include amongst others the following acts :—

1. The attaching of a sidecar to the motor cycle in such a manner as to cause damage or calculated to render the latter unsafe when ridden.
2. The use of a motor cycle or of a motor cycle and sidecar combined, when carrying more persons or a greater weight than that for which the machine was designed by the manufacturers.
3. The attaching of a sidecar to a motor cycle by any form of attachment not provided or supplied by the manufacturers or to a motor cycle which is not designed for such use.

Any motor cycle or motor cycle combination or sidecar sent to us to be plated, enamelled or repaired will be repaired upon the following conditions, *i.e.*, we guarantee that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, such guarantee to extend and be in force for three months only from the time such work shall have been executed or until the expiration of the six months above referred to, and this guarantee is in lieu and in exclusion of any common law or statute warranty or condition, and the damages recoverable are limited to the cost of any further work which may be necessary to amend and make good the work found to be defective.

CONDITIONS OF GUARANTEE.

If a defective part should be found in our motor cycles, motor cycle combinations or sidecars, or in any part supplied by way of exchange before referred to, it must be sent to us CARRIAGE PAID, and accompanied by an intimation from the owner that he desires to have it repaired or exchanged free of charge under our guarantee, and he must also furnish us at the same time with the number of the machine, the date of the purchase, or the date when the alleged defective part was exchanged as the case may be.

Failing compliance with the above, such articles will lie here AT THE RISK OF THE OWNER, and this guarantee and any implied guarantee, warranty or conditions shall not be enforceable.

We do not guarantee specialities such as tyres, saddles, chains, lamps, etc., or any component parts supplied to the order of the purchaser differing from standard specifications supplied with our motor cycles, motor cycle combinations, sidecars or otherwise.

Models A, C, CO, CM, D, S, SF, S2 and T are sold subject to the condition that we cannot accept responsibility if used with a sidecar.

NOTICE.

We do not appoint agents for the sale on our behalf of our motor cycles or other goods but we assign to motor cycle Dealers, areas in which we supply to such Dealers exclusively for re-sale in such areas. No such Dealer is authorised to transact any business, give any warranty, make any representation or incur any liability on our behalf.