The Book of the 3 H.P. ROYAL ENFIELD

TWO-SPEED MOTOR CYCLE

The Motor Cycle
that is made
- like a Gun -

Index.

The figures in this Index refer to the paragraph numbers in the book, and* NOT *to the page numbers-unless otherwise stated.

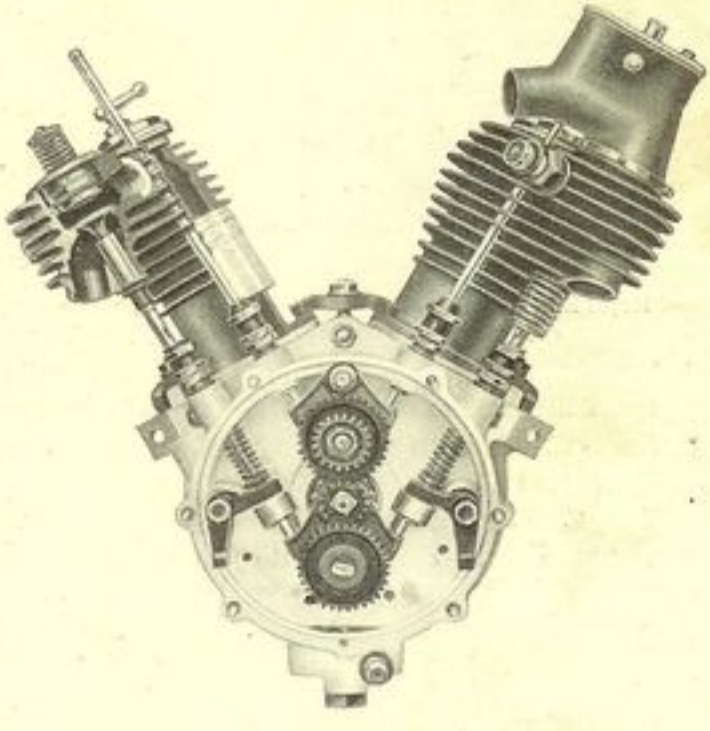
THE 3 H.P.
ROYAL ENFIELD MOTOR CYCLE

fitted with the

Enfield Patent Two-Speed and Free Engine Gear.

The 3 h.p. Royal Enfield Motor Cycle is fitted with a twin cylinder engine, which is manufactured in the Royal Enfield works. The dimensions of the standard engine are bore 60 m/m., stroke 75 m/m., giving a capacity of 425 c.c. The cylinders are set at an angle of 60 degrees. The inlet valves are of the overhead type, and are housed in domes directly over the exhaust valves. The rocker arms of the overhead valves are cased in to completely protect the working parts; the rocker arm bearings are oiled through lubricators fitted in the top of each cover.

1 The illustration on this page shows the 3 h.p. engine with the timing gear cover removed, and the back cylinder shown in section. The cover containing the rocker arm has been removed from the back cylinder to more clearly illustrate the position of the inlet valve. It will be noticed that this valve is fitted directly over the exhaust valve, this arrangement permitting of straight induction pipes, and consequently a direct and free ingress of gas.



3 h.p. Royal Enfield Engine, with Timing Gear cover removed
Back Cylinder shown in section

2 The crank pin and engine pin bearings are bushed with phosphor bronze, and the fly-wheel shafts are mounted on a double row of ball-bearings. The magneto is fitted in front of the engine and chain driven. Full particulars of the magneto are given in paragraphs 41 to 45.

The carburetter is the AMAC multiple jet type, specially designed for this motor cycle, and fully described in paragraphs 46 and 47. The kick-starter is fitted on the left hand side of the machine. The diagram on page 13 shows the constructional parts of the kick-starting clutch, which, not having to depend on ratchets or pawls, is reliable to the highest degree.

3 The great feature of the 3 h.p. Royal Enfield Motor Cycle is the mechanical lubricating system. This is fully dealt with in paragraphs 9, 10, 11 and 12. Apart from the increased efficiency of the mechanical method over the usual hand pump, this system possesses other advantages, one being that the usual tank is made without any compartments, and carries petrol only, the lubricating oil being contained in a special glass tank fitted at the back of the down tube. The return pipe discharges the oil into this glass tank, and, whilst the engine is running, it is always possible to see that the lubrication system is working properly. A pipe is also fitted leading direct to the front cylinder and ensuring a sufficient supply of oil to that part of the engine.

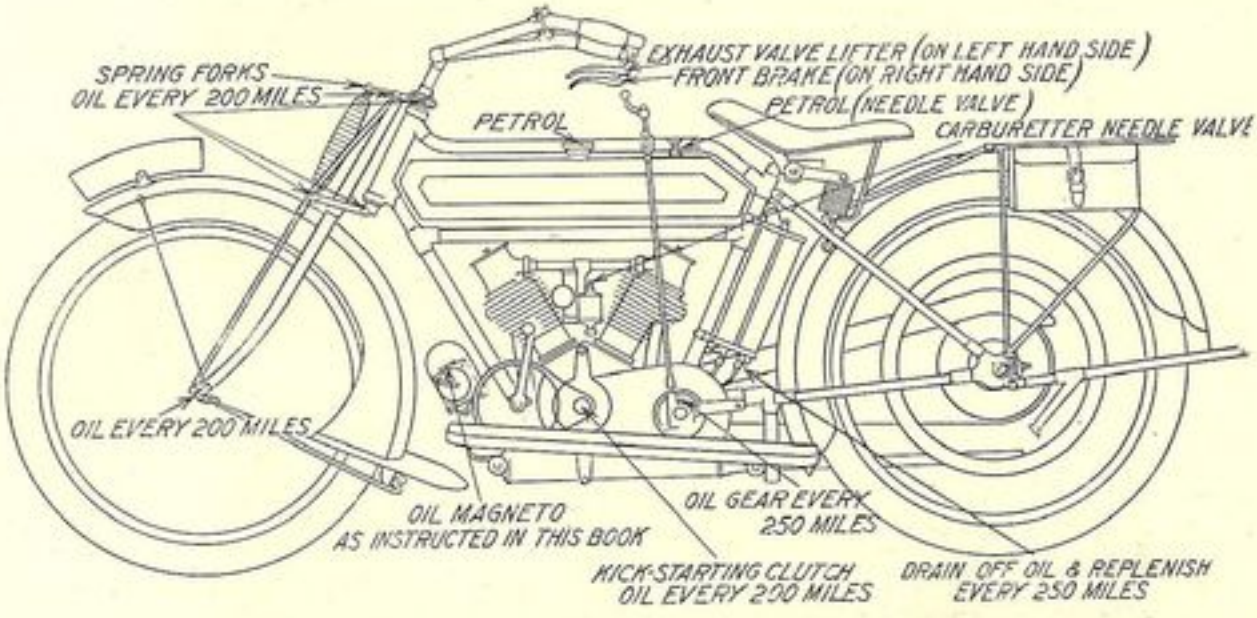
Royal Enfield Lubricating Oil, 1/8 Quart Tin.

4 The Enfield Patent Two-Speed and Free Engine countershaft gear is fitted, with the Patent Cush Drive Hub in the rear wheel. The transmission throughout is by superfine roller chains, both in the drive from the engine shaft to the Two-Speed Gear Sprockets, and also in the final drive from the countershaft to the rear wheel. The Two-Speed Gear and Cush Drive are fully dealt with in paragraphs 21 to 27. The Enfield patent countershaft gear has direct drive on each gear, and there is consequently no frictional loss.

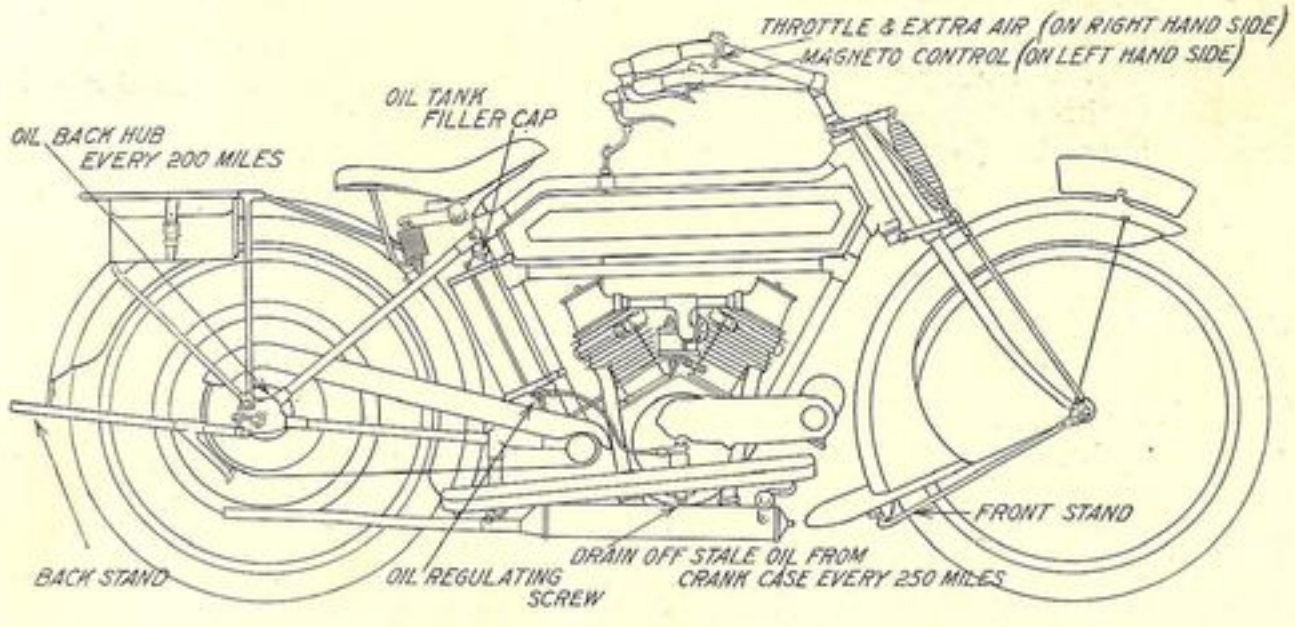
TO START THE ENGINE.

5 Assuming that the rider has little knowledge of, motor matters, it is advisable first of all to study the diagrams on the opposite page in order to become acquainted with the various controls and their positions on the machine. Having done this, fill up the petrol tank

DIAGRAMS OF THE CONTROL LEVERS, IMPORTANT PARTS, AND LUBRICATING POINTS ON THE 3 H.P. ENFIELD MOTOR CYCLE.



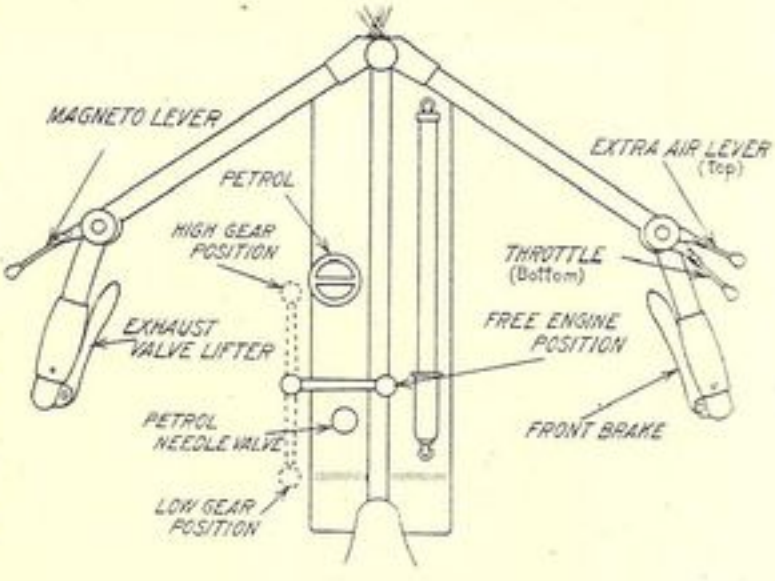
The above diagram shows the 3 h.p. Royal Enfield from the gear side.



View of the 3 h.p. Royal Enfield from the valve and transmission side.

through the large glass-topped filler in the tank, and also fill up the oil tank through the filler at the top to about two-thirds of the capacity of the glass barrel. For the lubrication of our 3 h.p. model we strongly recommend Royal Enfield Motor Oil (see page 6), or Price's Huile-de-Luxe. There is no hand pump fitted to the tank, because the mechanical lubrication makes it unnecessary. By means of the pumps fitted on the timing gear side of the crank case a supply of oil reaches the engine as soon as it is started up. This oil supply is continuous during the whole time the engine is running.

6 The next operation is to turn on the petrol by unscrewing the petrol needle valve on the top of the tank, which allows the petrol to flow into the carburetter. Depress the needle of the carburetter for a few seconds until the petrol overflows, and then open the throttle lever about half-way, keeping the extra air lever quite closed. The ignition lever should be advanced (*i.e.*, moved inwards) to about two-thirds of its full opening. (It is very important not to advance the ignition to its fullest extent when starting up.) Place the two-speed gear lever in the "free engine" position, *i.e.*, pointing across tank. Turn on the lubricating oil by unscrewing the oil regulating screw at the bottom of the glass oil tank (see diagram on page 7) about half a turn, and turn the oil tap leading into the front cylinder down, so that it is parallel with the oil union. (Further instructions on lubrication appear on pages 9, 10 and 11.) Now, standing astride the machine, sharply force down the kick-starter (do not raise valve-lifter). If the previous instructions have all been carefully carried out, the engine should fire immediately, but if the first "kick" of the kick-starting lever does not cause the necessary explosion, the process should be repeated. (See also paragraph 8.) With the engine running, the extra air lever should be gradually opened out, the ignition lever fully advanced, and the driver sit astride his machine.



PICKING UP SPEED.

7 Draw the gear lever gently backwards towards the low gear position—not right back into low gear until the machine picks up

speed. If the lever is drawn back too quickly it is possible that the engagement of the clutch will stop the engine, and the process of starting up will have to be gone through again. As soon as the machine picks up speed, the gear lever should be sharply pushed forward to the high gear position. Open the extra air lever as wide as possible, remembering that the carburetter should be given as much extra air as it will take without diminishing the speed. Control the speed of the machine by the throttle lever, and do not continually lift the exhaust lever, as doing so is liable to pit the valves. In riding through the traffic usually found in the centre of large towns, it is advisable to run on the low gear, with air and throttle levers partly closed and the magneto retarded (*i.e.*, the magneto lever moved slightly outwards).

DIFFICULTIES IN STARTING.

8 Providing all the instructions are systematically carried out, there should be no difficulty whatever in starting up. Of course, when a machine has not been running for some length of time, or in exceptionally cold weather, it may occasionally fail to start without considerable persuasion. If the carburetter overflows readily, the petrol supply is all right, and by injecting a small quantity of petrol through the compression tap on the top of each cylinder, this may be sufficient to free the pistons and enable the engine to be started. If, however, this simple expedient does not overcome the trouble, we would advise a careful examination of the whole machine from the "Fault-finding" Table given on page 29.

LUBRICATION.

9 In the paragraphs (Nos. 5 and 6) on starting up the engine we have given instructions for turning on the supply of oil to the engine. As we there remark, no hand pump is fitted to the tank, for the simple reason that directly the engine is started, the oil pumps are automatically brought into action, and the circulation of the oil from the oil tank to the engine, and *vice versa*, begins.

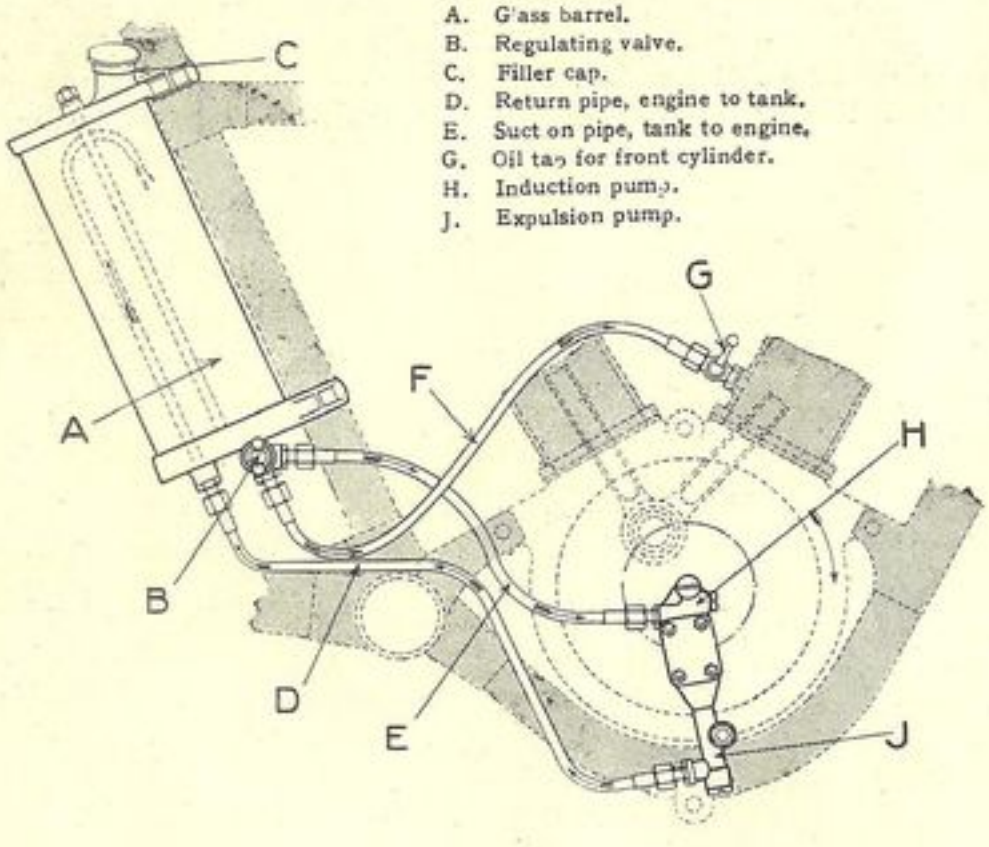
It will perhaps be useful if we completely describe the various parts which comprise the mechanical lubrication system.

10 The diagram on the following page shows the whole system, and the path followed by the oil from the tank (A) to the engine and back again. The supply of oil is regulated by a thumb screw valve (B), and passes along the suction pipe (E) to the induction pump (H).

This pump discharges into the hollow end of the crankshaft, forcing the oil along this shaft, through an aperture in the fly-wheel, into the crank pin bearing, and thence distributing it equally into both cylinders, so that each is perfectly and thoroughly lubricated. The oil then drips into the crank case sump, and any excess which has not passed through the engine shaft also finds its way through a release valve into this sump. From here the oil is pumped by the expulsion pump (J) along the return pipe (D) back again to the tank.

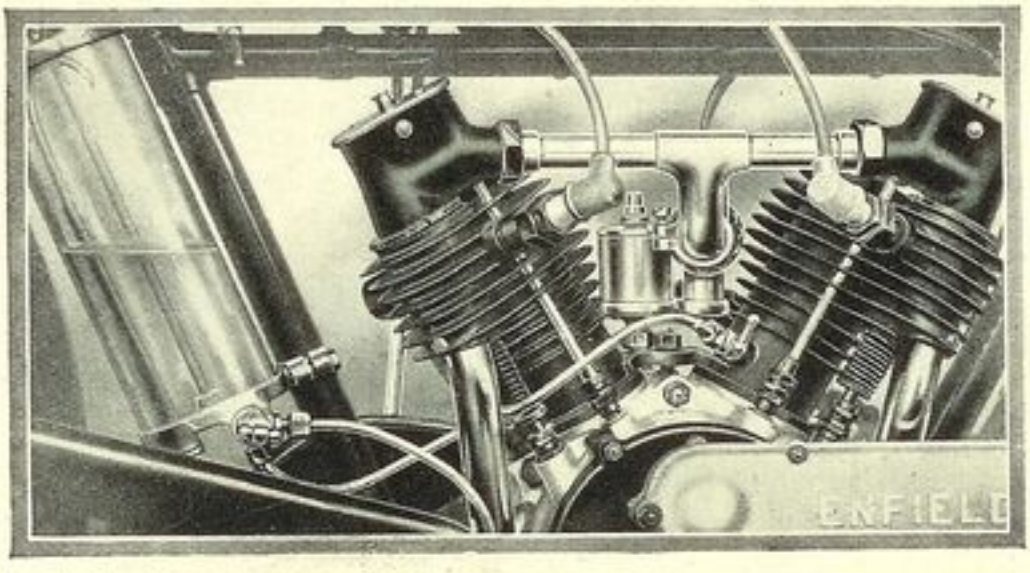
11 As we have previously explained, the thumb screw (B) should be turned on about half a turn for ordinary normal running. A slight variation will provide a larger or smaller supply as may be required. Excessive lubrication is quickly noticeable from a discharge of blue smoke from the exhaust pipe.

Diagram of 3 h.p. Royal Enfield lubricating system, showing the path of the oil during its circulation.



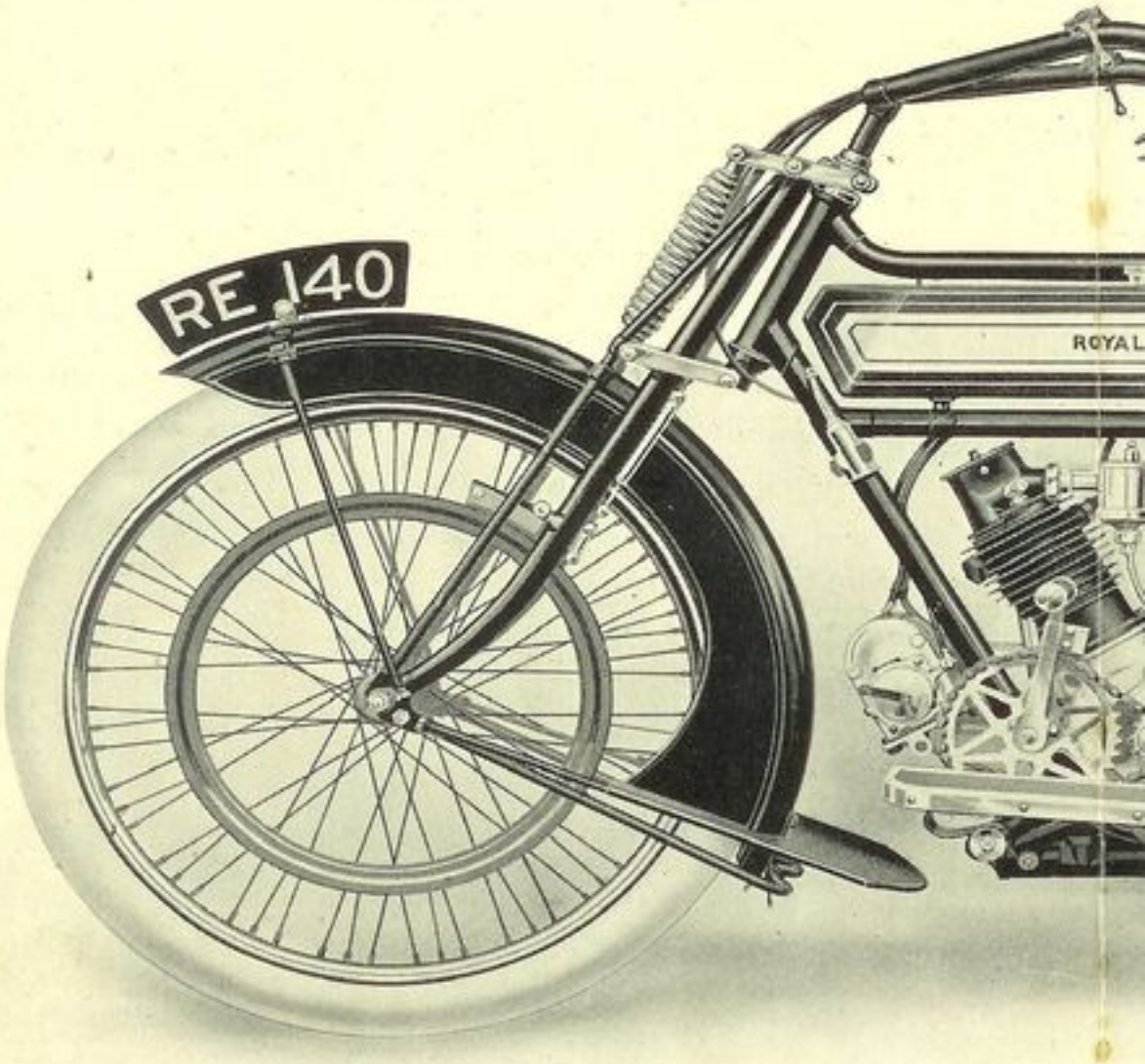
12 To ensure a sufficient supply of oil reaching the front cylinder a separate oil pipe is fitted leading into the cylinder, as shown in the illustration on the opposite page. When the engine is running, the oil tap leading into the front cylinder should be turned *down*, so that

it lies parallel with the oil union and at right angles to the cylinder. When the engine is not running, turn the tap upwards (to the position shown in the illustration), so as to stop the supply of oil, and also turn off the thumb screw B, (see opposite page), so that while the machine is at a standstill no oil will flow along the pipe to the engine.

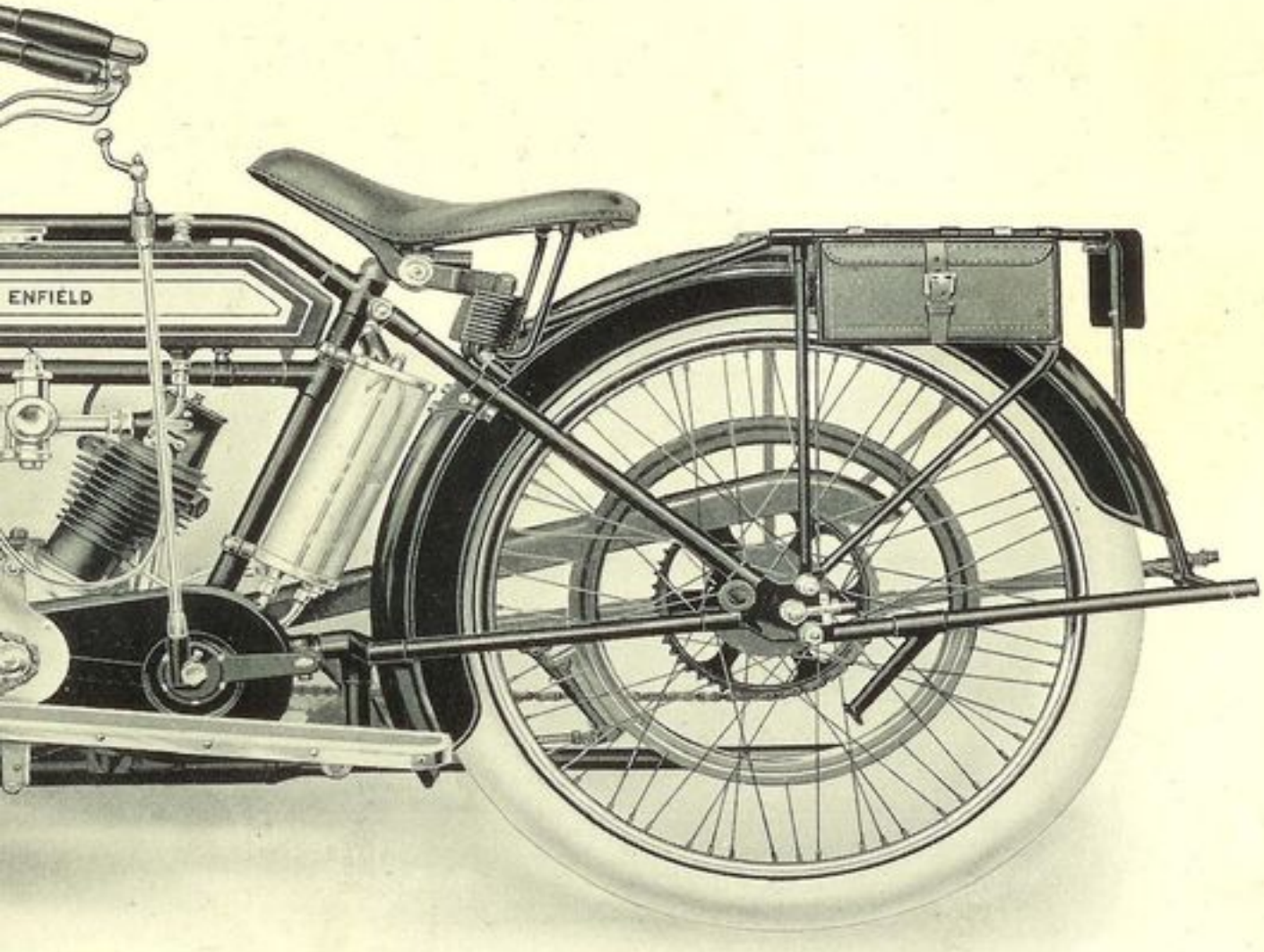


13 The position of the pockets for the sparking plugs on the 3 h.p. Royal Enfield engine makes it almost impossible for a plug to be "sooted up." Sooted plugs are usually the result of over-lubrication; but it must be remembered that a tendency to over-lubrication is better than under-lubrication. After about every 250 miles the drain plug at the bottom of the crank case (see diagram on page 7) should be opened, and the accumulated oil drained out. This is better done at the end of a ride, when the oil inside the crank case is warm and will drain out more readily. After the oil has ceased to drip, be careful to completely close the drain plug. Before starting-up the engine again turn on the oil supply by thumb-screw (B), and wheel the machine a few yards with the low gear engaged and the exhaust lifter raised. This carries a preliminary supply to the engine after the "draining-out" process. It is also advisable to renew the supply of oil in the glass cylinder (A) about every 250 miles, the filler cap (C) being marked on the diagram.

14 We advise the use of Royal Enfield motor oil (see illustration on page 6), or, failing this, Price's Huile de Luxe, as being most suitable for the 3 h.p. Royal Enfield motor cycle. Whatever oil is used, buy it in a sealed can. Do not allow anyone to fill up your oil tank from a large "no name" drum. Some garages are in the



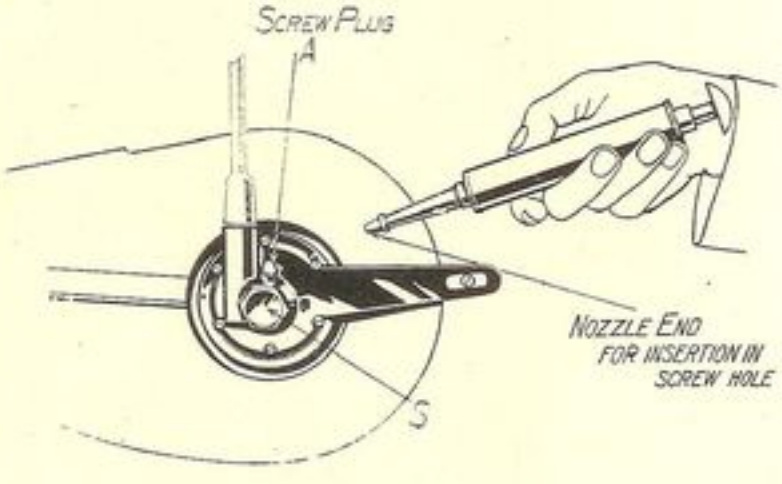
THE 3-H.P. ROYAL ENFI



ELD MOTOR CYCLE (MODEL No. 140).

habit of supplying heavy oils from large casks instead of the best grades of properly-refined motor cycle oils.

15 The two-speed gear should be oiled about every 250 miles. It will be noticed from the illustration below that a small screw plug (A) is inserted just above the cap (S). This plug should be withdrawn by means of a screwdriver. The oil injector (which we supply free with each machine) should be filled with a charge of oil and the nozzle end inserted in the aperture, from where the screw plug (A) has been withdrawn. The plunger should then be slowly pressed forward until all the oil has left the barrel of the injector. Screw the plug (A) home tightly after oiling. The hubs, bars of the spring forks, and other parts of the machine in frictional contact should be lubricated with a very light motor oil, or even a good cycle lubricating oil will be found satisfactory. See diagrams on page 7.



16 The Thomson-Bennett magneto requires an occasional supply of oil through the oil chamber, but this should be special magneto oil. In any case, it should be given very sparingly, and must on no account reach the Contact Breaker. Oil on the platinum points will give instant trouble. (See also paragraph 44.)

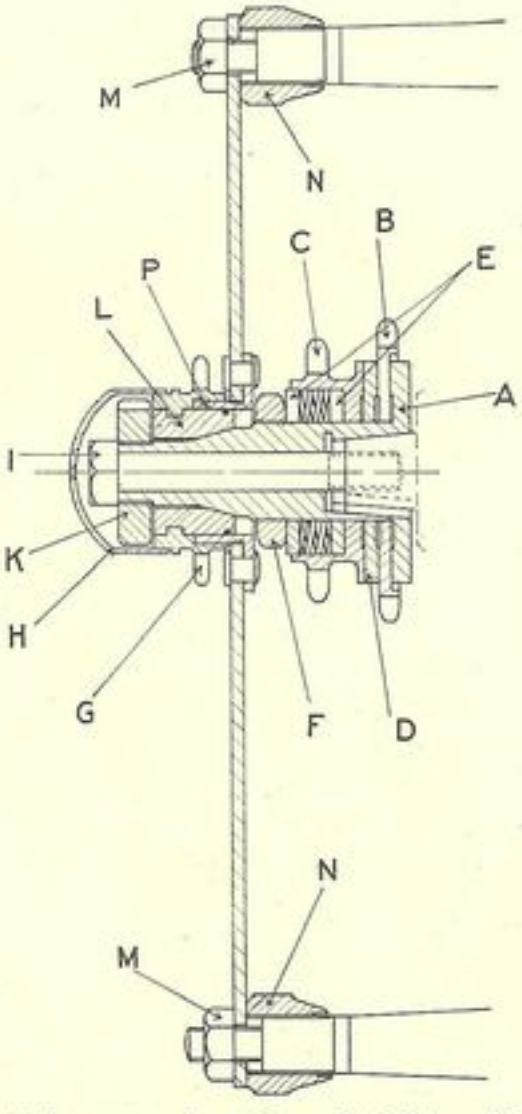
17 The driving and gear chains should be lubricated as directed in the instructions given in paragraph 36 on chain transmission. It is also advisable to run a little chain lubricant along them about every 200 miles. Always use for the chains a lubricant in which graphite is embodied, as graphite has valuable dust-resisting properties.

SLIPPING AND KICK-STARTING CLUTCHES.

18 The Enfield Patent slipping clutch fitted to the engine shaft is clearly shown in the diagram on the opposite page, also the kick-starting clutch. A is a bush mounted on the engine shaft; B and C the high and low gear sprockets respectively; these can revolve on the bush A between the friction washers D and E and the flange of A. The members D, E and G are so arranged that they may slide, but not revolve, on the bush A. F is the adjusting nut. When properly adjusted the sprockets "slip" between the friction washers just

sufficiently to absorb the engine shocks. The only adjustment which may be necessary is an occasional tightening of the nut F. The action of slipping locks this nut in position.

19 The KICK-STARTING CLUTCH is fitted at the extreme end of the engine shaft; its working will be seen from the diagram:—G is a sprocket with a quick acting internal thread; L is a cone with an external thread which fits into G. When the sprocket G is rotated it is held frictionally against the bearing P, and, being unable to move laterally beyond the nut K, the movement forces the internal cone L on to the cone formed on the bush or centre A. (This same bush is referred to in the preceding paragraph.) The greater the pressure applied to the sprocket G, the firmer the grip between the two cones L and A. When pressure is released from the kick-starter the cone L automatically disengages.



20 If the kick-starting clutch should become sluggish and fail to pick up quickly, it should be flushed out with paraffin and afterwards well oiled.

THE PATENT CUSH DRIVE HUB.

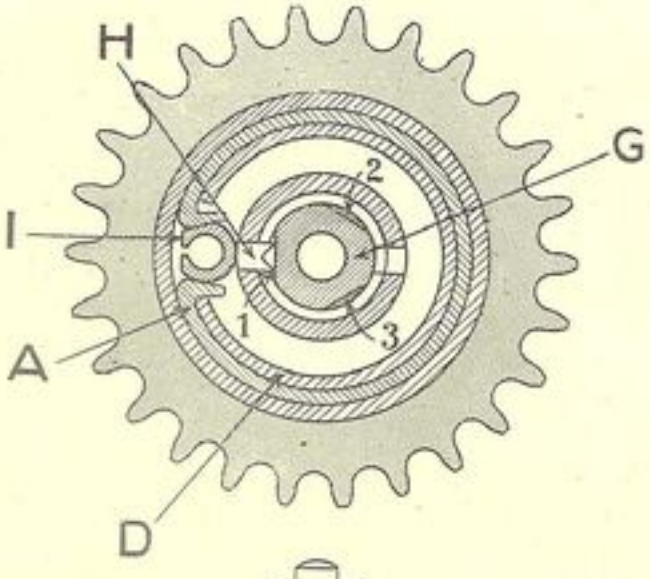
The patent Cush Drive Hub takes up the drive from the countershaft to the rear wheel with great flexibility and smoothness.

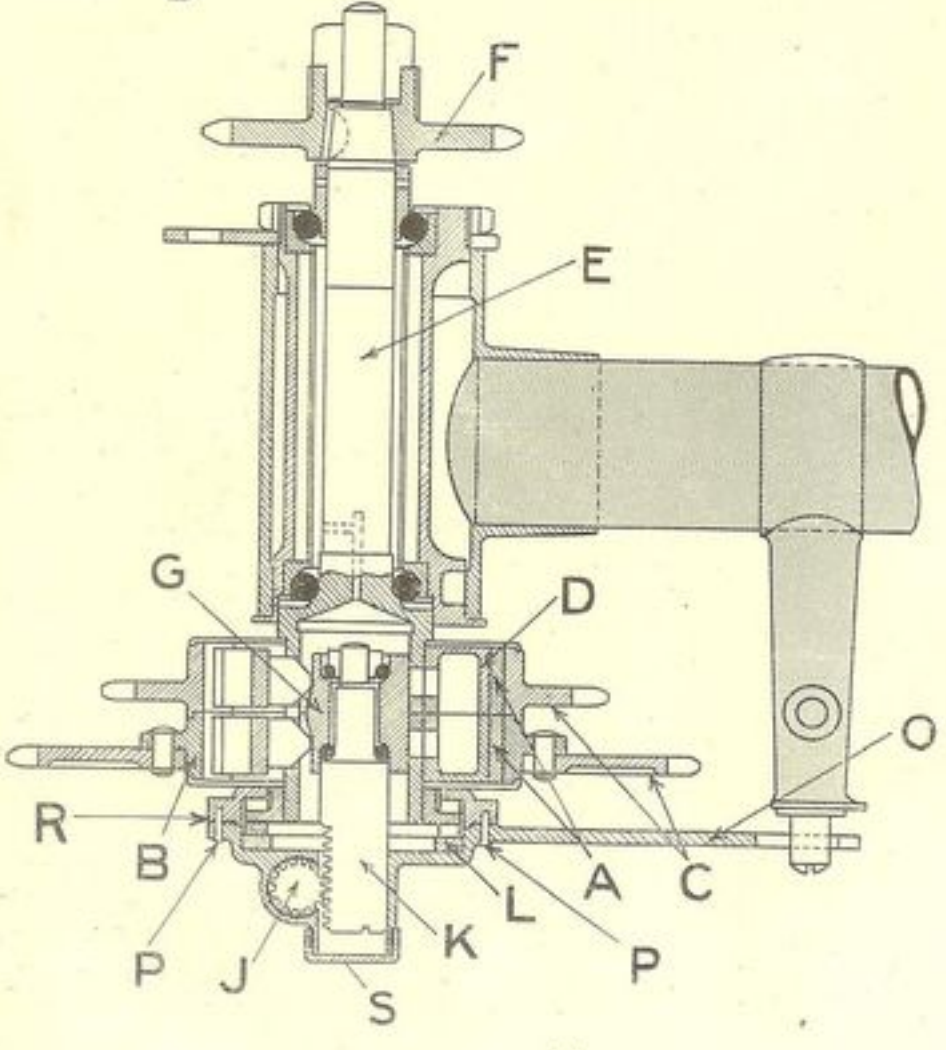
21 Briefly, the driving end of the rear hub is provided with three metal vanes, as is also the inside of the driving sprocket. On each side of the metal vanes in the hub is placed a block of solid rubber, and between these blocks the vanes on the driving sprocket fit. When in position there is alternately a block of rubber and a metal vane, the result being a complete absorption of all shocks transmitted from the countershaft. This Cush Drive Hub is so simple that adjustment is seldom (if ever) necessary. The bearings of the rear wheel are adjusted in precisely the same way as on the wheel of an ordinary bicycle, the adjusting cone being on the left-hand side.

THE ENFIELD PATENT TWO-SPEED AND FREE ENGINE GEAR.

22 The Two-speed Gear is of the expanding clutch type, and is operated by a hand lever placed in a position convenient to the driver's hand. There are no clutch or gear pedals whatever.

The power is transmitted by two roller chains (on the left hand side of the machine) from sprockets on the engine shaft, one for each gear, to a counter-shaft in the bottom bracket, which contains





the two-speed mechanism. The drive from the countershaft to the back wheel is by a roller chain on the right hand side of the machine. Midway between the two gears is the free engine position, which is passed through to engage either gear. The drive through both gears is direct, thus obviating that friction which is created when running through gear wheels. See diagram on opposite page for the constructional parts.

23 Either gear is brought into action by expanding the hardened steel bands A into one of the drums B, also of hardened steel, and to which the chain wheels C are fixed; the change in gear ratio being effected by different sized sprockets on the engine shaft. The expanding bands A are carried on internal drums D; these take the drive and are keyed to the shaft E, which runs on ball bearings. The sprocket F is also keyed to E, and transmits the power through a roller chain to the back wheel.

24 The clutches are engaged by a pair of cams cut in the block G, sliding in either direction, according to which gear is required. The action of sliding the cam is to force one of the pegs H against a split roller I. This forces open the band A, and it engages with B, which is rotated by the engine.

25 The roller I being split allows the clutch to pick up very smoothly. The block or cam G is moved by a rack K and pinion J, operated by a vertical shaft and lever from the top of the frame. Three faces, numbered 1, 2, 3, are cut in G, each being ·005 inches higher than the one before it. Should any wear take place, it can be adjusted by engaging a new cam face, which is but the work of a few minutes. There is no thrust on the bearings when either in gear or free engine; thrust occurs only when the clutches are being engaged or released; then it is only momentary, and is taken up by a thrust bearing L.

26 The chains from the engine to the two-speed gear sprockets are adjusted by an eccentric in the bottom bracket, which carries the spindle E (see paragraph 34). The final driving chain from the countershaft sprocket to the rear wheel is adjusted in the same way as an ordinary bicycle chain, by means of the adjusters on the fork ends

27 The standard gear ratios fitted to the 3 h.p. Royal Enfield are as follows: High Gear, 5·1 to 1; Low Gear, 8·9 to 1.

GEAR ADJUSTMENT.

28 The reliability of the Enfield Patent Two-speed Gear is almost proverbial, and the only adjustment which is likely to be necessary, under ordinary riding conditions, is the engagement of the second or third cam face when the preceding one shows signs of wear. The expanding clutches in the gear are operated by a three-sided cam, the faces cut in the sliding block G and marked 1, 2 and 3 respectively.

29 To engage the second or third cam face, first unscrew the cap S (see diagram on page 12) and the small screws P, which retain the thrust bracket in position. Pull the two-speed gear lever as far as it will go into the low position, and place the flat side of a thin screwdriver between the thrust bracket O and the plate R. If any difficulty arises in doing this, push the gear lever gently back again towards the free engine position until there is sufficient clearance for the screwdriver to be inserted between the bracket O and the plate R.

30 The cam G is in one piece with the rack K, and, if the above instructions have been carefully followed, it can be easily extracted. When the cam is withdrawn, engage the next face in alignment with the actuating pegs. For instance, if, when dismantled, it is found that No. 1 has been engaged, the face marked No. 2 should be engaged in its place. The gear can then be re-assembled by a reversal of the instructions above.

31 If further adjustment is necessary when No 3 cam is in use, it is advisable to fit a slightly longer actuating peg (H on diagram) and re-assemble with No. 1 cam in position. When ordering new actuating peg, state if it is for this purpose.

32 Sometimes when the slipping clutch needs a slight adjustment the trouble is erroneously attributed to the gear. In all cases, before making any adjustment to the two-speed gear, the nut on the end of the slipping clutch should be tightened up, as this will probably remedy the trouble. (See paragraph 18.)

ADJUSTMENT OF GEAR CHAINS.

33 From the remarks given in paragraph 37 on the general care and adjustment of the chain drive, it will be seen that it is very necessary the chains should be run at proper tension, neither too tight nor too slack. The two chains from the engine shaft sprockets to the countershaft sprockets are very simply adjusted by means of the eccentric in the bottom bracket. To take up any stretch which may develop in these chains proceed as follows:

34 First remove the upper half of the cover over the chains so that the tension can be seen carefully. On the end of the bracket eccentric will be found a lock ring and adjusting quadrant. Loosen the lock ring, also the nut which holds the quadrant in position; the eccentric may then be adjusted by means of the quadrant. This adjustment should be very carefully made to ensure neither of the chains being over-tensioned. It is sometimes a difficult matter to get both gear chains adjusted to the same degree of tension, in which case one of the chains must be left with a slight tendency towards slackness. See that the lock ring is properly tightened up after the adjustment has been made.

CHAIN TRANSMISSION.

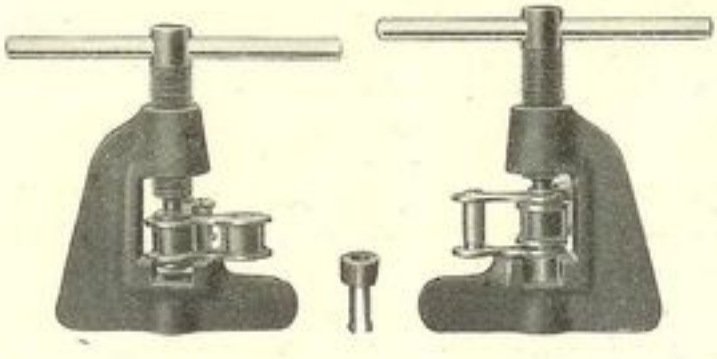
35 The system of chain transmission on all Royal Enfield motor cycles obviates the frequent breakages and adjustments which occur with belt-driven motor cycles, and, providing ordinary attention is given to the chains, they will run thousands of miles without trouble.

36 It is as necessary to lubricate the chains as the engine. One of the best lubricants is "Rangraphine." After about every 800 miles running the driving chain should be taken off the sprockets, washed thoroughly in petrol or paraffin to remove all grit and dirt, and then carefully dried. It should then be laid in the lubricant and warmed, so that it penetrates fully into the links. The chain should be left to cool, and afterwards, before replacing on the sprockets, any excess of lubricant on the outside should be carefully wiped away. It is not so much a question of the lubricant being on the outside of the chain, but what penetrates to the rollers and links that ensures perfect running. The gear chains require the same treatment, say, every 1,000 miles.

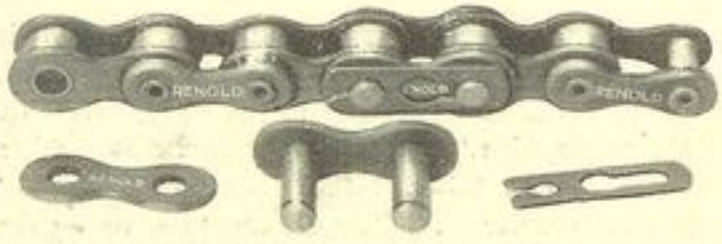
37 The gear chains should be so adjusted that when on the sprockets no part of the chain will lift up from its line more than ½in. With the driving chain a little more latitude is permissible. If the chain is allowed to become too slack, it is apt to "whip," which intensifies the wear and breaks the rollers. If, on the other hand, it is too tight, the pressure on the rollers is too great, and the whole chain is liable to be unduly strained.

38 The driving chain adjustment is effected in exactly the same way as an ordinary bicycle chain. For adjustment of the gear chains see paragraph 34.

39 If it should be necessary at any time to remove a link from either of the chains, the special Hans Renold Stud Extractor should be used. The accompanying illustration shows the method of using the tool. On the left it is shown removing a rivet, for which purpose the spring pin must be removed. The process consists in forcing the rivet head out of the upper side plate by turning the screw. Both rivets in the same link have to be forced out, care being necessary in placing the chain in the extractor, so that the under side plate can fall away between the jaws of the tool. The process of replacing a rivet is carried out by the use of the spring pin shown in the centre of the illustration. This fits between



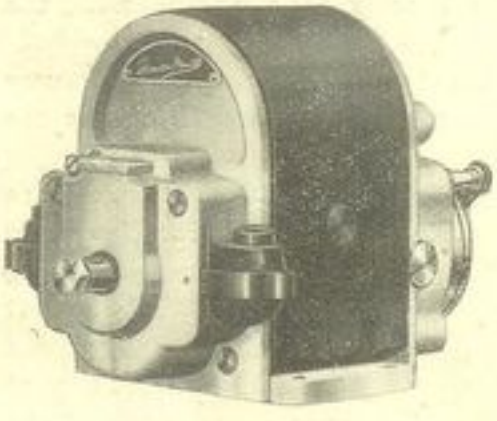
the jaws of the tool, and has a recess (or hole) in its head to take the head of the rivet when forced into the holes in the lower side plate. It must then be rivetted with a light hammer. The quickest method of joining up a chain after an outer link has been removed is to use the spring clip joint shown in the accompanying illustration. When in position this spring clip is quite safe and secure, but it requires careful handling in fitting.

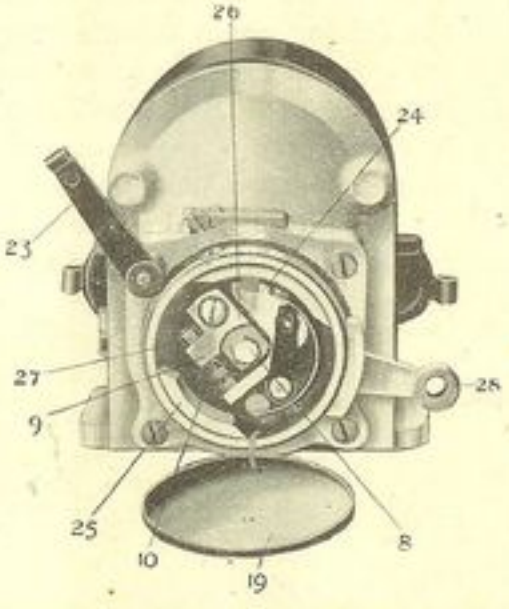


40 It is recommended that a few spares (half-links, spring clips, etc.) and a stud extractor be carried in the tool-bag for emergency repairs.

MAGNETO.

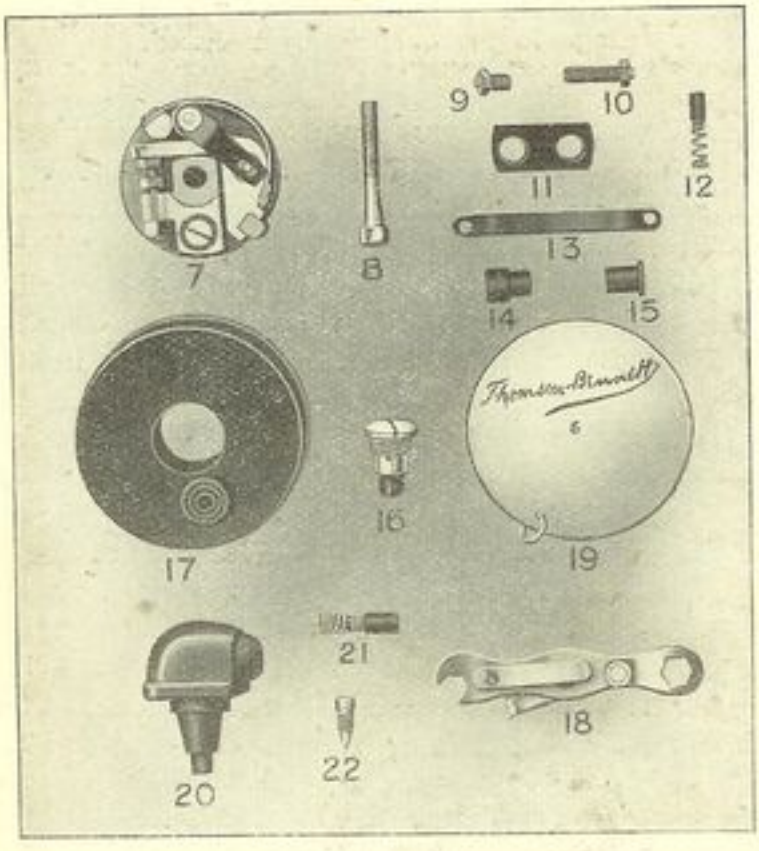
41 The magneto fitted to the 3 h.p. Royal Enfield is the latest type Thomson-Bennett, specially made for twin-cylinder engines. The makers issue a special booklet dealing with this, a copy of which we can supply on request. The following are a few brief particulars and points of interest.





42 The most delicate part of the Magneto is the contact breaker (7), and it is advisable to inspect it from time to time. In order to ascertain if the contact breaker is working correctly, move flat spring (23) aside, remove end cap (19), and see if the fastening screw (8) is well tightened up, also if the steel segments (24 and 25 respectively), as well as the two platinum screws (9 and 10), are securely fastened. Further, see if the contact lifter (26) is resting on the contact piece (27) when the fibre block of the lever has left the steel segments (24 and 25), and whether this lever is deflected again when the fibre block glides over the segments (24 and 25), and when the distance between the platinum contacts has to be 0·4 m/m. This

gap can be regulated by means of the platinum screw (9). If this is in order, and it is desired to examine the platinum screws of the contact breaker, same should be removed complete. For this purpose remove first of all timing lever (28), when the contact breaker will be completely exposed ; now remove screw (8) by means of the magneto spanner, and carefully take out the contact breaker. The platinum contacts (9 and 10) should be quite clean, and if not, any oil or dirt should be removed. If they are worn unevenly — and only then — they should be filed flat by means of a very smooth file, but only the least possible amount of platinum must be taken off. The proper distance of the gap between the platinum points should be 0·5 m/m. A special steel gauge of this thickness is provided on the magneto spanner. If the platinum screws are badly worn so that even filing will not improve them, new screws must be fitted. When replacing the contact breaker care has to be taken that it is in the correct position, which is determined by a key and keyway ; also when replacing the timing lever (28) care must be taken that the gap provided in same comes over the stop screw mounted on the rear end plate.



43 Special attention is required to see that the contact breaker (7) is a free and easy fit, as the pivot of same cannot be lubricated, it being carried in a fibre bush. On new magnetos it may occasionally happen that owing to the swelling of the fibre bush, caused by change of temperature, the contact lever becomes a fixture. This can easily be rectified by slightly enlarging the bore of the fibre bush by means of a suitable reamer.

44 In contrast to the motor, the moving parts of which require very frequent lubrication, the magneto must only be lubricated occasionally. The Thomson-Bennett magneto requires only a few

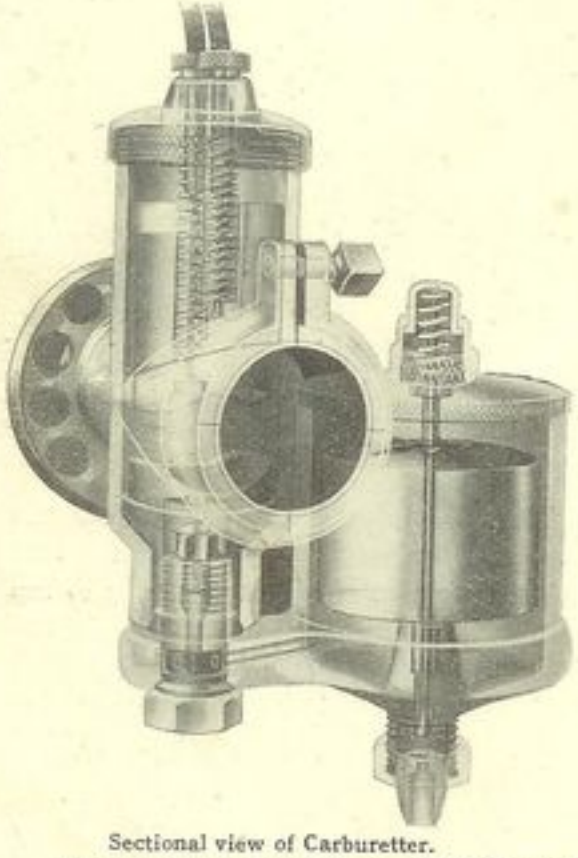
drops of *special magneto oil* once or twice a month, through the special oiling places provided. Ordinary lubricating oil must *not* be used.

45 Special care must be taken that the platinum points of the contact breaker are always free from oil, as otherwise it is impossible to make a good contact, and the production of the current from the magneto is considerably reduced.

CARBURETTER.

46 The Carburetter is the well-known AMAC multiple jet and variable choke type. Full particulars of this are given in the booklet published by the makers, copy of which we can supply on application.

47 Briefly, the quantity of petrol supplied to the engine is regulated by the single nozzle in the float chamber, after which the petrol is sprayed into the mixing chamber itself through a series of small holes, which give improved vapourisation. The petrol level is just below the top of the multiple sprayer, and the single nozzle is always submerged in petrol. A special testing nozzle is supplied for use if at any time it should be necessary to test the level of the float chamber. The extra air and throttle valves shut off the mixture gradually but perfectly. The air valve is really a variable choke jet; as it closes it gradually reduces the area just above the sprayer, so that the air at this point always has the correct velocity necessary for the perfect atomisation of the petrol. For ordinary working the carburetter is practically semi-automatic, and there are only three positions for the air lever—namely, fully closed when starting up, slightly open when running slowly, and fully open at speed.



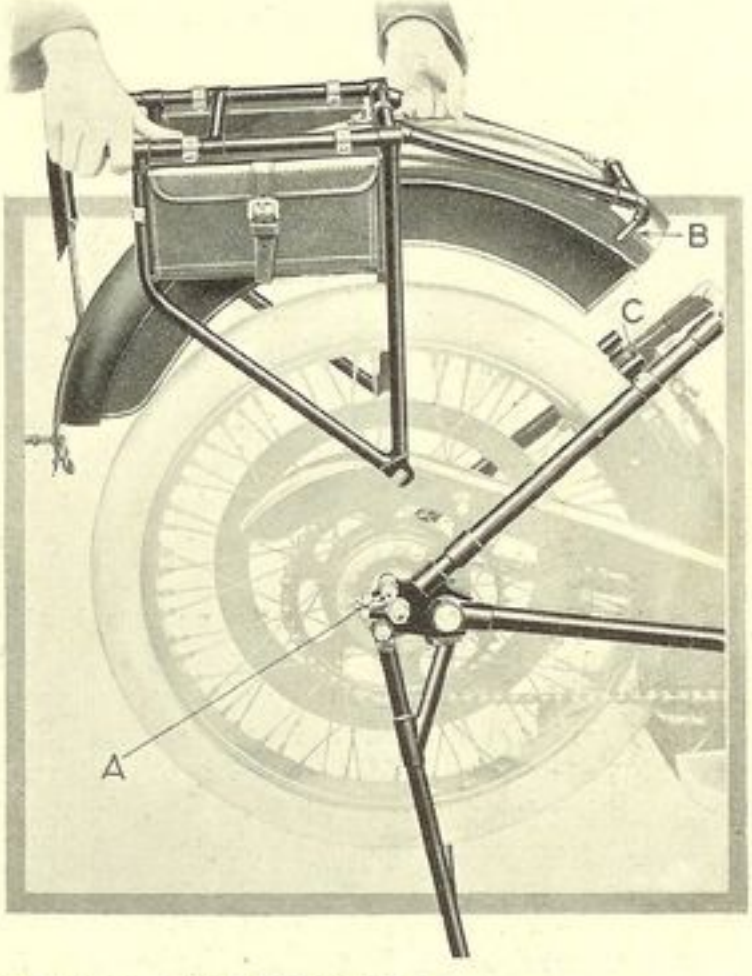
Sectional view of Carburetter.

THE DETACHABLE REAR MUDGUARD.

48 To admit of easy access to the rear tyre and wheel, we have designed an entirely new type of mudguard. It is absolutely detachable, as the illustration shows, the rear half, together with the carrier, being removable in a few seconds. This leaves practically two-thirds of the tyre exposed and easily "get-at-able."

49 To remove, first slack the nut A on each side of the back fork plate. A few turns will be sufficient to release the slotted carrier stay ends. The prongs B are fitted in socketed lugs C, the latter being brazed on to the back stays, and thus forming an integral part of the motor cycle frame. When the nuts A have been slackened the carrier and mudguard will lift quite clear as shown.

50 When replacing, the ends of the prongs (B) should be inserted just in the sockets and the slotted ends of the carrier stays placed in position over the studs. Push the prongs firmly down into the sockets so that the two portions of the mudguard fit up closely. The nuts (A) should then be carefully tightened up.



51 When in position, this carrier and guard are both very firm and secure. The rapidity with which it can be detached is a very great advantage to the motor cyclist, especially when held up on the road with a puncture in the rear tyre.

DISMANTLING CYLINDERS.

52 First of all remove the sparking plugs, carburetter and exhaust pipe unions—the carburetter can be removed with the cables complete. Unscrew the nuts and clamps which hold down each cylinder on the crank case. Possibly the cylinder will not lift straight off, and it is advisable to carefully work it backwards and forwards until it leaves the piston. The cylinder will come off more easily when the piston is at its lowest point. Each cylinder is lifted off in precisely the same way, and after they have been removed the inside of each piston should be filled with soft rag to prevent damage by the connecting rod. If carbon deposit is being scraped off the piston, it is also advisable to cover the top of the crank case with rag in order to prevent any of the deposit falling inside. There is no difficulty in

dismantling the cylinders of the 3 h.p. Royal Enfield, providing it is done very carefully, and that before removing any part one makes sure of the way it is attached, so that replacement may be properly done.

Fitting New Valve.

53 Remove petrol pipe and induction pipes, and unscrew the castellated ring at the bottom of the inlet dome (right hand thread). The removal of this ring will bring the dome away with it, and the inlet valve and its housing may then be lifted clear. In replacing an inlet valve, care should be taken to see that the small tappet working directly over the valve is in its proper position. We recommend greasing it to hold it in its guide whilst replacing the dome.

54 When the inlet valve has been removed, the exhaust valve is easily accessible. A new valve can be fitted by compressing the exhaust valve spring, and removing the flat cotter pin underneath, when the valve can be easily pushed up and withdrawn through the aperture. The new valve is then fitted by a reversal of this process.

Grinding-in Valves.

55 Frequently, when an engine shows signs of gradually losing power, the cause is due to the accumulation of carbon deposit, and the necessity for grinding-in the valves. As a general thing, the exhaust valve requires grinding-in sooner than the inlet valve. Remove the valve and spring, as explained above, scrape off any carbon deposit adhering to the valve, rub a little emery paste and oil, or flour emery, on the valve, place the valve back in position, and insert a screwdriver in the slot provided on the head of the valve. The valve should then be gently rotated on its seating, occasionally lifting it up and turning round to prevent rings or "scores" forming. The operation should be continued until both the surface of the valve and its seating are quite smooth and bright. There are several valve grinding appliances on the market, but these are more for workshop use, and the amateur will find the screwdriver process quite satisfactory.

Removing Carbon Deposit.

56 When an engine has been in use some considerable time, carbon deposit is bound to form on the piston and cylinder head. This is due usually to the road dust drawn in by suction to the engine through the air port in the carburetter and mixing with the lubricating oil. Using a cheap grade of oil will lead to carbonisation very quickly. The cylinders are dismantled exactly as described in paragraph 52 and the carbon deposit scraped off the piston with an old knife or a special scraper. For removing the deposit off the cylinder head a long-handled screwdriver is a most useful tool, or a long square file which has been softened and the end turned up makes an efficient scraper. Removing carbon deposit is a process which

requires a considerable amount of time and patience, as the deposit is bound to have set very hard.

57 It will usually be found that the piston ring grooves need to be cleaned out also. Piston rings are extremely brittle, and must be removed with great care. The best plan is to get three or four strips of thin tin, each about half an inch wide. The ring should be removed gently from its groove, one of the pieces of tin inserted underneath it, then pull the ring away a little farther round, insert another piece and so on. When the ring is lifted right out, it is an easy matter to work it up and over the top of the piston. The bottom ring should be removed first, and replaced last, the same process but reversed being used to get the rings back again into their grooves. Special pliers are also supplied for the purpose. The carbon deposit can be cleaned out of the grooves without removing the piston, although it is advisable, as mentioned elsewhere, to place a large cloth round the connecting rod, and also inside the top of the crank case so that no deposit or other foreign matter enters it. After the deposit has been scraped off, the cylinder head, piston and piston ring grooves may be cleaned with a stiff-bristled brush dipped in paraffin. If paraffin is used, wipe it all away before replacing cylinders.

Taking up Stretch in Exhaust Lifter Cable.

58 The cable operating the exhaust valve lifter is sometimes found to stretch in use, especially if the machine has been controlled by the exhaust valve instead of by the throttle. The adjustment will be found at the crank case end of the cable. There are two nuts—the top one is the adjustment nut, the bottom the lock nut; the latter should be slacked before the adjustment is made and afterwards tightened up securely.

Valve Lifter Disorganised.

59 If any breakage should occur in the valve lifter mechanism, which makes it impossible to raise the exhaust valves by the lever on the handlebar, the machine may be started up by opening the compression taps. As soon as there is the slightest sign of an explosion in the cylinders, the taps should be closed.

Adjustment of Brakes.

60 We would impress upon all motor cyclists the advisability of keeping their brakes properly adjusted so as to be always ready for use in case of emergency. The adjustment of each brake will be readily seen and needs no lengthy description.

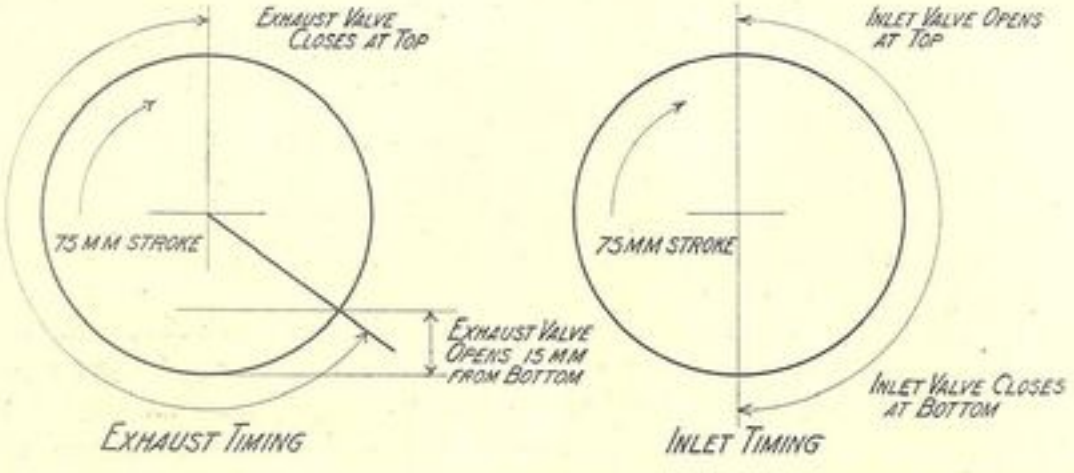
Lubricating Cycle Bearings.

61 It is highly important that the cycle parts should be regularly lubricated, as directed in the diagrams on page 7. A good brand of cycle lubricating oil is quite satisfactory for this purpose. The steering

head of the motor cycle should be kept properly adjusted, and if there is any play or shake in it (which may be detected by firmly grasping the handlebar and pulling it upwards), the bolt through the handlebar clip should be loosened and the adjusting cone turned until the shake is taken up, afterwards tightening the bolt again. It is not advisable to tighten up the cone until the steering is at all stiff.

VALVE TIMING.

62 It is sometimes difficult with a twin-cylinder engine to get the timing exactly the same in both cylinders, especially if the engine has been in use for any length of time. The accompanying diagram shows



the valve timing recommended for the 3 h.p. Royal Enfield engine, and when re-timing one of these engines, this diagram should be followed as closely as possible.

STOPPAGES—THEIR PROBABLE CAUSE.

63 Whenever the machine stops (either suddenly or gradually), and there is no noise emanating from the engine likely to give any clue to the cause, the first thing it is advisable to do is to see that there is a supply of petrol. Even experienced riders run out of petrol. If the petrol supply has given out, and it is impossible to obtain any, endeavour to get a supply of paraffin. By lifting the front wheel of the machine what petrol is left in the tank will flow to the carburetter, and be sufficient to start the machine again, whilst when it is warmed up the paraffin will enable one to reach the nearest supply of petrol. When running on paraffin it will probably be found necessary to completely close the extra air lever, and in any case no high rate of speed should be attempted.

64 If there is plenty of petrol in the tank, a rapid survey of the whole machine should be made in conjunction with the Fault-Finding Table on page 29. Some probable causes of stoppage are given on next page.

Sooted Plug.

Symptoms—Misfiring, that is, explosions in one or both cylinders not occurring regularly.

65 It is usually possible to discover the plug which is at fault by the heat of the cylinders, the one in which the misfiring has taken place being perceptibly cooler than the other. Take out the sparking plug with the adjustable spanner provided in the tool-kit, carefully clean the plug, either with paper or a cloth and a small quantity of petrol. When a plug is very badly "oiled up," some riders adopt the practice of filling the plug with a small quantity of petrol and then burning it out. See that the space between the central electrode and the outer points is right; there should be just sufficient space between them to take the thickness of an average visiting card.

Petrol not reaching Carburetter.

Symptoms.—Misfiring; engine stopping frequently, then starting again after the machine has stood for a few minutes.

66 This may be due to the petrol supply having run out as mentioned in paragraph 63, or to some obstruction in the pipe. To take off the petrol pipe, unscrew the union nuts at each end of the pipe, and pass a piece of wire down it, or if it is a small obstruction, it may be blown clear with the mouth. If there is an ample supply of petrol in the tank, and the carburetter floods readily, there may be some obstruction in the channel leading from the float chamber to the nozzle or jet. It may also be due to a choked jet.

Choked Carburetter Jet.

Symptoms.—Easily tested as when needle valve on the top of float chamber is tickled violently, the petrol will not drip from mixing chamber, although it will do so from the float chamber.

67 Take out the nozzle or jet, clean the aperture very carefully so as not to enlarge the hole. A hair bristle or something similar is the safest thing to use, if this is obtainable. If not, the screw pin from the oil-can will answer the purpose if used carefully.

Air Lock in Petrol Supply.

Symptoms.—Engine usually stops after a few weak explosions.

68 This is caused by the air vent in the petrol filler cap being stopped up, so that as the petrol is drained off from the tank a vacuum is formed. Clean the air vent in the filler cap and blow through the filler hole.

Water in Carburetter or Tank.

Symptoms.—If only a little water has reached the petrol, the engine is subject to occasional misfiring, but if there is much water present, there will be continual misfiring and explosions in the silencer.

69 If it is due to rain, it is no use taking down the carburetter in the open unless the rain has stopped, as more water will enter by doing so. In some cases it is possible, if the water has only entered the carburetter, to turn off the petrol and run the engine "free" until the carburetter is emptied. If the water has entered the petrol tank, there is nothing else to be done but to empty it and replace with a fresh supply of petrol. It is possible to test the presence of water in petrol by pouring a little of the mixture into the hand, when the petrol will evaporate and the water remain.

Seized Engine Bearings.

Symptoms.—Chiefly preceded by engine "knocks," ultimately engine stopping, and on attempting to turn is stiff and probably immovable.

70 In cases of piston seizures, the trouble may be caused by the piston warping, although this is very rare. Ninety-nine per cent. of all engine seizures are due to under-lubrication. The obvious remedy is to increase the supply of oil, but if the seizure is a bad one, inject a copious supply of paraffin through the plug holes, and endeavour to turn the engine round either by means of the kick-starter or by pushing the machine with the exhaust lifter raised. After it has been loosened, drain out the paraffin through the drain tap in the bottom of the crank case. After this treatment the trouble should be remedied, although it is advisable in most cases of seizure to have the engine dismantled as soon as possible in order to ascertain if any permanent trouble has resulted. If instructions on lubricating are carefully followed, engine seizures will never be experienced.

Over-Heating.

Symptoms.—Engine becomes noticeably hot, runs badly and "knocks" even on slight gradients.

71 Over-heating may be due to a variety of causes. In the case of a new machine it will usually be caused by under-lubrication, and is a preliminary to an engine seizure. If an engine has been driven "all out" for a considerable time this may account for it, and the remedy is to either stop and cool down, or drive the engine slowly for a few miles, giving it all the extra air it will take. Driving on too rich a mixture is another cause—the remedy for which is obvious. In the case of an engine which has been running several thousand miles, the trouble may be due to carbon deposit. See paragraph 56.

Ignition Troubles.

Symptoms.—No spark at plug or terminal.

72 Fortunately, present-day magnetos are so uniformly reliable that trouble is seldom experienced with them. Occasionally after a long

ride in heavy rain short circuiting may be caused by the plugs or magneto terminals getting wet. Similarly oil or grease on the magneto terminals will lead to the same effect. The carbon brushes may also get dirty, which will cause stoppage of the machine. Carbon brushes should be handled very gently, and their paths should be cleaned by rolling a piece of soft rag sufficiently small in size to go through the carbon brush aperture. Dip the end in petrol and insert it, meanwhile rotating the magneto. It is advisable, before attempting to remedy any trouble arising from the magneto, to carefully study the description given on pages 18 and 19. The magneto should not be dismantled except by someone thoroughly acquainted with it.

TYRE REPAIRS.

73 When a tyre deflates, never take it for granted that the tube is punctured. Lift the machine on to the stand and carefully examine the tread of the tyre for any object which may have entered. If nothing can be found the leakage may be due to the valve, as the lock nut is apt to work loose if it has not been tightly screwed up.

74 If a puncture is discovered, it is sometimes necessary to remove the cover only for nine or ten inches on each side of the puncture, this often being sufficient to allow the tube to be withdrawn. In removing the cover from the rim be careful to lift that side on which are moulded the words: "detach this side first."

75 One of the most important things in puncture repairing is to thoroughly clean the surface of the tube round the puncture so as to give the repair patch a clean surface on which to adhere. Petrol applied with a piece of rag is one of the best things that can be used for cleaning. After the surface of the tube and the patch itself has been treated with solution, allow plenty of time to elapse before applying one to the other. Patches put on whilst the solution is too damp do not adhere properly. It is also advisable to allow several minutes to elapse after the patch appears to have adhered before replacing the tube in the cover.

76 Carelessness in replacing the tube will often cause this to be "nipped" between the rim and the cover when the latter is being pulled back into the bead. The best remedy is to pump a little air into the tube and push it well into the centre of the rim before the bead of the cover is firmly bedded down.

77 If the cover is badly cut or gashed a satisfactory and permanent repair can be effected only by having the cover vulcanised. It is advisable to have this done at the earliest opportunity rather than to continue riding with an outside "gaiter"; the latter is quite useful in an emergency, but quickly wears down and is liable to "creep" and re-expose the gash.

GENERAL HINTS & OBSERVATIONS IN CONNECTION WITH THE 3 H.P. ROYAL ENFIELD MOTOR CYCLE.

Be economical in regard to petrol. Always give the carburetter as much air as it will take without diminishing the speed of the machine. Control the machine by the throttle lever, and do not lift the exhaust valve except when necessary.

If power diminishes, or the engine shows marked tendencies to over-heat, this is probably due to the presence of carbon deposit. Usually it is advisable to take off the cylinders and thoroughly clean out the deposit after every 1,500 to 2,000 miles.

Do not run the engine with the gear lever in the "free engine" (or neutral) position any longer than necessary. When changing from low gear to high, or *vice versa*, move the lever sharply across.

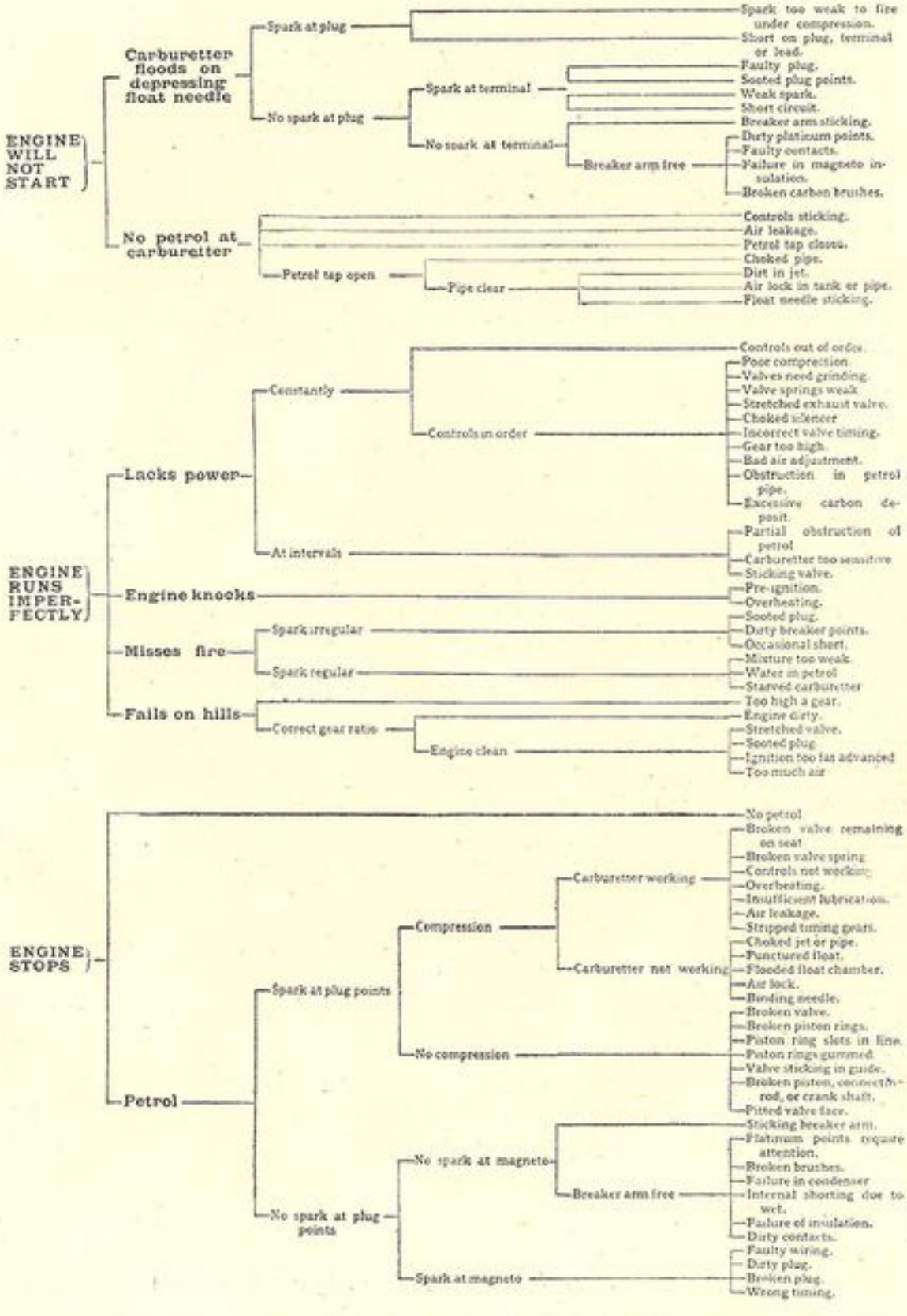
When filling up the petrol tank pour the petrol through gauze to drain out any grit and dirt. Use first quality petrol and not heavy spirit.

The importance of using good lubricating oil cannot be too strongly insisted upon. Cheap oils quickly cause carbonisation and excessive wear on the moving parts.

Do not run the machine with the tyres insufficiently inflated. The back tyre should be kept quite hard, and the front tyre inflated to slightly less pressure. As there is less weight on the front wheel a very hard front tyre is apt to set up excessive vibration, and this tends to lessen the steering head.

Oil the parts referred to on the diagrams on page 7. The bearings, etc., of the motor cycle require lubrication just as much as the engine, and the oiling should be done in accordance with the instructions given on the diagrams.

FAULT-FINDING TABLE.



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