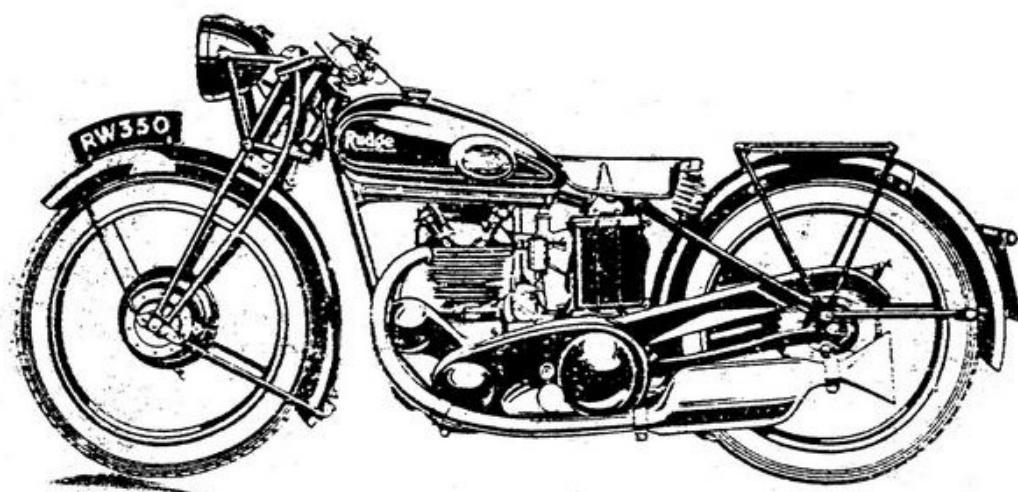


How to Take Care
of your

Rudge

REG. TRADE MARK.



Rudge 350 c.c. Model

Rudge - Whitworth Ltd.
Coventry

Telegrams :
Rudge, Coventry

Telephone ;
Coventry 4001

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RUDGE-WHITWORTH LIMITED

IN introducing this latest edition of Rudge Wrinkles, it is our aim to give, in a condensed form, all the information which a rider should require to keep his Rudge in good tune. Those who wish for further information on the subjects of Ignition and Carburation should refer to the special booklets dealing with these subjects, issued by the makers, which are sent out with each machine.

CHAPTER I.

RUNNING INSTRUCTIONS.

THE NEW MACHINE.

The Rudge is sent out from the Factory without oil in the gearbox and with a dry battery.

Fill the gearbox by unscrewing the filling plug (N, Fig. 5) and pouring in as much Castrol XXL oil as possible with the machine vertical. Remove the battery and have this charged by a thoroughly reliable electrician. The retailer, however, should do, and generally does, all this.

See that the petrol tank is filled with No. 1 spirit, or in the case of the 'Ulster' with Benzol mixture or Ethyl, and that the oil tank on the right side of the seat tube is filled with Castrol XXL oil.

In the case of the 250 c.c. the oil tank filler is on the right hand side of the saddle tank.

Castrol R oil should be used in the seat tube oil tank of the Dirt Track and T.T. Replica machines for racing.

Before actually starting up, it is as well to sit on the machine and accustom yourself to the controls (Fig. 1). The throttle and air levers (or twist grips when fitted) on the right handlebar open inwards, and the ignition control on the left handlebar also advances inwards. Inverted levers on the right and left bars operate the front brake and exhaust lifter respectively, while the clutch is controlled by an external lever on the left bar.

There remains the brake pedal near the right footrest, which applies both front and rear brakes in just the right proportion for effective braking, and the gear lever on the right of the tank, and the decompressor at the front of the timing cover.

As soon as you can find all these instinctively you may start the engine.

Turn on the petrol, flood the carburetter slightly, close the air lever, open the throttle one-fifth, open the decompressor (see page 15) by rotating outwards and kick, (In the case of the 250 c.c. machine no decompressor is fitted but it will be necessary to switch on by rotating the ignition switch clockwise, and using the exhaust lifter—left hand inverted lever). As soon as the engine starts release the decompressor by pressing the lever downwards into a vertical position. If the engine is warm do not close the air lever. If the engine is hard to start try closing the air, opening the throttle three-quarters and advancing the ignition.

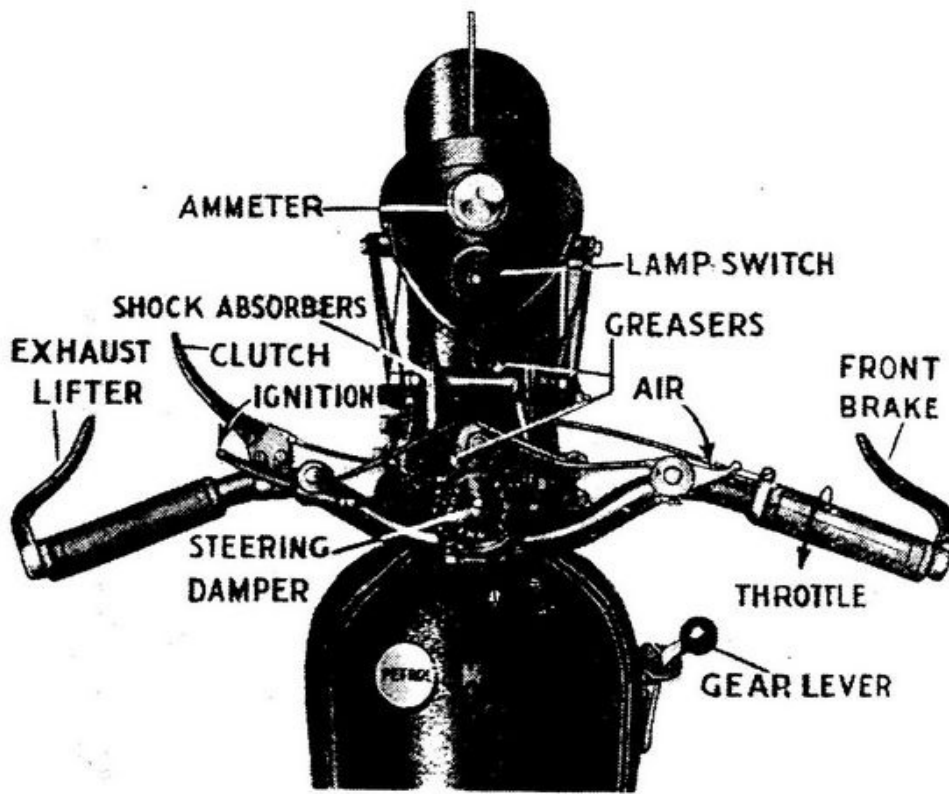


FIG. 1. THE CONTROLS.

With the engine running and the machine on the stand, practice controlling the speed, changing gear, operating the clutch and applying the brakes, so that you will feel perfectly at home when you take the road. Do not, however, run the engine with the machine stationary for more than a few minutes at a time.

AS THE 250 c.c. IS FITTED WITH COIL IGNITION IT IS NECESSARY, WHEN THE ENGINE IS STATIONARY, THAT THE SWITCH IS IN THE "OFF" POSITION OR THE BATTERY WILL DISCHARGE ITSELF.

GETTING AWAY. The Rudge clutch is delightfully sweet, so there is no excuse for a jerky and untidy get-away. Start the engine, disengage the clutch by depressing the handlebar lever (Fig. 1) and push the gear lever down into first or bottom gear position. Now let in the clutch so gently that you can hardly feel when the machine starts to move. If the machine starts with a jerk you have let in the clutch too quickly which is by no means good for the transmission.

CHANGING GEAR. Gear changing on a Rudge is a very simple matter, for the driver is provided with a gate (Fig. 17) which enables him to "get" his gears with absolute certainty when making full throttle changes, or when travelling at high speeds over bumpy ground. This gate provides a positive stop for each gear, thus preventing any risk of overshooting the desired position when changing in a hurry. The gate does not locate the gears, but simply stops the gear lever at the desired position. Remember to re-adjust the gear control rod whenever you move the gearbox to adjust the primary chain.

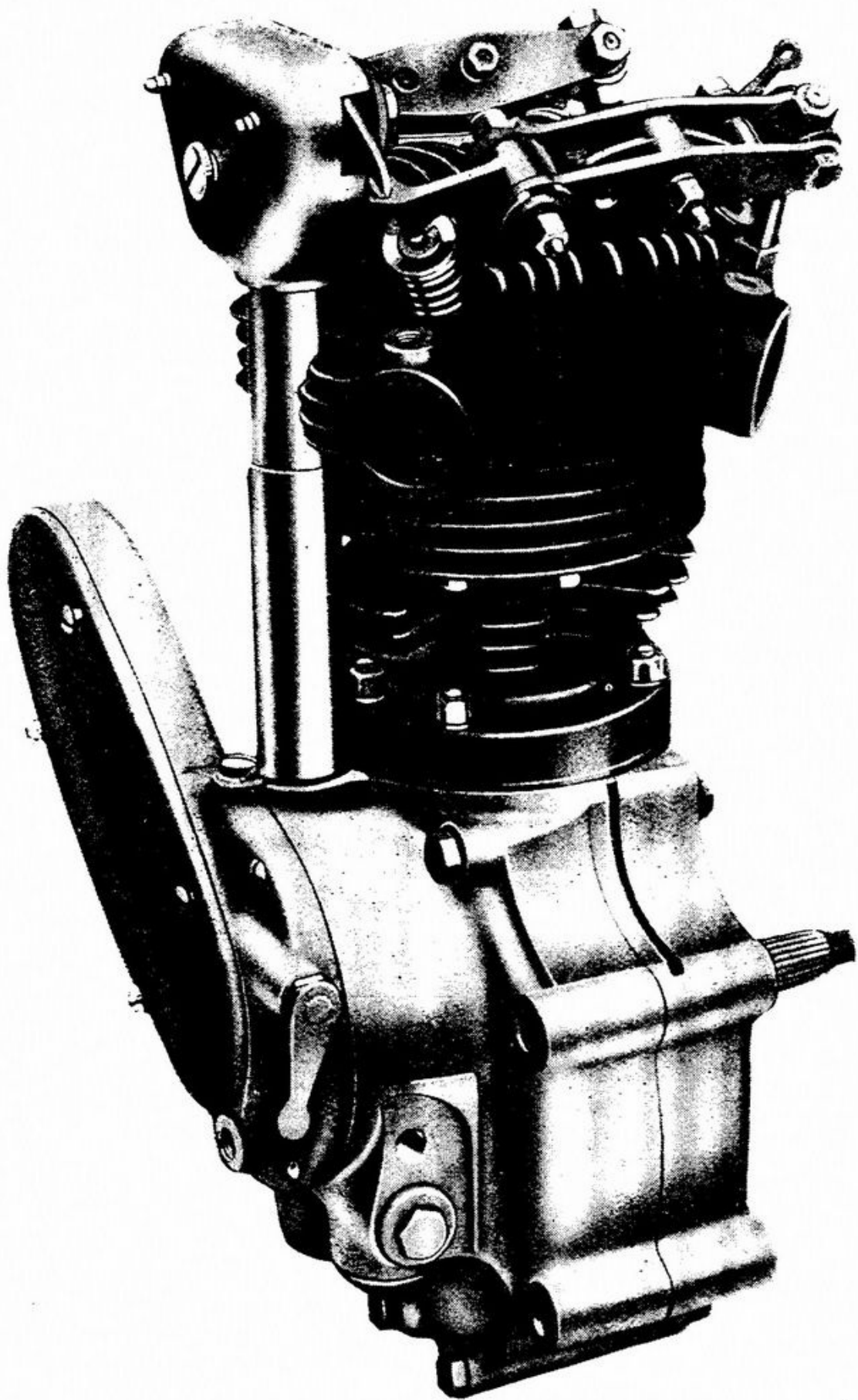


FIG. 2. THE 350 c.c. ENGINE.

TO CHANGE UP. Speed up the engine on the lower gear, throttle down, release the clutch slightly and move the lever smartly into the next position; then open the throttle again.

TO CHANGE DOWN. Throttle down a little, declutch and, as the engine starts to speed up, slip the gear lever to the next lower position.

Remember:—Shut nearly off when changing up, but only partly off when changing down.

CHANGING DOWN ON THE LEVEL. Apply the brakes and, with the clutch disengaged, give the engine time to speed up before moving the gear lever. To slam into a lower gear without speeding up the engine will slow the machine very quickly in an emergency but is very bad driving and imparts appalling stresses on the transmission. Anyway, with Rudge brakes it is quite unnecessary.

BRAKING. The Rudge internal expanding brakes are both exceptionally sweet and immensely powerful. They give perfect control but, like everything else, should not be misused if economy is to be considered. It may look very spectacular to dash up to a corner, pull up in an incredibly short time and shoot away again but such driving makes for a very heavy tyre bill. With the coupled braking system the risk of skidding on greasy roads is practically eliminated since the brakes are automatically applied in exactly the right proportions.

RUNNING IN. Do not exceed $\frac{1}{3}$ throttle for 500 miles, and $\frac{1}{2}$ throttle until 1,000 miles have been covered. After 500 miles it is permissible to test the speed by opening the throttle wide for a few seconds at a time, but for sustained work the throttle openings given should not be exceeded. Since the 'Ulster' model will very comfortably exceed 50 m.p.h. on $\frac{1}{2}$ throttle, the 'running in' period need not be very boring.

GOOD AND BAD DRIVING. It has been said that the test of a perfect driver is that nobody notices him and there is a lot of truth in it.

To become a perfect driver:—

Obey the rule of the road to the letter, and

Enter a main road dead slow, but

Blow your horn at a cross road and slow down and

Always imagine that the road round the corner is completely blocked, so

Respect all danger signals, and

DON'T cut in

DON'T assume that everybody else will do the same.

DON'T forget that oncoming traffic has right of way over overtaking vehicles.

DON'T overtake on a corner.

DON'T forget to signal yourself.

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Treat your machine gently	DON'T force an unwilling engine.
Drive on the throttle	DON'T drive on the brakes.
Cultivate neat gear changing ...	DON'T 'hang on top'.
Take a pride in slow running ...	DON'T race an engine unnecessarily.

Finally, DON'T remove the innards from the silencers and 'blind' up and down residential roads, for the Rudge, when driven properly, is as gentlemanly a machine as you could wish, but, and here is a tip worth untold gold—DO remember that a policeman is always right and that an ounce of tact will save a pound of fine.

ROUTINE ADJUSTMENT.

A certain number of points require regular checking at periods of between 200 and 300 miles to verify whether adjustment is needed. Detailed instructions are given under maintenance.

TAPPETS.

While the engine is cold ascertain whether there is any appreciable play between the tappets and overhead rockers by taking hold of the ends of the rockers and pushing them alternately up and down (Fig. 7). For correct adjustment the inlet push rod should be free to rotate but without appreciable up and down movement, while in the case of the exhaust valve allow .002in. clearance between rocker and valve stem. When the engine gets hot the clearance increases. It is essential to adjust when cold.

CHAINS.

The adjustment of the chains is another item which should be regularly inspected. To begin with, place the machine on the stand and turn the engine round a little at a time by means of the kick starter, feeling the front chain from time to time by inserting a finger round the back of the chain case. Needless to say, it is highly inadvisable to insert one's finger unless the engine is actually stationary. If the chain has seen much service it will be tighter at some points than at others, so discover the tightest point and adjust until there is about ¼in. of free up and down movement midway between the sprockets.

An inspection hole is provided in the back of the chain case of the 'Ulster' model.

In the same way rotate the back wheel with the gears in neutral and ascertain whether there is about ½in. of free up and down movement. Remember that it is better to have the chains too slack than too tight, but do not allow more than 2in. of up and down movement in the case of the rear, and 1in. in that of the front chain. This is an extreme allowance and it is preferable to keep as near the first mentioned adjustment as possible.

The dynamo drive is tightened by loosening the strap bolts and in the case of the 500 c.c. and 350 c.c. machines when looking at the machine from the right hand side rotating the dynamo clockwise and in the case of the 250 c.c. machine rotating the dynamo anti-clockwise.

The magneto chain is adjusted by slackening the nuts (A, Fig. 3) on the right hand side of the machine just below the magneto and rocking the table until the correct adjustment is obtained.

BRAKES.

The brake mechanism too should receive frequent inspection, although with the internal expanding Rudge brakes it is unlikely that, when once correctly set and bedded down, they will need adjustment more than once or twice in a season. Still, your life depends on your brakes so do not neglect them.

STEERING HEAD.

It is also advisable from time to time to check the adjustment of the steering head, since slackness at this point soon upsets the steering. Put the machine on the stand and place a box under the crankcase so that the front wheel is clear of the ground and attempt to rock it backwards and forwards. If the slightest play is felt this should be taken up. Play in the ball head should be distinguished from play in the shackle bushes, which can be cured by renewal of the bushes.

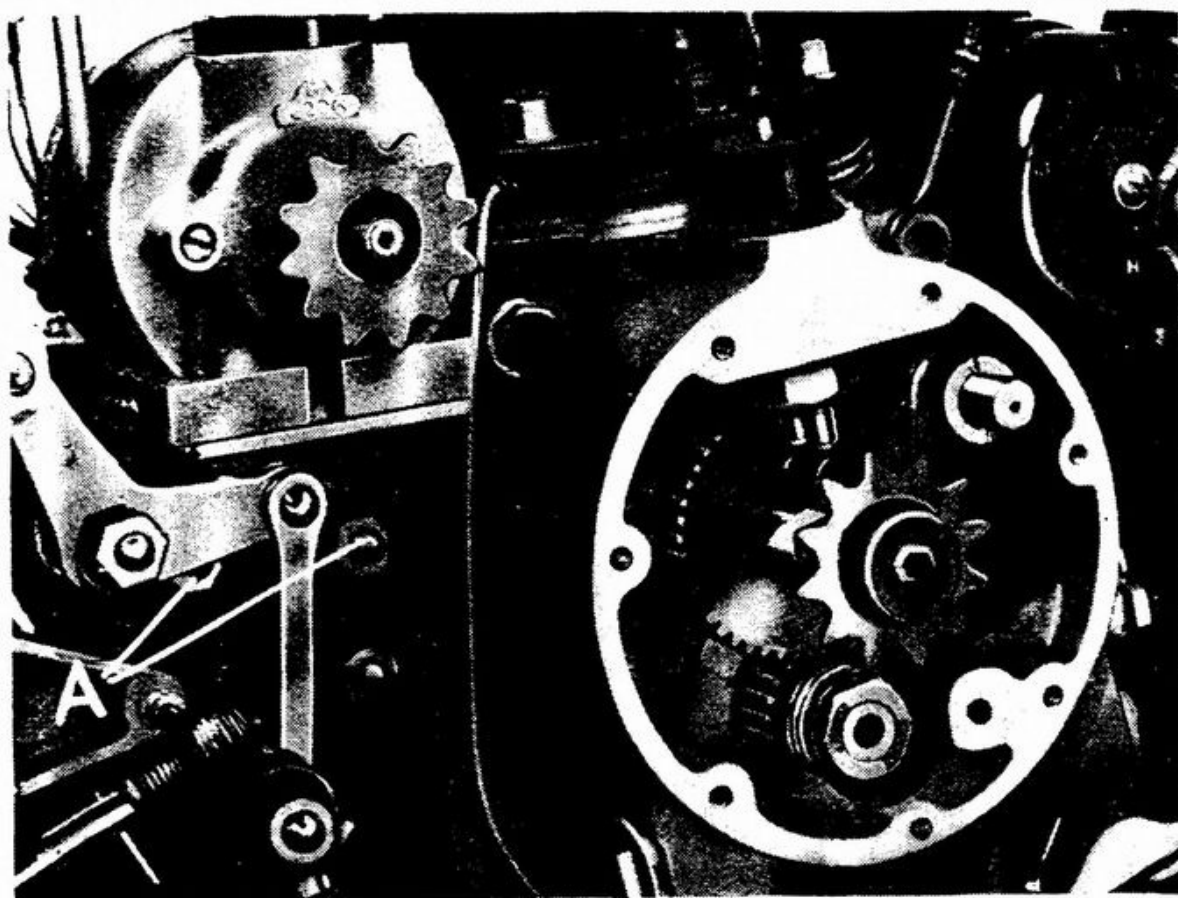


FIG. 3. MAGNETO DRIVE.

GEARBOX.

Remember that if the gearbox is moved at any time the gear control rod must be adjusted to suit. Also, after adjusting the rear chain, you must re-set the rear brake control.

This covers the principal adjustments which should be carried out at regular intervals. The methods of carrying these out will be found under their respective headings in the section devoted to maintenance and adjustment.

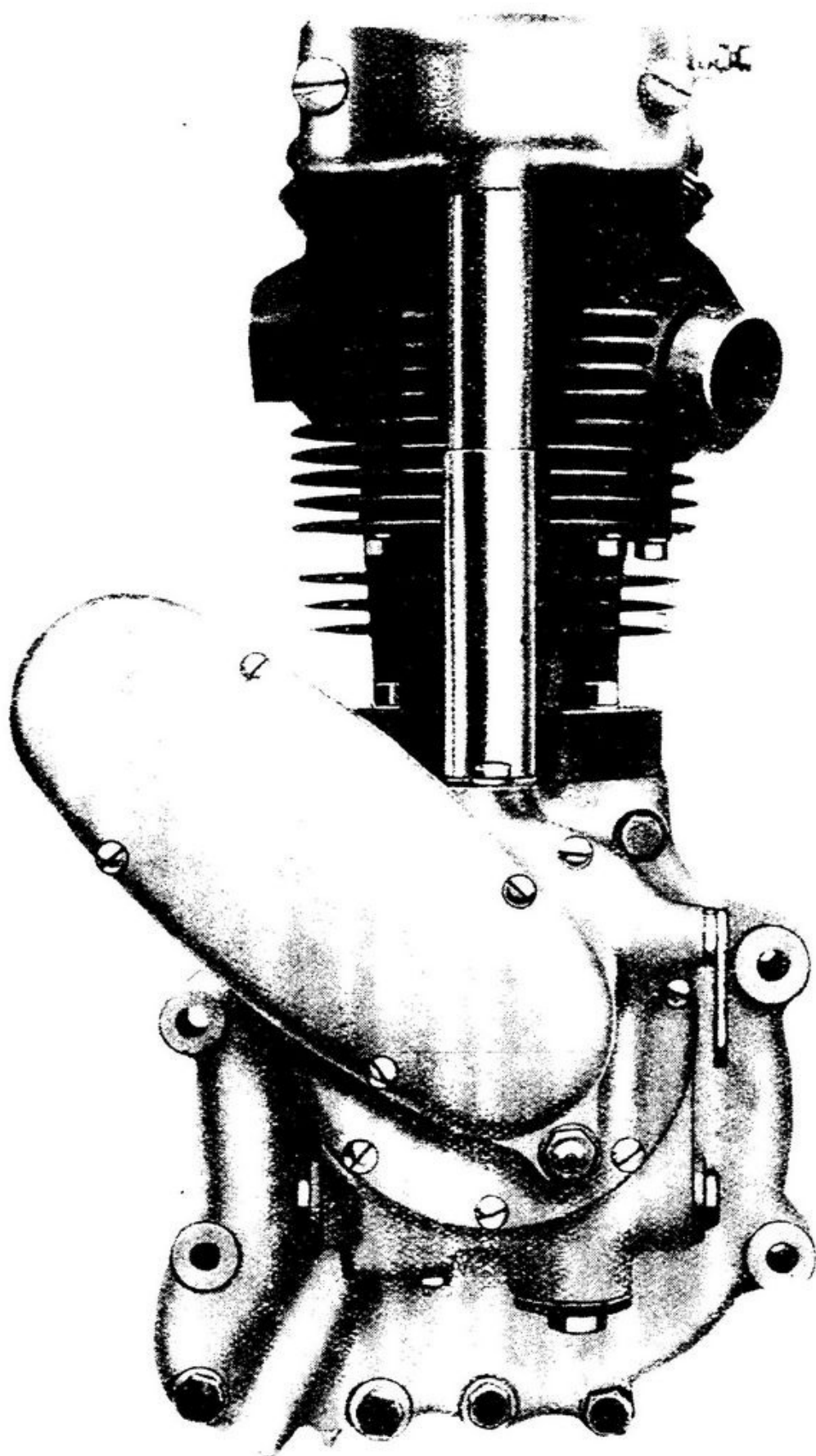


FIG. 4. THE 500 c.c. ENGINE.

LUBRICATION.

THE RUDGE DRY SUMP LUBRICATION SYSTEM.

DESCRIPTION. In the dry sump circulating system of lubrication adopted on the Rudge engines, oil, after leaving the oil tank, passes down pipe (A, Fig. 5) to the union (B, Fig. 5), where it enters the oil pump.

The main supply of oil is fed past the tell tale (C) to a spring loaded gland which passes the oil into the hollow main shaft. The oil then passes through the drilled fly wheel to a groove near the crank pin, whence it is fed into the big end rollers. One-seventh of the oil supply, however, leaves the delivery pump at the union (D) and is led by an external pipe to the union (E) at the back of the cylinder, thus lubricating the working face of the piston. The remainder of the engine is lubricated by splash.

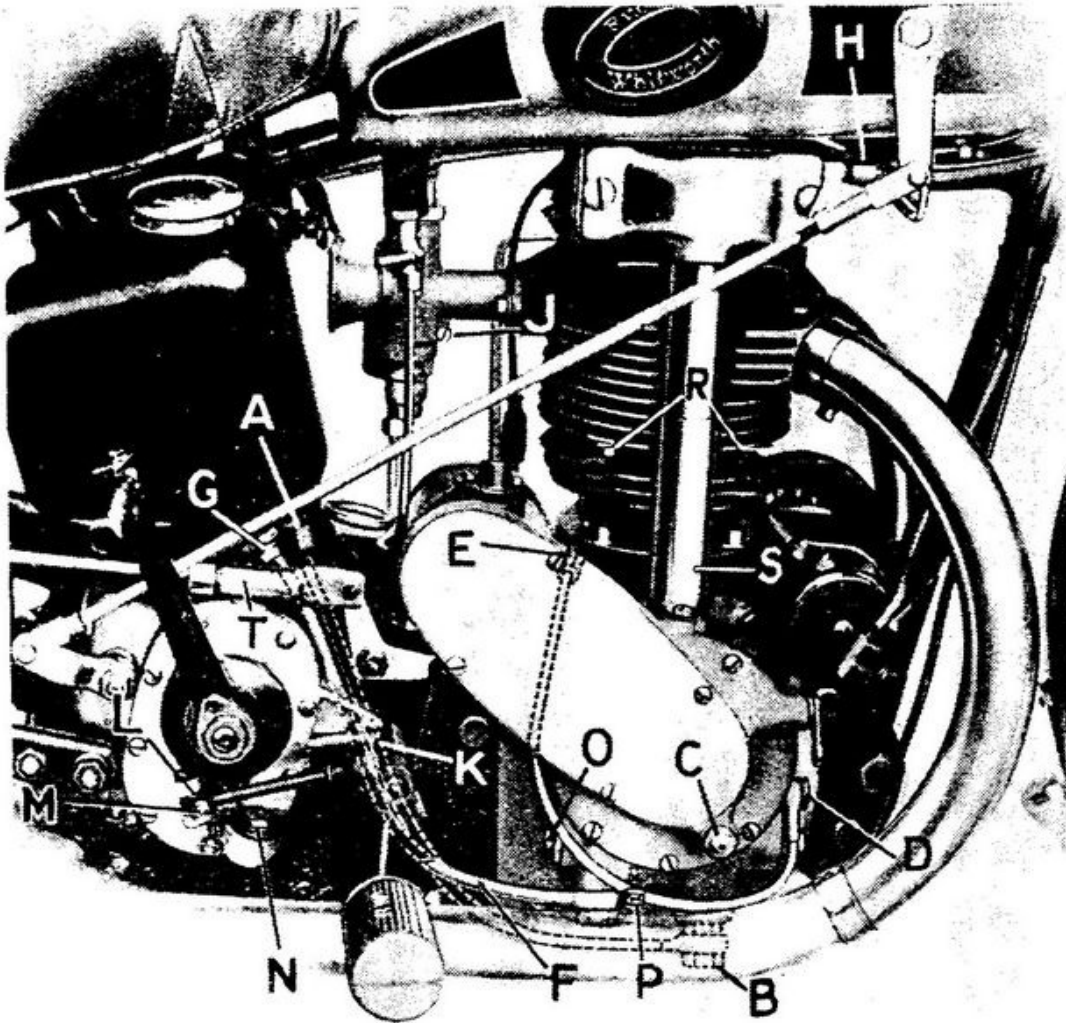


FIG. 5. LUBRICATION SYSTEM, 500 c.c.

Surplus oil is thrown by the flywheels into the sump, whence it passes through a filter into the return (rear) end of the oil pump and up an external pipe (F) to the oil tank.

The duplex oil pump has plungers at the rear and front ends, the former being of considerably larger diameter so that the pump is capable of returning far more oil than it delivers. There is thus no danger of surplus oil remaining in the crank case. On the other hand the working parts of the engine are continually flooded with cool filtered oil and therefore work under ideal conditions.

The advantages of the system are—a cooler running engine, capable of standing up to the heaviest work without any distress, great economy in oil consumption and a fool-proof lubrication system, whereby the rider, provided he sees there is oil in the tank, cannot over or under lubricate the engine.

RUNNING INSTRUCTIONS. On receiving the machine with empty tanks, first fill the oil tank with Castrol XXL (in summer) or Castrol XL (in winter). Run the engine, or, preferably, turn the engine over with the kick starter until the tell tale (C) indicates that oil is passing. With the engine running a few minutes it will be possible to see oil flow out of the large bore pipe immediately below the oil tank filler cap. This is the most certain indication that the oiling system is working properly.

Once the oil is circulating properly it is only necessary to replenish the oil tank when required and to clean the filter occasionally. This is done by unscrewing the large plug on the rear (L.H.) side of the sump. The filter gauze may then be thoroughly cleaned and any sludge or foreign matter scraped from the bottom of the sump.

It is not possible either to increase or decrease the supply of oil to the engine, nor is this necessary, since the supply of oil is ample for all conditions.

POSSIBLE TROUBLES AND THEIR REMEDIES.

If it is thought that the pump is not working properly the operation of the tell tale should be watched and the oil return supply in the oil tank examined. If this shows no oil is passing, an air leak in the suction pipe (A, Fig. 5) should be suspected. If tightening up the unions does not improve matters, the plug at the end of the pump body (O, Fig. 5) should be removed and it will be possible to see whether the plunger is operating. If this is not operating a damaged set pin (P, Fig. 5) or damaged teeth on the spindle

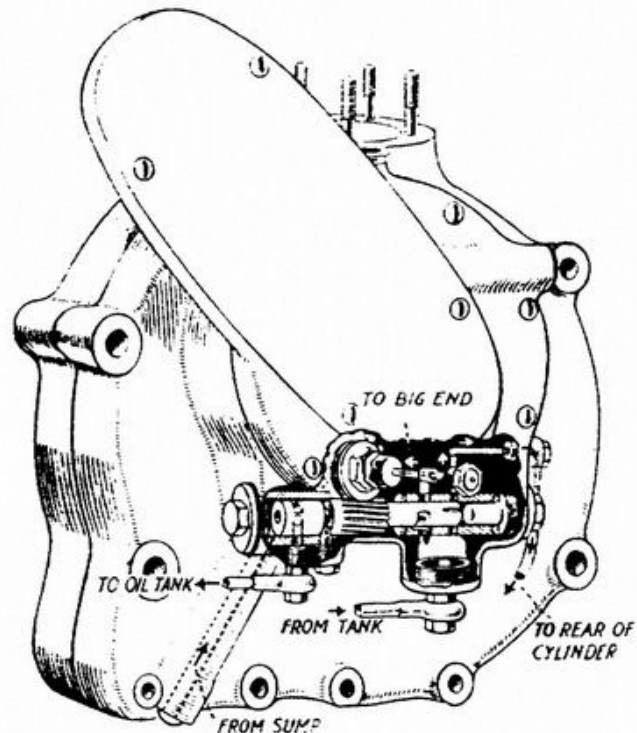


FIG. 6. THE OIL PUMP.

should be suspected. If, at any time, this set pin is removed it is **most essential** that it is fitted into the cam groove of the plunger so that, **before fitting, the position of the groove must be so arranged that it will permit the point of the set pin to enter before applying any force at all to the set pin.** Failure to do this will certainly damage the pump.

It is, however, most unlikely that any trouble will occur and beyond cleaning the filter at the first 500, and thereafter every 1,000 miles, and keeping the oil tank supplied with good quality oil, no attention should be required. At intervals of say 1,500 miles it is essential to drain the used oil from the tank and to replenish with a fresh supply.

THE CHOICE OF OIL. Most riders now-a-days realise how vitally important it is that nothing but the best possible oil should be used in a motor cycle engine. An inferior oil will cause irreparable damage to a good engine in the course of a few miles of hard driving. It is, therefore, essential that only branded oil of the right grade, and, preferably in sealed tins, should be used. We ourselves have made very extensive tests in this direction and have no hesitation in recommending Castrol XXL oil as thoroughly suitable for Rudge machines. Even for very heavy work Castrol XXL is advantageous, for, owing to the cool running of the Rudge engines, we have found that Castrol R is only needed for actual racing. Under even the hardest touring conditions an oil with a mineral base is perfectly satisfactory and enables longer distances to be covered before decarbonising.

Since many little-known brands of oil employ the same lettering to indicate the various grades, it is essential to ask for Castrol XXL and not merely XXL or XL. To be really safe it is preferable to purchase the oil out of sealed tins.

OIL TANK. First and foremost make sure that the oil tank is well supplied with oil before the commencement of each run.

GEARBOX. Inspect the level of oil in the gearbox about every 500 miles and make sure that, with the machine on level ground, the box is full to overflowing. The position of the filling plug makes it possible to over-fill the box. Castrol XXL should be used. Thick grease is entirely wrong and would soon cause trouble in a Rudge, or, for the matter of that, almost any motor cycle gearbox.

CHAINS. The front chain and dynamo chain will be adequately lubricated by the oil from the crankcase breather pipe. The magneto chain receives oil from the engine and being enclosed will require little attention. Under normal conditions it is advisable to lubricate the rear chain about every 500 miles with engine oil or such a lubricant as Castrolase. See that the engine shaft shock absorber is well greased occasionally.

CYCLE PARTS. About every 200 or 300 miles go round the spring forks, hubs and overhead rockers with the Tecalemit grease gun. In the earlier models of the 500 c.c. engine the lubricator for the exhaust rocker bearing is somewhat hidden beneath

the exhaust lifter spring and it is difficult to reach the lubricator without removing the exhaust lifter cable with the standard Tecalet grease gun. We are, however, able to supply an adaptor to be fitted to the end of the gun and this can be inserted on the nipple beneath the exhaust lifter spring. If this is done regularly a single depression of the gun should be sufficient for each point. Provided that the ball races are kept packed with a high melting point grease, very little replenishment will be needed and if an excessive amount of grease or oil is forced in this may find its way on to the brake shoes with disastrous results to the braking efficiency.

At similar periods go round with an oil can and put a few spots on either end of the valve push rods and on all control levers and exposed Bowden cable. Be careful not to omit the various joints of the gear and brake controls, and also put a few spots occasionally on the central stand pivot pin and the pin securing the peak of the saddle.

BOWDEN CONTROLS. It is essential for their smooth working that Bowden controls should be kept well lubricated. If lubrication as outlined above, is never neglected, the Bowden cables will retain their original smoothness, but if once they are allowed to become dry the only satisfactory method is to remove them from the machine. Hang them up and allow oil to trickle down between the inner and outer casing while working the inner cable up and down.



MAINTENANCE AND ADJUSTMENT

THE DECOMPRESSOR. Both internal rockers are mounted on a common pin inside the timing cover and the exhaust rocker is slidable with the aid of a spring which is housed in a recess in the inner end of the pin. The decompressor lever will be found in front of the timing cover on the right hand side of the engine. When the compressor is not in use the lever hangs down and when the lever is raised it brings into operation the spring which slides the exhaust rocker sideways on to a cam which lifts the valves and reduces the compression. Care must be taken when dismantling that the spring does not get lost and that it is placed in its housing when refitting. Decompressors are not fitted to T.T. Replica or 250 c.c. machines.

TO ADJUST THE TAPPETS.

Undo the telescopic tube (S, Fig. 5) by first loosening the nut at the base, rotate the tube until released and then push up, uncovering the adjustable tappets. Holding the head of the tappet (A, Fig. 7) with the "Rudge" spanner, slacken the locknut (B) with the second open ended "Rudge" spanner. Now hold the hexagon (G) with the small end of the thin hook spanner and adjust the clearance by screwing the head of the tappet (A) either up or down. When the adjustment is correct re-tighten the locknut (B) and again check the clearance.

On the 500 c.c., to adjust the exhaust remove the rocker cover plate, rotate the engine until the inlet valve is lifted, insert the closed ended sheet metal spanner below the rocker with the front end of the spanner raised on the ledge at the back of the aluminium cover,

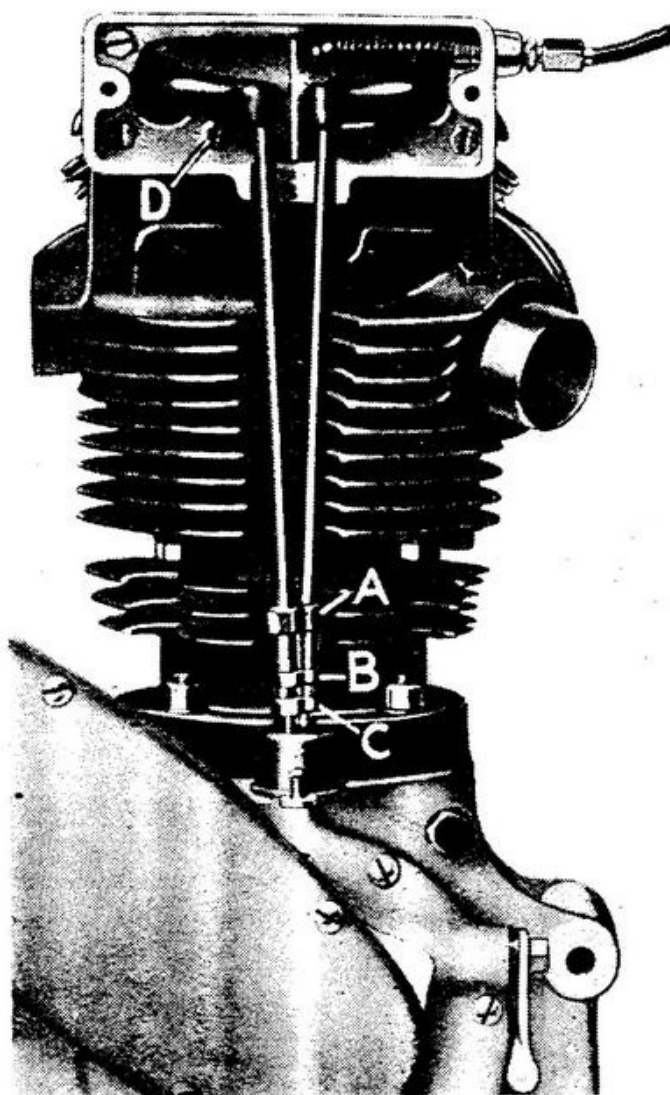


FIG. 7. ROCKER GEAR, 500 c.c.

and turn the engine until the tappet drops, when the inlet push rod may be withdrawn. If it is desired to remove the exhaust tappet, rotate the engine until the exhaust rocker is lifted and the sheet metal spanner may be placed between the exhaust lifter cam and the rocker. This will hold up the rocker so that the push rod may be withdrawn when the engine is turned. Replace in the reverse order.

In the case of the 350 c.c. engine, the small screwdriver provided with the tool-kit can be used to raise the exhaust rocker, by levering on the front rocker support plate. The illustration shows this quite clearly. It may be more convenient to operate in a similar manner to that given for the 500 c.c., by rotating until the rocker is lifted and merely using the screwdriver as a means of retaining the rocker in the lifted position while the push rod is removed, as shown in Fig. 8.

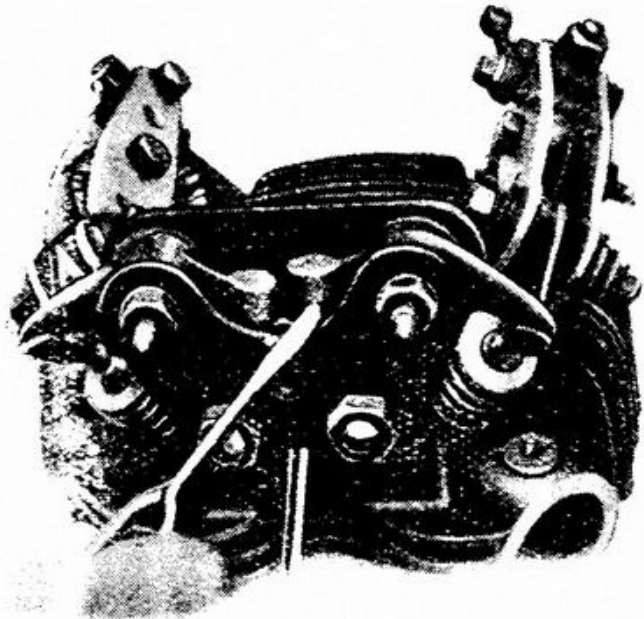


FIG. 8. REMOVING TAPPETS, 250 C.C. AND 350 C.C.

On the 250 c.c. and 350 c.c. engines there may possibly be play on the valves on the left side of the machine, even after the tappets are adjusted. In this case the clearance can be taken up by adjusting the nut and locknut on the sloping pillars which support the rocker plates across the machine.

DECARBONIZING. To decarbonize the Rudge engine is a simple matter which has been carried out by two people in well under three-quarters of an hour. Single handed, two or three hours should be ample for the work, for the detachable head is easy to clean and the valves do not require very much grinding in. Start by removing the carburetter, exhaust pipes and high tension lead. Then slack off the cylinder head holding down bolts (R, Fig. 5), spanners for which are provided in the tool kit, and with the handle of a light hammer tap the solid part of the head, not the fins, until it is loose, whereupon it may be lifted off. Unless the machine has done a considerable mileage it is quite unnecessary to remove the cylinder barrel and piston. If, however, several thousand miles of hard work have been covered, it is as well to undo the cylinder holding down nuts and lift the barrel off the piston.

The gudgeon pin may then be pushed out from whichever side is convenient and the piston removed. Remember, however, to mark it so that it may be replaced the same way round. Remove the rings by running a thin knife blade round and guiding them off very gently with the fingers. Remove carbon from the crown and ring grooves and see that the oil holes below the bottom ring are clear. The correct gap between the ends of the rings when in the cylinder bore is .010in. for the touring and .015in. for the sports engines.

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THE PISTON. If any slight seizure has taken place the skirt of the piston will be scored and in the case of a bad seizure there will be traces of aluminium in the cylinder bore. Remove every trace of the latter with scrapers and fine emery cloth, smooth down any marks on the piston with a dead smooth file and finish off with fine emery cloth, taking most scrupulous care to remove every trace of the abrasive. Ordinarily, however, none of this attention will be needed and if the engine is running well it is better to leave the cylinder barrel in situ and simply scrape the carbon from the piston crown and also from the top of the cylinder bore. Aluminium is soft and the carbon may be hard, so take care not to damage the piston in the process. Attention may now be turned to the cylinder head which can be dealt with in comfort on the bench.

THE CYLINDER HEAD. Take out and clean the sparking plug, clean all carbon out of the head and remove the valves.

On the 250 c.c. and 350 c.c. engines first remove the exhaust lifter cable, then proceed to remove the nut which fastens the rocker plates to the pillars attached to the cylinder head. Also slacken the nut and cupped washers which engage with the rocker support plates, and the rockers and plates will come away bodily from the cylinder head and will enable you to re-grind the valves. The rockers can be dismantled from the plates, if necessary, on the bench.

When cleaning a detachable mica sparking plug, use a rag soaked in petrol, not emery cloth.

VALVE GRINDING. The removal of the valve springs is facilitated by placing a block of wood inside the head, thus holding the valves on to their seats while the spring collars are pressed down by an adjustable spanner or similar device, and the split cotters (Fig. 9) removed. Take off the valves and springs, marking

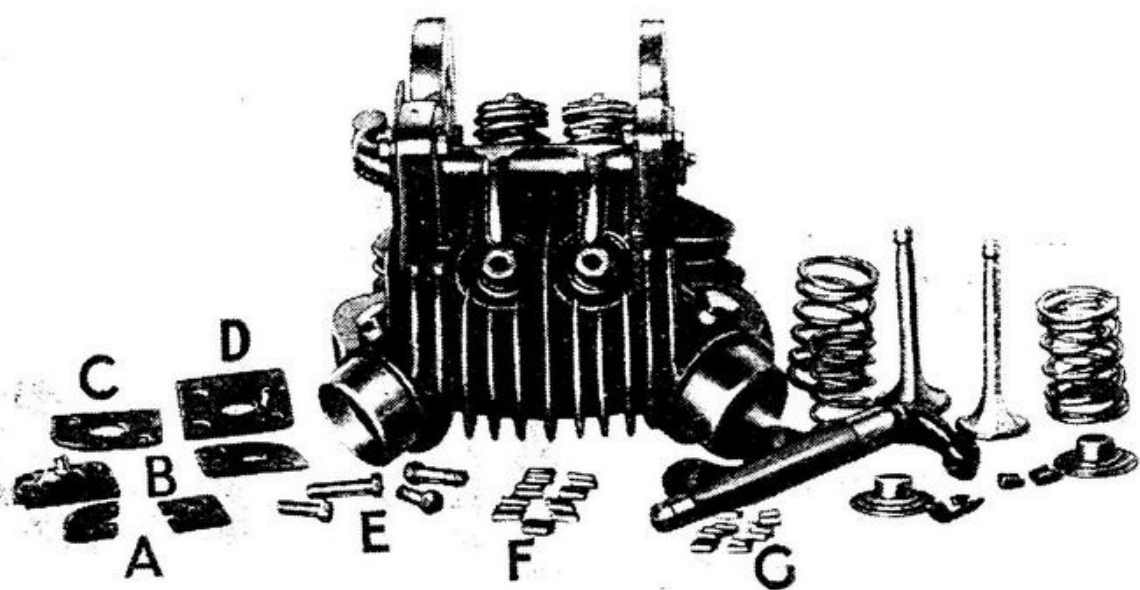


FIG. 9. THE 500 c.c. CYLINDER HEAD AND ROCKERS.

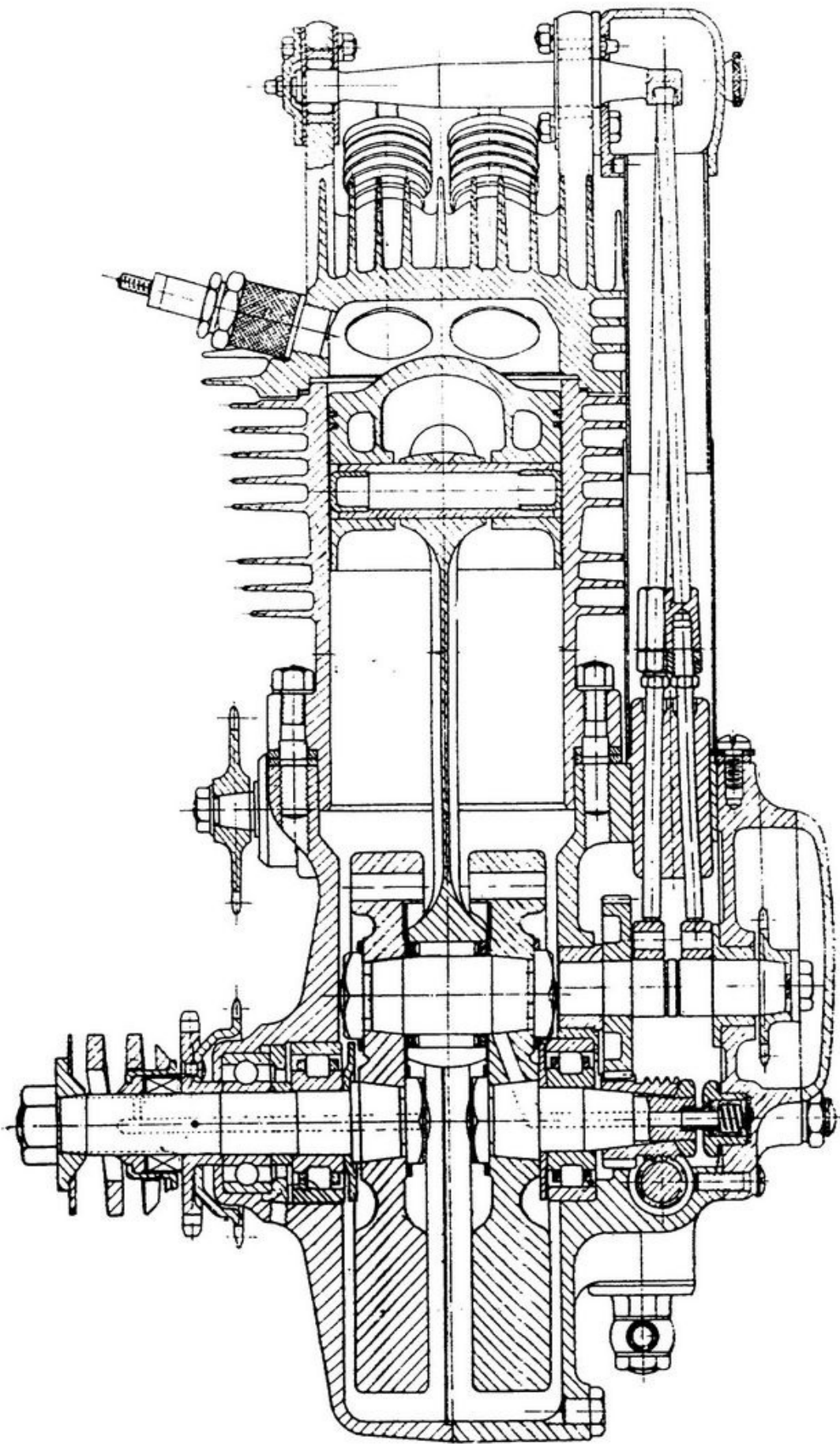


FIG. 10. GENERAL ARRANGEMENT 500 c.c. RUDGE ENGINE.

the former so that they may be returned to the same positions. If the springs have become weak replace them. Remove any remaining traces of carbon from the inside of the head and valve ports. If new valve guides are fitted, the seating must be re-cut with a special tool. Clean the valves and grind them in with one of the special grinding pastes obtainable for this purpose.

Support the head lightly in a vice in an upside down position, being careful to avoid damaging the fins. Smear the valve seating lightly with grinding paste and a spot of oil and hold the valve off the seating by pressing the end of the stem upwards with the left hand, using the right hand to operate the screwdriver. In order to avoid scoring the valve seats, instead of pressing the valve on its seating all the time the grinding is proceeding, it should be frequently lifted up with the left hand, turning the screwdriver all the time. Once the method has been learned, this can be done very quickly and results in a particularly smooth surface.

As soon as a good seating has been obtained, wash all components free from grinding compound, dirt, etc., lubricate the valve stems and replace the springs and split cotters with the aid of the wooden block. If the valve spring is well compressed the spring cotters may be slipped into place without difficulty.

Should the 500 c.c. rockers have been dismantled for any reason the following method of assembly should be followed. First thread the inner large plate (C, Fig. 9) over the end of the rocker against which the push rod bears, taking care that it is fitted so that it corresponds with the shape of the cast rocker support. Push the rocker endwise and slide the corresponding smaller plate over the other end. Now pack the rollers (F and G) back into the races and thread the largest plate of all (D) over the end of the rocker adjacent to the push rod. This should be fitted so that the sideways projection is towards the centre line of the engine, thus forming the back of the rocker casing. Next fit the split plates (A) to engage with the grooves in the opposite end of the rocker. These should be fitted so that they are divided horizontally. Finally, fit the convex end plate (B), which has a grease nipple in its centre, and bolt the plates together (E), finally refitting the aluminium rocker casing (D, Fig. 7). File the valve stems until the rocker touches both equally, and the head is ready to be put back on to the barrel.



FIG. 11. DEPRESSING VALVE SPRINGS, 500 c.c.

On the 500 c.c., after the overhead rockers have been refitted, the exhaust lifter lever can be inserted by depressing the exhaust valves

and overhead rocker. A good tip for depressing the valves is to place the closed ended sheet metal spanner on the valve spring seats with one end of the spanner under the overhead rocker as a fulcrum and depressing the other end. The overhead rocker will then be free to be lifted up. The illustration Fig. 11 shows how this is done.

The 250 c.c. and 350 c.c. rockers should be refitted in the reverse order from dismantling.

When re-assembling care should be taken to see that the tappet rockers are fitted correctly. The inlet rocker is provided with a cylindrical contact surface operating on the transverse rocker, the cylindrical surface being such that the axis points towards the sparking plug hole. The exhaust rocker is similar but the cylindrical surface is reversed and also points towards the plug hole, as shown in Fig. 12.

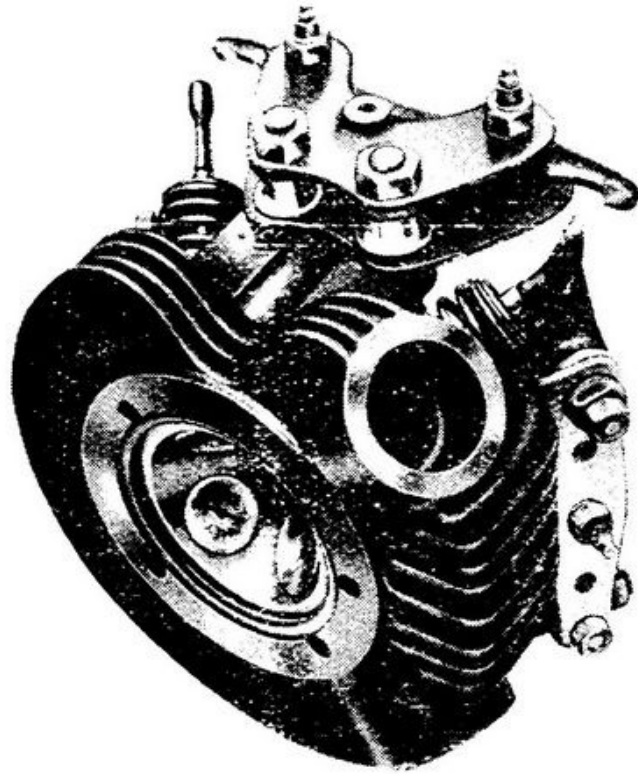


FIG. 12. ROCKER GEAR, 250 C.C. AND 350 C.C.

RE-ASSEMBLING. In the re-building of the engine, first replace the piston and gudgeon pin, with lashings of oil, then the cylinder barrel and finally the cylinder head.

It will be found that either one or two plates are fitted underneath the barrel, which provide for varying the compression. Thus, if docility is required two plates should be fitted, while for higher speeds both should be removed and Petrol Benzol used. If these packing plates are removed the engine should always be rotated by hand so as to be quite certain that the piston is clear of the valve and cylinder head, and shorter push rods may be required.

Fit paper washers between the cylinder and compression plate, and compression plate and crankcase. These may be made by tapping a piece of paper, held against the bottom of the cylinder barrel, with a light hammer. When fitting, smear these with thick oil or liquid jointing material. Finally replace the carburetter, sparking plug, high tension lead and exhaust pipes.

In replacing a cylinder head, see that the jointing surfaces are most scrupulously clean and that the copper gasket washer is undamaged. In tightening down the bolts securing the head, each should be turned one-sixth of a revolution at a time until all are dead tight. The same remarks apply to tightening down the cylinder barrel, if this has been removed.

COMPLETE OVERHAUL.

The Rudge engine is highly unlikely to need any further attention than that outlined above in the course of one, or even two seasons ordinary running, but for the benefit of those who, in tuning up for speed work or the like, prefer to dismantle the whole of their engine, a few notes on the dismantling and re-assembling may be of interest.

If the work is undertaken single handed it is preferable to proceed as for decarbonizing before removing the crankcase from the frame, but if the services of a friend can be commandeered it will probably be found easier to remove the exhaust pipes, exhaust lifter control (H, Fig. 5), magneto and dynamo, carburetter, high tension wire, oil pipes, front chain case and chains, and then to take out the bolts passing through the engine plates and lift the whole engine out on to the bench.

DISMANTLING THE TIMING GEAR. The magneto chain and sprockets must be dismantled before the small bolts securing the timing cover are taken out and this cover removed. To avoid disturbing the timing, the tappets may be left in place when the cover is removed. If, for any reason, it is desirable to remove the cam wheel it may be necessary in some models to take out the pump plunger and half time pinion. The half time pinion is integral with the worm and it is advisable to use a special extractor fitting on these threads to remove this.

In later models it is possible to remove the cam without disturbing the half time pinion or pump.

The 250 c.c. Timing Gear is dismantled as follows: swing up the retaining arm and remove the bakelite cover and condenser. Next remove the central screw holding contact breaker cam to cam shaft. Insert extracting screw in cam and gently ease off cam shaft taper (it is not, at this stage necessary to remove the contact breaker from the timing cover). Remove the timing screws and, having left the tappets in place so as not to disturb the timing, remove the timing cover. Then, having marked the tooth relationship between the pinion and cam shaft, remove the latter. If it is necessary to remove the pinion, the plunger must be removed from the pump, the retaining nut from the axle and the pinion with a special extractor, as in the case of the 500 c.c. and 350 c.c. engines.

The camshaft is removed by the use of a special extracting screw which is $\frac{3}{8}$ in. diameter by 26 threads per inch. When the timing cover is removed the advance and retard cable is still connected to the cover. This can, if necessary, be detached by first removing the wire ring fitting in the groove and the contact breaker mechanism can be removed completely. When this is done it will be noticed that the peg at the back of the contact breaker has been withdrawn from a hole in a sliding plunger, to which the cable is connected. The hexagon headed screw at the side of the timing cover can then be unscrewed and the cable withdrawn. In re-fitting it will be necessary, of course, to insert the peg at the back of the contact breaker into the hole in the plunger and carefully replace the wire ring.

THE ENGINE SHAFT SHOCK ABSORBER.

Undo, but do not remove, the nut on the nearside end of the crank shaft and tap the large washer (A, Fig. 13) until it is free on its taper, when it may be removed. Take off the spring (B), the splined member (C) and the sprocket (D).

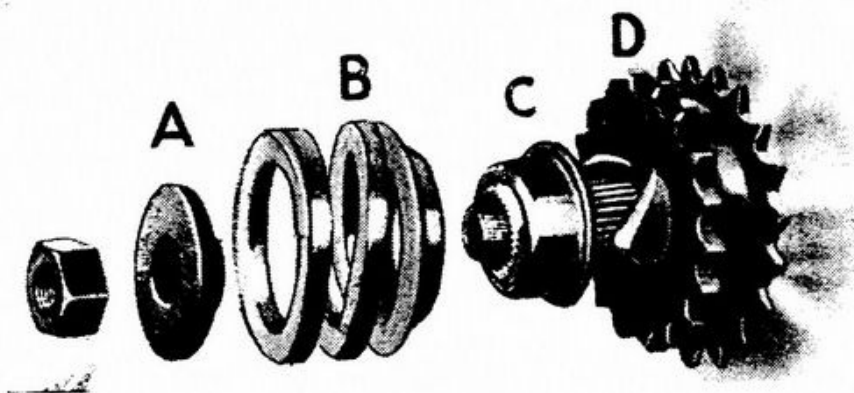


FIG. 13. THE ENGINE SHAFT SHOCK ABSORBER.

SPLITTING THE CRANKCASE.

After removing the cylinder and piston, as outlined above, undo the remaining crankcase bolts and gently tap the halves of the crankcase apart.

If the flywheel assembly should need any attention, we most strongly advise that it should be returned to the Works. The crank pin and main shafts are secured on tapers by right hand nuts, retained by locking plates, but their accurate re-assembly calls for a special jig and tools, and we feel that without such tools even a skilled mechanic could not ensure a satisfactory job.

Bearing in mind the speed and power of the Rudge engine, it will be realised that the slightest tendency for the flywheels to work loose or run out of truth will have very serious results.

The main shaft bearing assembly on 500 c.c. and 350 c.c. engines is as follows:—

First a ball race secured by a locking ring, which in turn is secured by a grub screw; this should not be interfered with, since, apart from swilling with petrol, it is very unlikely to need attention. Next comes a tubular distance piece which may be replaced if worn, although this is unlikely, then the roller races—one or more thin packing washers which may be varied to locate the flywheel assembly centrally in the case, and finally a large washer which lies against the flywheel. On the 250 c.c. the engine having two roller bearings, the crankshaft can be removed out of the crankcase, leaving the outer roller race in position in the case.

REBUILDING THE ENGINE.

Clean inside the crankcase, oil filter and bearings with petrol, subsequently re-oiling the latter. Cleanliness is the great secret of successful engine assembly, so make certain that all joint faces are clean.

If a thin film of one of the liquid joint materials is smeared over the faces of the joint, oil tightness will be assured. When re-assembling, fit the large washer, the packing washer, the roller race and the distance piece on the main shaft, leaving the ball race in the case, then introduce the complete assembly into the case and tap gently home.

TO TIME THE VALVES. If the small timing pinion has not been removed, it is simply necessary to replace the cam wheel so that the marks on this and the small timing pinion, made when dismantling the engine, correspond. If, however, the pinion has been removed, it will be necessary to re-time the valves. This may be best done with the cylinder head in place. Push the small timing pinion on to its taper but do not lock. adjust the tappets to give a clearance of .02in. on the 500 c.c., .017in. on the 350 c.c. and .015in. on the 250 c.c., and rotate the engine until the piston position corresponds with the timing given for the exhaust valve opening on page 52, the position of the piston being measured by a rod through the hole in the centre of the head. Turn the cam wheel in an anticlockwise direction until the exhaust tappet is just tight. Now tighten up the nut securing the small timing pinion. Check the setting to see that the pinion has not slipped while tightening, and the valves are timed—not nearly such a difficult operation as many people seem to think.

TIMING THE IGNITION. Replace the timing cover, magneto sprocket and chain, and see that one chain sprocket is slack on its taper. Rotate the engine until the piston is at top dead centre with both valves closed. Turn the engine backwards until the piston has descended 14 mm. in the case of the 500 c.c. "Special" and 18 mm. for the 500 c.c. T.T. Replica. Now set the ignition control at full advance and turn the armature clockwise (looking at the contact breaker end) until the points are just breaking. Tighten up the sprocket and the ignition is set.

In the case of the 250 c.c. replace the timing cover and screws, see that the contact breaker cam is slack on its taper and rotate the engine until the piston is at top dead centre with both valves closed. Turn the engine backwards until the piston has descended 12 mm. Now set the ignition control at full advance and turn the contact breaker cam anticlockwise until the points are just breaking and tighten the contact breaker cam on its taper. Replace the bakelite cover with condenser and see that the retaining arm makes contact with the metal button on the centre of the cover.

In the case of the "Ulster," 14-16 mm. advance may be given according to the work in hand. To tighten the magneto pinion with the points just breaking at full retard and the piston at top dead centre will not give correct advance and should only be done in an emergency as a purely temporary measure.

TO ADJUST THE EXHAUST LIFTER CONTROL. This is effected by slackening the locknut of the cable stop and screwing the stop in or out until the control starts to lift the exhaust valve after about one-third of its travel.

It is most essential that there should be back lash in this control so that the exhaust lifter cam does not touch the rocker when the engine is running.

THE GEARBOX.

The Rudge 4-speed gearbox will, if properly lubricated, run through several seasons without the need of any other attention. It is quite unnecessary to take the box to pieces, and in fact an amateur mechanic is likely to do more harm than good if he should attempt to dismantle his box. The only adjustments required to clutch or gearbox are as follows:—

TO ADJUST THE CLUTCH.

Always have a slight degree of back lash in the cable, which may be adjusted by means of the cable stop (K, Fig. 5), or by releasing lock nut (M) and adjusting screw (L) which bears on the end of the clutch push rod. The former method is preferable, as it gives finer adjustment. Both the cable and this push rod should be kept in a well lubricated condition.

TO ADJUST THE GEAR CONTROL.

If the box has been moved to adjust the front chain, it is essential to check and, if necessary, correct the adjustment of the gear control rod. To adjust the control engage either second or third gears and take out the pin (B, Fig. 17) by removing its split pin and washer; now hold the gear lever exactly central between the shoulders of the gate. The gears themselves will be held in their correct position by the locating mechanism inside the box. Now slip the yoke end of the control rod over the end of the gear lever and see whether the pin can be inserted; if not, slacken the locknut (A) and screw the yoke end either up or down the rod until the pin will slip into place. Tighten the locknut (A) and replace the washer and split pin securing the pin.

CHAINS.

TO ADJUST THE FRONT CHAINS.

Slacken the gearbox bolts and slide the box backwards or forwards by means of the drawbolt (A, Fig. 14). This operation is made easier by also slackening the chain stay bolts.

Use the smaller of the two large box spanners when tightening and slip the large one over the handle of the tommy bar to obtain increased leverage. All these nuts must be kept very tight indeed.

Adjust the gear control whenever the gearbox is moved.

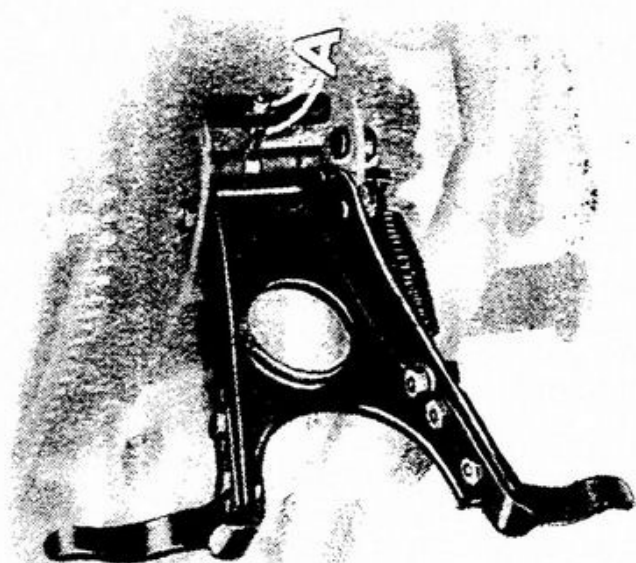


FIG. 14. FRONT CHAIN ADJUSTMENT.

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TO ADJUST THE BACK CHAIN ON THE 500 c.c. Slacken the nut on the left side of the machine and brake fulcrum bolt. Place the spanner on the bolt head on the right side and rotate the bolt anticlockwise to tighten. The cams on each side of the bolt will keep the wheel in alignment.

TO ADJUST THE BACK CHAINS ON THE 250 c.c. AND 350 c.c. Slacken the rear spindle nuts and brake fulcrum bolt and draw the wheel backwards by means of the draw bolts (A, Fig. 15) giving an equal number of turns to each side. If the wheel was correctly aligned previously, the alignment will be maintained. Finally tighten all nuts thoroughly and re-adjust the rear brake control if necessary.

TO ADJUST THE MAGNETO CHAIN. Slacken the nuts which fasten the magneto table to the cradle plate and move the magneto upwards and backwards.

TO ADJUST THE DYNAMO CHAIN. To tighten, loosen the strap bolts and rotate the dynamo clockwise when looking at the right side for 500 c.c. and 350 c.c. machines and anti-clockwise for 250 machines. It may be advantageous to slacken the front top cradle plate bolt and push this through about an eighth of an inch. In some cases the clamping strap screws are somewhat inaccessible and later models have been provided with an extended nut to assist in the chain adjustment. These can be supplied by our Service Department at a nominal charge.

When the machine is being overhauled, soak the chains in paraffin and then in a hot bath of graphite grease.

Do not forget to lubricate the back chain. The front chain and the dynamo chain are lubricated from the crankcase breather and the magneto chain, being totally enclosed, requires very little attention, as it obtains its oil from the crankcase.

Always replace the clip of a spring link so that its closed end faces the direction of travel.

WHEELS.

On the 500 c.c. and 350 c.c. machine the wheels are interchangeable and quickly detachable.

To detach the 500 c.c. front wheel remove the knock-out spindle and the brake anchor pin.

To detach the 250 c.c. and 350 c.c. front wheels slacken both spindle nuts clear of the fork ends and remove the brake anchor pin.

When replacing with another wheel take the brake mechanism from the drum and the internal sleeve from the left side of the hollow spindle (500 c.c. only) and transfer to the new wheel. Replace in the reverse order.

In the case of the 500 c.c. rear wheel, to remove, disengage the brake control by means of the quick release device (F, Fig. 16), undo the knock-out spindle nut (left side) and remove the knock-out spindle

and sleeve (right side). Move the wheel to the right and disengage the sleeve from the left frame jaw. The wheel is then free to drop and may be pushed forward so that the chain may be unhooked from the sprocket.

Having raised the hinged mudguard tail (B, Fig. 15), take the wheel out, change the brake mechanism to the spare wheel and replace in the reverse order, noting that the keys in the left sleeve and washer engage with the slot in the spindle.

On the 350 c.c. slacken the spindle nuts, remove the rear chain and the brake anchor pin. The wheel may then be pulled backwards out of the fork ends and removed from the machine.

The back fork ends on the 250 c.c. frame are of the forward drop-out type. If, after the brake anchor pin has been removed and the brake rod uncoupled, the spindle nuts are slackened off and the drawbacks are pulled sideways, the wheel will drop out of the frame and the chain can then be unhooked and the wheel removed.

The rear mudguard tail on the 250 c.c. is detachable and should be detached as a help to removing the rear wheel.

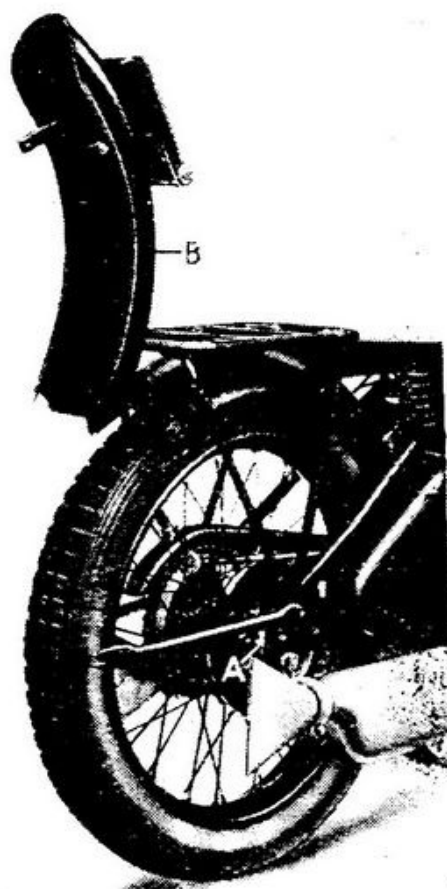


FIG. 15. HINGED MUDGUARD FLAP.

TO ADJUST THE WHEEL BEARINGS.

Without removing the wheel from the machine slacken off the lock nut and adjust the loose cone by means of the large square formed on it. Tighten up the lock nut and test the wheel to make sure that it is free. There should be just perceptible play in the bearings with everything tightened up.

On the 350 c.c. machine slacken the spindle nut on the loose cone side only, adjust by means of the large square on the cone, lock the cone with the lock nut and retighten the spindle nut.

On the 250 c.c. wheel the adjustment is made by turning the adjustable cone.

The spindle nut acts as the lock nut.

It is absolutely essential that when the wheel is tightened up in the machine there should be a slight trace of play in the bearings which can be felt at the rim.

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TO ALIGN THE WHEELS. It is vital to good steering that the wheels should be dead in line. Set the wheel on its stand with the handlebars dead straight. Kneel down about six yards to the rear and look along the sides of the back tyre. An equal amount of front tyre should be visible on each side. Make sure, however, before doing this, that the back wheel and tyre are running true. A more accurate method still is to use a stretched string or a wooden straight-edge and see that it touches the back tyres in two places and the front tyre in two places at the same time.

TYRES.

The wired-on tyres fitted to Rudge machines will be found to give very consistent satisfaction. It is important, however, that the tyre should be fitted correctly in the first place and that it should be maintained at the correct pressure.

A wired-on tyre is very easy to fit if the work is carried out in the right way. The tube should be slightly inflated and inserted into the cover either before or after the first side of the tyre is put on to the rim. Start to fit the second side opposite the valve and work round, taking the greatest care to force the lip of the cover well down into the well of the rim.

Tyre levers may be needed for the last 18in. or so, but undue force should be avoided. If the offside lip of the cover is down in the well it will go on fairly easily.

The latest types of cover are made to fit the rim fairly tightly in order to avoid the possibility of creep when partially deflated, and it will sometimes be found that after the tyre has been fitted and pumped up that the lip has not mounted the shoulders of the rim at all points.

Provided that the tube has not been nipped and that the rubber tape which covers the spoke heads has not become displaced, the tyre should be pumped up very hard when it will mount the rim in a proper manner. The pressure may then be reduced to the required amount.

A mark moulded on the side of the cover should be equidistant from the edge of the rim all the way round. If this mark suddenly dives down into the rim it shows that the cover has not mounted the shoulder of the rim at this point.

TYRE PRESSURES. The tyre pressure not only has a great effect on the life of the tyre, but also a marked bearing on the steering and control ability of the machine. An unduly soft front tyre prevents the front fork from working and tends to upset the steering, also causing the machine to pitch in an unpleasant fashion.

Adhesion, however, to the pressure given in the table below will ensure the best compromise between long life of the tyres and the safety and comfort of the rider.

Remember that the additional comfort gained from a soft tyre must be paid for by decreased tyre life.

TYRE PRESSURES.

	SOLO		Lbs. per sq. in.	SIDECAR	
	Front	Rear	Front	Rear	Sidecar
"Special" 26" x 3.25"	18	22	18	30	18
"Ulster" 27" x 3.25"					
350 c.c. 27" x 3.00"	24	26	27	36	22
T.T. Replica Front 27" x 3.00"	24	—			
Rear 27" x 3.25"	—	22			
250 c.c. 25" x 3.00"	18	22			

BRAKES.

The Rudge proportional coupled internal expanding brakes fitted to all models will be found to need practically no attention or adjustment owing to their large size and ample friction surfaces. Hand adjustment is provided for both front and rear brakes so that when adjustment is required, it is a matter of a few seconds only.

RUDGE PROPORTIONAL COUPLED BRAKES.

When braking gently in the usual way, the braking is best divided equally between the front and back wheels.

When braking harder, weight is taken off the back wheel and put on to the front wheel and equal braking will then skid the back wheel along before the front is fully braked.

The Rudge proportional coupled brakes, when put on gently, brake the back and front wheels equally, but when put on harder and weight is taken off the back wheel and put on the front wheel, they brake the front wheel harder in proportion, while still braking the back wheel gently, so as to get the maximum effect on both wheels without risk of skidding either wheel.

HOW THE PROPORTIONAL CONTROL WORKS.

An initially compressed spring is contained in a neat casing (T, Fig. 5). Its action is as follows:—

A slight depression of the pedal causes both front and rear brakes to be applied in equal proportion. Further pressure of the pedal increases the effect of the brakes to an equal degree until the pressure on the rear brake rod overcomes that of the initially compressed spring. By still further depressing the pedal a proportional increase of braking effect is obtained on the front wheel, while in the case of the back the initially compressed spring becomes further compressed without there being any appreciable increase in braking effect. This policy has been proved correct in racing car practice.

TO ADJUST THE BRAKES.

(F, Fig. 16) and the hexagon headed adjustable stop and locknut (C, Fig. 17) so that the brakes start to operate after the pedal has been depressed about $\frac{1}{2}$ in. Both brakes should come on together, which may be tested by depressing the brake pedal slowly and spinning each wheel in turn. If anything, the front brake should begin to operate very slightly before the back, as this has a steadying effect when pulling up on a greasy road. See that all exposed cables, joints and threads of the brake operating mechanism are well lubricated.

The hand control may be adjusted by means of the hand adjustment on the fork

It should be set so that the brake is applied without stretching the hand too far. The hand control exerts a very powerful braking effect and the control should be attached to the brake lever so that the leverage is less than is the case with the cable from the brake pedal.

To clean the shoes take out the wheel, remove the brake parts and scrub with petrol. See that the cam and its shafts are well greased but remove all trace of oil or grease which may have worked out of the wheel hub. Remember that when the rear wheel is moved for chain adjustment the rear brake adjustment must be altered to compensate for this.

SPRING FORKS AND STEERING HEAD.

Play in the spring forks or steering head of any machine will soon upset its steadiness at speed, so from time to time the machine should be jacked up on its central stand with a box under the crankcase and the forks and steering head tested for play by shaking the front wheel backwards and forwards. To adjust the steering head slacken the steering damper right off, slacken locknut (D, Fig. 17) and tighten nut (E), using the C spanner in the tool kit. For correct adjustment the steering head should be absolutely free, yet without trace of play. Before finally testing, tighten locknut (D), since this may affect the adjustment. Turn the bar from side to side. If there is a tendency to remain in a

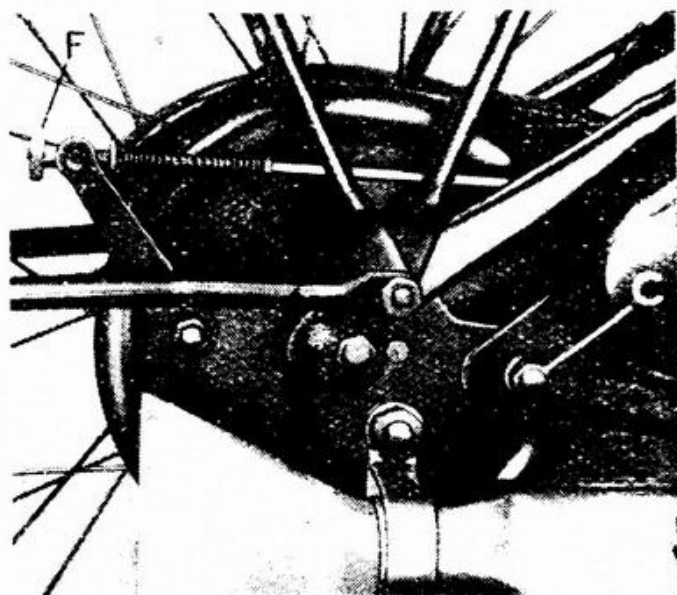


FIG. 16. REAR BRAKE ADJUSTMENT.

central position and to resist the first few degrees of movement, the steering head races are pitted and should be replaced. If the races are pitted and the head is tightened up too much a very unpleasant sway in the steering is set up.

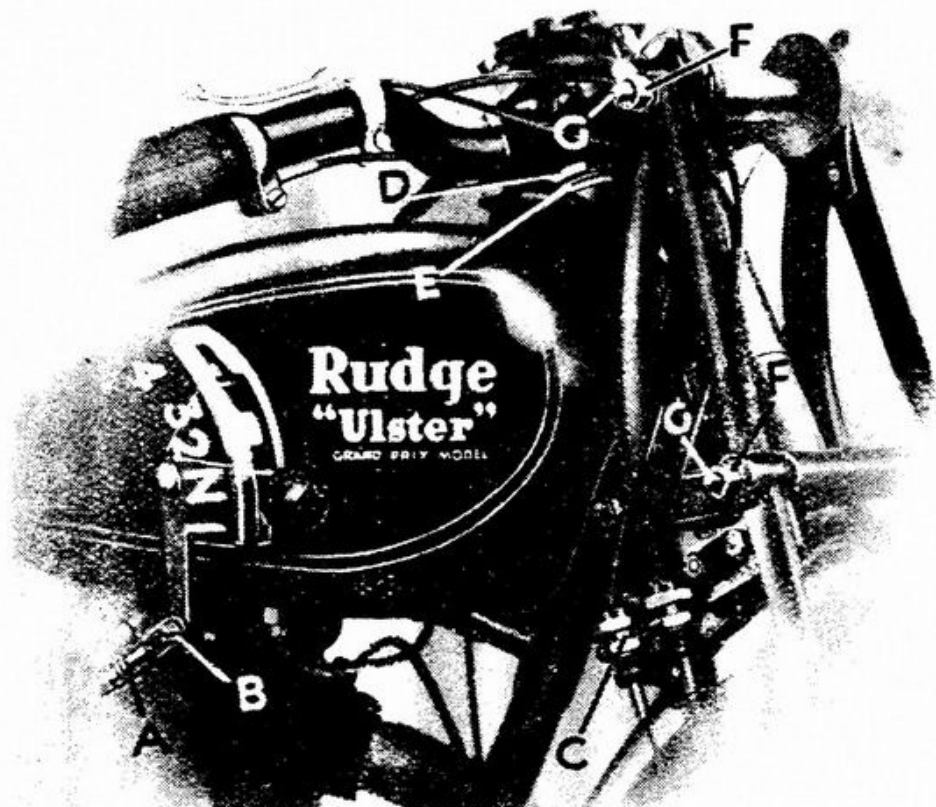


FIG. 17. THE GEAR LEVER AND STEERING HEAD.

If the spring forks are regularly lubricated with the Tecalmit greaser very little wear will take place.

To adjust the spring forks on 500 and 350 c.c. machines, slacken the lock nut on the near side of the shackle bolt, adjust by turning the shackle bolt by means of its squared end (G) until the correct degree of adjustment is obtained, then re-tighten the lock nut. A clockwise rotation of the square end of the shackle bolt slackens the adjustment and vice versa. There should be no slackness in the fork shackles, but it is vital to good steering that the forks work freely.

SHOCK ABSORBERS. Adjust the shock absorbers at the top of the fork girder in exactly the same manner as that outlined above.

STEERING DAMPER. Assemble as follows—1st friction disc, steel disc, secured to tank, 2nd friction disc, steel disc anchored to handlebar lug, star washer, spring washer, hand wheel, left hand screw.

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FRAME, TANK AND SADDLE.

Beyond keeping all nuts tight there is little that need be done in the way of frame maintenance. If a lack of alignment is suspected after an accident it is advisable to return both frame and forks to the Works to be tested on our special jigs.

TANK. The welded steel tank fitted to the Rudge range is not likely to need any attention. Its finish and strength are far superior to those of soldered tanks, while a filter is incorporated with the petrol outlet. The tanks on the larger machines have a capacity of nearly 3 gallons, or a solo range of 220 miles, while the tank on the 250 c.c. has a capacity of $1\frac{1}{2}$ gallons. To remove the tank disconnect the petrol pipe and the 'U' pipe connecting the two halves of the tank and in the case of the 250 c.c. the two oil pipes. Undo the bolts securing the tank to the frame tube clips. Disconnect the gear lever and the steering damper anchor plate, and the tank may be lifted from the machine.

SADDLE. Make sure that the clip holding the peak of the saddle to the frame is tightened up securely, since if this slides back the saddle is liable to strike the rear mudguard when negotiating rough roads. Put a few spots of oil on to the bearing of the saddle peak occasionally.

THE CARBURETTER.

Amal Carburetters are used on all Rudge models, several different sizes being employed.

In every case the method of tuning is the same. The machine should be taken to a long stretch of open road and various jets tried out until the best "all out" results are obtained with both throttle and air wide open. Now place the machine on a stand, run it slowly in neutral, gradually closing the throttle and retarding the spark. The knurled screw (J, Fig. 5) adjusting the pilot jet should be turned in a clockwise direction until eight stroking sets in. It should then be turned in an anti-clockwise direction until the engine picks up. Now throttle down a little more, when in all probability the engine will again start to eight stroke. Once more unscrew the pilot jet control and proceed in this way until the engine is running as slowly as possible. If the control is unscrewed too much the engine will spit and stop.

The method of tuning the intermediate mixture is by raising or lowering a taper needle (C, Fig. 18). This is secured by means of a hair pin spring which engages with one of four grooves and secures the needle to the throttle valve (B). Raising the needle makes the intermediate mixture richer and vice-versa. The usual setting is with the hairpin spring in the second groove from the top of the needle.

The air control on these carburetters should normally be fully open, but may be nearly closed for starting from cold or climbing stiff hills under heavy loads, e.g., sidecar.

The petrol level is set correctly. Do not attempt to alter it, and if the float is taken out of the float chamber, make sure that the spring clip engages with the groove on the needle when replacing it. A

screw with a locknut will be found on the mixing chamber, the object of which is to form a throttle stop. This screw prevents the throttle closing and should be adjusted to give slow running and starting position.

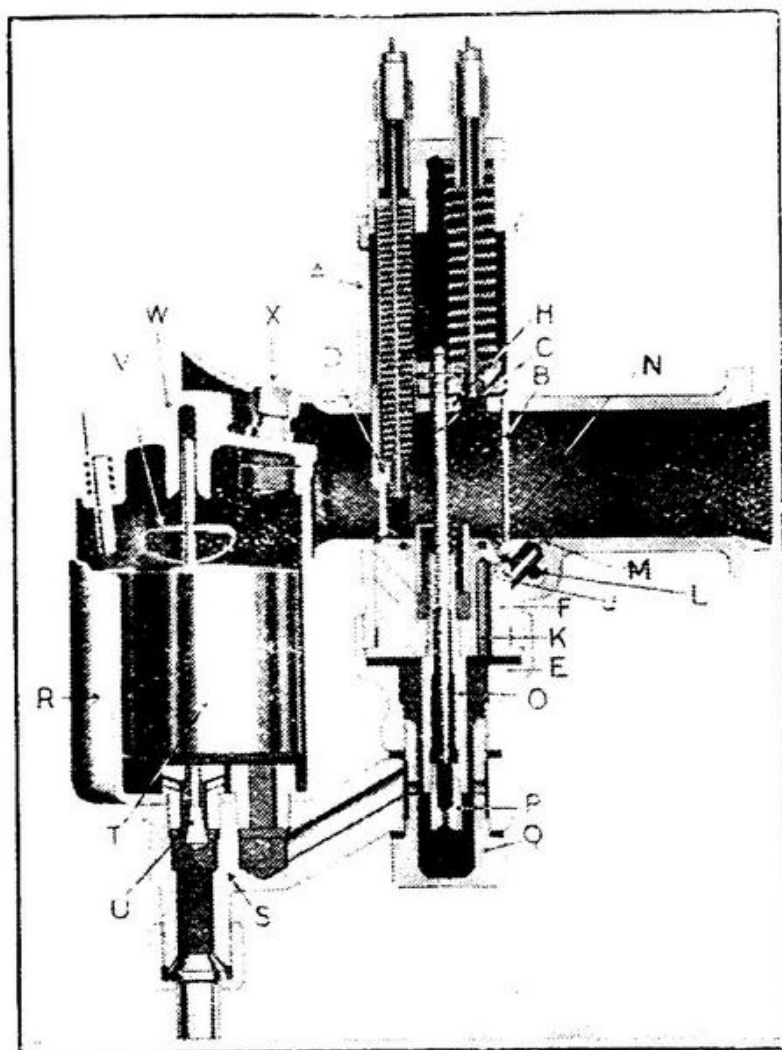


FIG. 18. THE CARBURETTER.

Keep the control cables well lubricated and see that, while the throttle valve definitely shuts when the lever is closed there is no slack in the cable.

It is as well to clean out the float chamber, jet and petrol pipe at intervals.

The correct jet settings are :—

"Ulster"	..	..	..	..	170	180 Spare.
500 c.c. T.T. REPLICA	..	..	..	..	54	59 Spare.
350 c.c. T.T. REPLICA	..	..	..	..	160	170 Spare.
"Special"	..	..	..	..	150	140 Spare.
"350"	..	..	..	..	130	120 Spare.
"250"	..	..	..	..	120	

TO DISMANTLE THE CARBURETTER.

Take off the petrol pipe, remove carburettor from cylinder head, undo the small nut beneath the mixing chamber (Q, Fig. 18) and take off the float chamber. The jet (P) may then be removed for

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cleaning. It is most important to make certain that the large nut (E) at the base of the mixing chamber is kept dead tight, since if this becomes loose the action of the instrument will be badly upset. Undo the knurled ring at the top of the mixing chamber and take out the throttle valve (B) and taper needle (C). To disconnect the throttle cable remove the hairpin spring and taper needle, push the end of the throttle cable down into the throttle valve and take it out through the larger hole which normally carries the taper needle.

Undo the top of the float chamber, slackening the set screw (X), and remove the spring clip (V) from the needle. Invert the float chamber when the float will drop out. The needle (U) is of the inverted cone type and may be removed through the bottom of the float chamber. In removing the needle the small gauze in the union will have to be pushed out and this should be cleaned before replacing.

To re-assemble, proceed in the reverse order.

THE MAGNETO.

The round pattern M-L Magneto fitted to Rudge machines is exceedingly reliable.

It is simply necessary to maintain a gap of .010in. at the contact breaker points, which should be dismantled and cleaned periodically.

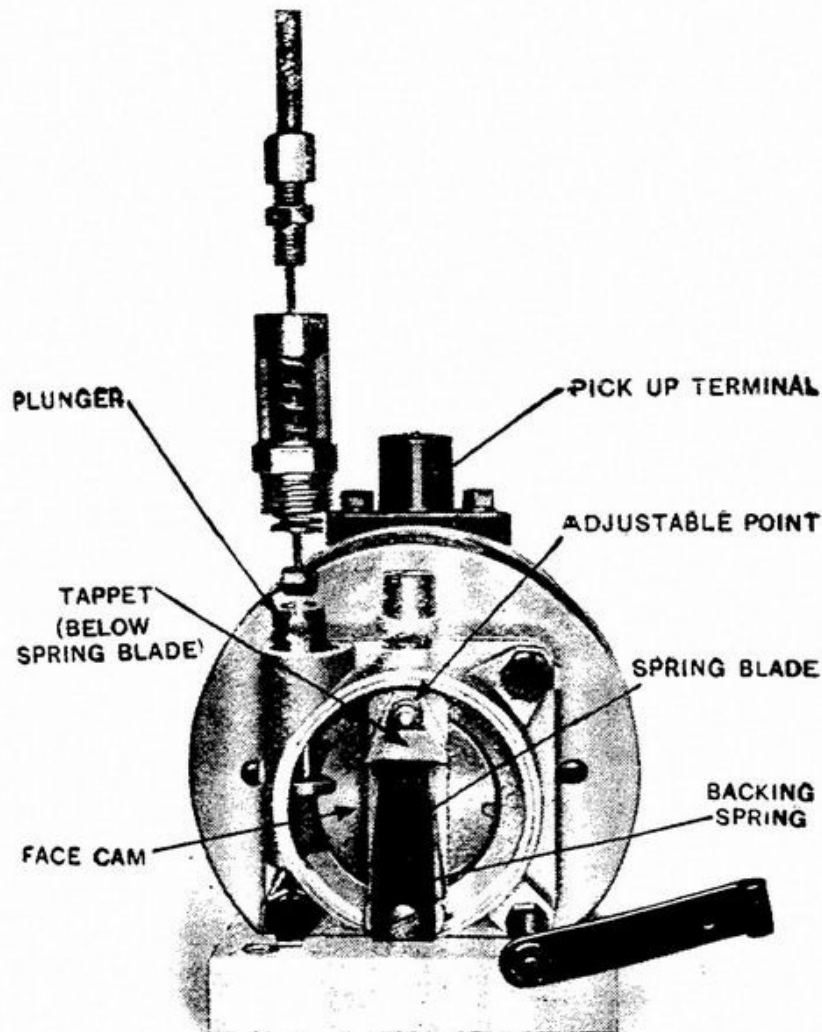


FIG. 19. THE MAGNETO.

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to lubricate the control cable and put one spot (not more) of oil on the steel face cam, about every 500 miles.

To clean the points, remove the screw securing the spring blade (Fig. 19), which carries the moving point. This blade may be removed, leaving both points accessible for cleaning. When replacing see that the small backing spring is placed with its convex side next to the spring blade. If this is replaced with its concave side towards the blade, breakage will probably occur. While the spring blade is removed, take off the contact breaker and inspect the push rod. If this shows any signs of sticking, it should be carefully cleaned and replaced.

To remove the control cable from the case, undo the hexagon nut and draw the cable upwards to its utmost extent, when it may be found that the nipple may be slipped sideways out of the hole in the plunger.

See that the high tension lead is not cracked or perished, and replace if there is any doubt. A smear of grease where the high tension lead enters the terminal on the magneto will prevent the ingress of water at this point.

LOCATING TROUBLES. If ignition trouble is suspected, remove the high tension lead and see if the magneto will spark to the cylinder when the engine is rotated. If so, try another plug. If not, remove the contact breaker cover and see that the points are dry, clean, correctly adjusted and working properly. Examine the high tension lead for cracks or breakage and see that the insulation has not been burnt against the cylinder fins. If all seems in order, take out the high tension terminal, rotate the magneto and see whether any shock can be felt by touching the slip ring with the end of a lead pencil. If no fault can be found and the interior of the magneto appears dry, return it to the makers.

Do not remove the armature from the machine, since by doing so you will demagnetise it and, owing to its construction, it cannot be re-magnetised except by a special machine.

SPARKING PLUGS. We recommend Lodge M.H.1. plugs for touring work, while for fast touring and general work on the "Ulster" a K.L.G. 583 plug will be found to give excellent results. For very hard work with the "Ulster" a Lodge R40 or H45 or a K.L.G. 246 may be fitted, while for racing a K.L.G. 356 is excellent.

In the case of a plug on which the gap can be altered, it will be found that excellent slow running can be obtained with a gap of .027in. With a very high compression engine, however, it is preferable that the gap should not exceed .020in. It is a good plan to dismantle a detachable plug occasionally and clean away all soot or carbon.

THE DYNAMO AND CUT-OUT COMBINED.

Type 6V. D.M.3G. is of the third brush shunt field regulating type. Both the positive and third brushes are insulated from the frame of the dynamo and the negative brush is earthed, owing to its being screwed direct to the dynamo bearing brackets. The dynamo output is 6 volts, 4.5 to 5 amps., and an average motor cycle lamp load of 3 amps. is generated at 1,800 r.p.m.

The opening and closing of the dynamo and battery circuit by means of the automatic cut-out is governed by the dynamo generated voltage, and this depends, firstly, on the position of the control switch; and, secondly, on the speed of rotation of the dynamo. With switch in the "off" position the cut-out contacts should be at all times separated. With switch on charge the cut-out contacts will be found to close at a road speed of 20 m.p.h., whilst with switch in the H. and L. positions, the contacts should close at 12 m.p.h. approximately.

LUBRICATION.

Use oil very sparingly. A supply of lubricant has been placed in the bearings when assembled, and this should prove sufficient for 1,000 miles. A few drops of good quality oil should be inserted through the oiler provided at the driving end every 500 miles and a small quantity of lubricating grease pressed into the hole (to be seen in the end of the commutator end bearing casting) every 1,000 miles. Avoid using too much grease and pressure, otherwise the grease may be forced through the bearing and this may eventually reach the commutator and cause trouble.

COMMUTATOR AND BRUSHES.

When in position, the brush should press firmly on the commutator. On no account should carbon brushes be replaced by other than those made by "Miller". The commutator and brushes should be periodically inspected. Remove all trace of carbon dust and grease and see that all the brushes move freely in the holders. To clean a blackened or dirty commutator, use fine glass paper. A commutator with a highly polished surface (dark bronze colour) should be left untouched. It is advisable to change the brushes just before they are worn out, as this will prevent the sparking which gives rise to blackening of the commutator and unsteady charging current, owing to the brushes making imperfect contact.

DYNAMO DRIVE.

See that the chain runs smoothly and that the sprocket teeth enter and leave the chain openings with a complete absence of jerks or knocks as these tend to set up vibrations which transverse the armature shaft and lead to fractured conductors. Place the hand on the dynamo from time to time; lack of smoothness in the drive will be readily felt and should be immediately remedied.

THE COIL. The coil being a stationary unit, no wear takes place and once installed it calls for no attention.

THE BATTERY. It is most important to check the acid level at frequent intervals. Neglect of this precaution has ruined countless batteries. Make good evaporation with distilled water (ordinary water will not do), but if acid has been spilt, replenish with acid of the right specific gravity which may be obtained from an Electrician.

For winter work it is preferable to charge whenever the machine is used, but on long summer runs when the lights are not needed, an occasional spell of charging is enough.

With a powerful headlamp, daylight charging should not be less than 50 per cent, when running solo, or 100 per cent. with sidecar, of the time that the lights are used at night.

If an electric horn is fitted, the times of charging should be further increased.

If the machine is used more at night time than in the daytime, fit smaller bulbs or run on the pilot bulb where possible, so that the generator can supply all the current required without draining the battery.

When rubber buffers have been fitted in the battery lid, care should be taken when removing the fixing the lid to ensure that these are always in position.

250 C.C. CONTACT BREAKER.

Attached to the rocking lever is a pad which presses firmly on the cam during part of the latter's rotation, and whilst doing so, the contact points are separated .018 inches to .020 inches and the coil circuit is open. During the remaining period in the cam's rotation, the cam leaves the pad and this allows the contacts to meet and thus close the coil circuit. The lever bearing pad, rotating cam and contact points are the only wearing parts for this form of ignition. They should be given periodical attention; the lever bearing should be clean and highly polished, the cam smeared lightly with vaseline, the least sign of sluggishness should be remedied by polishing and lubrication of pivoting spindle and bearing. The contact points must be free from oil, otherwise they may become pitted and dirty and it will be necessary to file them smooth and flat to ensure perfect contact. They should at all times be clean, and a petrol soaked rag should be used for this purpose. When in order, the contact face should present a frosted appearance. When the cam is clear of the pad the contacts should be pressed firmly together by means of the spring provided. Binding at the pivot bearing will weaken this pressure and prevent the smart make and break so essential for satisfactory results. If the contacts are badly burnt the condenser should be tested and, if faulty, replaced. To test the condenser remove it and apply a lighting main's voltage to its terminals—a lamp should be used in series, and thus avoid a short circuit in the event of the condenser proving faulty or breaking down during test. If in order, on removing main's voltage an appreciable snapping spark will be obtained on short circuiting the terminals of the condenser, even after a few second's pause. If leaky or partially shorted, no spark will be obtainable. Excess voltage will give rise to burnt contact points, but as this condition is only likely to be brought about by running with the battery disconnected, it need hardly be considered.

SEPARATE IGNITION SWITCH.

This switch, when off, opens the coil ignition circuit and thus prevents the battery discharging itself when the engine is not required. It is essential that this be used on stopping and starting.

TELL-TALE OR WARNING LAMP.

The warning lamp will be found to brighten as the engine slows down, and on stopping will remain bright if the switch is left on and the contact breaker or timer contacts remain closed. It is connected in parallel with a small resistance and both bulb and resistance are connected in series with the coil circuit when the switch is on. Thus, should the bulb get broken, the ignition will remain unaffected. However, the bulb should be replaced at the earliest opportunity. A replacement bulb will be obtainable almost anywhere, same being a 2.5 volt flash lamp type.

TESTS IF TROUBLE IS EXPERIENCED.

The low tension or battery side of the ignition may be checked by turning the ignition switch on and rotating the engine slowly. If the ammeter reading fluctuates between zero and 3.5 amps. with the battery up, this part of the system is satisfactory. On reaching average engine speeds this current value should drop to .75 or .5. If it does not, examine timer contact clearance, and if reduced, due to pad wear, adjust the proper clearance.

NOTE.—An excess demand by the ignition system will give rise to symptoms which might be diagnosed as low dynamo output; therefore check ignition demands with dynamo switch in "off" position.

The high tension may be checked by removing the high tension cable and holding the terminal say $\frac{1}{8}$ in. or $\frac{1}{4}$ in. away from some engine part. Repeat the operation indicated above for low tension test. A spark should be obtainable (when the low tension circuit is broken). If all appears in order, examine the plug, clean, and if unable to discover the cause of failure, try another plug. If a spark is unobtainable between the high tension terminal and engine body, examine the cable and renew, if damaged, or if the rubber appears to have deteriorated. If satisfied that the cable is in order, check the condenser and if this appears in order, return the coil to the makers.

IMPORTANT :—In the event of serious battery trouble, the ignition system will work satisfactorily for twenty minutes to half an hour if a medium size flash lamp type of battery (cells connected 4 in series to give approximately 6 volts) is used temporarily in its place. After a rest of ten minutes a further run of twenty minutes is obtainable, and so on until the battery is completely exhausted. The head lamp switch should be left in the "off" position under these temporary conditions.

FOCUSSING. To focus the head lamp remove the front (bayonet fitting for both this and the reflector) and screw the bulb, which is carried on a thread, in or out until the desired result is obtained.

SIZE OF LAMPS REQUIRED. A three ampere head lamp bulb may safely be used, while the pilot, tail and sidecar lamps may take .5 amp. each. Note that all bulbs must be of the single centre contact type.

Gas filled bulbs give a brighter light and are generally more economical than the vacuum variety.

LOCATING TROUBLES. If the lamps will not light when the machine is stationary, but do so when it is running, the battery is run down, or there is a broken connection between the battery and the control switch.

The lamps will not light at all. This may be due to :—

1. Bulbs burnt out or broken.
2. Shorting or broken connection.
3. Generator not charging and battery run down.

Lights flicker. This may be due to loose or broken contacts in the lamp holder or switch box. It may also be due to short circuit of the wiring or a loose connection at the battery.

GEARBOX AND CLUTCH.

NOTES FOR THE EXPERT.

In giving the following notes on dismantling, adjusting and re-erecting the Rudge gearbox, we wish to make it quite plain that we do not recommend an amateur to attempt to take his gearbox to pieces. An expert mechanic on the other hand will find them of considerable value in carrying out the work, which, whilst simple enough to those who are conversant with the box, might easily be done wrongly by one erecting it for the first time.

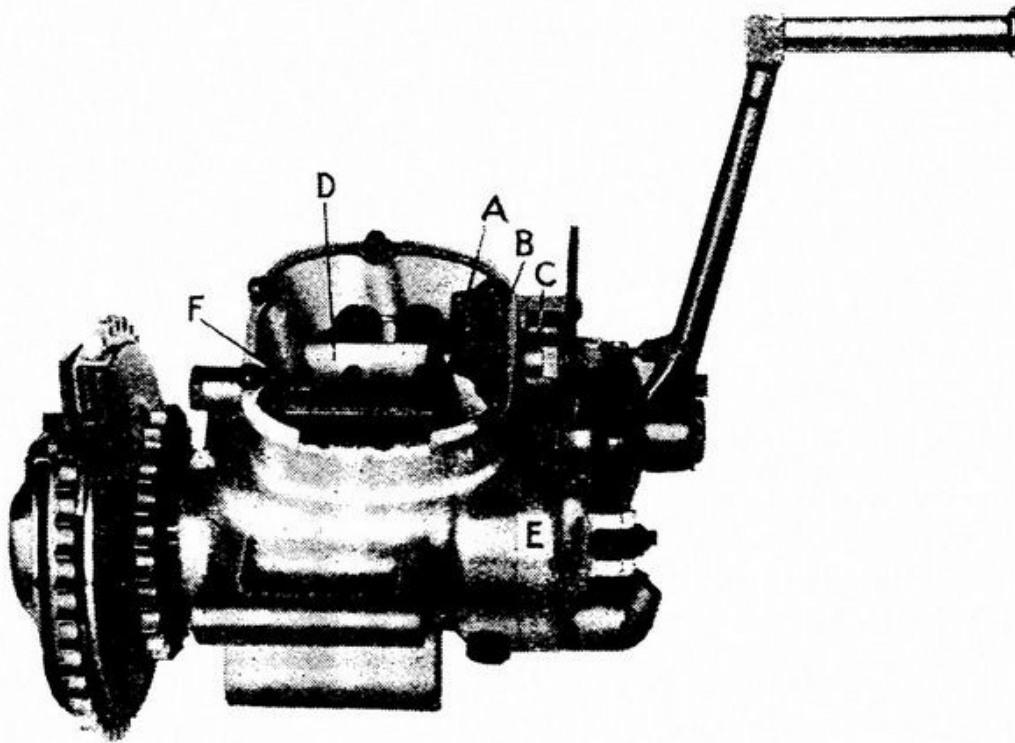


FIG. 20. THE RUDGE FOUR SPEED GEAR BOX.

TO DISMANTLE THE BOX.

Grip the box in a vice by holding down lugs at the bottom, take off the inspection cover (A, Fig. 20), noting that a grub screw (B) in this engages with a hole in the threaded cam plate bearing (C). Remove the cam plate complete with its bearing and external lever. Remove the end cover of the box (Fig. 22) complete with kick starter mechanism, but leaving the layshaft spindle in place. The removal of the nut securing the kick starter crank to its shaft allows of this.

Having previously removed the clutch and rear drive sprocket, take out the 1st speed wheel from the layshaft (Fig. 21), partially withdraw the layshaft spindle and also the mainshaft. Pull the complete layshaft towards the top of the box and tilt the mainshaft as far as possible away from it. This will allow the striking plates to be disengaged from the striking forks, whereupon the gear may be pulled out through the end of the box.

All parts should be cleaned and the rollers examined for signs of discoloration, and replaced where necessary. Apart from the roller race in the kick starter ratchet carrier, you will find three lengths of small diameter rollers. The shortest ones fit within the pinion formed on the end of the layshaft. The medium length ones are used outside the 4th speed wheel and also on the opposite end of the mainshaft, while the longest are fitted inside the 4th speed wheel in two rows separated by a washer (see Fig. 21). Loose washers are fitted behind the 4th speed wheel, also over each end of the mainshaft and between the 1st speed wheel and the roller race in the kick starter ratchet carrier.

In the 250 c.c. box will be found five lengths of rollers situated as follows:—The shortest of rollers in the kick starter ratchet carrier, the next length at the opposite end of the layshaft and the two longest, with a distance piece between them, inside the 4th speed wheel. The medium lengths are fitted outside the 4th speed wheel and on the opposite end of the mainshaft.

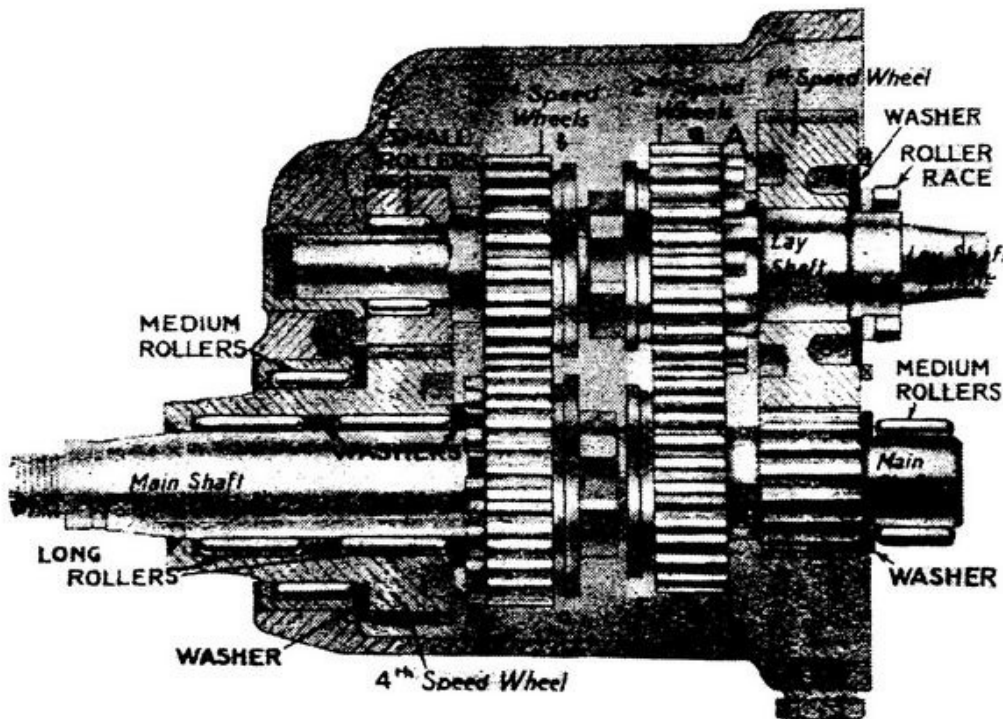


FIG. 21. THE FOUR SPEED GEAR ASSEMBLY.

The pairs of gear wheels used for second and third speeds are interchangeable, i.e., in the first case (a) meshes with (b), in the second case (b) meshes with (a).

It will be seen that the slot for the striking plate is formed at one side of the teeth (Fig. 23). When re-assembling take care that the narrow grooves on each pair of gear wheels are adjacent to each other and that the striking plates are assembled so that the pegs which form a bearing for the striking fork lie towards the inspection cover but remote from the striking fork.

TO RE-ASSEMBLE THE BOX. Using a high grade of pure vaseline to hold them in place, pack the bearing which carries the 4th speed wheel with medium rollers, next pack the inside of the 4th speed wheel itself with two rows of long

rollers separated by washers. Place this in the box. Now build up the 2nd and 3rd speed wheels on both main and layshafts. Insert the mainshaft with its washer on the 4th speed wheel but do not push right home. Insert the short small diameter rollers in the end of the layshaft and introduce the layshaft spindle. Place the striking plates in the grooves of the gear wheels on the mainshaft and engage them with the slots in the striking forks.

Now introduce the layshaft and holding the two shafts as far as possible apart, work the striking plates into their respective grooves in the layshaft gear wheels. Push the layshaft spindle into its housing and push both main and layshafts right home. Now replace the 1st speed wheel, washer and roller race on the end of the layshaft, the washer on the end of the mainshaft and the end of the gearbox is ready to be replaced (Fig. 21).

TO SET THE KICK STARTER RATCHET.

In the first place it is not necessary to dismantle the kick starter ratchet, provided that the crank and spring are left in position when the box is taken down. If, however, this has been done, proceed as follows:—

Place the kick starter carrier (A, Fig. 22) in its bearing, hook on the inner end of the spring (D) to the inner end of the spring. attach the other end to the peg on the starter crank or slot in the spring cover of the 250 c.c. and wind this up until the crank has passed the vertical. Push the crank on to its serrations. Now thread the ratchet drive sleeve (C) and its spring (D) on to the vernier quick thread on the carrier (A) in such a way that the lug (E) on the driving sleeve is touching the stop (F) on the gearbox cover when the crank is about 20 degrees behind the vertical.

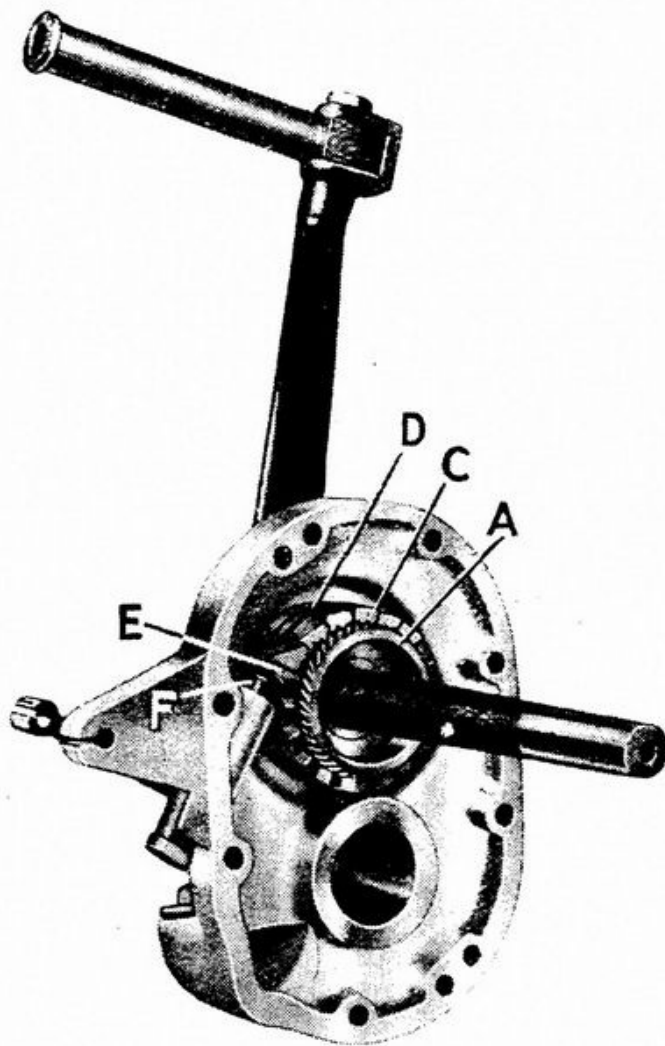


FIG. 22. THE KICK STARTER MECHANISM.

Press the crank upwards and see that the stop inside the cover prevents the driving sleeve from rotating too far so that it screws away from the first speed wheel along the vernier thread, thus holding the ratchet teeth out of engagement.

The illustration (Fig. 22) shows how these parts should appear when correctly set.

This setting can be done with the cover off the box. When complete it is simply necessary to pack the mainshaft race with medium size rollers, refit the cover plate using a liquid jointing material and replace the nut on the end of the layshaft spindle which secures the starter crank in place. If, however, the crank is not in a convenient position it should be moved on its serrations to another position.

TO ADJUST THE GEARS. As mentioned above, a grub screw in the inspection cover engages with a hole in the threaded brass cam plate bush (C, Fig. 20). As the box was adjusted correctly in the first place it is simply necessary to ensure that the grub screw (B) is returned to this hole, when the setting must necessarily be correct.

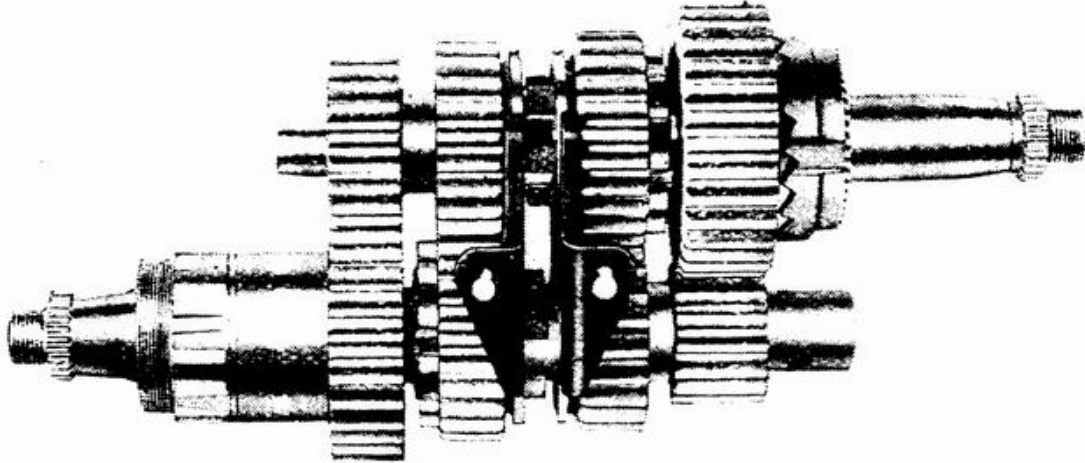


FIG. 23. THE GEARS REMOVED FROM THE BCX.

It may be however, that the setting has been interfered with and that more than one hole will be found in the brass bearing. In such a case it is advisable to re-set the box. To do so, fit a strap over the threaded bearing (C, Fig. 20) held down by the existing studs on each side. This keeps the bearing rigid and allows the operator to look through the inspection aperture.

In introducing the cam plate (D) see that it engages with the spring loaded plunger (F) which locates the gears. It will be seen that for top and bottom gears, engagement is effected by means of pegs on the sliding pinions which engage with the holes on the 1st and 4th speed wheels (Fig. 23).

Set the gear lever first in top and then in bottom gear positions and watch whether the depth of engagement of the pegs in the holes is exactly the same in each case, if not put a spanner on the flats of the brass cam plate bearing and screw this into or out of the box.

Screwing it in will cause deeper engagement for top gear whilst screwing it out will do the same for the bottom. When the depth of mesh is exactly the same for top gear as for bottom, remove the strap and refit the inspection cover, again using liquid jointing material. If the adjustment has been carried out correctly it will probably be found that the original hole in the threaded bush is close to the grub screw, so that it will be unnecessary to drill another.

If the lever is removed from the cam plate replace it so that when bottom gear is engaged it does not foul the fork on the gear control rod.

THE CLUTCH.

It is only after the gearbox has been badly over-filled with oil which has worked its way into the clutch, that slip is at all likely. Scrubbing plates with petrol will immediately cure this.

To remove the clutch from its taper take off the cover plate, remove locking plate, undo the central nut and give it a sharp tap from the back. If this fails to loosen it use an extractor. If it should be necessary to dismantle the clutch proceed as follows:—

Remove the cover plate (A, Fig. 24) and take the hook spanner used for adjusting the steering head, which will be found in the tool kit. Apply this spanner so that it bridges the central nut and bears against the projecting ends of the spring boxes. With a very large adjustable spanner grip this hook spanner which should undo the spring plate (B). If this expedient fails, a hammer and punch applied to the edge of the spring plate will loosen it.

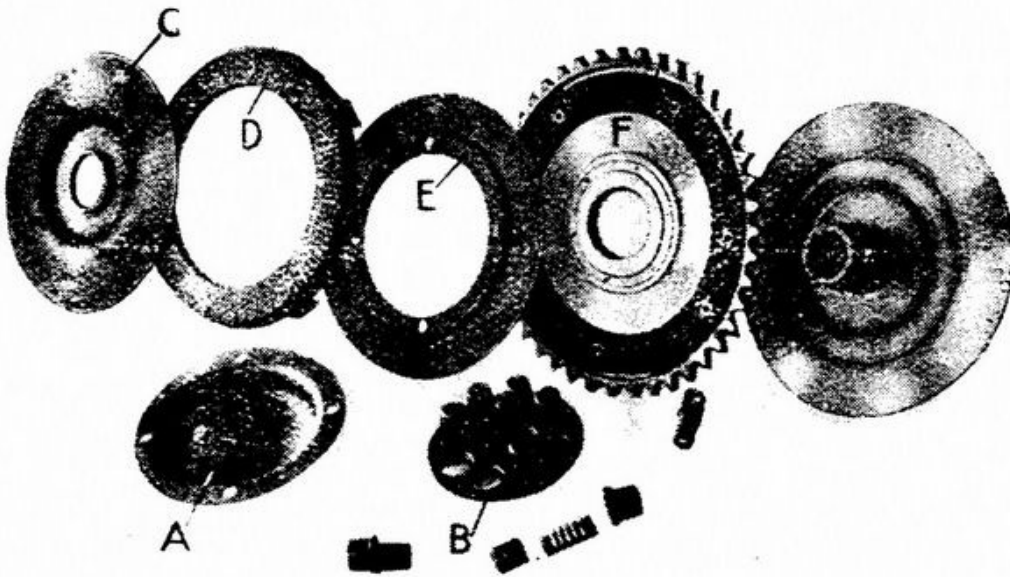


FIG. 24. THE TWO-PLATE CLUTCH DISMANTLED.

Do not, however, attempt to hammer against the spring boxes, or these will be damaged. Remove the spring plate, spring boxes and springs (Fig. 24). Next remove the outer clutch plate (C) remembering that the threaded ends of the four studs project outwards. Secondly remove the ring (D) faced on both sides with friction fabric. Dogs on the outside of this project through slots in the sprocket. Thirdly take off the thin dished plate (E). The four small holes in this engage with the pegs on the outer plate and the convex side of the dished plate should be outwards. Finally remove the clutch sprocket (F) with its double lining of friction material. It will be found that one side of this sprocket is recessed and the other plain. The recessed side should be away from the gearbox. To re-assemble proceed in the reverse order.

Rear drive sprocket is held by splines and a locking nut (L.H. th'd).

Should an amateur have any difficulty in removal of clutch or sprockets we shall always be pleased to carry out this work at our Factory at quite a nominal charge.

In practice, however, the private owners are never likely, during the first two, or even three years, to have need to dismantle any part of the gearbox or clutch, and these notes are primarily intended for sporting riders who may wish to alter their gear ratios from time to time by changing the gearbox sprocket.

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TUNING UP AND TRACING TROUBLES.

TUNING UP.

Many Rudge owners will no doubt wish to enter their machines for various kinds of competitions, so a few brief notes as to the lines upon which tuning up operations should be carried out may be of service. To commence with let us take the case of a rider who is entering for a long distance reliability trial which does not include any severe hills. The machine should be prepared in exactly the same way as though about to undertake a holiday tour.

FOR MAIN ROAD TRIALS AND TOURING.

See that the engine is clean both inside and out, lubricate everything thoroughly, adjust the tappets, gears, chains and brakes, see that a slight but not excessive amount of play is perceptible in the wheel bearings. thoroughly inspect all controls and overhaul the lighting set.

FOR GENERAL RELIABILITY WORK.

In addition to the above fit a Sports Rear Rear tyre, select a gear ratio suited to the work, grease the rim of the magneto contact breaker cover, examine and grease the ends of the high tension lead and fit a waterproof plug terminal. For very deep water add insulation tape to make the plug absolutely water-tight, raise the carburetter air intake by means of rubber hose pipe and close up the crankcase breather.

It is quite unnecessary to smother the magneto in grease—about one thimbleful is ample. Suit the engine to the work in hand, thus for a Six Days event run with a comparatively low compression, but for an event decided upon an acceleration test, remove the compression plates and tune the engine as though for racing. Finally do not neglect to put in as much riding practice as possible.

FOR RACING. Make sure that the engine is well run in. Remove the compression plates, on touring models but not on T.T. Replicas, substituting shorter push rods if necessary. Be sure that the valve heads clear the top of the piston. Also remove the lamps and mudguards. Dismantle the engine and make sure that every part is absolutely free without being unduly worn. Rub down any high spots on the piston and make sure that there is ample clearance, particularly above the rings. See that the valves are free in their guides and that the seatings are true, and polish the inside of the head and ports. For speed work Castrol R oil may be used with advantage. Select your gear ratios with the utmost care, advance the ignition timing slightly and tune the carburetter on the actual day of the event, using 50/50 petrol-benzol mixture.

Use a ribbed front 27in. by 3in. tyre and a studded rear 27in. by 3.25in. tyre and be particularly careful that the pressures are correct. Check the front forks and steering head over very carefully and experiment as to the best damper settings. Finally practice assiduously and cultivate a riding position which offers a minimum of wind resistance.

TRACING TROUBLES.

The ease and rapidity with which an expert will locate and rectify any troubles which he may have with his machine are not due to any special wizardry on his part, but rather to intelligent and systematic diagnosis.

It is true that the symptoms of any engine stoppage will usually give a clue as to its cause, and that considerable experience is needed in order to realise which of a number of possible eventualities has occurred, yet an expert rider can go up to a strange machine which will not run at all and within a couple of minutes or less can give a correct estimate as to the seat of the trouble.

We propose, therefore, to give Rudge users a certain definite sequence of tests which will enable a novice to locate a fault almost as quickly as an expert.

THE SEQUENCE. In the case of trouble due to any unknown cause, proceed as follows:—

Work the carburetter controls to and fro to test for cable breakage. Flood the carburetter and note at which point petrol overflows.

Detach the high tension cable and kick the engine round with the exhaust lifter raised or the decompressor open, holding the high tension terminal near the cylinder to see if there is a spark; also watch the valves. Finally test the compression. If all is in order inspect the plug and, if there is a good spark at the points, check the valve and ignition timing.

These operations take but a very few seconds yet they will infallibly indicate where the trouble lies. Remember, however, that as a general rule it is much easier to prevent the occurrence of a trouble in the Garage than to cure it on the road.

Don't wait to cure trouble. Avoid it.

Keep your Rudge in correct adjustment and do not leave the replacement of such items as worn chains and frayed cables until breakage occurs, and you can rely upon many thousands of pleasurable miles without a single involuntary stop.

IF THE ENGINE WON'T GO

Sequence of Testing	Trouble	Remedy
TEST CONTROLS	Broken throttle cable	Replace, or substitute air control cable.
	Sticking slides	Remove and clean.
FLOOD CARBURETTOR ...	No petrol	Turn on tap; refill tank. Clean pipe and filter.
	Water in petrol, or bad petrol	Drain and refill.
	Flooding from float chamber, but not jet ..	Remove and clean jet.
	Broken pipe	Repair with solder or rubber tube.

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Sequence of Testing	Trouble	Remedy
Detach H.T. Cable and rotate Engine with Exhaust Lifter raised or Decompressor open		
(a) Engine solid ...	Seizure or breakage ..	Attempt to free with paraffin. If unsuccessful dismantle.
(b) Engine stiff ...	Oil gummy or partial seizure	Inject petrol. If still stiff, see above.
(c) Compression still in evidence	Faulty exhaust lifter or cable	Adjust or repair
(d) Engine free and spark good	Possibly faulty plug ..	Clean or replace plug if everything else is in order.
(e) Engine free, no spark	Ignition trouble	Clean and adjust contact breaker and see that the tappet is free.
	(a) Armature turning	Inspect H.T. lead. Remove pick-up and test for spark from slip ring.
	(b) Armature not turning	Replace broken pinion or retighten pinion and retime ignition.
TEST COMPRESSION	Tappet or exhaust lifter holding valve up	
(a) No compression	Broken or burnt valve, valve spring, piston or piston rings	Adjust.
	Sticking valve	Replace.
	Slipped or damaged timing gear	Free with paraffin.
(b) Compression; Valves not working	Stripped timing	Retime or replace.
	Slipped timing	Replace and retime. Retime.
NO APPARENT FAULT	Faulty plug	Try another.
ENGINE MISFIRES		
(a) Good spark	Bad carburation	Clean or adjust carburetter.
	Water in petrol	See above.
(b) Intermittent spark	Dirty plug	Clean.
	Dirty contact breaker	Clean.
	Occasional short circuiting	Replace H.T. Cable.

Sequence of Testing	Trouble	Remedy
ENGINE KNOCKS	Pre-ignition or over-advanced	Retard the spark.
	Overheating	Check oil supply.
	Unsuitable fuel	Try Benzol mixture, or Ethyl.
ENGINE LACKS POWER	Out of tune	Check adjustments.
	Unsuitable plug	Replace.
	Overgeared	Change down or fit smaller sprocket.
ENGINE RACES ...		
(a) Gradually	Slipping clutch	Dismantle and clean plates.
(b) Suddenly	Broken chain or gear slipped out	Re-adjust gear box.
SNATCHY DRIVE	Gear box, gear control or chains out of adjustment	Re-adjust at once.
COMBINATION PULLS TO LEFT ...	Bad alignment	Insert washers at seat and rear connections, to make machine lean out and sidecar run in.

LIGHTING SET TROUBLE CHART

ENGINE RUNNING.

Symptom	Cause	Remedy
Bulbs light only when engine is running. They also vary in intensity. (Switch off immediately, otherwise all bulbs may be burnt out)	Loose, dirty and broken battery connections	Clean and tighten all battery cell and terminal connections. Top up cell with distilled water at once.
	Battery exhausted ...	Put on charge at once.

Symptom	Cause	Remedy
All lights flickering .	Loose battery connections	Tighten connections.
	Battery to switch cable connection loose or conductor damaged	Examine connection and cable; the cable may be damaged internally due to faulty fixing and excessive strain and bending (see damaged cable).
	Earth connection between battery, terminals and motor cycle frame faulty ...	Replace doubtful cable (see earth connections).
Only one of the lights flicker	Loose contacts	Examine bulb holder plunger. This may be sticking, also all contacts completing this particular circuit.
	Earth connections between lamp body and motor cycle frame faulty	See earth connections.
Boiling over of battery	Acid level too high ...	Lower level by drawing off. Plate separators should be just covered.
	Overcharging	Avoid day charging for a time. Allow the battery to become partially discharged. Complete the cycle of charged and discharged conditions occasionally (this tends to keep the battery healthy).
Poor light	Earth connection faulty	Clean and tighten contacts (see earth connections).

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Symptom	Cause	Remedy
	Blackened bulbs or dirty reflector	Replace bulbs and clean reflector.
	Incorrect focus adjustment	Make sure that correct bulbs have been fitted. Try out and adjust focus at night on straight level road.
	One of the battery cells may be shorted and inoperative	Test out cells with hydrometer or voltmeter.
	Cables damaged	Replace doubtful cable (see damaged cable).
Bulbs light, but gradually go out	Battery run down ... Short circuit on the system	Put on charge. Examine cables and connections. Disconnect any doubtful circuit and try out again. Repair insulation of cable if damaged. Keep all conductors clear of frame work of motor cycle. Replace doubtful cables (see damaged cables).
Lights flicker, or vary in intensity	Loose connections ... Faulty bulb	Tighten. Try another bulb.

T.T. REPLICA MACHINES.

The constructional features of these machines are, in some ways, different from the 1931 standard machines, the actual specification being identical with the machines which were used for the 1930 Tourist Trophy race.

The magneto is driven at half engine speed by gears and the oil pump is incorporated in the timing cover, being driven by a worm on the intermediate gear wheel. The pump is not absolutely identical with the standard machines. The small end of the pump which feeds the big end bearing and the rear of the cylinder is at the bottom, and the large end which returns the oil from the sump to the tank is at the top.

In the 500 c.c. engines the overhead rockers are hollow, being mounted on roller bearings and a central pin being held by side plates on the cylinder head. The overhead rocker gear on the 350 c.c. engine is identical with that on the 1931 350 c.c. engine.

A foot-operated step-by-step gear change is fitted and can be supplied with the brake pedal on the right hand side and the gear change pedal on the left, or vice versa, and a special close-ratio gearbox is fitted.

A handlebar controlled steering damper of the Bowden type is mounted on an extension of the nut which secures the handlebar to the steering stem.

The wheels are fitted with draw-backs instead of the cam operated adjuster which was evolved for the 1931 machine.

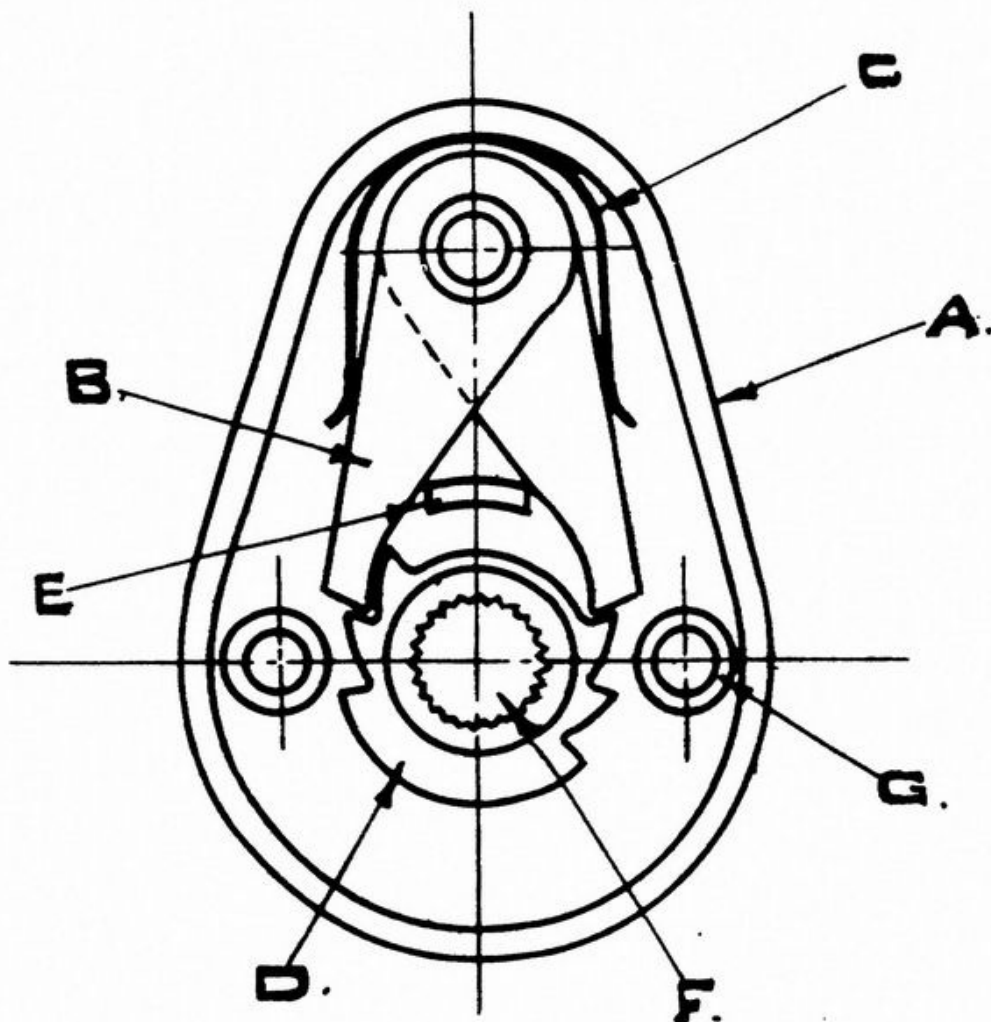
For touring purposes the machine is normally supplied with silencers and fish tails, but for track or road racing special open pipes should be used and, when this is done, a larger jet should be used. Unless otherwise specified T.T. Replicas are erected to run on petrol benzol. With open pipes the 500 c.c. will require a 59 or 61 jet and the 350 c.c. a 170 or 180 jet. When other jets are required it is necessary to specify the capacity and type of machine for which they are required, as the carburetters differ somewhat from the standard type.

STEP-BY-STEP

GEAR CHANGE.

The construction of the step-by-step mechanism is as follows:—A body (a) carries two pawls (b), around which a leaf spring (c) is fitted. The ends of the pawl (b) engage ratchet teeth in a wheel (d) and this ratchet wheel is mounted upon a gearbox quadrant (f). The movement of the body, which is actuated by the pedal, is limited by a stop (e) so that the quadrant (f) can only be moved one step at a time. In the event of this mechanism being disconnected, to re-assemble it is necessary that the attachment plates should first be bolted to the gearbox. Third gear should be engaged by movement of the quadrant (f) and the ratchet wheel (d) must be placed back on the serrations so that the wheel is in the position shown in the illustration. When the correct serration is engaged, the clearance between the ends of the pawls and

the ratchet teeth should be approximately .02in. Unless the whole gear-box is dismantled and screwed bush, which controls the position of the operating quadrant, has been altered, no difficulty should be experienced in re-assembly. It will be observed that the quadrant bush has been drilled and a locking screw fitted, and this controls the position of the gears inside the box.



STEERING DAMPER. This only calls for an occasional spot of oil on the friction surfaces. The normal way of using the damper is to adjust the knurled screw so that, when the operating lever is moved to give the maximum damping, the extent of the damping should not be more than that which the rider finds is required. Unless this is done, it is possible to lock the handlebars nearly solid.

As the damper is mounted on the handlebar nut, it is as well to see that this nut is firmly tightened.

LUBRICATION. We recommend that Castrol "R" should be used for both the engine and the gearbox and for best results it is advisable to drain out the oil from the engine and renew at frequent intervals, and also to keep the filter, both in the sump and in the oil tank, clean.

CHAPTER 6. SIDECAR.

TO FIT A RUDGE SIDECAR. Fit the front angle attachment by means of the bolts passing through the two lower holes in the front engine plates. This angle member hangs downwards. Remove the distance piece from the chain stay bolt and substitute the washers supplied. Remove the distance piece from the seat tube bolt and fit one $\frac{1}{4}$ in. thick washer. It will be found necessary to remove the battery and clip before the sidecar can be fitted. The battery should afterwards be fitted towards the back of the R.H. side of the sidecar body. In fitting the sidecar it will usually be found easier to put the back on first, followed by the front connection and finally the two torque members to the seat lug. If the front connection will not go on readily, remove the bolt securing the lower end of the front torque member. After bolting the front connection to the machine, the bolt securing the front torque member can be replaced fairly easily. Remember, however, that this bolt should be replaced with the nut on top owing to the fact that should an obstruction foul the chassis it is liable to cause this nut to unscrew. Be careful to thoroughly tighten all chassis bolts and nuts, especially the U bolt holding the crossed members on the centre of the chassis.

AN ALTERNATIVE ALIGNMENT. So much for fitting the standard sidecar with the machine dead upright and the sidecar wheel running in $\frac{3}{8}$ in. Many drivers, however, prefer to line their outfits up so that the machine is leaning outwards and so that the sidecar wheel tends to "run in" rather more, say $\frac{3}{4}$ in., thus preventing any tendency for the outfit to pull to the left. To line a Rudge sidecar in this way, fit additional washers on the chain stay connection and fit two instead of one of the $\frac{1}{4}$ in. thick washers on the seat pillar bolt. In extreme cases it may be advantageous to fit washers between the bottom of the front torque member and the chassis.

THE BODY, TO REMOVE. During an overhaul it is often convenient to leave the chassis in situ but to remove the sidecar body. This can be done in a few minutes by undoing two wing nuts behind the seat squab and one beneath the front of the body, which is then free to be lifted off the chassis.

OTHER TYPES OF SIDECARS. We most strongly recommend that only our own spring chassis sidecars be used with Rudge machines. Not only are these more efficient and more comfortable, but they impose far less stress on the frame of the machine.

GEAR RATIO. Unless the machine is ordered as suitable for sidecar work it will normally be delivered fitted with solo gear ratios. It will then be necessary to change the sprocket on the gear box for the correct sprocket. The correct gear ratios are given in the current catalogue and also in the list of "Useful Data" at the end of this booklet.

LUBRICATION. The hub is provided with a nipple and should be lubricated with the grease gun, and care should be taken to keep the bearings in correct adjustment.

SPRINGS AND SPRING SHACKLES. These should be lubricated from time to time with engine oil: if they are allowed to get dry squeaks will result.

USEFUL

INFORMATION REQUIRED

Bore	250 c.c.	350 c.c.
Stroke	62.5 mm.	70.0 mm.
Capacity	81.0 mm.	90.5 mm.
	249 c.c.	349 c.c.

VALVE TIMING.

Inlet opens before T.D.C. ....	.2 mm.	.2 mm.
Inlet closes after B.D.C.	8.0 mm.	8.4 mm.
Exhaust opens before B.D.C.	13.4 mm.	14.4 mm.
Exhaust closes after T.D.C.	2.2 mm.	2.4 mm.
Magneto advance before T.D.C.	12-14 mm.	15-16 mm.
Tappet Clearance when timing valves .....	.015"	.017"
Tappet clearance normal, cold engine, inlet exhaust	Nil.	Nil.
Plug gap .....	.002"	.002"
Contact breaker point gap .....	.027"	.027"
Piston ring gap .....	.020"	.010"
Type of plug .....	.005"	.007"
	Lodge MHI	Lodge MHI

Jet settings	120	130
		120 Spare

TYRE PRESSURES.

Front: 1, Solo; 2 Sidecar	18	24-27
Back: 1, Solo; 2, Sidecar	22	26-36
Sidecar	—	22
Tyre size	25" x 3.00"	27" x 3.00"

GEAR RATIOS. ALL MODELS.

		Solo	S/car
Gearbox Sprocket	18T	17T	15T
Rear Sprocket	38T	38T	38T
4th	6.0	5.35	6.04
3rd	7.68	7.27	8.22
2nd	10.5	9.5	10.72
1st	14.95	17.4	19.46
Compression ratio	7.0		6.8
Weight	218 lbs.		290 lbs.

TANK CAPACITY.

Petrol	1½ gall.	2¾ gall.
Oil	3 pints	½ gall.
Oil consumption	3,000	3,000

PETROL CONSUMPTION.

Solo	80-120	70-100
Sidecar	—	55
Wheelbase	4' 3"	4' 6"
Overall Length	6' 6"	7' 0"
Overall Width, Combination	—	5' 0"
Overall Length, Combination	—	8' 5"
Saddle Height	26½"	26½"
Width of Handlebar	26"	30"
Ground Clearance	5½"	4¾"

DATA

"SPECIAL"		"ULSTER"		350 T.T. REPLICA		500 T.T. REPLICA	
85.0 mm.		85.0 mm.		70.0 mm.		85.0 mm.	
88.0 mm.		88.0 mm.		90.5 mm.		88.0 mm.	
499 c.c.		499 c.c.		349 c.c.		499 c.c.	
.2 mm.		10.0 mm.		9.0 mm.		9.0 mm.	
8.4 mm.		13.0 mm.		14.4 mm.		14.4 mm.	
14.4 mm.		16.0 mm.		14.4 mm.		14.4 mm.	
2.4 mm.		10.0 mm.		9.0 mm.		9.0 mm.	
12-14 mm.		14-16 mm.		16.0 mm.		18.0 mm.	
.020"		.020"		.008"		.010"	
Nil.		Nil.		Nil.		Nil.	
.002"		.002"		.003"		.003"	
.027"		.020"		.020"		.020"	
.010"		.010"		.010"		.010"	
.010"		.015"		.017"		.017"	
Lodge MHI		KLG 583 or Lodge H42		KLG 583 (Touring) KLG 348 (Racing)		KLG 583 (Touring) KLG 348 (Racing)	
150		170		160		54	
140 Spare		180 Spare		170 Spare		59 Spare	
18		18		24		24	
22-30		22-30		22		22	
18		18		—		—	
26" x 3.25"		27" x 3.25"		Front 27" x 3.00" Rear 27" x 3.25"		Front 27" x 3.00" Rear 27" x 3.25"	
Solo	S/car	Solo	S/car				
20T	17T	21T	17T	21T		21T	
38T	38T	45T	38T	45T		38T	
4.53	5.35	5.1	5.35	5.1		4.32	
6.17	7.27	5.8	7.27	5.8		4.9	
8.05	9.5	7.6	9.5	7.6		6.4	
14.6	17.4	10.3	17.4	10.3		8.7	
5.5		6.8		8.0		7.1-7.25	
310 lbs.		310 lbs.		290 lbs.		290 lbs.	
2¾ gall.		2¾ gall.		3½ gall.		3½ gall.	
½ gall.		½ gall.		½ gall.		½ gall.	
2,500		2,500		2,500		2,000	
60-90		60-90		70-100		60-90	
50		50		—		—	
4' 6"		4' 6"		4' 7½"		4' 7½"	
6' 11"		7' 0"		7' 0"		7' 0"	
5' 0"		5' 0"		—		—	
8' 5"		8' 5"		—		—	
26"		28½"		28"		28"	
30"		30"		30"		30"	
4¼"		4¾"		3⅝"		3⅝"	

