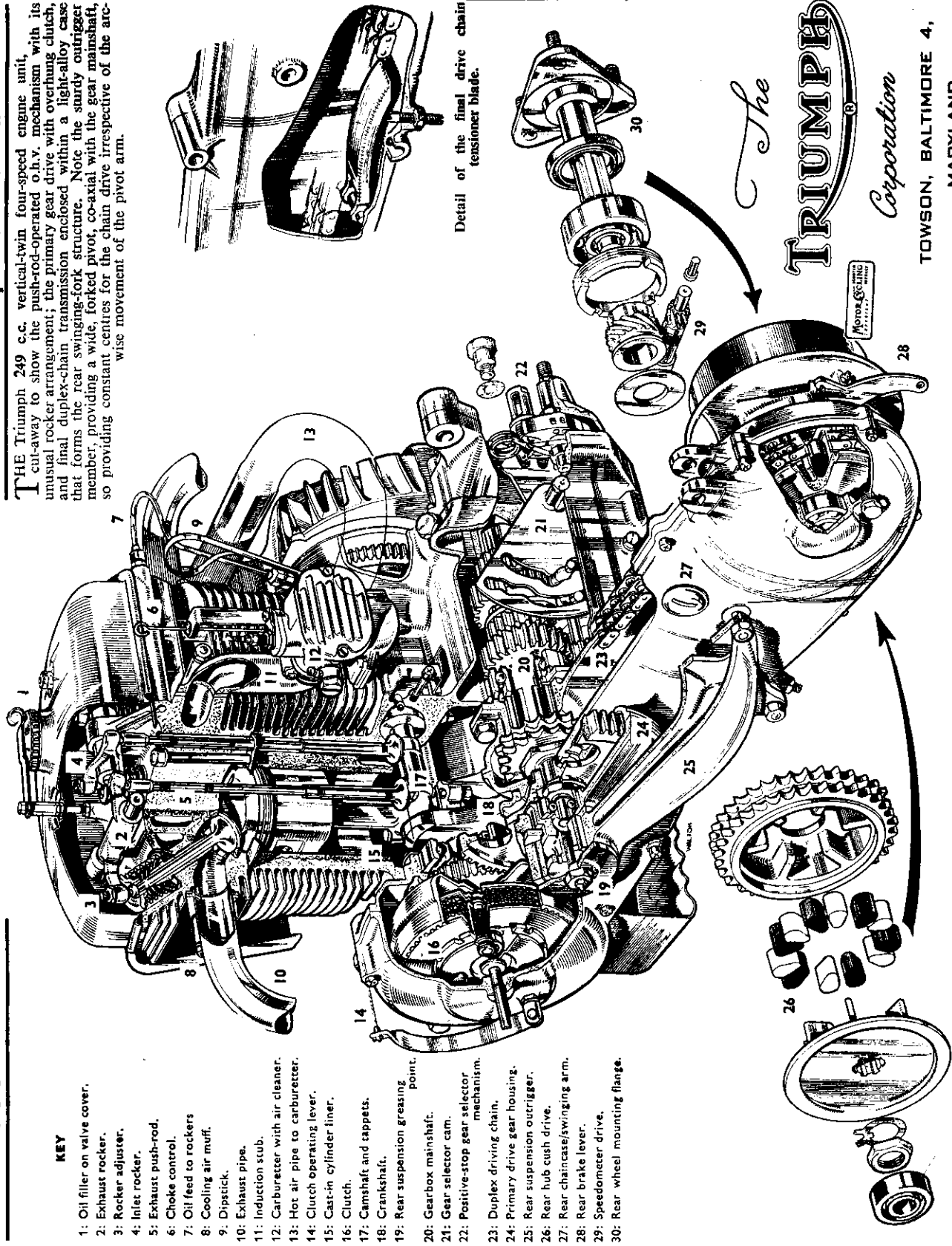


THE Triumph 249 c.c. vertical-twin four-speed engine unit, cut-away to show the push-rod-operated o.h.v. mechanism with its unusual rocker arrangement; the primary gear drive with overhung clutch, and final duplex-chain transmission enclosed within a light-alloy case that forms the rear swinging-fork structure. Note the sturdy outrigger member, providing a wide, forked pivot, co-axial with the gear mainshaft, so providing constant centres for the chain drive irrespective of the arc-wise movement of the pivot arm.



KEY

- 1: Oil filler on valve cover.
- 2: Exhaust rocker.
- 3: Rocker adjuster.
- 4: Inlet rocker.
- 5: Exhaust push-rod.
- 6: Choke control.
- 7: Oil feed to rockers
- 8: Cooling air muff.
- 9: Dipstick.
- 10: Exhaust pipe.
- 11: Induction stub.
- 12: Carburettor with air cleaner.
- 13: Hot air pipe to carburettor.
- 14: Clutch operating lever.
- 15: Cast-in cylinder liner.
- 16: Clutch.
- 17: Camshaft and tappets.
- 18: Crankshaft.
- 19: Rear suspension greasing point.
- 20: Gearbox mainshaft.
- 21: Gear selector cam.
- 22: Positive-stop gear selector mechanism.
- 23: Duplex driving chain.
- 24: Primary drive gear housing.
- 25: Rear suspension outrigger.
- 26: Rear hub cush drive.
- 27: Rear chaincase/swinging arm.
- 28: Rear brake lever.
- 29: Speedometer drive.
- 30: Rear wheel mounting flange.

Detail of the final drive chain tensioner blade.

The
TRIUMPH

Corporation

TOWSON, BALTIMORE 4,
MARYLAND

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

REMOVING THE SIDE VALANCES

Removing the Side Valances

To remove the side valances for maintenance on the engine unit, take off the dual seat by removing the two $\frac{1}{4}$ in. nuts and bolts coupling the "C" shaped hinges to the dual seat brackets. Take out the three $\frac{3}{16}$ in. bolts, two at the front of the valances and one at the rear bottom end, and remove the two $\frac{1}{4}$ in. diameter nuts and bolts which secure the number plate.

When a spare wheel and rear carrier are fitted the number plate is on the rear carrier and need not be removed from the carrier.

Break the connectors to the rear lamp. These will normally be found underneath the rubber tool tray, but when a rear carrier and spare wheel are fitted the connectors will be well outside the valances and will be obvious.

When a spare wheel is fitted, undo the two nuts, slacken off the two bolts at each side of the dual seat that support the rear carrier, lift the carrier and take off the spare wheel. Then take out the two bolts at the sides of the dual seat and remove the carrier complete with number plate. Remove the two $\frac{5}{16}$ in. bolts at the middle rear of the valances which also hold the spare wheel brackets.

The valances will now only be held by two bolts at each side, one domed slotted bolt immediately below the dual seat and one round head bolt at the bottom edge immediately above the pillion passenger's footboards. On the right-hand side of the machine the dual seat catch knob must also be removed. The valances are now ready to be taken away complete with the plastic beadings.

Reassembly of the valances is the complete reverse of dismantling. They should therefore be located first by refitting the two domed head slotted bolts immediately below the dual seat and the round head bolts above the pillion passenger's footboards, but these two bolts should be left slack to facilitate refitting the bolts around the edges of the valances. It is a wise precaution to locate all the bolts through the beading before tightening.

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

DISMANTLING FOR DECARBONISING

The term decarbonising means the removal of all carbon deposits from the combustion chambers, piston crowns and ports. It is generally recognised as including attention to valves, guides and springs. Before commencing to decarbonise, it is desirable to have the following equipment available in case of need, in addition to the toolkit.

- | | |
|--|--|
| 1. Top overhaul gasket set number 00 3120. | 7. Valve grinding tool (suction type). 61-5035 |
| 2. Inlet valves number 76 60(2). | 8. Valve grinding paste. |
| 3. Exhaust valves number 76 61(2). | 9. Scrapers for removing carbon. |
| 4. Valve springs number 76-63(4) & 76 69(4). | 10. Set of feeler gauges. |
| 5. Valve guides number 76 15(4). | 11. Supply of clean engine oil. |
| 6. Valve spring compressor number 61-5001. | |

In order to carry out the work of decarbonising some dismantling is necessary and these instructions are for the guidance of owners wishing to undertake this job themselves. Care should be taken to avoid damage to nuts, bolts and other fixings by the use of incorrect tools, and as parts are removed the fixing bolts should be replaced and the nuts just started so that they are not lost and to facilitate reassembly.

Before the engine can be dismantled it is necessary first to remove the dual seat and side valances. The seat is held by two bolts and nuts securing "C" shaped brackets, and the side valances are secured by eleven bolts, all of which must be removed together with the dual seat catch knob.

Detach the sparking plug leads and remove the cylinder head cowl and rocker cover. The cowl is held by two nuts, one at each end of the cylinder head, and the cover by two nuts on top. Note that removal of the cowl does not release the exhaust pipe flanges and that it is necessary to take off two further nuts securing these flanges before the exhaust pipes can be moved away from the cylinder head.

There is no need to disturb the connection between the carburetter and its manifold. All that is necessary is to take off the two nuts securing the manifold to the cylinder head and the carburetter can then be moved sufficiently to one side to allow dismantling to proceed.

Slacken off the lower union of the rocker oil feed pipe and unscrew the upper union completely to allow the pipe to swing out of the way.

Remove the sparking plugs and take off the seven cylinder head nuts. These nuts will require a small cranked ring spanner to remove.

The cylinder head can now be taken from the block for decarbonising. This will reveal the cylinder head joint face gasket which should be removed and examined. Replacement is generally desirable.

Removal of carbon is best done using a simple scraper, but it is important to avoid damage to the soft aluminium cylinder head and piston crowns. Any marks on the joint faces will give rise to gas leakage and may lead to further damage by burning after the engine is reassembled. To facilitate attention to the pistons they should be turned to top dead centre (i.e., as far as they will come) and this position can be achieved by engaging top gear and rotating the rear wheel.

Having removed all traces of carbon, carefully clean all parts with a slightly oiled rag, being sure to move the pistons down the cylinders to enable carbon to be wiped from the top of the cylinder bores where it will have gathered above the top piston rings.

The opportunity should now be taken to examine the valves, and for this to be done they must be removed using Service Tool number 61-5001. The rockers need not be dismantled.

Be very careful not to lose the split collets which will be released when the valve spring has been compressed. It is a wise precaution to remove all the valves before continuing with any other work and to put them together with their respective collets and caps carefully on a shelf or in a box, indicating from which positions in the cylinder head they were removed.

Service Sheet No. 1002 (contd.)

Scrape all carbon from the inside of the ports, (i.e., the passages in the cylinder head which allow the entry and exit of gases.) Take care to avoid damage to the seats. (These are the angular faces in the cylinder head, which, when mated with similar seats on the valves, provide a gas-tight seal.) Clean up the valves by careful use of fine emery cloth.

Unless the engine has covered a considerable mileage, it is unlikely that anything but a simple grinding-in operation will be necessary to restore the valve seats to perfect condition. Valve grinding is done by smearing a small quantity of grinding paste (obtainable from any Dealer) on the valve faces, re-inserting them into their guides and rotating backwards and forwards. The valve should be moved round to a new position after every few movements. This should not be overdone, or in time valve pocketing, with consequent lack of efficiency, will develop.

If considerable pitting of the seats is evident they must be recut and the valves either reground or replaced. This is best left to a Dealer, who will have the necessary service tools.

Before reassembling, clean off all traces of paste and smear the parts with clean engine oil.

Reassembling is undertaken in the reverse order, but note should be taken that it is a wise precaution to replace valve springs when decarbonising. They are not expensive and replacement will help to maintain the efficiency and performance of the engine.

The part numbers of the valve springs are 76-69, 76-63, inner and outer respectively. When refitting valves particular care should be taken to ensure that the collets are correctly seated.

⚙ The cylinder head holding down nuts should always be tightened in the order shown in Fig. 1, and each nut must be pulled down a little at a time to avoid distorting the head.

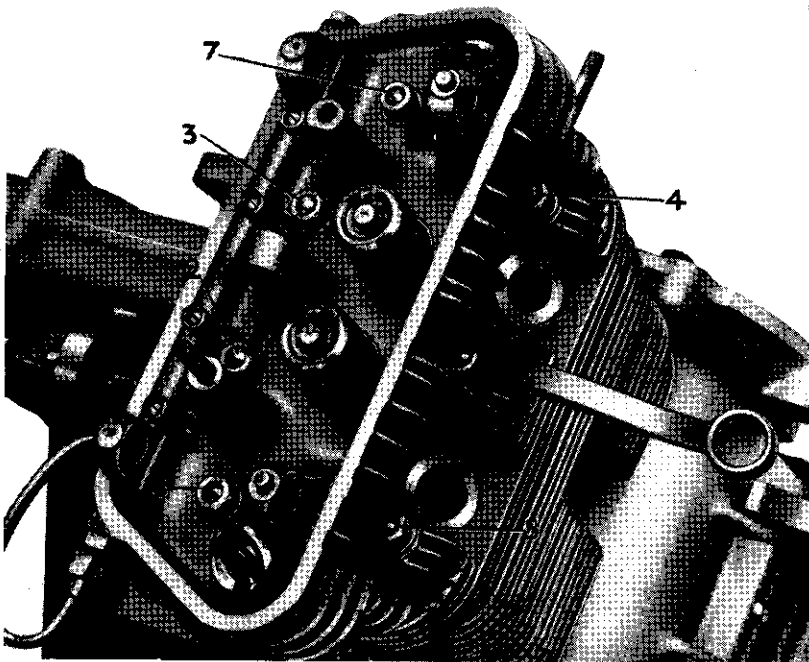


Fig. 1.
Cylinder Head Nut Tightening.

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

REMOVAL OF THE ENGINE, GEARBOX AND FINAL DRIVE NUT

When the engine and transmission are removed for overhaul they must be taken out as a complete unit comprising the engine, gearbox and final drive.

Remove the side valances as described in Service Sheet No. 1001.

Drain off all the oil by removing the lowest Phillips head screw and the filler plug on the primary and the rear drive housings, the two $\frac{1}{4}$ in. bolts at the rear of the gearbox, and the drain plug in the base of the sump.

Raise the rear wheel clear of the ground. For this purpose a block or small wooden trestle as Fig. 2 is necessary and assistance will be required to lift the machine and place the block underneath the rear cross channel on the frame.

Remove the rear wheel by taking off the three hub nuts, which have a normal right-hand thread; these nuts are countersunk both sides and can be fitted either way. Now take off the air ducting around the cylinder head; it is secured by two small nuts on $\frac{1}{4}$ in. diameter studs which also secure the exhaust pipes. After these nuts are removed take out the one $\frac{1}{4}$ in. diameter bolt which secures the carburettor air pipe; this is on the top cross member between the two vertical pillars of the frame, and is immediately below the petrol tank. Disconnect the sparking plug leads. Now prise off the lug securing the air duct on the left-hand stud and lift the air ducting complete with the carburettor air pipe clear and place on one side.

Next remove the exhaust pipes by taking off the remaining $\frac{1}{4}$ in. nuts from the studs nearest the rear wheel, and slacken off the clips securing the exhaust pipes to the silencer and the two bolts at the top of the silencer. This will enable the silencer to be swung away from the pipes and the exhaust pipes can then be taken off the studs securing them to the cylinder. The right-hand side exhaust pipe also carries the spring which tensions the kickstarter chain. The spring will therefore have to be unhooked from the exhaust pipe and the chain link before the right-hand pipe can be placed on one side.

Disconnect the speedometer drive from the rear hub by unscrewing the union nut (Fig. 3). The speedometer drive cable is the upper of the two cables which run to the rear wheel, the lower one being the brake cable. Also disconnect the rear brake cable by taking out the split pin and clevis pin which secure the cable end to the brake lever on the rear hub.

Remove the two black and yellow wires which run from the distributor to the left-hand and right-hand ignition coils by taking off the two nuts on top of the coils. Note that the longer of the two cables (black and yellow) goes to the right-hand coil.

With a suitable tool such as a screwdriver or a hammer shaft, press in the clutch lever on the engine, slip the nipple out of the lever, pull the outer casing out of the lug and place the spring on one side. Push the cable down under the frame out of the way.

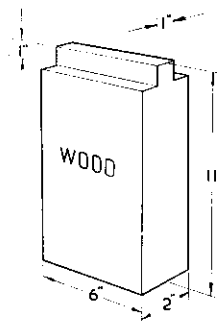


Fig. 2.

Service Sheet No. 1003 (contd.)

Make sure that the petrol tap is turned off and uncouple the banjo union at the carburettor end of the petrol pipe. Be careful not to lose the two fibre washers or the small gauze filter which is fitted inside the banjo union.

The petrol tap rod is supported by a bracket which is secured to the nearside rocker cover stud; remove the $\frac{1}{4}$ in. nut on this stud lift the bracket off the stud and swing it to one side. Replace the nut loosely on the stud to retain the fibre and steel washers.

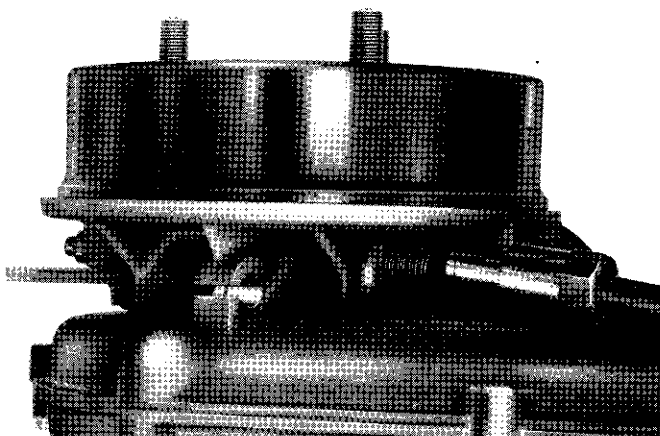


Fig. 3.

Speedometer cable connection

support arm must be removed before the unit can be taken out of the frame, since it passes round the left-hand vertical column of the frame. Unscrew the three nuts at the rear of the curved arm which secure it to the rear drive and remove the hollow bolt at the front end of the curved support arm, (this is the bolt which also carries a grease nipple). Take off the large diameter steel washer which is pegged. Now disconnect the lower end of the rear suspension damper unit, and swing the damper unit up and out of the way. Raise the rear drive and gently prise off the curved support arm. Lifting the rear drive unit will allow sufficient clearance for the support arm to pass over the pillion passenger's footboard.

The three bolts which secure the rear end of the support arm should now be taken away since they are liable to foul the frame as the unit is being removed.

Remove the rear mudguard by taking out the four $\frac{1}{4}$ in. diameter nuts and bolts, two at the front on the cross member between the two vertical tubes of the frame and two at the rear which also carry the silencer and petrol tank support bracket.

Unscrew the two $\frac{3}{8}$ in. nuts on the bolts attaching the engine unit to the two vertical frame tubes at the rear of the frame. On the left-hand tube it will also be necessary to take out the two $\frac{1}{4}$ in. bolts securing the quarter portion of the clip. Drive the bolts partially through but still allow them to support the engine. Now remove the front engine plates by taking off the nuts on the two crankcase studs and remove the two $5/16$ in. bolts and nuts which secure the "L" shaped engine plates to the chassis cross member. When the bolts securing the plates to the cross member have been removed slide the plates off to left and right from the studs. The engine will now be supported only by the two $\frac{3}{8}$ in. bolts through the rear brackets.

Disconnect the generator cables by breaking the connectors which will be found underneath the floor boards. This operation will be easier to carry out if each connector is broken individually.

The unit is now ready to be taken out of the frame, and it is quite easy to do so providing the correct procedure is adopted, which is to drive out the two bolts holding the engine to the vertical frame tubes, tilt the unit forward so that the lugs on the engine clear the lugs on the frame and then tilt it sideways towards the left-hand side, at the same time lifting it out. This will enable the rear drive to pass between the two vertical tubes.

Complete dismantling of the engine, gearbox and final drive unit is described on Service Sheet No. 1004.

On the right-hand side of the machine will be seen the gearchange lever, fitted to the quadrant spindle; take off the nut securing the lever to the spindle end and prise the lever off the squared end of the spindle. Now depress the kickstarter lever and disconnect the chain from the lever by removing the spring link. The kickstarter sprocket and the chain can be removed after the unit has been taken out of the frame, but the sprocket can be removed at this stage if necessary, it is fitted on to a taper shaft which is keyed. Remove the nut securing the sprocket, and with an open-ended spanner behind the sprocket and against the adjacent Phillips head screw, tap the end of the spanner sharply so as to jerk the sprocket from the taper on the shaft.

It will now be necessary to turn to the left-hand side of the machine, and here will be seen the curved support arm on the rear drive unit. This

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

COMPLETE DISMANTLING OF THE ENGINE, GEARBOX AND FINAL DRIVE NUT

If the oil has not already been drained from the unit it should be done at this stage. To drain the final drive take out the Phillips head screw immediately below the oil level plug and remove the oil level plug as well. The primary drive is on the left-hand side of the unit and carries the clutch lever and the contact breaker unit; to drain, remove the Phillips screw immediately below the rear or final drive bearing and again remove the oil level and filler plug to allow the oil to flow.

To drain the gearbox, remove the two hexagon bolts, one above the other, at the rear of the gearbox just behind the gearchange assembly. The sump is drained by removing the plug on the right-hand side bottom corner of the sump; this is the rectangular container under the engine.

Dismantling should only be undertaken by someone with mechanical experience, otherwise serious harm could result to the unit. If in doubt place the job in the hands of the Dealer.

Before cleaning off any accumulation of oil or dust look for obvious signs of oil leakage. The points where this occurs usually show as very clean spots whereas the rest of the unit, though oily, will also be dirty with an accumulation of road dust.

Where the unit is heavily coated with dust and oil it is as well to wash it comparatively clean before dismantling.

During the actual dismantling care should be taken to look for signs which show that a particular part requires replacement. In the case of bearings they should be clean and polished, if there are any score marks or signs showing that the metal has "picked up" the bearing or bush should be replaced. Ball or roller bearings should spin quite freely without excessive play, and if there are signs of lumpiness or grit in them it is an indication that the balls or rollers or the races are pitted and here again the parts should be replaced.

It is good policy to use only sound and unworn spanners and in certain cases it is essential that an appropriate service tool is handy. Detailed below are those service tools which are used for dismantling the unit. Although one or two operations can be done without them, such as removal of the valve springs and contact breaker, (these are covered by service tool number 61 5001 and 5005 respectively), the use of the tools will facilitate the work.

Service tools are as follows:

- 61 5001 Valve spring compressor.
- 61 5002 Extractor for generator and flywheel.
- 61-5005 Extractor for contact breaker cam and auto advance unit.
- 61-5007 Extractor for clutch.
- 61 5019 Extractor for speedometer drive.
- 61 5022 Crankshaft holder.
- 61 5025 Universal extractor (for primary drive and timing pinions).

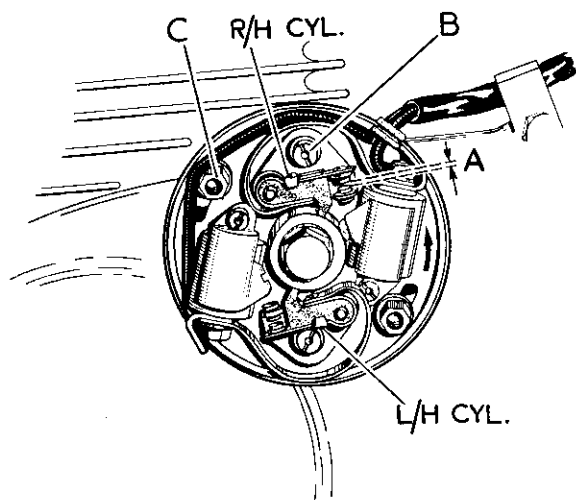
Dismantling Drive Side of Unit

With the spanner provided in the toolkit remove the two sparking plugs, take off the two $\frac{1}{4}$ in. nuts holding the rocker box cover, remove the steel washers and fibre washers and remove the cover. Examine the cover gasket to decide whether or not it can still be used. If the gasket is damaged in any way, as for example, if parts of it have adhered to the cylinder head, or if it is compressed too thin, it is advisable to use a new one.

Slacken off the two union screws holding the oil feed pipe to the rocker box and crankcase, and remove the pipe, leaving the unions screwed into both the crankcase and cylinder head.

Remove the seven nuts and washers which hold the cylinder head to the block. Four of these are at the rear inside the rocker box and three at the front adjacent to the sparking plugs. The smaller ring spanner provided in the toolkit is the most suitable tool to use on these nuts. Take off the cylinder head and in this case, although the gasket may appear to be in good condition, since it is a comparatively cheap and certainly an important item, it is advisable to use a new one when reassembling.

There may be no need to dismantle the rocker assembly but in case this operation is described at a later stage.



Contact Breaker.
Fig. 4.

A standard type of screwdriver can be used to take off the contact breaker cover by removing the two $\frac{3}{16}$ in. screws, following which the cover can be placed to one side after the rubber grommet holding the leads has been slid out of the "U" shaped slot in the cover. Unscrew the two long hexagon nuts (C) Fig. 4, which are slightly to the left and right of the contact breaker plate and take off the plate complete with the leads after disconnecting the black and white lead from the left-hand ignition coil and the black and yellow lead from the right-hand coil.

The contact breaker cam and automatic advance and retard unit is retained by the centre bolt which is now visible. Slacken off the bolt and if tool number 61-5005 is not available tap the bolt sideways to release the unit from the tapered

shaft. If the tool is available take out the bolt, insert the tool and withdraw the unit by screwing the tool in clockwise.

Take off the plain steel bush from the bearing support arm spindle and the plain steel thrust washer behind the bush, noting that the washer is fitted with the chamfered side towards the primary drive cover.

The primary drive cover itself is held in position by seven Phillips head screws and one $\frac{1}{4}$ in. nut and a $\frac{5}{16}$ in. nut and bolt at the front. This bolt also carries the starter motor support bracket when a starter is fitted.

Service Sheet No. 1004 (contd.)

When all the screws, nuts and bolts are removed, the primary drive cover can be taken off, the joint being broken by gently tapping the cover with a rawhide mallet or a hammer shaft but great care must be taken or the cover may be cracked or distorted.

The clutch push rod will come away with the cover. The condition of the phosphor bronze pad on the push rod should be carefully noted and if it shows signs of having worn or the metal having "picked up", the push rod should be replaced. Make sure that the small rubber "O" ring on the push rod shaft is in good condition, and if necessary replace it to prevent leakage of oil through the push rod bore. The final drive support arm bearing is a press fit into the primary drive cover and if it is to be removed the cover should be heated in boiling water, and the bearing driven out with a suitable punch through the hole in the housing. The replacement must be fitted while the cover is still hot. (This method should be employed whenever a bearing is to be removed from an aluminium case.) The contact breaker drive is simply a sliding fit in the bronze bush in the rear primary drive case.

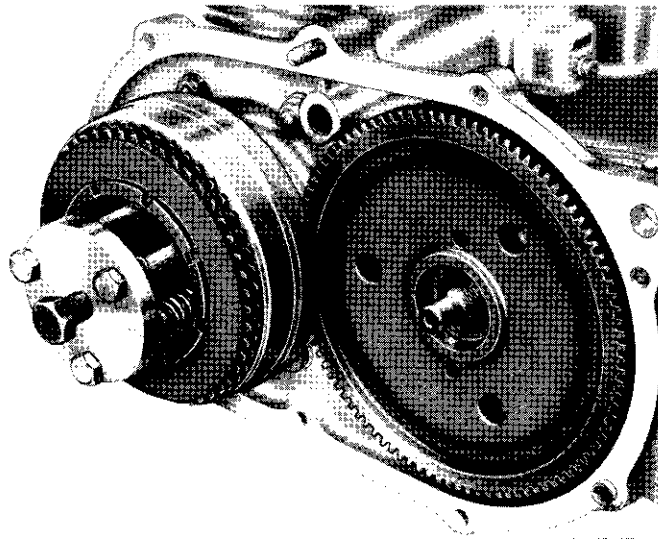
Before removing the clutch, flatten the tab washer on the larger primary driven gear and slacken off the centre nut. This operation will be facilitated if the unit is placed in gear by operating the gearchange spindle and the brake applied with a suitable length of tube over the brake lever.

Now unscrew the three clutch pressure spring nuts. To avoid tilting the plate and locking the nuts give each nut approximately one full turn at a time. When all the nuts are off take off the springs and place the pressure plate on one side. Then replace the spring and nut on one of the studs to keep the unit intact during dismantling. Flatten the star shaped tab washer under the clutch centre nut and

remove the nut, again locking the unit in the manner just described. Great care must be taken to avoid damaging the clutch spring studs for they can very easily be bent if the spanner slips. When the nut is off remove the star washer and, using service tool number 61 5007, draw off the clutch centre and clutch complete as in Fig. 5.

The clutch housing and gear is a push fit over the bearing and can be taken off without an extractor. It should be noted that there is a thrust washer between the end of the clutch sleeve and the splined clutch centre, and this washer has the chamfered face outwards towards the clutch.

The driving and driven plates should be carefully examined. If the steel driving plates are badly scored they should be replaced and if the bonded driven plates have the segments worn thin these also should be replaced. (The sequence of assembly is first a driven plate with a bonded lining against the rear pressure plate, then a plain steel driving plate and so on alternately.



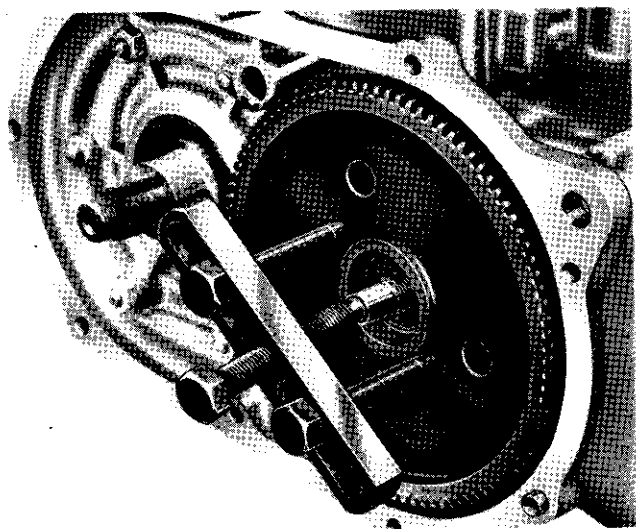
Removing Clutch Unit
Fig. 5.

Service Sheet No. 1004 (contd.)

The plain steel clutch housing bearing sleeve can be slid off the mainshaft. Note that it is fitted with the larger diameter towards the engine.

Having previously flattened the tab washer and slackened off the nut on the large primary driven gear, this gear can now be drawn off the gearbox mainshaft using service tool number 61-5025 fitted with the short extractor legs 61-1732 (Fig. 6). The final removal of the gear should be carried out with care, and if possible with the key in the gearbox mainshaft at 12 o'clock position since if the key is loose and drops down behind the oil seal it may cause damage.

Unscrew the six $\frac{1}{4}$ in. nuts holding the primary drive inner cover to the crankcase and remove the washers. The joint can be broken by tapping gently with a rawhide mallet or something similar. The inner cover also carries the crankshaft main bearing housing and if this bearing is to be changed owing to noticeable roughness or up-and-down play it will be necessary to flatten the tab washers on the four retaining bolts, remove the bolts and take off the bearing



Removing Primary Gear

Fig. 6.

remove the outer chain cover by taking out the nine Phillips head screws, but careful note should be made of their respective positions and lengths. Before final removal of the cover take out the chain adjuster screw by unscrewing the locknut and removing the screw completely.

Again break the joint by tapping gently with a rawhide mallet and remove the cover. This may come away complete with the slipper pad and its fulcrum pin, or the pad may remain in the rear portion of the swinging arm case. It should be noted that the pad must be quite free on the bearing pin.

In the outer chain cover will be found a ball bearing at the rear and an oil seal at the front. The ball bearing can be removed by heating the case in boiling water and then tapping gently on to a bench. The oil seal is fitted from the outside of the case, with the lip pointing inwards. When replacing care should be taken to ensure that it is fitted squarely in the hole and is not tilted to one side. The Woodruff key in the gearbox mainshaft should now be removed carefully to avoid damage to the key or to the shaft.

plate. The bearing itself can then be removed from the inner drive cover by heating the case in boiling water and then tapping gently out on to a wooden bench. The replacement should be fitted while the cover is still hot and the replacement bearing is cold. There is also an oil seal in the cover, which is fitted from the inside, (i.e., the clutch side with the lip towards the bearing.)

Behind the primary drive inner cover there is a rubber "O" ring pressed on to the boss on the outside of the outer chain cover. If this "O" ring has become soft or enlarged then a replacement should be fitted on reassembly.

It will now be possible to

Service Sheet No. 1004 (contd.)

Flatten the tab washer on the rear cush drive unit and unscrew the nut, locking the assembly by applying the rear brake. The nut has a normal right-hand thread. The gearbox sprocket nut has no tab washer and is also unscrewed in a normal anti-clockwise direction. Here again it will be necessary to lock the unit by applying the rear brake, or alternatively by applying a substantial tool between the rear hub studs and locking against the bench.

Now remove the single countersunk screw which retains the brake drum on the stub axle and slide the drum off. Using a rawhide mallet or copper hammer, gently tap the stub axle through the cush drive towards the wheel side. The cush drive can then be taken out of the chain and the gearbox sprocket together with chain can be taken off the splined gearbox main-shaft.

Behind the cush drive and rear sprocket assembly are the speedometer drive and thrust washer, the latter being between the speedometer drive and the rear sprocket, and inside the inner chain cover is a bearing retained by a lock ring having a normal right-hand thread. To remove this bearing it will be necessary first to extract the speedometer drive using service tool number 61 5019. When this is taken out it will be seen that there is a pressure pad let into the case at the opposite end of the speedometer drive.

After the bearing lock ring has been removed, the case should be heated in boiling water and the bearing dropped out in the manner previously described, and the replacement, if necessary, fitted while the case is still hot. Note that the speedometer drive is fitted with the flange outwards, (i.e., towards the cush drive and rear sprocket unit). The plain steel washer can be fitted either way round.

If the cush drive is to be dismantled for fitting new rubbers the spider should be pressed out of the sprocket using a wooden plug or similar tool on the centre splined portion and supporting the sprocket on one of the double row of teeth, as in Fig. 7. Do not attempt to prise the spider out with a screw-driver under the flange as this may cause the flange to break away.

The cush drive comprises twelve rubbers, which are fitted between the spider and sprocket vanes. On some early models all twelve rubbers were soft; later models employ six soft and six hard rubbers, the hard ones being fitted immediately to the left of the vanes looking inside the rear sprocket, as in Fig. 8. These hard rubbers are usually painted white.

Take off the rear brake shoes by pressing the lower shoe down and at the same time twisting it off the brake cam and fulcrum pin. The inner chain cover can now be taken off the pivot stub. Note the rubber "O" ring on the stub.

The phosphor bronze bush in the front end of the cover is a press fit and the usual method of extraction should be employed if it is worn and therefore to be replaced.



Parting the Cush drive
Fig. 7.

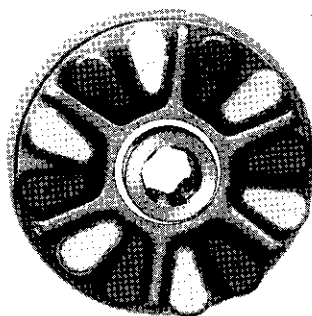
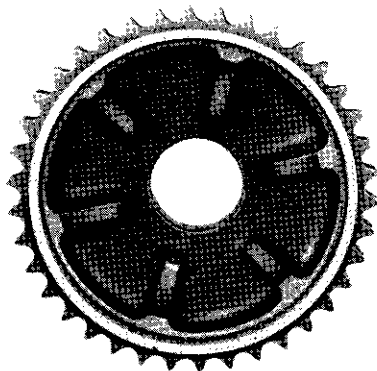
An oil seal is fitted in the cover from the brake shoe side, again with the lip of the oil seal facing inwards towards the bearing. If a replacement is to be fitted the old seal can be prised out with a screwdriver but care should always be taken when fitting a new oil seal to see that it is inserted squarely into the hole, and great care should be taken to avoid any damage to the feather edge of the seal.

The brake cam spindle can be removed by taking off the nut behind the brake arm, and drawing the cam out towards the hub side. If, however, the cam is quite free in the housing and there is no apparent excessive wear on the cam face there is no need to disturb it. The fulcrum pin is secured by a nut on the inside of the cover; here again there is no need to disturb it unless there is obvious damage. The two location dowels in the cover should be undamaged and a good fit in their holes.

Dismantling Timing Side of Unit

Dismantling of the left-hand or primary drive side is now completed and attention can be given to the right-hand side of the unit.

If the fan cowl has not already been removed, unscrew the three small Phillips head screws



and the one plain screw at the top right-hand front which also carried the throttle cable clip. Unscrew and remove the nut securing the kick-starter sprocket and remove the sprocket complete with the chain and spring. Take out the Woodruff key, being careful not to damage the key or the slot in the shaft.

Cush Drive Rubber Assembly
Fig. 8.

removed by screwing in a normal anti-clockwise direction, using an 11/16 in. Whitworth ring spanner. The crankshaft, however, must be prevented from turning by holding the opposite side with service tool number 61 5022.

The large extension nut securing the flywheel and fan can now be re-

With the flywheel centre nut removed, the flywheel can be extracted with service tool number 61-5002. This will expose the stator unit secured to the crankcase by three 5/16 in. nuts and washers, which should be unscrewed using a tubular spanner to avoid damage to the

Service Sheet No. 1004 (contd.)

stator unit. With the nuts and washers removed the stator can be drawn off the three studs by simply pulling it away and threading the leads through the rubber grommet in the back of the case. The three distance pieces on the studs should be taken away to avoid being lost in subsequent dismantling. Carefully prise out the Woodruff key from the mainshaft, again taking care to avoid damage to the key or the slot in the shaft.

If the machine is fitted with a starter motor, the two 5/16 in. bolts securing the motor to the back of the timing gear cover should be removed and the starter taken away. In the case of models without starter a blanking plate is fitted in lieu of starter and this plate need not be disturbed.

Slightly to the left of the starter sprocket is a projection having two flats; this is the cam plate plunger housing. Using a spanner which is a good fit on the two flats, unscrew the housing in a normal anti-clockwise direction and remove it complete with the plunger and spring.

The gearbox end cover can now be removed after the five Phillips head screws have been taken out; again the joint will have to be broken by tapping gently with a rawhide mallet.

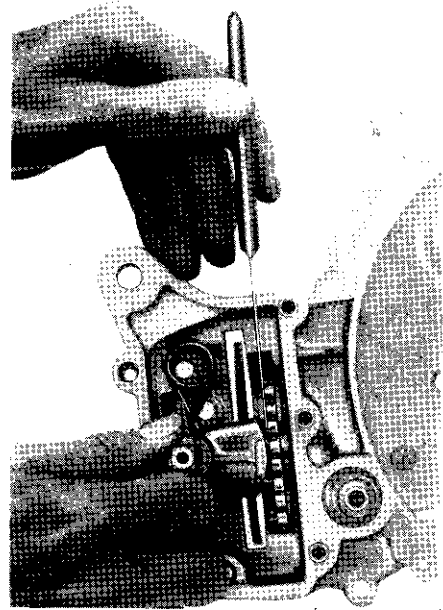
Removal of the end cover will expose the outer portion of the cam plate and the selector quadrant together with its scissor spring, the spring being retained in the inner cover by a large hexagon-headed bolt. Unscrew this large bolt and draw it out noting that as it is drawn through the spring it will remove the star washer which is fitted between the bolt and the case. The selector quadrant can then be taken out quite easily if a thin strip of steel such as a table knife is slipped between the two plungers and the cam plate. (See Fig. 9). The other end of the quadrant spindle is simply a push fit into the back of the case.

The two plungers should be undamaged on their chamfered ends and quite free to move in the housing, and should not be disturbed if they are satisfactory.

The next operation is to remove the timing and gearbox cover which is in one piece.

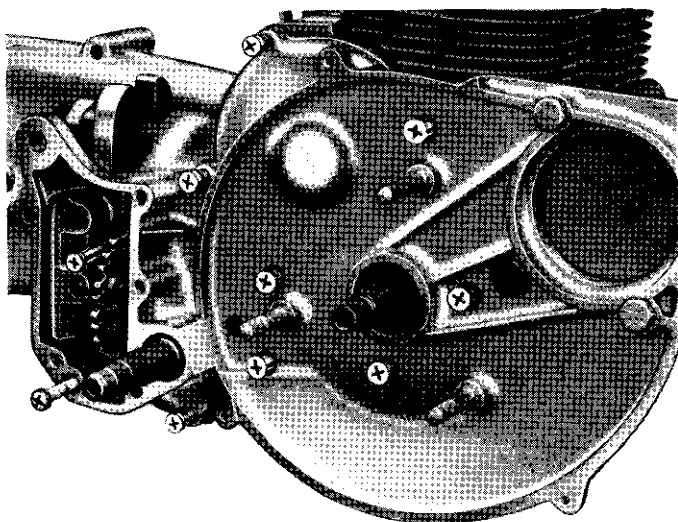
Take out the five large countersunk screws holding the timing cover around the crankshaft and the five Phillips head screws on the gearbox cover portion. (Two of these are inside the gearbox portion on the left-hand side of the selector quadrant.) Do not disturb the slotted screw on the timing cover portion; this retains the kickstarter stop plate. See Fig. 10.

With all screws removed the cover can now be withdrawn, bringing with it the gearbox mainshaft, cam plate, selector forks, layshaft and gear cluster. See Fig. 11.



Removing Selector Quadrant

Fig. 9.



Gearbox and Timing Cover Screws.
Fig. 10.

As the assembly is drawn out it may be that the thrust washer which is fitted to the mainshaft will drop into the case. Look for this washer and if it does drop replace it temporarily on the gearbox mainshaft so that its location is remembered. It will be necessary during this operation to hold the cam plate centrally to avoid fouling either the upper or lower portions of the gearbox case.

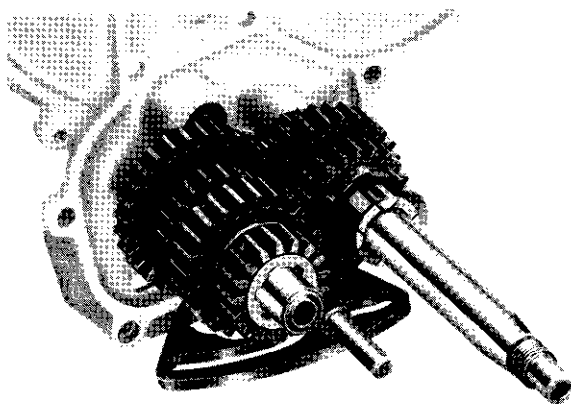
In some cases the selector fork spindle may remain in the gearbox. It is simply a push fit into the gearbox and the cover.

At this stage it should be noted that there is a possibility of the top front engine mounting stud dropping out of the crankcase if it is an easy fit in the case, and since it is essential that this stud is in position before the gearbox and timing cover and the primary drive inner covers are fitted the point should be borne in mind for reassembly. It is therefore, a wise precaution to replace the two nuts on to this stud so that it is retained in position.

The only parts now left in the gearbox are the pinion sleeve and the main bearing. The pinion sleeve can be driven through the bearing into the gearbox and this will release the gearbox sprocket distance piece which fits over the pinion sleeve on the outside of the gearbox.

The pivot stub for the chaincase swinging arm unit is fixed to the gearbox by four bolts and two locking plates that are turned up over the bolts. It is most unlikely that the stub will have to be replaced but it has to be removed to allow replacement of the gearbox mainshaft bearing if examination proves this to be necessary.

Remove the stub by turning back the locking plates and taking out the four bolts, but obviously if the mainshaft bearing has to be removed it is better to do this when the complete unit has been stripped. The usual method of removal and replacement is employed but it must be tapped from the outside of the gearbox and replaced from the inside. The same applies to the layshaft phosphor bronze bearing.



Gear Cluster.
Fig. 11.

Dismantling the Gear Cluster

Take out the selector fork spindle, which is a push fit into the cover, and remove the two selector forks. The mainshaft and layshaft can then be removed from the bearings in the outer cover, and this will only leave the cam plate and its pivot pin in the outer cover. The cam plate can be removed by taking out the split pin and drawing out the pivot pin from the side. The kickstarter spindle and ratchet slide on to the end of the layshaft. The ratchet pawl should be examined to see that it is in good condition and that the small plunger and spring underneath the pawl are not sticking. If the pawl is worn or damaged it should be replaced. The ratchet teeth inside the low gear and kickstarter pinion should also be examined to make sure that it is fit for further use.

The mainshaft phosphor bronze bush in the outer cover is an interference fit and is also pegged on the face to prevent it revolving. Replace this bush only if wear is apparent.

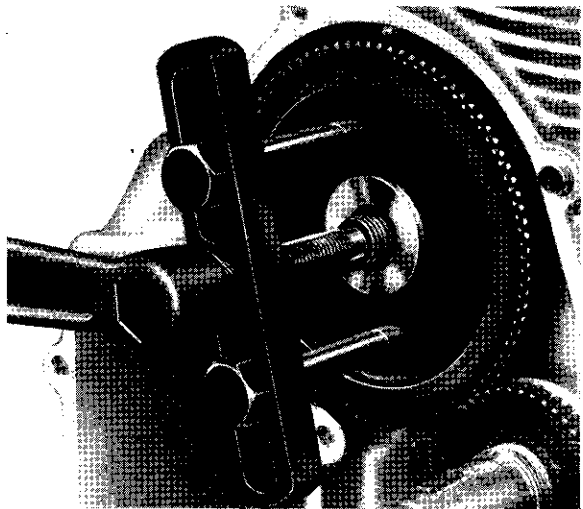
The 20T sliding dog pinion can be slid off the mainshaft splines leaving the small 16T pinion, which is a press fit on the shaft, retaining in position the 25T pinion. The mainshaft 16T and 25T pinions are selectively assembled during manufacture and if any one of these parts has to be replaced the complete assembly under part number 76 3174 must be obtained.

Similarly, the 25T layshaft pinion is retained on the shaft by the 17T pinion, also a tight press fit, and this assembly is always supplied complete. The part number is 76 3018.

Removal of the Timing Gear

To remove the timing gear it will be necessary to hold the crankshaft using service tool 61 5022.

Flatten the tab washer on the large timing or camshaft pinion and unscrew the nut in a normal anti-clockwise direction; the camshaft pinion is then extracted from the shaft using service tool 61-5025 fitted with legs 61 1732 (short legs). See Fig. 12.



Removing Camshaft Pinion
Fig. 12.

The large crankshaft pinion nut is again unscrewed in an anti-clockwise direction. There is no tab washer and the tool required is a normal 11/16 in. Whitworth spanner. To withdraw the pinion special long bolts must be used with extractor number 61-5025. These are numbered 61 5006.

It will be noted that both pinions are marked to facilitate reassembly and that the crankshaft pinion nut has a register which goes against the pinion. There is also a dowel in the crankshaft which locates the small crankshaft pinion.

Service Sheet No. 1004 (contd.)

Removal of the camshaft pinion will expose the oil pump link which is driven by an eccentric on the camshaft and is retained in position by a phosphor bronze plate held by two large countersunk screws. These screws can be removed with a normal type screwdriver, after which the phosphor bronze plate can be taken off and the distance piece removed showing the eccentric and linkage assembly.

To remove the link, flatten the tab washer underneath the screw head on the oil pump plunger, take out the bolt and then slide the link out of the fork end. It can then be taken off the camshaft together with the eccentric.

There is a Woodruff key in the end of the camshaft and if this is undamaged and a good fit it need not be disturbed for removal of the camshaft, which can be slid out of the crankcase from either end.

This unit uses a timed camshaft breather which is simply a hole drilled straight through the camshaft, lining up with holes drilled through the centre camshaft bearing. The breather is therefore open at every half revolution of the camshaft.

To remove the camshaft turn the block upside down so that the cam followers drop away from the shaft and then slide the camshaft out. The unit can then be turned the right way up and the cam followers dropped down into the crankcase.

Turn the unit upside down again and remove the twelve Phillips head screws retaining the sump cover. The cover can then be taken away together with the baffle plate and the oil pump filter, which is fitted over the oil pipe between the baffle plate and the sump cover.

The oil pipe is an interference fit into the crankcase and should not be disturbed if it is undamaged.

Gaskets are fitted between the crankcase and the baffle plate and between the baffle plate and the sump cover. The engine breather cover, which is to the bottom rear of the cylinder block, can be removed together with the fibre gasket by taking out the small 3/16 in. Phillips head screw. The only attention required in this case will be to clean it of any dirt or accumulation of sludge.

Removal of the Oil Pump

Unscrew the slotted plug which will be seen on the crankcase joint face; this has a normal right-hand thread. With the plug removed the remaining parts of the pump can be taken out, using a piece of thin wire bent to a hook at the end. First lift out the spring, if this has not come away with the screw plug, then drop out the first steel ball; next lift out the long plunger noting that the small hole with the countersunk face is uppermost. Then another spring and another steel ball with finally a thin washer, again having a countersunk face or ball seating which is uppermost, (i.e., next to the ball). When these parts are removed it only leaves the plunger which is connected to the link and the phosphor bronze plunger bush which should not be disturbed.

Removal of the Connecting Rods and Pistons

With the crankcase and cylinder block upside down on the bench flatten the tab washers underneath the connecting rod cap bolt nuts and unscrew the nuts. Take off the tab washers and lift off the big end caps. These are numbered and the caps must be mated with the corresponding numbers on the connecting rods. If the bolts are a tight fit in the caps they should be gently tapped through with the handle of a mallet.

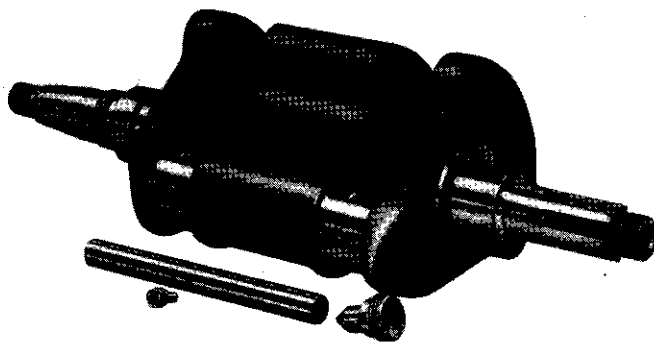
Each connecting rod complete with piston should then be drawn upwards through the cylinder bore and taken out from the top of the cylinder. Each piston should be immediately marked on the inside face to show which bore it was taken from and which way it was fitted; a good plan is to mark the inside of the skirt with the letter "L" for the left-hand cylinder, putting the mark on the back of the skirt to denote which way round the piston was fitted. A note should be made of which way the number on the connecting rod was fitted, or alternatively, mark the web of the rod in a similar manner to the piston to indicate which cylinder it came from and which way round it was fitted. Do not in any circumstances mix the big end nuts and bolts; the nuts should be placed immediately on the bolts from which they were taken to facilitate reassembly. If the wrong nut is fitted to a bolt it will affect its position and may make it difficult to secure by the tab washers.

With the removal of the connecting rods and pistons the crankshaft can be drawn out from the left-hand side of the cylinder block.

The big end bearings should be bright and free from any score marks. If there is any sign of seizure then the bearing shells should be replaced; in the same manner the crankpins on the crankshaft should be clean and bright. Pistons should be carefully examined to see that the rings are free in their grooves and that they are not carboned up or broken. If there is any suspicion that the rings are worn they should be removed and gaps checked with the ring inside the cylinder bore. The gaps should be between .006 in. and .010 in.

If the unit has covered a considerable mileage there may be a certain amount of sludge built up in the crankshaft sludge trap, in which case it is advisable for it to be cleaned out. Procedure is to take out the slotted plug on the drive side end of the crankshaft and the grub screw in the centre of the crankshaft and then to draw out the sludge trap. (See Fig. 13). The passage ways should be cleaned very thoroughly in petrol or by using a suitable degreasing plant.

When reassembling the sludge trap insert the trap into the shaft, then the small centre grub screw and finally the large screw. Both the screws must then be centre-punched after final tightening. This is most important.



Crankshaft Sludge Trap
Fig. 13.

Service Sheet No. 1004 (contd.)

The only parts now left are the fixed items such as studs and the crankshaft bush. This is a press fit into the timing side and again the block should be heated in hot water or a suitable degreasing vat, if the old bush is worn or scored and therefore to be replaced. Note that the replacement is fitted from inside the crankcase and that there is a locating peg through the steel face of the bush into the case.

Any stud can be removed (although this is not normally necessary) by screwing on two of the appropriate nuts, locking them, and then unscrewing the stud with a spanner on the lower of the two nuts. A new stud can be replaced in similar manner, this time using the spanner on the top of the two nuts. When the replacement stud has been screwed home, simply unlock the two nuts and take off, but care must be taken not to overstrain a stud when fitting. Note that in general a screw thread into the crankcase is B.S.F. whereas the thread for the nuts is usually C.E.I. In some cases, however, a Whitworth thread is used into an aluminium case, but it is always the coarser of the two threads on a stud which goes into the case. If there is any doubt as to which end of the stud to insert, check the threads with one of the nuts which fits that particular stud. Another guide is that it is usually the longer length of thread which enters the case.

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

RE-ASSEMBLY OF THE ENGINE, GEARBOX AND FINAL DRIVE UNIT

Before commencing re-assembly make sure that all the necessary gaskets, tab washers and woodruff keys are available to replace any that have been damaged during dismantling.

Another essential is to ensure absolute cleanliness of all parts.

It is assumed that any bushes or bearings which needed replacement have already been fitted to the block ; no further mention will be made of these except in special cases.

First the oil pump must be assembled into the crankcase ; the parts are fitted from the base, where the sump is bolted to the crankcase block.

Insert the one thin steel washer with the chamfered hole towards the base - this provides the seating for the first steel ball. Insert the ball, then the spring and the spring seat so that the counterbore engages correctly over the spring and the chamfered hole is facing the crankcase base to provide the seating for the second steel ball. Insert the second ball, the second spring and finally the screwed plug, making sure that it engages over the spring. Screw it right home and see that it is below the crankcase face. Centre punch the edge of the screw and the face to secure. Insert the plunger with the fork end uppermost and the tapped hole towards the back of the case.

Now insert the camshaft, making sure that the woodruff key is in position for the pump drive, place the eccentric over the camshaft, then the connecting link over the eccentric, followed by the distance piece and finally the elongated locking plate which is secured by two countersunk screws. Centre punch the edge of the screws and the plate to secure.

Swing the connecting link down into the fork of the oil pump plunger, and insert the small hexagon bolt with the tab washer underneath the head of the bolt. Lock the bolt securely and turn the tab washer underneath the head of the bolt. Lock the bolt securely and turn the tab washer over on to the flat of the bolt and the flat of the oil pump plunger.

At this stage it is as well to check the action of the oil pump by filling the sump with clean oil. Place the dip tube in the oil, screw the nut on the camshaft and operate the pump by turning with a spanner in a clockwise direction. High speed will not be necessary and if the pump is satisfactory oil will be drawn up and ejected through the oilways of the crankshaft main bearing bush. If the oil pump fails to function then the assembly procedure has been incorrectly carried out.

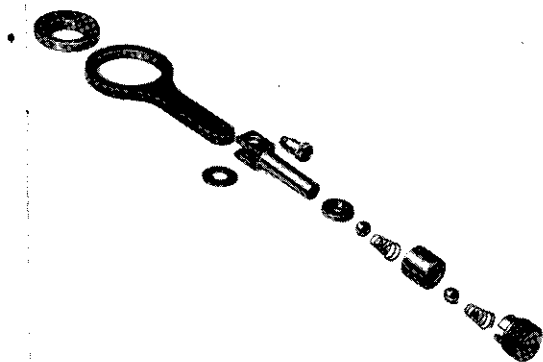


Fig. 14. Oil pump.

We now come to one of the bearings which requires special mention ; this is the gearbox mainshaft and pinion sleeve bearing and it is a special sealed bearing, the seal being outwards, and the rear swinging arm bearing plate must be refitted before this bearing can be inserted through the gearbox.

Refit the swinging arm bearing plate, which is secured by the four hexagon headed bolts and two locking plates, turn the locking plates up on to all four bolts after final tightening, press the sealed bearing in, seal side first, through the gearbox, making sure that it seats right home against the swinging arm plate. Now press the pinion sleeve through the gearbox and into the bearing and make sure that it is right home, otherwise when the gearbox cluster is assembled it may tighten up. After pressing the pinion sleeve right home insert the distance piece over the outside of the pinion sleeve and into the rear swinging arm bearing plate.

Apply clean engine oil to the crankshaft timing side bearing and insert the crankshaft from the left hand side, making sure that it is absolutely clean and free from any traces of grit or dust. Be sure that the dowel is in position on the timing side to locate the timing gear.

Place the timing gear over the crankshaft so that the keyway is in line with the dowel and the timing mark on the pinion is on the outside. In this case there is no tab washer used under the nut, but the nut has a special register which faces towards the pinion. Using service tool 61-5022 hold the crankshaft and tighten the nut on the pinion.

Now remove the nut which was placed on the camshaft for the purpose of testing the pump, insert the thrust washer over the camshaft and against the elongated brass plate, then refit the camshaft pinion with the timing mark on the outside and meshed with the timing mark on the crankshaft pinion. The easiest way to do this is to mesh the camshaft gear with the crankshaft gear and then to turn the camshaft gently to line its keyway up with the keyway in the pinion. When both are in line gently tap the pinion home, place the tab washer in position so that the centre key or tab is in the keyway on the shaft, screw on the nut and tighten, finally turning over the tab washer on to one of the flats on the nut.

It will be assumed that the carbon has been removed from the pistons, that the rings have been checked for gap, and that the pistons have been replaced on their connecting rods the correct way round according to the markings placed inside the skirt when dismantling.

Apply a coating of clean engine oil to the piston skirt and rings and to the crank journals, remove the cap from one of the rods, placing the cap and the nuts in such a position as to facilitate assembly and ensure correct mating of cap, bolts and nuts as mentioned in Service Sheet No. 1004 dealing with dismantling. With service tool 61-5004 compress the rings on the piston, having first positioned the ring gaps equidistant round the piston. Lubricate the cylinder wall and insert the big end of the connecting rod down through the cylinder, being careful not to scratch the cylinder bore, slide the piston into the bore and at the same time direct the big end over the crankshaft. When the big end of the connecting rod is in position replace the cap ensuring that the numbers on the cap mate up with the numbers on the rod, place new special tab washers over the bolts and screw on the nuts until they grip the tab washers, then turn down the

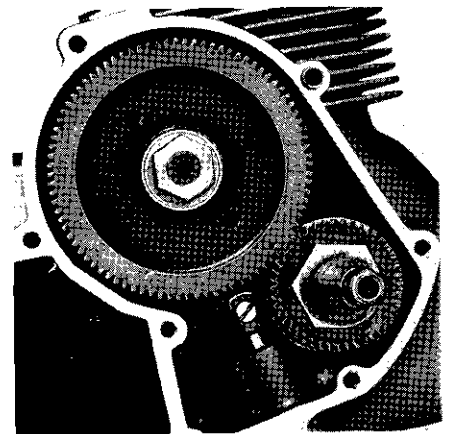


Fig. 15. Timing pinions.

two tabs which are opposite each other on to the cap of the connecting rod. Tighten the nuts down with a torque wrench which has been set to 15 lb. ft., finally turning up the single tab on to one of the flats on the nut and repeat this operation for the other cylinder.

Smear the base of the crankcase with good quality jointing compound and place a new paper washer in position. Apply compound to the washer and then fit the baffle plate with the lips of the cross slits inwards towards the cylinder. Place the oil filter over the dip tube or feed pipe, apply compound to the base of the sump cover, place the cover in position over the crankcase and insert the 12 Phillips head screws. (Each screw should have a shakeproof washer underneath the head). Tighten all the screws down finger tight then finally secure with a screwdriver working diagonally across the cover. Do not completely tighten one screw at a time but increase pressure gradually. Make sure that the sump plug and fibre washer are in position in the base of the sump.

It is now advisable to assemble the gear cluster and the simplest method of carrying this out is to assemble the cluster on to the cover plate.

Pick up the plate and insert the cam plate through the slot in the cover plate so that the larger portion with the cam tracks is towards the inside of the gearbox, insert the pivot pin so that the hole in the pin lines up with the hole in the cam plate and insert a new split pin, opening out the ends.

Now take the 29 tooth ratchet pinion, 'A' (Fig. 16), place the thin steel washer 'B' inside and then fit the kick starter spindle complete with its pawl into the ratchet pinion. Slide the kick starter spindle through the cover, engaging the pawl under the stop plate with the stop against the plate.

If, for any reason, the stop plate has been removed from the cover make sure that it is re-fitted the correct way round, which is with the leading edge which is slightly chamfered against the stop on the spindle. If it is fitted the wrong way round it is liable to prevent the spindle from going right home in the case.

Fit the main shaft 'C' complete with the fixed 16 tooth pinion and the free 25 tooth pinion but leaving off the sliding 20 tooth pinion and the selector fork. Pick up the 20 tooth sliding lay shaft pinion 'D', and fit the selector fork to it so that in its final position the boss will point towards the change lever side of the box. Place the pair in position over the ratchet pinion and engage the fork roller in the small cam track on the cam plate, that is the track nearest to the cover. Slide the main shaft sliding pinion 'E', complete with fork over the shaft and engage the roller in the longer cam track on the cam plate, which in this case is the track away from the cover. Slide the layshaft 'F', through the 20 tooth pinion twisting slightly to engage the splines and press right home. Now pick up the selector fork shaft 'G', pass it through the two selector forks and engage in the hole in the gearbox cover.

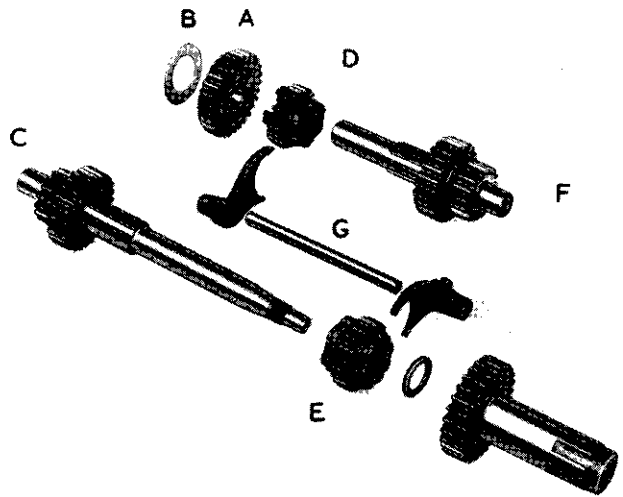


Fig. 16. Gear cluster.

Apply jointing compound to the face of the gearbox and the mating face of the cover (place thrust washer between the splined end of the mainshaft and the pinion sleeve), and slide the mainshaft through the pinion sleeve, at the same time engaging the selector fork shaft and the lay shaft at the back of the box. This operation will be simplified if the cam plate is held in the central position. When the shafts are correctly located press right home and insert all the screws. If difficulty is experienced it is usually an indication that the pinion sleeve has not been pressed fully home into the mainshaft bearing at the back of the box.

Enter the five countersunk screws around the crankcase portion of the cover, Fig. C12A, Service Sheet 422. One of these screws is longer than the rest and this is fitted at the top of the cover immediately above the stator screw or stud. Insert the three Phillips head screws between the stator housing and the gearbox and the two screws on the gearbox portion, one inside just above the cam plate pivot pin and the other at the bottom edge of the joint face. Care should be taken to see that the correct screw is used. A general guide as to the correct length is that as the screw is about to engage the thread there should be approximately $\frac{5}{16}$ " of the shank showing below the head of the screw.

The gear change selector quadrant should have both the plungers and the scissor spring already fitted, if the scissor spring is to be replaced it should be fitted as shown in Fig. 00. Pick up the large diameter bolt and pass it through the eye of the spring and place the star washer over the thread of the bolt. Insert the assembly into the gearbox, engaging the short end of the spindle in its hole, screw in the stud and secure. Some slight difficulty may be experienced in meshing the plungers but this can be facilitated by placing a thin strip of steel between the two plungers and the cam plate thus compressing both plungers. When the shaft of the gear quadrant is right home and the bolt is screwed up the strip of metal can be taken away, allowing the plungers to engage properly on the camplate.

Place the three distance pieces on the three stator plate studs, pass the leads of the stator through the rubber grommet in the back of the case and slide the stator over the studs so that the lead is in line with the hole in the back of the case. Replace the three nuts and spring washers tightening with a tubular spanner to avoid damage to the coils of the stator unit.

Apply jointing compound to the gearbox portion of the inner cover and to the face of the gearbox outer cover, tap the cover gently home over the shafts and insert the screws, taking the usual care to see that the correct screw is fitted into each hole.

Now pick up the kick starter sprocket and chain, place the return spring over the kick starter spindle with the long end dropping downwards, engage the sprocket over the keyway place on the washer and nut and secure, making sure that the key is in position.

Engage the short end of the return spring in the hole at the back of the sprocket, and then, with a hooked piece of wire over the long end of the spring, swing it round clockwise to place the long end behind the gearbox cover. The spring is then under tension. Swing the chain over the sprocket anti-clockwise, pick up the cam plate plunger, spring and housing and screw in, using a good spanner on the flats of the plunger housing.

Make sure that the flywheel key in the crankshaft is secure, place the flywheel and fan over the crankshaft engaging the key in the keyway and screw in the extended nut and washer. Hold the driving end of the crankshaft with service tool 61-5022 and secure the flywheel nut.

To complete the assembly on the fan side it is only necessary to fit the cowl, using a small $\frac{3}{16}$ " Phillips head screw and one slotted screw at the top front. This screw with its nut also secures the throttle cable clip.

The re-assembly of the rear transmission and swinging arm can now proceed. First make sure that the distance piece is in position over the outer end of the gearbox pinion sleeve. This distance piece will be inserted through the bearing which supports the rear swinging arm. Also replace the rubber 'O' ring over the outside of the bearing, making sure that it is in good condition and is a close fit on the housing.

If the bearing in the rear end of the back half of the chaincase is to be renewed, heat the chaincase, press the new bearing in and, using service tool 61-5026, secure with the castellated lock ring which has a normal right hand thread.

The oil seal behind the main bearing is fitted from the brake drum side with the lip of the oil seal towards the bearing. Make sure that the pressure pad at the end of the speedometer drive is in position in the case, and replace the speedometer drive spindle and bush. This can be carried out by screwing on service tool No. 61-5019 and then driving in the bush using a rawhide mallet or hammer.

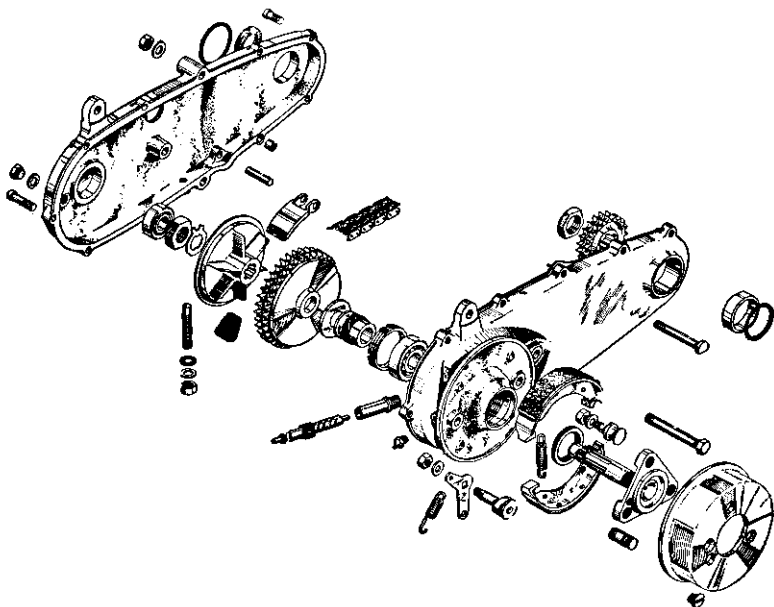


Fig. 17. Rear transmission assembly.

Pass the stub axle through the bearing, making sure that it is right home. Slide the speedometer drive worm wheel over the axle and then place on the plain steel thrust washer which can be fitted either way.

The rear sprocket and cush drive assembly has twelve rubbers. Six of these are now soft and six hard, but some of the earlier models employed twelve rubbers all of which were soft. The hard rubbers are fitted on the left hand side of each vane in the chainwheel or sprocket, the soft rubbers being on the right hand side. See Fig. 8, Service Sheet No. 1004. The vanes of the sprocket cover are then pressed between the rubbers in the chainwheel.

Having assembled the cush drive, place the chain over the sprocket and slide the sprocket over the splines of the stub axle. Fit a new splined tab washer, and then the locknut which should be secured tightly and locked with the tabs turned up over the nut. It will be necessary during this operation to lock the spindle by using a suitable bar through the studs on the outer side of the stub axle.

Place the gearbox sprocket in the other end of the chain and slide the rear half of the chaincase together with the sprocket and chain over the gearbox mainshaft, screw on the nut securing the gearbox sprocket and secure by centre punching between the inside diameter of the nut and the outside diameter of the shaft. Replace the rear chain tensioner or slipper pad over the pivot pin and engage the pin in the lower portion of the rear case with the slipper facing towards the rear hub. Make sure that it is free to move on the pin.

If the bearing in the rear end of the outer half of the chaincase is to be renewed the case should be heated before pressing in the replacement bearing.

Apply jointing compound to both faces of the rear chaincase. Replace the outer section and screw in the nine Phillips head screws, and the rear chain tensioner stud with its locknut, making sure that the locknut is well clear of the case. Adjust the pin until some resistance is felt, then release one full turn and secure the locknut against the lower edge of the case.

The rear brake shoes and drum should be re-fitted as described in Service Sheet No. 1011.

Press in the oil seal at the front outer end over the gearbox mainshaft. The lip of the seal should be inwards towards the gearbox and care should be taken to ensure that the seal is fitted squarely into the housing. Replace the other 'O' ring over the boss on the outside of the rear chaincase at the front end. Before fitting the primary drive case ensure that the upper front engine plate is in position.

If the crankshaft main bearing in the rear of the primary drive case is to be renewed it should now be pressed into the case from the crankshaft side. The circular steel retainer can then be fitted and secured by the four small bolts and tab washers. The hole in the tab washer for the bolt is offset so that the narrowest portion of the washer is towards the outside edge of the retainer, the longest portion dropping into the cut-away. After the four bolts have been secured, the tab washers should be turned up on to one flat of each bolt. The oil seal behind the main bearing is then fitted from inside the primary drive rear cover (i.e., on the clutch side), again with the lip of the oil seal facing towards the bearing.

The bush for the distributor drive spindle is a press fit into the case, being flush with the flat on the clutch side of the case. Apply jointing compound to the face of the crankcase and the rear face of the rear primary drive cover. Replace the cover over the studs around the crankshaft and the long stud at the top and replace the six nuts and shakeproof washers around the studs in the centre of the case, leaving the long top stud until the outer primary drive case is fitted. Now tuck a piece of clean rag between the rear of the primary drive case and the rear transmission underneath the gearbox mainshaft and insert the woodruff key into the mainshaft, making sure that it is a good fit, and press in the oil seal. Remove the piece of rag and refit the rear primary drive gear with the boss inwards, being careful not to dislodge the key since this would drop down into the rear transmission and would mean the removal of all this assembly to retrieve the key. Place the tab washer in position with the centre tab fitting the keyway and screw on the locknut tight enough to retain the pinion but leaving the final tightening until the remainder of the primary transmission is assembled. Now replace the collared clutch sleeve over the crankshaft at the front end of the primary drive case, the larger diameter of the sleeve seating inside the oil seal. Place the clutch housing and the primary drive gear (this is a composite component), over the mainshaft and sleeve, meshing the gear with the larger primary gear. Replace the chamfered distance piece inside the clutch housing over the crankshaft with the chamfer outwards towards the clutch plates.

The simplest way to assemble the remaining parts of the clutch is to assemble all the plates on to the clutch centre, which is the splined component with the three holes for the spring studs.

First slide on a plain steel plate up to the outer flange, then a lined plate, next a steel plate and so on alternately, finishing with the clutch pressure plate, which is the plate with the three studs, and inserting the studs through the housing. Now place one spring over a spring stud and screw on one of the spring lock nuts. This will retain the plates close together for the final assembly. Position the outer splines or teeth of the bonded plates in line with each other and slide the whole assembly over the crankshaft, engaging on the centre splines of the shaft and positioning the outer splines or teeth of the lined

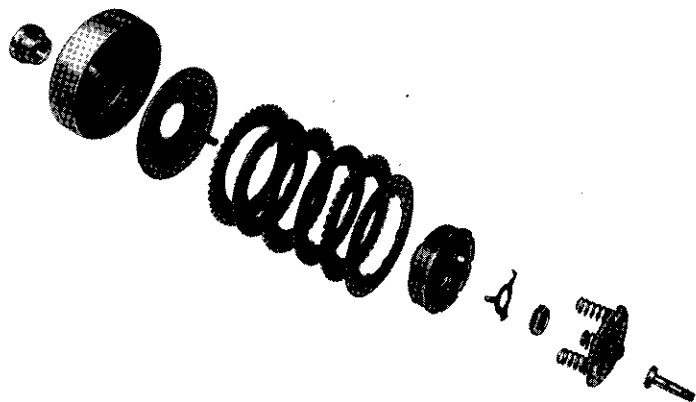


Fig. 18. Clutch assembly.

plates into the clutch housing at the same time. When the assembly is correctly located tap it gently home on to the shaft, replace the three-legged tab washer with the two thin legs into the holes in the clutch centre, and screw on the locknut. Be very careful not to slip with the spanner as this may damage one of the spring studs.

Having secured the clutch assembly, engage one of the gears, and apply the rear brake while tightening the nut on the large primary drive gear. Turn the tab washer up on to the flat of the nut to secure the nut.

Take off the spring and nut which was placed over one of the studs to hold the clutch assembly, insert the three nuts into the spring plate, place the springs over the studs and screw on the three nuts an equal amount at a time. Do not attempt to screw one nut down first as this will tilt the plate and make it very difficult to screw on the other nuts. Tighten the nuts down evenly until approximately one and a half threads are showing on the ends of the studs.

There should be no need to disturb the rear swinging arm support bearing which is projecting through the primary drive outer cover unless the bearing inside the support is to be changed. If this part is to be replaced the support arm bearing should be pressed out of the cover, the bearing extracted and the replacement fitted, finally pressing the bearing back into the cover, making sure that the small cut away is engaged over the dowel on the inside of the cover. It is always advisable to heat the case in hot water and to press the component in cold.

Replace the contact breaker drive spindle so that the tongue on the end of the spindle engages correctly in the slot in the end of the camshaft. Insert the clutch push rod through the outer cover from the inside with the phosphor bronze pressure pad on the inside, again make sure that the rubber 'O' ring on the push rod is in good condition. If the phosphor bronze pressure pad is worn thin or scored the push rod itself should be replaced.

Apply jointing compound to both the inner and outer cover faces, place the outer cover in position, replace the Phillips screws and the one $\frac{1}{4}$ " nut over the stud at the top of the cover together with one shakeproof washer and replace the $\frac{5}{16}$ " nut and bolt at the front end of the cover. This bolt also carries the starter motor support bracket when a starter motor is fitted.

Refit the automatic advance mechanism and cam so that the keyway in the end of the cam is at the bottom or at 6 o'clock. Replace the contact breaker so that the condenser with the black and white lead is on the left hand, and the nuts and washers are approximately central in the elongated slots. In this position the contact breaker points should be set just about to open. Reset ignition timing as described in Service Sheet No. 1007.

Before replacing the contact breaker cover see that the black and white lead is brought outside the left hand long nut and that the rubber grommet is correctly engaged in the U shaped slot in the cover. Slide the cover into position and secure by the two $\frac{3}{16}$ " screws.

Make sure that the cylinder bores are clean and that there is a liberal coating of clean engine oil, fit a new cylinder head gasket with the thin raised portion around each cylinder bore facing upwards.

Having previously assembled the valves and valve rockers in the cylinder head as described in Service Sheet No. 1006, prepare to replace together with the four push rods.

The simplest method of carrying this out is to apply a dab of grease to the cup of each push rod, then press each rod on to the ball end of the rocker arm. The grease will hold the rods in position while the head is being fitted over the studs. Slacken off the rocker adjusting screws, replace the seven cylinder head nuts and plain washers and tighten down evenly and securely.

Do not fully tighten one nut at a time as this might distort the cylinder head and result in leakage at the joint. See Fig. 1, Service Sheet No. 1002 for order of tightening.

When the cylinder head has been finally fitted reset the rocker adjusting screws in the following manner.

With the right hand exhaust valve fully open set the left hand exhaust valve clearance to $\cdot005$ ", then with the left hand exhaust valve fully open repeat the operation on the right hand exhaust valve. This procedure is the same for the inlet valves.

Replace the rocker box cover and gasket, making sure that the gasket is correctly located, and place on the two fibre washers, plain washers and the two nuts, but do not tighten these two nuts until the engine is finally set in the frame and the support bracket to the petrol pipe is replaced over the left hand stud.

Re-assembly of the unit is now completed and it is ready for re-fitting into the frame, but it will facilitate the replacement of oil if it is now added to the primary drive case, the gearbox and the rear transmission. Replenishment of the oil in the sump can be left until the unit is in the frame.

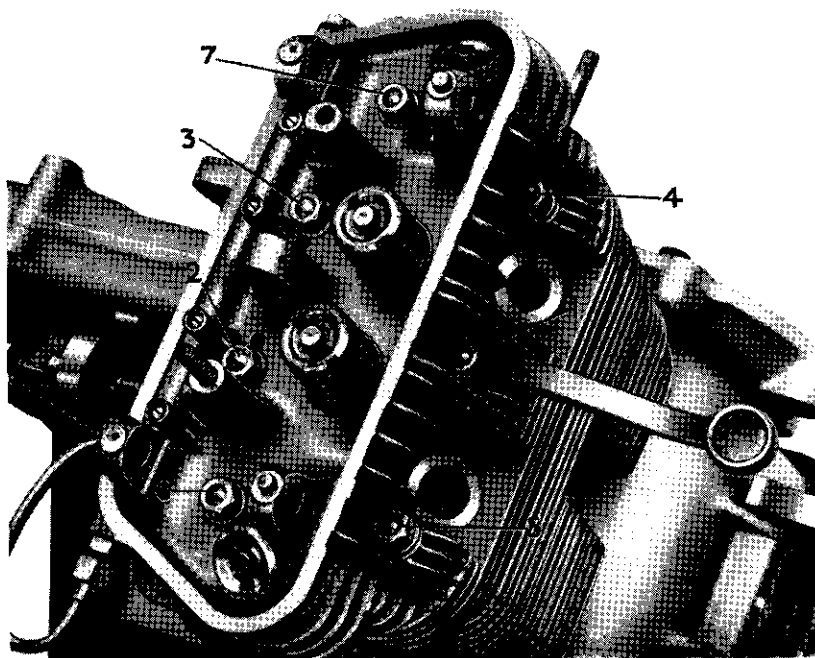


Fig. 19.

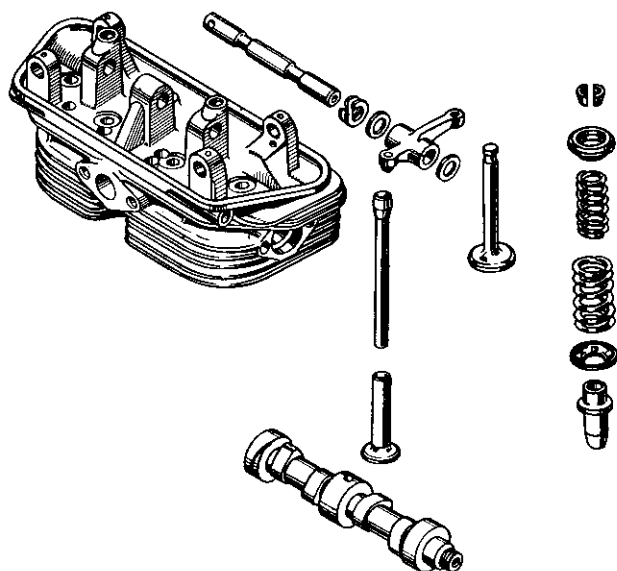
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ATTENTION TO VALVES

To remove a valve, compress the springs with Service Tool No. 61-5001. Take out the split collets and remove the valve spring cup and springs, and the valve will then drop down through its guide. Each valve is removed in the same way.

The valves must be cleaned thoroughly to remove carbon deposits. Fine emery cloth can be used sparingly but be careful not to remove metal.

Normally it will only be necessary to grind-in the valves to their seats lightly. To do this smear a small quantity of fine grinding paste on the face of the valve and return the valve to its seat. Grip the valve head with Service Tool No. 61-5035 and rotate, whilst maintaining a slight pressure. Raise the valve and turn it to a new position every few moments. Grinding should continue until both mating faces show a uniformly matt metallic surface all round.



Camshaft and Valve Gear A. Fig. 20

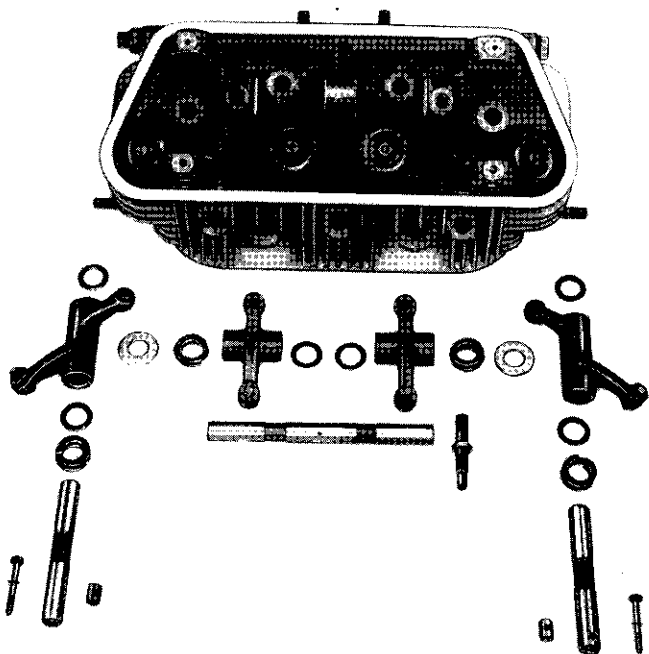
If the valve seats are badly pitted do not attempt to re-grind as this will only wear away the valves. Instead, the seats must be re-cut with Service Tool No. 61-5036 and the valve re-faced by a Dealer. If a valve guide is worn, as shown by excessive side clearance between stem and guide it can be pressed out from the combustion chamber side after the cylinder head has been heated in boiling water for 2 or 3 minutes. It is necessary first to remove the rocker before pressing out an exhaust valve guide and how to do this is explained in the next section. Press in the new guide from the rocker side, again with the cylinder head hot. After fitting a new guide the valve seat should be re-cut to ensure that it is concentric with the guide.

Re-assembly of the valves is in reverse order but do not forget to remove all traces of grinding compound and to smear the valve stems with clean engine oil.

Dismantling and re-assembling Valve Rockers and Shafts.

In normal circumstances there will be no need to disturb the valve rocker assembly. If it is necessary the operation is quite simple, but it must be noted that oil is pumped through passage ways drilled in the cylinder head and then up through the posts supporting the rocker shafts and through oilways in the shafts to lubricate valve rockers. It is, therefore, essential that the rocker shafts are re-assembled correctly, otherwise the oil supply to the rockers will be cut off.

The exhaust rockers are situated at left and right hand of the cylinder head with the inlet rockers in the middle. To take out an exhaust rocker shaft remove the small hexagon headed bolt from the sparking plug side rocker post and tap the shaft through towards the plug side. A small piece of tube must be fitted over the end of the shaft so that the steel ball which is pressed into the shaft to close the drilled oilway is not disturbed. As the shaft is drawn out it will be seen that there is an oilway drilled at 90° to its axis, this oilway mating up with the hole in the post.



Valve Rocker Assembly. Fig. 21

There is a thrust washer against each rocker post and on the plug side a spring washer between the end of the rocker and the thrust washer.

To remove the inlet valve rocker shaft and rockers, take out the hexagon headed stud on the left hand post and tap the shaft through towards the right hand side; there is no need to disturb the stud on the right hand post. There is a thick washer against each outside post, with a spring washer between thrust washer and rocker and a thin thrust washer between rocker and central post. There is a radial slot on the end of the shaft to line up with the stud on re-assembly. Again re-assemble in reverse order; partially insert the shaft, place a thick thrust washer against the outside post, then a spring washer followed by the first inlet rocker. Press the shaft through to the middle post,

fit a thin thrust washer, then the second inlet rocker, the spring washer and finally a thick thrust washer against the outer post.

As a general rule there is no need to disturb the adjusting screws on the rockers except for setting the valve clearance on re-assembly, but it is as well to examine the ball ends of the screws. If these are chipped or damaged they will cause rapid wear on both the adjusting pin and the push rod and should therefore be replaced.

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REPLACING THE ENGINE, GEARBOX AND FINAL DRIVE UNIT IN THE FRAME

With the front engine studs in position, pick up the unit and holding it tilted slightly to the left pass the rear drive unit through the two vertical frame members. Bring the engine upright and slide it into position so that the two crankcase lugs slide into the mounting brackets on the two vertical frame pillars. Having placed the unit loosely in position, insert the rear right hand engine mounting bolt through the lug on the frame and the lug on the crankcase, then pass the left hand bolt through the mounting in a similar manner. Place the $\frac{1}{4}$ " clip over the main bolt and fit the two small $\frac{1}{4}$ " diameter bolts and nuts.

Pick up the L shaped front engine mounting plates and slide each one into position over the front engine studs so that the feet of the plates are turned outwards ; refit the nuts and washers over the studs but do not tighten completely. Now replace the bolts through the chassis cross member and tighten down securely, finally tightening the nuts on the crankcase studs. At this stage the rear damper unit should be coupled at its upper end to the dual seat carrier.

Replace the curved bearing arm which passes outside the left hand vertical tube by sliding it over the main bearing bush, which has four holes equally spaced around its periphery. Insert the three long bolts which retain the rear end of the bearing arm, passing them through from the rear of the final drive case. Two of these bolts have flats on their heads which engage in flats on the back of the chaincase, the middle bolt having a hexagon head. Note that the lower bolt also carries the speedometer cable clip. Replace the large washer on the front end of the bearing arm, making sure that it is engaged over the dowel pin, and finally refit the hollow bolt which also carries a grease nipple.

Now pick up the speedometer cable and carefully engage the squared end of the inner cable in the speedometer drive and screw the cable union nut on to the drive bush. Re-connect the brake cable by passing the inner cable through the slot in the lug, fit the fork end of the cable over the lever, insert the clevis pin followed by the washer and finally the split pin. Do not omit to spread the ends of the split pin.

Re-connect the two low tension leads to the coils, the longer one going to the right hand coil. Refit the rear mudguard which is secured by four $\frac{1}{4}$ " diameter nuts and bolts, two on the cross members between the two vertical pillars and two at the rear on the bracket which carries the petrol tank and silencer.

The kick-starter chain can now be re-connected to the pedal by re-fitting the spring connecting link, making sure that the closed end of the spring is facing towards the rear of the machine. Replace the gearchange lever over the squared end of the gearchange spindle, fit the plain washer, spring washer and finally the nut. Make sure that the large plain washer is fitted over the square on the spindle, and is not trapped between the square and the other washer. Tighten the nut securely. Later models use a special nut only.

If the fabric distance piece is not already fitted to the carburetter flange studs it should now be refitted, together with the jointing washers and the manifold together with carburetter placed in position.

If the carburetter has been removed from the swan neck manifold make sure that the rubber "O" ring is in position inside the carburetter body. If this is omitted it is liable to cause air leaks and consequently weak mixture and overheating. Refit the two spring washers and $\frac{1}{4}$ " nuts on to the studs holding the inlet manifold and tighten evenly and securely. Do not in any circumstances tighten down one nut before the other as this is liable to distort the manifold face, and will again result in leakage.

Replace the petrol pipe on the float chamber, making sure that the gauze filter is inside the banjo union, and that the large fibre washer is between the union and the float chamber, with the small fibre washer between the head of the bolt and the outside face of the banjo union. Replace the petrol tap support bracket over the left hand rocker box stud and replace the $\frac{1}{4}$ " diameter nut. The fibre washer and steel washer should already be in position on the stud and underneath the bracket.

It is always advisable to use new exhaust pipe gaskets at the cylinder head joint. Refit the exhaust pipes on to the cylinder head and then swing the silencer down over the ends of the exhaust pipes and securely tighten the clips. Tighten the two bolts holding the silencer when the clips have been correctly fitted. The air ducting around the cylinder head, which also carries the pipe supplying air to the carburettor, can now be refitted by sliding it over the front exhaust pipe studs and securing in position with the small $\frac{1}{4}$ " nuts. The cool air pipe is secured to the strut across the frame immediately below the petrol tank, by one $\frac{1}{4}$ " nut and bolt with spring washer. Replace the H.T. lead on the plugs noting that the lead from the right hand coil is fitted to the right hand spark plug. Now slide the clutch cable through the slot in the lug on the primary drive cover, make sure that the outer casing is seating in the lug, fit the spring over the inner wire and with the aid of a hammer shaft, press in the clutch lever and slip the clutch nipple into the lever.

The rear wheel can now be refitted, care being taken to ensure that the valve is on the right hand side of the machine. The three conical wheel nuts can be fitted either way round but each nut should be tightened evenly ; if one nut is tightened down too much it is liable to distort the wheel on its seating on the stub axle. Make sure that the nuts are securely tightened after the wheel is on the ground. Now re-connect the kick-starter chain tensioner spring, which is hooked on to the bracket on the right hand exhaust pipe, with the long flat connecting link hooked over the second chain roller from the kick-starter sprocket on the gearbox. When the sprocket is in the rest position this roller is the second from last tooth on the sprocket. The link must pass outside the gearchange lever. Re-connect the alternator cables to the couplings underneath the frame, making sure that the colours are correctly matched and that the rubber grommet is in position in the back of the flywheel case. Check the gearchange for operation and make sure that the two "C" shaped hinges are in position on the lugs of the dual seat carrier.

The small clip which supports the throttle cable must be connected to the air ducting around the flywheel by means of the $\frac{3}{16}$ " pin and nut at the top right hand side of the front.

Place the body panels in position, fitting the top and bottom screws. These are the round head screw beneath the dual seat, and the screw at the bottom immediately above the pillion passenger's footboards, but do not tighten either at this stage. Refit the bolts round the edges of the valances, these being the two $\frac{3}{16}$ " bolts at the front and one at the rear bottom end, then the two $\frac{5}{16}$ " bolts which also carry the spare wheel brackets (when fitted), and the $\frac{1}{4}$ " bolts at the top which support the number plate. When a spare wheel and carrier are fitted re-connect the rear carrier to the two lugs which project from the dual seat frame, refit the spare wheel, couple the lower end of the carrier in position on the spare wheel and secure the two wheel nuts. Make sure that the plastic beading is pressed well home before finally tightening the panel bolts.

Re-connect the "C" shaped hinges to the dual seat brackets by the two $\frac{1}{4}$ " bolts and screw on the dual seat catch knob.

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ADJUSTMENTS WHICH CAN BE CARRIED OUT WITHOUT EXTENSIVE DISMANTLING

It is essential for the efficient running of the machine that certain checks are carried out periodically, in accordance with the summary of routine maintenance laid down in the instruction manual.

On the left hand side of the machine is a nacelle with a wire mesh grill; this is held in position by one $\frac{3}{16}$ " screw on the right hand side, the left hand side being retained by a small lip behind the valance. Take out the screw and remove by lifting the nacelle from the right hand side.

The circular contact breaker cover can now be seen situated to the right of the clutch operating lever. There is also a large hexagon plug which is the primary drive oil level and filler plug and slightly to the right is a hexagon bolt fitted with a grease nipple to provide a means of greasing the rear drive swinging arm bearing.

Contact Breaker.

The contact breaker gap (A Fig. 4 Service Sheet No. 1004) when fully open should be between .014" and .016".

To check the gap take out the two small screws which retain the circular contact breaker cover and turn the engine over carefully until one of the fibre heels is on the peak of the cam, and the points adjacent to this heel are fully open. This can be done either by placing the machine in gear and moving the rear wheel or by gently turning the engine by means of the kick-starter.

If gap A is incorrect when the points are fully open, slacken the small circular nut B which will be seen inside the C shaped coil of the spring, and the fixed contact point can then be moved in or out as necessary. This is the contact point nearest the small condenser. When the gap is correct, retighten the nut inside the C shaped spring and check again, re-adjusting if necessary.

Again turn the engine over until the other set of points is fully open and repeat the operation. When both sets of points have been checked replace the cover by sliding the rubber grommet into the U shaped slot, lift the black and white wire outside the left hand, long hexagon nut, to ensure that it does not foul the cam when the engine is running and replace the contact breaker cover screws.

Ignition Timing.

The normal ignition advance is 5° and the Scooter engine is very sensitive to ignition settings, only the smallest deviation from the correct setting being sufficient to cause overheating and rough running.

The best way to check the timing is to observe the vanes on the cooling fan. These are spaced 11° apart so that half the distance between two vanes is very near to 5°. The full procedure is, firstly, to rotate the engine until the nearside piston is on top dead centre of the compression stroke (i.e., both valves closed). Then turn the engine backwards through 5°, remembering that it is a "backward-running" engine, and the lower set of points (Fig. 4 Service Sheet No. 1004) should then be just breaking.

If the setting is incorrect slacken off the two long hexagon nuts C which secure the contact breaker back plate and rotate the plate until the points are just about to open. Then re-tighten the two hexagons and re-check the adjustment.

Note that turning the plate clockwise advances and anti-clockwise retards the timing. Also remember the importance of the contact breaker gap, for even a slight variation tends to alter the timing. (Opening the points advances the timing ; closing them retards the timing).

A rough check of the timing can be made by observing the position of the hexagon nuts C in the slots in the contact breaker plate. They should be approximately $\frac{1}{16}$ " to the left of the centre of the slots and it will be seen that the timing can be roughly set by slackening off the hexagons, with the nearside piston on top dead centre of the compression stroke, ensuring that they are in the approximate centre of the slots and then re-tightening after turning the contact breaker plate approximately $\frac{1}{16}$ " to the right.

Clutch.

Should it be necessary at any time to increase the spring tension on the clutch pressure plates, access to the spring nuts can be obtained through the primary drive oil level and filler plug. It should, however, be borne in mind that adjustment of the clutch springs should only be necessary after a very considerable mileage or if clutch slip is occurring, and before any alteration to the spring tension is made ascertain that the clutch cable is correctly adjusted, as indicated by approximately $\frac{1}{4}$ " of free movement at the end of the clutch handlebar lever, as in Fig. 22. The inner cable must be quite free and not binding due to frayed wire or other causes.

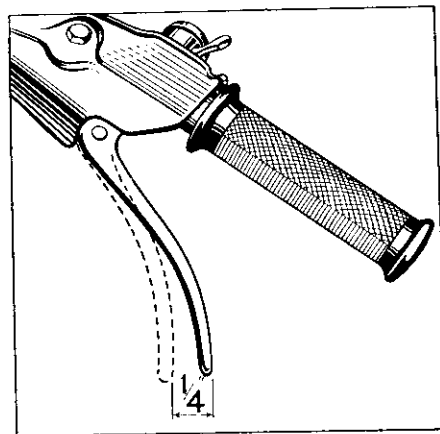


Fig. 22. Clutch control adjustment.

To adjust the clutch springs take out the oil level and filler plug and turn the engine gently until one of the three nuts can be seen through the hole, then with a forked screwdriver screw in the nut very slightly ; say a quarter to half a turn. Revolve the engine again until another nut shows and repeat the operation and again for the third nut, but great care must be taken to ensure that each nut is adjusted exactly the same amount, otherwise the plates will be distorted and clutch drag liable to occur.

Clutch slip can sometimes be detected by means of the kick-starter, for the slip can be felt if the pedal is depressed and the engine fails to turn over. It can also be detected when climbing hills under load by high revving of the engine with loss of pulling power.

Because either clutch slip or clutch drag (failure to free the drive completely) is occurring, do not jump to the conclusion that the clutch springs require adjustment. Instead make sure that the clutch cable itself is quite free in the outer casing and that it is not damaged in any way.

Checking Oil Level in Primary Drive.

This is done by leaning the machine over slightly towards the left hand side, when, if the level is correct, oil will start to run out of the filler plug hole. If the level is low then oil should be added up to the bottom edge of the hole and the plug replaced. For the correct grade of oil refer to the oil recommendation chart in your instruction book.

Adjusting Clutch and Throttle Control Cables.

Adjustment of both these cables may be necessary after a short initial mileage on the machine as outer casings are liable to contract. Adjusters are situated behind the headlamp and in front of the steering column, but do not attempt to carry out adjustment to either cable unless there is a definite need. There should be just perceptible play on the clutch lever when the machine is at rest to ensure that the clutch operates properly. If there is no play on the lever then the clutch is liable to slip when the machine is under load.

The throttle cable should only be adjusted if there is a time lag in the operation of the throttle, as indicated by a delay in response when the twist grip is turned towards the rider.

To carry out adjustment take out the screw below the headlamp rim and lift the headlamp forward and upwards from the bottom, lifting it clear of the lip which retains the top edge. If it is necessary to place the lamp to one side it can be disconnected by twisting the black bakelite retainer anti-clockwise and by taking out the small parking light bulb which is a press fit into the reflector.

The clutch cable adjuster will be seen on the thicker of the two cables which carry adjusters, the thinner one being the throttle cable. If the clutch cable is too slack release the locknut, screw out the adjuster as required and re-tighten the locknut, but take care to see that there is slight movement on the clutch lever. The same procedure is adopted with the throttle cable if play has to be taken up.

If it is necessary to adjust the position of the throttle to provide a better tick-over, then this operation is carried out by means of an adjuster on the carburetter itself. This is described in the next section.

Before replacing the headlamp make sure that the cables are in the centre of the steering tube and not to the side of the steering column.

To replace the headlamp, engage the top edge of the rim over the lip on the front shield, press the lamp well home and screw in the screw at the base of the rim.

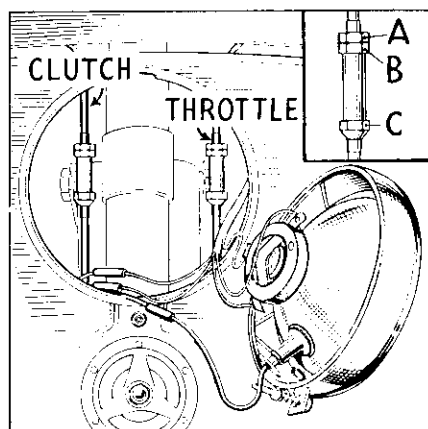


Fig. 23.
Adjusting the Clutch Cable (also Throttle)

Throttle Control.

To adjust the throttle for tick-over, lift the dual seat to gain access to the screw on the right hand side of the carburetter. (14 Fig. 28). By screwing this in clockwise the throttle slide is raised to provide a faster tick-over or lowered to slow down the tick-over speed. The best throttle opening is that which gives an even but not too fast tick-over and is also suitable for starting the engine with the twist grip completely closed against the stop.

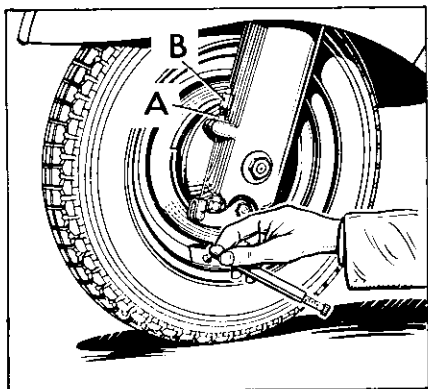


Fig. 24.

Front Brake Cable.

The front brake cable has an adjuster situated on the left hand side of the machine and on the front edge of the fork tubes. (See Fig. 24).

Care should be taken when adjusting to see that the brake does not bind. The handlebar lever should be quite free and should have a free movement of approximately $\frac{1}{4}$ " when measured at the tip of the lever.

To adjust, undo the locknut and screw the adjuster in or out as necessary, bearing in mind that screwing out will take up the slack in the cable and screwing in will provide more slack. Do not omit to re-tighten the locknut after the correct adjustment has been obtained.

Rear Brake.

The rear brake is foot-operated by cable connection and there is an adjuster situated to the rear and underneath the pillion passenger's left hand footboard. (Fig. 25). The adjustment is correct if the brake pedal is approximately $1\frac{1}{2}$ " from the footboard when the brake is applied. If the pedal comes too close to the footboard, undo the locknut on the adjuster and screw the adjuster out as necessary. Then re-tighten the locknut, and make certain that the brake is not binding.

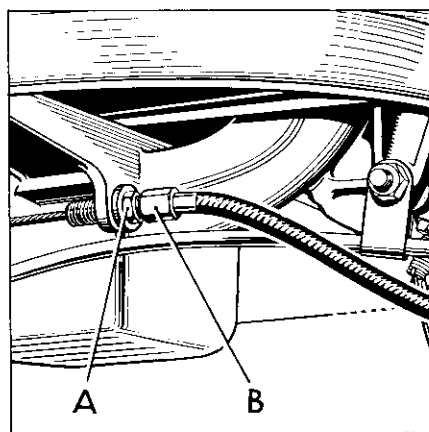


Fig. 25. Rear brake adjustment.

Changing the Wheel.

In the event of a puncture, the wheel affected will have to be removed for the puncture to be repaired, or for the wheel to be changed if a spare wheel is carried. The procedure for removal of the wheel will be described assuming that a spare wheel is carried on the machine.

Release the lightning fastener round the spare wheel cover, take off the two nuts securing the rear carrier and spare wheel and slacken the two bolts securing the rear carrier at each side of the dual seat. Lift up the carrier and take off the spare wheel, then remove the cover and place the spare on the ground next to the wheel to be changed.

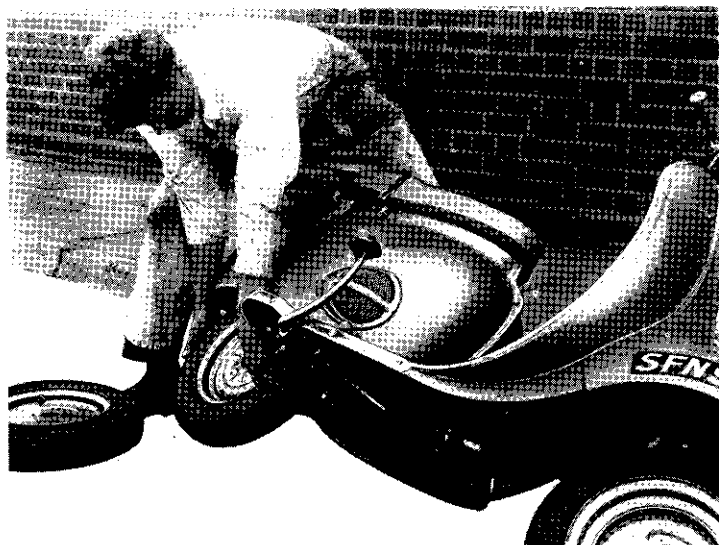


Fig. 26. Changing a wheel.

wheel ; pick up the spare wheel, place it in position with the deeper side of the wheel against the rear drive (that is with the valve on the right hand side or uppermost), screw on the three nuts until the counter-sink is gripping the wheel slightly and raise the machine upright. Place it on the stand and securely tighten the three nuts a little at a time. Do not tighten one nut completely since this is liable to tilt the wheel on the stub axle.

Always make sure that the three nuts are securely tightened.

In the case of the front wheel the procedure is the same but do not in any circumstances take the three wheel nuts off completely ; simply slacken them off so that they can be finally removed with the fingers. Again, take the machine off the stand and lean it over towards the left hand side, resting on the edge of the stand leg. Then go round the machine to the right hand side, hold the handlebars and press slightly away so that the front tyre is slightly off the ground and pressure on the wheel is released. Take off the three nuts, pick up the spare wheel and place it in position on the hub, this time with the valve next to the hub or brake drum (that is on the left hand side of the machine), screw on the three nuts, again tightening each one a little at a time and when the wheel is gripped sufficiently to locate it raise the machine upright, place it on the stand and finally tighten the three wheel nuts securely.

Note that the front wheel is fitted with the valve on the left hand side and the rear wheel is fitted with the valve on the right hand side of the machine.

Valve Clearance Adjustment.

This is commonly known as tappet adjustment but the name does not properly apply in the case of the Scooter engine because the adjusting pins are mounted above the valves at the end of the valve rockers, and not on the tappets themselves.

A certain amount of clearance or lost motion in the valve operating mechanism is essential to ensure that the valve heads close properly on their seats and provide a gas-tight joint. The clearance of .005" for both inlet and exhaust valves is most critical and the Scooter engine is unlikely to run efficiently if there is any deviation from the standard settings.

The procedure for checking and adjusting (which can be carried out with the valances in position) is first to raise the dual seat and then to detach the sparking plug leads by placing the first two fingers of the right hand beneath the plug terminal and pulling upwards with the thumb against the rocker cover. Next remove the two nuts which hold the rocker cover in position, swing the petrol tap support bracket to one side and take off the steel and fibre washers from the two studs. The rocker cover can then be removed but care must be taken or the joint washer may be damaged.

Turn the engine by means of the kick-starter or by rotating the rear wheel with top gear engaged until Valve No. 1 (see diagram) is fully open. Valve No. 4 will then be in the correct position for checking its clearance. Check all the valves in this way in accordance with the table below by means of a .005" feeler gauge inserted between the end of the valve stem and the adjusting pin on the rocker.

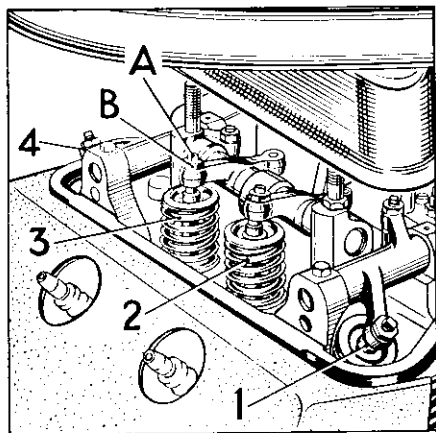


Fig. 27. Tappet adjustment.

Both nuts should be tightened a little at a time to ensure that the cover is not distorted and it may also be necessary to support the petrol tap bracket to see that this is not twisted out of position for this will affect the opening and closing of the petrol tap.

Sparking Plugs.

It is essential for the efficient functioning of the engine that the sparking plugs are cleaned periodically at about 5,000 mile intervals and the gap between the plug terminals checked. Cleaning is best carried out by a garage having the proper equipment, the charge for this work being very moderate.

The plug gaps can be checked and reset by the owner-rider, however. To do this remove the plug leads and unscrew the plugs with the spanner provided in the tool kit. When lifting the plugs out be very careful not to drop the joint washers as they will be impossible to retrieve without removing all the valances and the ducting round the engine.

The plug electrodes should be bright black in appearance and not fouled with oil. If they are whitish in appearance it is an indication of weak mixture and the cause of this should be ascertained and be eliminated. In general it can be said that weak mixture can only be caused by a partial stoppage in the carburetter, usually in the main jet. Correct spark plug setting is .018" - .020" and the setting should always be corrected by bending the outside electrode ; in no circumstances should the centre electrode be moved.

How to set the valves for checking clearances.

When No. 1 Valve is fully open check No. 4 Valve.

"	"	2	"	"	"	"	"	3	"
"	"	3	"	"	"	"	"	2	"
"	"	4	"	"	"	"	"	1	"

Note that this operation must be carried out when the engine is cold.

When re-assembling make sure that the washer is in good condition before replacing the cover. Use a new one if in doubt. Carefully locate the cover over the two rocker box studs and press it gently down making sure that the washer has not been misplaced. Place the two fibre washers and then the steel washers in position over the studs, swing the petrol tap support bracket over the left hand side stud and screw on the two 1/4" nuts.

When replacing the plugs see that the copper jointing washers are in position, insert the plug very carefully through the hole in the shroud, screw in with the fingers and finally tighten with the plug spanner. When replacing the high tension leads and plug terminals make sure that the lead from the right hand coil is placed on the right hand side spark plug, and the one from the left hand coil on the left hand side spark plug.

Cleaning the Carburetter.

It is sometimes necessary to dismantle and to clean the carburetter to remove any foreign matter that may have found its way through the two filters, or to remove moisture which is certain to accumulate sooner or later. This is an operation which can be done without removing the valances, though the work will be simplified if it is carried out when the valances have been removed for some other operation.

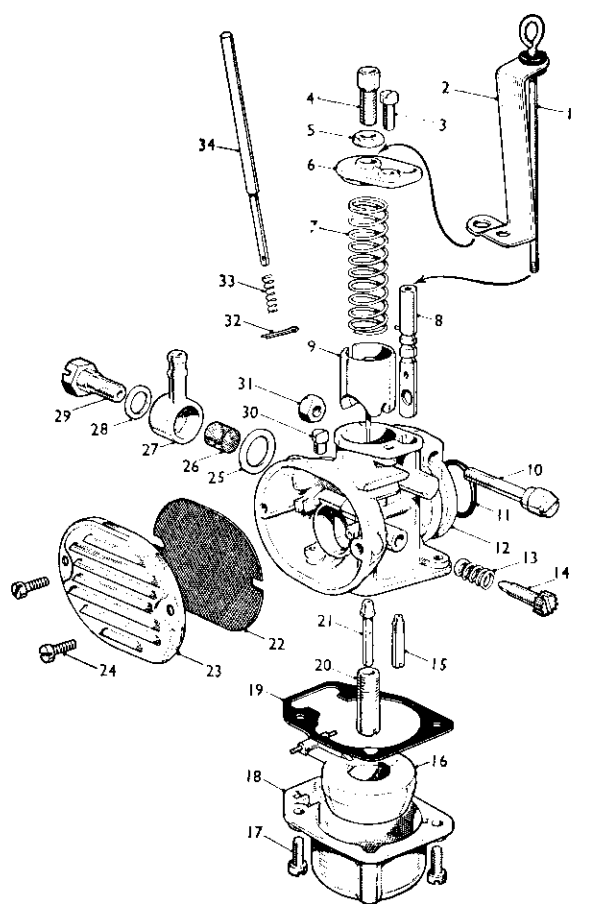
Assuming that the operation is to be carried out without removing the valances first turn off the petrol at the tap. Remove the nut from the left hand side rocker box stud this being the one which retains the petrol tap bracket. Lift the bracket up and swing it to one side out of the way. Now, with a short screwdriver slacken off the screw (29 Fig. 28) on the left hand side of the carburetter which secures the banjo union on the end of the petrol pipe to the float chamber. Be very careful when lifting the screw out not to lose the fibre washers each side of the banjo union and not to damage or drop the cylindrical gauze filter inside the union.

Place the screw, washers and gauze filter carefully on one side.

Unscrew the two $\frac{1}{4}$ " nuts and washers securing the swan neck manifold to the cylinder head and carefully work the carburetter complete with manifold off the studs. It is sometimes considered easier to remove the manifold from the studs and to unscrew the banjo union afterwards but this is a matter of choice.

The carburetter can now be lifted up and out of the engine shields for removal of the float chamber, etc., for cleaning. In normal circumstances it is only necessary to remove the float chamber and possibly the pilot and main jets. (15 and 20, Fig. 28).

Unscrew the two small $\frac{3}{16}$ " pins (17, Fig. 28) one on each side of the



- | | |
|--|---------------------------------|
| 1. Starter Slide Control Rod. | 18. Carburettor Bowl. |
| 2. Bracket for Control Rod. | 19. Gasket. |
| 3. Cover Plate Screw. | 20. Main Jet. |
| 4. Cable Adjuster. | 21. Emulsion Tube. |
| 5. Locknut for Cable Adjuster. | 22. Air Intake Gauze. |
| 6. Cover Plate. | 23. Cover for Air Intake Gauze. |
| 7. Spring, Main Slide. | 24. Cover Screw (2). |
| 8. Starter Slide. | 25. Filter Elbow Washer. |
| 9. Main Slide and Needle. | 26. Filter Gauze. |
| 10. Clamping Screw. | 27. Filter Elbow. |
| 11. "O" Ring. | 28. Filter Plug Washer. |
| 12. Carburettor Body. | 29. Filter Plug. |
| 13. Spring, Throttle Adjustment Screw. | 30. Plugging Screw. |
| 14. Throttle Adjustment Screw. | 31. Clamping Screw Nut. |
| 15. Slow-running Jet. | 32. Split Pin. |
| 16. Float. | 33. Spring for Ticker. |
| 17. Carburettor Bowl Screw (2). | 34. Ticker Stem. |

Fig. 28. The carburetter.

float chamber and remove the float chamber complete with the nylon float. Be very careful not to damage the paper gasket which will be found between the float chamber and the body of the carburettor.

The float can now be lifted out and the chamber cleaned thoroughly of any accumulation of water or foreign matter.

If the jets are to be removed, the screwdriver should be in good condition. Never use one which is badly worn and which can slip and possibly shave off a portion of the jet.

Unscrew the jets by means of the screwdriver (they have normal right-hand threads and are therefore unscrewed anti-clockwise), and blow out any foreign matter. Do not in any circumstances use a piece of wire to poke a jet out. The pilot jet (15) is situated at the corner of the body and the main jet (20) in the centre.

Having cleaned the jets they should be replaced, again taking extreme care not to shave a portion of the jet away by allowing the screwdriver to slip since any portion of metal may be jammed in the jet aperture.

If the paper gasket between the float chamber and the body of the carburettor has been damaged, it should be replaced with a new one. Place the gasket in position, see that the nylon float is correctly positioned in the float chamber and replace the chamber, screwing in the two small $\frac{3}{16}$ " screws. Make sure that these are tight before replacing the carburettor.

To reconnect the carburettor, place the screw with the small fibre washer against the smaller diameter of the banjo union, insert the cylindrical gauze filter, then place the larger fibre washer in position and screw up on to the float chamber, finally tightening with a screwdriver. Now work the carburettor down into the aperture and gently in position over the two studs. Again, care should be taken to see that the gaskets are in good condition. Replace the two $\frac{1}{4}$ " nuts and washers, tightening each one a little at a time so as not to distort the manifold joint face. Replace the petrol tap support bracket over the left hand side rocker box stud and replace the $\frac{1}{4}$ " nut.

Rear Chain Adjustment.

The total up and down movement of the rear chain should be $\frac{1}{4}$ ". This can be checked by taking out the inspection plug situated half-way along the case towards the top.

When adjustment is necessary, slacken the locknut on the stud projecting from the lower edge of the case, and screw the stud in or out as required. Screwing in will tighten the chain and screwing out will slacken it.

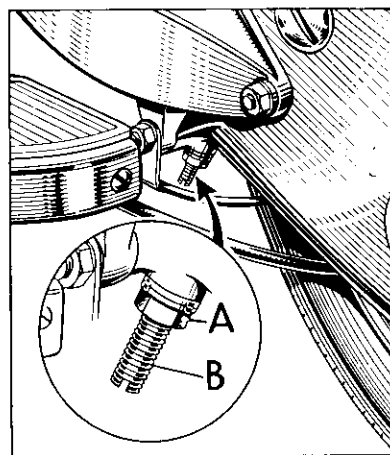


Fig. 29. Rear chain adjuster.

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

REMOVING AND REFITTING FRONT MUDGUARD AND LEGSHIELD ASSEMBLY AND STEERING HEAD TUBE

If the steering head tube is to be replaced, for example after accident damage, it is first of all necessary to remove the front mudguard and legshield assembly. Proceed as follows.

Remove the front forks as described in Sheet No. 1010. Disconnect and remove the battery or batteries, followed by the headlamp unit. Remove the single screw on either side of the instrument panel, which holds the panel to the legshield. The panel can remain loosely in position. Take out the four screws underneath the mudguard, which hold the headlamp cowl in position and remove the cowl. Disconnect the horn wires.

Remove the left and right hand chrome beadings, take out the screws holding the mudguard and mudguard extensions to the legshield and footboards and remove the mudguard and extensions. Remove the brake and gear change pedals and slacken off the foot board. After the bolts holding the legshield to the frame and foot board are taken out (those fastened to the frame are at the back of the shield just below the instrument panel) the shield can be removed.

Remove the earth wire from the frame and disconnect the head tube by taking off the four nuts from the studs that pass through the tube clips and driving the studs out of the clips. The legshield bracket will come away with the top stud. Draw the head tube complete with clips up and out of the frame tubes.

Re-assemble in reverse order, but do not tighten the top head tube stud until the legshield is bolted in position and take care that the beadings are in position before finally tightening the panels.

250 c.c. O.H.V. TWIN CYLINDER SCOOTER

DISMANTLING AND RE-ASSEMBLY OF THE FRONT FORK AND WHEEL

To withdraw the front fork from the steering column, sufficient clearance must be obtained at the front of the machine to allow the fork to be drawn out and downwards. This clearance can be obtained by placing the machine on a trestle with the wheel projecting over the end, or by placing blocks under the centre stand to give at least 6" clearance beneath the tyre.

If a windscreen is fitted, take off the two bolts and nuts which pass through the windscreen pillars and the handlebar cover, and remove the windscreen and the handlebar cover.

Disconnect the brake and clutch cables from both handlebar levers by pulling out the outer casing nipple and releasing the inner wire from the lever. Disconnect the front brake cable from the brake cam lever by pulling out the split pin and clevis pin, and then unscrew the brake cable adjuster from the aluminium sliding member.

Slacken off the two twist grip screws and take out the two small screws holding the dipper switch to the handlebar. Slacken the pinch bolt 'C' (Fig. 32) in the handlebar clip.

Remove the front wheel by taking off the three wheel nuts. Now take off the two large hexagon nuts 'A' (Fig. 32) on the top of the steering column, which have normal right-hand threads, and lift off the handlebar steering lock plate 'B' (Fig. 31) and dust cover 'C'. Take careful note of the way in which the plate is fitted against the stop plate on the steering head tube. Carefully prise out the long key 'D' from the column.

Now draw the fork down, at the same time holding a piece of clean rag to catch the balls which will be released from the lower race.

Complete Dismantling of the Fork

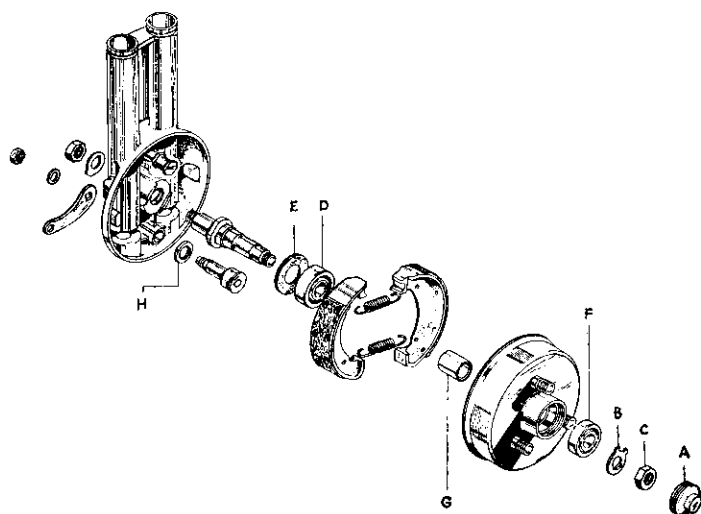


Fig. 30.
Front Hub (exploded)

Where the fork is to be completely dismantled, such as for replacement of one which has been damaged in an accident, proceed as follows.

Remove the cap 'A' (Fig. 30) on the hub; this has a left-hand thread and must therefore be unscrewed in a clockwise direction. It will be necessary to apply the brake by using a piece of tube over the brake cam lever.

The bearings are a press fit into the brake drum and on to the hub spindle, and in some cases it may be necessary to use an extractor to draw the drum and bearings off the spindle (tool No. 61-5033). Flatten the tab

Service Sheet No. 1010 (contd.)

washer 'B' which will be seen under the spindle nut 'C' and unscrew the nut in a normal anti-clockwise direction. Take off the tab washer and draw the brake drum complete with bearings off the spindle.

Examination of the drum will show that there is a large bearing 'D' on the inner end of the shell adjacent to an oil seal 'E' which has the lip facing towards the bearing. On the outer end of the shell is a smaller bearing 'F' and there is a distance piece 'G' between these two bearings.

Remove the brake shoes by prising them from the brake cam and the fulcrum pin, noting that the shoes are fitted with the narrow side towards the brake back plate and that there is a distance piece 'H' on the cam spindle between the shoes and the back plate.

To release the lower member from the fork, unscrew the two domed nuts 'E' (Fig. 29) at the lower end of the member. The front nut is removed with a spanner using a screwdriver to hold the slotted end of the damper rod. In the case of the rear or fork spring nut, no screwdriver will be necessary.

With the two domed nuts removed the lower member can be drawn off the two fork tubes. The two shouldered washers 'F', one on the spring stud and the other on the damper rod, may come away with the lower member, but in any case they should be removed and kept until ready for re-assembly. The spring can be removed by unscrewing the bolt and washer at the upper or crown end of the fork; this will release the spring complete with the bottom and the top scrolls.

To take out the damper, unscrew the disc valve 'G' in the end of the tube and draw the damper out complete with washer and nut at the top.

The dust cover can be removed by taking out the centre bolt and elongated plate which locates between the two fork tubes on the fork crown.

The brake cam lever can be released by unscrewing the nut on the lever and the cam can then be drawn through the lower member. The fulcrum pin is a press fit in the lower member and should not be removed.

If the hub spindle is to be removed it will be necessary to flatten the tab washer on the outer end of the spindle, unscrew the nut and then heat the aluminium sliding member in hot water before tapping the spindle through towards the brake drum side. Note that it is located by two flats.

Hub Bearings

The larger of the two bearings is fitted from inside the drum with the oil seal between the bearing and the brake shoes, the lip of the seal being towards the bearing. The smaller bearing is fitted from the outer end of the hub shell (i.e., the locknut end) with the distance piece between the two bearings.

Head Bearings

The bottom steering head cone is a press fit on to the fork steering column and the bottom cup is a press fit on to the outside of the steering head tube, the top cup being a press fit into the tube. There are 28 steel balls in each head race. A broad rubber band is employed on the lower race as a dust excluder.

When the head races are to be renewed (this is possible without removing the head tube or legshield from the frame), the bottom cup should be removed

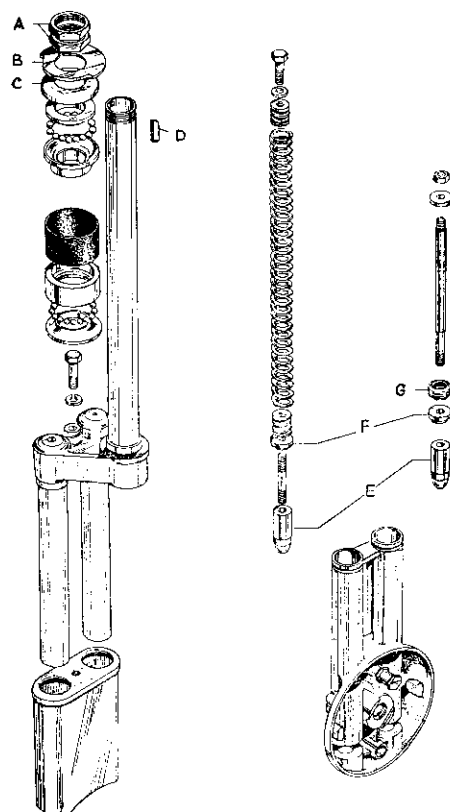


Fig. 31.
Front Fork (exploded)

Service Sheet No. 1010 (contd.)

from the head tube by tapping it with a suitable punch round the outside edge. The top cup can be removed by driving it from inside the tube, again using a suitable punch or drift. Replacements should be pressed on and into the tube; make sure that they are set squarely before being driven well home.

Front Fork re-assembly

Assuming that a new fork is being built into the machine, first slide the dust cover over the two fork tubes and secure with the centre bolt, washer and long steel plate. Pack the damper tube with as much "Jetlube" grease as it will hold (an old cycle pump will be found useful) slide the damper rod, nut and washer end first and screw in the disc valve at the lower end of the tube. Now slide the fork spring up the other tube, secure with the bolt and washer through the fork crown, and replace the two shouldered washers on the damper rod and spring stud so that the smaller diameters are at the bottom.

Screw service tool No. 61-5018 on to the end of the damper rod, but do not lock tightly, otherwise difficulty may be experienced in removing the tool. Guide the service tool through the lower member, at the same time guiding the fork spring through the other side. When the service tool is through, draw the damper rod and the stud on the end of the fork spring scroll through the lower member, so that the domed nuts may be fitted.

Remove the service tool from the damper rod and screw on the domed nut, holding the damper rod with the screwdriver through the nut, and then refit the other domed nut to the spring stud.

Pass the brake cam spindle through the distance piece with the chamfered side towards the head of the brake cam, place the brake lever on the outside and screw on the washer and nut. Pass the main spindle (if removed) through the lower member, having first heated the member in hot water, and locate it by means of the two flats. Replace the tab washer and screw on the locknut, turning the tab up on to the nut. Replace the brake shoes with the narrow portion of the shoe next to the aluminium lower member. This can be done by holding the shoes with the springs fitted in a V formation, then fitting them over the fulcrum pin and brake cam by pressing outwards and downwards against the lower member.

Slide the brake drum into position over the spindle, refit the tab washer and the locknut, turning the tab up on to the locknut when finally tightened.

The fork will now be ready for refitting to the steering head tube.

Grease both cups on the frame and apply 28 balls to the lower cup; make sure that the rubber dust excluder is on the bearing but high enough not to interfere with the fitting. Slide the fork column up through the bearing and then, supporting the fork, place 28 balls in the top bearing and refit the top cone and dust cover. Replace the long key in the fork column, slide the handlebar into position over the key and screw on the two top locknuts by first screwing the lower nut 'B' (Fig. 32) down until the steering head adjustment is correct; it should be free to revolve without any appreciable up or down movement. When the adjustment is correct, tighten the top locknut 'A' and retighten the clip 'C' on the handlebar.

With the races assembled, draw the rubber dust cover down on to the fork crown and replace the hub cap by screwing in anti-clockwise.

Slide the twist grip over the handlebar, replace the front brake and clutch cables and refit the dipper switch and horn button by screwing in the two small screws.

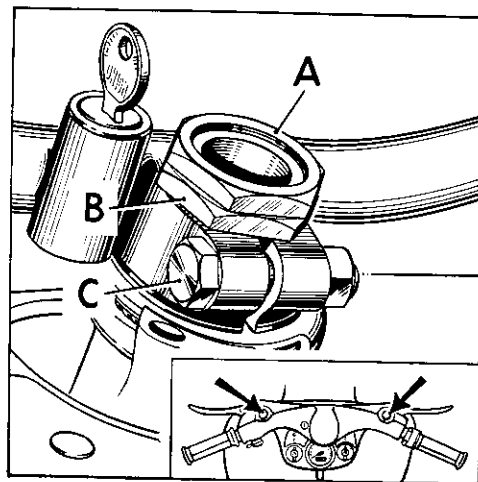


Fig. 32.
Steering Head Adjuster.

Service Sheet No. 1010 (contd.)

Make sure that all cables and controls pass down the front of the steering head and do not allow an acute bend above the instrument panel, as a cable in this condition may foul the stop plate. Connect the front brake by screwing the cable adjuster into the lower member and refit the clevis pin in the brake lever. Do not forget the split pin and do not omit to re-tighten the lock nut on the brake adjuster. Replace the wheel and check the wheel nuts when the tyre is on the ground.

Check that all controls are correct before replacing the handlebar cover and windscreen.

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CHANGING BRAKE SHOES

After a very considerable mileage it will be necessary to replace the brake shoes, and this can be done without dismantling the hubs.

Rear Brake

To change the rear brake shoes first lift the machine off the stand so that the rear wheel is clear of the ground and place a small trestle or block of wood under the rear cross member of the frame.

Remove the rear wheel by taking off the three hub nuts and take out the single countersunk screw which holds the brake drum to the stub axle and draw off the drum.

With a screwdriver or similar tool unhook the springs from the shoes, taking careful note of the way in which they are fitted and remove the shoes. To refit, place the leading shoe in position on the fulcrum pin and cam, this being the shoe at the top looking from the right-hand side of the machine, and hook one spring into the hole nearest the brake cam.

Now obtain a piece of strong cord and tie it into a loop approximately 1" diameter; place the trailing shoe which is the lower one, in position, slip the loop of cord over the lower end of the spring and using a screwdriver as a lever through the other end of the loop expand the spring until the end can be pressed into the hole in the lower or trailing shoe. This will now hold the two shoes in position.

Pick up the remaining spring and hook it into the hole in the trailing shoe nearest the fulcrum pin, so that the loose end is uppermost, and, again placing the cord over the hook and using the screwdriver as a lever, expand the spring until the loose end can be hooked into the leading shoe. Now remove the cord.

As the rear brake cable may have been adjusted to compensate for wear on the brake linings, it will now be advisable to slacken off the cable by screwing the adjuster in before refitting the brake drum. After refitting the drum and screwing in the single countersunk head screw, replace the wheel, secure the three wheel nuts, spin the wheel to make sure that the brake is not binding and re-adjust the cable as necessary. Make sure that the locknut on the adjuster is tightened securely after the correct adjustment has been obtained.



Fig. 33.

Fitting Rear Brake Shoe Spring.

Service Sheet No. 1011 (contd.)

Front Brake

The presence of the stub axle makes the procedure for the front brake somewhat different from that for the rear.

Raise the front of the machine so that the front wheel is clear of the ground by placing a block of wood approximately 2" thick underneath each leg of the centre stand. Remove the front wheel by taking off the three wheel nuts.

Apply the front brake and remove the hub cap by unscrewing in a clock-wise direction; it has a left hand thread.

Beneath the cap will be seen the wheel lock nut and a tab washer; flatten the tab on the washer and unscrew the locknut in the normal manner, which is anti-clockwise. Take off the nut and the tab washer and draw off the brake drum complete with bearings and oil seal. (Service tool No. 61-5033.)

Now, using two screwdrivers, prise the shoes up and away from the pivot bolt and brake cam.

To re-fit. Hold the two shoes with the springs fitted, open them to form a V and press them down and over the pivot pin and brake cam, making sure that they are fitted the correct way round, which is with the narrow portion against the brake back plate.

Slacken off the brake cable by screwing in the adjuster on the lower member, refit the brake drum with the tab washer and lock nut, turning over the tab washer after the nut has been secured. Screw in the hub cap by turning in an anti-clockwise direction and refit the wheel, finally resetting the brake cable adjustment. After spinning the wheel to ensure that the brake is not binding.

Always make sure when removing wheels that they are fitted the correct way round, which is the rear wheel with the valve on the right hand side of the machine and the front wheel with the valve on the left. If the wheels are incorrectly fitted the alignment will be affected.

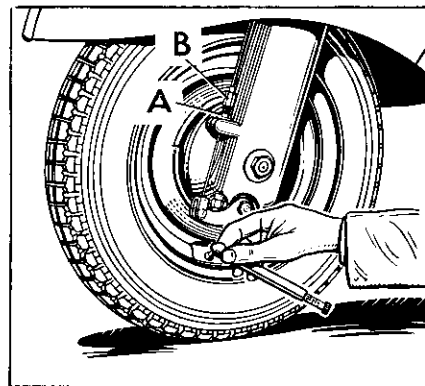


Fig. 34
Front Brake Adjuster.

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REMOVING AND REPLACING THE PETROL TANK

Removal

It is sometimes necessary to remove and clean a petrol tank where foreign matter such as dirt or water has got into the fuel. When this is necessary, turn off the petrol at the tap and then disconnect the lower end of the petrol pipe where it is coupled to the carburetter by taking out the screw, being careful not to lose the two fibre washers, or the gauze filter, which is fitted inside the banjo union. Remove the one $\frac{1}{4}$ " nut which secures the petrol tap support arm to the left hand rocker box stud and swing the bracket clear of the stud. Slacken the bolts at the top of the silencer where it is secured to the petrol tank and silencer bracket and after releasing the clips securing the silencer to the exhaust pipes, swing the silencer clear of the pipes. The rear mudguard must also be removed. This is secured by two $\frac{1}{4}$ " bolts and nuts to the cross member between the two vertical frame tubes and two bolts and nuts to the rear petrol tank and silencer bracket. Take out these bolts and remove the mudguard downwards and out. Take off the single nut and shakeproof washer which secure the rectifier to the frame and place the rectifier carefully out of the way.

The rear damper unit must be removed completely by taking out both the upper and lower pivot pins, one through the double brackets on the dual seat carrier and the lower one through the rear drive unit.

The petrol tank itself is secured by three shouldered bolts with nuts, two at the front and one at the rear. Take off the nuts, which also have spring washers and large plain washers, pull out the bolts, remove the rubber buffers, swing the rear bracket out of the way and drop the petrol tank down and out of the frame, taking care to see that the petrol pipe which is still attached does not hook itself round the frame cross members.

Replacement

The procedure for refitting the petrol tank is the reverse of removal, but first place the tank in position underneath the dual seat carrier so that the two lugs at the front are resting on the brackets between the two vertical members of the frame and the rear lug on the tank is resting on the bracket provided for supporting the petrol tank, the silencer and the mudguard.

When the tank is in position, see that the petrol pipe is free to be coupled to the carburetter, and place each of the plain $\frac{1}{4}$ " thick rubber buffers between the lug on the tank and the lug on the frame. Now fit one of the special shouldered rubber buffers underneath the lugs on the frame, press the special shouldered bolt down through the petrol tank bracket, place the large diameter steel washer against the lower rubber buffer, then the spring washer, and screw on the nut. Repeat this for each of the three mounting points, leaving the nuts finger-tight until assembly of the three mounting points has been completed. Now secure the three mounting bolts and nuts until the nuts are tightened against the shoulders on the bolts. No difficulty will be experienced here providing that the special shouldered rubber washers have been correctly fitted with the shoulders inside the brackets provided on the frame and on the rear bracket. Now refit the mudguard by inserting the four $\frac{1}{4}$ " diameter bolts and nuts, two at the front and two at the rear. Refit the exhaust pipes into the silencer and secure the clips, replace the rectifier on its bracket, making sure that the shakeproof washer is in position under the nut, replace the damper unit with the spring uppermost and finally reconnect the petrol pipe to the carburetter, taking care to see that the gauze filter is inside the banjo union, and that the small fibre washer is between the head of the screw and the outside face of the union with the larger diameter fibre washer between the banjo union and the float chamber of the carburetter.

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CHANGING SPEEDOMETER OR SPEEDOMETER CABLE

If it is necessary at any time to change the speedometer head or the cable, the following procedure should be adopted. When the cable is to be replaced, disconnect the cable at the rear brake drum underneath the swinging arm by unscrewing the outer casing union nut and pull the inner cable out of mesh with the drive. When only the head is to be changed it is only necessary to remove the cable clips to obtain sufficient slack in the cable for the instrument panel to be lifted up.

Take out the headlamp screw and lift the headlamp up off the lip on the top of the nacelle and disconnect the leads by turning the black bakelite ring in an anti-clockwise direction. Pull out the parking light bulb and place the rim and reflector on one side.

Now take out the two bolts holding the handlebar shroud and windscreen, when this is fitted, and lift the windscreen and shroud clear of the handlebars.

Slacken off the two screws holding the twist grip and remove the front brake and clutch cables from the levers on the handlebars by pulling out the outer casing and releasing the nipple from the lever. Take out the two screws holding the dipper switch and horn button to the left-hand side of the handlebar.

When all the cables are clear of the bars, slacken off the pinch-bolt on the handlebar and undo the two large nuts on the top of fork column. Lift the handlebars from the forks, then slide the twist grip off the end of the bar and place the handlebars to one side. Lift the steering stop plate off the fork column and take out the two screws at each side of the instrument panel these being just underneath the panel in the rear portion of the leg shield.

With a Phillips screwdriver take out the two small Phillips screws in the centre of the ignition and lighting switches and lift the two knobs off the switches. Then undo the two square nuts securing the switches to the panel and push the switches through to the underside of the panel.

The instrument panel can now be lifted up and by twisting slightly can be worked clear of the steering lock plate on the back of the steering head tube. It will only be necessary to obtain sufficient clearance to get at the speedometer cable union nut.

Unscrew the nut and pull the inner cable clear of the speedometer head.

When the cable is to be replaced, the old one should be drawn out and the replacement threaded through, then recoupled to the speedometer and reassembly can proceed.

If the speedometer head is to be changed, unscrew the nut holding the bracket on the underside of the speedometer head, take off the bracket together with the speedometer bulb and lift the speedometer head up through the top of the panel. The replacement head is then fitted in the reverse manner, but care should be taken to see that the bracket is positioned in such a way that the bulb will illuminate the speedometer through the small panel in the speedometer head.

Re-assembly

Having fitted the replacement speedometer head or the cable, refit the ignition switches by screwing on the square nuts, making sure that the switches are correctly located in the D shaped holes, and if any of the cables have been pulled through the steering aperture in the panel, make sure that they are replaced ready for the panel to be lowered into position. Now ease the panel down over the steering head stop plate

Service Sheet No. 1013 (contd.)

and into position, making sure that the two brackets on the underside of the panel lie between the rear portion of the leg shields and the front panel and that the panel fits over the top edge of the leg shields and is also clipping over the plastic beads round the outer edges of the leg shields. Insert the two screws underneath each side of the instrument panel and secure.

Place the steering stem stop plate over the stem, making sure that it is fitted the correct way up so that it engages properly on the stop plate on the back of the steering head. Place the handlebars in position over the steering column first sliding on the twist grip. Replace the two large nuts on top of the handlebars and adjust the head bearings, finally tightening the handlebar pinch-bolt.

Reconnect the front brake and clutch lever cables to the levers and refit the dipper switch and horn button by screwing in the two small screws. This operation will be facilitated if the lower screw is engaged in the hole slightly before refitting the top one.

Replace the lighting and ignition knobs over the flats on the switches and secure with the two Phillips screws with the dished washers underneath the heads of the screws.

See that all the cables are located down the front of the steering column and that there is not any excess loop in the cables which might foul the stop plate on the steering column.

Reconnect the bakelite headlight coupling by turning in a clockwise direction and press in the parking light bulb. Place the headlamp over the lip on the top of the nacelle and push it well home before securing with the screw at the base of the rim.

- Check the operation of all the controls and refit the handlebar shroud and the wind shield. Finally recouple the speedometer cable at the rear wheel.

250 c.c. O.H.V. Twin Cylinder Scooter fitted with Lucas 5AF Alternator

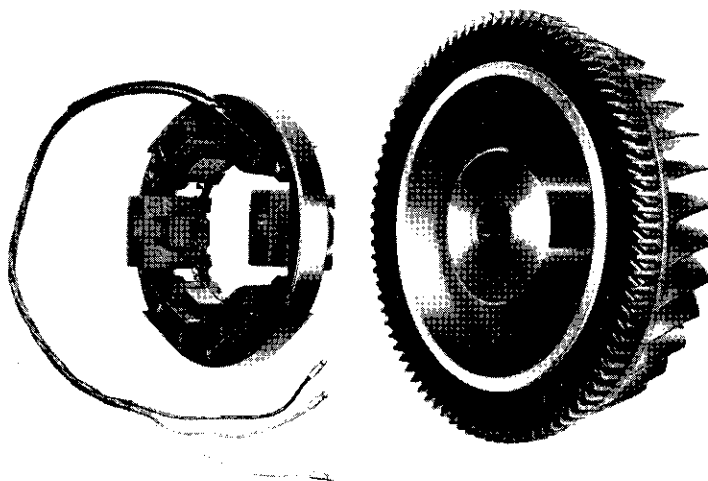
Introduction and Testing Procedure

Cable Colours

Green/Black

Green/Yellow

Green/White



General Description

Designed specially for enclosed engines where fan cooling is necessary, the 5AF alternator consists of a conventional, RM13 type, wound stator for bolting to the engine crankcase but its RM15 type rotor is cast integral with the engine flywheel. This has cooling fins cast in its external surface while an inertia ring is screwed to its periphery. When the engine is fitted with an electric starting motor, a starter ring gear is substituted for the inertia ring. There is a 6 volt and 12 volt version of this unit. Two particular applications of the 5AF alternator concerns the 250 c.c. o.h.v. twin cylinder scooters, which include a de-luxe machine having a starting motor fitted with a starter ring gear. On the standard machine is fitted a 6 volt 5AF which incorporates an inertia ring, instead of the starter ring gear.

The 6 volt 5AF is rated at 60 watts, whilst the 12 volt unit is rated at 110 watts.

SERVICE SHEET No. 1050 (contd.)

Output Control

The standard circuit has the output wires from the generator connected by their snap connectors to similarly coloured wires on the wiring harness and provides the following output control.

Lighting Switch in "OFF" Position

The output is taken from one pair of coils by means of the Green/White and Green/Black wires, and the remaining coils (Green/White and Green/Yellow wires) are open-circuited.

Lighting in Switch "PILOT" Position

Output taken from one pair of coils by Green/White and Green/Black wires as before and the remaining coils are on open-circuit.

Lighting Switch in "HEAD" Position

All three pairs of coils are connected in parallel and the maximum output is obtained. **Note.**— To provide an increased charging rate with the lighting switch in the "OFF" position, some models will be found to have the wire joining terminals 5 and 6 of the headlamp switch removed. This means that no coils are shorted out in this switch position and the charging rate is slightly increased.

In circumstances where a considerable amount of low speed running is necessary or there are long periods of parking with the lights on, it is possible to increase the charging rate with the lighting switch in the "OFF" and "PILOT" positions by connecting the Green/Yellow alternator cable by its snap connector to the Green/Black harness cable and the Green/Black alternator cable to the Green/Yellow harness cable.

The Green/White cables should not be disturbed. These alternative connections considerably increase the charging rate in these switch positions, and the connections should be returned to standard for normal conditions of use or long runs.

Owing to the effects of the above modifications it is essential that the wiring circuit is returned to standard before checking the charging rates during fault finding.

Emergency Starting

With the ignition switch in the "EMG" position, the battery is not isolated from the alternator and will, in fact, receive a charge whilst the machine is being run.

This arrangement is also a safeguard against continuous running in the "EMG" position. The back pressure of the battery will increase as it is charged, until it is sufficiently strong to affect the working of the ignition system. When this happens misfiring will occur, resulting in poor engine performance. In view of this, always check that the machine is not being run with the ignition switch continually in the "EMG" position, before testing the system for other faults.

Motor Cycle Trials Events, etc.

When using the machine for trials riding, the alternator can be used continuously in the "EMG" position without a battery, providing the lead from the main harness to the battery negative terminal is earthed to the machine, but contact points are liable to become badly burned.

Test Procedure

As the lights and other equipment are operated on a normal D.C. circuit they can be checked by normal continuity tests with a battery and bulb.

The following equipment is required to satisfactorily test the charging circuit. The meters used should be accurate moving coil instruments.

A.C. voltmeter scale 0–15 volts

1 ohm, load resistance

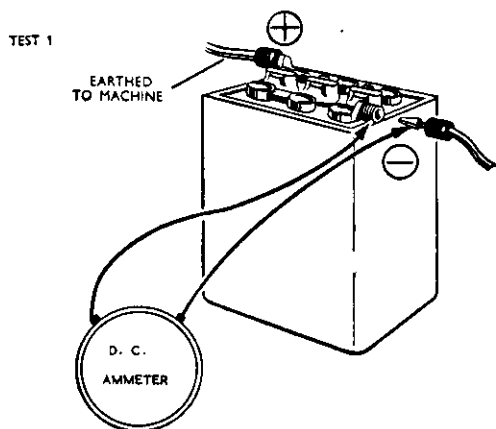
D.C. ammeter scale 0–15 amps.

12 volt battery and 36 watt bulbs

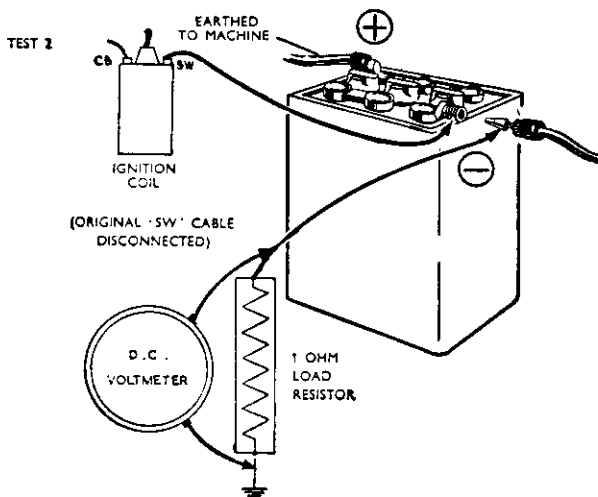
D.C. voltmeter scale 0–15 volts

Checking D.C. Input to Battery

Test 1. Ammeter connected in series with main lead and battery.



Test 2. Disconnect main lead from battery. Connect 1 ohm resistor in place of battery. Feed ignition coil separately from battery. Turn ignition switch to IGN position.



If battery is in poor condition or low state of charge use Test 2.

Test	Switch Position	Reading Amps. at 3,000 r.p.m.	
		6 Volt	12 Volt
1	OFF	1.75 (min.)	2.5 (min.)
	PILOT	0.75 (min.)	1.5 (min.)
	HEAD	0.5 (min.)	3.25 (min.)

Test	Switch Position	Reading Volts at 3,000 r.p.m.	
		6 Volt	12 Volt
2	OFF	1.75 (min.)	3.75 (min.)
	PILOT	1.75 (min.)	3.25 (min.)
	HEAD	3.25 (min.)	6.0 (min.)

Conclusions from these Tests

Test 1. If meter readings are as stated, the charging circuit and alternator are satisfactory. No reading; check the generator. A low reading can be caused by a faulty battery. Proceed with Test 2. If readings still low check battery with hydrometer and discharge tester.

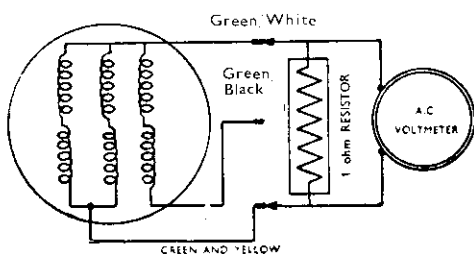
Test 2. If meter readings are lower or higher than values stated, check the generator. No reading on meter, check the rectifier.

Important

Inaccurate readings can be due to faulty wiring, bad connections at the snap connectors or poor earths. Make a quick visual check of all connections before proceeding with the tests.

Remember it is no use carrying out Test 1 if the battery is faulty or in a low state of charge, if in doubt proceed with Test 2.

Testing the Alternator on the Machine, using an A.C. Voltmeter and 1 Ohm Load Resistor



Test	Voltmeter and Resistor Connected Across	Reading Volts at 3,000 r.p.m.	
		6 Volt	12 Volt
1	Green/White and Green/Black	3.25 (min.)	3.5 (min.)
2	Green/White and Green/Yellow	6.25 (min.)	5.5 (min.)
3	Green/White and Green/Yellow (with Green/Black connected to Green/Yellow)	8.75 (min.)	7.0 (min.)
4	Any one lead and Generator Stator (Earth)	No Reading	No Reading

Conclusions from these Tests

Low reading on any group of coils indicates shorted turns.

Zero reading will indicate open-circuit coil.

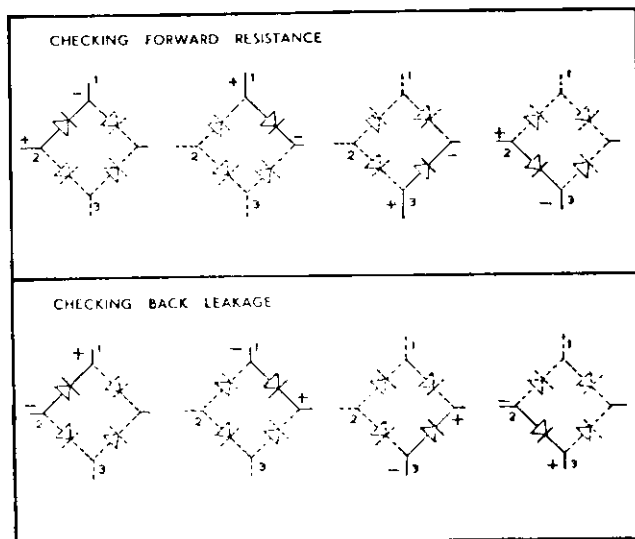
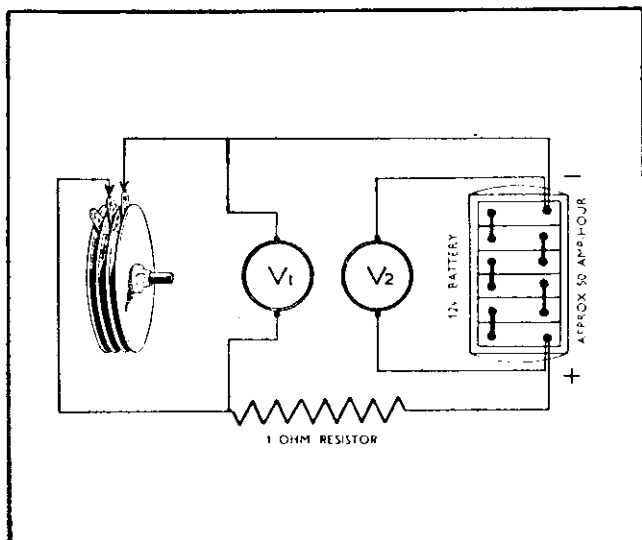
If all coils read low, partial de-magnetisation of rotor may have occurred as a result of faulty rectifier. Check rectifier, and battery earth polarity before replacing rotor.

A reading between any one lead and the generator stator indicates an earthed coil. Replace stator or locate earth by isolating and testing individual coils.

Note

With the engine running at 3,000 r.p.m. (approx.) the output voltages are steady, and even if the engine is running a few r.p.m. faster or slower the values stated will be obtained from a good generator.

Rectifier—Bench Testing



V1 will measure the volt drop across the rectifier plate.

V2 must be checked when testing the rectifier plate, to make certain the supply voltage is the recommended 12 volts on load.

It is essential that the supply is kept at 12 volts for these Tests.

Forward Resistance Test

Test 1. Connect test leads in turn across terminals 2 and 1, bolt and 1, bolt and 3, 2 and 3. Reading in all positions should not be greater than 2.5 volts. Keep the testing time as short as possible to avoid overheating the rectifier cell. **Note.**—If the latter type of rectifier, which has no terminal markings, is fitted, the same procedure is followed. The same voltage values also apply.

Back Leakage Test

Test 2. Proceed as for Test 1, and test each cell in turn, but reverse the test leads. Reading on V1 should not be less than 2 volts below the open-circuit reading on voltmeter No. 2, i.e., 10 volts.

Conclusions from these Tests

Test 1. If the voltage reading on V1 is more than 2.5 volts, on any cell, it is aged and the rectifier should be replaced.

Test 2. If the voltage reading on V1 is less than 10 volts, on any cell, the rectifier is shorted and should be replaced.

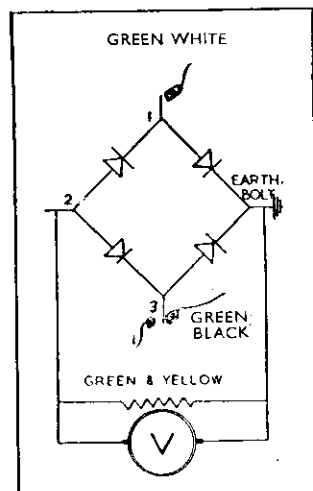
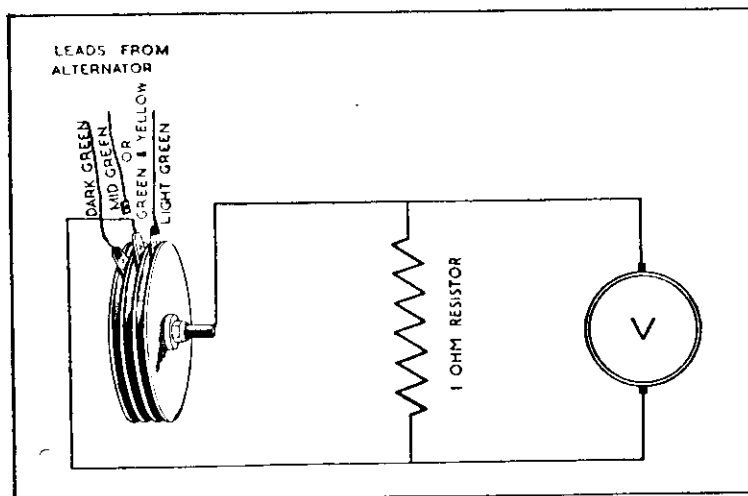
Important

Before fitting a replacement rectifier, check the following points:—

1. Check that battery is correctly connected, **Positive to Earth.**
2. Check rectifier visually for signs of damage.

Do not make any adjustment to the nut which holds the elements together on the through bolt. The efficiency of the rectifier depends upon the correct tension of this bolt. The tension on the bolt is set correctly before leaving the works, and cannot be adjusted correctly in service.

Checking Rectifier in Position on Machine



Voltmeter and Resistor Connected Across	Reading with Leads Connected as Shown
Terminal No. 2 (or centre terminal on latest type) and frame of machine	7.0 (min.) 6 volt 6.5 (min.) 12 volt

Procedure

Connect the alternator leads as detailed direct to the rectifier terminals No. 1 and No. 3 with all the other cables disconnected from the rectifier.

(Note.—On the latest type rectifiers the terminals are not numbered, so connect the alternator leads to the outer cranked terminals).

Connect the test leads which must have a D.C. voltmeter with 1 ohm load shunted across, between earth (frame of machine) and terminal No. 2 (centre terminal on latest type rectifier) when the values stated should be obtained with engine running at 3,000 r.p.m.

Conclusions from Tests

If the alternator passes its individual test, but it fails on this test it indicates that either the rectifier is faulty or it is not properly earthed.

Connecting the test leads to the centre bolt will eliminate the possibility of faulty earth connection.

Testing the External Wiring Circuit

Using D.C. Voltmeter only

1. All cables, including battery, to be connected as normal.
2. Connect voltmeter Red test lead to earth.

Testing Charging Circuit through Ignition Switch

3. Connect Black test lead to No. 2 terminal on rectifier.
4. Switch ignition to IGN position.
5. Battery volts (i.e., six or twelve should register on voltmeter.
6. If there is a zero reading on voltmeter in the above condition, check circuit back through ignition switch and ammeter, etc., to the battery.

Testing Emergency Start Circuit

7. Connect Red test lead to earth.
8. Connect Black test lead to distributor C.B. terminal.
9. Open ignition contacts.
10. Switch ignition to EMG position.
11. Battery volts should register on the voltmeter.
12. Transfer Black test lead to alternator Green/Yellow lead.
13. Battery volts should register on voltmeter.

Note

These tests are to be carried out in the case of "No Charge" or "No Emergency Start" if previous tests have been carried out and all is in order.

It is important that both the ignition timing and the rotor timing is correct for efficient operation of Emergency Start.

Testing the 'Low,' 'Medium' and 'High' Charge Positions

Using D.C. Voltmeter only

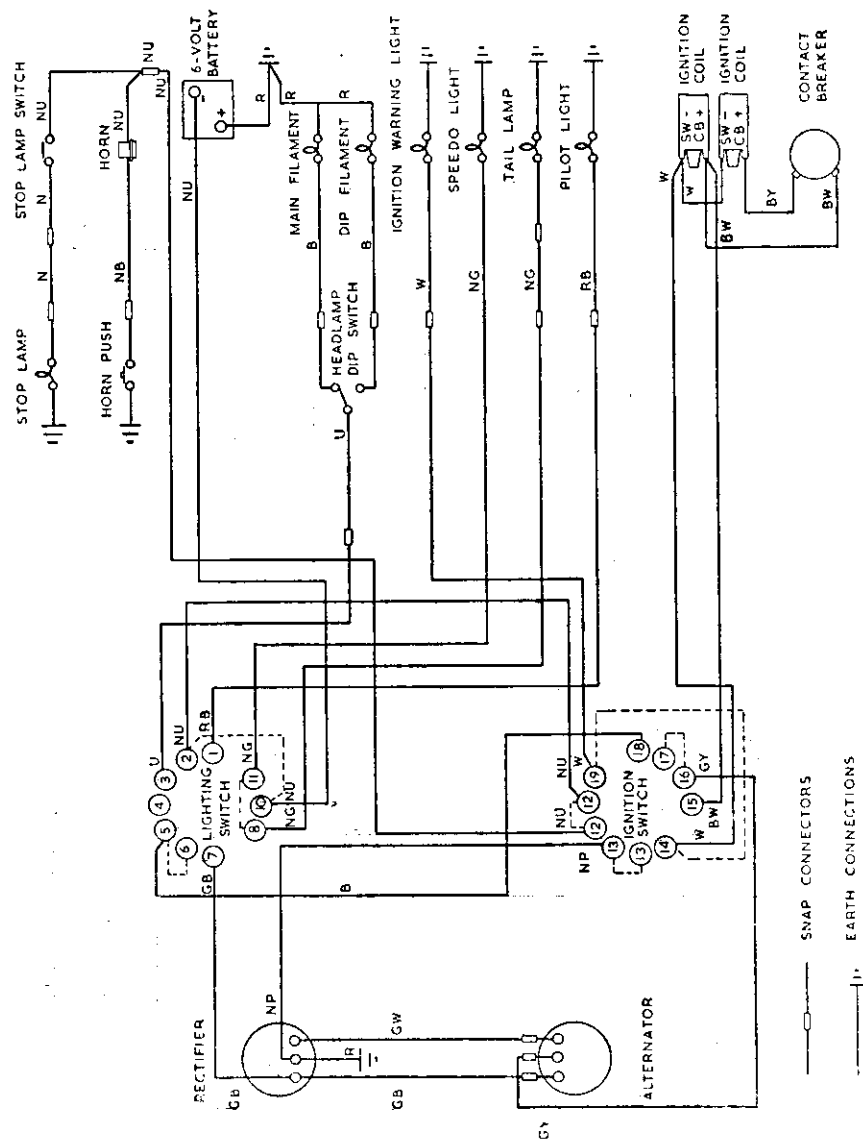
1. Connect Red test lead to earth.
2. The set, including battery, connected as normal with the exception of the alternator Green/Yellow cable which should be disconnected at the snap connector under the saddle.
3. Connect Black test lead to Green/Yellow cable coming from headlamp (i.e., not coming from alternator).
4. With ignition switch in IGN position and lighting switch OFF.
5. A low voltage (i.e., 1—2) should register on voltmeter.
6. With lighting switch in PILOT, zero voltage should register on voltmeter.
7. With lighting switch in HEAD position a low voltage should register on voltage.

Note

Incorrect switching of these cables will cause incorrect charging rates, i.e., failure of Green/Yellow and Green/Black linking together in HEAD position will result in a low charge rate with headlight switched on.

In the case of incorrect switching it is necessary to check the wiring and the switch for correct connections, etc.

Wiring Diagram 6 Volt Model

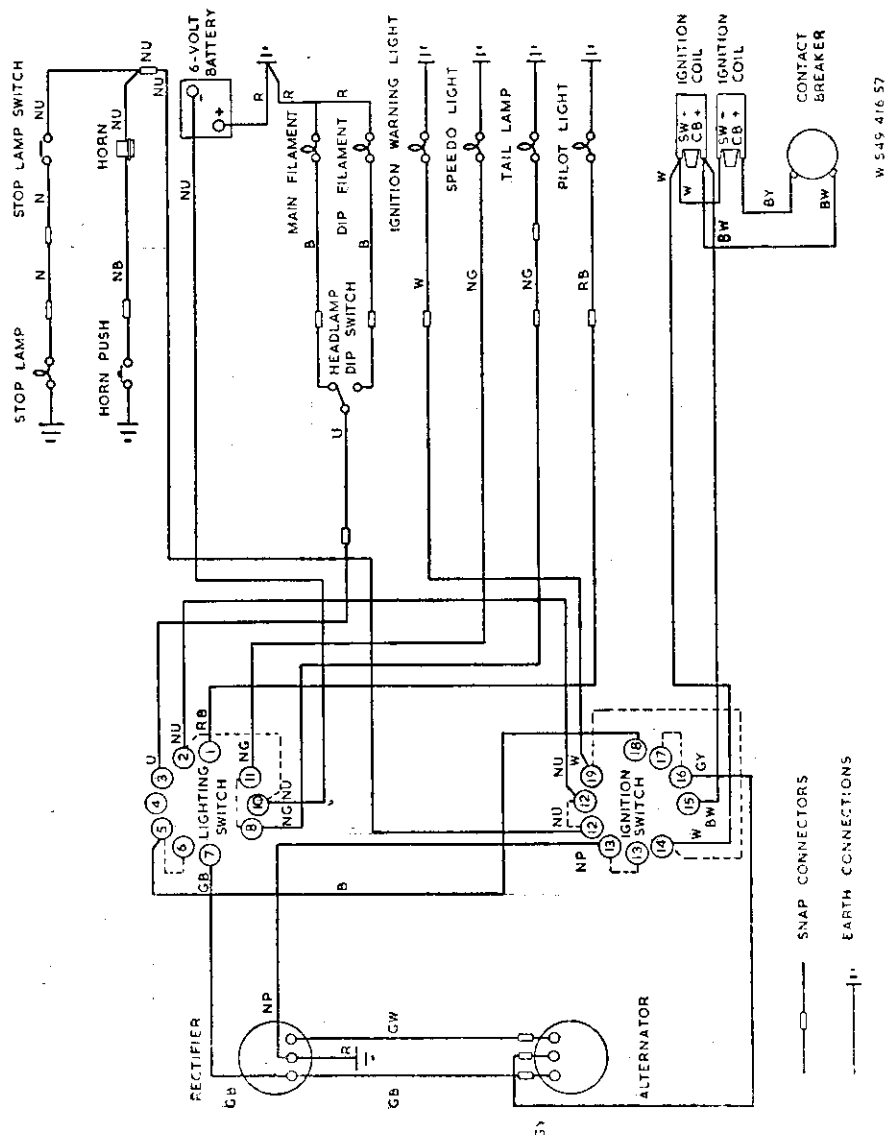


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Colour Code

- | | | | | |
|---------|----------|-----------|-----------|----------|
| R—Red. | N—Brown. | U—Blue. | P—Purple. | L—Light. |
| B—Black | G—Green. | Y—Yellow. | W—White. | D—Dark. |

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