SCOOTER SERVICE SHEET

1005

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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.

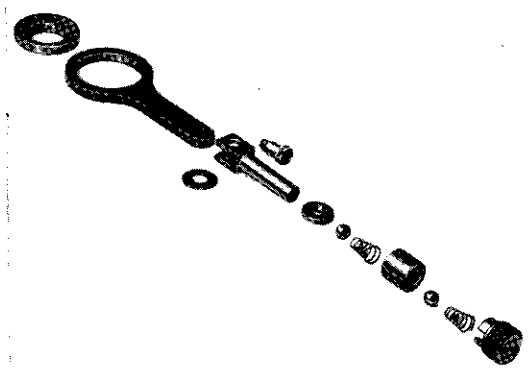

Fig. 14. Oil pump.

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.

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.

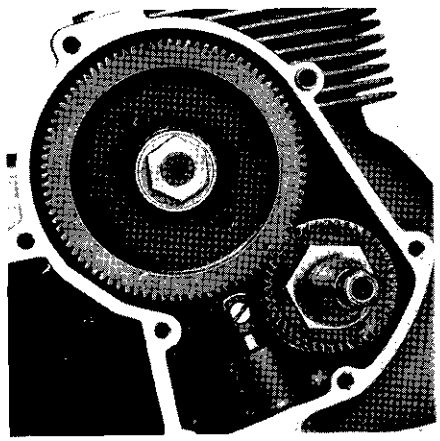

Fig. 15. Timing pinions.

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

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.

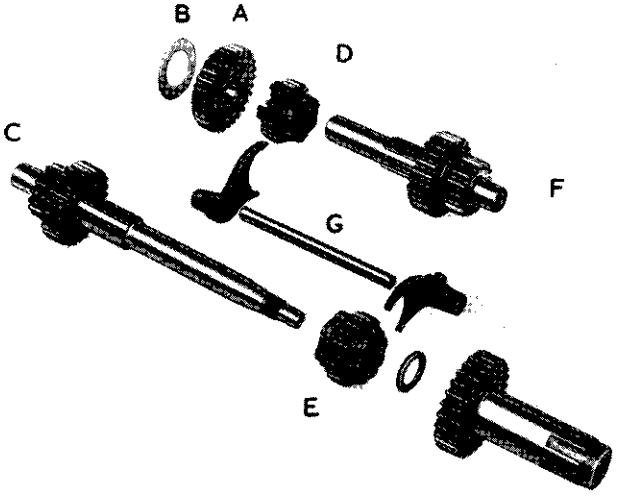

Fig. 16. Gear cluster.

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.

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.

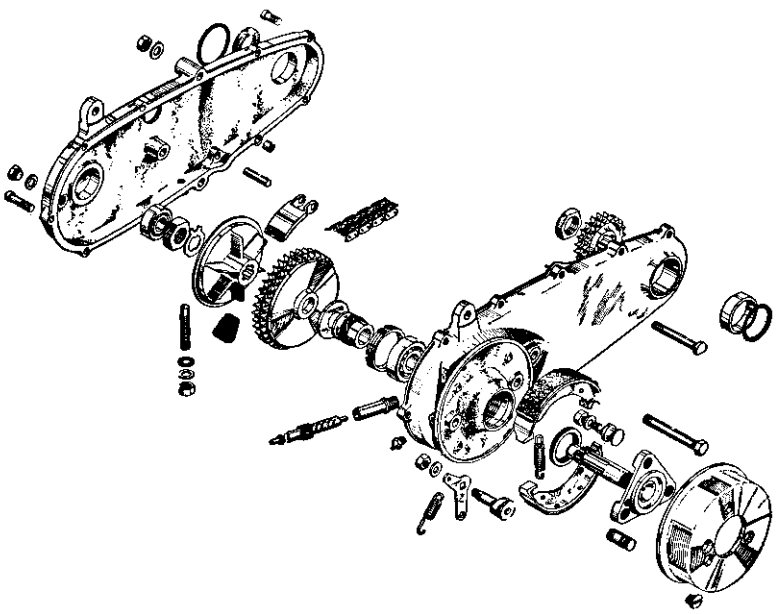

Fig. 17. Rear transmission assembly.

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.

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 or 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 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.

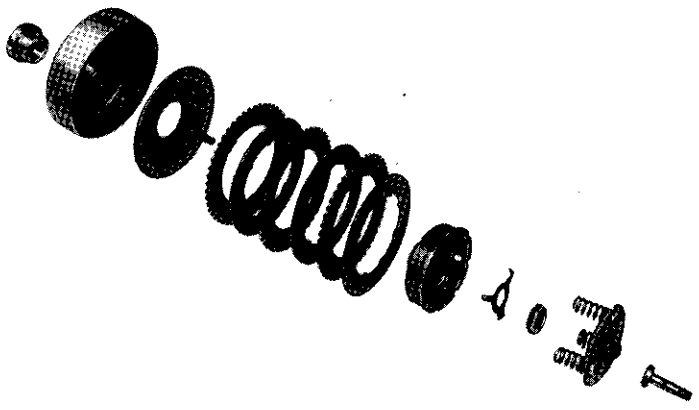

Fig. 18. Clutch assembly.

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.

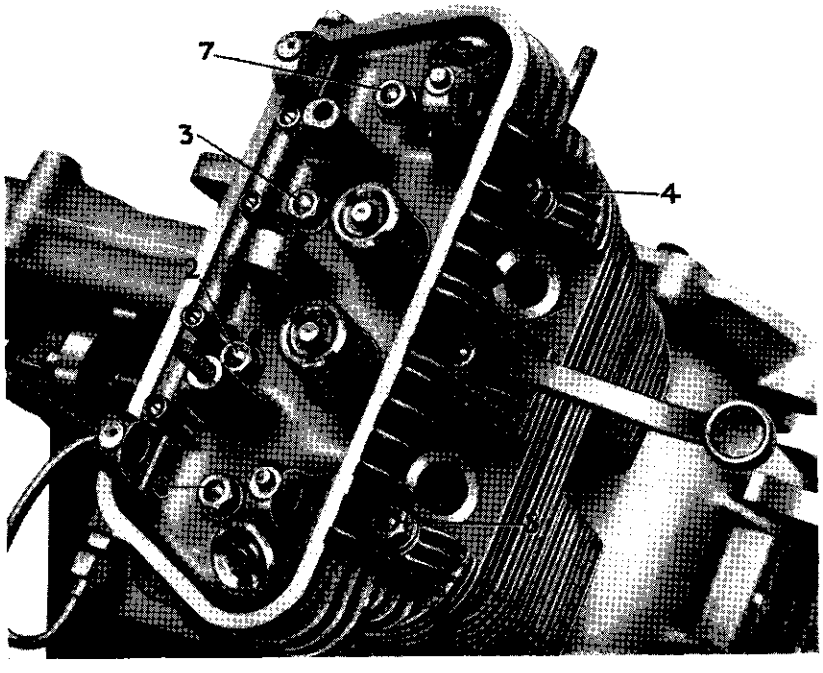

Fig. 19.

With the right hand exhaust valve fully open set the left hand exhaust valve clearance to ·005", 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.

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