

**B.S.A. Service Sheet No. 413 (cont.)**

We do not advise the fitting of over-size rollers to the big end assembly. The whole assembly, comprising crankpin, connecting rod and rollers, should be changed. All these components are carefully matched, working to one ten-thousandth part of an inch, and supplied in complete sets, ready for fitting.

If the bore of the cylinder, when measured at right angles to the gudgeon pin, shows wear to the extent of .010 in. or more, the cylinder should be rebored, and an oversize piston fitted. (Oversize pistons are available in 0.5 mm. (.020 in.) and 1 mm. (.040 in.).

Wear in mainshaft bearings or bushes will be readily apparent, and bearings showing signs of damaged balls, rollers or tracks should be replaced.

Special clearances are specified for mainshaft bearings used on B.S.A. motor cycles, and it is NOT advisable to fit other than genuine B.S.A. replacements.

# **BSA SERVICE SHEET No. 414**

August 1954

**Models C10L and C11G**

## **RE-ASSEMBLING THE ENGINE**

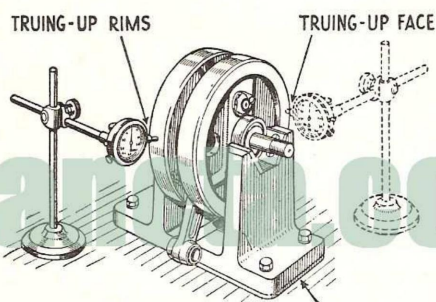
The need for absolute cleanliness cannot be over-emphasized. Parts should be thoroughly cleaned, and all traces of any anti-rust preparation with which new parts may be coated must be removed. All bearings should be smeared with fresh engine oil before re-assembly.

### **Flywheels**

If the big-end assembly is to be renewed it is as well to check the weight of the new components against those which have been removed. A slight variation in weight is inevitable, but if it does not exceed  $1\frac{1}{2}$  ozs. no action need be taken; otherwise the flywheel assembly should be re-balanced. This tolerance should not be exceeded since, when first assembled, the flywheels were carefully balanced to suit the original parts, and the balance may be adversely affected if the weights of the new components differ considerably from those originally fitted.

Fit the flywheels to the crankpin, making sure that the key on the drive side is properly engaged in its keyway, and tighten the crankpin nuts by hand.

In order to tighten the crankpin nuts properly, the whole flywheel assembly must be held rigidly, preferably with the aid of a flywheel bolster. Alternatively, fix two  $\frac{9}{16}$  in. diameter posts rigidly to the bench with their centres  $3\frac{7}{8}$  in. apart. Midway between these posts a hole of 1 in. diameter should be bored to receive the mainshaft. The flywheel assembly can be mounted on these posts so that they pass through the holes bored in the flywheels. Tighten the drive side crankpin nut very firmly, using a tubular extension piece on the spanner, and punch over the edge of the crankpin with a centre punch to lock the nut.



Suitable packing under timing side 'vee' block to compensate for smaller diameter bearing.  
Fig. C38. Checking flywheel alignment.

Now turn the assembly over, so that the gearside flywheel is on top and tighten the crankpin nut lightly. The grub screw in the end of the crankpin must be riveted over or centre-punched to prevent it unscrewing. If it unscrews, serious damage may result to the engine. Check that the side clearance of the connecting rod in the flywheels does not exceed .012 in. and is not less than .010 in.

The flywheels will now be aligned only very approximately and further steps must be taken to ensure that the wheels are as true as possible. Two of the actual (or similar) bearings to be used in the engine should be fitted to the mainshaft and the latter mounted

B.S.A. Service Sheet No. 414 (cont.)

on vee-blocks. The flywheels must be trued up, both on faces and rims, for which purpose a dial micrometer is necessary (Fig. C38), and after the wheels are trued to within at least .005 in., tighten the timing side crankpin nut fully. A mallet or lead hammer applied to the flywheels will provide a sufficiently heavy blow for final truing, and will not harm the flywheels (Fig. C39). The shafts should be finally trued to within .002 in. maximum. The shafts must not be struck.

All parts must be thoroughly clean and free from paraffin, grit or other foreign matter, and all traces of old jointing compound should be removed. If any bushes have been replaced then they must be reamed out to the correct dimensions.

The mainshaft bearing should be reamed with the aid of Service Tool, Part No. 61-1932, as shown in Fig. C40. The reamer holder should be passed through the drive side ballrace before engaging the reamer in the bush, thus ensuring correct alignment. Clear the case of any swarf resulting from the reaming operation and commence re-assembly.

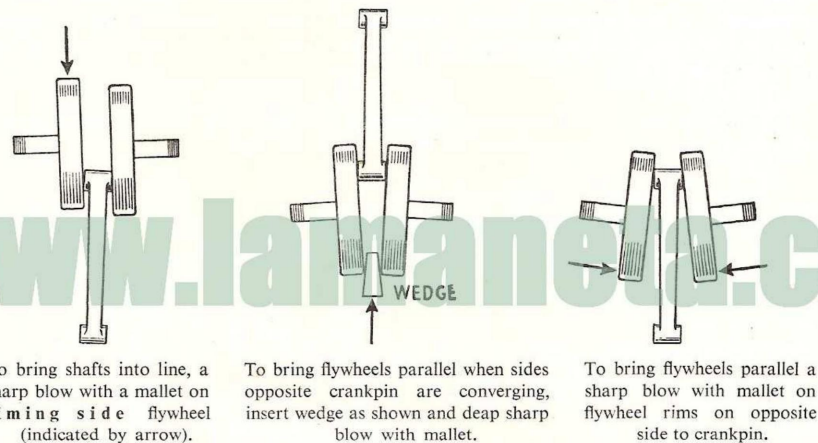


Fig. C39. Method of correcting flywheels out of alignment. Note that above illustrations are exaggerated.

Place the oil flinger washer on the drive side mainshaft and push the flywheel assembly into position in the drive side crankcase half. Thinly coat the mating faces of the crankcase with jointing compound and slide the gear side half into position. The two halves must be perfectly mated and the flywheel assembly must rotate freely when the halves are bolted firmly together.

Replace the oil pump and bolt it into position making sure that the spring washers beneath the bolt heads are not omitted. Slide the pump driving spindle into position and retain it with its pin. Make sure that the blade of the pin is fully engaged in the spindle groove, and if necessary a small washer should be placed over the end of the pin to prevent its moving away from the spindle, but ensure that it does not force the pin too tightly into the groove when the timing cover is replaced.



**B.S.A. Service Sheet No. 414 (cont.)**

Replace the key and push the small timing pinion into position on the mainshaft. Tighten the retaining nut and turn over the lockwasher.

Fit the cam followers, also the tappets in the case of the C10L, then replace the camshaft, ensuring that the mark on the camshaft gear coincides with the marked tooth on the mainshaft pinion. (See Fig. C41.).

Apply clean engine oil to the pinions and cams, then replace the timing cover using a new joint washer. Make sure that the oil seal passes easily over the shaft, or if a new oil seal is to be fitted, it can be pushed into position after the timing cover has been replaced.

Replace the advance and retard mechanism, making sure that, as the taper is engaged, the peg on the advance and retard spindle locates in the groove in the camshaft, then tighten down the retaining bolt.

Finally time the engine as described in Service Sheet No. 404.

Assembly from this point is the same as after decarbonising. Replace the engine in the frame and tighten the engine and gearbox plate stud nuts.

Replace the primary chain case as indicated in Service Sheet No. 409. Make sure that the ported mainshaft sleeve which passes through the drive side oil seal is correctly positioned with the ports nearest the flywheel. It is immaterial which of the mainshaft grooves engages with the peg on the inside of the sleeve.

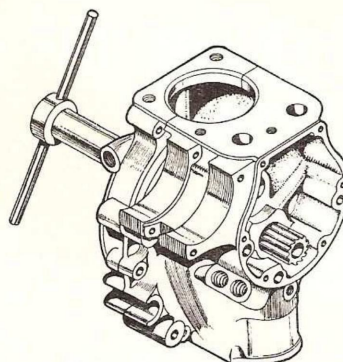


Fig. C40. Main Bearing Reamer.

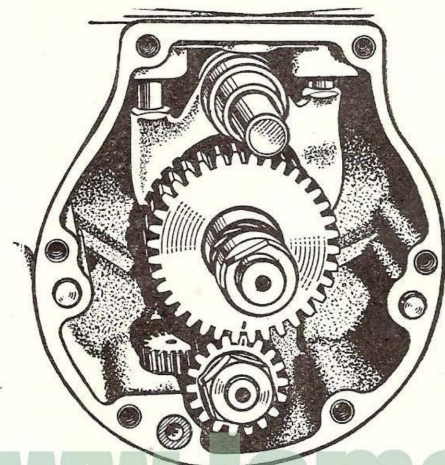


Fig. C41. Timing Gear Marks.



# BSA SERVICE SHEET No. 415

September, 1954  
Reprinted March, 1955  
Revised December, 1957

## Models C10L and C11G

### USEFUL DATA

|                                                       | C10L                | C11G & C12          |
|-------------------------------------------------------|---------------------|---------------------|
| Cylinder bore (mm.) ... ..                            | 63                  | 63                  |
| Engine stroke (mm.) ... ..                            | 80                  | 80                  |
| Engine capacity (c.c.) ... ..                         | 249                 | 249                 |
| Standard compression ratios ... ..                    | 5-1                 | 6.5-1               |
| 1954 Camshaft, Part No. ... ..                        | 29-1993             | 29-2025             |
| Tappet clearance, Inlet ... ..                        | .004 in.            | .003 in.            |
| Exhaust ... ..                                        | .006 in.            | .003 in.            |
| Valve timing, Inlet opens before T.D.C. ... ..        | 25°                 | 25°                 |
| Inlet closes after B.D.C. ... ..                      | 70°                 | 70°                 |
| Exhaust opens before B.D.C. ... ..                    | 70°                 | 70°                 |
| Exhaust closes after T.D.C. ... ..                    | 25°                 | 25°                 |
| 1955-56 Camshaft, Part No. ... ..                     | 29-2075             | 29-2076             |
| Tappet clearance, Inlet ... ..                        | .012 in.            | .010 in.            |
| Exhaust ... ..                                        | .015 in.            | .012 in.            |
| Valve timing, Inlet opens before T.D.C. ... ..        | 29°                 | 29°                 |
| Inlet closes after B.D.C. ... ..                      | 84°                 | 84°                 |
| Exhaust opens before B.D.C. ... ..                    | 80°                 | 80°                 |
| Exhaust closes after T.D.C. ... ..                    | 28°                 | 28°                 |
| Piston ring gap, Compression ... ..                   | .010 in.            | .010 in.            |
| Oil control ... ..                                    | .010 in.            | .010 in.            |
| Piston ring side clearance ... ..                     | .002 in.            | .002 in.            |
| Piston clearance at base of skirt ... ..              | .0045/.0065 in.     | .0035/.0055 in.     |
| Contact breaker gap ... ..                            | .015 in.            | .015 in.            |
| Ignition setting, Fully advanced before T.D.C. ... .. | $\frac{5}{32}$ in.  | $\frac{1}{4}$ in.   |
| Fully retarded before T.D.C. ... ..                   | $\frac{1}{16}$ in.  | T.D.C.              |
| Plug type, Champion ... ..                            | N8B                 | L10S                |
| Plug gap ... ..                                       | .018/.020 in.       | .018/.020 in.       |
| Carburetter, Standard type ... ..                     | 274BT/3EG           | 274BU/1EH           |
| Choke size ... ..                                     | $\frac{3}{32}$ in.  | $\frac{3}{32}$ in.  |
| Throttle slide ... ..                                 | 4/4                 | 4/4                 |
| Needle position ... ..                                | 2                   | 3                   |
| Needle jet ... ..                                     | .1055               | .1065               |
| Main jet ... ..                                       | 90                  | 80                  |
| Carburetter, Monobloc type ... ..                     | 375/2               | 375/4               |
| Choke size ... ..                                     | $\frac{3}{32}$ in.  | $\frac{3}{32}$ in.  |
| Throttle slide ... ..                                 | 375/3 $\frac{1}{2}$ | 375/3 $\frac{1}{2}$ |
| Needle position ... ..                                | 2                   | 3                   |
| Needle jet ... ..                                     | .1055               | .1055               |
| Main jet, without air cleaner ... ..                  | 120                 | 140                 |
| Main jet, with air cleaner ... ..                     | 85                  | 100                 |

B.S.A. Service Sheet No. 415 (contd.)

|                                                 | C10L              | C11G & C12                 |
|-------------------------------------------------|-------------------|----------------------------|
| Petrol tank capacity (galls.) ... ..            | 2½                | 2½                         |
| Oil tank capacity (pints) ... ..                | 4                 | 4                          |
| Gearbox capacity (pints) 1954-55 ... ..         | ½ (3 speed)       | ½ (3 speed)<br>1 (4 speed) |
| Standard gear ratios 4th ... ..                 | —                 | 6.2                        |
| 3rd ... ..                                      | 6.6               | 6.2 7.6                    |
| 2nd ... ..                                      | 9.8               | 9.25 11.1                  |
| 1st ... ..                                      | 14.5              | 14.1 16.15                 |
| Gearbox capacity (pints) 1956 4 speed ... ..    | ½                 | ½                          |
| Standard gear ratios, 4th ... ..                | 6.6               | 6.26                       |
| 3rd ... ..                                      | 8.0               | 7.64                       |
| 2nd ... ..                                      | 11.7              | 11.1                       |
| 1st ... ..                                      | 17.1              | 16.15                      |
| Engine sprocket ... ..                          | 16T               | 17T                        |
| Clutch sprocket ... ..                          | 43T               | 43T                        |
| Gearbox sprocket ... ..                         | 19T               | 17T (C12 19T)              |
| Rear wheel sprocket ... ..                      | 47T               | 42T (C12 47T)              |
| Primary chain size ... ..                       | ½ × .305 in.      | ½ × .305 in.               |
| No. of links ... ..                             | 69                | 69 (C12 70)                |
| Rear chain size ... ..                          | ½ × .205 in.      | ½ × .305 in.               |
| No. of links, Rigid frame 1954-55 ... ..        | —                 | 104                        |
| No. of links, Spring frame 1954-55 ... ..       | 110               | 107                        |
| No. of links, Spring frame 1956 ... ..          | 111               | 115                        |
| Front fork movement, 1954-55 ... ..             | 3¾ in.            | 6 in.                      |
| Front fork movement, 1956 ... ..                | 6 in.             | 6 in.                      |
| Rear suspension movement ... ..                 | 2 in.             | 2 in. (C12 2¾ in.)         |
| Front fork capacity (engine oil) 1954-55 ... .. | Grease            | ¼ pint (142 c.c.)          |
| Front fork capacity (engine oil) 1956 ... ..    | ¼ pint (142 c.c.) | ¼ pint (142 c.c.)          |
| Front brake size, 1954 ... ..                   | 5½ × 1 in.        | 5½ × 1 in.                 |
| Front brake size, 1955-56 ... ..                | 5½ × 1 in.        | 7 × 1½ in.                 |
| Rear brake size ... ..                          | 5 × ¾ in.         | 5½ × 1 in.                 |
| Rim sizes ... ..                                | WM1 × 19          | WM1 × 19                   |
| Standard tyre sizes ... ..                      | 2.75 × 19         | 3.00 × 19                  |
| Tyre pressures, p.s.i. Front ... ..             | 18                | 18                         |
| Rear ... ..                                     | 27                | 26                         |
| Wheelbase ... ..                                | 52½ in.           | 53½ in. (C12 54 in.)       |
| Ground clearance ... ..                         | 5 in.             | 4½ in. (C12 4 in.)         |
| Saddle height ... ..                            | 29½ in.           | 29½ in.                    |
| Dry weight (Rigid frame) 1954 ... ..            | —                 | 301 lbs.                   |
| (Spring frame) 1954 ... ..                      | 256 lbs.          | 316 lbs.                   |
| (Spring frame) 1955 ... ..                      | 256 lbs.          | 304 lbs.                   |
| (Spring frame) 1956 ... ..                      | 260 lbs.          | 312 lbs.                   |

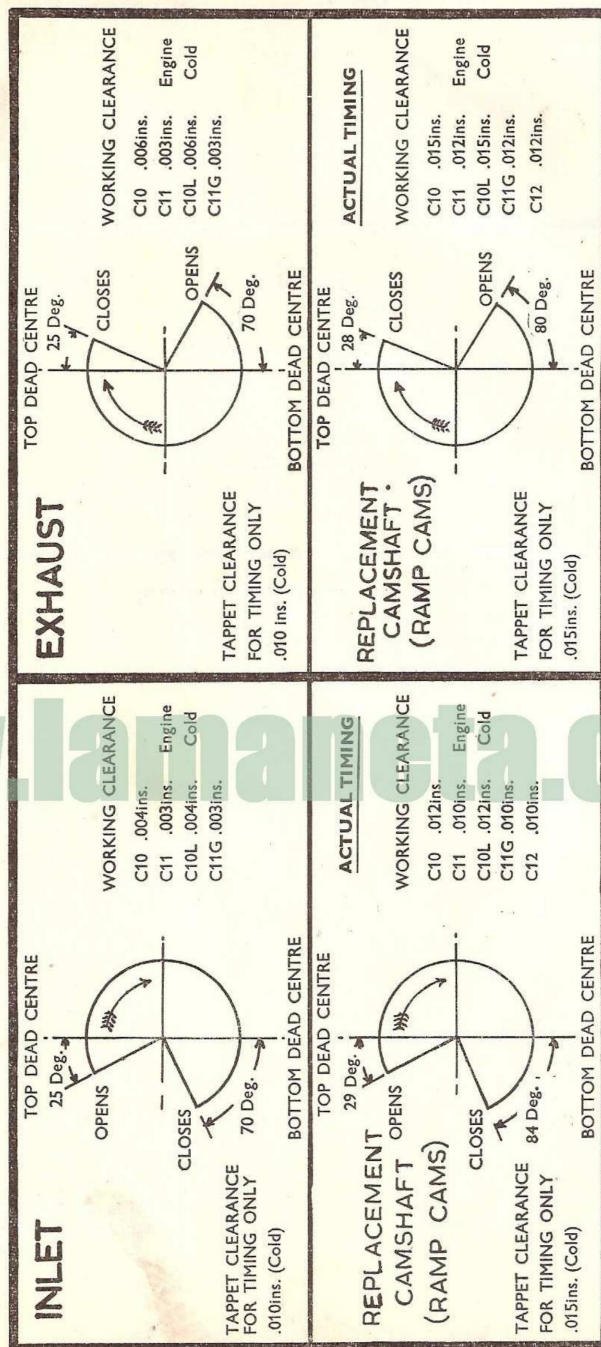
B.S.A. MOTOR CYCLES LTD.,  
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# BSA SERVICE SHEET No. 415A

July, 1955  
Revised Nov. 1957

Fig. 1. 'C' GROUP MODELS VALVE TIMING CHART



NOTE: Ramp type camshafts bear the following part numbers:—  
C.10—29-2078; C.11—29-2079; C.10L—29-2075; C.11G—29-2076, and can be used to replace the original camshafts in early models.

They are fitted as standard on and after Engine numbers:—

BC.10L—3562 and BC.11G—10438.

When ramp cams are fitted, the inlet valve clearance must be checked or adjusted when the exhaust valve is about to open. The exhaust valve clearance must be checked or adjusted when the inlet valve has just closed.



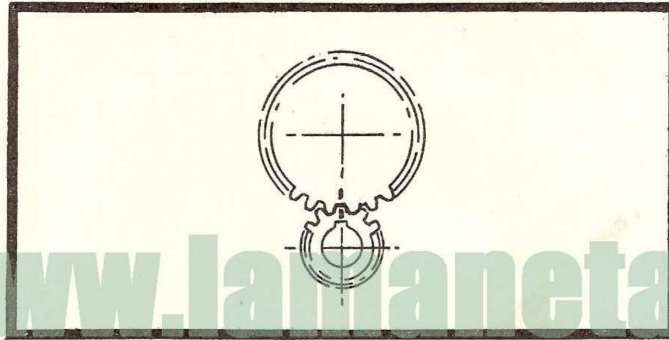


Fig. 2. VALVE TIMING MARKS

# BSA SERVICE SHEET No. 514

This sheet supersedes No. 814  
Reprinted Jan. 1958

## "D" and "C" Group Models PLUNGER TYPE REAR SUSPENSION

### DISMANTLING.

First remove the rear wheel, see Service Sheet No. 410 for "C" Group Models and No. 508 for "D" Group Models. "C" Group Part Nos. are shown in brackets where they differ from "D" Group Part Numbers.

Disconnect the rear mudguard stays, and take out the pinch bolts at the top and bottom of the rear suspension columns. The centre column, Part No. 90-4117, Fig. D27, can now be driven out using a soft drift so as to avoid damage to the end of the column.

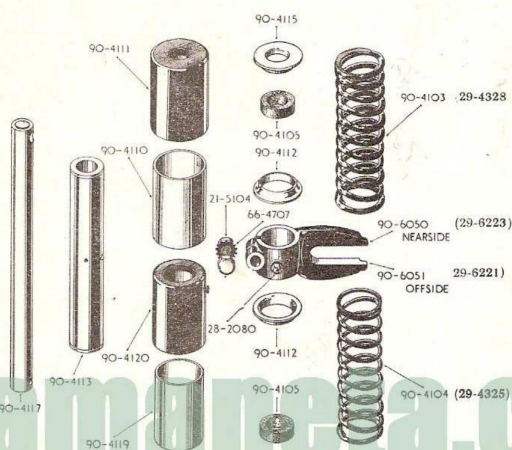


Fig. D27.

Grip the upper and lower shrouds firmly with both hands, compress the springs and lift out the suspension assembly.

Remove the shroud and springs from the sliding member, Part No. 90-4113. Carefully note the position of the steel washers and rubber bushes for subsequent assembly.

The bushes in the sliding member can now be examined for wear. If they require renewal, the tube complete with bushes must be replaced.

Unscrew the pinch bolt locknut, Part No. 90-4119, and take out the bolt. Insert a screwdriver into the slot, in the fork end 90-6051 (29-6221), the tube can then be withdrawn.

When replacing the tube ensure that the hole in the side of the tube lines up with the grease nipple in the fork end.

Note that the nearside fork end carries an anchor lug for the brake cover plate. On "C" Group Models the head of the right hand fork end clamping bolt is employed to secure the brake cover plate.

#### REASSEMBLY.

Replace the shroud and springs on the sliding member in the reverse order to that of dismantling.

Take up the assembly and place the lower shroud in the frame lug. Press down on the upper shroud to compress the springs, and slide the assembly between the lugs (Fig. D28).

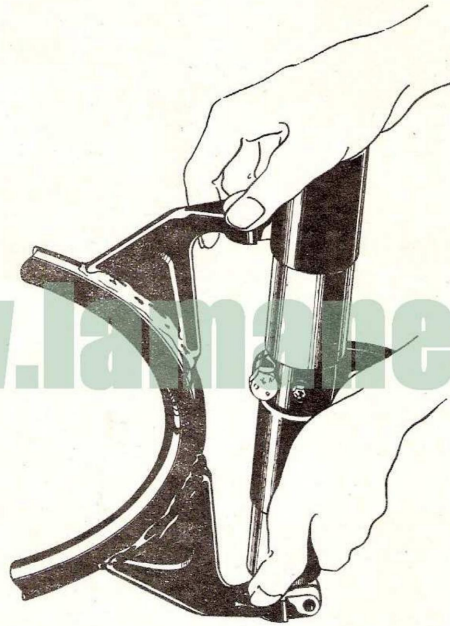


Fig. D28.

Use the Champher on the lower end of the centre column to locate the assembly correctly in the frame top and bottom lugs. Insert the column from the top, ensuring that the slots are in line with the pinch bolt hole.

Replace the pinch bolts mudguard stays and rear wheel, couple up the brake and adjust.

Finally check over all nuts and bolts for tightness.



# BSA SERVICE SHEET No. 603

## "B" "C" and "M" Group Models

October, 1948  
Reprinted July, 1957

### THE LUBRICATION SYSTEM

The engine lubrication system is of the dry sump type operated by a double gear pump, situated in the bottom of the crankcase on the right-hand side. The only external oilways are the supply and return pipes to the tank and the rocker feed and drainage pipes on the B Group. The oil drawn from the oil tank to the supply side of the pump first passes through a close mesh filter. This filter is not fitted to M Group machines as a felt filter is incorporated in the oil return pipe.

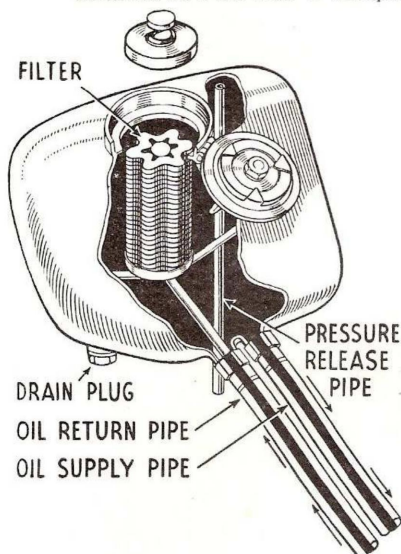
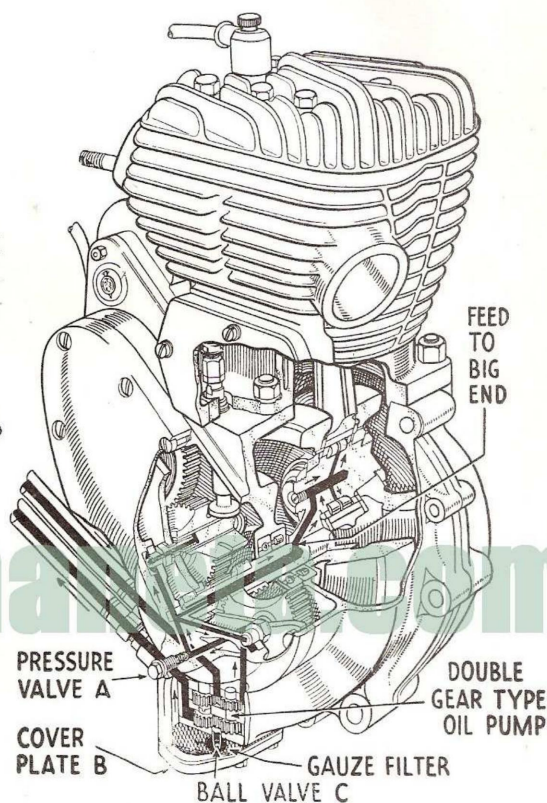


Fig. M3. The Lubrication System  
Models M20 and M21

From the supply side of the pump the oil passes through a ball valve A, and is then transferred to the hollow drive side mainshaft to supply the big end roller bearing. On B and M Models the transfer is made via a nozzle fitted in the timing cover which projects into the end of the drilled mainshaft and additional oilways in the timing cover provide positive lubrication to the cam pinion spindles. In the case of the C Group models, the oil passes through a hole in the main bearing bush, round an annular groove in the journal and thence via a radial drilling to the hollow centre of the shaft. (See Fig. M4.). On C10L and C11G Models a fine bleed hole from the main bearing meters a supply of oil to the camshaft and cam followers.



B.S.A. Service Sheet No. 603 (continued)

After lubricating the big-end and circulating throughout the engine in the form of oil mist, the oil drains down, through a filter to the bottom of the crankcase from which it is drawn by the return pump past ball valve *C* and delivered up the return pipe to the tank.

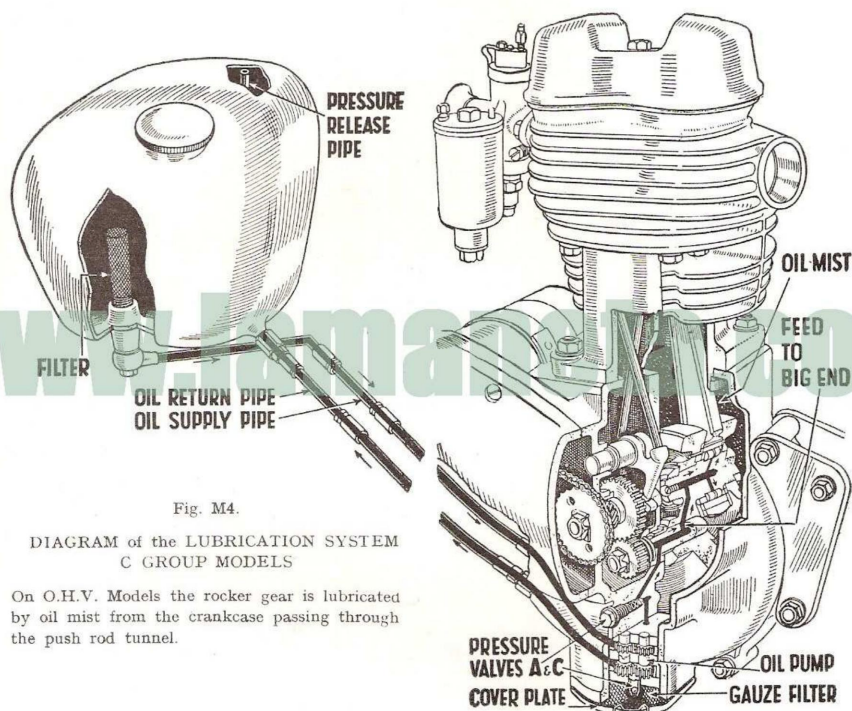


Fig. M4.

DIAGRAM of the LUBRICATION SYSTEM  
C GROUP MODELS

On O.H.V. Models the rocker gear is lubricated by oil mist from the crankcase passing through the push rod tunnel.

On "B" group machines oil is fed through a union situated in the pipe between the return pump and the tank, to the rocker spindles, and after lubricating the rockers and enclosed valves, is returned to the crankcase through an external oil pipe attached to the base of the inlet valve spring housing (see Fig. M5). An internal oilway connects the two valve spring wells.

Incorrect seating of the ball valve *A* will allow oil to transfer from the tank to the engine, whilst the machine is stationary. In this event, unscrew the plug over the valve, and remove spring and ball. Clean the ball and its seating and replace. If the ball valve *C* should get stuck in its seating, there will be no return of oil to the tank. To correct, remove the cover plate below the pump and insert a piece of wire into the valve orifice, and lift the ball off its seating to free it. To check the flow of oil in the lubricating system, remove the tank filler cap whilst the engine is running. Oil should be seen issuing from the return pipe from the crankcase. The tank and crankcase should be drained periodically, and replenished with clean oil (see Periodical Maintenance).



B.S.A. Service Sheet No. 603 (continued)

Any restriction in the pressure release pipe in the tank will cause an increase in pressure inside the oil tank, and will result in leakage of oil at the filler cap. This can be put right by inserting a length of flexible wire into the pipe at its lower end (just in front of the rear mudguard) and pushing the wire right up the pipe, thus clearing obstruction.

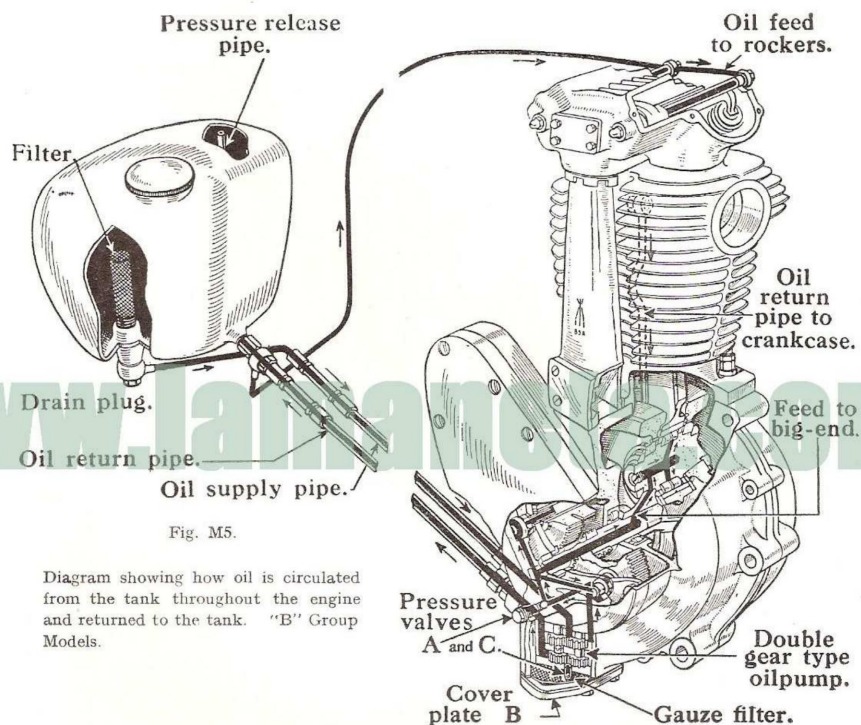


Fig. M5.

Diagram showing how oil is circulated from the tank throughout the engine and returned to the tank. "B" Group Models.

To remove the "B" and "C" Group oil tank filter for cleaning, remove the oil pipe banjo union plug at the bottom of the tank. The filter will come out with the plug.

On models with the Swinging Arm type frame the oil tank is of slightly different construction but the system is the same. The oil tank filter is attached to the large hexagon nut in the outside of the tank and its removal does not entail interfering with the oil pipes.

To remove the "M" Group filter for cleaning, release the tank filler cap, release the filter cap thus exposed, and lift the filter out. In all cases the filter should be placed in a can large enough to cover it with petrol, and thoroughly washed. Before replacing make sure that it is quite dry of petrol.

The pump filter can be withdrawn after removing the cover plate B and should be thoroughly washed with petrol, dried and replaced.

On no account try to remove the oil pump unless it requires attention. (See Service Sheet on Complete Dismantling of Engine.)



## B.S.A. Service Sheet No. 603 (continued)

### THE CRANKCASE BREATHER VALVE.

The Crankcase Air Release Valve is of similar construction on all models although its position in the crankcase is dependant on the model and the year of manufacture.

On all "C" Group models the breather is situated on the left-hand side of the crankcase behind the primary chaincase. 1946 and 1947 "B" and "M" machines have the breather positioned at the rear of the drive side bearing boss. Later "B" and "M" Group models have the breather positioned in the lower edge of the timing chest cover.

In each case, its purpose is to allow free release of air from the crankcase as the piston descends, and to prevent air being drawn back into the crankcase as the piston ascends. A crankcase breather valve which is faulty, or partially blocked, will result in oil leakage from the engine.

Before the breather valve can be withdrawn the air release pipe must be removed by unscrewing the union nut. The complete breather valve can then be unscrewed from the crankcase. To dismantle the breather, undo the large hexagon on the outer end of the valve, the valve retaining collar can then be unscrewed with the aid of a large screwdriver thus allowing the fibre disc valve to fall free. Before reassembling, wash the components thoroughly in petrol to free them from any oil residue that may cause the valve to stick.

Before replacing the breather valve on "C" Group models the movement of the disc valve should be checked to ensure that it does not exceed .010in. If excessive clearance is found and the disc valve is undamaged the face of the retaining collar should be ground so as to reduce the depth of the recess in which the disc valve lies. Take care not to grind too much away so that the disc valve has no clearance.

If the breather valve is fitted into the timing case cover, ensure that it is positioned so that the hole drilled in the side of the pipe inside the cover is facing towards the cover and slightly towards the rear. Failure to observe this precaution may result in excessive oil loss. Correct positioning of the hole may be effected by varying the thickness of the fibre washer fitted between the air release valve and the timing case cover.

### MODELS C10L and C11G.

Instead of the pressure operated clack valve, a mechanically timed breather is employed. This takes the form of a hollow drive-side engine Mainshaft with a radial drilling which, at the appropriate piston position, is brought in line with a drilled port in the crankcase thus allowing the gases to exhaust freely to the atmosphere. The engine sprocket distance sleeve, which fits over the portion of the mainshaft with the radial drilling, has six transfer ports so that it is immaterial which of the six spline-grooves locates the internal peg of the sleeve.

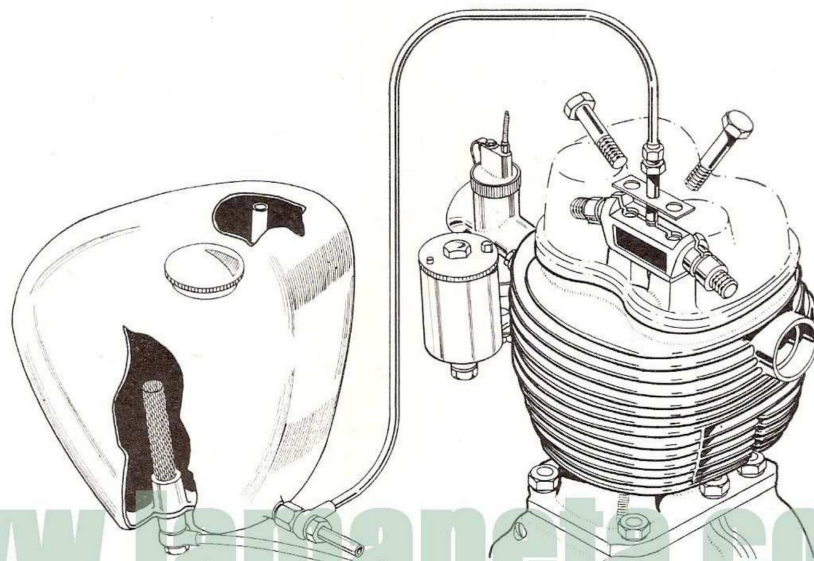
This type of breather is completely automatic and requires no adjustment or other maintenance whatsoever.

### MODEL C12, 1956.

The Model C12 engine is identical with the C11G model. However, the lubrication system has been modified to provide positive lubrication to the valve rocker gear. The take off is from the oil tank return pipe, as on the "B" group plunger models and the oil is fed through a rocker feed pipe to the rocker cover securing bolt which is drilled to allow the oil to pass to the trunnion. This trunnion incorporates oil grooves direct to each rocker fulcrum. After lubricating, the oil drains to the sump down the push rod tunnel, providing extra lubrication for the cams and cam followers in the process.

This modification can be adopted on the C11 and C11G engines at very low cost. The parts required are listed overleaf, and they can be obtained through your dealer.

B.S.A. Service Sheet No. 603 (*continued*)



Rocker Gear Lubrication C12 (1956)

Parts required for conversion of C11 and C11G engines.

| Part No. | Description.         |
|----------|----------------------|
| 29-2086  | Rocker Oil Feed Pipe |
| 29-2091  | Rocker Trunnion      |
| 29-2092  | Bolt                 |
| 45-2454  | Locking Plate        |
| 65-8420  | Connection           |
| 65-8421  | Washer               |
| 65-8424  | Nut                  |

# **BSA SERVICE SHEET No. 612**

June 1954  
Reprinted January 1958

**All Models**

## **BRAKE RELINING**

### **Brake Shoe Removal and Replacement**

After the brake plate has been removed from the wheel, the brake cam lever A (Fig. M40) should be detached and the cam spindle B pushed in slightly to allow the shoes to clear the brake plate. Insert a screwdriver between the brake shoes at the fulcrum pin C and twist the screwdriver.

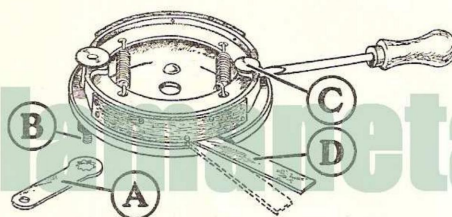


Fig. M40. Removing the Brake Shoes

Place a small lever D between one of the shoes and the cover plate and lever the shoe away from the cover plate until the spring pressure is released. Both shoes can then be lifted from the brake plate.

The shoes can be replaced by the reverse procedure. Hook the springs on to the shoes and place the ends of the shoes in position on the fulcrum pin and cam lever. Then push the shoes outwards until the springs pull them into their correct position.

**NOTE:** The brake shoe springs are quite strong and care should be taken that the fingers are not trapped by the brake shoes during these operations.

### **Brake Shoe Relining**

With the shoes removed the linings can best be removed by drilling away the heads of the rivets and punching the shanks out to the inside of the shoe with a suitable drift.

New linings are die pressed to suit the curvature of the shoes, but will require drilling and counter-boring for the rivets. Position the lining and hold it in place at one end by means of clamps. Using the holes in the shoes as guides, drill holes of the correct size for the rivets adjacent to the clamp. Turn the shoe over, and counterbore the holes just drilled sufficiently deep so that the rivet heads will stand below the lining surface; this is important, since the rivets will otherwise score the brake drum.



**B.S.A. Service Sheet No. 612 (continued)**

Insert the rivets into the holes and rivet them over on the inside of the shoe. This is easily accomplished by holding in a vice a short length of rod, whose diameter is equal to that of the rivet head, and using it as an anvil upon which to rest the rivet head while hammering the shank over. (See Fig. M41.) This will also make sure that the rivets do not stand proud of the lining.

Move the clamps to the next pair of holes, taking care that the lining is kept in firm contact with the shoe the whole time, and repeat the above procedure. When the lining is finally riveted down, bevel off the ends of the linings and file off any local high spots.

Precautions to be observed when fitting the relined shoes to the hubs are given in the Service Sheet on Hubs and Brakes.

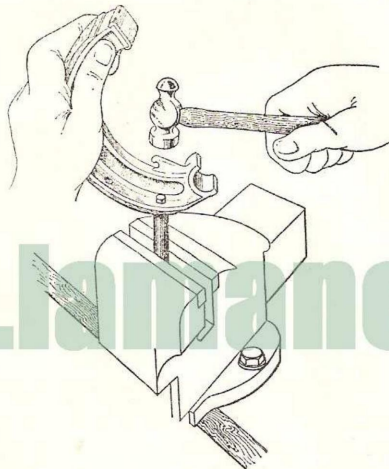


Fig. M41. Riveting the Linings

# BSA SERVICE SHEET No. 704

Revised and Reprinted October, 1949  
Reprinted Oct., 1957

## All Models

### PISTON CLEARANCES

To avoid the possibility of seizure or piston tap, pistons must be fitted with adequate but not excessive clearance.

The following are the recommended total clearances between the bottom of the piston and the cylinder wall.

|                    |              | MODEL | Tolerances     |
|--------------------|--------------|-------|----------------|
| D1                 | .. ..        | .. .. | .0027"/.0045"  |
| D3                 | .. ..        | .. .. | .0025"/.004"   |
| C10, C10L          | .. ..        | .. .. | .0045"/.0065"  |
| C11, C11G, C12     | .. ..        | .. .. | .0035"/.0055"  |
| B31                | .. ..        | .. .. | .004"/.0055"   |
| B31 (Split skirt)  | .. ..        | .. .. | .0005"/.0016"  |
| B32A               | .. ..        | .. .. | .002"/.004"    |
| BB32. Gold Star    | 8 : 1        | .. .. | .003"/.0045"   |
|                    | 6.5 : 1      | .. .. | .004"/.0055"   |
|                    | 7.5 : 1      | .. .. | .002"/.004"    |
|                    | 9 : 1        | .. .. | .003"/.0045"   |
| CB32. Gold Star    | 6.5 : 1      | .. .. | .002"/.004"    |
|                    | 8 : 1        | .. .. | .003"/.0045"   |
|                    | 8.5 : 1      | .. .. | .003"/.0045"   |
|                    | 9 : 1        | .. .. | .003"/.0045"   |
|                    | 12.25 : 1    | .. .. | .004"/.0055"   |
| DB32. Gold Star    | 13 : 1       | .. .. | .004"/.0055"   |
|                    | 7.25 : 1     | .. .. | .0025"/.004"   |
|                    | 8 : 1        | .. .. | .003"/.0045"   |
|                    | 9 : 1        | .. .. | .003"/.0045"   |
| B33                | .. ..        | .. .. | .0045"/.0065"  |
| B33. (Split skirt) | .. ..        | .. .. | .0006"/.00275" |
| B34A               | .. ..        | .. .. | .0045"/.0065"  |
| BB34. Gold Star    | 7.5 : 1 Std. | .. .. | .0045"/.0065"  |
|                    | 8 : 1        | .. .. | .0025"/.0045"  |
|                    | 9 : 1        | .. .. | .0025"/.0045"  |
|                    | 6.8 : 1      | .. .. | .0045"/.0065"  |
|                    | 11 : 1       | .. .. | .0025"/.0045"  |
| CB34. Gold Star    | 7.25 : 1     | .. .. | .003"/.0045"   |
|                    | 8 : 1        | .. .. | .003"/.0045"   |
|                    | 9 : 1        | .. .. | .003"/.0045"   |
| DB34. Gold Star    | 8 : 1        | .. .. | .003"/.0045"   |
|                    | 8.75 : 1     | .. .. | .003"/.0045"   |
| M20                | .. ..        | .. .. | .004"/.006"    |
| M21                | .. ..        | .. .. | .004"/.006"    |
| M33                | .. ..        | .. .. | .0045"/.0065"  |
| M33. (Split skirt) | .. ..        | .. .. | .0006"/.00275" |

B.S.A. Service Sheet No. 704 (continued)

|                                    |         |                               |    |    |    |    |    |    |               |
|------------------------------------|---------|-------------------------------|----|----|----|----|----|----|---------------|
| A7                                 | .. .. . | 6.7 : 1                       | .. | .. | .. | .. | .. | .. | .002"/.004"   |
| (Split skirt)                      | ..      | 6.7 : 1                       | .. | .. | .. | .. | .. | .. | .0011"/.0031" |
|                                    |         | 7.25 : 1                      | .. | .. | .. | .. | .. | .. | .002"/.004"   |
| (Split skirt)                      | ..      | 7.25 : 1                      | .. | .. | .. | .. | .. | .. | .0011"/.0031" |
| A7 (Star Twin)                     | ..      | .. .. .                       | .. | .. | .. | .. | .. | .. | .002"/.004"   |
| A7 (Split skirt)                   | ..      | (Star Twin and Shooting Star) | .. | .. | .. | .. | .. | .. | .0011"/.0031" |
| A10 (Golden Flash)                 | ..      | 6.5 : 1                       | .. | .. | .. | .. | .. | .. | .003"/.0045"  |
| (Split skirt)                      | ..      | 6.5 : 1                       | .. | .. | .. | .. | .. | .. | .0025"/.0045" |
| (Split skirt)                      | ..      | 7.25 : 1                      | .. | .. | .. | .. | .. | .. | .0025"/.0045" |
| A10 (Super Flash and Road Rocket). | ..      | 8 : 1                         | .. | .. | .. | .. | .. | .. | .003"/.0045"  |
| Dandy 70                           |         | 7.25 : 1                      | .. | .. | .. | .. | .. | .. | .003"/.0048"  |



# **BSA SERVICE SHEET No. 705**

## **All Models**

*October, 1948  
Reprinted Jan. 1958*

### **PERIODICAL ATTENTIONS.**

#### **HUBS.**

**Every 1,000 miles.**

Inject grease through the nipples located in the centres of the hubs. Do not overdo this, otherwise grease will penetrate to the brake linings and cause ineffective brakes. Three or four strokes of the gun should be ample. Where no grease nipple is provided the bearings should be removed and packed with grease when the machine is in need of complete overhaul.

#### **BRAKE CAM SPINDLES.**

Grease sparingly. Two or three strokes of the gun only, or if no grease nipple is provided, apply a few drops of engine oil between the brake arm and the spindle.

#### **SPEEDOMETER DRIVE.**

Grease well. Three or four strokes of the gun regularly.

#### **ENGINE OIL.**

**Every 2,000 miles (except 2-stroke models).**

The oil tank and sump should be drained (preferably when the engine is warm after a longish run), and the tank refilled with fresh oil.

In case of new or re-conditioned engines, the oil should be drained and renewed after the first 250 miles, and again after 1,000 miles.

#### **REAR CHAIN.**

Remove the rear chain, clean thoroughly in paraffin, and soak in engine oil or molten grease and graphite.

#### **CONTACT BREAKER (except A and C Group Models).**

A very small quantity of thin oil should be injected into the lubrication wick, and the face cam smeared with oil. The wick is accessible after removing the spring contact arm (held by the round-headed screw at the opposite end to the contact point) and is located in the hollow end of the round-headed screw which is revealed when the spring arm is removed.

When replacing the arm, it is important that the small curved backing spring is refitted correctly, i.e., with the bent portion facing outwards.

#### **DYNAMO ARMATURE BUSH (A and C Group Models fitted with lubricator).**

A few drops of oil injected through the lubricator are sufficient.

**Every 5,000 miles.**

Drain the gearbox and refill with new oil up to the level of the filler plug.

Drain the telescopic forks and refill each leg with correct amount of new oil.

In the case of new or re-conditioned gearboxes, change the oil after the first 1,000 miles.

#### **New Machines.**

#### **CYLINDER HEAD BOLTS (except B and M O.H.V. engines).**

Examine the cylinder head joint daily, and if leakage becomes apparent, tighten the bolts, working diagonally so as to pull the head down evenly. Do not over-tighten otherwise there is a possibility of distortion or bolt stretch.

#### **CYLINDER BASE NUTS (except B and M O.H.V. engines).**

There are five of these—one at each of the four corners outside, and one inside the tappet chest on the single cylinder models. A Group Models have eight cylinder base nuts and Model C11 six nuts. Tighten after the first 100 miles.

#### **CYLINDER BARREL AND HEAD FIXING (B and M O.H.V. engines).**

The barrel and head are both secured to the crankcase by four long bolts coupled to bushes screwed into the latter. Apply a spanner to the upper hexagon for tightening. These bolts have right-hand threads, and, being inverted, are tightened by turning the spanner to the right.

B.S.A. MOTOR CYCLES LTD., Service Dept., Birmingham, 11.

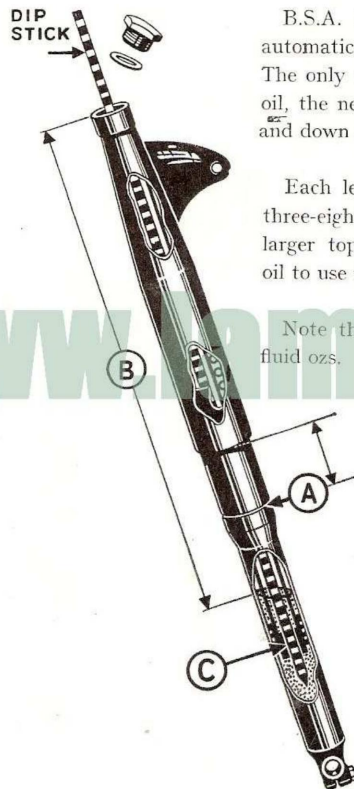
(PRINTED IN ENGLAND).

# **BSA SERVICE SHEET No. 706**

## **A, B, C and M Group Models**

*Reprinted May 1958*

### **THE TELESCOPIC FORKS**



B.S.A. hydraulically damped telescopic forks are entirely automatic and no adjustment is necessary or provided for. The only maintenance required is occasional topping up with oil, the necessity for which will be indicated by excessive up and down oscillation.

Each leg should contain a quarter of a pint (142c.c.), or three-eighths of a pint (213c.c.) for models fitted with the larger top bush in the sliding tube. The correct grade of oil to use is S.A.E. 20 for all models.

Note that a quarter of a pint equals 8 tablespoons or 5 fluid ozs.

To check the oil level within the forks, place the machine on its stand, remove the plated hexagon cap from the top of each shaft and pass a thin rod down inside to act as a dipstick. The depth of oil should be approximately seven and seven-eighths inches (quarter pint), or nine and one-sixteenth inches (three-eighths pints).

Later models have a drain plug fitted at the base of each fork leg. It is, therefore, only necessary to drain the oil and refill with the correct quantity.

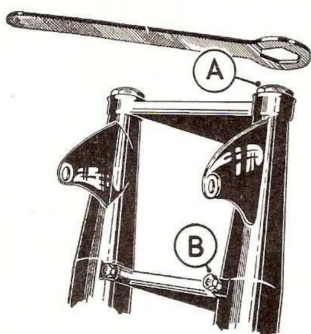
Fig. X1.

#### **QUARTER-PINT CAPACITY.**

Models C10, C10L (1956 onwards), C11, C11G, C12, B31/33 (up to 1956), B32/34 and Gold Stars (up to 1952), M20, M21, M33, "A" Group (up to 1952).

#### **THREE-EIGHTHS PINT CAPACITY.**

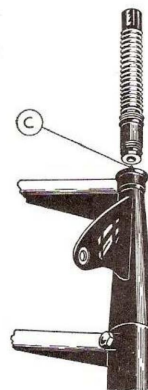
Models B31/33 (1956 onwards), B32/34 and Gold Stars (1952 onwards), "A" Group (1952 onwards).



#### DISMANTLING

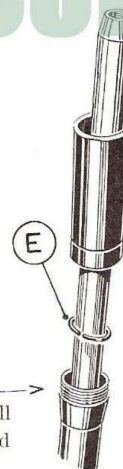
The most convenient way to dismantle the forks is to remove each leg separately, having first detached the front wheel and mudguard. Remove the filling plug at the top of the leg (A, Fig. X2) and then slacken off the pinch bolt on the bottom yoke (B).

Insert a screwed plug, B.S.A. Service Tool No. 61-3350, into the thread at the top of the leg which is exposed when the filling plug is removed (C, Fig. X3), and tap this vigorously with a suitable hammer or mallet, whereupon the leg should be released and can be withdrawn downwards from the yokes.



Having withdrawn the leg it should be held in a vice by the lug at the bottom through which the wheel spindle normally goes, and the spring should then be lifted off. The lower spring seating is slotted to accommodate a special unscrewing tool, B.S.A. Service Tool No. 61-3005, consisting of a tubular member with suitable dogs to engage in the slots, and with this the spring seating, together with the tubular sleeve which normally encloses the lower part of the spring, can be unscrewed (D, Fig. X2).

Having drawn the tubular sleeve clear as far as possible, being careful to avoid drawing the oil seal up the taper of the leg, a circlip holding the upper sliding bush in position, will be revealed, and this should then be prised out (E, Fig. X3).



#### NOTE.

During assembly one turn of No. 5 Twine round the undercut will provide an additional and effective seal. Overlap the ends and trim off.

Fig. X2.

Fig. X3.



Next pull out the main tubular member which will come away complete with the circlip, the two bushes and the oil seal housing. The presence of oil in the lower part of the assembly may offer some slight obstruction to the withdrawal of the main tube, especially if the oil is cold and thick, but this can easily be poured out. To remove the bushes and oil seal housing, unscrew the gland nut at the lower end of the main tube (F, Fig. X4). As the operation necessitates clamping the main tube, care should be taken to ensure it is not damaged. It is recommended it be secured approximately five to seven inches from its upper end.



To remove the oil seal from its housing B.S.A. Service Tool No. 61-3006 should be used (G), and to replace it use Tool No. 61-3007 (H).

Take care to fit the internal rubber facing downwards (I).

#### RE-ASSEMBLY

Re-assembly is carried out in the reverse order to dismantling. All the components should be quite clean. Remove any road grit from the springs and then smear them liberally with thick grease before assembly. Ensure that the oil seal is not damaged or worn. To fit the main fork tubes screw B.S.A. Service Tool (61-3350) into the top of the tube (J, Fig. X4) and pull it up sharply into the top yoke. Then fit the collar and nut on to the tool and draw the tube fully home into the yoke. When the tube is quite home then the pinch bolts on the lower yoke should be tightened, the tool may then be removed and after filling the legs with the correct amount of oil the top plugs should be replaced and fully tightened.

To remove the two yokes and the steering stem from the frame, it is necessary first to slacken off the pinch bolt at the rear of the top yoke. Withdraw the split pin under the head of the steering damper knob, screw off the knob, then the top nut immediately under it. The steering damper mechanism can then be withdrawn downwards from the steering stem and the steering head bearing adjusting sleeve should be unscrewed by means of B.S.A. Service Tool No. 61-3002 or 61-3008 for A Group models. The steering stem complete with bottom yoke, can then be withdrawn from underneath.

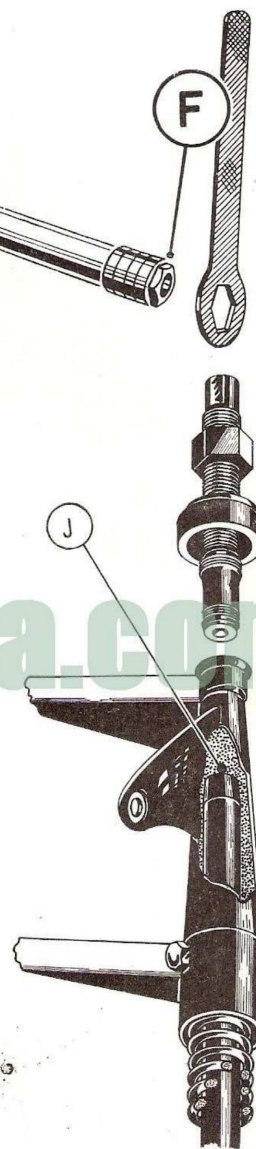


Fig. X4.

# BSA SERVICE SHEET No. 708

Reprinted Aug. 1958

## All Models

### CARBURATION. Monobloc and Separate Float Chamber Type

#### How the Carburettor Works

The function of the carburettor is to atomise the petrol and proportion it correctly with the air drawn in through the intake on the induction stroke. The action of the float and needle in the float chamber maintains the level of fuel at the needle jet, and when the engine is stopped and no further fuel is being used the needle valve cuts off the supply.

The twist grip controls, by means of a cable, the position of the throttle slide and the throttle needle and so governs the volume of mixture supplied to the engine.

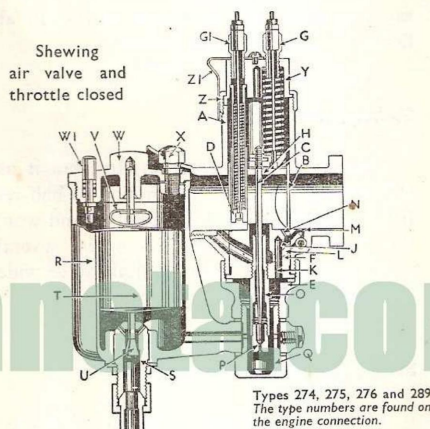
The mixture is correct at all throttle openings, if the carburettor is correctly tuned.

The opening of the throttle brings first into action the mixture supply from the pilot jet, then as it progressively opens, via the pilot by-pass the mixture is augmented from the needle jet. Up to three-quarter throttle this action is controlled by the tapered needle in the needle jet, and from three-quarters onwards the mixture is controlled by the main jet.

The pilot jet 'J', which in the older type of carburettor is embodied in the jet block, has been replaced in the Monobloc carburettor by a detachable jet (9) (Fig. X5) assembled in the carburettor body and sealed by a cover nut.

The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber and goes from there as a rich petrol/air mixture through the primary air choke into the main air choke.

Although the maintenance and tuning instruction contained in this Service Sheet apply equally well to the Monobloc and separate float chamber types of carburettor, the new instrument has been designed with a view to giving improved performance, and certain constructional changes have been made.



- |                               |                                     |
|-------------------------------|-------------------------------------|
| A. Mixing Chamber.            | P. Main Jet.                        |
| B. Throttle Valve.            | Q. Float Chamber Holding Bolt.      |
| C. Jet Needle and Clip above. | R. Float Chamber.                   |
| D. Air Valve.                 | S. Needle Valve Seating.            |
| E. Mixing Chamber Union Nut.  | T. Float.                           |
| F. Jet Block.                 | U. Float Needle Valve.              |
| G. G.I. Cable Adjusters.      | V. Float Needle Clip.               |
| H. Jet Block Barrel.          | W. Float Chamber Cover.             |
| J. Pilot Jet.                 | W1. Tickler.                        |
| K. Passage to Pilot.          | X. Float Chamber Lock Screw.        |
| L. Pilot Air Passage.         | Y. Mixing Chamber Top Cap.          |
| M. Pilot Mixture Outlet.      | Z. Mixing Chamber Lock Ring.        |
| N. Pilot By-pass.             | Z1. Mixing Chamber Security Spring. |
| O. Needle Jet.                |                                     |

Fig. X4. A Sectioned illustration of needle jet carburettor



#### **B.S.A. Service Sheet No. 708 (cont.).**

The float chamber is a drum-shaped reservoir, die cast in one piece with the mixing chamber. The material used being zinc-alloy. The float is designed to pivot instead of rising and falling, as in the separate float chamber type, and as it does so, it impinges on a nylon needle controlling the inflow of fuel.

Variations of up to 20° in the angle of the carburettor when fitted, do not affect the working of the float, therefore it lends itself to use for down draught carburation and is not so greatly effected by the degree of lean when cornering. Access to the float (Fig. X6) is gained by removing a plate held in place by three screws.

Compensation for over-rich mixture which results from snap throttle openings, is provided by bleed holes in the needle jet (Fig. X5). A compensatory air bleed is provided, this is the larger of the two holes at the mouth of the air intake, which leads to the space around the needle jet. (Fig. X5).

The pilot intake is the smaller of the two holes, and operates in conjunction with the detachable pilot jet. (Fig. X5). This pilot mixture is adjusted as before, by an adjusting screw. (Fig. 8a.)

#### **Hints and Tips. Starting from Cold**

Flood the carburettor by depressing the tickler and close the air control, set the ignition, say, half retarded. Then open the throttle about  $\frac{1}{8}$ " , then kick start. If the throttle is too far open, starting will be difficult.

#### **Starting. Engine Hot**

Do not flood the carburettor, but it may be found necessary with some engines to close the air lever, set the ignition to half-retarded, the throttle to  $\frac{1}{8}$ " open and kick-start. If the carburettor has been flooded and won't start because the mixture is too rich—open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle  $\frac{1}{8}$ " open, and air valve wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

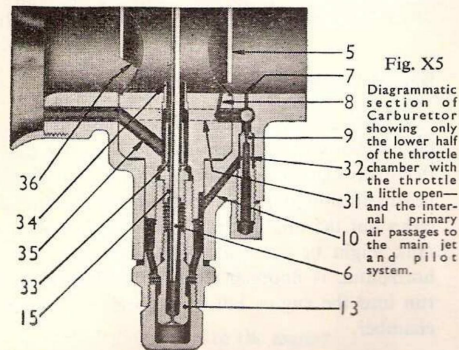
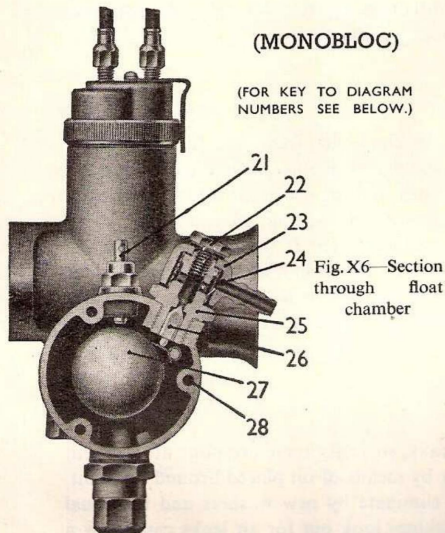
#### **Starting, General**

By experiment, find out if and when it is necessary to flood, also note the best position for the air lever and the throttle for the easiest starting. Excessive flooding, particularly when the engine is hot, will make starting more difficult. It is necessary only to raise the level of petrol in the float chamber, by depressing the tickler.

STARTING, SINGLE LEVER CARBURETTORS, OPEN THE THROTTLE VERY SLIGHTLY FROM THE IDLING POSITION AND FLOOD THE CARBURETTOR MORE OR LESS ACCORDING TO THE ENGINE BEING COLD OR HOT RESPECTIVELY.



**SECTIONAL ILLUSTRATIONS OF CARBURETTORS. Types 375, 376 and 389**



FOR KEY TO DIAGRAM NUMBERS SEE BELOW.

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Mixing Chamber Top.        | 18. Mixing Chamber Cap Spring. |
| 2. Mixing Chamber Cap.        | 19. Cable Adjuster (Air).      |
| 3. Carburettor Body.          | 20. Cable Adjuster (Throttle). |
| 4. Jet Needle Clip.           | 21. Tickler.                   |
| 5. Throttle Valve.            | 22. Banjo Bolt.                |
| 6. Jet Needle.                | 23. Banjo.                     |
| 7. Pilot outlet.              | 24. Filter Gauze.              |
| 8. Pilot by-pass.             | 25. Needle Seating.            |
| 9. Pilot Jet.                 | 26. Needle.                    |
| 10. Petrol feed to pilot jet. | 27. Float.                     |
| 11. Pilot Jet Cover Nut.      | 28. Side Cover Screws.         |
| 12. Main Jet Cover.           | 31. Air to pilot jet.          |
| 13. Main Jet.                 | 32. Feed holes in pilot jet.   |
| 14. Jet Holder.               | 33. Bleed holes in needle jet. |
| 15. Needle Jet.               | 34. Primary Air Choke.         |
| 16. Jet Block.                | 35. Primary air passage.       |
| 17. Air Valve.                | 36. Throttle valve cutaway.    |

Fig. X7—Section through mixing chamber, showing air valve and throttle closed

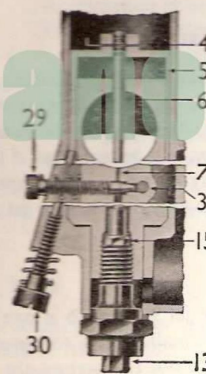
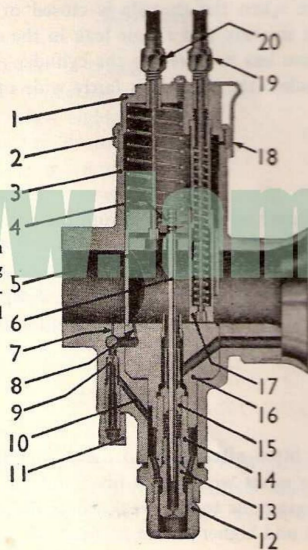


Fig. 8a

**30 THROTTLE ADJUSTING SCREW**

Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is shut off.

**29 PILOT AIR ADJUSTING SCREW**

This screw regulates the strength of the mixture for 'idling' and for the initial opening of the throttle. The screw controls the depression on the pilot jet by metering the amount of air that mixes with the petrol.

### **Cable Controls**

See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjusters on the top of the carburettor. See that the throttle shuts down freely.

### **Petrol Feed**

Verification. Detach petrol pipe union at the float chamber end; turn on petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks. Flooding may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machines is due to impurities (grit, fluff, etc.) in the tank—so clean out the float chamber periodically till the trouble ceases. If the trouble persists the tank might be drained, swilled out, etc. Note that if the carburettor, either vertical or horizontal, is flooding with the engine stopped, the overflow from the main jet will not run into the engine but out of the carburettor through a hole at the base of the mixing chamber.

### **Fixing Carburettor and Air Leaks**

Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe—check by means of oil placed around the joint, if there are leaks the oil will be sucked in, and eliminate by new washers and the equal tightening up of the flange nuts. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

### **Explosions in Exhaust**

May be caused by too weak a pilot mixture when the throttle is closed or nearly closed—also, it may be caused by too rich a pilot mixture and an air leak in the exhaust system; the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the explosion occurs when the throttle is fairly wide open the trouble will be ignition—not carburation.

### **Excessive Petrol Consumption**

On a new machine may be due to flooding, caused by impurities from the petrol tank lodging on the float needle seat and so preventing its valve from closing. If the machine has had several years use, flooding may be caused by a worn float needle valve. Also excessive petrol consumption will be apparent if the throttle needle jet 'O' (Fig. X4), or (15) (Fig. X5) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be, then the only remedy is to get a new needle jet.

### **Air Filters**

These may affect the jet setting, so if one is fitted afterwards to the carburettor the main jet may have to be smaller. If a carburettor is set with an air filter and the engine is run without it, take care not to overheat the engine due to too weak a mixture; testing with the air control will indicate if a larger main jet and higher needle position are required.



**B.S.A. Service Sheet No. 708 (cont.).**

**Faults**

The trouble may not be carburation; if the trouble cannot be remedied by making mixtures richer or weaker with the air control, and you know the petrol feed is good and the carburettor is not flooding, the trouble is elsewhere.

**Fault Finding**

There are only TWO possible faults in carburation, either RICHNESS of mixture or WEAKNESS of mixture, so in case of trouble decide which is the cause, by:

- |                                                                                                     |   |                                                                                                     |
|-----------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------|
| 1. Examining the petrol feed ..                                                                     | { | Verify jets and passages are clear<br>Verify ample flow<br>Verify there is no flooding              |
| 2. Looking for air leaks ..                                                                         | { | At the connection to the engine<br>Or due to leaky inlet valve stems                                |
| 3. Defective or worn parts ..                                                                       | { | As a slack throttle-worn needle jet<br>The mixing chamber union nut not tightened up, or loose jets |
| 4. TESTING WITH THE AIR CONTROL to see if by richening the mixture the results are better or worse. |   |                                                                                                     |

| Indications of                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Richness                                                                                                                                                                                                                                                                                                                                                                             | Weakness                                                                                                                                                                                                                                                                                                                                                    |
| Black smoke in exhaust.<br>Petrol spraying out of carburettor.<br>Four strokes, eight-stroking.<br>Two strokes, four-stroking.<br>Heavy, lumpy running.<br>Heavy petrol consumption.<br>? If the jet block F is not tightened up by washer and nut E richness will be caused through leakage of petrol.<br>? Air cleaner choked up.<br>? Needle jet worn large.<br>Spark plug sooty. | Spitting in carburettor.<br>Erratic slow running.<br>Overheating.<br>Acceleration poor.<br>Engine goes better if:<br>Throttle not wide open, or Air Control is partially closed.<br>? Has air cleaner been removed.<br>? Jets partially choked up.<br>Removing the silencer or running with a racing silencer requires a richer setting and large main jet. |

**Note**

Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing. DECIDE BY TEST WHETHER RICHNESS OR WEAKNESS IS THE TROUBLE AND AT WHAT THROTTLE POSITION. See throttle opening diagrams, Fig. X6.



### Procedure

If at a particular throttle opening you partially close the air control, and the engine goes better, weakness is indicated; or on the other hand the running is worse, richness is indicated. THEN YOU PROCEED TO ADJUST THE APPROPRIATE PART AS INDICATED FOR THAT THROTTLE POSITION.

#### Fault at Throttle Positions indicated on Fig. X9

##### To Cure Richness

Fit smaller main jet.  
Screw out pilot air screw.  
Fit a throttle with larger cut-away.  
Lower needle one or two grooves.

1st  
2nd  
3rd  
4th

##### To Cure Weakness

Fit larger main jet.  
Screw pilot air screw in.  
Fit a throttle with smaller cut-away.  
Raise needle one or two grooves.

### Notes

It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle: the proper thing to do is to lower the needle.

Information on throttle slides and needle position is given in paragraphs (f) and (e) respectively in the next section entitled TUNING.

### Changing from standard petrols to special fuels

Such as alcohol mixtures will, with the same setting in the carburettor, certainly cause weakness of mixture and possible damage from overheating.

### TUNING

(a) Figs. X8 and 8a are two diagrammatic sections of the carburettor to show:

1. The throttle stop screw.
2. The pilot air screw.

#### (b) Throttle stop screw

Set this screw to prop the throttle open sufficiently to keep the engine running when the twist grip is shut off.

#### (c) Pilot air screw

This screw regulates the strength of the mixture for 'idling' and for the initial opening of the throttle. The screw controls the suction on the pilot petrol jet by metering the amount of air that mixes with the petrol.

**Note.** The air for the pilot jet may be admitted internally or externally according to one or other of the designs, but there is no difference in tuning.

#### (d) Main Jet

The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike.

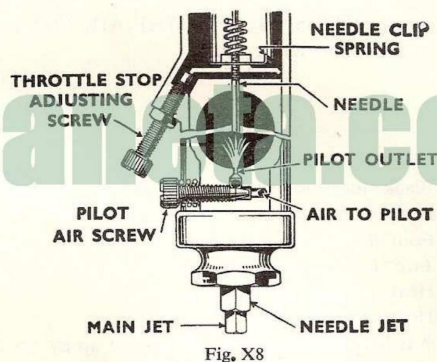


Fig. X8

**Never reamer a jet out, get another of the right size**

The bigger the number the bigger the jet. Spare jets ARE SEALED.

To get at the main jet, undo the float chamber holding bolt Q (Fig. X4) or Main Jet Cover No. 12 (Fig. X7). The jet is screwed into the needle jet so if the jet is tight, hold the needle jet also carefully with a spanner whilst unscrewing the main jet.

(e) **Needle and Needle Jet**

The needle is attached to the throttle and being tapered either allows more or less petrol to pass through the needle jets as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The needle jet is of a defined size and is only altered from standard when using alcohol fuels.

The taper needle position in relation to the throttle opening can be set according to the mixture required by fixing it to the throttle with the needle clip spring in a certain groove (see illustration above), thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttle openings from quarter to three-quarter open (see illustration, Fig. X9).

(f) **Throttle Valve Cut-away**

The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cut-away is recorded by a number marked on the throttle, viz.: 6/3 means throttle type 6 with No. 3 cut-away; larger cut-aways, say 4 and 5, give weaker mixtures, and 2 and 1 richer mixtures.

(g) **Air Valve**

Is used only for starting and running when cold, and for experimenting with, otherwise run with it wide open.

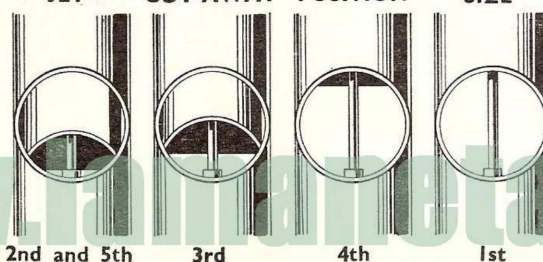
(h) **Tickler**

A small plunger located in the float chamber lid. When pressed down on the float, the needle valve is pushed off its seat and so 'flooding' is achieved. Flooding temporarily enriches the mixture until the level of the petrol subsides to normal.

**Phases of Amal Needle Jet Carburettor Throttle Openings**

Up to  $\frac{1}{2}$  open    from  $\frac{1}{2}$  to  $\frac{3}{4}$  open     $\frac{3}{4}$  to  $\frac{5}{8}$  open     $\frac{5}{8}$  to full open

PILOT    THROTTLE    NEEDLE    MAIN JET  
JET    CUT-AWAY    POSITION    SIZE



2nd and 5th

3rd

4th

1st

SEQUENCE OF TUNING

Fig. X9



### Sequence of Tuning

Tune up. In the following order only, by so doing you will not upset good results obtained.

**Note.** The carburettor is automatic throughout the throttle range—the air control should always be wide open except when used for starting or until the engine has warmed up. We assume normal petrols are used.

Read remarks on Fault Finding and Tuning for each tuning device and get the motor going perfectly on a quiet road with a slight up gradient so that on test the engine is pulling.

#### 1st Main Jet with throttle in position

Test the engine for full throttle; if when at full throttle, the power seems better with the throttle less than wide open or with the air valve closed slightly the main jet is too small. If the engine runs 'heavily' the main jet is too large. If testing for speed work note the jet size is rich enough to keep engine cool, and to verify this, examine the sparking plug by taking a fast run, declutching and stopping engine quickly. If the plug body at the end has a bright black appearance, the mixture is correct; if sooty, the mixture is rich; or if a dry grey colour, the mixture is too weak and a larger jet is necessary.

#### 2nd Pilot Jet with throttle in positions 2 and 5

With engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle stop screw, and ignition set for best slow running: (1) Loosen stop screw nut and screw down until engine runs slower and begins to falter, then screw the pilot air screw in or out to make engine run regularly and faster. (2) Now gently lower the throttle stop screw until the engine runs slower and just begins to falter, then lock the nut lightly and begin again to adjust the pilot air screw to get best slow running; if this second adjustment makes engine run too fast, go over the job again a third time. Finally, lock up tight the throttle stop screw nut without disturbing the screw's position.

#### 3rd Throttle Cut-away with throttle in position

If, as you take off from the idling position, there is objectionable spitting from the carburettor, slightly richen the pilot mixture by screwing the air screw in about half a turn, but if this is not effective, screw it back again and fit a throttle with a smaller-cut-away. If the engine jerks under load at this throttle position and there is no spitting, either the throttle needle is much too high or a larger throttle cut-away is required to cure richness.

#### 4th Needle with throttle in position 4

The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, viz., with the clip in a groove as near the end as possible; if acceleration is poor and with air valve partially closed the results are better, raise the needle by two grooves; if very much better try lowering needle by one groove and leave it where it is best.

**Note.** If mixture is still too rich with clip in groove No. 1 nearest the end—the Needle Jet probably wants replacement because of wear. The needle itself never wears out.

**5th** Finally go over the idling again for final touches.



# **BSA SERVICE SHEET No. 708B**

*November 1950.  
Reprinted June, 1958.*

## **ALL MODELS CARBURATION AT HIGH ALTITUDES**

The carburetter settings of all B.S.A. Motor Cycles are designed to give the best all round performance at altitudes of a few thousand feet.

At greater altitudes the air becomes rarefied with the result that the mixture is incorrect.

To overcome this difficulty it is necessary to reduce the size of the main jet, the reduction depending on the altitude at which the machine is mainly used.

The table below shows the percentage of reduction at given altitudes, but it must be emphasised that while the alteration to jet size will correct the mixture, it will not replace the lost power. This can only be corrected by "Blowing" or super-charging.

It may also be advisable to retune the carburetter for smaller throttle openings and this should be done in accordance with Service Sheet 708.

| Altitude.   |     |     |     |     |     |     | Percentage of<br>reduction in jet size. |
|-------------|-----|-----|-----|-----|-----|-----|-----------------------------------------|
| 3,000 feet  | ... | ... | ... | ... | ... | ... | 5%                                      |
| 6,000 feet  | ... | ... | ... | ... | ... | ... | 9%                                      |
| 9,000 feet  | ... | ... | ... | ... | ... | ... | 13%                                     |
| 12,000 feet | ... | ... | ... | ... | ... | ... | 17%                                     |

B.S.A. MOTOR CYCLES LTD.,  
Service Dept., Birmingham, 11.  
(PRINTED IN ENGLAND)

# **BSA SERVICE SHEET No. 709**

## **All Models**

*October, 1948.*

*Reprinted October, 1954.*

### **FAULT FINDING**

No adjustments should be made, or any part tampered with, until the cause of the trouble is known. Otherwise adjustments which are correct may be deranged.

#### **Engine Stops Suddenly.**

- Petrol shortage in tank, or choked petrol supply pipe or tap.
- Choked main jet, or water in float chamber.
- Oiled up or fouled sparking plug.
- Water on high tension pick-up or on sparking plug.
- Choked vent hole in petrol tank filler cap.

#### **Engine Fails to Start, or is difficult to start.**

- Lack of fuel, or insufficient flooding if cold.
- Excessive flooding, allowing neat petrol to enter the cylinder.
- Oiled sparking plug, or stuck-up valve or valve stem sticky.
- Weak valve spring, or valve not seating properly.
- Throttle opening too large, or pilot jet choked.
- Contact points dirty, or gap incorrect.
- Flat battery, if coil ignition, or faulty electrical connections in ignition circuit.

#### **Loss of Power.**

- Valve, or valves, not seating properly.
- Weak valve spring or springs, or sticking valve.
- No tappet clearance, or excessive clearance.
- Lack of oil in tank.
- Brakes adjusted too closely.
- Badly fitting or broken piston rings.
- Punctured carburettor float.
- Incorrect ignition timing.

#### **Engine Overheats.**

- Lack of proper lubrication.
- Weak valve springs, or pitted valve seats.
- Worn piston rings, or late ignition setting.
- Air control to carburettor out of order, or punctured float.

#### **Engine Misses Fire.**

- Weak valve spring.
- Defective or oiled sparking plug, or oil on contact points.
- Incorrectly adjusted contact points or tappets.
- Defective sparking plug cable.
- Defective sparking plug.
- Loose sparking plug terminal.
- Carburettor flooding, due to stuck or defective float.
- Partly choked main jet.

#### **Excessive Oil Consumption.**

- Stoppage, or partial stoppage, in pipe returning oil from engine to tank.
- Clogged, or partially clogged, filter in sump, or oil tank.
- Badly worn or stuck-up piston rings, causing high pressure in engine crankcase.
- High crankcase pressure, caused by release valve (breather) action. (Disc may be damaged or jammed with dirt.)
- Air leak in dry sump oiling system.
- Non-return valve in system not seating.
- Ball valve in oil pump stuck on its seat.

B.S.A. MOTOR CYCLES LIMITED, Service Dept., Birmingham, 11.

(PRINTED IN ENGLAND)

# **BSA SERVICE SHEET No. 710**

Oct., 1948  
Reprinted Nov., 1957

## **All Models CHAIN ALTERATIONS AND REPAIRS**

A chain rarely breaks if it is kept properly lubricated and adjusted. Usually it is worn out long before it reaches breaking point. The rear chain is the most heavily stressed and is therefore the one most likely to give trouble. Spare parts should be carried to enable the rider to carry out a repair on the road with the aid of a chain rivet extractor (see Fig. X7). The front chain will probably be worn out before it requires shortening.

### **How to use the chain rivet extractor**

First press down lever A (Fig. X7) to open the two jaws (B). Insert the link to be removed so that the jaws grip the roller and support the uppermost inner side plate. The punch (C) is then screwed down on to the rivet head until the rivet is forced through the outer plate.

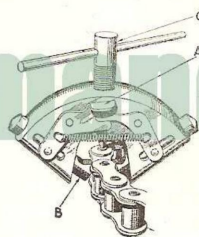


Fig. X7.

### **To shorten a worn rear chain**

After a big mileage, the rear chain may have stretched so that no further adjustment is possible by the usual method. In this case it is possible to shorten the chain by one link or pitch, so increasing its useful life. First remove the single connecting spring link (A) securing the two ends of the chain (Fig. X8). If the chain terminates in two ordinary links as in Fig. X8 (in which case the chain will be of an even number of pitches) extract the third and fourth rivets (B) from the end and replace the detached three pitches by a single connecting link (C). The connection is made with an additional spring link (D). If one end of the chain has a double cranked link (Fig. X9)—in which case the

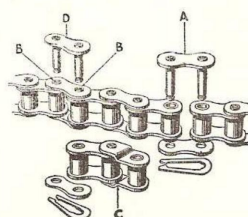


Fig. X8.



**B.S.A. Service Sheet No. 710 (cont.)**

chain will have an odd number of pitches—extract the second and third rivets (A), releasing the cranked link unit complete, which can be retained for further use. Replace with one inner link (B) and again connect up with an additional single connecting link (C).

**To repair a damaged chain**

If a roller or link has been damaged (X, Fig. X9) remove rivets (D), take out the damaged link and replace with one inner link, secured by two single connecting links.

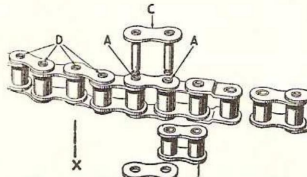


Fig. X9.

It is important that the spring clip fastener should always be put on so that the CLOSED end faces the direction of travel of the chain—i.e., when clip is on top run of chain, closed end is towards front of machine—when clip is on bottom run, closed end is towards rear of machine.

It should be noted that once a rivet has been extracted it must not be used again, so that it is important to check that the correct rivet is being removed before actually removing it. In the case of double cranked links, the complete unit comprises an inner link and the cranked outer link—three rollers in all—and these must never be separated.

**Fitting rear chain**

To fit a new rear chain, turn wheel until the spring link of the old chain is located on rear sprocket. Disconnect, and allow the lower run to drop down. Join the top run of the old chain to the new chain by means of the connecting link, and then by pulling on the bottom run of the old chain the new one will be carried round gearbox sprocket. Then the old chain can be disconnected and the ends of the new one joined together.

When the rear chain breaks and falls from its sprockets, the new or repaired chain can be replaced without taking off the chainguards. One end of the chain must be fed (from the rear) under the front end of the rear top chainguard on to the gearbox sprocket. A long bladed screwdriver or a piece of stiff wire may assist this operation. When the chain has located on the sprocket teeth, engage a gear and gently turn gearbox over with the kick-starter. This will feed chain round gearbox sprocket. When sufficient length of chain is hanging below sprocket, disengage gear and chain can then be pulled round until both runs can be fed inside rear chainguard and engaged on rear wheel sprocket.

# **BSA SERVICE SHEET No. 713**

*This sheet supersedes No. 411  
Reprinted Oct., 1957*

## **All Models Except D Group DISMANTLING OF STEERING HEAD**

Remove the headlamp from the forks after undoing the two retaining bolts, and allow it to hang in a position where it cannot be damaged. If a headlamp cowl is fitted, it should be removed complete with the headlamp.

Detach the handlebars complete with controls, and lay them on top of the petrol tank, using a piece of rag to protect the enamel. Remove the chromium plated tap caps A and B (Fig. C31). Slacken the pinch bolt C and remove the adjusting sleeve D. Tap off the fork top yoke by striking it with a mallet underneath its front edge.

The steering column can now be drawn downwards from the head, and the top ballrace removed. Note: If the bearings are dry a means of catching the steel balls should be arranged as they will fall as the column is drawn out.

The cups which remain in the head can be withdrawn by means of extractor No. 61—3060 for "C" Group, and 61—3063 for "A," "M" and "B" Groups. This is screwed firmly into the cup, then extractor and cup are driven out from the opposite end with the aid of a suitable bar.

If the cups and cones are pitted to even a slight degree, they must be replaced, otherwise steering will be adversely affected and will rapidly become worse.

Pitting is invariably due to "hammering" of the balls in their tracks, caused by slack adjustment.

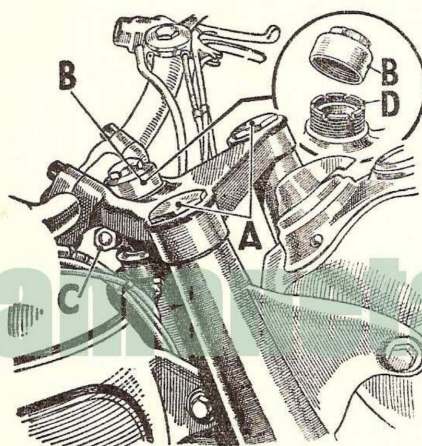


Fig. C.31. The front fork and steering head.

## **RE-ASSEMBLY OF STEERING HEAD**

When fitting new ballrace cups make sure that they are driven in squarely and that they are pressed well home. Replace the steering column balls, cone, adjusting sleeve and top-yoke. If any difficulty is experienced in retaining the balls in position, smear the tracks heavily with grease.

Adjust the column so that it turns freely without play and tighten the pinch bolt C.

Finally replace headlamp and handlebar controls.

**B.S.A. MOTOR CYCLES LTD.**  
Service Dept., Birmingham, 11  
Printed in England.

# **BSA SERVICE SHEET No. 805**

*Reprinted March 1958*

## **All Models**

### **BATTERY — LEAD-ACID TYPES**

The range of Lucas batteries listed here covers those models fitted to B.S.A. motor cycles in recent years.

PU5E and LVW5E Small capacity batteries for light-weight machines.

PU7E .. .. Standard battery for cradle mounting.

GU11E .. .. Larger capacity battery for sidecar machines.

SC7E .. .. Large capacity lightweight battery for machines fitted with starting motors or two-way radio equipment, e.g. police machines.

All current Lucas motor cycle batteries are 'dry charged', and do not require initial charging. Except that these batteries have porous rubber separators, they are identical with earlier models supplied wet or uncharged and require the same routine maintenance when in service.

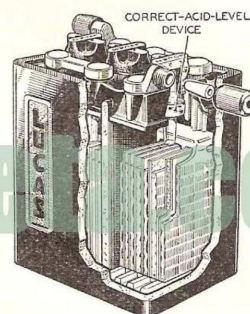


Fig. Y18. Sectioned battery, model PU7E/9

### **STORAGE**

Used batteries must be fully charged before storing. In temperate climates they should be examined fortnightly, or weekly in the case of model LVW5E and all models when stored in the tropics. If necessary, give them a short refreshing charge.

After a long period of storage, the condition of the battery will often improve if it is put through a 'cycle', as described on page 4.

### **MAINTENANCE**

Every fortnight, or more frequently in hot climates, examine the condition of the battery. Examine five-plate batteries every week.

Never use a naked light when examining the condition of the cells, as there is a danger of igniting the gas coming from the active materials.

#### **Cleaning**

Remove the battery cover and clean the cell tops. Examine the connections. If they are loose or dirty, remove them and scrape the contact surfaces clean. Coat them with petroleum jelly before replacing.

Remove the filler plugs and check that the vent holes are clear and that the rubber washer fitted under some plugs is in good condition.

#### **Topping-up**

During charging, water is lost by gassing and evaporation. Examine the electrolyte level in each cell and, if necessary, add distilled water to raise the electrolyte level with the top edges of the separators.

SC7E batteries have a woven glass pad fitted in each cell to reduce splashing when the battery is gassing during charging. When 'topping-up' this type of battery it is useful to note that the correct electrolyte level is reached when moisture appears through the porous glass pad.



**The Lucas Battery Filler**

The use of a Lucas motor cycle Battery Filler will be found helpful in this 'topping-up' process, as it ensures that the correct electrolyte level is automatically attained and also prevents distilled water from being spilled over the battery top.

**Correct-Acid-Level-Devices**

The correct-acid-level-device fitted to some Lucas batteries consists of a central tube with a perforated flange which rests on a ledge in the filling orifice.

When 'topping-up' a battery fitted with these devices, pour distilled water round the flange (not down the tube) until no more drains through into the cell. This will happen when the electrolyte level reaches the bottom of the central tube and prevents further escape of air displaced by the 'topping-up' water. Lift the tube slightly to allow the small amount of water in the flange to drain into the cell. The electrolyte level will then be correct.

If a battery requires 'topping-up' too frequently, the voltage regulator (on machines fitted with d.c. generators) may be out of adjustment, i.e. set too high, and should be checked. Conversely, a persistently low state of charge may be due to a regulator being set too low.

If one cell in particular needs 'topping-up' more than another, it is likely the container is cracked, in which event replace the battery and clean the carrier, using a solution of ammonia or bi-carbonate of soda in water. After cleaning and drying, paint the battery carrier and other surfaces affected by the electrolyte with anti-sulphuric paint.

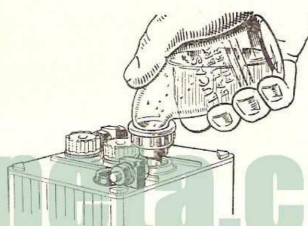


Fig Y19. The Lucas battery filler

**TABLES OF SPECIFIC GRAVITIES AND CHARGING RATES**

| Battery | Plates per cell | Amp. Hr. Capacity |                 | Electrolyte to fill one two-volt cell |      | Home Trade and Climates Ordinarily below 90°F. (32°C.) Specific Gravity of Acid (corrected to 60°F.) |               | Climates frequently over 90°F. (32°C.) Specific Gravity of Acid (corrected to 60°F.) |               | Initial Charge Current | Re-charge Current |
|---------|-----------------|-------------------|-----------------|---------------------------------------|------|------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|---------------|------------------------|-------------------|
|         |                 | At 10 hour rate   | At 20 hour rate | Pint                                  | c.c. | Filling                                                                                              | Fully Charged | Filling                                                                              | Fully Charged | Amp.                   | Amp.              |
| 1       | 2               | 3                 | 4               | 5                                     | 6    | 7                                                                                                    | 8             | 9                                                                                    | 10            |                        |                   |
| LVW5E   | 5               | 5                 | 5.7             | 1/8                                   | 71   | 1.270                                                                                                | 1.270-1.290   | 1.210                                                                                | 1.210-1.230   | 0.3                    | 0.5               |
| PU5E    | 5               | 8                 | 9               | 1/6                                   | 94   | 1.270                                                                                                | 1.270-1.290   | 1.210                                                                                | 1.210-1.230   | 0.6                    | 1.0               |
| PU7E    | 7               | 12                | 13.5            | 1/5                                   | 113  | 1.270                                                                                                | 1.270-1.290   | 1.210                                                                                | 1.210-1.230   | 0.8                    | 1.5               |
| GU11E   | 11              | 20                | 22.8            | 1/3                                   | 189  | 1.270                                                                                                | 1.270-1.290   | 1.210                                                                                | 1.210-1.230   | 1.3                    | 2.2               |
| SC7E    | 7               | 22.5              | 26              | —                                     | 250  | 1.270                                                                                                | 1.270-1.290   | 1.210                                                                                | 1.210-1.230   | 1.5                    | 2.5               |

The maximum permissible electrolyte temperature during charging is given below. Should the temperature of the electrolyte exceed this value interrupt the charge and allow the battery temperature to fall at least 10°F. (5.5°C.) before charging is resumed.

| Climates normally below 80°F. (27°C.) | Climates between 80°-100°F. (27°-38°C.) | Climates frequently above 100°F. (38°C.) |
|---------------------------------------|-----------------------------------------|------------------------------------------|
| 100°F. (38°C.)                        | 110°F. (43°C.)                          | 120°F. (49°C.)                           |

The specific gravity of the electrolyte varies with temperature. For convenience in comparing specific gravities, they are always corrected to 60°F., which is adopted as the reference temperature. The method of correction is as follows:

For every 5°F. below 60°F., deduct 0.002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F., add 0.002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer having its bulb actually immersed in the electrolyte, and not the ambient temperature.

## SERVICING

### Battery Persists in Low State of Charge

First consider the conditions under which the battery is used. If the battery is subject to continuous discharge, e.g. long periods of night parking with lights on without suitable opportunities for recharging, a low state of charge is inevitable.

A fault in the dynamo or regulator, or neglect during a period out of commission, may also be responsible.

### Vent Plugs

See that the ventilating holes in each vent plug are clear, and that the rubber washer fitted under the plug is in good condition.

### Level of Electrolyte

The surface of the electrolyte should be level with the tops of the separators. If necessary, top-up with distilled water. Any loss of acid from spilling or spraying (as opposed to normal loss of water by evaporation) should be made good by dilute acid of the same specific gravity as that already in the cell.

### Cleanliness

See that the top of the battery is free from dirt or moisture which might provide a discharge path. Check that the battery connections are clean and tight.

### Hydrometer Tests

The space between each separator is not wide enough to permit the nozzle of an hydrometer to be inserted. Before taking a sample, tilt the battery to bring sufficient electrolyte above the separators. If the level of the electrolyte is so low that an hydrometer reading cannot be taken, no attempt should be made to take a reading after adding distilled water until the battery has been on charge for at least 30 minutes.

Measure the specific gravity of the acid in each cell in turn. The reading given by each cell should be approximately the same; if one cell differs appreciably from the others, an internal fault in that cell is indicated.

Specific gravity readings and their indications are as follows:

Climates under 90°F.

|             |    |                            |
|-------------|----|----------------------------|
| 1.270—1.290 | .. | Cell fully charged         |
| 1.190—1.210 | .. | Cell about half discharged |
| 1.110—1.130 | .. | Cell fully discharged      |

Climates over 90°F.

|             |
|-------------|
| 1.210—1.230 |
| 1.130—1.150 |
| 1.050—1.070 |

The appearance of the electrolyte drawn into the hydrometer when taking a reading gives a useful indication of the state of the plates; if it is very dirty, or contains small particles in suspension, it is possible that the plates are in a bad condition.

### Discharge Test

Motor-cycle batteries must *not* be subjected to the heavy discharge test, as recommended for motor-car and commercial vehicle batteries.

### RECHARGING FROM AN EXTERNAL SUPPLY

If the hydrometer test indicates that the battery is merely discharged, and is otherwise in a good condition, it should be recharged, either on the motor-cycle by a period of daytime running, or on the bench from an external supply.

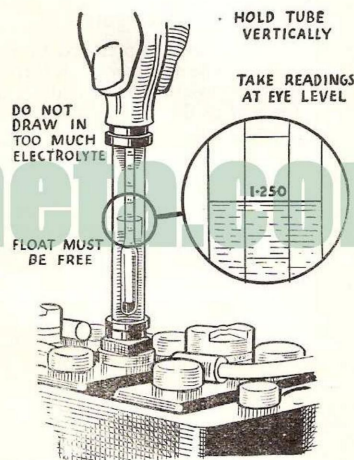


Fig Y20. Taking hydrometer readings



#### B.S.A. Service Sheet No. 805 (continued)

If the latter, the battery should be charged at the rate given in the table until the specific gravity and voltage show no increase over three successive hourly readings. During the charge the electrolyte must be kept level with the tops of the separators by the addition of distilled water.

A battery that shows a general falling-off in efficiency, common to all cells, will often respond to the process known as 'cycling'. This process consists of fully charging the battery by passing through it from an external source the appropriate re-charge current given in the table. The battery is then discharged by connecting to a lamp board, or other load, taking a current equal to the normal re-charge current. The battery should be capable of providing this current for at least 7 hours before it is fully discharged, as indicated by the voltage of each cell falling to 1.8. If the battery discharges in a shorter time, repeat the 'cycle' of charge and discharge.

#### PREPARING BATTERIES FOR SERVICE

All new batteries are supplied without electrolyte but with the plates in a charged condition. When they are required for service it is only necessary to fill each cell with sulphuric acid of the correct specific gravity. No initial charging is required.

##### Preparation of Electrolyte

The electrolyte is prepared by mixing together distilled water and concentrated sulphuric acid. The mixing must be carried out either in a lead-lined tank or in suitable glass or earthenware vessels. Slowly add the acid to the water, stirring with a glass rod. *Never add water to acid*, as the resulting chemical reaction causes violent and dangerous spurring of the concentrated acid. The specific gravity of the filling electrolyte depends on the climate in which the battery is to be used.

The approximate proportions of acid and water are indicated in the following table:

| To obtain Specific Gravity<br>(corrected to 60°F.) of | Add 1 vol. of acid 1.835 S.G.<br>(corrected to 60°F.) to |
|-------------------------------------------------------|----------------------------------------------------------|
| 1.270                                                 | 2.8 vols. of water                                       |
| 1.210                                                 | 4.0 vols. of water                                       |

Heat is produced by the mixture of acid and water, and the electrolyte should be allowed to cool before pouring it into the battery.

The total volume of electrolyte required can be estimated from the figures quoted in the table on page 2.

##### Filling the Battery

Carefully break the seals in the cell filling holes and fill each cell with electrolyte to the top of the separators, *in one operation*. The temperature of the filling room, battery and electrolyte should be maintained between 60°F. and 100°F. If the battery has been stored in a cool place, it should be allowed to warm up to room temperature before filling.

##### Putting into Use

Batteries filled in this way are 90 per cent charged. If time permits, however, a freshening charge of four hours at the normal recharge rate given in the table would be beneficial.

During the charge the electrolyte must be kept level with the top edge of the separators by the addition of distilled water. Check the specific gravity of the acid at the end of the charge; if 1.270 acid was used to fill the battery, the specific gravity should now be between 1.270 and 1.290; if 1.210, between 1.210 and 1.230.

##### Maintenance in Service

After filling, the battery needs only the recommended attention.



# **BSA SERVICE SHEET No. 806**

*Reprinted March 1958*

## **All Models**

### **LAMPS**

#### **LUCAS LIGHTING**

##### **Headlamps**

Although the headlamps fitted to individual models may vary in detail, they remain similar with regard to the general features described below. All headlamps are fitted with a double filament main bulb and a pilot bulb. One of the double filaments provides the main riding beam while the second, brought into operation by means of the dipper switch, provides the dipped beam.

On some models the headlamp incorporates a panel containing the ammeter and lighting switch but if a cowl is fitted then it carries these components externally to the headlamp shell.

Other headlamps contain wire wound resistances for the purpose of reducing the charging rates under certain conditions and these are described under the appropriate lighting circuit.

##### **Setting and Focusing**

The best way of checking the setting of the lamp is to park the motor cycle in front of a light coloured wall at a distance of about 25 feet. If necessary, slacken the bolts securing the headlamp and move the lamp until, with the main driving light switched on, the beam is projected straight ahead and parallel with the ground. With the lamp in this position, the height of the beam centre from the ground should be the same as the height of the centre of the headlamp from the ground.

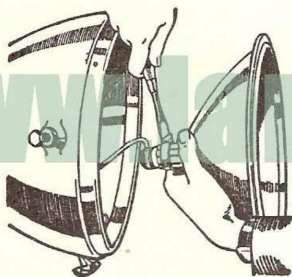


Fig. Y.22 Headlamp Focusing.

The headlamp must be focused so that, when the main driving light is switched on, a uniform beam without any dark centre is given. If the bulb needs adjusting, remove the lamp front and reflector, as described below, and slacken the bulb holder clamping clip at the back of the reflector. Move the bulb holder backwards and forwards until the correct position is obtained, and then tighten the clamping clip.

More sealed beam light units are fitted with the pre-focus type of bulb and therefore no focusing is necessary.

##### **Removal of Front and Reflector, pre-1948 models**

Press back the fixing clip at the bottom of the lamp. The front and reflector can now be taken off. The bulb holder is secured to the reflector by means of two fixing springs. When replacing the front, locate the top of the rim first, then press on at the bottom and secure with the fixing clip.

**1948 Models (Fig. Y.23)**

Press back the fixing clip at the bottom of the lamp, and remove the lamp front. The reflector is secured to the lamp body by means of a rubber bead. When refitting the rubber bead, locate its thinner lip between the reflector rim and the edge of the lamp body. To replace the front, locate the metal tongue in the slot at the top of the lamp, press the front on, and secure by means of the fixing catch.

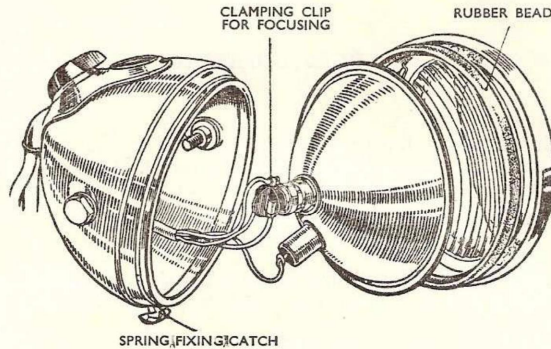


Fig. Y.23.

**Sealed Beam Headlamps**

Later models are fitted with a sealed light unit having the reflector and glass sealed together. After slackening the securing screw on the top of the headlamp, the rim, complete with light unit, may be removed. To replace, locate the rim on the lip at the bottom of the lamp body, press the light unit assembly and rim into position and tighten the securing screw. The main headlamp bulb in some of these headlamps is of the pre-focus type and is held in position by a cap with bayonet type fitting. In all cases access to the main or pilot bulbs is obtained by removal of the light unit assembly.

Breakage of the headlamp glass with this type of unit involves replacement of the glass and reflector complete. The light unit may be removed from the headlamp rim after prising out the retaining clips.

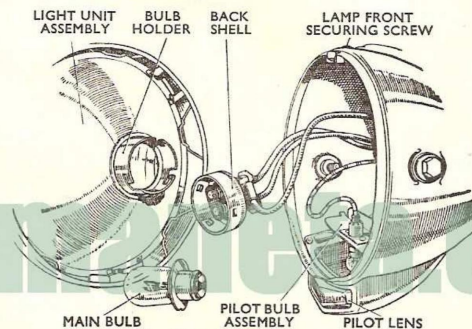


Fig. Y.24 Sealed Beam Unit.

**Replacement of Bulbs**

When the replacement of a bulb is necessary, it is important not only that the same size bulb is fitted, but that it has a high efficiency and will focus in the reflector. Cheap and inferior replacement bulbs often have the filament of such a shape that it is impossible to focus correctly; for example, the filament may be to the one side of the axis of the bulb resulting in loss of range and light efficiency.

Lucas Genuine Spare Bulbs are specially tested to check that the filament is in the correct position to give the best results with Lucas lamps. To assist in identification, Lucas bulbs are marked on the metal cap with a number. When fitting a replacement, see that it has the same number as the original bulb.

**B.S.A. Service Sheet No. 806 (cont.)**

When fitting a main headlamp bulb, care must be taken to insert it the correct way round, i.e. with the dipped beam filament above the centre filament.

The pre-focus type bulb is located by a flange and there is a notch which engages on a raised portion of the bulb holder to ensure correct positioning.

Where the pilot bulb is contained in an underslung cowl, the metal strip on which the bulb is mounted should be pushed to the rear and lifted away in order to provide access to the bulb.

**Tail Lamps**

Where the tail lamp is of the metal type the body or back should be removed by pushing it in, rotating to the left, and pulling away, thus providing access to the bulb. The moulded plastic type of rear lamp can be dismantled by unscrewing the two screws in the cover.

When a stop lamp is fitted, a two-filament type of bulb is employed with offset bayonet type fixing pins to ensure that it can only be fitted correctly.

**MAIN BULBS**

**Models A7, A10, B31, 32, 33, 34, C12 and M20, M21.**

Lucas No. 168, 6v. 24/24w. (with E3H Dynamo). Lucas No. 169, 6v. 30/30w. (with E3L Dynamo). Lucas No. 312, 6v. 30/24w. (Pre-focus type Bulb).

**Models C10 and C11.**

Lucas No. 180, 6v., 18/18w. (with E3H Dynamo). Lucas No. 168, 6v. 24/24w. (with E3L Dynamo).

**Models C11G and D1 (early) Lucas**

Lucas No. 312, 6v. 30/24w. (Pre-focus type Bulb).

**PILOT**

Lucas No. 200, 6v. 3w. Lucas No. 988, 6v. 3w. (with Sealed Beam Light Unit).

**TAIL**

Lucas No. 205, 6v. 6w.

Lucas No. 384, 6v. 6/18w. (Stop/Tail Lamp).



# **BSA SERVICE SHEET No. 807**

*Reprinted March, 1958*

## **All Models**

### **ELECTRIC HORN—HIGH FREQUENCY MODELS**

#### **General**

Electric horns are adjusted to give their best performance before leaving the Works, and will give long periods of service without any attention.

#### **Servicing**

If the horn becomes uncertain in action or does not vibrate, it does not follow that the horn has broken down. The trouble may be due to a discharged battery or a loose or broken connection in the horn wiring.

The performance of the horn may be upset by the fixing bolt working loose, or by the vibration of some part adjacent to the horn. To check this, remove the horn from its mounting, hold it firmly in the hand by its bracket and press the push. If the note is still unsatisfactory, the horn may require adjustment, but this should only be necessary after a very long period of service.

#### **Method of Adjusting**

The adjustment of a horn does not alter the characteristics of the note but merely takes up wear of vibrating parts.

If the horn is used repeatedly when badly out of adjustment, due usually to unsuccessful attempts at adjustment, the horn may become damaged, due to the excessive current which it will take. When testing, do not continue to operate the push if the horn does not sound. If, when the push is operated, the horn does not take any current (indicated by an ammeter connected in series with the horn) it is possible that the horn has been adjusted so that its contact braker is permanently open.

After adjusting, note the current consumption, which must not exceed 3—4 amperes. A horn may give a good note, yet be out of adjustment and taking an excessive current. When adjusting do not attempt to unscrew the nut securing the tone disc or any other screw in the horn.

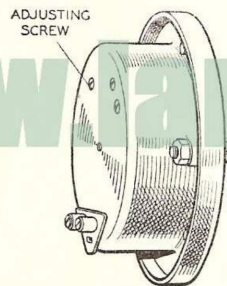


Fig. Y 26

Typical electric horn, showing adjustment screw.

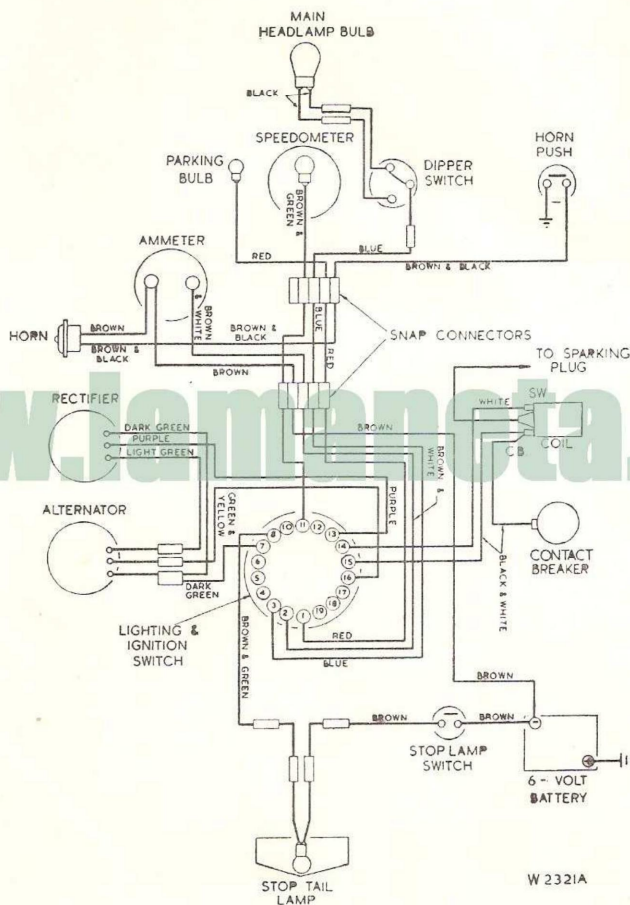
The adjustment is made by turning the adjustment screw, usually in a clockwise direction. The underside of the screw is serrated, and the screw must not be turned for more than 2 or 3 notches before retesting. If the adjustment screw is turned too far in a clockwise direction, a point will occur at which the armature pulls in but does not separate the contacts.

# BSA SERVICE SHEET No. 808D

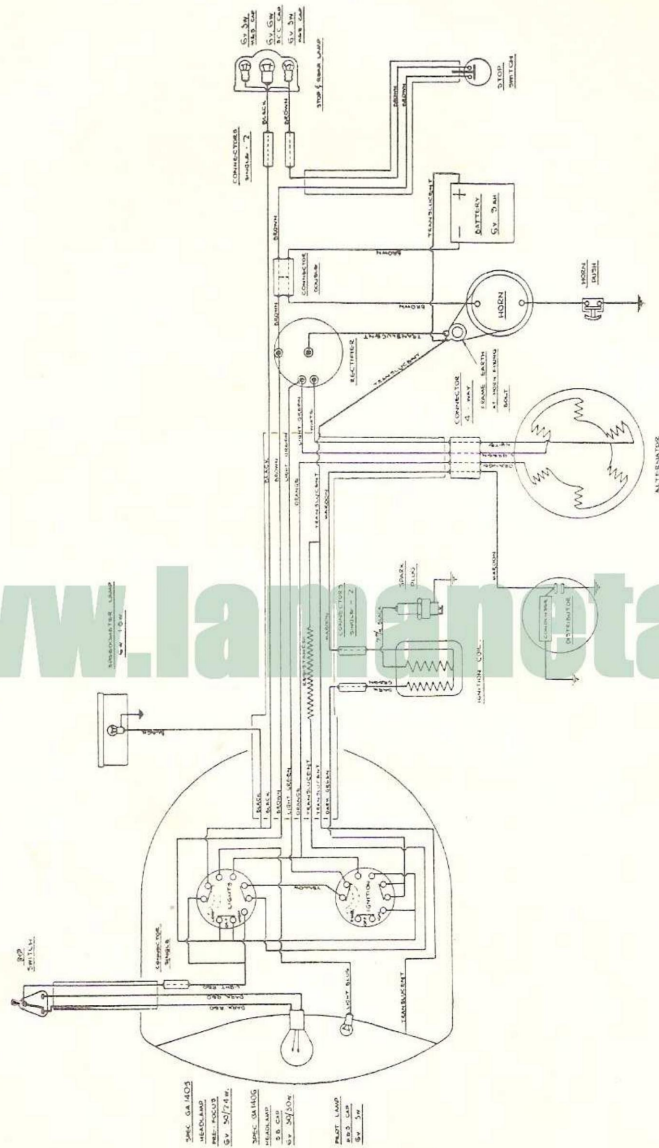
1956 C Group Models

WIRING DIAGRAMS

C12



# C10L (1956)



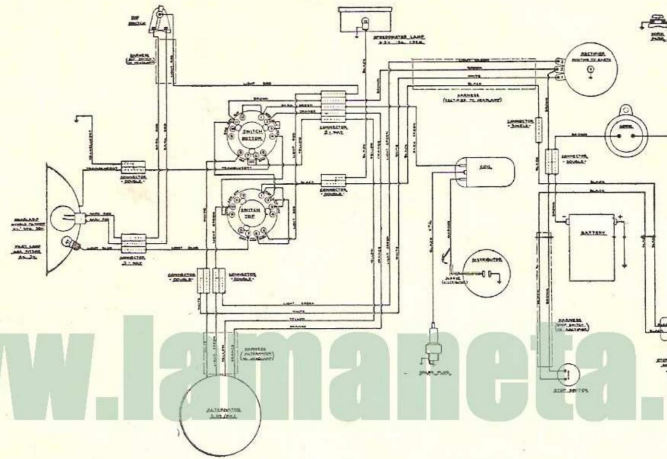


# BSA SERVICE SHEET No. 808C

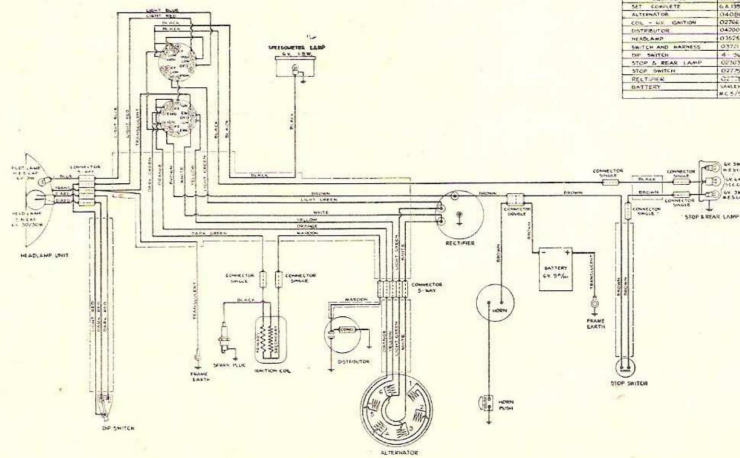
## WIRING DIAGRAMS

Reprinted January, 1958

### Model C10L (Wipac Lighting)

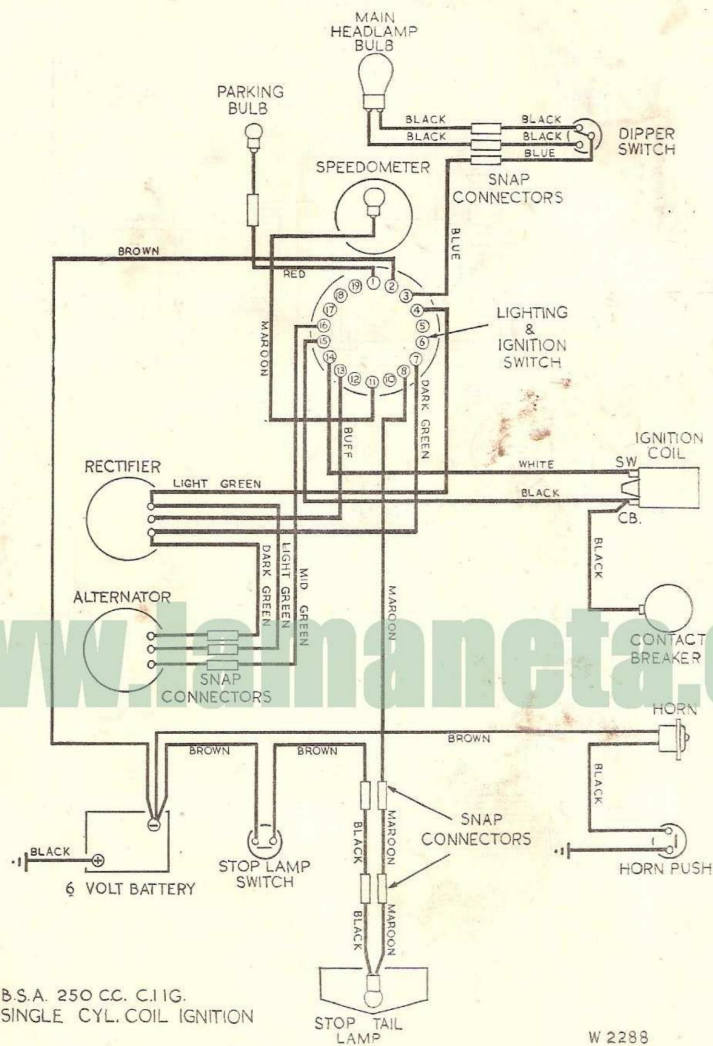


1954 Models



1955 Models

**Model C11G  
(Lucas Lighting)**



B.S.A. 250 CC. C11G.  
SINGLE CYL. COIL IGNITION

W 2288

B.S.A. MOTOR CYCLES LTD.  
Service Dept., Birmingham 11  
Printed in England.

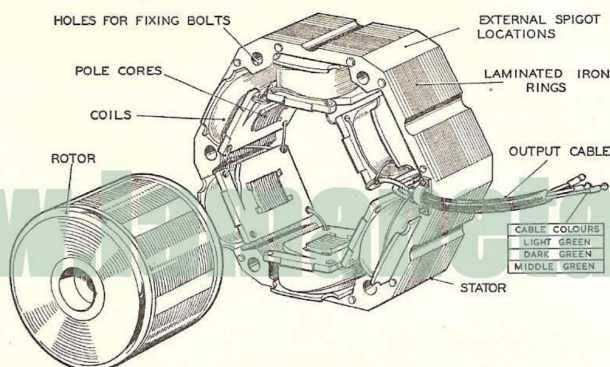
# BSA SERVICE SHEET No. 813

November, 1954

## Model C11G LUCAS LIGHTING

The electrical system used on these models provides D.C. for the battery, ignition coil and lights, by passing the A.C. output of the generator through a bridge type rectifier.

The alternator is connected to a section of the headlamp switch so that the output is automatically matched to the demands of the lighting circuit and the characteristics of the alternator prevent overcharging.



STATOR & ROTOR OF LUCAS RM14 MOTOR CYCLE ALTERNATOR

Fig. Y43 Lucas Alternator

### 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 Light Green and Dark Green Wires, and the remaining coils (Light Green and Middle Green wires) are shorted out.

#### Lighting Switch in "PILOT" position

Output taken from one pair of coils by Light Green and Dark Green 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.



#### **B.S.A. Service Sheet No. 813 (cont.)**

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 Medium Green Alternator Cable by its snap connector to the Dark Green Harness Cable and the Dark Green Alternator Cable to the Medium Green Harness Cable. The Light Green 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.

#### **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
- D.C. ammeter scale 0-15 volts
- 1 ohm. load resistance
- 12 volt battery and 36 watt bulb

When checking the alternator output the engine should be run at approximately 2,000 r.p.m.

If the performance of the alternator has proved unsatisfactory, it is advisable to first check the wiring to make sure that good contact is being made at the various connections and that none of the wiring or alternator coils are shorting to the frame.

**B.S.A. Service Sheet No. 813 (cont.)**

**Test 1**

Connect a suitable D.C. ammeter in series with the battery. Make sure that the battery connections are sound and that the alternator and switch wiring are standard. The charging rate should be as listed in the table below:

|                            |                                       |
|----------------------------|---------------------------------------|
| Switch in "OFF" position   | $1\frac{1}{2}$ — $2\frac{1}{2}$ amps. |
| Switch in "PILOT" position | $\frac{1}{2}$ — $1\frac{1}{2}$ amps.  |
| Switch in "HEAD" position  | $\frac{1}{4}$ — $\frac{3}{4}$ amps.   |

If the battery is in poor condition or a low state of charge, this may affect the charging rate slightly, and if it is suspect, it should be replaced by a battery in good condition.

Reduced charge or no charge with the switch in the "OFF" and "PILOT" positions may indicate that this pair of coils are shorted or on open circuit.

Reduced charge or no charge with the switch in the "HEAD" position only, may indicate that the remaining two pairs of coils are shorted or on open circuit.

Reduced charge in all switch positions is likely to be due to a damaged rectifier, but may be caused by any of the faults listed above.

If Test 1 indicates that a fault may lie with either the generator or rectifier, then they should be individually checked by Tests 2 and 3.

**Test 2**

Disconnect the alternator by means of the snap connections and connect a 1 ohm resistance across each set of the alternator output leads in turn. The resistance must be accurate and capable of taking a current of 8 amps without overheating. An A.C. voltmeter across the resistance should give the following readings:

|                                                                    |         |               |
|--------------------------------------------------------------------|---------|---------------|
| Between Light Green and Dark Green Leads                           | .. .. . | 3—4 volts     |
| Between Light Green and Middle Green Leads                         | .. .. . | 6—7 volts     |
| Between Light Green and combined Middle Green and Dark Green Leads |         | 8.5—9.5 volts |

If the readings are low or zero the alternator has been demagnetised or otherwise damaged.

**Note:** If current from the battery passes through the alternator when the engine is running the rotor can become partly de-magnetised. This may happen if the rectifier breaks down or if the battery connections are reversed. Always make sure that the positive terminal of the battery is connected to the frame of the machine.

If a faulty alternator is detected, the rectifier and remainder of the circuit must still be tested as a damaged alternator is likely to be caused by another fault in the circuit.

### Test 3

The rectifier must be disconnected before it is tested.

Connect the negative side of the 12v. battery, in series with the 6w. bulb, to the earth terminal of the rectifier. Connect the positive side of the battery to each of the rectifier A.C. terminals in turn. The bulb should light in both positions.

Reverse the battery leads and repeat the tests. The bulb should not light in either position.

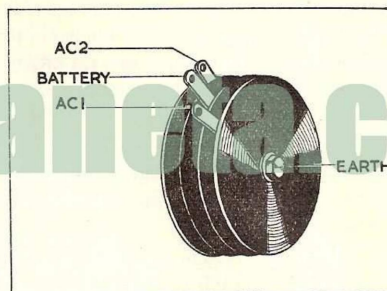


Fig. Y44 Rectifier Terminals

Connect the positive terminal of the battery, in series with the bulb, to the central D.C. battery terminal of the rectifier. Connect the negative terminal of the battery to each of the rectifier A.C. terminals in turn. The bulb should light in both positions.

Reverse the battery connections and repeat the tests. The bulb should not light in either position.

If the rectifier fails to comply with any of the above tests it is faulty and must be replaced.

### Headlamp Switch

If both the rectifier and alternator appear satisfactory the wiring and switch contacts must be checked most carefully to eliminate any possible faults. The correct headlamp switch connections are shown in Service Sheet 808A.

### Alternator Removal and Replacement

The procedure for removing and replacing the alternator is described in Service Sheet 409 on Primary Transmission. Note that the stator should be assembled with the clip retaining the output cables on the side of the stator facing the engine.