BSA

SERVICE SHEETS

350 OHV
500 OHV

B group models
with Swinging Arm

BSA SERVICE SHEET No. 202

"A" Group Models

Reprinted June 1960.

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 timing case. All oilways are internal except for the supply and return pipes to the tank and the feed to the rocker spindles. The oil flows from the tank—through a filter in the tank—to the supply portion of the pump, which delivers it past an automatic valve to the timing side main bearing, and thence to the hollow crankshaft and the big-end bearings.

Oil pressure in maintained at the big-ends by the pressure release valve *A* (Fig. A2). When the pressure in the system exceeds 50/60 lbs. per square inch, this valve opens and allows surplus oil to be passed into the bottom of the timing case.

On A10 machines after Engine No. ZA10–4712, and A7 machines after Engine No. AA7–101, the crankcase has been modified to provide an additional oil supply to the cylinders. The oil by-passed by the pressure release valve is now fed through drilled oilways to the camshaft trough, and is then directed on the cylinder walls (Fig. A2A). A small bleed hole also provides additional lubrication to the timing gear.

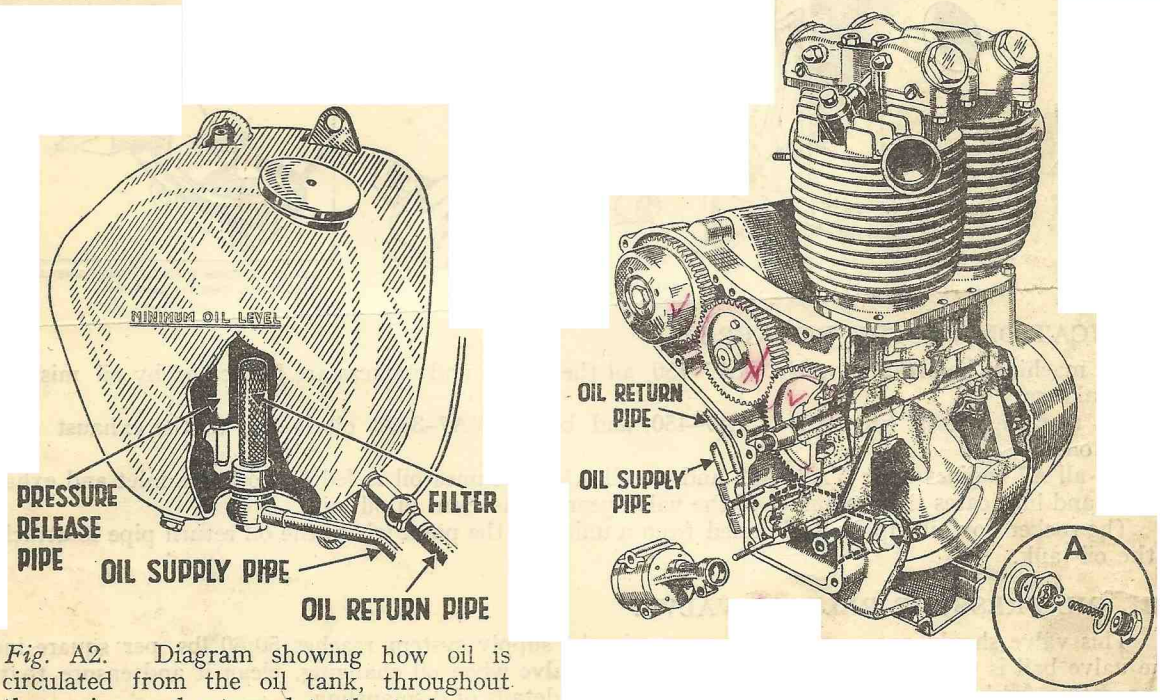

Fig. A2. Diagram showing how oil is circulated from the oil tank, throughout the engine, and returned to the tank.

After lubricating the big-ends and circulating through the engine in the form of mist, the oil drains down through a filter in the bottom of the crankcase.

From there it is drawn through a non-return valve by the return portion of the pump (large gear set) and delivered up the return pipe to the tank.

To check the flow of oil in the lubricating system, remove the tank filler cap while the engine is running. Oil should be seen issuing from the return pipe from the crankcase.

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 remedied by inserting a piece of flexible wire into the outer end of the pipe to clear any obstruction.

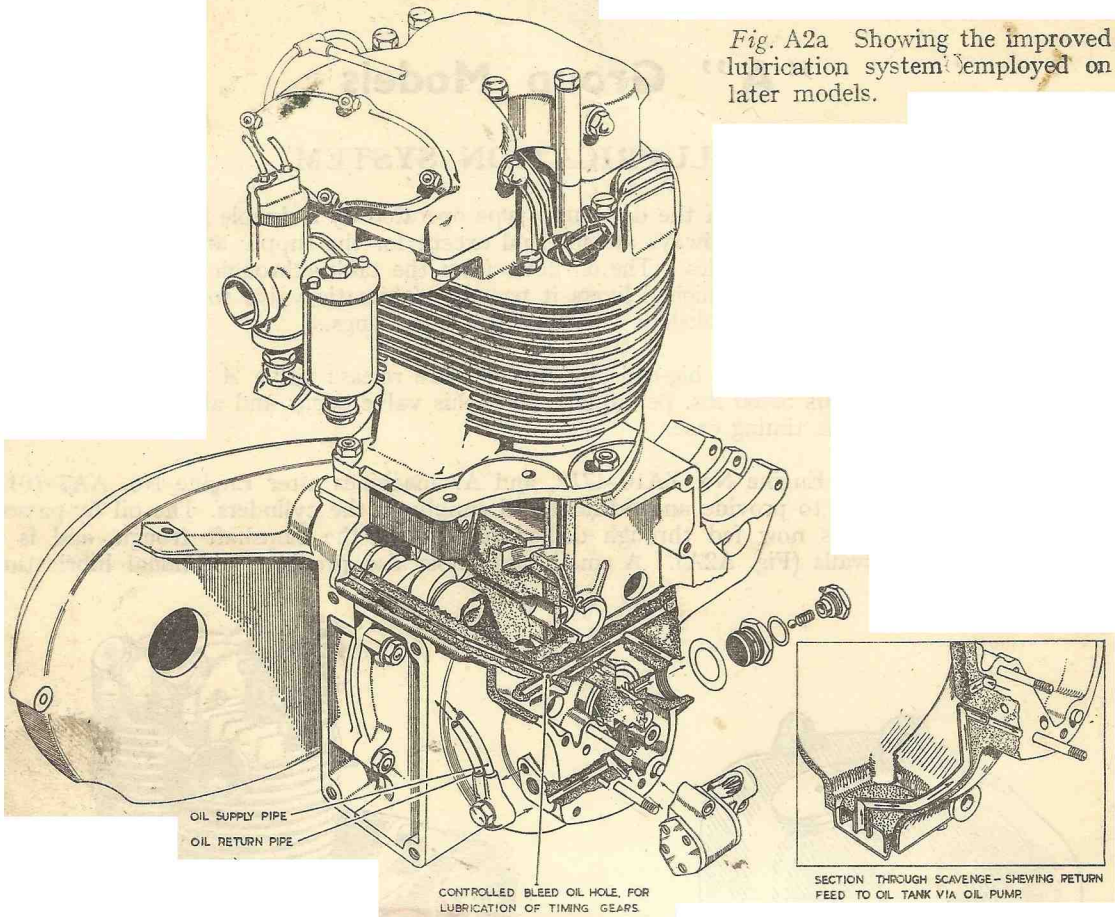

Fig. A2a Showing the improved lubrication system employed on later models.

LUBRICATION OF THE ROCKERS

On machines before Engine No. XA7–450, all the valves and rockers are lubricated by oil mist from the crankcase.

On machines from Engine No. XA7–450, and before YA7–3402 oil is fed to the exhaust rocker spindle only.

On all A7 engines after YA7–3402 and on all A10 machines oil is fed to both the inlet and exhaust rockers and lubricates the remainder of the valve gear in the form of oil mist.

The rocker box oil supply is obtained from a union to the point where the oil return pipe is attached o the oil tank.

THE OIL PRESSURE RELEASE VALVE.

This valve should open when the pressure in the supply system reaches 50/60 lbs. per square inch. The valve ball is of 5/16in. diameter. Remove the valve when oil changing, clean it and ensure that it is operating freely. See Service Sheet 203 for further details of dismantling.

OIL CHANGE.

In case of new or re-conditioned engines, the oil should be drained and renewed after the first 250 miles, and again after 500 miles. Then periodically every 2,000 miles.

Drain the oil tank and the sump, preferably when the engine is hot, by removing the drain plug and the banjo with the filter at the bottom of the tank. Also the drain plug and the cover with the filter on the bottom of the crankcase. Clean by washing in petrol. Before replacing make sure that the parts are quite dry.

On Swinging Arm models the construction of the oil tank is slightly different, but the system of oil flow is the same. The oil filter is attached to the hexagon nut in the side of the tank and unscrewing it will provide access to the filter without disturbing the oil supply pipes.

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(PRINTED IN ENGLAND)

BSA SERVICE SHEET No. 212A

May 1954
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A, B and M Group Models

(For A7 Models before Engine No. ZA7 101. See Service Sheet 212)

ADJUSTMENT, DISMANTLING AND RE-ASSEMBLY OF FRONT HUB AND BRAKE (7 in. Brake)

Wheel Removal and Replacement

To remove the front wheel, first disconnect the brake cable, then slacken the pinch bolt *A* (Fig. A31(a)). Insert a tommy bar in the hole in the head of the spindle at *B* and unscrew the spindle, noting that it has a left hand thread and therefore unscrews in a clockwise direction. With the spindle withdrawn the bush *C* should be pulled out to its fullest extent. This will leave the wheel free to be pulled away from the right hand fork leg and withdrawn from the machine.

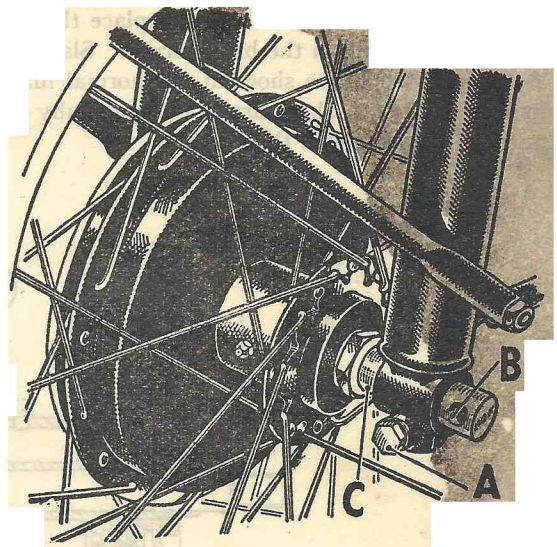

Fig. A31(a). Wheel Removal

The wheel is replaced in the reverse order, noting that the brake plate stop must be located in its recess at the rear of the right hand fork leg. It is most important that after the spindle has been tightened and before the pinch bolt is tightened, the forks are depressed once or twice to enable the left hand fork end to position itself on the distance bush. If this precaution is not observed, the fork leg may be clipped out of position and will not function correctly.

Dismantling and Re-assembly of the Hub

This is fitted with ball journal bearings and therefore no adjustment is necessary or provided for. The only attention required is periodical grease gun lubrication.

If it becomes necessary to replace the bearings unscrew the nut retaining the brake anchor plate and remove the plate together with the brake mechanism.

Unscrew the cap *A* (Fig. 32(a)) noting that this has a left hand thread and therefore unscrews in a clockwise direction. Using a hide mallet from the brake drum side, drive out the hollow spindle *B* which will carry with it the nearside ballrace *C*, dust Cap *D*, and distance piece *E*.

Only the offside ballrace *F* now remains in the hub and this should be driven out with the aid of a soft drift.

During re-assembly ensure that the ballrace *F* is fully home and that the retaining collar *A* is quite tight.

Brake Relining

To remove the brake shoes lay the drum cover plate flat on a bench and lever the shoes upwards. They can then be drawn over, and free of the cam and fulcrum pin. If the cam pads show excessive wear the brake shoes should be renewed.

When the brake shoes are removed the linings can be replaced as described in Service Sheet 612.

When new linings or new shoes have been fitted, the brakes must be centralised after refitting the wheel. To do this, replace the brake cover plate, complete with shoes, fulcrum pin and cam in the brake drum. Slacken the fulcrum pin nut, and turn the cam so as to open the brake shoes in the normal manner. The fulcrum pin will then move in its slot until both shoes are pressing equally on to the drum. Tighten the fulcrum pin nut firmly and release the brake.

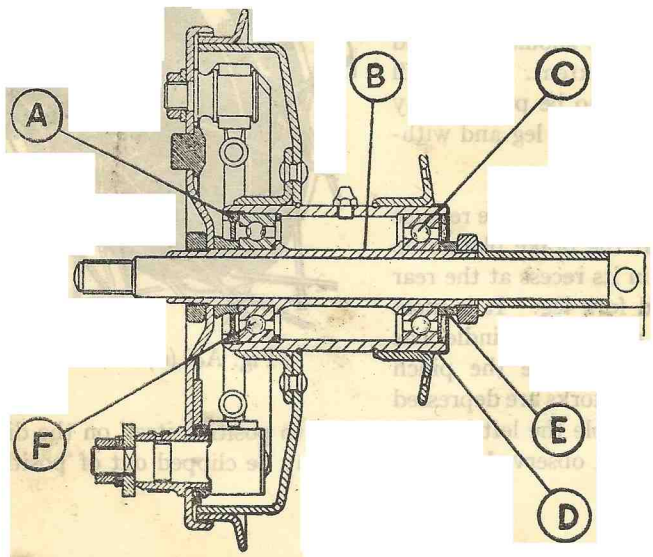

Fig. A32(a). Section of Front Hub (7 in. Brake)

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B.W.

BSA SERVICE SHEET No. 212B

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"A", "B" AND "M" GROUP MODELS

ADJUSTMENT, DISMANTLING AND RE-ASSEMBLY OF FRONT HUB AND BRAKE (8 in. Brake)

Wheel Removal and Replacement

To detach the wheel, first disconnect the brake cable by pushing it out of the brake clip at (E) and unscrewing it from the bracket at (F). Remove the torque arm nut (C) and undo the pinch bolt (A). Insert a tommy bar in the hole in the head of the spindle at (B) and unscrew the spindle, noting that it has a left-hand thread and therefore unscrews in a clockwise direction. Support the wheel as the spindle is withdrawn, and when it is clear the wheel can be pulled away from the right-hand fork leg and removed from the machine.

After removal do not let the wheel fall on to the bush which projects from the brake drum side of the hub. Although the bush is pressed in, it may, if subjected to a sharp blow, be forced back into the hub. If this should happen the bush can be retrieved and re-positioned with the aid of the wheel spindle.

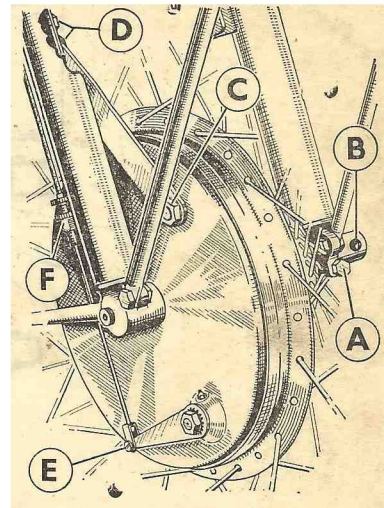

Fig. A31b. *Wheel Removal.*

The wheel is replaced in the reverse order to that for removal. It is most important that after the spindle has been tightened and before the pinch bolt is tightened, the forks are depressed once or twice to enable the left-hand fork end to position itself on the spindle shank. If this precaution is not observed, the fork leg may be clipped out of position and will not function correctly.

Dismantling and Reassembly of the Hub

Withdraw the brake plate which is a push-fit on the bush (B) Fig. A32b. Remove the locking split pins and unscrew the bearing retaining collars (C) and (D), which have normal right-hand threads. Replace the spindle and drive out the brake side ballrace (E) together with the bush (B) by striking the end of the spindle with a hide mallet. Only the ballrace (F) now remains in the hub and can be removed with a suitable soft drift.

Before replacing the bearing retaining collars ensure that the rubber oil seals in them are in good condition. The collars should be done up quite tight and if necessary fresh holes should be made for the locking split pins.

Brake Relining

To remove the brake shoes lay the drum cover plate flat on a bench and lever the shoes upwards. They can then be drawn over, and free of the cam and fulcrum pin. If the cam pads show excessive wear the brake shoes should be renewed.

When the brake shoes are removed the linings can be replaced as described in Service Sheet No. 612.

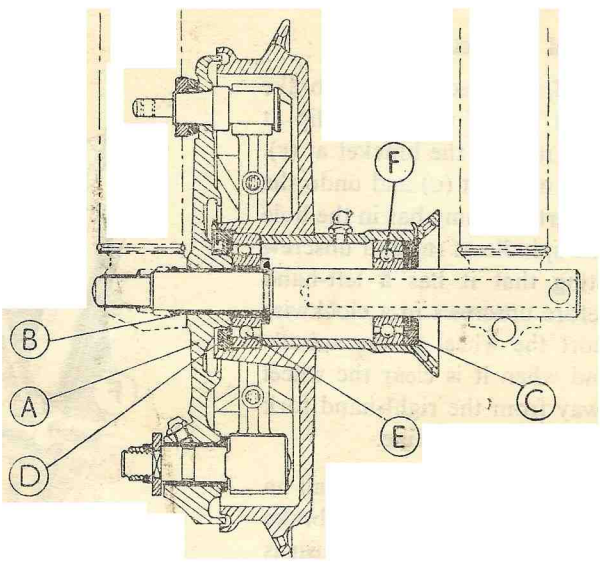

Fig. A32b. *Section of Front Hub* (8 *in. brake*).

BSA SERVICE SHEET No. 212D

May 1954
Reprinted August 1964

"A" AND "B" GROUP MODELS
(with Welded Type Frame)

ADJUSTMENT, DISMANTLING AND RE-ASSEMBLY OF REAR HUB AND BRAKE

Wheel Removal

Removal of the wheel does not affect the chain or brake adjustment. Remove the spindle (B) Fig. A31d, it has a normal right-hand thread and therefore unscrews in an anticlockwise direction. The distance bush (E) falls clear when the spindle is removed and the wheel can then be pulled away from the brake drum and withdrawn from the machine.

When detaching the rear wheel it is quite unnecessary to touch the hexagon nut (A) on the left-hand side.

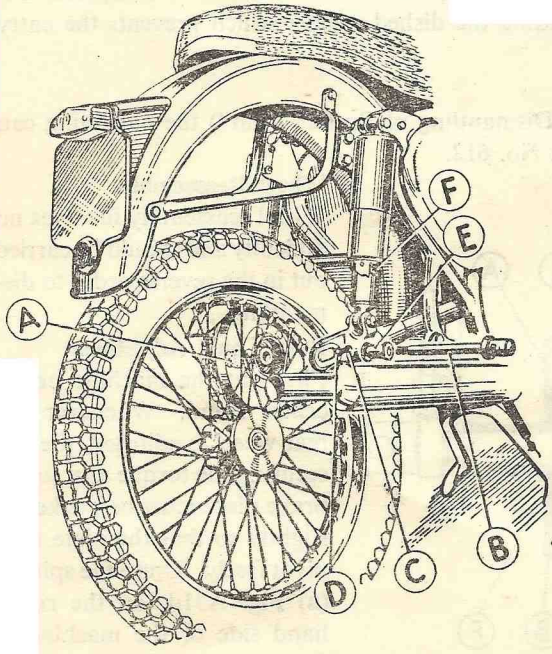

Fig. A31d. *Rear wheel removal.*

Hub Dismantling and Reassembly

The hub is fitted with two ballraces which are a light press-fit on the hollow spindle and in the hub shell. Remove the dust cap (A) Fig. A32d, and felt washer (B). Unscrew the ballrace retaining ring (C). This ring has a left-hand thread and therefore unscrews in a clockwise direction.

With the aid of a suitable soft drift applied to the brake drum end of the hollow spindle (D), drive out the spindle and ballrace (E). Then tap the spindle from the bearing, as the spindle comes away the distance bush (F) will be released. The only parts remaining in the hub are the ballrace (G) and the spacing washer (H), and these need not be disturbed unless the ballrace is suspected of being faulty. Wash it thoroughly in paraffin to remove all trace of grease when any play will be immediately detected. If it is decided to replace the race it can be driven from the hub shell with the aid of a soft drift. During reassembly ensure that this bearing is fully home and that the locking ring (C) is quite tight.

Removal and Dismantling of the Brake Drum

After removal of the rear wheel the brake drum is held in position by the nut (J) and by the nut securing the brake anchor strap. To remove the drum, first disconnect the rear chain and brake rod, then remove the nut (J) and the nut retaining the torque arm to the brake plate. The brake drum can then be pulled away from the brake plate and removed

from the machine. Pivot the brake plate support strap on the cam lever boss so that the brake plate is free to be withdrawn from the fork leg.

To remove the brake shoes lay the brake plate on a bench (shoes uppermost) and lever the shoes upwards. They can then be drawn over and free of the cam and fulcrum pin. The operating cam and fulcrum pin should be inspected but it is unlikely that more than greasing will be necessary. If the cam pads on the brake shoes show excessive wear then new shoes should be fitted. To replace the shoes, attach the springs and push the shoes over the cam and pivot by reversing the dismantling procedure.

If examination of the brake drum shows that the teeth have become worn and the braking surface scored, a new drum must be fitted. The drum must not be machined to produce a new braking surface. To do so is only a temporary cure and further attention would be required later.

The brake drum ballrace, which is totally enclosed in the drum, should not normally require attention. The ballrace is held in position in its housing by a dished washer and a spring circlip (K), which can be removed with the aid of a screwdriver. The replacement ballrace should be well greased before fitting the dished washer which prevents the entry of grease into the brake drum.

Brake Shoe Relining

After removal of the brake shoes (see "Dismantling of Brake Drum") the old lining can be removed as described in Service Sheet No. 612.

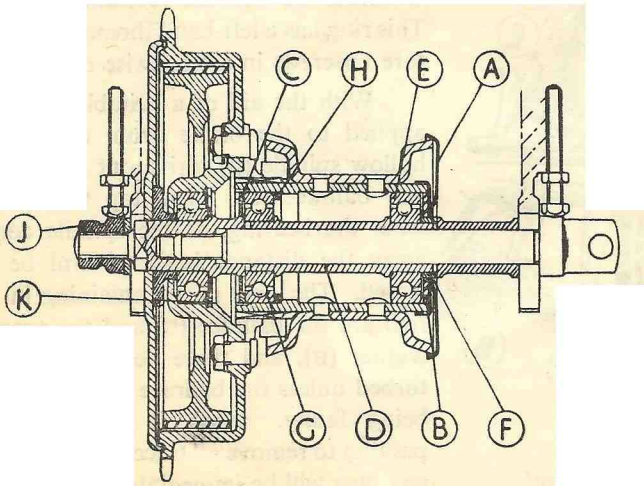

Fig. A32d. *Section through the rear hub.*

Wheel Reassembly

Wheel reassembly involves no difficulty and should be carried out in the reverse order to dismantling.

Rear Chain Adjustment

First put the machine on its centre stand. Whenever the rear wheel is adjusted, the nut securing the torque arm to the brake plate must be slackened slightly so that the plate may pivot freely. Undo the spindle (B) Fig. A31d, on the right-hand side of the machine, a few turns, and slacken nut (A) just sufficiently to allow the wheel to move.

Slacken the locknuts (C) and screw out the adjusters (D) to tighten the chain. With the wheel in its lowest position there should be a total up and down movement of 1¼ in. in the centre of the chain at its tightest point. Ensure that the wheel spindle is against the adjusters and that the wheels are in line. Check the alignment by means of a taut piece of string which should be equidistant from the front and rear of each wheel.

Tighten the nut (A), the spindle (B) and the nut securing the torque arm to the brake plate. Re-check the chain adjustment and the wheel alignment.

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BSA SERVICE SHEET No. 212E

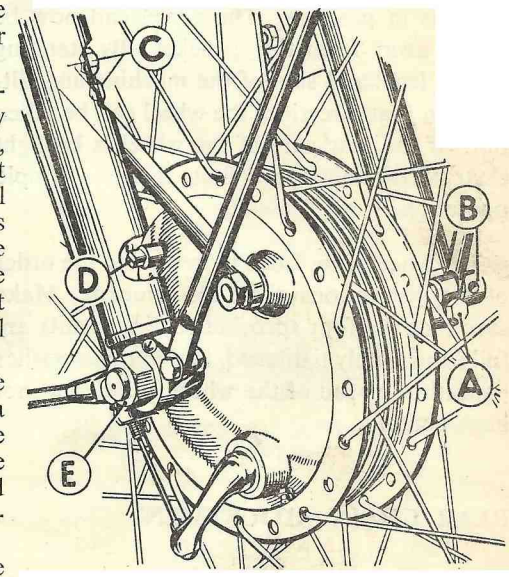
Reprinted September 1963

"A" and "B" Group Models
(with Full Width Hubs)

ADJUSTMENT, DISMANTLING AND RE-ASSEMBLY OF HUBS AND BRAKES

FRONT WHEEL REMOVAL AND REPLACEMENT

To remove the wheel, place the machine on both front and centre stands, take out the two bolts securing the brake anchor strap to the fork leg, and unscrew the large nut from the right-hand side of the wheel spindle. Disconnect the brake cable completely from the brake plate. If sufficient slack cannot be obtained by screwing down the cable adjuster, the outer casing may be released from its holder at the handlebar end.



Next, slacken the pinch bolt in the left-hand fork leg and draw out the spindle by inserting a tommy bar in the hole provided, and using a pulling and twisting motion. At the same time support the weight of the wheel to avoid damaging the bush which projects through the brake plate and partly enters the right-hand fork leg. Should this bush be pushed inadvertently back inside the hub, it can be re-positioned by inserting the wheel spindle from the left-hand side.

There is no distance piece fitted outside the hub, location being maintained by means of a shoulder formed on the spindle meeting the bush already referred to. Once the spindle has been removed, the wheel can be pulled away from the right-hand fork leg and withdrawn.

Refitting is carried out by reversing the procedure for removal, except that tightening the pinch bolt must be left until the machine has been taken off the stands. The forks should then be fully depressed and released several times to ensure that the left-hand leg takes up the correct position on the wheel spindle. The inner edge of the tommy bar hole should be approximately level with the outer face of the fork leg. Finally, tighten the pinch bolt and check the tightness of all other bolts and nuts which have been disturbed.

FRONT WHEEL REMOVAL AND REPLACEMENT (models with Frame prefix letters FA or FB)

To remove the wheel, place the machine on the stand, disconnect the brake cable by removing the split pin and clevis pin on the brake arm. Unscrew the four bolts holding the fork end caps when the wheel will then drop to the ground. Note that there is a register at each end of the spindle to clear the bolts, these also serve to locate the wheel in the forks.

REFITTING

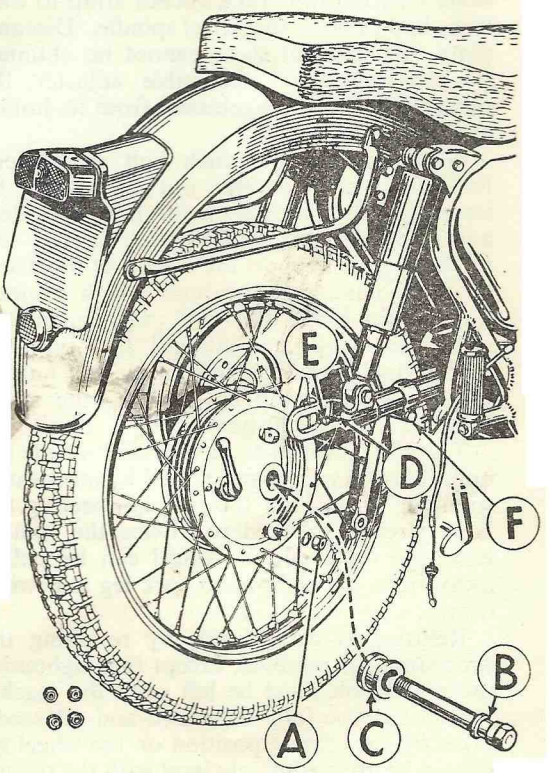
This is simply the reverse of the above procedure but care must be taken to locate the lug on the right-hand leg in the groove on the brake cover plate.

Do not omit the split pin when re-connecting the brake cable.

REAR WHEEL REMOVAL AND REPLACEMENT

Place the machine on the centre stand, and remove the right-hand silencer. Unscrew the four nuts securing the sprocket to the hub. Where the rear chain is totally enclosed, access to these nuts is gained by removing the rearmost of the two rubber plugs in the chaincase. Disconnect the brake cable completely from the brake plate. It may be necessary to disengage the ferrule of the outer casing from the frame lug, in order to obtain enough slack in the inner cable. Take off the brake anchor strap by removing the nut holding it to the brake plate, and loosening the bolt fixing the forward end to the swinging arm fork.

Next, unscrew and take out the wheel spindle from the right-hand side, and extract the distance piece. The large nut on the left-hand fork end should not be disturbed as this holds the fixed spindle of the sprocket which remains in position. The wheel can now be pulled away from the sprocket. By standing on the left-hand side of the machine and tilting it in that direction, the wheel can be taken out. If the rear part of the wheel is brought clear of the mudguard first, this is a simple operation.



The wheel is replaced by reversing the order of the instructions given for removal. Make sure that the four sprocket retaining nuts are fully and evenly tightened, and that the washer beneath the head of the wheel spindle has not been omitted.

REAR CHAIN ADJUSTMENT

The chain must be adjusted while the machine is on the centre stand, with the swinging arm fork at the lower limit of its travel. When a chaincase is fitted, access to the chain is gained by removing the foremost of the two rubber plugs. Rotate the wheel several times to find the position in which the chain is tightest. The total up and down movement in the centre of the top run should be 1¼ in. If the setting varies appreciably from this, the chain should be re-adjusted as follows:—

Slacken the wheel spindle and the fixed spindle nut. Release the two locknuts and screw the adjusting screws in or out as required. Take care that both are turned an equal amount to avoid putting the wheel out of line.

When the tension is correct, secure the locknuts, press the wheel forward in the fork ends and tighten, first the fixed spindle nut and finally the wheel spindle.

WHEEL ALIGNMENT

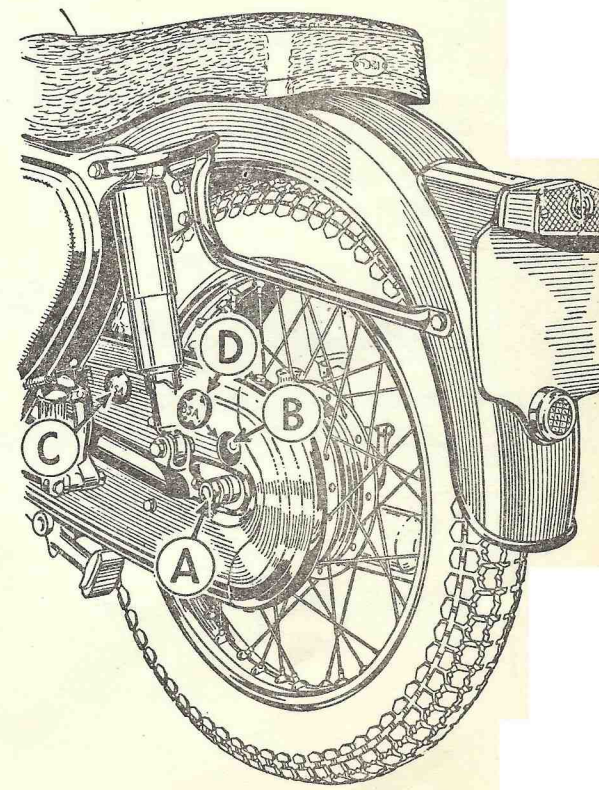
It is advisable to check the aligneent of the wheels periodically, particularly after the chain, has been adjusted. A long straight-edge is placed alongside and close to, the two wheels and supported as high up from the ground as possible. The distances from the straight-edge to the rims, measured at the front and rear of each wheel, should all be equal.

Tyres are unreliable guides in checking wheel alignment, since tyres of different section will give the appearance of error when, in fact, everything is in order.

BRAKE ADJUSTMENT

A fulcrum type adjuster is provided on each brake (except those models with engine prefix letters FA or FB, where adjustment is carried out by screwing in or out, as required, the finger adjusters on the brake cables), in addition to the usual cable adjuster. The adjusting pin should be turned in a clockwise direction until it will turn no further, then slackened off until the wheel rotates freely. The adjusters have a click action, each click representing one-twelfth of a turn.

The brake shoes must not be allowed to bind even slightly, as this may generate sufficient heat to distort the drum, or cause the grease to melt and impregnate the linings.



BRAKE SHOE RECONDITIONING

After the brake plate has been taken from the hub, the adjusting pin should be slackened right off, and the plate laid flat with the shoes uppermost. They can then be levered up at right angles to the plate, pivoting on their ends, until the tension of the springs has been relieved.

Should new linings be required, full instructions for fitting are contained in Service Sheet No. 216

SPROCKET ASSEMBLY—REMOVING AND DISMANTLING

Before the sprocket assembly can be removed, the chaincase must first be taken off. The rear section is held by two hexagon-headed set screws, while the top and bottom sections are secured by two bolts in each, passing through lugs on the swinging arm fork. The large nut on the fixed spindle must also be loosened.

If a chainguard instead of a chaincase is fitted, the four bolts holding it to the swinging arm fork can be taken out to allow the guard to be raised sufficiently to clear the sprocket.

After parting the chain at the spring link, the large nut on the end of the fixed spindle is screwed off. The sprocket can then be dismounted and the spindle tapped out. The bearing and the grease retainer are pressed in, and may be driven out with a suitable drift.

When reassembling note that there should be a large washer between the sprocket and the fork end, and also a smaller washer between the fork end and the fixed spindle nut.

HUB DISMANTLING AND REASSEMBLY

The front hub contains two ball journal bearings which require no adjustment. They are secured by locking rings on the outside, and are located by circlips in the hub shell on the inside. Both locking rings have a right-hand thread, the one on the brake drum side being split-pinned to the hub for additional security. A special peg spanner (part number 61–3542), is used to unscrew the locking rings, which incorporate felt grease seals. Early models had separate seals and steel retainers, the concave sides of which should face the bearings. The bearings themselves are pressed into the hub shell, and can be tapped out with a soft metal drift, taking care not to damage the circlips.

When reassembling, make sure that the circlips are properly seated in their grooves before refitting the bearings. Do not omit the bush from the right-hand bearing, as this has a shoulder on the inner end and cannot be replaced from outside the hub. Note that the locking rings have different sized centre holes, the larger being for the right-hand side.

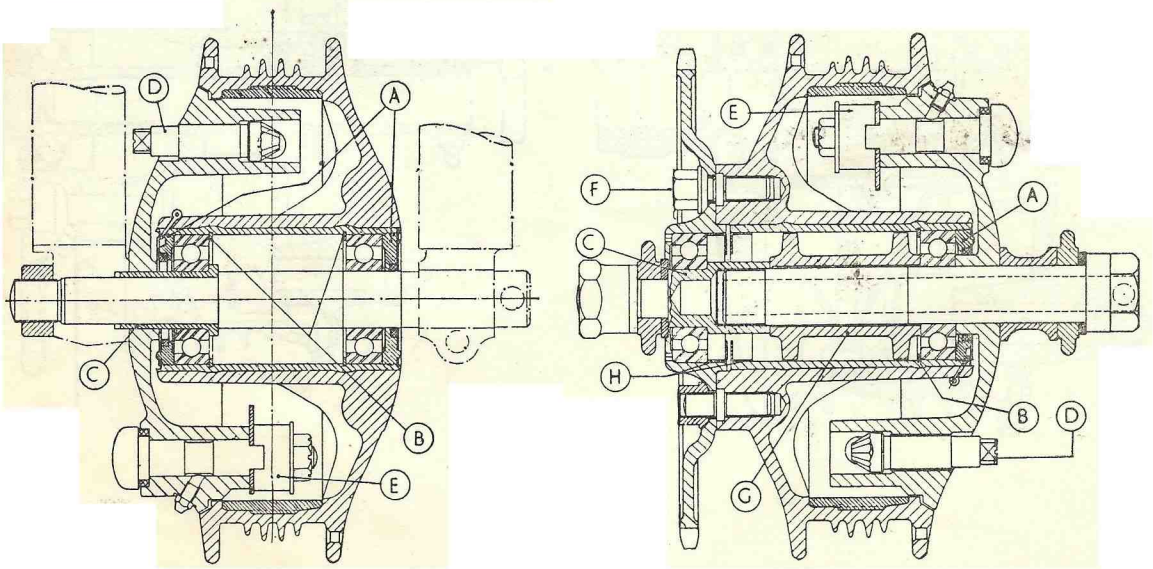
The rear hub carries only one bearing, on the right-hand side, which is held by a locking ring and split pin in exactly the same way as already described for the front hub. It is removed and replaced in a similar manner.

On the left-hand side is a pressed in grease retainer. There is also a loose distance piece inside the hub.

If the bearing locking rings have been renewed it will be necessary to drill fresh split pin holes.

The other rear wheel bearing is housed in the sprocket itself. All four bearings are identical, the part number being 89–3022. No grease nipples are provided on these hubs; the bearings are packed with grease during assembly and they should be re-packed at intervals of 10,000 to 15,000 miles.

The brake cam spindle housings have grease nipples, but these should be used sparingly to avoid forcing grease into the brakes.



HUB DISMANTLING AND REASSEMBLY (models with engine prefix letter FA or FB)

The front hub has two bearings part number 42–5819, the right-hand side can be driven out from the left-hand side using the spindle as a drift, after the brake cover plate and bearing lock-ring have been removed.

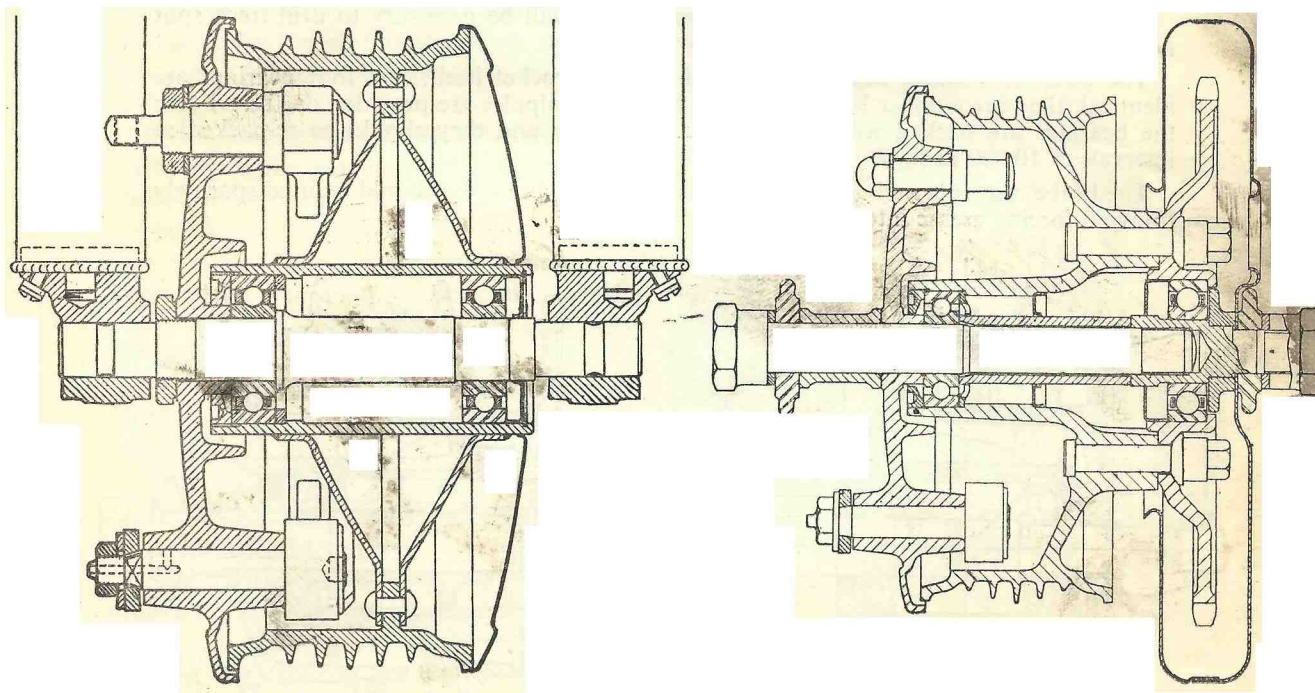
To remove the left-hand side bearing, take out the circlip and dust cover and drive out the bearing from the right-hand side using the spindle reversed.

When replacing the bearings do not omit the ring behind the bearing on the right-hand side.

REAR HUB

The rear hub is similar to the earlier type except that there is only one grease retainer on the sprocket side (bearing number 89–3022) and the right-hand bearing is part number 42–5819, no split pin being used to secure the lock-ring.

There is a smaller grease retainer midway along the centre distance tube.



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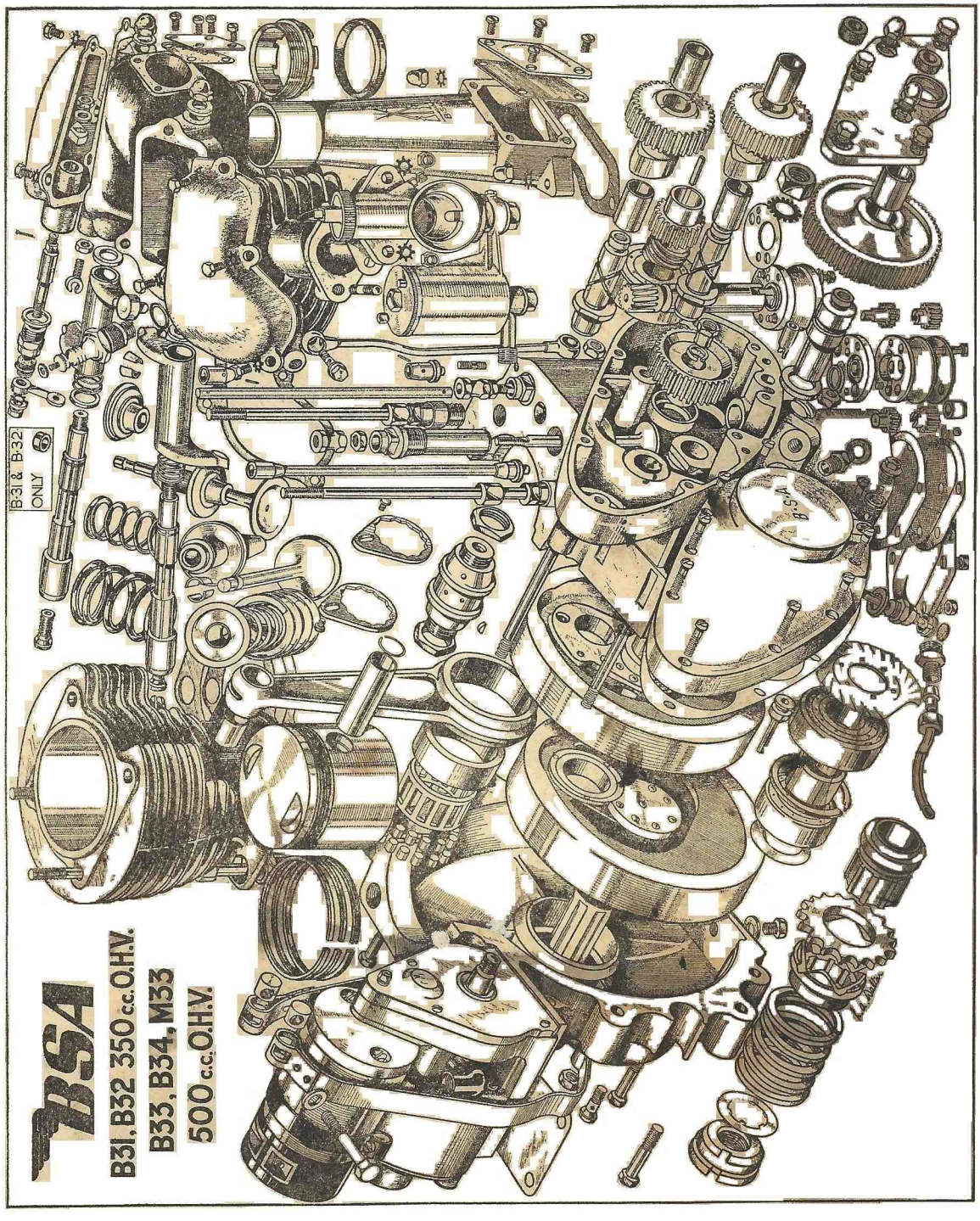

Fig. B1. The "B" Group Engine (Except "C.B." Series) (Exploded View)

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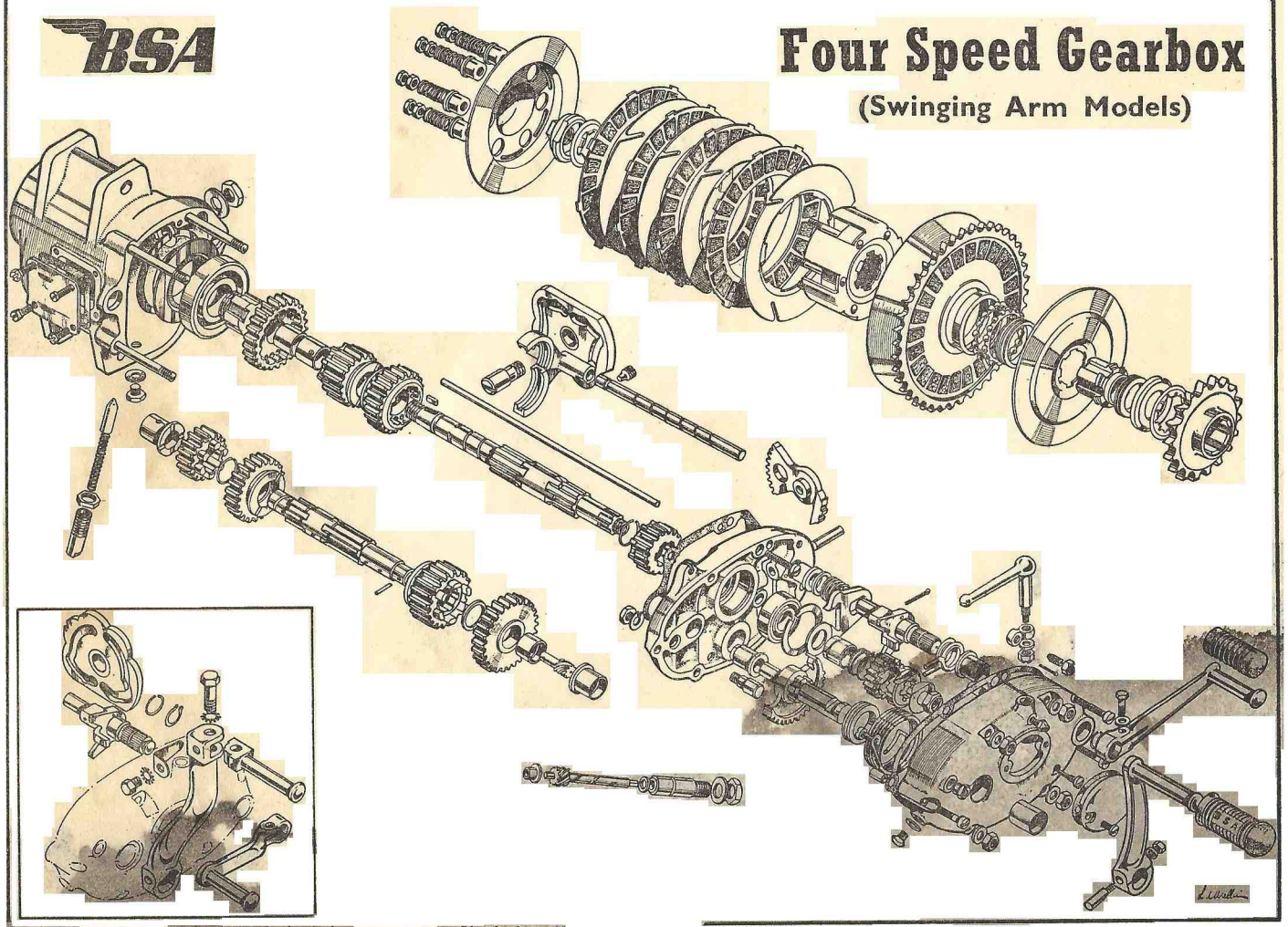
(PRINTED IN ENGLAND)

BSA

Four Speed Gearbox

(Swinging Arm Models)



BSA SERVICE SHEET No. 302A

Service Department, B.S.A. Motor Cycles Ltd., Armoury Road Birmingham 11

M.C. 527

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BSA SERVICE SHEET No. 303

October 1948
Reprinted August 1963

"B" GROUP AND M33 MODELS

ENGINE DISMANTLING FOR DECARBONISING

Symptoms which indicate that Decarbonising is necessary

Decarbonising and "top overhaul" of an engine is extremely simple, but it should only be carried out when the engine really needs it, which normally should be only at periods over 2,000 miles. The usual symptoms are an increased inclination to "pink" (a metallic knocking when under heavy load) due to the building-up of carbon on the top of the piston and inside the cylinder head; a general falling-off of power noticeable mainly on hills, and a tendency for the engine to run hotter than usual.

The correct procedure for decarbonising is described by stages.

Removal of Petrol Tank, etc.

It is first necessary to remove the petrol tank. Turn off the petrol tap and detach the petrol pipe. If the speedometer is mounted in the tank, disconnect the speedometer drive by releasing the strainer bolt under the tank, raising the speedometer clear of the tank and unscrewing the knurled nut connecting the drive to the instrument. If the speedometer is mounted on the fork yoke it need not be disturbed. Remove the tank securing bolts and lift the tank from the frame top tube.

Next detach the high-tension lead and remove the sparking plug. Disconnect the steady-stay from the rear of the cylinder to the frame, and then take off the carburetter by removing the flange bolts. Take care not to damage the carburetter flange washer. By unscrewing the ring nut at the top of the carburetter, the slide can be pulled right out and tied up to the top tube out of the way, while the main body of the instrument can be completely removed. By unscrewing the exhaust pipe and silencer clips to the frame, the pipe and silencer can be removed complete.

Removing Cylinder Head

Disconnect the oil feed pipe from the rocker spindles and the return pipe from the inlet rocker box. Note that the union screw plugs for the oil pipe to the rockers have a much smaller hole in the side than the union for the return pipe—a point to remember when reassembling.

The exhaust valve lifter cable can either be disconnected, or the exhaust rocker box cover removed leaving the cable intact. Remove the inlet valve rocker box cover. Slacken the castellated gland nut securing the push-rod cover tube to the cylinder head (a special "C" spanner is provided for this). Detach the tappet inspection cover at the base of the tube and undo the two acorn nuts clamping the base of the tube to the crankcase.

Lastly unscrew the four long bolts holding the cylinder head and barrel to the crankcase, applying the spanner to the top, or smaller diameter, hexagon. The larger diameter hexagon screws the bolt sockets into the crankcase and should not be touched unless it becomes necessary to replace a holding-down bolt, when the complete assembly of bolt and socket must be fitted.

The cylinder head, complete with push-rod cover tube, should now be raised, the push-rods lifted off the tappets and dropped to the crankcase face. The head and push-rod cover tube can now be lifted upwards and forwards clear of the barrel. Note that the head has plain ground joint to the barrel, no gasket being used. If the head shows a tendency to stick, a few light taps with a wooden mallet under the exhaust port will loosen it. With the head clear of the machine, the push-rod cover tube can be detached.

Decarbonising

Rotate the engine by means of the kickstarter until the piston is at the top of its stroke, and scrape off the carbon deposit with an old penknife, taking care not to damage the piston crown.

All traces of carbon must be cleaned from the cylinder head in a similar manner. This is preferably done after the valves have been removed (see below) in which case care must be taken to avoid damaging the valve seats.

Grinding-In Valves

It is not necessary to remove the rockers in order to take out the valves and spring, but if it is decided to strip the head completely, it is only necessary to undo the acorn nuts on the rocker spindles and tap these out, preferably using a small centre punch so as not to damage the threads on the spindle ends. Careful note should be kept of the rocker assembly for replacement—i.e. the spring, followed by the steel washer, and finally the aluminium oil seal washer.

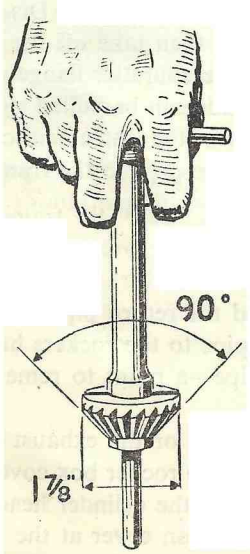

Fig. B3. *The Valve Seat Cutter.*

To remove the valves place a wooden block, of a size which will fit inside the cylinder head, on a bench, and then lay the head over the block with the valve heads resting on it. Lift off the hardened end caps if fitted from the valve ends, and then compress the valve springs until the split collets can be removed. When the collets are out, the valve springs and top collar can be lifted off.

Valve grinding should only be attempted if the seatings are not pitted. If badly pitted the seats must be re-cut, and a special tool 61–3305 is available for this operation Fig. B3. Attempts at grinding-in in this case will result in wear of the valve seats, and the valves may become pocketed.

Smear a small quantity of grinding compound (obtainable from any garage or accessory shop) over the face of the valve, and return the valve to its seat. Hold the valve with the special tool provided and rotate the valve backwards and forwards whilst maintaining a steady pressure. The valve should be raised and turned to a new position after every few

strokes. Grinding should be continued until the valve seat and face show a uniformly polished surface all round. It is most important that valves should be ground-in on their correct seats. Both valves are marked, one "IN" and the other "EX", for identification purposes.

Before replacing the valves and springs, all traces of grinding compound must be removed from both faces and seats, and the valve stems smeared with engine oil.

Replacing Valve Guides

If new valve guides are to be fitted, the removal of the original ones is quite a simple operation, and necessitates the use of a valve guide punch (Fig. B4) and a hammer to drive the guides out of the cylinder head.

For B31, B32 and Gold Star inlet guides use Service Tool number 61–3265, the dimensions of which are (A) ½ in. diameter, (B) .310 in. diameter.

Service Tool number 61–3268, (A) ½ in. diameter, (B) .350 in. diameter should be used for B31, B32 and Gold Star exhaust valve guides and for inlet guides on models B33-34 and M33.

For exhaust guides on B33-34 and M33 use Service Tool number 61–3263 (A) ½ in. diameter, (B) .370 in. diameter.

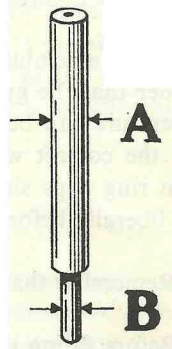

Fig. B4.

Valve Springs

After a period of several thousand miles it may be desirable to renew the valve springs as these tend to lose their efficiency due to heat. If the springs are renewed while decarbonising, it will save dismantling specially to replace them at a later date.

Piston and Ring

While the engine is dismantled, it is advisable to examine the piston, rings and cylinder barrel. Lift the barrel upwards and forwards into the front angle of the frame, and as the piston emerges from the barrel it should be steadied to prevent possible damage. When the barrel is removed, cover the mouth of the crankcase with rag to prevent dust and grit falling in. To remove the piston from the connecting rod it is first necessary to take out one of the gudgeon pin circlips. This is best accomplished with a pointed instrument such as the tang end of a file suitably ground.

Before the gudgeon pin can be withdrawn it may be necessary to heat the piston with the aid of rags immersed in hot water, wrung out, and held round the piston. Then, supporting the piston, tap the gudgeon pin through using a light hammer and a punch.

When the piston is free, mark the inside of the piston skirt at the back, so that it can be replaced the correct way.

If the rings are stuck in the grooves they will need to be carefully prised free and removed from the piston. All carbon deposit should be carefully scraped from the grooves and the inside edges of the rings. If either of the rings shows brown patches on the face, replace with a new ring.

Check the piston ring gap by inserting the piston in the barrel and sliding each ring independently up to the skirt of the piston. Check the gap with feeler gauges; this should not be less than .008 in. or more than .012 in. Fit new rings if the gap exceeds the figure stated. It is advisable to check the gap of new rings before fitting, and if the gap is less then .008 in. the ends of the rings should be carefully filed to the correct limit.

It should be noted that piston rings are very brittle, and unless handled very carefully are easily broken.

Reassembly

Reassembly is carried out in the reverse order and points to note are as follows:—

When assembling the piston it is advisable to heat it as explained in "dismantling" in order that the gudgeon pin can be fitted easily (if a degreaser is available the required temperature can be reached by a few seconds immersion). Make sure that the piston is fitted the correct way round and that the gudgeon pin circlips are firmly located. The piston ring gaps should be "staggered" around the piston circumference and the piston oiled liberally before the barrel is fitted.

Remember that it is essential that the valves are fitted to their correct seats.

Before fitting the cylinder head place the push-rod cover tube in position, but do not screw up the gland nut. Place the push-rods inside the tube and lift the head into position, keeping the head raised until the rods are located on the tappet, then position them on the rockers. Lower the head into position and replace the acorn nuts securing the push-rod tube. Screw up the long cylinder head and barrel bolts in diagonal order until they are tight. The push-rod cover gland nut can now be tightened up and the tappets adjusted as described in Service Sheet No. 604. Connect up the oil feed pipes to the rockers and replace the engine steady stay.

The fitting of the exhaust pipe, valve lifter cable and fuel tank are perfectly straightforward and should present no difficulty.

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B Group Models

REMOVING ENGINE FROM FRAME AND COMPLETE DISMANTLING

Procedure for removal of the engine from the frame will commence from the point reached on Service Sheet No. 303 where the cylinder head and barrel had been removed.

Drain the oil tank, and disconnect the oil pipes. Detach the leads to the dynamo, and the earth wires situated on the magneto near the contact breaker housing. Then disconnect the ignition control cable at the handlebar end.

Models with Engine Prefix Letters G.B.

After draining the oil tank disconnect the leads to the ALTERNATOR and the Contact Breaker.

Chaincase Removal

The chaincase and primary transmission should be removed as described in Service Sheets 307 or 310 on Primary Transmission (on models fitted with alternator refer to Service Sheet No. 315.)

Engine Removal

Remove the bolts securing the engine plates to the crankcase and then unbolt and remove the front engine plates. Slacken the gearbox bolts as these tend to clamp the rear engine plates together. The engine is now ready to be lifted from the frame.

Dismantling the Engine

It is advisable, before commencing to dismantle the engine, to construct a simple jig as shown in the accompanying diagram, on which the engine can be mounted (see Fig. B.5.) Alternatively one of the crankcase lugs can be clamped in a vice, with the weight of the crankcase being taken by a suitable support.

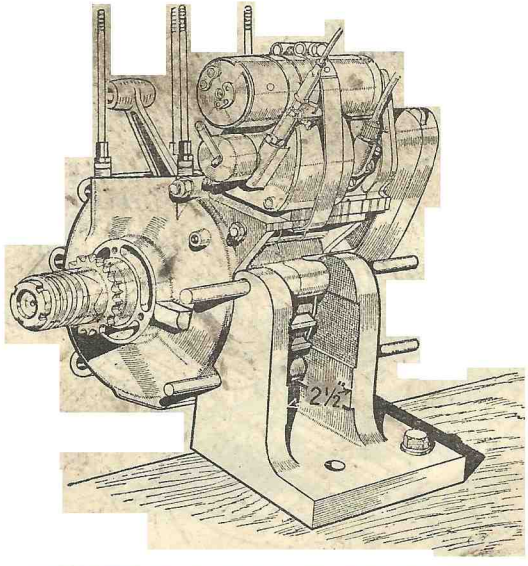

Fig. B.5. Angle Bracket for Mounting Engine

Place a tray underneath the engine to catch any oil which may drip, and then remove the timing cover. Removal of the timing cover screws will be greatly facilitated if a comparatively large screwdriver is used.

Some difficulty may be experienced in removing the timing cover owing to the adhesion of the sealing compound, and in this case the lugs at the end of the cover should be tapped gently to break the joint.

Care should be taken to ensure that the small nozzle in the timing cover which feeds oil to the big-end is not damaged or distorted in any way, as it may subsequently foul the mainshaft and get broken off, and thus starve the big-end and cylinder barrel of lubrication.

Removing Magneto Pinion

This pinion locked on to the magneto shaft by its taper, and after removing the nut, an extractor (61-1903) must be applied to the threads on the inside of the pinion to withdraw the pinion. Next slacken off the magdyno strap bolt, and remove the magdyno as a complete unit.

Note.—There is a composition oil seal washer behind the magneto pinion, and there may be shims fitted to the base of the magneto. These items must be replaced when rebuilding.

Models with Engine Prefix Letters G.B.

The Contact Breaker pinion is secured to its shaft by a pin and circlip and need not be disturbed unless the pinion is to be replaced, the unit can be withdrawn complete with the pinion after the 3 nuts have been removed. A paper gasket is used between the back of the timing case and the Contact Breaker.

Out-rigger Plate

Remove the engine mainshaft nut, and the six bolts which hold the plate in position. It will be noted that all these bolts are not alike, and they must be replaced in the same position as prior to removal. The plate and all the pinions with the exception of the timing pinion can now be removed, and to withdraw this pinion an extractor (61-3256) should be applied. (See Fig. B.6.)

To obviate the possibility of damage to the mainshaft, a plug of suitable dimensions should be placed in the oil hole of the mainshaft. If the pinions are rebushed they should

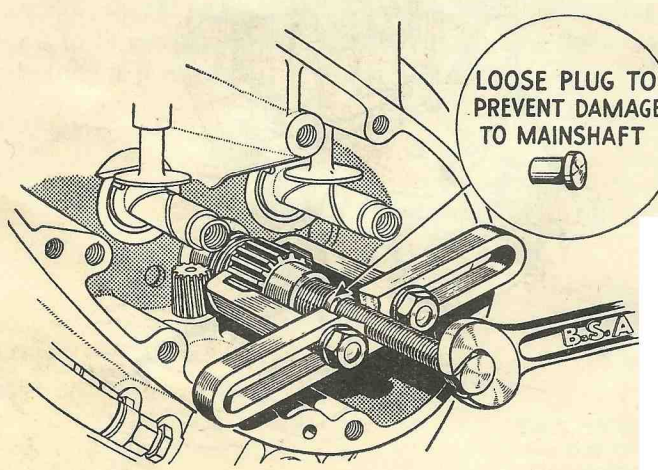

Fig. B.6. Engine Shaft Pinion Extractor 61-3256

be reamed out to .6255 in.-.6250 in. for the cams, and .7505 in.-.7495 in. for the idler pinion. The correct size for the bearing in the out-rigger plate is .815 in.-.814 in.

Before the oil pump spindle is released it is necessary to remove the locating plunger which is situated in the timing case. This plunger has an internal thread, and a timing cover screw can be inserted and used to pull out the plunger once the washer has been removed. (See Fig. B.7.)

Pump Removal

Unscrew the four nuts in the base of the crankcase, and remove the pump cover plate with the filter and joint washers. Now the two bolts holding the pump in position can be removed and the pump, together with the spindle, withdrawn from the crankcase.

Note.—The bolts holding the pump on to its seating can be identified by the spring washers under the heads of the bolts. The other bolts, which do not have washers under the head, serve to hold the pump together, and these should not be touched unless the pump is faulty and it is necessary to replace the internal parts.

If it is necessary to replace the cylinder holding-down bolts, the originals should now be removed, and the crankcase will be ready for splitting.

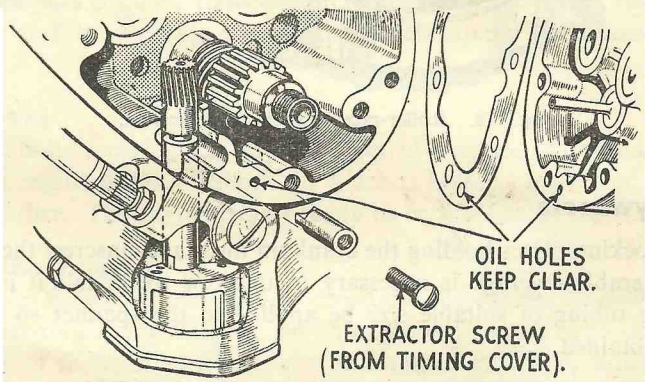

Fig. B.7. Oil Pump Spindle Locking Plunger

Splitting the Crankcase

Remove all the bolts around the crankcase joint, and draw each half of the crankcase from the flywheels. It will be noted that the outer races of the drive and gear-side roller bearings will stay in the crankcase. The ball race in the drive-side crankcase half is held in position by a spring ring, and this ring must be removed before any attempt is made to press out the bearing.

To remove the outer race of the roller bearings, a punch must be applied, as shown in Fig. B.8, and the removal of these races will be greatly facilitated if the crankcase is first heated by immersion in boiling water.

To remove the drive-side ball bearing, take out the distance piece which is normally positioned between the ball and roller bearings, remove the spring ring and use a press tool to press the bearing from its housing.

If it is desired to remove the cam pinion spindles they can easily be withdrawn by means of an extractor (61-691), but do not remove these spindles unless it is absolutely necessary. If it is necessary to replace a tappet, of course, the cam spindles must be removed so that the tappets can be drawn out downwards into the timing cover. When removing tappets it is necessary to unscrew the tappet guides in addition to withdrawing the cam spindles, and in the case of the exhaust guide the timing pinion must also be removed.

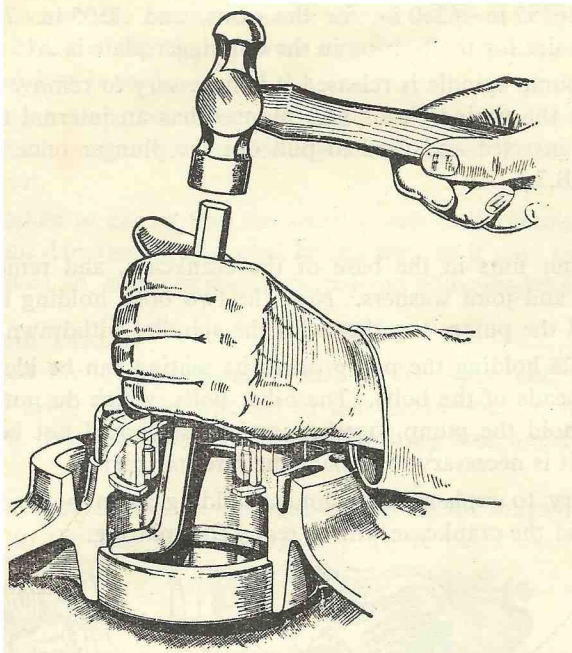

Fig. B.8. Roller-race extraction (driveside).

Parting the Flywheels

Remove the locking plates holding the crankpin nuts, and unscrew the nuts. It will be found that considerable leverage is necessary to unscrew these, and it is suggested that a length of strong tubing of suitable size be applied to the spanner so that the desired leverage may be obtained.

The crankpin is a taper fit in the flywheels, and can be released by being tapped smartly with a mallet.

In the event of big-end wear we do not advise the fitting of oversize rollers, and the whole big-end assembly should be replaced. When a new big-end bearing has been inserted it is necessary for it to be ground out to 1.7702/1.7704 in., as a slight distortion is liable to occur when the bearing is pressed in.

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"B" Group Models

RE-ASSEMBLING THE ENGINE

The need for extreme cleanliness cannot be over-emphasized.

Parts should be thoroughly cleaned and all trace of any anti-rust preparations with which new parts may be coated must be removed.

All bearing surfaces should be liberally smeared with engine oil when assembling.

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 the weights is inevitable, but provided that the discrepancy does not exceed $1\frac{1}{2}$ ozs. no further action need be taken. This tolerance should not be exceeded, since in the first instance the flywheels have been balanced to suit the original parts, and the balance may be adversely affected if the weight of the new components varies considerably from that of the original ones.

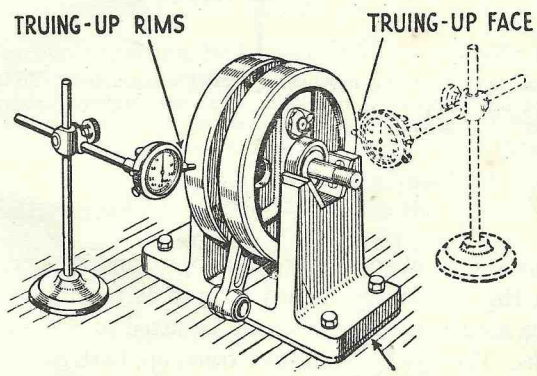


Fig. B9.

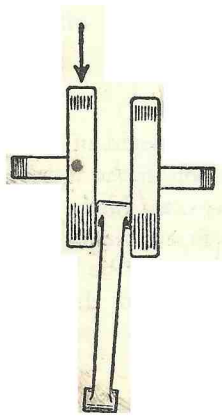
Suitable packing under timing side "vee" block to compensate for smaller diameter bearing.

The driving side flywheel should now be fitted to the crankpin (this is the side with the keyway) and the nut tightened up by hand. Fit the timing side flywheel and again tighten the crankpin nut by hand.

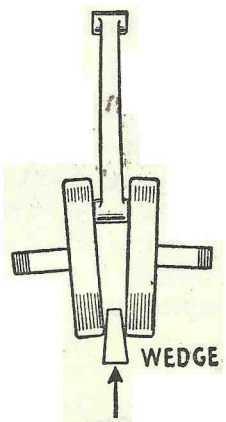
In order to tighten the crankpin nuts properly, the whole flywheel assembly must be held rigidly. For this purpose, it should be mounted in a large vice (fitted with lead clamps) with the driving side flywheel uppermost. If a large enough vice is not readily available an alternative method is to fix rigidly to the bench in a vertical position, two $1\frac{1}{16}$ in. diameter posts, the distance between their centres being $3\frac{7}{8}$ in. Midway between the posts a hole of 1 in. diameter should be bored in the bench to receive the mainshaft. The flywheel assembly is mounted on these posts so that they pass through the holes bored in the

flywheels, and the driving side flywheel should be uppermost. Tighten the crankpin nut very firmly, using a tubular extension to the spanner as when dismantling, and fit the locking plate and screw.

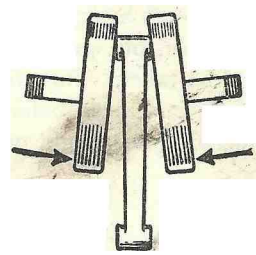
Now turn the assembly over, so that the gearside flywheel is on top, and tighten the crankpin nut lightly. The grub screw in the end of the crankpin must be riveted over or centre-punched to prevent its unscrewing. If it unscrews, serious damage may result to the engine. Check that the side clearance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



To bring shafts into line, a sharp blow with a mallet on **timing side** flywheel (indicated by arrow)



To bring flywheels parallel when sides opposite crankpin are converging, insert wedge as shown and deal sharp blow with mallet



To bring flywheels parallel a sharp blow wih a mallet on flywheel rims on opposite side to crankpin

Fig. B10.

The flywheels will now be aligned only very approximately and further steps must be taken to ensure that the wheels are aligned as true as possible. Two of the actual (or similar) bearings to be used in the engine should be fitted to the mainshafts and the latter mounted on vee-blocks. The flywheels must be trued up, both on faces and rims, for which purpose a dial micrometer is necessary (Fig. B9), 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. B10). The shafts must not be struck. The shafts should be finally trued to within .002 in. maximum.

Crankcase

Withdraw the bearings from the shaft and press them into their appropriate positions in the crankcase halves. A new washer will be required behind the small drive side bearing and a new retaining ring must be fitted. In the case of single lip roller bearings, only the outer race can be so fitted. Do not omit the retaining ring which holds the driving side bearing in position, and check that the ends of the spacing sleeve between the bearings are parallel to within .002 in. In order that the inner bearing and the sleeve will stay in position, it is advisable to lay the crankcase half on a bench with the outer bearing lowest.

Fit the oil flinger washer to the driving side mainshaft and note this washer is bent over in one place to prevent accidental movement when fitting. If a new washer is being used it should be bent in a similar manner to the one which has been removed. Insert the driving shaft carefully into the crankcase, taking care not to disturb the flinger washer. The shaft should fit into the bearing without the use of unnecessary force and although the shaft must be a fairly tight fit in the bearings it should be possible to assemble it by hand. If necessary, ease the shaft with emery cloth, carefully cleaning off any trace of emery afterwards.

It is advisable to attend to the timing side of the crankcase before continuing further. Replace the oil pump driving spindle together with its locating pin (see Fig. B7) and then fit the oil pump in position. The fibre washer between the pump and the crankcase should be smeared with jointing compound, but an excessive amount must not be used, since any surplus will be squeezed out and may find its way into the oil passage. The pins securing the oil pump must not be screwed up too tightly. Check that the pump spindle can be rotated between finger and thumb.

Now replace the tappets and guides, the latter being screwed well home, and insert the cam pinion spindles. These should be pressed home, taking great care to keep them dead square, and must be fitted so that the flat on the spindle shoulder is parallel to the tappet foot, for which it provides clearance and consequently its position is most important.

Assembly of the crankcase will be made easier if the flywheel assembly, together with the driving side portion of the crankcase fitted on as previously explained, is mounted in a vice. Lead clamps must be used and the splined portion of the shaft held.

The mainshaft bearings may now be pressed into the gearside half of the crankcase and the latter replaced on the mainshaft. Bolt up the crankcase and check that the flywheels, etc., spin easily. Fit sprocket centre, tighten up, and verify also that the connecting rod is centrally disposed in the crankcase mouth. Provided that the connecting rod is not visibly out of the centre, there is no necessity for any adjustment to be made. If the connecting rod is out of centre, it will invariably be towards the driving side of the crankcase. In this event a shim will have to be made and inserted between the driving side flywheel and the oil flinger washer. It may also be that the distance sleeve between the driving side bearings has become a little worn on its end faces, and a new component (one specially chosen so that its length is on the maximum limit) will rectify the connecting rod alignment.

When the connecting rod alignment is found correct, remove the gearside half of the crankcase and clean the joint of any compound used previously. Fit the magdyno straps on their hinge pins, smear jointing compound lightly on the crankcase joint face and again bolt up the crankcase. Check that top of crankcase, where cylinder base flange fits, is dead flat.

Timing Gears

Replace the engine shaft pinion, taking special care to note that the worm is engaging properly with the oil pump spindle and that rotation of the flywheels drives the pump.

The cam pinions are interchangeable and consequently the timing marks are duplicated on both pinions. This should not cause any difficulty when timing the valves if it is remembered that the dash mark only is used for the inlet cam and the dot for the exhaust cam (Fig. B11).

The magdyno can now be fitted to the crankcase and its straps loosely coupled up. Make sure that the dowels in the base engage properly in their holes in the platform, and that any packing shims are refitted. Refit the idler pinion between the inlet cam pinion and the magdyno pinion, but do not replace the pinion retaining plate at this stage.

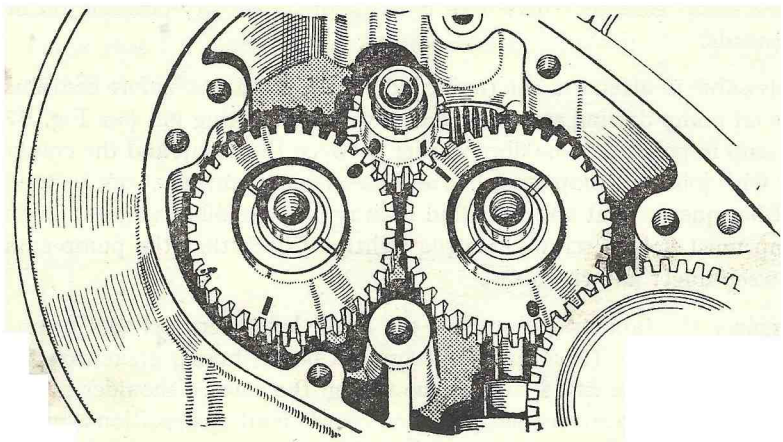


Fig. B11. Valve Timing.

An oil sealing washer is fitted behind the magdyno pinion, and this should be temporarily removed. Replace the magdyno pinion on its taper; it need not be driven on very firmly, but just tight enough to prevent slip. Check the backlash between this pinion and the idler. If excessive, the gear will be noisy; if insufficient, a whining noise will result.

In order to adjust the backlash, shims are fitted under the magdyno if necessary, when the engine is first built. If a different magdyno is being fitted, it is essential this backlash be checked carefully, shims of a different thickness being used as required.

Remove the magdyno pinion once more, replace the oil sealing washer and again fit the magdyno pinion loosely in position. It is preferable to leave the setting of the ignition until the barrel and piston are in position, and for this reason the magdyno pinion should not be tightened up. The valve timing can now be set. Replace the pinion retaining plate, noting that the coarse threaded bolts screw into the crankcase bosses, and then fit the lockwasher and nut on the engine mainshaft. Play between the pinions and the retaining plate should be .002—.003 in.

Assembly from this point will be the same as after decarbonising (Service Sheet No. 303).

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"M" GROUP, C10, C11, "A" GROUP (S.A.), AND "B" GROUP
(Except those with engine prefix letters G.B. or "A" Group after engine numbers CA7-8623, CA755-8112 and DA10-13298)

DISMANTLING AND RE-ASSEMBLING THE CLUTCH

Take off the nearside footrest and then undo all the screws round the rim of the chaincase. As the outer half of the chaincase cover is taken off, careful note should be made of the positioning of the washers, etc., for replacement purposes. The joint washer should be carefully preserved.

Remove the six adjusting nuts, the springs and spring cups, and take off the clutch pressure plate so exposing the mainshaft nut which holds the clutch body in position.

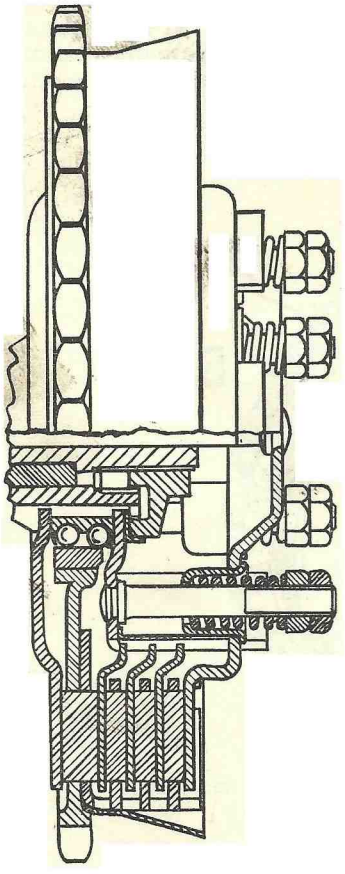

Fig. B18. *Section through Clutch.*

The mainshaft nut is prevented from undoing by a locking washer which is turned over a flat on the nut. Flatten out the turned over edge of the washer and remove the nut. The clutch centre can now be withdrawn from the taper on the mainshaft using an extractor (part number 61–3362). Take care that the mainshaft key is not mislaid.

When the clutch is removed from the mainshaft it can be completely dismantled and the various components examined for wear. Special attention should be paid to the slots in which the clutch plates slide and any grooves should be removed with the aid of a fine file. If the grooves are very deep their removal will mean that the plates have excessive clearance and rapid wear will ensue. If the sprocket teeth are worn to a hook shape the sprocket must be replaced, otherwise rapid chain wear will result.

The steel plates should be smooth and if badly scored they should be replaced, while the fabric and cork inserts will require a thorough washing in petrol if there is any trace of oil on them. If the inserts are glazed or saturated in oil they should be replaced.

Finally, examine the balls, ball cages and tracks. If wear on the chainwheel bush or on the bearing boss of the clutch centre exceeds .0015 in. the bush or centre should be replaced (see Service Sheet No. 702 for correct dimensions).

NOTE:—When fitted to certain models this clutch is provided with additional plates, thus necessitating the use of a wider chainwheel and clutch centre, but the method of dismantling and re-assembly is unaltered. C10 and C11 models have less plates than shown in the diagram but dismantling and assembly remain the same.

Reassembly of the Clutch

The clutch is of straightforward construction and a study of Fig. B18 will show how the parts are assembled. Do not forget the mainshaft key when replacing the clutch centre.

The plates must be fitted in their proper order as follows:— Drive plate (tongues on inner diameter), fabric insert plates, drive plate, etc. Before refitting the pressure plate it is advisable to smear a small quantity of grease on the centre button at the point of contact with the clutch push rod.

The clutch springs should be replaced if they have shortened appreciably. The spring retaining nuts should be tightened initially until the outer nut (A) Fig. B19, is just fully engaged on its thread.

It is most important that the clutch spring pressure is evenly distributed, and this should be checked by ensuring that the clutch pressure plate does not tilt when the clutch is withdrawn. If the plate does tilt the nuts should be adjusted until the spring pressure is even. Unequal spring pressure may cause clutch drag and noisy gearchange. When the adjustment is complete tighten the locknuts firmly.

Clutch Re-adjustment

After a considerable mileage has been covered it may be necessary to screw the spring retaining nuts in further to allow for wear on the clutch inserts. Release the locknuts (A), and tighten the nuts (B) by a few turns. After the adjustment has been carried out, check that the clutch lifts evenly and then tighten the locknuts.

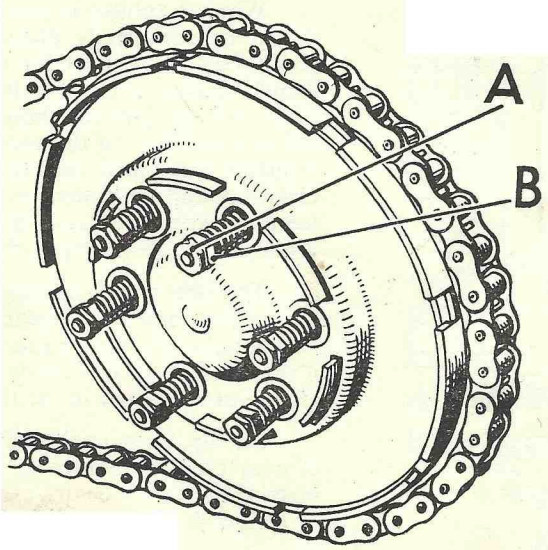

Fig. B19. *Clutch Spring Adjustment.*

BSA SERVICE SHEET No. 310

May 1954
Reprinted July 1963

A and B Group Models

(With Welded Type Frame)

(Except those with Engine prefix letters GB)

PRIMARY TRANSMISSION

Clutch Adjustment

Two adjustments are provided for the clutch control arm on the gearbox outer cover. The first of these is at the clutch push rod and is exposed when the inspection plate is removed. It consists of a grub screw *H* (Fig. B22) and locknut *G*. Between the inner end of the screw and the clutch push rod a steel ball is inserted, and the grub screw must be adjusted so that there is just a little clearance between the ball and push rod.

To carry out this adjustment loosen the locknut and with the aid of a screwdriver adjust the grub screw. Then retighten the locknut.

The other adjustment is provided by the cable adjuster on top of the gearbox. Remember that some free movement in the control arm is necessary as, if the adjustment is too tight, there will be constant pressure on the clutch with consequent wear and loss of efficiency. The control arm pivot should be greased occasionally by means of the grease nipple *F*.

Primary Chain Adjustment

Adjustment of the front chain is achieved by pivoting the gearbox backwards and forwards on the bottom support bolt. To adjust the chain, remove the knurled inspection cover on the primary chaincase and slacken the nuts *A* and *B* (Fig. B22) which clamp the top and bottom gearbox lugs in the rear engine plates. An adjuster is attached to the right hand side of the top gearbox bolt. Slacken the locknut *C* and screw the

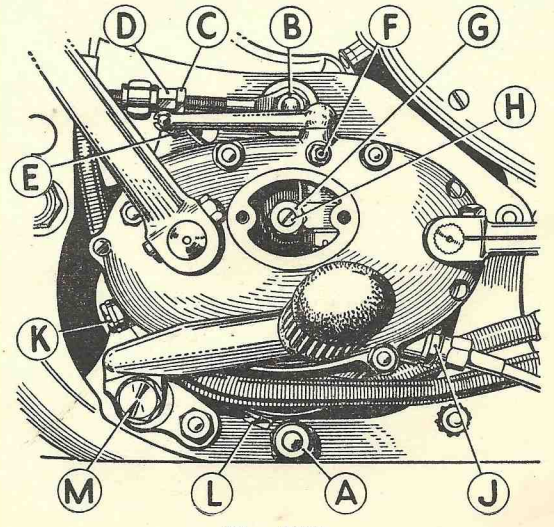

Fig. B22

adjuster *D* backwards or forwards until the chain tension is correct. This is when the maximum up and down movement of the chain at the tightest point is $\frac{1}{2}$ in. Tighten the gearbox bolt nuts *A* and *B*, also the adjuster locknut, and re-check the adjustment. Note that after re-adjusting the primary chain, the rear chain will be in need of adjustment.

Chaincase Removal

Drain off the oil in the case by removing the drain screw in the lower edge of the primary chaincase. Two of the screws retaining the primary chaincase outer cover have red painted heads. The front one of these is the chaincase oil level screw, and the rear one the drain screw. Remove the left hand footrest. This may be rather tight, but a few light blows on the front of the footrest should free it. Undo the small screws round the rim of the chaincase and pull off the outer half.

To dismantle the cush drive assembly, bend back the cush drive nut locking washer by inserting a small screwdriver through the coils of the spring, and remove the nut. Withdraw the locking washer, the spring and the cush drive sliding sleeve. If any difficulty is experienced in unscrewing the cush drive nut due to the engine rotating, place the machine in gear and apply the back brake.

Remove the clutch in the manner described in Service Sheet 308.

Remove the engine sprocket and pull the cush drive bearing off the mainshaft. Unscrew the bolts which hold the inner half of the chaincase to the crankcase, after breaking the locking wire which passes through the heads of the bolts. There now remains only one bolt which secures the rear of the chaincase to the frame, and its removal will allow the chaincase to be detached.

Re-assembly of the primary transmission and chaincase should be carried out in the reverse order to dismantling.

Before replacing the cush drive nut ensure that the lock washer is correctly located in the splines on the mainshaft.

B.S.A. MOTOR CYCLES LTD
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B.W.

BSA SERVICE SHEET No. 311

Reprinted June 1964

A and B Group Models with Swinging Arm Frame

DISMANTLING AND RE-ASSEMBLY OF GEARBOX AND GEARCHANGE

Gearbox Removal

In most cases it will be found convenient to dismantle the gearbox while it is still in position. However, if attention to the final drive pinion sleeve bearing is required it may be advisable to remove the complete gearbox. The primary transmission, clutch and chaincase must be removed in either case and this should be carried out as described in Service Sheet 310.

To remove the gearbox from the frame, slacken the retaining bolts and remove the two right hand rear engine plates. The gearbox is then free to be withdrawn from the right hand side of the machine.

Dismantling

Remove the clutch and speedometer cables. Move the gears to the neutral position between first and second. Undo the four nuts and three screws round the rim of the outer cover but do not slacken the screw and nut which are not on the edge of the cover as these do not prevent its removal. The outer cover can then be removed complete with the kickstarter, gearchange and clutch lever. As the cover is withdrawn the kickstarter lever will tend to rotate under the action of the return spring and the clutch lever should be pulled out to the fullest extent so that the kickstarter lever may be rested against it, thus preventing the complete release of the spring.

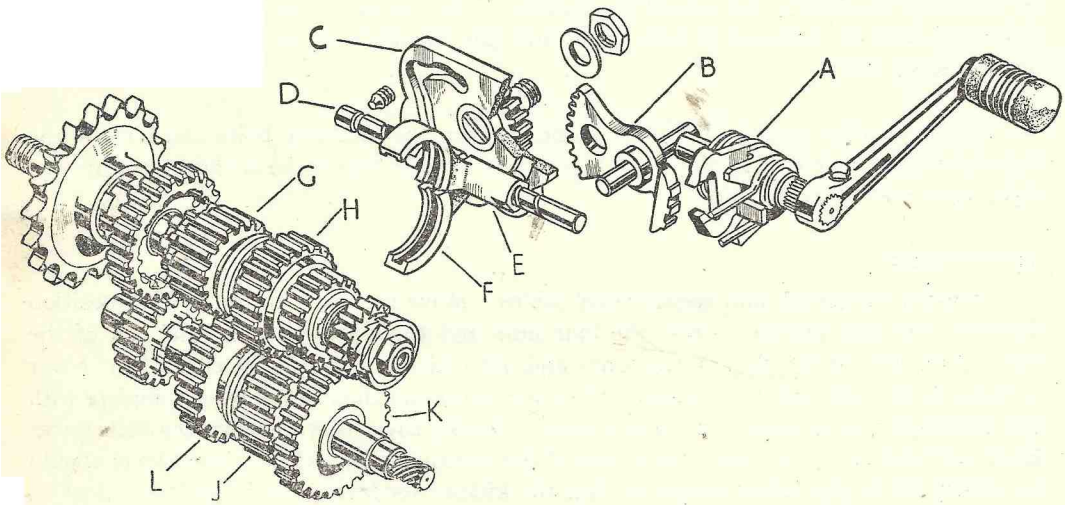
The gearchange mechanism can be dismantled by removing the gearchange lever and the circlip which retains the gearchange spindle in the outer cover. Withdraw the spindle complete with change mechanism which can then be completely dismantled after removing the split pin. Examine the operating claw '*A*' for wear and if the ends are no longer well formed the claw should be replaced.

Before the inner cover is removed the clutch push rod should be withdrawn and the single screw to the left of the top right stud, must be undone. The inner cover together with the mainshaft and gearchange rocking lever 'B' can then be withdrawn, leaving the gear cluster in position. To remove the rocking lever the gear lever spindle bush must first be pushed out of the inner cover. This will reveal the end of the rocking lever spindle which is threaded internally $\frac{1}{4}$ in. C.E.I. Screw in a suitable screw or bolt, then use this to pull out the spindle

If it is necessary to remove the mainshaft from the inner cover the shaft should be held in a soft jawed vice so that the kickstart ratchet nut can be undone after its locking washer has been bent back. The kickstart ratchet, ratchet pinion, spring and bush should

then be removed, leaving the shaft free to be pushed from its bearing. This bearing can be removed by pulling out the retaining circlip and then warming the cover in hot water before tapping the bearing from its housing with a suitable soft drift.

The rod *'D'* on which the two gear operating claws slide is pressed into the gearbox shell at the clutch end and is secured by a small grub screw on the outside of the case. Release the grub screw and pull out the rod. It is then possible to withdraw the gear cluster and operating claws together with the layshaft so that the only components remaining in the gearbox shell are the final drive pinion sleeve assembly and cam plate *'C'*.



Unscrew the selector plunger housing locknut and remove the plunger housing from the gearbox shell. The gear selector cam plate will now slide from its pivot and the latter can also be removed after unscrewing the retaining nut and warming the case. The layshaft bearings are a press fit in the gearbox and if necessary can be driven out with the aid of a soft punch.

Run a length of old chain round the gearbox sprocket and hold the chain in a vice to prevent the sprocket rotating. Flatten the locking tab washer and undo the retaining nut. Withdraw the sprocket from its spline, then tap the pinion into the gearbox with a soft mallet. To remove the pinion sleeve bearing, prise out the retaining circlip, withdraw the oil seal, then warm the case in hot water before tapping the bearing out of the case. Do not disturb the ballrace unless it is suspected of being faulty. Wash it thoroughly in petrol to remove all traces of oil and any play will then be immediately detected.

Examine the various parts for wear, and if the forks which actuate the sliding pinions show signs of seizure it will be advisable to replace them. Attempts to erase the seizure marks will result in excessive side play.

The fixed pinions on the layshaft and mainshaft are pressed on, and new components must be a tight fit. Examine the selector plate for worn cam grooves, and replace if necessary. The rocking arm should be replaced if the teeth show signs of wear as, of course, should pinions with damaged or worn teeth.

Re-assembly

Re-assembly is carried out in the reverse order to dismantling. The aluminium case should always be warmed before a bearing is pressed in. When replacing the gearbox sprocket ensure that the oil seal is in good condition and that the retaining nut locking washer is correctly seated in the spline. Tighten the nut fully and turn the lockwasher over into the slots on the nut. If the teeth on the sprocket are worn to a hook shape a new sprocket must be fitted otherwise rapid chain wear will result.

Replace the cam plate and selector plunger making sure that the plunger is in the neutral position between first and second gear. Place the layshaft in position and then feed in the first pair of gears '*J*' and '*L*' together with their selector claw '*F*.' These claws are interchangeable but if the original components are to be used then they should be replaced in their original positions. Replace the second pair of gear wheels '*G*' and '*H*' together with selector claw '*E*' and make sure that the guide pins of both selector claws are correctly engaged in the cam groove. Replace the selector claw rod and secure it in position by means of its grub screw. Position the spacing washer and the large pinion on the layshaft. Assemble the mainshaft, kickstart ratchet mechanism and rocking lever into the inner cover. The mainshaft and inner cover can then be pushed into the gearbox, but before they are completely home the rocking lever must be correctly set so that the red dots on the lever and on the cover are in line. Replace the single inner cover retaining screw.

Note that when a reverse cam plate 42–3001 is fitted the red dots will not coincide as described above. Correct meshing of the rocking lever must be obtained by trial and error.

Assemble the gearchange and kickstarter mechanism in the outer cover, then push the latter on to the four studs, rotating the kickstarter slightly so that the quadrant does not jam on its stop.

Replace the four nuts and three screws in the outer cover. The gearbox is now completely re-assembled.

B.S.A. MOTOR CYCLES LTD.,
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B.S.A. Press

BSA SERVICE SHEET No. 312

Revised October 1958
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B Group (Swinging Arm Frame)

USEFUL DATA

				ALTERNATOR MODELS	
Engine Stroke	88 mm.				
Engine Bore	B31 (71 mm.)	B33 (85 mm.)			
Engine capacity	B31 (348 c.c.)	B33 (499 c.c.)			
Petrol Tank capacity	3½ gallons			2 or 4 gallons	
Oil Tank capacity	5 pints			5½ pints	
Gearbox capacity	1 pint				
Front Fork capacity (each leg)	⅜ pint (212 c.c.)				
Chaincase capacity	1/7 pint (80 c.c.)			½ pint S.A.E. 20	
Tappet clearance (engine cold)	.003 in. inlet and exhaust				
Piston Ring Gap	.010 in.				
Piston Ring side clearance	.002 in.				
Piston clearance (bottom of skirt)	B31 (.0005—.0016in.)	B33 (.0006—.00275in.)			
Ignition setting (fully advanced)	$\frac{7}{16}$ in. before T.D.C.	(⅜ in. B33 model)			
Contact Breaker Gap	.012 in.				
Compression Ratio	B31 (6.5 : 1)	B33 (6.8 : 1)			
Sparking Plug	Champion L10S				
Sparking Plug Gap	.018—.020 in.				
Valve Timing: Inlet	Opens 25° before T.D.C.	Closes 65° after B.D.C.			
Exhaust	Opens 65° before B.D.C.	Closes 25° after T.D.C.			
Carburettor	B31 (Monobloc)	B33 (Monobloc)			
Bore	1 in.	1 in.	1⅛ in.	$1\frac{1}{16}$ in.	
Main Jet	150	260	200	260	
Throttle Valve	6/4	376/3½	29/4	376/3½	
Needle Position	3	2	3	3	
Needle Jet	.1065	.1065	.1065	.1065	
			SIDECAR		
Gear Ratios	B31	B33	B31	B33	
Top	5.6	5.0	6.25	5.59	
3rd	6.77	6.05	7.55	6.76	
2nd	9.86	8.79	10.95	9.82	
1st	14.42	12.90	16.10	14.42	
Front Chain ½ × .305 in.	B31 (67 pitches)	B33 (68 pitches)			
Rear Chain ⅝ × ¼ in.	B31 (98 pitches)	B33 (98 pitches)	⅝ × ⅜ in. (97 Solo, 98 Sidecar)	⅝ × ⅜ in. (98 Solo and Sidecar)	
Tyres: Front	B31 (3.25 × 19)	B33 (3.25 × 19)			
Rear	B31 (3.25 × 19)	B33 (3.50 × 19)			
Tyre pressure (Solo)	Front:16 lbs per sq. in. Rear: 18 lbs. per sq. in.				
Total Front Fork movement	5¾ in.				
Rear Suspension movement	4 in.				
Brake Dimension: Front	B31 (7 × 1⅛ in.)	B33 (8 × 1⅜ in.)	B31 (7 × 1⅛ in.)	B33 (7 × 1⅛ in.)	
Rear	B31 (7 × 1⅛ in.)		B31 (7 × 1⅛ in.)	B33 (7 × 1⅛ in.)	

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BSA SERVICE SHEET No. 313

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"A" and "B" Group Models
with Swinging Arm Frame

REAR SUSPENSION

REMOVING AND DISMANTLING THE SUSPENSION UNITS

Support the machine on the central stand. Take out the top and bottom bolts securing the suspension units and pull them away from the mounting lugs.

The upper shroud is retained by split collets, and the spring must be compressed before the collets can be removed. The assistance of a second person may be necessary for this operation. Alternatively, Service Tool number 61–3503 can be used, as shown in Fig. B24.

Place the tool in position on the shroud, insert the pin through the top lug and turn the handle until the shroud has been pressed down far enough to allow the collets to be withdrawn. After the tool has been released, the spring and both shrouds can be removed.

No further dismantling is possible, and if the damper units are damaged, they must be replaced.

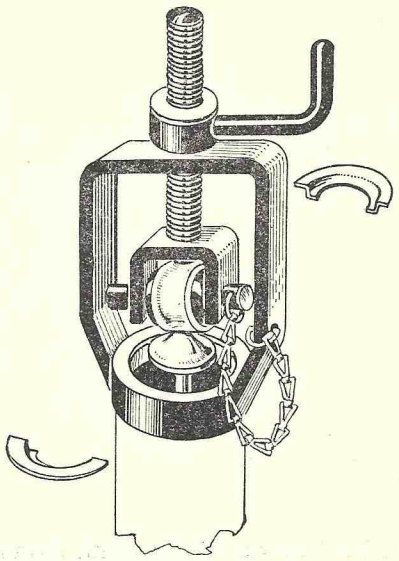

Fig. B24.

REMOVING AND REPLACING THE SWINGING ARM FORK

With the machine on the centre stand, take out the rear wheel in the normal manner. Detach the chainguard, or chaincase, and remove the chain and sprocket assembly. Remove the brake pedal and, on 1956 models, withdraw the crossover shaft. Take out the two bottom bolts from the suspension units, and pull these clear of the mounting lugs. Unscrew the large nut on the offside end of the fork spindle, and also the small bolt from the spindle locking plate on the nearside. Drive out the spindle with a suitable drift, taking care not to damage the threaded end.

Now take hold of the two fork ends and twist the whole fork in a clockwise direction. It can then be drawn away towards the rear.

On some models, the rear mudguard extends down between the arms of the fork, behind the pivot. In this case, the mudguard also must be removed before the fork can be taken out.

The "silentbloc" spindle bushes have a very long life, and replacement is rarely necessary.

Reassembly of the fork into the frame is carried out in the reverse order to dismantling, except that the final tighteneing of the spindle nut should be left until all other parts have been refitted. Then, take the machine off the stand and load it with the weight normally carried. Tighten the spindle nut fully so as to clamp the centre sleeves of the bushes to the frame members in the correct position.

B.S.A. MOTOR CYCLES LTD., Service Department, Armoury Road, Birmingham 11.

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BSA SERVICE SHEET No. 314

Printed June, 1958

B GROUP MODELS,

(with Engine Prefix Letters GB)

PRIMARY TRANSMISSION

Clutch Adjustment.

Two adjustments are provided for the clutch control arm on the gearbox outer cover. The first of these is at the clutch push rod and is exposed when the inspection plate is removed. It consists of a grub screw *H* (Fig. B25) and locknut *G*. Between the inner end of the screw and the clutch push rod a steel ball is inserted, and the grub screw must be adjusted so that there is just a little clearance between the ball and push rod.

To carry out this adjustment loosen the locknut and with the aid of a screwdriver adjust the grub screw. Then retighten the locknut.

The other adjustment is provided by the cable adjuster on top of the gearbox. Remember that some free movement in the control arm is necessary as, if the adjustment is too tight, there will be constant pressure on the clutch with consequent wear and loss of efficiency. The control arm pivot should be greased occasionally by means of the grease nipple *F*.

Primary Chain Adjustment.

Adjustment of the front chain is achieved by pivoting the gearbox backwards and forwards on the bottom support bolt. To adjust the chain, remove the knurled inspection cover on the primary chaincase and slacken the nuts *A* and *B* (Fig. B25) which clamp the top and bottom gearbox lugs in the rear engine plates. An adjuster is attached to the right hand side of the top gearbox bolt. Slacken the locknut *C* and screw the adjuster *D* backwards or forwards until the chain tension is correct. This is when the

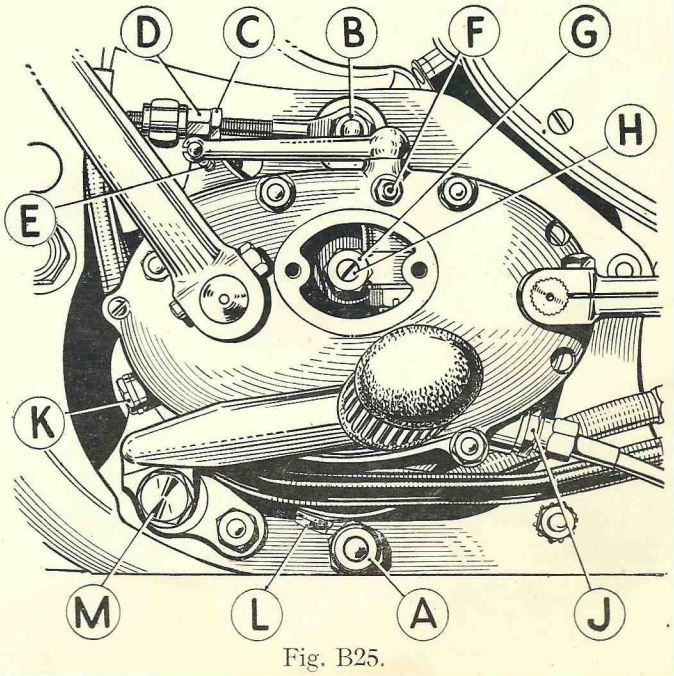

Fig. B25.

maximum up and down movement of the chain at the tighest point is ½in. Tighten the gearbox bolt nuts *A* and *B*, also the adjuster locknut, and re-check the adjustment. Note that after re-adjusting the primary chain, the rear chain will be in need of adjustment.

Chaincase Removal.

Drain off the oil in the case by removing the drain screw in the lower edge of the primary chaincase. Two of the screws retaining the primary chaincase outer cover have red painted heads. The front one of these is the chaincase oil level screw, and the rear one the drain screw. Remove the left hand footrest. This may be rather tight, but a few light blows on the front of the footrest should free it. Undo the small screws round the edge of the chaincase and pull off the outer half.

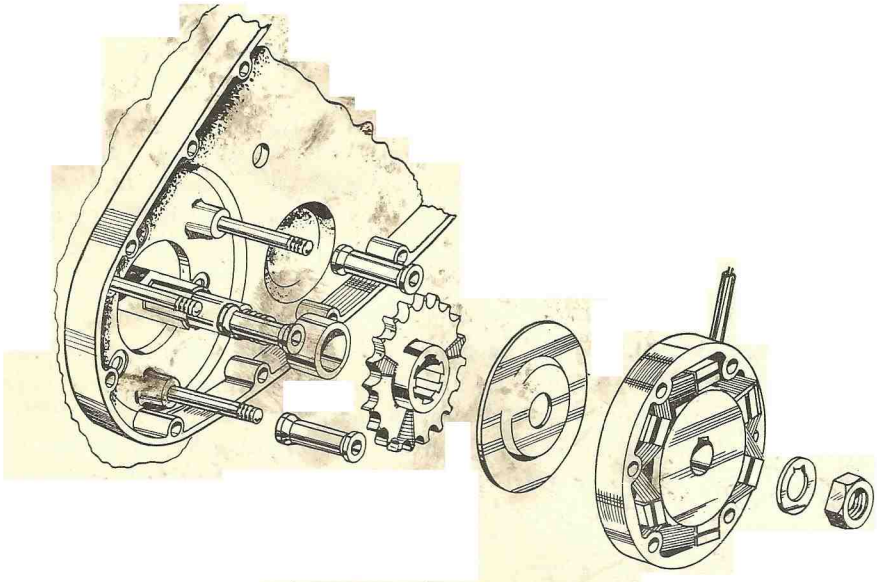

Fig. B26. Alternator Assembly.

The alternator assembly is dismantled by prising back the tab on the lock washer and unscrewing the large nut on the end of the engine shaft. If the nut is very tight, engage top gear and apply the rear brake to prevent the engine turning. Next take off the three nuts which retain the coil assembly. Lift this off the studs and withdraw the rotor, which is keyed to the shaft, also the spinner. Should the coil assembly prove difficult to remove, it may be gently prised off with a screwdriver, taking great care not to damage the windings.

Remove the clutch in the manner described in Service Sheet No. 315.

Remove the engine sprocket from the mainshaft. Unscrew the bolts which hold the inner half of the chaincase to the crankcase, after breaking the locking wire which passes through the heads of the bolts. There now remains only one bolt which secures the rear of the chaincase to the frame, and its removal will allow the chaincase to be detached.

Re-assembly of the primary transmission and chaincase should be carried out in the reverse order to dismantling.

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BSA SERVICE SHEET No. 315

Printed May 1964

"B" GROUP MODELS

(with engine prefix letters GB)

CLUTCH

Dismantling

Remove the chaincase as described in Service Sheet No. 314. Remove the four spring retaining nuts and withdraw the springs and spring cups. The spring pressure plate and other clutch plates can then be removed, and if only attention to these items is required the clutch need not be dismantled further. The steel plates should be smooth, and if badly scored must be replaced, while the cork inserts may require washing in petrol if the oil on them is thick and gummy. If the inserts are burnt or glazed they should be replaced.

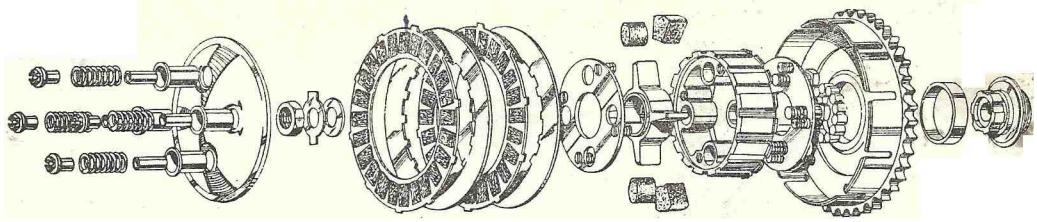

Fig. B27. *Exploded view of clutch.*

To dismantle the remainder of the clutch, turn back the tab washer on the mainshaft and take off the nut which has a right-hand thread, note the position of the plain washer. The complete clutch can now be withdrawn from the mainshaft, making sure that the rollers do not fall out from between the clutch centre and the chainwheel.

Lift the chainwheel from the clutch centre and remove the 20 rollers. The four bolts, eight screws and the two cover plates from the clutch centre can also be removed to expose the vane and shock absorber rubbers. If the rubbers require attention, the vane must be pushed out with the aid of a suitable drift.

Reassembly

Before commencing reassembly examine the roller tracks on the chainwheel bush and clutch centre, and if the wear on either of these components exceeds .0015 in. it should be replaced.

If the chainwheel teeth are worn to a hook shape, the chainwheel must be replaced or rapid wear on the chain will result.

To reassemble the vane into the clutch centre, first replace the vane and the four thicker rubbers which should be on the left-hand side of each vane arm (Fig. B28). Hold an old gearbox mainshaft in a vice and position the vane centre on it to prevent it rotating. Rotate the clutch centre so as to compress the rubbers and slip the remaining four rubbers into position. The clutch centre can best be gripped with the aid of a plain clutch plate. Replace the clutch centre cover plates and the four bolts and eight retaining screws.

The remainder of the clutch assembly is quite straightforward. Position the 20 rollers carefully on the clutch centre before sliding the chainwheel over them. Re-position the remainder of the clutch on the shaft and replace the nut and washer. Make sure that the nut is fully tightened before the tab washer is turned over.

Replace the clutch plates ensuring that the thick plain backplate is put in first. When the spring assemblies have been replaced the retaining nuts should be tightened down firmly on to the distance pieces.

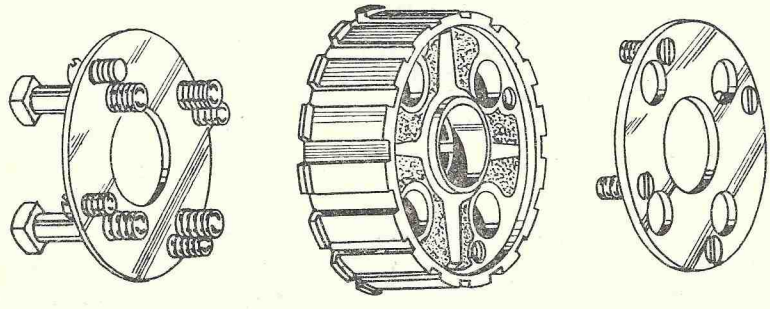

Fig. B28. *Vane assembly.*

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BSA SERVICE SHEET No. 603

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

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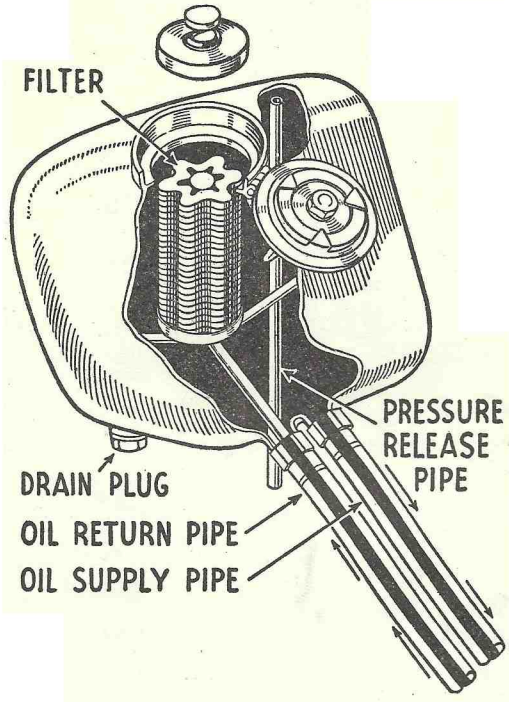
THE LUBRICATION SYSTEM

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.



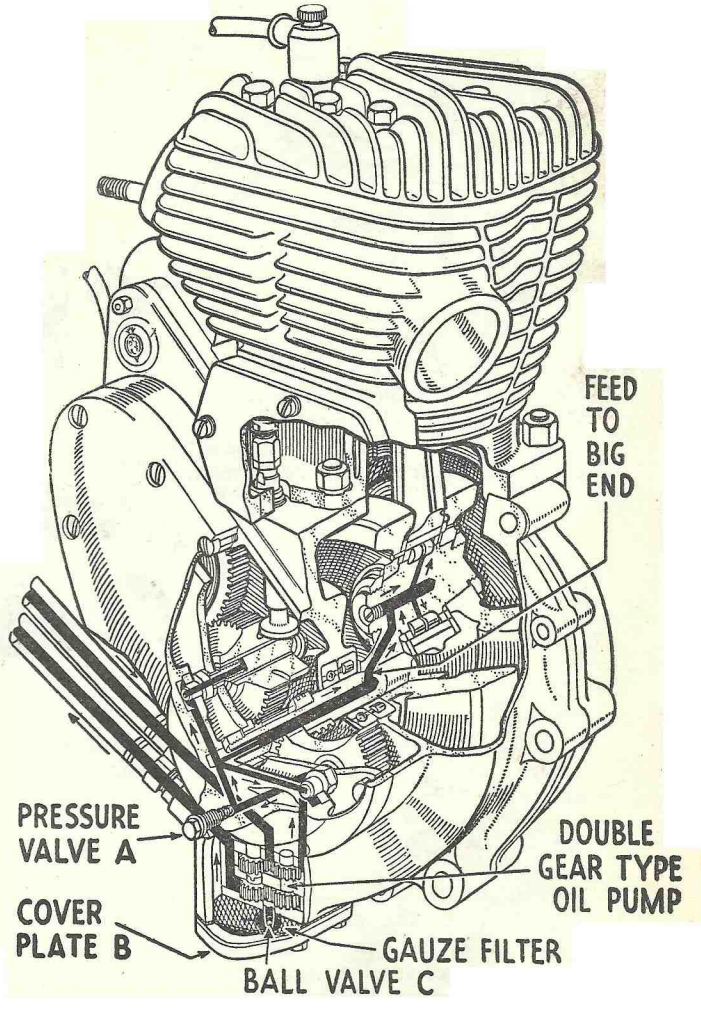


Fig. M3. *The Lubrication System (models M20 and M21)*

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.

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.

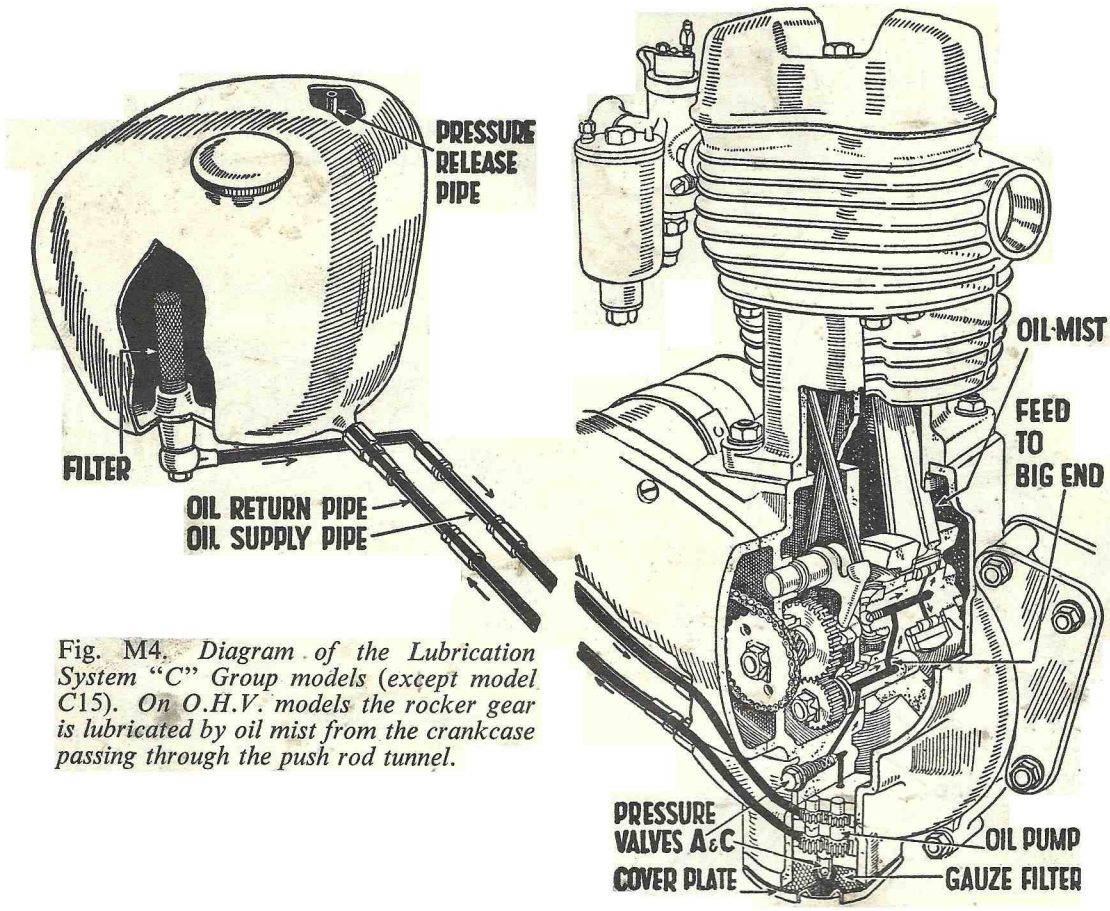


Fig. M4. *Diagram of the Lubrication System "C" Group models (except model C15). On O.H.V. models the rocker gear is lubricated by oil mist from the crankcase passing through the push rod tunnel.*

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").

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.

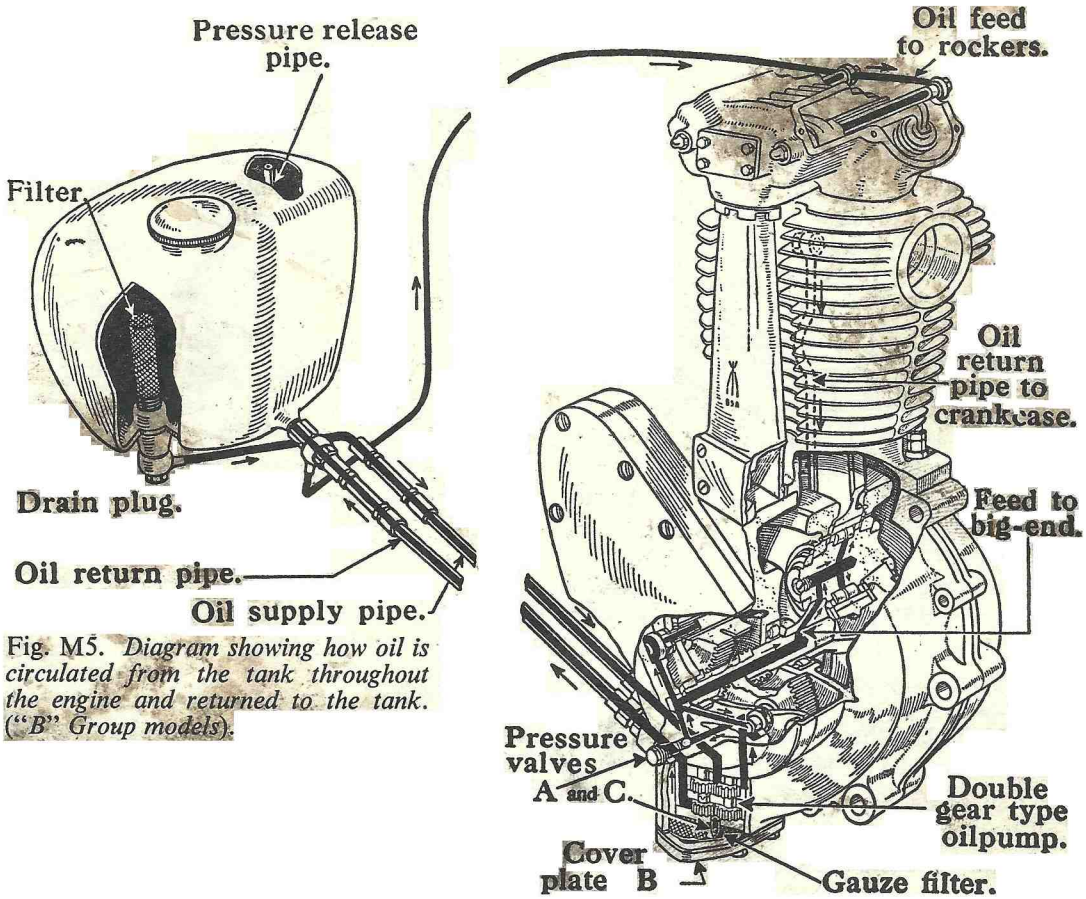


Fig. M5. *Diagram showing how oil is circulated from the tank throughout the engine and returned to the tank. ("B" Group models).*

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 big 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").

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.

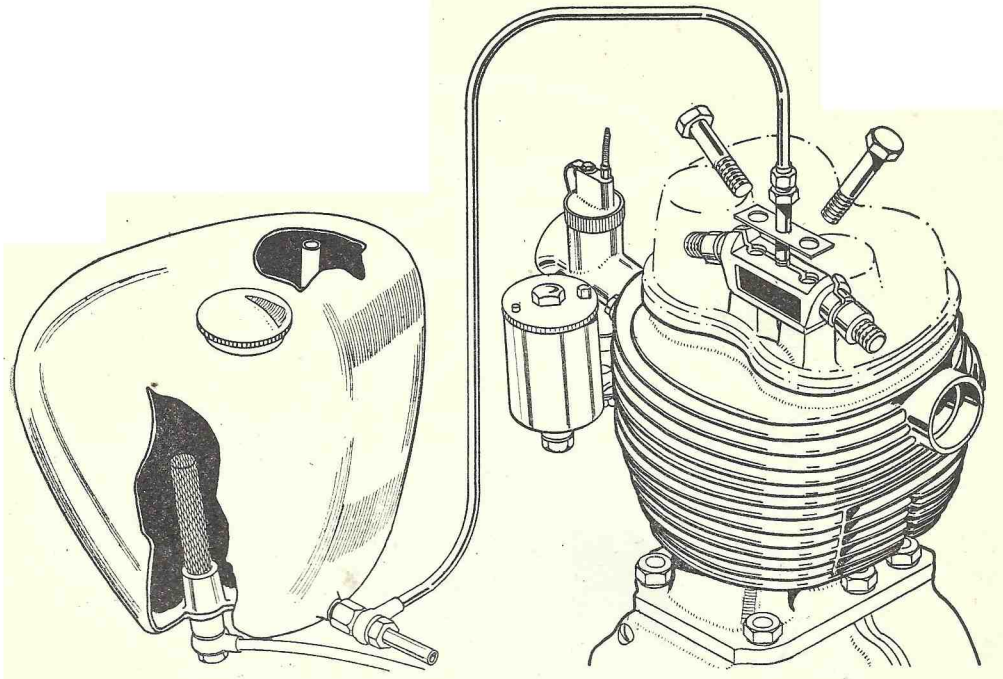
Before replacing the breather valve on "C" Group models the movement of the disc valve should be checked to ensure that it does not exceed .010 in. If excessive clearance is found and the disc valve is undamaged the face of the retaining collar should be ground so as to reduce the depth of the recess 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 immeterial 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.



Rocker Gear Lubrication C12 (1956).

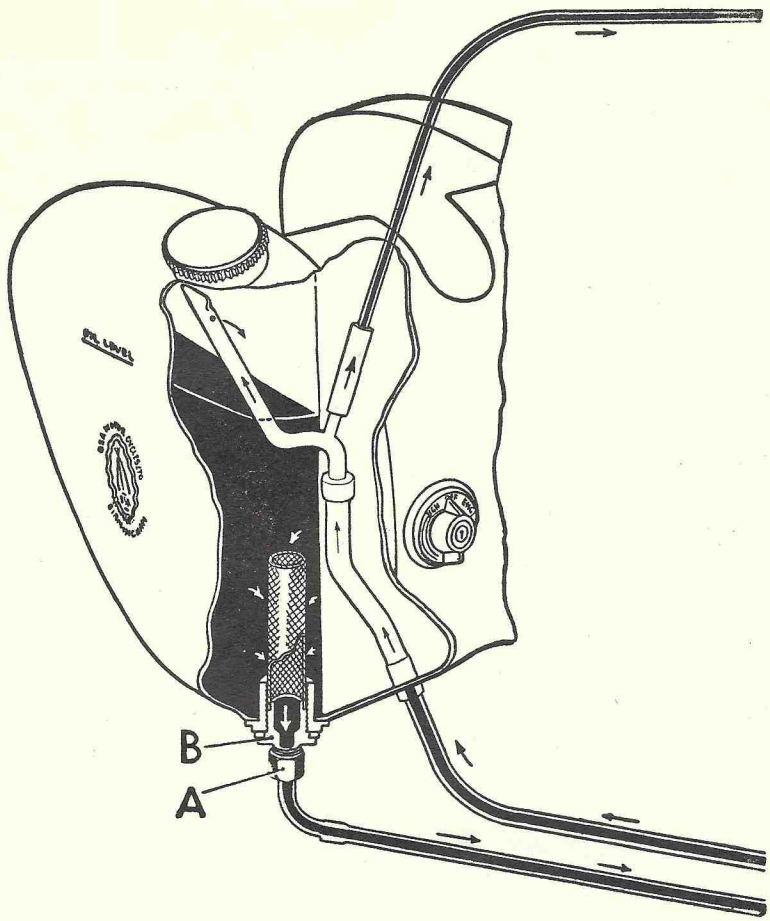
Parts required for conversion of C11 and C11G engines:—

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.

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 above, and they can be obtained through your dealer.

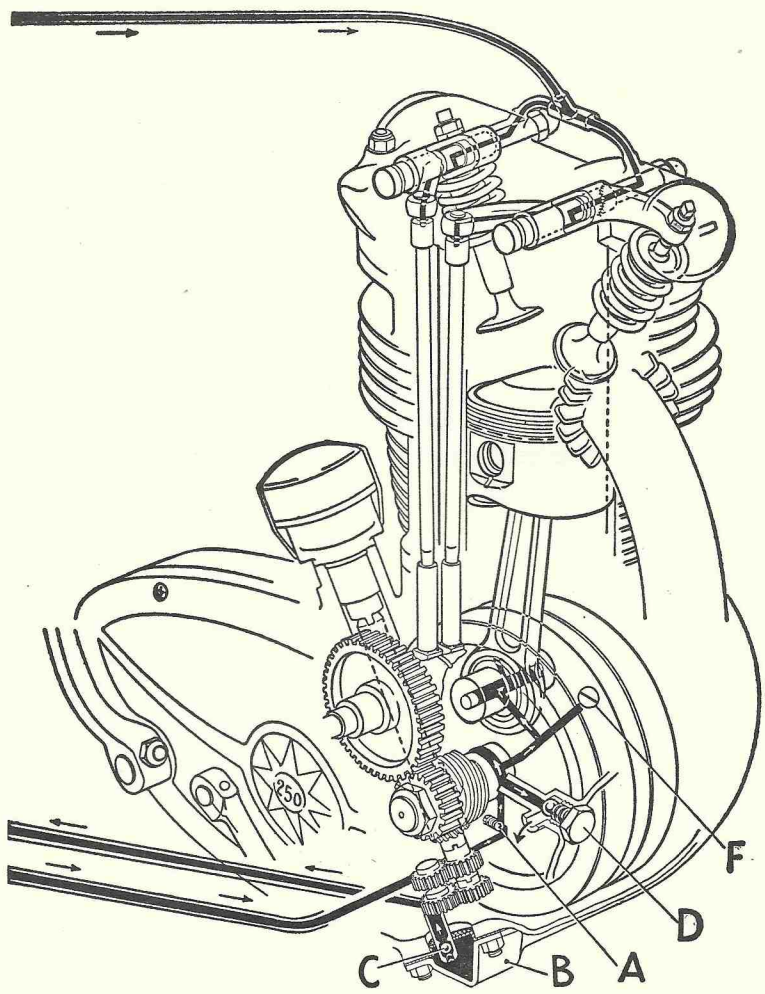


The Oil Tank C15.

MODEL C15

The lubrication system is of the dry sump type and is operated by a double gear pump situated in the bottom of the crankcase on the right-hand side. The oil tank capacity is four pints and oil is drawn from the oil tank to the supply pump (top set of gears). It is then pumped past the non-return valve (A), and along the hollow mainshaft to the big-end.

After lubricating the engine the oil flows down through a filter to the bottom of the crankcase from which it is drawn by the return pump (lower set of gears) past the non-return oil valve (C), and delivered up the return pipe to the tank. At the junction of the return pipe to the tank a by-pass pipe leads a supply of oil to the rockers, push-rods end, etc.



Lubrication System C15.

The valve (A) prevents oil transfer from the tank to the crankcase while the machine is standing, and together with the sludge trap (F), does not require attention until such time as the engine is completely dismantled.

A by-pass valve (D) ensures a constant pressure in the system. Surplus quantities of oil are discharged into the crankcase.

If the ball valve (C) should be stuck in its seating there will be no return of oil to the tank. In this event remove the cover plate (B) below the pump, insert a piece of wire into the valve orifice and lift the ball off its seating to free it.

Crankcase Breather C15

The breather is mechanically timed as on the C10L and C11G models but takes the form of a hollow camshaft with a radial drilling which, at the appropriate piston position, is brought in line with a drilled port in the inner timing cover, this port has its outlet inside the outer timing cover. Pressure is then released through a small radial cut-away at the rear end of the outer cover joint face.

Changing the Oil C15

This should preferably be done immediately after running, so that the oil is warm and will, therefore, flow more freely. Disconnect the oil pipe union nut (A), at the base of the tank and collect the old oil in a suitable receptacle.

Filters

Remove the oil tank and crankcase filters for cleaning at regular intervals, this can be carried out in conjunction with the change of oil. After releasing the oil pipe at (A), unscrew the hexagon plug (B), which carries the filter in the tank, and wash thoroughly in petrol. Make sure that all the petrol has evaporated before replacing. Refill with the correct grade of oil.

The pump filter can be withdrawn after removing the crankcase cover plate and should be thoroughly washed with petrol, dried and replaced. The oil pump is extremely reliable and it is most unlikely that it will give trouble therefore it should not be disturbed unnecessarily. The pump is held in position by three bolts. The two other bolts hold the sections of the pump together.

B.S.A. MOTOR CYCLES LTD., Service Department, Armoury Road, Birmingham 11.
B.S.A. Press

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"B" AND "M" GROUP MODELS

ENGINE ADJUSTMENTS

(which can be carried out without dismantling)

Oil Pressure Valves

There are two ball valves in the system, and both are placed between the tank and the sump to prevent the transfer of oil when the engine is not running. The spring loaded ball valve as illustrated in Fig. M6 is situated in the timing cover, and permits a supply of oil under pressure to the big-end.

In the event of dirt or foreign matter lodging between the ball and its seating oil will slowly drain from the tank and into the sump when the engine is stationary, and on starting smoke will issue from the exhaust, but will clear after the engine has been running for some time. To rectify this dismantle the pressure valve by unscrewing the hexagon-headed nut in the base of the timing cover, withdraw the spring and bolt, and carefully clean the ball and its seating. Finally replace the ball and give it a sharp tap with a hammer and copper drift to ensure a correct seating, and replace the spring, fibre washer and nut.

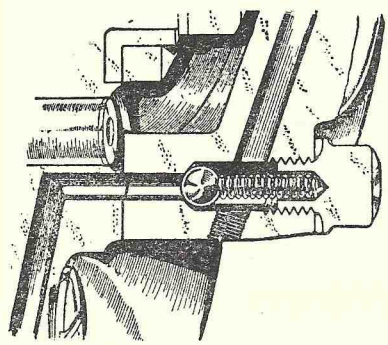

Fig. M.6. Pressure valve in timing cover.

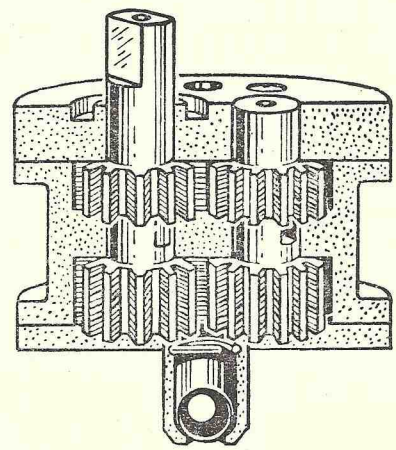

Fig. M.7. Ball valve below return pump.

The other valve is situated in the base of the oil pump (see Fig. M7) and consists of a ball bearing held on to its seat by gravity. Failure of the oil to return may be due to this ball sticking on its seat. This can be overcome by inserting a short length of wire into the valve orifice, and forcing the ball off its seating. It is not advisable to remove the pump from the crankcase unless such a procedure is absolutely essential, for unless the pump seating is oiltight, oil will transfer from the tank via the pump housing.

Exhaust Valve Lifter

At all times keep the actuating cam on the lifter clear of the rocker arm on "B" Group and M33 machines (Fig. M8) or the tappet head on M20 and M21 machines; otherwise the tappet clearances will be affected and the valve gear will be noisy. Failure to check this clearance may result in a burned exhaust valve. Adjustment is usually carried out by means of the cable adjuster, but the actuating arm can be removed and reset at any position on the serrated shaft.

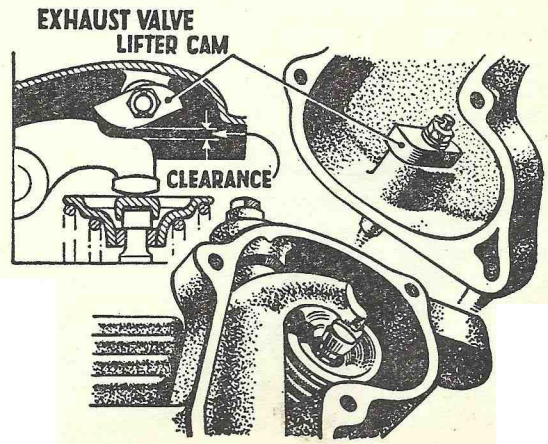

Fig. M.8. Exhaust valve lifter adjustment.

Tappet Adjustment

Before any attempt is made to check the tappets ensure that the exhaust lifter is adjusted in accordance with the previous instructions. Owing to the special cam design it is essential that the following directions be adhered to.

1. Rotate engine until the **inlet** valve has just closed.
2. Adjust **exhaust** tappet.
3. Turn engine until **exhaust** valve has just taken up tappet clearance, but has not started to open valve.
4. Adjust **inlet** tappet.

Obviate the possibility of an incorrect tappet clearance on O.H.V. models by lifting the push rod with the fingers before inserting feelers, or the weight of the push rod may prevent feelers being correctly inserted.

The actual adjustment is carried out by releasing the locknut (B) Fig. M9, holding the tappet with a spanner and screwing the tappet head (A) up or down. When the correct clearance is obtained tighten the locknut on to the head of the tappet and re-check clearance.

NOTE:—Correct tappet clearances are as follows:—

Models B31, B32, B33, B34, M33—
inlet .003; exhaust .003.

Models M20, M21—
inlet .010; exhaust .012.

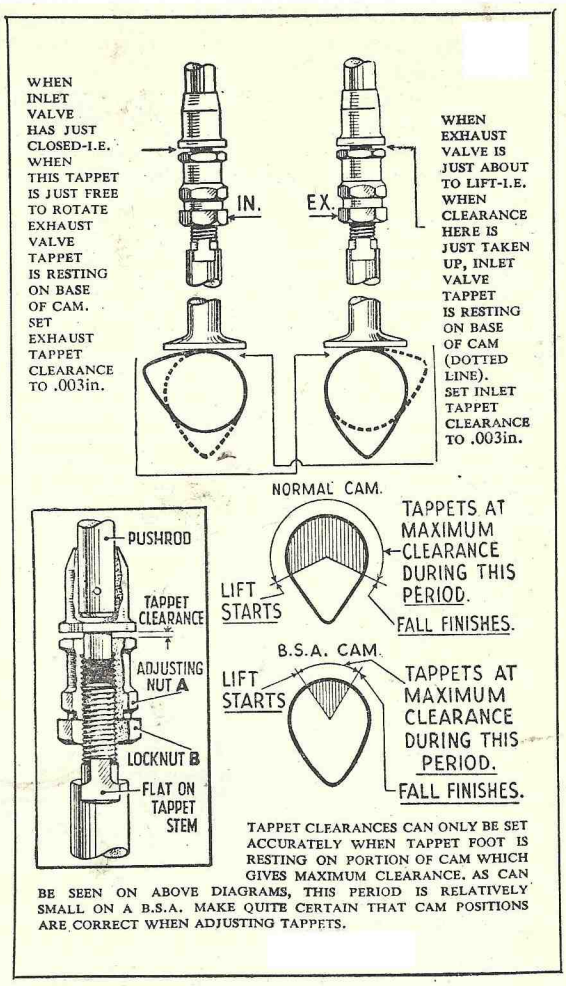

Fig. M.9.

Ignition Timing (except models with engine prefix letters G.B.)

It is a rare occurence for the magneto pinion to slacken off and upset the timing, and it is inadvisable to disturb the setting unless absolutely necessary, or unless the timing is known to be at fault.

It is advisable however, to check the timing periodically, or after carrying out any adjustment to the contact breaker points, as a slight variation tends to advance or retard the engine. If the timing requires resetting first check that the fully open gap is .010—.012 in., then remove the timing cover and in so doing take care to see that the small nozzle which feeds oil to the hollow crankshaft is not damaged (see Service Sheet No. 606).

With the cover removed, take off the locknut which holds the magneto pinion on to its taper, and with the aid of a magneto pinion extractor, withdraw the pinion. (The pinion is fixed on its shaft by a plain taper.)

To reset the timing, turn the engine forward until the piston is at the top of the compression stroke, and then turn the engine **backwards** until the piston has descended $\frac{7}{16}$ in. Turn the contact

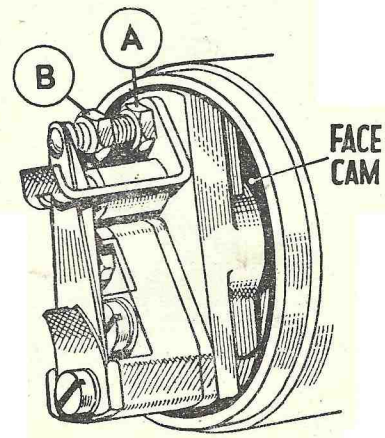

Fig. M.10.

breaker in the direction of rotation until the points are just open (.002 in.) with the ignition lever fully advanced. Tap the magneto pinion lightly on to its taper, tighten up the nut carefully, and when dead tight re-check the setting.

N.B.—It is essential that the ignition setting as laid down here be adhered to or high running temperatures and the possibility of a seizure will be present.

To adjust the contact breaker gap, release the locknut (A) Fig. M10, and adjust the gap to .012 in. maximum by rotating the small bolt (B) in the desired direction.

"B" Models with Engine Prefix Letters G.B.

Ignition Timing

It is unlikely that the ignition timing will alter, but if, for any reason, it is found necessary to check or reset the ignition timing it is advisable first to check the contact breaker points and if necessary, re-adjust as described under the next heading.

To check the timing, remove the sparking plug and the contact breaker cover. Insert a slim rod through the sparking plug hole to feel the top of the piston, then rotate the engine until the piston is at top dead centre on the compression stroke (i.e. with both valves closed). Keep the rod as vertical as possible and mark top dead centre position on it. The best way of rotating the engine is to engage top gear and turn the rear wheel.

Turn the engine backwards through about 45° then bring it forward again until the contact breaker points are just on the point of opening. When the cam is moved to the fully advanced position as shown in the unit (Fig. M10A) the position of the points is best determined by inserting a piece of fine paper, (such as cigarette paper) between the points. The points are just about to open when the paper is only lightly gripped and can be withdrawn with a gentle pull.

The piston should then be $\frac{7}{16}$ in. before top dead centre for model B31, and $\frac{3}{8}$ in. for model B33, as measured by the rod through the plug hole.

If the timing is slightly out it can be set by slackening bolt (A) Fig. M10A, and rotating the contact breaker a degree or two either way as required until the points are in position as described above. Then retighten bolt (A).

To retime the ignition if this becomes necessary remove the contact breaker complete with housing by taking out the three top timing cover screws (i.e. the one at the top of the timing cover, and the one on each side of it). These are longer than the other timing cover screws, which need not be disturbed, and are provided with nuts (B) at the back. When they are taken out the contact breaker with housing can be drawn out as a complete unit together with its driving pinion still in position. Disconnect the low-tension cable (C) from its terminal.

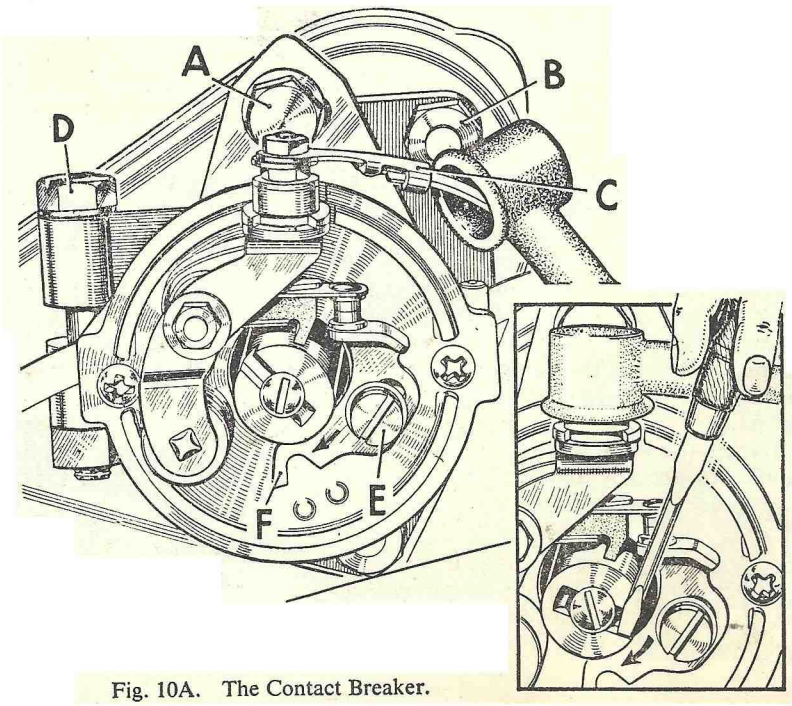

Fig. 10A. The Contact Breaker.

Rotate the engine until the piston is in the correct position as described above (i.e. $\frac{7}{16}$ in. for B31 and $\frac{3}{8}$ in. for B33 before top dead centre at the end of the compression stroke). Now take the contact breaker unit, remove the cap, and turn the driving pinion until the points are just on the point of opening with the cam held in the fully advanced position as already described for checking the timing. Release the cam and hold the unit in such a position that the nut (A) and terminal (C) are vertical. (These two should be in line. If they are not, then slacken pinch bolt (D) and turn the housing until (A) comes into line with (C). Then retighten pinch bolt 'D').

Holding the unit in this position, gently insert it into its register at the back of the timing cover. If it will not go right home withdraw it and turn the pinion the least fraction of a tooth to enable it to mesh with the idler pinion which drives it and re-insert. When it is fully home refit the three screws, and check the timing, making any necessary adjustment at bolt (A).

To adjust the Contact Breaker Points

Turn the engine until the points are fully open and check with a set of feeler gauges. The correct gap is .012—.015 in. If incorrect slacken screw (E) and move plate (F) gently with a screwdriver until the correct gap is obtained. Then tighten screw (E) and re-check the gap.

Carburettor (all models)

To maintain the efficiency of the carburettor it is necessary to dismantle it periodically and wash thoroughly in clean petrol.

Renew any worn parts, particularly the needle valve if the head has a distinct ridge at the point of seating, the throttle valve if excessive side play is present, and the taper needle and clip if it is possible to rotate the needle freely in the clip.

For further attention to the carburettor and for tuning details see Service Sheet No. 708.

Sparking Plugs (all models)

The machine is supplied with Champion non-detachable type sparking plugs to suit the characteristics of the engine. If the best performance with regard to both power and economy is to be obtained then they must remain clean and properly gapped.

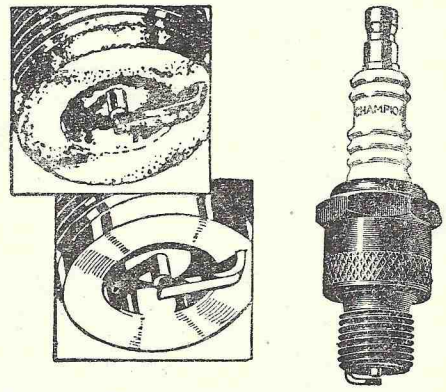

Fig. A.6. The Sparking Plug.

The sparking plugs should be removed periodically for examination. If the carburation is correct and the engine is in good condition the plugs will remain clean for considerable periods. An over-rich mixture will however cause the formation of a sooty deposit on the plug points and eventually on the plug body (see upper view of Fig. A6). Heavily leaded fuels may form a greyish deposit in a similar manner. If a heavy deposit is found, the plug should be cleaned, with the aid of the sand blast type of plug cleaner found at most garages, as otherwise the performance of the machine may be affected. If a heavy deposit is allowed to build up inside the plug it may prevent the engine from firing altogether. A weak mixture will cause burning of the plug points and give the plug a whitish appearance (see Service Sheet No. 708).

Check that the gap between the sparking plug points is correct and if necessary reset to .018—.020 in. (.45—.50 mm.) by bending the side wire. In no circumstances attempt to move the central electrode as this may damage the insulation. If the points are badly burnt away or cleaning fails to restore the plug to its full efficiency then it should be replaced by a new one.

When replacing the plug make sure that the copper washer is in good condition. Use a tubular spanner to prevent damage to the plug and keep the outside of the insulation free from oil and dirt by wiping with a clean rag.

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ALL MODELS—USEFUL DATA

Model	C10	C11	C12	C15 Std.	B31	B32	B33	B34	M20
Engine bore ...	63 mm.	63 mm.	63 mm.	67 mm.	71 mm.	71 mm.	85 mm.	85 mm.	82 mm.
Engine stroke ...	80 mm.	80 mm.	80 mm.	70 mm.	88 mm.	88 mm.	88 mm.	88 mm.	94 mm.
Engine capacity ...	249 c.c.	249 c.c.	249 c.c.	249 c.c.	348 c.c.	348 c.c.	499 c.c.	499 c.c.	496 c.c.
Petrol tank capacity	2½ galls.	2½ galls.	2¾ galls.	2½ galls.	3 galls.	3 galls.	3 galls.	3 galls.	3 galls.
Oil tank capacity ...	4 pints	4 pints	4 pints	4 pints	4 pints	4 pints	4 pints	4 pints	5 pints
Gearbox capacity ...	*½ pint	*½ pint	½ pint	½ pint	1 pint	1 pint	1 pint	1 pint	1 pint
Tappet clearance cold :—									
Inlet	.004″	.003″	.010″	.008″	.003″	.003″	.003″	.003″	.010″
Exhaust	.006″	.003″	.012″	.010″	.003″	.003″	.003″	.003″	.012″
Tyres (front) ...	3.00 × 19	3.00 × 20†	3.00 × 19	3.25 × 17	3.25 × 19	2.75 × 21	3.25 × 19	2.75 × 21	3.25 × 19
Tyres (rear) ...	3.00 × 19	3.00 × 20†	3.00 × 19	3.25 × 17	3.25 × 19	4.00 × 19	3.25 × 19	4.00 × 19	3.25 × 19
Piston ring gap (plain)	.010″	.010″	.010″	.010″	.010″	.010″	.010″	.010″	.010″
Piston ring gap (oil control) ...	.010″	.010″	.010″	.010″	.010″	.010″	.010″	.010″	.010″
Piston ring side clearance	.002″/.004″	.002″/.004″	.002″/.004″	.002″/.004″	.002″/.004″	.002″/.004″	.002″/.004″	.002″/.004″	.002″/.004
Piston clearance— bottom of skirt ...	.0045″/ .0065″	.0035″/ .0055″	.0035/″ .0055″	.0025″/ .004″	.0040″/ .0055″	.0040″/ .0055″	.0045″/ .0065″	.0045″/ .0065″	.0040″/ .0060″
Gear ratios :—									
Top	6.6	6.6	6.26	5.98	5.6	7.1	5.0	5.6	5.3
3rd	—	—	7.64	7.65	7.3	9.2	6.5	7.4	7.0
2nd	9.8	9.8	11.1	10.54	11.1	14.2	10.0	11.5	10.9
1st	14.5	14.5	16.15	15.96	15.9	20.2	14.2	16.8	15.8
Ignition setting (inches before T.D.C.)									
Fully advanced ...	—	—	—	11/32″	7/16″	7/16″	7/16″	7/16″	7/16″
Fully retarded ...	1/32″	1/32″	T.D.C.	—	—	—	—	—	—
Carburetter :—									
Jet	90	80	140	—	150	150	200	200	170
With air cleaner	90	80	100	140	150	150	170	170	—
Sparking plug :—									
C.I. cyl. head ...	L.10	L.10S	L.10S	—	L.10S	L.10S	L.10S	L.10S	—
Al. alloy cyl. head	N8	—	—	N5	—	NA8	—	NA8	N8
Compression ratio	5.1–1	6.5–1	6.5–1	7.25–1	6.5–1	6.5–1	6.8–1	6.8–1	4.9–1
Valve timing—inlet :									
Opens before T.D.C.	25°	25°	34°	26°	25°	25°	25°	25°	25°
Closes after B.D.C.	70°	70°	78°	70°	65°	65°	65°	65°	65°
Valve timing–exhaust									
Opens before B.D.C.	70°	70°	74°	61½°	65°	65°	65°	65°	65°
Closes after T.D.C.	25°	25°	38°	34½°	25°	25°	25°	25°	25°
Distributor points gap	.012″	.012″	.015″	.012″	—	—	—	—	—
Magneto points gap	—	—	—	—	.012″	.012″	.012″	.012″	.012″
Plug points gap ...	.015″ to .018″	.015″ to .018″	.018″ to .020″	.020″ to .025″	.015″ to .018″	.015″ to .018″	.015″ to .018″	.015″ to .018″	.015″ to .018″
Tyre pressures :—									
Front (per sq. in.)	20 lb.	20 lb.	18 lb.	16 lb.	16 lb.	—	16 lb.	—	17 lb.
Rear (per sq. in.)	28 lb.	28 lb.	26 lb.	22 lb.	20 lb.	—	17 lb.	—	22 lb.

For Swinging Arm and other models not listed see appropriate series.

*4-speed Gearbox 1 pint

†3.00 × 19 on later models

Model	M21	M33	A7 Up to Engine No. ZA7 11192	A7 S.T. Two Carburetters	A7 On and After Engine No. AA7 101.	A7 S/T & S/S On and After Engine No. AA7S 101.	A10	R/R and S/R
Engine bore	82mm.	85mm.	62mm.	62mm.	66mm.	66mm.	70mm.	70mm
Engine stroke	112mm.	88mm.	82mm.	82mm.	72.6mm.	72.6mm.	84mm.	84mm
Engine capacity	591c.c.	499c.c.	495c.c.	495c.c.	497c.c.	497c.c.	646c.c.	646c.c.
Petrol tank capacity	3 galls.	3 galls.	3 galls.	3½ galls.	3½ galls.	3½ galls	4¼ galls.	2 or 4 galls.
Oil tank capacity	5 pints	5 pints	4 pints	4 pints	4 pints	4 pints	4 pints	5½ pints
Gearbox capacity	1 pint	1 pint	1 pint	1 pint	1 pint	1 pint	1 pint	14 fl. ozs.
Tappet clearance (cold):								
Inlet	.010"	.003"	.015"	.015"	010"	.008"	010"	.008"
Exhaust	.012"	.003"	.015"	.015"	.016"	.012"	.016"	.008"
Tyres (front)	3.50×19	3.25×19	3.25×19	3.25×19	3.25×19	3.25×19	3.25×19	
Tyres (rear)	3.50×19	3.50×19	3.50×19	3.50×19	3.50×19	3.50×19	3.50×19	
Piston ring gap (plain) ...	010"	.010"	.013"	.013"	.013"	.013"	.013"	
Piston ring gap (oil control)	.010"	.010"	.011"	.011"	.011"	.011"	.011"	
Piston ring side clearance ...	.002"/.004"	.002"/.004"	.002"/.004"	.002"/.004"	.002"/.004"	.002"/.004"	.002"/.004"	.002"/.004"
Piston clearance—bottom of skirt	.0040"/ .0060"	.0045"/ .0065"	.0030"/ .0050"	.0030"/ .0050"	.0030"/ .0050"	.0030"/ .0050"	.0030"/ .0050"	.003"/ .005"
Gear ratios:						S/T S/S		
Top	5.9	4.8	5.1	5.1	5.1	5.0 5.28	4.42	4.53
3rd	7.8	6.3	6.2	6.2	6.2	6.05 6.38	5.36	5.48
2nd	12.2	9.9	9.0	9.0	9.0	8.8 9.28	7.77	7.96
1st	17.8	14.3	13.2	13.2	13.2	12.9 13.62	11.41	11.68
Ignition setting (inches before T.D.C. fully advanced) ...	7/16"	7/16"	3/8"	3/8"	5/16"	3/8"	11/32"	3/8"
Carburetter:								
Jet	170	200	—	110	—	—	—	250
With air cleaner	—	170	140	—	140	160	170	240
Sparking plug C.I. cyl. head...	L.10	L.10S	L.10S	L.10S	L.10S	L.10S	L.10S	NA 10
A.l alloy cyl. head	N8	—	—	—	—	—	—	
Compression ratio	5–1	6.8–1	6.6–1	7–1	6.6–1	7.25–1	6.5–1	R/R 8-1 S/R 8.26–1
Valve timing—inlet:								
Opens before T.D.C. ...	25°	25°	24°	24°	30°	42°	30°	42°
Closes after B.D C. ...	65°	65°	65°	65°	70°	62°	70°	62°
*Valve timing—exhaust: ..								
Opens before B.D.C. ...	65°	65°	60°	60°	65°	67°	65°	67°
Closes after T.D.C. ..	25°	25°	21½°	21½°	25°	37°	25°	37°
Distributor points gap ...	—	—	—	—	—	—	—	
Magneto points gap	.012"	.012"	.012"	.012"	.012"	.012"	.012"	.012"
Plug points gap	.015" to .018"	.015" to .018"	.015" to .018"	.015" to .018"	015" to 018"	.015" to 018"	.015" to .018"	.018"/.020"
Tyre pressures:								
Front (per square inch)...	16lb,	17lb.	17lb.	17lb.	17lb.	17lb.	17lb.	17 lb.
Rear (per square inch) ...	18lb.	18lb.	18lb.	18lb.	18lb	18lb	18lb.	19 lb.

*NOTE:— Standard A7's after Eng. No. CA7–5232 and Standard A10's after Eng. No. DA10–1647 have the same camshaft as the S/S and R/R machines and valve timing is therefore the same.

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

BSA SERVICE SHEET No. 704

Reprinted September, 1964

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
Dandy 70		7.25 : 1	.003″/.004″
D1			.0027″/.0045″
D3, C15			.0025″/.004″
D5, D7			.003″/.005″
C10, C10L			.0045″/.0065″
C11, C11G, C12			.0035″/.0055″
C15.	(Star Group)	6.4 : 1 To 10 : 1	.0017″/.0033″
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″
		13 : 1	.004″/.0055″
DB32.	Gold Star	7.25 : 1	.0025″/.004″
		8 : 1	.003″/.0045″
		9 : 1	.003″/.0045″
B40.	(Star Group)	7.0 : 1 To 8.7 : 1	.0015″/.003″
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″
DBD34.	Gold Star	8.75 : 1	.003″/.0045″

B.S.A. SERVICE SHEET No. 704 (continued)

M20			.004″/.006″
M21			.004″/.006″
M33			.0045″/.0065″
M33.	(Split skirt)		.0006″/.00275″
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)	.001″/.0031″
A7.	(Shooting Star)	8 : 1 (after engine No. CA7S.S4501)	.0035″/.005″
A50.	(Star Twin)	8.0 : 1 To 9.0 : 1	.0011″/.0025″
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″
A10.	(Golden Flash)	7.5 : 1 (after Engine No. DA10–651)	.0035″/.005″
A10.	(Super Rocket)	8.5 : 1 (after Engine No. CA10R6001)	.004″/.0055″
A10.	(Rocket Gold Star)	8.75 : 1	.001″/.0025″
A65.	(Star Twin)	7.5 : 1 To 9.0 : 1	.0012″/.0027″

BSA MOTOR CYCLES LIMITED
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TELESCOPIC FORKS

'A', 'B' AND 'M' GROUP, C10, C11G AND C12 MODELS

Of robust design B.S.A. telescopic forks require the minimum of maintenance it being necessary only to replenish the oil occasionally between major overhauls.

For normal use each fork leg should contain a quarter pint of oil (142 c.c.) or three-eighths of a pint (213 c.c.) according to model as detailed below.

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-eighth Pint Capacity
Models B31-33 (1956 onwards), B32-34 and Gold Stars (1952 onwards), 'A' Group (1952 onwards).

Oil Changes
To replenish the oil remove the drain plugs at the base of the fork tubes and remove the fork top nuts. Allow the oil to drain off. Replace the plugs and pour either a quarter or three-eighths pint of oil into the hollow tubes revealed when the top plugs are removed.

Dismantling
Before beginning to overhaul the forks have the following tools and replacement parts available in case they are required:—

61–3001	Fork top nut spanner
61–3003	Fork plug spanner
61–3005	Oil seal holder assembly tool
61–3006	Oil seal extractor
61–3007	Oil seal assembly tool
61–3350	Fork leg assembly and removal tool
29–5334	Packing shim (.005 in.)
29–5335	Packing shim (.010 in.)
29–5336	Packing shim (.020 in.)
29–5337	Packing shim (.030 in.)
65–5424(2)	Fork top bush ('A' and 'B' Group)
29–5347(2)	Fork bottom bush ('A', 'B', C11G and C12)
29–5346(2)	Fork top bush (C10L, C11G and C12)
29–5313(2)	Fork oil seal (all models)
	Number five twine (approx. 18 in.)

Remove the front wheel and front mudguard. Take out the fork top cap (A) Fig. X1, screw Service Tool part number 61–3350 into the thread at the top of the fork shaft using the larger of the fine threads.

Slacken off the pinch bolt (B) Fig. X1.

Take a firm grasp of the lower fork sliding tube and strike the top of the tool smartly with a hammer. This will release the shaft from its taper and the complete fork leg can be drawn down and removed from the machine.

Repeat the operation on the other leg.

To dismantle the lower section of the fork hold the fork sliding tube by gripping the wheel spindle lug in a soft-jawed vice and lift off the spring (see Fig. X2).

Enter Service Tool part number 61–3005 until the dogs on the tool engage in the slots at the bottom of the oil seal holder (D) Fig. X2. Pressing the tool down and turning at the same time unscrew the oil seal holder. Slide the holder up the shaft until it becomes tight on the tapered section of the shaft. Do not use excessive force or the oil seal may be damaged.

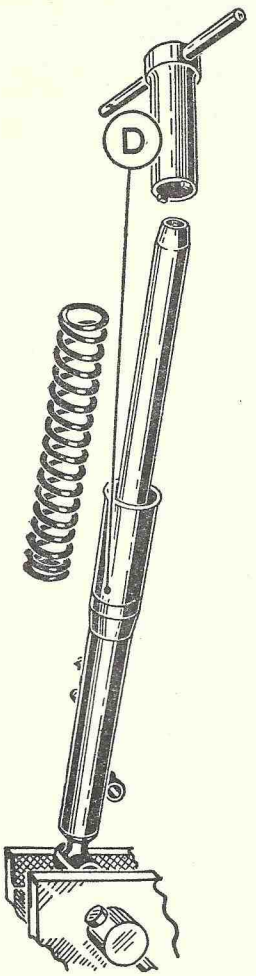

Fig. X2.

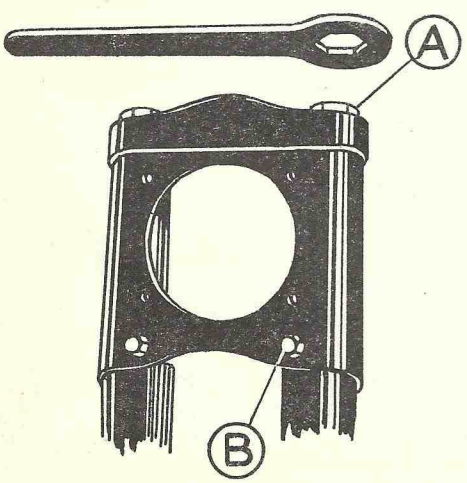

Fig. X1.

The top fork bearing is retained in the fork leg by a circlip (E) Fig. X3, which can be prised out with a sharp tool such as the tang end of a file. There may be a number of shims fitted between the circlip and the top bearing. These must be replaced if the bushes are not renewed when assembling.

Grip the shaft in a vice using soft-jaw clamps on the unground portion of the shaft and unscrew the gland nut (F) Fig. X4. Service Tool part number 61–3003 is designed for this purpose. Remove the gland nut which secures the lower bearing and both bearings, shims, circlip and oil seal holder will then slide off the shaft.

If it is necessary to remove the oil seal place the lower edge of the holder on a soft wooden block and enter Service Tool part number 61–3006 into the top of the holder. Give this tool a sharp tap with a hammer and the oil seal will be driven out.

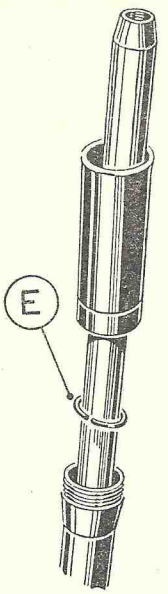

Fig. X3.

Reassembly

Reassembly is carried out in the reverse order. Cleanliness is essential and before attempting to reassemble clean all parts thoroughly and clean down the bench on which the forks have been dismantled.

If the oil seal is to be replaced care must be taken that the feather edge of the seal is not damaged. Enter the oil seal (I) Fig. X6 into the holder, metal part first, and drive home using B.S.A. Service Tool part number 61–3007 (H) Fig. X6. Place the oil seal holder over the shaft and pass it up the shaft until it is firmly held on the tapered section. Do not use excessive force or the oil seal may be damaged. Place the circlip over the shaft followed by the shims and top bearing and then the bottom bearing. Place the steel washer over the thread of the gland nut, screw up the gland nut and holding the shaft firmly in a soft-jawed vice as described in dismantling procedure firmly tighten the gland nut.

Place the lower sliding tube in a vice and enter the fork shaft with parts assembled into the lower sliding tube. Fit the circlip and check for up and down movement on

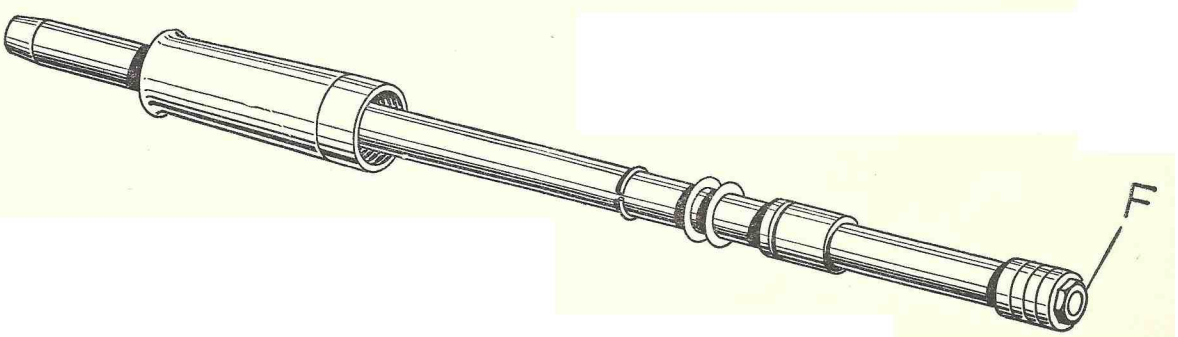

Fig. X4.

the top bush. If a new bush has been fitted it may be necessary to add to, or take from, some of the existing shims. Packing shims are avilable in the following sizes:—

.005 in. Part Number 29–5334
.010 in. Part Number 29–5335
.020 in. Part Number 29–5336
.030 in. Part Number 29–5337

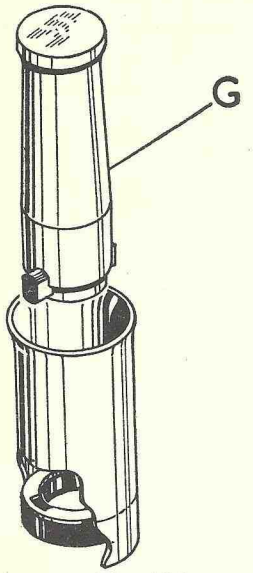

Fig. X5.

If the bush is not properly shimmed a tapping noise may be heard when the machine is ridden.

Having shimmed up the bush correctly and fitted the circlip firmly in position, screw down the oil seal holder and take one turn of number five twine around the base of the thread to provide an additional seal. Screw down the oil seal firmly using B.S.A. Service Tool part number 61–3005.

To fit the main tubes to the fork yokes screw B.S.A. Service Tool part number 61–3350 into the top of the tube and pass it up through the two yokes, then fit the collar and nut and draw the tube firmly home into the yokes. When the tube is fully home 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 can be replaced and fully tightened. Finally slacken the pinch bolt, position the top outer shroud centrally over the lower leg. Check that the top nuts are completely tight and re-tighten the pinch bolts.

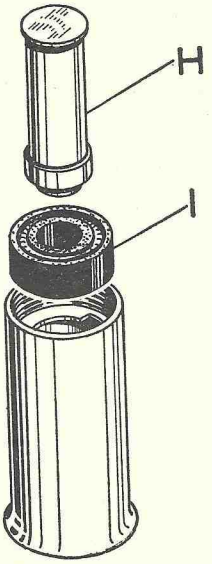

Fig. X6.

B.S.A. MOTOR CYCLES LTD., Service Department, Armoury Road, Birmingham 11.
PRINTED IN ENGLAND

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Gold Star and Competition Models

USEFUL DATA

Engine Stroke		88mm.
Engine Bore		B32 71mm. B34 85mm.
Engine Capacity		B32 348c.c. B34 499c.c.
Oil Tank Capacity		5 pints.
Gearbox Capacity		1 pint.
Front Fork Capacity (each leg)		$\frac{3}{8}$ pint (212c.c.)

Tappet Clearances (cold engine):

Cam. 65–2420	.003in. Inlet and Exhaust.
Cams. 65–2434 to 65–2440	.001in. Inlet and Exhaust.
Cams. 65–2442 to 65–2452	.008in. Inlet. .010in. Exhaust.
1954 onwards (Clubmans Models)	.006in. Inlet and Exhaust.

Piston Ring Gap	Top .012in. 2nd and Scraper .010in.
Piston Ring Side Clearance	.0015in.
Piston Clearance (bottom of skirt)	.0025in. – .0045in.
Contact Breaker Gap	.012in.

nition Setting B.T.D.C. (fully advanced)	350c.c. Touring, Trials and Scrambles, $\frac{7}{16}$in. 500c.c. Touring and Trials, $\frac{1}{2}$in. Scrambles, $\frac{7}{16}$in.
Racing (Clubmans)	$\frac{15}{32}$in.
Racing (Alcohol)	350c.c., $\frac{3}{8}$in. 500c.c., $\frac{7}{16}$in.
Racing (Petrol Benzol)	350c.c., $\frac{15}{32}$in. 500c.c., $\frac{1}{2}$in.

Sparking Plug	Touring and Trials	Champion NA8.
	Scrambles	Champion NA10 or NA12.
	Racing	Champion NA14.
Carburetter	Trials – Standard	Touring – Standard or T.T.10.
	Scrambles – T.T.10	Racing – T.T.10; T.T.10 R.N. or G.P.

Engine Sprockets available	16, 17, 18, 19, 20 Teeth.
Gearbox Sprockets available	16, 19 Teeth.
Clutch Sprocket	43 Teeth (44 Teeth to Special Order).
Chainwheel Sprocket	42 Teeth.

Internal Gear Ratios:		Marked.	Top.	3rd.	2nd.	Bottom
Plunger Frame Models,	Extra Close	(Ex. Close)	1.0	1.1	1.31	1.78
	Close	(Close)	1.0	1.32	1.72	2.48
	Standard		1.0	1.32	2.05	2.98
Swinging Arm Frame,	Extra Close	(R.R.)	1.0	1.099	1.326	1.929
	Close	(Day)	1.0	1.101	1.460	2.124
	Scrambles	(Sc)	1.0	1.325	1.754	2.343
	Standard	(Std)	1.0	1.210	1.758	2.580
	Wide Ratio	(Tri)	1.0	1.549	2.339	3.167

Chain Sizes	(Front)	$\frac{1}{2}$in. x .305in.
	(Rear)	$\frac{5}{8}$in. x .250in.

Tyre Sizes	(Front)	Touring and Scrambles, 3.00 x 21; Trials, 2.75 x 21 Racing, 3.00 x 19 or 21
	(Rear)	Touring and Racing, 3.25 x 19 (350c.c.); 3.50 x 19 (500c.c.) Trials and Scrambles, 4.00 x 19.

B.S.A. MOTOR CYCLES LTD.
Service Dept., Armoury Road, **Birmingham, 11**
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BSA SERVICE SHEET No. 708

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ALL MODELS

CARBURATION. Monobloc and Seperate Float Chamber Type

How the Carburetter Works

The function of the carburetter 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.

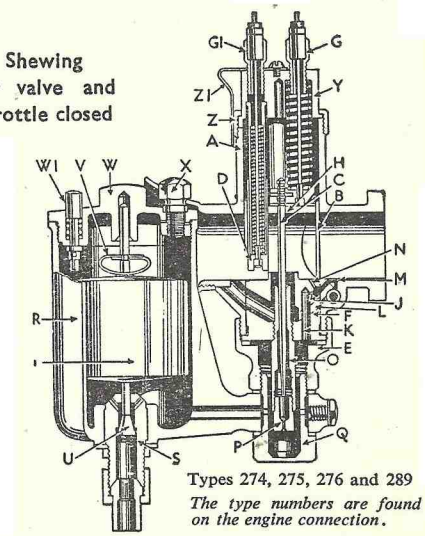
The mixture is correct at all throttle openings, if the carburetter is correctly tuned.

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 carburetter is embodied in the jet block, has been replaced in the Monobloc carburetter by a detachable jet (9) Fig. X5, assembled in the carburetter 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 carburetter, the new instrument has been designed with a view to giving improved performance, and certain constructional changes have been made.



Types 274, 275, 276 and 289

The type numbers are found on the engine connection.

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

Fig. X4. *A sectioned illustration of Needle Jet Carburetter.*

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 carburetter 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 carburetter by depressing the tickler and close the air control, set the ignition say, half-retarded. Then open the throttle about ⅛ in., then kick-start. If the throttle is too far open, starting will be difficult.

Starting—Engine Hot

Do not flood the carburetter, but it may be found necessary with some engines to close the air lever, set the ignition to half-retarded, the throttle to ⅛ in. open and kick-start. If the carburetter 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 ⅛ in. open, and air valve wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

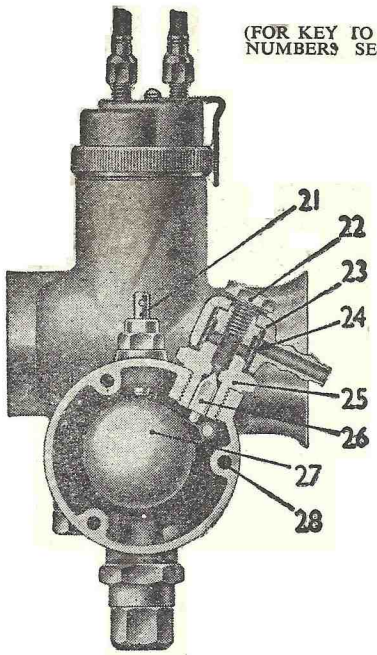
Starting—General

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 Carburetters

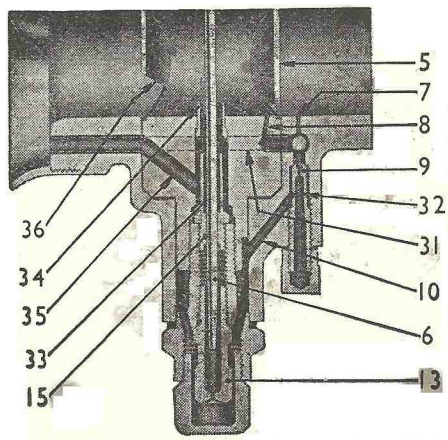
Open the throttle very slightly from the idling position and flood the carburetter more or less according to the engine being cold or hot respectively.

SECTIONAL ILLUSTRATIONS OF CARBURETTERS. Types 375, 376 and 389



(MONOBLOC)

Fig. X6. *Section through Float Chamber.*



Diagrammatic section of Carburetter showing only the lower half of the throttle chamber with the throttle a little open—and the internal primary air passages to the main jet and pilot system.

FOR KEY TO DIAGRAM NUMBERS SEE BELOW.

Fig. X5.

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

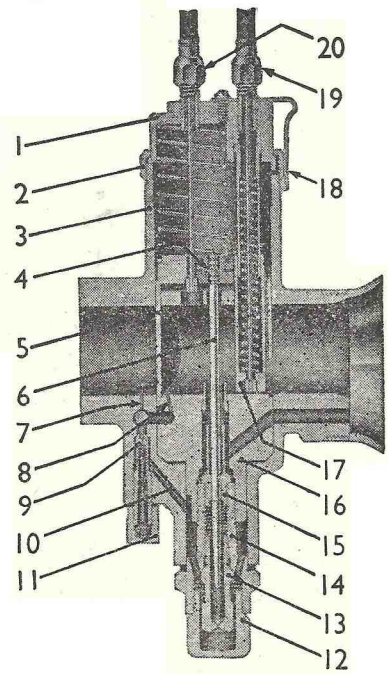


Fig. 7. *Secttion through Mixing Chamber, showing Air Valve and Thaottle closed.*

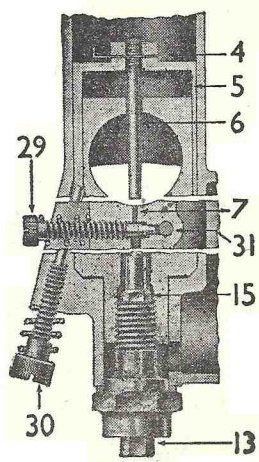


Fig. 8a.

29. PILOT AIR ADJUSTING SCREW

This screw regulates the strength o 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.

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.

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 carburetter. 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 carburetter, 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 carburetter through a hole at the base of the mixing chamber.

Fixing Carburetter 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 carburetter the main jet may have to be smaller. If a carburetter 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.

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 carburetter 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. / Verify ample flow. / Verify there is no flooding.
2. Looking for air leaks ... { At the connection to the engine. / Or due to leaky inlet valve stems.
3. Defective or worn parts ... { As a slack throttle-worn needle jet. / 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.

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

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 thottle 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 position.*

Fault at Throttle Positions indicated on Fig. X9

To Cure Richness:		To Cure Weakness:
Fit smaller main jet.	1st	Fit larger main jet.
Screw out pilot air screw.	2nd	Screw pilot air screw in.
Fit a throttle with larger cut-away.	3rd	Fit a throttle with smaller cut-away
Lower needle one or two grooves.	4th	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 carburetter, certainly cause weakness of mixture and possible damage from overheating.

TUNING

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

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

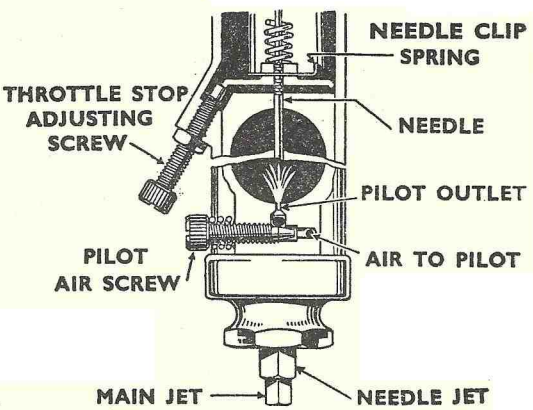


Fig. X8

(*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.

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 number 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 number 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 neddle 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

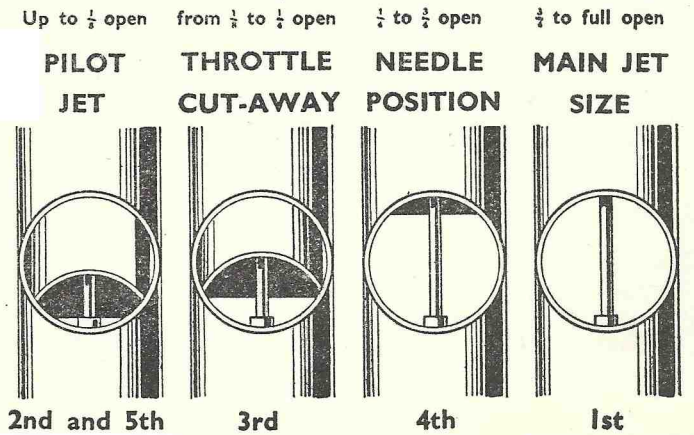


Fig. X9

Sequence of Tuning

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

NOTE.—The carburetter 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 piolit 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 carburetter, 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 number 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.

B.S.A. MOTOR CYCLES LTD., Service Department, Armoury Road, Birmingham 11.
B.S.A. Press.

BSA SERVICE SHEET No. 708B

November, 1950
Reprinted October, 1964

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 re-tune the carburetter for smaller throttle openings this should be done in accordance with Service Sheet 708.

Altitude.	Percentage of 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., Armoury Road, Birmingham 11.
B.S.A. Press.

BSA SERVICE SHEET No. 709

All Models

October, 1948.
Reprinted Jan., 1964

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.

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 carburetter float.
Incorrect ignition timing.

Engine Overheats.

Lack of proper lubrication.
Weak valve springs, or pitted valve seats.
Worn piston rings, or late ignition setting.
Carburetter setting too weak, or partly choked petrol pipe

Engine Misses Fire.

Weak valve spring.
Defective or oiled sparking plug, or oil on contact points.
Incorrectly adjusted contact points or tappets.
Faulty condenser.
Defective sparking plug or H.T. cable.
Loose sparking plug terminal.
Carburetter flooding, due to stuck or defective float.
Partly choked main jet.
Choked vent hole in petrol tank filler cap.

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.
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., Armoury Road, Birmingham, 11
(PRINTED IN ENGLAND)

BSA SERVICE SHEET No. 710

October 1948
Reprinted October 1964

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 on to the rivet head until the rivet is forced through the outer plate.

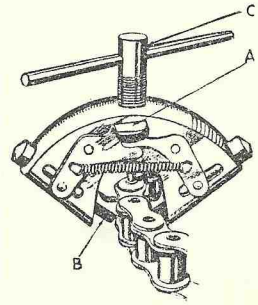


Fig. X7.

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 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 ling, Fig. X9—in which case the chain will have an odd

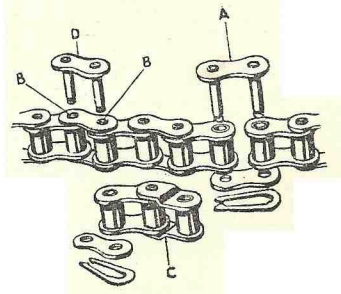


Fig. X8.

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.

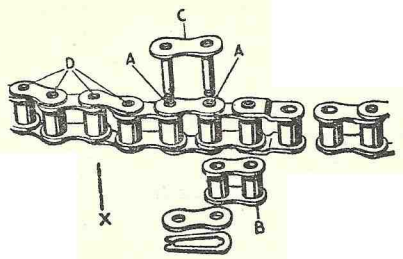


Fig. X9.

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 toward front of machine—when clip is on bottom run, closed end is towards rear of machine.

It hould 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 the 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 reartop 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 kickstarter. 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.

B.S.A. MOTOR CYCLES LTD., Service Department, Armoury Road, Birmingham 11.
B.S.A .PRESS

BSA SERVICE SHEET No. 713

Revised November 1958
Reprinted September 1964

ALL MODELS EXCEPT "D" GROUP AND C15
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.

On later models of the type shown in Fig. C31A the lamp is not removed, but it is necessary to take off the lamp front by unscrewing pin (F) and to disconnect the speedometer cable and the leads to the switch.

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 top caps (A) and (B) Fig. C31. Slacken the pinch bolt (C) and remove the adjusting sleeve (D) or (E) Fig. C31A. Tap off the fork top yoke by striking it with a mallet underneath its two sides alternately.

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.

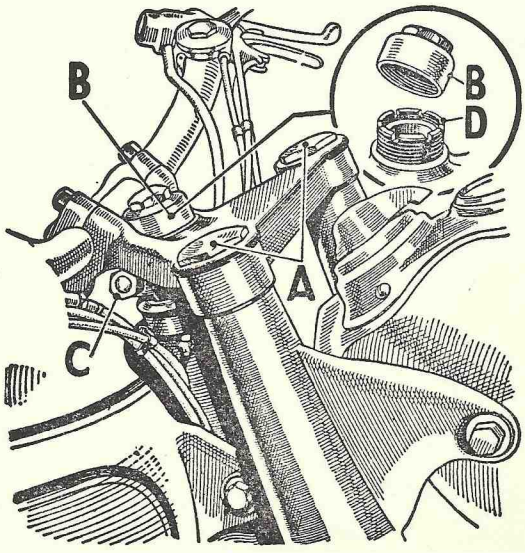


Fig. C31. The Front Fork & Steering Head.

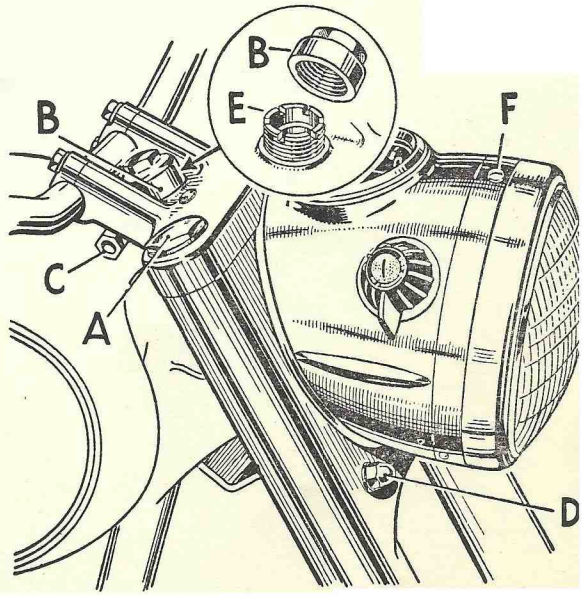


Fig. C31A.

Reassembly 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., Armoury Road, Birmingham 11
B.S.A. Press.

BSA SERVICE SHEET No. 802

October, 1948
Reprinted June, 1960

B and M Group Models
MAGDYNO

The Magdyno is a combined generator and magneto unit the generator being mounted above the magneto and driven through gears from the magneto driving shaft. Details of the E3HM generator which is incorporated in the Magdyno are given in Service Sheet No. 809. The Magdyno is arranged for variable ignition by means of hand control.

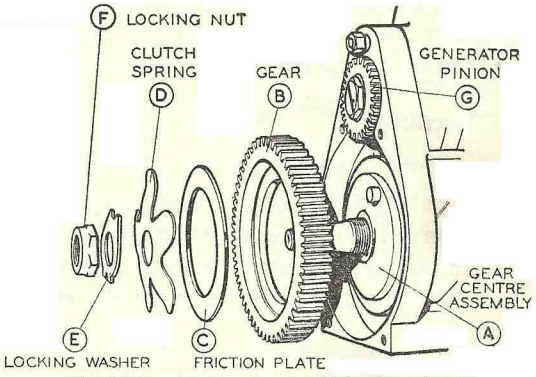


Fig. Y.5. Arrangement of slipping clutch.

A shock absorbing drive is incorporated in the larger of the two gears which take the drive from the magneto shaft to the generator. This considerably relieves the peak loading on the teeth of the driving gear and gives far longer life. The drive is taken from the gear centre 'A' (Fig. Y.5) which is keyed to the magneto shaft, through the fabric gear 'B' which is held against the gear centre under the pressure of a star-shaped spring 'D' to the pinion 'G' on the generator shaft. The effect of a violent overload is to cause the fabric gear to slip relative to the gear centre and so prevent shock from being transmitted to the fabric gear.

ROUTINE MAINTENANCE

Lubrication

To be carried out every 3,000 miles.

The cam is lubricated from a wick contained in the contact breaker base. To reach the wick, take out the screw securing the spring arm carrying the moving contact and lift off the backing spring and spring arm. The screw carrying the wick can then be withdrawn. At the same time, unscrew the contact breaker securing screw, take the tappet which operates the contact spring from its housing and lightly smear with thin machine oil. When replacing, see that the backing spring is fitted on top of the spring arm and that its bent portion is facing outwards.

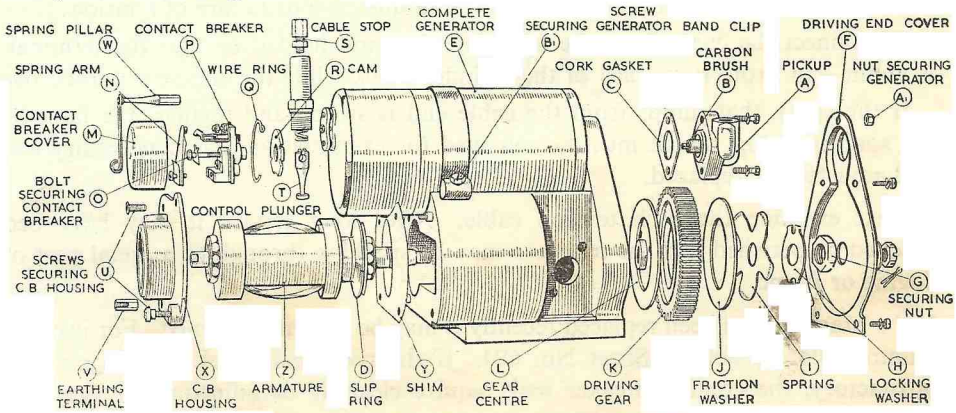


Fig. Y.6. The Magdyno (Exploded view)

Adjustment

To be carried out every 3,000 miles.

Remove the contact breaker cover and turn the engine until the contacts are fully opened. Check the gap with a gauge having a thickness of .012 in. If the setting is correct, the gauge should be a sliding fit, but if the gap varies appreciably from the gauge it should be adjusted. Keep the engine in the position to give maximum opening of the contacts, slacken the locknut and turn the contact screw by its hexagon head until the gap is set to the gauge. Finally tighten the locknut and re-check the setting.

Cleaning

To be carried out every 6,000 miles.

Take off the contact breaker cover and examine the contact breaker. If the contacts are burned or blackened, clean them with fine carborundum stone or with very fine emery cloth, and afterwards wipe away any dust or dirt with a petrol-moistened cloth. Cleaning of the contacts is made easier if the moving contact arm is removed. Procedure is given above.

Remove the high tension pick-up, wipe clean and polish with a fine dry cloth. The high tension pick-up brush must move freely in its holder. If it is dirty, clean with a cloth moistened with petrol. If the brush is worn to within $\frac{1}{8}$ in. of the shoulder it must be renewed. While the high tension pick-up is removed, clean the slip ring track and flanges by holding a soft cloth on the ring by means of a suitably shaped piece of wood while the engine is slowly turned.

Replacement of High Tension Cable

If, on inspection, the high tension cable shows signs of perishing or cracking, it must be replaced by a suitable length of 7 mm. rubber-covered ignition cable.

To fit a new high tension cable to a pick-up terminal, bare the end of the cable for about $\frac{1}{4}$ in., thread the knurled moulded nut over the cable, thread the bare wire through the washer removed from the end of the old cable and bend back the strands. Finally screw the nut into the pick-up.

SERVICING

Testing Magneto in position on engine

Testing magneto in position to locate cause of misfiring or failure of ignition:

Disconnect the cable from the sparking plug and hold it so that the terminal end is about $\frac{1}{8}$ in. from some part of the cylinder block while the engine is turned over.

If the spark that jumps from the cable end is strong and regular, the fault lies in the sparking plug, which must be removed for examination and if necessary cleaned and adjusted, or replaced.

Next examine the high tension cable. After long service it may have become cracked or perished and the magneto may be sparking through to a metal part of the engine or frame.

If the Magneto has been replaced recently it may be incorrectly timed. For instructions on retiming refer to Service Sheet No. 604. If the performance of the Magneto is still not satisfactory, the contact breaker may require cleaning or adjustment. (See Routine Maintenance.)

If the contacts are badly burned they should be renewed by a replacement contact set. If the contact breaker is in good order, there may be an internal fault in the magneto.

To Dismantle

Take off the driving end cover 'F' (Fig. Y.6) by unscrewing the four countersunk head screws. To dismantle the slipping clutch it will be necessary to use a jig (Fig. Y.7) to hold the larger gear whilst the securing nut is being undone. This consists simply of a length of $\frac{1}{4}$ in. diameter mild steel rod bent to a flat U the ends being cut short with their centres $3\frac{3}{16}$ in. apart, so that one can be slipped in the hole in the wheel whilst the other is engaged with the hole in the top of the casting through which the dynamo securing stud usually goes. A $\frac{7}{16}$ in. box spanner can then be used on the securing nut 'G' (Fig. Y.6). Note that the tab of the locking washer 'H' must be bent back first.

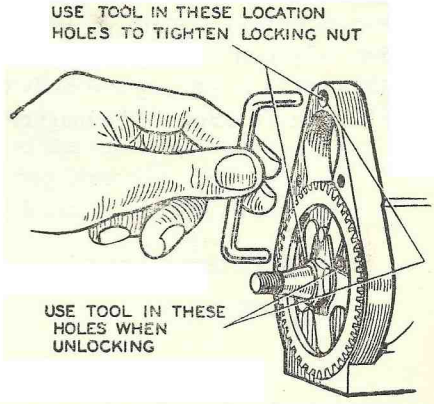


Fig. Y.7. Dismantling slipping clutch

Remove the locking washer 'H', clutch spring 'I', friction washer 'J', and driving gear 'K'.

Take off the contact breaker cover 'M', remove the spring arm 'N' carrying the contact, unscrew the bolt 'O' securing the contact breaker 'P', and draw the contact breaker off the shaft. Spring the wire ring 'Q' securing the cam 'R' out of its location in the contact breaker housing, and remove the cam. The timing control barrel and cable will have been removed when taking the Magdyno off the motor cycle. Remove the control plunger 'T'.

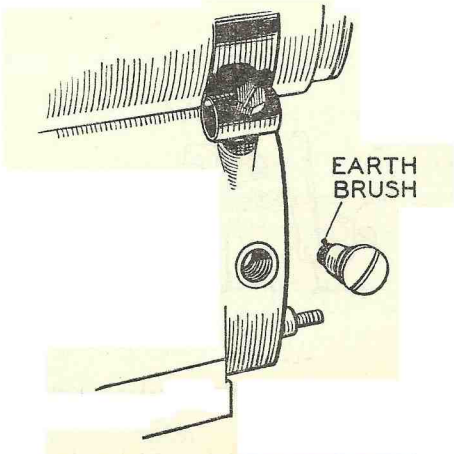


Fig. Y.8. Location of earthing brush

Remove the pick-up holder and the small earthing brush (Fig. Y.8), which will be found on the side of the Magdyno. Unscrew the screws 'U' (Fig. Y.6), earthing terminal 'V' and pillar 'W' from the contact breaker end plate 'X', and remove the plate from the

Magdyno together with the shims 'Y'. The armature 'Z' can then be removed from the machine by tapping the driving end of the shaft with a rawhide mallet to detach it from the gear centre 'L'. There is no need to put a keeper across the magnet as it retains its magnetic properties more or less indefinitely. Although it loses a certain immaterial amount of power in the first removal of the armature, subsequent removals do not affect it. Do not allow the magneto body to come in close contact with any iron filings as they may become attracted to the magnet and cause the armature to bind.

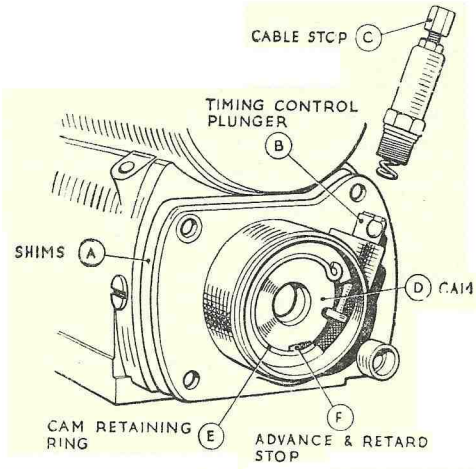


Fig. Y.9. Contact breaker housing, showing timing control mechanism

When the armature is removed, it should be examined for mechanical faults such as a cracked or bent shaft. Any defect in the winding or condenser needs special equipment to detect, and in the event of trouble being suspected, a complete service armature should be fitted.

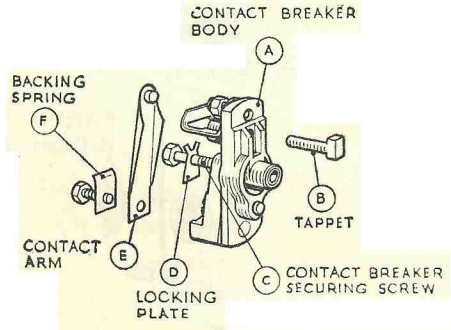


Fig. Y.10. Contact breaker tappet

It is important that the two ball bearings which support the armature shaft are in good condition. If they are packed on assembly with a suitable high melting point grease they will stand an almost unlimited amount of normal wear, but if they start to fail due to a bent shaft or other cause, they must be replaced. The balls and cages can readily be removed off the inner races which can then be pulled off the armature shaft using an extractor. The outer races can be removed with an expanding collet type extractor.

Carefully examine the slip ring and if it is damaged in any way it must be replaced. To do this take off the inner race of the bearing using an extractor, lift off the shims and the grease flinging plate and pull the slip ring off the shaft. (Note: When removing the inner race the extractor must bear on the brass shaft extension and not on the electric contact or insulator down the centre of the shaft. A disc of appropriate diameter can be placed across the face of the shaft extension.) Carefully straighten the wire coming from the armature and see that the bared end is clean and then fit the new slip ring over the shaft, taking care that the wire enters the hole in the boss in the slip ring and that it goes fully home without bending. Seal the lead-in to the slip ring boss with varnish—a special air drying varnish is used at the works but shellac varnish can be used in an emergency.

Replace the grease flinging plate, the full number of shims and inner race of the bearing.

TESTING

If test apparatus is not available, a rough check of the armature windings can be made by means of a two-volt battery (a tapping across one cell of the motor cycle battery) and an ammeter.

To check the primary winding of the armature

Screw the contact breaker retaining screw into the end of the armature shaft.

Connect one terminal of the battery to one terminal of the ammeter.

Connect the second terminal of the ammeter to the screw in the armature shaft.

Connect the second terminal of the battery to the metal body of the armature.

The ammeter will record the current taken by the armature primary winding and should be approximately 4 amperes.

To check the secondary winding of the armature

Leave the connections as detailed above for the primary winding check.

Take a piece of high tension cable about 15 in. long and bare one end back about $\frac{1}{2}$ in. and the other end about 4 in. Wrap the longer bared end round the brass insert of the slip ring and hold the other end about $\frac{1}{8}$ in. from the body of the armature.

If the lead from the battery which was connected to the armature body to test the primary winding is then flashed quickly on and off the body, a spark should occur between the high tension wire and the armature body.

Failure to spark indicates a fault either in the armature windings or the condenser and a replacement armature must be fitted.

An armature test can be carried out by connecting in series an 8-volt accumulator, a four lobe cam and contact breaker (having 45° closed period) and the armature under test, the contact breaker to coil connection being at earth potential. A 0.2 mfd. condenser must be connected across the contacts. Run the contact breaker at 750 r.p.m., giving 3,000 operations of the contacts per minute, and connect the high tension cable from the

coil to either a 3-point spark gap or rotary gap set to 13 kv. Regular sparking should occur under these conditions. Explore the surface of the winding with an earthed pointer—no flashover must occur.

It should be noted that in the above test, sparking will occur, provided that the armature winding is in order, even if the condenser in-built with the armature is open-circuited. Disconnect the 0.2 mfd. condenser from the supply circuit above when regular sparking should continue. Failure to do so indicates that the armature condenser is faulty and a replacement armature must be fitted.

If satisfactory performance is not obtained during the above test, measurement should be made of the maximum primary running current. To do this, include also in the above series circuit a moving coil ammeter (of not more than 5 amperes full scale deflection) and a variable resistance of approximately 5 ohms (of adequate current rating for cool running). Connect the H.T. cable from the coil to a 3-point spark gap set to 5.5 mm. or a rotary gap set to 9.5 kv. Run the contact breaker as before, and adjust the variable resistance until occasional missing occurs, that is, when the coil is just failing to spark regularly. Under these conditions, the permissible primary currect as read on the ammeter should be not more than 1.2 amperes.

In both the above tests, it is important that the supply voltage be maintained at 8 volts, that the cam speed be kept constant, and that the winding under test is not subjected to any external magnetic influence (e.g., it must not be tested on an iron bed-plate).

Reassembly

See that the bearings are clean and if necessary wash them in petrol and dry thoroughly. Lightly pack them with high melting point grease. Fit the inner races on the armature shaft using a hand press and a length of tube fitting over the shaft and locating on the race. Fit the balls and cages in position over the inner races and press the outer races into their housings with a mandrel of the type shown, taking care to ensure that a suitable serrated insulating washer is positioned between each race and its housing to ensure that the race is a tight fit in its housing.

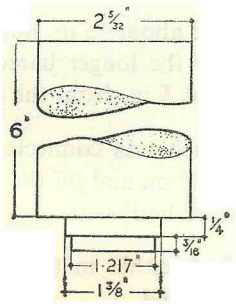


Fig. Y.11. Mandrel for replacement of outer races

See that the slip ring and metal insert are clean; if necessary carefully wipe it clean with a petrol moistened cloth. See that the inside of the magneto body is clean and free from swarf and insert the armature in the body, drive end first.

Refit the contact breaker end plate, taking care that the end plate shims are in position, and replace and tighten the end plate fixing screws. Also replace the pillar carrying the cover fixing arm.

Check the armature for end play. It should revolve freely when turned by hand, but no end play should be felt. If necessary adjust by adding or removing shims behind the contact breaker plate until adjustment is correct.

Replace the cam and contact breaker as follows:

Insert the timing control plunger in its housing, followed by the spring, and screw the timing control tube, together with cable stop, into the housing.

Place the cam in its housing with the formed surface facing outwards, position the broad slot in the cam over the timing range pin and locate the end of the control plunger in the appropriate slot in the cam. Secure the cam by springing the circlip into its location. Note that a recess is provided for the 'eye' at one end of the circlip.

See that the tappet moves freely in the contact breaker body, add a few drops of thin machine oil to the cam lubrication wick, and place the contact breaker body on the end of the armature shaft. Place the specially shaped tag washer over the contact breaker fixing screw and locating the flat side of the washer against the location provided for it in the contact breaker body, screw the bolt home and lock by bending the tags of the washer over the flats on the head of the bolt.

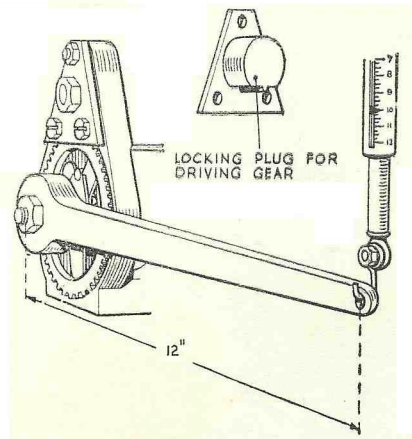


Fig. Y.12. Method of checking clutch setting

Fit the spring arm carrying the contact and also the backing spring (bent portion facing outwards), place a lock washer over the fixing screw, and fully tighten it.

Adjust the contacts to the correct setting (see Routine Maintenance) and replace the contact breaker cover.

See that the pick-up is clean and the brush moves freely. Place the cork washer in position on the magneto body, followed by the pick-up and secure by means of the fixing screws or spring arm.

Check that the earthing brush moves freely in its holder and screw it into the magneto body.

To reassemble the slipping clutch, key the gear centre 'A' (Fig. Y.5) on to the spindle, replace the driving gear 'B', friction washer 'C', clutch spring 'D', locking washer 'E', and secure by tightening the fixing nut 'F' fully. The U-shaped jig must be used to prevent rotation of the shaft while tightening the nut.

After assembling, the setting of the clutch must be checked, This can easily be done by locking the driving gear and applying a steady load on the driving spindle, as shown in Fig. Y.12. The clutch should slip with a torque of 4—10 lbs. feet or more, i.e., a 4—10 lb. pull measured on a spring balance via a spanner 12 in. long. If slipping occurs at a value outside these limits, a new clutch spring must be fitted.

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BSA SERVICE SHEET No. 804

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C10, C11, "A", "B" AND "M" GROUP MODELS
REGULATOR UNIT–Models MCR1 and MCR2

This unit houses the generator voltage regulator unit and the cut-out. Although combined structurally, the regulator and cut-out are electrically separate.

On machines fitted with an E3L dynamo the regulator unit is type MCR2, this unit is slightly different in construction to the MCR1. The procedure for testing and adjusting is, however, unaltered.

Positive Earth Lighting System

Some machines have the battery positive terminal connected to the frame instead of the negative terminal. This does not affect the regulator adjustment except that the voltmeter connections should be reversed.

The Regulator

The regulator unit is arranged to work in conjunction with the shunt-wound generators described in Service Sheet No. 809. The regulator is set to maintain a pre-determined generator voltage at all speeds, the field strength being controlled by the automatic insertion of a resistance in the generator field circuit, and a current or series winding on the same regulator compensates this voltage figure in accordance with the output current, to ensure that the battery does not receive an excessive charging current when in a discharged condition. Hence the charging current depends upon the difference between the controlled generator voltage and the battery terminal voltage and is therefore at a maximum when the battery is discharged, automatically tapering off to a minimum as the battery becomes charged and its voltage rises. In addition, a form of temperature compensation ensures that the voltage characteristics of the regulator are matched to those of the battery for large variations in working temperature.

Normally, during day-time running, when the battery is in good condition, the generator gives only a trickle charge, so that the ammeter reading will seldom exceed 1–2 amperes.

The Cut-out

The cut-out is an automatic switch which is connected between the dynamo and battery. It consists of a pair of contacts held open by a spring and closed magnetically. When the engine is running fast enough to cause the voltage of the generator to exceed that of the battery, the contacts close and the battery is charged by the generator. On the other hand, when the speed is low or the engine is stationary, the contacts open, thus disconnecting the generator from the battery and preventing current flowing from the battery through the windings.

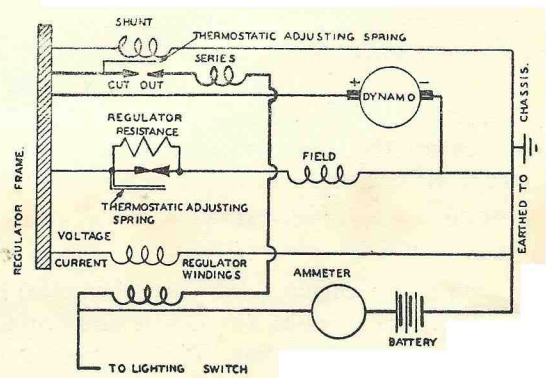


Fig. Y15. *Circuit diagram of Charging System.*

Test Data

Cut-out	MCR.1	MCR.2
Cut-in voltage	6.2—6.6 volts	6.3—6.7 volts
Drop-off voltage	3.5—5.3 volts	4.5—5.0 volts
Reverse current	0.7—2.5 amperes	3.0—5.0 amperes

Regulator

SETTING IN OPEN CIRCUIT

10°C.	50°F.	8.0—8.4 volts	7.7—8.1 volts
20°C.	68°F.	7.8—8.2 volts	7.6—8.0 volts
30°C.	86°F.	7.6—8.0 volts	7.5—7.9 volts
40°C.	04°F.	7.4—7.9 volts	7.4—7.8 volts

Servicing

TESTING IN POSITION TO LOCATE FAULT IN CHARGING CIRCUIT

If the procedure given in Service Sheet No. 809 shows the generator to be in order, proceed to check further as follows:—

First ensure that the wiring between regulator and battery is in order. To do this di connect the wire from the (A) terminal of the regulator (Fig. Y16). It may be necessary in some cases to remove the regulator from the motorcycle.

Connect the end of the wire removed to the positive terminal of a voltmeter, and connect the negative voltmeter terminal to an earthing point on the machine.

If a voltmeter reading is given, the wiring is in order and the regulator must be examined If there is no reading, examine the wiring for broken wires or loose connections.

Regulator Adjustment

Remove the cover of the regulator unit, insert a piece of paper between the cut-out contacts, and proceed as follows:—

Connect the positive terminal of the moving coil voltmeter (0—10 volts) to the (D) terminal on the regulator and connect the other lead of the voltmeter to an earthing point on the engine.

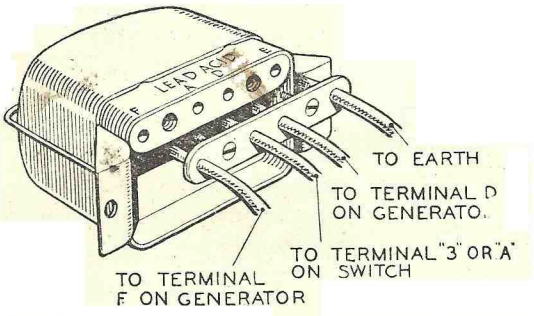


Fig. Y16. *Connections to Regulator Unit.*

Start the engine and slowly increase the speed until the voltmeter needle "flicks" and then steadies; this should occur at a voltmeter reading between the limits for the particular atmospheric temperature.

If the voltage at which the reading becomes steady is outside these limits, the regulator must be adjusted.

Shut off the engine, release the locknut (A) Fig. Y17, on the regulator adjusting screw (B) and turn the screw in a clockwise direction to raise the setting, or in an anti-clockwise direction to lower the setting. Turn the screw a fraction of a turn at a time and then tighten the locknut.

When adjusting, do not run the engine up to more than half-throttle, as while the dynamo is on open circuit, it will build up to a high voltage if run at a high speed and so a false voltmeter reading would be obtained.

Remove paper from between cut-out contacts.

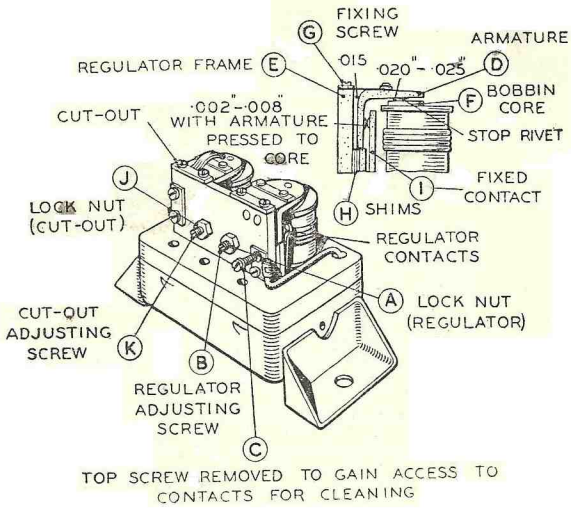


Fig. Y17. *Regulator and Cut-out Adjustment and Setting.*

Cleaning the Regulator Contacts

After long periods of service it may be found necessary to clean the vibrating contacts of the regulator. These are accessible if the top screw (C) securing the fixed contact is removed and the bottom screw slackened to permit the fixed contact to be swung outwards. The contacts can then be polished with fine emery cloth.

Mechanical Setting of Regulator

The armature carrying the moving contact of the regulator is accurately set and should no be removed. If, however, it does become necessary to re-set the contacts, slacken the two fixing screws (G) Fig. Y17, and proceed as follows:—

Insert a .015 in. (0.20 in.) feeler gauge between the back of the armature (D) and the regulator frame (E).

Press back the armature against the frame and down on to the top of the bobbin core with the gauge in position, and lock the armature by tightening the two fixing screws (G). Check the air gap between the top of the bobbin core (F) and the underside of the armature (D)—not under the stop rivet. Adjust if necessary to .025 in. (.012—.020 in.), by removing shims (H) at the back of the fixed contact on an MCR1 regulator or by bending the fixed contact breaker on an MCR2 regulator. The gap between the regulator contacts when the armature is pressed down should now be .002—.008 in. (.006—.017 in.). Finally check, and if necessary re-set, the electrical adjustment of the regulator.

The figures in brackets refer to the MCR2 regulator.

Electrical Setting of Cut-out

If the regulator setting is within the correct limits, but the battery is still not receiving current from the dynamo, the cut-out may be out of adjustment or there may be an open circuit in the wiring of the cut-out and regulator unit.

Remove the cable from the terminal on the regulator marked (A). Remove the voltmeter lead from the (D) terminal of the regulator unit and connect it to terminal (A). Run the engine as before: at a fairly low engine speed, the cut-out should operate, when a voltmeter reading should be given of the same value as that when the voltmeter was connected to terminal (D). If there is no reading, the setting of the cut-out may be badly out of adjustment and the contacts not closing.

To check the voltage at which the cut-out operates, the voltmeter must be connected between the (D) terminal and earth. Start the engine and slowly increase its speed until the cut-out contacts are seen to close, noting the voltage at which this occurs. This should be 6.2—6.6 volts.

If operation of the cut-out is outside these limits, it will be necessary to adjust. To do this slacken the locknut (J) Fig. Y17, on the cut-out adjustment screw (K) and turn the screw in a clockwise direction to raise the voltage setting or in an anti-clockwise direction to reduce the setting, testing after each adjustment by increasing the engine speed until the cut-out is seen to operate, and noting the corresponding reading.

Tighten the locknut after making the adjustment. If the cut-out contacts appear burnt or dirty, place a strip of fine glasspaper between the contacts then, with the contacts closed by hand, draw the paper through. This should be done two or three times with the rough side towards each contact.

Mechanical Setting of Cut-out

If, for any reason, the armature has to be removed from the cut-out frame, care must be taken to obtain the correct air-gap settings on reassembly. These can be obtained as follows:—

Slacken the two armature fixing screws, adjusting screw (K) and the screw securing the fixed contact. Insert a .014 in. gauge between the back of the armature and the cut-out frame. (The air-gap between the core face and the armature shim should now measure .011—.015 in. If it does not, fit a armature assembly). Press the armature back against the gauge and tighten the fixing screws. With the gauge still in position, set the gap between the armature and the stop plate arm to .030—.034 in. be carefully bending the arm. Remove the gauge and tighten the screw securing the fixed contact.

Insert a .025 in. gauge between the core face and the armature. Press the armature down on to the gauge. The gap between the contacts should now measure .002—.006 in. and the drop-off voltage should be between the limits given in the test data. If necessary, adjust the gap by carefully bending the fixed contact breaker.

BSA SERVICE SHEET No. 804A

Reprinted September 1964

"A", "B" AND "M" GROUP MODELS
CONTROL BOX - MODEL BR107

General

The regulator and cut-out contacts are positioned, for ease of access, above their respective armatures. It will be noticed that some of the internal electrical joints are resistance brazed.

SETTING DATA

Cut-out

Cut-in voltage	... 6.3—6.7 volts
Drop-off voltage	... 4.8—5.3 volts
Reverse current	... 3.0—5.0 volts

Regulator

Setting on open circuit relative to ambient temperature.

10°C.	50°F.	...	7.7—8.1 volts
20°C.	68°F.	...	7.6–87.0 volts
30°C.	86°F.	...	7.5— .9 volts
40°C.	104°F.	...	7.4— .8 volts

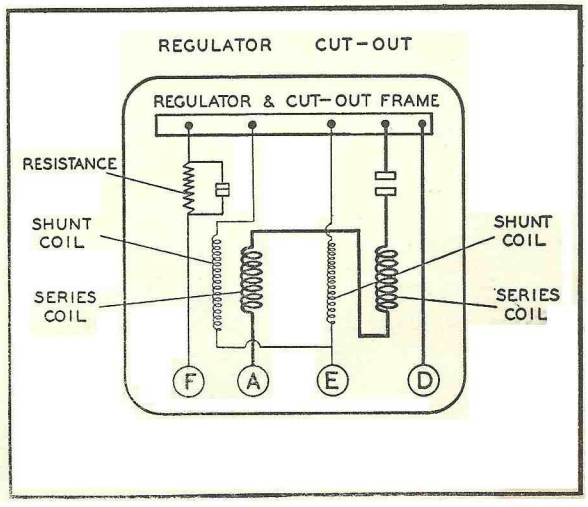


Fig. Y15a. *Internal Connections of Control Box.*

Servicing

Before making any adjustment to the regulator, ensure that the dynamo, dynamo drive and battery are in order.

If the machine is used regularly and a sound battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, the following procedure should be adopted:—

Withdraw the cable from terminal (A) Fig. Y16a, and connect it to the negative terminal of a voltmeter. Connect the positive voltmeter terminal to an earthing point on the machine. If a voltmeter reading is given, the circuit from the battery to terminal (A) is in order.

If there is no reading, examine the wiring for defective cables or loose connections. Reconnect the cable to terminal (A).

Check that the wiring between dynamo terminal (D) and control box terminal (D), and between dynamo terminal (F) and control box terminal (F), is in good condition.

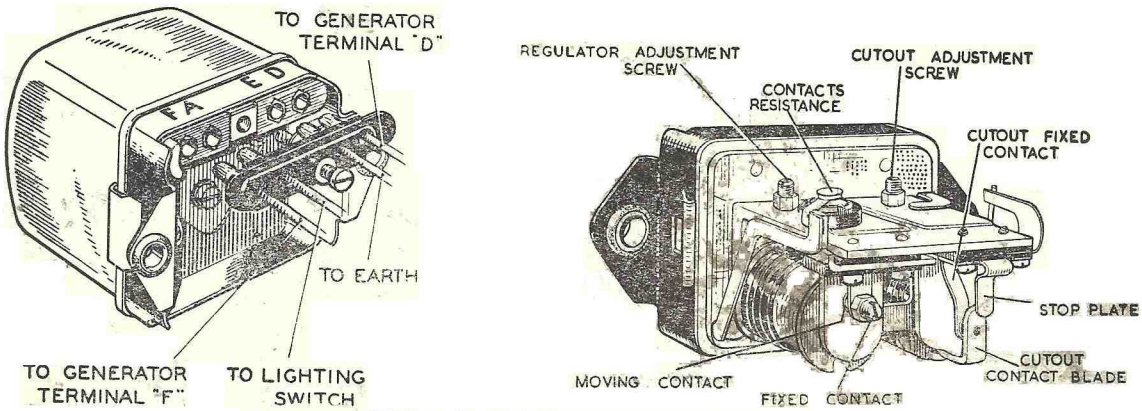


Fig. Y16a. *Control Box Connections and Internal Layout*

Electrical Setting of Regulator

The regulator is carefully set during manufacture and it should not be necessary to make further adjustment. If the charging system is suspect, it is important that only a good quality moving coil voltmeter (0—20 volts) is used for checking.

Connect the negative voltmeter lead to terminal (D) and the positive lead to terminal (E) on the control box. Remove the negative cable from the battery.

Start the engine and slowly increase the speed until the voltmeter needle "flicks" and then steadies. Note the reading and stop the engine.

If the voltage lies outside the limits given in the setting data, the regulator must be adjusted.

Remove the control box from the machine and take off the cover. It is important that adjustments are carried out with the control box supported in a similar position to that in which it is mounted on the machine. Re-start the engine.

Slacken the locknut of the adjusting screw, Fig. Y17a, and turn the screw clockwise to raise, or anti-clockwise to lower the setting. Turn the screw only a fraction of a turn at a time and then tighten the locknut. Repeat until the correct setting is obtained. Then stop the engine.

Adjustment should be completed within 30 seconds, otherwise heating of the shunt-winding will cause false settings to be made. A dynamo run at high speed on open circuit will build up a high voltage; therefore, do not run the engine up to more than half full speed.

Mechanical Setting of Regulator

If the armature has been removed, the air-gap settings will have to be re-adjusted. Otherwise they should not be altered. To adjust, proceed as follows:—

Slacken the locknut on the voltage adjusting screw and unscrew the adjuster until it is well clear of the armature tension spring. Also slacken the two armature securing screws, Fig. Y17a.

Insert a .015 in. feeler gauge wide enough to cover completely the core face between the armature and the core shim, taking care not to damage the shim. Press the armature squarely down against the gauge and tighten the two securing screws. With the gauge still in position, screw the adjustable contact down until it just touches the armature contact.

Tighten the locknut, and re-set the voltage adjusting screw as described above.

Cleaning Contacts

After long periods of service it may be found necessary to clean the contacts. Use a fine carborundum stone or fine emery cloth. Wipe away all traces of dust or other foreign matter with methylated spirits.

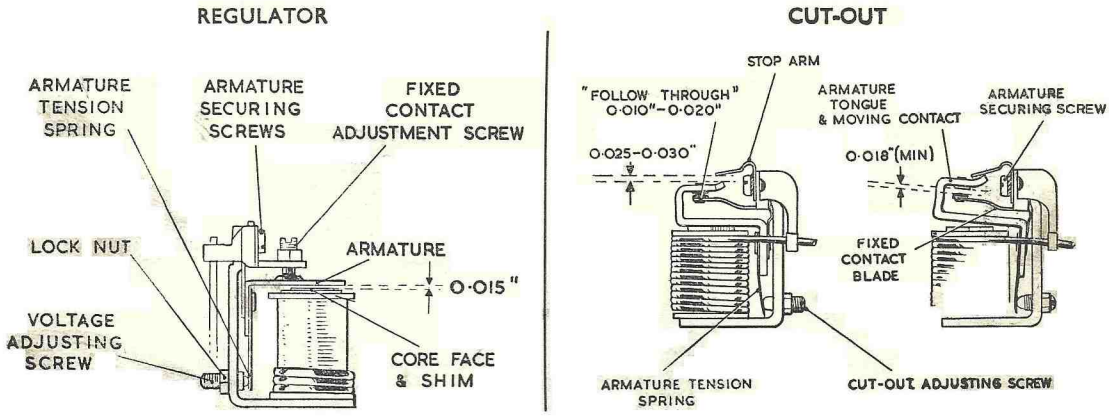


Fig. Y17a. *Regulator and Cut-out Adjustment and Setting.*

Electrical Setting of Cut-out

If the regulator is correctly set but the battery is still not being charged, the cut-out may be out of adjustment.

Connect a voltmeter between terminals (D) and (E) on the control box, start the engine and slowly increase the speed until the contacts close. Note the reading, and stop the engine. If outside the limits of 6.3—6.7 volts, it will be necessary to adjust the cut-out.

Re-start the engine, and slacken the locknut securing the cut-out adjusting screw, Fig. Y17a. Turn the screw clockwise to raise, or anti-clockwise to lower the setting. Move the screw only a fraction of a turn at a time and then retighten the locknut. Test after each adjustment by increasing engine speed and noting the voltmeter reading at the instant of contact closure. Stop the engine.

Setting of the cut-out, like that of the regulator, must be made as quickly as possible because of temperature rise effects.

If the cut-out fails to operate, there may be an open circuit in the wiring of the control box, in which case the unit should be replaced.

Mechanical Setting of Cut-out

If, for any reason, the armature has been removed from the frame, the correct air-gap settings must be obtained on reassembly.

Slacken the adjusting screw locknut and unscrew the adjuster until it is well clear of the tension spring. Press the armature squarely down on the core face and tighten the securing screws. Adjust the gap between the armature tongue and the stop arm by carefully bending the arm. The gap must be .025—.030 in. when the armature is pressed down, Fig. Y17a. Similarly, the fixed contact blade must be bent so that, when the armature is pressed down, there is a minimum "follow-through" or blade deflection of .010 in. To prevent contact chatter, the "follow-through" must not exceed .020 in.

With the armature in the free position, the contact gap must be .018 in. minimum.

Finally, re-set the cut-out adjusting screw.

Cleaning Contacts

If the cut-out contacts appear rough or burnt, place a strip of fine glasspaper between them, close the contacts by hand and draw the paper through two or three times with the rough side towards each contact in turn. Wipe away dust or other foreign matter with methylated spirits.

Do not use emery cloth or carborundum stone for cleaning cut-out contacts.

B.S.A. MOTOR CYCLES LTD., Service Department, Armoury Road, Birmingham 11.
B.S.A. Press

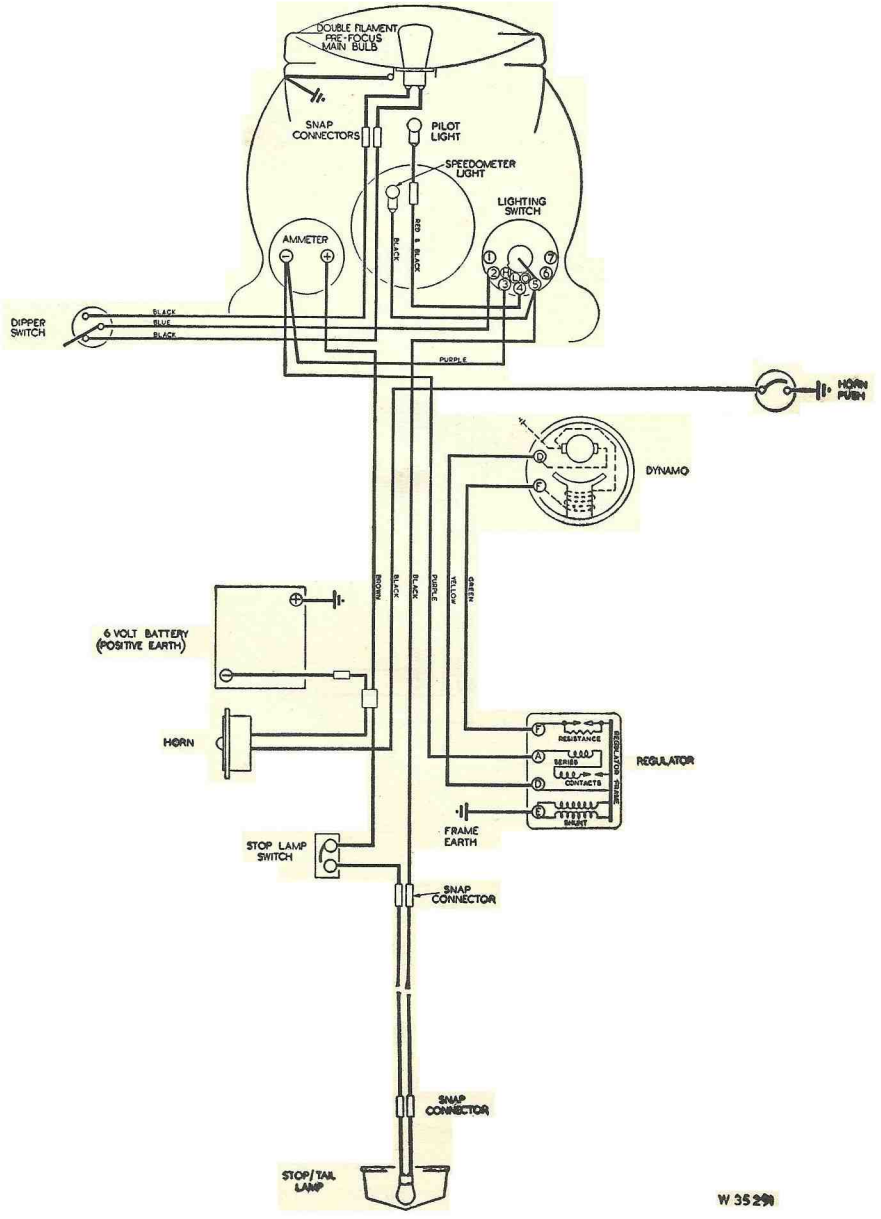
BSA SERVICE SHEET No. 808A

Reprinted July 1964

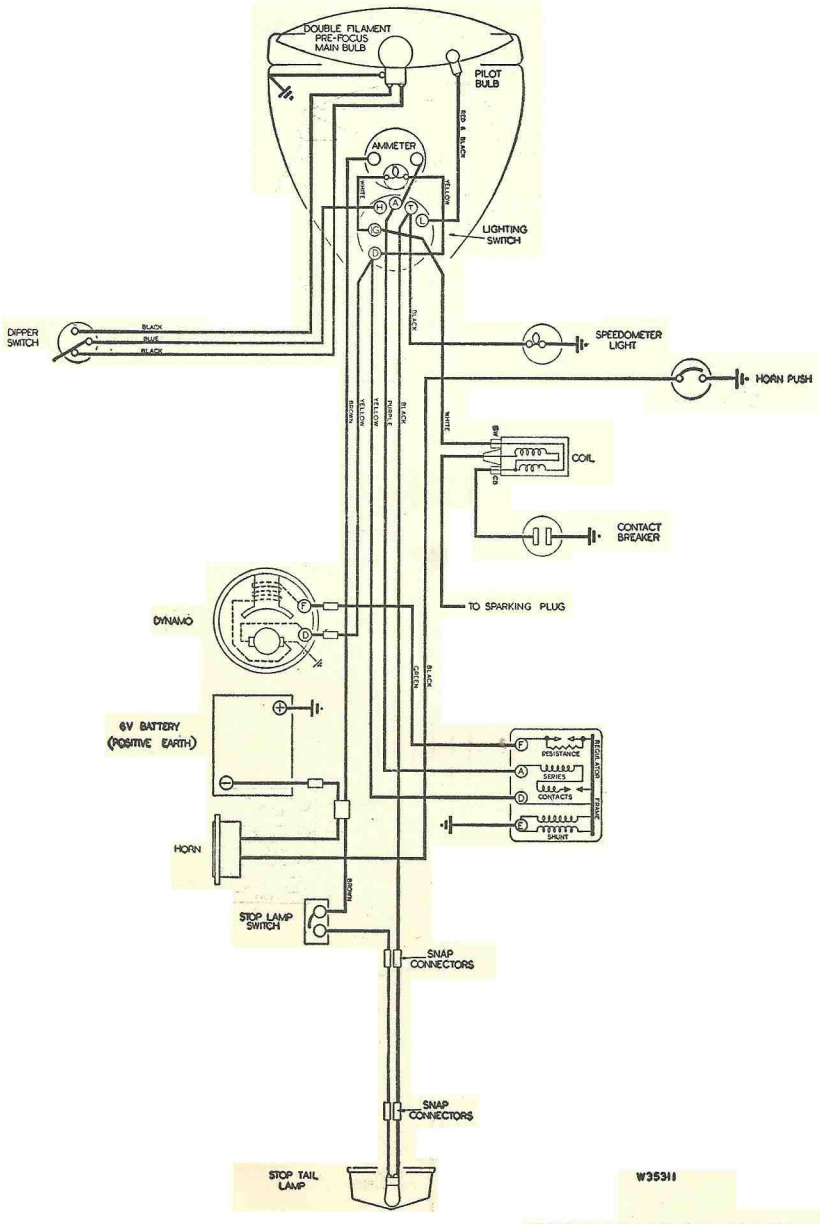
A, B and M Group Models

WIRING DIAGRAM

(Positive Earth System)



C Group Models
WIRING DIAGRAM
(Positive Earth System)



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Service Dept., Armoury Road, Birmingham 11.

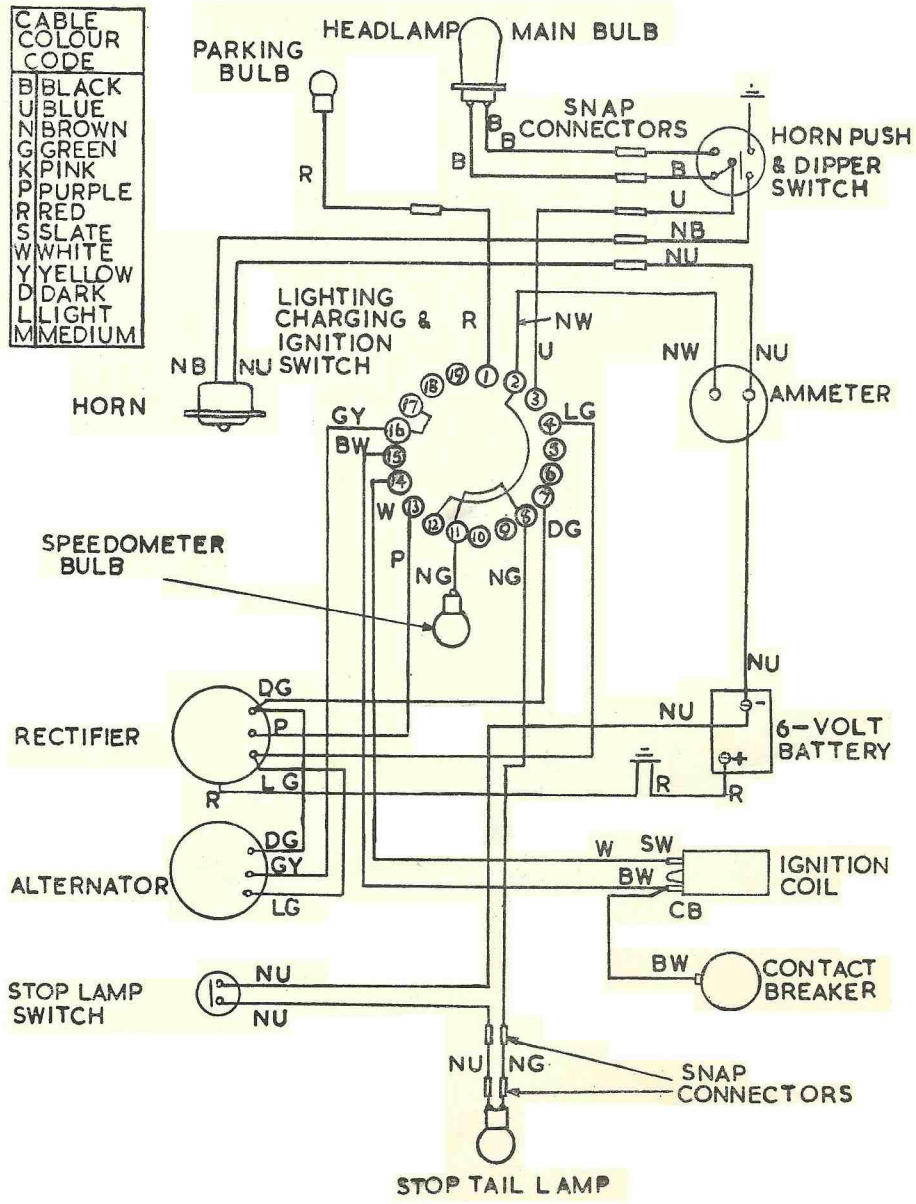
BSA SERVICE SHEET No. 808H

Reprinted November, 1962

B Group Models

(FITTED WITH ALTERNATOR)

WIRING DIAGRAM (Positive Earth System)



B.S.A. MOTOR CYCLES LTD.
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BSA SERVICE SHEET No. 809

Revised October 1958
Reprinted July 1964

All Models except D1, C10L, C11G, C12, C15 and "B" Group fitted with Alternators

GENERATORS–MODELS E3H and E3HM

The generator is a shunt-wound two pole machine, arranged to work in conjunction with a regulator unit to give an output which is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the generator gives a high output, whereas if the battery is fully charged the generator gives only a trickle charge to keep the battery in a good condition without over-charging. In addition, an increase of output is given to balance the current taken by the lamps when in use.

Models E3H and E3HM are similar in construction. The former will be found on motor cycles having separate magneto or coil ignition, while model E3HM is the generator portion of the combined unit known as the "magdyno".

ROUTINE MAINTENANCE

Lubrication

The lubricator at the commutator end bracket must be given a few drops of good grade thin machine oil every 1,000—2,000 miles. The bearing at the driving end is packed with H.M.P. grease and will last until the machine is taken down for a general overhaul, when the bearing should be repacked.

Inspection of Commutator and Brush Gear

About once every six months remove the cover band for inspection of commutator and brushes. The brushes are held in contact with the commutator by m ans of springs. Move each brush to see that it is free to slide in its holder; if it sticks, remove it and clean with a

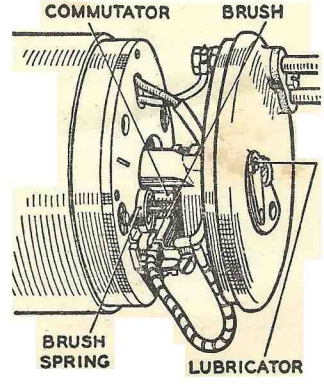

Fig. Y30. *Commutator and Bracket Assembly.*

cloth moistened with petrol. Care must be taken to replace the brushes in their original positions, otherwise they will not "bed" properly on the commutator. If, after long service, the brushes have become worn to such an extent that the brush flexible is exposed on the

running face, or if the brushes do not make good contact with the commutator, they must be replaced by genuine Lucas brushes. The commutator should be free from any trace of oil or dirt and should have a highly polished appearance. Clean a dirty or blackened commutator by pressing a fine dry cloth against it while the engine is slowly turned over by means of the kickstarter crank. (It is an advantage to remove the sparking plug before doing this). If the commutator is very dirty, moisten the cloth with petrol.

Test Data

Cutting-in speed: 1,250—1,500 r.p.m. at 7 generator volts.

Output: 6.5 amps at 1,900—2,200 r.p.m. at 7 generator volts, taken on 1.1 ohm resistance load. Resistance to be capable of carrying 10 amps without overheating.

Field resistance: 3.2 ohms.

SERVICING

Testing in position to locate fault in Charging Circuit

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of trouble.

Check that the generator and regulator unit are connected correctly. The generator terminal (D) should be connected to the regulator unit terminal (D) and generator terminal (F) to regulator unit terminal (F).

Remove the cables from the generator terminals (D) and (F) and connect the two terminals with a short length of wire. Start the engine and set to run at normal idling speed.

Connect the positive lead of a moving coil voltmeter, calibrated 0—10 volts, to one of the generator terminals and connect the negative lead to a good earthing point on the generator yoke or engine.

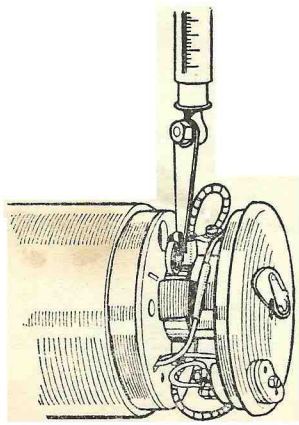

Fig. Y31. *Testing Brush Spring Tension.*

Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to rise above 10 volts, and do not race the engine in an attempt to increase the voltage. It is sufficient to run the generator up to a speed of 1,000 r.p.m. If there is no reading, check the brush gear as

described below. If there is a low reading of approximately ½ volt, the field winding may be at fault. If there is a reading of approximately 1½ to 2 volts, the armature winding may be at fault.

Remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they do not bear on the commutator, or if the brush flexible is exposed on the running face, new brushes must be fitted.

Test the brush spring tension with a spring scale. The correct tension is 10—15 oz. and new springs must be fitted if the tension is low.

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by means of the kickstart (with sparking plug removed).

Re-test the generator as above. If there is still no reading on the voltmeter, there i an internal fault and the complete unit, if a spare is available, should be replaced. Other wise the unit must be dismantled for internal examination.

If the generator is in good order, restore the original connections. Connect regulator unit terminal (D) to generator terminal (D) and regulator terminal (F) to generator terminal (F). Proceed to test the regulator unit as described in Service Sheet No. 804.

To Dismantle

Remove the generator from the motor cycle. To remove the generator from the magdynos unscrew the hexagon-headed nut from the driving end cover and slacken the two screws securing the band clip. Proceed to dismantle, as follows:—

On E3HM machines, bend back the tag on the washer (B) Fig. Y33, locking the screw (A) securing the driving gear (C) and remove the screw. On E3H machines, withdraw the cotter pin (A) and remove the nut (B) from the armature shaft. Withdraw the gear from

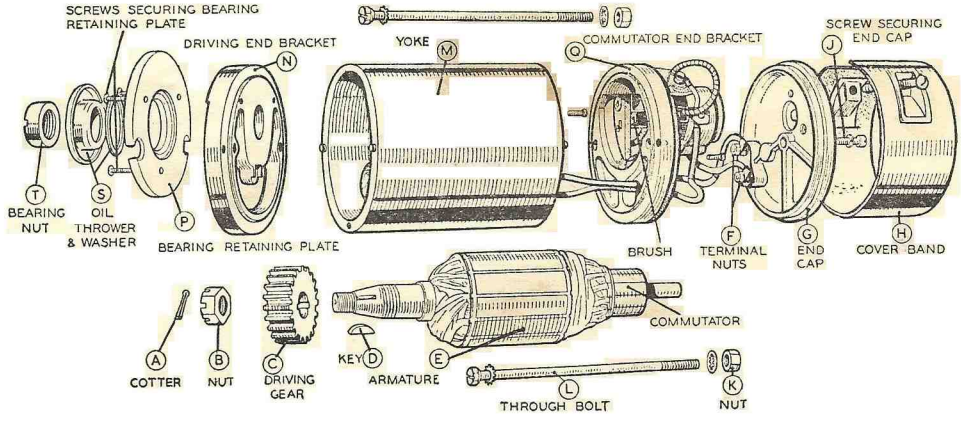

Fig. Y32. *Generator, model E3H (with oil seal).*

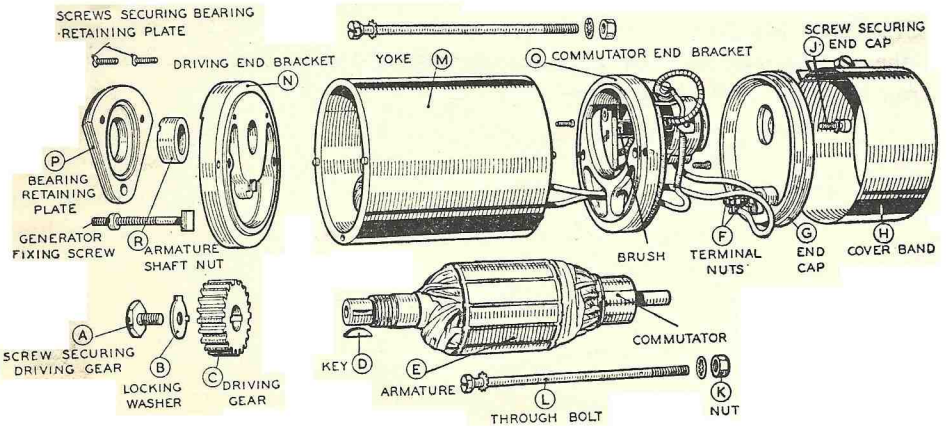

Fig. Y33. *Generator, model E3HM.*

the shaft by carefully levering it off or by means of an extractor. Remove the key(s) (D), from the shaft.

Remove the cover band (H), hold back the brush springs and lift the brushes from their holders.

Take out the screw (J), with spring washer, from the centre of the black moulded end cap (G). Draw the cap away from the end bracket, take off terminal nuts (F), and spring washers, and lift the connections off the terminals.

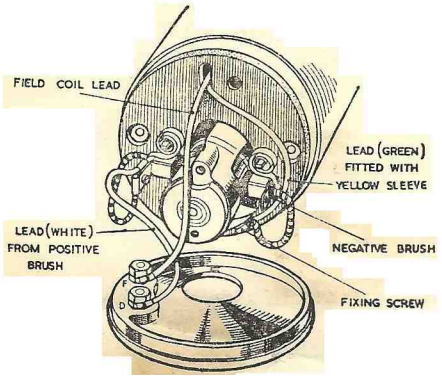

Fig. Y34. *Generator Connections.*
Note:- On later machines, the white lead is omitted, the brush flexible lead being connected direct to terminal "D"

Unscrew and remove from the driving end bracket the two through bolts (L) securing the driving end bracket (N) and commutator end bracket (Q) to the yoke (M). Hold the nuts (K) at the commutator end while unscrewing the bolts, and take care not to lose the nuts.

On E3HM Machines.—Remove the bearing retaining plate (P) from the driving end bracket secured by two screws and a long threaded bolt. Unscrew the nut (R) from the end of the armature shaft and the armature can then be removed from the driving end bracket (N) by means of a hand press.

On E3H Machines.—Remove the bearing nut (T) and the oil thrower and washer (S). Withdraw the three screws securing the retaining plate (P). The armature can then be removed from the driving end bracket (N) by means of a hand press.

Take out the screw securing the green field coil lead with the yellow sleeve to commutator end bracket and remove the end bracket (Q), withdrawing the connectors through the slot in the insulating plate.

Unscrew the three screws securing the insulating plate to the commutator end bracket and remove the plate complete with brush gear.

Commutator

Examine the commutator. If it is in good condition, it will be smooth and free from pits or burned spots. Clean with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of very fine glasspaper while rotating the armature. To remedy a badly worn commutator, mount the armature with or without the drive end bracket in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glasspaper.

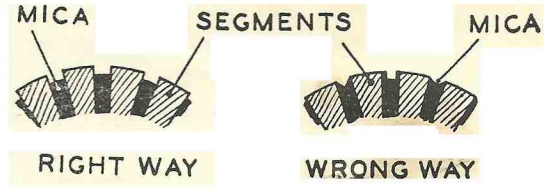

Fig. Y35. *Method of Undercutting Commutator Insulation.*

Undercut the mica insulation between the segments to a depth of $\frac{1}{32}$ in. with a hacksaw blade ground down until it is only slightly thicker than the mica.

Field Coil

Measure the resistance of the field winding by means of an ohm meter. If this is not available, connect a 6-volt D.C. supply with an ammeter in series across the coil. The ammeter reading should be approximately 1.9 amperes. No reading on the ammeter indicates an open circuit in the field winding.

To check for earthed coil, connect a mains test lamp between one end of the coil and the yoke. If the bulb lights, there is an earth between coil and yoke.

In either case, unless a replacement generator is available, the field coil must be replaced but this should only be attempted if a wheel-operated screwdriver and pole shoe expander are at hand, the latter being especially necessary to ensure that there will not be any air-gap between the pole shoe and the inner face of the yoke.

To replace the field coil, proceed as follows:—

Unscrew the pole shoe retaining screw (Fig. Y36) by means of the wheel-operated screwdriver.

Draw the pole shoe and field coil out of the yoke and lift off the coil.

Fit the new field coil over the pole shoe and place it in position inside the yoke. Take care to ensure that the taping of the field coil is not trapped between the pole shoe and the yoke.

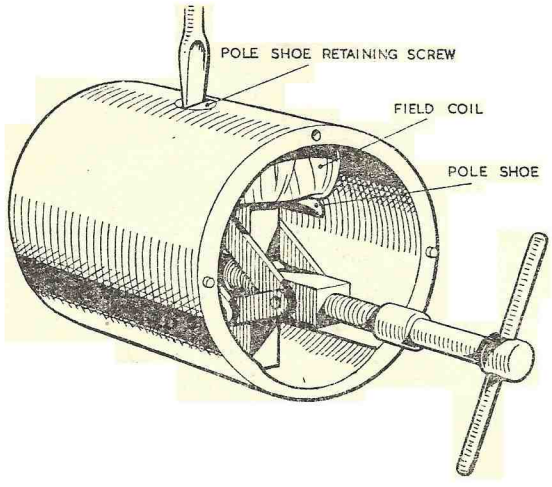

Fig. Y36. *Pole Shoe and Field Coil Assembly.*

Locate the pole shoe and field coil by lightly tightening the fixing screw. Insert the pole shoe expander, open to its fullest extent and tighten the screw. Remove the expander and give the screw a final tightening with the wheel-operated screwdriver. Lock the screw in position by caulking, that is, by tapping some of the metal of the yoke into the slot in the head of the screw.

Armature

The testing of the armature winding requires the use of a voltdrop test or growler. If these are not avilable, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

Bearings

A ball bearing is fitted at the driving end and a plain porous bronze bearing bush at the commutator end.

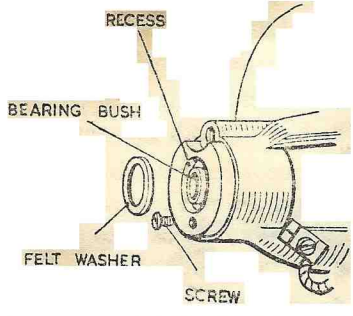

Fig. Y37. *Commutator End Bracket with Bearing Bush.*

Bearings which are worn to such an extent that they will allow side movement of the armature shaft must be replaced. To replace the bearing bush at the commutator end, proceed as follows:—

Remove the screw, press the bearing bush out of the commutator end bracket and remove the felt washer (see Fig. Y37).

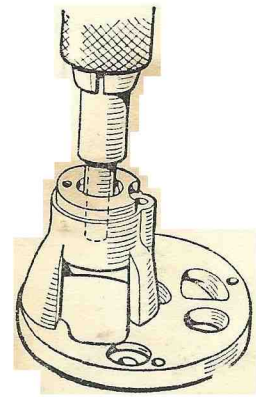

Fig. Y38. *Fitting Bearing Bush using a shouldered Mandrel.*

Press the new bearing bush into the end bracket using a shouldered mandrel (Fig. Y38) of the same diameter as the shaft which is to fit in the bearing. (NOTE:—Before use, new bearing bushes should be stored in a covered container and fully covered with oil of a grade equivalent to Mobiloil Arctic, or other good thin mineral oil. The minimum time of soaking should normally be 24 hours, but in cases of extreme urgency this period may be shortened by heating the oil to 100°C., when the time of immersion may be reduced to 2 hours). The bush should be pressed in until it is flush with the face of the end bracket. Fit the felt washer in the space between the bearing and the wall of the bearing housing.

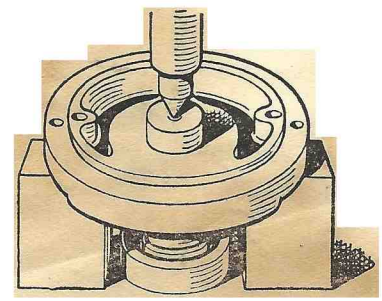

Fig. Y39. *Removing the Ball Race.*

The ball bearing at the driving end is replaced as follows:—

Remove bearing retaining plate from driving end bracket as previously described.

Press the bearing out of the end bracket, using a metal drift locating on the inner journal of the bearing (Fig. Y39).

Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

Position the bearing in its housing and press it squarely home, applying pressure on the outer journal of the bearing (Fig. Y40).

Reassembly

In the main, the reassembly of the generator is a reversal of the operations described in the paragraph on dismantling, bearing in mind the following points.

The field coil lead fitted with the short length of yellow tubing must be connected together with eyelet of the negative brush to the commutator end bracket by means of the screw provided.

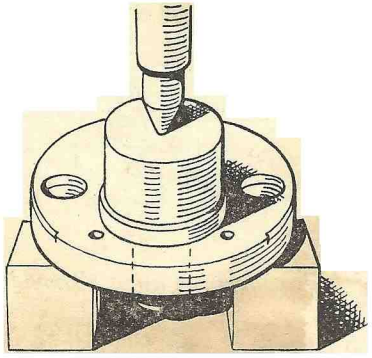

Fig. Y40. *Fitting the Ball Race.*

The second field coil lead must be connected to terminal (F) on the mouled end cap.

The lead (coloured white) from the terminal on the positive brush box must be connected to terminal (D) on the mouled end cap.

(NOTE:—On later machines, the brush flexible lead is connected direct to terminal (D) and the white lead is omitted).

Take care to refit cover band in original position and make sure that the securing screw, when of flush-fitting pattern, does not short on brush gear.

E3L Dynamo

On some models an E3L dynamo is fitted. This is a higher output machine and the test figures are as follows. Cutting in speed 1,050—1,200 r.p.m. at 6.5 dynamo volts. Output 8.5 amps at 1,850—2,000 r.p.m. at 7 dynamo volts taken on .8 ohm resistance load. Resistance to be capable of carrying 10 amps without overheating. Field resistance 2.8 ohms. The dismantling and testing instructions are similar to those given for the E3H dynamo except for the following:—

1. Ball bearing fitted at commutator end.
2. Brush spring tension, 13—20 ozs.
3. Testing field coils, the ammeter reading will be 2.1 amperes.