



SERVICE SHEETS

250 OHV Star
350 OHV Star

Models

**CI5, CI5T, CI5S,
CI5SS and B40**

00-4082

BSA SERVICE SHEET No. 412C

Reprinted May 1965.

D3, D5, D7, C12, C15 and B40 SWINGING ARM MODELS REAR SUSPENSION

FRAME

The silent bloc bushes fitted to the rear suspension swinging arm are unlikely to need replacement for some considerable time. If it is found necessary to renew them, first remove the suspension units by detaching the top pivot bolts and the bottom retaining nuts.

Remove the rear wheel and chainguard. Undo the fork spindle nut and tap out the spindle, using a suitable drift.

Lift the rear fork until it is clear of the side plates; it can then be turned and pulled away from the rear.

After the central distance piece has been displaced the bushes can be removed with a suitable drift.

DISMANTLING THE SUSPENSION UNITS

Early C12 models were fitted with a damper spring of 100 lb./inch rate, this was later increased to 124 lb./inch.

The 124 lb./inch spring, part number 29-4570 can be fitted to early machines where it is considered necessary.

The spring is retained by circlips fitted at its base and a service tool, part number 61-5064 has been introduced to facilitate removal.

The tool is assembled as shown in Fig. C46 and when the nut is screwed down sufficiently the spring is compressed thus releasing the circlips. The circlips can be extracted through the apertures in the tool and the spring comes away when the tool is removed.

Reassembly is in the reverse order.



Fig. C46.

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

BSA SERVICE SHEET No. 421

MODELS C15 AND B40 ENGINE DISMANTLING FOR DECARBONISING

It will facilitate this work if the dual seat and petrol tank are removed. Take off the seat which is attached to the frame by the top bolts of the rear suspension units and clipped to a cross tube at the front.

Turn off the petrol tap and detach the petrol pipe by unscrewing the union nut. The tank is mounted on rubber pads and secured by a single bolt which passes through a rubber sleeve in the centre of the tank. Remove the rubber cap on the tank top, unscrew the nut, and withdraw the tank leaving the bolt in the frame.

Disconnect the engine steady bracket from the frame and the rubber connection between the air cleaner and carburetter.

The exhaust pipe is a push on fit and can be removed after the finned collar has been slackened and the bolts securing the pipe to the frame released.

Disconnect the exhaust lifter from the lever on top of the rocker box.

Removing the Cylinder Head and Valves

Take off the oil feed pipe to the rocker spindles and remove the sparking plug.

Remove the two 5/16 in. nuts holding the engine steady bracket to the rocker box, revolve the engine to set the piston at T.D.C. on the compression stroke, i.e., with both valves closed, and take off the four nuts *H* (Fig. C1A) holding the cylinder head and barrel.

Late model B40 machines have an extra nut each side of push rod tower.

With the rocker box in position on the head raise the head until it clears the fixing studs, rotate the whole assembly about the push rods to clear the frame tube, and lift off.

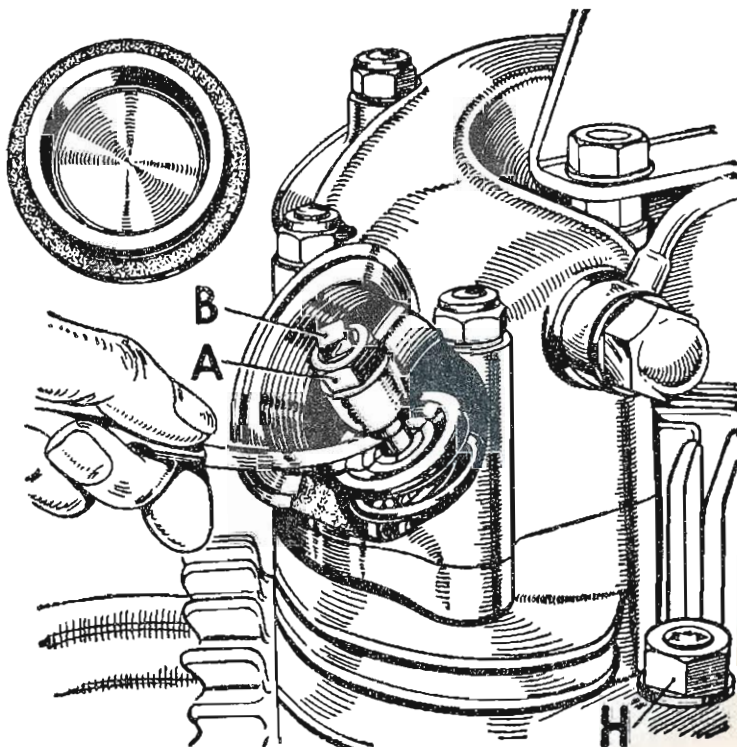


Fig. C1A. Tappet Adjustment.

B.S.A. Service Sheet No. 421 (contd.)

Take the push rods out of the tube and on 250c.c. models remove the tube. There are sealing rings at each end, and if there has been any sign of leakage the seals should be replaced.

Now take off the two thin nuts on the steady stay studs and the seven 1/4 in. nuts holding the rocker box to the head, unscrew the two circular inspection covers, remove the cover above the push rod tube by unscrewing the centre bolt, and lift the rocker box from the head.

There should be no need to disturb the rockers unless it is known that they require attention. Carefully remove the head gasket.

It is not necessary or desirable to remove the cylinder barrel unless it is suspected that the piston or its rings are the cause of some trouble.

Compress the valve springs with Service Tool 84061-3340 and remove the split cotters and springs. Take out the valves.

Scrape all carbon from cylinder head and ports and from the top of the piston, finally polishing with fine emery cloth. Take care not to damage the valve seats. Remove all traces of loose carbon and dust. Rotate the engine so that the piston descends to allow removal of dust from the upper cylinder walls.

Valve Springs

After a period of several thousand miles, valve springs tend to lose their efficiency due to heat, and as their cost is relatively low, it is good policy to renew them at this stage rather than dismantle specially for this purpose at a later date. The correct free length is, inner 1-5/8 in., outer 2-1/32 in. for C15, C15T and B40. Note: The high performance scrambles engine uses different valve springs their free lengths being:- inner 1.500" outer 1.670". The fitted length must be 1-1/8".

Grinding in Valves

Valve grinding should only be carried out where the pitting is not deep. If deep pit marks are evident the valve should be refaced on a machine, as grinding in would only cause wear of the seats and the valve may become pocketed.

Clean all carbon off the valve and from the stem underneath the head, being careful not to damage the face or the portion of the stem which moves in the valve guide.

Smear a small quantity of grinding compound—obtainable from any garage, over the valve face and return it to its seat.

Using Tool number 11465-9240 rotate the valve backwards and forwards maintaining a steady pressure, every few strokes lifting the valve from its seat and turning to a new position.

Continue until the face shows a smooth surface all round with no dark spots.

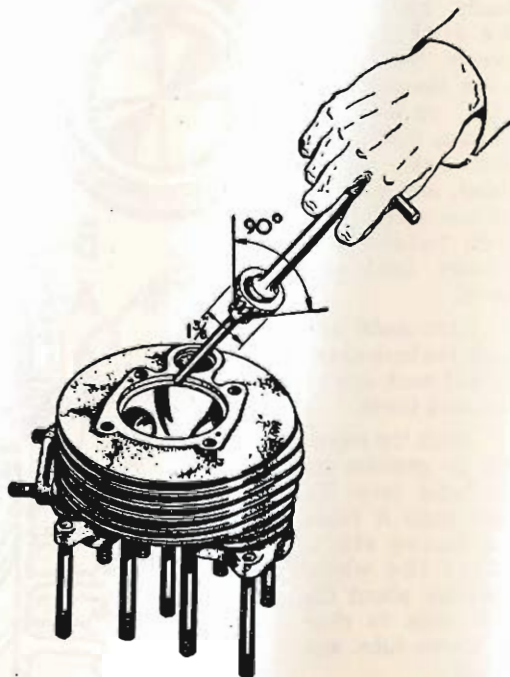


Fig. C2A. Cutting the Valve Seats.

B.S.A. Service Sheet No. 421 (contd.)

It is most important that valves are ground in on their correct seats, for this reason both valves are marked, one "IN" and the other "EX."

After grinding remove all traces of compound from both valve face and seating, and smear the stems with clean engine oil.

If the valve seats in the head require re-cutting, use Service Tools number 83661-3293 Pilot, 85561-3300 Cutter (Fig. C2A).

Fitting New Guides

When new guides are to be fitted, the old ones can be driven out with Service Tool number 83261 3265 from inside the combustion chamber and new ones fitted with the same punch from above.

Before driving in the new guides on C15 models, make sure that the circlips are a good fit. (B40 does not employ circlips here) Valve seats in the head must always be re-cut when new guides are fitted to ensure that the seat is concentric with the guide bore.

Removing the Cylinder Barrel

Slacken off the two nuts on the crankcase at the base of the cylinder and slide the cylinder off, steadying the piston as it emerges from the barrel. Cover the crankcase mouth with clean rag to prevent dust and grit falling in.

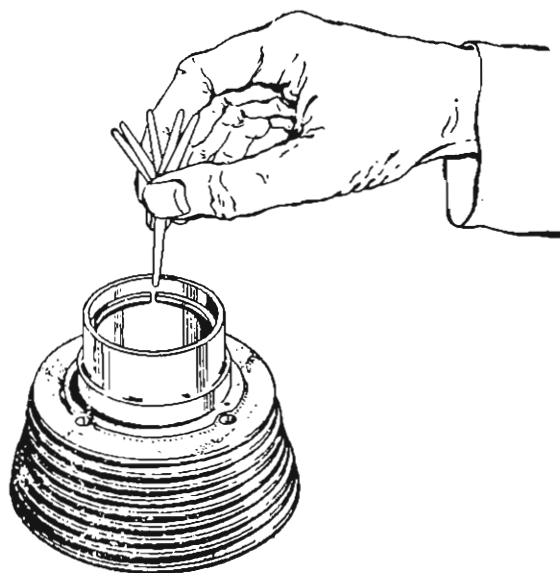


Fig. C3A. Checking Piston Ring Cap

Piston Rings

The gudgeon pin is located by means of wire circlips which must be removed with the tang of a file or similar tool. Warm the piston and withdraw the gudgeon pin, thus freeing the piston, and immediately after its removal mark the inside of the piston so that it may be reassembled in its original position.

If inspection of the piston rings shows that they are stuck, prise them out very carefully, and clean them. Remove any carbon from the grooves and rings, but before replacing, check them in the cylinder for gap. (Fig. C3A). If the gaps are excessive, new rings having gaps of between .009 in and .013 in. when in position must be fitted.

B.S.A. Service Sheet No. 421 (contd.)

Late models have a taper ring in the middle groove, this ring must be fitted the correct way, e.g.— with the side marked 'top' uppermost.

At this stage it is advisable to check the big end bearing for wear. Turn the engine until the piston is at the top of its stroke, and resting both hands on the sides of the crankcase mouth, hold the connecting rod between fingers and thumbs, and feel for up and down play. It should be remembered that, even though there may be a little play present it will not necessarily mean sudden failure of the bearing, though it will inevitably become worse. Where play seems excessive, and big end noise has been noticed with the engine running, the engine should be completely dismantled, and a new big end assembly fitted.

Assembly after Decarbonising

Replace the valves and springs in the cylinder head, making sure that the valves are assembled on the seats from which they were removed, and take care to see that the split collets are seated correctly in their grooves in the valve stems—a dab of grease on the stem will assist this operation.

Pour a little oil into the crankcase, and smear the cylinder walls liberally with oil. See that the cylinder base washer is in good condition—if damaged, replace, otherwise oil leaks will develop. Turn the engine until the crankshaft is a little past bottom dead centre, then compressing the top piston ring with the fingers, slide the cylinder barrel over the piston and top ring. Compress each ring in turn as the barrel is refitted, and take care to avoid breaking the rings. It is essential to see that the mouth of the crankcase is completely covered with rag before commencing to replace the cylinder as if it is uncovered, and a ring is broken, the pieces may drop into the crankcase and will be difficult to recover. Return the piston to top dead centre on the compression stroke, ready for the cylinder head to be fitted.

Replace the push rod tube in position alongside the cylinder barrel, on 250c.c. models, apply a little grease to the lower ends of the push rods and place the rods in position on the tappets. Replace the head gasket.

Refit the rocker box to the cylinder head leaving off the inspection covers, and slacken off the rocker adjusting screws.

Place the head in position over the studs, locate the outer push rod in the inlet rocker (rear) and the inner push rod on exhaust rocker (front) as in Fig. C4A.

Screw on the four cylinder head nuts and washers and tighten down firmly and evenly. Check that the push rods are correctly fitted and replace the inspection covers and washers.

Securely tighten the two nuts on the crankcase immediately below the cylinder base and check over the rocker box nuts.

Replace the engine steady stay over the two thin 5/16 in. nuts screw on the thick 5/16 in. nuts and spring washers and tighten securely, re-connect the steady stay to the frame. Re-connect the exhaust lifter cable to the lever on top of the rocker box.

Tappet Adjustment

Rotate the engine forward until the inlet valve is just closed and the push rod is free to rotate and set the exhaust valve clearance by screwing the adjuster pin *B* (Fig. C1A) in or out and tighten the locknut *A* (Fig. C1A) securely.

Rotate the engine forward again until the exhaust valve clearance is just taken up but before the valve starts to open, and set the inlet valve clearance. Check both settings after the locknuts have been tightened to make sure that they have not altered.

Finally replace the tappet inspection covers, sparking plug, H.T. lead, carburetter, air cleaner connection, petrol tank, petrol pipe and dual seat.

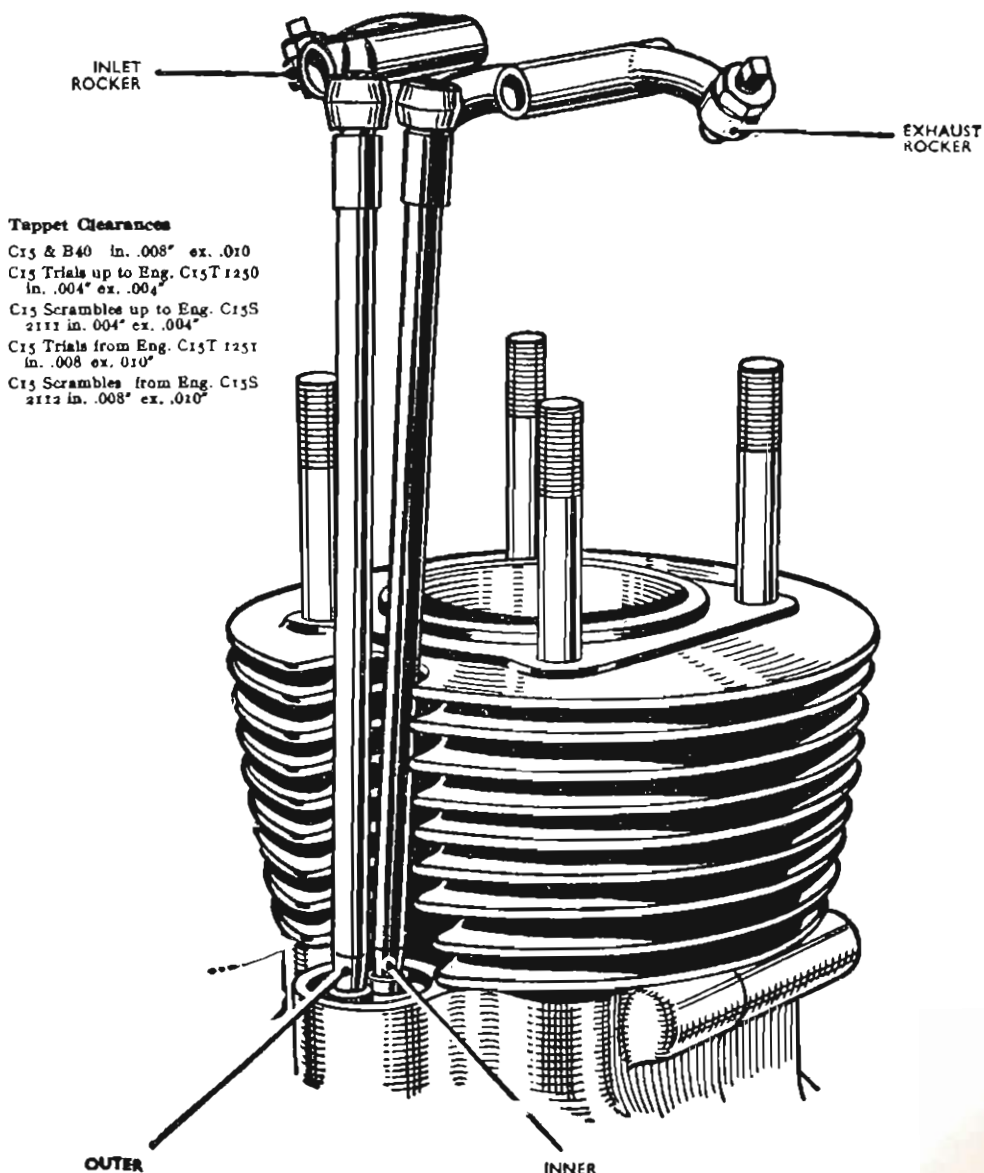


Fig. C4A. Fitting the Push Rods.

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

BSA SERVICE SHEET No. 422

MODELS C15 AND B40

(Except those with Engine Nos. prefixed C15F or B40F)

DISMANTLING AND REASSEMBLING THE CLUTCH, GEARBOX AND GEARCHANGE

The gears are contained in a separate housing formed in the rear portion of the crankcase and become accessible after the inner and outer timing covers have been removed from the R/H side of the unit, so that the valve timing pinions are uncovered at the same time.

Parts such as the kickstart spring and pawl, cam plate and spring, selector forks and footchange return spring, can be replaced without removing any other parts but if the gears are to be removed then the whole of the primary drive must be dismantled first.

Primary Drive

Disconnect the alternator lead by pulling out the three connectors. Remove the left hand footrest, it is fitted to a taper shaft and will require a sharp blow with a mallet to release it after the nut which has a L/H thread, has been removed.

Place a large flat tin under the primary chain case to catch the oil, and take out the 10 screws holding the cover. The screws are of three different lengths and careful note should be taken of their respective positions to facilitate refitting, screw *M* (Fig. C5A) also serves as the level plug.

Depress the rear brake pedal and take off the primary chain case cover.

To remove the stator take off the three nuts and washers *E* (Fig. C6A) and pull the alternator lead through the rubber grommet in the back of the chain case.

Note carefully that the stator plate is fitted with the lead on the outside.

Bend back the tab of the lock washer *B* (Fig. C6A) under the engine main shaft nut and remove the nut *C* which has a R/H thread.

It will facilitate the removal of the nut if top gear is engaged and the rear brake applied.

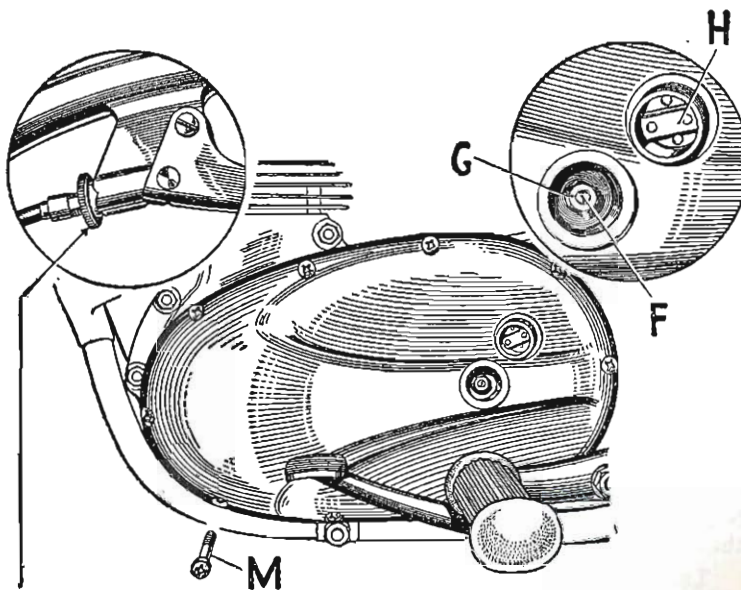


Fig. C5A. Clutch Adjustment

Pull off the rotor and take out the Woodruff key to avoid it being lost.

Remove the four spring retaining nuts *P* (Fig. C6A) on the clutch, and withdraw the springs and cups. The pressure plate *L* (Fig. C6A) and the remaining clutch plates can now be removed but note should be made of the order in which they are fitted.

Bend back the tab of the lock washer and unscrew the gearbox main shaft nut. The lock washer has a special tongue which engages in the hub of the clutch and it must be refitted in the same way.

The thrust washer which will now be exposed is recessed on one side and must be fitted with the recess outwards.

Pull out the clutch push rod, engage top gear, apply the rear brake, and unscrew the gearbox main shaft nut.

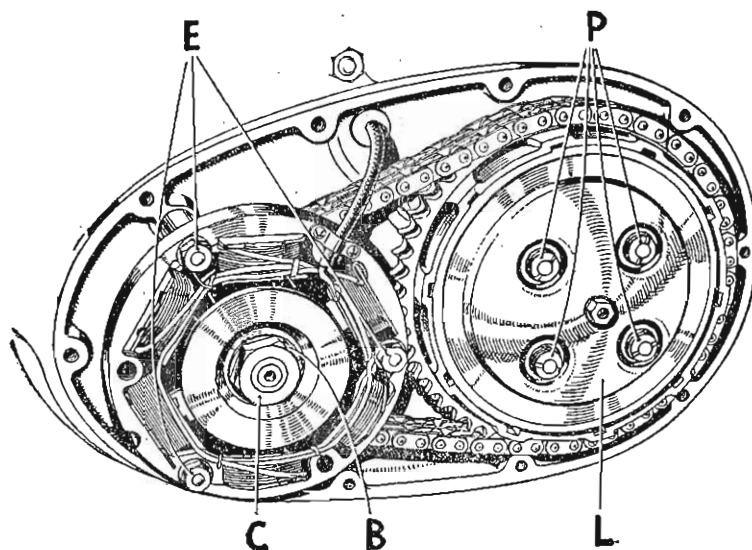


Fig. C6A. Clutch and Generator Removal.

With extractor number 82561-3583 (Fig. C7A) the clutch sleeve can be freed from the tapered main shaft and the chainwheel, chain and engine sprocket withdrawn together and laid face down on the bench with the spring studs uppermost.

The clutch centre *B* (Fig. C8A) can be lifted out leaving the sleeve *C* and rollers in the chainwheel.

To examine the cush drive rubbers take out the four counter sunk head screws and lift off the front cover plate, unless wear or damage is suspected however the rubbers should not be disturbed.

New rubber inserts *E* (Fig. C8A) should be fitted as shown with the thicker segment being inserted first on the pressure or driven side of the vane and compressed by slightly rotating the vane, when the thinner segments can be pressed into position. A special tool No. 83161-3689 is necessary for the B40 as the rubbers are much stronger and of equal thickness.

Later model C15 and B40 machines with eight rubbers of equal thickness now use eight round rubbers of equal thickness. Neither the wedge or the round rubbers of equal thickness can be used on the early models unless the clutch centre and spider are changed for the latest type, but, the old type rubbers will continue to be available as spares.

When reassembling the clutch, note that the plates are alternately plain and segmented, the first plate next to the chainwheel being plain.

With the clutch removed the detachable plate registered in the rear half of the chain case is now exposed.

Take out the six counter sunk head screws and remove the plate complete with the oil seal.

If the oil seal is suspected of being faulty or leakage has occurred it should be replaced, care being taken not to damage the outer surface of the bush on which the seal bears.

Between the circular plate and the end of the pinion sleeve is a felt washer, the purpose of this washer is to prevent grit damaging the oil seal.

At this stage the gearbox can be dismantled providing the main shaft high gear (or pinion sleeve) is not being disturbed, but if complete dismantling is required the tab

washer under the sprocket nut should be turned back and the nut slackened off while it is still possible to engage the gears.

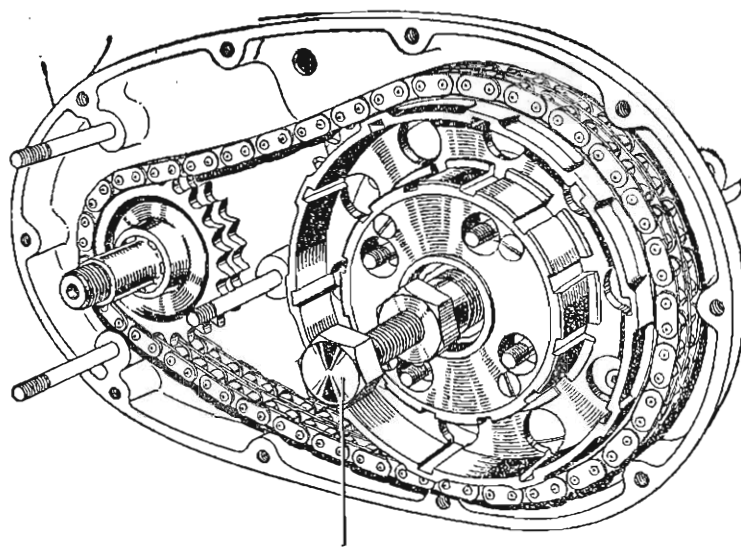
It is now necessary to turn to the other side of the engine unit to remove the inner and outer timing covers.

Take off the exhaust system by slackening the pinch bolt in the finned collar and removing the bolts securing the pipe and silencer to the frame.

Scribe a pencil mark across the

body of the distributor and the top of the crankcase to assist in resetting the ignition timing.

Release the pinch bolts in the kickstart and foot change levers and remove the levers, slacken the R/H footrest nut and tap the footrest down out of the way.



EXTRACTOR

Fig. C7A. Removing the Clutch.

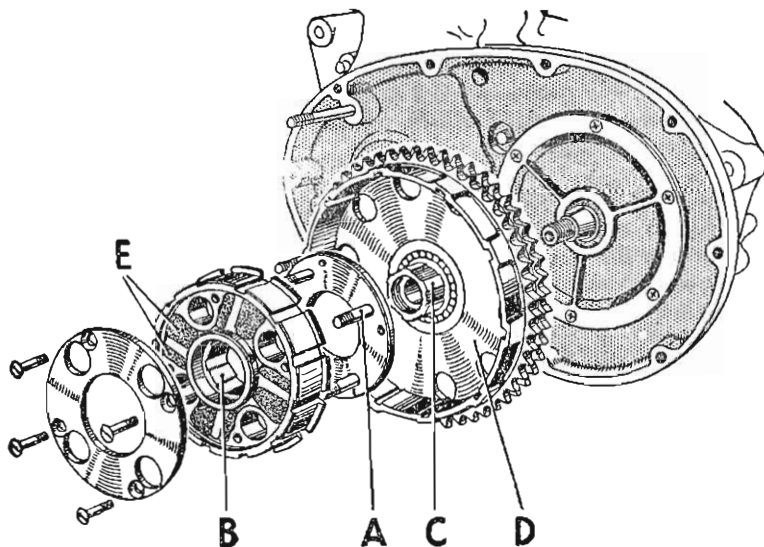


Fig. C8A. Clutch Drive Unit.

Unscrew the seven outer cover retaining screws, noting their respective locations, particularly the long small headed screw which also clamps the contact breaker unit.

With the outer cover removed disconnect the clutch cable and withdraw it through the back of the inner cover, being careful not to lose the ball located in the thrust button on the clutch actuating lever.

Prise the kickstart return spring anchor plate (Fig. C9A) off the two flats on the spindle and remove the plate and spring.

Turn back the tab on the lock washer under the cam shaft nut and remove the nut, lock washer, thrust washer and the small locating peg for the thrust washer.

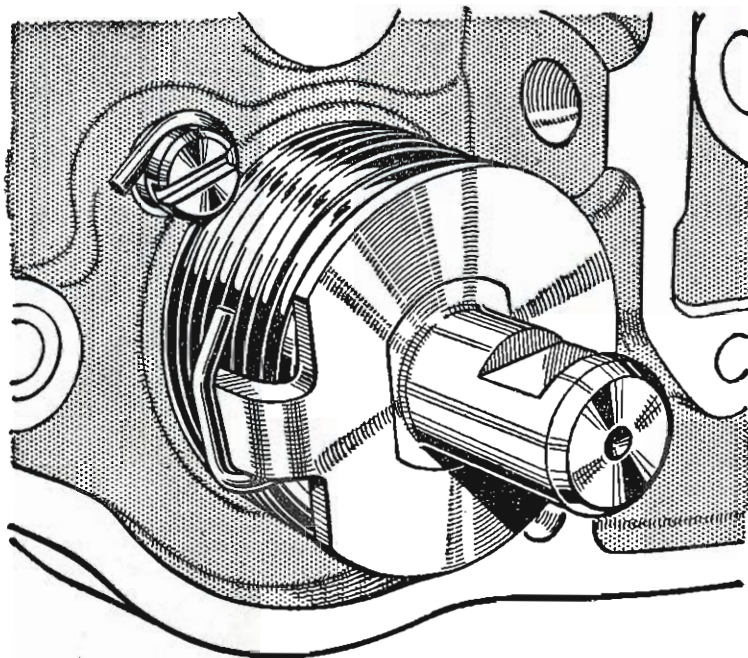


Fig. C9A. Fitting the Kickstarter Spring.

Take off the cover plate adjacent to the gear change spindle by removing the two screws and remove the split pin from the cam plate pivot.

The pivot pin can now be withdrawn towards the L/H side leaving the cam plate in the gearbox.

After removing the eight recessed screws the inner cover joint can be broken by tapping the kickstart spindle boss with a mallet. Ease the cover off gently, applying finger pressure to the spindle ends to avoid displacing other components.

The gear cluster, shafts and actuating parts are now exposed together with the valve timing gears and dismantling on the R/H side is therefore the same as for exposing the valve timing pinions.

Unscrew the fulcrum bolt *E* (Fig. C10A) carrying the return spring when the plunger quadrant, shaft and spring can be removed. The cam plate can now be taken away from the selector forks.

If the cam plate spring blade *B* (Fig. C11A) attached to the rear wall of the gearbox is satisfactory it need not be disturbed.

The gear cluster together with the main shaft, lay shaft and selector forks can now be withdrawn leaving the selector fork shaft and pinion sleeve in position in the box.

Note:- If the only attention required is renewal of the kickstart pawl and spring it is only necessary to pull the kickstart spindle away from the layshaft first gear. Make sure that the ratchet in the first gear is fit for further use.

While the gears can be removed from the shafts it should be noted that the smallest gear on the mainshaft is a press fit, thus retaining the adjacent gear, similarly the innermost gear on the lay shaft is a press fit also retaining the adjacent gear.

Note position of thrust washers.

Do not disturb the high gear (or pinion sleeve unless it is known that the bearing or oil seal is faulty, but if it is to be removed, take off the rear chain, sprocket, locknut and tab washer.

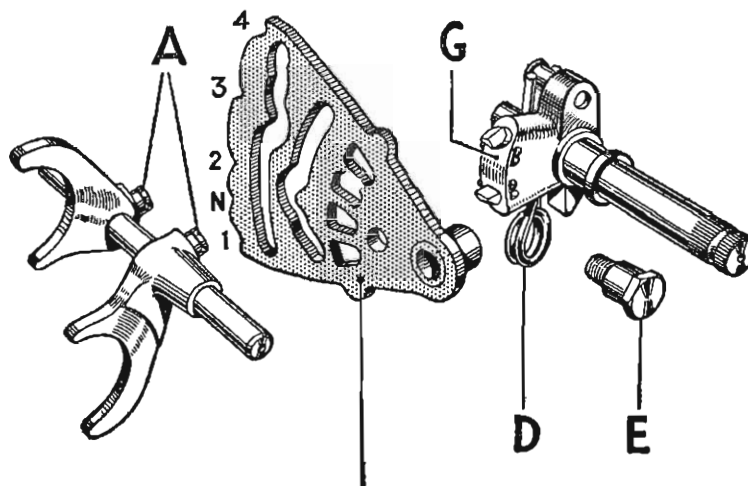


Fig. C10A. Gearchange Mechanism.

Heat the portion of the gearbox round the pinion sleeve by applying rag dipped in boiling water and tap the bearing and pinion into the gearbox shell. The replacement should be inserted and driven well home while the gearbox is still warm.

Reassembly

Pick up the main shaft and lay shaft complete with the gear cluster and the selector forks as shown in Fig. C11A.

The selector forks are interchangeable but it is advisable to replace them in their respective positions.

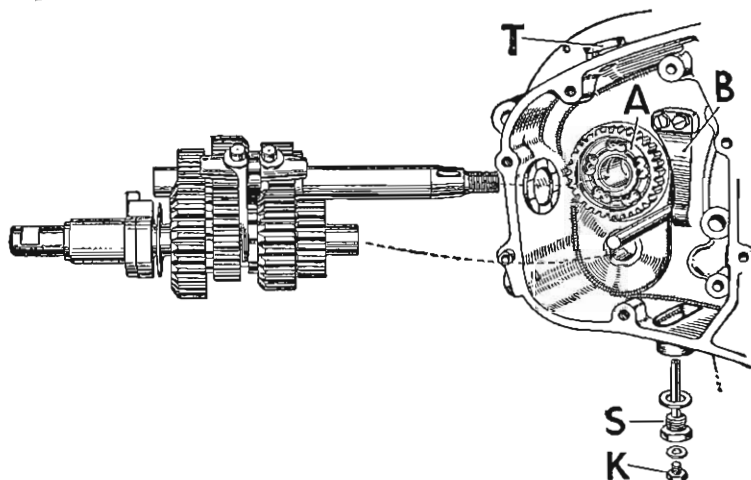


Fig. C11A. The Gearbox and Gears.

Now slide the whole assembly carefully into position locating the selector forks over the spindle as the assembly enters. Engage the cam plate in the 2nd gear notch (Fig. C10A) on the leaf spring at the back of the box and over the rollers on the selector fork pegs.

Replacing the Footchange Return Spring

Hold the shaft in a vice using soft clamps, with the short end and the peg uppermost, then with two substantial tools such

as screwdrivers, one through the loop and the other between the prongs twist the spring *D* (Fig. C10A) and force it over the short end of the shaft so that the prongs lie in the position shown in Fig. C12A. The spring will be squared up when the pivot bolt *E* is screwed home.

Insert the footchange lever quadrant shaft into the box and start the bolt *E* (Fig. C10A) with the fingers, twisting the spring slightly at the same time, finally locking the bolt securely.

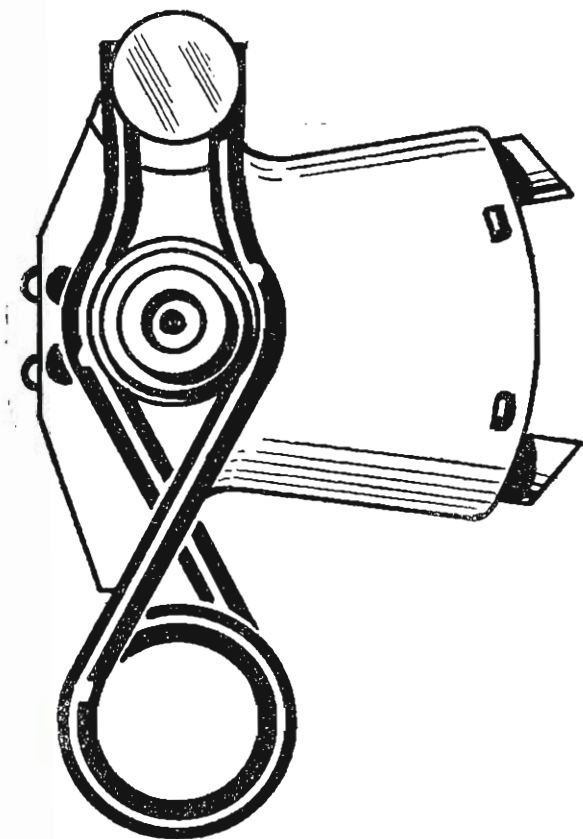


Fig. C12A. Fitting Footchange Return Spring.

Now replace the outer cover being careful to screw the small headed screw into the distributor clip.

Fit the remaining screws and the kickstart and foot change levers.

Primary Case

If the gearbox sprocket has been removed it must now be replaced with the boss inwards, then the tab washer and nut.

Thread the rear chain over the sprocket and couple up the ends, select top gear, apply the rear brake then tighten the sprocket nut securely, finally turning over the tab washer.

Where the oil seal is being replaced in the chain case back, it should be pressed in from the gearbox side flush with the cover and the lip inwards.

Place the felt grit protection washer in position over the bronze bush and against the end of the pinion sleeve.

See that the crankcase and inner cover joint faces are clean, apply a thin film of jointing compound and slide the inner cover over the various spindles at the same time carefully guiding the cam plate into the slot in the inner cover. Make sure that the cover is close up to the crankcase, replace the eight screws, the cam plate pivot pin, split pin, the washer and cover over the pivot and the two screws.

Before proceeding further check the gear selection.

Place the kickstart spring in position with hook over the stop plate screw, engage the tag on the anchor plate in the outer end of the spring and turn the plate anti-clockwise approximately 180° to engage the plate over the two flats on the spindle as shown in (Fig. C9A).

Pass the clutch cable through the back of the inner cover, apply a dab of grease to the pad on the clutch thrust arm and insert the small steel ball, then connect the cable to the arm.

Replace the thrust washer on the cam shaft with counter sunk face inwards and insert the small peg in the shaft, fit the tab washer and nut, tighten securely and turn the tab over.

B.S.A. Service Sheet No. 422 (contd.)

Refit the cover with a paper gasket which need only be jointed on one side and screw in the six counter sunk head screws. Place the felt washer over the gearbox main shaft next to the cover. Replace clutch push rod.

Smear the clutch sleeve *C* (Fig. C8A) with grease and place the 24 rollers in position. Next slide the chain wheel over the rollers and the clutch centre *B* (Fig. C8A) over the splines of the clutch sleeve. Place the engine sprocket on the bench alongside with the boss upwards and thread the primary chain over both the sprocket and chain wheel pulling the chain taut.

The engine main shaft distance piece should not have been disturbed but if it was removed for any reason it must now be replaced with the chamfered side inwards.

See that the Woodruff keys are fitted to both main shafts and that they are a good fit in the keyways.

Pick up the engine sprocket, chain and chain wheel in both hands and slide them over their respective shafts. Place the thick washer with the recess outwards in position against the clutch sleeve then the tab washer which has a special tongue fitting into the clutch centre, then the lock nut. Turn the tab washer over the nut after tightening.

Now place the clutch plates in position starting with one plain plate then one segmented plate and so on alternately, there being five plain plates and four segmented plates.

Place the pressure plate in position then the four spring cups and springs which should be of equal length. If there is any doubt about the condition of the springs, replace them since they are quite cheap to buy.

Screw on the four spring nuts until the underside of each head is approximately 1/8 in. from the face of each cup.

If the springs are compressed excessively, the handlebar lever will be stiff to operate, alternatively, if the spring pressure is insufficient the clutch will tend to slip. Adjust for true running of the plates by declutching and depressing the kickstart lever, when it will be seen if the plates are running true or not. If necessary, adjust the nuts individually to correct any run out.

Replace the rotor with the recessed face outwards, fit the tab washer and nut, turning the tab over the nut after tightening securely.

Place the three distance pieces on the stator plate studs and replace the stator with the lead wires on the outside and at the top.

Screw on the three nuts and spring washers and tighten evenly.

The air gap between the rotor and stator should be equal all round, when correct thread the lead wires through the rubber grommet in the back of the case.

Refit the primary case and the 10 screws, shortest at the rear and longest at the front.

Connect up the lead wires, check the ignition timing, and finally tighten the distributor clamp screw and replace the exhaust system.

Note:- C15 scrambles and sports star models are fitted with a primary chain tensioner. This tensioner can be fitted to C15 Star models the parts required being 13741-0143, 10641-0146 (2) and 10641-0148.

Service Bulletin No 83 (Sept. 1961) gives full instructions for fitting.

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

BSA SERVICE SHEET No. 422A

**MODELS C15 AND B40 WITH ENGINE NUMBERS
PREFIXED C15F OR B40F**

DISMANTLING AND REASSEMBLING THE CLUTCH, GEARBOX AND GEARCHANGE

The gears are contained in a separate housing formed in the rear portion of the crankcase and become accessible after the inner and outer timing covers have been removed from the right-hand side of the unit, so that the valve timing pinions are uncovered at the same time.

If the gears are to be removed then the whole of the primary drive must be dismantled first.

PRIMARY DRIVE

Disconnect the alternator lead by pulling out the three connectors. Remove the left-hand footrest, it is fitted to a taper shaft and will require a sharp blow with a mallet to release it after the nut which has a left-hand thread, has been removed.

Place a large flat tin under the primary chaincase to catch the oil, and take out the 10 screws holding the cover. The screws are of three different lengths and careful note should be taken of their respective positions to facilitate refitting, screw (M) Fig. C5A also serves as the level plug.

Depress the rear brake pedal and take off the primary chaincase cover.

To remove the stator take off the three nuts and washers (E) Fig. C6A, and pull the alternator lead through the rubber grommet in the back of the chaincase.

Note carefully that the stator plate is fitted with the lead on the outside.

Bend back the tab of the lockwasher (B) Fig. C6A under the engine crankshaft nut and remove the nut (C) which has a right-hand thread.

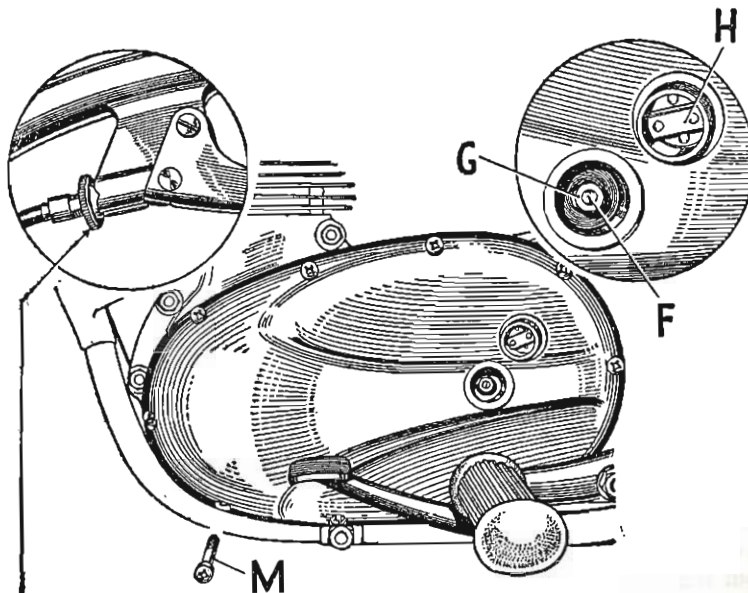


FIG. C5A. Clutch adjustment.

It will facilitate the removal of the nut if top gear is engaged and the rear brake applied.

Pull off the rotor and take out the Woodruff key to avoid it being lost.

Remove the four spring retaining nuts (P) Fig. C6A on the clutch, and withdraw the springs and cups. The pressure plate (L) Fig. C6A and the remaining clutch plates can now be removed but note should be made of the order in which they are fitted.

Bend back the tab of the lockwasher, pull out the clutch push rod, engage top gear, apply the rear brake, and unscrew the gearbox main shaft nut. The lockwasher has a special tongue which engages in the hub of the clutch and it must be refitted in the same way.

The thrust washer which will now be exposed is recessed on one side and must be refitted with the recess outwards.

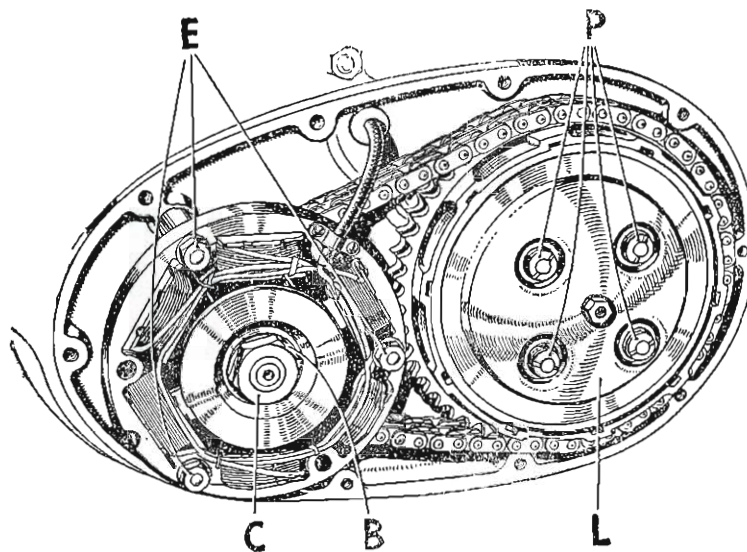


FIG. C6A. *Clutch and generator removal.*

With extractor number 61-3583 (Fig. C7A) the clutch sleeve can be freed from the tapered main shaft and the chainwheel, chain and engine sprocket withdrawn together and laid face down on the bench with the spring studs uppermost.

The clutch centre (B) Fig. C8A can be lifted out leaving the sleeve (C) and rollers in the chainwheel.

To examine the cush drive rubbers take out the four countersunk head screws and lift off the front cover plate, unless wear or damage is suspected the rubbers should not be disturbed.

New rubber inserts (E) Fig. C8A should be fitted as shown with the thicker segment being inserted first on the pressure or driven side of the vane and compressed by slightly rotating the vane, when the thinner segments can be pressed into position. A special tool numbered 61-3689 is necessary for the B40F as the rubbers are much stronger and of equal thickness.

When reassembling the clutch, note that the plates are alternately plain and segmented, the first plate next to the chainwheel being plain.

With the clutch removed the detachable plate registered in the rear half of the chain-case is now exposed.

Take out the six countersunk head screws and remove the plate complete with the oil seal.

If the oil seal is suspected of being faulty or leakage has occurred it should be replaced, care being taken not to damage the outer surface of the bush on which the seal bears.

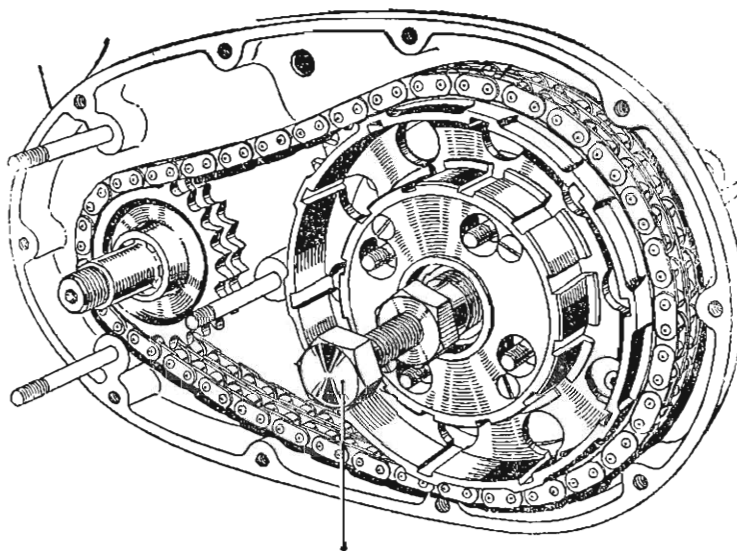


FIG. C7A. *Removing the clutch.*

Between the circular plate and the end of the pinion sleeve is a felt washer, the purpose of this washer is to prevent grit damaging the oil seal.

At this stage the gearbox can be dismantled providing the main shaft high gear (or pinion sleeve) is not being disturbed, but if complete dismantling is required the tab washer under the sprocket nut should be turned back and the nut slackened off while it is still possible to engage the gears.

It is now necessary to turn to the other side of the engine unit to remove the inner and outer timing covers.

Take off the exhaust system by slackening the pinch bolt in the finned collar and remove the bolts securing the pipe and silencer to the frame.

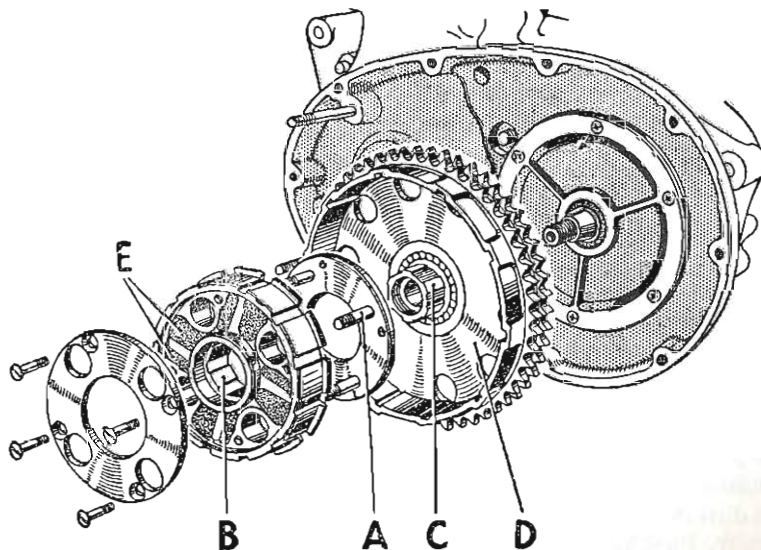


FIG. C8A. *Clutch drive unit.*

Release the pinch bolts in the kickstart crank (with carrier) and the footchange lever, and take off both.

Slacken the right-hand footrest nut and tap the footrest out of the way.

Disconnect the clutch cable, unscrew the seven cover retaining screws, noting their respective locations and remove cover.

If the clutch actuating lever is to be withdrawn, care must be taken to avoid losing the operating rack and ball which are loosely located on the inside of the outer cover.

Take out the two contact breaker securing bolts and the central fixing bolt that secures the spindle to the camshaft. Disconnect the low-tension lead and withdraw contact breaker. If necessary the cam can be removed with Service Tool No. 61-3761.

Release the spring from the kickstart spindle and take off spindle with bush. After removing the eight recessed fixing screws, the inner cover joint can be broken by tapping gently around the edges with a mallet.

The cover, complete with the gear cluster and footchange mechanism can then be eased away, leaving only the valve timing gear and oil pump exposed.

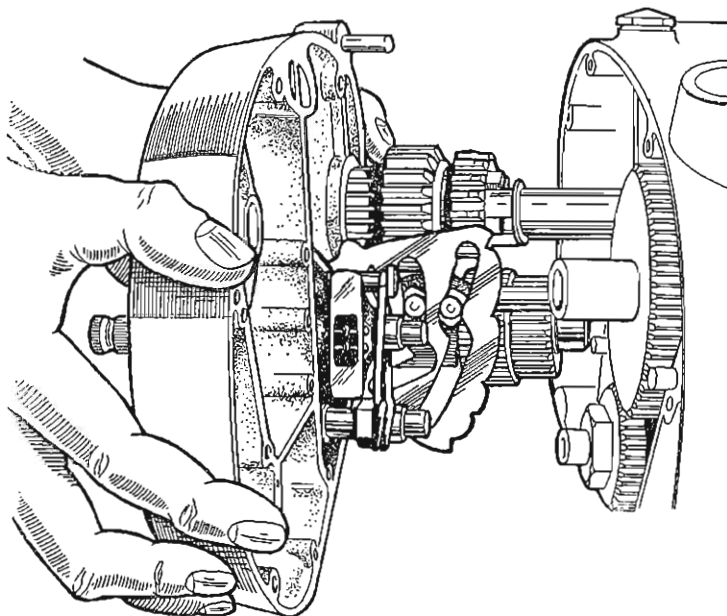


FIG. C9A. *Removing the inner timing cover.*

Withdraw the plunger quadrant and return spring from the inner cover, leaving the fulcrum bolt in position. After extracting the split pin from the cam plate pivot, the pivot and the cam plate can be drawn away from the cover.

The mainshaft is secured to the inner cover by a locking washer and nut (also retaining the kickstart mechanism) and may be left in place while the layshaft, gears and selector forks are removed.

It should be noted that the smallest gear on the mainshaft is a press fit, thus retaining the adjacent gear; similarly, the innermost gear on the layshaft is a press fit also retaining the adjacent gear.

Note position of each thrust washer and ensure that they are replaced correctly.

Do not disturb the high gear (or pinion sleeve) unless it is known that the bearing or oil seal is faulty. First heat the portion of the gearbox around the pinion sleeve by applying rag dipped in hot water, then tap the bearing and sleeve into the gearbox shell. The replacement bearing should be inserted and driven right home while the case is still warm.

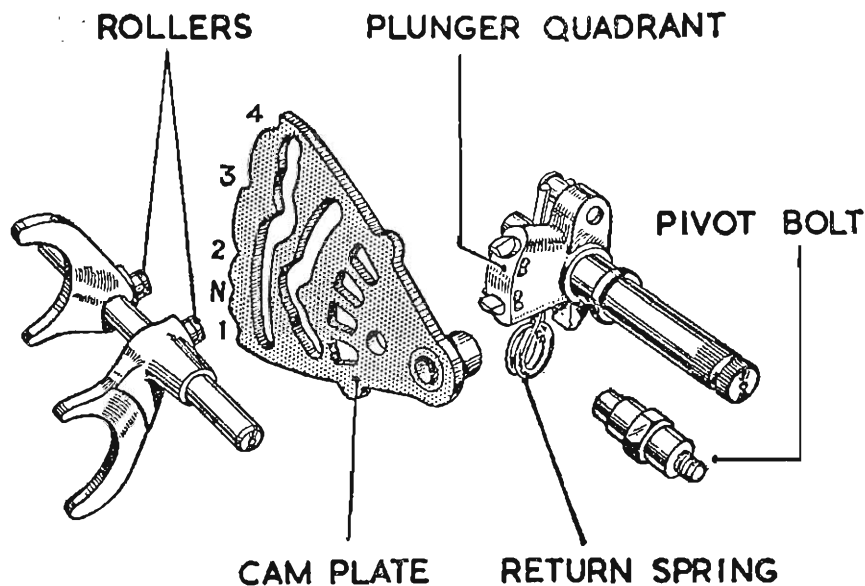


FIG. C10A. *Gearchange Mechanism.*

REASSEMBLY

Reassemble the layshaft, gear cluster and selector forks to the mainshaft. The selector forks are interchangeable on all models (except the C15 Trials machine which has wide ratio gears) but it is advisable to replace them in their respective positions.

Insert the selector spindle through the forks and into its location in the cover.

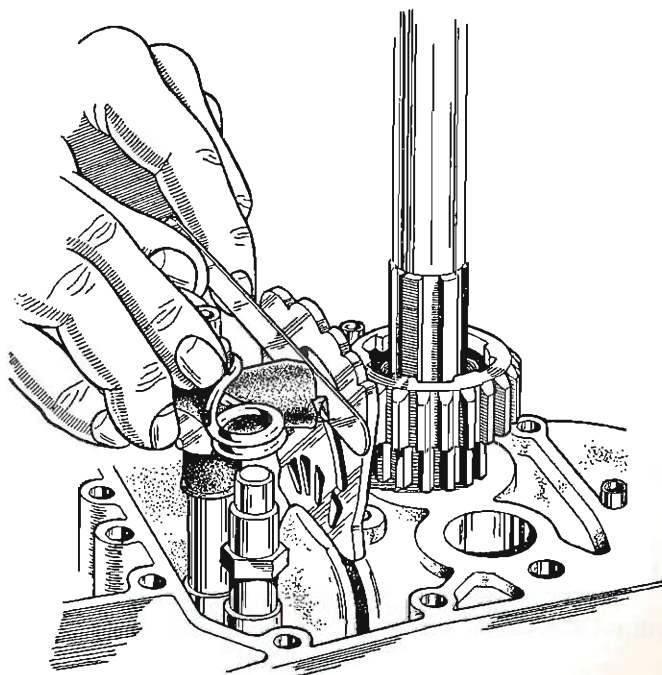


FIG. C11A. *Fitting Gearchange Plunger Quadrant.*

Carefully guide the cam plate into the slot in the inner cover, replace the pivot and secure with the split pin. Engage the cam plate over the selector fork rollers and set the plate so that the second gear notch will locate with the leaf springs in the crankcase.

Hold the quadrant shaft in a vice using soft clamps, with the short end and the peg uppermost. With two substantial tools such as screwdrivers, one through the loop and the other between the prongs, twist the spring and force it over the short end of the shaft. Square the spring up, replace the plunger quadrant in the inner cover and locate the spring over the pivot bolt (see Fig. C11A).

See that the crankcase and inner cover joint faces are clean, apply a thin film of jointing compound and carefully refit the cover (with gear cluster and footchange mechanism) to the crankcase. After checking that the gear cluster and selector fork spindle are correctly located, and that the cover is close up to the crankcase the eight securing screws can be replaced and tightened.

Before proceeding further, check the gear selection.

Insert the contact breaker into the camshaft spindle, replace central fixing bolt and securing bolts loosely, and reconnect the low-tension lead.

Replace the kickstart spindle, spring and spindle bush.

Locate the clutch operating rack and ball in the outer cover, insert the clutch actuating lever into its aperture in top of cover and mesh the pinion with the operating rack.

Refit the outer cover with the seven screws in their respective locations.

Reconnect the clutch cable and replace the kickstart and footchange levers.

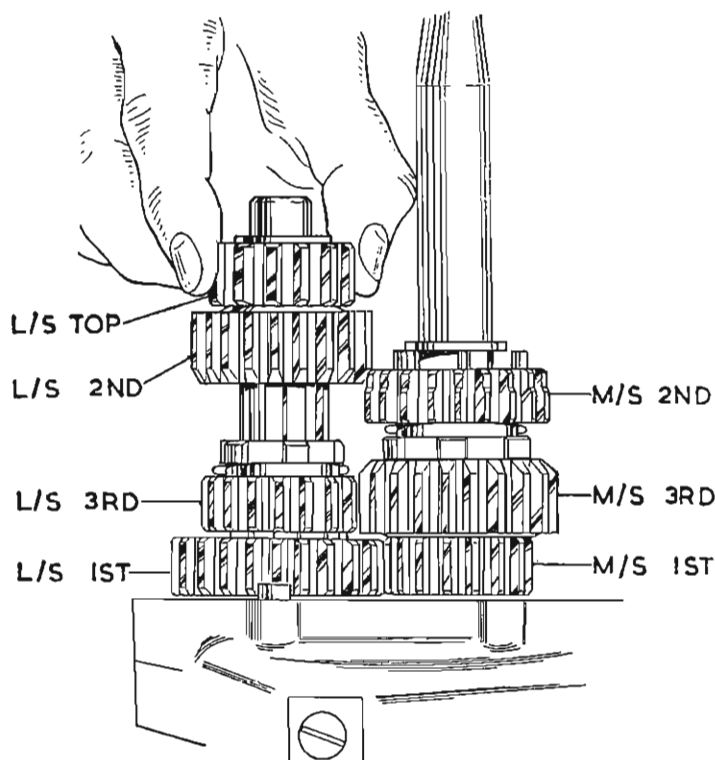


FIG. C12A. Gearbox assembly.

PRIMARY CASE

If the gearbox sprocket has been removed it must now be replaced with the boss inwards, then the tab washer and nut.

Thread the rear chain over the sprocket and couple up the ends, select top gear, apply the rear brake then tighten the sprocket nut securely, finally turning over the tab washer.

Where the oil seal is being replaced in the chaincase back, it should be pressed in from the gearbox side flush with the cover and the lip inwards.

Place the felt grit protection washer in position over the bronze bush and against the end of the pinion sleeve.

Refit the cover with a paper gasket which need only be jointed on one side and screw in the six countersunk head screws. Place the felt washer over the gearbox mainshaft next to the cover. Replace clutch push rod.

Smear the clutch sleeve (C) Fig. C8A with grease and replace the 25 rollers in position. Next slide the chainwheel over the rollers and the clutch centre (B) Fig. C8A over the splines of the clutch sleeve. Place the engine sprocket on the bench alongside with the boss upwards and thread the primary chain over both the sprocket and chainwheel pulling the chain taut.

The crankshaft distance piece should not have been disturbed but if it was removed for any reason it must now be replaced with the chamfered side inwards.

See that the Woodruff keys are fitted to both mainshafts and that they are a good fit in the keyways.

Pick up the engine sprocket, chain and chainwheel in both hands and slide them over their respective shafts. Place the thick washer with the recess outwards in position against the clutch sleeve then the tab washer which has a special tongue fitting into the clutch centre, then the locknut. Turn the tab washer over the nut after tightening.

Now place the clutch plates in position starting with one plain plate then one segmented plate and so on alternately, there being five plain plates and four segmented plates.

Place the pressure plate in position then the four spring cups and springs which should be of equal length. If there is any doubt about the condition of the springs, replace them since they are quite cheap to buy.

Screw on the four spring nuts until the underside of each head is approximately $\frac{1}{8}$ in. from the face of each cup.

If the springs are compressed excessively, the handlebar lever will be stiff to operate, alternatively, if the spring pressure is insufficient the clutch will tend to slip. Adjust for true running of the plates by declutching and depressing the kickstart lever, when it will be seen if the plates are running true or not. If necessary, adjust the nuts individually to correct any run out.

Replace the rotor with the recessed face outwards, fit the tab washer and nut, turning the tab over the nut after tightening securely.

Place the three distance pieces on the stator plate studs and replace the stator with the lead wires on the outside and at the top.

Screw on the three nuts and spring washers and tighten evenly.

The air gap between the rotor and stator should be equal all round, when correct thread the lead wires through the rubber grommet in the back of the case.

Refit the primary case and the 10 screws, shortest at the rear and longest at the front.

Replace the exhaust system, remembering to tighten the pinch bolt in the finned collar.

NOTE:—C15 Scrambles and Sports Star models are fitted with a primary chain tensioner. This tensioner can be fitted to C15 Star models the parts required being 41-0143, 41-0146 (2) and 41-0148.

Service Bulletin No. 83 (September 1961) gives full instructions for fitting.

BSA SERVICE SHEET No. 423

MODELS C15 AND B40

(except those with Engine Nos. prefixed C15F or B40F)

COMPLETE DISMANTLING OF THE ENGINE/GEARBOX UNIT

The procedure for complete dismantling of the engine and gearbox unit will be described from the point reached in the section on decarbonising (Service Sheet No. 421), continuing with dismantling of the gearbox (Service Sheet No. 422). Further dismantling will be assumed to commence at this point.

Pull out the distributor noting the way the clip is fitted (see Fig. C13A) inset.

Lift the tappets to the highest position and take out the camshaft, the tappets can now be withdrawn downwards into the timing chest. Note that the lubrication holes are facing towards the gearbox.

Take off the sump cover and filter.

Remove the three screws marked (A) Fig. C14A, holding the oil pump and draw the pump down and out of the crankcase.

It is not advisable to attempt dismantling of the oil pump, should a fault be suspected a serviced unit can be obtained through your dealer.

Using a brass or copper drift $\frac{3}{8}$ in. dia. through the pump drive aperture, tap the distributor drive shaft and bush upwards clear of the mainshaft worm wheel after removing the drive bush grub screw.

Flatten the tab washer on the mainshaft, unscrew the nut (right-hand thread) and with extractor 61-3681, fitted with legs 61-3588, pull off the mainshaft pinion.

The same extractor now fitted with legs number 61-3585 can be used to draw off the mainshaft worm wheel. If the Woodruff key is loose in the shaft it should be replaced, also take careful note of the way in which the wormwheel is fitted.

On later model C15 machines and B40 models, the distributor drive bush is secured by a grub screw which must be removed before the bush is driven out.

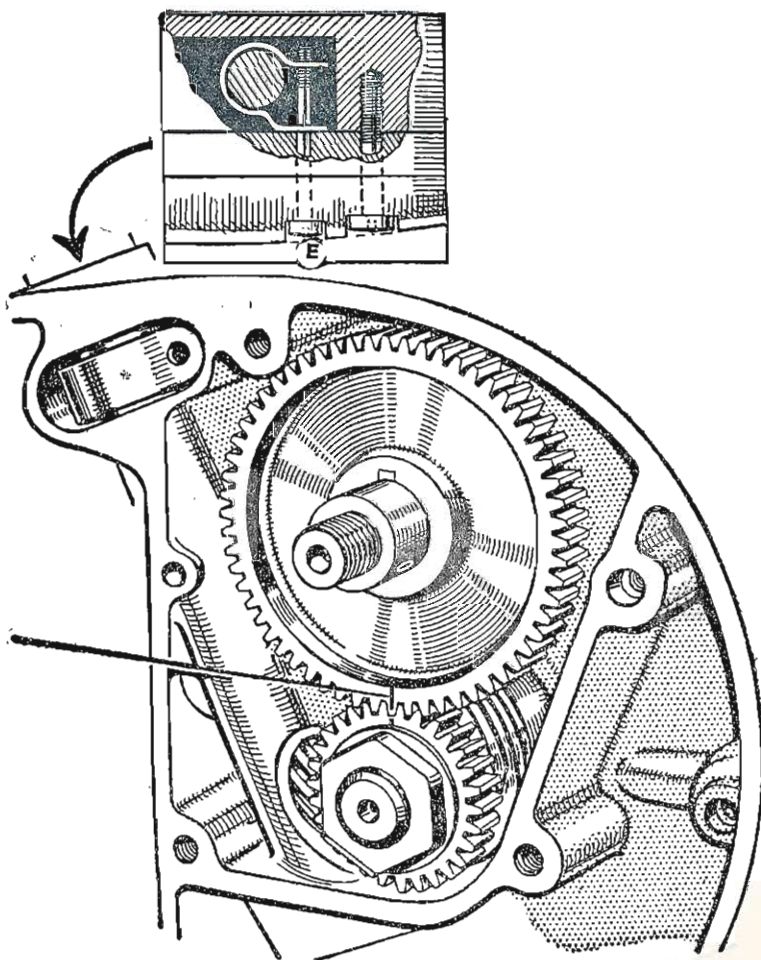


FIG. C13A. *Valve timing marks.*

Unscrew the four $\frac{5}{16}$ in. nuts (two in the primary case and two at the base of the cylinder) and take out the three bolts at the front of the crankcase to split the case.

Part the case by drawing off the drive side together with the flywheel assembly.

Carefully tap out the flywheel assembly from the drive side half noting the position of the main-shaft distance piece which has the chamfer facing inwards.

The spacer on the drive side shaft can be drawn off with tool number 61-3593 if necessary.

If any of the bushes in the crankcase are to be replaced the case should be heated in hot water and each replacement bush fitted immediately the old bush has been extracted and while the case is still hot.

Parting the Flywheels

The flywheels are a press-fit on the crankpin and no attempt should be made to part them unless the services of an expert mechanic and fully equipped workshop are available.

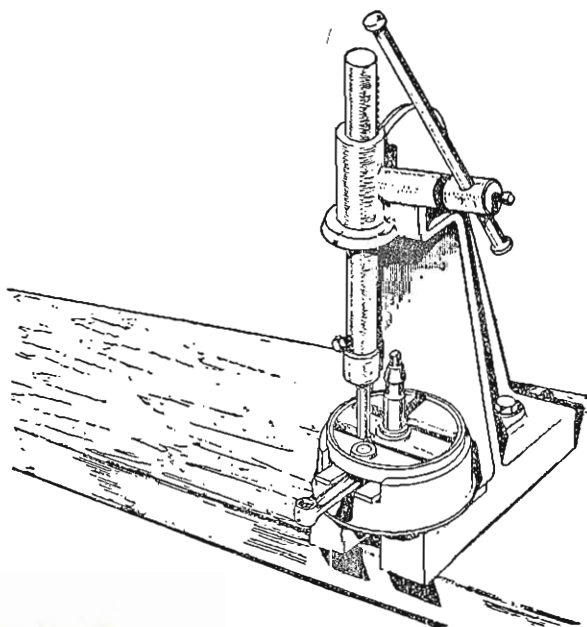


FIG. C15A. Parting the flywheels with service tool 61-3589 for C15 or 61-3686 for B40.

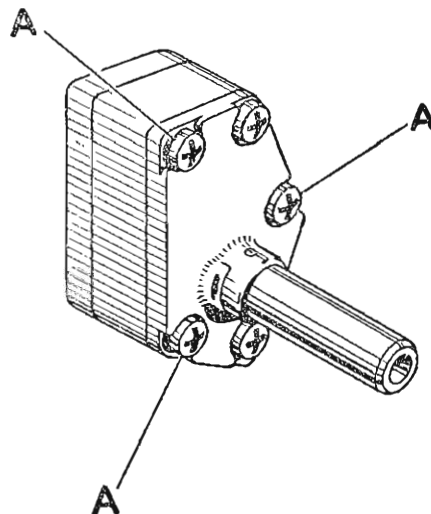


FIG. C14A. Oil pump.

Should the big-end assembly require replacement it is advisable to obtain a works reconditioned unit through the medium of your dealer.

If it has been decided that the big-end bearing must be replaced the flywheels should now be parted, using service tool number 61-3589 (Fig. C15A). Place the flywheels in the bolster and position the stripping bars, service tool number 61-3590. Use the punch, service tool number 61-3601 to drive out the crankpin. Take off the uppermost flywheel and reverse the lower one in the bolster. Again using service tool number 61-3601 drive out the crankpin.

Reassembly of the unit is described on Service Sheet No. 424.

BSA SERVICE SHEET No. 423A

**MODELS C15 AND B40 WITH ENGINE NUMBERS
PREFIXED C15F OR B40F**

COMPLETE DISMANTLING OF THE ENGINE/GEARBOX UNIT

The procedure for complete dismantling of the engine and gearbox unit will be described from the point reached in the section on decarbonising (Service Sheet No. 421), continuing with dismantling of the gearbox (Service Sheet No. 422A). Further dismantling will be assumed to commence at this point.

Raise the tappets as high as possible and take out the camshaft. The tappets can now be withdrawn downwards into the timing chest. Note that the lubrication holes in the tappets are facing towards the gearbox.

Take off the sump cover (secured by four nuts) and remove the filter.

Take out the three screws marked (A) Fig. C14A securing the oil pump and draw the pump down and out of the crankcase.

It is not advisable to attempt dismantling the oil pump. Should a fault be suspected, a service unit can be obtained through your dealer.

Take out the plug and washer from the top of the crankcase and note that the oil pump drive spindle is held in position by a bush, which is itself retained by a grub screw passing through the housing.

Remove the grub screw and, using a soft metal drift $\frac{3}{8}$ in. diameter through the pump drive aperture, tap the drive shaft and bush upwards clear of the worm wheel.

Examination of the timing gears will show that there are marks on the faces of the gears. These marks are to assist in correct reassembly, so ensuring precise valve timing. It is good practice to familiarise oneself with them before removing the gears (see Fig. C13A).

Flatten the tab washer on the crankshaft, unscrew the nut (right-hand thread) and with extractor 61-6381, fitted with legs 61-3588, pull off the crankshaft pinion. The same extractor, now fitted with legs 61-3585, can be used to withdraw the worm wheel.

If the Woodruff key is loose in the shaft it should be replaced; also take careful note of the way in which the worm wheel is fitted.

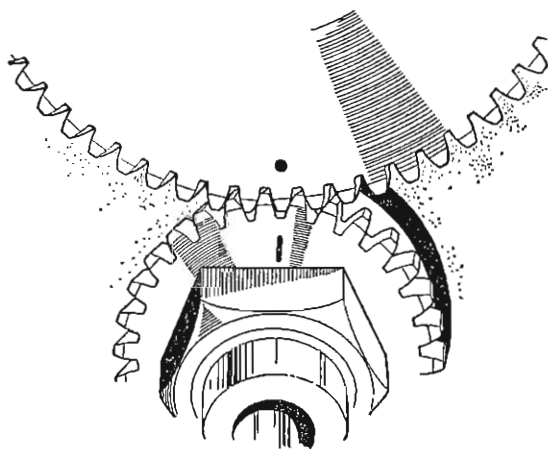


FIG. C13A. Valve timing marks.

Unscrew the four $\frac{5}{16}$ in. nuts (two in the primary case and two at the base of the cylinder) and take out the three bolts at the front of the crankcase to split the case.

Part the case by drawing off the driveside together with the flywheel assembly.

Carefully tap out the flywheel assembly from the driveside half noting the position of the mainshaft distance piece which has the chamfer facing inwards.

The spacer on the timing-side shaft can be drawn off with tool number 61-3593 if necessary.

If any of the bushes in the crankcase are to be replaced the case should be heated in hot water and each replacement bush fitted immediately the old bush has been extracted and while the case is still hot.

PARTING THE FLYWHEELS

The flywheels are a press-fit on the crankpin and no attempt should be made to part them unless the services of an expert mechanic and fully equipped workshop are available.

Should the big-end assembly require replacement it is advisable to obtain a works reconditioned unit through the medium of your dealer.

If it has been decided that the big-end bearing must be replaced the flywheels should

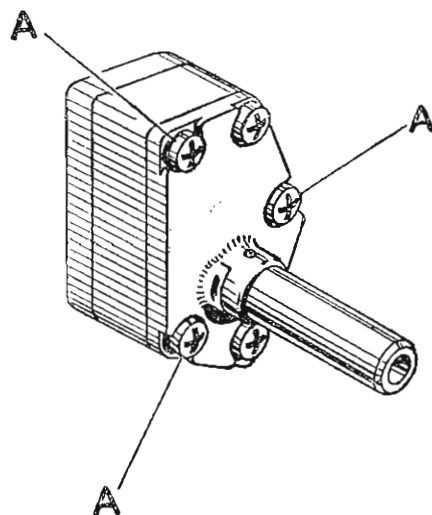


FIG. C14A. *Oil pump.*

now be parted, using Service Tool No. 61-3589 (Fig. C15A). Place the flywheels in the bolster and position the stripping bars Service Tool No. 61-3590. Use the punch Service Tool No. 61-3601 to drive out the crankpin. Take off the uppermost flywheel and reverse the lower one in the bolster. Again using Service Tool No. 61-3601 drive out the crankpin.

Reassembly of the unit is described on Service Sheet No. 424A.

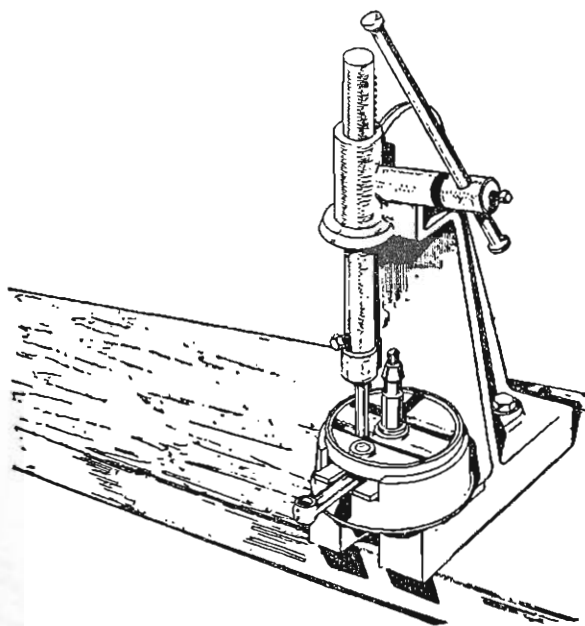


FIG. C15A. *Parting the flywheels with Service Tool 61-3589 for C15 or 61-3686 for B40.*

BSA SERVICE SHEET No. 424

MODELS C15 AND B40 REASSEMBLY OF THE ENGINE – GEARBOX UNIT

(EXCEPT MODELS WITH ENGINE NUMBERS PREFIXED C15F OR B40F)

Before commencing to assemble it is important to see that all parts are quite clean and free from road grit and dust both inside and outside as some of the grit may get transferred to vital bearing surfaces during handling.

CRANKCASE

Clean off all the old jointing compound being careful not to damage the joint faces.

If new bushes or ball races are to be inserted, warm the crankcase halves, extract the old part and press in the new part while the case is still hot.

Where oil-ways are drilled in bushes it is essential that the holes are correctly positioned so that the oil-ways are not blocked.

On the drive-side the bearings are fitted from inside the case and the oil seals from the outside. When fitting a replacement seal note that the lip must be facing inwards.

FLYWHEEL ASSEMBLY

To fit a new connecting rod and big-end assembly, place the gear-side flywheel in the bolster, locate the crankpin over the hole in the flywheel using the gauge so that the oil hole is in line with the oil-way in the flywheel and press right home. Check the oil-ways for clearance, now place the connecting rod and the drive-side flywheel in position and using the bridge piece, Service Tool number 8 44 61-3591 over the crankpin hole press the crankpin fully "home" into the drive-side flywheel (Fig. C16A).

The flywheels will now be only approximately aligned and must be trued.

As the flywheels on the model B40 are larger diameter, different Service Tools are required, these are:—

Model C15 Bolster 8 73 61-3589

Model B40 Bolster 8 73 61-3686

Model C15 Gauge 8 28 61-3597

Model B40 Gauge 8 28 61-3687

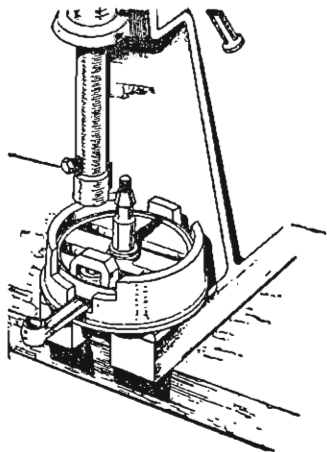


Fig. C16A.
Reassembly of the Flywheels.

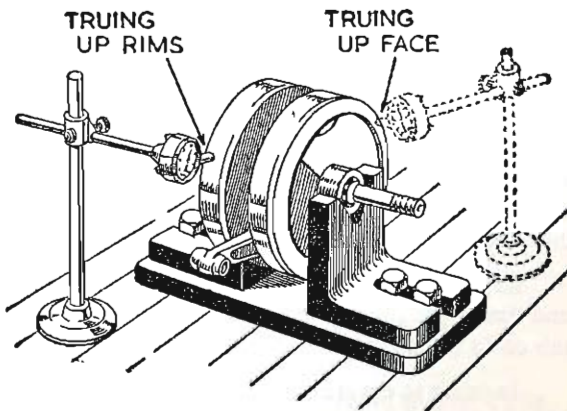
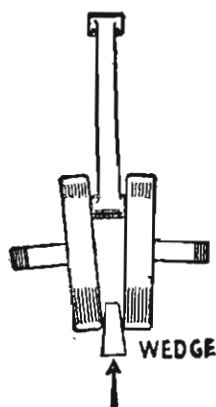


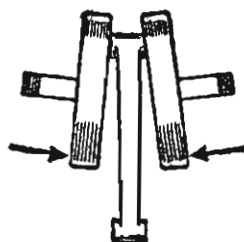
Fig. C17A.
Checking Flywheel Alignment.

Mount the assembly in vee blocks with the mainshaft bearing on the drive-side shaft and Service Tool number 8 33 61-3592 on the gear-side shaft over the drilled bush. True up as indicated in Fig. C18A using a dial indicator gauge for checking.

True the wheels to within .005 in., the drive-side shaft to within .002 in. and the gear-side shaft to within .0005 in.



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 with mallet on flywheel rims on opposite side to crankpin.

Fig. C18A.

Having renewed the big-end assembly and checked for concentricity, replace the left-hand side half crankcase over the flywheel assembly. This operation will be simplified if a block of wood is used, it should be deep enough to keep the end of the shaft clear of the bench and wide enough to support the flywheels.

Apply a coating of jointing compound to the joint faces, fit the right-hand half case and replace the three bolts at the front of the case and the four nuts (two at the base of the cylinder and two in the primary case). Tighten the bolts and nuts evenly to avoid distorting the joint faces.

Replace the Woodruff key on the right-hand side mainshaft and refit the worm gear and timing pinion with the extension inwards, fit the tab washer and nut, turning over the tab on to the nut after tightening securely.

In order to ensure correct positioning of the distributor, pick up the drive and holding it with the slot in line with the crankshaft, mesh the teeth with those on the mainshaft worm wheel.

Place the distributors drive bush in position on **top** of the drive and tap gently down until the circular groove is in line with the screw hole in the housing.

Replace the oil pump using a new paper gasket.

The oil pressure release valve is situated on the front right-hand half of the crankcase and may not have been disturbed, but it is as well, at this stage, to make sure that it is clean and free from grit.

After thoroughly cleaning the sump filter replace the filter and cover using a new gasket, which need only be "jointed" on one side, tighten the four nuts on to shakeproof washers. Turn the crankshaft to T.D.C.

Now pick up the tappets and insert them into the holes from inside the timing chest and with lubrication holes in the tappets towards the gearbox. Holding the tappets up insert the camshaft with the screwed end outwards and mesh the timing mark with the mark on the mainshaft pinion.

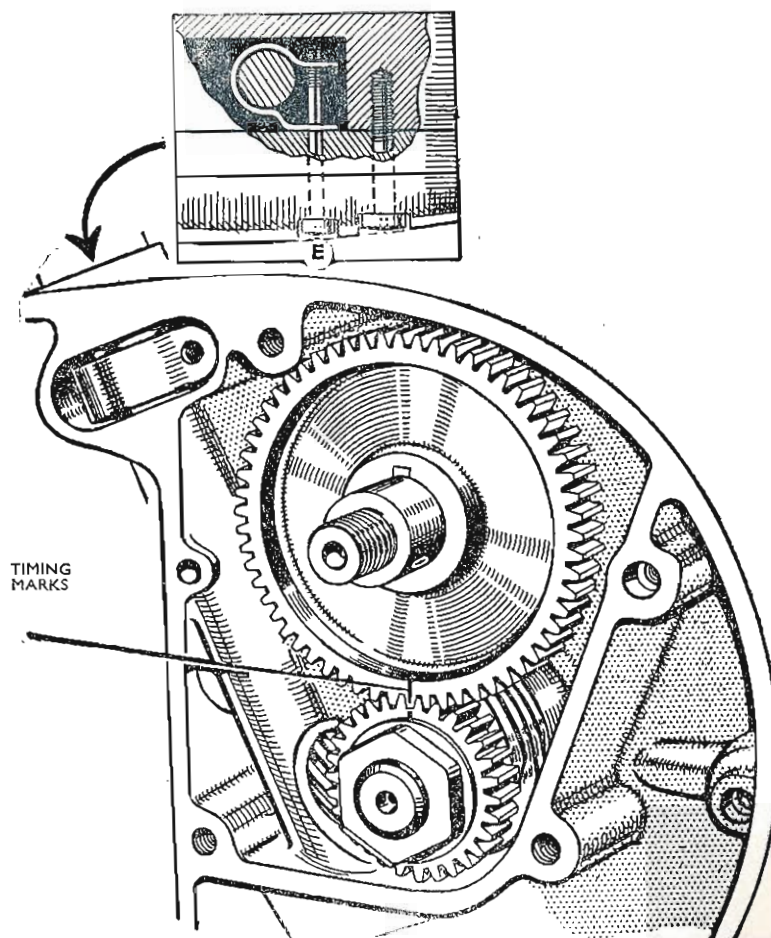


Fig. C19A. *Valve Timing Marks.*

Insert the distributor clip into the aperture in the crankcase as shown in Fig. C19A, and fit the distributor loosely in position with the wire clip away from the cylinder.

On later model C15 machines and the B40, the cover is retained by a single centre screw.

B.S.A. Service Sheet No. 424 (contd.)

Assembly from this point is described in Service Sheet number 422 continuing with Service Sheet number 421.

After assembly of the engine and gearbox it is only necessary to retime the ignition. Expose the contact breaker by taking off the cover (A) as shown in Fig. C20A and with the sparking plug out, insert a thin rod through the plug hole, rotate the crankshaft until the piston is at top dead centre on the compression stroke with both valves closed.

Now keeping the rod as vertical as possible rotate the engine backwards until the piston is $1/16$ in. for C15 or $1/32$ in. for B40 from the top of the stroke when the contacts should be just about to open. This is best determined by inserting a piece of cigarette paper between the points which are about to open when the paper can be withdrawn by a gentle pull.

If the setting is incorrect with the piston set as above, rotate the distributor gently until the points are about to open then tighten the clip screw and re-check the setting. The fully open gap (E), should be .015 in.

Finally reconnect the distributor and alternator leads and replace the spark plug and high tension lead.

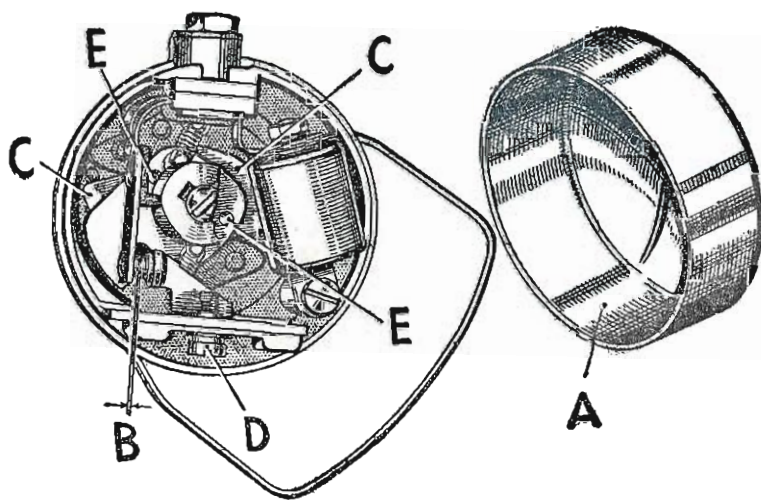


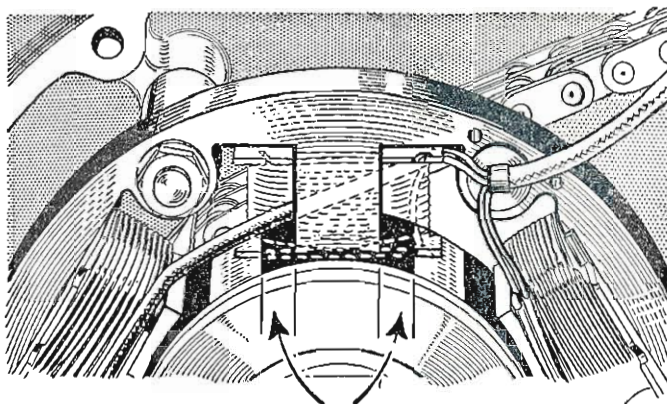
Fig. C20A. *Contact Breaker and Auto-advance Mechanism.*

Ignition Timing, models C15T and C15S

The two models are timed by a different method due to the "energy transfer" system. This system is sensitive in operation and the following instructions must be strictly followed for best results.

B.S.A. Service Sheet No. 424 (contd.)

Set the contact breaker to .015 in. Bring the piston to the top of the bore on the compression stroke. Rotate the engine backwards so that the piston descends about $\frac{1}{2}$ in. then bring the rotor into the position shown, in this position the contact breaker points should be just about to open, if necessary, adjust by turning the contact breaker housing.



OVERLAP
MUST BE EQUAL ON BOTH
SIDES WHEN POINTS ARE
BREAKING

Special Note

The above remarks apply to Standard and Competition models fitted with contact breaker units having a 15 degree advance.

Later models are fitted with a unit which is limited to 10 deg. advance. These can be identified by the 10 deg. stamped on auto-advance bob-weight visible just below the contact breaker. On these models the ignition setting is 5 deg. B.T.D.C. for both Standard and Competition models.

BSA SERVICE SHEET No. 424A

MODELS C15 AND B40 WITH ENGINE NUMBERS PREFIXED C15F OR B40F

REASSEMBLY OF THE ENGINE/GEARBOX UNIT

Before commencing to assemble it is important to see that all parts are quite clean and free from road grit and dust both inside and outside as some of the grit may get transferred to vital bearing surfaces during handling.

CRANKCASE

Clean off all the old jointing compound being careful not to damage the joint faces.

If new bushes or ballraces are to be inserted, warm the crankcase halves, extract the old part and press in the new part while the case is still hot.

Where oil-ways are drilled in bushes it is essential that the holes are correctly positioned so that the oil-ways are not blocked.

On the driveside the bearings are fitted from inside the case and the oil seals from the outside. When fitting a replacement seal note that the lip must be facing inwards.

FLYWHEEL ASSEMBLY

To fit a new connecting rod and big-end assembly, place the gearside flywheel in the bolster, locate the crankpin over the hole in the flywheel using the gauge so that the oil hole is in line with the oil-way in the flywheel and press right home. Check the oil-ways for clearance, now place the connecting rod and the driveside flywheel in position and using the bridge piece, Service Tool number 61-3591 over the crankpin hole press the crankpin fully "home" into the driveside flywheel (Fig. C16A).

The flywheels will now be only approximately aligned and must be trued.

As the flywheels on the model B40 are larger diameter, different Service Tools are required, these are:—

Model C15 Bolster 61-3589
Model B40 Bolster 61-3686
Model C15 Gauge 61-3597
Model B40 Gauge 61-3687

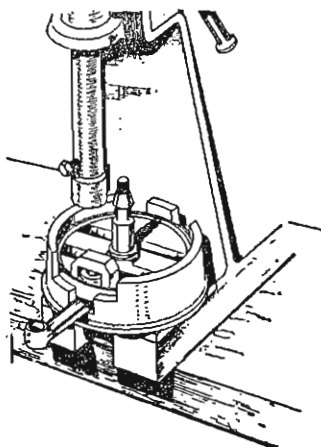


FIG. C16A.
Reassembly of the flywheels.

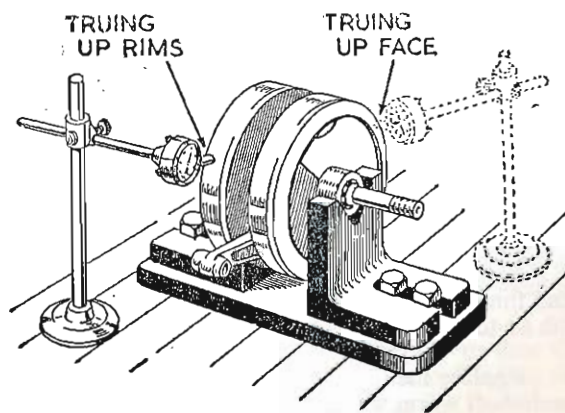
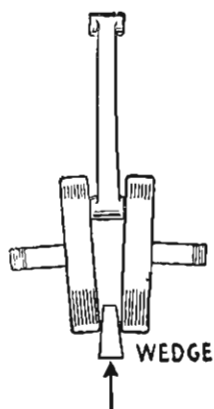


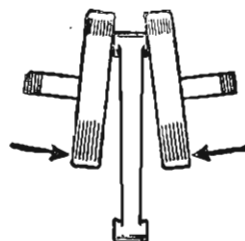
FIG. C17A.
Checking flywheel alignment.

Mount the assembly in vee-blocks with the mainshaft bearing on the driveside shaft and Service Tool number 61-3592 on the gearside shaft over the drilled bush. True up as indicated in Fig. C18A using a dial indicator gauge for checking.

True the wheels to within .005 in., the driveside shaft to within .002 in. and the gearside shaft to within .0005 in.



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 with mallet on flywheel rims on opposite side to crankpin.

FIG. C18A.

Having renewed the big-end assembly and checked for concentricity, replace the left-hand side half crankcase over the flywheel assembly. This operation will be simplified if a block of wood is used, it should be deep enough to keep the end of the shaft clear of the bench and wide enough to support the flywheels.

Apply a coating of jointing compound to the joint faces, fit the right-hand half case and replace the three bolts at the front of the case and the four nuts (two at the base of the cylinder and two in the primary case). Tighten the bolts and nuts evenly to avoid distorting the joint faces.

Replace the Woodruff key on the right-hand side mainshaft and refit the worm gear and timing pinion with the extension inwards, fit the tab washer and nut, turning over the tab on to the nut after tightening securely.

Replace the oil pump drive in the shaft aperture and mesh the teeth with those on the mainshaft worm wheel.

Place the oil pump drive bush into position on top of the drive and tap gently down until the circular groove is in line with the screw hole in the housing.

Replace the grub screw to secure the bush and drive and refit plug and washer.

Fit the oil pump, using a new paper gasket.

The oil pressure release valve is situated on the front right-hand half of the crankcase and may not have been disturbed, but it is as well, at this stage, to make sure that it is clean and free from dirt. If the valve has been removed ensure that, on reassembly, the spring is refitted with its larger end inside the screwed plug.

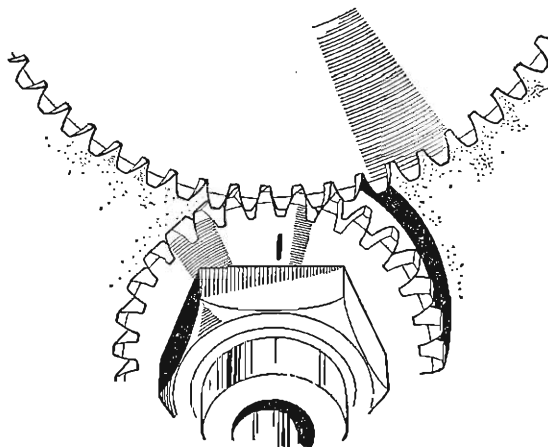


FIG. C19A. *Valve timing marks.*

After thoroughly cleaning the sump filter, replace the filter and cover using a new gasket, which need only be "jointed" on one side. Tighten the four nuts on to shakeproof washers.

Turn the crankshaft to top dead centre and insert the tappets into the holes from inside the timing chest, with the lubrication holes in the tappets towards the gearbox. Holding the tappets up, insert the camshaft and mesh the timing mark with the mark on the crankshaft pinion (see Fig. C19A).

Assembly from this point is described in Service Sheet No. 422A continuing with Service Sheet No. 421.

After assembly of the engine and gearbox it is only necessary to retime the ignition.

Expose the contact breaker by taking off the cover and with the sparking plug out, insert a thin rod through the plug hole, rotate the crankshaft until the piston is at top dead centre on the compression stroke with both valves closed.

Now, keeping the rod as vertical as possible, rotate the crankshaft backwards until the piston is .280 in. or $33\frac{1}{2}$ degrees from the top of the stroke. Take out the central fixing bolt and free contact breaker from its location in the camshaft. Rotate the spindle until the points are just about to open, ease the contact breaker back into the camshaft and secure in position with the fixing bolt.

The ignition timing is now set in the full retard position but this is not ideal because whilst the timing will be set for engine tick-over speeds, the firing at wide throttle openings will vary due to the differences in the amount of automatic-advance.

Since exact timing accuracy is required at operating speeds, it is better to time the engine in the fully advanced position, so transferring any variations in the firing to the tick-over or low engine speeds when it can least affect the performance.

Whilst setting the ignition timing, therefore, the contact breaker cam must be held in the fully advanced position.

With the piston at the recommended position before top dead centre, rotate the cam in an anticlockwise direction until the bob-weights are fully expanded and hold in position. Loosen the contact breaker plate bolts and rotate the plate either backwards or forwards until the contact points are just opening. Tighten the bolts, release the cam and re-check the setting. There should be no change in the fully-open contacts gap setting.

Finally, reconnect the contact breaker and stator leads and replace the spark plug.

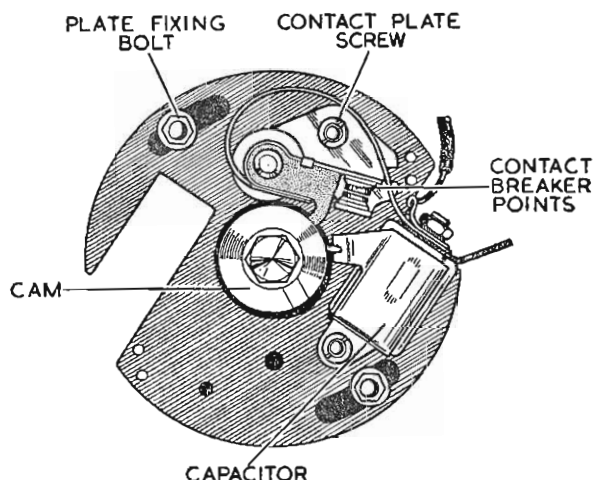
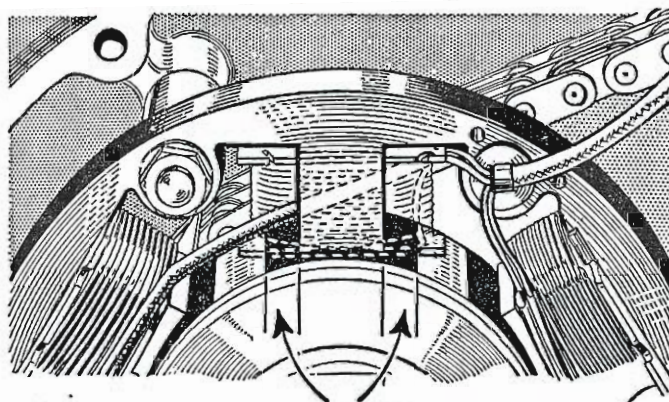


FIG. C20A. *Contact breaker*

IGNITION TIMING (models C15T and C15S)

The two models are timed by a different method due to the "energy transfer" system. This system is sensitive in operation and the following instructions must be strictly followed for best results.

Set the contact breaker to .015 in. Bring the piston to the top of the bore on the compression stroke. Rotate the engine backwards so that the piston descends about $\frac{1}{2}$ in. then bring the rotor into the position shown, in this position the contact breaker points should be just about to open, if necessary, adjust by turning the contact breaker housing.



OVERLAP
MUST BE EQUAL ON BOTH
SIDES WHEN POINTS ARE
BREAKING

BSA SERVICE SHEET No. 425

MODELS C15 AND B40 DISMANTLING AND REASSEMBLY OF HUBS AND BRAKES

Both wheels are fitted with ball journal bearings which do not require adjustment. The bearings are packed with grease during assembly and this should last until the machine is in need of a major overhaul.

Front Wheel Removal

With the machine on its centre stand place a box or small wooden trestle underneath the crankcase so that the front wheel is clear of the ground.

Disconnect the brake cable by removing the split pin *A* and the clevis pin *B*, Fig. C21A at the brake drum end, and withdraw the cable from the lug on the lower fork end. Remove the end caps *D* by unscrewing the four bolts (two in each cap) and as the last bolt is removed support the wheel to avoid damage to the threads on the bolts or the screwed sockets. The wheel will now be free.

Front Hub Dismantling

This should only be necessary when the bearings require replacement or greasing.

Unscrew the large nut on the spindle *F*, Fig. C21A this will be facilitated if the brake is applied using a short length of tubing, such as a box spanner, over the brake lever.

Take off the brake cover plate complete with shoes, cam and fulcrum pin.

The bearing retainer which is now exposed has a left-hand thread and can be removed by unscrewing in a clockwise direction with a suitable peg spanner. (Service Tool No. 82661-3694)

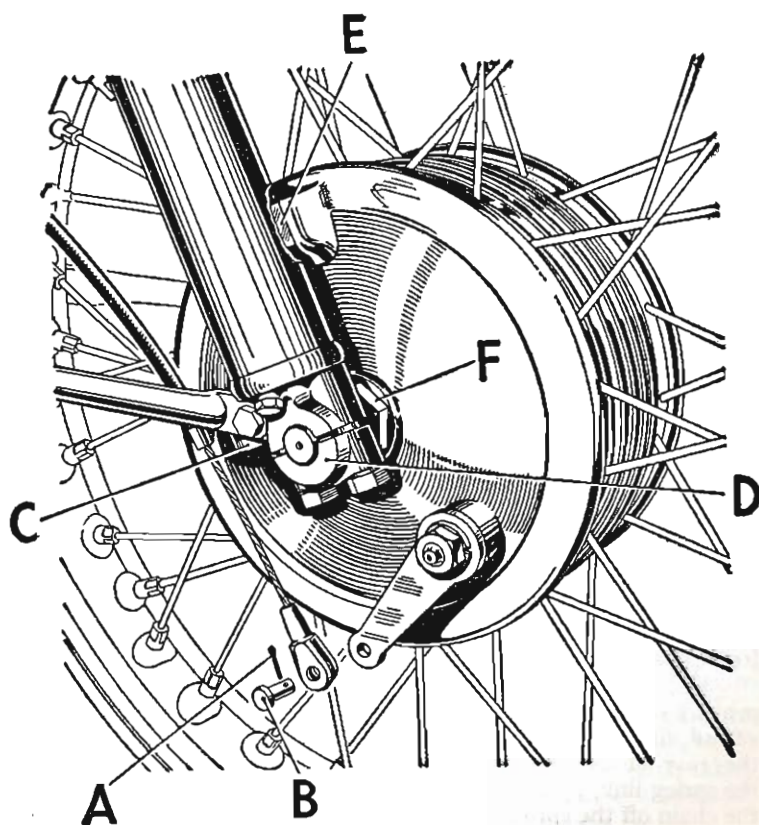


Fig. C21A. Removing the Front Wheel.

B.S.A. Service Sheet No. 425 (contd.)

Now drive out the R/H or brake side bearing by striking the L/H side of the spindle with a mallet or copper hammer, if neither of these is available use a piece of hard wood placed against the end of the spindle to protect it.

To remove the L/H side bearing prise out the circlip and using a suitable drift, drive out the bearing and dust cover from the R/H side. If a suitable drift or punch is not available the spindle can be used but care should be taken to avoid damage.

Fitting New Bearings

Place the bearing squarely in position on the R/H side and drive in using a piece of tubing on the outer ring of the bearing. When it is resting on the abutment face in the hub, screw in the lock ring using a peg spanner and turning anti-clockwise (L/H thread).

Insert the spindle, screwed end first from the L/H side, and tap it gently home so that the bearing inner ring is seated against the shoulder on the spindle.

Place the L/H bearing over the spindle and drive it into the housing until the dust cap just clears the circlip groove and replace the circlip.

Brake Shoes

Before replacing the cover plate make sure that the brake linings are fit for further use and that the cam spindle is quite free in the cover plate.

Replacement shoes can be fitted either by springing the old ones off the fulcrum and cam spindles, or the shoes complete with spindles can be removed from the cover plate by taking off the domed nut on the fulcrum pin and the nut and lever on the cam spindle

Replacing the Wheel

Make sure that the cover plate nut *F* (Fig. C21A) is securely tightened, engage the tongue *E* in the slot in the cover plate, replace the two caps and four bolts in the fork ends, but before final tightening pull the wheel to the R/H side so that the cover plate nut is resting against the R/H fork end.

Replace the brake cable, clevis pin and split pin and check over the fork end bolts for tightness.

Rear Wheel Removal

With the machine on its stand disconnect the rear chain at

the spring link, place a sheet of paper on the ground under the run of the chain and wind the chain off the sprocket onto the paper but leaving it on the gearbox sprocket.

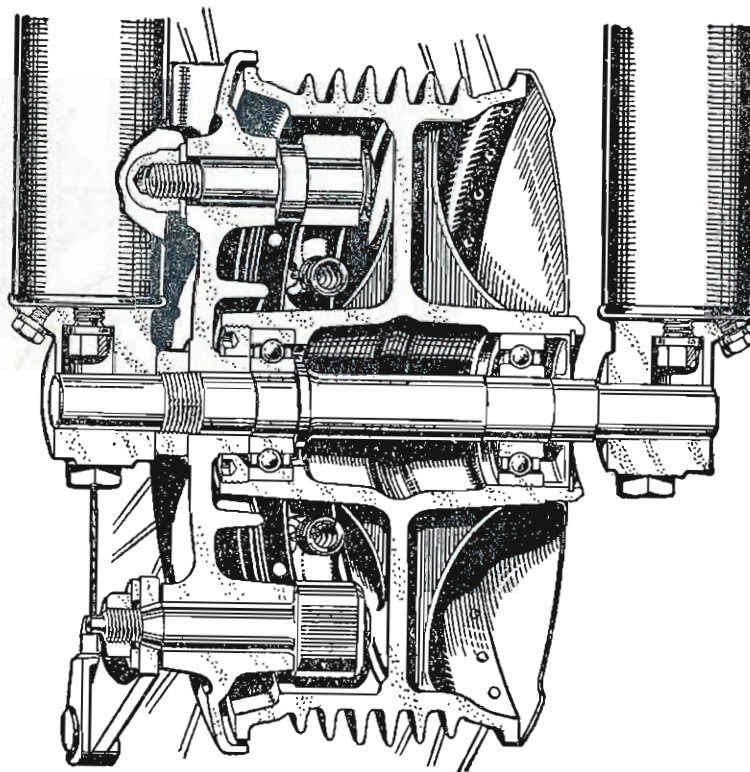


Fig. C22A. Front Hub Arrangement.

Take off the brake rod adjusting nut *A* (Fig. C23A) and the anchor arm *D* and disconnect the speedometer drive by unscrewing the union nut at the end of the cable.

Unscrew the spindle nuts *B* (Fig. C23A) and pull the wheel out of the fork ends at the same time freeing the brake rod from the swivel pin in the lever. Cant the machine over slightly towards the L/H side and remove the wheel from the R/H side.

Rear Wheel Dismantling

Unscrew the large central nuts on the spindle locking the spindle in the same way as described for the front wheel, and remove the brake cover plate complete with shoes and the speedometer drive gearbox from the R/H side. (Note the distance piece and driving dogs).

Next unscrew the bearing retainer which has a R/H thread and is therefore removed by using the peg spanner in an anti-clockwise direction.

Now drive the spindle through the bearing on the brake side so driving out the R/H bearing together with the felt washer, housing, and plain washer.

The brake side bearing can now be driven out from the opposite side using a suitable drift or the spindle, but care must be taken not to damage the spindle threads if the spindle is used.

Fitting New Bearings

New bearings can be fitted in the reverse order but care must be taken to see that the drive side bearing, which is the larger of the two, is close up to the abutment in the hub shell and the shoulder on the spindle.

After fitting the drive side bearing and its retainer, insert the spindle from the R/H side, drive in the R/H bearing until it is seated against the shoulder on the spindle, insert the plain washer, felt washer and housing and press down into the recess. Slide the distance piece over the R/H side spindle end, then the speedometer drive gearbox, taking care to mesh the driving dogs, and screw on the spindle lock nut, this nut can be finally tightened after the brake cover plate is fitted.

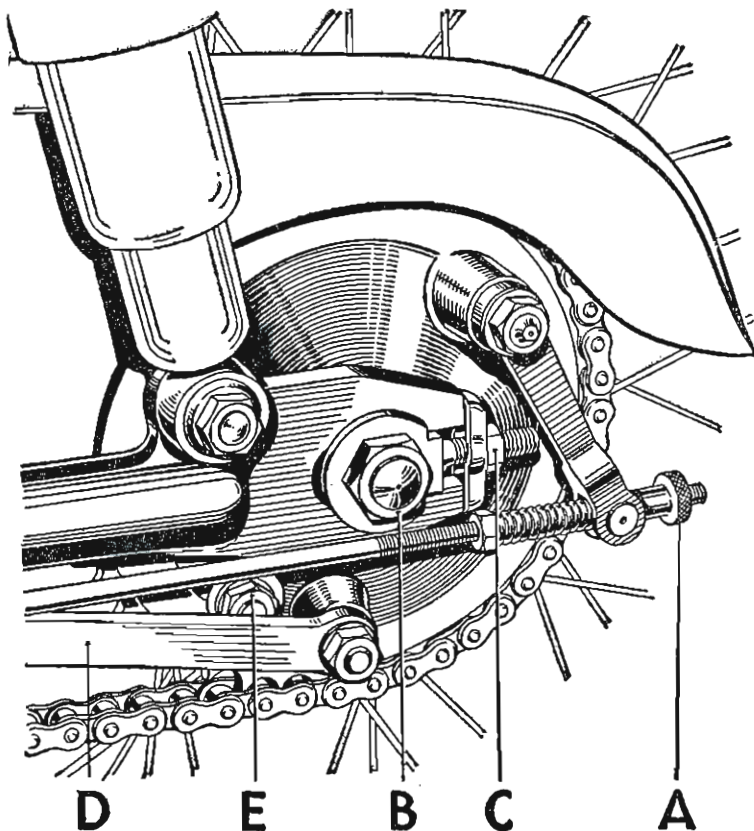


Fig. C23A. Rear Chain Adjustment.

Brake Shoes

These are dealt with in the same manner as described for the front wheel and are interchangeable with the front shoes, the only difference being that there is the normal type of nut used on the fulcrum pin.

After replacing the cover plate and nut, tighten the lock nut on the speedometer drive.

Brake Drum and Chainwheel

This is registered onto the hub shell and retained by six bolts and three tab plates and should not be disturbed except for replacement purposes of either the drum or spokes on that side.

The C15 Star uses a 45T chainwheel and the B40 a 46T, both being integral with the brake drum, but, as the chain line is different on the two models, the chainwheels are not interchangeable.

C15 Competition models use the same chain line as the B40 and alternative chain rings are available in 52T, 56T and 60T sizes which can be used on the B40 if desired in conjunction with the brake drum.

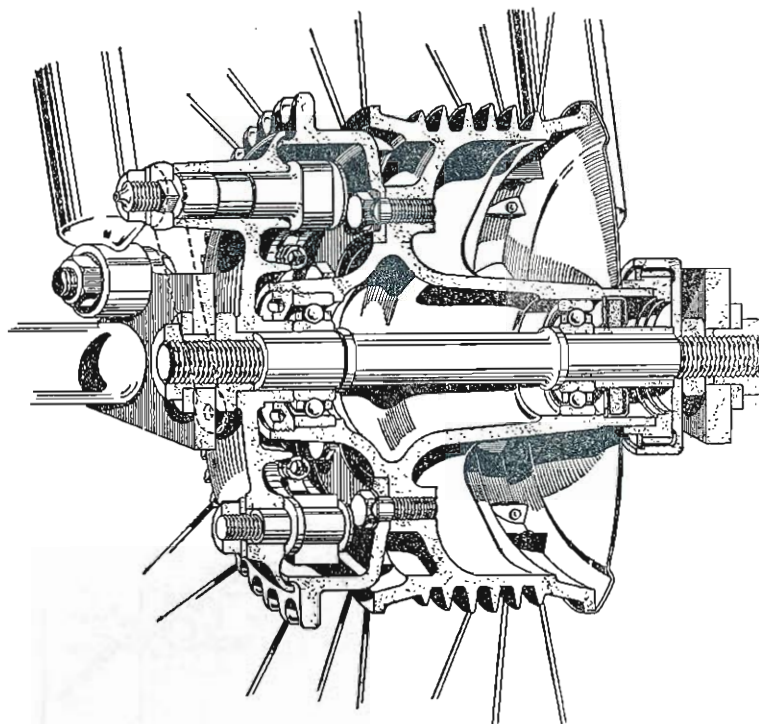


Fig. C24A. Rear Hub Arrangement.

Rear Wheel Replacement

Procedure is the reverse of that for removal but care should be taken to see that the wheel is in alignment with the front. This is done by applying a straight edge against the wheels which must touch the front and rear of both tyres. Also the spring on the chain connecting link must be fitted with the open end towards the rear on the top run.

It is most important to see that all nuts are securely tightened particularly those on the brake anchor strap.

BSA SERVICE SHEET No. 426

Model C15

FRONT FORK AND STEERING HEAD

Under normal conditions the only servicing which the front forks will require is occasional renewal of the oil. The need for this may be indicated by excessive movement, but it should only be necessary after considerable mileage.

Changing the Oil

First remove the plugs marked (A) Fig. C25A, and take out the drain plugs shown at (B) Fig. C26A. After allowing the oil to drain out, apply the front brake and depress the forks a few times to drive out any oil remaining.

CABLE ADJUSTER

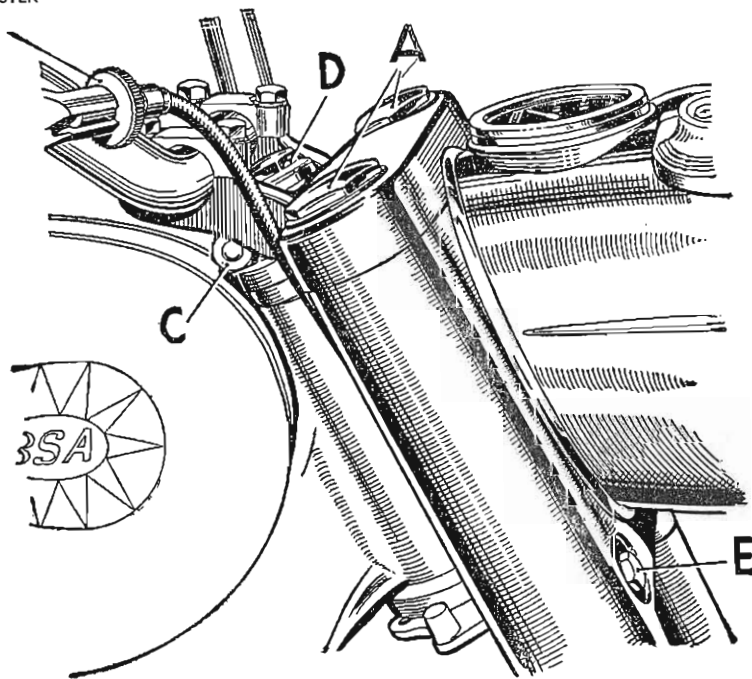


Fig. C25A. *Front fork and steering head.*

Replace the drain plugs after ensuring that the fibre washers are in good condition and refill each leg with $3\frac{1}{2}$ fluid ounces of an S.A.E. 20 oil, replace the top plugs and tighten securely.

Steering Head Adjustment

To test the head for play support the crankcase on a box so that the front wheel is clear of the ground, then standing in front of the machine with the legs together against the front tyre, push and pull alternately on the handlebars.

If any play is apparent the steering should be adjusted.

Slacken the clamping nut (c) Fig. C25A, and tighten the cap nut (d) until the adjustment is correct. The handlebars should turn freely, if the movement is "lumpy" it indicates that the top nut is too tight or the ballraces are damaged.

When the adjustment is correct, tighten the clamp nut (c) securely.

Dismantling the Forks

It should only be necessary to dismantle the forks after a very large mileage has been covered and special Service Tools will be required.

Drain off the oil as previously described on this sheet and remove the front wheel, followed by the front mudguard complete with the stays which are retained by four nuts and bolts on each side.

Unscrew the cap nuts (A) Fig. C25A, take out the fork springs and slacken the pinch bolts (E) in the bottom yoke.

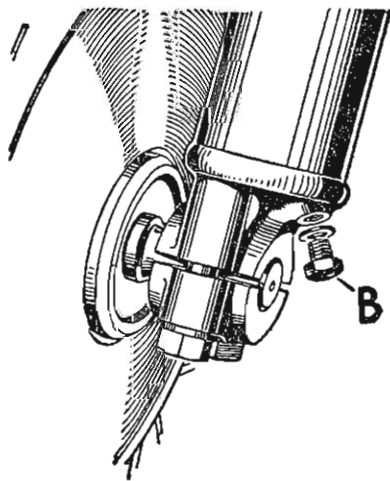


Fig. C26A. Front fork drain plug.

wheel spindle lug, a $\frac{1}{8}$ in. Whit. socket or tubular spanner is the most suitable. When the bolt is out, turn the leg upside down when the restrictor rod will drop out of the main tube.

To release the legs from the top yoke screw in Service Tool number 8 41 61-3350 in place of the top cap (A), strike the end of the tool a sharp blow with a hammer and draw the leg down through the bottom yoke. Repeat the procedure for the other leg (see Fig. C27A).

The collar at the top of the sliding shaft carries an oil seal and dust shroud, on early machines only one oil seal is fitted, later models have two oil seals, one above and one below the dust shroud.

To remove the collar, hold the leg in a soft-jawed vice by gripping the wheel spindle lug and unscrew using Service Tool 8 32 61-3586. The dust shroud is a press fit into the screwed collar and retains the lower oil seal. Note that the oil seal must always be fitted with the lip downwards.

If new bushes are to be fitted the restrictor rod must now be removed. Unscrew the small-headed $\frac{5}{16}$ in. bolt which is recessed into the

Note that there is a milled slot in the end of the rod, this is for drainage and the slot must be positioned over the drain screw when the rod is replaced.

Bolt the assembly into Service Tool 8 75 61-3587 using the two spindle lug bolts and draw the main tube and alloy spacer out of the sliding member. The top bush can now be lifted off and the lower bush removed after the castellated nut has been unscrewed.

Reassembling the Forks

After replacing the lower bush, slide on the alloy spacer tube then the top bush with the flange uppermost.

Insert the main tube into the sliding member, lower bush first and press in the distance piece and top bush.

Service Tool 8 75 61-3587 with 8 38 61-3602 can be used for this purpose or a long piece of tube having an inside diameter of $1\frac{1}{4}$ in., but great care must be exercised not to damage the top bush. Screw on the collar using Tool number 8 32 61-3586.

Now insert the restrictor rod slotted-end first, and with the aid of the spring locate the slot over the drain plug, screw in the small-headed $\frac{5}{16}$ in. diameter bolt and secure.

Take out the spring and slide the assembly up through the bottom yoke and using Service Tool 8 41 61-3350 draw the leg up tight into the top yolk tightening the pinch bolt (E) Fig. C25A before releasing the Service Tool.

The top cap (A) Fig. C25A can be used in place of the Service Tool but it must be removed again to refill with oil and to replace the spring.

After replacing both legs slacken off the top caps and the pinch bolts in the bottom yoke, replace the guard and front wheel, remove the support from underneath the engine and pump the forks up and down a few times to line up the legs, finally tightening up all nuts and bolts from the bottom upwards.

Do not forget that the front wheel must be drawn close up to the brake side before the clip bolts are tightened.

Suitable oils for the forks are Mobiloil Arctic, Shell X100-20, Castrolite, Esso 20, B.P. Energol S.A.E. 20.

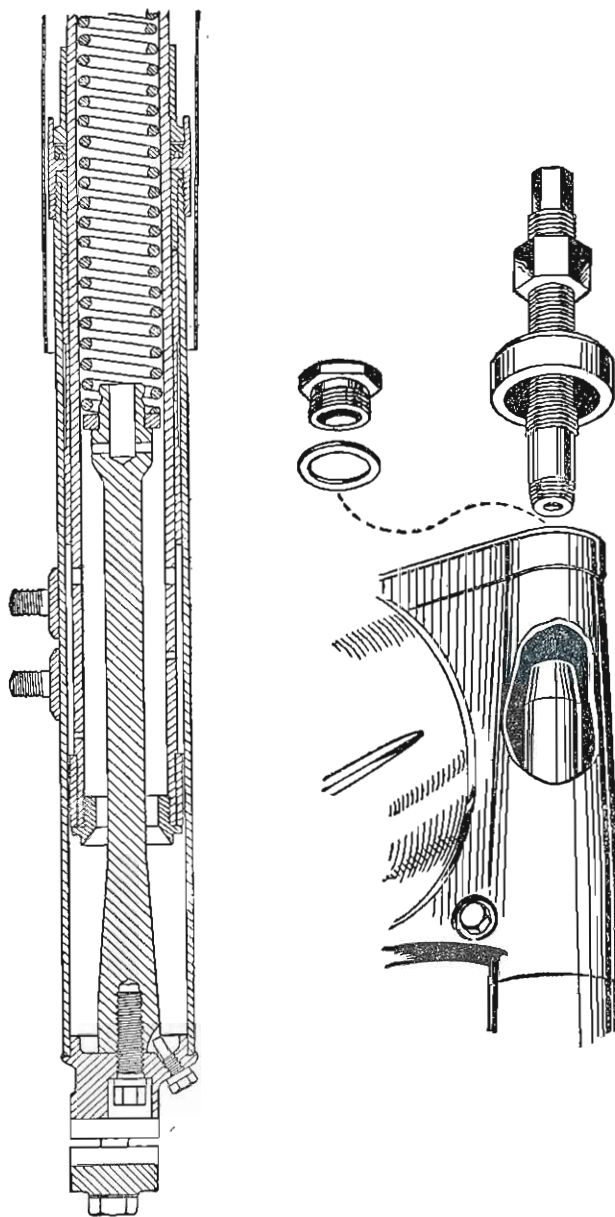
Dismantling the Steering Head

The steering can be dismantled without stripping the forks but sufficient slack must be obtained in the lighting cables and the front brake cable disconnected, to allow the column to be drawn down out of the head.

Take out the four bolts securing the handlebar and lift the bar to one side. Slacken the pinch bolt (C) Fig. C25A and take off the caps (A) and (D) Fig. C25A and the top fork cover.

Now with a rawhide or copper mallet strike the sides of the top yoke alternately to release it from the tapered legs.

Lift the top yoke to one side and draw the steering column down and out of the head but be careful to catch the bearings which will be released as the column is withdrawn. There are 24 $\frac{3}{16}$ in. diameter steel balls in each race.



The two inner cones are the top Part number 1 19 40-5029, bottom 1 16 40-5027, and the two cups are also identical, Part number 1 17 40-4074.

The cups are a press fit into the head lug and can be driven out from opposite ends with the aid of a suitable drift.

If there are small indentations in either the cups or cones or the steel balls are pitted, they should be replaced.

Reassembling the Steering

Drive the new cups into the head lug using a flat plate or bar across the top of the cup and make sure that they enter the seatings squarely.

Grease the cups and press 24 balls into each. Slide the column carefully up into the head and place on the top cone and dust cover, next the top yoke and cap (D) Fig. C25A. Screw in the caps (A) and replace the handlebar.

Check over the adjustment of the steering finally tightening nut (C) and replacing the brake and lighting cables.

Fig. C27A. *Dismantling the front fork.*

BSA SERVICE SHEET No. 426A

B40 and C15 Competition Models

FRONT FORK AND STEERING HEAD

Under normal conditions the only servicing which the front forks will require is occasional renewal of the oil. The need for this may be indicated by excessive movement, but it should only be necessary after considerable mileage.

Changing the Oil

First remove the plugs marked (A) Fig. C33A, and take out the drain plugs shown at (B) Fig. C34A. After allowing the oil to drain out, apply the front brake and depress the forks a few times to drive out any oil remaining.

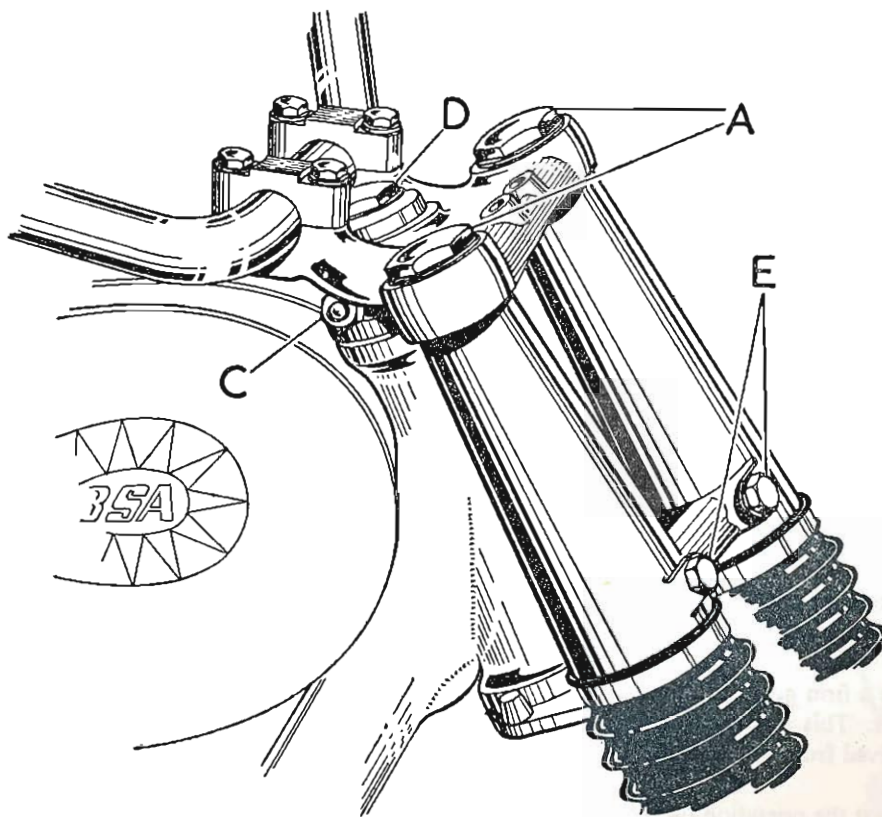


Fig. C33A. *Front fork and steering head.*

Replace the drain plugs after ensuring that the fibre washers are in good condition and refill each leg with $\frac{1}{3}$ pint (190 c.c.) of an S.A.E. 20 oil, replace the top plugs and tighten securely.

Steering Head Adjustment

To test the head for play support the crankcase on a box so that the front wheel is clear of the ground, then standing in front of the machine with the legs together against the front tyre, push and pull alternately on the handlebars.

If any play is apparent the steering head bearings should be adjusted.

Slacken the clamping nut (c) Fig. C33A, and tighten the cap nut (D) until the adjustment is correct. The handlebars should turn freely, if the movement is "lumpy" it indicates that the top nut is too tight or the ballraces are damaged.

When the adjustment is correct, tighten the clamp nut (c) securely.

Dismantling

Before commencing work on the forks it is advisable to have the following tools and replacement parts available in case they are required:—

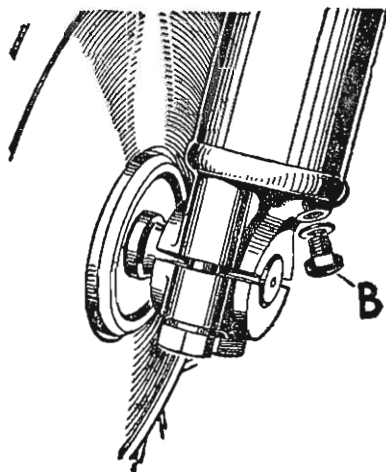


Fig. C34A. Front fork drain plug.

SHIMS	1 01 29-5335 (.010 in.)
	1 01 29-5336 (.020 in.)
	1 01 29-5337 (.030 in.)

OIL SEAL	1 20 29-5313 (2)
----------	------------------

TOP BUSH	1 32 65-5424 (2)
----------	------------------

LOWER BUSH	1 29 29-5347 (2)
------------	------------------

A length of number five twine approx. 15 in. long.

SERVICE TOOLS	8 41 61-3350
	8 41 61-3005
	8 43 61-3006
	8 36 61-3007

Remove the front wheel and mudguard.

Take out the fork top cap (A) Fig. C33A, and screw tool number 8 41 61-3350 into the thread at the top of the fork shaft using the larger of the fine threads (c) Fig. C36A.

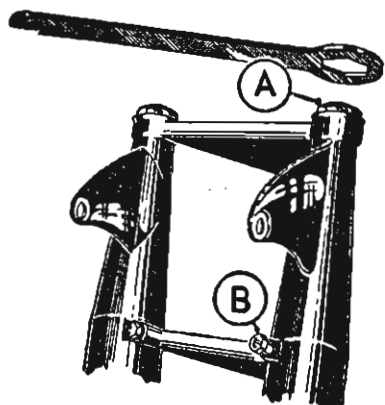
Slacken off the pinch bolt in the bottom yoke.

Remove the clip holding the rubber bellows on C15 Competition models and break the adhesion of the rubber by twisting slightly to left and right.

Take a firm grasp of the lower fork sliding member 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 sliding tube by gripping the wheel spindle lug in a soft-jawed vice as in Fig. C35A, and lift off the spring followed by the rubber bellows.



Slide Service Tool number 8 41 61-3005 over the main tube and enter the dogs in the slots at the bottom of the oil seal holder (D) Fig. C35A.

Pressing the tool down and turning at the same time unscrew the oil seal holder complete with the extension tube.

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.

The top fork bearing is retained in the sliding member by a circlip 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 bush. These must be replaced if the bushes are not renewed when assembling.

Lift out the main tube complete with the oil seal holder and bushes.

Grip the tube in a vice using soft clamps on the unground portion of the shaft and unscrew the nut at the lower end of the shaft. This nut secures the lower bush and after its removal the oil seal holder, circlip, shims and bushes can be slid 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 number 8 43 61-3006 into the top of the holder (G) Fig. C39A.

Give the tool a sharp tap with a hammer and the oil seal will be driven out.

Reassembly

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

If the oil seal is to be replaced care must be taken to see that the feather edge of the seal is not damaged. Enter the oil seal into the holder, metal part first, and drive home using Service Tool number 8 36 61-3007 (H) Fig. C39A.

Slide the oil seal holder over the shaft until it is on the tapered section but do not use force or the seal may be damaged.

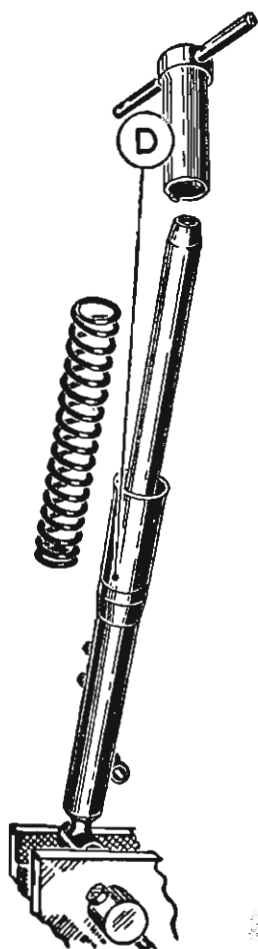
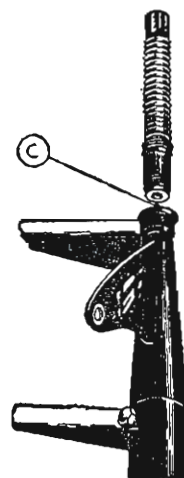
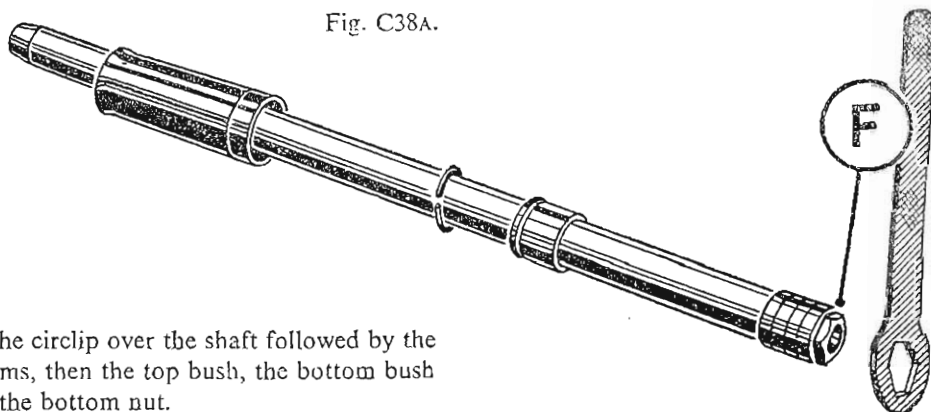


Fig. C35A.

Fig. C36A.

Fig. C38A.



Place the circlip over the shaft followed by the packing shims, then the top bush, the bottom bush and finally the bottom nut.

Grip the sliding member in the vice and enter the mainshaft, with the assembled parts, into the sliding member. Fit the circlip over the top bush and check for up and down movement on the bush. If a new bush has been fitted it may be necessary to add to, or take from, the existing shims.

Packing shims are available in the following sizes:—

.010 in. Part number 1 01 29-5335

.020 in. Part number 1 01 29-5336

.030 in. Part number 1 01 29-5337

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 on to one turn of twine round the groove at the end of the thread. This will provide an additional seal.

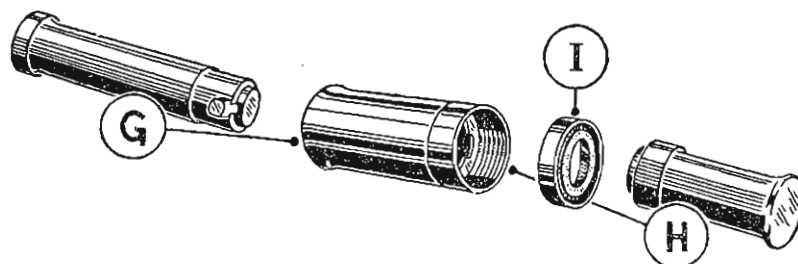


Fig. C39A.

Repeat the operation on the other leg.

Before refitting the leg to the steering head, apply a liberal coating of grease to the spring and place the spring in position and the rubber bellows if fitted over the oil seal holder, and secure with the one clip.



Now screw Service Tool number 8 41 61-3350 (minus the nut and collar) into the top of the tube and pass the tube up through the two yokes, fit the collar and nut and draw the tube firmly home into its taper (j) Fig. C37A.

Tighten the pinch bolt in the bottom yoke before removing the tool.

Repeat the operation on the other leg, replace the clips round the tops of the rubber bellows, fill the forks with the correct amount of oil ($\frac{1}{3}$ pint each leg) and replace the top fork plugs.

Finally replace the wheel and mudguard.

Do not forget that the front wheel must be drawn close up to the brake before the clip bolts are tightened.

Suitable oils for the forks are Mobiloil Arctic, Shell X100-20, Castrolite, Esso 20, B.P. Energol S.A.E. 20.

Dismantling the Steering Head

The steering can be dismantled without stripping the forks, but when a headlamp is fitted the lighting cables and the front brake cable must be disconnected, to allow the column to be drawn down out of the head.

Take out the four bolts securing the handlebar and lift the bar to one side. Slacken the pinch bolt (c) Fig. C33A, and take off the caps (A) and (D).

Now with a rawhide or copper mallet strike the sides of the top yoke alternately to release it from the tapered legs.

Lift the top yoke to one side and draw the steering column down and out of the head but be careful to catch the bearings which will be released as the column is withdrawn. There are 24 $\frac{3}{16}$ in. diameter steel balls in each race.

The two inner cones are top, part number 1 19 40-5029, bottom 1 16 40-5027 and the two cups are identical, part number 1 17 40-4074.

The cups are a press fit into the head lug and can be driven out from opposite ends with the aid of a suitable drift.

If there are small indentations in either the cups or cones or the steel balls are pitted, they should be replaced.

Reassembling the Steering

Drive the new cups into the head lug using a flat plate or bar across the top of the cup and make sure that they enter the seatings squarely.

Grease the cups and press 24 balls into each. Slide the column carefully up into the head and place on the top cone and dust cover, next the top yoke and cap (D) Fig. C33A. Screw in the caps (A), and replace the handlebar.

Check over the adjustment of the steering, finally tightening nut (c) and replacing the brake and lighting cables (when lamps are fitted).

BSA SERVICE SHEET No. 427

MODELS C15 AND B40
ATTENTION WHICH CAN BE GIVEN WITHOUT DISMANTLING

Oil Pressure Valves

There are three ball valves in the lubrication system but only two can receive attention without complete dismantling of the engine.

The pressure release valve is situated at the front of the timing case on the right-hand side and is accessible when the plug (D) Fig. C28A is removed.

It is advisable to clean the ball, spring and ball seating every few thousand miles or when the oil is changed.

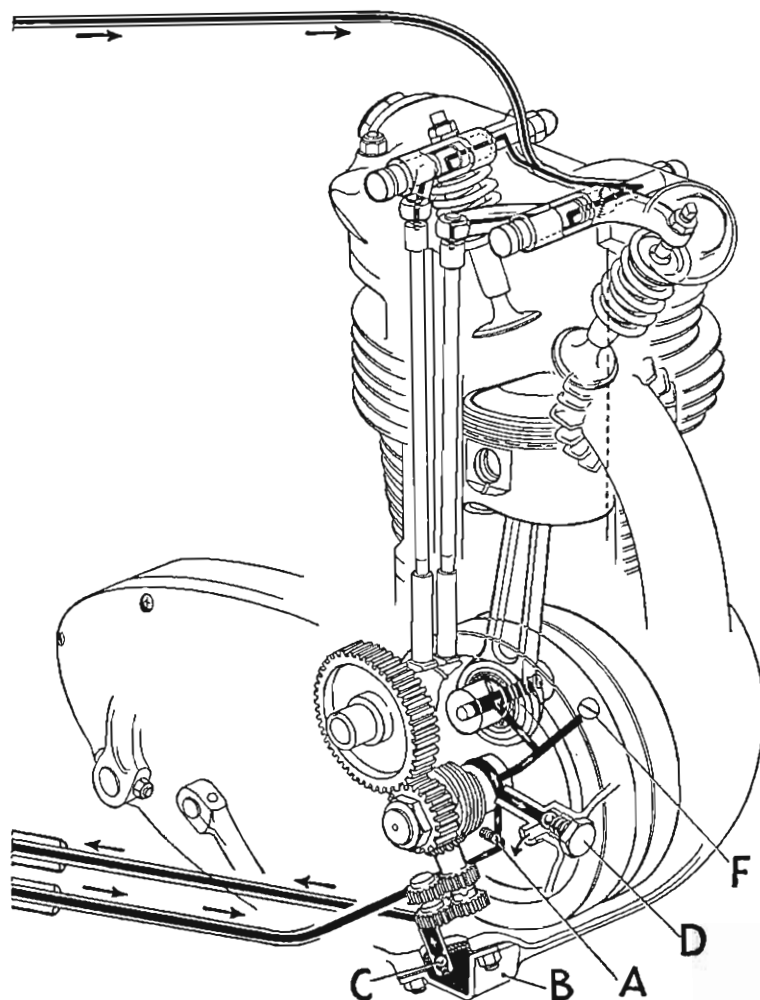


FIG. C28A. *Lubrication system.*

If the ball valve (C) Fig. C28A should be stuck on its seating it will prevent the return of oil to the tank. In this event, remove the cover plate (B) below the pump, insert a suitable piece of wire and lift the ball off its seating to free it.

Tappet Clearance

The engine must be quite cold whenever the tappet clearance is checked. Remove the inspection covers and take out the spark plug.

Rotate the engine forward until the INLET valve has just closed and the push rod is just free to rotate, this is the correct position for checking the EXHAUST valve.

Slide a feeler gauge between the end of the valve and the adjusting pin as shown in Fig. C29A.

If adjustment is necessary slacken the locknut (A) and adjust pin (B) until the correct gauge will just slide between the valve and the pin. Hold the pin firmly in position and tighten the locknut. Check the clearance again in case tightening the locknut has altered the setting.

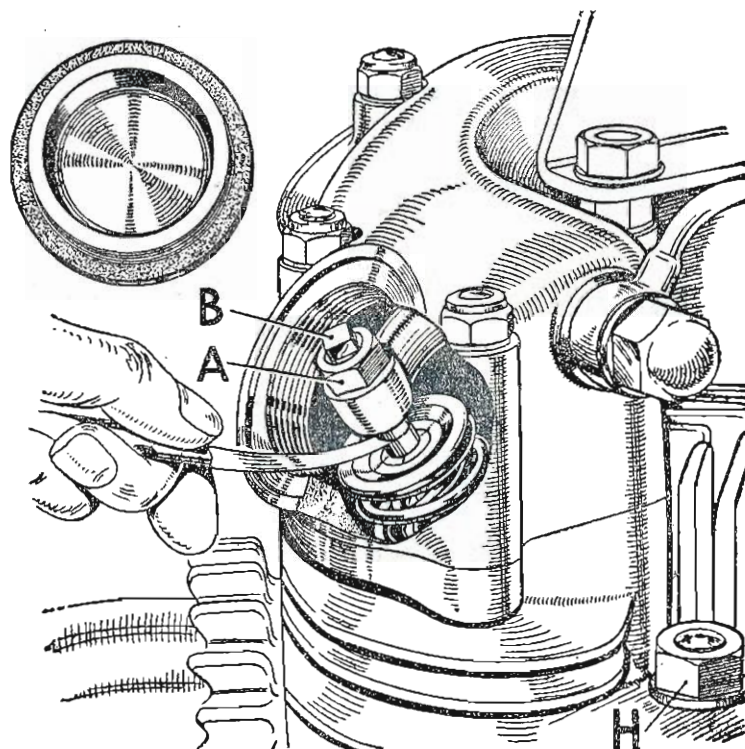


FIG. C29A. Tappet adjustment.

After the exhaust valve has been adjusted rotate the engine forward again until the exhaust valve clearance is just taken up, but before the valve actually starts to open.

This is the correct position for checking the inlet valve which is adjusted in a similar manner to that described for the exhaust valve.

Correct clearances are:—

	C15 and B40	
Inlet valve		.008 inches
Exhaust valve		.010 inches

C15T prior to engine number C15T-1251.

C15S prior to engine number C15S-2112.

Inlet valve		.004 inches
Exhaust valve		.004 inches

C15 Trials and Scrambles machines after the above engine numbers are fitted with camshafts having ramp cams and on these machines the tappet clearances are the same as the other models, i.e.:—

Inlet .008 inches.

Exhaust .010 inches.

These new camshafts can be fitted to earlier machines if necessary. The spares number is 1 43 40-0477.

Contact Breaker Gap

Remove the cover (A), Fig. C30A after pressing aside the spring clip or removing the centre screw.

The gap between the points when fully open should be .015 in. Rotate the engine slowly until the foot of the rocker arm is on the peak of the cam, then check the gap between the contacts at (B) with the feeler gauge.

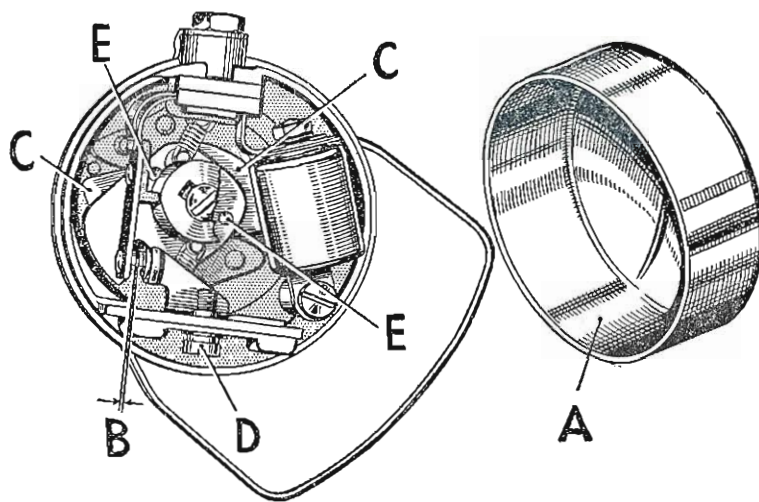


FIG. C30A. Contact breaker and auto-advance mechanism (early type).

If the gap requires adjusting, slacken the screw (D) and move the plate until the gap is correct, then retighten the screw and re-check the setting.

No oil or grease should be allowed to get on the contact breaker points which should always be clean and dry.

Ignition Timing

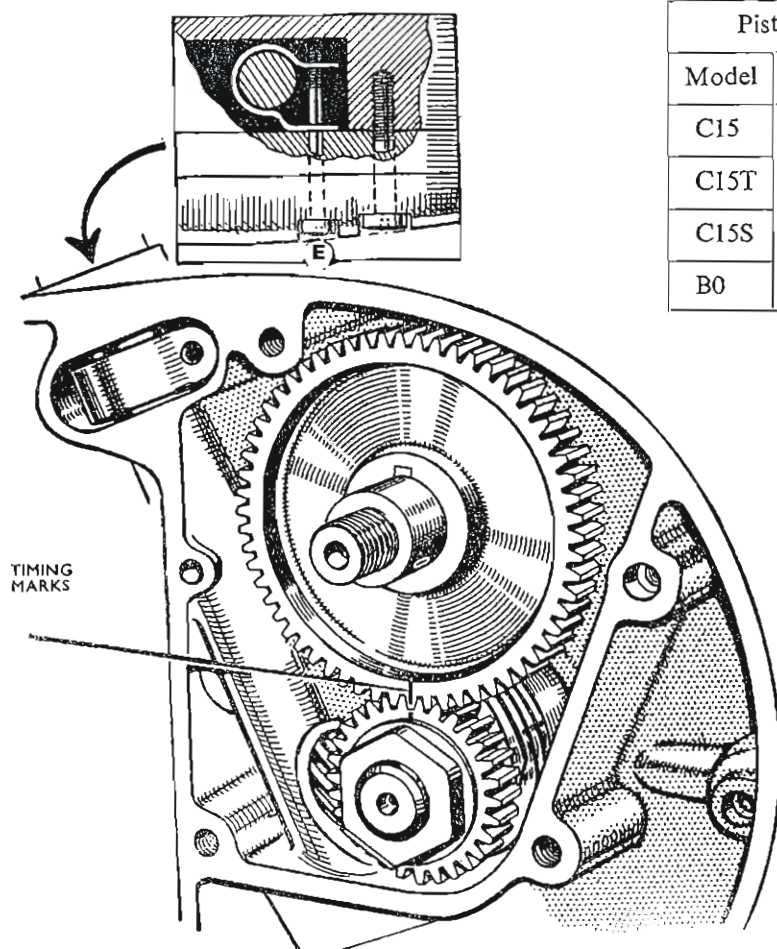
To check the ignition timing expose the contact breaker as previously described. As a slight variation in the contact breaker gap alters the timing (wide gap advances and narrow gap retards the timing), it is advisable to check after adjusting the points.

With the spark plug out, engage top gear and turn the engine by means of the rear wheel until the piston is at the top of its stroke with both valves closed, if either valve is open rotate the engine one complete revolution to bring the piston to the correct position, that is: top dead centre on the compression stroke.

Insert a slim rod, such as an old spoke, through the spark plug hole and keeping the rod as vertical as possible, make a mark in line with some point on the head such as one of the fins, now make a second mark $\frac{1}{32}$ in. above. Re-insert the rod and, again keeping it as vertical as possible, turn the engine back by revolving the rear wheel backwards until the piston has descended to bring the second mark on the rod in line with the point chosen on the head.

The piston should now be at the firing point (see table) and the contact breaker points should be just about to open.

If the setting is incorrect, slacken the clip screw (E) Fig. C31A, which is situated at the top of the outer timing cover and rotate the body of the distributor gently either way until the foot of the rocker arm is at the base of the cam when the points should be just about to separate. This gives a timing in the static position.



Piston position before T.D.C.		
Model	Degrees	Inches
C15	33½° F.A.	9/32 in. F.A.
C15T		
C15S		
B0		

F.A.—Fully advanced.

FIG. C31A. Valve timing marks.

To obtain the correct timing in the fully advanced position, reset the piston 9/32 in. B.T.D.C., now hold the auto-advance in the advanced position by turning the cam anti-clockwise and reset the body of the distributor so that the points are just about to open.

Ignition Timing (engines prefixed C15F and B40F)

Engines with numbers prefixed C15F or B40F have the contact breaker fitted at the side of the timing cover. On these models access to the contact breaker is obtained by removing two cover screws. Timing is adjusted by slackening two pillar bolts and moving the contact breaker plate to left or right as required.

When it is necessary to remove the auto-advance and contact breaker cam, take off the contact breaker plate, remove the centre bolt holding the cam and using tool number 8 14 61-5005 pull off the unit by simply screwing the extractor bolt in until the unit is released from its taper in the cam-shaft spindle.

To reset the contact breaker cam, position the piston as previously described, insert the auto-advance unit loosely in the camshaft then replace the contact breaker plate midway in the slots with the points at approximately 3 o'clock. Now turn the cam to right or left until the points are about to open and secure the cam with the centre bolt. Obtain the final setting in the fully advanced position as described for the older models except that in this case the final adjustment is made by turning the contact breaker plate whilst holding the cam in the advanced position.

Models C15T and C15S

The C15T and C15S are timed by a different method due to their being equipped with the "energy transfer" ignition system. This system is very sensitive in operation and the following instructions should be strictly followed if the best results are to be obtained.

Set the contact breaker gap to .015 in. before commencing to time the engine.

Now bring the piston to top of the bore on the compression stroke as described previously, then rotate the engine backwards so that the piston descends about $\frac{1}{2}$ in., before bringing the rotor into the position shown in Fig. C32A. The rotating of the engine backwards first, ensures that the backlash is taken up in the gears. It therefore follows that while bringing the rotor into the position illustrated, the engine should be in a state of constant forward revolution.

Now with the rotor in this position the contact breaker points should be just about to open. This can be checked and if necessary corrected as with the standard models.

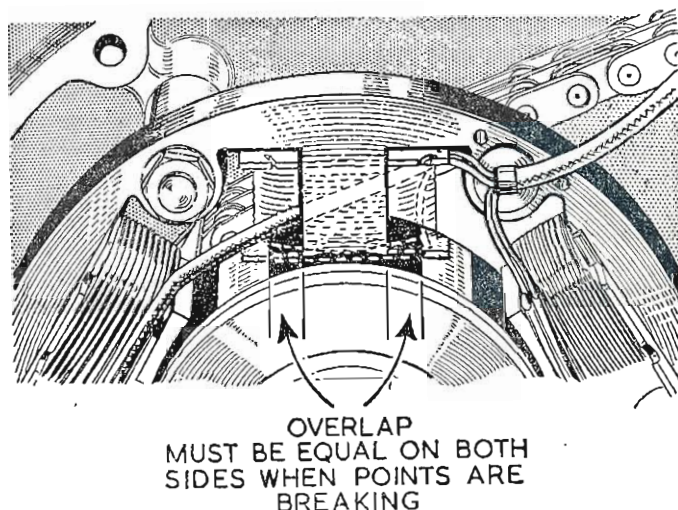


FIG. C32A.

Sparkling Plug

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

The sparking plug should be removed periodically for examination. If the carburation is correct and the engine is in good condition the plug 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. C33A). 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 .020-.025 in. by bending the side wire.

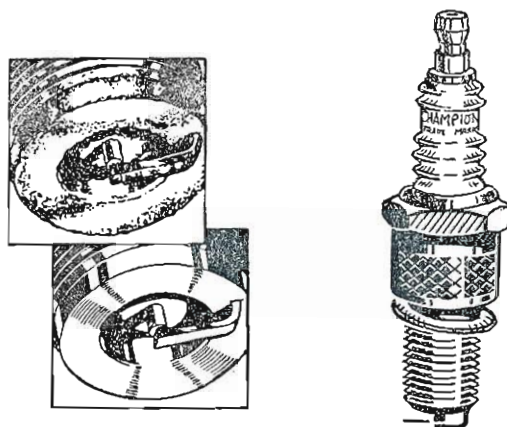


FIG. C33A. *The sparking plug.*

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.

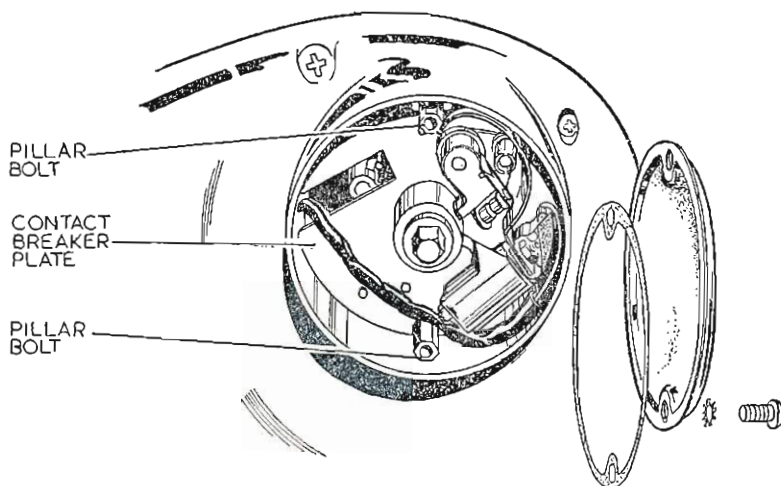


FIG. C30B. *Contact Breaker and Auto Advance (Current Type)*

BSA SERVICE SHEET No. 428

USEFUL DATA

	C15	C15T	C15S	C15 Sport Star B40	
ENGINE NUMBER ...	...	(on left side of crankcase below the cylinder)			
FRAME NUMBER ...	...	(at the top of the steering head tube)			
ENGINE:					
Capacity (c.c.) ...	249	249	249	249	343
Cylinder bore (mm.) ...	67	67	67	67	79
Stroke (mm.) ...	70	70	70	70	70
Compression ratio ...	8 : 1	8 : 1	10 : 1	8.75 : 1	7 : 1
		*prior to eng. C15T-1251.	*prior to eng. C15S-2112.		
Inlet opens B.T.D.C. ...	26°	41½°	41½°	51°	26°
Inlet closes A.B.D.C. ...	70°	62½°	62½°	68°	70°
Exhaust opens B.B.D.C. ...	61½°	62½°	62½°	78°	61½°
Exhaust closes A.T.D.C. ...	34½°	41½°	41½°	37°	34½°
Piston rings—compression, (in.)	.0625 wide	.0625 wide	.0625 wide	.0625 wide	.0625 wide
Piston rings—scraper, (in.) ...	.125 wide	.125 wide	.125 wide	.125 wide	.125 wide
Piston rings gaps—minimum (in.)	.009	.009	.009	.009	.009
maximum (in.)	.013	.013	.013	.013	.014
Spark plug ...	Champion N5	Champion N5	Champion N3	Champion N4	Champion N5
Plug points gap—minimum (in.)	.020	.020	.020	.020	.020
maximum (in.)	.025	.025	.025	.025	.025
TRANSMISSION:					
Gear ratios—top ...	5.98	9.0	9.0	6.36	5.48
third ...	7.65	14.67	10.8	7.64	7.0
second ...	10.54	22.0	14.94	10.54	9.63
first ...	15.96	28.53	19.0	13.44	14.6
Clutch friction plates ...	4	4	4	4	4
Chain sizes—front (in.) ...	⅜ Duplex (70 pitches)	⅜ Duplex (70 pitches)	⅜ Duplex (70 pitches)	⅜ Duplex (70 pitches)	⅜ Duplex (70 pitches)
rear (in.) ...	½ × .335 (112 pitches)	½ × .335 (122 pitches)	½ × .335 (122 pitches)	½ × .335 (112 pitches)	½ × .335 (116 pitches)
Teeth on—engine sprocket ...	23T	23T	23T	23T	23T
gearbox sprocket ...	17T	**15T	*15T	16T	19T
clutch sprocket ...	52T	52T	52T	52T	52T
rear chainwheel ...	45T	††60T	†60T	45T	46T
CAPACITIES:					
Fuel tank (galls.) ...	3 (13.6 litres)	2 (9 litres)	2 (9 litres)	3 (13.6 litres)	3 (13.6 litres)
Oil tank (pints) ...	4 (2¼ litres)	5 (2.8 litres)	5 (2.8 litres)	4 (2¼ litres)	4 (2¼ litres)
Gearbox (pints) ...	†1/5 (220 c.c.)	1/5 (220 c.c.)	1/5 (220 c.c.)	7/16 (250 c.c.)	1/5 (220 c.c.)
Front forks (pints) ...	1/6 (100 c.c.)	1/3 (190 c.c.)	1/3 (190 c.c.)	1/6 (100 c.c.)	1/3 (190 c.c.)
Primary chaincase (pints) ...	¼ (140 c.c.)	¼ (140 c.c.)	¼ (140 c.c.)	¼ (140 c.c.)	¼ (140 c.c.)

*After engine C15T-1251 and C15S-2112 valve timing is:—

Inlet opens B.T.D.C. ...	51°
Inlet closes A.B.D.C. ...	68°
Exhaust opens B.B.D.C. ...	78°
Exhaust closes A.T.D.C. ...	37°

†After engine C15-26792 and B40-2402 the gearbox capacity is increased to ½ pint (285 c.c.).

USEFUL DATA—continued

	C15	C15T	C15S	C15 Sport Star	B40
WHEELS:					
Rim size—front	WM2-17	WM1-20	WM1-20	WM2-17	WM2-18
rear	WM2-17	WM3-18	WM3-18	WM2-17	WM2-18
Tyre size—front	3.25-17	3.00-20	3.00-20	3.25-17	3.25-18
rear	3.25-17	4.00-18	4.00-18	3.25-17	3.50-18
Brakes, dia. × width—front (in.)	6 × 7/8	7 × 1 1/8	7 × 1 1/8	6 × 7/8	7 × 1 1/8
rear (in.)	6 × 7/8	6 × 7/8	6 × 7/8	6 × 7/8	6 × 7/8
CARBURATION (AMAL):					
Bore (in.)	7/8	7/8	1 1/8	1	1 1/8
Main jet	140	140	190	200	190
Pilot jet	25	25	25	25	20
Throttle valve	375/4	375/4	376/3 1/2	376/4	376/3
Needle position	3	3	2	2	3
Needle jet	.1055	.1055	.106	.106	.105
GENERAL DETAILS:					
Front suspension movement (in.)	5	5	5	5	5
Rear suspension movement (in.)	2 3/8	2 3/8	2 3/8	2 3/8	2 3/8
Generator output	60 watts	60 watts	60 watts	60 watts	60 watts
Contact breaker gap (in.) ...	.015	.015	.015	.015	.015
Battery capacity	13 amp/hr. at 20 hour rate.	—	—	13 amp/hr. at 20 hour rate.	13 amp/hr. at 20 hour rate.
Overall length	78	81	81 1/2	78	80
Wheelbase (in.)	51 1/4	51 3/4	51 3/4	51 1/4	52
Ground clearance (in.)	5	7 1/4	7	5	7
Saddle height (in.)	30	33	32	30	32
Overall height (in.)	37	42	41 1/2	36	39 1/2
Handlebar width (in.)	26	31 1/8	31 1/8	27	26
Steering head angle	65°	63°	63°	65°	65°
Steering lock angle	50°	60°	60°	50°	40°
Weight (lbs.)	275	265	265	275	295
Tyre pressures—front (lbs.) ...	16	19	19	17	17
rear (lbs.)	22	16	16	21	21

**Alternatives 17T, 18T, 19T and 20T.

††Alternatives 52T, 56T and 60T.

The recommended inflation pressures are based on a rider's weight of 140 lbs. If the rider's weight exceeds 140 lbs. increase the tyre pressures as follows:—

FRONT TYRE: Add one lb. per square inch for every 28 lb. above 140 lb.

REAR TYRE: Add one lb. per square inch for every 14 lb. increase above 140 lb.

If a pillion passenger or luggage is carried, the actual load bearing upon each tyre should be determined and the pressures increased in accordance with the Dunlop Load and Pressure Schedule.

BSA SERVICE SHEET No. 603

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

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.

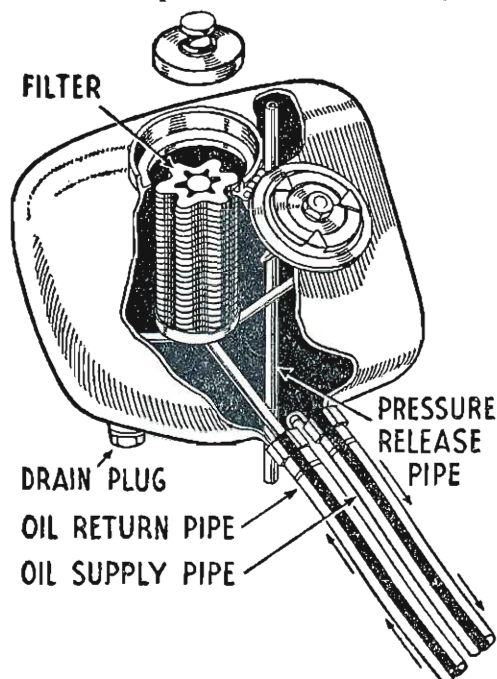
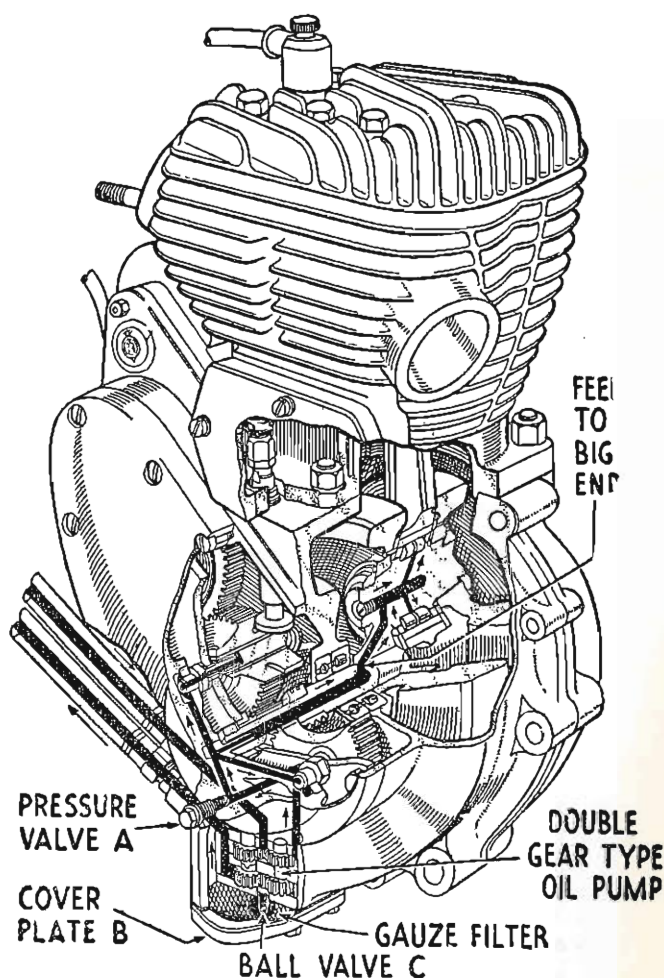
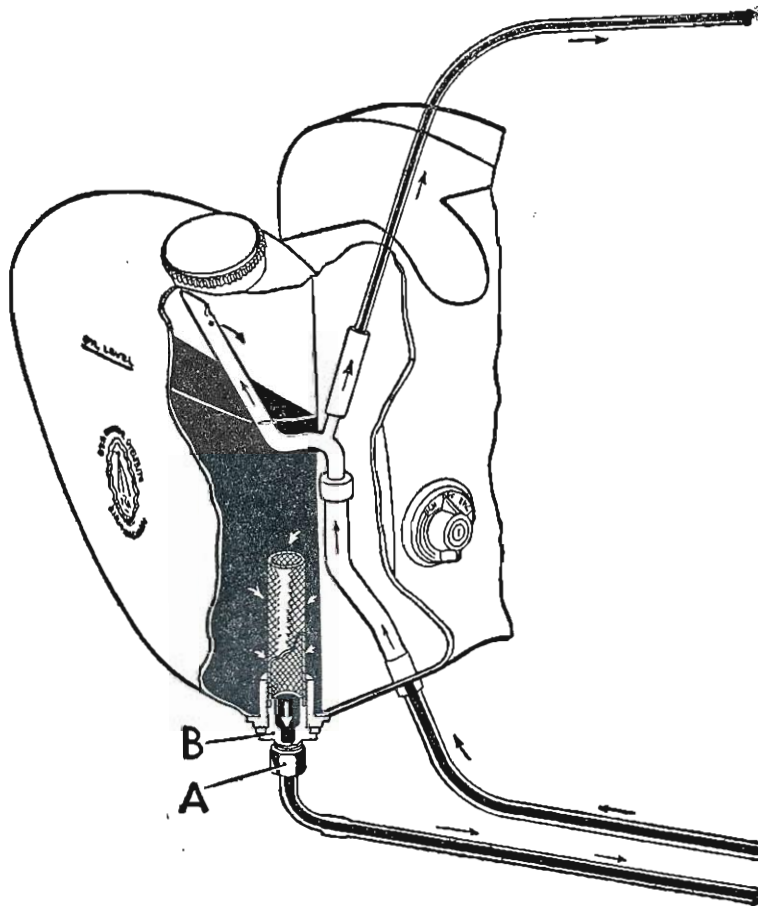


Fig. M3. *The Lubrication System (models M20 and M21)*

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.



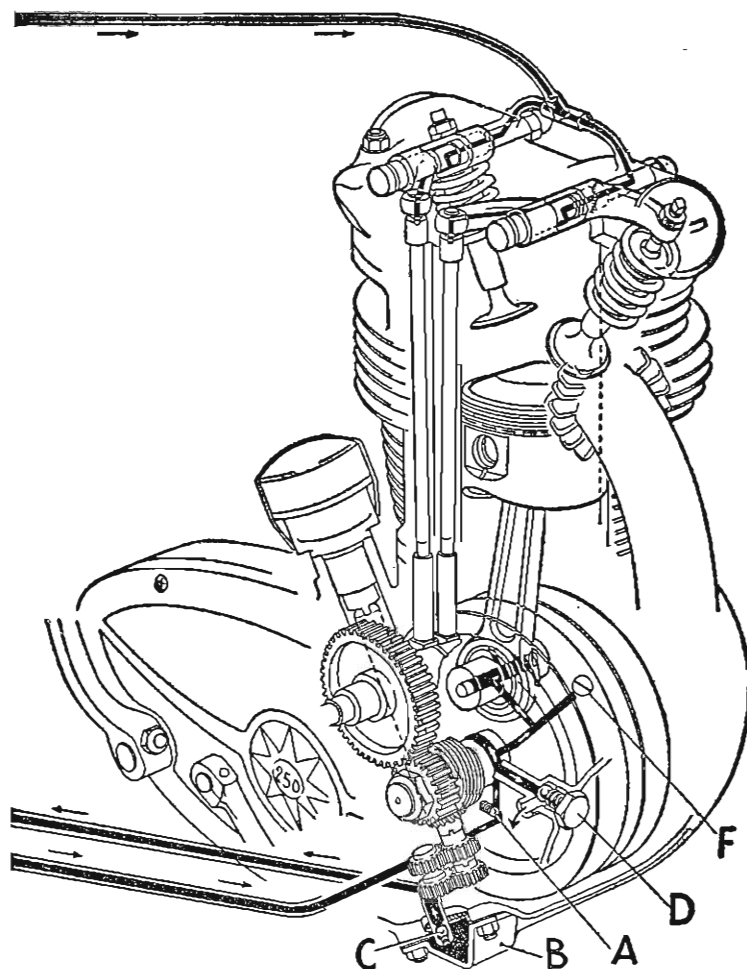


The Oil Tank C15.

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.

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.

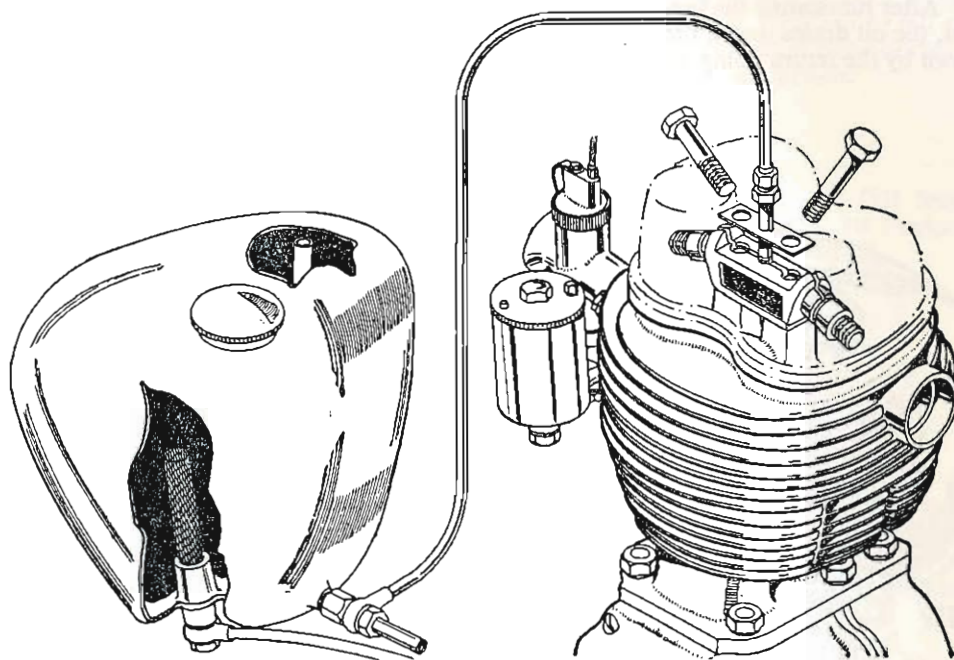
Before replacing the breather valve on "C" Group models the movement of the disc valve should be checked to ensure that it does not exceed .010 in. If excessive clearance is found and the disc valve is undamaged the face of the retaining collar should be ground so as to reduce the depth of the recess 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 immaterial which of the six spline-grooves locates the internal peg of the sleeve.

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



Rocker Gear Lubrication C12 (1956).

Parts required for conversion of C11 and C11G engines:—

<i>Part No.</i>	<i>Description</i>
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.

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.

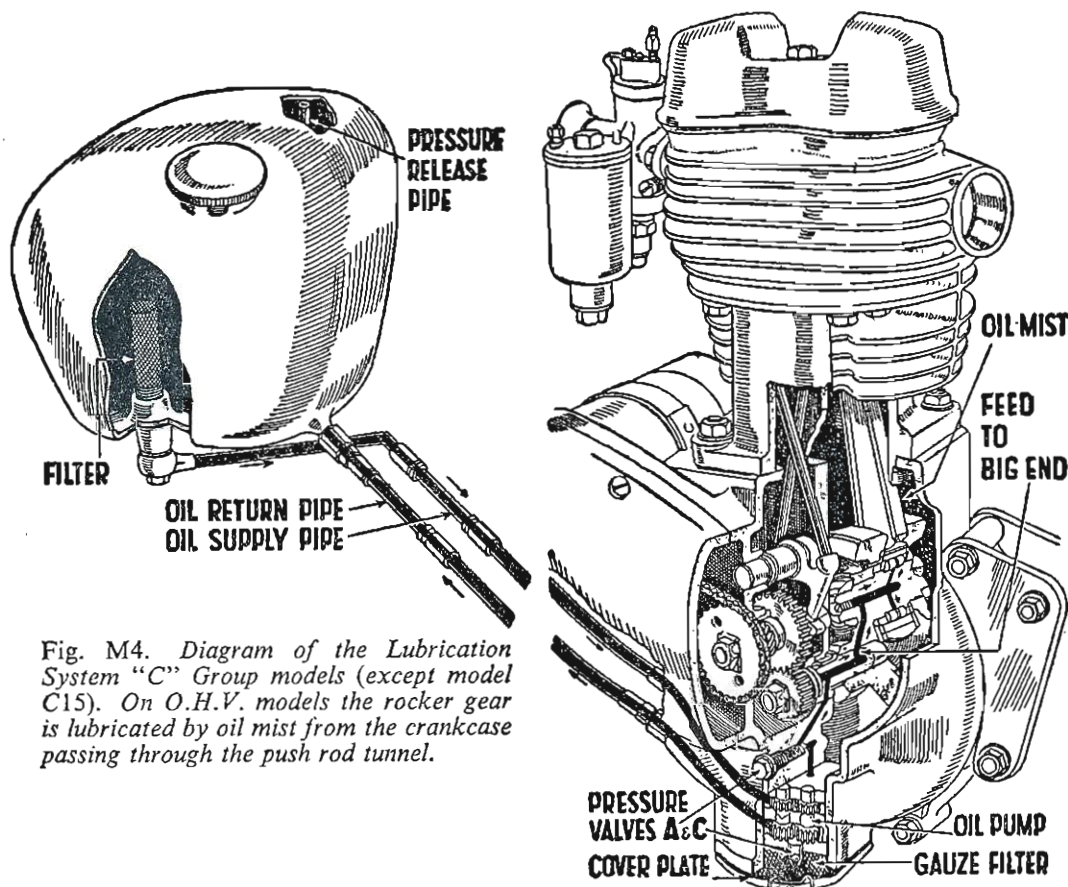


Fig. M4. Diagram of the Lubrication System "C" Group models (except model C15). On O.H.V. models the rocker gear is lubricated by oil mist from the crankcase passing through the push rod tunnel.

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.

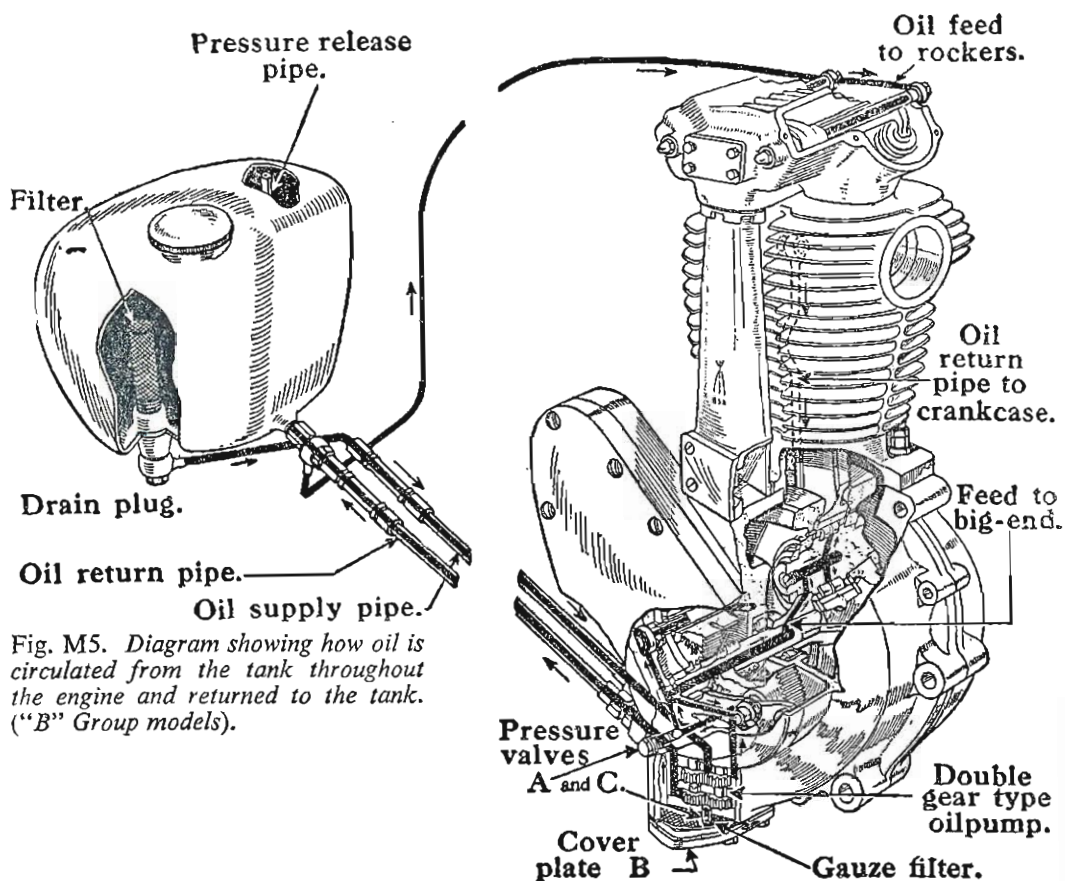


Fig. M5. Diagram showing how oil is circulated from the tank throughout the engine and returned to the tank. ("B" Group models).

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").

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.

Engine bo
Engine st
Engine ca
Petrol tan
Oil tank c
Gearbox
Tappet cl
inlet (in
exhaust
Tyres—fr
Tyres—re
Piston rin
plain (ir
oil cont
Piston rin
Piston clea
bottom

Gear ratios
Top ...
third
second
first ...
Ignition set
T.D.C.):
fully adv
fully ret

Carburetter
jet ...
with air

Spark plug
C.I. cylin
Al. alloy

Compressio

Valve timin
opens be
closes af

Valve timin
opens be
closes af

Distributor
Magneto p
Plug points

Tyre press
front (lb
rear (lb.

BSA SERVICE SHEET No. 701

ALL MODELS—USEFUL DATA

MODEL	C10	C11	C12	C15 Std.	B31	B32	B33	B34	M20
Engine bore (mm.) ...	63	63	63	67	71	71	85	85	82
Engine stroke (mm.) ...	80	80	80	70	88	88	88	88	94
Engine capacity (c.c.) ...	249	249	249	249	348	348	499	499	496
Petrol tank capacity (galls.)	2½	2½	2¾	2½	3	3	3	3	3
Oil tank capacity (pints) ...	4	4	4	4	4	4	4	4	5
Gearbox capacity (pint) ...	*½	*½	½	½	1	1	1	1	1
Tapet clearance cold:									
inlet (in.) ...	.004	.003	.010	.008	.003	.003	.003	.003	.010
exhaust (in.) ...	.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 (in.) ...	.010	.010	.010	.010	.010	.010	.010	.010	.010
oil control (in.) ...	.010	.010	.010	.010	.010	.010	.010	.010	.010
Piston ring side clearance (in.)	.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
third ...	—	—	7.64	7.65	7.3	9.2	6.5	7.4	7.0
second ...	9.8	9.8	11.1	10.54	11.1	14.2	10.0	11.5	10.9
first ...	14.5	14.5	16.15	15.96	15.9	20.2	14.2	16.8	15.8
Ignition setting (in. 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.	—	—	—	—	—	—
Carburettor:									
jet ...	90	80	140	—	150	150	200	200	170
with air cleaner ...	90	80	100	140	150	150	170	170	—
Spark plug:									
C.I. cylinder head ...	L.10	L.10S	L.10S	—	L.10S	L.10S	L.10S	L.10S	—
Al. alloy cylinder head ...	N.8	—	—	N.5	—	NA.8	—	NA.8	N.8
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 (deg.):									
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 (deg.):									
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 (in.) ...	.012	.012	.015	.012	—	—	—	—	—
Magneto points gap (in.) ...	—	—	—	—	.012	.012	.012	.012	.012
Plug points gap (in.) ...	.015-.018	.015-.018	.018-.020	.020-.025	.015-.018	.015-.018	.015-.018	.015-.018	.015-.018
Tyre pressures:									
front (lb. per sq. in.) ...	20	20	18	16	16	—	16	—	17
rear (lb. per sq. in.) ...	28	28	26	22	20	—	17	—	22

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

*Four-speed gearbox, 1 pint.

†3.00 × 19 on later models.

MODEL	M21	M33	A7 (up to Eng. No. ZA7-11192)	A7 ST 2 carbu- retters)	A7 (on (and after Eng. No. AA7-101)	A7 S/T & S/S (on & Eng. No. AA7S-101)	A10	R/R & S/R
Engine bore (mm.) ...	82	85	62	62	66	66	70	70
Engine stroke (mm.) ...	112	88	82	82	72.6	72.6	84	84
Engine capacity (c.c.) ...	591	499	495	495	497	497	646	646
Petrol tank capacity (galls.) ...	3	3	3	3½	3½	3½	4¼	2 or 4
Oil tank capacity (pints) ...	5	5	4	4	4	4	4	5½
Gearbox capacity (pint) ...	1	1	1	1	1	1	1	14 fl. oz.
Tapet clearance—cold:								
inlet (in.) ...	.010	.003	.015	.015	.010	.008	.010	.008
exhaust (in.) ...	.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 (in.) ...	.010	.010	.013	.013	.013	.013	.013	—
oil control (in.) ...	.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 (in.) ...	.0040— .0060	.0045— .0065	.0030— .0050	.0030— .0050	.0030— .0050	.0030— .0050	.0030— .0050	.0030— .0050
Gear ratios:						s/r s/s		
Top ...	5.9	4.8	5.1	5.1	5.1	5.0 5.28	4.42	4.53
third ...	7.8	6.3	6.2	6.2	6.2	6.05 6.38	5.36	5.48
second ...	12.2	9.9	9.0	9.0	9.0	8.8 9.28	7.77	7.96
first ...	17.8	14.3	13.2	13.2	13.2	12.9 13.62	11.41	11.68
Ignition setting (in. before T.D.C. fully advanced) ...	7/16	7/16	3/8	3/8	5/16	3/8	11/32	3/8
Carburettor:								
jet ...	170	200	—	110	—	—	—	250
with air cleaner ...	—	170	140	—	140	160	170	240
Spark plug:								
C.I. cylinder head ...	L.10	L.10S	L.10S	L.10S	L.10S	L.10S	L.10S	NA.10
Al. alloy cylinder head ...	N.8	—	—	—	—	—	—	—
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 (deg.):								
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 (deg.):								
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 (in.) ...	.012	.012	.012	.012	.012	.012	.012	.012
Plug points gap (in.) ...	.015-.018	.015-.018	.015-.018	.015-.018	.015-.018	.015-.018	.015-.018	.018-.020
Tyre pressures:								
front (lb. per square inch) ...	16	17	17	17	17	17	17	17
rear (lb. per square inch) ...	18	18	18	18	18	18	18	19

*NOTE.—Standard A7's after engine number CA7-5232 and Standard A10's after engine number DA10-1647 have the same camshaft as the S/S and R/R machines and valve timing is therefore the same.

BSA SERVICE SHEET No. 704

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	Standard	...	...	...	...	.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 (contd.)

MODEL										Tolerances
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)	...	...	...	...	...	...	...	...	.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. CA7SS-4501)	...	...	...	...	...	.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. CA10R-6001)	...	...	...	...	...	.004—.0055"
A10	(Rocket Gold Star)	...	...	8.75 : 1	...	...	...	...	...	.001—.0025"
A65	(Star Twin)	...	...	7.5 : 1 to 9.0 : 1	...	...	...	...	...	.0012—.0027"

BSA SERVICE SHEET No. 708

ALL MODELS

CARBURATION. Monobloc and Seperate Float Chamber Type

How the Carburettor Works

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

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

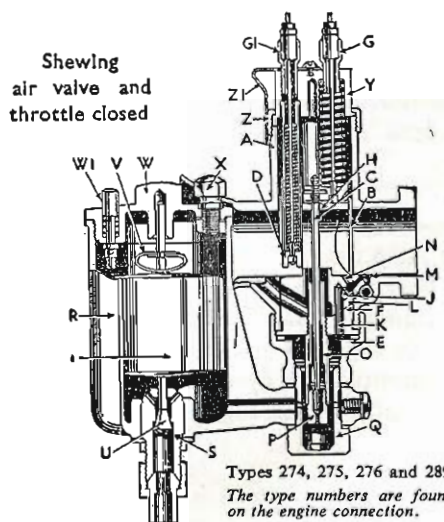
The mixture is correct at all throttle openings, if the carburettor is correctly tuned.

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

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

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

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



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

Fig. X4. A sectioned illustration of Needle Jet Carburettor.

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 $\frac{1}{8}$ 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 $\frac{1}{8}$ 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 $\frac{1}{8}$ in. open, and air valve wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

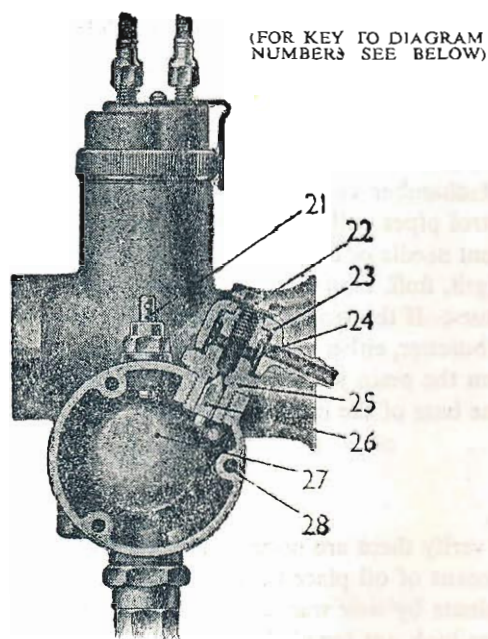
Starting—General

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 CARBURETTORS. Types 375, 376 and 389



(MONOBLOC)

Fig. X6. Section through Float Chamber.

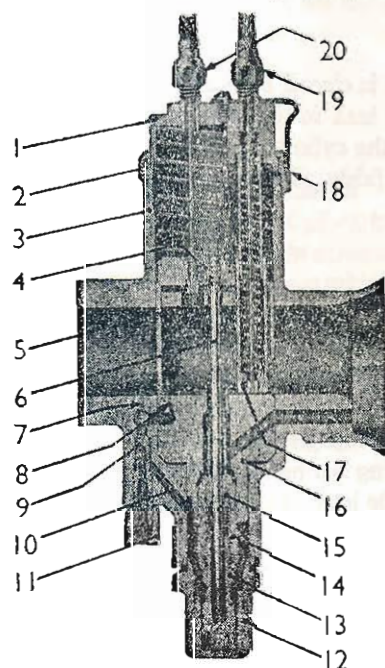
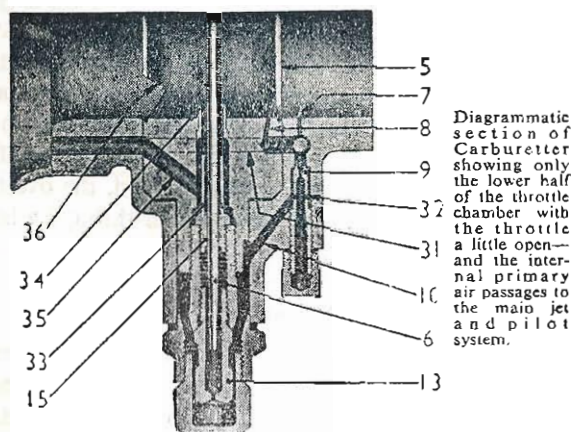
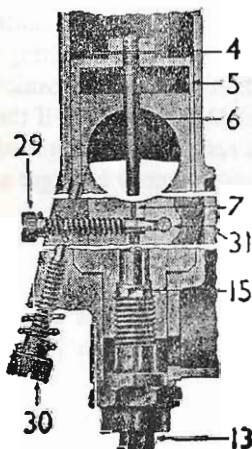


Fig. 7. Section through Mixing Chamber, showing Air Valve and Throttle closed.



FOR KEY TO DIAGRAM NUMBERS SEE BELOW
Fig. X5.

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



29. PILOT AIR ADJUSTING SCREW

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

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. <i>Testing with the air control</i> to see if by richening the mixture the results are better or worse. | | |

Indications of

Richness:

- Black smoke in exhaust.
- Petrol spraying out of carburetter.
- Four strokes, eight-stroking
- Two strokes, four-stroking.
- Heavy, lumpy running.
- Heavy petrol consumption.
- ? If the jet block (F) is not tightened up by washer and nut (E) richness will be caused through leakage of petrol.
- ? Air cleaner choked up.
- ? Needle jet worn large.
- Sparkling plug sooty.

Weakness:

- Spitting in carburetter.
- Erratic slow running.
- Overheating.
- Acceleration poor.
- Engine goes better if:—
- Throttle not wide open, or air control is partially closed.
- ? Has air cleaner been removed.
- ? Jets partially choked up.
- Removing the silencer or running with a racing silencer requires a richer setting and large main jet.

Note

Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing. *Decide by test whether richness or weakness is the trouble and at what throttle position.* See throttle opening diagrams, Fig. X6.

Procedure

If at a particular throttle opening you partially close the air control, and the engine goes better, weakness is indicated; or on the other hand the running is worse, richness is indicated. Then you proceed to adjust the appropriate part as indicated for that position.

Fault at Throttle Positions indicated on Fig. X9

To Cure Richness:

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

To Cure Weakness:

- | | |
|-----|--------------------------------------|
| 1st | Fit larger main jet. |
| 2nd | Screw pilot air screw in. |
| 3rd | Fit a throttle with smaller cut-away |
| 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 carburettor, certainly cause weakness of mixture and possible damage from overheating.

TUNING

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

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

(b) Throttle Stop Screw

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

(c) Pilot Air Screw

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

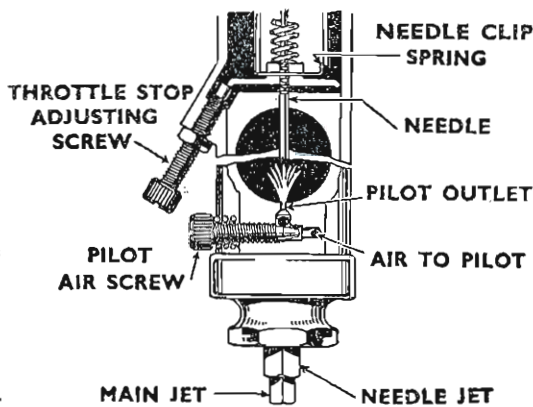


Fig. X8

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.

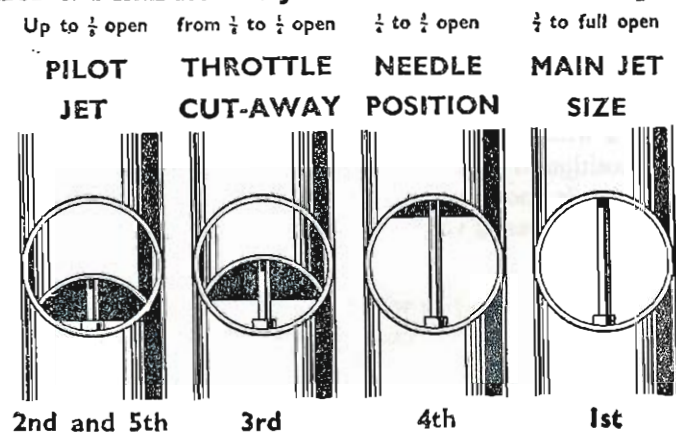
(g) Air Valve

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 needle valve is pushed off its seat and so "flooding" is achieved. Flooding temporarily enriches the mixture until the level of the petrol subsides to normal.

Phases of Amal Needle Jet Carburettor Throttle Openings



SEQUENCE OF TUNING

Fig. X9

Sequence of Tuning

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

NOTE.—The 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 pilot air screw to get best slow running; if this second adjustment makes engine run too fast, go over the job again a third time. Finally, lock up tight the throttle stop screw nut without disturbing the screw's position.

3rd Throttle Cut-away with Throttle in position

If, as you take off from the idling position, there is objectionable spitting from the 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.

BSA SERVICE SHEET No. 709

October, 1948

Reprinted September, 1965

ALL MODELS 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.
- Oil sparking plug, or stuck-up valve or valve stem sticky.
- Weak valve spring, or valve not seating properly.
- Throttle opening too large, or pilot jet choked.
- Contact points dirty, or gap incorrect.
- Flat battery, if coil ignition, or faulty electrical connections in ignition circuit.

Loss of Power:

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

Engine Overheats:

- Lack of proper lubrication.
- Weak valve springs, or pitted valve seats.
- Worn piston rings, or late ignition setting.
- Carburettor 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 high-tension cable.
- Loose sparking plug terminal.
- Carburettor 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.

SERVICE SHEET No. 709

October, 1948

Reprinted September, 1965

ALL MODELS 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.
- Oil sparking plug, or stuck-up valve or valve stem sticky.
- Weak valve spring, or valve not seating properly.
- Throttle opening too large, or pilot jet choked.
- Contact points dirty, or gap incorrect.
- Flat battery, if coil ignition, or faulty electrical connections in ignition circuit.

Loss of Power:

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

Engine Overheats:

- Lack of proper lubrication.
- Weak valve springs, or pitted valve seats.
- Worn piston rings, or late ignition setting.
- Carburettor 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 high-tension cable.
- Loose sparking plug terminal.
- Carburettor 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.

BSA SERVICE SHEET No. 710

October 1948

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.

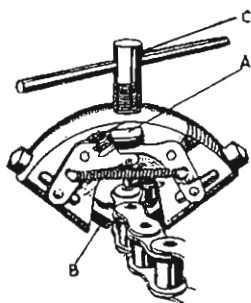


Fig. X7.

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

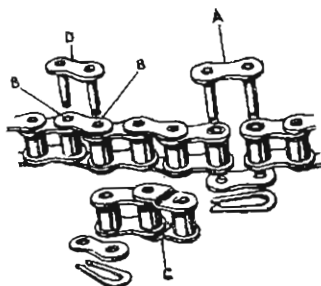


Fig. X8.

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.

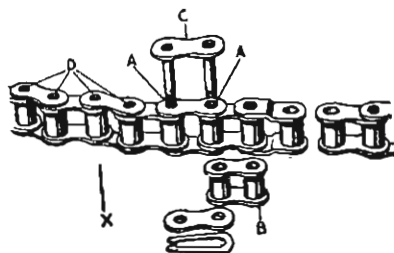


Fig. X9.

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

Fitting Rear Chain

To fit a new rear chain, turn wheel until the spring link of the old chain is located on rear sprocket. Disconnect, and allow the lower run to drop down. Join the top run of the old chain to the new chain by means of the connecting link, and then by pulling on the bottom run of the old chain the new one will be carried round 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 rear top chainguard on to the gearbox sprocket. A long bladed screwdriver or a piece of stiff wire may assist this operation. When the chain has located on the sprocket teeth, engage a gear and gently turn gearbox over with the 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.

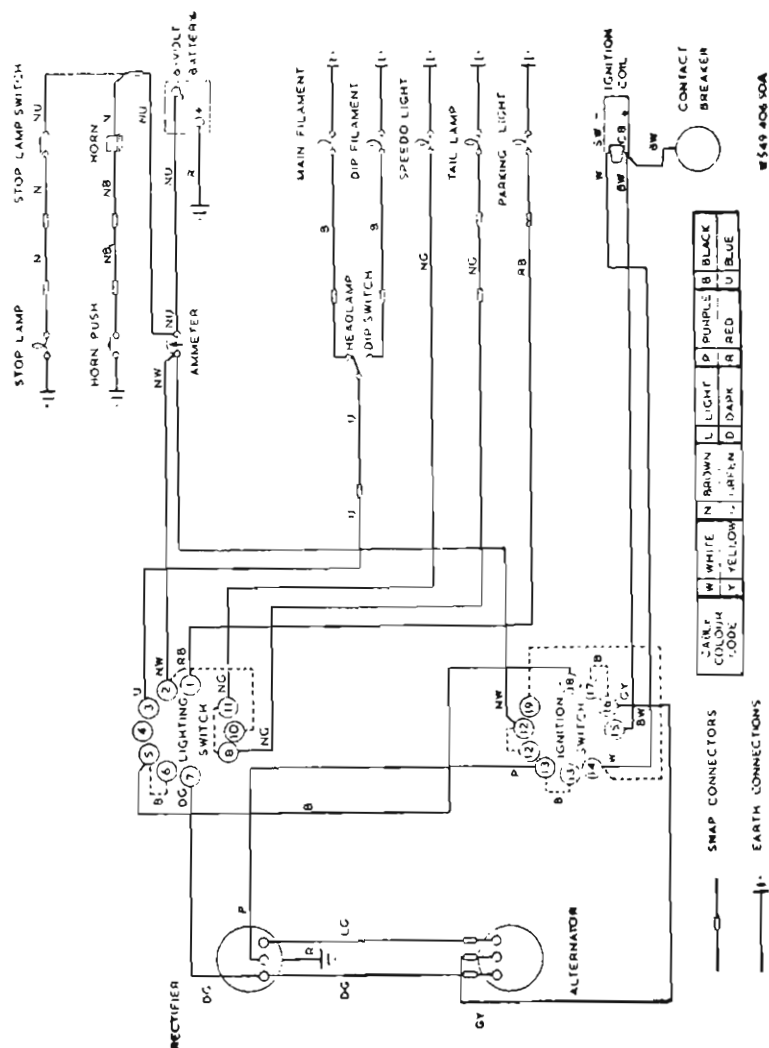
BSA SERVICE SHEET No. 808J

Revised April 1961.

Reprinted December 1962.

Models C15 and B40

WIRING DIAGRAM. (Positive Earth System)



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

SERVICE SHEET No. 813B

C15 COMPETITION MODEL

ALTERNATOR AND "ENERGY TRANSFER" SYSTEM INTRODUCTION AND SERVICE TESTING PROCEDURE

INTRODUCTION

To cater for special machines such as the C15 Competition, which is a high-performance competition and trials machine, Lucas engineers have developed a special RM13 type alternator and "energy transfer" ignition coil. The alternator windings comprise of two sets of series connected coils, one set for direct lighting when this is required, the other set of coils being connected purely for ignition purposes. The alternator and ignition coil are similar in operation to a magneto whilst retaining the physical characteristics of the conventional coil ignition system namely, separate ignition coil and contact breaker, and are designed for continuous use without a battery in circuit; this is particularly advantageous in competition work.

"ENERGY TRANSFER" IGNITION

Working Principles.—The main feature of an "energy transfer" ignition system is that the ignition coil primary is connected *in parallel* with the contact breaker points, whereas in the conventional coil ignition circuit the primary winding and contact breaker are connected in series. In practice this means that the current generated in the alternator ignition coils can flow direct to earth through the contact points, when these are closed, but when they are open its alternative path to earth is *via* the ignition coil primary. The sequence of events which, of course, takes place at high speeds, due to the action of the contact breaker, is as follows.

With the contact breaker points closed, the ignition generating coils of the alternator, one end of which is permanently connected to the frame of the machine, are in effect short-circuited causing heavy currents to circulate in them. When the contact breaker points open the short-circuit effect is removed and the built-up energy circulated in the generating coils is rapidly transferred to the primary of the ignition coil. The effect of this "high energy" pulse in the ignition primary is to induce a high voltage in the secondary winding which, in turn, is transmitted through the high-tension cable to the sparking plug. The contact breaker is arranged to open only at peak instants in the A.C. generating cycle, to ensure that maximum energy is available for ignition purposes.

Another feature worth noting is that the "energy transfer" system operates on a rising current in the ignition coil primary, and not as in the conventional coil ignition system, on a falling current in the primary winding.

GENERAL DESCRIPTION

Stator.—Wound with four coils only. Two series connected coils are used for ignition purposes being permanently connected across an "energy transfer" coil model 2E.T. Diametrically opposite are two coils, similarly connected, of a slightly heavier gauge wire, for use when direct lighting is required; these will supply sufficient current for a 6-volt 24/24 watt headlamp bulb together with a 6-volt 3 watt or 6-volt 6 watt tail lamp bulb, i.e. 27/30 watt.

As with previous models of the RM13, three wires are brought out from the stator for connecting to the external circuit. One end of the LIGHT GREEN or RED lead is earthed to the frame of the

B.S.A. Service Sheet No. 813B (contd.)

machine, the other end is connected to both the lighting and ignition coils. The DARK GREEN or BROWN/BLUE lead is connected to the lighting switch, when lighting is used, and the GREEN/YELLOW or BLACK/WHITE lead is connected to the contact breaker and primary of the "energy transfer" coil.

Rotor.—The rotor is a standard RM13 unit, but when keyed on to the model C15 Competition crankshaft the magneto timing differs from that of the standard C15.

Contact Breaker Cam.—A special short open-period (30°) cam has been designed for use with this alternator to ensure that the maximum of efficiency is obtained from the 2E.T. "energy transfer" ignition coil to give the high performance characteristic required with this type of competition machine.

2E.T. "Energy Transfer" Ignition Coil.—The 2E.T. has been specially designed for use in "energy transfer" ignition systems. It employs a closed iron circuit and a primary winding whose impedance is closely matched with that of the alternator ignition generating coils, resulting in a high performance characteristic, particularly for starting.

SERVICE NOTES

Converting from Standard to Competition Engine.—The model C15 Competition machine has several engine features which differ from those of the standard machine. A special cylinder head and camshaft, etc., are incorporated in the design. Merely fitting a competition alternator and "energy transfer" ignition coil to a standard machine, and advancing the ignition timing will not bring it up to the competition specification. To achieve this the necessary engine parts will also have to be replaced. Also, advancing the ignition in trying to reach competition performance may seriously damage a standard engine.

If a conversion is contemplated a B.S.A. Agent should be approached for the relevant engine conversion details.

Timing.—It is very important that care is taken when timing, for ignition purposes, a machine fitted with this special RM13 and "energy transfer" ignition system. The C15 Competition has been designed as a high performance machine, for use in competition and trials work and therefore the ignition timing, on which the high performance is very dependant, must be accurately set. Remember, it is not only the piston/spark timing relationship which is involved but also the "magneto" performance (spark energy) of the alternator. This will be appreciated more fully when it is remembered that, as the rotor of the alternator is keyed to the engine crankshaft, which in turn is coupled through the connecting rod to the piston, any movement of the piston during the timing procedure will affect the position of the crankshaft and hence the magnetic timing position of the rotor.

In other words the maximum alternator "magneto" performance can only be obtained when the piston is accurately set to the timing position recommended by the manufacturer (12° B.T.D.C.), engine fully retarded.

SYSTEMATIC FAULT LOCATION

The following notes recommend the procedure to be adopted in the event of trouble developing with the equipment.

1. Engine Fails to Start

1. Remove the high-tension lead connected to the sparking plug and hold it approximately $\frac{1}{8}$ in. from the engine cylinder block. The gap should spark at normal "kick-start" speed. If it does check that plug gap is correct to manufacturers recommendation, if plug electrodes are worn or insulation cracked, plug should be replaced. Re-connect high-tension lead to plug and again check for sparking with plug resting on cylinder head. If plug gap sparks refit and proceed to check fuel supply, carburation, etc.

NOTE:—It is essential that the correct plug gap is maintained—a wider gap will cause difficult starting or perhaps failure to start. Accurate timing is also a critical factor in starting, the correct setting is 12° B.T.D.C., engine fully retarded.

B.S.A. Service Sheet No. 813B (contd.)

If there is no spark, or if engine still cannot be started, proceed to check ignition system as follows:—

2. Check that contact breaker gap is correctly set, the gap should be maintained at .014—.016 in. Check the capacitor by substitution.
3. Place a piece of dry card between contact breaker points. Disconnect the ignition feed from the harness, and using a 2-volt cell of a 6-volt or 12-volt battery, with an ammeter in series, check the ignition coil primary for continuity. The primary winding has a resistance of approximately 0.5 ohms; the reading on the meter should not be more than 4 amp. An excessive reading indicates shorted turns whilst no reading will indicate open-circuit or earthed turns. In either event a replacement coil should be fitted.

If coil proves to be satisfactory, proceed to check the alternator ignition coils as follows:—
Remove rotor and

4. Connect the 2-volt battery and ammeter across the alternator ignition coil feed and earth (frame of machine). The resistance of the coils is approximately 4 ohms and the meter reading should be approximately 0.5 amp.

An excessive reading indicates shorted turns whilst no reading will indicate open-circuit or earthed turns. In either event a replacement coil or stator is required.

NOTE:—This test must be done as quickly as possible to avoid damage to coils through overheating and misleading readings due to increase in coil resistance with temperature rise. It will be found that two to three seconds duration gives ample time to observe the ammeter readings.

On no account should this test be made with the rotor in position, otherwise partial demagnetisation will result.

If after carrying out the above tests the engine will not start even though the stator windings, ignition coil, etc., are satisfactory, remagnetise the rotor or check by substitution as it may have become partially demagnetised, resulting in a low output performance.

2. Engine Difficult to Start or Runs Intermittently

If after checking as detailed in (1:1) and (1:2), trouble still persists, it will be necessary to proceed as laid down in (1:3) and (1:4).

3. No Lights with Lighting Switch in Head or Dip Position, and Engine Running

5. First check for burnt out filaments by substitution.
Check wiring and connections between headlamp and lighting switch, alternator and switch, rectifying as necessary.

Check continuity of lighting switch.

NOTE:—Poor earth connections can be particularly troublesome, and will cause high voltages which reduce bulb life. Burnt-out or blackened bulbs often indicate the existence of bad earths, which should be rectified before fitting new bulbs. This point about earth connections particularly concerns the competition alternator as the earthed side of both the lighting and ignition coils is brought out and connected externally to the frame of the machine. A bad connection at this earth point will, if allowed to persist, result in damage to the contact breaker points as well as to the bulbs.

If the lights will not work after carrying out the above procedure and bulbs, wiring and switch, etc., have proved satisfactory, check the alternator lighting coils as follows:—

6. With the 2-volt battery and ammeter connected across the lighting coil feed and earth (frame of machine), the meter should read approximately $6\frac{1}{2}$ amps. An excessive reading will indicate shorted turns, no reading will indicate an open-circuit or earthed turns. In either event a replacement coil or stator is required.

B.S.A. Service Sheet No. 813B (contd.)

NOTE:—This test must be done as quickly as possible to avoid damage to coils through overheating, and misleading readings due to increase in coil resistance with temperature rise. It will be found that two to three seconds duration gives ample time to observe the ammeter readings.

On no account should this test be made with the rotor in position, otherwise partial demagnetisation will result.

4. Bench Testing—Alternator and 2E.T. Ignition Coil 2E.T. Ignition Coil

The 2E.T. ignition coil should be tested similarly to the procedure detailed for the S.R. magneto coils except for the test voltage which must be 12-volts, and no ammeter is required.

A four lobe D.K. type contact breaker having closed periods of not less than 42° and having an operating range up to 750 r.p.m. is required. Also, a 12-volt battery, a three-point rotary spark gap and 1 ohm resistor approximately 15 watt.

Proceed to test as follows:—

7. Connect the 12-volt battery, contact breaker, resistor in series with the coil primary winding. Battery polarity should be such that the negative side of battery is connected to the earthed end of the primary.

Also connect with a jumper lead, the spark gap point that is farthest from the ionising electrode, to the negative side of the circuit.

Connect the high-tension cable from coil to the three-point spark gap to the electrode nearest the ionising point.

Run the contact breaker at 750 r.p.m. Regular sparking should occur at the spark gap which should be set to 8 mm. (approximately 14 Kv). This test should not be continued for more than 30 seconds because the arcing of the contacts will be fairly heavy, due to the slow running speed and low primary resistance.

Alternator—Lighting and Ignition Coils.

Lighting Coils—D.C. Output Test

The lighting coil output can be checked by feeding it through a bridge rectifier standard type—into a 6-volt battery. The battery should have a *rheostat connected across it which should be adjusted as necessary to maintain the 6-volt potential during testing.

Also in parallel with battery, connect voltmeter to measure potential.

The battery and ammeter should then be connected in series with the lighting coils and readings taken at the following alternator speeds.

<i>Alternator R.P.M.</i>	<i>Output in Amps into 6-volt battery</i>
2,000	2.8 (minimum)
5,000	5.3 (maximum)

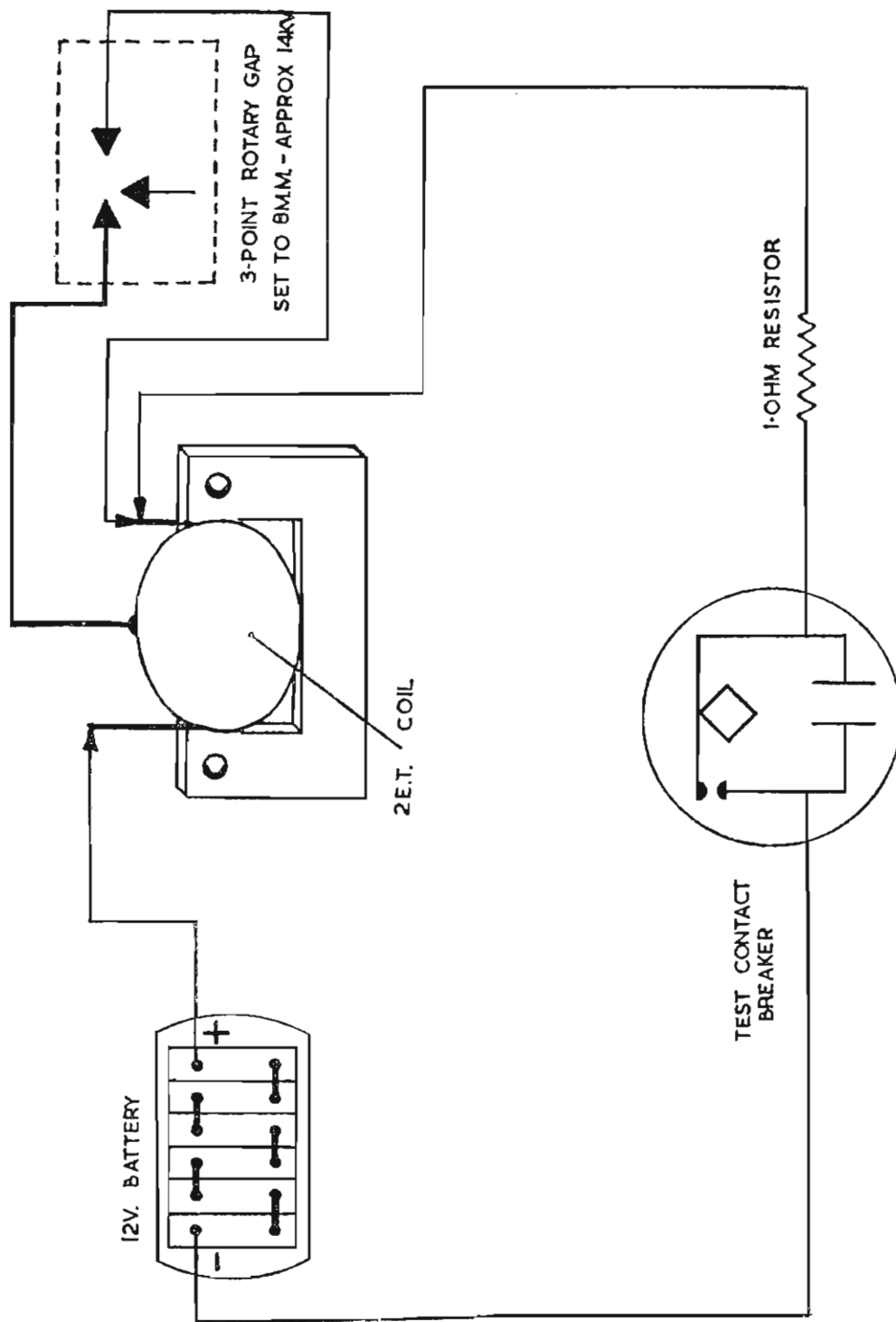
Ignition Coils—D.C. Output Test

Using the same test gear and procedure as detailed for the lighting coil tests, the ignition coil output readings are as follows:—

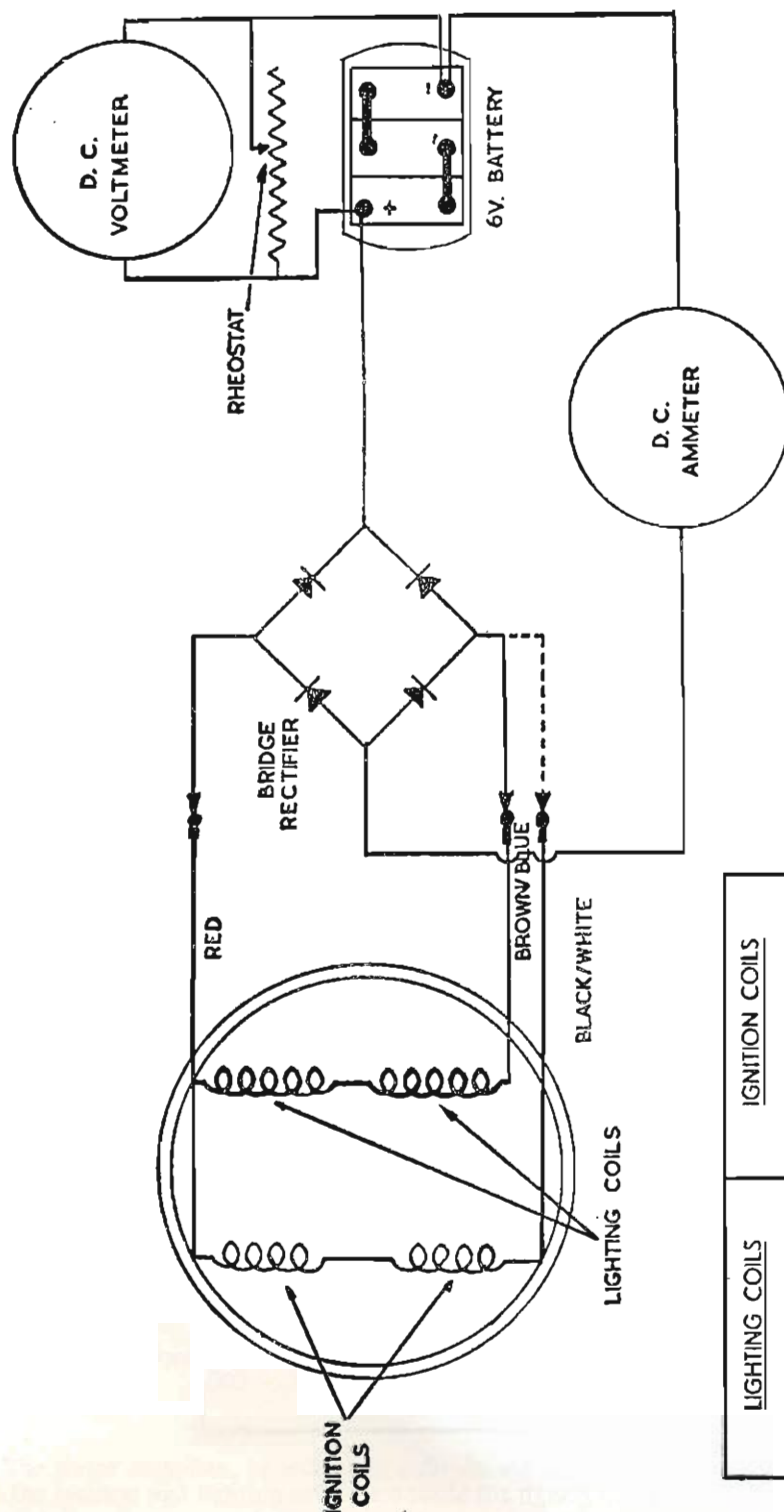
<i>Alternator R.P.M.</i>	<i>Output in Amps into 6-volt battery</i>
2,000	1.4 (minimum)
5,000	1.8 (maximum)

The stator complete, or individual coils should be replaced if the output readings for either or both the ignition and lighting coils are outside the figures quoted.

*CAPABLE OF CARRYING 10 AMPS WITHOUT OVERHEATING.



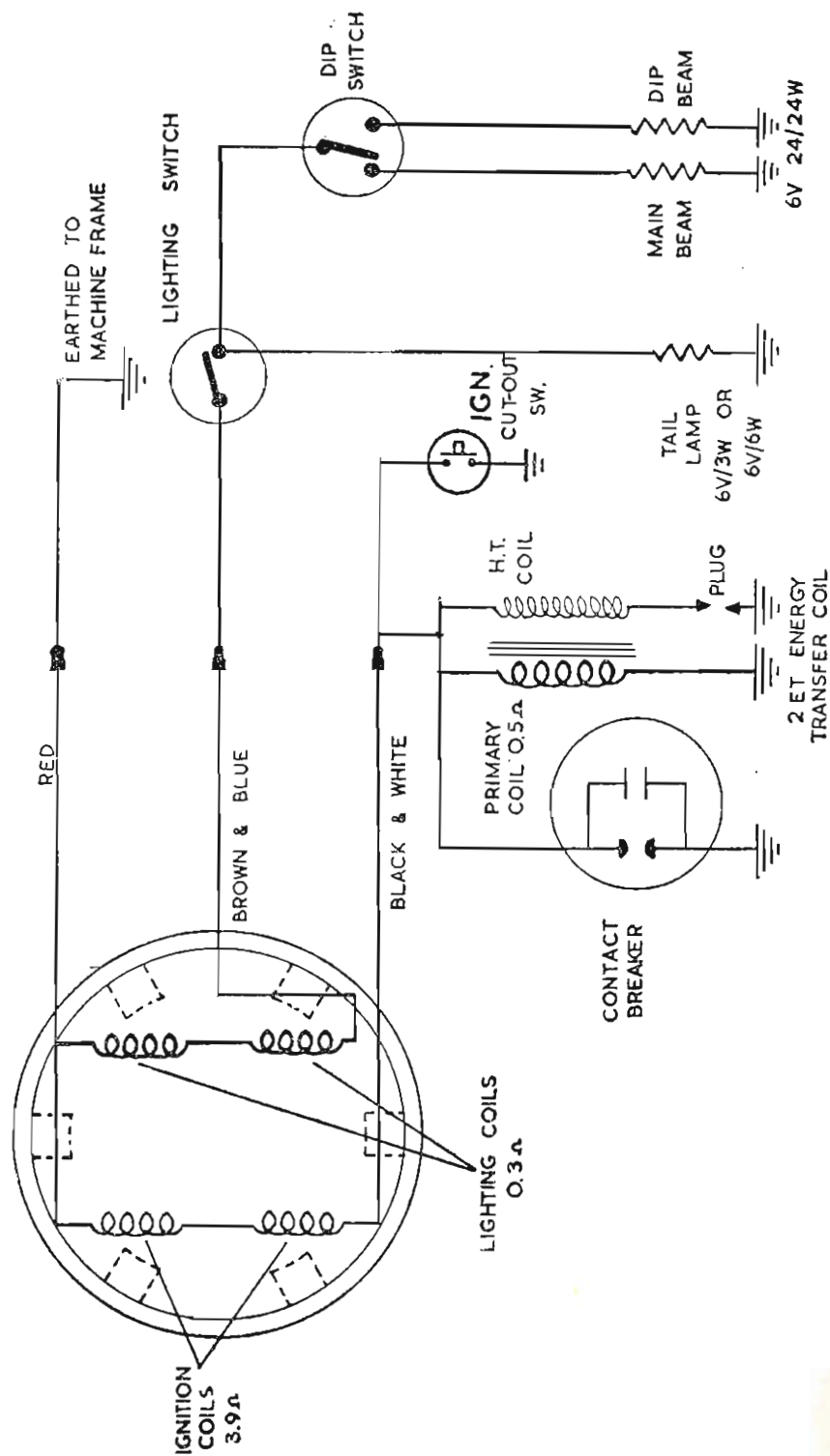
2 E.T. "ENERGY TRANSFER" IGNITION COIL
SPARK PERFORMANCE TEST CIRCUIT

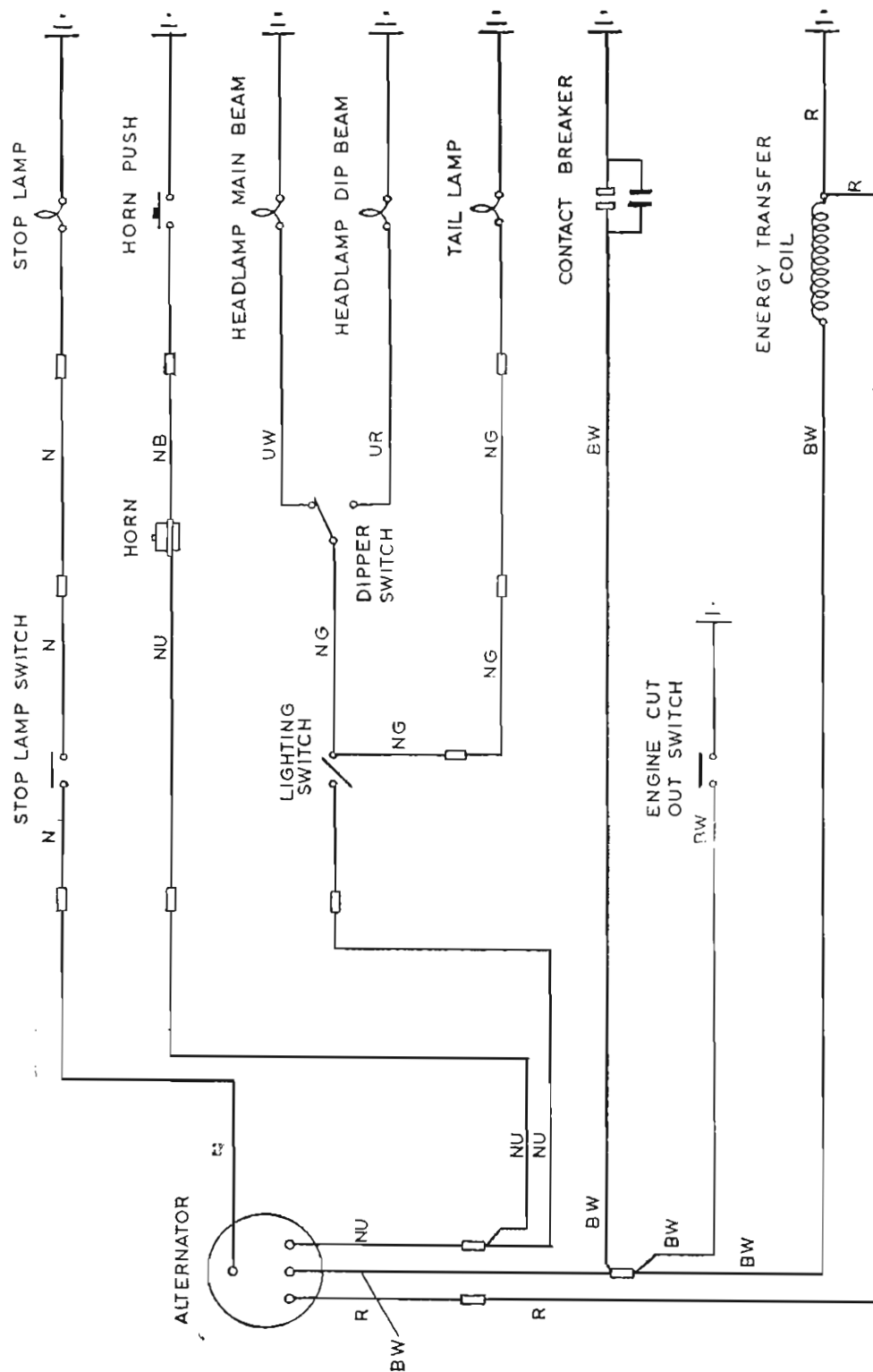


RM 13 (COMPETITION) ALTERNATOR
D.C. OUTPUT TEST CIRCUIT

LIGHTING COILS		IGNITION COILS	
ALTERNATOR R.P.M.	OUTPUT IN AMPS.	ALTERNATOR R.P.M.	OUTPUT IN AMPS.
2000	2.8 (min)	2000	1.4 (min)
5000	5.3 (max)	5000	1.8 (max)

CIRCUIT DIAGRAM OF RM 13 (COMPETITION) ALTERNATOR
AND "ENERGY TRANSFER" IGNITION SYSTEM AS FITTED
TO C15. COMPETITION MODEL





SNAP CONNECTORS
EARTH CONNECTIONS
MADE VIA CABLES
OR VIA FIXING BOLTS

CIRCUIT DIAGRAM OF RM 13 (COMPETITION) ALTERNATOR
AND "ENERGY TRANSFER" IGNITION SYSTEM AS FITTED
TO C15 COMPETITION MODEL
(WITH STOP LAMP.)

W 54943594

PRINTED IN ENGLAND BY WARWICK PRINTING CO. LTD., WARWICK