



# BSA POWER UNIT SERVICE

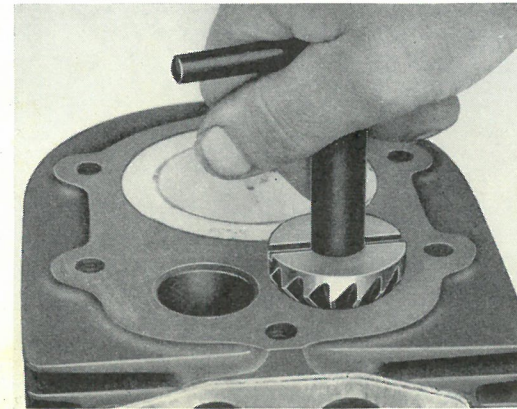
## Section 1. TECHNICAL DATA

|                       | 320 c.c.                           | 420 c.c.                            |
|-----------------------|------------------------------------|-------------------------------------|
| Bore ... ..           | 3 in. (76.2 mm.)                   | 3.23 in. (82 mm.)                   |
| Stroke ... ..         | 2.75 in. (69.8 mm.)                | 3.125 in. (79.4 mm.)                |
| Capacity ... ..       | 318 c.c.                           | 419 c.c.                            |
| Maximum B.H.P. ... .. | 5.15 at 2,500 r.p.m.               | 6.25 at 2,500 r.p.m.                |
| Main jet ... ..       | Petrol 80<br>Paraffin 90<br>TVO 85 | Petrol 85<br>Paraffin 100<br>TVO 90 |

### BOTH MODELS

|                                    |   |
|------------------------------------|---|
| Fuel capacity ... ..               | 1 gallon (4.5 litres)   |
| Sump capacity ... ..               | Models "A" and "E" 2 pints (1,136 c.c.)<br>Models "F" and "G" 3½ pints (1,988 c.c.)     |
| Spark plug ... ..                  | Champion No. 7, 18 mm.  |
| Plug gap ... ..                    | .018—.020 in. (0.44 to 0.50 mm.)  |
| Contact breaker ... ..             | .015 in. (0.38 mm.)   |
| Ignition timing ... ..             | 7/16 in. B.T.D.C. (5.6 mm.) with impulse coupling held open.                            |
| Piston ring gap ... ..             | .008—.012 in. (0.2—0.3 mm.)   |
| Crankshaft shims available ... ..  | .002 in. (0.05 mm.); .003 in. (0.075 mm.)<br>.005 in. (0.125 mm.); .007 in. (0.175 mm.) |
| Oversize piston available ... ..   | .020 in. (½ mm.); .040 in. (1 mm.)  |
| Undersize con-rod shells ... ..    | .010 in. (0.25 mm.); .020 in. (0.5 mm.); .030 in. (0.75 mm.)                            |
| Undersize crankshaft bushes ... .. | .010 in. (0.25 mm.); .020 in. (0.5 mm.)   |
| Average petrol consumption ... ..  | 320 c.c., 3 pints (1.1 litres); 420 c.c., 4½ pints (1.7 litres)                         |
| Reduction gears available ... ..   | 2 : 1; 3 : 1; 6 : 1   |

| Brand           | Above 32°F. | 0 to 32°F. | Below 0°F  |
|-----------------|-------------|------------|------------|
| Mobiloil ... .. | BB          | A          | Arctic     |
| Shell ... ..    | Triple      | Double     | Single     |
| Castrol ... ..  | XXL         | XL         | Castrolite |
| Esso ... ..     | 40          | 30         | 20         |
| Energol ... ..  | S.A.E. 40   | S.A.E. 30  | S.A.E. 20  |

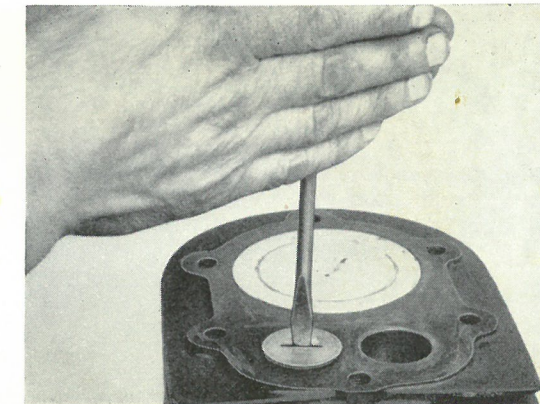


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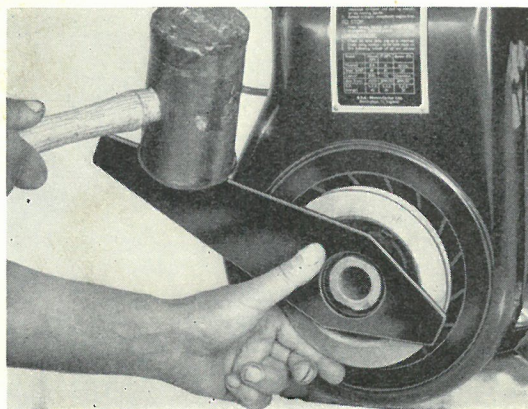
Clean and carefully examine the valves for pitting. Valves in a pitted condition should either be re-faced on a suitable machine or replaced. If the valve seats show signs of pitting they should be re-cut with B.S.A. Service Tool number 61-3303. When re-cutting seats remove only sufficient metal to provide a true joint. Do not attempt to remove pitting from either valve or seat by grinding the two parts together with carborundum paste as pocketing will inevitably result.

Whether or not the valves or valve seats have been re-faced they will now require re-grinding. Lightly smear both faces with fine carborundum paste and with a screwdriver grind in the valve with a semi-rotary motion. A light coil spring placed under the valve head will assist considerably and the valve should be allowed to rise occasionally by pressure of the spring. It should then be turned to 180° before continuing. When a dull, even, matt surface, free from blemishes is obtained the valve seats and ports must be thoroughly cleaned with a rag soaked in paraffin until all traces of grinding paste are removed.

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## Section 2. DISMANTLING FOR DECARBONISATION

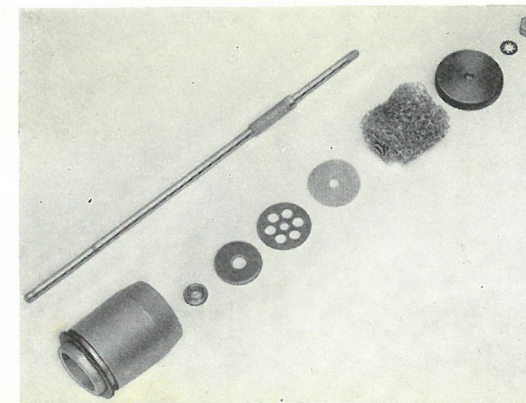
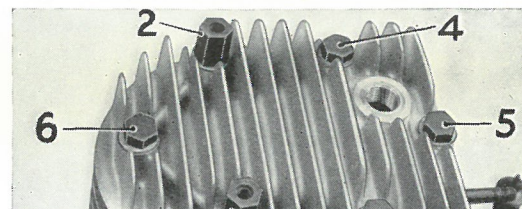


1

Remove starter pulley using B.S.A. Service Tool number 61-3370, or, if not available, a suitable spanner fitted to the pulley boss. Detach fuel pipe from carburetter. The fuel tank is held by two bolts above the cylinder head and two studs and nuts at the crankcase just above the oil filler plug. Remove these bolts and nuts and take off the tank complete with brackets.

Disconnect the carburetter control rod from the carburetter throttle lever, remove the manifold complete with exhaust pipe and carburetter by unscrewing the three brass nuts which hold the manifold in position, taking care not to damage the joint washers. Detach the H.T. lead and plug. Remove two bolts locating

2



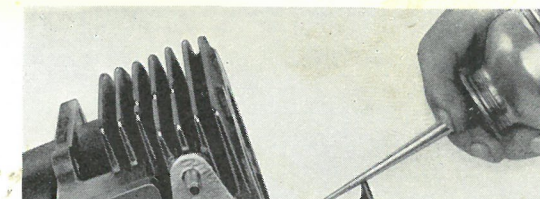
8

The breather unit is combined with the dipstick and also forms the cap for the oil filler hole. This functions on the simple flapper valve principle and apart from infrequent renewal of the disc or gauzes merely requires thorough cleaning by washing with petrol. Whilst washing can be carried out without dismantling, it is best to take the unit to pieces for this purpose. Extreme care is necessary when re-assembling to ensure that parts are refitted in correct sequence and the right way up.

## Section 3. RE-ASSEMBLY AFTER DECARBONISATION

Decarbonisation is now complete and the unit is ready for re-assembly in the reverse order to that outlined

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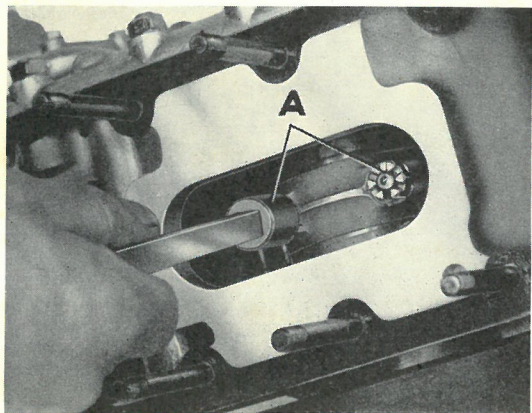


# ICE CHAR



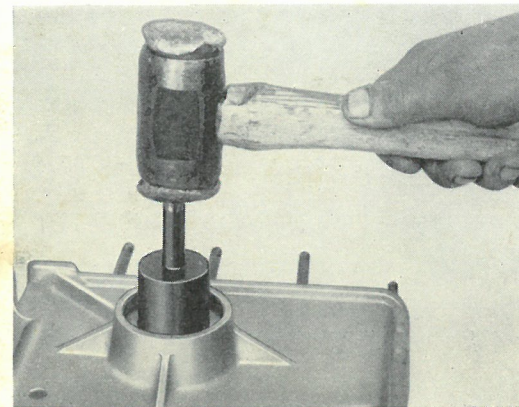
# —320/420 C.C. MODELS A, E, F & G

## Section 5. RE-ASSEMBLY



13

The sump (on models "A" and "E" the crankshaft inspection plate also) should now be removed to expose the big-end bearing which should be brought to its lowest position. Undo the two nuts (A) and remove the big-end cap, push the piston and connecting rod up through the cylinder barrel and remove from the top. Mark the inside of the piston to indicate the front face. Undo the four cylinder base bolts and take off the cylinder barrel.

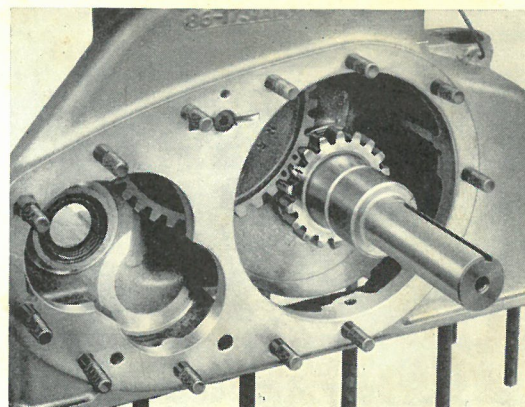


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The unit is now ready for re-assembly. In this operation cleanliness is absolutely vital. Fit new bushes as necessary. If a reground crankshaft is obtained under-size main bushes are supplied and included in the price. Bushes are to finished size and must not be reamed after fitting. Insert the tappets and re-fit the camshaft, first supporting by Service Tool number 61-3371. Gently tap in the spindle ensuring that the locating peg is correctly positioned in the groove cut into the crankcase. Examine the thrust washers and replace if they show signs of wear, ensure that they are correctly located on the inner crankcase and timing cover housings and hold in position during crankshaft assembly by a light grease smearing.

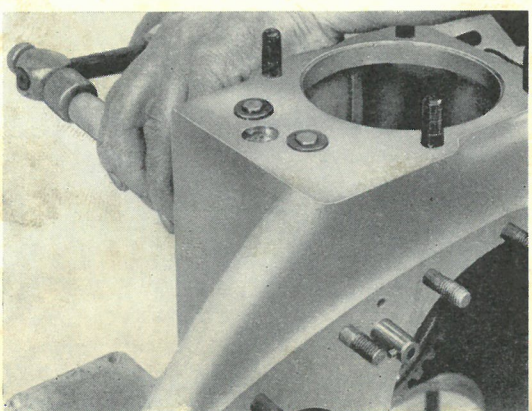
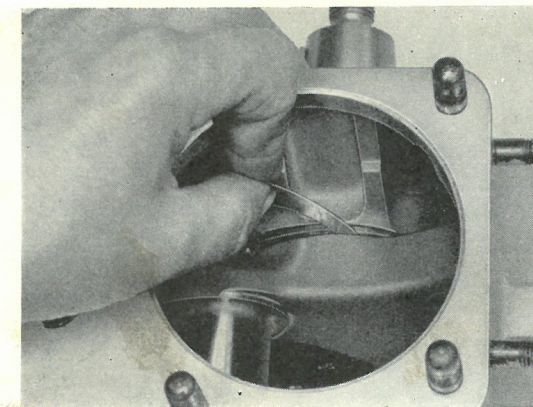
Undo the three hexagon-headed screws from the base of the magneto platform and remove the magneto together with the loose drive coupling. Release the tab washer, take off the nut and driving dog. Remove the governor control cover complete with spindle followed by the lower governor control bracket and overriding control arm. Take out the "T"-piece from the centre of the control bobweights. Undo the 13 timing cover nuts and remove the cover complete with oil pump and driving gears. Turn the crankshaft until the marked tooth on the crankshaft gear engages between the two marked camshaft pinion teeth and withdraw the crankshaft.

14



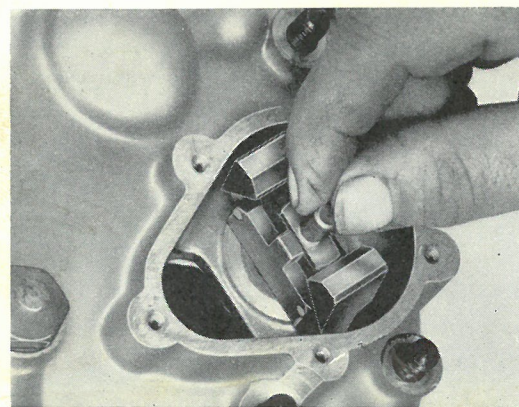
Correct crankshaft end float is vital and should be between .004 in. and .006 in. Shims are fitted between the crankshaft gear and the crankshaft web, and normally these will be correct on re-assembly. Insert the crankshaft ensuring that the marked gear tooth engages between the two marked camshaft teeth and refit the timing cover using a new paper washer. Tighten two cover nuts only. Check the end float and if correct ensure that the governor shaft gear is correctly located spot to spot with the camshaft gear, and tighten the remaining nuts. If incorrect, remove the crankshaft pinion and alter the shimming to give the correct float. Shims are available in .002 in., .003 in., .005 in. and .007 in. dimensions.

21



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The camshaft revolves on a fixed spindle driven into the crankcase wall. To extract it, tap the spindle out from the fan side of the crankcase, using Service Tool number 61-3371. The camshaft which is now roughly located by the service tool should be supported by one hand and the tool withdrawn with the other. Lower the camshaft sufficiently to allow the tappets to be withdrawn downwards and finally draw the camshaft through the side of the crankcase.

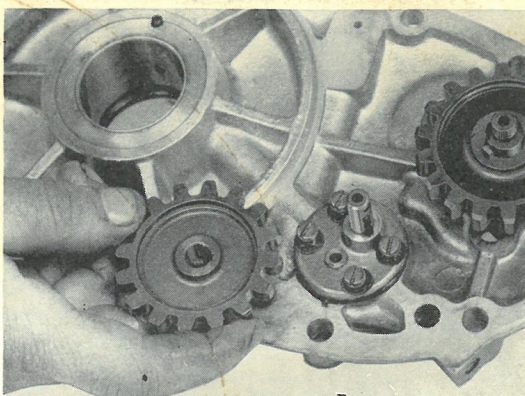


22

Replace the "T"-piece between governor bobweights. Refit governor brackets and cover. Rotate the crankshaft until the big-end journal is towards the bottom of the crankcase and refit the connecting rod using correct size big-end bearing shells. These shells are supplied complete with re-ground shafts. Big-end caps and connecting rods are marked to indicate correct fitting of the end cap which is of the utmost importance. Tighten the big-end nuts to 25 lbs./ft. and insert new split pins.

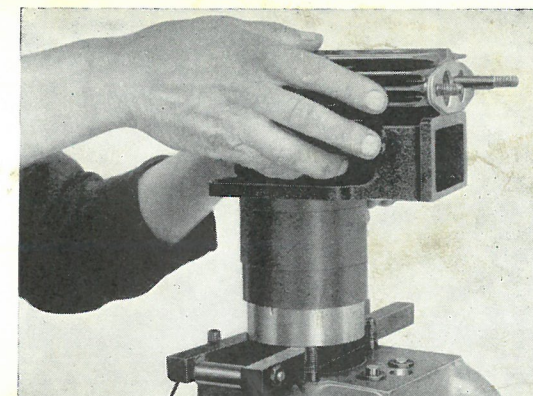
The oil pump is situated in the lower half of the timing case and should not be dismantled unless absolutely necessary. If dismantling is considered necessary remove the split pin and pull off the 16T gear followed by the key. Unscrew the four 3/16 in. cheese-headed screws which are locked by shakeproof washers and gently prise off the cover plate. The pump gears can now be removed for inspection. Should there be any sign of damage to either the gears or the alloy faces of the pump the parts concerned should be replaced.

16



Ensure that the sump oil filter is in good condition and clean. Refit the sump. Fit new crankshaft oil seals using Service Tool number 61-3399. Extreme care is necessary to avoid damage to the seal lips. Refit the flywheel ensuring that the centre nut is really tight. Refit the fan and starter pulley. Turn the piston rings so that gaps are at 120° to each other, warm the piston and fit to the connecting rod. Carefully compress the piston rings and slide on the barrel. Refit and tighten the cylinder base nuts. Fit the valve shim cups and adjust as in paragraph 11.

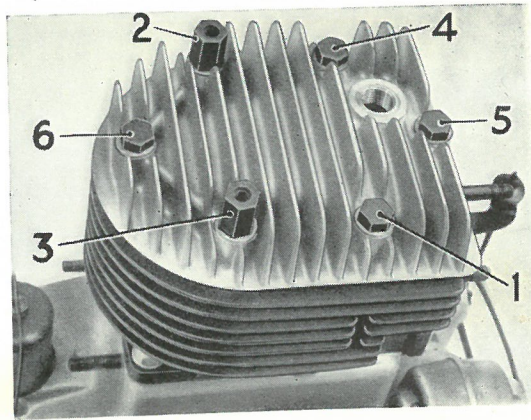
23





Disconnect the carburetter control rod from the carburetter throttle lever, remove the manifold complete with exhaust pipe and carburetter by unscrewing the three brass nuts which hold the manifold in position, taking care not to damage the joint washers. Detach the H.T. lead and plug. Remove two bolts locating cowl at starter pulley side and slide off cowl. Slacken six cylinder head bolts in rotation to avoid distortion and remove head by breaking joint, if necessary by tapping with a soft mallet.

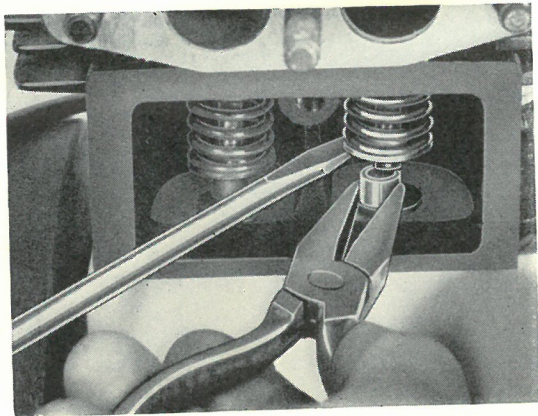
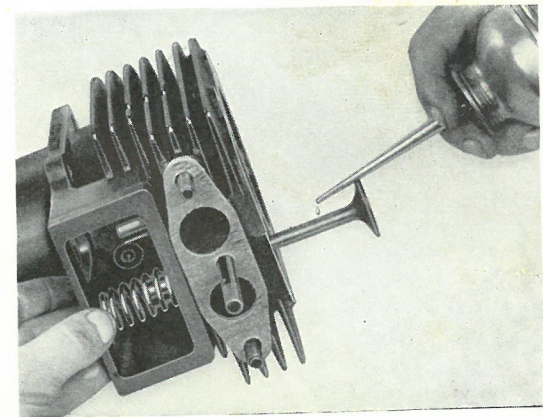
2



### Section 3. RE-ASSEMBLY AFTER DECARBONISATION

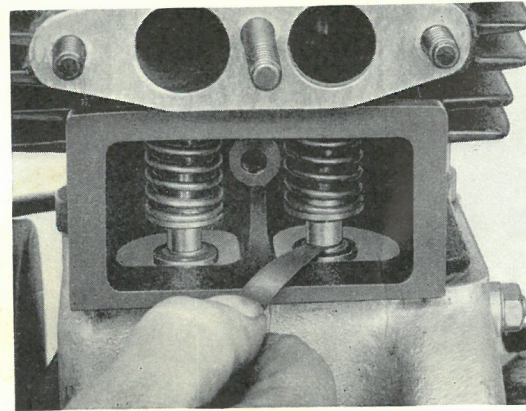
Decarbonisation is now complete and the unit is ready for re-assembly in the reverse order to that outlined in paragraphs numbered 1 to 7. Prior to assembly however the valve springs should be examined. Their free length is  $1\frac{5}{8}$  in. any difference in length over  $\frac{1}{8}$  in. means the spring is unfit for further service. Smear valves, springs and collars with oil, replace in the cylinder barrel, lever the spring upwards and insert the cotter.

9



3

Before attempting to remove the valves it is advisable to wedge a piece of cloth into the tappet chest oil drain hole to prevent the parts dropping into the sump. Insert a screwdriver under the valve spring collar and lever upwards. With a pair of long nosed pliers take off the valve stem thimble complete with any shimming discs it may enclose. The valve cotter can now be removed and the valve lifted out. Valves and associated parts should be placed carefully to one side to ensure that they are replaced correctly on re-assembly.

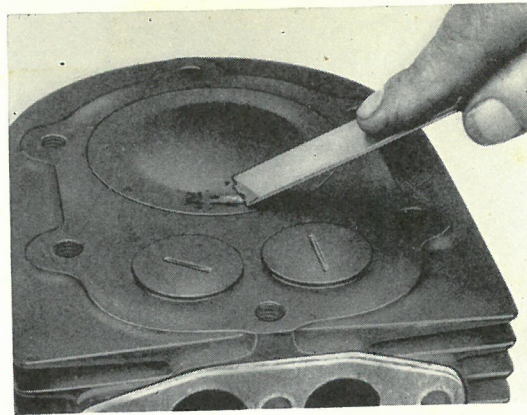


10

Turn the engine until both valves are closed and check clearances between top of tappet and valve stems. For correct clearance see Section 1. Any variation should be corrected by inserting or removing the appropriate valve shims which are available in .003 in., .010 in., .012 in. and .014 in. thickness. Refit the cylinder head followed by the manifold complete with exhaust system and carburetter. Replace the cooling cowl.

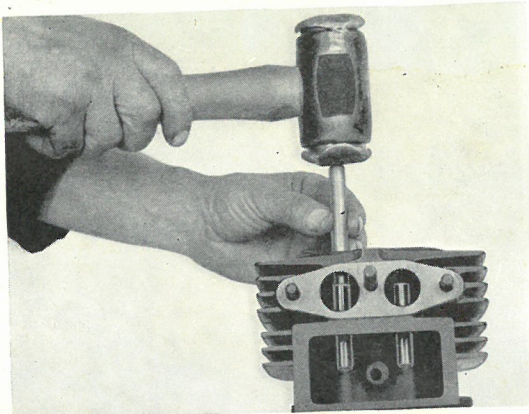
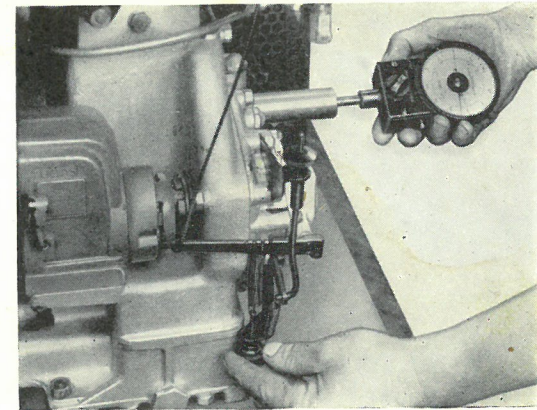
Rotate the engine until the piston is at the top of its stroke and with a screwdriver or similar blunt scraper gently remove the carbon deposit from the piston crown and cylinder head. Bear in mind that injudicious use of the scraper may cause damage to these alloy parts. Remove carbon from valve seats and top face of cylinder block. Blow clear of dust and wash in clean paraffin.

4



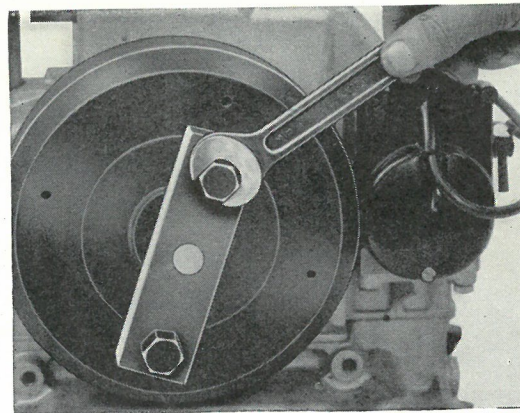
Refit the throttle linkage, drain the sump and refill with one of the recommended lubricants. Clean and refit sparking plug and H.T. lead, refit petrol pipe. Turn on the petrol, flood carburetter, close strangler and start engine. Open strangler and allow to run at a fast tickover for a few minutes by operating the throttle by hand. Finally allow the governor to control the engine speed and use a tachometer to ensure that this is correct. Variation to speed can be made by screwing adjuster clockwise to increase the speed or anti-clockwise to reduce it.

11



5

Should new valve guides be required, it will be necessary to remove the cylinder barrel by undoing the four nuts at its base and lifting clear of the piston. Extract the guides (from below) using B.S.A. Service Tool number 61-3382. The new guides should then be driven in from the top for which purpose the same tool should be used. Irrespective of condition of valve seats, these should be re-cut after fitting new guides to ensure concentricity of seats and stems.



12

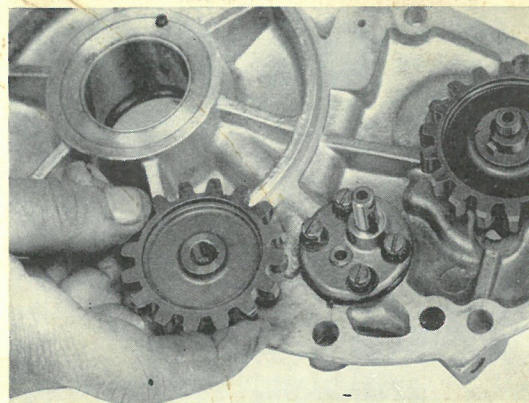
### Section 4. COMPLETE DISMANTLING

Drain the sump and remove the cylinder head, carburetter, controls and exhaust system as outlined in Section 2. Unscrew the four hexagon bolts holding the flywheel fan and lift clear. Undo the centre nut (normal right-hand thread). Take off the washer and locating plate after which the flywheel can be withdrawn from the shaft using Service Tool number 61-3368.



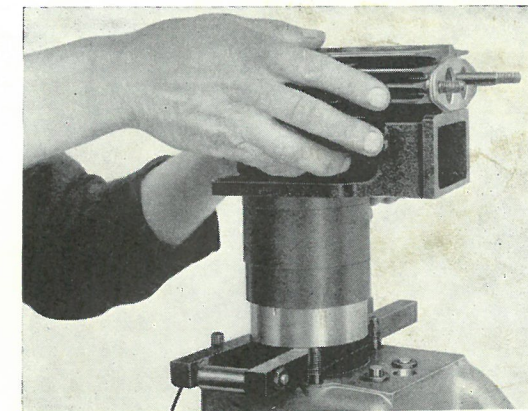
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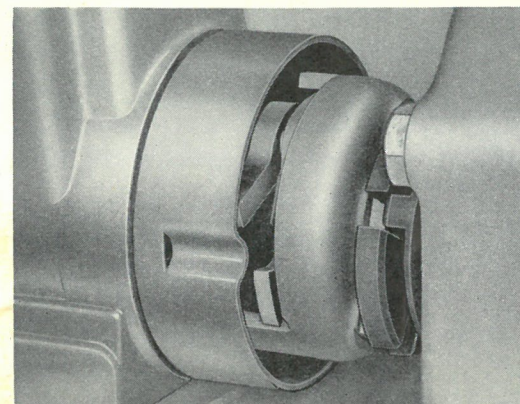


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Crankcase and magneto drive oil seals can now be removed by inserting a screwdriver behind the seal and levering upwards. Always fit new seals on re-assembly. B.S.A. Service Dealers can supply oversize and under-size seals for use with slightly worn housings or shafts. Warm the crankcase and timing cover and press out the main bearings.

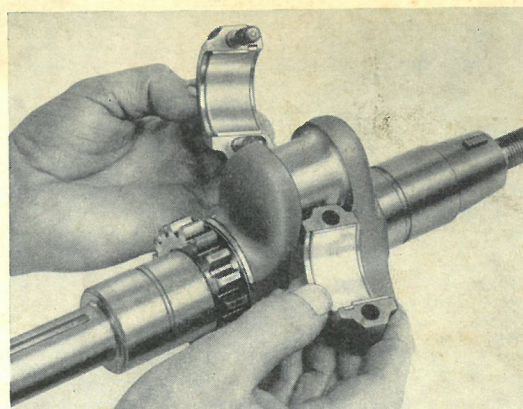
24

Rotate the engine until the piston is at T.D.C. with both valves closed. Turn it backwards through about 45°. Rotate the magneto armature shaft clockwise until resistance is felt; this is the impulse starter device resistance. Offer up the drive coupling to the driving dog and rotate the crankshaft slightly until the dog is engaged. The engine is then correctly timed. Reconnect the governor linkage, re-assemble the cylinder head and covers as in Section 3, refill with oil and test making adjustments to give correct performance as in paragraph 12.



Examine all crankshaft bearing journals for signs of wear or scoring which will indicate the need for re-grinding. Factory exchange crankshafts are available through appointed Service Dealers. If wear on a journal exceeds .003 in. or if there is sign of scoring it is unwise to replace bearing shells without regrinding the journal. Standard shaft dimensions are journals, 1.5000—1.5005 in., crankpin 1.3745—1.3750 in. (420 c.c.) main and 1.6245—1.6250 in. (320 c.c.).

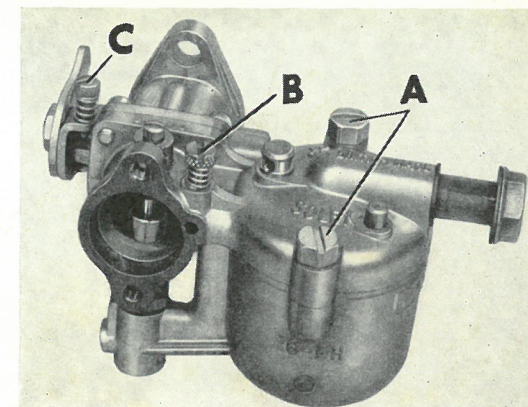
18



## Section 6. CARBURATION

The standard carburettor fitted is the Solex 26FHD, but for certain applications an Amal instrument is used. Both consist basically of two castings, i.e. the carburettor body incorporating a butterfly valve, and the float chamber. A strangler is fitted for easy starting. Normal maintenance requires only that the float chamber studs (A) be taken out, and the bowl, jets etc. thoroughly washed in petrol. On both instruments jet sizes etc. are determined at Works and the only adjustment which may be necessary is to the idling mixture screw (B).

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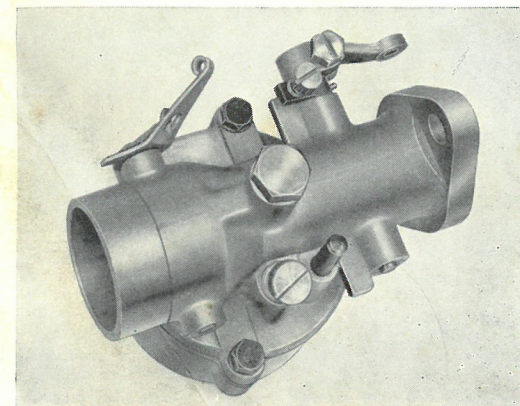


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Wear in the cylinder bore will be indicated by a ridge or step approximately 1/8 in. below the top. If there are signs of heavy scoring or if wear exceeds .006 in. a re-bore is necessary. Rebored cylinders complete with pistons are available through the B.S.A. Exchange Replacement Service. If it is intended to refit the original piston in the original barrel take off the rings and insert them into the cylinder. Use the piston to push the rings a little way down to ensure that they are square with the bore. Check the gaps with a feeler gauge and if they exceed .012 in. replace the rings.

26

Screwing in richens the idling mixture and vice versa. A tendency to miss intermittently generally indicates weak mixture, whilst a tendency for the engine to "hunt" denotes richness. The idling speed is regulated by the slow running screw (C) which limits the closing of the throttle valve. Should flooding occur the float and needle valve should be carefully examined to ensure that neither is damaged and that the needle is not held off its seating by dirt or grit. If flooding continues examine the petrol unions, and on the Solex instrument, the fixing of the main jet carrier.



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