

OTHER CHARTS AVAILABLE IN THIS GROUP—

No. MC52	Dismantling the engine/gear-box unit.
No. MC53	Rebuilding the engine/gear-box unit.
No. MC54	Front fork, steering and wheels.
No. MC55	Automotive Unit Replacement Parts (A50, A65)
No. MC56	Front Fork, Steering and Wheels (Cyclone, Rocket and Lightning Models)

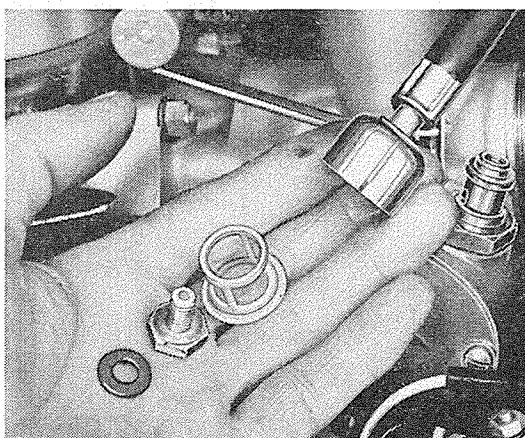


SERVICE CHART

Removing and Replacing the Engine Gear-box Unit

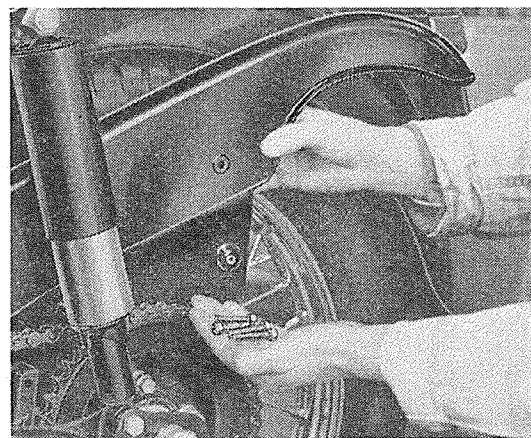


500 STAR Model A50
650 STAR Model A65
CYCLONE, ROCKET &
LIGHTNING Models
O.H.V. TWINS



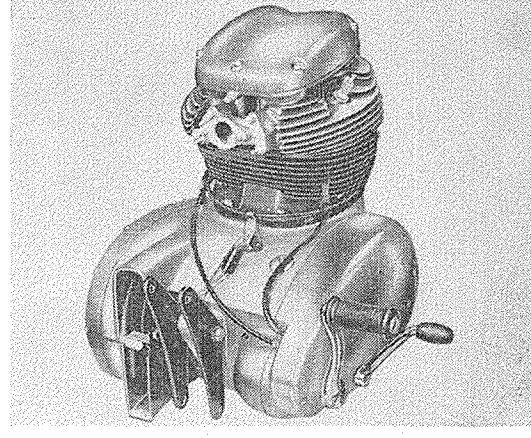
1

During the process of removing the engine unit keep careful watch for any nuts or bolts which have been loosened and chafed, such parts are no longer safe to use and should be replaced.
Examine carefully the wiring for places where the insulation may have rubbed through and protect with a few turns of insulating tape.
Turn off the petrol supply at the tap and disconnect the feed pipe at the carburetter by removing the banjo union screw. Replace the screw, fibre washers and filter on to the carburetter to avoid loss or damage.



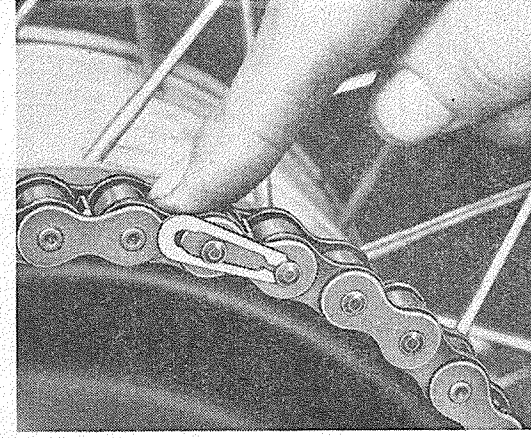
7

The rear chainguard is secured by four bolts which screw into captive nuts, remove the bolts and take the guard away.
When the brake plate is on the left-hand side the lower right-hand bolt also secures the brake anchor strap and is fitted with a split pin to secure the nut.



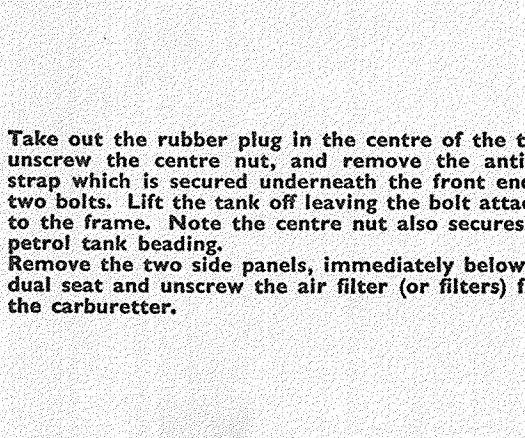
13

Having completed the overhaul of the engine and gearbox unit it should be complete with kickstart and footchange lever, clutch cable, and engine plates. Coil the clutch cable round the cylinder block for the time being. The illustration shows an early model with single engine bolt, later models have two rear bolts, which should be left loose. Models with quickly detachable clutch cable need not have it fitted at this stage.

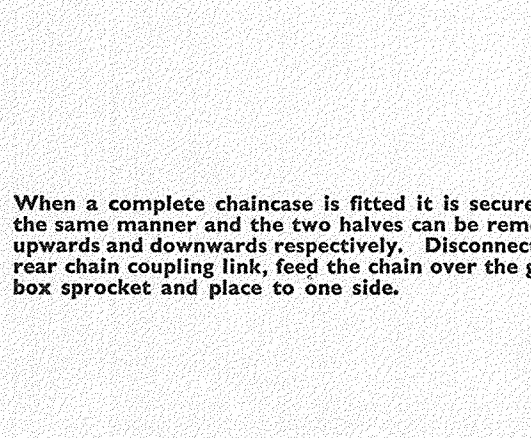
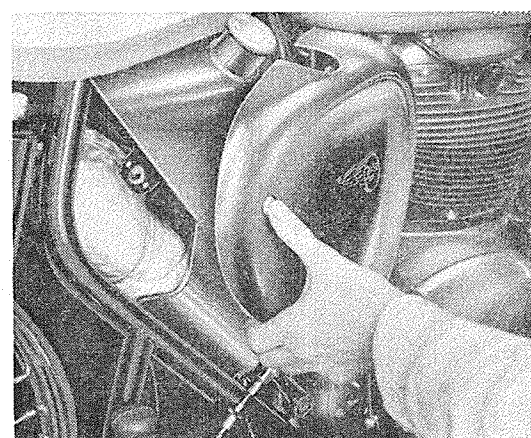


19

Replace the rear chain so that the closed end of the spring link is towards the front of the machine, then refit the chainguard or chaincase (whichever is fitted) securing with the four bolts.
When the brake plate is on the left-hand side do not omit the spacer between the brake anchor strap and the chainguard or the split pin from the lower bolt.

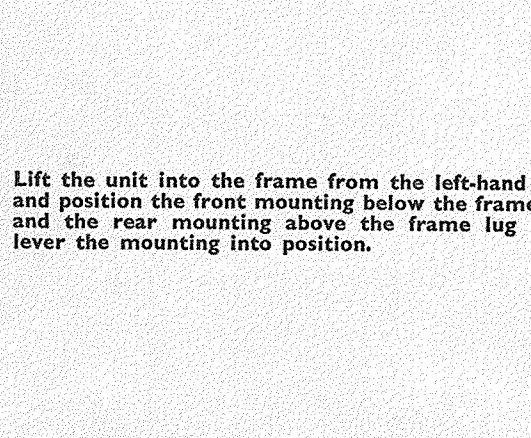
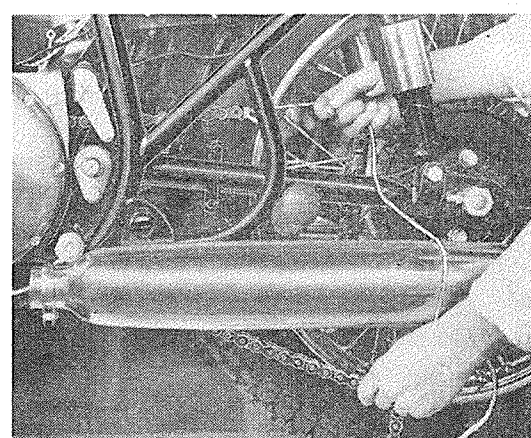


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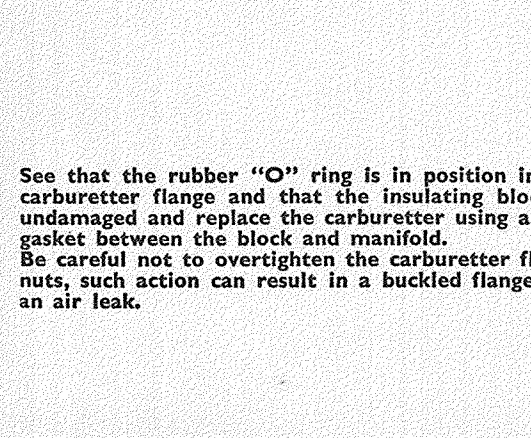
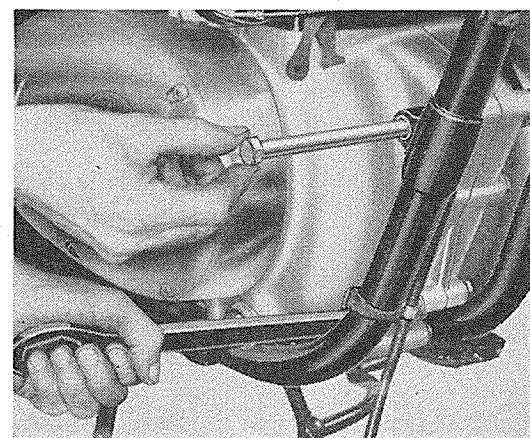
8

When a complete chaincase is fitted it is secured in the same manner and the two halves can be removed upwards and downwards respectively. Disconnect the rear chain coupling link, feed the chain over the gear-box sprocket and place to one side.



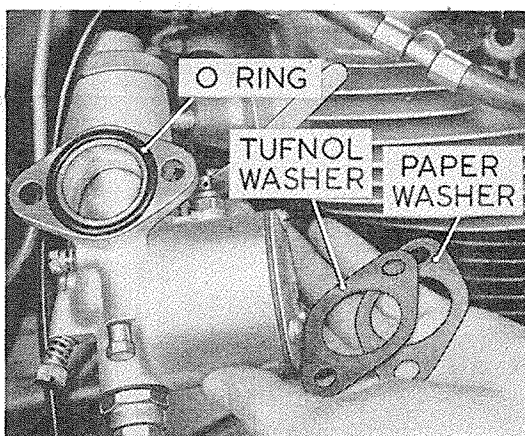
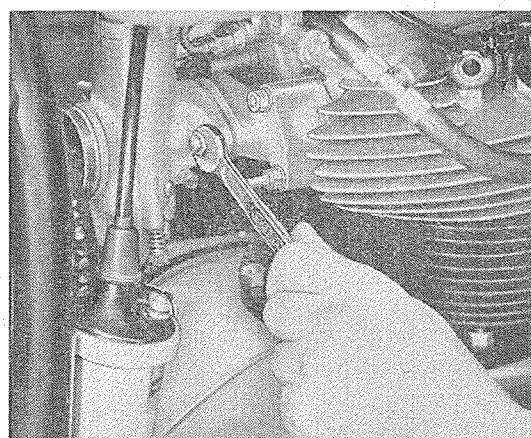
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Lift the unit into the frame from the left-hand side and position the front mounting below the frame lug and the rear mounting above the frame lug then lever the mounting into position.



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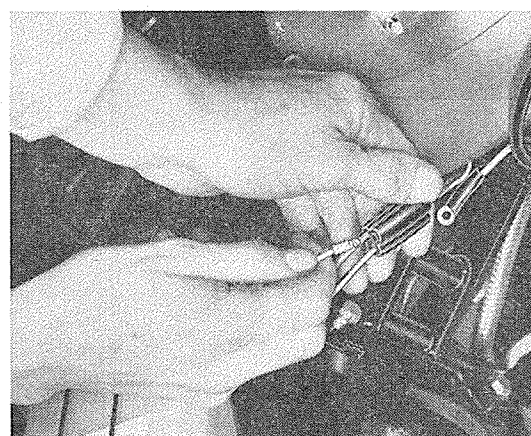
See that the rubber "O" ring is in position in the carburetter flange and that the insulating block is undamaged and replace the carburetter using a new gasket between the block and manifold. Be careful not to overtighten the carburetter flange nuts, such action can result in a buckled flange and an air leak.



3

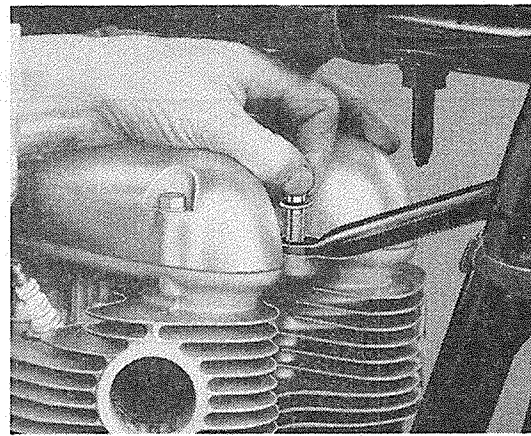
TWIN CARBURETTERS

The following instructions apply equally to machines equipped with twin carburetters except that there are the two air cleaners, two fuel feeds, and the two carburetters to be removed. To remove twin carburetters completely disconnect the cables at the throttle and air controls this will avoid disturbing slide settings. Unscrew the two nuts securing the carburetter, remove the washers, pull the carburetter off the studs and tie back out of the way. Note that the gasket is fitted next to the manifold, with the insulating block next, then the carburetter. The rubber "O" ring fitted into the carburetter flange should be a good fit and unbroken.



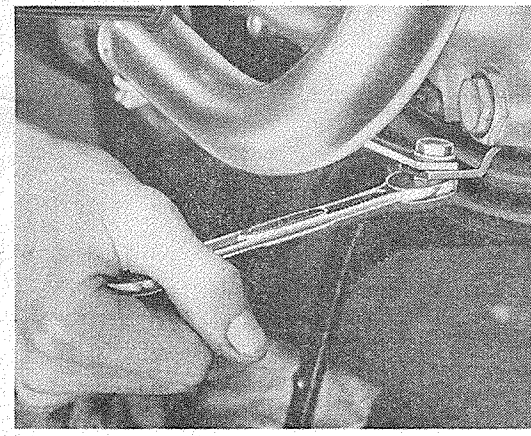
9

On standard single carburetter models disconnect the generator leads by pulling the wires out of the couplings, and remove the low-tension wires from the terminals on the coils. Twin carburetter models with standard generator must also have the left-hand coil removed. Models having "energy transfer" ignition system, where both coils are immediately above the gearbox, will require both coils removed.



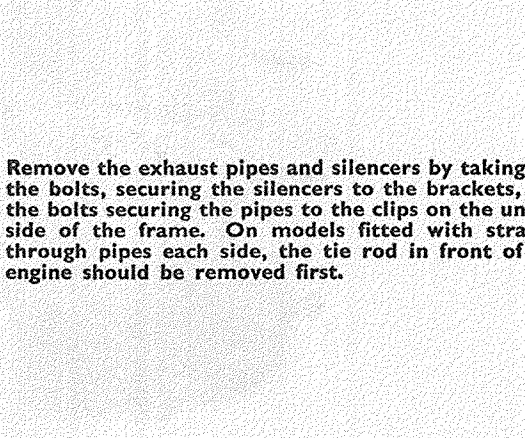
15

Insert the mounting bolts through the lugs, replace the nuts and washers and make absolutely tight. Do not omit the packing piece which is usually on the lower engine bolt between the frame and the crankcase. Replace the engine steady stay.

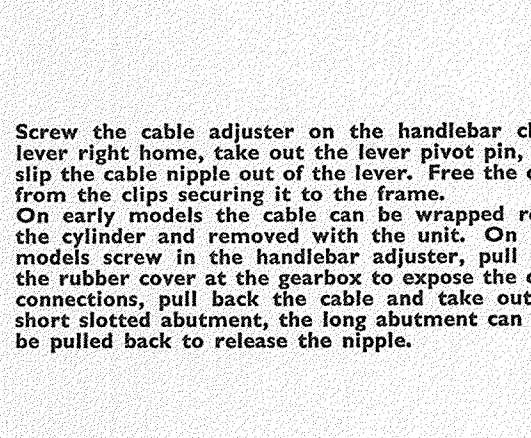
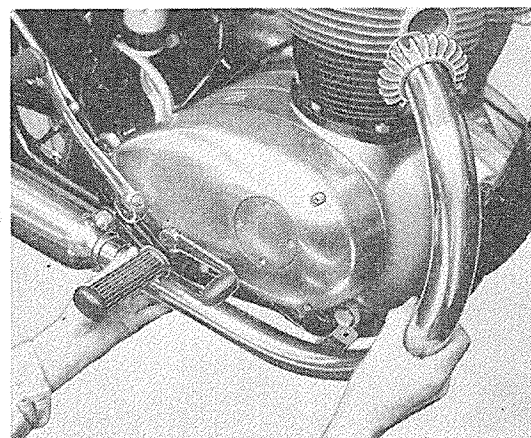


21

Press the exhaust pipes well down into the exhaust ports, replace the silencers and secure to the brackets at the rear and the clips at the front of the frame. On models fitted with straight through pipes on each side the front tie rod should be fitted last. Of the distance pieces at the rear the longest is on the left-hand side.

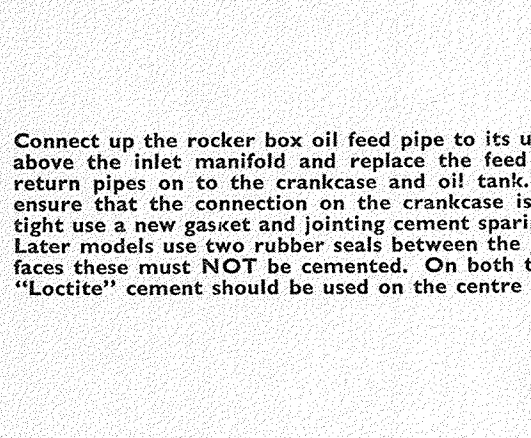
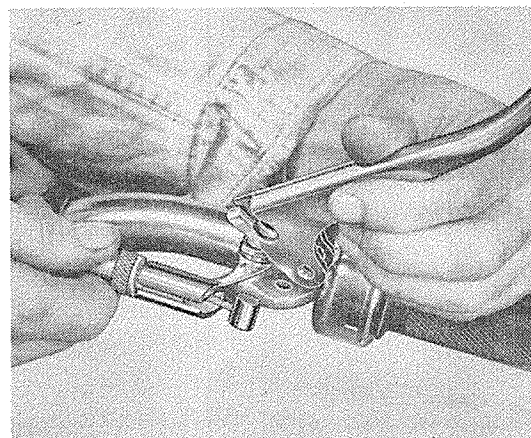


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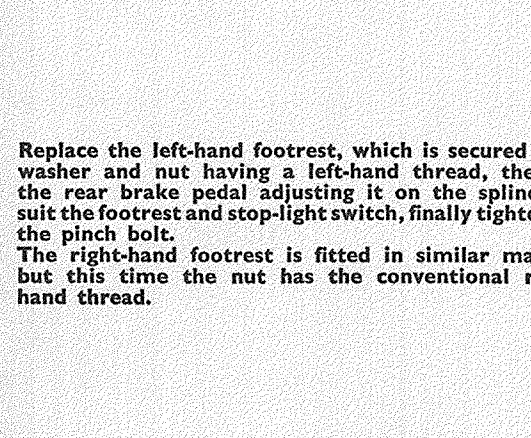
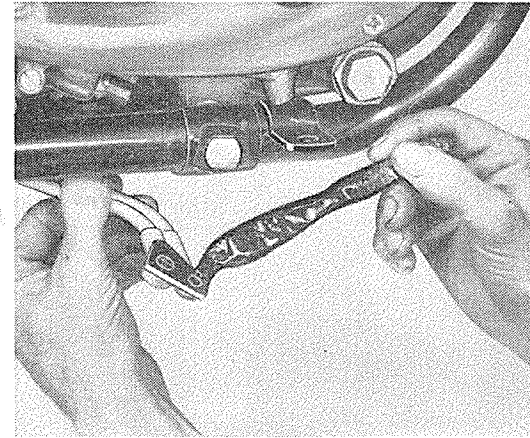
10

Screw the cable adjuster on the handlebar clutch lever right home, take out the lever pivot pin, then slip the cable nipple out of the lever. Free the cable from the clips securing it to the frame. On early models the cable can be wrapped round the cylinder and removed with the unit. On later models screw in the handlebar adjuster, pull back the rubber cover at the gearbox to expose the cable connections, pull back the cable and take out the short slotted abutment, the long abutment can then be pulled back to release the nipple.



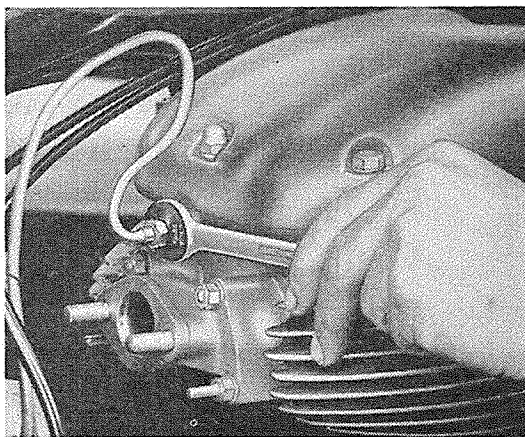
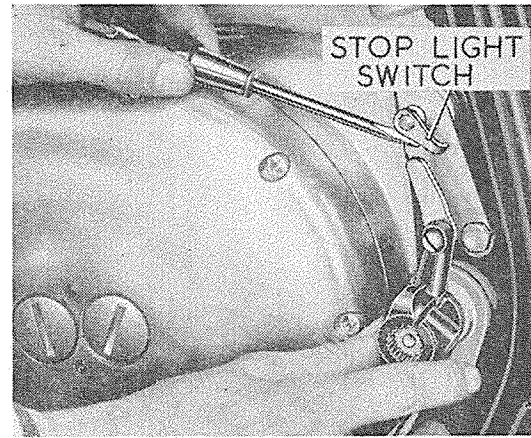
16

Connect up the rocker box oil feed pipe to its union above the inlet manifold and replace the feed and return pipes on to the crankcase and oil tank. To ensure that the connection on the crankcase is oil-tight use a new gasket and jointing cement sparingly. Later models use two rubber seals between the joint faces these must NOT be cemented. On both types "Loctite" cement should be used on the centre bolt.



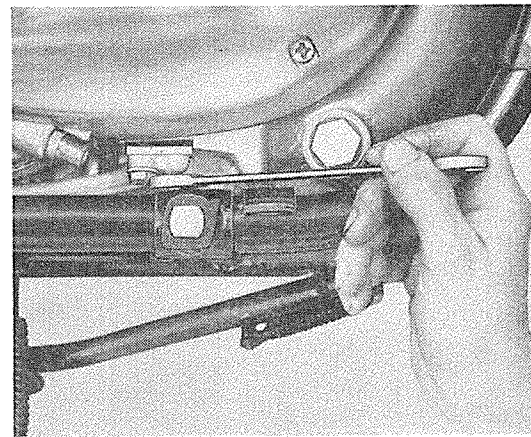
22

Replace the left-hand footrest, which is secured by a washer and nut having a left-hand thread, then fit the rear brake pedal adjusting it on the splines to suit the footrest and stop-light switch, finally tightening the pinch bolt. The right-hand footrest is fitted in similar manner but this time the nut has the conventional right-hand thread.



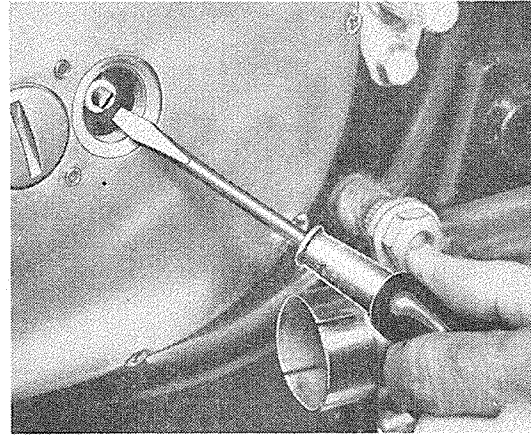
5

Pull the oil feed pipe clear of the rocker box after removing the union nut just above the inlet manifold. If necessary the pipe can be pulled from its rubber connection after the union nut is unscrewed. On early models this connection is at the base of the oil tank and on later models it is at the top front just below the frame lug. 1967 models have the connection at the oil union below the crankcase.



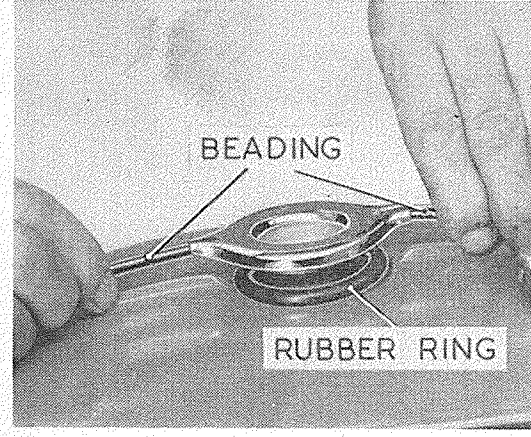
11

Disconnect the speedometer and tachometer cables (if fitted) the former from underneath the gearbox and the latter from the front of the timing case, simply unscrew the cable nipples and pull out the cables.



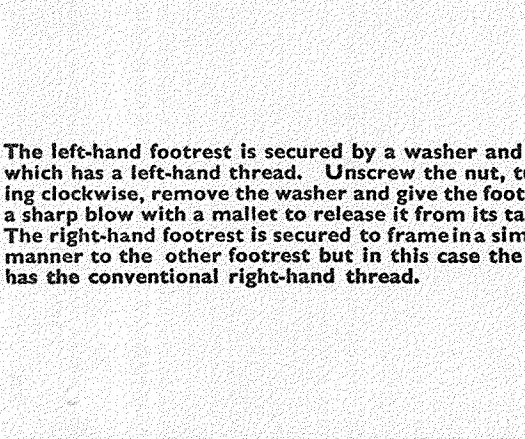
17

Feed the clutch cable through the rubber frame clips, pass the nipple and adjuster through the handlebar bracket, then insert the nipple into the lever and secure the lever with the fulcrum pin and nut. Adjust the cable as necessary.

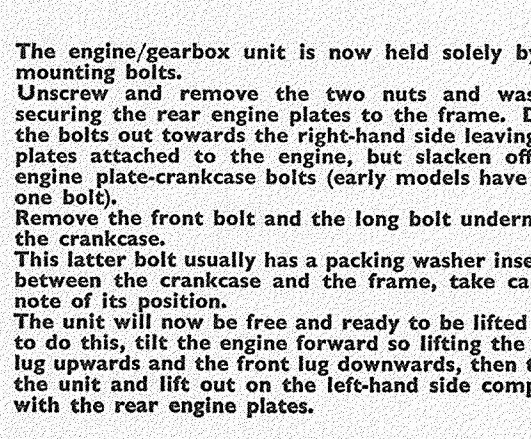
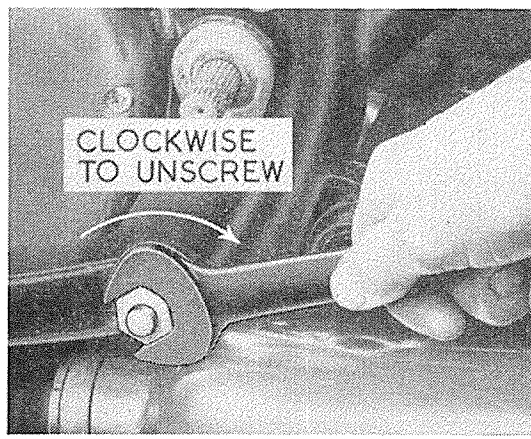


23

Pick up the petrol tank and position the holding down bolt in the centre tube then press the tank down into position and secure with the large diameter washer and nut. If the rubber bush becomes displaced simply press it back into position with a tubular spanner.

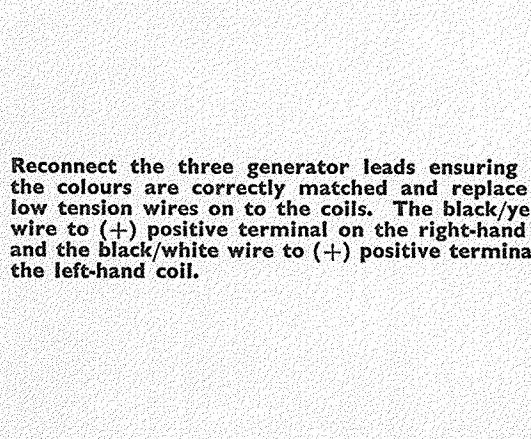
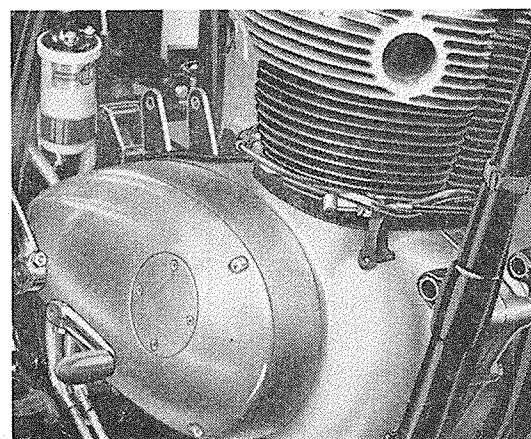


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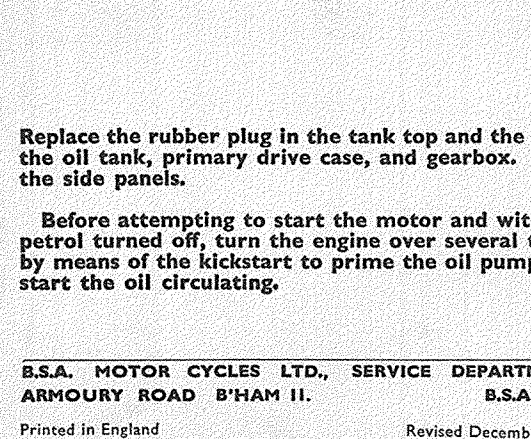
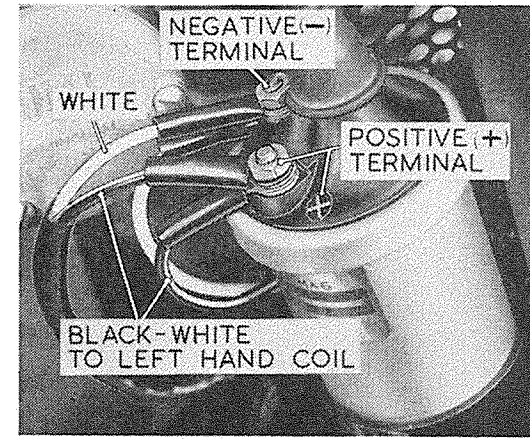
12

The engine/gearbox unit is now held solely by its mounting bolts. Unscrew and remove the two nuts and washers securing the rear engine plates to the frame. Drive the bolts out towards the right-hand side leaving the plates attached to the engine, but slacken off the engine plate-crankcase bolts (early models have only one bolt). Remove the front bolt and the long bolt underneath the crankcase. This latter bolt usually has a packing washer inserted between the crankcase and the frame, take careful note of its position. The unit will now be free and ready to be lifted out, to do this, tilt the engine forward so lifting the rear lug upwards and the front lug downwards, then twist the unit and lift out on the left-hand side complete with the rear engine plates.



18

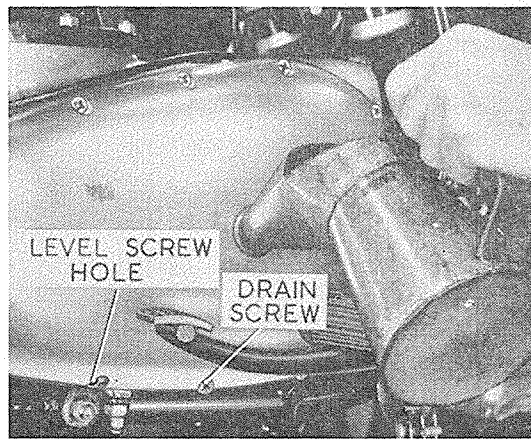
Reconnect the three generator leads ensuring that the colours are correctly matched and replace the low tension wires on to the coils. The black/yellow wire to (+) positive terminal on the right-hand coil and the black/white wire to (+) positive terminal on the left-hand coil.



24

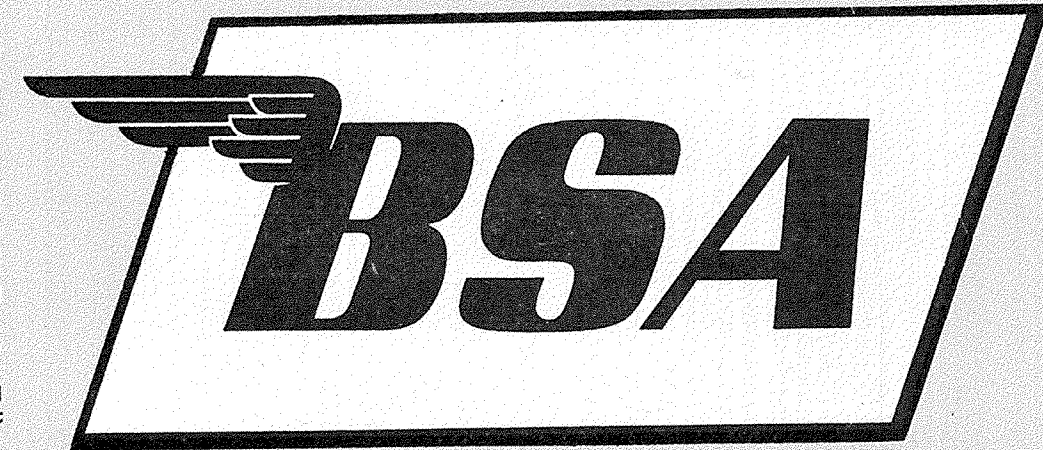
Replace the rubber plug in the tank top and the oil in the oil tank, primary drive case, and gearbox. Refit the side panels.

Before attempting to start the motor and with the petrol turned off, turn the engine over several times by means of the kickstart to prime the oil pump and start the oil circulating.



OTHER CHARTS AVAILABLE IN THIS GROUP:—

No. MCS1	Removing and replacing the engine/gearbox unit.
No. MCS2	Dismantling the engine/gearbox unit.
No. MCS3	Rebuilding the engine/gearbox unit.
No. MCS4	Front fork, steering and wheels.
No. MCS5	Automotive Unit Replacement Parts (A50, A65).
No. MCS6	Front Fork, Steering and Wheels (Cyclone, Rocket and Lightning Models)

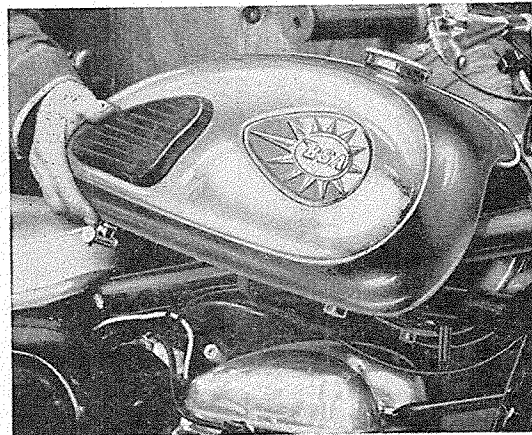


SERVICE CHART

DECARBONISING and TOP OVERHAUL



500 STAR Model A50
650 STAR Model A65
CYCLONE, ROCKET &
LIGHTNING Models
O.H.V. TWINS



1

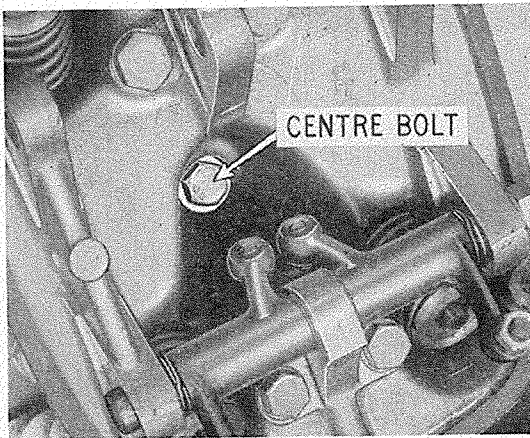
DISMANTLING FOR DECARBONISING

Decarbonising or "top overhaul" is quite simple, but, it should only be carried out when the engine really needs it. The usual symptoms are a tendency to "pink" (metallic knocking sound when under heavy load) due to the building up of carbon on top of the pistons and inside the combustion chamber, a general falling-off of power noticeable mainly on hills, and a tendency for the engine to run hotter than usual.

Before commencing work it is advisable to have the equipment described in paragraph 24 available.

TWIN CARBURETTERS

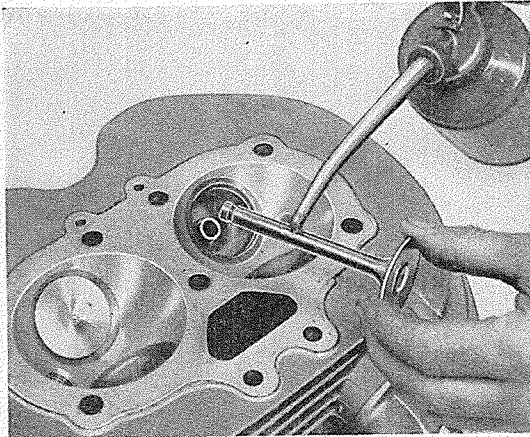
The following instructions apply equally to machines equipped with twin carburetters except that there are two air cleaners, two fuel feeds, and the two carburetters to be removed.



7

PUSH RODS

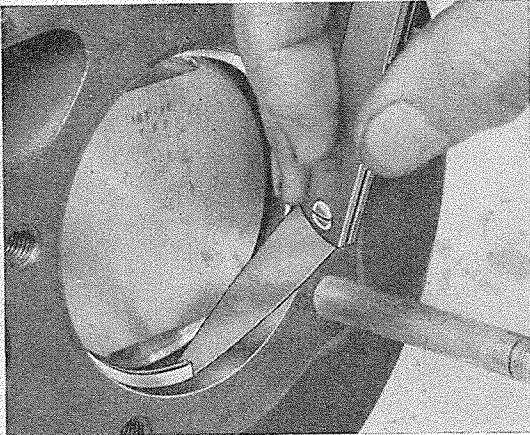
The cylinder head is secured by four nuts and washers on studs screwed into the barrel adjacent to the spark plugs, and five bolts, two at each side of the centre rocker shaft pillars and one at the bottom of the push rod tunnel. This latter bolt is short and the push rods must be removed to obtain access to it. Lift out the exhaust push rods, slacken off the inlet rocker adjusting screws, and take out the inlet push rods. Pull off the spark plug high tension leads and remove the spark plugs.



13

AFTER GRINDING

Raise the valve and turn to a new position every few strokes. Grinding should be continued until the valve seat and face show a uniform smooth surface all round. Valve grinding without refacing can be carried out only when pitting is not deep. After grinding all traces of grinding compound must be removed from both valve seat and face, and the stems smeared with clean engine oil.



19

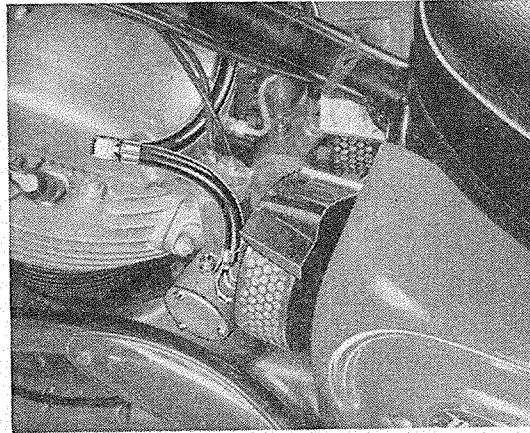
REPLACING THE RINGS

It is advisable to check the gap of new rings before fitting, and if the gap is less than the minimum stated above the ends of the rings should be carefully filed to the correct limit. Ensure that when the piston ring gaps are measured the rings are in the position of minimum bore wear. It should be noted that piston rings are very brittle, and unless handled carefully are easily broken. The procedure for reassembling is in the reverse order to that for dismantling. Note that the middle ring on each piston is tapered this being indicated by the letter "T" marked on one face which must always be uppermost on the piston.

REMOVE THE TANK

Turn off the petrol supply at the tap and disconnect the fuel pipe at the carburettor by unscrewing the banjo union bolt(s). Do not lose the nylon filter or the fibre washers. Take out the rubber plug in the centre of the tank and remove the nut and washer which will be exposed. Underneath the tank at the front end is an anti-roll bar, remove the nuts and washers, take the bar away and lift the tank clear of the frame. Remove the two side panels and unscrew the air filter from the carburettor. Unscrew the nuts securing the carburettor, remove the washers, pull the carburettor off the studs and tie back out of the way. Remove the engine steady stay.

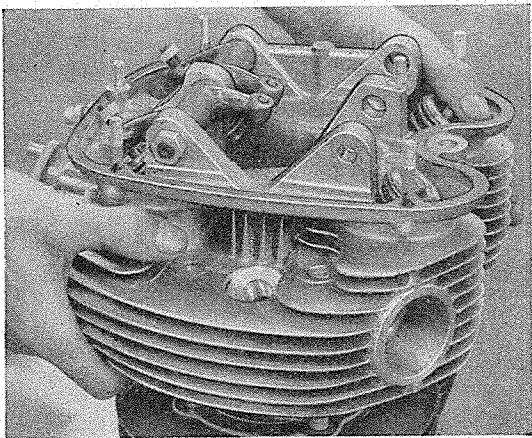
2



REMOVING THE HEAD

Slacken off the cylinder head nuts and bolts starting with the four long centre bolts then the short one in the push rod tunnel and finally the four nuts unscrewing each a little at a time to avoid distorting the head. When all the nuts and bolts are removed, break the joint by tapping the exhaust ports gently with a hide mallet, and lift the head clear. Do not disturb the inlet manifold, unless it is to be changed, or the gaskets are to be renewed. When twin carburetters are used they are fitted direct to the head and do not require a manifold.

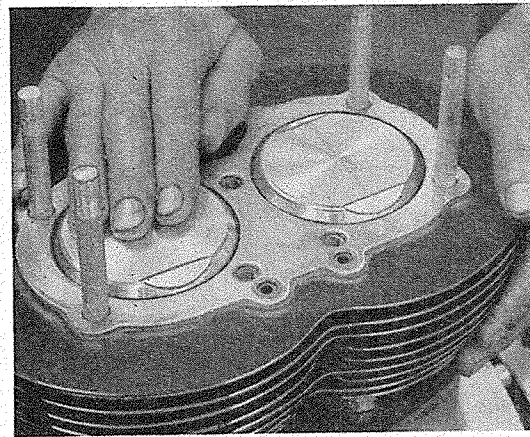
8



CYLINDER BLOCK

In the ordinary course of events it should rarely be necessary to remove the cylinder block, since top overhaul, already described, usually suffices to keep the machine in first-class working condition. In any case, this operation is difficult to carry out without the help of an assistant, and unless the condition of the engine indicates that the pistons, rings or cylinder bores require attention, the cylinder block should not be disturbed. Excess clearance can some times be detected with the fingers on top of the piston.

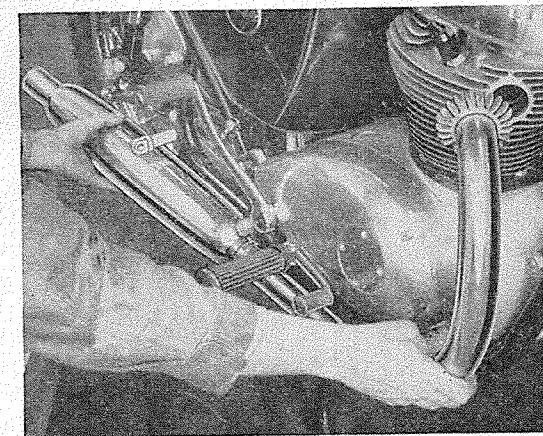
14



REASSEMBLY AFTER DECARBONISING

Having ground-in and replaced the valves and springs, replace the pistons on the connecting rod so that they are the same way round. Always use new gudgeon pin circlips and see that they are pressed right down into their grooves. If the circlips come adrift the cylinder will require replacement. Use a new cylinder base washer and support the pistons with two pieces of wood placed across the crankcase under the piston skirts.

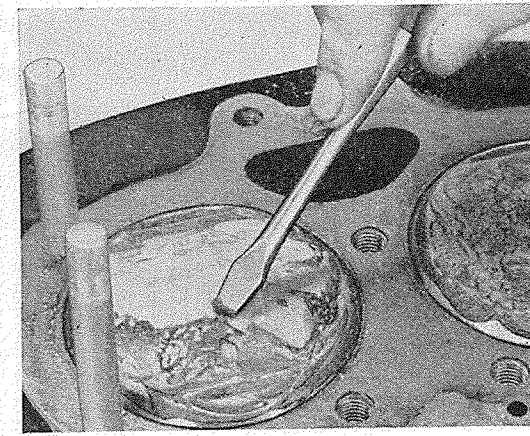
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3

REMOVE EXHAUST PIPES

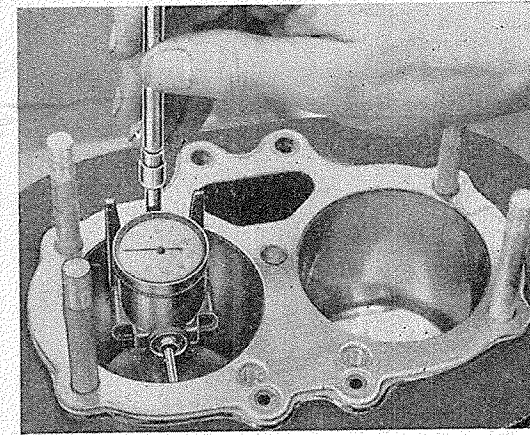
Remove the exhaust pipes and silencers by taking out the bolts securing the silencers to the brackets, and the bolts securing the pipes to the clips on the underside of the frame. If the exhaust pipes are tight in the head tap inside the curves with a hide mallet to release them. There is no need to disturb the exhaust pipe collars.



9

REMOVING CARBON

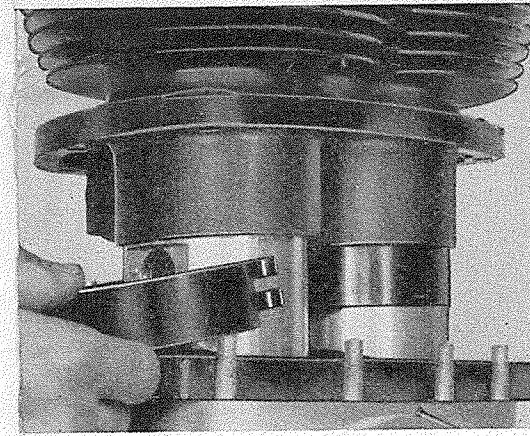
Rotate the engine by means of the kickstart lever until the pistons are at the top of the stroke, plug the push rod tunnel with clean rag, and proceed to remove the carbon deposit with a suitable scraper, taking care not to dig into the aluminium piston crowns. After scraping again rotate the engine, to lower the pistons and wipe all loose carbon from inside the cylinder bores but do not remove the hard ring of carbon at the top. Clean all traces of carbon from the cylinder head and valve ports. As the head is an aluminium casting, particular care must be taken not to damage the head or scratch the joint faces.



15

CYLINDER BORES

Symptoms indicating faulty piston rings might include heavy oil consumption, poor compression (but only if the valves are in good order; otherwise they are much more likely to be the cause) and excessive piston slap when warm. Piston slap may be due to worn bores, which can be checked without removing the block, if the pistons are moved to bottom dead centre, thus exposing the bores for examination and measurement.



21

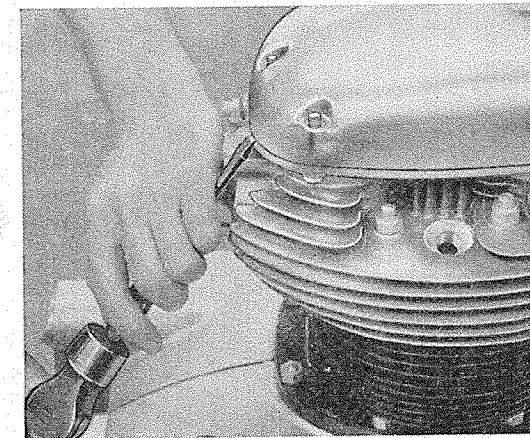
REPLACING THE BARREL

Apply a coating of clean engine oil to the pistons and position the ring gaps equally round the pistons. Using two piston ring slippers compress the rings so that they are just free to move then replace the cylinder barrel removing the slippers after the rings have entered the barrel. Take out the two pieces of wood to drop the barrel over the studs, replace the stud nuts and tighten down evenly to avoid distortion.

ROCKER BOX

Take off the six 1/2 in. nuts and plain washers holding the rocker box cover, break the joint by a light tap, and remove the cover, there are two projections at the rear of the cover to assist in its removal. The paper gasket between the joint faces is cemented to one side only and must be replaced when rebuilding. Disconnect the oil feed to the rocker box by unscrewing the union nut just above the inlet manifold.

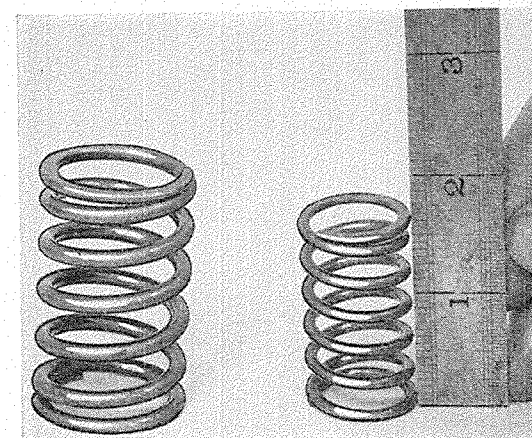
4



VALVE SPRINGS

Using Service Tool number 84 61-3340 compress the valve springs until the split collars can be removed. When the collars are out, the valve springs and top collar can be lifted from the valve stem. The springs may have settled through long use and should therefore be checked, the free lengths are inner, 1 1/2 in.; outer, 2 1/32 in. If the springs have settled more than 1/16 in. they should be replaced.

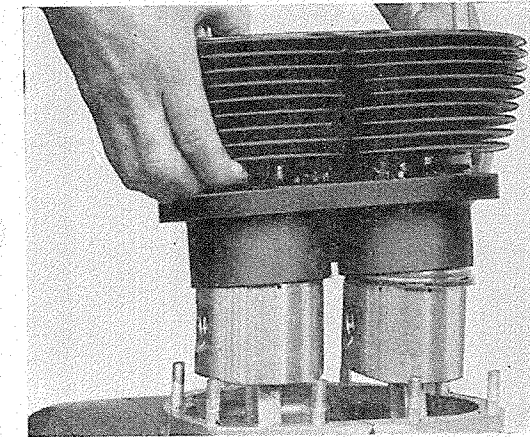
10



REMOVING THE BARREL

To remove the cylinder block, undo and remove the eight cylinder base nuts, turn the engine until the pistons are at bottom dead centre, and then, preferably getting astride the machine, carefully lift the block up until the pistons are clear of the bores. While this is being done, get an assistant to steady the pistons as they emerge and to relieve you of the weight of the block, so that it may be lifted clear. When the block is removed, cover the mouth of the crankcase with rag to prevent dust and grit falling in. To remove a piston from its connecting rod it is first necessary to take out one of the gudgeon pin circlips.

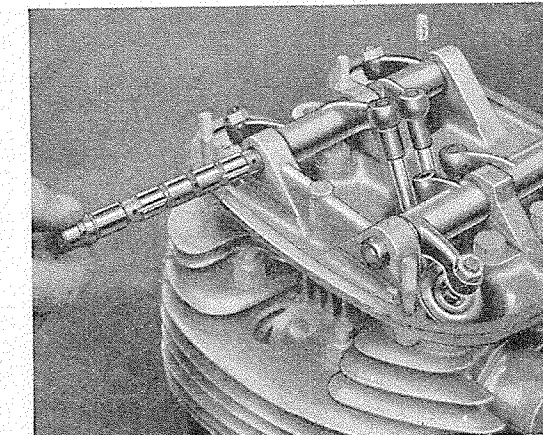
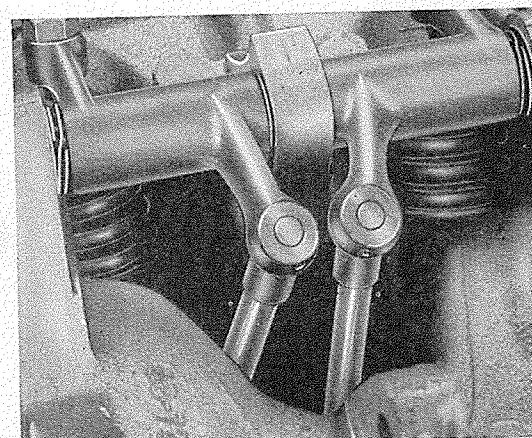
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REPLACING THE HEAD

Place the head gasket in position. Slacken off the inlet valve rockers completely and place the head in position over the four studs. Screw in the five cylinder head bolts and replace the four nuts and washers on the studs, tighten down each a little at a time criss-crossing the head from the centre outwards. Do not forget the short bolt inside the push rod tower, this bolt cannot be fitted with the push rods in position. When the head is finally pulled down replace the two short push rods on the two outer tappets and under the inlet (rear) rocker arms.

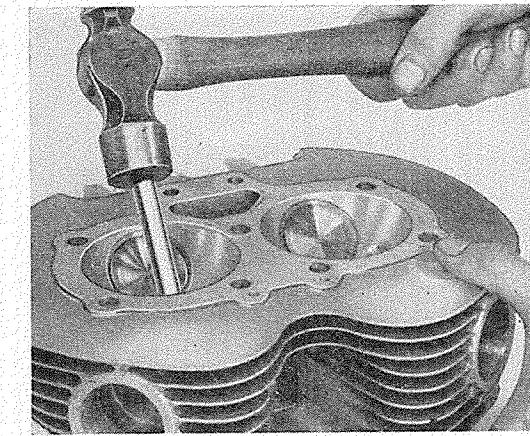
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5

EXHAUST ROCKER ASSEMBLY

The exhaust rocker assembly must be removed to obtain access to the front cylinder head bolts. Unscrew the nut holding the exhaust rocker shaft (at the front of the engine) and tap the shaft through towards the left-hand side leaving the rockers in position. Take careful note of the location of the spring and thrust washers, and remove the rockers from the head. From left to right the assembly should be:— Thrust washer Spring washer Centre post R/H rocker L/H rocker Spring washer Thrust washer Spring washers are always fitted next to the rockers, they must never be fitted next to the shaft pillars.



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VALVES AND GUIDES

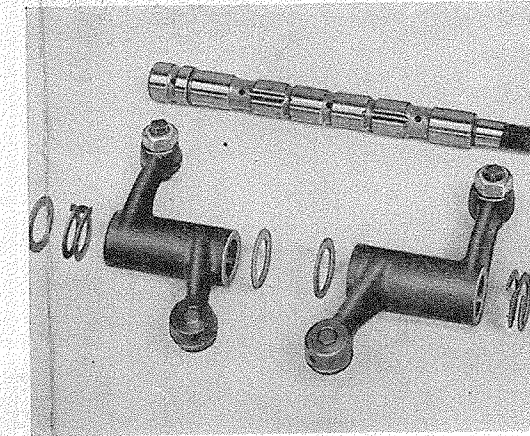
Check the valves in the guides, there should be no excessive side play or evidence of carbon build-up on the portion of the stem which operates in the guide. If wear is evident the valve and guide should be changed. Old guides can be driven out and new ones fitted with Service Tool number 81661-3382, but the aluminium head should always be heated in hot water before this is done. If new guides have been fitted or there are deep pit marks on the valve seats in the head, the seats must be recut, using Pilot Tool number 83661-3293, and Cutter number 85561-3299.



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REMOVING PISTONS

This is best accomplished with a pointed instrument such as the tang end of a file suitably ground. Before a gudgeon pin can be withdrawn it may be necessary to heat the piston with the aid of rags immersed in hot water, wrung out, and held round the piston. Then, supporting the piston, tap the gudgeon pin through, using a light hammer and a punch. When the piston is free, mark the inside of the piston skirt at the back, so that it can be replaced the correct way round and on the same connecting rod.



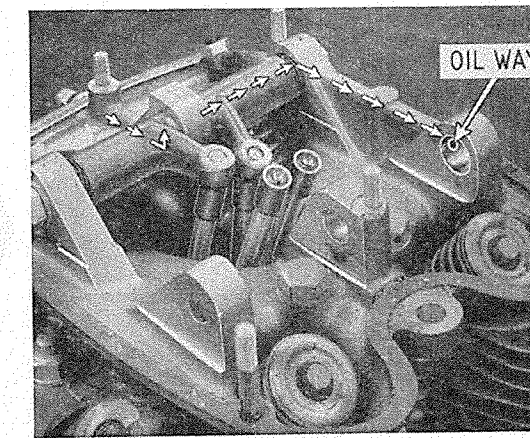
FINISHING OFF

Assemble the exhaust (front) rockers in the order detailed in paragraph 5, with the adjuster screws over the valves and fit the two long push rods on to the two inner tappets and under the exhaust rockers. Finally adjust the tappets and replace the rocker box cover. Correct tappet clearance is .008 in. .010 in. Complete the work by replacing the carburettor, petrol pipes, engine steady stay, rocker oil feed, petrol tank etc.

ROCKER LUBRICATION

The rocker shafts are interchangeable but there is no need to disturb the inlet shaft, except for replacement purposes or if there is doubt about the oil supply to the rockers. Oil is fed to the inlet centre post, through the drillings, then through the inlet shaft via an annular groove and axial drilling to the left-hand post, then through another oilway to the left-hand exhaust post and the exhaust rocker shaft. It is therefore essential that these oilways are kept free from obstruction, test by blowing or forcing oil through under pressure.

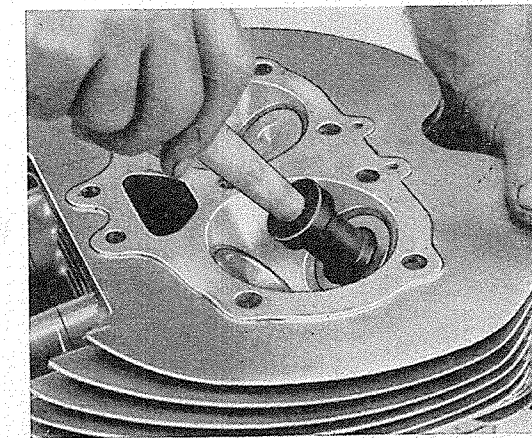
6



GRINDING-IN VALVES

When pitting in the valve heads is deep, they should be refaced, or, in serious cases, replaced. The valves can then be ground-in with fine grinding compound, each valve to its own seat. Smear a small quantity of grinding compound (obtainable from any garage) over the face of the valve and return the valve to its seat. Hold the valve with the tool number 1465-7240 and rotate the valve backwards and forwards maintaining a steady pressure.

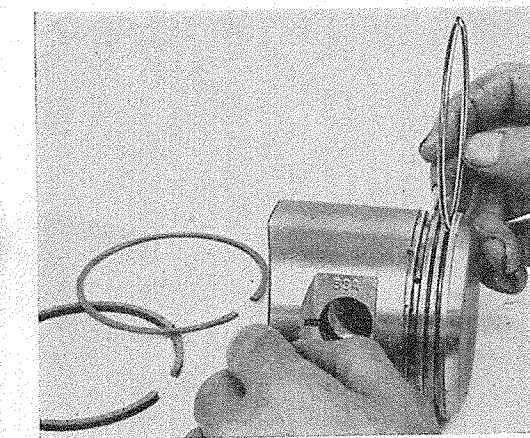
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PISTON RINGS

If the rings are stuck in their grooves they will need to be carefully prised free and removed from the piston. All carbon deposit should be carefully scraped from the grooves and the inside edges of the rings. If any of the rings show brown patches on the surface, replace with a new ring. Check the ring gaps by inserting each piston in its bore and sliding each ring independently up to the skirt of the piston. Check the gap with a feeler gauge. This should not be less than .010 in. or more than .013 in. for the two upper rings, and .008 in. and .011 in. respectively for the bottom ring, which is the slotted scraper ring. Fit new rings if the gap greatly exceeds the figure stated.

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USEFUL INFORMATION

Perfect cleanliness is essential to ensure success in any service task, so, before starting the job, make sure that you have a clean bench or working area in which to operate and room to place parts as they are removed.

TOOLS REQUIRED

Spanners from 3/16 in. to 3/4 in. Whit. Scrapers and fine emery cloth. Set of feeler gauges. Supply of jointing compound, grinding paste and clean engine oil. Two pieces of hardwood 9 in. long x 3/4 in. square.

SPARES REQUIRED

Top overhaul gasket set for 500 c.c. No. 11900-3157 Top overhaul gasket set for 650 c.c. No. 11900-3158 Gudgeon pin circlips (set). No. 40266-0954 Valve springs (set). No's 11040-0169 and 11568-0475