

GROUP M ENGINE

M 1, Removing and refitting engine

- Fig. 1 Tools: Wheel nut spanner, screw-driver, electrical screw-driver, socket spanners 10/12/14 mm with universal joint, 12-point ring spanner 10/14 mm, open ended spanners 7/11/14 mm, ratchet wrench, plastic mallet, flat pliers.
- Fig. 2 1. Turn off the petrol tap, remove seat and backrest.
2. Disconnect the negative lead from the body. (socket spanner 10 mm)
3. Disconnect the wires from the cable connector group. (blue, green and black-brown) (electrical screwdriver)
- Fig. 3 4. Remove wheel cover plates from rear wheels and slacken wheel nuts. (screwdriver, wheel nut spanner)
5. Support the vehicle on the rear.
6. Remove the two rear wheels. (wheel nut spanner)
7. Remove engine covering panel and detach starter. (open ended spanner 7 mm)
8. Detach ignition coil and withdraw high-tension cable. (socket spanner 10 mm)
9. Draw the three disconnected wires (job 3) outwards.
10. Remove the two mudguards (fenders). (socket spanner 10mm)
- Fig. 4 11. Detach petrol pipe from carburetor.
12. Remove clamp securing the hose connection toward the air silencer. (flat pliers)
- Fig. 5 13. Unscrew carburetor cover assembly, withdraw throttle slide and envelop it in a cloth.

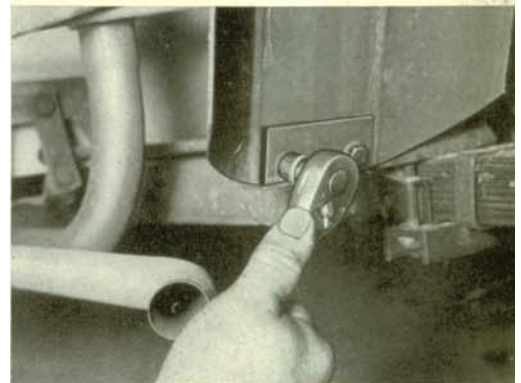
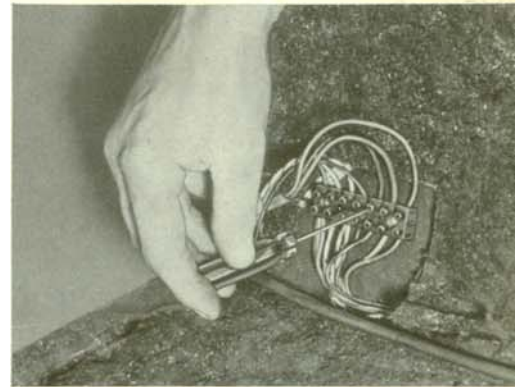
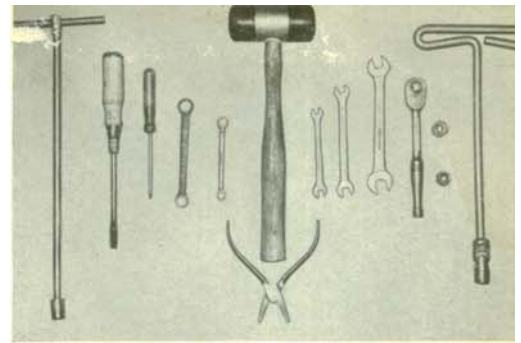


Fig. 6 14. Remove carburetor starter slide (choke piston) and wrap it in a clean cloth. (open ended spanner 11 mm)

15. Detach exhaust flange from engine. (socket spanner with universal joint 12 mm)

16. Disconnect the silencer from its rear attachment. (socket spanner 10 mm with ratchet, ring spanner 10 mm for counteracting on unscrewing)

Fig. 7 17. Slacken the two upper rubber mountings on carrier and clutch flange. (socket spanner 14 mm with universal joint, ring spanner 14 mm, open ended spanner 14 mm)

Caution: When refitting the two upper rubber mountings after joining engine and transmission, engage them first on the gearbox flange and then on the engine carrier. Before connecting the earth (ground) lead polish the contact spots.

18. Remove the lower pair of the four screws fixing gearbox to engine. (ring spanner 14 mm)

Fig. 8 19. Slacken the two lower rubber mountings, right and left. (socket spanner 14 mm with ratchet)

Fig. 9 20. Support the engine on the knees for removal, remove the two rubber mountings and applying slight taps with a plastic mallet withdraw engine from transmission. Down transmission to the frame.

Fig. 10 Caution: When refitting lift transmission correspondingly and engage engine on the four gearbox fixing screws.

The refitting is carried out in precisely the reverse order.

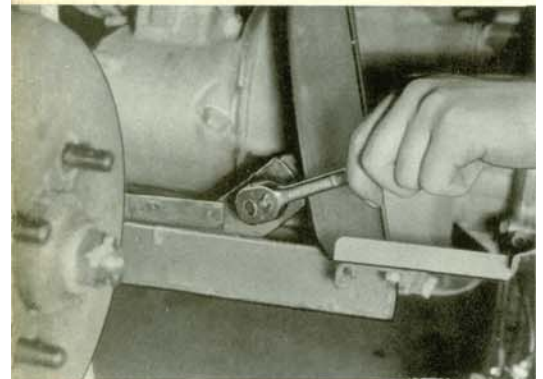
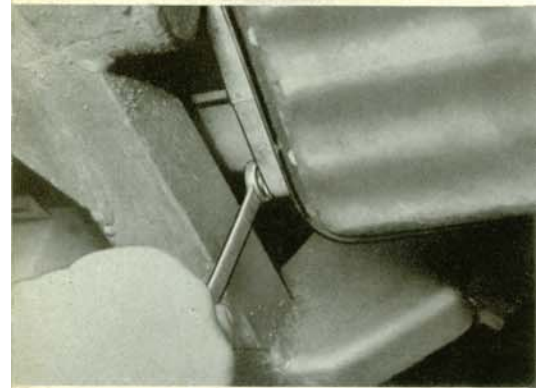
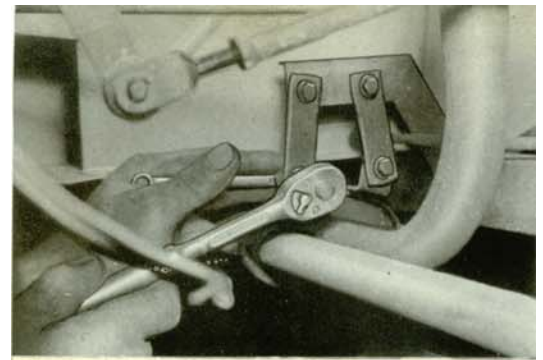
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M 2, Removing and refitting engine
with transmission

The body is removed

Fig. 11 Tools: Open ended spanners
10/12/14 mm, socket
spanner 14 mm with univer-
sal joint, ring spanner
14/17 mm, screwdriver
6 mm, pliers for cotter
pins.

Fig. 12 1. Slacken clamp securing exhaust
tube beneath the silencer, push
exhaust tube rearwards.
(open ended spanner 10 mm)

Fig. 13 2. Remove cotter pin on both gear
selector rods on transmission,
remove bolts and take off selec-
tor rods. (cotter pin pliers)

3. Slacken locknut for clutch ad-
justment, turn adjusting nut
fully in, press clutch lever on
and unhook the Bowden wire.
(open ended spanner 12 mm)

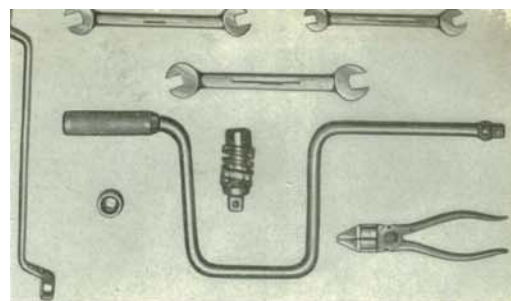
Fig. 14 4. Adjust clutch, unscrew nut
fully out of the lever, remove
pressure spring on clutch lever.

5. Remove throttle slide from car-
buretor.

Fig. 15 Caution: Wrap throttle slide in
a clean cloth and tie it up on
the frame by means of an insu-
lating tape. Put a clean cloth
in the carburetor.

6. Remove air duct rubber elbow
from carburetor by loosening
the securing clamp.
(screwdriver 6 mm)

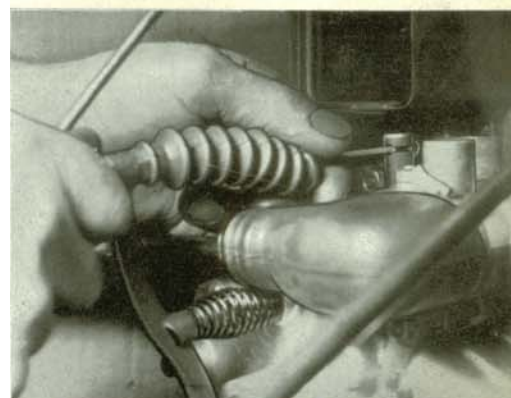
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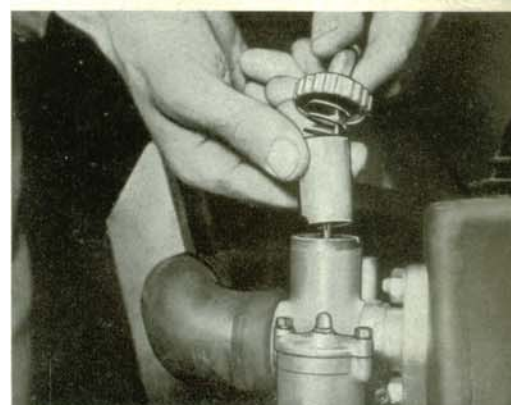
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Fig. 16. 7. Detach silencer from engine. Three nuts on cylinder head, two nuts on top and bottom of transmission. (socket spanner with universal joint 14 mm)

8. Remove nuts from three bolts on the universal joint at gear-box end.
(ring spanner 17 mm and open ended spanner 17 mm for counteracting on unscrewing)

Attention: These three bolts must be removed that secure the rubber ring to the three-arm drive flange on gearbox shaft.

Fig. 17. 9. Remove the two lower engine fixing screws on the rubber mountings, right and left.
(Open ended spanner 14 mm)

Fig. 18. 10. Slacken the four upper engine fixing screws at right and left.
(ring spanner 14 mm)

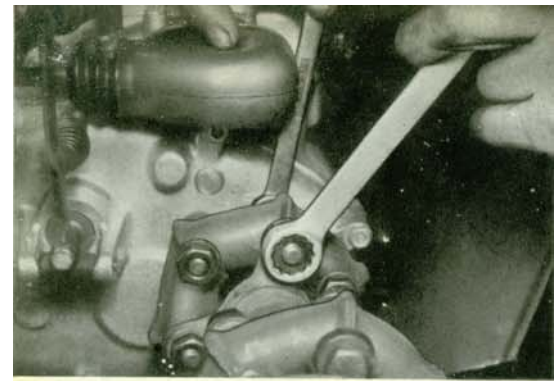
Fig. 19. Attention: One screw will be left on either side and not removed completely unless the assistant holds the engine for removal. On refitting don't forget the earth (ground) lead. Polish the contact surface.

11. Raise engine, remove the fixing screws from the upper carrier and withdraw the engine from the universal joint.

Fig. 20. Attention: When installing engine have it raised by an assistant and enter the tree bolts on the universal joint.

Then only screw in the two lower engine fixing screws on the rubber mountings and thereafter the four upper engine holding screws. The further refitting is carried out in reverse order to that indicated for removal.

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M 3, Removing and refitting clutch

Engine is removed following
M 1 or M 2.

- Fig. 21 Tools: Socket spanners 10 and 14 mm, ring spanner 14mm, two clamping screws for clutch, No. 357, centering arbour for clutch, No. 529.

- Fig. 22 1. Detach gearbox from engine housing. (4 nuts with socket spanner 14mm and ring spanner 14 mm)

Caution: The two upper engine fixing screws must not be slackened.

- Fig. 23 2. Remove clutch unit. (socket spanner 10 mm)

Caution: To release clutch unit and to compress it on refitting use two clamping screws for clutch reassembly Matra 357 from the tool set for motor-cycles.

Caution: For refitting clutch unit employ clutch centering arbour No. 529.

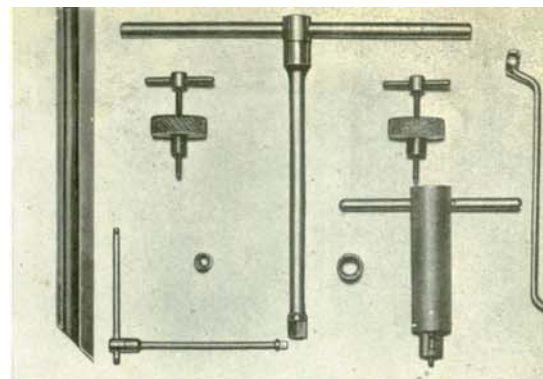
- Fig. 24 3. With the aid of a straightedge check driven disc and pressure plates for distortion.

- Fig. 25 Caution: If the clutch disc is worn or the pressure plates warped (blue coloured) replace the parts in question.

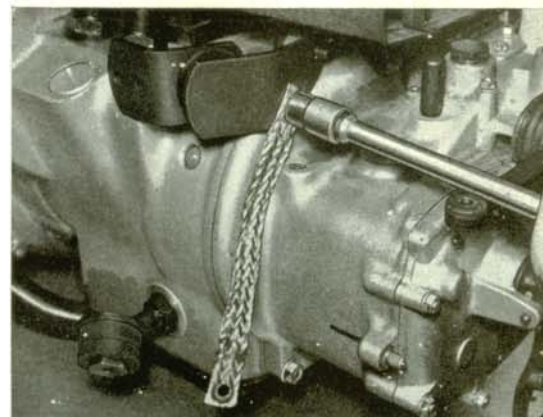
Caution: On reassembly of clutch make certain that the protruding part of driven disc hub shows outwards. The plain (unchamfered) face of clutch pressure plate must press against the driven disc. Position of clutch parts.

The reassembly is carried out in precisely the reverse order.

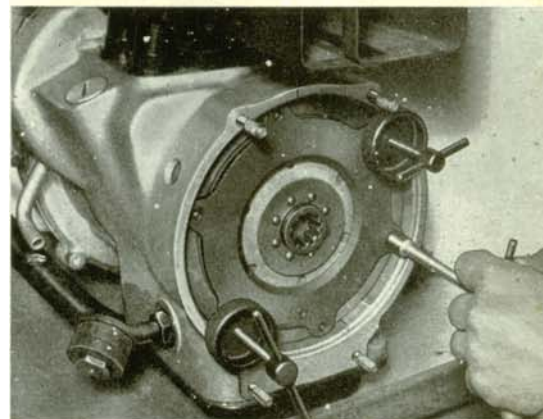
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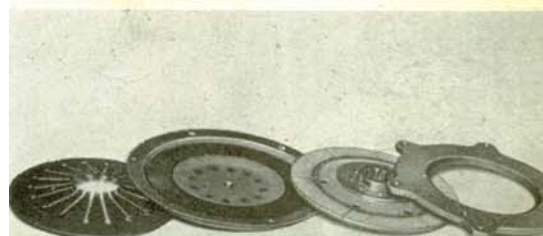
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M 4, Readjusting clutch

M 6, Basic adjustment of clutch

- Fig. 26 Tools: Two open ended spanners
12 mm, socket spanner
10 mm, feeler gauge 0.2mm
(.008")

M 4, Readjusting the clutch
(in vehicle)

- Fig. 27 1. Slacken locknut of clutch adjusting screw.
(Two open ended spanners 12mm)

2. Unscrew clutch adjusting screw out of the clutch lever until the free movement at the clutch pedal pad is about 15 mm (.6 in.). (Clearance between clutch actuating screw and clutch rod about 0.2 mm = .008 in.).

M 6, Basic adjustment of clutch

(engine and transmission are refitted upon the frame)

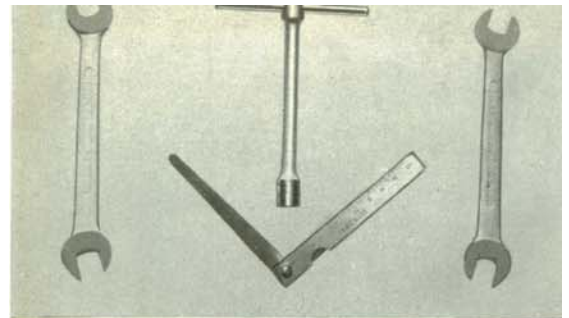
- Fig. 28 1. Adjust the clutch adjusting screw so that the clutch rod flushes with the surrounding plain cast portion of transmission case.

- Fig. 29 2. If this position cannot be reached with the adjuster, alter the shims behind the adjusting screw until the thrust unit of clutch actuating mechanism flushes correctly.
(socket spanner 10 mm)

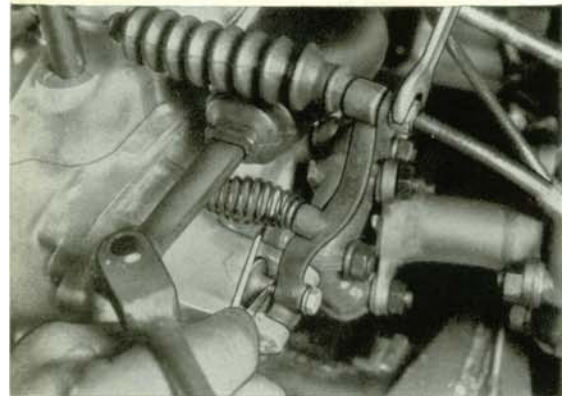
- Fig. 30 3. Adjustment of pedal clearance as per M 4. (two open ended spanners 12 mm)

Caution: The clutch being correctly adjusted and the adjusting screw completely screwed-in the clearance between the thrust unit and the clutch actuating screw must be 0.2mm = .008 in. and the free movement at the clutch pedal pad about 15 mm = .6 in.

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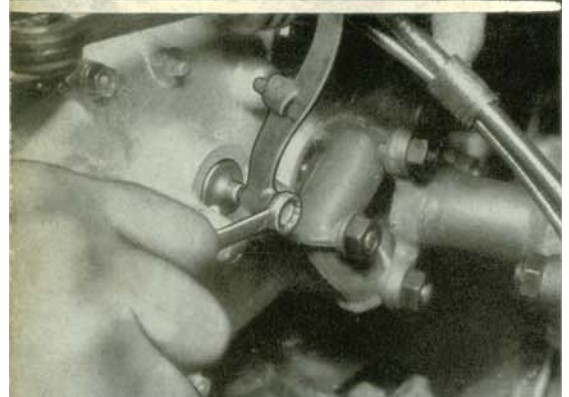
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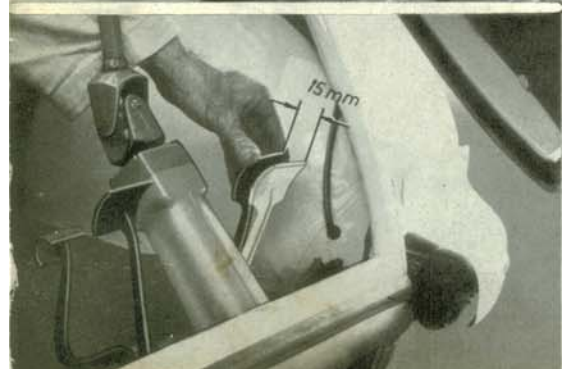
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M 9, Dismantling and reassembling engine

Fig. 31 Tools: Open ended spanners 9 and 14 mm, ring spanners 19 and 27 mm, socket spanners 14/17/36 and 10 mm, screwdrivers 6/8 and 10 mm, torque spanner, hammer, chisel, pointed pliers, wooden piece, plastic mallet, flywheel fixture No. 498, puller screw for blower wheel No. 527, puller screw for armature No. 528, puller No. 299 with compensating ring No. 299a, piston board, heating sleeve for piston, gudgeon pin drift No. W 5002, gudgeon pin puller, camshaft puller No. 355, flywheel puller No. 311.

- Fig. 32 1. Fit engine upon support stand. (open ended spanner 14 mm)
2. Drain engine oil. (ring spanner 19 mm)
3. Disconnect ignition coil connections from terminals 1 and 15. (open ended spanner 9 mm)
4. Remove ignition coil with holding bracket. (socket spanner 10 mm)
- Fig. 33 5. Remove carburetor. (open ended spanner 14 mm)
6. Remove rocker covers. (open ended spanner 14 mm)
7. Remove the baffle assemblies of air cooling arrangement.
- three slotted head screws, front
 - two slotted head screws bottom
 - one slotted head screw, rear top
- (screwdriver 6 mm)
8. Remove cap covering the dynamo-starter assembly. (screwdriver 6 mm)
9. Remove blower housing, four slotted head screws. (screwdriver 8 mm)
10. Apply flywheel fixture No. 498. (open ended spanner 10 mm)

Fig. 34 11. Remove blower wheel fixing screw. (socket spanner 17 mm)

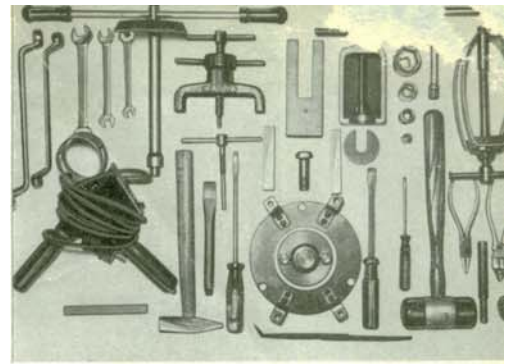
Fig. 34 12. Remove blower wheel with the aid of screw-type puller No. 527.

Fig. 35 13. Remove frame and field coil assembly of dynamo-starter unit, four slotted head screws (screwdriver 8 mm)

Caution: When assembling the generator and starter unit release the carbon brushes from spring pressure by withdrawing the springs and push brushes back to avoid damaging them.

14. Remove armature with the aid of screw-type puller No. 528.

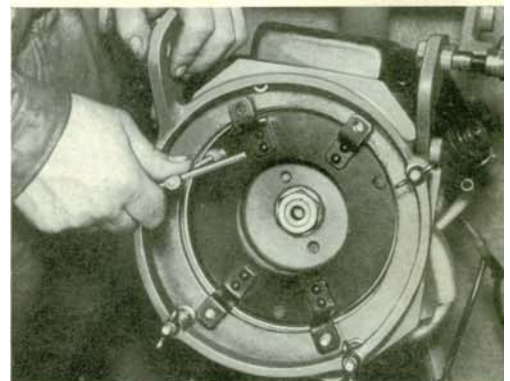
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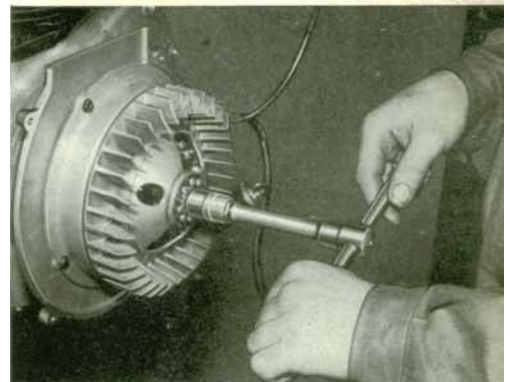
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Fig.
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15. Remove spring washer from crankshaft journal.
(screwdriver 6 mm)

16. Unscrew nuts and screws securing camshaft drive covering unit.
3 screws 10 mm
6 nuts 10 mm
1 countersunk screw
(open ended spanner and socket spanner 10 mm, screwdriver 8 mm)

Caution: Don't forget the countersunk screw on right-hand border of housing.

Fig.
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17. Remove timing cover by tapping it off with the aid of a wooden tool.

Caution: The wooden tool must not be applied on the front flange of housing, but on the base of this unit (figure 37). At the opposite side apply tool upon the rib between flange and base of the casting. Never try to enter a screwdriver between the castings. If the housing is too tight to tap it apart, heat it slightly.

Fig.
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18. Withdraw ball bearing from crankshaft. (puller No. 299 with compensating ring No. 299a)

Caution: When removing with compensating ring and refitting with tube piece grasp ball bearing inner race only. Before refitting heat ball bearing on a heating plate up to about $60^{\circ}\text{C} = 140^{\circ}\text{F}$.

Fig.
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19. Remove rotary valve on breather unit.

20. Open chain lock.

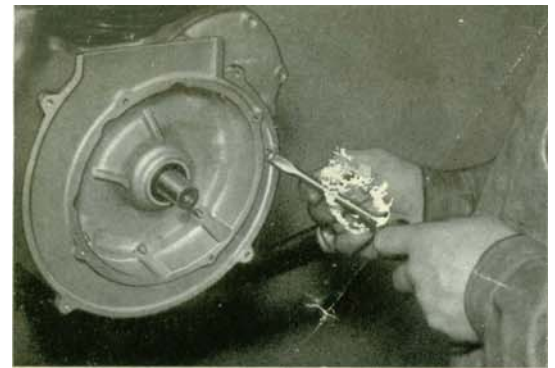
Caution: When refitting chain make sure that the closed end of chain lock cotter regards in direction of chain rotation, so that the camshaft sprocket turns in a clockwise direction.

Fig.
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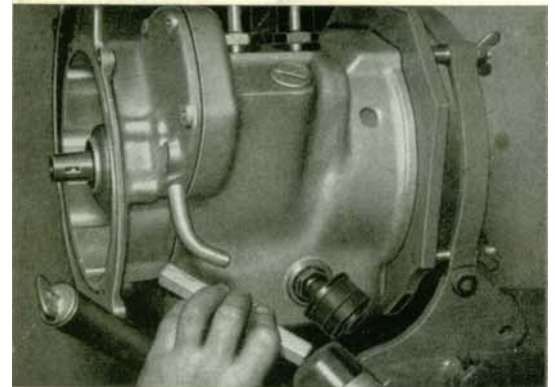
21. Unscrew cylinder head holding-down screws (4 thorough screws carrying the rocker assemblies) and remove cylinder head.
(socket spanner 14 mm)

Caution: When assembling tighten cylinder head with the aid of a torque spanner to 3.5 mkg = 25.3 ft. lbs. Tighten screws evenly in a diagonal order.

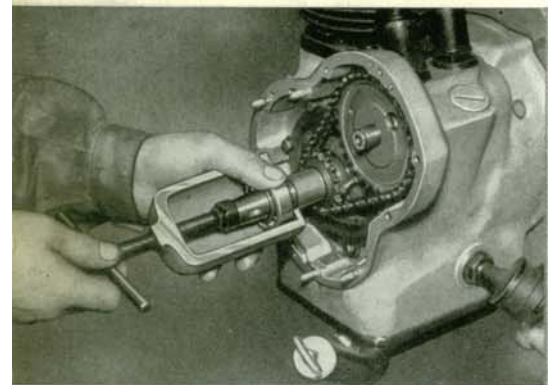
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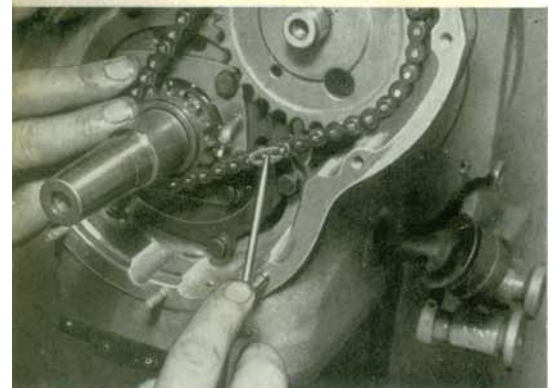
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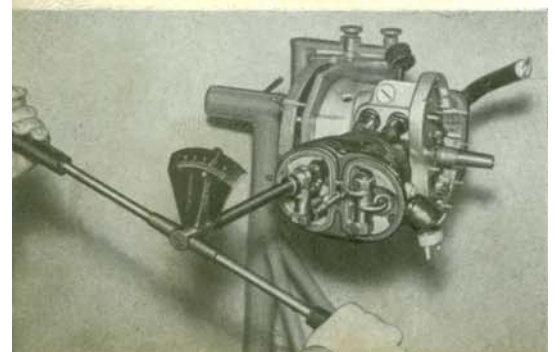
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Assembling the engine

Fitting chain and adjusting camshaft drive

1. Set the piston on T. D. C.

Caution: To replace timing chain without engine removal set engine on T. D. C. through the inspection hole machined in engine crankcase. The arrow engraved in flywheel must register with the dash on housing.

- Fig. 41 2. Rotate camshaft to its overlap dead center position. A straight-edge placed upon the pushrods must be parallel to the joint face of cylinder head.

- Fig. 42 Caution: When refitting chain without engine removal apply a punch mark. The third tooth of camshaft sprocket, counted from the drill hole for the driven peg to the left, must shown vertically downwards.

- Fig. 43 3. Return camshaft sprocket and engage chain on top.

- Fig. 44 4. Rotate camshaft sprocket to the right and engage chain upon crankshaft sprocket in the punch marked position (T. D. C. position).

- Fig. 45 5. With the aid of an appropriated tool bring chain members together and push the free chain member upon the lock member.

6. Place chain lock in position.

7. Fit chain lock cotter with the closed end in direction of rotation.

Caution: To compensate chain tension there are provided three different lengths and colours marks for identification purposes: Blue = short chain, red = middle chain, green = long chain. The fitted chain must not show more than 3 mm (.12") of play (slack) when applying thumb pressure. Fit chain of corresponding length with the colour mark outward.

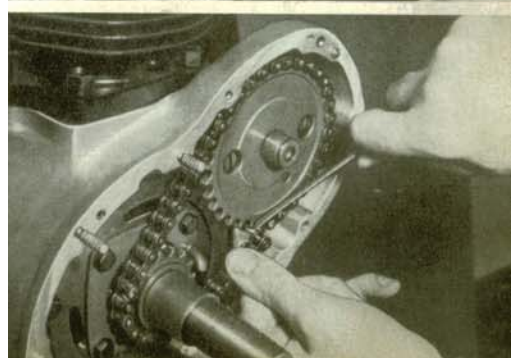
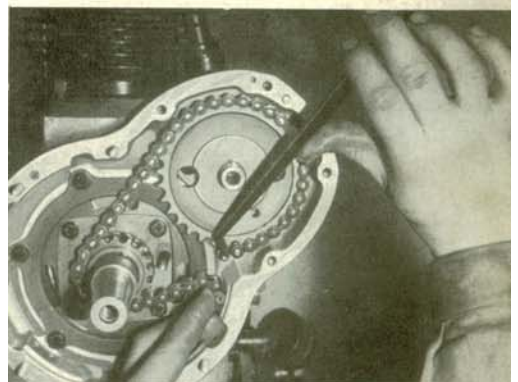
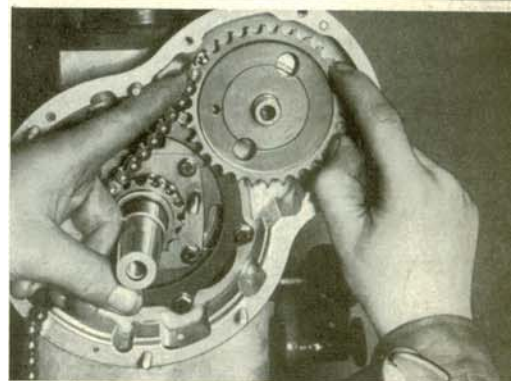
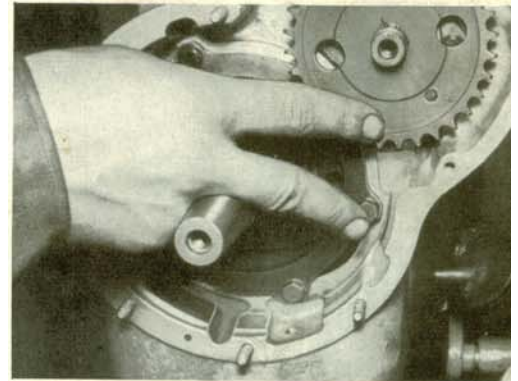
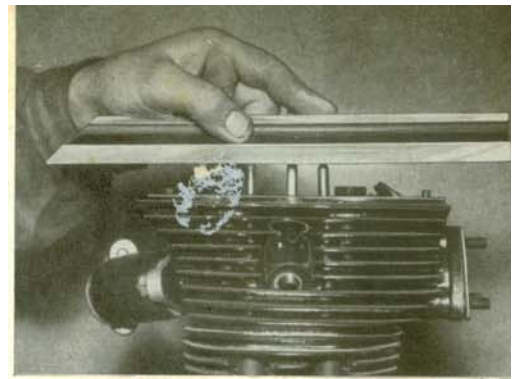
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Further dismantling

- Fig. 46 22. Withdraw push rods.
23. Slacken cylinder base clamping nuts. (open ended spanner 14mm)

24. Insert piston board.

25. Remove gudgeon pin retaining circlip. (pointed pliers)

26. Heat piston with heating sleeve up to about $60^{\circ}\text{C} = 140^{\circ}\text{F}$ and press out gudgeon pin (electric heating sleeve, gudgeon pin drift).

- Fig. 47 Caution: If the piston pin does not come out by thumb pressure, do not tap, but apply piston pin remover device.

- Fig. 48 Caution: Always assemble pistons and pins bearing the same colour marks for identification purposes. When assembling piston heat same upon heating plate or in oil up to $60^{\circ}\text{C} = 140^{\circ}\text{F}$ and warm gudgeon pin slightly.

27. Remove tappets.

Caution: Identify the tappets by tags so that they can be correctly reinstalled in the same position and location.

28. Unscrew plug giving access to the oil pump drive.

29. Remove oil pump drive.

- Fig. 49 30. Enter screwdriver through the two holes in camshaft sprocket in order to remove the two screws fixing the camshaft bearing holding bush. (screwdriver 10 mm)

31. Remove camshaft with the aid of camshaft puller No. 355.

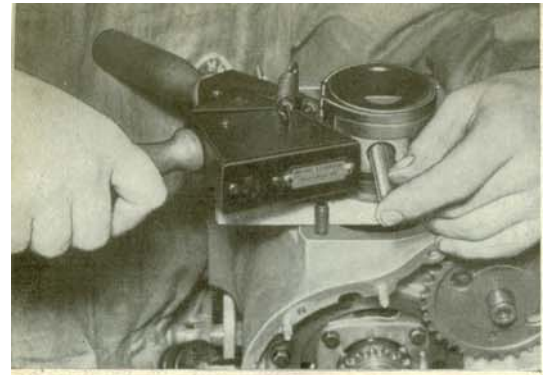
Caution: Handle camshaft carefully to prevent it from hurting.

- Fig. 50 Caution: When refitting make certain that the camshaft sprocket aligns with the crankshaft sprocket so that the timing chain runs correctly. Eliminate an eventual misalignment by pressing camshaft sprocket a bit more inwards.

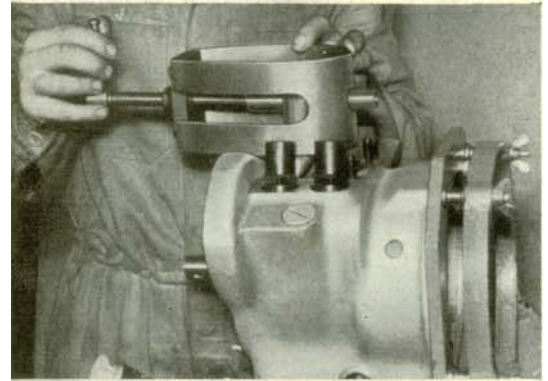
32. Remove two screws from crankshaft front bearing cover plate. (socket spanner 10 mm)

33. Remove crankshaft sprocket. (puller No. 299)

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Caution: To refit the sprocket heat it to about $150^{\circ}\text{C} = 300^{\circ}\text{F}$, tilt engine and slide sprocket on vertically standing shaft downwards.

34. Detach oil sump.

(socket spanner 10 mm)

35. Remove oil pump, straighten bent ears of lock washer and remove two screws.

(hammer, chisel, socket spanner 10 mm)

36. Straighten locking lugs on fly-wheel nut lock washer.

(Hammer, chisel)

Caution: When refitting bend lock washer slightly before installation to facilitate completion of bending on the fitted washer.

Fig. 51 37. Unscrew flywheel nut from flywheel blocked previously by fixture No. 498 (see No. 10 to 23).

Caution: To screw on the nut place turned surface towards the flywheel and check flywheel for tight fit by moving it to and fro. If the tapered shaft end does not fit well give it a short lapping treatment. After installation check flywheel clutch face squareness and out-of-round of crankshaft end with the aid of a dial gauge. Max. out-of-squareness 0.08 - 0.1 mm = .0032" to .004".

Fig. 52 38. Remove flywheel. (flywheel puller No. 311, ring spanner 27 mm)

Fig. 53 Caution: When assembling make certain that the flywheel key does not sit upon flywheel.

39. Remove 5 screws fixing flange of front bearing cover plate. (socket spanner 10 mm)

Fig. 54 40. Heat engine crankcase on a plate or in an oven up to about 100 to 120° C = 210 to 250° F.

Fig. 55 41. Place connecting rod so that the big end stands at the recess machined in right-hand border of crankcase aperture and remove crankshaft by turning it slightly upwards.

42. Immediately thereafter expel camshaft bearing by pushing the warm crankcase against a hard wood plate (work-bench).

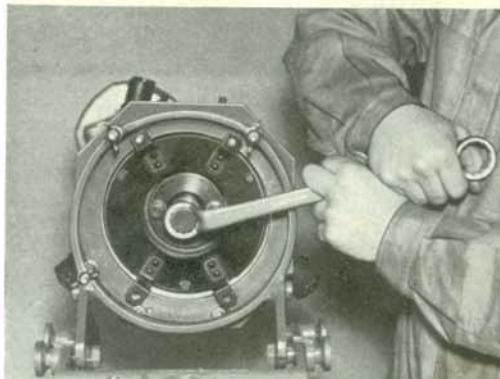
The reassembly is carried out in precisely the reverse order.

For individual treatment of connecting rod, piston, valves, crankshaft and oil pump see under M 12, M 14, M 20, M 24 and M 26

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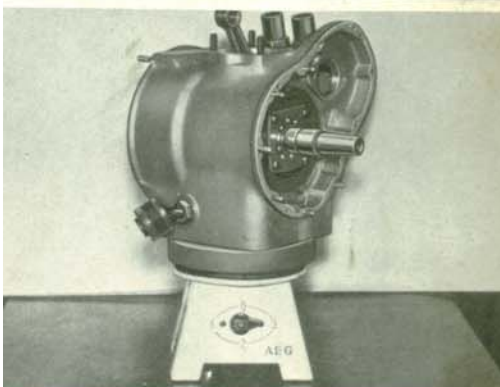
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M 12 Replacing connecting rod bushing

(Engine is removed, cylinder and piston are dismounted from engine, gudgeon pin bushing is pressed in)

- Fig. 56 Tools: Hunger reaming tool for rod bushings, socket spanner 14 mm, ring spanner 14mm, parallels for alignment of connecting rods L 5036, drift for gudgeon pin W 5002, feeler gauge.

- Fig. 57 1. Install Hunger reaming tool and fix it with two nuts 14 mm. (socket spanner 14 mm)
2. Slacken eccentric shaft and align small end with tapered end of reaming tool. (ring spanner 14 mm)

- Fig. 58 3. Tighten eccentric shaft. (ring spanner 14 mm)
4. Ream rod bushing with reaming tool. (socket spanner 14 mm)

Caution: Seal crankcase well with rags.

- Fig. 59 5. Enter gudgeon pin and check position of connecting rod with the aid of two parallels and feeler gauge or by means of a visual test. (2 parallels L 5036, feeler gauge)

Caution: If the connecting rod must be straightened, apply the two rod straightening tools only on the upper third of connecting rod. A correct and careful treatment of the rod bushing obviates any further alignment.

- Fig. 60 6. Heat piston on a plate or in oil up to $60^{\circ}\text{C} = 140^{\circ}\text{F}$, warming gudgeon pin slightly at the same time.

7. Enter piston pin with the aid of drift. (gudgeon pin drift W 5002)

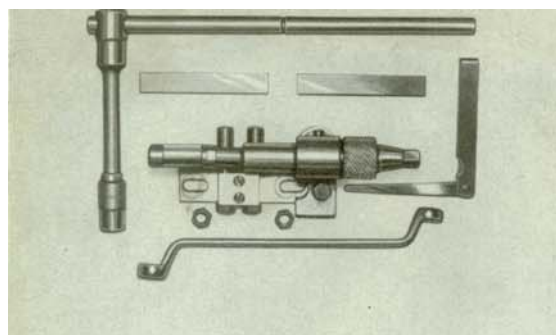
Caution: Place piston in correct position, arrow on top of piston must regard in direction of the timing case.

Caution: When fitting a new piston and pin assembly use always items bearing the same identification colour marks.

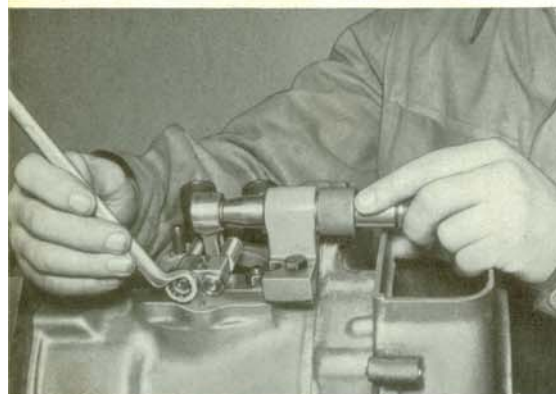
M 14 Installing new cylinder

(Old cylinder is removed, new piston fitted)

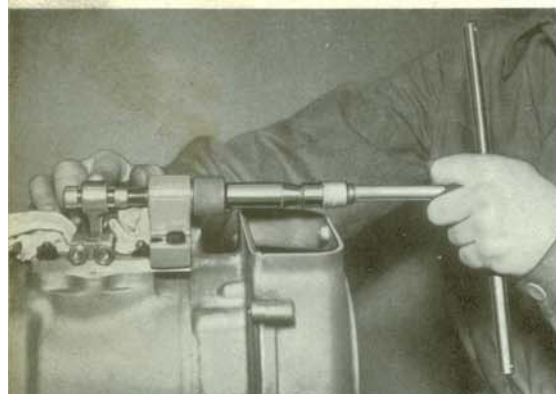
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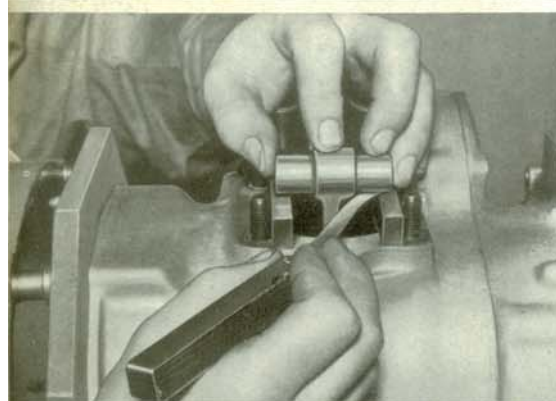
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Fig. 61 Tools: Piston ring compressor, piston board, drift to adapt pushrod covering tubes No. 530, open ended spanner 14 mm, hammer.

1. Place cylinder base gasket upon crankcase, rough side towards housing.

Fig. 62 2. Protect piston by piston board and compress piston rings by means of the piston ring compressor. (piston board, piston ring compressor)

Caution: Oil piston and rings around.

Fig. 62 3. Adapt the cylinder and slide it down together with the piston ring compressor.

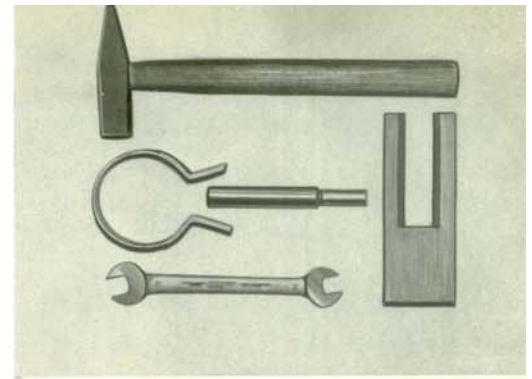
Fig. 63 Caution: Make certain that the rubber grommets on the tappet guides engage well and fit evenly upon these units.

Fig. 64 4. Replace cylinder base nuts and tighten them in a diagonal order to secure even tightness. (open ended spanner 14 mm)

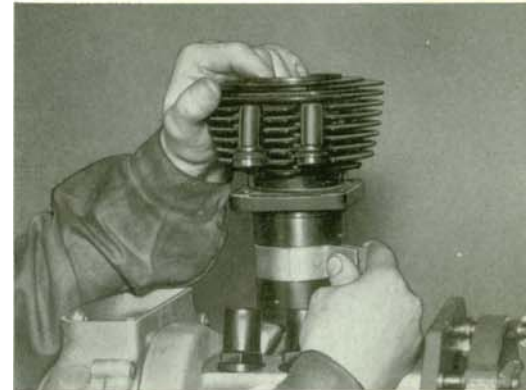
Caution: After a short operation period tighten the four base nuts again.

Fig. 65 5. In case a gap is left between rubber grommet and tappet guide tap the pushrod covering tube slightly down by means of the special drift No. 530.

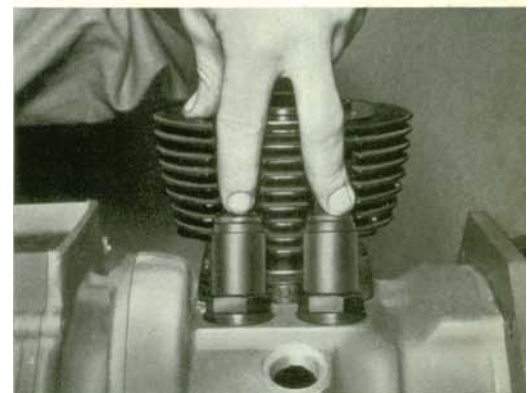
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M 20 Adjusting valves

Fig. 66 Tools: Ring spanner 14 mm, open ended spanner 2x12 mm, feeler gauge 0.15/0.20mm, sparking plug spanner.

Fig. 67 1. Remove screw plate giving access to sparking plug and valves.

2. Withdraw shielded terminal of high-tension lead and unscrew sparking plug. (spark plug spanner)

3. Remove rocker covers. (ring spanner 14 mm)

4. Set engine by rotating the blower wheel to T.D.C. compression, in which position the two valves are closed.

Fig. 67 5. Slacken locknut of valve clearance adjusting screw. (2 open ended spanners 12 mm)

Fig. 68 6. Using feeler gauge check valve clearances, 0.15 mm = .006" for intake valve at left (timing case side), and 0.2 mm = .008" for exhaust valve at right (fly-wheel side). (feeler gauge)

Fig. 69 7. To adjust the clearance, if it is found to be incorrect, screw adjuster pin up or down as required until the correct amount of play is felt. The feeler gauge must slide easily between rocker end and valve stem when being drawn for and aft.

8. Secure obtained position of adjusting pin by tightening the locknut.

9. When locknut is properly tightened, check the play again with the feeler gauge, to make certain that it has not been altered while tightening the nut. Rectify the play if necessary.

10. Check rocker cover gasket, and if it is found to be worn, discard it.

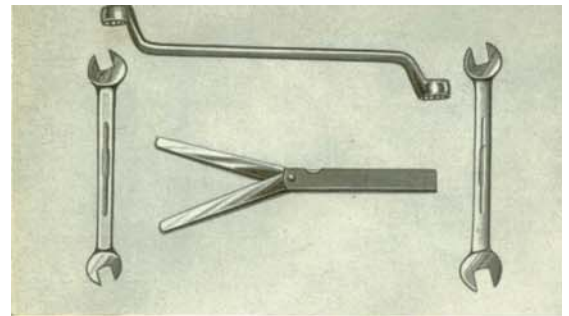
Fig. 70 11. Replace rocker covers.

Caution: Be sure to install rocker covers in a way that the cover locating pins on the cylinder head fit correctly in the corresponding drill holes in rocker covers. This is necessary to ensure freedom from distortion and consequent oil leakages. (ring spanner 14 mm)

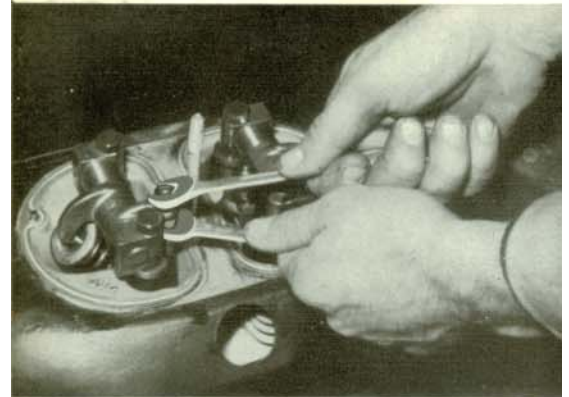
13. Replace sparking plug and shielded terminal of high-tension lead.

14. Replace inspection aperture cover plate.

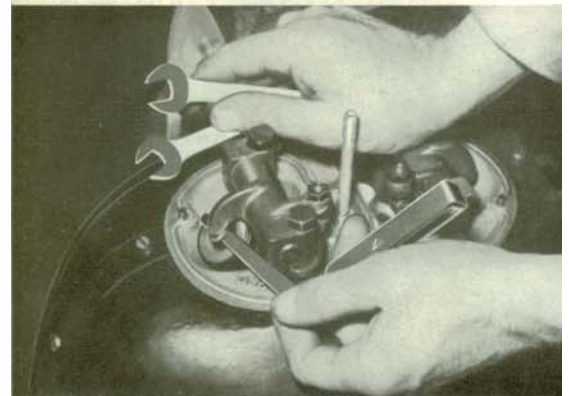
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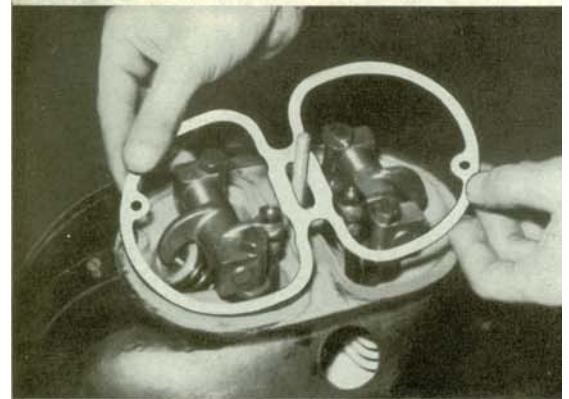
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M 22 Overhauling cylinder head

(Cylinder head is removed)

Fig. 71 Tools: Holding board for intake and exhaust valves No. 361a, valve spring lifter V 5034, valve reseating tool Hunger, valve grinding equipment, scriber, hammer, drift, heating plate.

Fig. 72 1. Place cylinder head upon wooden block.
(holding board No. 361a)
2. Install valve spring lifter.
(tool V 5034)

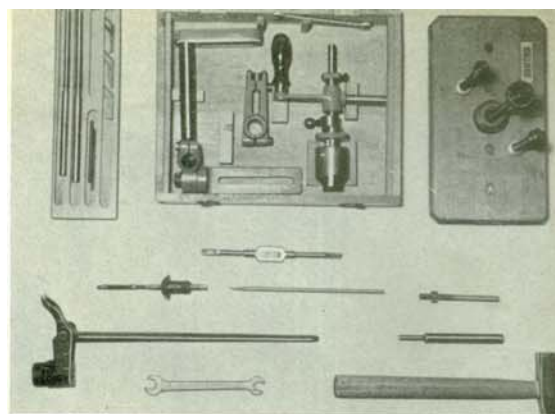
3. Compress the valve springs until the split collets can be removed. (scriber)
4. Withdraw valve springs, raise cylinder head from the board and remove the valves.
5. Remove valve guides.

Caution: Cut or turn valve guide on spring side down to the retaining circlip, remove circlip and with the aid of a drift expel the old guides towards the combustion chamber. To enter the new guides heat cylinder head assembly up to about $220^{\circ}\text{C} = 425^{\circ}\text{F}$. Secure the new valve guides by means of the retaining circlips.

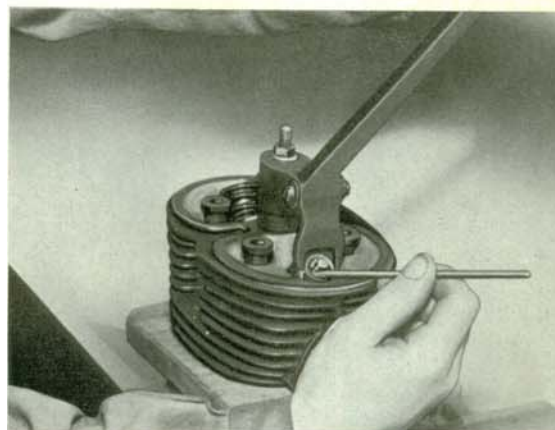
6. Using reaming tool ream each valve guide to 7 mm = .28 inch plus a maximum of 0.085 mm = .0034 inch of clearance.
7. Apply Hunger valve reseating equipment and rectify the seats.

Fig. 74 Caution: Valve seat width 1.5 to 2 mm = .06 inch to .08 inch, re-cut seatings with cutting tool 45 deg. Determine the width of seat by using a 15 degree cutter at the top, and a 75 degree cutter at the bottom.
8. Measure unloaded length of valve springs. Length of long spring 42.3 mm = 1.763 inch, length of short spring 37.5 mm = 1.48 inch. Discard springs that do not meet the above requirements.

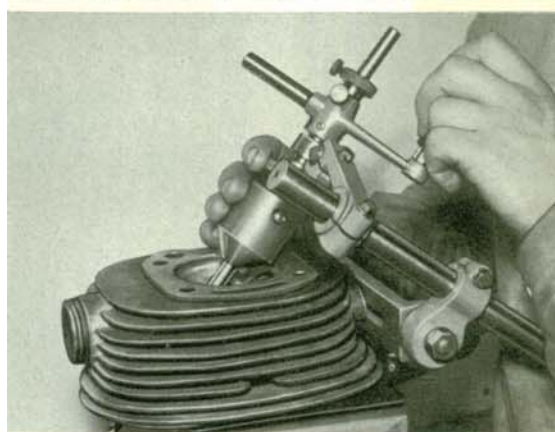
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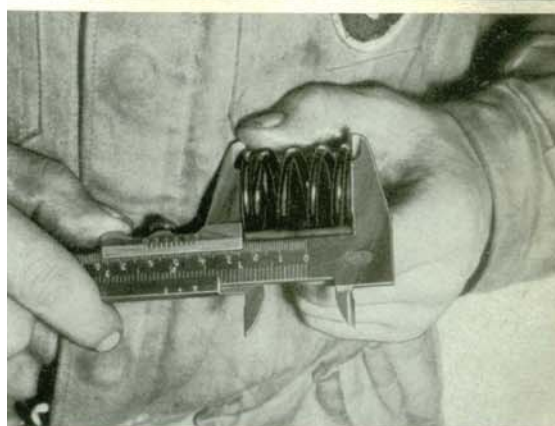
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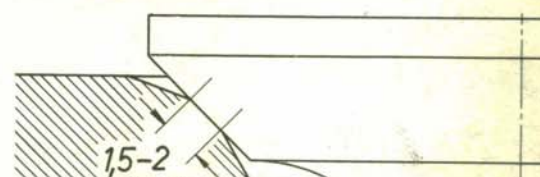
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Caution: When reassembling valve springs, make certain the closed coils are toward the cylinder head.

9. Grind valves with the valve re-facing equipment.

Caution: The application of the Hunger valve reseating and re-facing equipment obviates the treatment with a grinding compound.

10. When the seat is properly positioned, it must contact the middle portion of valve face. To recondition the seat with respect to the face of valve apply cutters 15 degree and 75 degree, as shown in Figure 75.

M 24 Overhauling crankshaft

Crankshaft assembly with bearings is removed.

This job should only be carried out by those servicemen who possess the necessary special tools and the knowledge to apply them correctly. In all other cases install a replacement crankshaft assembly.

Fig. 76 Tools: Socket spanner 10 mm, open ended spanner 32 mm, special tools for crankshaft overhaul 467, 282, 353 A-C, 493/1-4, 531, 524, feeler gauge, screwdriver 8 mm, square, scribe.

- Fig. 77
1. Remove flange with oil pipe from front bearing cover plate, four screws. (socket spanner 10 mm)
 2. Install puller No. 467 and remove front bearing cover. (socket spanner 10 mm, Matra puller 467)

- Fig. 78
3. Unscrew slotted head screw from oil thrower disc. (screwdriver 8mm)
- Caution: When refitting oil thrower disc secure slotted head screw by a punch blow. The oil thrower disc must attach evenly on the counterweight face.

4. Remove oil thrower disc with slight blows of a plastic hammer.
5. Remove ball bearing from fly-wheel bearing cone. (puller No. 282, open ended spanner 32 mm)

- Fig. 79
6. Install bushing compensating thickness of shaft. (bushing No. 531)

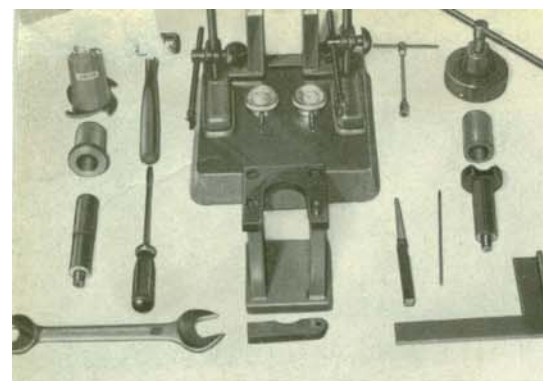
7. Place crankshaft upon test equipment and check tapered shaft ends for true rotation. Out-of-true limit on shaft ends is 0.02 mm = .0008 inch. (crankshaft testing equipment No. 353 A, two indicator dials with stand 353 B and 353 C).

Fig. 80

Caution: If the crankshaft is found to run out of true it can be recentralised. This job, however, should only be carried out by those servicemen who learnt it at the BMW Service Department's training school.

8. Mark crankshaft cheeks to ensure their correct location when assembling. (square, scribe)

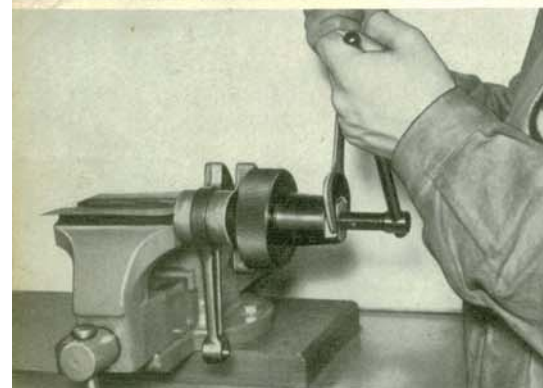
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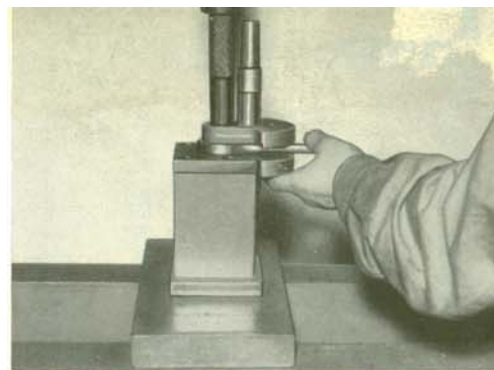


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- Fig. 81 9. Separate the two crankshaft halves by removing crankpin with the aid of a press.
(press tool No. 493, intermediary piece No. 493/3, drift No. 493/1)
10. Check crankpin for trueness.
Maximum allowable out-of-round 0.003 mm = .00012 inch.
- Fig. 82 11. Remove connecting rod from crankpin. (holding bushing No. 493/2, plastic mallet)
- Fig. 83 Caution: To replace con rod upon crankpin use replacer No. 524.
- For the sizes of connecting rods and big-end roller bearings see spare parts list.
- Fig. 84 12. Lap connecting rod if necessary. (lapping arbour V 5046)
- Fig. 85 13. Assemble crankshaft with hydraulic press.
- Caution: Apply press tool No. 493/1 in reversed condition. Insert feeler gauge 0.05 mm = .002 inch between big end and counterweight. Compress until the feeler gauge just can be removed. Insert intermediary piece below counterweight to prevent distortion of crankpin.
14. Heat ball bearing to about 60°C = 140°F and slide it upon crankshaft end journal.

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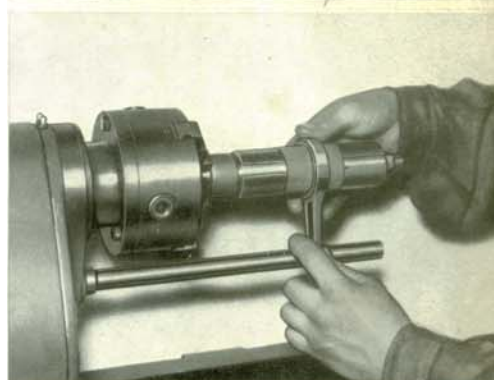
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M 26 Overhauling oil pump

Fig. 86

Tools: Hammer, socket spanner 10 mm, screwdriver 10mm, feeler gauge 0.03/0.04 and 0.05 mm = .0012/.0016" and .002", straightedge.

Fig. 87

1. To check oil pump dip it in oil so that the gears are beneath the oil level and rotate it clockwise by means of the drive. When turning with the fingers oil must ooze out of the oil outlet orifice.

Fig. 88

2. Straighten bent ears of oil screen lock washer. (hammer, chisel)

Caution: During all these jobs hold pump with the hand, do not put it in a vice.

3. Remove oil screen. (socket spanner 10 mm)

Caution: When assembling place oil strainer assembly at the attachment flange, the strainer opening outwards, insert the connection washer.

4. Straighten bent ears of pump screws locking washers. (Hammer, chisel)

5. Remove pump fixing screws. (two screws, socket spanner 10 mm, one screw, screwdriver)

Fig. 89

Caution: After assembling secure slotted head screw by a punch blow.

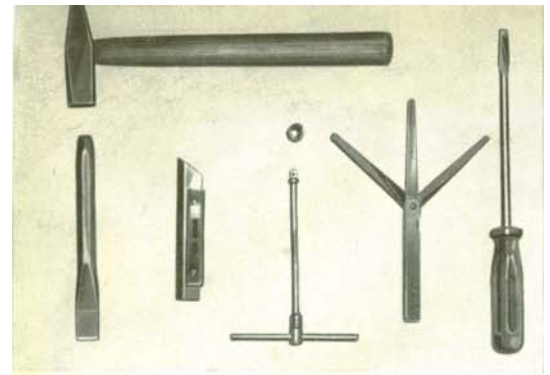
6. Measure clearance over pump gears. Maximum allowable clearance 0.03 to 0.04 mm = .0012 to .0016 inch. (straightedge, feeler gauge)

Fig. 90

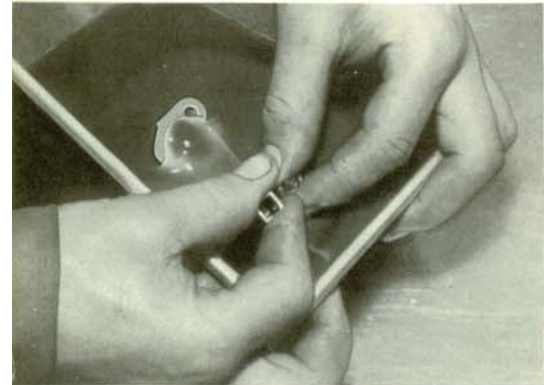
7. Check clearance between gears (backlash) 0.03 to 0.05 mm = .0012 to .002 inch. (feeler gauge)

Caution: If the bottom plate is scored owing to rotation of pump gears, the bottom surface may be rectified until clearance below straightedge will disappear.

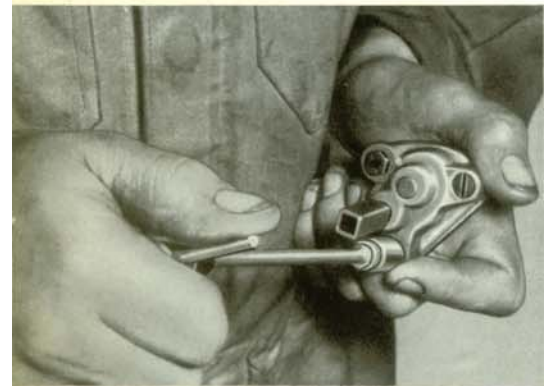
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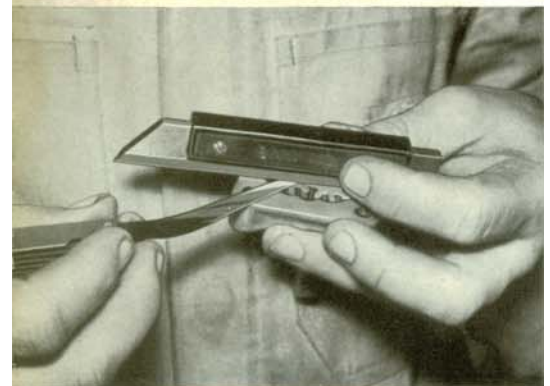
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M 30 Adjusting ignition timing

Fig.
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Tools: Sparking plug spanner, sparking plug steel brush, screwdriver 6 mm, feeler gauge 0.4 to 0.6 mm = .016 to .024 inch.

Fig.
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When resetting ignition timing also clean sparking plug and re-adjust electrode gap.

1. Remove screw plate giving access to sparking plug.
2. Withdraw spark plug connector and unscrew sparking plug.
3. Clean sparking plug and adjust electrode gap to 0.6 mm = .024".
4. Remove cover from blower wheel. (screwdriver 6 mm)
5. Rotate blower wheel in a clockwise direction until the colour-marked blade registers with the mark "S" on the housing of the blower unit.
6. Continue turning the blower wheel until the breaker contact points are fully opened.

Fig.

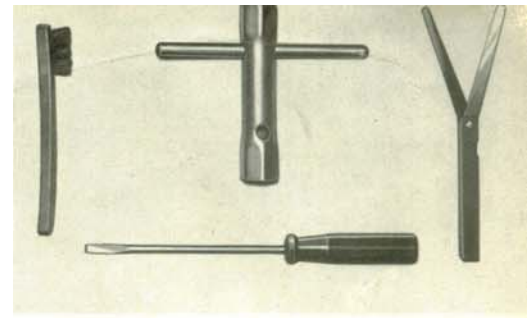
Fig:
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7. Check contact breaker gap with the contact gauge (0.4 mm = .016 ").
8. If the gap is too big or too small, slacken the stationary point locking screw (Fig. 93, 1) and turn the eccentric adjusting screw (Fig. 93, 2) until the correct gap is obtained. Then tighten lock screw.

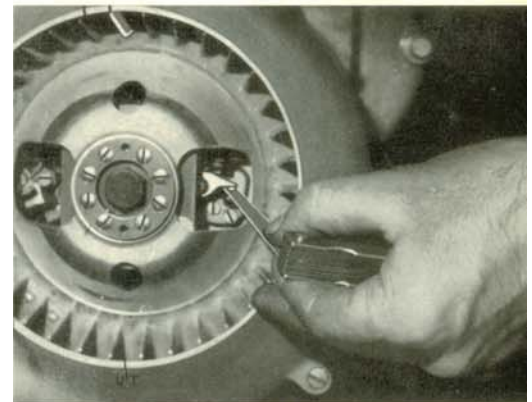
Fig.
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9. Slacken the two contact breaker plate securing screws and turn the blower wheel until the colour-marked blade meets the mark "S" on the blower housing.
10. Disconnect black-coloured contact breaker lead from terminal 1 of ignition coil and connect the test lamp with one pole to terminal 1 of ignition coil and the other to the connector end of the disconnected black lead.
11. Push in ignition key to switch on ignition and move the contact breaker plate contrary to rotation direction (upwards) until the lamp lights up. Then move contact breaker plate carefully in direction of rotation (downwards) until the lamp just goes out.

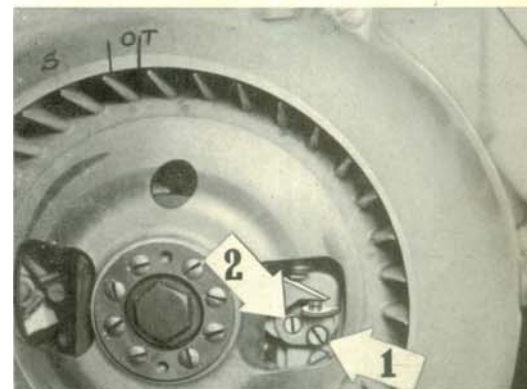
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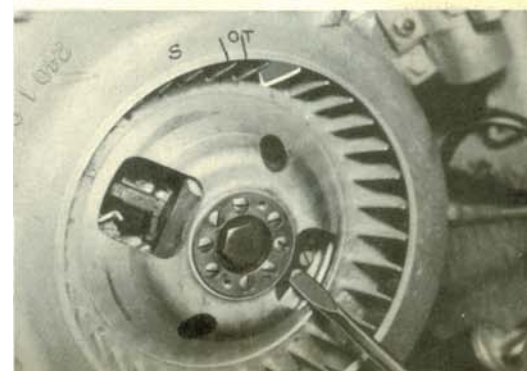
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12. Tighten the contact breaker plate in this position by means of the two locking screws (figures 94/95).
13. Remove test lamp, reconnect the contact breaker lead to terminal 1 of ignition coil and replace the blower wheel cover. (screwdriver)
14. Replace sparking plug, push cable connector upon sparking plug and reposition screw plate upon the inspection aperture.