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PART 1

MODERN MOTOR REPAIR

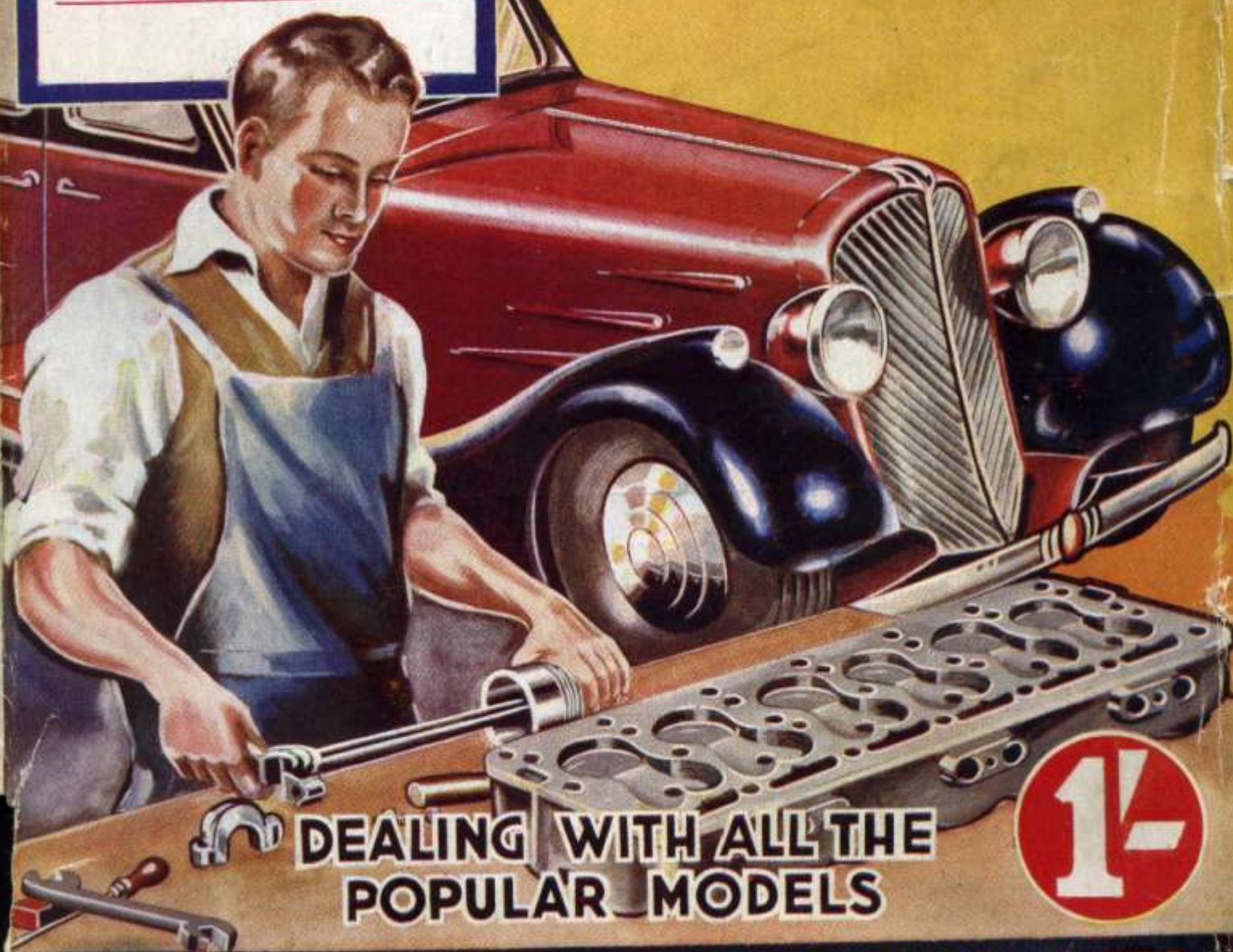
DEALING WITH

The overhaul and repair of recent models of the following popular makes :—

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GIVEN INSIDE
ENGINE TIMING CHART

GENERAL EDITOR
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**DEALING WITH ALL THE
POPULAR MODELS**

1

WRITTEN BY MOTOR REPAIR SPECIALISTS

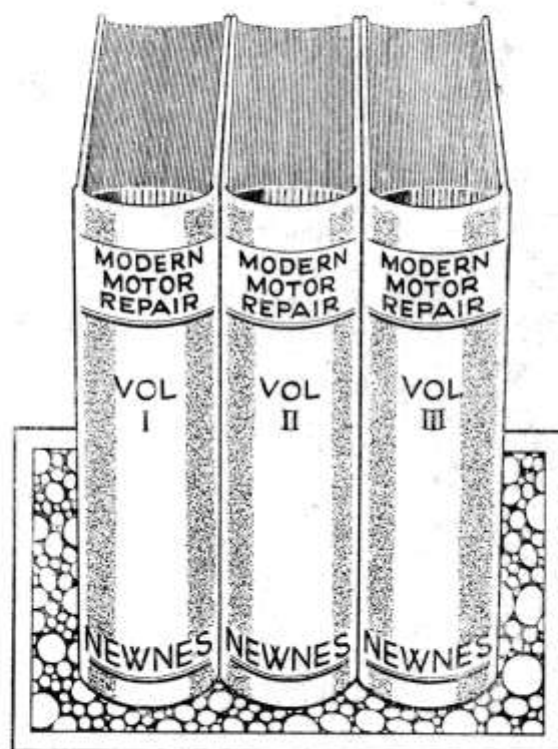
MODERN MOTOR REPAIR

Will provide in a convenient compass all the practical points and special repair methods applicable to the leading makes of cars, e.g., quickest ways of removing engine from chassis, special methods of tappet adjustment, arrangement of timing wheels, method of taking up vertical play in steering column, special tips on dismantling brakes, gearbox, etc. These special notes have been compiled under the direct supervision of the Service Managers or Service Distributors of the particular cars dealt with and are, therefore, absolutely authoritative.

The complete work will be worth pounds to anyone employed in the Garage Industry and will also prove a splendid investment for those car owners who take an interest in keeping their car running to the best advantage.

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These three handsome volumes containing more than 1,200 illustrations and many useful charts and tables can be obtained at a trifling cost.

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TUNING THE M.G. MIDGET

By CECIL KIMBER (Manager Director of M.G. Cars, Ltd.)

THE job of tuning a car falls into two distinct divisions: (1) The finer points of routine adjustment necessary for the upkeep of a car in good condition. (2) Modification to the existing design in search of extra brake horsepower.

The M.G. Midget, based as it is on racing experience, is already so efficient that a search for extra horses under section 2 would be of little avail. This article will therefore deal with the rounding up of stray horses under section 1.

The engine is of the high revolving type, and cleanliness, both external and internal, is of vital importance. In this respect lubrication and decarbonisation are the most important points.

Lubrication.

Never use anything but a recommended brand of oil, and use plenty of it. This is not meant to imply that the oil should be kept above the full mark, but that it should be frequently changed—at least every 1,500 miles.

Cleaning the Oil Filter.

Draining the sump gives the opportunity for attention to another important item—cleaning the oil filter. Instead of draining the oil by the removal of the small square-headed plug on the near side of the sump, remove the oil filter from the base of the sump.

Sequence of Operations.

The procedure is as follows: Run the engine for a short period to ensure the oil is warm. Undo the brass nut holding the suction pipe to the filter at the front end of the sump a few turns. This will allow the whole filter to be unscrewed a turn or two.

Now slacken the brass nut at the pump end of the oil suction pipe—this must be done so that the pipe may be moved away from the filter without bending—after

freeing the pipe from the filter, the filter can be completely unscrewed and removed from the sump.

And the Reason.

The object of doing these operations in the above sequence is that very little oil will escape before the removal of the filter; on its actual removal the oil will surge out, carrying much of the grit and slush that may have accumulated at the base of the sump. Here a pit is a great advantage; not only is it easier to get at the various parts, but it allows the back wheels to be lifted, thus making the oil surge out faster, without making it difficult to place a tin under the car to catch the oil.

Decarbonising.

The importance of decarbonising the engine need hardly be stressed here. This operation should be carried out at least every 5,000 miles, and, if possible, at more frequent intervals.

Space does not permit of a detailed description. The following hints may, however, prove useful.

Removal of the cylinder head nuts is often facilitated by having to hand in addition to the ring spanner provided two or three other $\frac{1}{4}$ -in. spanners of different angles. The nuts should be unscrewed until they butt against the distance pieces on the rocker shaft; the head can then be held away from the block by the insertion of a suitable piece of wood and the nuts screwed right off. Do not use emery to clean the top of the piston; a small quantity of metal polish is permissible.

The Secret of Good Valve Grinding.

Now for the secret of good valve grinding. The valve should be raised from its seating every few reciprocations and given a half turn in order that the grinding compound may spread itself evenly over



Fig. 1.—TUNING THE TWIN CARBURETTORS.

This illustration shows the tuner listening to the air intake of each carburettor with the engine ticking over at about 500 r.p.m. If the sounds from each intake are not equal slacken off the flexible coupling between the two butterflies and turn the butterfly adjusting screw of the front carburettor until the sounds are of equal intensity. Final adjustments for the carburettor are described on page 30.

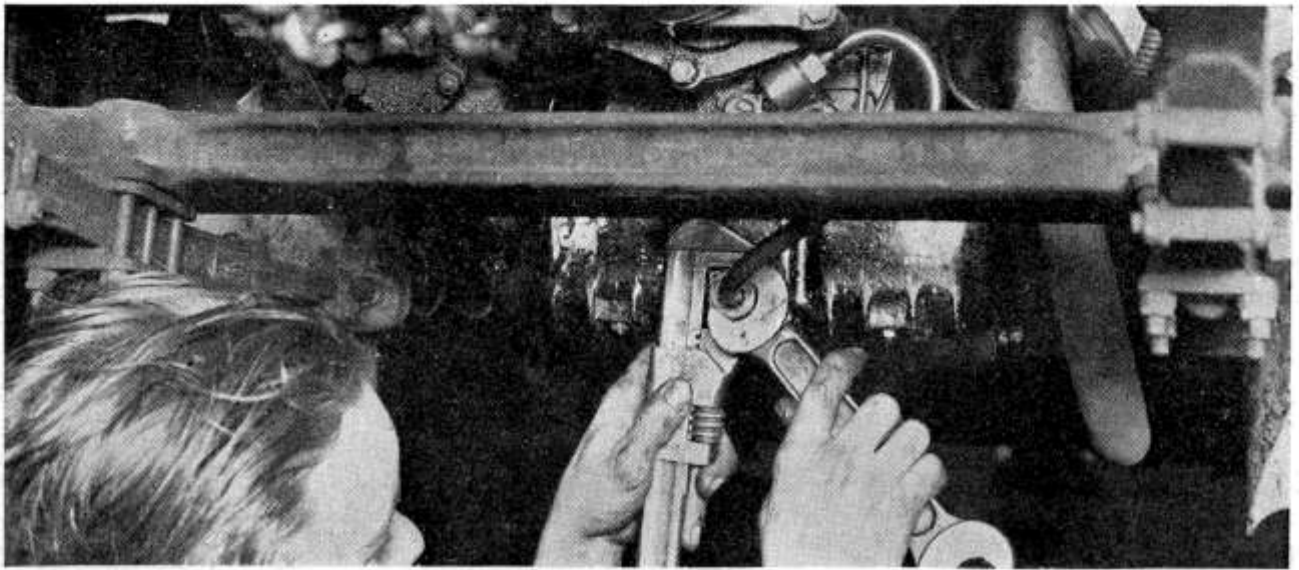


Fig. 2.—REMOVING THE OIL FILTER.
First undo the union at the front end of the sump.

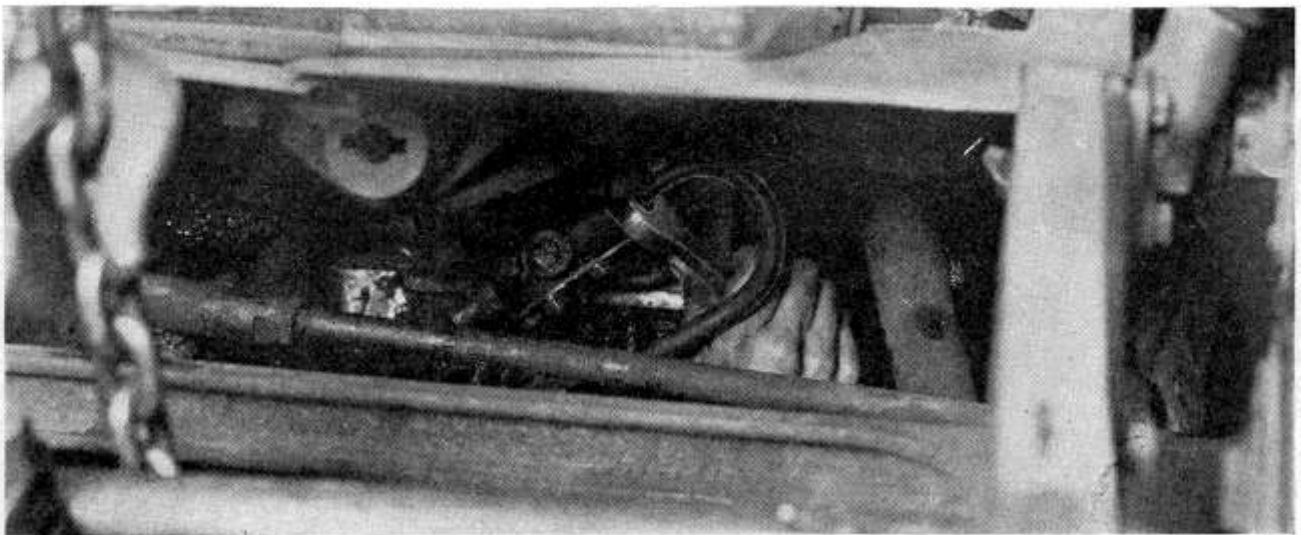


Fig. 3.—REMOVING THE OIL FILTER.
Next slacken the brass nut at the other end of the oil suction pipe to free it.

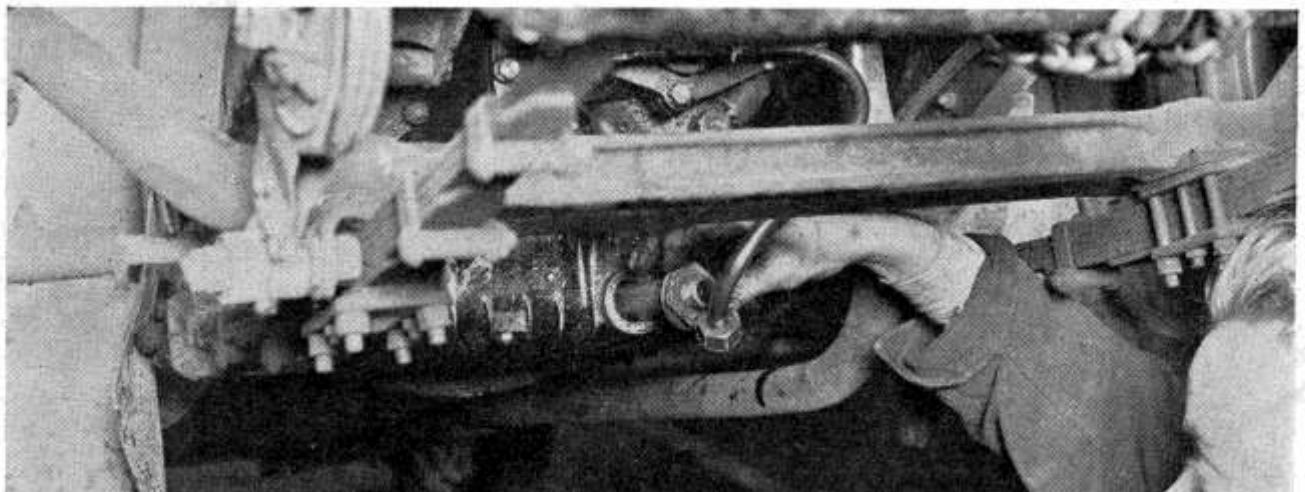


Fig. 4.—REMOVING THE OIL FILTER.
The filter can now be drawn out of the sump for cleaning. Have a receptacle ready to catch the oil which will flush out the sump as it rushes out.

the whole surface. This periodical lifting is best obtained by the insertion of a light coil spring beneath the valve head.

Polishing Combustion Chambers and Ports.

There are one or two small items outside the usual routine of decarbonising which the really keen owner may attend to while the head is removed from the engine. The combustion chambers and ports, although already smooth, may be polished with

measured and the largest noted. By more judicious removal of metal the remaining chambers may be brought to the same c.c. as the largest one.

How to Align Port Apertures in Manifold Gasket and Head.

Another refinement worth attention is the exact alignment of the port apertures in the manifold gasket and head. Probably the easiest procedure to follow is to remove

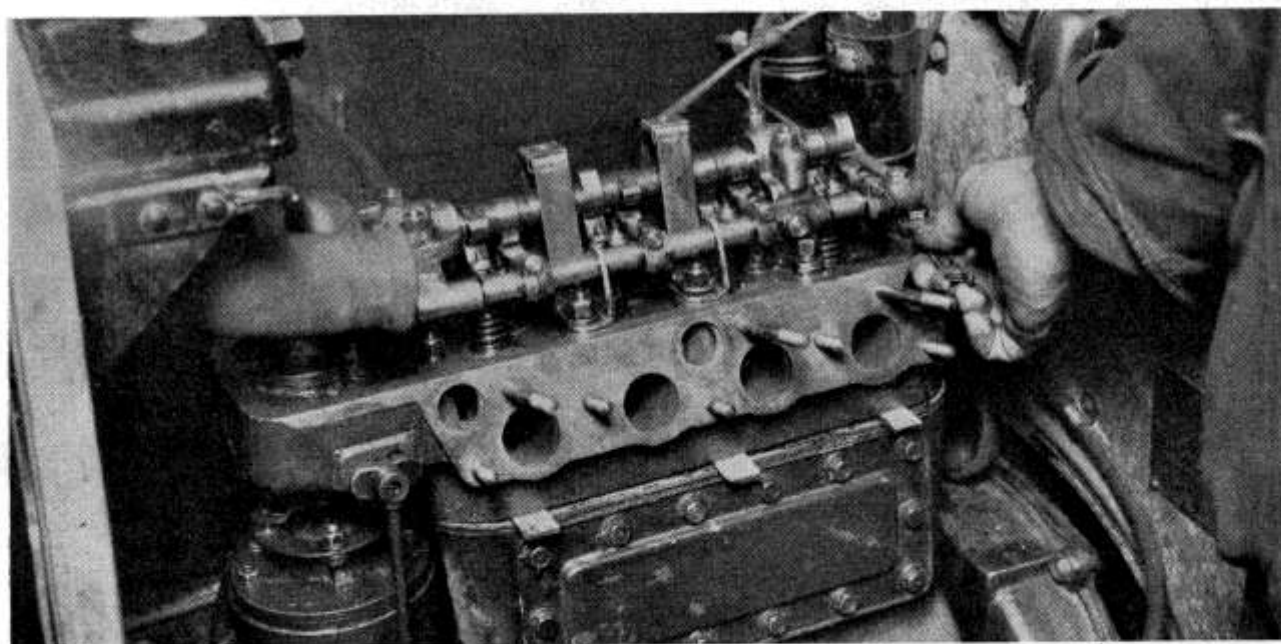


Fig. 5.—A TIP FOR REMOVING THE CYLINDER HEAD NUTS.

First unscrew the nuts until they butt against the distance pieces on the rocker shaft. Now raise the head and insert wooden wedges between the head and the block as shown. This will enable the nuts to be screwed right off the studs. Simple when you know how.

advantage. This is a somewhat laborious job; when a small machine-driven emery stone is unavailable it must be carried out by judicious use of files and emery paper. Great care should be taken not to scratch the valve seatings; also remember that cast iron is a brittle metal.

An Important Point Concerning Combustion Chambers.

The full benefit of polishing the head will not be obtained unless the capacity of each combustion chamber is the same. This can be ascertained by arranging the head on a flat surface with the valves in place and combustion chambers uppermost. Thin oil or water should now be poured into each chamber from a pipette or similar measuring device. The cubic capacity of each chamber can then be

the inlet manifold and place a piece of paper over the studs on the head; now carefully tap out the position of the ports on to the paper. The paper then gives the exact relative position of the stud holes in the manifold and the ports in the head.

Now place the paper over the manifold making the stud holes in the two coincide, and carefully enlarge the ports with a file to coincide with the paper. This operation should now be reversed by cutting out a paper pattern of the manifold and placing it on the head; any superfluous metal in the ports on the head may now be removed.

This, of course, is more difficult than enlarging the ports in the softer metal of the inlet manifold, and should be done sparingly.

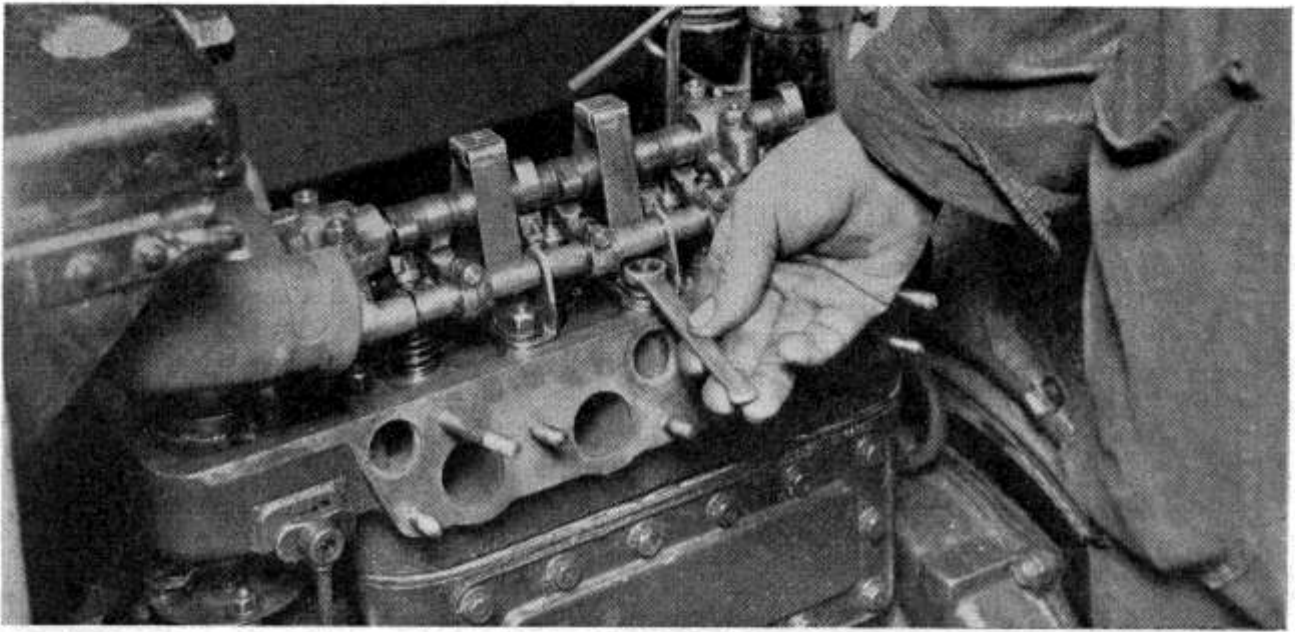


Fig. 6.—A REMINDER OF AN IMPORTANT POINT.

When replacing the cylinder head it is most important in order to prevent distortion, and to ensure a good joint, that the cylinder head nuts should be pulled down evenly, starting from the centre and working outwards.

Do Not Forget Exhaust Ports.

In fact, the whole business should be done with great care, and the least possible quantity of metal removed, because any considerable enlargement will upset the carburation. It should be noted that the alignment of the exhaust ports is almost as important as the inlet ports. Great care should be taken to remove all traces of emery from the ports.

Adjusting the Rockers.

Now for the method of adjusting the rockers. Admittedly this should be carried out when the engine is at its normal running temperature, but before the engine can be run some adjustment must be made.

Slacken off the locking screw on the

rocker arm and be sure that its cam is pointing vertically upwards. The adjustment is made by turning the bronze nut on the side of the rocker arm. The rocker arm is mounted on a bronze bush which is itself eccentrically mounted on the rocker shaft. (See Fig. 12.)

The thickened portion of the bronze bush should be pointing downwards; in this position the clearance decreases with a downward movement of the adjusting spanner.

If the thickened portion of the bush is pointing upwards no oil will get through to the working surface of the arm, and consequent excessive noise and wear will be set up. Four thousandths of an inch is the correct clearance between

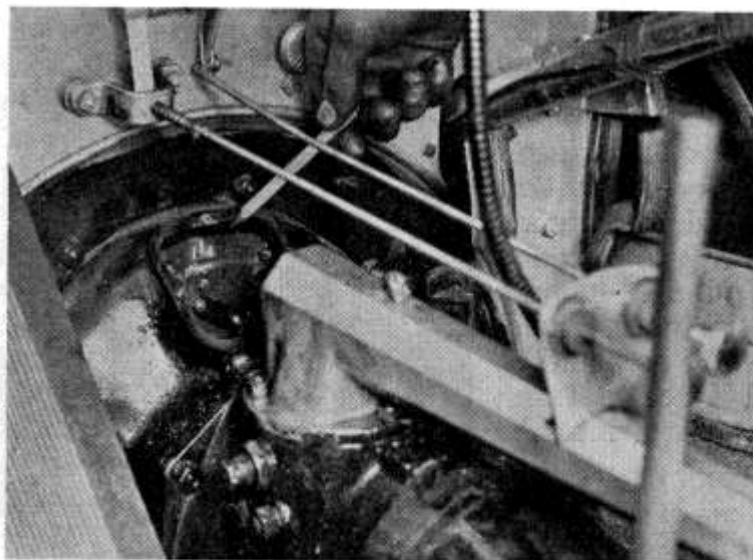


Fig. 7.—VALVE AND IGNITION TIMING.

First remove the clutch inspection plate and turn engine until the mark $1/4$ on the flywheel is on the highest point.

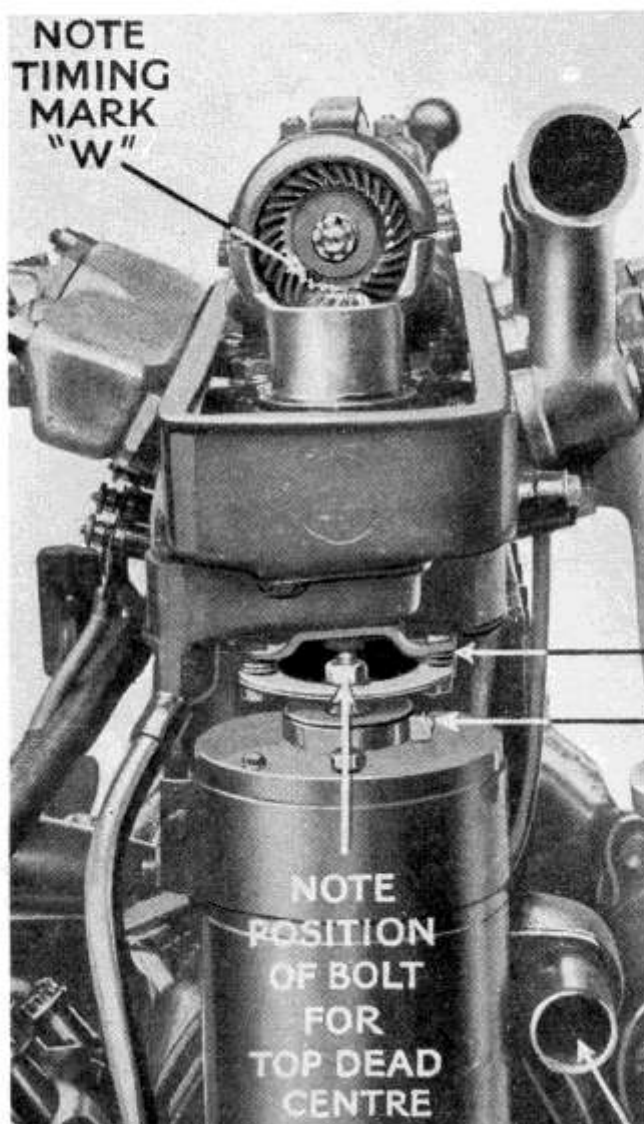


Fig. 8.—VALVE AND IGNITION TIMING.
See that the marks on the timing wheels on the head coincide.

the rocker arm and the cam.

Replacing Cylinder Head.

Replacement of the cylinder head should not present any difficulties. See that all gaskets and washers are in good condition and use some good jointing compound on the cylinder head gasket. Gold size is the most suitable preparation, but it should be used sparingly and care be taken to avoid any running down into the bores.

Tightening Cylinder Head Nuts.

It is most important in order to prevent distortion and ensure a good joint that the cylinder head nuts be pulled down evenly, starting at the centre and working criss-cross out-

wards. It will be found much easier to tighten the cylinder head nuts before the manifolds are replaced.

Valve and Ignition Timing.

At first sight the valve timing arrangements may seem a trifle baffling, but they are really very simple—remove the clutch inspection plate and twist the engine till the marks 1 and 4 on the flywheel are vertically upwards. See that the distributor arm is pointing to number 1 segment—it may be pointing to number 4, in which case turn the engine one complete revolution. Now, referring to Fig. 8, see that the marks on the timing wheels on the head coincide. The holes in the flexible coupling should now need only a little movement to match up.

A Necessary Precaution.

As a final precaution, warm up the engine by running it for about five minutes and look for water leaks; remove the valve cover again, and check the cylinder head nuts and rocker clearances. Also make certain that oil is flowing freely through the rocker arms.

Now Check the Plug Gaps.

The electrical equipment should now receive attention. Provided the battery is in good condition, the two most important items are the plugs and the distributor. It has now been found that the

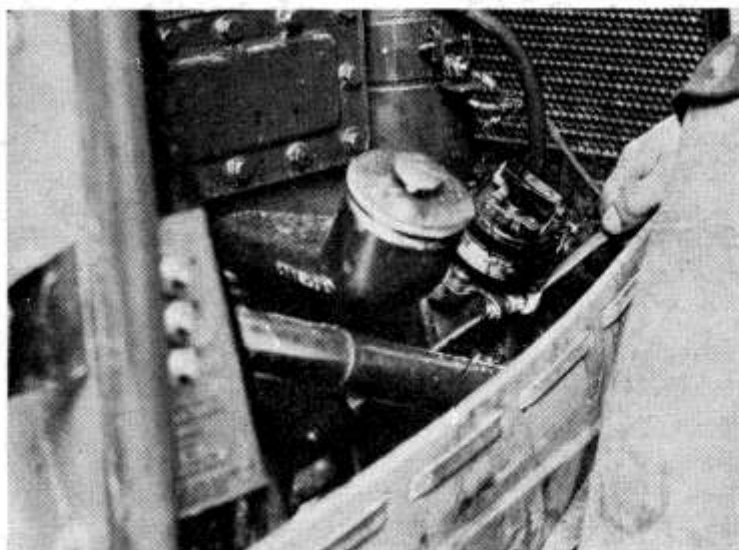


Fig. 9.—TO RESET THE IGNITION TIMING.
This can be done by moving the distributor body after loosening the nut and bolt on the clip. Correct adjustment here will have considerable effect on engine performance.

best gap for the 14 mm. plugs is .018 in.—this is rather important as the previous recommendations have been from .020 in. to .025 in. Should misfiring be experienced it is as well to take the plugs apart and clean them; also look carefully for faulty insulation.

And the Distributor Gap.

The distributor gap should be checked from time to time and the points cleaned, correct gap being .020 in. If the engine is either very rough or sluggish it is as well to check the ignition timing.

How to Reset Ignition Timing.

All the adjustment that may be needed here can almost certainly be obtained by moving the distributor body relative to the cam. This is done by loosening the nut and bolt on the clip which is just under the distributor head; the distributor head will now be free to turn relative to the cam. With hand control ignition the points should be breaking at top dead centre, with the ignition fully retarded.

There are two types of automatic ignition fitted—one gives a 13° and the other a 10° advance (26° and 20° on the crankshaft). On most cars the number 10 or 13 will be found stamped inside the distributor. With the 10° advance type the points should be fully open at top dead centre, and with a 13° type half open. Correct adjustment here will have a considerable effect on smooth running performance.

The Carburettors.

There is very little that can go wrong with the S.U. carburettors, and consequently few adjustments will be needed, but in any case before any adjustment is attempted it is advisable to check over such items as tappets, plugs, coil, distributor, etc.

How to Free a Stuck Piston.

Should adjustment become necessary,

the first thing to do is to warm up the engine. See that the pistons and taper needles are free; they should fall back on their seating with a click. There are only two things liable to stop this: the first is a sticking piston, and the remedy is to remove the dash-pot cover, clean everything, and apply a little thin oil. If the piston still sticks it must be due to the taper needle fouling the jet.

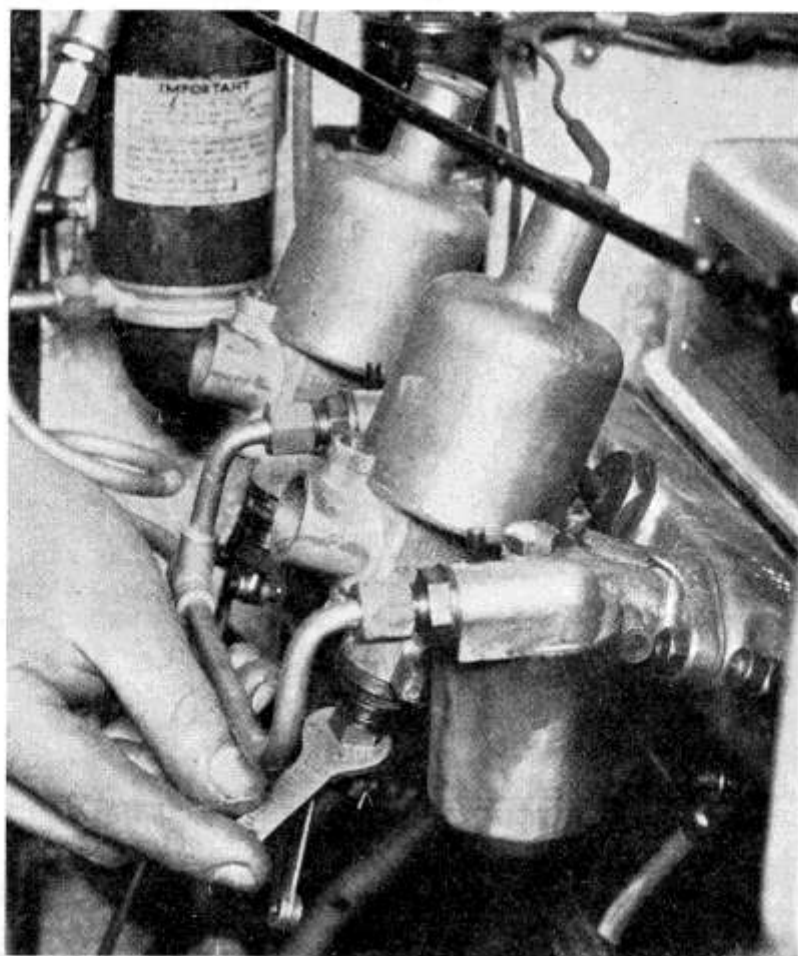


Fig. 10.—CENTRING A JET.

Before the jet can be moved the jet holding nut on the bottom of the carburettor must be loosened.

Either the needle must be bent and a new one is required, or the jet is out of centre.

Centring the jet is liable to prove a difficult business and should not be attempted except as a last resort.

Before the jet can be moved the jet holding nut on the bottom of the carburettor must be loosened. The jet and collar can now be moved about in the carburettor body.

Screw the jet adjusting nut up to its top position and move the jet head right

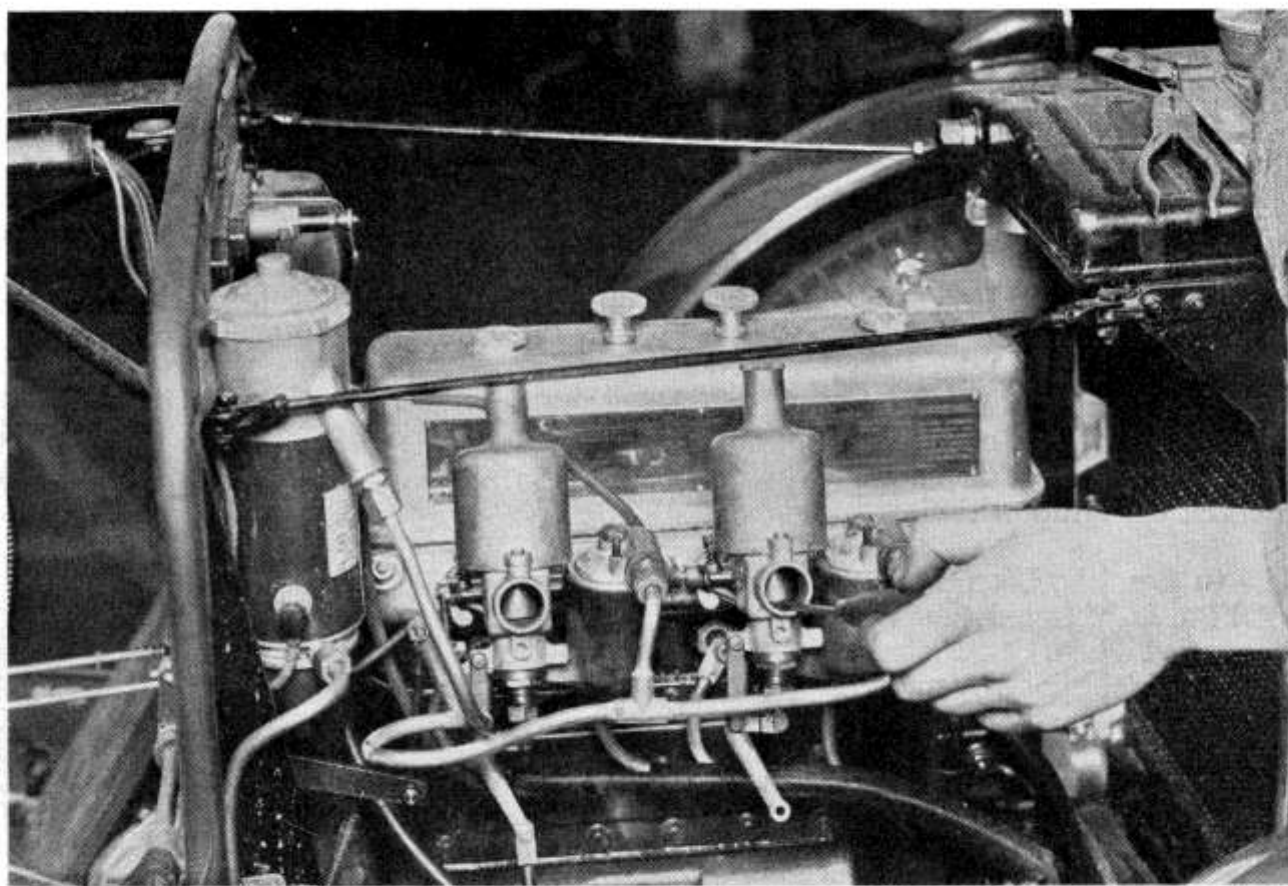


Fig. 11.—TESTING THE CARBURETTOR FOR EQUALITY.

Disconnect the mixture control coupling and lift the front piston about $\frac{1}{8}$ of an inch. A small screwdriver can be used. If the engine continues to run for a few seconds and then stops, the carburettors are synchronised. The full description of this test is given on page 31.

up against it. The jet is now far above the normal running position and well up on the tapered needle; if the jet can be arranged to clear this thickened part of the needle, it will be perfectly free when the jet is lowered into its normal running position.

When the jet appears to be in its correct position tighten up the jet holding nut and try the piston; probably the jet will have moved a little bit in the tightening process and the piston will still stick. The only thing to do is to try again. It is as well to check the petrol level in the jet; this should be 1 mm. below the top of the jet and can be regulated by bending the prong between the float and needle valve.

Carburettor Tuning.

Any further adjustments may now be divided into three divisions:—

- (1) To get the mixture strength of each carburettor correct.
- (2) To get the mixture strength of both carburettors the same.

- (3) To get the throttle opening of both carburettors the same.

Adjusting Throttle Openings.

Dealing first with No. 3—when the engine is warm, arrange the slow running adjustment so that the engine is ticking over at about 500 r.p.m.—now listen at each carburettor intake to make sure that the hissing sounds are of equal intensity; if they are not, slacken off the flexible coupling between the two butterflies and turn the butterfly adjusting screw of the front carburettor till the hissing sounds are equal. Tighten up the flexible coupling again without moving the butterflies relative to one another. The throttle openings should now be the same on both carburettors.

How to Ensure that Mixture Strengths are Correct and Equal.

Now for items 1 and 2—disconnect the mixture control coupling between the two carburettors—see that both jet heads

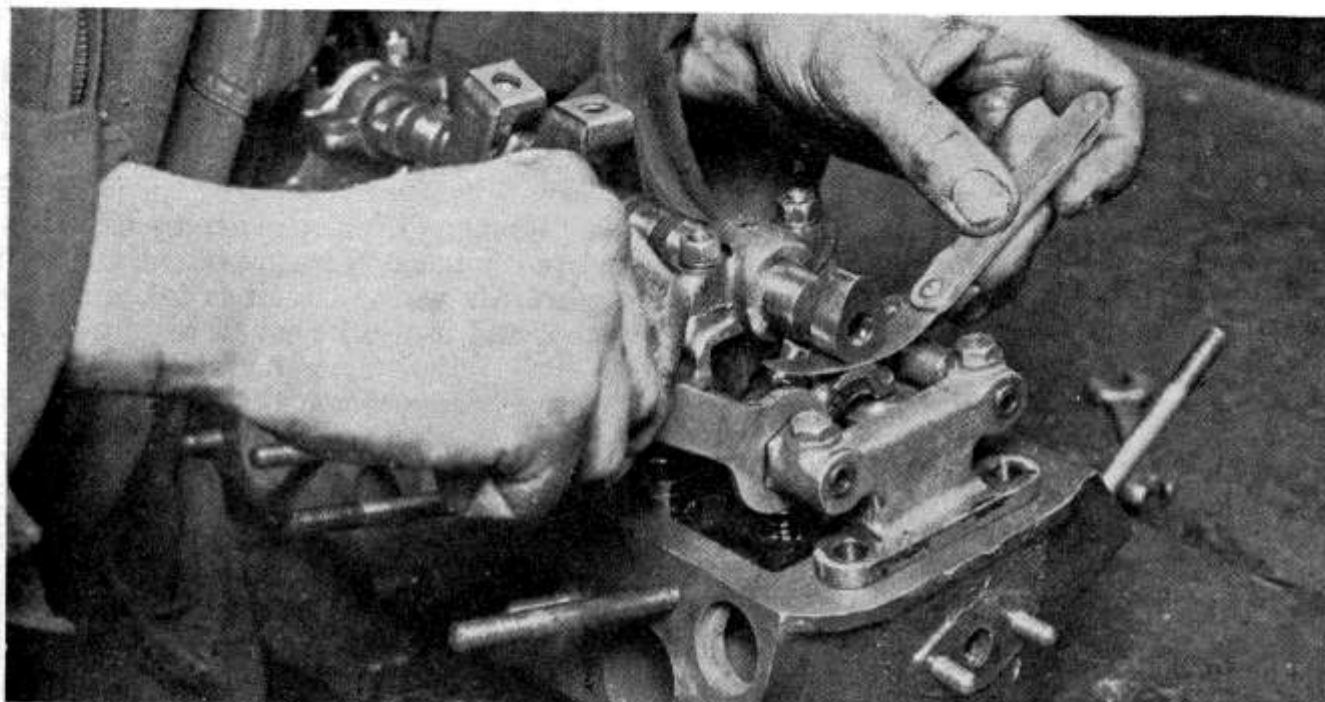


Fig. 12.—ADJUSTING THE ROCKERS OF THE M.G. MIDGET.

This picture shows the operation being done on the bench. For accurate tuning it must be carried out *in situ* with the engine at its normal running temperature. The exact method of adjustment is described in detail on page 27.

are up against the adjusting nuts in the normal running position and lift the front piston a little (about $\frac{1}{32}$ in.). One of four things is liable to take place.

(1) The engine may continue to run for a few seconds and then stop.

(2) The engine may continue to run without any appreciable change.

(3) The engine may stop almost immediately.

(4) The engine may rev. up momentarily.

An Expert Diagnosis.

No. 1 means the adjustment is correct and the carburettors are synchronised.

No. 2 means that the engine is running on the back carburettor alone. This carburettor is therefore giving too rich a mixture, and must be weakened, after which try again until No. 1 state is attained.

No. 3 means that the back carburettor is giving too weak a mixture. It must therefore be strengthened until No. 1 state is attained.

No. 4 means that the front carburettor is giving too rich a mixture. It must

therefore be weakened. The engine will now probably behave as in No. 2 or 3, and suitable adjustments must be made to make it behave as in No. 1.

How to Boost Up the Performance.

As a check the whole operation should be reversed by lifting the piston of the back carburettor. Where performance rather than economy is sought a mean between the conditions of 1 and 2 should be aimed at; the engine should then just manage to run on one carburettor. This will increase consumption, but improve acceleration.

Final Words—Tuning Means Accurate Adjustment.

There remains little else to be written on this subject without straying into the realms of super-tuning. It can only be mentioned here how often these simple adjustments are neglected or carelessly carried out. They are of the utmost importance to a sports engine like the M.G., where tuning resolves itself into really accurate adjustment.