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The Book of the AUSTIN TEN

ABBEY

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The Book of the
AUSTIN TEN

A FULLY ILLUSTRATED
INSTRUCTION BOOK FOR ALL OWNERS
OF MODELS FROM 1932 TO 1947

BY
STATON ABBEY

AUTHOR OF
"*Automobile Transmission Overhaul*," "*Automobile Chassis Maintenance and Overhaul*," etc.

1934.

SECOND EDITION

LONDON
SIR ISAAC PITMAN & SONS, LTD.

First edition 1937
Reprinted 1939
Reprinted 1941
Reprinted 1942
Reprinted 1946
Second edition 1948
Reprinted 1959
Revised and reprinted 1950
Reprinted 1951
Reprinted 1953
Reprinted 1954
Reprinted 1956
Reprinted 1957

SIR ISAAC PITMAN & SONS, LTD.
PITMAN HOUSE, PARKER STREET, KINGSWAY, LONDON, W.C.2
THE PITMAN PRESS, BATH
PITMAN HOUSE, BOUVERIE STREET, CARLTON, MELBOURNE
22–25 BECKETT'S BUILDINGS, PRESIDENT STREET, JOHANNESBURG

ASSOCIATED COMPANIES
PITMAN MEDICAL PUBLISHING COMPANY, LTD.
39 PARKER STREET, LONDON, W.C.2
PITMAN PUBLISHING CORPORATION
2 WEST 45TH STREET, NEW YORK
SIR ISAAC PITMAN & SONS (CANADA), LTD.
(INCORPORATING THE COMMERCIAL TEXT BOOK COMPANY)
PITMAN HOUSE, 381–383 CHURCH STREET, TORONTO

MADE IN GREAT BRITAIN AT THE PITMAN PRESS, BATH
E9—(G.4101)

PREFACE

THE first Austin Ten, introduced in 1932, was the forerunner of a range of popular light cars which were gradually improved and enlarged over a period of fifteen years. Each successive model embodied refinements which kept it abreast of current developments in design and performance while retaining the characteristic Austin dependability and economy.

This tradition also resulted in a car which gives considerable scope to the enthusiastic and practically-minded owner. Although the car's reliability is outstanding, such routine attentions and minor and major repairs as may be required from time to time can be carried out simply and straightforwardly.

Although the Ten has now been succeeded by the 11 h.p. "A. 40" model, it was considered, in 1948, well worth while to revise, bring up to date, rearrange, and considerably expand this book, for the more recent Tens on the road to-day will undoubtedly still have many years of useful life before them, if the example of the earlier models is any criterion.

The present edition has been further revised as a result of readers' suggestions and covers all aspects of maintenance and overhaul that are within the scope of the average owner; many hints and tips based on practical experience have been included, but readers will no doubt have devised or discovered other useful dodges which may be worth incorporating in future editions. Suggestions and criticisms on these lines will, therefore, be welcomed.

ST. OSYTH
ESSEX

STATON ABBEY

CONTENTS

CHAPTER 1

THE NEW CAR

ALTHOUGH no new Austin Tens are now being made, the acquisition of a car for the first time, or the replacement of an earlier model by a more modern version, is always something of an event. The first desire of the owner of an Austin Ten upon taking delivery is almost always to gaze on it with admiration, to show it to all those interested friends, and to compare its performance with that of the car it supersedes, particularly so if its predecessor was also a Ten. This desire, or combination of desires, should be curbed, and the owner's first responsibilities undertaken in a systematic and organized manner.

First, the driver's licence will be assumed to be in existence; then the insurance of the new car must be effected, and registration duly accomplished.

Then the elbows can be squared and the tools checked. Any deficiencies should be made good, especially the wheel brace, jack, tyre pump, and tyre pressure gauge. This done, a general examination of the car can be undertaken with that keen relish peculiar to the motorist taking over a new car. The decision that everything is O.K. is the signal for the start of the first run.

Owners possessing a partiality for a running-in compound, especially a compound containing graphite in colloidal form, are strongly advised to use it, inserting it into the sump according to the makers' instructions.

First see that the supplies of petrol, water and oil are adequate, then see that the gear lever is in neutral (see Fig. 3). The controls and instruments can be clearly seen in Figs. 1 and 2. To start the engine, turn the ignition switch key to the "On" position. Pull out the strangler and then press the starter button.

Do not attempt to attain any high speeds, however strong may be the urge. First get to know the car and any faults it may possess. If the engine has been reconditioned, restraint in this respect is vital to the service eventually to be given by your car. A new engine must be run-in carefully during the first 500 miles, and even afterwards, for reasons fully explained in the chapter on lubrication.

The first attentions to the car should include running over all the accessible nuts and bolts with suitable spanners. This attention is particularly necessary for the cylinder-head and manifold nuts. The engine parts settle down with use and the heat from

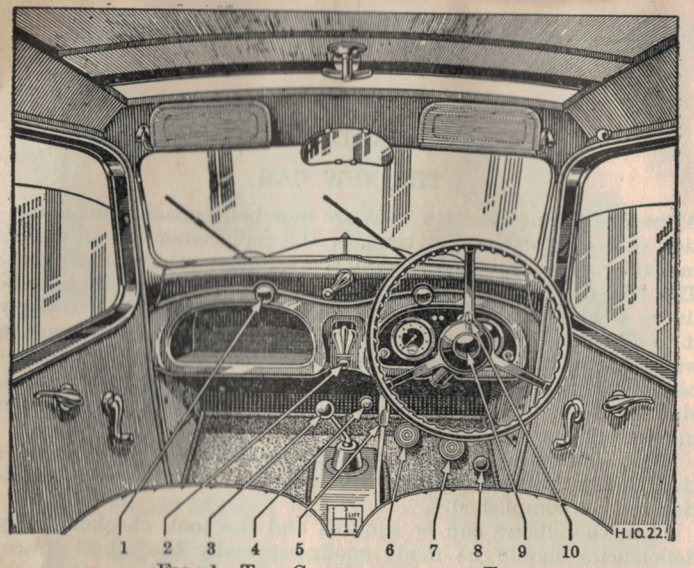

FIG. 1. THE CONTROLS OF THE TEN

1 = Windscreen wiper control
2 = Strangler control
3 = Gear lever
4 = Headlight dip and switch control
5 = Handbrake lever
6 = Clutch pedal
7 = Brake pedal
8 = Accelerator pedal
9 = Horn switch
10 = Direction indicator control

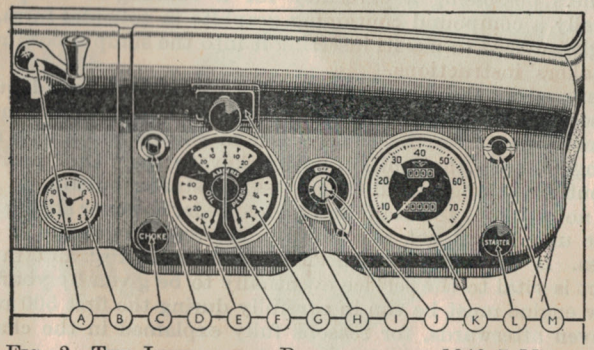

FIG. 2. THE INSTRUMENT PANEL OF THE 1940–7 MODEL

A = Windscreen control
B = Electric clock
C = Choke control
D = Panel light switch
E = Oil pressure gauge
F = Ammeter
G = Petrol gauge
H = Windscreen wiper control
I = Lighting switch
J = Ignition switch
K = Speedometer
L = Starter switch
M = Ignition warning lamp

the functioning of the engine. This early attention will allow this slack to be taken up to maintain the efficiency of the car as a whole, as the running-in process proceeds.

Run over the items outlined in Chapter IV. Not only will this ensure that no point has been overlooked, but any faults will also

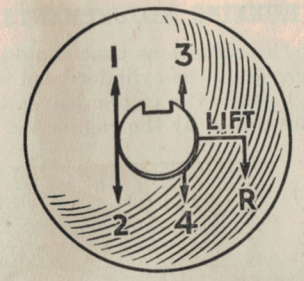

FIG. 3. SHOWING THE VARIOUS GEAR POSITIONS OF THE AUSTIN TEN GEARBOX ON THE EARLIER MODELS

be brought to light; if these are put right at this stage, subsequent trouble will be avoided.

With this important milestone in the life of the Austin Ten safely passed, the owner can rest assured that, given proper care and attention, his car will provide him with many thousands of miles of care-free, dependable motoring.

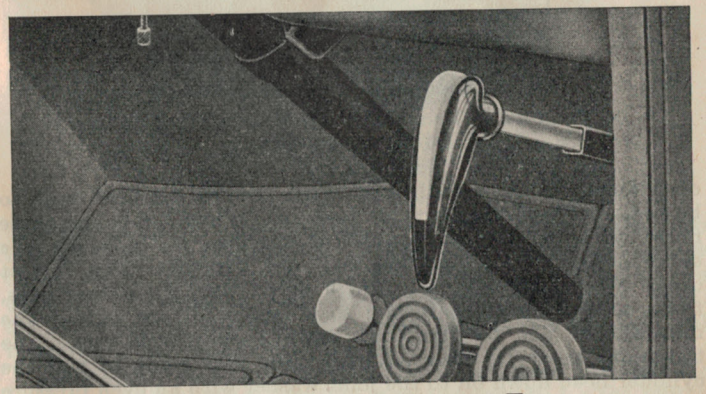

FIG. 4. SHOWING THE SCUTTLE-MOUNTED HANDBRAKE (1939 MODELS)

CHAPTER II

RUNNING ADJUSTMENTS

AMONG the first of the attentions that should be paid to a new engine is that of tightening the cylinder-head nuts. These are, of course, tight enough when the engine leaves the works, but the effect of the heat developed by the engine and the bedding down

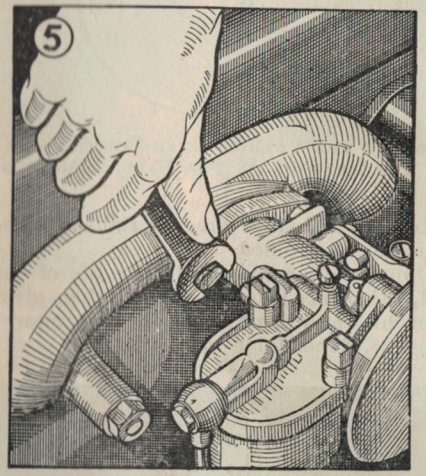

FIG. 5. TIGHTENING THE CARBURETTOR TO MANIFOLD NUTS

of the new cylinder-head gasket often permits the head nuts to be tightened quite appreciably later on. When tightening these nuts, do so in the same order as specified on replacing the cylinder head after decarbonizing (see Fig. 42). The correct order is to start with the centre ones, then the corner ones, those alternately opposite and so on until all are tight. The nuts should not be tightened down hard individually. The tightening must be done gradually, the idea being to pull the cylinder head down on to the joint washer with an even pressure distributed over the whole of the joint surface. If pressure is

applied more to one part than to another the joint will not be good and the head may be strained out of truth. If the cylinder head nuts are not thus tightened and get slack, either gas or water leaks may develop. The latter is particularly

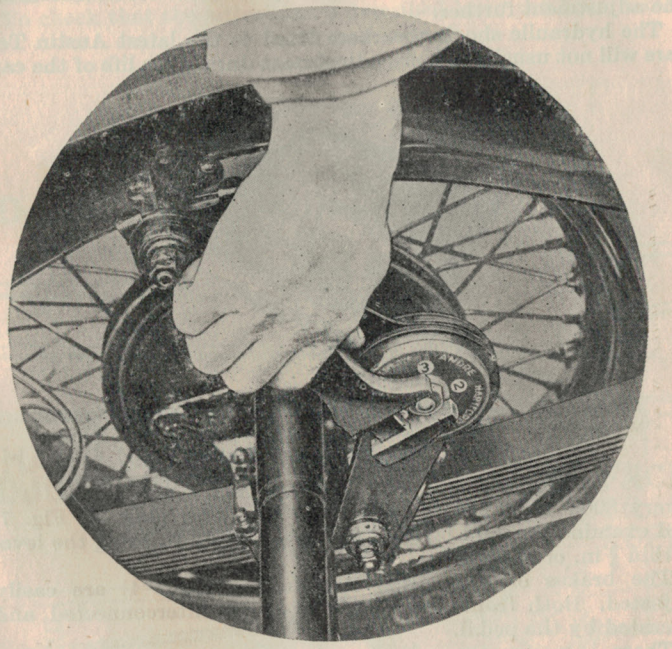

FIG. 6. ADJUSTING TENSION OF FRICTION SHOCK ABSORBER

undesirable, as a considerable leak from the cooling system into the cylinders may entail an expensive bill for repairs, water being, for all practical purposes, incompressible. Therefore, see to it that all cylinder-head nuts and sparking plugs are tight, for even a small gas leak will mean loss of compression and impaired engine efficiency.

The wheel nuts should be checked for tightness and also the road spring clips. These are not trivial attentions for the purely fussy owner; they will assure every owner's peace of mind if properly carried out.

The friction type shock absorbers fitted to earlier cars are adjustable. Tightening the centre nuts (Fig. 6) increases their resistance to movement, but do not overtighten as this will render the suspension harsh and jerky. If the car bounces too much, give the centre nut a turn and try the effect before increasing the adjustment further.

The hydraulic shock absorbers fitted to the latest Austin Ten cars will not usually require adjustment during the life of the car.

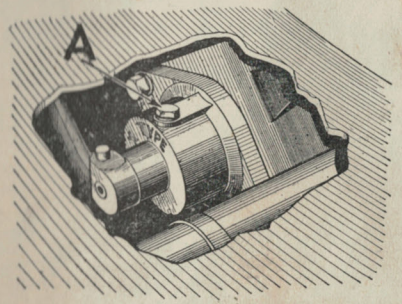

FIG. 7. HYDRAULIC SHOCK ABSORBERS ARE REPLENISHED WITH FLUID AT FILLER A. THE PISTON-TYPE SHOCK ABSORBERS ARE SIMILARLY TOPPED UP

Every 8000 to 10,000 miles unscrew the filler plug *A*, Fig. 7, and examine the fluid level. Add Luvax Fluid to bring the level within $\frac{3}{4}$ in. of the top.

The brakes of the earlier Austin Ten (1932–4) are easily adjusted. Both front and rear brakes are interconnected and operated by the pedal.

There is a common adjustment, made by turning the nut *A*, Fig. 8, in a clockwise direction to take up wear, or anti-clockwise when it is required to slack the brakes off.

The handbrake has a separate adjustment. To take up wear put the lever right off, slacken the lock-nut on the handbrake adjusting pin and unscrew the pin until the head is just clear of the face on the cross shaft lever and then tighten the lock-nut to secure the adjustment.

After continued use, one or more of the brake linings may have worn to a greater extent than the remainder. Separate adjustment for each of the four brakes is therefore provided.

The rear brakes are adjusted by turning the hexagons on the brake-rods, *B*, Fig. 8, in a clockwise direction to take up individual wear and anti-clockwise to lengthen the rods.

A similar arrangement provides separate adjustment for the front brakes on earlier Austin Ten models.

A later type of brake embodies cable operation and adjustment for each front brake as shown at Fig. 9. *A* is a self-locking nut and is turned clockwise to take up wear.

To check that the adjustments described have not been taken

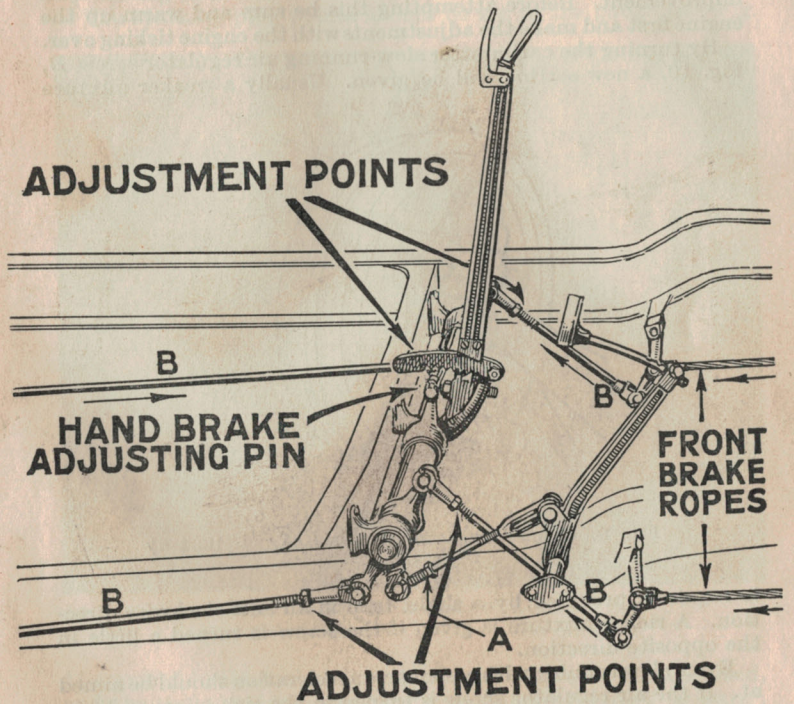

FIG. 8. BRAKING SYSTEM (1932–4)

too far, raise the car up on all four wheels with the jack and suitable blocks and turn each wheel by hand with the handbrake off. They should all revolve freely, of course, and the adjustment should be slackened off if there is any tendency for the brakes to rub. An easier and more common method of testing the brakes is to drive the car a little way, stop without using the brakes, and then feel the drums. Any heat, due to rubbing, will indicate that the adjustment is too close and requires slackening off.

The latest type (1936–47) of Girling brake has a separate adjuster behind each brake. To adjust screw up till a resistance is felt and then screw back one full notch.

The carburettor setting will not require altering unless exceptional circumstances require it. After the car has been run-in, it may be found that the slow running of the engine can do with improvement. Before attempting this be sure and warm up the engine first and make the adjustments with the engine ticking over.

By turning the carburettor slow-running air regulator screw *B*, Fig. 10, a new setting will be given. Usually a weaker mixture

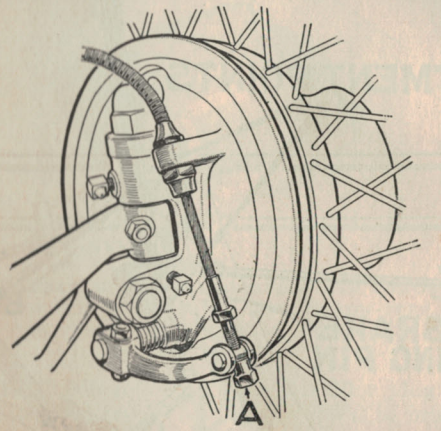

FIG. 9. CABLE-OPERATED FRONT BRAKES (1934–5)
A is adjuster

is required, provided by a slight turn in an anti-clockwise direction. A richer mixture is given if the screw is turned a little in the opposite direction.

Even, slow running with responsive acceleration should be aimed at. If the air regulator screw is turned in the rich mixture direction (clockwise) as far as possible without rendering the slow running uneven, the acceleration will be improved. If economy is of more importance, weaken the slow-running mixture by turning the regulating screw in the anti-clockwise direction. Actually it will be found that the amount of adjustment permissible without affecting the even, slow running described is small. A too-rich mixture will give uneven, lumpy running known as "hunting," conversely a weak, slow-running mixture can be diagnosed by a tendency for the engine to stop at infrequent intervals or upon deceleration. At the same time that the air-screw is adjusted

the throttle stop-screw *A*, Fig. 10, should receive attention. As its title implies, this screw determines the minimum throttle opening. To increase the slow-running engine speed, the minimum throttle opening can be increased by turning the stop-screw in a clockwise direction. Conversely, the engine speed is decreased by turning the screw in the reverse direction.

The sparking plug points should be set to the gauge (see Fig.

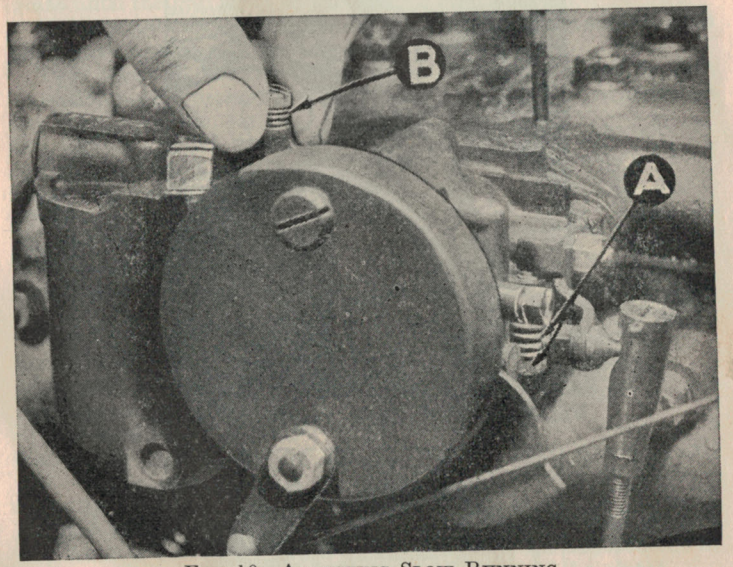

FIG. 10. ADJUSTING SLOW RUNNING
A = Throttle stop screw *B* = Air screw

11 supplied in the tool kit) every time the engine is decarbonized, and the batteries need topping-up regularly with distilled water. Each of the three cells in each battery has a porcelain plug which when removed should be carefully put on one side together with its rubber washer. The acid level can be seen through the plug holes and distilled water can be easily poured in until the level is just up to the top of the plate separators. The electrolyte gases freely when overcharged and frequent topping-up will be needed if the dynamo is allowed to supply more current than the battery requires. *Warning*—do not examine the battery electrolyte level with the aid of a naked flame. The gas given off—hydrogen—combines with the air to form an explosive mixture.

After topping-up all the cells, replace the porcelain plugs with their rubber washers, clean the terminals, if at all corroded, and smother them well with vaseline.

The top of the distributor cover, the coil, and the sparking plug

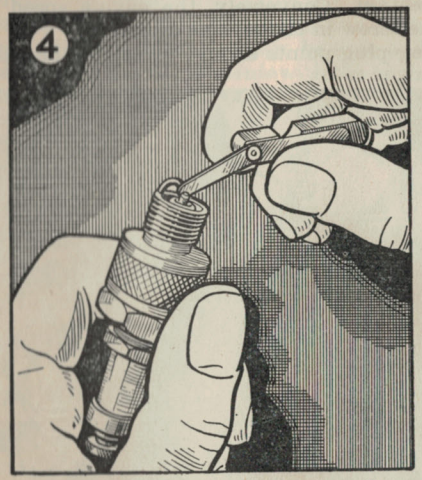

FIG. 11. SETTING PLUG POINTS TO GAUGE

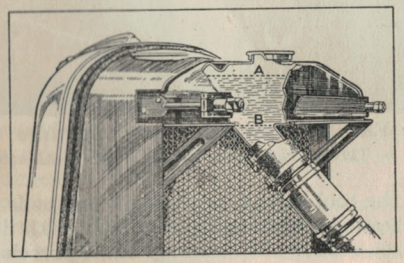

FIG. 12

A = Maximum water-level overflow *B* = Minimum level

insulation should be cleaned regularly. The moulded nuts securing the ignition leads in the distributor cover and the coil should be tested for tightness as a poor lead contact may result from a loose nut. The distributor contacts must be kept clean, so remove the distributor cover by releasing its two securing spring clips. Clean the interior of the distributor cover of any dust with a

wiper and rub the four electrodes with a petrol rag. The central carbon brush must also be clean and free in its guide.

The contact-breaker points are the most important from the cleanliness point of view. If the contacts look burnt, they should be cleaned with a slip of very fine emery cloth and then rubbed over with the petrol rag. Check the gap with the gauge (which is combined with the small ignition screwdriver), and move the plate until the gap is set to the thickness of the gauge.

Make certain, when retightening the two securing screws, that the adjustment is not disturbed when doing this.

Tyre wear is directly affected by neglect or failing to give attention to the correct tyre pressures. The recommended pressures are 24 lb. per sq. in. for the front tyres and 24 lb. for the rear, or 30 lb. for the rear if the car is fully laden. These figures should be strictly adhered to, and checked at frequent intervals, using a tyre pressure gauge.

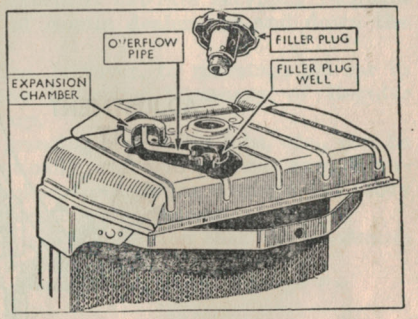

FIG. 13. THE RADIATOR HEADER TANK AND FILLER ON 1940–7 MODELS

The cooling system requires hardly any attention from the owner beyond occasionally topping-up the level to replace any water lost by leakage or evaporation (see Figs. 12 and 13).

After the clutch has been in use for some time, the wear of the friction surfaces will give rise to a need for adjustment in order to ensure the continued full engagement of the clutch.

The adjustment should be such as to allow at least $\frac{3}{8}$ in. *free* movement of the clutch pedal. After depressing the pedal to this extent the stronger resistance of the clutch springs will be felt, so that it is easy to ascertain if the amount of movement is correct. Lack of free movement is serious, for it does not permit the clutch to engage fully. The pedal should be tested from time to time, otherwise damage may be done to the clutch owing to the plates slipping.

To adjust the pedal movement, first put a tommy bar into the hole in the clutch operating shaft to hold it in position (see Fig. 14). Then slightly slacken the clamping screw at the bottom of the clutch pedal lever and depress the pedal sufficiently to give the necessary free movement. Securely tighten the clamping screw and check the adjustment.

If the attentions just described are periodically applied to your Austin Ten a long life to all the working parts will be assured,

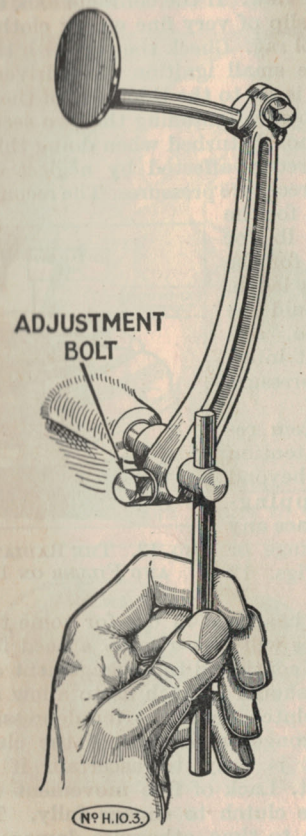

FIG. 14. ADJUSTING CLUTCH PEDAL POSITION

and you will find your car will always give you a sweet and sure performance.

CHAPTER III

SUMMARY OF REGULAR ATTENTIONS

THE busy Austin Ten owner often has little spare time in which to attend to the many diverse requirements of his car.

By the same token he often has little time with which to assimilate the necessary information contained in the manufacturer's literature.

An easy solution for this type of owner, is, of course, for him to take advantage of the excellent flat-rate servicing facilities provided by the hundreds of Austin dealers up and down the country.

For the owner who wishes, however, to maintain his car in good condition himself, the following Summary of Regular Attentions has been drawn up.

By its guidance, all the greasing and oiling jobs, etc., can be done regularly and systematically, and will prevent any important attention being overlooked through the owner's too hasty perusal of the literature appertaining to his car.

The summary is based on the assumption that the maximum weekly mileage does not exceed 300. ~ 52x300 = 15600

REGULAR ATTENTIONS

Every Day or 200 miles. Examine water level in radiator and fill up to within a short distance of the filler cap.

Examine the oil level in the crankcase by the dipstick and add more fresh oil if necessary.

Fill up with petrol if necessary. The tank holds 6 gallons.

Every Week or 500 miles. With the grease gun charge the two front axle swivel pins. Each end of the steering cross tube. The steering shaft. Both steering side-tube joints. Spring shackle pins.

Examine the brakes, and adjust if necessary.

Grease front brake cables (if fitted).

Test the tyres for correct pressures (see page 15) and examine them for cuts.

Every Month or 2000 miles. Examine the gearbox oil level, which should be up to the bottom of the plug hole. Contents 2 pints.

Change the engine oil.

Examine the back axle oil level, which should be up to the

A = Crankcase—replenish to the full mark *daily if necessary*

B = Gearbox—*replenish monthly*

C = Rear axle and steering box—*replenish monthly* (special oil)

E = Steering side tube (2), cross tube (2), swivel axles (2 each), brake pedal shaft (1)—*grease weekly*

G = Propeller shaft splined end, brake balance levers (2)—*grease monthly*

H = Top of steering column on wheel—*few drops of engine oil monthly*

J = Front hubs—*grease occasionally*

K = Distributor—oil (sparingly) every 1000 miles

L = Dynamo bearing—*grease occasionally*

M = Brake and throttle control joints—*oil occasionally*

Grease Spring shackles *weekly* on certain *export* models

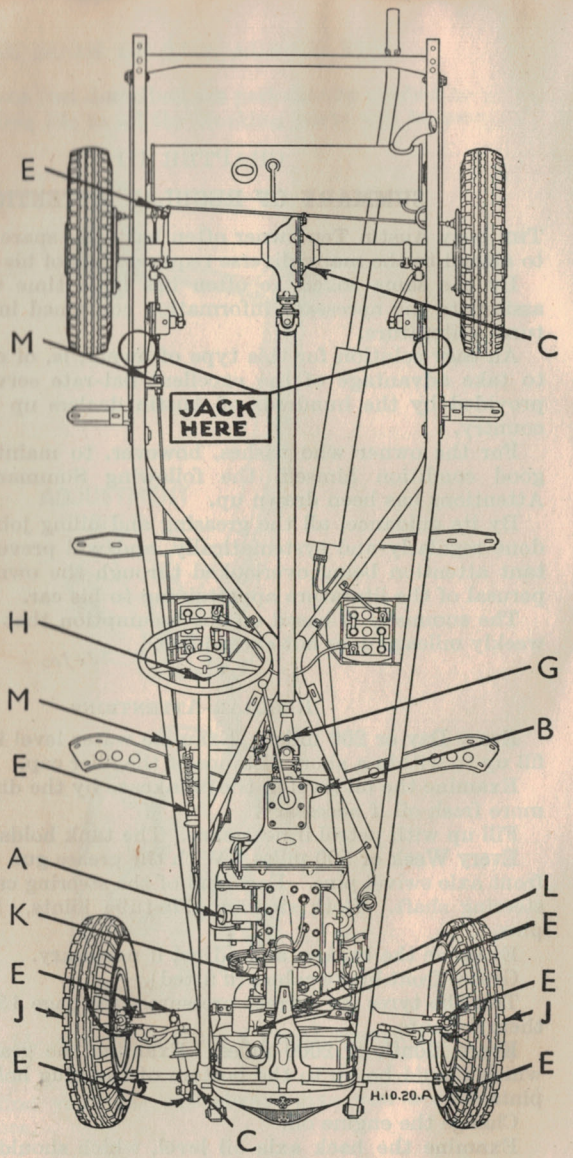

FIG. 15. LUBRICATION CHART

bottom of the plug hole. Add fresh oil if necessary, using the special adaptor on the grease gun. Contents about 1 pint.

Grease front hubs if necessary.

Oil the clutch release ring if not fitted with carbon thrust.

Inject oil into the steering gearbox.

Oil the braking system and all control joints.

Examine the battery, top-up with distilled water if necessary.

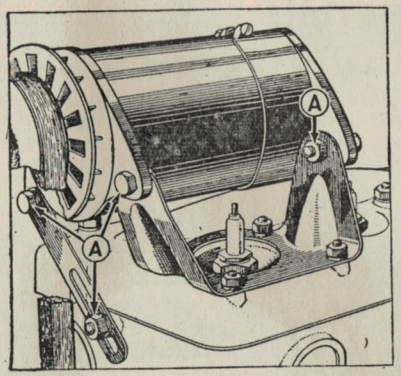

FIG. 16. IT IS IMPORTANT THAT THE FAN-AND-DYNAMO DRIVING BELT IS NOT RUN TOO TIGHT, AS OTHERWISE DAMAGE TO THE DYNAMO BEARINGS MAY RESULT. ON 1940–7 MODELS DYNAMO CAN BE MOVED WHEN THE NUTS MARKED "A" HAVE BEEN SLACKENED

Give ignition distributor oiler a few drops of light oil.

Check the fan belt tension (Fig. 16).

Every Two Months or 4000 miles. Change engine oil. Contents ½ gallon. Clean and set gap of sparking plugs.

Every Four Months or 8000 to 10,000 miles. Remove engine sump, clean gauze strainer and interior of engine.

Change gearbox oil.

Change back axle oil.

OCCASIONAL ATTENTIONS

Examine all nuts and bolts such as road spring clips, cylinder-head nuts, wheel nuts. Examine steering connexions.

Clean the petrol filter, the air filter, when fitted (page 78), and the oil reservoir filter (when the engine oil is changed), Fig. 17. Drain the gearbox and the back axle and refill with fresh oil.

Flush the radiator through. Clean the ignition distributor and

the top of the coil and clean and adjust the contact-breaker points and also the dynamo and starter commutators. Adjust the tappets, and the fan and dynamo belt, decarbonize the engine and grind-in the valves. Check the alinement of the front wheels.

The top of the distributor cover and the sparking plug insulators should be regularly cleaned. The moulded nuts securing the high-tension leads in the distributor cover and the coil should be

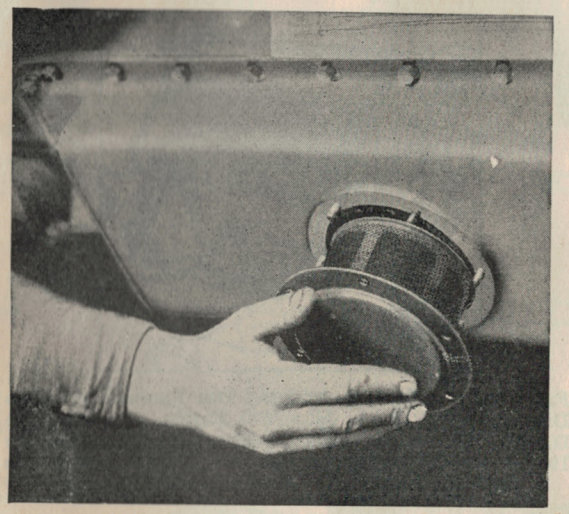

FIG. 17. REMOVING THE OIL FILTER FOR CLEANING

tested for tightness as a poor lead contact may result from a loose nut. The distributor contacts must be kept clean, so remove the distributor cover by releasing its two securing spring clips. Clean the interior of the distributor cover of any dust with a wiper and rub the four electrodes with a petrol rag. The central contact must also be clean.

The contact-breaker points are the most important from the cleanliness point of view. If the contacts look burnt they should be cleaned with a slip of very fine emery cloth and then rubbed over with the petrol rag. Check the gap with the gauge which is combined with the ignition screwdriver, when the contacts are fully open. If the gauge indicates too large a gap, slacken the two screws in the contact plate with the ignition screwdriver and move the plate until the correct setting is obtained; afterwards resecure the two screws.

CHAPTER IV

LUBRICATION

THE life of a car as a whole depends essentially on its adequate lubrication. Fortunately Austin Ten owners find that their car is as simple in its lubrication requirements as it is easy to control.

The most important part of the car in this respect is obviously the prime mover—the engine. The high temperatures and pressures involved in the functioning of an engine necessitate adequate lubrication of the working parts by a suitably blended oil.

The Austin Ten engine has a highly efficient lubrication system (Fig. 18) of the full pressure type in which a positive gear pump is employed.

The pump spindle is driven by skew gearing from the camshaft and the pump forces oil to all the crankshaft main bearings via the main oil pipe. From the three main bearings the oil passes through holes drilled in the crankshaft to each big-end bearing and also through passages in the crankcase leading from the main bearings to the three camshaft bearings.

As the oil spray leaves the big ends it is flung round the interior of the crankcase, providing efficient lubrication for the pistons and cylinders and the connecting-rod gudgeon pins.

Lubrication of the valve stems is provided for by breathers in the valve chest at the rear of the valve cover. The oil in its circulation then drips down the inside of the crankcase on to the gauze filter above the sump cover. The strainer filters from the oil, dirt, road grit, and other impurities which the mesh will not pass.

The pump circulates the oil after it has passed the strainer, thus ensuring that even the least amount of foreign matter present in the oil is not passed on to the bearings.

The conscientious Austin Ten owner will make a habit of regularly inspecting the level of the oil in the crankcase of his engine by using the dipstick provided for the purpose. This examination should be made about once a week or more often, according to the amount of use given to the car.

Oil should be added through the oil filler tube to bring the level up to the "FULL" mark on the dipstick again, if it is found to have fallen below. It is as well, particularly with a new car, to make this a regular practice. A new engine, although it may use little oil for the first two or three thousand miles, will be developing much higher temperatures at its working surfaces than later

on when it is well run-in. Thus the lubrication requirements of a new engine are of supreme importance. It must be ensured, when testing the oil level, that the engine is stopped and the car

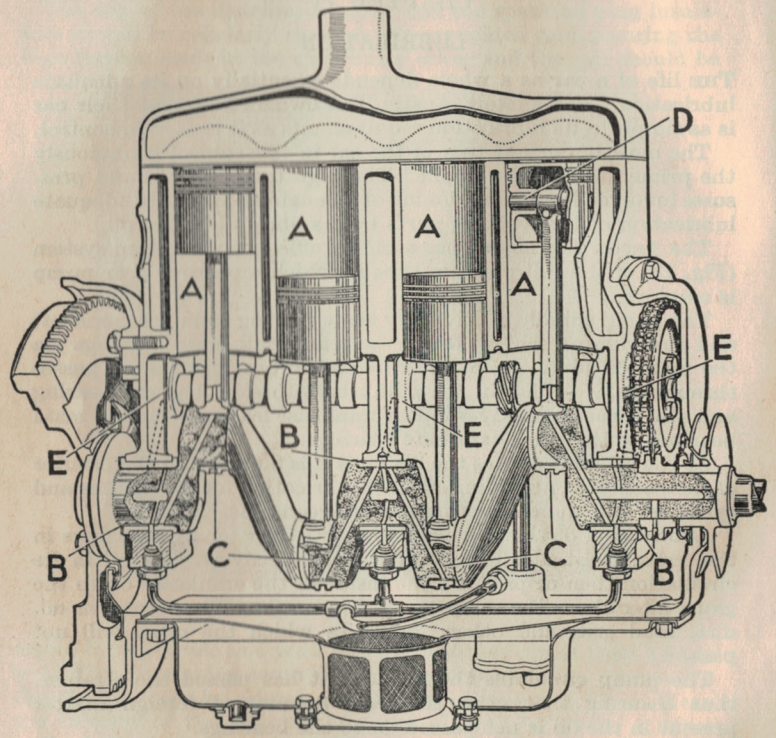

FIG. 18. A SECTIONAL VIEW OF THE AUSTIN TEN ENGINE SHOWING THE CHIEF BEARING SURFACES REQUIRING LUBRICATION

A = Cylinder bores
B = Three main bearings
C = Connecting rod bearings
D = Gudgeon pins
E = Camshaft bearings

on level ground, if a true indication is to be obtained. It may be found necessary to dip, wipe and replace the dipstick more than once before a satisfactory reading is given. If the engine has been stopped for some time, say overnight, a more exact

indication, providing the car is level, will be given by the dipstick, as all the oil will have drained down from the higher parts of the crankcase into the sump.

When actually replenishing, always use fresh oil of the correct blend and grade as detailed at the end of this chapter. These oils are, by the way, stamped on the oil filler tube cap by the manufacturer, so that the owner will have the necessary information in front of him when he comes to replenish his crankcase, even if he has forgotten the names of the brands and has not this handbook with him.

While it is quite safe to run the engine for a long time with the oil level below the full mark, there is the ever-present danger of always leaving this duty until some more convenient time, until eventually through lack of oil the engine seizes up, involving a heavy repair bill. A quarter-of-an-inch above the bottom of the dipstick is the lowest level to which the oil should be allowed to fall as a low level involves the risk of partial or complete failure of the system. The motion of the moving car often causes the pump to be starved by surging when only a small quantity of oil is in the sump. Therefore, always make a habit of looking at your dipstick before undertaking a long journey, and top-up to the correct level with fresh oil if necessary.

It will be noticed at the end of the chapter that an alternative engine and gearbox oil is no longer recommended for summer and winter use. In hot weather earlier types of oil were much more "runny" and would pour more easily than in winter, when they were often quite treacly. It can readily be understood that, by using a thinner oil in cold weather, much easier starting could be obtained, with lower friction losses, than if a more viscous oil used during the summer was retained.

It is surprising what a difference there is between a cheap oil at ordinary air temperature and the same oil at its normal working sump temperature. The latter is nearly always ten to twelve times less viscous than the former, while at the crankshaft bearings of a hot engine the oil may be quite forty times thinner than when cold.

Modern high-grade lubricants, however, while being "thin" enough for winter use, still retain sufficient body at high temperatures; only the sports or badly worn engines, therefore, require a heavier oil in summer.

The termination of the first 500 miles should mean the first change of oil for the engine. During this time it can be assumed that the car has been lightly driven and as all the parts are new and unworn very little oil should have been required to maintain the level.

In spite of the fact that all the component parts of a new engine

are skilfully manufactured to close limits by machine tools leaving the working surfaces with a glass-like finish, it is yet a rough engine in the proper sense of the word when it is compared with a similar engine that has been run-in with its parts burnished and bedded down by its functioning. The high spots of the new parts have to be actually rubbed down, and until they are polished away they are subjected to high pressures and temperatures.

The end of the first 500 miles should see the best part of the running-in process achieved, but the oil has had a bad time from the engine heat in the process and it will contain a considerable amount of metal that has been burnished from the moving parts.

The metal particles are not the only foreign matter present, as gradual contamination has taken place to deprive the oil of its value as a lubricant. Starting the engine up from cold with the strangler in action too long, and prolonged periods of idling are responsible for the presence of unused petrol in the oil. The petrol has passed the pistons, washed the cylinder walls of their protective oil film and remains to dilute the crankcase oil. This petrol, and also condensed water from the exhaust gases that has also passed the pistons, do not so seriously affect the lubricant as at first glance it may appear. Re-evaporation by engine heat and the breathing of the crankcase ensures that only a small percentage of this petrol and water remains. Other diluents of the lubricant from the products of combustion besides the water already mentioned are mostly acids.

Therefore, it will readily be understood that the oil must be changed for fresh, and, as has been shown, most of the impurities will be run clear if arrangements are made for the draining to be done after the car has come in from a run, so that, being hot and agitated, the oil will carry with it most of the sludge that may be present in the system.

To drain the engine sump the drain plug underneath the engine at the rear must be unscrewed and removed after a suitable receptacle has been placed below to catch the waste oil. Jacking up the front of the car or placing it on a slight slope will facilitate the process of draining and render it less easy for sludge to cling to the bottom of the sump cover.

When the last drops have indicated that the draining is complete, replace the drain plug with its fibre washer and insert a light flushing oil, which can be bought for the purpose, into the crankcase through the oil filler tube. Remove the sparking plugs so that the engine can be rotated easily, and turn the starting handle until satisfied that the inside of the engine has been thoroughly flushed out. Then unscrew the sump plug again and

let the flushing oil drain away. It is unwise to use petrol or paraffin in place of a genuine flushing oil, as a proportion will inevitably be left in the oilways and the interior of the crankcase to dilute to a considerable extent the new oil when it is poured into the engine.

Carefully clean the drain plug and its fibre washer when replacing them once more and also the seating round the plug

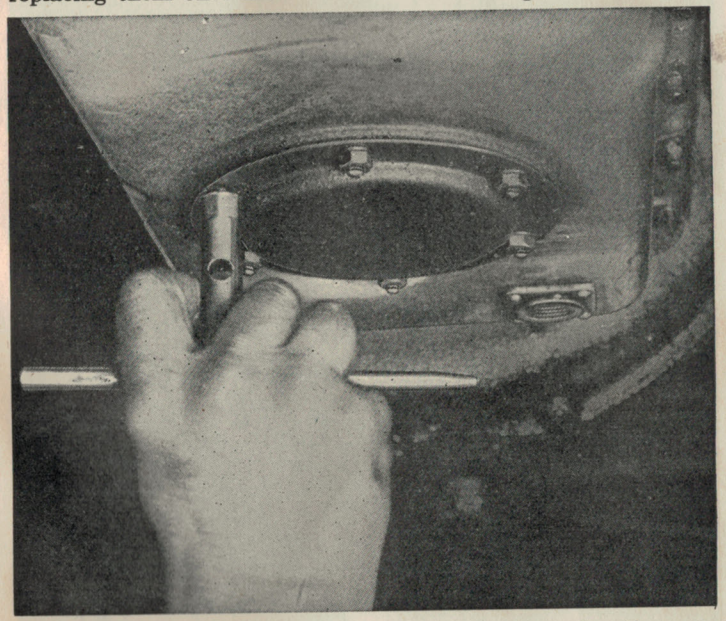

FIG. 19. THE OIL FILTER COVER IS SECURED BY SIX NUTS

orifice, as it is important to ensure that no grit or other matter will prevent a good seal being made when the drain plug is tightened home or oil drips will subsequently prove themselves a nuisance on the garage floor.

With the drain plug and washer carefully replaced, approximately ¾ gallon of one of the approved brands of oil can now be poured into the engine through the oil filler tube.

The engine is now ready for a further spell of work, and the oil need not be changed again until 2000 miles have been recorded on the speedometer.

Before starting up, however, it is as well to rotate the engine

by hand so that the fresh oil is distributed by the pump along the oil passages.

At the next change of oil and subsequently at every other change, the oil reservoir, filter and oil tray ought to be removed

FIG. 20. REMOVING THE OIL FILTER FOR CLEANING

and the interior of the crankcase thoroughly cleaned. Six nuts secure the oil filter cover in the centre of the reservoir (see Fig. 19). With these removed, the cover will drop clear and with it the filter (Fig. 20).

The oil filter cover need not be disturbed if it is intended to remove the reservoir, which is secured by eighteen setscrews. As the reservoir has a lip at its outer edge, the best tool to use is

a box spanner. As the tommy bar will probably be obstructed by the track rod when the front setscrews are being undone, it is best to fit the end of the box spanner into the next largest size, passing the tommy bar through the latter, and so doubling the

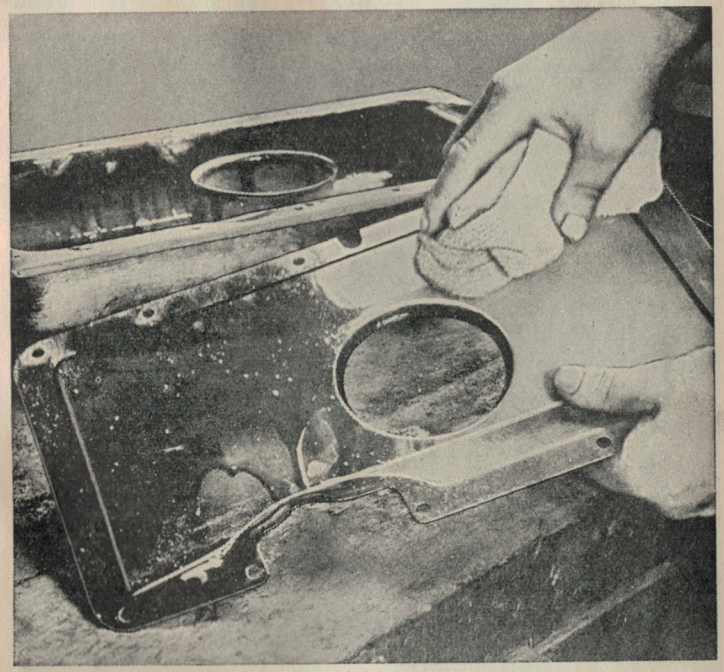

FIG. 21. THE OIL TRAY MUST BE CAREFULLY CLEANED OF SLUDGE

effective length of the spanner. Under the head of each setscrew is a spring washer and a small oval plate; the latter locates in the channelling and acts as a locking device. At the rear of the reservoir there is, in addition, an angle stiffening piece (Fig. 22), which can be removed when the four setscrews which pass through it are withdrawn. After the reservoir has been removed with the gauze filter a further ten setscrews with spring washers will have to be undone to release the oil tray (Fig. 21) now disclosed. On 1940 and later engines it will be necessary to remove the reservoir in any case, since the filter cannot

be detached from outside. The filter gauze, which is attached to the oil pump body by two bolts, can then be removed for cleaning.

The filter is easily cleaned by swilling in either paraffin or petrol and by using a brush to clean the gauze. Be careful

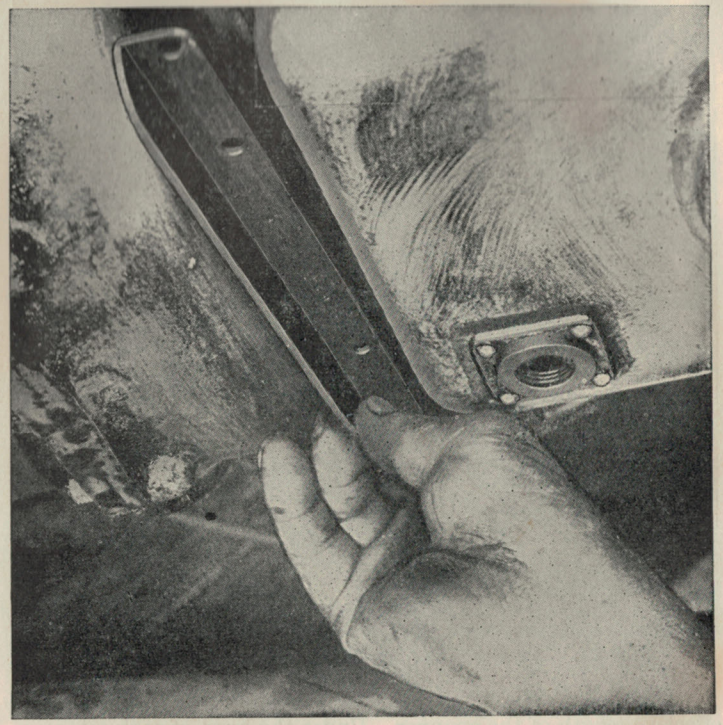

FIG. 22. THIS ANGLE STIFFENING PIECE MUST BE DETACHED BEFORE THE SUMP CAN BE REMOVED ON EARLIER MODELS

to use a brush that does not shed its bristles and refrain from using fluffy rags. A few portions of bristle or a piece of fluff may easily lead to an oil stoppage if allowed to be pumped along the system, so see that no strands or pieces of cleaning material are left after the interior of the crankcase has been thoroughly cleaned (see Fig. 23).

A good oil-tight joint must be made of the reservoir and a new joint washer is usually desirable when replacing it (see Fig. 24). Clean carefully both the joint surfaces in the crankcase and on the reservoir, and smear the washer with grease on both sides. After securing the oil tray by its ten retaining setscrews, place

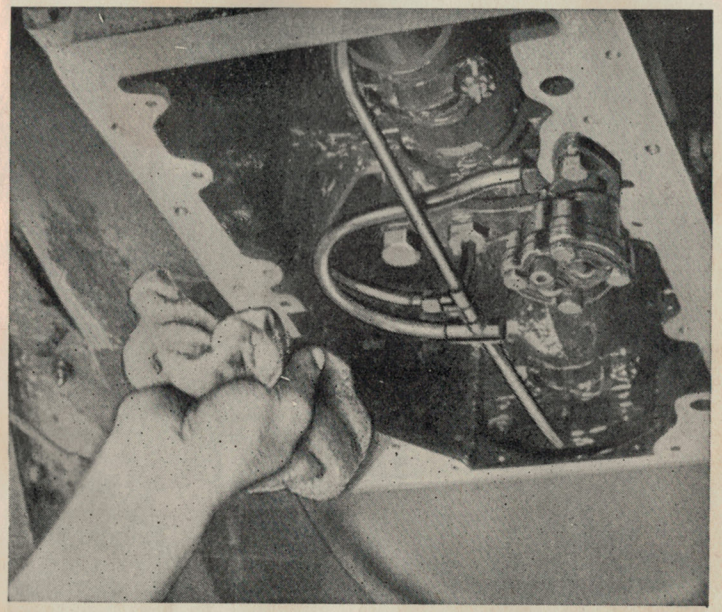

FIG. 23. CLEANING THE INTERIOR OF THE CRANKCASE

the greased washer on the rim of the reservoir and offer it up to the crankcase. The retaining setscrews of both the oil tray and the sump cover should first be tightened finger-tight all round, after it has been ensured that all the setscrews have their proper washers. They should then be tightened up a little at a time all round, so that an even pressure is obtained over the entire joint surface. If this is done, and a box spanner used to tighten the screws a few degrees at a time, a good joint will result (see Fig. 25).

It is a good plan, when finally tightening the screws, to start at the centre of the oil tray or the reservoir, and work outwards to the ends until the screws are all dead tight.

Oil Pressure Indications

The oil pressure recorded by the gauge on the dashboard should normally be about 30 lb. per sq. in. when running at 30 m.p.h. in top gear. A lower pressure is shown, of course, when the engine

Fig. 24. The Oil Reservoir or Sump, showing a New Joint Washer being Fitted

is idling, while a higher pressure may be recorded when the engine is first started from cold.

The latter is due to the resistance offered by the relatively thick, cold oil, to being forced through the various small oilways. In practice a very high pressure would be built up, probably sufficient to burst an oil pipe, were it not for the provision of an oil pressure relief valve in the system. This consists of a

spring-loaded valve which is lifted from its seating by the excessive pressure and so allows some of the oil to flow back into the reservoir.

Naturally, if this valve should be held off its seating when the oil has reached its normal temperature, loss of pressure would be

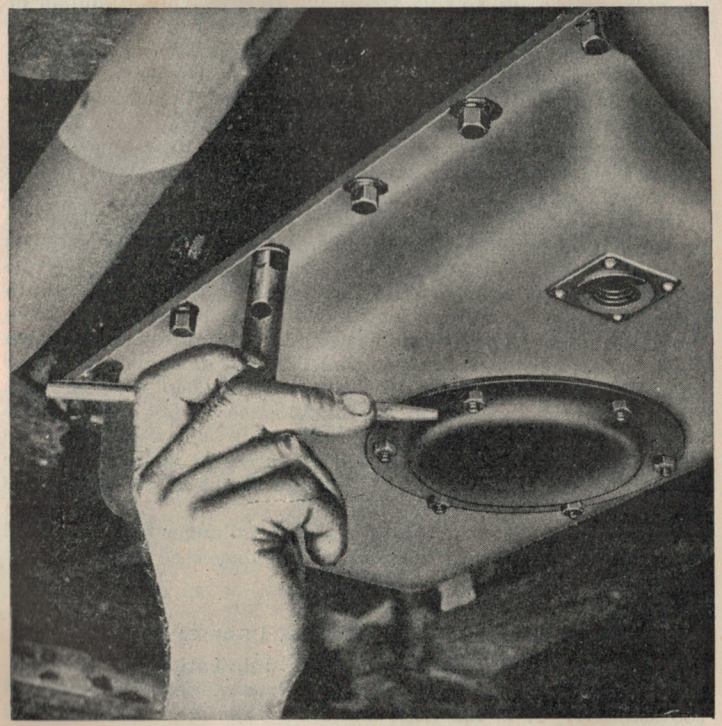

Fig. 25. Tightening up the Sump, Setscrews

experienced. If low pressure cannot be traced to such defects as leakage from the pipe connecting the oil pressure gauge to the engine, badly worn main and connecting rod bearings, of the use of an incorrect grade of oil, the pressure relief valve may be suspected.

On pre-1940 models the valve consists of a spring-loaded ball, fitted in a small boss on the near side of the crankcase, towards the

rear. Slacken the locknut, and remove the screw, so that the spring and ball may be removed. Do not screw the locknut along the screw, or the original setting will be lost.

Clean the ball in petrol or paraffin, and renew it if it is pitted or ridged. It is a good plan to place a suitable receptacle beneath the valve orifice and to turn the engine over sharply a number of times with the starting handle until oil flows from the opening, thus washing any grit or carbon from the internal seating.

When replacing the ball and spring, screw the setscrew in as far as the original position, tighten the locknut, and check the pressure when the engine has thoroughly warmed up. If it is too low, screw the screw inwards a turn or so; if too high, screw the adjuster outwards. Always retighten the locknut before starting the engine.

On the 1940 and later models inspection or adjustment of the pressure relief valve is not quite so simple, since the valve is embodied in the oil pump body, and it will consequently be necessary to drain off the oil and remove the reservoir to obtain access to it. The setscrew and locknut will be seen just above the gauze filter. The locknut is secured by a tab washer, which must be carefully bent back so that it is not damaged; the best plan, however, is to fit a new tab washer when reassembling. Emphasis must be laid on the importance of not altering the position of the locknut on the setscrew, as in this case, should the original adjustment be lost, it will be necessary again to remove the reservoir if a test shows that readjustment of the setscrew is required.

The valve on these models consists of a plunger with a conical seating face. It should be cleaned and inspected as previously described.

Transmission and Chassis Lubrication

The importance of attending to the lubrication of the transmission and chassis in a systematic manner cannot be emphasized too strongly. It is the little-and-often that does the trick and enables the car to give of its best. It is not fair to leave the steering connexions, for instance, without lubricant for thousands of miles, during which time water and road dust, an excellent abrasive mixture, have been wearing down the working surfaces, and then afterwards expect to put matters right by flooding the parts concerned with lubricant.

It will be found that, given a little thought, the necessary oiling and greasing jobs can be rapidly disposed of if a regular scheme is formulated and pursued.

To check the level of the oil in the gearbox, first run the car

on to level ground, then take out the front floor mats and remove the screws holding down the rubber cover to the top of the gearbox and so allow the floorboard to be raised on the earlier models.

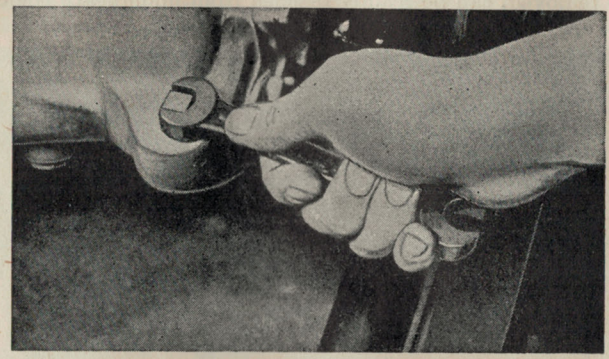

Fig. 26. Gearbox Oil Level and Filler Plug

Then unscrew the oil level plug to be seen on the nearside of the gearbox (Fig. 26) and inspect the level. The oil should just reach the bottom of the thread and fresh engine oil should be poured in if the level is too low. Then replace the screwed plug, the floorboards if fitted, and the front mats. This attention should be observed about every 200 miles.

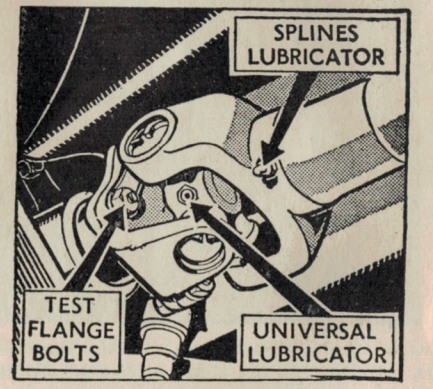

Fig. 27. Two Important Lubrication Points on Later Models
(Earlier cars have a lubricator for the spines only)

The same oils recommended for the engine are suitable for use in the gearbox (see page 42). This ensures a light, easy gear-change.

The running-in process, as it affects the gearbox, results in the contamination of the gearbox oil with minute metal particles abraded from the interior working surfaces, and it thus requires to be changed quite early, at about 1000 miles.

Two pints of fresh oil of a recommended brand must be poured into the gearbox after the old has been drained away.

The drain plug at the bottom of the gearbox, which has first to be removed, can be readily reached from underneath the car.

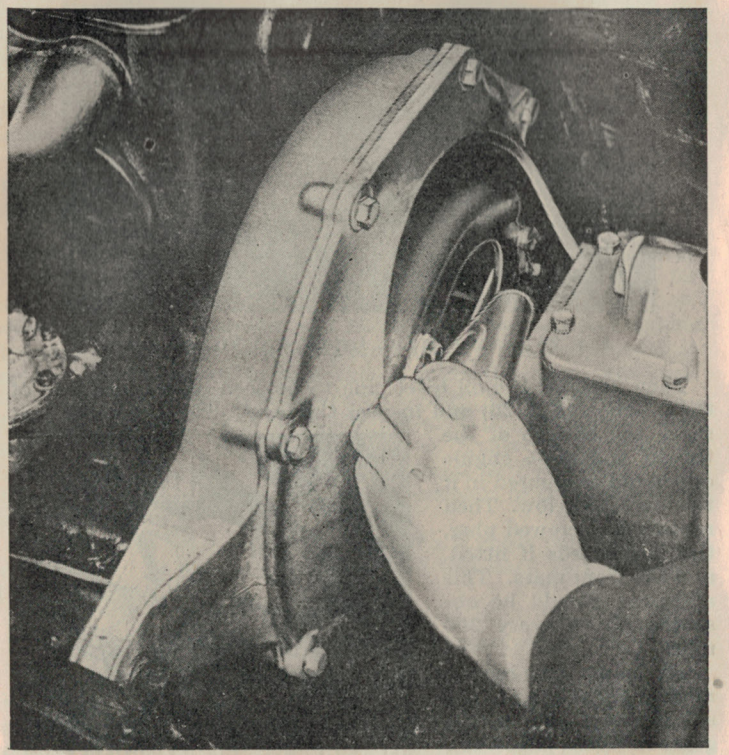

FIG. 28. OILING THE CLUTCH TOGGLE LEVER PIVOTS ON AN EARLY MODEL TEN

The importance of ensuring that lubricant is warmed up before draining was explained when dealing with the engine (page 23). It will be taken for granted, then, that the car has had a run sufficient to warm the gearbox oil and ensure its thorough draining when the drain plug is removed.

The old oil will then drain out quickly, and having been recently agitated by the functioning of the gearbox, will carry most of the impurities with it.

After allowing the last drops of the old oil to drip into a suitable receptacle, carefully clean the drain plug and its fibre washer and the joint face on the gearbox. Then refit the drain plug and washer and screw up tight. Remove the combined level and

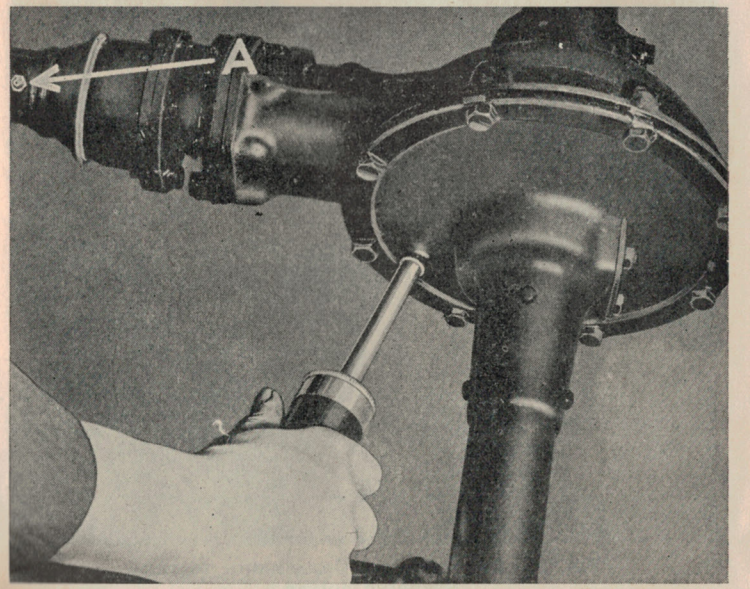

FIG. 29. LUBRICATING THE REAR AXLE

A is a grease nipple on the rear universal joint fitted prior to the later needle roller bearing joints

filler plug, if this has not already been done, and fill up with two pints of new oil which is in readiness. This should give an oil level up to the bottom of the thread in the plug hole.

After this first change, the oil need not be renewed again until a further 5000 miles has been undergone, but the level must be maintained over this period by regular inspection and topping-up.

The clutch requires weekly attention in the form of a few drops of engine oil through the oiler tube on the earlier models. On

the later models with carbon clutch thrusts requiring no additional lubrication at this point, it is advisable occasionally to apply the oil-can to the declutching lever pivots and their pins.

The oil in the back axle should be changed at the same time as the gearbox is dealt with, namely, at the termination of the

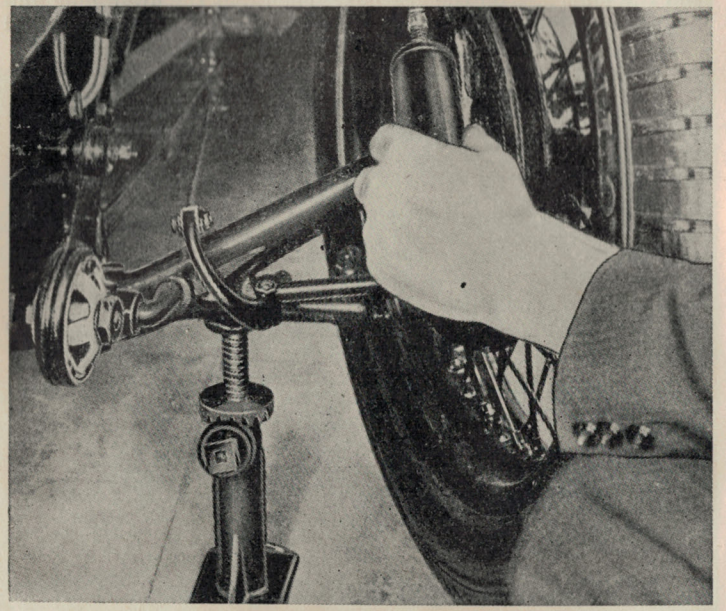

FIG. 30. APPLYING THE GREASE-GUN TO THE STEERING JOINTS

first thousand miles. Whereas engine oil is suitable for use in the gearbox a special lubricant is required for the back axle.

The brands recommended are given on page 42 and a quick-action attachment is provided with the grease-gun to enable this lubricant to be rapidly injected into the back axle (Fig. 29) either when topping-up or refilling. As with the gearbox, there is a combined oil filler and level plug at the rear of the back axle case. Oil should be added if upon inspection the level is not up to the oil level orifice. This inspection should be made at intervals of about 200 miles.

To change the oil, remove the drain plug from the base of the

back axle and let the old oil flow into a can shallow enough to pass under the axle. Replace the drain plug and fibre washer when the axle is empty and inject back axle oil of one of the recommended brands until it flows out of the level orifice when the grease-gun is removed.

To use the quick-action attachment of the grease-gun take out the cork plug and chain and fill with the special lubricant. Screw the cover over the grease-ram and fit the quick-action nozzle in place of the cap at the other end. When the gun is now used

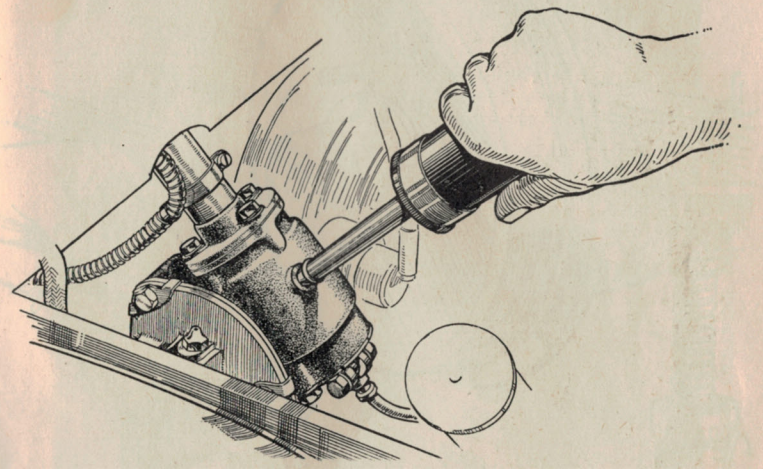

FIG. 31. LUBRICATING THE STEERING BOX

with the quick-action end at the orifice, a large quantity of lubricant will be rapidly injected.

If too much oil has been injected through over-zealous use of the gun, do not replace the filler plug until the surplus oil has drained out again and the level is correct, i.e. up to the mouth of the level orifice. Then carefully clean the plug and its washer and tighten home. It is important to ensure that all excess oil is allowed to escape by this means, as if it is retained within the axle case it will not benefit the mechanism in any way, and the probability is that a proportion will work past the oil seals on the axle shafts and reach the brakes to impair their efficiency.

If an exact measure of the back axle contents is required to ensure that the axle is not over-filled, approximately one pint will bring the oil up to the right level.

The next 5000 miles will require this oil to be changed again, and

during the intervening period of the car's running regular inspection and topping-up will be necessary at about every 1500 miles.

Continuing with the transmission, the needle-bearing type universal joints do not require lubrication except on late models and at the front splined end of the propeller shaft, which requires

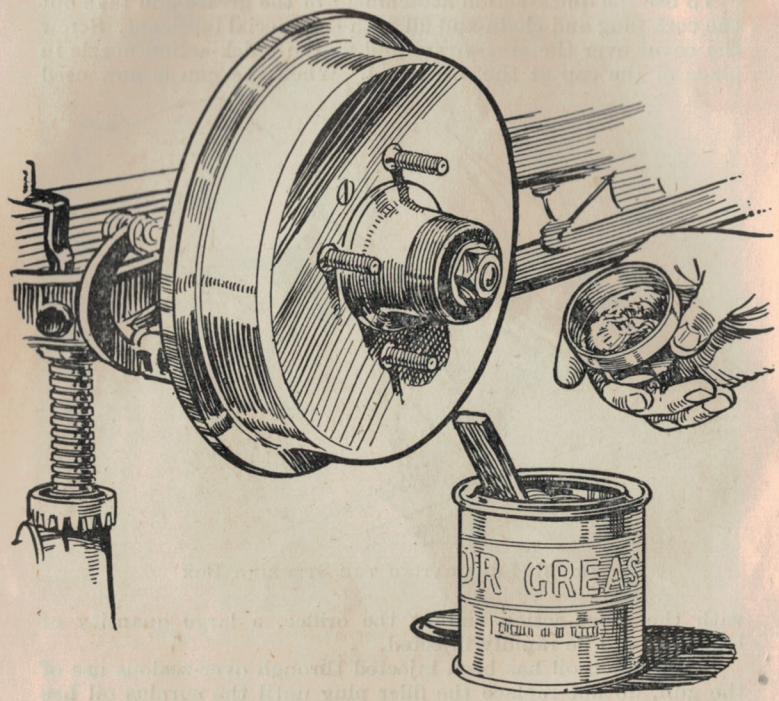

FIG. 32. SHOWING A GREASED FRONT HUB CAP BEING REPLACED

attention once a month at the grease nipple provided, using the ordinary grease in the grease-gun.

The steering connexions are important and the grease nipples should be wiped clean to make sure that no grit, dust, etc., is forced into the bearings with the fresh grease. When applying the grease-gun to these parts, continue until the new grease has forced out all the old, which should then be removed with a rag.

It is advisable when greasing the steering swivels to jack up each front wheel in turn to take the weight of the car off the swivel

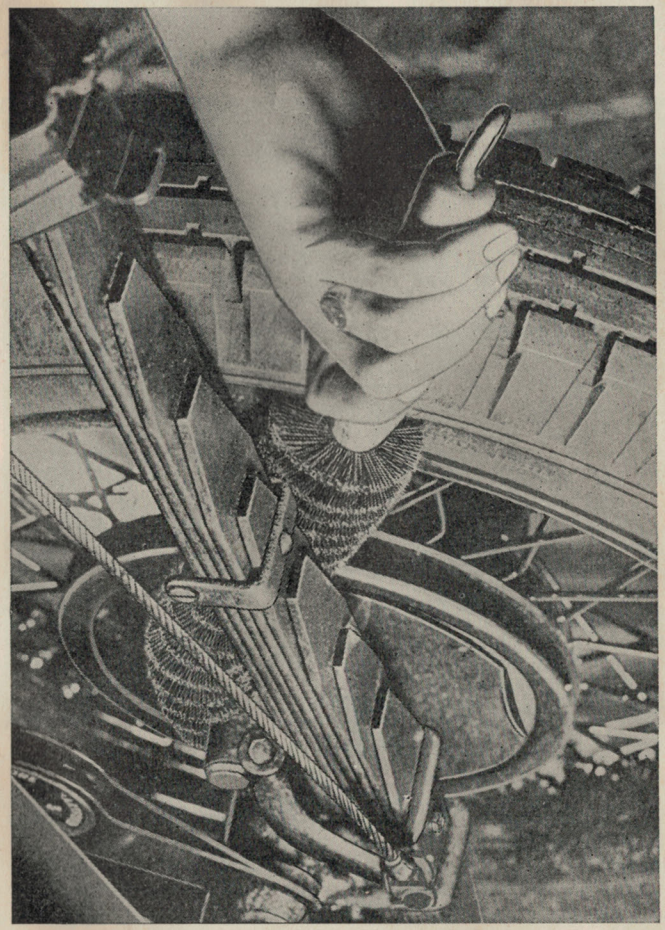

FIG. 33. CLEANING ROAD SPRINGS

axles and thus ensure that the fresh grease will penetrate to all the working surfaces (Fig. 30).

There are only seven points requiring attention by the grease-gun. The steering cross-tube has a grease nipple at each end which can be easily got at, although the car may have to be

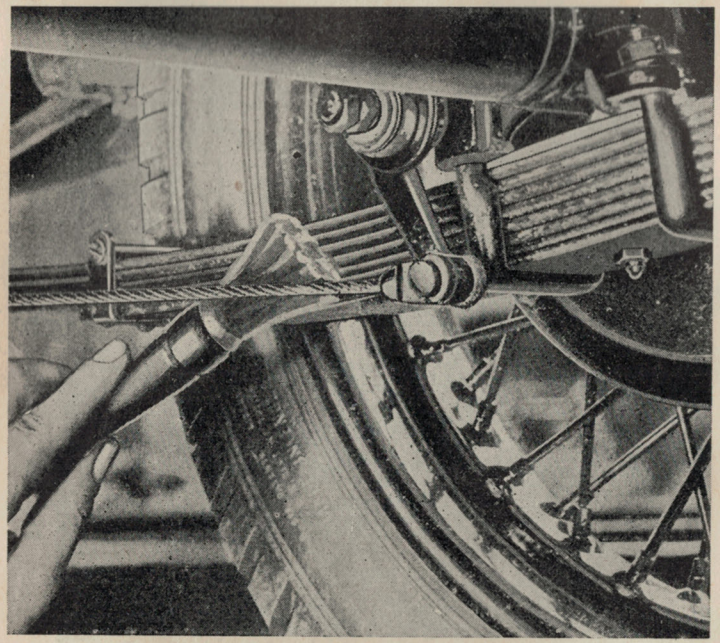

FIG. 34. APPLYING OIL TO CLEANED SPRINGS

moved a little to give sufficient room between the wheel spokes to operate the gun.

The same grade of oil used for the back axle is also used for the steering gearbox. A charge once a month is required by grease-gun through the nipple on the steering box casing (Fig. 34). The nipple can be reached quite easily from the front of the scuttle.

A warning is necessary here—don't inject an excessive quantity of lubricant—here again it is a case of little-and-often.

Oil should occasionally be applied to the hole lubricating the steering column bearing under the wheel.

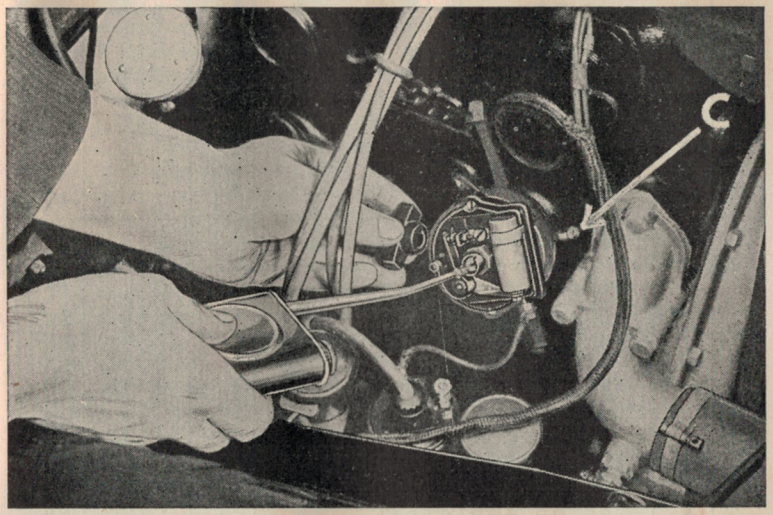

FIG. 35. OILING THE DISTRIBUTOR AUTOMATIC ADVANCE MECHANISM

C is the distributor spindle-bearing lubricator

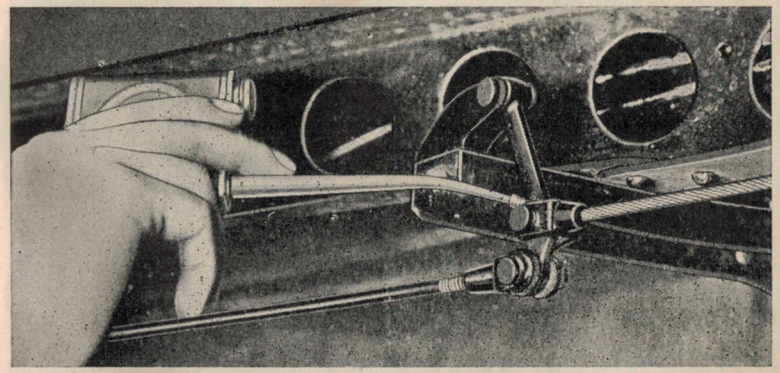

FIG. 36. OILING BRAKE MECHANISM

RECOMMENDED LUBRICANTS

	VACUUM	SHELL	WAKEFIELD'S	ESSO	B.P. ENERGOL	DUCKHAM'S
ENGINE— Summer Winter	1932–9 Mobiloil BB Mobiloil A	1932–9 X-100 40 X-100 30	1932–9 Castrol XL Castrol XL	1932–9 Essolube 40 Essolube 30	1932–9 Energol 40 Energol 30	1932–9 NOL Forty NOL Thirty
All Seasons	1940–47 Mobiloil A	1940–47 X-100 30	1940–47 Castrol XL	1940–5 Essolube 30	1940–7 Energol 30	1940–47 NOL Thirty
Summer Winter		1932–9 Sports X-100 50 X-100 30	1932–9 Sports Castrol XXL Castrol XL	1946–7 Essolube 30 Essolube 20		
GEARBOX	Mobiloil BB	X-100 40	Castrol XXL	Essolube 40[1]	Energol 40	NOL Forty
WHEEL HUBS	Mobil Hub Grease	Retinax A or RB	Castrolease Heavy	Esso Grease	Energrease C3	H.B.B. Grease
REAR AXLE Summer Winter STEERING BOX	Mobilube GX 140[2] Mobilube GX 90[2] Mobilube GX 140	Spirax 140 EP	Castrol Hi-Press Gear Oil	Esso Expee Compound 140	Energol EP 140	NOL EP 140 Transmission Oil
CHASSIS GREASE POINTS	Mobilgrease No. 2 or No. 4	Retinax A or RB	Castrolease Heavy	Esso Grease	Energrease C3	Laminoid Soft or H.P.G. Grease
OIL-CAN Distributor and Dynamo	Mobiloil Arctic	X-100 20/20 W	Oilit	Esso Handy Oil	Energol 30	NOL Thirty
SPRINGS, RUSTED PARTS AND SQUEAKS	Mobil Spring Oil	Donax P	Castrol Penetrating Oil	Esso Penetrating Oil	Energol Penetrating Oil	Laminoid Liquid

[1] On models manufactured prior to 1938 use Essolube 50.
[2] On models manufactured prior to 1937 use Mobilube C.

A weekly dose of oil from the oil-can will serve for the ends of the steering side-tube where the ball pins work in their sockets. The brake-cam spindles that actuate the brake shoes on the earlier Tens are automatically lubricated, those at the rear having self-lubricating bushes, while those at the front receive supplies of lubricant from the swivel-pin greasers. These bearings, therefore, and also the rest of the brake mechanism need not concern the owner except for a few drops of oil occasionally applied to the working parts of the system.

The front hub caps can be removed with the ring spanner in the kit, filled with grease and screwed in place again (Fig. 32). The rear hubs are fed with lubricant from the rear axle.

Old oil drained from the engine or gearbox will do to brush the springs with. If this is done occasionally, the springs will not rust and squeak but will maintain their resilience, and the comfort of the users of the car will be assured. Penetrating oils that creep easily will also serve this purpose excellently and will quickly penetrate between the spring leaves (see Fig. 34).

The spring leaves are made slightly hollow, and when they are finally assembled and clipped together a thin reservoir or film of oil is easily maintained between the leaves. The action of the springs tends to spread the oil and ensures a smooth flexible suspension.

Lastly, when dealing with any of the oiling and greasing jobs first see to it that the oil-can, grease-gun, and the nipples, etc., are clean. If a nipple will not pass its charge of grease, remove it and fit a new one if it is still obstinate after cleaning with petrol.

As is well known, electrical equipment will not suffer a superfluity of lubricant. A little oil in the wrong place may prove to be a source of trouble later on. The electric windscreen wiper, the dynamo and the electric starter, all have their lubrication requirements provided for when they are manufactured and no subsequent attention in this direction will be required from the owner. A lubricator is fitted to the distributor spindle bearing (*C*, Fig. 35) and a drop or two of oil will be required here about every month or every 1000 miles, whichever comes first. If the cap is removed, a smear of petroleum jelly can be given to the distributor cam, and an occasional drop of oil to the top of the distributor spindle to lubricate the automatic advance and retard mechanism, and a very occasional drop on the contact-breaker pivot (see Fig. 35).

To get at the top of the distributor spindle the rotor will have to be pulled off, but the screw then rendered visible must not be unscrewed. The oil will penetrate round it and reach the automatic mechanism below. Make sure that the rotor is replaced

accurately in the same position as before, as it will only fit properly in the one position.

The body does not possess many moving parts, but a little oil or grease at regular intervals at such places as the door locks and hinges, windscreen hinges and chain-winding mechanism, and direction indicator pivots, will go a long way to ensure the easy operation of the various moving components of the body and prevent elusive squeaks arising later on.

CHAPTER V

DECARBONIZING

DECARBONIZING and grinding-in the valves are both jobs often performed by owners. They are, at the same time, jobs that can be confidently and successfully undertaken by anyone with only a slight mechanical knowledge. For the job of decarbonizing no special tools have to be bought; the contents of the tool kit meet all requirements.

Decarbonizing need not necessarily involve grinding-in the valves, although the same dismantling and reassembling of the engine have made these two maintenance items almost synonymous. If the compression of the cylinders when tested with the starting handle is up to standard, and equal for all four cylinders, decarbonizing can be effected without disturbing the valves.

The need for decarbonizing is sometimes made evident to the owner by a metallic knocking sound coming from the engine when it is pulling hard, especially at low engine speeds.

This knocking noise is due to the excess of carbon deposited on the surfaces of the combustion spaces and on the tops of the pistons, causing irregular and local areas of combustion with the incidental rapid increase in pressure giving rise to the knocking sounds. Combustion should be as even as possible, starting from the sparking plug points and spreading through the charge, giving a not too-rapid explosion. The piston will then receive a comparatively steady sustained pressure instead of a sharp violent one.

Excess of carbon in an engine is also responsible for irregular running by its becoming incandescent from the heat of combustion and then firing the incoming charge prematurely.

Owners may have noticed also that this can happen with a hot, carbonized engine when the ignition is switched off, the incandescent carbon firing the charges as they are inspired and enabling the engine to run for several further revolutions.

When an engine is in this state, the earliest opportunity should be taken to decarbonize it. If some time must necessarily elapse before the job can be undertaken, the knocking noise from the engine can be temporarily alleviated by using an anti-knock fuel with an alcohol or tetra-ethyl content, or by retarding the ignition. The latter will, of course, normally impair the performance, but it will slow down the combustion rate slightly, and if the driver engages a lower gear earlier than usual, knocking will be rendered less obtrusive. The engine will not run so well in this

state; the loss of efficiency due to the carbon is self-evident by the loss of power, overheating, and increased consumption of petrol.

A good indication as to the state of the combustion spaces as far as carbon is concerned can be obtained from the condition of the sparking plugs. If, on removal for examination, the plugs have acquired a considerable amount of carbon around the base of the electrodes, a similar state can be assumed to exist in the combustion chambers.

Before getting down to the actual job it will be as well to warm up the engine. It will be found to be much easier to break the joints and unscrew the cylinder-head nuts, etc., if this is done.

Drain the water from the cooling system by turning the tap on the water inlet elbow by the bottom hose connexion on the offside of the engine. The capacity of the cooling system is roughly 17½ pints. Therefore, if the winter anti-freeze solution is to be retained, a receptacle large enough to contain this amount should be placed under the draining orifice. If, however, it is not desired to keep the cooling water, and a drain is handy, the best plan is to run the car near by and then run the water off.

Then disconnect the earth lead from the battery for safety's sake, and to give unrestricted access to the engine when working, remove the bonnet. To do this release both the bonnet hinge fixings at the ends of the bonnet support stay. The bonnet stay is the steel pressing, secured at scuttle and radiator, that lies underneath the bonnet hinge. With this fixing undone, one side of the bonnet should be raised and the bonnet completely removed from the opposite side, grasping the bonnet sides at front and rear. Damage to the cellulosed wings and radiator cowl will be guarded against if a friend is persuaded to lend a hand in manipulating the bonnet.

With the bonnet clear, it may be thought that access to the engine will be increased if the horn is removed. If this is so, before removing the horn, first disconnect both horn wires.

The cooling system should be drained by now, so that the radiator can be separated from the cylinder head. To do this, undo the top and bottom clips for the top hose and remove the latter complete with thermostat (if fitted) (Fig. 37).

Remove the sparking plug leads, replace the plug terminals, and tuck the leads out of the way, after releasing the barrel nut securing the ignition wire carrier.

It is now necessary to remove the dynamo from its mounting on the cylinder head. First slacken the fan and dynamo belt adjustment in order to allow the fan belt to be lifted off its pulley. Four of the cylinder-head nuts secure the dynamo bracket on the

Ten, another secures the ignition lead carrier and another (on some models) the battery earth cable.

The cylinder-head holding-down nuts (Fig. 42) can now be slackened all round before unscrewing them individually. This procedure is to prevent the cylinder head from being strained. There are seventeen of these nuts with metal washers underneath, and when these have been removed the sparking plugs can be

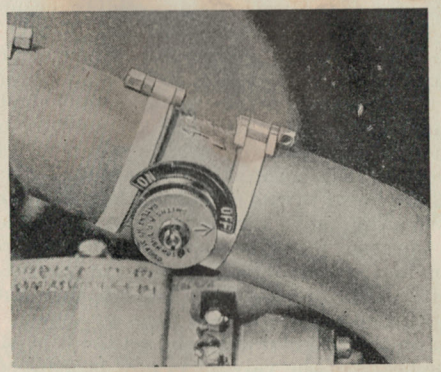

FIG. 37. THE SMITH THERMOSTAT FITTED ON EARLIER MODELS

unscrewed and the special lifting screw provided in the tool kit screwed into the foremost plug hole.

By grasping the water outlet branch and the lifting screw firmly and pulling up with a slight rocking motion, the head will normally be withdrawn off its holding-down studs with little trouble. In the event of the head proving obstinate, however, one or two judicious mallet blows may loosen it.

An alternative method of overcoming difficulty in removing the cylinder head is to refrain from unscrewing the sparking plugs until the head has been withdrawn. In which case, by rotating the crankshaft with the starting handle (with the ignition switched off, of course), after the holding-down nuts have been removed, it will be found that the compression of the engine will break the joint and free it enough to enable it to be drawn off the studs by hand.

When actually withdrawing the head, note carefully if the joint washer or gasket is stuck to the cylinder head or to the cylinder block, or if it is stuck to both. In the latter case

free it gently from either surface and then lift the cylinder head clear.

If the gasket has been left on the cylinder block it, too, will have to be carefully lifted off the monobloc studs. This is best done as near the horizontal as possible to avoid damaging its copper-asbestos washer joint. If it sticks on one or more of the threaded studs it will have to be eased away carefully. When putting the gasket in a safe place, make a slight mark on the upper surface, for identification purposes, to ensure that it is replaced the same way up. Be careful not to make too definite a mark, or the efficiency of the washer may be impaired.

It sometimes happens that a cylinder-head nut binds on its stud so that the stud itself is unscrewed from the cylinder block. To replace the stud firmly in the monobloc when the head is clear, screw the stud in its tapped hole, using a spanner on the nut that caused the trouble. When the stud has been firmly screwed down to the limit of its lower threaded length, the obstinate nut can be "started" by continuing to turn it in the right-handed direction. Once free on the stud, it can be easily run off the thread, leaving the stud firm in the monobloc. If the nut has been loosened beforehand, it will be necessary to use another nut to lock it before attempting to replace the stud.

The carbon on the cylinder head and on the tops of the pistons and round the heads of the valves can now be scraped off. If the sparking plugs have not been removed, remove them before attempting to clean the cylinder head and place them on one side for cleaning and adjusting. The condition of the carbon deposits in the engine indicate the mechanical condition of the engine generally. A hard, dry deposit shows that the oil consumption is good, and therefore the piston, piston rings, etc., are not unduly worn. The reverse is shown if the carbon is soft and oily.

Use a small scraper or a screwdriver for removing the carbon, but before doing so turn the crankshaft with the starting handle to bring two pistons to the top of their cylinder bores. Stuff pieces of rag into the other open bores to prevent the intrusion of loosened carbon, and, although it is not strictly necessary, some owners may consider it worth while also to close the water openings in the cylinder block with rag. Take particular care, if this is done, to remove these same scraps of rag, taking a roll call if need be, for if one of those pieces slips down and is not recovered, it will ultimately obstruct the circulation system and cause overheating.

With the tools selected, scrape all the carbon off the tops of the two pistons (Fig. 38) (being careful not to scratch unduly the soft aluminium alloy) and the interior edges of their cylinder bores. Be careful not to disturb the carbon round the chamfered

edges of the pistons and the corresponding one of the cylinder bore. Then clean the deposits from all the valve heads and the adjacent combustion surfaces, afterwards rubbing all the scraped area with a paraffin or petrol rag. This will clear away all the loose carbon dust and reveal the patches missed by the scraper. After dealing with these and ensuring that all the carbon has been

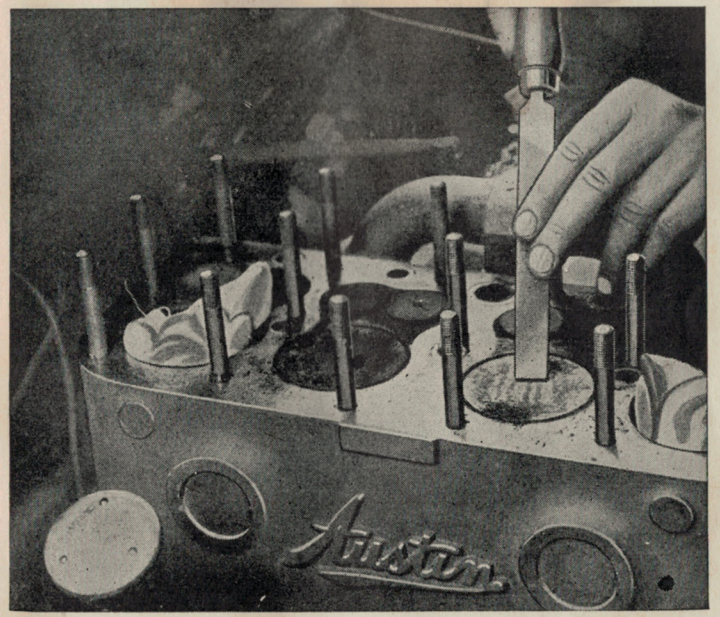

FIG. 38. SCRAPING CARBON DEPOSIT FROM PISTON CROWN

removed, the crankshaft can be given a half-turn to bring the other pair of pistons to the top of their cylinders; they will push out the rags.

These can be shaken out, used to wipe the cylinder bores of the decarbonized pistons, shaken again, and stuffed into those cylinders while the other two pistons are dealt with.

Carefully scrape the carbon deposits from the piston crowns, and afterwards clean with the petrol rag as was done with the first pair of pistons.

This done, attention can be given to the cylinder head, and, turned upside down, it can be scraped free from carbon, using

special care with those models employing an aluminium head (Fig. 39). The interior rounded surfaces will not be so easy to clean as the piston crowns, etc., but if a suitably curved tool is used the job will not be unduly difficult. When all four combustion spaces in the cylinder head have been dealt with and cleaned out afterwards with the petrol rag, clean the interior

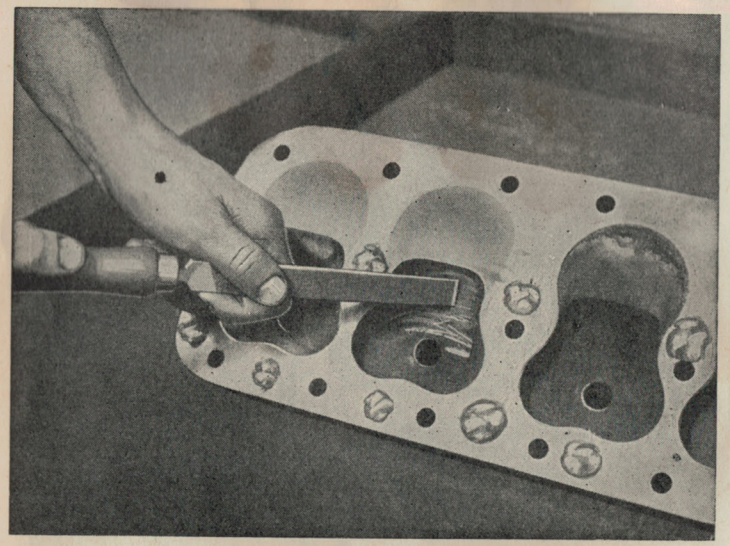

FIG. 39. DECARBONIZING CYLINDER HEAD
Note rag in water passages

edges of the cylinder-head gasket of carbon, and examine it carefully for defects. If damaged, replace it with a new gasket.

If it is not desired to grind-in the valves, reassembly of the cylinder head and joint can be commenced.

Before doing so, see that all the parts are thoroughly clean, especially the contact surfaces—not a particle of carbon must be on one of them or an unsatisfactory joint may result. A good way to ensure that no carbon bits or dust will remain in the cylinder bores is to squirt engine oil on the piston crowns (Fig. 40) and the cylinder walls and then rotate the crankshaft with the starting handle. It will be found that any carbon particles will be left on the cylinder walls by the receding pistons. It is then an easy matter alternately to wipe the surplus oil from the

cylinder walls and turn the starting handle, until satisfied that all are clean.

If the gasket is a new one or if the old one is in good condition, it should not be necessary to use gold size or any other sealing compound. If care has been taken to ensure that all the contacting surfaces are really clean, the gasket smeared with grease

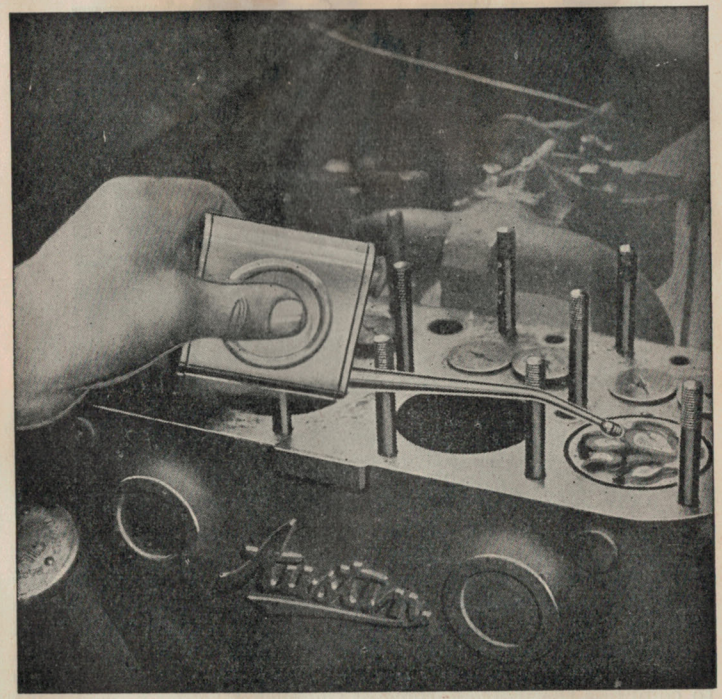

FIG. 40. OILING PISTONS AND CYLINDERS PRIOR TO REFITTING CYLINDER HEAD

on both sides, and the head is pulled down evenly, a perfect joint will result. Before refitting the head, make sure that no rags have been left in any of the cylinder bores or water ducts.

If the original gasket is used again see that the marked side is uppermost. The wisest plan, however, is always to fit a fresh gasket. The cost is small, and will prove an economy in the long run.

The gasket may stick on one or more of the holding-down studs; it is a flimsy affair and requires gentle handling. It had best be eased down the obstructing stud or studs with a suitable box spanner. Fit the oiled gasket and the cylinder head, and oil the cylinder-head holding-down studs and nuts so that the nuts with their washers can be easily run down the

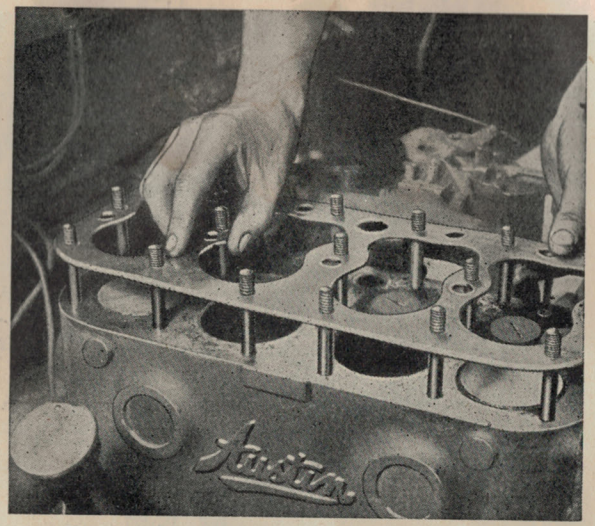

FIG. 41. REPLACING CYLINDER-HEAD GASKET

threads by hand. Then replace the ignition lead carrier, the dynamo bracket and the battery earth cable (if earthed on the cylinder head). When all the nuts are finger-tight, tighten them further with a box spanner, giving each half a turn at a time in the order shown in Fig. 42 until all are tight home. The idea is to compress the whole surface of the gasket to get a good joint and also to prevent the head from being even slightly tipped at one end or a side, and so cause the casting to be strained.

With a good joint thus effected the sparking plugs can be replaced if they have been cleaned and have had their points set to the gauge supplied in the tool kit. The leads can then be replaced on the sparking plug terminals and the top water hose connexion replaced and the clip tightened up. When the dynamo has been replaced and the fan belt adjusted, all that is left to be done is for the cooling system to be refilled with water or the

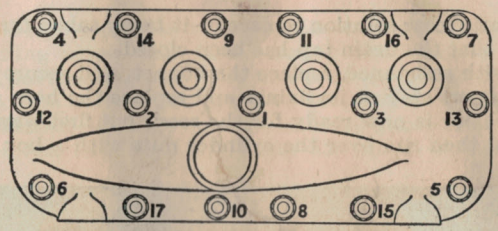

FIG. 42. CORRECT ORDER OF TIGHTENING CYLINDER HEAD NUTS

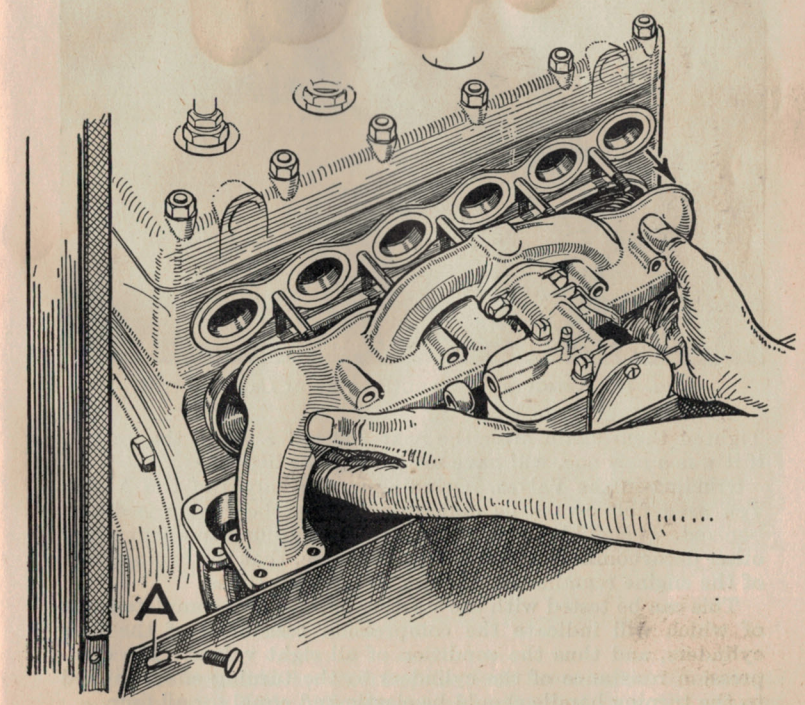

FIG. 43. REMOVING THE CARBURETTOR AND MANIFOLD COMPLETE

More room is provided if the flitch plate is detached at *A*

original anti-freeze solution replaced—it being taken for granted, of course, that the drain tap has been closed.

Then, with assistance, replace the bonnet, and secure it to the bonnet support stay at its fixings and replace the horn and horn wires. The car is now ready for the road, but first warm up the engine and then run over the cylinder nuts with a box spanner.

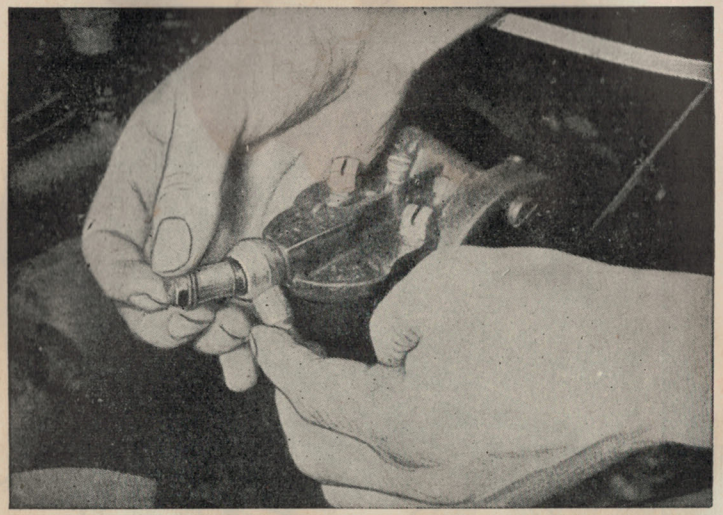

FIG. 44. REMOVING PETROL PIPE FROM CARBURETTOR

Tighten them again after the next 250 miles, when the gasket, if it was a new one, will have settled down a little.

Grinding-in the Valves. Grinding-in the valves of the Austin Ten need not always be undertaken when the engine is decarbonized. It should suffice if the valves are ground-in about every other decarbonization, providing, of course, that the compression of the engine remains satisfactory in between times.

This can be tested with the starting handle, two complete turns of which will indicate the compression resistance of the four cylinders, and thus the condition of all eight valves. The compression resistance of the cylinders to the turning effort applied to the turning handle should be elastic and equal for all four.

Assuming that the engine has been stripped for decarbonizing, the next step will be to remove the combined inlet and exhaust manifold together with the carburettor (Fig. 43). For this, first

release the air strangler wire from the carburettor by slackening its securing screw and disconnecting the throttle control by undoing its securing nut. The unions of the petrol pipe from the pump to the carburettor must be detached at both ends, carefully retaining the fibre washers and the gauze filter at the carburettor end (see Fig. 44). Then disconnect the exhaust pipe

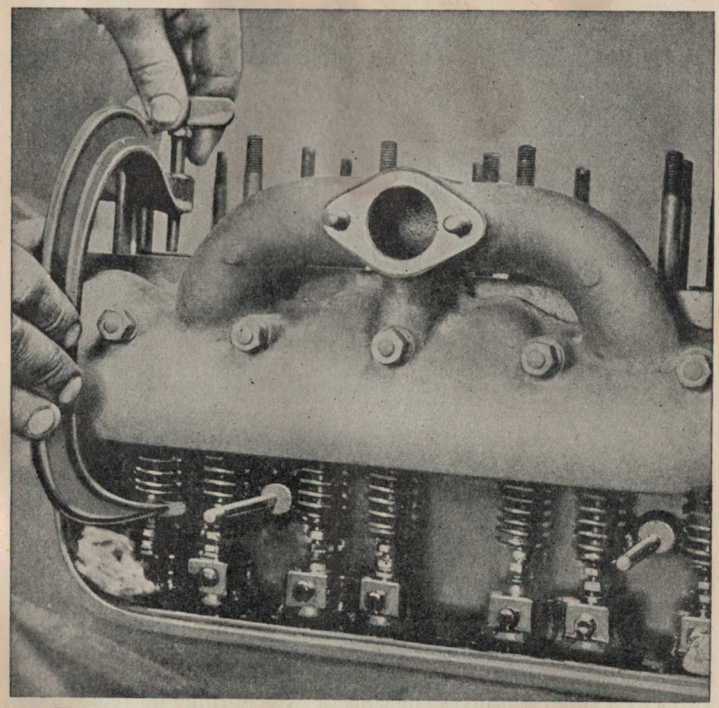

FIG. 45. COMPRESSING VALVE SPRINGS WITH VALVE LIFTER IN ORDER TO EFFECT THEIR REMOVAL

Note the crankcase breather holes stopped with rag

from the manifold by undoing the four brass nuts. These nuts may present a little difficulty owing to the heat from the exhaust having distorted them to a slight extent.

The carburettor need not be separated from the manifold. The manifold and carburettor can be detached in one piece by

undoing the five brass securing nuts with their washers and drawing the manifold off the studs. There are two washers to take care of, the manifold joint washer and the exhaust pipe flange washer. These should be examined and replaced if damaged or showing black areas where exhaust leaks have occurred.

The valve cover must next be removed by undoing its two screws with large knurled heads. With the cover away, the valve

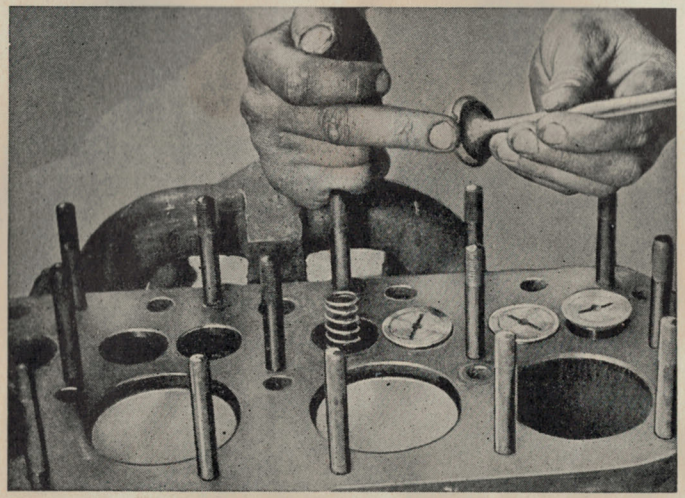

FIG. 46. APPLYING GRINDING PASTE TO VALVE

springs, valve stems and tappets are visible. Using the thin tappet spanners out of the tool kit, slacken the lock-nuts of all the tappets and screw down the tappet heads to provide plenty of clearance for the subsequent operations. By using the valve spring compressor (Fig. 45) provided in the tool kit, taking one valve at a time, compress the coils of each spring and remove the cotter pin or the conical cotters on later models. With all the cotters removed, take out all the eight valves, being careful to note their order. If it is desired to examine the valve springs they can be removed by partly compressing each with the compressor, and pulling them out slightly from the bottom to clear their respective tappets.

Examine all the valves, and if none are too badly pitted they can be ground-in. If, however, pitting is pronounced, the best plan is to have them refaced by a competent mechanic before

grinding them in. Grinding-in involves rotating the valve head on its seating with a grinding compound in between.

Before commencing, carefully clean the valves of carbon and dip the stems in petrol and push them up and down in the guides to remove any gummy deposit (Fig. 49). If the valves are in a

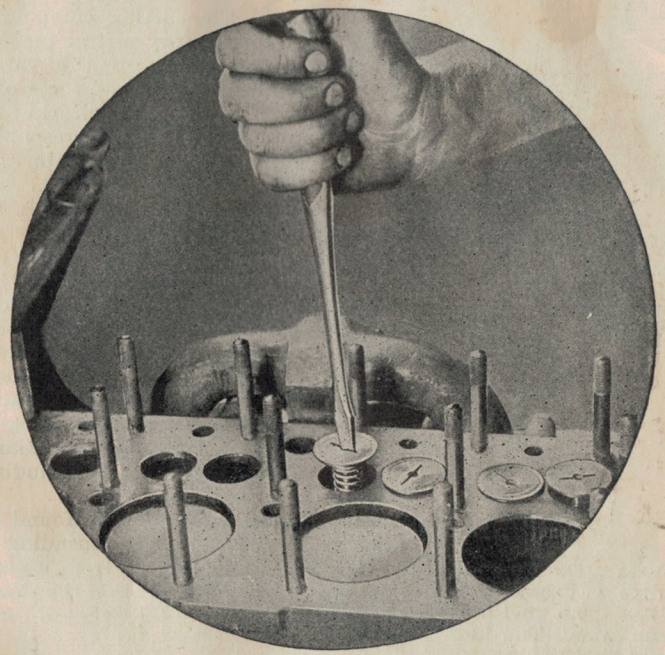

FIG. 47. GRINDING-IN VALVE WITH SCREWDRIVER
Note light return spring under valve head

reasonable condition, a fine grinding compound can be used. Otherwise use a coarse grade first and follow with the fine grade afterwards.

Smear the valve seating with a little compound (Fig. 46) and lower the valve. Then rotate the valve backwards and forwards, using an even pressure on a screwdriver in the slotted head.

On later models the valve heads are not slotted, but have two depressions in them into which a special pegged tool fits. This is supplied in the tool kit or can be obtained from an Austin dealer (see Fig. 48).

Make sure, when dealing with each valve, that the cams are well away from each tappet so that the valves can seat fully. At intervals, the valve receiving attention should be lifted off its seat (for this purpose a light spring placed under the valve head is of advantage (see Fig. 47)) and replaced in a different position to distribute evenly the cutting compound and ensure a satisfactory seating for the complete circumference of the valve face. Examine the valve as the work proceeds until a smooth dull ring is formed round the valve seat corresponding in width to the seat cut in the monobloc.

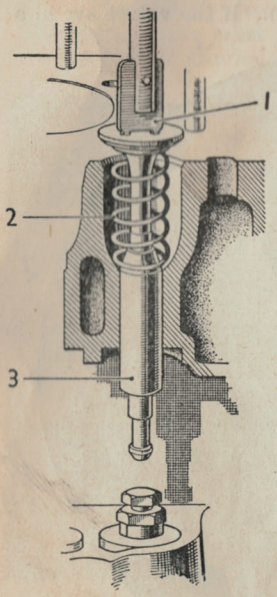

FIG. 48. ON LATER ENGINES A PEGGED TOOL (1) IS USED TO ROTATE THE VALVE. THE LIGHT SPRING (2) AND THE VALVE GUIDE (3) ARE ALSO SHOWN

To test if the seat is true, clean all the compound from both valve and seat and replace. Then rotate the valve in this dry state as if continuing the grinding-in process. The correctly ground-in valve and seat will then reveal a bright ring concentric with the smooth matt band first observed. If this ring is unbroken, the valve will be gas-tight on assembly. Proceed with grinding-in all the valves in this manner, taking each one in its proper order and grinding it in on its correct seat.

The exhaust valves will be found to take the longest time when grinding-in as they are manufactured from a steel having a tougher specification than that of the inlets. So see that they do not get mixed up.

Having correctly ground-in all the eight valves, remove all traces of the grinding-in compound from them and from their seats on the monobloc. Make sure also that no compound has penetrated into the interior of the valve guides by repeating the cleaning process of dipping the valve stems in petrol and passing them up and down the bores of the guides.

With everything perfectly clean, smear the valve stems with a little graphite grease for lubrication purposes and refit them to the monobloc, assembling the spring cup and cotter pin with the aid of the valve spring compressor. If the valves are all placed with their slots in line, the cotter pin holes in the stems will be at right angles and ready for the pins. The procedure is, of course,

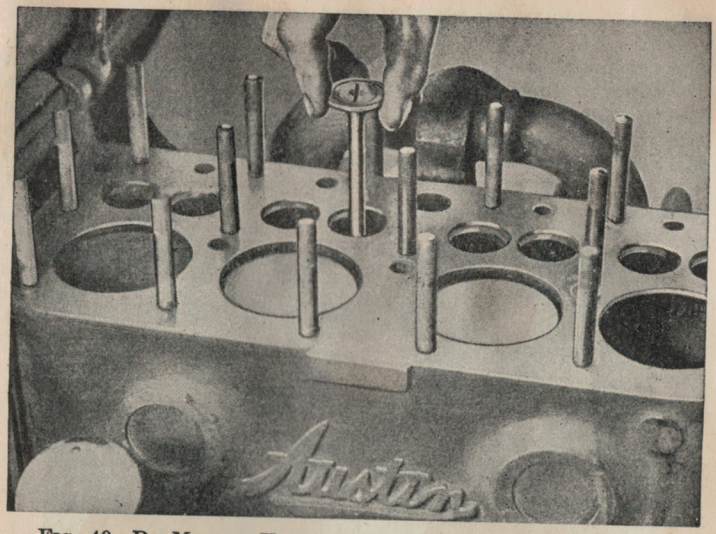

FIG. 49. BY MOVING VALVE UP AND DOWN WITH PETROL IN VALVE GUIDES GUMMY DEPOSITS ARE REMOVED

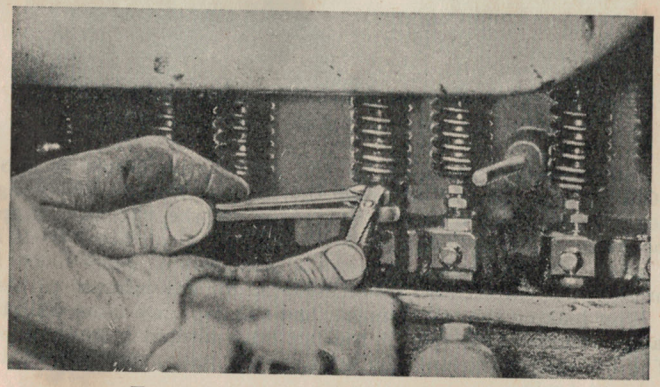

FIG. 50. SETTING TAPPET CLEARANCES

the reverse of that for dismantling. The next step is to adjust the tappets. Start from No. 1 valve and turning the engine with the starting handle, watch it rise and fall. Then give the handle another quarter-turn to ensure that the cam is well away from the base of the tappet. The first valve is then properly seated and the necessary working clearance between them can be set with the gauge supplied in the tool kit.

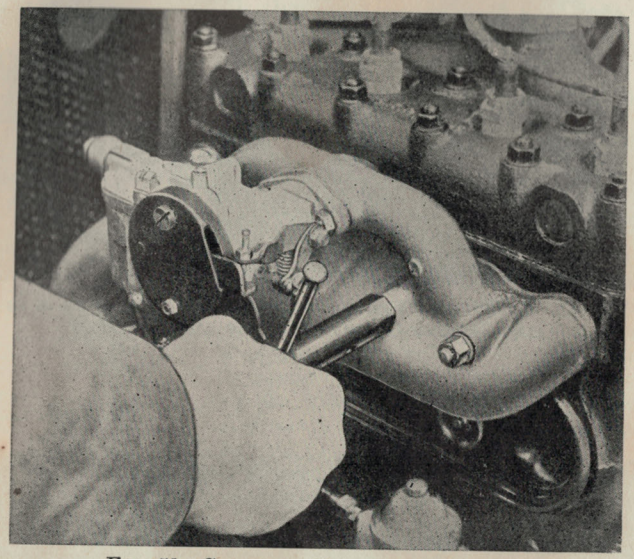

FIG. 51. CHECKING TIGHTNESS OF NUTS

The clearance provided by the use of the gauge is about 0·004 in. and, having adjusted the tappet head to the gauge, lock it with the lock-nut provided, using the two thin tappet spanners (Fig. 50). On the 1946–7 model a clearance of 0·012 in. is used. Sports models required a clearance of 0·004–0·006 in. for the inlet valves, and 0·006–0·008 in. for the exhaust valves.

After locking this adjustment, test the gap once more with the gauge to make sure that it has not been altered in the process. If it has shifted, unlock the bottom nut, reset, and tighten the lock-nut again.

This procedure applies to all the eight valves from 1 to 8, ensuring in every case that the cam is well away from the base of the tappet of the valve concerned.

The most important work now completed, there only remains the refitting of the remaining dismantled parts. To accomplish this, simply reverse the order in which they were dismantled. taking particular care of the joint washers at the exhaust pipe flange, the manifold joint, and the valve cover. Finally go over all nuts and retighten if necessary (Fig. 51).

If the grinding-in process has been particularly well done, the compression, when tested on the starting handle, will be up to standard. More often, however, it is not, owing to the disturbance of the component parts of the engine.

If, however, the handle is tried again after the first short run, the true compression will be felt. After the first few miles have been run, remove the valve cover and manifolds once more and check over the tappet clearances with the gauge. This is advised as the valves will have bedded down slightly on their seats.

CHAPTER VI

MAJOR ENGINE OVERHAULS

THE work covered in earlier chapters normally represents the limit of the average owner's ability. More ambitious work can be, and often is, carried out in the home garage, but this presupposes the possession of fairly comprehensive equipment and a useful measure of skill and experience. The manufacturers, therefore, wisely recommend that any major jobs should be carried out by an Austin dealer; in most cases this will prove an economy in the long run.

Since it is not always possible to follow this sound advice, however, a book of this type would not be complete without the essential details required by the owner who is sufficiently experienced to carry out engine overhauls himself. As a sound basic knowledge of fitting and workshop practice must be assumed, it will be sufficient, within the limited space of this chapter, to cover only the salient points of dismantling, fits and clearances, and reassembly.

Removing the Engine. Strictly speaking, it is unnecessary to remove the engine from the frame unless attention to the crankshaft or main bearings is required. Other work, such as piston and ring replacement, connecting rod bearing repairs, and even reboring, can be quite satisfactorily carried out with the engine in the chassis.

If it is necessary to remove the engine on pre-1940 models, it should be done by lowering it, complete with gearbox, beneath the car. In addition to the obvious dismantling required, the dynamo, water inlet elbow, clutch pedal, and gearbox cover with gear lever must be removed. After taking the weight of the engine on slings, the front and rear mountings can be unbolted. Remove the rear mounting bracket.

Removal of the engine from the chassis calls for a certain amount of manœuvring. First lower the front of the engine until the starting dog is beneath the front chassis cross member. Next, push the engine forward until the sump rests on the front axle. Now swing the gearbox downwards to bring the cylinder head below the dash, and move the engine backwards until the sump and starter dog are clear of the front axle. The engine can now be lowered to the ground.

On the 1940 and subsequent models the procedure is rather different. After preliminary dismantling, a lifting bracket should

be bolted under the fourth cylinder head nut from the front of the engine, in the middle row of nuts. Temporarily replace the cylinder head if it has been removed.

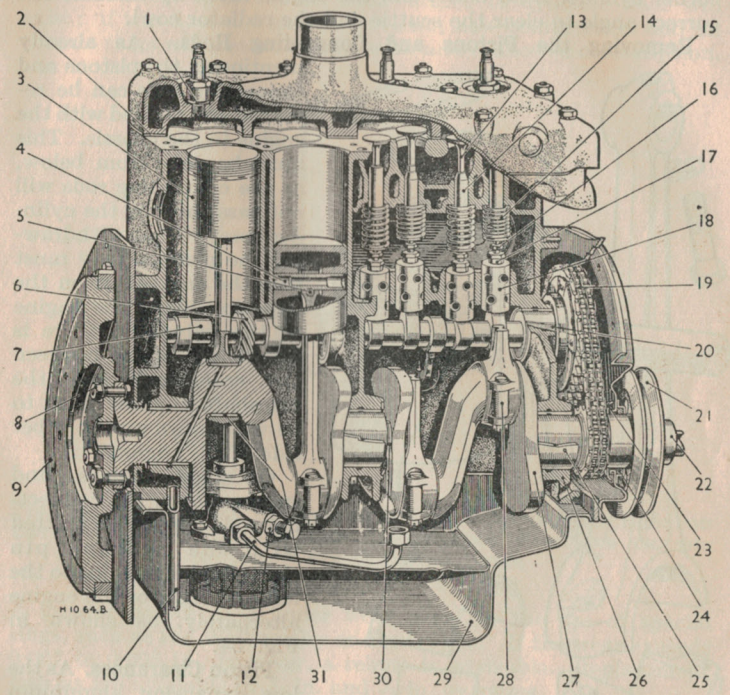

FIG. 52. THE EFFICIENT ENGINE OF THE 1947 TEN

1 = Sparking plug
2 = Cylinder head gasket
3 = Piston
4 = Gudgeon pin
5 = Gudgeon pin locking bolt
6 = Oil pump and distributor driving gear
7 = Camshaft
8 = Flywheel securing bolt
9 = Flywheel
10 = Rear bearing oil return pipe
11 = Oil feed pipe
12 = Oil pressure relief valve adjuster lock-nut
13 = Valve
14 = Valve guide
15 = Valve spring
16 = Tappet screw
17 = Tappet lock-nut
18 = Barrel tappet
19 = Timing chain
20 = Front camshaft bearing
21 = Crankshaft pulley
22 = Starting handle engagement dog
23 = Oil thrower
24 = Oil seal
25 = Front main bearing
26 = Front main bearing cap
27 = Crankshaft balance weight
28 = Connecting rod big-end
29 = Sump
30 = Centre bearing thrust washer

The engine can then be lowered to the ground, with the forward end raised, until the gearbox rests on a soft packing on the ground. Two clips should then be fitted under the two front corner cylinder head bolts, and the engine lifted by these at the correct angle to clear the scuttle and the radiator cowl.

Removing the Pistons and Connecting Rods. As already mentioned, the pistons and connecting rods can be removed and refitted with the engine in the chassis. This must be done from below, as the connecting rods will not pass through the cylinder bores. When withdrawing the pistons, they must pass the crankshaft on the opposite side of the engine to the valves, as there is insufficient space between the crankshaft and the camshaft to allow them to be withdrawn on the other side of the engine.

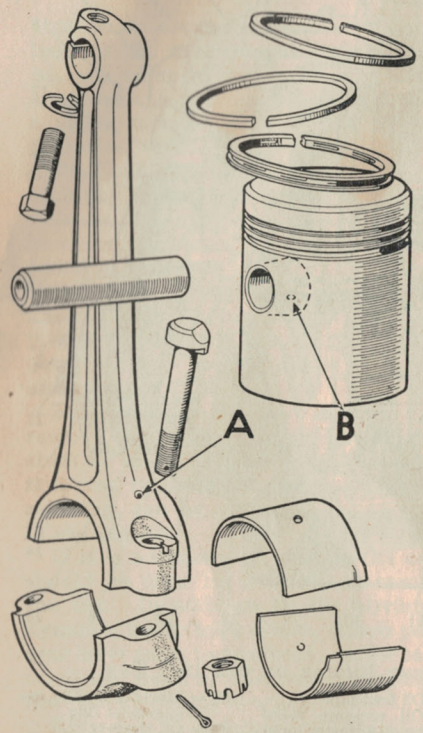

FIG. 53. THE CONNECTING ROD AND PISTON ASSEMBLY USED ON 1940–7 ENGINES. "A" IS THE BIG-END OIL JET HOLE, AND "B" THE OIL HOLE IN THE GUDGEON PIN BOSS

On 1940 engines, and subsequently, the connecting rods should be refitted with the gudgeon pin clamping bolts facing to the left and right of the engine alternately, as shown in Fig. 54.

Piston Clearances. As the low expansion aluminium alloy pistons are taper-ground, it is not easy to check the clearance between the piston skirt and the cylinder wall accurately. The clearance on new pistons is 0·003 in. when cold, measured on the skirt; a considerably greater clearance of 0·009 in. exists at the top of the piston.

During manufacture the pistons are accurately matched to the bores, and the grade number of the piston is stamped on the piston crown and on the face of the cylinder block, in the form of a numeral surrounded by a diamond. If for any reason new pistons are fitted to a new, or comparatively new engine, it is essential to fit the correct grade number for each cylinder.

In most cases, of course, some degree of cylinder wear will exist; if this does not exceed 0·002 in., new compression and oil control rings will restore compression and reduce oil consumption.

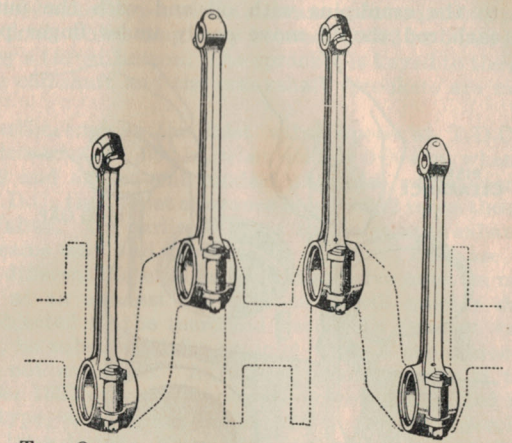

FIG. 54. THE ORDER OF ASSEMBLING THE CONNECTING RODS ON LATER ENGINES. NOTICE THE ALTERNATING POSITIONS OF THE GUDGEON PIN CLAMPING BOLTS

A greater degree of cylinder wear calls for the use of special rings, such as the Wellworthy or Cords type. If the wear exceeds 0·007 to 0·008 in., however, a rebore is advisable. Replacement pistons are available in $\frac{1}{32}$ in. and $\frac{1}{16}$ in. oversizes.

The Piston Rings. Three rings are fitted to each piston: two compression and one oil control. The ring clearance in the groove should be from 0·001 to 0·0015 in. on earlier engines, and from 0·0012 to 0·0027 in. on the 1940–7 engines. In the latter instance the oil control rings need a larger clearance, from 0·0015 to 0·003 in. being correct. The piston ring gaps should be from 0·005 to 0·008 in. on earlier engines, and from 0·006 to 0·010 in. on the 1940 and subsequent models.

The Gudgeon Pins. These should be a push fit in the pistons at 70 deg. F. It should be possible to press them home with the thumb. The pins are clamped in the small ends of the connecting rods, the webs of which are split for a short distance to allow the clamping bolt to squeeze the small end around the pin on earlier

models. Later engines have split little ends. The clamping bolt fits a groove in the gudgeon pin, and must therefore be removed before the pin can be pushed out.

The Connecting Rod Bearings. On the pre-1940 cars, bearing wear can be taken up by lightly filing or rubbing down the caps. The bearings should not be fitted too tightly, however; when assembled to the crankpins with oil and with the nuts fully tightened, each rod should move easily under finger pressure,

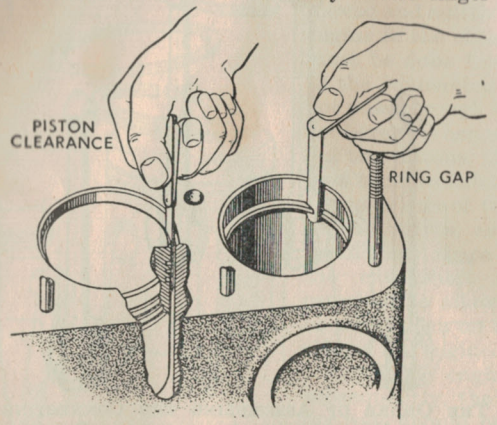

FIG. 55. CHECKING THE GAP BETWEEN THE PISTON AND THE CYLINDER WALL

To measure the skirt clearance, invert the piston in the bore. The method of measuring the ring gap is shown on the right.

but should not drop by its own weight from a horizontal position. The side-clearance on the bearings should be from 0·002 to 0·004 in.

On the later engines, thin-shell, steel-backed bearings are used. These must not be scraped to fit, nor should the caps be filed or rubbed down; replacement bearings can, however, be fitted without the necessity for any subsequent running-in. They should have a side clearance of from 0·008 to 0·012 in. and a radial clearance of from 0·00025 to 0·0015 in.

The Main Bearings. The crankshaft runs in three white-metal steel-backed bearings having a radial clearance of about 0·002 in. On earlier engines the crankshaft end-float, which is not held to very close limits, is controlled by loose flanges dowelled to the rear main bearing and cap. On later engines the centre main bearing controls the end-float, which should be from 0·002 to 0·003 in.

The front and rear main bearing caps have cork oil sealing strips, which are fitted into grooves in the caps. When refitting the caps, see that the strips are in good condition and are correctly seated in the grooves. If in doubt, renew the seals.

The Camshaft and Valve Timing. The camshaft is carried in three bearings, which, since 1936, have been of the white metal lined, steel-backed type, with a clearance of about 0·001 to 0·002 in. The end float, which may vary between 0·002 to 0·008 in., is controlled by a thrust button. The sprocket is keyed to the shaft, and both the camshaft and the crankshaft sprockets are marked for timing.

On earlier engines the inlet valve opens at T.D.C., with a tappet clearance of 0·006 in. when cold or 0·004 in. when hot. On the 1940 and subsequent models, the inlet valve opens 10 deg. before T.D.C., the tappet clearance being 0·012 in. on these engines.

The Valves. On earlier engines the inlet and exhaust valves are the same size, and superficially similar. They are, however, made of different material, and an inlet valve must on no account be used as an exhaust valve, since it will quickly deteriorate when subjected to the increased heat. An exhaust valve may, however, be substituted for an inlet valve if the correct replacement is not available. A further point to note is that from September 1937 onwards, cone-type cotters were fitted instead of the pin-type, so that the earlier valves are not interchangeable with the later design. From 1940, the inlet valves are larger than the exhaust.

Renewing Valve Guides. The valve guides are a press fit in the cylinder block and may be driven downwards by using a suitable stepped drift. The tappet screw should, of course, be removed to give sufficient clearance to allow the valve guide to be removed.

The new guide should preferably be pressed into position; if it is necessary to tap it into place, a drift made from copper or brass should be used to prevent injury to the top of the guide. The lower end of the guide should project half-an-inch below the face of the cylinder block.

CHAPTER VII

THE FUEL SYSTEM AND CARBURETTOR

The Petrol Pump. The petrol pump, which delivers the fuel in the correct quantity demanded by the carburettor, possesses an automatic mechanism which accurately governs its operation.

The revolving camshaft *G* (Fig. 56), with the eccentric *H*, lifts the rocker arm *D*, which is pivoted at *E* and which pulls the pull

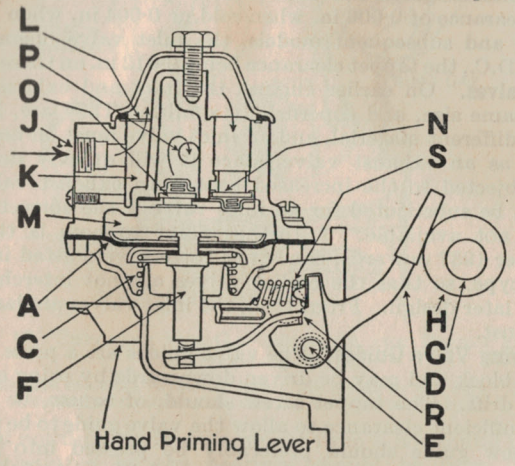

FIG. 56. THE PETROL PUMP IN SECTION

rod *F*, together with the diaphragm *A*, downward against pressure of the spring *C*, so causing a vacuum to be created in the pump chamber *M*.

Fuel from the tank at the rear of the car will enter at *J* into the sediment chamber *K*, and pass through the filter gauze *L* and the suction valve *N* into the pump chamber *M*. On the return stroke, spring pressure *C* pushes the diaphragm *A* upwards, forcing the fuel from the chamber *M* through the pressure valve *O* and the opening *P* into the carburettor.

When the carburettor bowl is filled, the float in the float chamber shuts off the inlet needle valve, thus creating a back

pressure in the pump chamber *M*. This pressure will hold the diaphragm *A* downward against the spring pressure *C*, and it will remain in this position until the carburettor requires further fuel. The float then descends and opens the needle valve. The rocker-arm *D* is in two parts, the outer operating the inner by making contact at *R*, and the movement of the eccentric *H* is absorbed by the "break" when fuel is not required.

The spring *S* is merely for the purpose of keeping the rocker-arm *D* in constant contact with the eccentric *H* to eliminate noise.

No regular maintenance attentions are required by this pump. It is a self-contained unit that will, in all probability, function faultlessly for years without attention by the owner. It is designed to operate without adjustment of the moving parts and without lubrication. The latter is provided for by oily vapour from the crankcase which lubricates the linkage below the diaphragm.

If attention is likely to be demanded, it will doubtless resolve into an occasional clean for the gauze filter under the cover in the head of the pump.

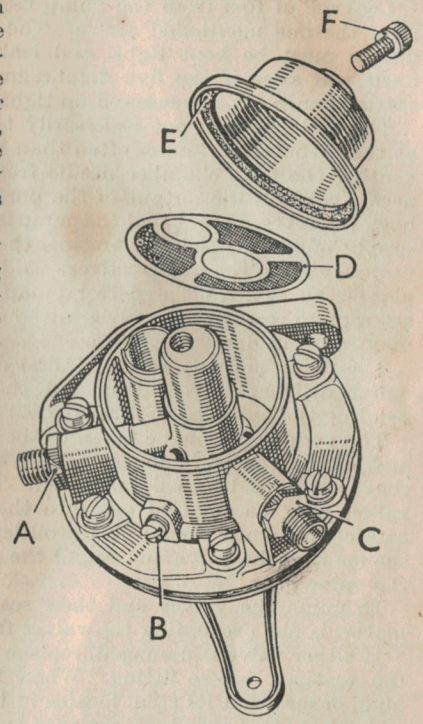

FIG. 57. THE PETROL PUMP WITH THE COVER REMOVED

"A" is the outlet union; "B" the drain plug; "C" inlet union; "D" the gauze filter screen; "E" the cork sealing ring; and "F" the cover securing screw.

To do this, remove the top cover by undoing its securing screw. The gauze lies immediately below and can be removed for cleaning by rinsing in petrol.

The main chamber of the pump is now exposed, and the opportunity should be taken to swill out any foreign matter that may be present before refitting the gauze. Locate the holes for the

centre screw and the pump inlet valve correctly when replacing the gauze, also see that the top cover makes a good fit on its cork washer to obviate the possibility of subsequent leakage.

Leakage of fuel from the pump can arise from other reasons than the one mentioned above. The inlet and the outlet pipe unions must be kept tight, and leakage from the diaphragm itself will arise if the five diaphragm screws round the pump casting flange are not screwed up tight.

The fuel pump is not necessarily to blame if flooding occurs at the carburettor; more often than not this is due to grit preventing the float chamber needle from seating properly. (This needle controls the output of the pump to the carburettor.) If, however, it is apparent that the pump is not providing an adequate supply of fuel to the carburettor, the cause of the trouble will probably lie in the pump valves. To inspect the valves, the best plan is to remove the petrol pump from the crankcase. To attempt to remove the valves without doing so is not easy and may result in damaging them.

The pump is easily removed, first disconnecting the inlet and outlet delivery pipe unions and then undoing the two nuts securing the pump to the crankcase.

The pump can now be taken to the garage bench and the inlet and outlet valves removed. These are just under the gauze; they can both be easily removed. The valve springs and the valves may be emptied out into the palm of the hand, being careful not to mix them up; the outlet valve spring locates round the stem of the valve and round the short stem on the inside of the valve plug.

Examine the valves and their seatings and see that foreign matter is not preventing the valves from seating properly.

If either valve is damaged, replace with a new one and clean the seatings before fitting. When replacing the outlet valve plug, ensure that its stem locates in the coils of the valve spring which has previously been replaced on top of the valve. The same applies to the inlet valve except that its spring is beneath the actual valve plate.

It is important that the fibre washers under the heads of both valve plugs are not omitted on reassembly and also ensure that both plugs are tight home. There is also a fibre washer under the head of the top cover screw.

The linkage operating the diaphragm will not require attention, and in nearly every case the only necessary attention to the pump will be a cursory examination of the gauze filter under the top cover.

The Carburettor. From the rear tank the petrol flows via the pump through the union *A*, Fig. 58, the filter and the needle

seating into the float chamber. The petrol rises, and, when reaching a certain predetermined height, causes the float to push the needle on to its seating, thus regulating the petrol flow.

The float chamber contains the main jet (1), Fig. 60, compensating jet (2), compensating well (3), and slow running jet (4). The

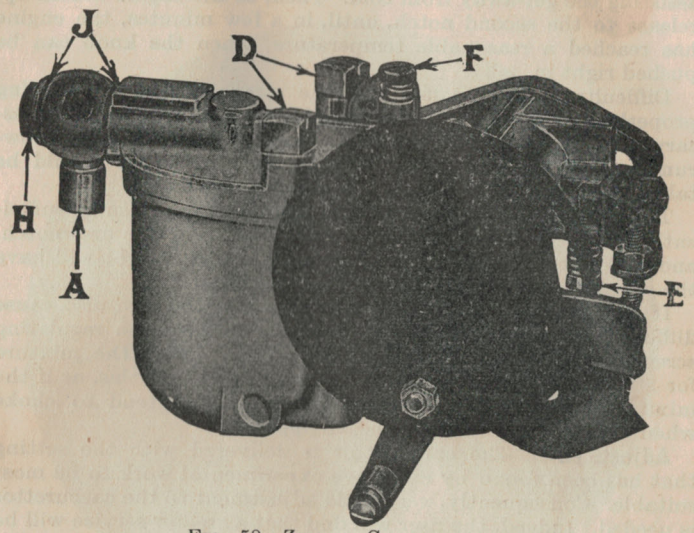

FIG. 58. ZENITH CARBURETTOR

petrol then flows through the main and compensating jets and also rises in the compensating well.

From the jets the petrol flows along two separate channels into a common channel in the emulsion block (5), which is attached to the float chamber.

The petrol in the compensating well is in direct communication with the air and with the emulsion block. Consequently, all the petrol from the jets and compensating well is centred in one channel in the emulsion block. This channel leads to a nozzle (6), which projects directly into the choke tube.

Starting. To obtain an easy start from cold, the control on the dash operating the air strangler should be fully extended and the engine should be cranked over a few times by pulling out the self-starter control knob, or by means of the starting handle, if the battery is not fully charged.

Then release the knob to the first notch, which partially

opens the air strangler, and opens the throttle a little. If the engine is then switched on, it should start readily and continue to run.

It is quite in order to run for a short time with the knob in the first notch, thus temporarily enriching the mixture and assisting the get-away from cold. Then, as the engine warms up, release to the second notch, until, in a few minutes, the engine has reached a reasonable temperature, when the knob can be pushed right in.

Difficulty can be caused by the strangler flap not closing properly, and the control wires should be examined, and, if necessary, altered to permit the flap closing fully. A choked slow-running jet will also cause difficulty and this part should be taken out of the carburettor, and carefully cleaned.

Trouble can also be caused if the throttle is not opening sufficiently when the strangler knob on the dash is in the first notch, and in this case turning the screw a little to the right will have the effect of opening the throttle a little wider.

If the mixture for slow running is weak, this can also cause difficulty in starting up, and in this case turn the regulating screw in a clockwise direction, which will enrich the mixture for starting and slow running, but do not overdo this, as if the mixture is too rich the engine will hunt and tend to choke when running slowly with the engine warm.

Adjustments. The carburettor is delivered with the setting that has been found by extensive experimental work to be most suitable. Consequently, very little adjustment to the carburettor is needed. Indeed, the user will find that a greater service will be obtained from the carburettor if the various screws, etc., are only moved when absolutely necessary.

On those occasions, however, when an adjustment is advisable (after a new engine has been run-in an adjustment of the slow running is sometimes necessary, or when the carburettor requires cleaning), the following procedure should be observed.

There are two adjustments for the slow running which may need attention. One is the throttle stop screw, which, unless too stiff, can be turned with the fingers. This screw determines how far the throttle can be closed. By turning it in a clockwise direction, it increases the minimum degree of opening, turned anti-clockwise a slower tick-over is obtained. The other slow-running adjustment regulates the strength of the slow-running mixture by varying the suction. Turned anti-clockwise the strength of the mixture is weakened, turned clockwise it is strengthened.

Both these adjustments should be effected when the engine is warm after a run. The combined adjustments should give a good pick-up without a falter when the throttle is released. If the

engine refuses to tick-over for any length of time, or it stalls on deceleration it is a sure sign that the slow-running mixture is weak. To remedy this the mixture should be enriched by turning the regulating screw in a clockwise direction.

If, however, the engine hunts when idling, the mixture is too

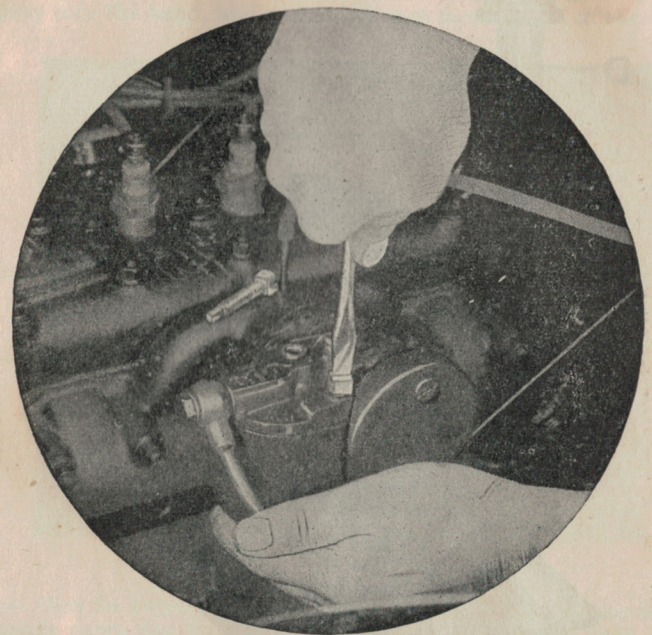

FIG. 59. DETACHING THE CARBURETTOR BOWL

rich and requires weakening by turning the air-regulating screw anti-clockwise.

Poor Acceleration. In the winter time this can be very often due to the engine not getting sufficiently hot.

If, in spite of the engine being thoroughly hot, the acceleration is bad, then see to the following points.

Slow-running Adjustment is Too Weak. Try the slow-running screw in a richer position. The compensating jet 2 (Fig. 60) may be too small. Try one size larger.

Lack of Power and Speed. If this is due to the carburettor, it is probably owing to the main jet being partially choked or a little

too small, and a size larger should be tried. Care should be taken to make sure the lack of speed is not due to the ignition being retarded or to an insufficient supply of petrol from the tank,

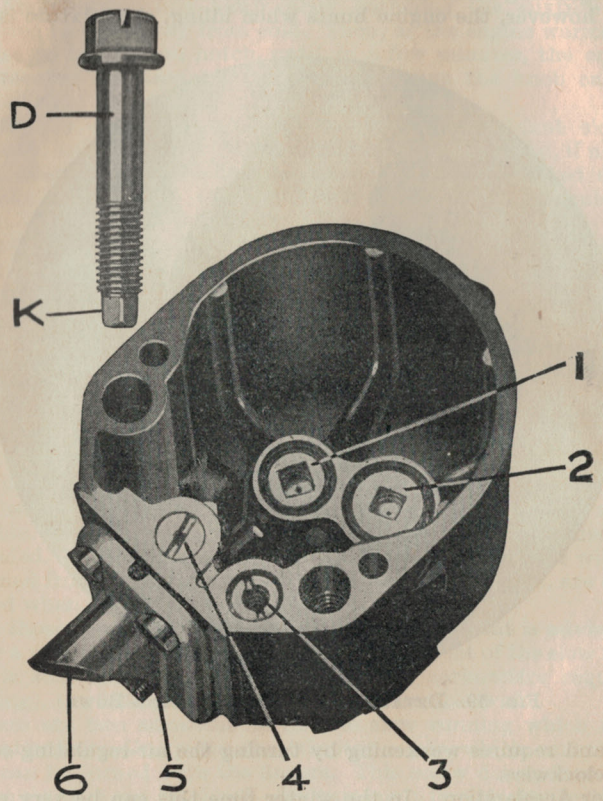

FIG. 60. THE CARBURETTOR BOWL

D = Holding down screw
1 = Main jet
2 = Compensating jet
3 = Compensating well
K = Squared end to form jet key
4 = Slow-running jet
5 = Emulsion block
6 = Nozzle

faulty ignition, or to poor compression due to leaking valves or wrong tappet adjustment.

Make sure also, that the strangler valve opens fully, as if this

sticks in a partially closed position it will restrict the speed of the car and increase petrol consumption.

Dismantling the Carburettor. The bowl of the carburettor can be removed by taking out the holding-down screws *D* (Figs. 59 and 60). The hand should be placed underneath the bowl during this operation, for when the screws are removed the bowl will drop into the hand, and any petrol that is contained in the bowl

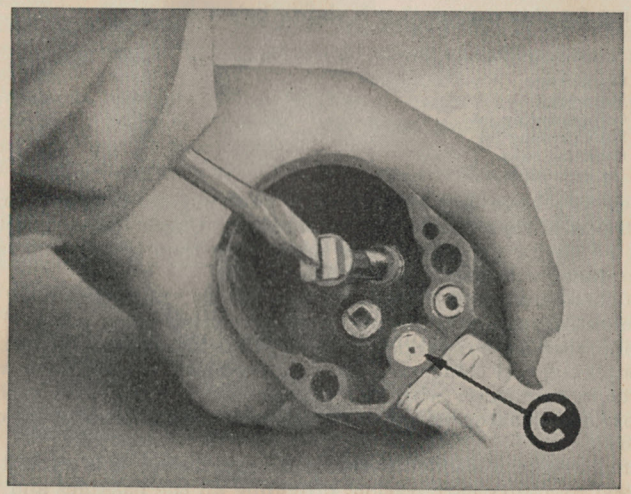

FIG. 61. REMOVING CARBURETTOR JETS

can then be emptied back into the tank. On turning the bowl upside down the float will slide out and reveal the main and compensating jets at the bottom of the bowl.

The Jets. The jets should be removed occasionally and thoroughly cleaned. The holding-down screws *D* are shaped at the end to fit into the jets. When the bottom end is placed into the jets a spanner or screwdriver applied to the head of the screw will loosen the jets for removal (see Fig. 61).

When cleaning the jets it is not advisable to pass anything through them that is liable to damage them. The most satisfactory and effective method is to blow through the jets by means of the tyre inflator and wash them in petrol. This will remove any obstruction and leave the jets undamaged.

The sizes of all jets in Zenith carburettors run in fives, and the larger the number the larger the jet.

The Filter. The petrol is filtered on entering the carburettor, and the filter should be cleaned from time to time. To remove the filter, unscrew the petrol connexion *H* (Fig. 58) and pull the filter out of its chamber. The filter gauze can then be thoroughly cleaned with petrol.

When reassembling the filter, care must be taken to see that the washers *J* are correctly replaced.

Alteration of the Standard Adjustment. The complete standard setting for this carburettor is shown below—

	Horizontal		Down-Draught
	Pre 1936	1936	
Choke tube	19	21	23
Main jet	72	82	95
Compensating jet	55	50	50
Slow running jet	60	60	40
Capacity tube	2	2	2
Progression jet	60	60	100

When you have any trouble with your engine, do not assume that it is always due to the carburettor. Check the carburettor first of all for cleanliness and make sure that the setting is in accordance with the standard mentioned.

If these are found correct, then do not be tempted to alter the carburettor until you have gone all over other likely parts of the engine, such as the sparking plugs, ignition timing, the valves may be sticking, and things of that kind, because there are no moving parts in connexion with the adjustment of the Zenith carburettor, and consequently the adjustment cannot alter of its own accord.

If the engine suddenly starts to run badly, this cannot be caused by faulty carburation, providing all the passages and jets are clear and there is a good supply of petrol from the tank.

The Down-draught Type Zenith Carburettor. The carburettor fitted to the Ripley Sports Model and now fitted as standard is of the down-draught type. It embodies the well-known Zenith principles of main and compensating jets. The carburettor is mounted on top of the inlet pipe, because the fundamental advantage of down-draught carburation lies in the fact that fuel is assisted by gravity into the cylinders, instead of having to be lifted against it or across it as is the case of a normal vertical or horizontal instrument.

One of the holding-down screws is squared at the end and can be used to remove the jets.

A small screwdriver will remove the slow-running jet. When cleaning the jets, do not pass anything through them that is likely to damage the carefully calibrated orifices. The most satisfactory and efficient method is to blow through them and wash them in petrol. Swill out with a little petrol any sediment which

may have collected in the bottom of the float chamber. It is not necessary to remove the emulsion block from the float chamber. Unscrew the petrol pipe connexion, and withdraw the filter gauze. Thoroughly clean this part by washing in petrol. When reassembling the filter, care must be taken to see that the washers are correctly replaced.

Adjustments. The carburettor is delivered with the setting that has been found by extensive experimental work to be most suitable for all-round conditions.

The main jet has the greatest influence at high engine speeds, therefore alteration of this jet would affect maximum power and road speed.

Compensating Jet. This jet has a controlling effect upon acceleration from low speeds, low speed pulling on hills, and quick "get-away" from cold.

The Slow-running Jet. This jet measures the petrol supplied when the engine is idling. Petrol is drawn through this jet into a channel which has its outlet at the throttle edge. The petrol is atomized immediately on leaving the jet by air entering the carburettor at the base of the slow-running adjusting screw. The size of the slow-running jet should be such that smooth regular idling is provided with the slow-running screw set at approximately one complete turn open. This adjustment should always be made with the engine quite hot. The speed at which the engine idles can be regulated by means of the throttle arm stop-screw. Turning this part in a clockwise direction increases the engine speed, and vice versa. In all cases of difficulty with slow running, inspect the positions of the adjusting screws. Continued difficulty may be traced to air leaks at the inlet pipe joints, etc., to the valves, or to the ignition system.

Starting from Cold. Easy starting is assured by an automatic air strangler interconnected with the throttle lever. The strangler is situated in the air intake of the carburettor, and is closed by fully extending the dashboard control. By means of the interconnecting mechanism, this operation sets the throttle open just the right amount to ensure an easy start.

To avoid the possibility of the strangler permitting excessively rich mixture passing into the cylinders, a diaphragm is embodied in the strangler flap, which opens and permits extra air to enter immediately the engine fires. The quick opening and closing of this diaphragm when the engine is running will cause a buzzing noise, and serves to remind the driver that the strangler is still in operation and should be released. A half-way position is provided on the dashboard control, and it is advisable to run the engine for a few minutes during cold weather with the strangler in this position, before attempting to drive the car away.

Failure to Start Readily. The carburettor having been cleaned and the ignition system, valves, etc., checked over, the following points should be examined.

Make sure the air strangler flap closes completely when the dashboard control is operated and ascertain that petrol is being supplied. Also check the adjustment of the link between strangler and throttle; shortening the connecting link will increase the opening of the throttle.

When cars are used in very hot climates or at high altitudes, a slightly weaker setting than normal is usually required.

Standard Settings for 30-V.M.4 Carburettor. Sizes of Zenith jets normally run in 5's—the higher the number the larger the jet. The standard settings are—

Choke jet	23
Main jet	107
Compensating jet	60
Slow running jet	50
Progression jet	100
Capacity tube	2
Needle seating	1·5

Oil-wetted Air Cleaner. An A.C. oil-wetted intake silencer and air cleaner is fitted to the carburettor on later models.

At 5000-mile intervals, or weekly where dust is constantly experienced, the silencer needs cleaning and re-oiling. It should be removed from the carburettor after slackening the retaining clips, and the front end containing the gauze should be swilled in a shallow pan of petrol.

After drying, the metal gauze mesh should be re-oiled with engine oil, allowing the surplus to drain off before refitting the cleaner. Refit with the gauze end facing forward.

CHAPTER VIII

OVERHAULING THE BRAKES AND STEERING

Brakes. A virtue of the Austin Ten that is not fully realized by owners until a considerable mileage has been covered, is the ease with which the efficiency of the braking system can be maintained. A very important point, this, as the braking system must always be as dependable as the car.

The hand-lever and pedal of the new car will be found, like the clutch pedal, to have a certain amount of free movement. This ensures that the brake shoes are not rubbing against their drums when out of action. The gradual wear of the brake linings as the brakes are used will, of course, increase the amount of lost movement in the levers. The linings give lengthy service for a slight amount of wear, but that wear is magnified at the levers, by the ratio of the mechanical leverage of the system; so that the unwanted lost movement at the pedal and handbrake levers has to be taken up on occasion by the means of adjustment provided.

The Girling-type braking system is fitted to the 1936–47 Austin Ten.

On the new Ten models, the pedal and handbrake actuate both front and rear brakes, as hitherto, but a valuable feature of the design is the rear brake push-rod, which is fitted with a compression spring. This device prevents the rear wheels locking when the brakes are violently applied, and a preponderance of the car weight is thrown on to the front axle. Gentle application of the brake pedal results in the effort being applied in practically equal proportions to both front and rear brakes. Violent application of the brake pedal, however, results in more effort being applied to the front axle than the rear, as the rear brakes are operated through the compression spring.

As is well known the Girling system is highly efficient, and it will be seen from the diagram (Fig. 62) of the Austin Ten linkage that torsional members are practically eliminated, thus reducing lost motion to a minimum.

All the joints and connexions are lightly loaded when in operation, by virtue of the low leverage employed, and are therefore comparatively frictionless. Both front and rear brakes embody a compensating device to ensure that the off-side and near-side brakes produce a balanced retarding force. In the rare event of an accident causing part of the system to fail, at least one pair of brakes will be available.

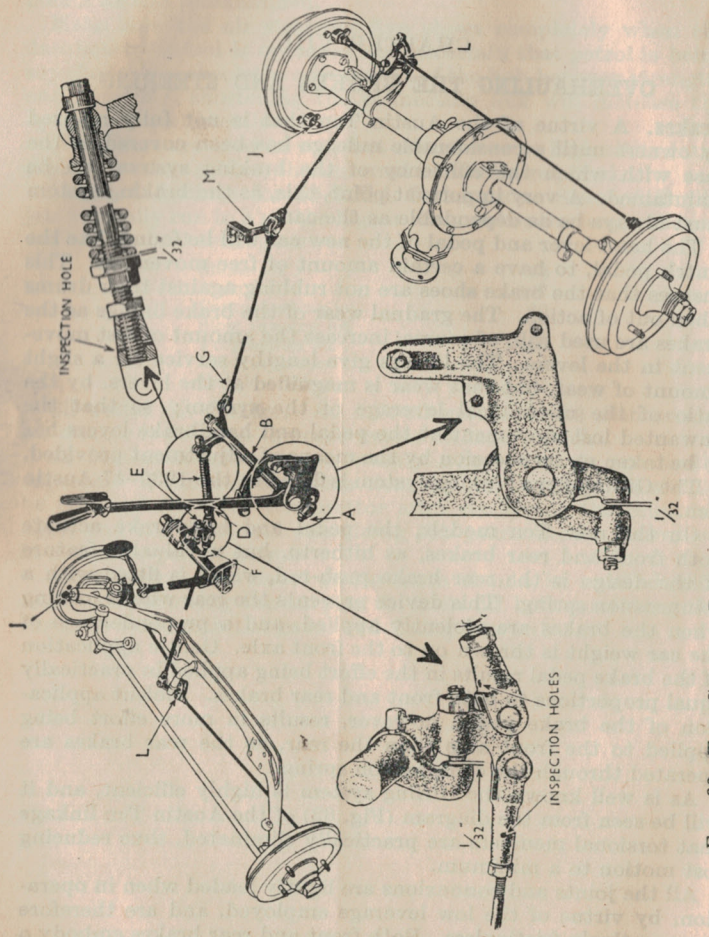

FIG. 62. THE GIRLING BRAKING SYSTEM AS APPLIED TO THE AUSTIN TEN

The brake shoes can be adjusted to compensate for lining wear without interfering in any way with the linkage. The transverse operating rod for each brake assembly is attached to a cone carried in a housing attached to each back-plate. This cone moves two steel rollers that force the plungers apart on to the brake shoe ends. The fulcrum ends of the shoes locate against plungers which are carried in another housing, also attached to the brake back-plate, and are separated by the head of the adjustment screw,

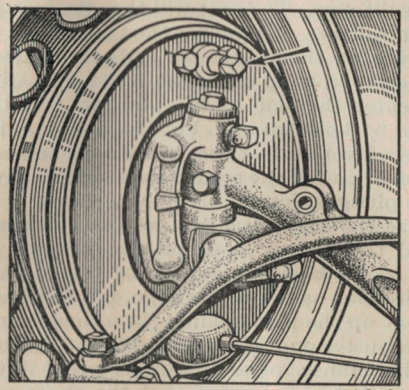

FIG. 63

which has four tapered flats. By screwing in the tapered adjustment screw, the plungers and the shoe ends are forced apart to give the required adjustment.

To adjust the brakes for wear, the car must be on level ground with the handbrake off. Then screw up each adjuster (Fig. 63) in a clockwise direction as far as it will go, each quarter-turn being felt and heard. When the adjuster is fully screwed up, but not forced, it should be screwed back one full flat, indicated by a click, thus providing the necessary clearance to ensure that the shoes do not foul the drums when the brakes are released. This should be repeated on the three remaining adjusters. From the foregoing it will be seen that it is not necessary to jack up any of the wheels while effecting this easy and rapid adjustment.

Dismantling the brakes for inspection, cleaning or relining is a simple matter when the drum with hub is extracted and the shoes and linings are exposed. The drums can be removed without disturbing the hubs if the securing screws are removed after marking the position of each drum. One shoe can be pulled away

from the expander housing until its end is clear. Then it can be moved in an outward direction away from the back plate and the brake springs connecting the two shoes unhooked. This leaves the second shoe free to be pulled clear—the operating plungers will be retained in the expander housing. While the shoes are removed make sure that the expander unit is able to float on the back plate. When refixing it to the back plate screw the nuts up quite tight with the double coil spring washers underneath. Then slack the nuts back one complete turn before inserting the split pins. The unit will then float on the back plate and be self-centralizing. To replace the shoes, hook them together with one spring at their adjuster ends, and assemble on the adjuster plungers, crossing the shoes to do so. Allow the end of one shoe to enter the slot in the plunger, and then hook the second spring to both shoes. Finally, using a tommy-bar or screwdriver as a lever against the special boss on the brake shield, pull the expander end of the second shoe sufficiently far to enable it to enter its plunger slot.

To centralize the shoes and ensure correct clearance between the shoes and the drums, slack off the set-pins that hold the adjuster unit to the back plate, and, by turning the adjuster in a clockwise direction as far as it will go, put the brake shoes hard on. Then screw up the pins holding the adjuster unit tightly and slack off the adjuster one full notch. When all drums have been treated in this manner, press the brake pedal down as hard as possible once or twice, to ensure that the shoes are centralized. The shoes should now be quite free of the drums.

If any repair or overhaul requires the brake-rods to be dismantled and re-set, as a preliminary to assembling adjust all four brakes in the manner already described. Then connect the front and rear axle transverse rods to their balance-levers, ensuring that these are vertical and able to pivot at their anchorage to give efficient brake compensation.

Unlock and slacken the handbrake adjustment at *A* (see Fig. 62) until only the dome of the adjusting screw projects from the boss and push the lever right forward.

Assemble the rear end of the rear brake-rod to the rear cable and its brake link *M* and the front end of the lever on the cross-shaft *B*. If the clearance at *A* is not $\frac{1}{32}$ in., it must be brought to this amount by altering the position of the adjusting screw.

The same instructions apply to the linking up of the front axle set, the front brake-rod being fitted to the forward end of the brake pedal adjusting lever after the rear brake push-rod with compression spring has been fitted to the foremost cross tube lever and the brake pedal adjusting lever. The pedal clearance should be set at $\frac{1}{32}$ in. by adjusting the screw.

It is important that the compression spring is free to the extent of $\frac{1}{32}$ in. on the rear brake push-rod, and an adjusting nut and lock-nut is provided to enable this adjustment to be maintained.

It is also important that at no time must the adjustable fork end on the rear brake push-rod, and the front and rear brake-rods at *G* and *H* be screwed off the rods farther than the inspection holes provided. This point can be checked with the aid of a thin wire.

Also note that the fit of the pins in their fork ends must always be free, as plenty of clearance has been purposely allowed.

To fit a new transverse rod to either front or rear axle, disconnect the rod from its balance lever and remove the brake-drum, first marking it so that it can be put back in the same position. If for any reason the screws are difficult to remove, the hub and brake-drum can be taken off as an assembly.

Both shoes can then be readily removed. Remove the expander unit by undoing the two castle nuts holding it to the back plate, drawing the rod attached to it through the cover.

To remove the rod, the expander plungers must be withdrawn after removing the small split pins on each side. The rod and the expander cone can now be drawn out, taking care that the two small rollers are not lost. Knock out the pin attaching the rod to the expander cone, and fit the new rod. Reassemble the expander unit, making sure the rollers are properly in place. If there is any difficulty in reassembling the rollers, a little grease smeared on them and the slots in which they work will serve to hold them in place whilst being assembled. Now push the rod through the dust cover, and tighten up fully the two castle nuts holding the unit to the back plate, not forgetting the double spring-washer beneath them. Slack back the castle nuts one complete turn, thus allowing the unit to float on the back plate, and insert a split pin in them. Reassemble the shoes, making sure the springs are between the shoe webs and the back plate and re-fit the brake drum or hub assembly. Re-connect the transverse brake-rods, making sure that the balance lever is vertical. Press the brake pedal down as hard as possible once or twice in order to centralize the brake shoes in the drums.

Finally see that the free movement of the compression spring on the rear brake push-rod, and the free centring movement of the expander housings in the brake plate slots, is not impeded by any accumulation of mud or dust.

On the pre-1936–7 Tens the pedal operation of all four brakes is adjusted by shortening the rod connexion from the pedal lever to the brake cross-shaft, and excessive free movement can be readily taken up by turning, in a clockwise direction as seen from the rear, the winged nut, or hexagon, according to type, on the

rod in question. For this the handbrake must be fully released. If desired, this adjustment is rendered accessible from above by lifting the floorboard in front of the driving seat.

On these earlier Tens it is best to make a small adjustment first, say, of half a turn, and then to feel the brake operation, subsequently making any further adjustment that may seem desirable. Then, adjust to make sure that the shoes are not rubbing when the pedal is released, run the car a short distance without using the brakes, and feel the drums, which will be warm if the shoes make contact with them.

A setscrew at the base of the handbrake lever provides an independent adjustment for this control by advancing its engagement with the cross-shaft lever.

To make the adjustment, push the lever right forward, slacken the lock-nut on the front side of the lever, and turn the adjusting screw anticlockwise to bring its head towards the lever on the brake cross-shaft.

The adjustment is complete when only an inch of free movement is felt at the top of the hand-lever before the brakes begin to engage, and there should be a small clearance between the head of the adjusting screw and the lever on the cross-shaft when the hand-lever is fully forward.

These are the two brake adjustments that will be most commonly required, but sometimes, after considerable service, one or more sets of brake-shoe linings may wear down more rapidly than their fellows or the brake connexions may vary in effective length, and it is then necessary to re-balance the brakes, or they will operate unevenly, tend to lock one wheel before the others, and possibly affect the steering.

The need for brake re-balancing is thus usually evident from the behaviour of the car, which, when the brakes are suddenly applied, will tend to pull to one side, or skid one or more wheels if the brakes are at fault. In fact, the feel of the steering will serve to show on which side of the car the braking is too advanced, for the car will pull to that side and any skid marks on the road will confirm, and most likely identify, the actual wheel at fault. This is admittedly a rough and ready method of testing brake balance and many owners may prefer to have the brakes of their Ten tested on one of the highly accurate brake testers now installed in so many service stations, which in a few seconds will give a reliable reading for the efficiency of each of the four brakes under operating conditions.

When the unbalance is detected, the brake operation can be equalized by the individual adjustments provided on the rods which lead from the brake cross-shaft to each brake cable link. These rods are screwed, with right- and left-hand threads into

their forks at each end, the adjustment being locked in each instance by a nut engaging with the fork nearest the brake cross-shaft. When this lock-nut is slackened back, the rod can be turned by its hexagon in a clockwise direction (as seen when looking towards the cross-shaft) whereby the forks screw farther on to the rod and shorten its effective length.

With the adjustment made, all the road wheels should offer an equal resistance to turning when the brakes are applied, and the car should pull up quickly and smoothly without any tendency to deflect the steering or for any one wheel to skid before the others.

The foregoing particulars of the individual brake adjustments apply to the majority of Austin Ten cars at present in use. The earliest models, however, have only right-hand threads at the cross-shaft ends of the brake-rods. To shorten these rods it is necessary to remove the pin to release the brake fork farther on the road after slackening back its lock-nut, this nut subsequently being re-tightened up to the fork to secure the adjustment. The felt washer, which will be found on each side of the cross-shaft lever where it fits in the fork, must be replaced, as it prevents rattle and retains lubricant. Finally, the connecting pin should be re-secured with a split pin. Incidentally, it should be realized that the adjustment is only half as rapid with this early type of rod as that given by the later rod with left- and right-hand threads which simultaneously screw into each fork to shorten the effective length of the rod both ends.

On later models, 1934–5, there are no rods for the front brakes, a cable of special type running direct through a flexible conduit, Fig. 64, from the cross-shaft lever which is actuated by the hand-lever. It sometimes happens that the brake cross-shaft movement is restricted, before the brakes require relining, by the hand-lever fouling the frame cross-member immediately behind it.

To overcome this difficulty and restore the range of adjustment, the rods (or cables) will require to be shortened equally all round as already described. A few turns of each of the four rods (nuts, or forks as the case may be) should restore the controls to their original position, to leave a reasonable range of adjustment, but the braking must be finally balanced. Moreover, owners of the models with right- and left-hand threaded rods for the rear brakes and cables for the front brakes, should remember that, for an equal degree of adjustment, the front brake nuts will have to be given twice the number of turns given to the brake-rods which, as explained, shorten simultaneously from both ends.

On occasion, even before the brake cross-shaft movement is stopped by the frame cross-member, the handbrake adjustment may be found inadequate. In other words, the adjustment screw

may have been set so far out of the lever that no threads are left for the lock-nut to engage with on the other side.

In these circumstances, an additional range of adjustment can be obtained for the hand-lever if the setscrew is removed completely and the lock-nut screwed on it up to its head before it is

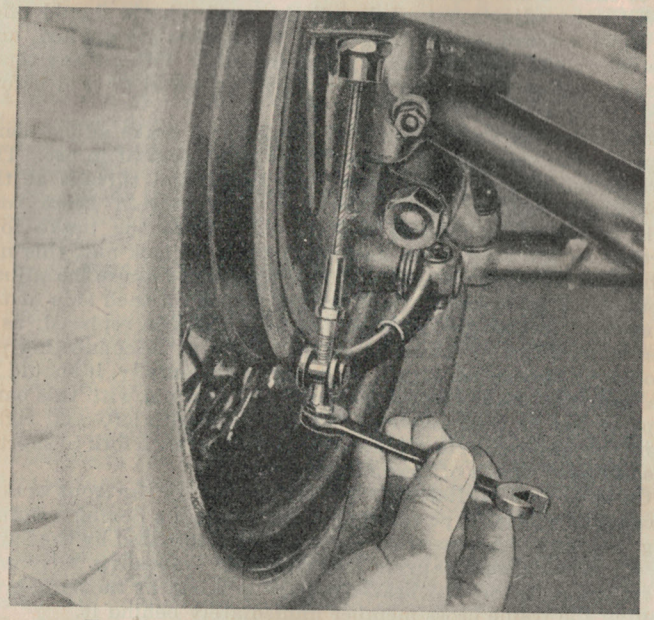

FIG. 64. ADJUSTING A FRONT BOWDEN BRAKE CABLE

replaced, so that the nut is able to engage with the rear face of the lever instead of the forward face.

To do this, the brake quadrant at the foot of the lever will have to be dismounted by removing its securing bolt. Then the hand-lever should be pushed right forward so that the adjusting setscrew can be screwed clear of the brake cross-shaft lever, with which it normally engages, while the lever is set back by depressing the brake pedal. Removal of the handle at the top of the hand-lever will allow it to go farther forward if additional clearance is required before the screw can be withdrawn. When the screw is replaced it will be found possible to secure the

adjustment by the lock-nut, giving the one inch of free movement already prescribed.

So much for the adjustment of the brake controls.

The brakes themselves deserve a little attention on occasion, especially if there is any tendency for them to squeak, which

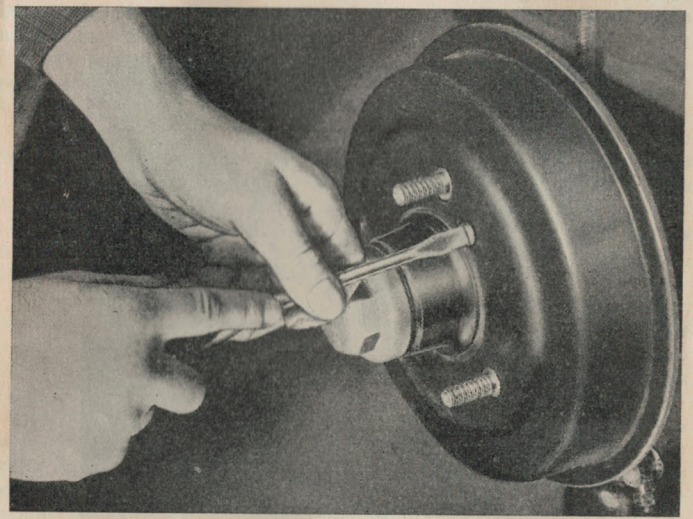

FIG. 65. REMOVING BRAKE DRUM

may be due to wear, or may equally arise from dirt on the linings or in the drums. It is a simple matter to dismount each wheel in turn and remove the brake-drums, undoing the screws which secure each to its hub (Fig. 65), but it is as well to mention here that in refitting each drum, its mounting surfaces should be quite clean so that it fits snugly up to its correct position on the hub. When the brake-drum is off, the linings are accessible and can be cleaned with a rag just moistened with petrol, which will pick up the dirt from the interstices of the lining fabric and effectively remove it from the inside of the drum (Fig. 66) as well as remove any traces of unwanted grease or oil from any of the braking surfaces. The linings can then be examined, and if any of the rivets appear to be standing proud to cause brake screech, or the linings seem so worn that all the rivets are well up to the braking surface, the shoes will have to be remedied. With the shoes removed it is a simple matter, if a rivet is standing proud,

to rest the rivet head on some solid support, and punch the end farther over to draw the head down below the surface of the lining. However, removal of the shoes usually involves withdrawing the hub (unless the owner finds it possible to unhook and refit the brake springs while the hub remains in position).

Brake relining is not a maintenance attention often undertaken by the private motorist, but mechanically-inclined Austin

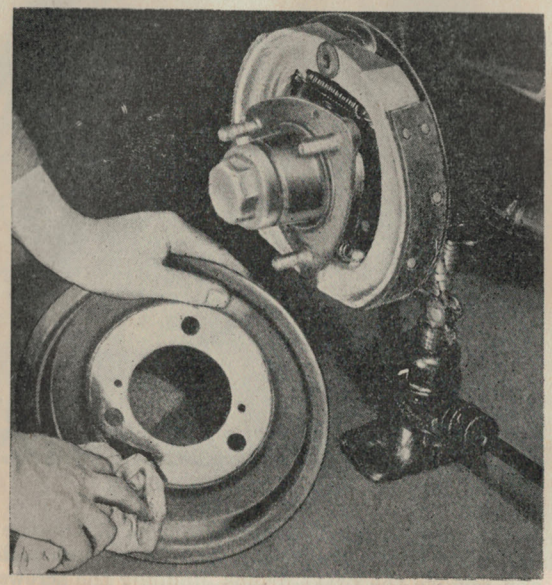

FIG. 66. CLEANING BRAKE DRUM

Ten owners will not find this job too difficult if they decide to do it themselves. We may as well mention, however, that the standard charge for this service is only about £2, plus the cost of linings, rivets, etc., and most owners, therefore, consider it hardly worth while undertaking the work themselves.

As it is never advisable to reline only one pair of brakes, seeing that all the brakes act together, eight linings will be required and forty-eight $\frac{3}{16}$ in. × $\frac{1}{2}$ in. rivets, all of which can be obtained from any Austin dealer, the linings being supplied curved to the radius of the shoe, but not drilled.

The procedure is the same for each brake. It is first necessary

to remove the road wheel and then extract the hub and brake-drum complete, using the hub extractor provided in the tool kit. If an extractor is not supplied one can be obtained from the Austin Motor Company for a nominal charge. The caps on the front hubs, and the castellated hub-nut locked by a split pin on all the hubs, will have to be removed first and then the body of the extractor can be screwed on the hub. On its centre screw being tightened against the axle, the hub will come clear, although if it is very tight a sharp hammer blow on the head of the screw, after it has been tightened well home, will usually "start" the hub.

With the hub off, the brake springs can be unhooked from the shoes, to leave the latter free. In dealing with the rear brakes it is not necessary to remove the key from the key-way in the axle shaft.

The old linings can be removed by punching out the rivets and the new linings can then be clamped to the shoe while $\frac{3}{16}$ in. diameter rivet holes are drilled.

Each new lining can be best positioned on its shoe by gripping the shoe and lining horizontally in a vice. When the rivet holes on one side of the shoe have been drilled, pegs can be used to locate the partly-drilled lining while it is being drilled on the other side.

The holes then require to be countersunk enough to allow the head of the rivet to lie about $\frac{3}{32}$ in. below the surface of the new brake lining, and if this is not done carefully, the rivets may work proud of the lining, or the lining may quickly wear down to the rivet, to result in bad braking, possible scoring of the brake drums, and, in any event, an unpleasant brake screech.

After riveting, by spreading the hollow rivet ends with a suitable punch, so that the rivet heads drop into the countersunk recesses in the linings and the latter firmly bed down on the shoes, the linings should be slightly bevelled along the edges with a coarse file and the ends backed-off with the same tool to provide leading and trailing edges to ensure that the brakes do not grab when applied.

The backing off will suffice if it starts from the surface of the lining at the first rivet, to leave the lining at about half thickness at each end.

Reassembling is a reversal of the process described, but it will be found necessary to lengthen the brake rods (or cables) and slacken off the main adjustments to their original setting before the hubs and drums can be refitted owing to the thickness of the new linings. When the castellated axle nuts have been tightened well home, remember to refit new split pins.

It will finally be necessary to balance the braking of cars not

fitted with Girling brakes by the method previously outlined, as well as to finalize the pedal and hand-lever adjustment, and after the car has run a few hundred miles it is as well to check the brake balance once again and make any further adjustments that may seem necessary.

Worm and Sector Steering Gear. In the later type of worm and sector steering the worm is machined to provide greater clearance at the extremities of the worm travel than at the centre. This extra clearance ensures that the steering is light at both full lock positions and that when wear occurs, the adjustments, which are provided in all necessary directions, can be taken up without causing steering on extreme lock to be at all stiff. As all steering gears wear most at about the straight-ahead position the importance of this feature of the design is apparent.

Before dismantling the steering box in an endeavour to cure rattle, first ensure that the trouble is not due to excessive play outside the unit.

Thus, having checked up the spring anchorages, shackles and U-bolts, front hubs and steering joints, see that the rattle is not coming from a loose steering column support bracket.

Occasionally a dull drumming has been known to have arisen from a loose felt packing round the inner column, allowing it to vibrate. Slack barrel nuts securing the direction indicator switch mechanism in the steering wheel will sometimes produce a rattle. When it is certain that the source of rattle is play in the steering box, the necessary adjustment can then be readily made. There are shim adjustments for end play in the column and the steering arm shaft. The adjustment for the mesh between the worm-wheel and the sector is provided by an adjustable setscrew and nut.

If it is desired entirely to dismantle the steering, or to remove the steering wheel for any purpose, the direction indicator assembly tube first must be withdrawn up the steering column, after releasing the steering box bottom cover pinch-bolt, disconnecting the indicator and horn wires, and arranging to catch the oil that will flow from the cover of the steering box when the indicator assembly tube is withdrawn. For the adjustment of the end play in the column a series of shims are located between the bottom cover and the bottom face of the steering box. Bend back the tabs on the lock washers that secure the bottom cover setscrews (2) (Fig. 67), remove the latter and take out the thinnest shim. Replace the bottom cover and setscrews and ascertain if the end play has been eliminated. Care is necessary to see that when the bottom cover is securely re-bolted the thrust bearings are still quite free to rotate. The steering column should be rotated while the screws are being tightened up as this allows the taper

roller races to centre themselves accurately. It must also be ensured that the joint between the end cover and the box is properly re-made if subsequent oil leakage is to be avoided.

Adjustment for end play of the steering arm shaft is effected by unlocking and unscrewing the thrust button (5) and withdrawing

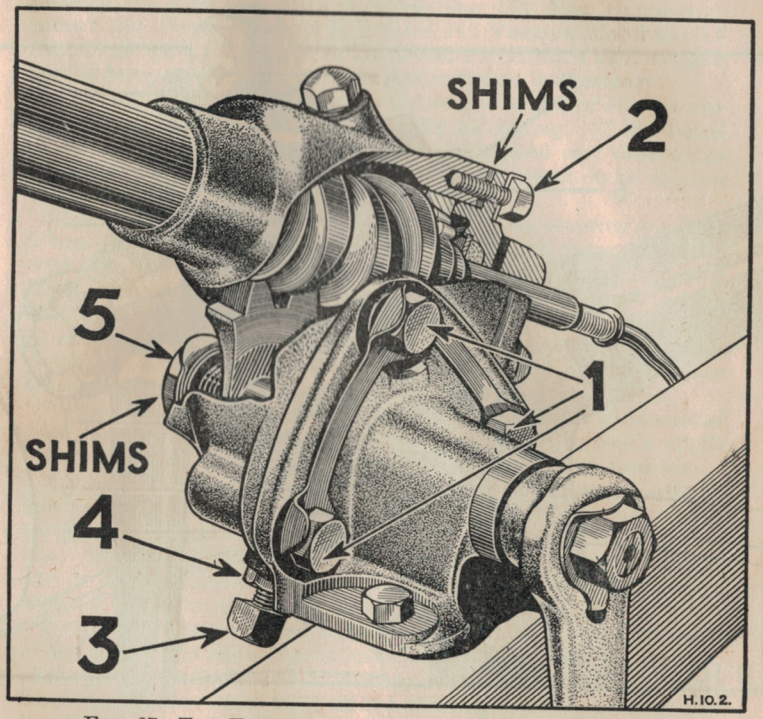

FIG. 67. THE TYPE OF HOURGLASS STEERING FITTED TO THE 1936 LICHFIELD AND SHERBORNE MODELS

one of the packing shims revealed, preferably the thinnest one. Then replace the lock washer and tighten the button up fully, securing the adjustment by bending over the lock washer tab.

The degree of mesh between the worm and worm-wheel can be varied by first slackening the three screws (1), unlocking the lock-nut (4), and turning the adjustment screw (3) in a clockwise direction to obtain the variation of adjustment required.

After the adjustment has been made, without leaving the steering stiff anywhere from full lock to full lock, the three screws (1) must be resecured. In instances where the steering unit has been detached from the frame for overhaul it will be necessary in order to obtain the correct rake angle, to replace it before

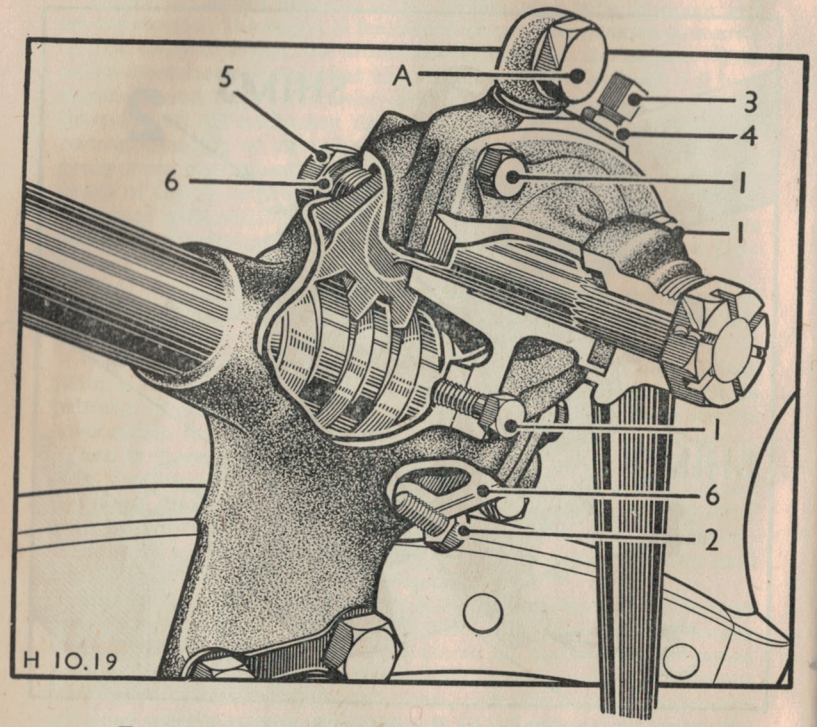

FIG. 68. THE LATER TYPE OF HOURGLASS STEERING AS FITTED TO THE 1937 TEN

attempting to adjust for mesh. Therefore, first bolt the unit to the frame and secure the column by its bracket to establish the amount of rake, then adjust the mesh, finally tightening the three screws.

Bishop Cam Steering Gear. Recent models are fitted with the Bishop cam and lever type of steering gear. The cam is in the form of a spiral groove at the foot of the steering column. A

tapered peg, carried on a rocker arm fitted to the shaft to which the steering drop arm is attached, engages with the groove, and is swung through an arc as the cam is rotated by the steering column.

An oil filler plug is provided at the top of the steering gearbox; provided that the gearbox is kept topped up with an extreme-pressure oil, such as Castrol Hi-Press Gear Oil, Esso Expee compound 140, Price's Energol E.P. SAE 140 Vacuum Mobilube GX 140, Shell Spirax E.P. 140, or Duckham's NOL E.P. 140, the gear should have a very long life before adjustment is necessary.

One important point is always to use one brand of oil: excess-pressure lubricants do not take kindly to mixing. If the brand of oil is changed, the gearbox must be drained and thoroughly flushed out before filling with fresh oil. Grease must on no account be used.

When backlash does eventually develop in the steering gearbox, it can usually be cured by moving the conical peg closer into mesh with the cam. On recent models an adjustable thrust screw is fitted to the side-plate of the gearbox. After the locknut has been slackened, the screw should be screwed inwards just sufficiently to eliminate backlash when the wheels are in the straight-ahead position. A slight degree of slackness will then exist when the wheels are turned towards either lock. This is intentional.

With the gear correctly adjusted *and the side rod disconnected from the steering drop arm*, it should be possible to feel a slight "high-spot" as the wheel is turned past the central position.

On earlier models not fitted with a thrust screw, it will be necessary to drain the steering gearbox, take off the side plate, and remove one of the shims fitted between the side plate and the box. Refit the side plate and test the gear. If necessary, remove one or more additional shims. Do not forget to fill the gearbox with oil when the correct adjustment has been obtained.

Shims are also provided between the end cover and the base of the gearbox to allow the end-play on the column to be adjusted, although this adjustment is seldom required. If the felt bush fitted inside the outer tube of the steering column to form the top bearing for the column needs renewal, the work is best left to an Austin dealer, since a special puller must be used to remove the steering wheel. In practice, any adjustment of the steering gear should not be tackled by the novice, as it calls for a certain degree of experience and skill.

CHAPTER IX

THE IGNITION AND ELECTRICAL SYSTEMS

Ignition. The coil ignition system employed on the Austin Ten is provided with an automatic advance mechanism, which relieves the driver of the necessity for constant adjustment of a hand ignition control. Its advantages are particularly evident when accelerating, and during hill climbing; pre-ignition, knocking, or "pinking" being very much reduced.

The device is housed in the distributor body, and it consists of a centrifugally-operated mechanism by means of which the ignition is advanced in proportion to the engine speed.

Very little attention is needed to keep the ignition equipment in first-rate condition if the following instructions on lubrication, cleaning, and adjustment are carried out.

The Distributor. The distributor cover can be removed on springing aside its two securing clips. The electrodes and the inside of the cover are then accessible for cleaning with a dry duster (Fig. 69) or petrol soaked rag. See that the carbon brush is clean and moves freely in its holder. The contact-breaker points can be similarly cleaned if required. Normally the gap between the contacts will not require adjustment until a considerable mileage has been covered, unless the points have burned. For this adjustment, first turn the engine by the starting handle until the points are seen to be fully open. Then, using the ignition screwdriver, slacken the two screws in the contact plate, and move the plate until the gap is set to the thickness of the gauge. After making the adjustment, care must be taken to tighten the locking screws.

The Coil. The coil needs no attention apart from keeping the terminals tight and the top clean.

Ignition Switch and Warning Lamp. The key by means of which the ignition is switched on should be withdrawn when the engine is not running; this will ensure that the battery does not discharge by the current continuing to flow through the coil windings, should the ignition be inadvertently switched on.

The warning lamp on the instrument panel will light when the ignition is switched on and the engine is not running. Should the bulb of the warning lamp fail, this will not affect the ignition, but it should be replaced as soon as possible. It can be removed from its socket when the small cover plate holding the red glass is

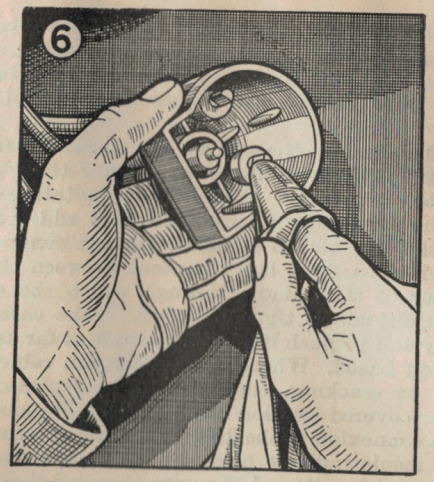

FIG. 69. THE DISTRIBUTOR ELECTRODES SHOULD BE CLEANED WITH A PETROL SOAKED RAG

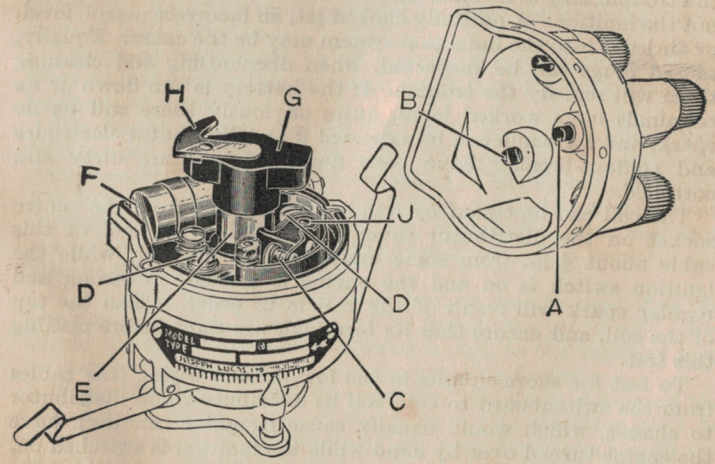

FIG. 70. PART SECTIONAL VIEW OF THE DISTRIBUTOR

unscrewed. The replacement bulb should be a 2·5 volt, 0·2 amp. screw cap type (No. 252 M.E.S.) as originally fitted.

Lubrication. The distributor spindle bearing is lubricated by means of an oiler which needs a few drops of oil every 1000 miles.

Every 3000 miles, give the cam a slight smear of petroleum jelly and place a single drop of oil on the pivot *J* (Fig. 70) on which the contact-breaker works. Withdraw the rotating arm *G* from the top of the spindle by lifting it off, and add a few drops of thin oil to the top of the spindle. Do not remove the screw exposed to view, as there is a clearance between the screw and the inner face of the spindle through which the oil passes to lubricate the automatic timing control. Take care to refit the arm correctly and to push it on to the shaft as far as possible.

High-tension Leads. When the high-tension cables show signs of perishing or cracking, they should be replaced. Use only 7 mm. rubber-covered ignition cable for all high-tension leads.

To make a connexion to the distributor or coil terminals, thread the knurled insulating nut over the lead, bare the end of the cable for about ¼ in., thread the wire through the brass washer provided, and bend the strands back. When the moulded nut is screwed home, the cable will be securely clamped, and the nut will support the cable and prevent vibration and fracture.

Ignition Faults. When the engine will not fire, or fires erratically, the trouble may arise from the carburettor, or petrol supply, and not the ignition. A partially choked jet, an incorrect petrol level, or air leaks into the induction system may be the cause. Equally, sooted plugs can be suspected, when dismantling and cleaning them will remedy the trouble. If the battery is run down or its terminals have worked loose, quite obviously there will be no spark, and the same can be expected if the distributor electrodes and contact-breaker have been neglected and are dirty and corroded.

The coil can be tested by removing the cable from the centre socket on the distributor cover, and holding the end of this cable about ¼ in. from some metal part of the car, while the ignition switch is on and the engine is turned. A strong and regular spark will result if the coil is in order. Clean the top of the coil, and ensure that its terminals are tight before making this test.

To test for short circuits in the low-tension wiring (the cables from the switchboard to coil, coil to distributor, and distributor to chassis, which would equally cause irregular running), have the engine turned over by hand while the ignition is switched on, and watch the ammeter reading. It should rise and fall as the contact-breaker points close and open. This test will also indicate

if the contact-breaker is functioning correctly. If the contacts remain open, there will be no discharge, if partially closed the reading will fluctuate.

If the high-tension cables from the distributor to the plugs are not securely attached to the distributor, misfiring may occur, or if the rubber insulation shows signs of perishing, there may be leakage of current giving rise to the same symptoms. Renewing the cables is then the remedy.

Sparking Plugs. The modern sparking plug is a dependable item of the ignition system. Many owners will be surprised to

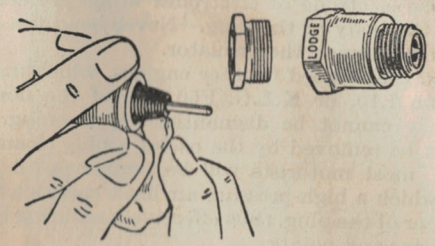

FIG. 71. CLEAN PLUG INSULATION WITH A PETROL SOAKED RAG

know that for every mile traversed by their car, each plug functions at least 1500 times.

The plugs will benefit by an occasional inspection and clean. They should receive this attention every time the engine is decarbonized, at least.

The larger, 18 mm. K.L.G. M50 or Lodge C3 sparking plugs fitted to pre-1937 engines are often of the so-called "detachable" type, meaning that they can be dismantled for cleaning purposes. The body of the plug should be lightly gripped in a vice, when the smaller hexagon, or gland nut, surrounding the insulator, can be unscrewed with a well-fitting spanner. The insulator can then be lifted out of the body.

If a vice is not available, two spanners can be used, but the greatest care must be taken not to distort the gland nut. Nor should the upper spanner be allowed to slip, as the insulator may be damaged or fractured, rendering the plug useless.

When the parts have been separated, carefully scrape all the carbon from the interior of the body. The insulator may be carefully scraped, if of porcelain, but mica insulators should not be given such drastic treatment. Rubbing with a petrol-soaked cloth will usually enable the carbon deposits to be removed.

The small copper washer fitted between the insulator and the body must also be cleaned; care must be taken not to scratch or distort it, as a gas-tight seal at this point is essential when the plug is reassembled. The copper-asbestos washer fitted between the body of the plug and the cylinder head must be renewed if it shows signs of being badly flattened or is otherwise damaged.

When all parts are clean, the plug should be reassembled, not forgetting the internal gland washer. Tighten the gland nut firmly, but do not use such force as to distort it.

The gap between the points should now be adjusted to 0·020 in. by bending the electrode or electrodes which are attached to or form part of the body of the plug. Never bend the central electrode, as this may crack the insulator.

The 14 mm. plugs fitted to later engines, which may be Lodge CN, Champion L10, or K.L.G. F50, are of the non-detachable type. As they cannot be dismantled for cleaning, the carbon deposits must be removed by the use of a plug cleaning machine at a garage; most motorists will be familiar with this type of machine, in which a high-pressure air blast carries a fine abrasive into the interior of the plug, thus effectively scouring the insulator, interior surfaces, and points.

When it is not possible to have the plugs cleaned at a garage, the work can be done quite effectively at home with the aid of the Masterpiece plug cleaner, an inexpensive piece of equipment which operates on the same principle as the garage plug cleaner, but in which the air pressure is obtained by connecting the cleaner to a tyre pump of the foot or hand operated type. About a dozen strokes of the pump will clean the plug efficiently. The rubber connector is then unscrewed from the cleaner and any abrasive remaining in the plug is blown out by the air jet from the connector.

It only remains to set the points to the correct gap, which is 0·017 to 0·018 in. with these plugs, check the condition of the copper-asbestos washer, and refit the plug to the engine. Even the latter apparently simple job, however, often results in cracked or broken insulators. It is essential to use a well-fitting box spanner, and to apply the turning effort to the bar with both hands. Otherwise the spanner may tilt, the insulator will be cracked, and the expense of a new plug must be incurred.

Timing the Ignition

In order to reset the ignition timing, remove all the sparking plugs except the front one, No. 1, and turn the crankshaft until No. 1 piston is at top dead centre before a firing stroke. This can be ascertained by watching the valves or by removing the

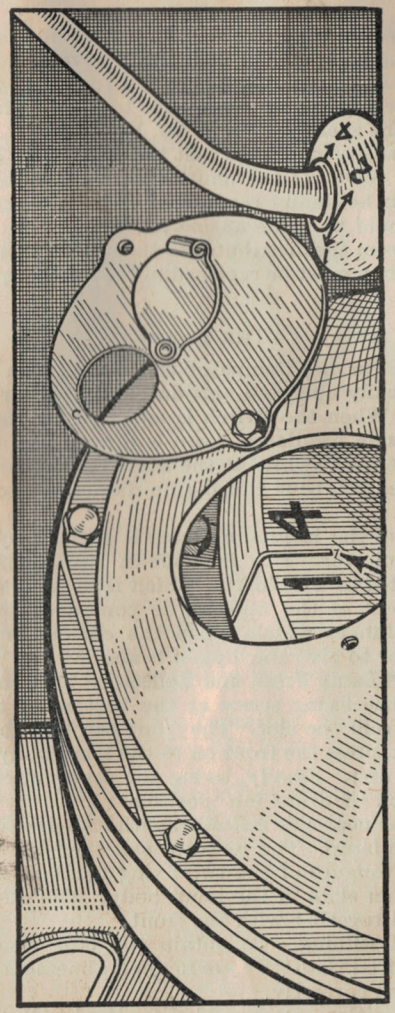

Fig. 72. Flywheel Timing Marks

clutch pit cover. Top dead centre is marked on the flywheel 1/4 (Fig. 72).

Turn the flywheel back about $\frac{9}{16}$ in. (measured on the flywheel rim) and, having removed the distributor cover, slacken the screw for the clip to the distributor casing and turn the casing until the contact-breaker points just commence to open. This is the position at which the spark occurs in No. 1 cylinder.

Tighten the adjusting screw, refit the distributor cover and test the car on the road. If the ignition seems too far advanced or retarded, it can be finally readjusted, but only extremely small movements should be made at one time.

If the leads from the distributor to the sparking plugs have been disconnected, they must be replaced in the firing sequence marked on the cover 1, 3, 4, 2.

The Lamps

Headlamps. The headlamps of the Austin Ten are provided with an electrically operated anti-dazzle device for operation by a foot-switch. When the switch is operated by the driver's left foot, the near-side headlamp beam is dipped and turned to the near-side of the road, while at the same time, the off-side headlamp is switched off, thus causing no discomfort to approaching traffic.

The dipping of the headlamp beam is effected by a movement of the lamp reflector. This is made in two parts; the centre portion is pivoted in a fixed rim which is in turn secured to the body. Movement of the reflector is controlled by means of a solenoid and plunger which, when the current is switched on, tilts the reflector to give the dipped beam.

Removing the Lamp Front and Reflector. To remove the lamp front, slacken the fixing screw at the bottom of the lamp and swing it aside from the slot. The front can then be withdrawn. When replacing, press the front on to the lamp body, locating the top of the rim first. Finally, swing the screw into the slot and tighten it to lock the front into position.

To remove the near-side reflector, withdraw the fixing screw at the back of the lamp. The reflector can then be withdrawn by dislocating the tongues of the two fixing brackets riveted to the reflector rim from slots in the lamp body. The off-side reflector can be removed together with the front.

Focusing and Alining. To obtain the best results from the lamps it is essential that they are in good alinement and that the bulbs are focused correctly.

Alternative positions are provided for the headlamp bulb in its holder. Each position should be tried for the best projection light.

To aline the lamps, slacken the single fixing nut, then move the lamp on its adjustable mounting to the desired position, finally locking the adjustment by tightening the nut.

Fuse. A fuse is provided with the electrical dipper unit to protect the equipment in the event of the reflector failing to function properly. The fuse is of the visible cartridge type, and is carried in spring clips alongside the dipping mechanism. If the reflector fails to function, remove the fuse from its holder and

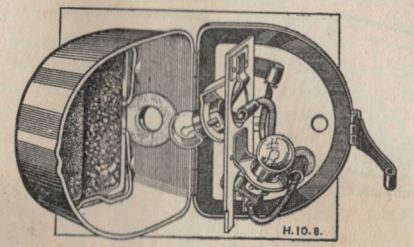

Fig. 73. The Interior of the Stop and Tail Lamp on Earlier Models

see whether there is a break in the fuse wire. A spare fuse is clipped to the reflector bracket.

Side Lamps. The side lamp fronts can be removed by twisting them to the left and withdrawing.

Stop-and-Tail Lamps. The front of the stop and tail lamp can be swung aside for bulb replacement by turning it to the left and withdrawing it from its base, when the fixing screw is slackened (see Fig. 71).

Bulb Sizes, The sizes of the bulbs are: Head, 618 S.V.; Side, B.A.S. No. 8S; Tail, B.A.S. No. 8S; Stop, B.A.S. No. 8S; Dash, B.A.S. No. 8S.

The Reflectors. The reflectors of the lamps are covered with a protective coating, and any marks can be easily removed with a soft cloth. On no account use any metal polish on reflectors.

The lighting and starting units on the Austin Ten are arranged for wiring on the earth return system so that it is essential that all units are in metallic contact with the frame.

Dynamo. Up to August, 1934, the dynamo was a simple self-regulating third-brush machine. From that date however, a voltage regulator unit is fitted, augmenting the normal control of the charge by the cut-out and providing complete control of the automatic functioning of the charging system by adjusting the dynamo output to suit the prevailing condition of the battery. The cut-out hitherto merely broke the charging circuit at low

speeds when the dynamo output fell below a certain value in order to prevent the battery from discharging back into the dynamo windings. The regulator now allows a high dynamo output when the battery is in a low state of charge. On the other hand, when the battery charge is high, the dynamo is only allowed to provide a trickle charge sufficient to maintain the battery condition. In addition the battery output is compensated for. If a fully charged battery is being called upon to supply

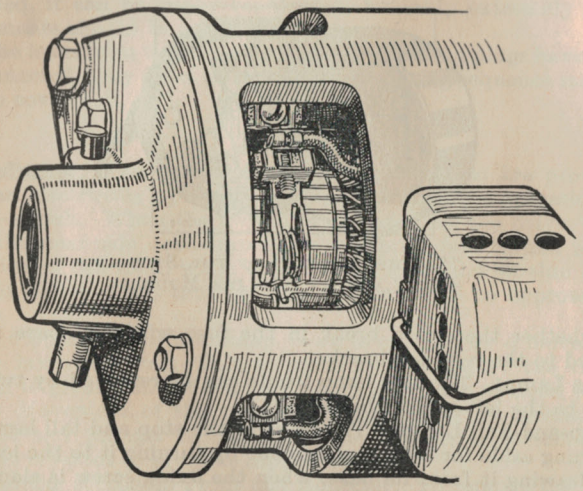

FIG. 74. SHOWING DYNAMO COMMUTATOR AND BRUSHES

current to all the lamps, the dynamo output is accordingly higher to balance the consumption of current.

The driver is thus relieved of any responsibility in respect of the charge rate and the ammeter merely serves as an assurance that the electrical system is functioning correctly without human intervention.

The effect of the voltage control as recorded by the ammeter will not be immediately perceptible when starting, and the charge will probably rise to a steady maximum of 10 amps. or more at a top gear speed of about 30 m.p.h.

It will possibly remain at a high figure for several minutes and will then fall to a steady charge to accord with the state of the battery, probably resulting in an ammeter reading of about 3 amps. if the battery is in good condition.

This low figure in itself is no indication of any defect in the equipment.

This equipment should receive the same attention as the superseded uncontrolled equipment.

All terminals must be kept secure, especially the dynamo and battery terminals, although in the event of the battery being suddenly disconnected the voltage control device does safeguard against bulb failure.

When the charge rate is unsatisfactory and there is no apparent fault in the wiring or connexions and attention to the dynamo brushes gives no improvement, the dynamo or the regulator unit should receive attention at an electrical service station.

On no account must the dynamo be tested while it is running by earthing its field terminal, as by doing so the field resistance is "shorted" and a high voltage and current is built up in the main and short circuits. The voltage regulator unit is then called upon to make and break a circuit with a current much higher than its contacts are designed to cope with and there is therefore a consequent serious risk of failure.

The only dynamo parts calling for any attention are the commutator and the brushes, which are readily accessible when the cover is removed (see Fig. 74). The commutator surface must be kept clean and free from any oil or brush dust. It may be cleaned with ordinary soft rag, but if it has been neglected use fine glass-paper. Blow away any carbon dust and see that the carbon brushes are wearing evenly and that the arms move freely on their pivots. To fit a new brush, it is only necessary to remove the single screw to withdraw the worn brush from its holder.

The dynamo bearings are packed with grease before leaving the works and do not require oiling.

Cut-out and Fuse. The cut-out and junction box is mounted with the voltage regulator unit in the latest models and with the half-charge dynamo resistance in the earlier models. When the dynamo voltage falls below that of the battery, the cut-out opens and thereby prevents the battery from discharging itself through the dynamo.

The cut-out and regulator are accurately set before leaving the works, and do not need any adjustment and are therefore sealed.

There are two fuses which are of the cartridge type. The one marked "AUX" is connected to the accessories circuits, and will blow in the event of a short circuit in the wiring of the electric horn, windscreen wiper, and other units connected to the "AUX" terminal, the indication that the fuse has blown being the failure of these units.

The other fuse marked Main 35 protects the dynamo, and is connected in the dynamo main circuit. The indication of a blown

dynamo fuse is that the dynamo will fail to charge. A spare fuse (*B*, Fig. 75) is provided in case of emergency. Before fitting a replacement fuse, examine the wiring of the equipment the fuse protects for loose connexions or short circuits, and remedy.

The smaller fuse box at the side of the main junction box

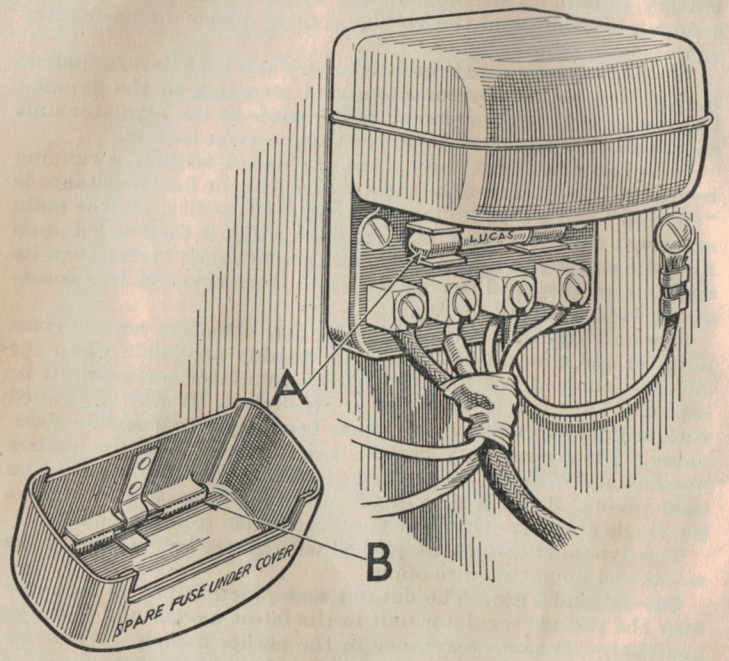

FIG. 75. 1932–3 TYPE CUT-OUT AND FUSE BOX
A is main fuse and *B* is the spare

houses a further fuse which safeguards the electric petrol gauge and direction indicator circuits.

Never fit any fuse other than the standard Lucas fuse as originally fitted.

Dynamo Field Fuse. On cars with third-brush control dynamos a fuse is provided in the dynamo field circuit to protect the machine in the event of anything being wrong in the charging circuit, such as a loose or broken battery connexion. The fuse is of the cartridge type and is housed with the half-charge resistance in the cut-out and fuse unit on the engine side of the dash. If

the dynamo fails to charge the battery at any time (indicated by a discharge reading being given on the ammeter during daytime running) inspect the fuse, and if it has blown replace it with the spare fuse provided, after inspecting the charging circuit wiring for loose or broken connexions and remedying. This fuse must not be replaced while the engine is running. If the new fuse blows after starting up, the cause of the trouble must be found and remedied. Never fit any fuse other than the Lucas standard fuse as originally fitted. The size of the fuse is marked on a coloured paper slip which can be seen inside the fuse.

Starter Motor. The commutator of the starter motor is accessible on removing the sheet metal band cover. The unit requires very little attention beyond keeping the commutator clean and free from oil, brush dust, etc., as in the case of the dynamo. Remember that although the starter will turn the engine over, however stiff, it is advisable to crank the engine over by hand two or three revolutions, as this will considerably diminish the load for starting. This, of course, is only necessary when the car has been standing for some time.

If the starter pinion jams in mesh with the flywheel ring when operating the starter motor switch, usually it can be released by putting the gear lever into top gear, and moving the car bodily backwards and forwards. If this is not successful, the starter will have to be dismantled.

Never use the starter motor to propel the car, as it throws too severe a strain on the battery and the motor.

If the engine does not start at the first attempt, do not press the starter switch until the engine has come to rest. If this precaution is not adopted, the starter ring teeth on the flywheel, or the starter pinion teeth, may be damaged.

Lighting and Charging Switch and Ignition Key. A key is provided by means of which the ignition switch is locked, so that the engine cannot be started. When the slot into which the key fits is in a vertical position, a spring releases the key and it may be withdrawn. The ignition is then cut off. To switch on the ignition, insert the key and turn to the right (clockwise), until the slot is in a horizontal line. The key cannot be withdrawn while the ignition is switched on; it must be turned off and the slot be in a vertical position first.

The lighting and charging switch positions for cars without voltage controlled dynamos, are—

"Summer Half Charge"	Dynamo giving about half its normal output.
"Winter Full Charge"	Dynamo giving its full output.
"Side"	Side lamps and tail lamp on.
"Head"	Headlamps, side lamps, and tail lamp on.

Dipper Switch. If the headlights are on full, a touch of the left foot on the switch (Fig. 1) alters the lights to the "dip-and-switch" position, and they remain so until another touch returns them to the "full on" position.

FIG. 76. TIGHTENING A BATTERY CABLE CONNEXION

Ammeter. The ammeter indicates the rate at which the battery is being charged or discharged.

It also indicates how the uncontrolled system is functioning. For example, if no reading is given on the charge side of the scale, when the ignition and charging switch is in the "Winter Full C" position and the car is running at say, 20 m.p.h. with lights off, then a fault in the dynamo charging circuit is indicated.

To determine the output of the dynamo, switch off all the lights and add the amount of current used for ignition (about 2 amp. at normal speeds) to the reading given on the ammeter.

The amount of current used for ignition may be somewhat

higher than the above figure when starting. The ammeter does not indicate the amount of current used by the starter.

Battery. It is of the utmost importance that the battery receives regular attention, as upon its good condition depends the

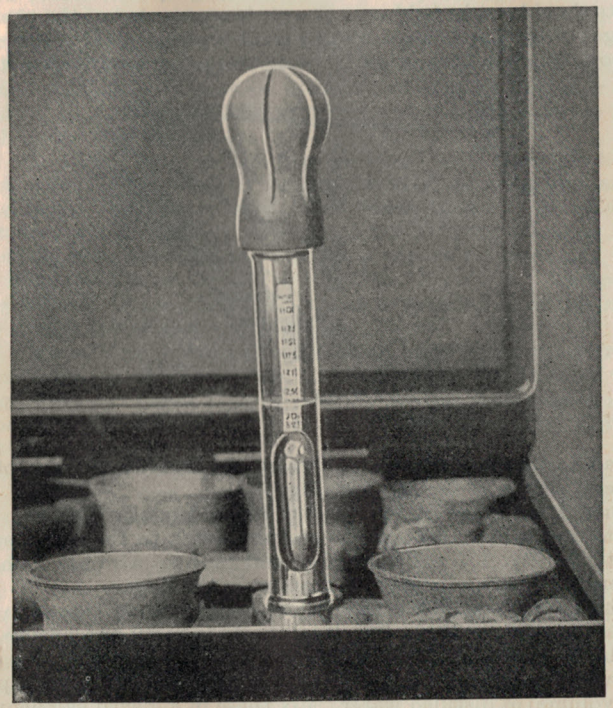

FIG. 77. ASCERTAINING THE SPECIFIC GRAVITY OF THE ELECTROLYTE IN A BATTERY CELL BY MEANS OF A HYDROMETER

satisfactory running of the starter motor, the functioning of the ignition, and the illumination of the lamps and accessories.

At least once a month the vent plugs in the top of the battery should be removed and the level of the acid solution examined. If necessary, distilled water, which can be obtained at all chemists and most garages, should be added to bring the level up to the top of the separators. There is a danger in over-filling in that an

overfull cell will sometimes siphon over and the creeping acid will eventually cause corrosion on the surrounding metal parts. If, however, acid solution has been spilled from the cells it should be replaced by a diluted sulphuric acid solution of 1·300 specific gravity. It is important when examining the cells that naked lights should not be held near the vents on account of the possible danger of igniting the gas coming from the plates. It is advisable to complete the inspection by measuring the specific gravity of

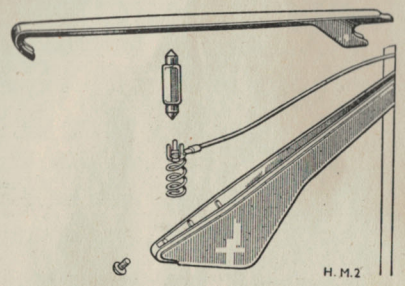

FIG. 78

the acid with a hydrometer as this gives a direct indication of the state of charge of the battery (Fig. 77).

Should the state of the battery be continually bad, see that all its connexions through the starter switch to the switchboard are tight (Fig. 76) and unbroken, and that no wire has a chafed covering, allowing leakage of current to the frame.

The Electrolyte. When the battery arrives empty (as in the case of cars sent abroad) the first thing to do is to fill and charge it.

This means that a solution is prepared composed of one part (by volume) of pure concentrated sulphuric acid with three parts (by volume) of distilled water. Mix these in a glazed earthenware vessel. Great care must be taken in this operation. Add the acid in very small quantities, almost drop by drop, and stir with a glass rod. *Never add the water to the acid.* This is highly dangerous and a serious explosion may result. This mixing generates heat, and it is important that the electrolyte should not be used in the battery before it has been allowed to cool. Pour the electrolyte into the cells of the battery by means of a glass or celluloid funnel, until it completely fills the cells to the top of the vent hole. Allow the battery to stand for ten minutes or so, then put in more acid solution so that each is again filled to the same point with electrolyte. The electrolyte will have a specific gravity of 1·285 when

fully charged. Batteries may be charged at almost any service station.

Direction Indicators. Every two or three months, raise the indicator arm and apply one drop of thin machine oil to the two hinged joints between the arm and the operating mechanism. Only the merest drop of oil should be added; any excess may affect the working of the solenoid mechanism.

If at any time, the arm fails to light up when in operation, examine the bulb. To remove the bulb, switch the indicator on, and then, supporting the arm in a horizontal position, move the switch to the "off" position.

On the earlier type of direction indicator withdraw the bulb holder, which is clipped into the underside of the arm, by means of the metal tongue provided. The latest type has a bakelite arm with a metal top. By unscrewing the securing screw at the end of the indicator arm, this metal top can be removed and the bulb withdrawn from its holder (see Fig. 76). *Do not attempt to remove the bulb holder while the indicator is switched on as this may cause a short circuit and so damage it.*

On some models, move aside the small trigger projecting from the underside of the arm, when the cap of the bulb holder will spring open. Fit a new bulb in place of the one which has burnt out or is faulty and refit the cover. Bulbs fitted: No. T63F, 3-watt festoon type.

If the direction indicators or electric petrol gauge fail to function examine the fuse protecting them (this is fitted on the dash near the cut-out); if it is blown, inspect the wiring for a short circuit.

The Electric Petrol Gauge. The electric petrol gauge is automatic in action and registers the contents of the petrol tank. It is active only when the ignition is switched on; consequently when the tank is being replenished, first switch off the ignition to stop the engine, then switch on again and the needle on the dial will record the amount of spirit which is poured into the tank.

There are four points at which a loose or broken connexion might put the gauge out of action, these being one at the tank unit and three at the back of the gauge, as will be seen from Figs. 79 and 80. On the later models there are only two terminals on the gauge.

It is important that both the gauge and the tank unit should earth properly. The cable from the tank unit may be earthing at some point if the gauge shows a full tank without cause. If it is the tank unit terminal which is earthed, the unit will require repairing.

The gauge can be tested by connecting a voltmeter between the

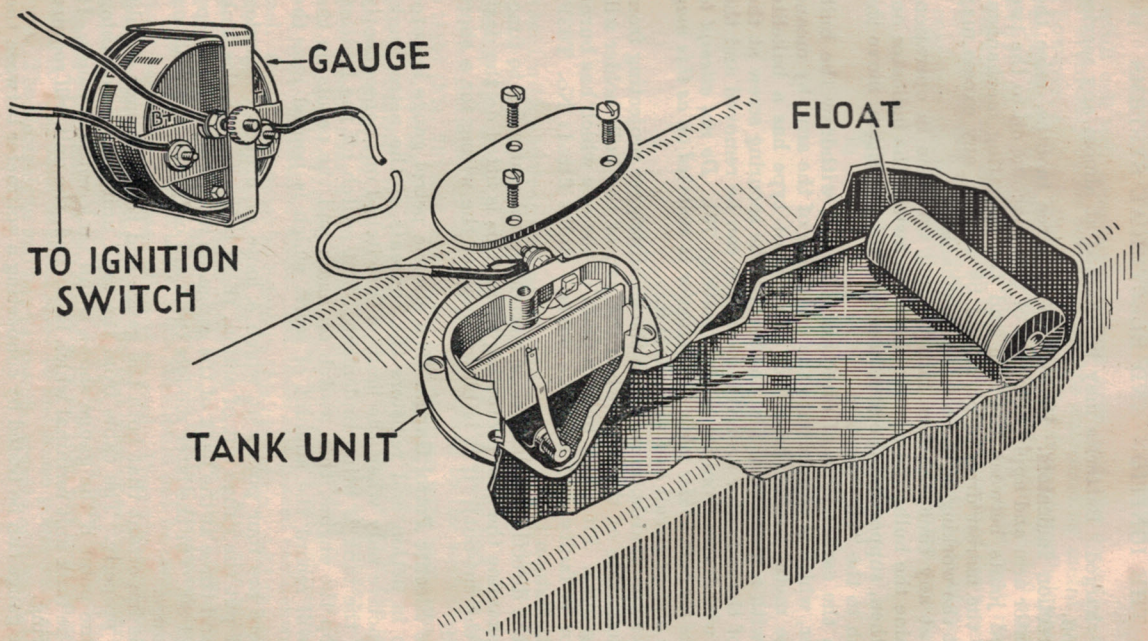

FIG. 79. SHOWING HOW THE ELECTRIC PETROL GAUGE FUNCTIONS

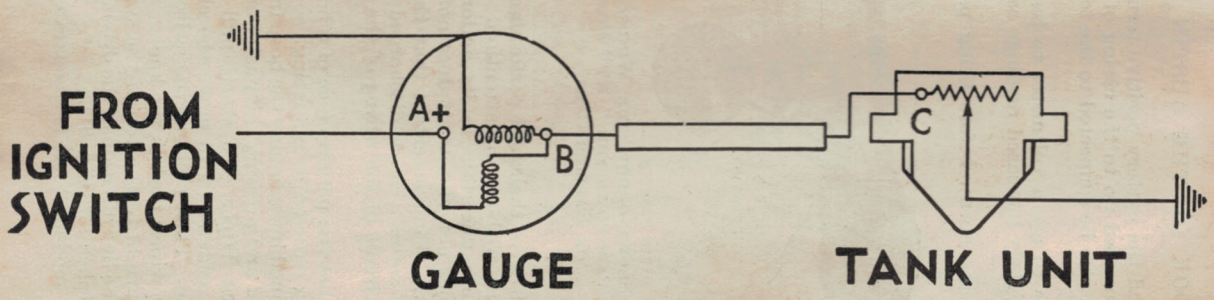

FIG. 80. THE WIRING FOR THE ELECTRIC PETROL GAUGE

feed terminal *BX* and the battery positive terminal, having the battery negative connected up to the casing of the gauge. The battery negative can also be connected to the terminal *T* for the tank unit cable.

Another method is to use a voltmeter to test the tank unit, which should give slightly increased readings as the float arm is lifted by hand.

Electric Horn. These horns, before being passed out of the

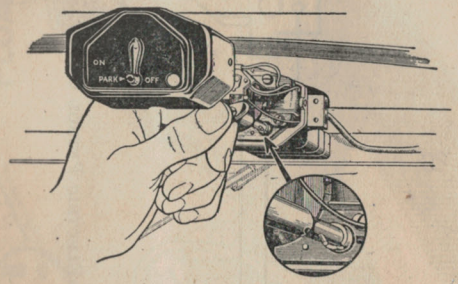

FIG. 81. SHOWING HOW THE WINDSCREEN WIPER IS PARKED IN THE "OFF" POSITION ON EARLIER CARS

works, are adjusted to give their best performance, and will give a long period of service without any attention.

If the horn becomes uncertain in its action, giving only a choking sound, or does not vibrate, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, e.g. a discharged battery, a loose connexion, or short circuit in the wiring of the horn, or if quite dead, a blown fuse.

It is also possible that the performance of a horn may be upset by the horn becoming loose on its mounting.

This can be ascertained by removing the horn from its mounting, holding it in the hand and pressing the push button.

Electric Windscreen Wiper. To start, pull out the curved handle and swing it aside so as to move the cleaning arm into position on the screen. Then pull out the switch knob and give it a spin. To stop the wiper, push in the knob. Then pull out the curved handle and turn in to the top of the switch knob. This locks the arm out of the line of vision of the driver and also ensures that the wiper is switched off (Fig. 81).

On the later dual models, there is a separate control for the

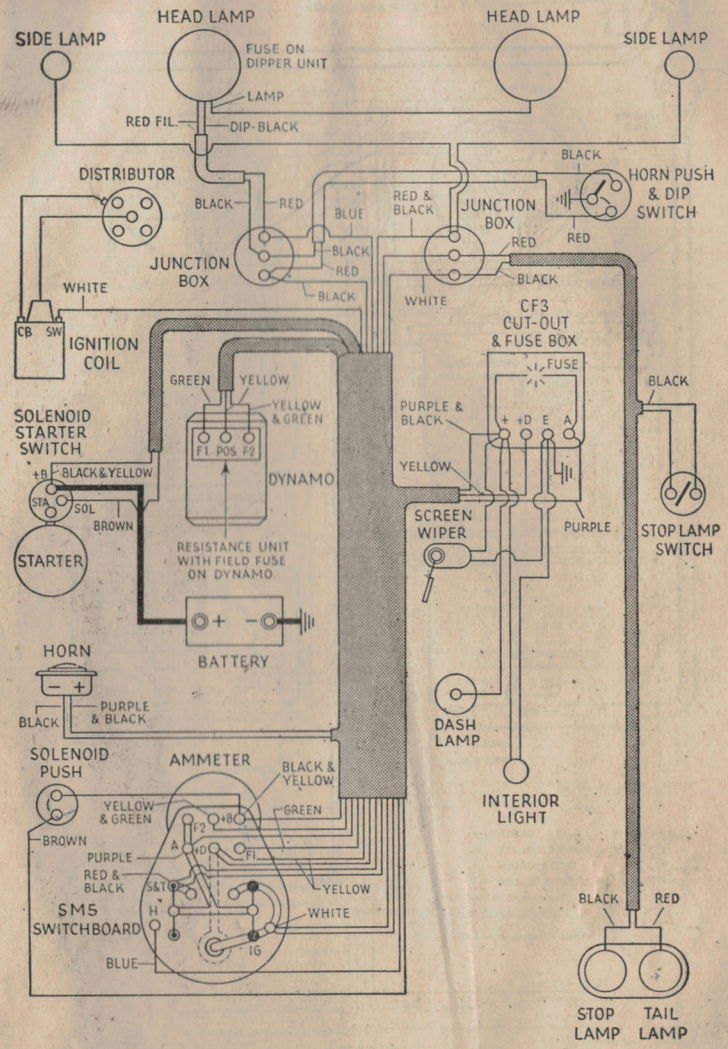

FIG. 82. WIRING DIAGRAM 1933 AUSTIN TEN

The wiring on 1932 models is similar, except that Lucas-Graves bulbs are fitted to the headlamps instead of the electrically-operated "dip-switch" arrangement

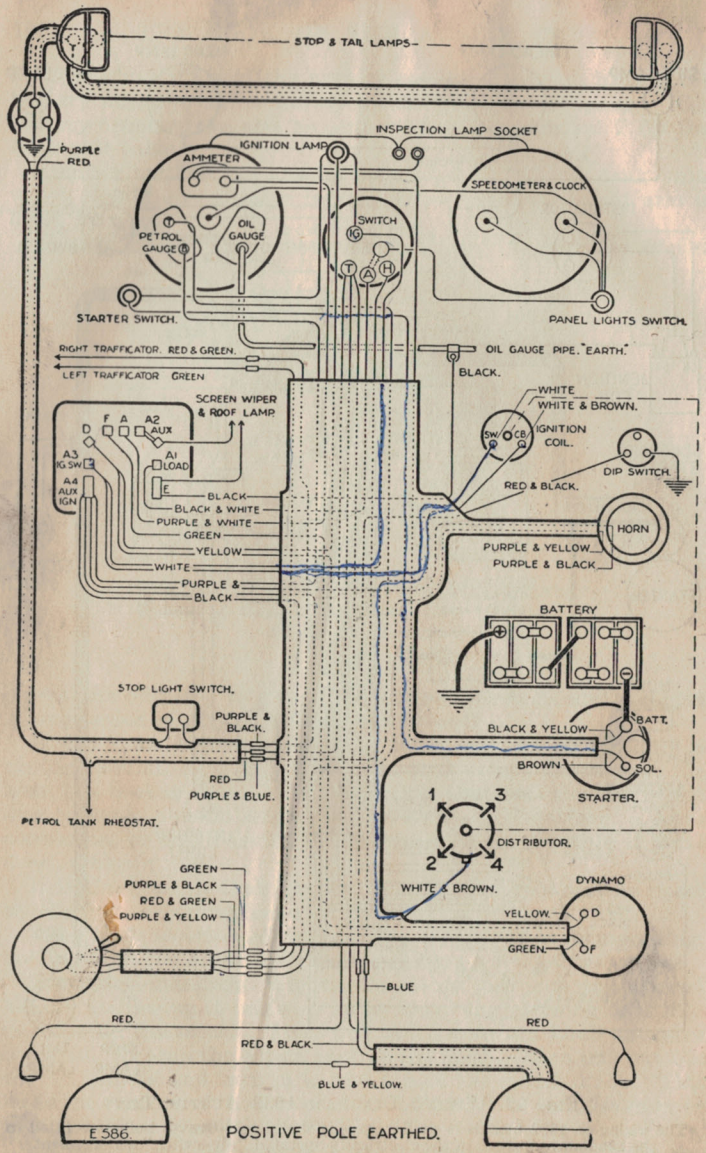

FIG. 83. WIRING DIAGRAM 1936–8 AUSTIN TEN

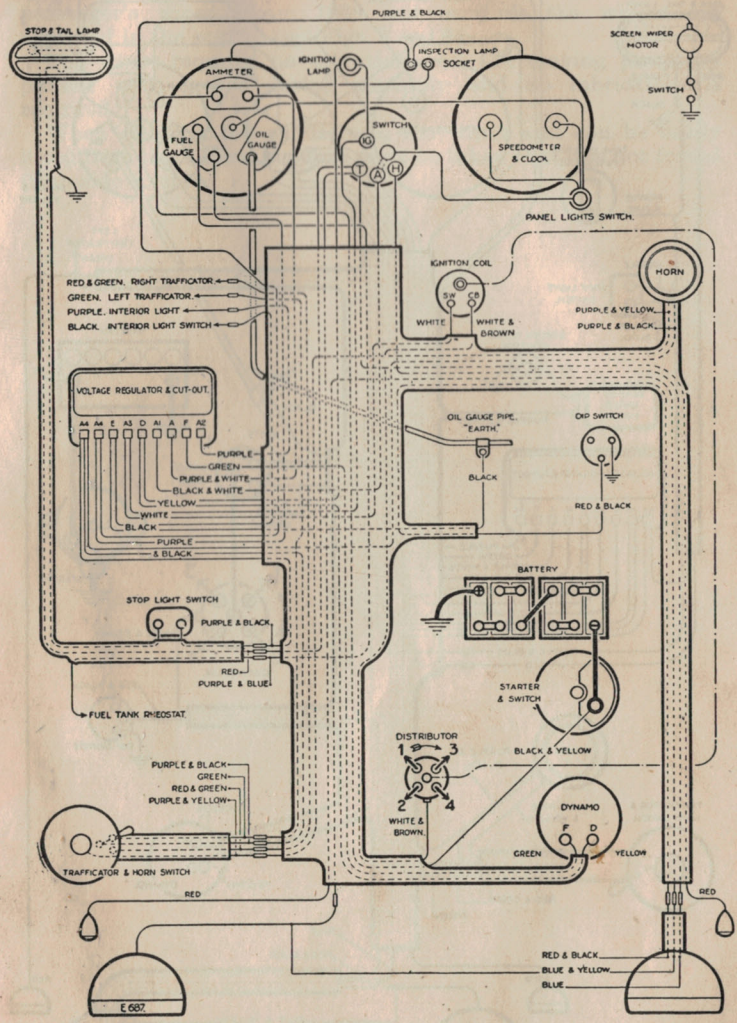

FIG. 84. WIRING DIAGRAM 1939 AUSTIN TEN

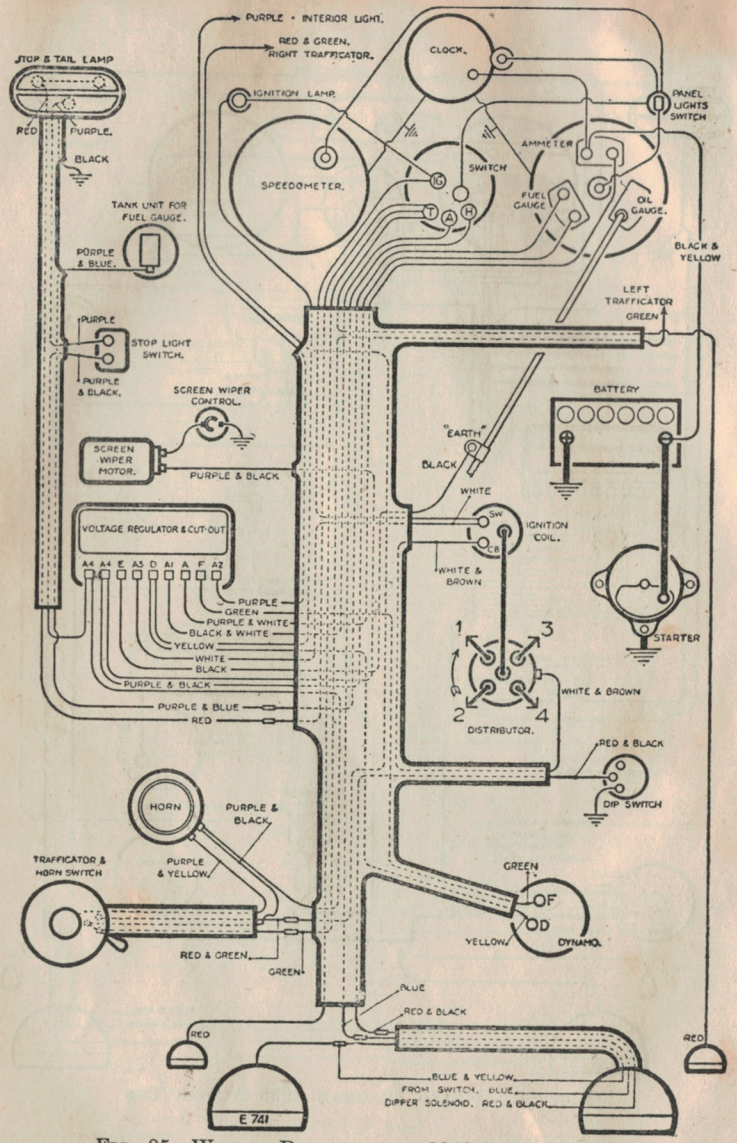

FIG. 85. WIRING DIAGRAM FOR 1940–7 AUSTIN TEN

passenger's wiper. From 1938 and onwards the wipers are mounted in the scuttle (see Figs. 1 and 2).

The wiper requires no attention; all the moving parts are packed with grease during assembly and no lubrication is required.

When cleaning the windscreen, the wiper arm can be easily lifted from the screen, but care must be taken that it is not forced from side to side.

TABLE I

How to Locate and Remedy Trouble

Condition	Method of Detection of Possible Causes	Remedy
	Starter will not turn engine and lamps do not give good light. Battery discharged.	Start engine by hand. Battery should be recharged by running car for a long period during daytime with charging switch in full charge position. Alternatively recharge from an independent electrical supply.
	Controls not set correctly for starting.	See that ignition is switched on, petrol turned on, and everything is in order for starting.
Engine will not fire.	Remove lead from centre distributor terminal and hold it about ¼ in. away from some metal part of the chassis, while engine is turned over. If sparks jump gap regularly, the coil and distributor are functioning correctly. If the coil does not spark, the trouble may be due to any of the following causes—	Examine the sparking plugs, and if these are clean and the gaps correct, the trouble is due to carburettor, petrol supply, etc.
	Fault in low tension wiring. Indicated by (1) no ammeter reading when engine is slowly turned and ignition switch is on, or (2) no spark occurs between the contact points when quickly separated by the fingers when the ignition switch is on.	Examine all cables in ignition circuit and see that all connexions are tight. See that battery terminals are secure.
	Dirty or pitted contact points.	Clean with fine emery cloth and afterwards with a cloth moistened in petrol.
	Contact breaker points out of adjustment. Turn engine until contacts are fully opened and test gap with gauge and spanner.	Adjust gap to gauge.

Condition	Method of Detection of Possible Causes	Remedy
	Remove each sparking plug in turn, rest it on the cylinder head, and observe whether a spark occurs at the points when the engine is turned. Irregular sparking may be due to dirty plugs or defective high tension cables.	Clean plugs and adjust the gaps to about 20 thousandths of an inch. (0·020 in.) Replace any lead if the insulation shows signs of deterioration or cracking. Examine carburettor, petrol supply, etc.

TABLE II

How to Locate and Remedy Dynamo Trouble

Symptoms	Probable Fault	Remedy
Ammeter fails to indicate charge when running with no lights in use, or gives heavy discharge with lights on.	Dynamo not charging due to: Broken or loose connexion in charging circuit causing field fuse to blow (when fitted).	Examine charging circuit wiring. Tighten loose connexion or replace broken lead. Particularly examine battery connexions. Fit replacement fuse.
	Commutator greasy or dirty.	Clean with soft rag moistened in petrol.
Ammeter gives low or intermittent charge reading.	Dynamo giving low or intermittent output, due to—	
	Loose or broken connexions in dynamo circuit.	Examine charging circuit wiring. Tighten loose connexions or replace broken lead. Particularly examine battery connexions.
	Commutator or brushes greasy.	Clean.
	Brushes worn, not fitted correctly or wrong type.	Replace worn brushes. See that brushes "bed" correctly.
Ammeter gives high charge reading. (Where voltage regulator is fitted this may be due to low state of battery.)	Dynamo giving high output due to—	
	Loose connexions in dynamo charging circuit.	Examine charging circuit wiring. Particularly battery connexions. Tighten loose connexions.
	Battery acid level low.	"Top-up" cells with distilled water.
	Brushes not fitted correctly.	See that brushes "bed" correctly.
	Control brush position altered.	Have control brush adjustment reset at nearest Service Depot. (Third brush machines only.)

TABLE III

How to Locate and Remedy Starter Motor Trouble

Condition	Probable Fault	Remedy
Motor sluggish or fails to move engine.	If engine cannot be turned by hand, then fault is due to a stiff engine.	Locate and remedy cause of stiffness.
	If engine can be turned by hand then trouble may be due to—	
	Battery discharged.	Start by hand. Charge battery either by a long period of day-time running or from independent electrical supply.
	Broken or loose connexion in starter circuit.	See that connexions to battery, starter, and starter switch are tight, and that cables connecting these units are in order.
	Starter commutator or brushes dirty.	Clean.
	Brushes worn, not fitted correctly or wrong type.	Replace worn brushes. See that brushes "bed" correctly.
	Starter pinion jammed in mesh with flywheel.	Rotate squared end of starter shaft with spanner. When a squared end is not provided on the starter shaft, the pinion can usually be released by putting the car in gear and rocking it backward and forward. If this method fails, remove starter from car and test its alinement. Remount starter and tighten fixing bolts.
Starter operates but does not crank engine.	Pinion of starter drive does not engage with flywheel due to dirt on screwed sleeve.	Clean sleeve with paraffin and add a few drops of machine oil.
Starter pinion will not disengage from flywheel when engine is running.	Starter pinion jammed in mesh with flywheel.	Rotate squared end of starter shaft with spanner.

TABLE IV

How to Locate and Remedy Lighting Trouble

Symptoms	Probable Fault	Remedy
Lamps give insufficient illumination.	Battery discharged.	Charge battery either by a long period of daytime running or from independent electrical supply.
	Lamps out of alinement or bulbs out of focus.	Aline lamps and focus bulbs.
	Bulbs discoloured through use, or reflectors dirty	Fit new bulbs or clean reflectors.
Lamps light when switched on, but gradually fade out.	Battery discharged.	As above.
Brilliance varies with speed of car.	Battery discharged or overcharged.	As above.
	Battery connexion loose or broken.	Tighten connexions, or replace faulty cables.
Lights flicker.	Loose connexion.	Locate loose connexion and tighten.
Failure of lights.	Fuse blown.	Examine wiring for faulty cables and remedy. Fit replacement fuse.
	Battery discharged.	As above.
	Loose or broken connexions.	Locate and tighten loose connexion, or remake broken connexion.

CHAPTER X

CARE OF THE BODYWORK

The bodywork should retain its freshness for years, provided that it is regularly cleaned and polished. Dirt and grit are the enemies of cellulose, plating, and upholstery alike, so that the golden rule is frequent dusting, washing, and polishing, rather than a wholesale "field day" at long intervals.

Dust may be lightly flicked off the cellulose with a duster, but any appreciable amount should be removed by allowing a liberal amount of water to flow over the panels, while a sponge is used to clean the paintwork. To attempt to rub off the dust with a dry cloth is to court scratching and dulling of the surfaces.

After drying-off with a wash leather, a good finish will probably be obtained without further treatment. The use of a first-class cellulose polish, preferably of the wax variety, however, will give an added gloss and protection against the weather. If the surface is dull, a slightly abrasive polish of the type termed a "cellulose cleaner" may be used to remove the oxidized film, followed by the wax polish.

Post-war finishes are, unfortunately, not up to pre-war standards, owing to shortages of raw materials such as pigments, oils, glycerine, and so on. While the manufacturer has nevertheless produced excellent results with the materials at his disposal, the owner can help to ensure a lasting finish by paying particular attention to washing and polishing, using on each occasion a slightly abrasive polish, followed by a hard-gloss wax.

The chromium plating, however, should on no account be polished with any abrasives, nor should ordinary metal polish be used. A good brand of special chromium polish will remove any tarnish, but washing with warm, soapy water, followed by rinsing and leathering off, is all that is normally required to keep the chromium sparkling.

Apart from washing and polishing, the hoods fitted to the cabriolet and open models will also repay care. To lower the special type of roof on the earlier Austin Ten Colwyn Cabriolet, the following procedure is necessary. Release the two fastenings above the windscreen and lift the canopy rod. Then detach the three clips which secure the front bar on which the fabric is carried. Roll back the fabric as far as it will go and secure the roll by fastening the loop provided at each side to the top stud of each roof stretcher, then swing forward the

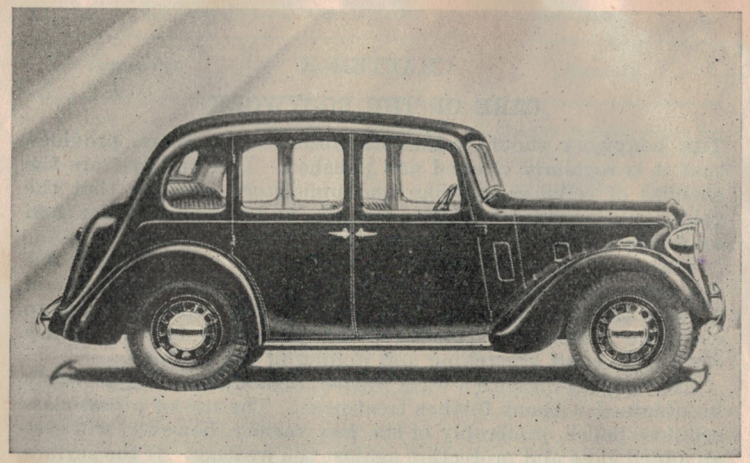

FIG. 86. THE CAMBRIDGE SALOON

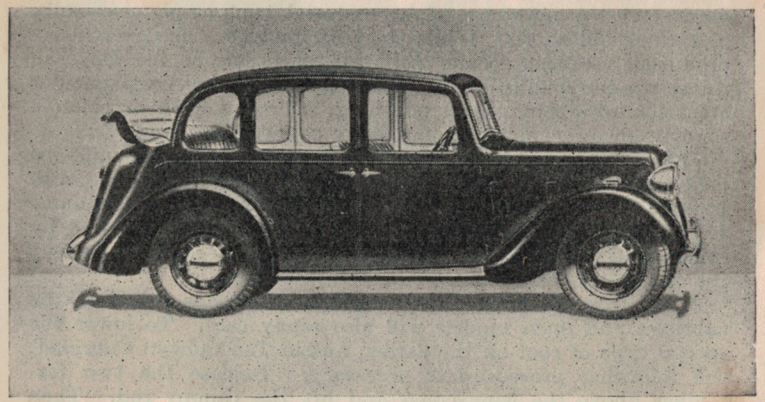

FIG. 87. THE CONWAY CABRIOLET

hinged roof bar. Pull the two arms of each roof stretcher to break the joint, fold the rear portion of the hood down and secure the rear window by its two fasteners to the top of the rear

FIG. 88

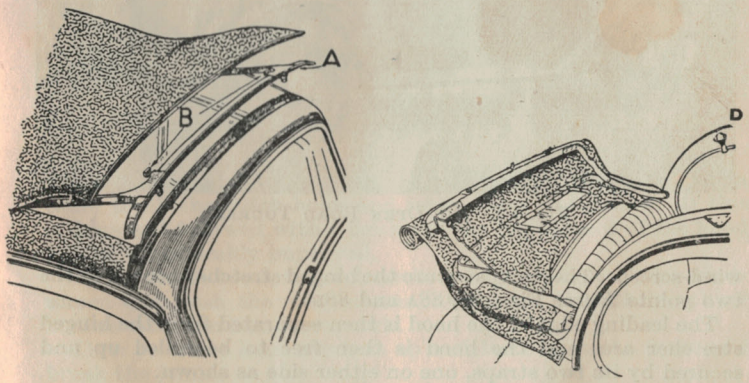

FIG. 88A FIG. 88B

CORRECT METHOD OF FOLDING CABRIOLET ROOF

seat. *The roof stretcher joints must not be broken before the front of the roof fabric is released from the canopy rod.*

Raising the roof is a reversal of the above operations. In lifting the roof members to the door pillars ensure that the

locating dowel enters the hole in each pillar. The roof can be left rolled back at the partially open position if desired.

The hood of the latest Conway Cabriolet has no fixed stretcher arms, and is rolled from the front when it is desired to open it. Cross bars roll with the hood and are automatically located on the side rails,

To open the hood, first unfasten the two clips *C*, over the

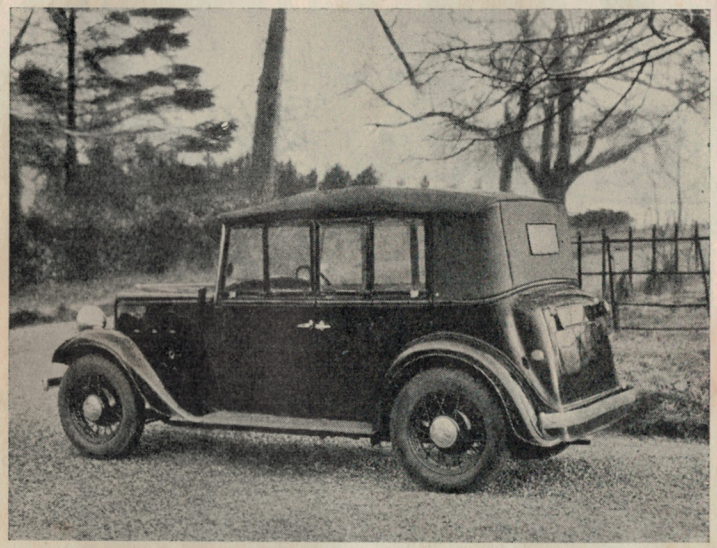

FIG. 89. THE OPEN ROAD TOURER

wind-screen. These clips secure the hinged stretcher arm *A* at the two points *B* (see Figs. 88, 88A and 88B).

The leading edge of the hood is then separated from the hinged stretcher arm and the hood is then free to be rolled up and secured by its two straps, one on either side as shown.

To dismantle the hood completely unfasten the two clips *D*, one over each quarter window and lower carefully to the position in Fig. 88B. When erecting the hood, see that the hood edges lie in the channelling on either side of the car before fastening either the rear or forward clips.

The hood and side-curtains of both the two-seater and the four-seater tourer can be rapidly erected or stowed away, and,

when up, give the occupants complete protection from the most inclement weather.

The hoods and side-curtains of these open cars will benefit from a little care in the handling of them. If the car has seen hard service the usual faded appearance of the hood can easily be remedied by a good clean with a brush and cold water. When the hood has dried apply a good quality black boot polish with a

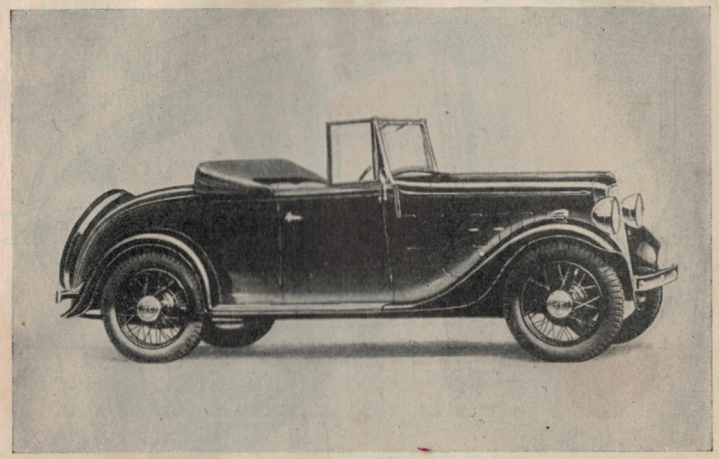

FIG. 90. THE CLIFTON TWO-SEATER

brush and rub it well in, especially round the hood seams, in order to fill the stitch holes and make them waterproof. If this is done and followed with a brisk rub the appearance of the hood will be considerably improved.

To lower the hood, first release it from the pillars of the wind-screen and push the side screens inwards so that their rubber buffers clear the iron framework.

Then push the hood straight up and back from the front and break the joints.

The hood will then collapse towards the back of the car. Pull the material out until it lies in one big fold over the back of the car; fix the hood frame to the hood rest on the body by means of the fasteners on the strap at the front end of the hood, and secure the two rear window fasteners on to their two studs at the back of the body. If the hood cover is used, then the two straps on the hood cover will clip on to these two studs instead.

Then fold the hood material back, ensuring that the edges are even, turn them in, and fit the cover over.

Complete the job by securing the cover by the straps, one on each side.

When it is desired to raise the hood, remove the cover, release

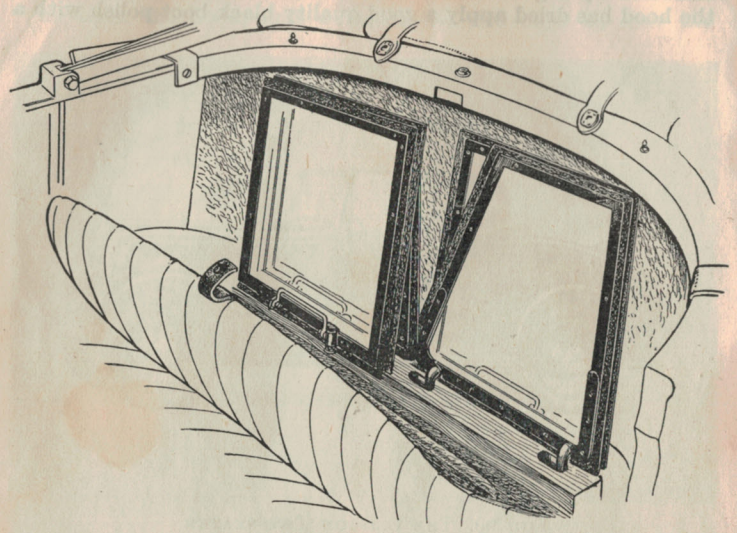

FIG. 91. HOW THE TOURER SIDE CURTAINS ARE STOWED WHEN NOT IN USE

the fastening, and unfold the hood material. Lift the top hood stick vertically, holding the metal side-iron of the hood frame near the hinge. Push the front hood stick forward and pull back the irons to straighten the hinge and the whole hood can be dropped forward and secured in position to the windscreen.

Correct stowing of the side-curtains is important if they are to enjoy a long life; celluloid is easily scratched and becomes brittle as it ages.

It is a good plan to wrap them in some protective material to prevent them from rubbing together and chafing with the motion of the car.

On the Tourer the side-curtains are stowed away behind the rear seat squab, which can be hinged forward, revealing the wood base into which they can be secured.

First fold them and place the nearside front screen with its posts in the slotted sockets to the off-side of the recess. The off-side front screen can then be similarly fitted to the near-side of the compartment. They should be placed with the opening handles of the pivoting panels towards the rear of the car. The rear screens can then be folded and fitted in the same sockets with their handles forward, that for the near-side going to the off-side of the recess and the off-side screen going to the near-side as shown in Fig. 91.

CHAPTER XI

FACTS AND FIGURES

In this chapter the important points of the specifications of the various models are reviewed. At the end will be found a useful table of modifications which have been incorporated from time to time; this, besides recording the history of the Austin Ten, will also serve as a guide to "dating" any particular car.

The Engine. The four-cylinder water-cooled engine of the Austin Ten has a bore and stroke of 63·5 × 89 millimetres, giving a capacity of 1125 cubic centimetres. The R.A.C. rating is 9·9 horse power; 28 brake horse power is developed by the standard engine at 4000 r.p.m. The Sports engine developed 30 b.h.p. at 3800 r.p.m. Oil consumption is approximately 1000 to 1200 m.p.g. Petrol consumption is about 35 m.p.g. at 30 m.p.h. Petrol consumption of the Sports model is much the same as for the standard cars at touring speeds.

The cast-iron cylinder block is cast in one with the crankcase, which is closed at the base by a sump cover. The engine is rubber-mounted to absorb vibration, the latest type having three point suspension. The 1939–44 engine has an aluminium cylinder head, higher compression ratio, larger inlet valves, and improved induction, but a cast-iron head is fitted to 1944–7 models.

The side valves are all on the near-side and are operated from the camshaft by adjustable tappets.

The valve chest is enclosed by an oil-tight cover secured with knurled screws. The crankshaft is robust and is carried in three bearings, the pistons are of low-expansion aluminium alloy and the exhaust and inlet manifolds are cast in one to provide a hot spot. The connecting rods are of steel and the gudgeon pins are clamped in position. The lower of the three piston rings on each piston scrapes down the surplus oil flung up by the crankshaft, and returns it to the sump, which holds 6 pints, after passing it through the filter gauze above the sump cover. Engine lubrication is by means of a mechanical pump which is driven by gearing from the camshaft and which forces the oil to all the crankshaft, camshaft and big-end bearings, to the timing chain and to the oil pressure gauge on the instrument board.

Clutch. The clutch is of the single dry-plate type, very light in operation and smooth in taking up the drive. The later series of cars is fitted with a flexible centre clutch plate with a spring drive, on which is mounted the friction material.

Gearbox and Transmission. The four-speed gearbox is rigidly bolted to the engine and contains 2 pints of lubricant. Gear changes are readily and silently effected by a long central gear lever easily reached by the driver. Changes into second, third, and top gears are facilitated by the synchromesh mechanism. The ratios provided by the gearbox between the engine and the road wheels on earlier models were: 1st, 21·1 to 1, 2nd, 12·78 to 1; 3rd, 8·04 to 1 and top 5·25 to 1. On the Sports model the ratios were 18·9 to 1, 11·39 to 1, 7·19 to 1, and 5·25 to 1. On 1940 and subsequent models the ratios are: 21·82 to 1; 13·22 to 1; 8·31 to 1; and 5·31 to 1 respectively.

The rear axle is of the spiral bevel three-quarter floating type with differential. The universal joints of the propeller shaft have needle bearings front and rear.

These needle roller bearings have a large number of small diameter rollers that have a very long life. The universals are charged with lubricant during manufacture and require no further attention on earlier cars, but later models have a lubricating nipple on the universal joint.

Brakes. The hand and foot controls both operate the four wheel brakes which are of the internal expanding Girling type. The brakes are smooth and powerful and can be easily and independently adjusted. The brake shoes are of steel and relining instructions are given on page 89. The latest type of handbrake has a pistol grip mounted at the scuttle.

Steering. The steering is light and responsive and well raked, giving a comfortable driving position. The steering gear is of the worm and sector or cam and follower type with provision for taking up wear, and provides a turning circle of 38 ft. in diameter. The horn button is in the centre of the steering wheel, in the hub of which is located the automatic mechanism for returning the direction indicators.

Suspension. The front springs on later models are longer than on previous cars and are semi-elliptic as are those at the rear. Shock absorbers at front and rear were of the hydraulic vane or piston type from 1935 onwards.

Wheels and Tyres. The wheels are of the latest pressed steel spoke type and can be rapidly detached.

The tyres fitted to the Cambridge Saloon, Conway Cabriolet, and the Open cars are 5·25–16 E.L.P., and 5·00 × 16 on recent cars.

Equipment. The saloon equipment includes 12 volt lighting and starting with hand-starter, carpets, pedal rubbers, chromium-plated lamps with dip-and-switch foot control, side-lamps, direction indicators with automatic return, dual interior visors and luggage carrier, rear window blind, driving mirror, draught and fume excluders, dual combined stop and tail lamp, bumpers

front and rear, combined carburettor air strangler and throttle control, electric petrol gauge, clock, speedometer, dual electric windscreen wipers, electric horn, spare wheel and tyre, number plates and licence holder.

A List of the Alterations in Design that have been Made to the Austin Ten since its Inception in 1932

Year	Month	Chassis No.	Alteration	Particulars of Alteration
1932	June	1,630	*Steering box*	Provision made for adjusting mesh of worm and worm wheel by means of an external screw.
	Oct.	5,800	*Rear hub bearing and oil seal*	Leather oil sealing ring adopted. Inner race of journal bearing increased in width.
	Sept.	4,186	*Head- and side-lamps*	Larger dip-and-switch headlamps fitted with different steering column switch.
	Sept.	4,186	*Radiator filler cap*	Spring type cap fitted.
	Nov.	7,470	*Petrol pump*	"Twelve-Six" type of pump fitted.
	Dec.	8,210	*Frame stiffening*	Stiffening channels added to inside of front of each side member.
1933	Jan.	[1]9,600	*Petrol pump and pipes*	Petrol unions and pipes of special design to obviate leaks.
	March	1,232	*Valve cover studs*	Shorter valve cover studs introduced.
	March	13,237	*Swivel axles*	Lubrication of swivel axle pins improved by specially grooved bushes and additional greasers.
	May	16,967	*Change speed lever*	Lower end of lever increased in thickness.
	July	21,000	*Cross-braced frame*	Cross-braced frame introduced, minor changes in brake controls and silencer equipment.
	July	21,000	*Improved lighting equipment*	12-volt system with indirect lighting of instrument panel.
	Aug.	21,231	*Synchromesh gearbox*	Synchromesh for third and top.
	Nov.	25,550	*Petrol tank*	Electric petrol gauge introduced.
	Nov.	28,000	*"V" type carburettor*	Latest type of carburettor adopted.
	Nov.	27,600	*Van-starting handle*	Fixed starting handle used.
	Dec.	29,100	*Swivel arm keys*	Larger keys introduced.
1934	Jan.	31,548	*Exhaust pipe and silencer*	Silencer joint modified.
	April	34,830	*Carburettor for overseas chassis*	Gauze type of air cleaner fitted.
	May	[1]42,000	*Petrol pump and piping*	"T" type of A.C. pump with hand-priming lever introduced.

[1] Engine Number.

Year	Month	Chassis No.	Alteration	Particulars of Alteration
1934	June	41,559	*Thermostat*	Included in standard specification.
	July	42,701	*Propeller shaft*	Needle-bearing type of Hardy Spicer universal joints used.
	Aug.	43,501	*New programme features*	Synchromesh for 2nd speed. Sloping radiator cowl. Foot-operated dip-switch. Automatic direction indicators, etc.
	Sept.	44,633	*Rear-axle case air-vent*	Tube type introduced.
	Sept.	45,809	*Front brake control*	Cable-operated system adopted.
	Oct.	46,000	*Crown wheel*	Differential case and crown wheel bolted together instead of riveted.
1935	Jan.	54,631	*Valve springs*	Stronger type used.
	Feb.	—	*Radiator filler*	Position changed to same side as oil filler.
	March	62,631	*Headlamps*	Design modified, lamps and wiring self-contained.
	June	68,569	*Carbon clutch thrust*	Oilless type of clutch thrust introduced.
	July	70,494	*Shock absorbers*	Luvax hydraulic type fitted.
	July	—	*Crankshaft main bearings*	Shell type adopted.
	Aug.	70,900	*Air strangler control*	Increased in length.
	Aug.	71,250	*Bevel pinion adjusting sleeve*	Material altered from steel to cast iron and bearing area increased.
	Aug.	71,656	*Constant mesh gears*	Spiral angle increased; layshaft front cover altered in material and a spiral oil groove cut in laygear bushes.
	Sept.	72,163	*Swivel pin bushes*	Rolled sheet bushes used in place of bronze tubular bushes.
	Sept.	73,258	*Headlamps*	24-watt headlamps superseded by 36 watt.
	Sept.	73,412	*Air-cooled dynamo*	New type of dynamo adopted furnished with ventilating ducts and a cooling fan.
	Dec.	80,107	*Export springs with metal bushes*	Bushes pegged in spring eye to prevent movement.
	Dec.	79,169	*Electrical earthing circuit*	Positive pole earthed.
	Dec.	80,598	*Differential shaft*	Shape of keys and keyways altered.
	Dec.	81,016	*Thermostat and connexions*	Position of instrument altered.
	Dec.	81,001	*Steering unit*	New worm and sector type of steering gear.
1936	Jan.	82,109	*Front spring shackles for export*	Shackles and pins combined in one piece.
	Jan.	82,940	*Declutching lever springs*	Stronger springs fitted.

Year	Month	Chassis No.	Alterations	Particulars of Alteration
1936	Feb.	83,616	*Brake drums*	Steel drums superseded by cast iron.
	March	87,142	*First and second speed fork rod*	Modified design.
	March	87,147	*Radiator, support and cowl*	Alterations to suit new type bonnet hinge.
	March	87,491	*Foot-operated dip switch*	Modified design.
	April	90,887	*Bevel pinion bearings*	Clearance transferred to create a pre-loaded thrust.
	May	91,754	*Rear hub oil seal*	New design of oil retainer.
	May	92,151	*Brake shoes and linings*	Steel shoes with different linings introduced.
	July	97,001	*New programme features*	New Cambridge saloons with Girling brakes, etc.
1938	June	—	*Engine*	Aluminium cylinder head.
			Shock absorbers	Piston-type fitted.
			Brakes	Pistol grip handbrake.
1939	May	—	*New 1940 model introduced*	New body style. Combined floor and chassis, and other improvements.
1941	—	—	*Private car production ceased*	
1944	—	—	*Private car production recommenced*	Improvements included redesigned steering, new transmission, and timing chain silencer.
1947	Oct.	—	*Austin Ten superseded by 11 h.p. A 40 model*	

INDEX