The Instruction Manual of the

Midget

J. 3.

(Supercharged)

INDEX

The lists of M.G. Agents, Radiator Repair Service Depots, Lucas Agents, are to be found at the end of the Manual.

Chassis No......

Engine No......

Must be quoted in all correspondence

Owner :

Name.....

Address.....

.....

.....

Car Registration No......

Licence No......

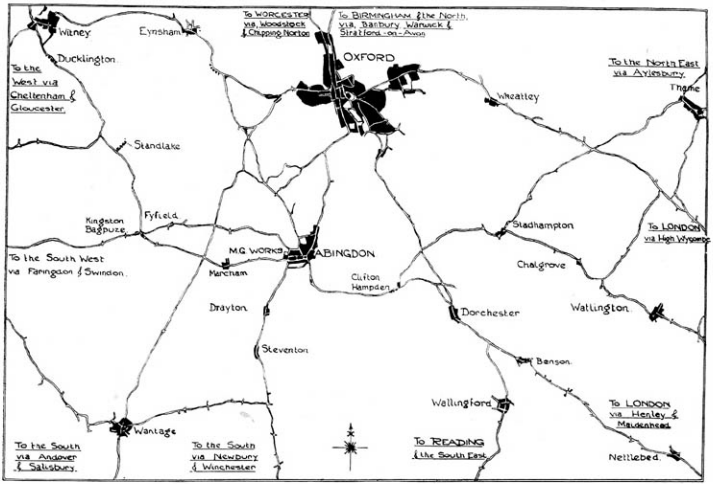
Renewal Date.....

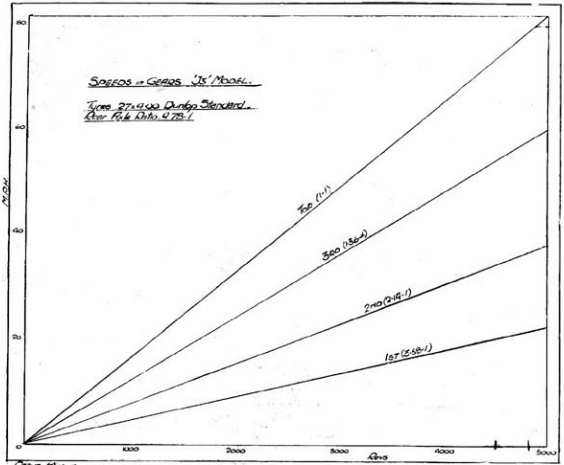
IMPORTANT

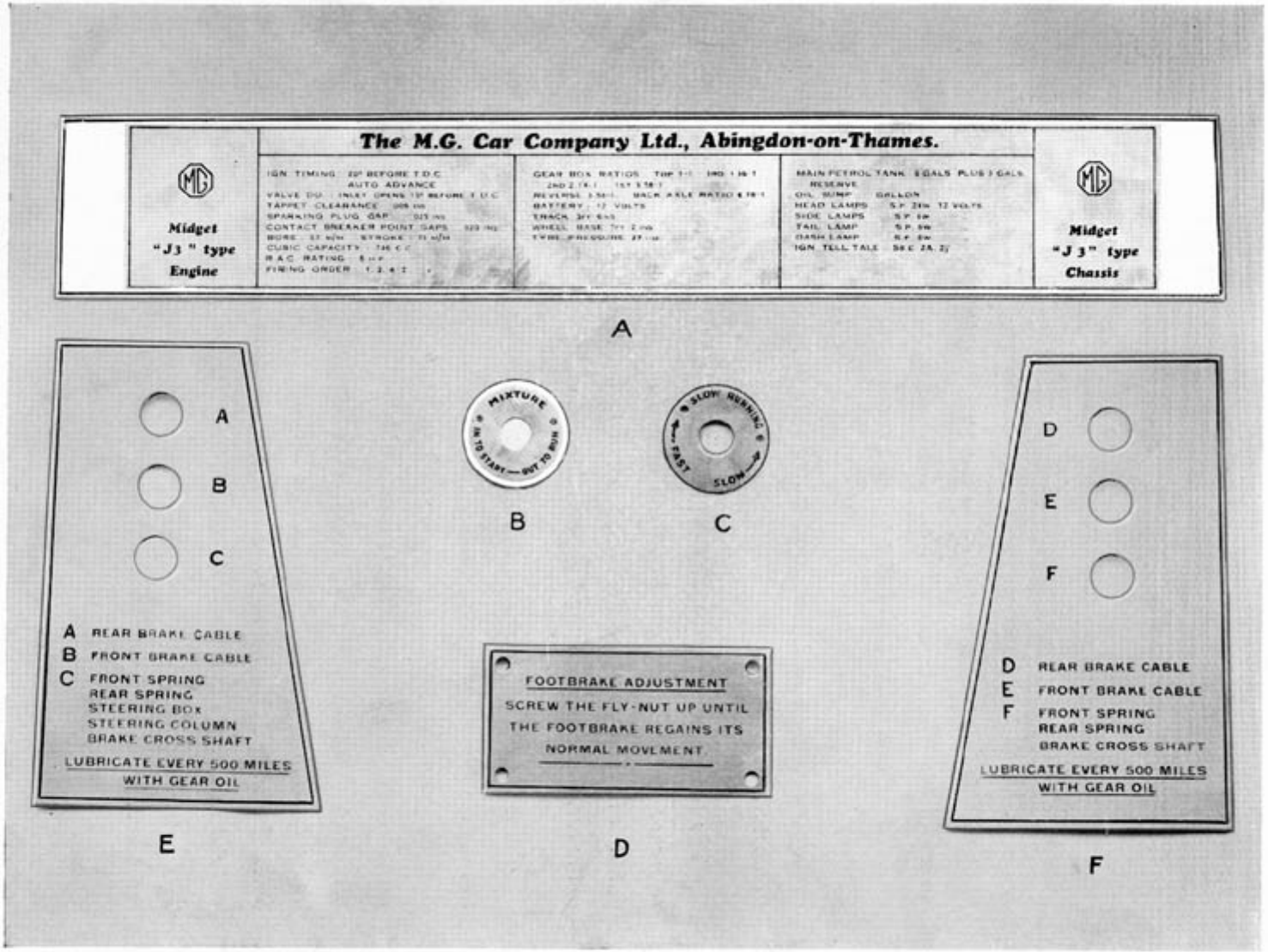
THE attention of owners of new M.G. Midget Sports cars is drawn to the following.

The importance of carefully running-in a new engine cannot be over-estimated, and care and restraint during the first 2,000 miles will be handsomely repaid.

Change the engine oil after the first 500 miles, and every 1,000-1,500 miles thereafter.

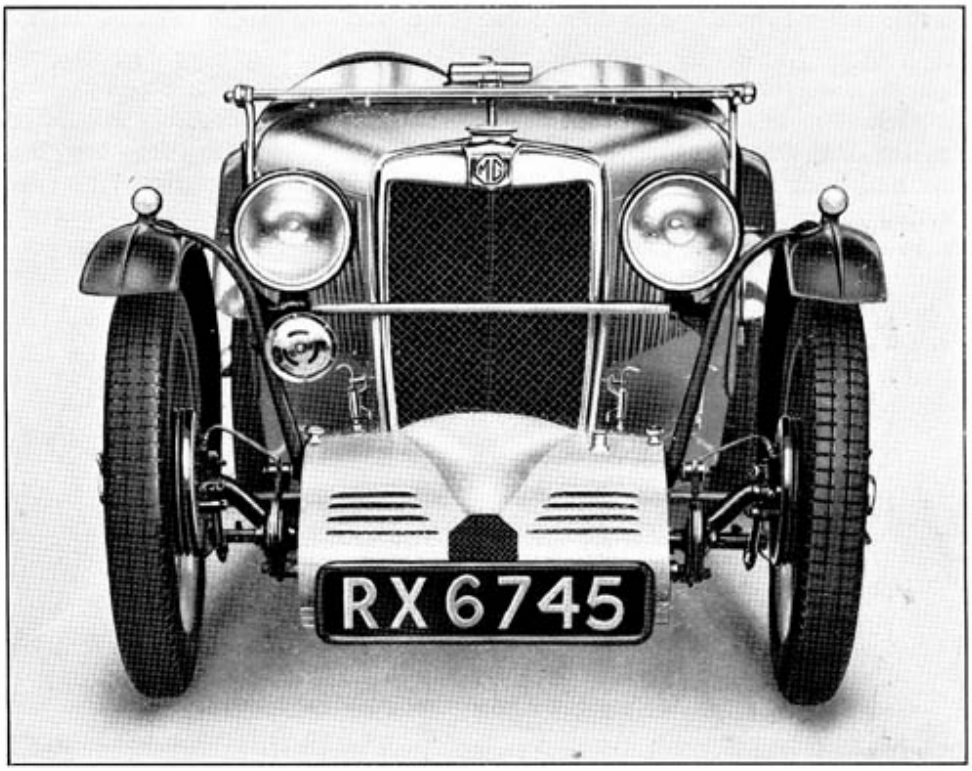

To WORCESTER via Woodstock & Chipping Norton
To BIRMINGHAM & the North, via Banbury, Warwick & Stratford-on-Avon
Witney
Eynsham
Ducklington
To the West via Cheltenham & Gloucester
OXFORD
To the North East via Aylesbury
Thame
Wheatley
Standlake
Kingston Bagpuze
Fyfield
Stadhampton
To LONDON via High Wycombe
To the South West via Faringdon & Swindon
M.G. WORKS
ABINGDON
Marcham
Chalgrove
Clifton Hampden
Drayton
Dorchester
Wallington
Steventon
Benson
Wallingford
To LONDON via Henley & Maidenhead
Wantage
To the South via Andover & Salisbury
To the South via Newbury & Winchester
To READING & the South East
Nettlebed


SPEEDS IN GEARS 'JS' MODEL.
Tyres 27x4.00 Dunlop Standard.
Rear Axle Ratio 4.714:1.
M.P.H.
80
60
40
20
0
Top (1:1)
3rd (1.36:1)
2nd (2.19:1)
1st (3.58:1)
1000
2000
3000
4000
5000
R.P.M.


The M.G. Car Company Ltd., Abingdon-on-Thames.
Midget "J3" type Engine
Midget "J3" type Chassis
A
MIXTURE
IN TO START — OUT TO RUN
B
SLOW RUNNING
FAST
SLOW
C
A
B
C
A REAR BRAKE CABLE
B FRONT BRAKE CABLE
C FRONT SPRING
REAR SPRING
STEERING BOX
STEERING COLUMN
BRAKE CROSS SHAFT
LUBRICATE EVERY 500 MILES WITH GEAR OIL
E
FOOTBRAKE ADJUSTMENT
SCREW THE FLY-NUT UP UNTIL THE FOOTBRAKE REGAINS ITS NORMAL MOVEMENT.
D
D
E
F
D REAR BRAKE CABLE
E FRONT BRAKE CABLE
F FRONT SPRING
REAR SPRING
BRAKE CROSS SHAFT
LUBRICATE EVERY 500 MILES WITH GEAR OIL
F

The Manual of the M.G. Midget

(Supercharged J 3)



The M.G. Midget Supercharged Model J3 Two-Seater.

The first thing that the owner will want to know concerning his Car will be the various lubricants that are recommended by the makers and the points of the chassis that require attention. The engine oil filler is situated on the off side of the engine alongside which there is a dip stick. **Under no circumstances should the Car be driven fast on the lower gears or exceeding 35 miles an hour on top gear during the first 500 miles, and upper cylinder lubricant at the rate of ½-oz. per 2 gallons must be mixed with the petrol to lubricate the Supercharger.** At the end of this period the engine oil should be drained and the base chamber refilled with new oil. The oil filter which will be referred to later should be removed and washed out with petrol, this should be again attended to after the first 1,000 miles and every subsequent 1,000 miles.

It is inadvisable to run a cold engine fast until the oil has had an opportunity of circulating and warming up sufficiently in order to circulate freely through the oil passage ways throughout the engine. The pump is called upon to suck from the base chamber or sump, oil which has become thick with standing, particularly in cold weather. It may be noticed that the oil gauge will show that the pressure drops as the speed increases if the

engine is driven at all fast when cold. This is an indication that the oil has not become sufficiently thin to pass into the pump in sufficient quantity and the speed of the Car therefore should be kept down until such a time as the oil pressure remains constant. The pump lubricates the whole of the engine including the valve gear.

It is just as important when warming up the engine not to allow it to tick over too slowly (approximately, 1,000 r.p.m. is the best warming up engine speed), as this will prevent the cylinder walls being properly lubricated owing to thickness of the oil, also do not use the choke any longer than necessary.

The gearbox and rear axle are provided with hexagon shape caps situated in such a manner that they automatically indicate the height level to which oil should be filled, and prevent the possibility of over filling. It should be remembered that the Car should not be moved in any way when the gear box and back axle are being filled, otherwise additional lubricant may be carried round by the teeth of the gears thus causing the housing to contain more oil than they need and above the proper level.

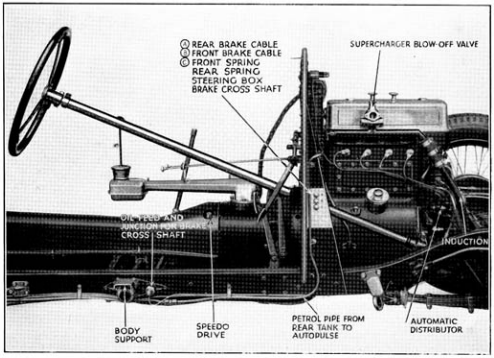


Figure 1.—Shewing the grouped nipples on the off side of dash wall support, with the petrol line to the petrolift. The oil feed to the brake cross shaft is shown at the point " C " on the left of the illustration.

Chassis fittings are conveniently lubricated from 6 oil nipples, 3 on either side of the Car, which are to be found on the brackets supporting the dash-board. The bonnet has to be lifted and the nipples fed by the oil gun provided with the Car. Reference to the plates attached to the dash-board show that on the off side of the Car there are nipples marked A, B and C and on the near side of the Car nipples D, E and F. The points lubricated by these various nipples are the brake cables, the spring trunnions, the steering box and column and the brake cross shaft. The brake operating spindles which pass through the brake drums are separately lubricated as also are the

steering head pins and the track rod and other steering ball socket joints. **Only use Shell gear oil in the oil gun.**

A lubricating chart is provided at the end of the book indicating the lubrication that is carried out from the central dash-board nipples and is shown in black and the other points on the Chassis that have to be individually lubricated are shown with a red circle surrounding them, and if there is any doubt in any owner's mind as to the exact location of the nipples, they can be seen in one or more of the illustrations of the parts contained in this manual.

The following lubricants are recommended by the Company :

Approved Engine Oils. Every M.G. Midget is tested on AeroShell and the sump and spare tin are filled with the same brand when the car is issued new. We very strongly recommend the use of this oil, as we have found it most satisfactory under the most arduous racing conditions.

On the rare occasions when AeroShell cannot be obtained the following is the list of Oils approved for use :—

Shell Triple (summer and winter).
Castrol XL (winter), XXL (summer).
Duckham's Adcol NP2 (winter), NP3 (summer).
Sports " Filtrate " (regd.) (summer and winter).
Mobiloil " AF " (winter), " D " (summer).
Morrisol (summer and winter).
Pratts' Heavy (summer and winter).
Price's Motorine " C " de Luxe (summer and winter).
Speedolene " B " (summer and winter).
Sternol WW Heavy (summer and winter).

Gearbox and Back Axle.—As in the case of engine oils, we also append the following list as approved for use in the gearbox and back axle :—

Gearbox and Back Axle.

Shell Gear Oil.
Castrol Gear Oil.
Duckham's Gear Oil " N."
Filtrate Gear Oil (regd.).
Mobiloil " C." (Mobiloil " CW " for gearbox in winter).
Pratts' Gear Oil.
Price's Motorine Amber " B."
Speedolene " H."
Sternol Liquid Ambroleum.

Upper Cylinder and Supercharger Vane Lubricants.

Shell Upper Cylinder Lubricant.
Castrollo.
Gargoyle Upper Cylinder Lubricant.
Mixtrol.

and under no circumstances must a mineral and vegetable base oil be mixed in the engine.

Great care should be exercised in mixing oils at all, and it is far preferable if anybody wishes to run on a particular oil or is so forced by circumstances, that the old oil should be drained out first and a complete replenishment made.

Under no circumstances should paraffin be used to wash out the lubricating system unless the engine is being dismantled. More detailed instruction

of the lubricating system of the engine will be found on pages 39—42 which deals with the complete travel of the oil from the sump to the pump, thence through the various pipes and passages in the engine to the main and big end bearings and to the overhead valve gear. The oil pump is provided with a relief valve of very simple construction consisting of a spring and dash-pot enclosed in a cover plug. The details of this will also be found on page 40.

We will now leave the general lubrication summary with the advice to **only use recommended oils whenever obtainable.** Five gallon drums can always be supplied by accredited Agents, and this is by far the cheapest way of buying oil. Keep the receptacle that is used for filling clean and covered, and also wash around back axle and gear box filler caps before these are unscrewed. **The Engine, gearbox, and back axle should preferably be drained prior to refilling after the Car has been running some time, so that the lubricant has had a chance to become fluid.**

General Survey. Immediately after taking delivery of the car it is advisable to become familiar with its general mechanical details and in order to assist as much as possible it has been thought advisable to give a brief pictorial survey.

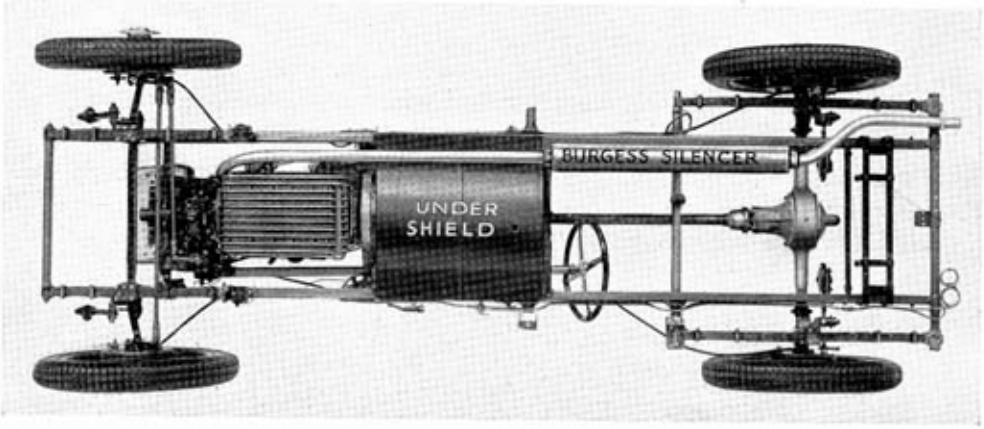


Figure 2.—Underneath view of the M.G. Midget chassis, with Supercharger removed, showing the Burgess silencer and ribbed Elektron sump.

Turn for a moment to page 2 and carefully note the illustration which shows the various instruction plates on the car.

Plate ' B ' should be specially noted as it is of the utmost importance to run the engine as little as possible with the mixture control in the rich position. The mixture control rod should be' pulled out ' for normal running or to weaken the mixture.

Having become familiar with the Instruction Plate we will pass on to the chassis.

The view shown in Illustration No. 2 is perhaps a little unconventional to some people, but it is the view obtained by looking at a chassis from underneath. The batteries and petrol tank are not in position, but the under

shield beneath the gear box and front passenger's compartment can be seen. Certain views taken from below will be described later, more particularly the front and rear axles.

The engine suspension is three point, the single or front point being mounted in the centre of the front cross member of the chassis. The nose piece of the engine is fitted into the cross member by means of a split bearing into which is fitted a rubber bush. This nose piece has two brackets, one on either side, on to which the radiator is fixed by means of two studs.

The underslung chassis frame is of unusual design having an extremely low centre of gravity, the main principles of which having already been tested and brought to perfection in competition work and racing.

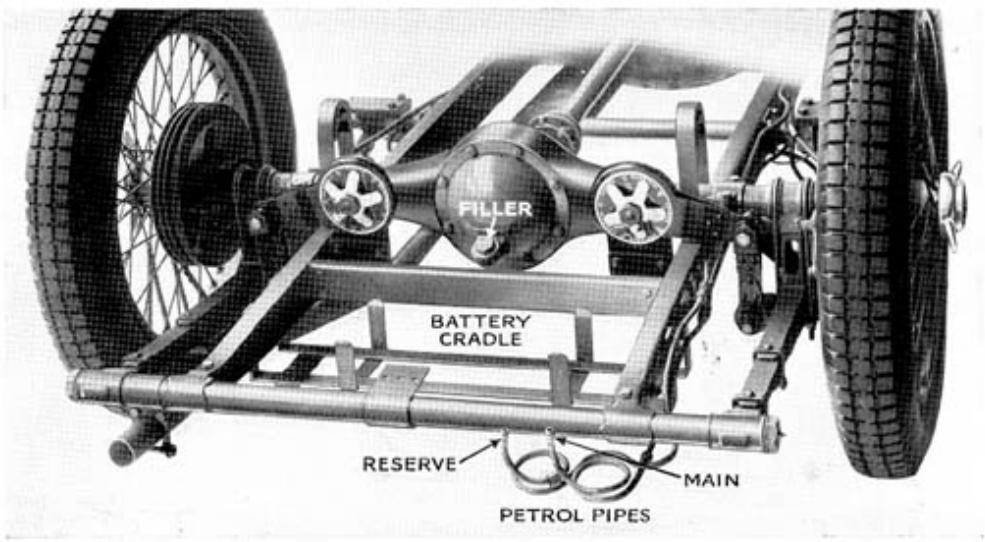


Figure 3.—Rear view of chassis with batteries removed from cradle, showing position of shock absorbers, rear axle oil filler, petrol pipe lines, and battery.

Figure 3 is a rear end view of the chassis and shows the back axle attached to the springs by long " U " bolts and a spacer, the mounting of the shock absorbers, the rear cover to the back axle with its filler cap, and the cradle for the battery. The rear cross member has extensions on either side in which the rear end of the rear springs are located.

Figure 4 shows the Petrol Tank, having a capacity of 12 gallons, leaving 3 gallons for reserve. The Petrol Tap is at the top of the Tank in a position which is easily accessible from the driver's seat, and is suitably marked to indicate the desired position of the Lever.

Figure 5 may need a little explanation. It contains a close up view of the rear of the chassis as well as a view taken of the spring anchorage and shock absorber bracket as seen from beneath the Car. The springs are held in position by two " U " bolts. It is obvious that these will require tightening from time to time, and therefore the illustration shows exactly how they

are mounted Shock absorbers need no lubrication whatever, being mounted on " silent blocs." To tighten the shock absorber turn the nut in a clockwise direction.

Illustration 5A is a close up view of the shock absorber mounting assembly from above, the rebound axle clip being situated alongside this. The rear brake cable has been purposely drawn through the yoke in order to show how this terminates in a brass stop into which the cable is swaged. Carefully note the position of the Brake Camshaft Lubricator. This Greaser is of the cup type and will require to be refilled with ordinary grease every 500 miles, lubrication being regulated by periodical adjustment of the screwed cap with which it is fitted.

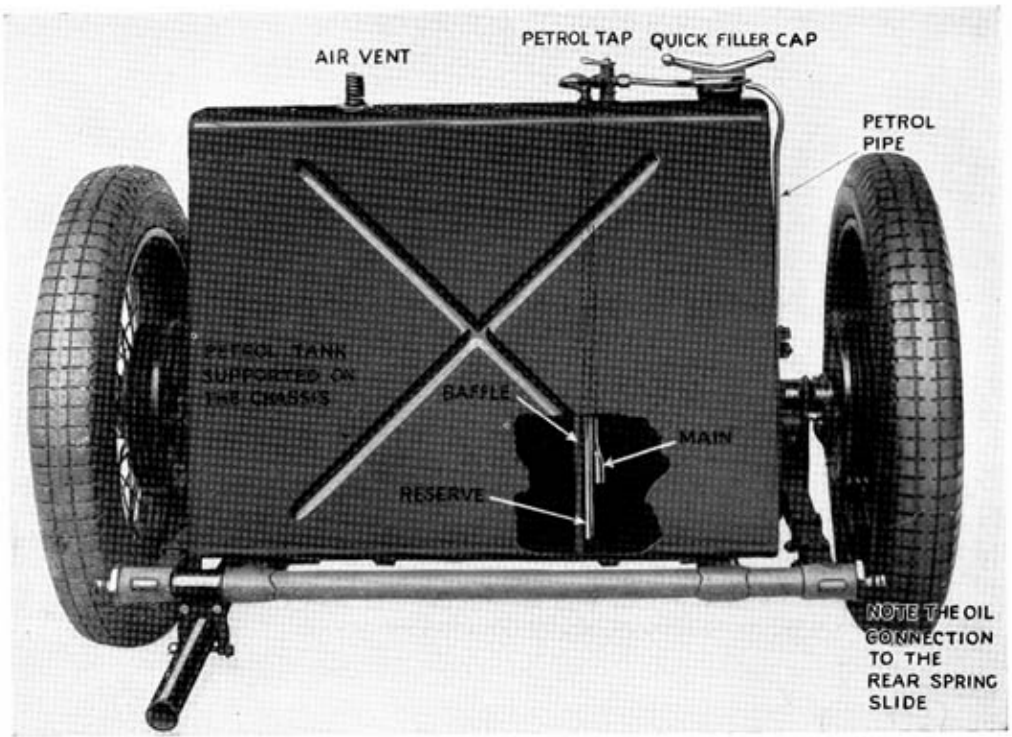


Figure 4.—Sectional view of the petrol tank on the J3 model.

Steering. The operation of the Marles-Weller Gear, which is standard on M.G. Midget ' J3 ' models is entirely novel. A hardened steel cam in which a spiral groove is cut, is mounted on the shaft carrying the steering wheel. Into this groove is inserted a follower, on each side of which and deeply embedded in it are two hemispheres which make contact with the sides of the cam track. This follower is free to rotate in a bearing in the rocker shaft to which the drop arm operating the drag link is fixed.

The cam is mounted between special ball bearings expressly designed for the duty they have to perform. At the top end of the shaft carrying the cam

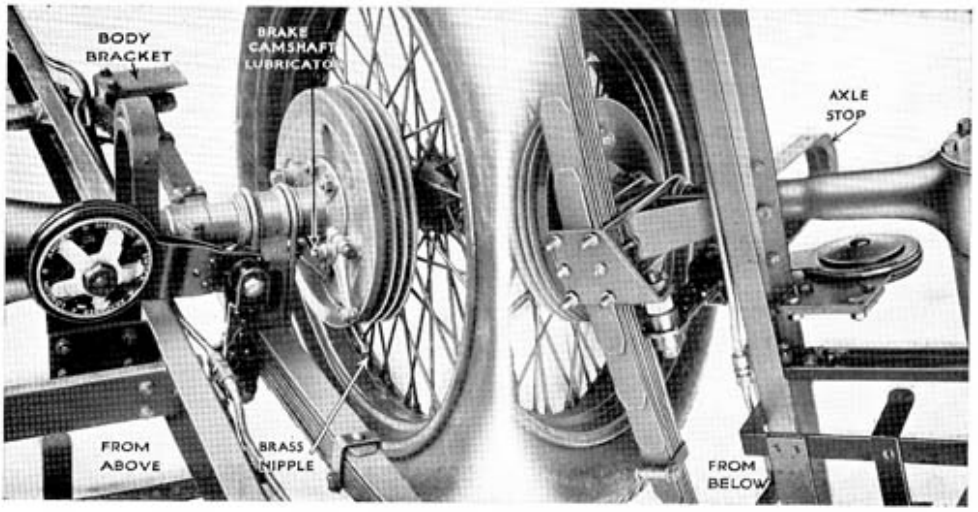


Figure 5 and 5a.—View of the off side of the rear axle, as seen from above and below. The shock absorber adjustment and mounting are visible.

and also the steering wheel, a third bearing is mounted, which bearing is arranged to eliminate any binding of the shaft.

This bearing excludes all dust and dirt, both from its own working parts and from the gear, and is designed to damp out vibration of the steering column.

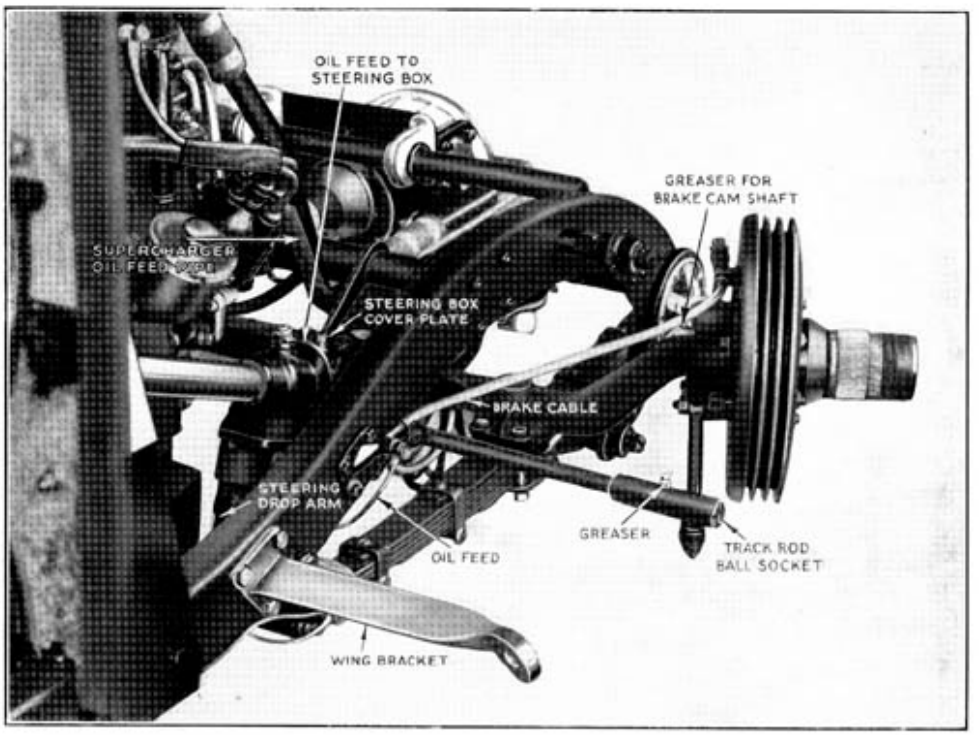


Figure 6.—Note the oil feed to the steering gear box, the track rod, the brake camshaft cup greaser, and the oil pipe and junction on the brake cable.

The rocker shaft is carried in massive phosphor bronze bearings providing adequately against the shocks to which this part is subjected in use.

The operation of the gear is very simple. As the steering wheel and cam are rotated, the hemispheres and follower engaging the cam are moved backwards and forwards in the groove, thus imparting the required motion to the drop arm and drag link. At the same time each hemisphere aligns itself in its seating to the side of the track engaging with it, and the follower, complete with its four hemispheres, also adjusts itself in the bearing in the rocker shaft.

It will be seen from this that a considerable area is always evenly presented to the cam track by the hemispheres, and this area and the self-alignment of the contacting faces is the fundamental difference between the Marles-Weller and other types of steering gears.

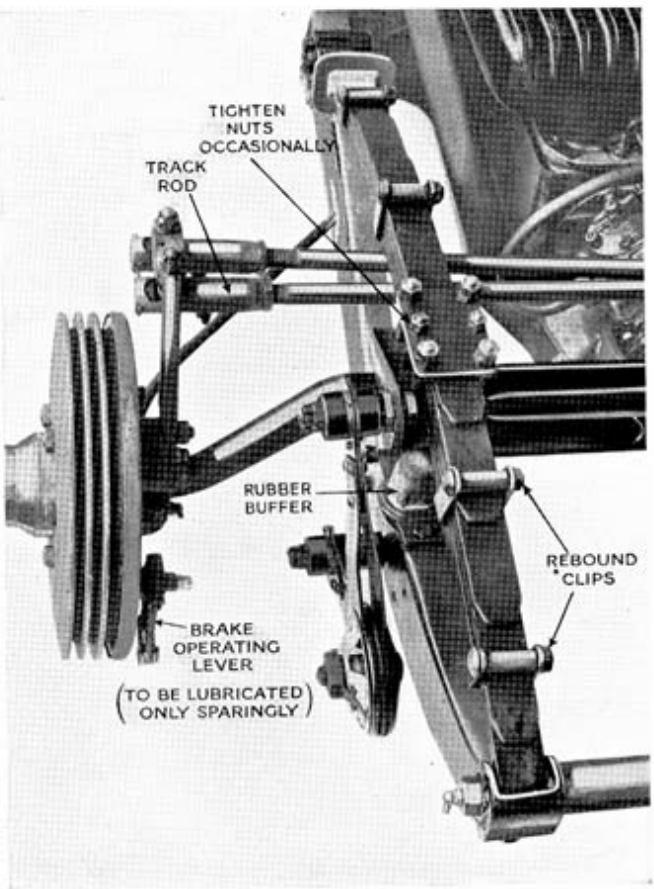


Figure 7.—Underneath view of the off side of the frame, showing steering connections on the track rod and threaded push rod. Six spring clip bolts require tightening occasionally.

The area and the self-alignment explained above are responsible for the sweet performance and long life of the Marles-Weller gear, the same action being available throughout the whole of its movement.

The view of the Steering Gear Box in Illustration No. 6 besides showing the oil feed to the steering gear box and track rod also shows the drop arm and the track rod ball socket. Every articulating joint of the Steering is

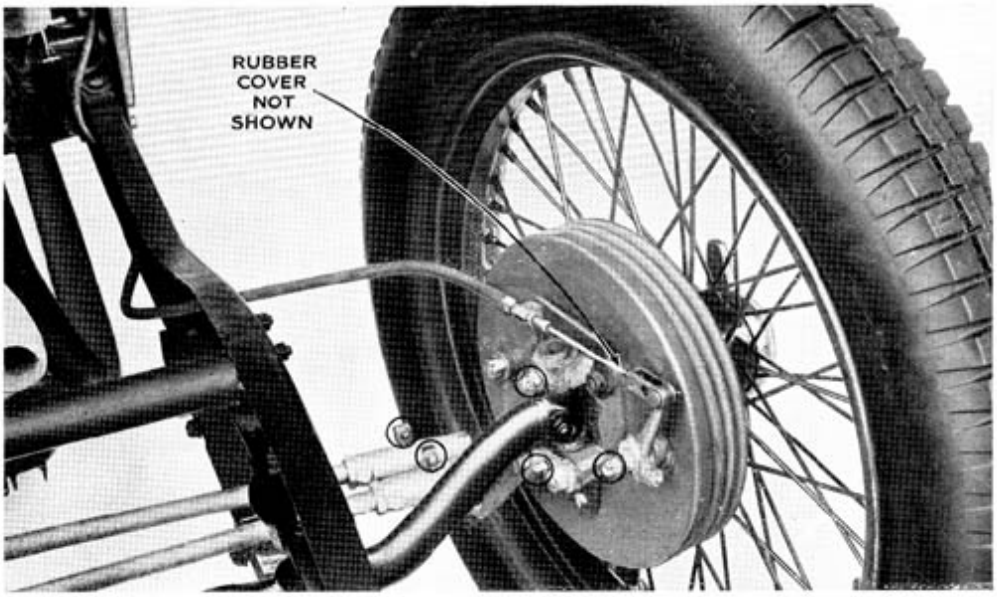
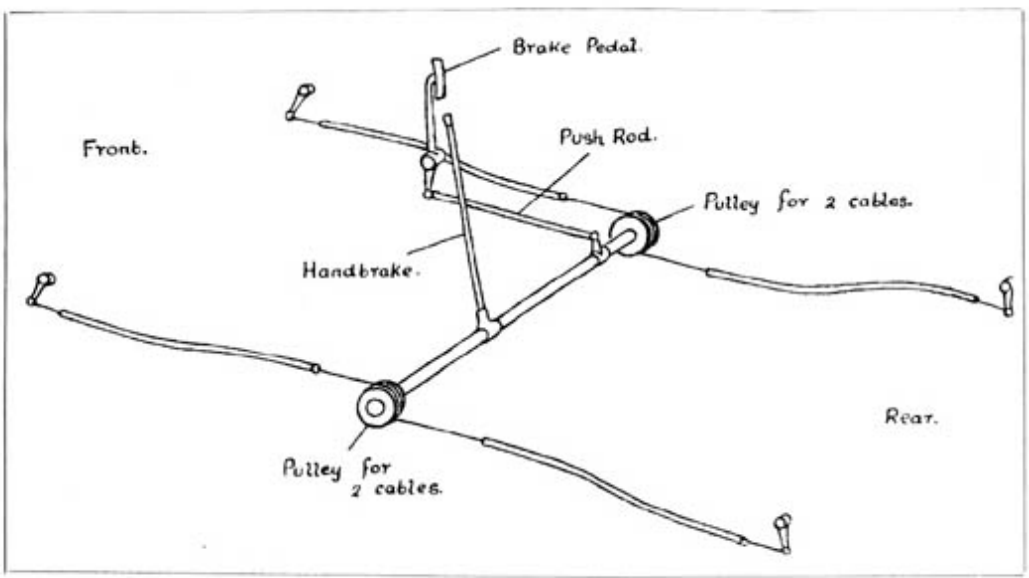


Figure 8.—Showing various oiling points referred to in the text.

fitted with an oil nipple. The track rod is threaded at either end. In fact, all the Steering Rods, or, to be more exact, Tubes, are threaded. This permits of accurate adjustment, and to take care of any irregularities in the tracking of the wheels.

Illustration No. 7 is an underneath view of the front end of the frame showing the near side steering arm to which are attached two ball sockets of the Steering Rods. This illustration shows clearly the shock absorber mounting, the rubber buffer between the frame and the spring and the various lubricators on the near side front axle assembly.



This sketch shows diagrammatically how the brakes are applied.

Illustration No. 8 is the same view as Illustration No. 7, but taken from above, and after it has served its purpose to illustrate the lubricating points of the steering Head Pin, Steering Rod Joints, and Brake Camshaft Spindle, it is proposed to pass on to the most important part, namely the Brakes. The details concerning adjustment for the Steering gear and a sectional view of the steering box, are to be found on pages 30—32.

Brakes. No useful purpose will be served by including redundant illustrations in the book, and it will already have become apparent from the examination of Illustrations Nos. 6 and 8 that the brakes are applied through the agency of steel cables which pass through braided rubber covered outer cables from either side of the centre of the chassis to the brake drums, the final application being shown in Illustration No. 8. A cross shaft is placed

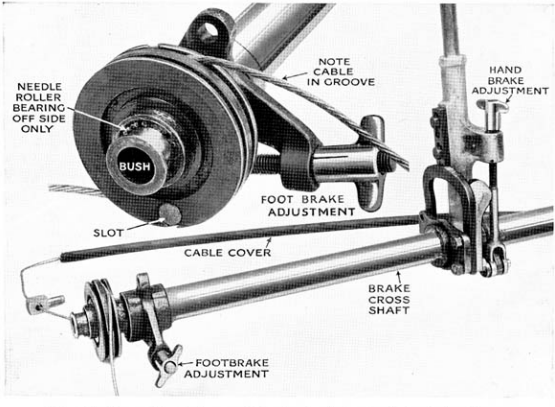


Figure 9.—Views of the brake cross shaft, showing the hand and foot brake adjustments, and the manner in which the cross shaft is supported at one end on a needle bearing.

in the middle of the chassis anchored at either end and supported in the centre to a tubular cross member of the frame. The hand brake lever is situated on the near side of the gearbox, and towards the base an extension will be found on which there is a thumb nut. The foot brake adjustment is on the off side of the Car. The brake cross shaft removed from the Car is shown in Illustration No. 9.

The foot brake pedal is coupled to the actuating cross shaft by a rod and either extremity of the cross shaft is provided with a pulley having holes drilled through it top and bottom to receive the end adaptors of the cables. As either brake is applied, the cross shaft is rotated pulling the rear brake cables forward, and the front brake cables backward.

Independent adjustment. Should it be necessary to adjust the Brakes independently this can be done by means of adjusting screws fitted to the cable stops on the axle back plates. At this point on the cables a rubber dirt excluder is fitted in the form of a rubber tube, and this tube is mounted on what is actually the locknut for this adjustment.

By undoing this locknut the cable stop can be adjusted on its thread by the amount required and the locknut re-tightened.

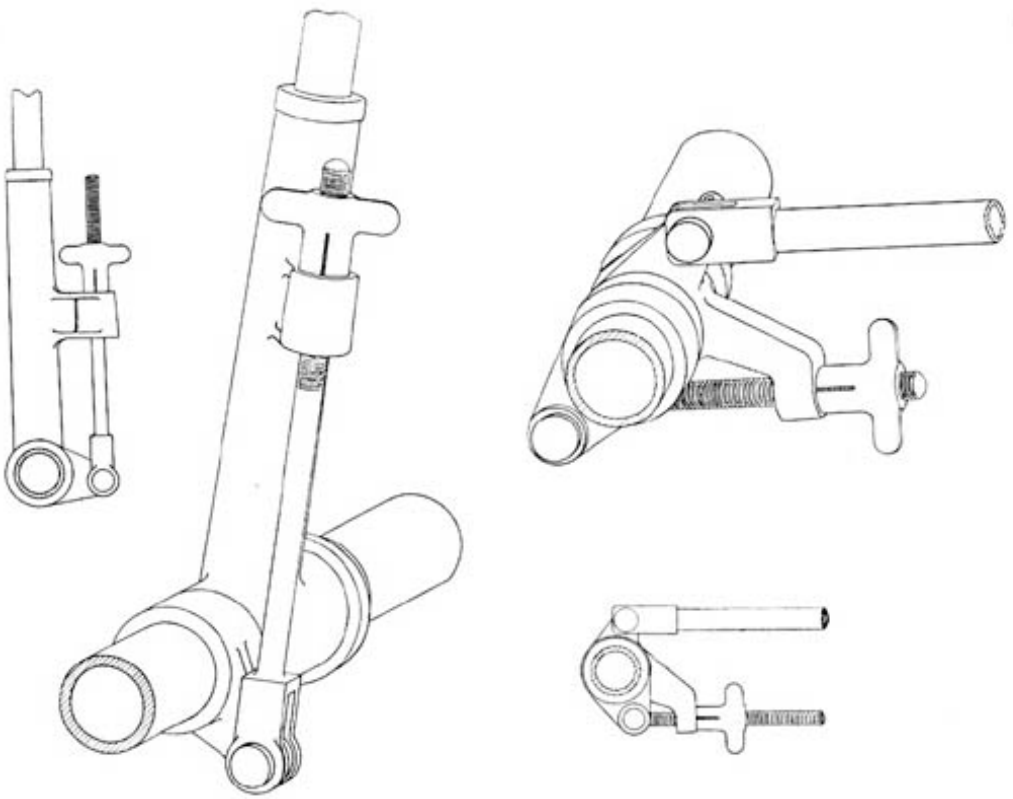


Figure 10.—Details of the foot and hand brake major adjustments. To tighten the brakes the thumb nuts should be turned in a clockwise direction.

The whole of the brake cross shaft is lubricated from the dashwall nipples, and in order to give perfect freedom for the rotation of the cross shaft, it is mounted at one end on what are termed needle bearings. These are shown in Illustration No. 9. Should it ever become necessary to remove the cross shaft, if care is exercised the entire bush of the needle bearings need not be removed. To re-assemble the needle bearing the inner shaft should be covered with grease and the bearings imbedded in it when it will be found that they will stop in position in order that they can be inserted inside the cable operating pulley.

It is necessary from time to time to remove the brake drums in order to clean out the brakes or have them re-lined. The procedure is very simple. When the wheel is removed as shown in Illustration No. 12, take off the nuts

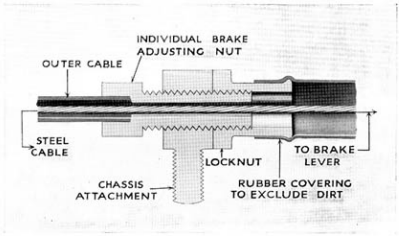


Figure 11.—Independent brake adjustment for each wheel, see text on page 13.

with a $\frac{5}{16}$" spanner, and after releasing the brake, the drum can be withdrawn by a slight tapping on the ribs with a wooden mallet or a piece of wood and a hammer. The brake drum and its components are shown in the centre of Illustration No. 12, and in the off side of the illustration the brake shoes with the two pull off springs can be seen.

The purpose of the countersunk screw in the fluted portion of the hub is to provide a means of easy access to the split pin of the hub nut. When the screw has been removed the split pin can easily be taken out or replaced through the hole in the hub.

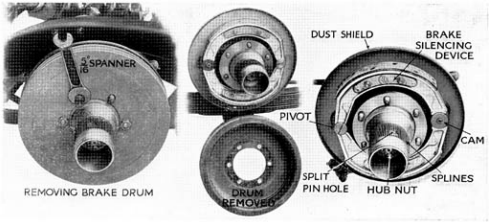


Figure 12.—Three views of a brake being dismantled, first showing the drums being removed, the centre view of the hub with drum removed, and on the right the brake shoes and brake silencing device.

Brake Anti-sqeak Device. The brake shoes are fitted with an anti-squeak device, which consists of lead alloy blocks fitted into the channel section of the brake shoes and held in position by means of clevis pins and little coil springs.

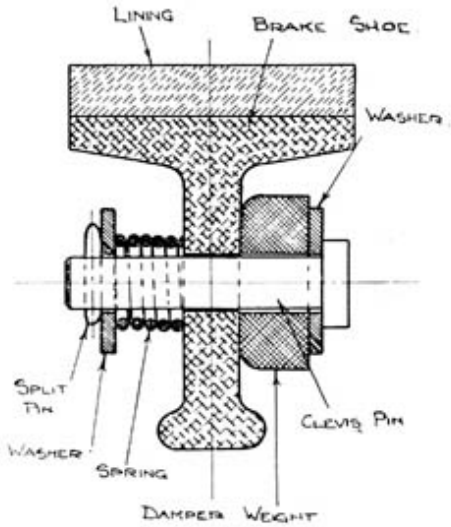


Figure 13.—Sectional view through a brake shoe, showing the lead weight attached to the brake shoe, and the various component parts for same.

When vibrations take place in the brake drum, they are communicated to the brake shoes and the shoes vibrate, the lead weights however are in effect ' left behind ' by the vibrating shoes and energy is wasted in friction between the weights and the shoes. The conditions under which the weights are mounted can in practice be made such that they can always waste more energy than the squeaking forces can generate and the squeak is prevented.

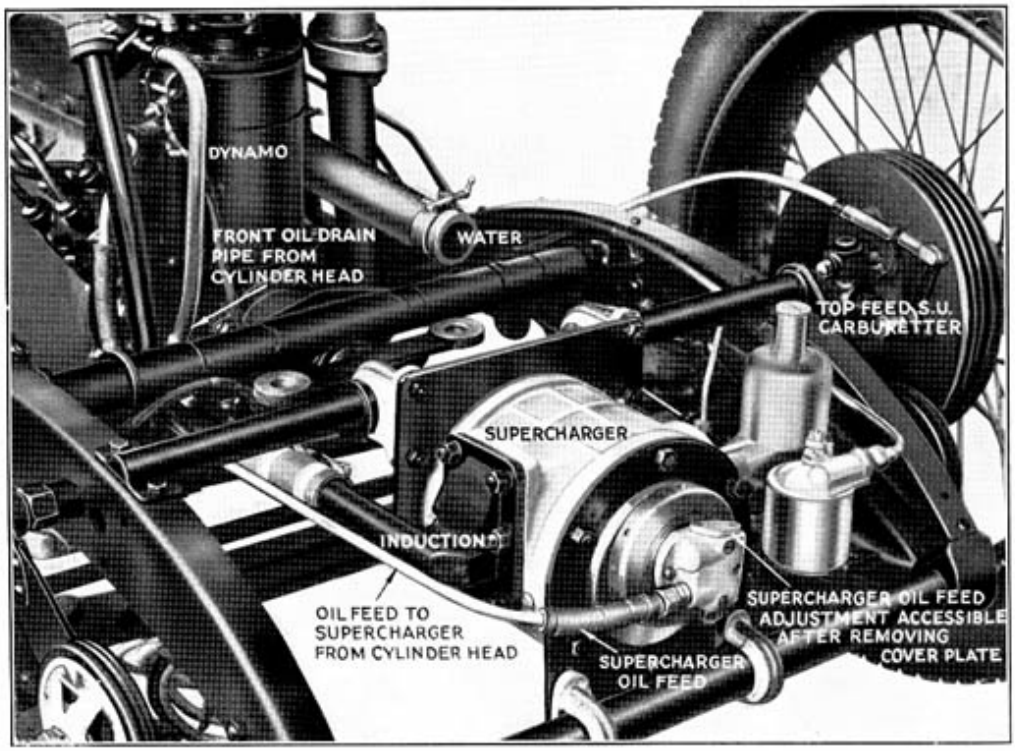


Figure 14.—The Supercharger on the J3 M.G. Midget. Note particularly the oil feed.

Supercharger. The No. 6a ' Powerplus ' supercharger fitted to the M.G. Midget Model J3 is of the eccentric vane type, in which the blade element is wholly contained in the internal sleeve, which latter revolves inside the stationary casing; this type is considered to be most efficient under all conditions, keeps its tune over a long period, and any wear taking place cannot endanger the working of the machine. Good pumping is maintained over the whole speed range due to close clearances being employed without any danger of mechanical failure at high speeds.

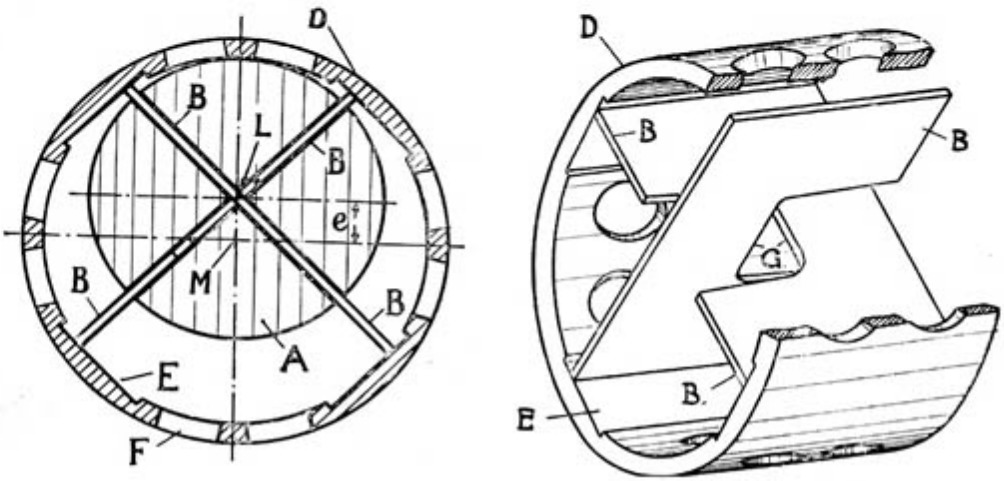
The following short explanation will assist the owner in understanding the working principles of the supercharger.

Figure 15A is a diagram of the sleeve and Rotor, in which A is the Rotor having slots in which slide blades B; D is a sleeve in which are formed pairs of parallel flat surfaces E of perpendicular distance equal to the internal diameter of the sleeve; the outer ends of the blade B are in contact with these flats and move across them. Holes F are also formed in the sleeve to permit of free passage of air into and out of the sleeve.

The Rotor A rotates about its axis L, and the sleeve D rotates about its axis M at the same speed as the Rotor A, a drive being provided to synchronise these two components. The distance between these two axes is known as the " Eccentricity " of the pumping element.

Figure 16 shows how opposite blades are connected together at G and move as one unit their combined length being equal to the distance between the corresponding flats E.

The volume of space between any pair of blades at right angles is constantly changing and this causes the pumping action.



Figures 15 and 16.—Showing diagramatically the sleeve and rotor of the Supercharger, and 16, how the blades are connected together.

It can be shown mathematically that the centrifugal force is constant for a uniform speed of the Rotor, and furthermore that the centrifugal force of one blade member is always equal and opposite to that of the other blade member; therefore the machine is in balance and may, in consequence, be run at high speeds with the minimum of power absorbed. The value of this centrifugal force is less than half that of previously known types of Blower; or conversely, for the same speed of operation, a more robust blade construction can be adopted.

Lubrication. This is controlled by a positively driven pump fitted at the front end of the supercharger, fed from the cylinder head front oil drain pipe. **To assist in lubricating the blades of the supercharger half an oz. of upper cylinder lubricant per two gallons must be mixed with the fuel,** this upper cylinder lubricant can be measured with the measure supplied for this purpose, and which is fitted in the top of the tank. The upper cylinder lubricant mixes well with the fuel.

The supercharger oil pump is carefully checked by the makers to pass approximately 3 cc. of oil per thousand revolutions and this adjustment should not be altered as it is adequate for all touring purposes. On the later superchargers the oil pump adjustment is sealed by the makers, Messrs. Superchargers Ltd., who would require an explanation if the seal is broken by anyone except their authorised service agents.

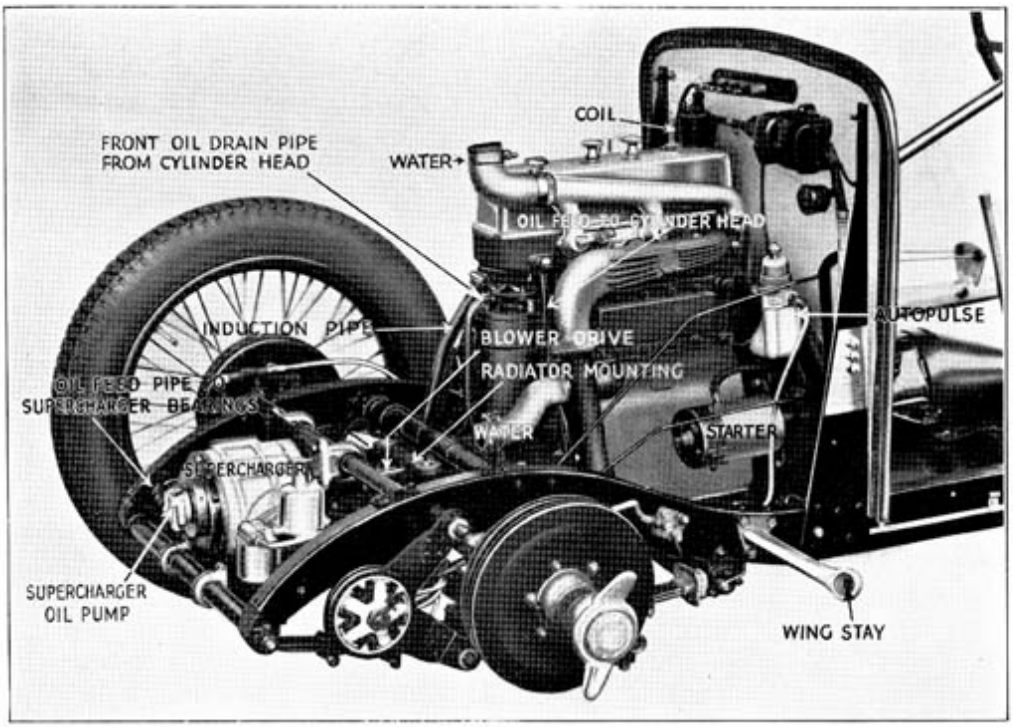


Figure 17.—The Supercharger from the near side.

Maintenance. The ' Powerplus ' supercharger does not need any special care and when used only for touring purposes should be overhauled when engine overhauls take place.

When the car has been laid up for a long time or in very cold weather, the gumming up of oil in the supercharger may make it difficult to turn, and it should be ' freed 'before starting the engine. The best way to do this is to inject some petrol (about an egg-cup full) into the supercharger through the carburetter air intake.

Adjustments. A number of adjustments periodically required by the M.G. Midget can be carried out by the average owner driver, and these are briefly described below. Separate chapters are devoted to the carburetter and electrical systems.

Engine. Decarbonising is the chief attention which the engine requires. It is impossible to lay down a definite time or mileage at which this will become necessary, as it depends on so many factors—the age of the engine, the way it is driven, and a hundred and one other things. With the present day advanced designs and high quality lubricating oils, engines may run for a five figure mileage without demanding attention, but we strongly recommend that the cylinder head be lifted not less often than every 5,000 miles. The chief reasons for this are that it enables the valves to receive regular attention, avoiding excessive pitting and burning, and also that maximum performance is maintained.

A new engine should be decarbonised after the first 1,000 miles.

In addition to the standard tool kit, the following should be at hand before starting operations :—

Spare cylinder head gasket.

Valve grinding paste—this can be purchased ready mixed, and it is best to have two grades—medium and fine.

Castille soap, or some good proprietary jointing compound.

A shallow basin (such as a baking tin) to form a paraffin bath for the " bits."

Dismantling. Open the radiator drain tap, and while the water is draining off, proceed to :—

Remove bonnet altogether.

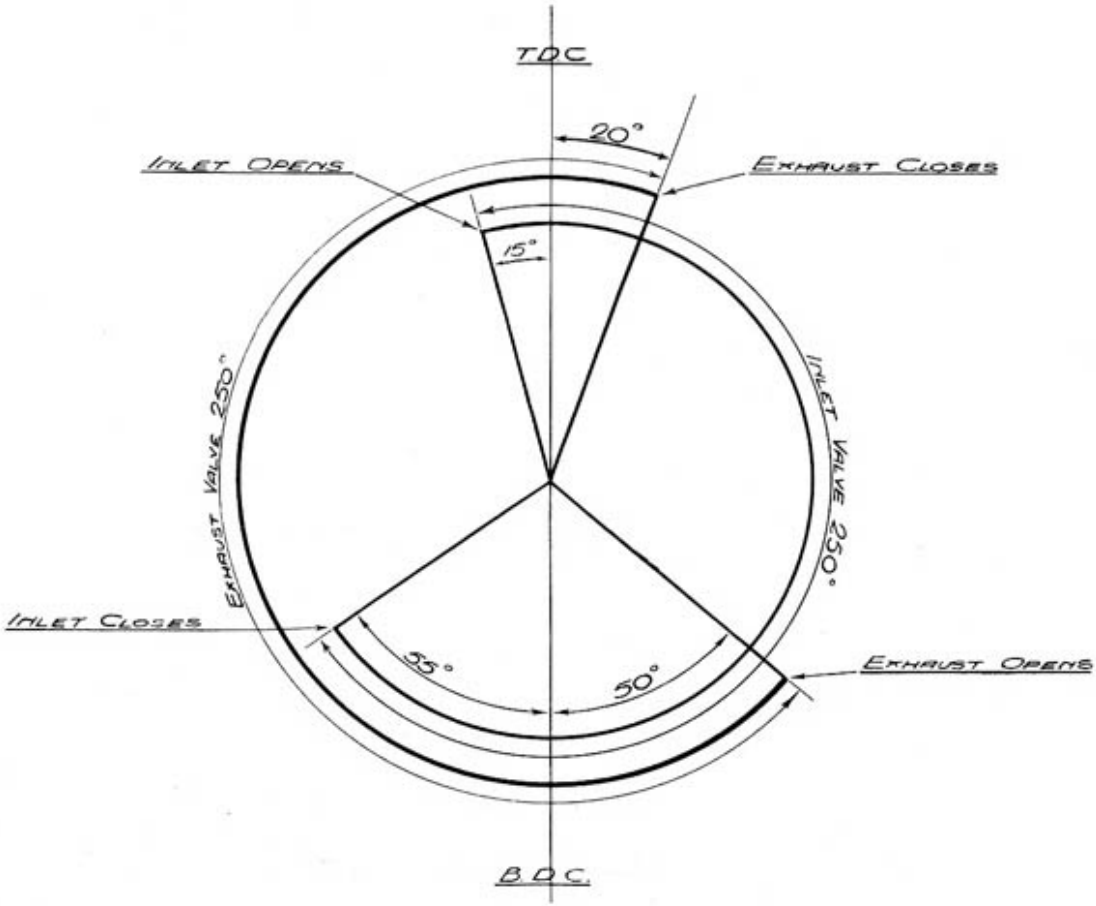
Detach cables from the sparking plugs—these are all of different lengths so that there is no fear of confusion when re-assembling.

Remove valve gear cover : and do not mistake the " M.G." breathers at either end for nuts ! They cannot be unscrewed, and need not be touched.

Next remove the induction pipe, all that is necessary being to undo the nuts holding it on to the cylinder head, there is sufficient flex in the coupling to allow it to be pulled clear of the head.

Release the Water Manifold by undoing the three attachment clips shown in Illustration No. 18 and then proceed to detach the Front Exhaust Pipe before removing the Water and Exhaust Manifolds in turn.

VALVE TIMING CHART.



After removal of the manifolds, dismantling may be continued as follows :—

Uncouple the oil delivery pipe from the clyinder head (near side forward) by unscrewing the single retaining bolt, and withdraw the oil restrictor, to avoid risk of loss when the head is subsequently removed.

Uncouple the oil return pipe at the *front* of the engine by unscrewing the two nuts only—it need not be withdrawn from its studs as it will draw straight off when the head is lifted.

At the same time undo the oil pipe and remove it from the supercharger oil pump, it is essential to do this, otherwise, when reassembling an air lock may form in the pipe.

Remove bodily the oil return pipe at the *rear* of the engine by unscrewing the retaining nuts at top (behind cylinder head block) and bottom, taking care not to lose the washers.

Between the projecting portion of the cylinder head block and the dynamo will be found a circular flexible coupling. Remove the two bolts which attach it to the dynamo drive yoke. This will permit the flexible coupling to be withdrawn with the cylinder head.

The cylinder head is held on to the cylinder block by ten nuts screwed on to the long studs passing through the cylinder head. Slacken off these nuts in rotation (see Illustration No. 22), half a turn at a time with the special ring spanner marked ' cylinder head,' which will be found in the tool kit, until they are quite loose, then finally remove them. It is unwise to unscrew any one of these nuts completely before slackening off the remainder, as this will impose uneven stress upon the cylinder head, leading to its distortion.

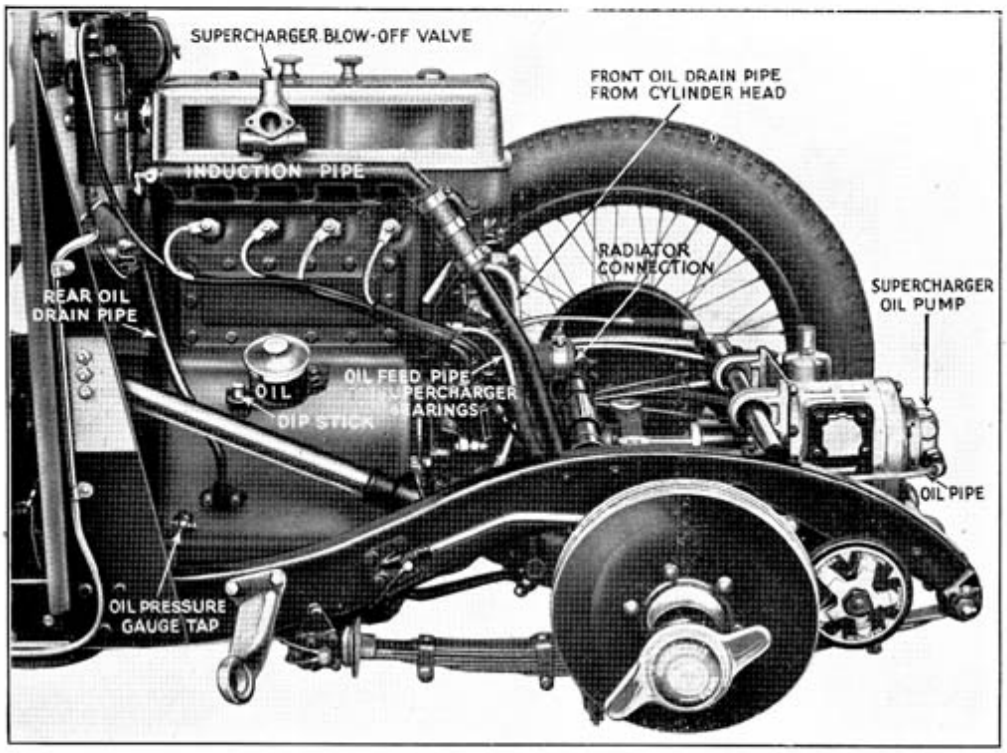


Figure 18.—An offside view of the engine, and supercharger. Particular notice should be taken of the various oil pipes referred to at the commencement of the Engine Dismantlement Section.

The cylinder head is now ready to be lifted from the cylinder block. The breaking of the joint between the two will be facilitated by smartly tapping the sides of the head with a wooden mallet or with a hammer with a piece of wood interposed to take the blow. The joint may, however, not break freely, in which case it is permissible to insert a screwdriver or similar blunt wedge-shaped tool between the joint at the two place—one on either side of the engine—where the cylinder head gasket has been cut away for the purpose. Do not insert the screwdriver too far. It should on no account be forced against the gasket, which would become damaged as a

result. When the joint is broken no difficulty should be experienced in lifting the head clear of the studs providing it is withdrawn squarely. Place the head on a bench out of harm's way, and carefully lift the copper asbestos gasket straight off the cylinder head studs, keeping it parallel with the upper face of the cylinder head block and taking particular care that it is not bent or otherwise damaged in the process.

Decarbonising. Everything is now in readiness for decarbonising the piston crowns and the surrounding face of the cylinder block. Turn the

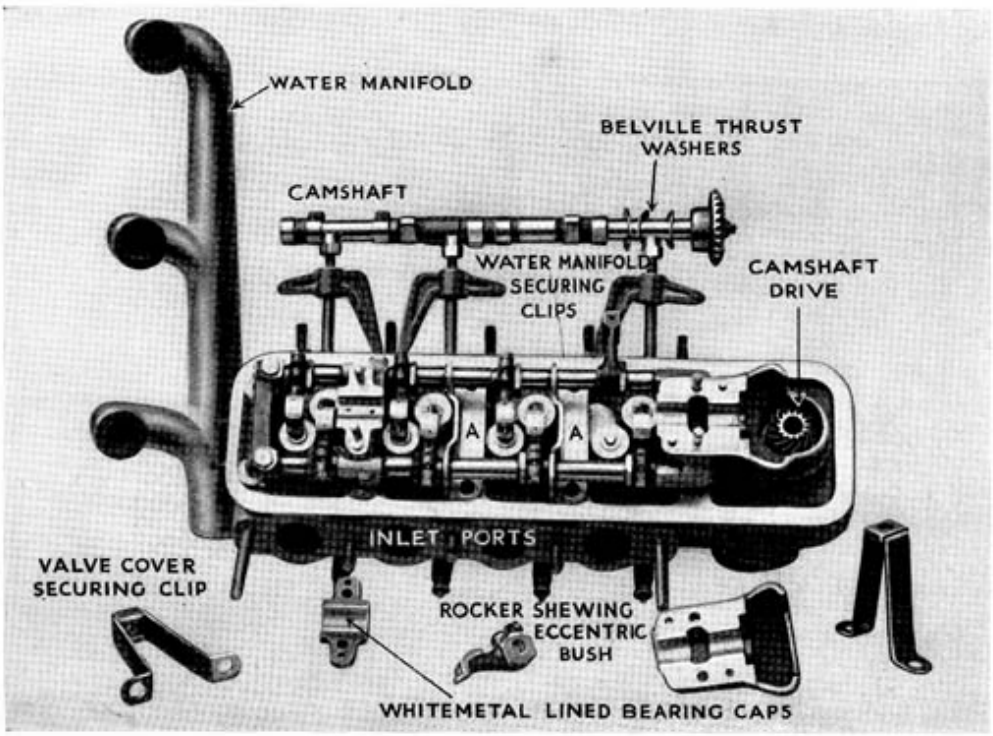


Figure 19.—Showing the cylinder head after the camshaft has been removed to give access to the valves. Note the rocker which has been swung clear of the valves, and the rocker shaft steady brackets marked "A."

engine by the dynamo cross head until any two pistons are at the top of their travel, when it will be found that the remaining two are at the bottom of their cylinders. Stuff the open ends of these cylinders with clean rag, and with an old screwdriver, or some blunt tool, scrape the black deposit off the pistons and the face of the cylinder block adjacent to the cylinder bores. With a clean rag damped with paraffin clean off every trace of foreign matter remaining, but do *not* attempt to polish things up with emery cloth or other abrasive, or you will do far more harm than good. When these two pistons have been properly cleaned give the engine another half a turn and clean the other two in the same way.

Attention should now be given to the cylinder head. Remove the sparking plugs with the special Spanner provided and turn the head upside down, thus exposing the combustion chambers, in each of which will be observed the circular heads of two valves—one inlet and one exhaust.

With a blunt screwdriver carefully scrape away the carbon deposit adhering to the surface of the combustion spaces, taking particular care to go round each valve with a small screwdriver in order to remove all trace of carbon. Clean the combustion chambers and valve heads carefully with rag moistened with paraffin.

Removing the Valves. Having thoroughly cleaned the combustion spaces and valve heads, place the cylinder head on the bench the right way up. To obtain access to the valve springs, it is necessary to remove the camshaft. This is easily achieved by unscrewing the four nuts holding the camshaft bearing caps in position. These should be given half a turn in rotation, in a similar manner to the cylinder head retaining nuts, until they are eventually removed. The camshaft can then be lifted from its bearings and removed by passing it through the valve cover saddles. Removal of the camshaft enables all the valve rocker-arms to be swung clear of the valves.

A small wood block slightly thicker than the depth of the combustion spaces and an easy fit within them should now be prepared. Slip this block into the combustion space so that the valve heads are resting upon it, in order that the valve springs can be compressed with a suitable tool such as a screwdriver, without forcing the valves open. Depression of the springs will expose a small spring circlip engaging in a groove in the pencil-like end of the valve stem. When the springs of both valves have been removed, the head may be raised from the bench and the wood withdrawn, thus allowing the valves to be drawn from their guides. Repeat this operation on the remaining valves until they are all removed.

Grinding-in the Valves. Examination of the valves will show that the edges of their mushroom-like heads are bevelled off at an angle to correspond with the similar bevelled edges of the valve ports in the cylinder head and thus provide a gastight joint when they are in contact. Obviously, gastightness is not attained if these bevelled surfaces are dirty or " pitted," and in order to clean them up so that they make perfect contact over the whole of their surfaces it is necessary to grind them in. After grinding-in the valves the utmost care should be taken to see that they are re-inserted into the same port from which they were taken. It is inadvisable to mark the valve head or cylinder block. The valves should be placed on the bench in such a position that it can easily be decided from which port they were taken.

The grinding-in process consists in coating the bevelled face of the valve with a small quantity of valve-grinding paste—applied on the end of a match-

stick—reinserting the valve in its guide and partially rotating it backwards and forwards on its seating by means of the special tool provided in the kit. Here we come to the secret of good valve grinding. The valve should be raised from its seating every few reciprocations and given a half turn in order that the grinding compound may spread itself evenly over the whole surface. If this is not done there is the possibility that minute circular grooves will be cut into the face of both the valve and its seating, which will absolutely prevent one from obtaining a good gastight fit. Probably the most convenient way of carrying out this periodical lifting is to obtain a light coil spring (similar to the valve spring but much lighter), and insert it into the valve port beneath the valve head. When pressure is released on the screwdriver the valve will pop up, when it can easily be rotated into a fresh position.

It is not necessary to continue grinding the valves once the faces of both valve and seating have assumed a clean, even, matt-surfaced appearance. A polished surface must not be expected and is quite unnecessary. If the engine has been run for a long period without being decarbonised, the valve may be badly " pitted "—that is to say, it will have a number of small black spots or depressions on its face. Should these depressions be at all excessive or deep, it is best to have the valve face trued up on a special machine at a garage. This will prevent needless grinding away of the valve seating in the cylinder head—a matter of importance, as it cannot be renewed. Any valves which are distorted should immediately be replaced by new ones. To attempt to grind them in will only produce extensive damage to the seating.

After each valve is ground in it should be withdrawn and carefully washed in paraffin, and, what is equally important, the valve seating and the surrounding valve port should also thoroughly be cleaned with a rag moistened with paraffin. Do not wash out the valve ports with petrol or paraffin or some of the grinding compound will find its way into the valve guides or other working parts, and it is of the utmost importance that it should be prevented from finding its way on to any of the working surfaces of the engine, where extensive damage may be done.

Reassembling the Valves. When you have satisfied yourself that all trace of the grinding compound has been removed, the valves may be reassembled. Care should again be taken to see that they are in their correct ports. After inserting the valve in its guide and resting its head on the wood packing block, the valve spring may be placed in position with the valve spring cap resting on top of it. Engage a tool on the cap and depress the spring so as to expose the whole of the groove in the upper end of the valve stem. Spring the circlip into the groove in the valve stem and gradually release the spring. Make sure that the circlip is properly engaging in its groove before dealing with the next valve. If the valve cover saddles have been removed, do not forget to replace them in position before reassembling the valves which are between the camshaft bearing brackets, or you will find that these are in the way and that you cannot replace the saddles.

Replacing the Camshaft. Swing all the valve rockers into position against their respective valves and replace the camshaft with the two marked teeth of its bevel wheel engaging on either side of the marked tooth of the driving pinion. The camshaft bearing caps are tenoned into the bearing brackets so that there is no possibility of misalignment. Care should be exercised, however, to tighten up the camshaft bearing cap nuts evenly. Each should be given a partial turn at a time until all are perfectly tight.

Adjusting the Rockers. In the process of grinding-in the valves a certain amount of metal is always removed. This tends to reduce the clearance existing between the head of the valve and the under-surface of the rocker-arm. It is essential for the proper functioning of the engine that this clearance should in any case not be less than .006"—.008", and it is therefore necessary to check the clearance of each valve with a feeler gauge before the

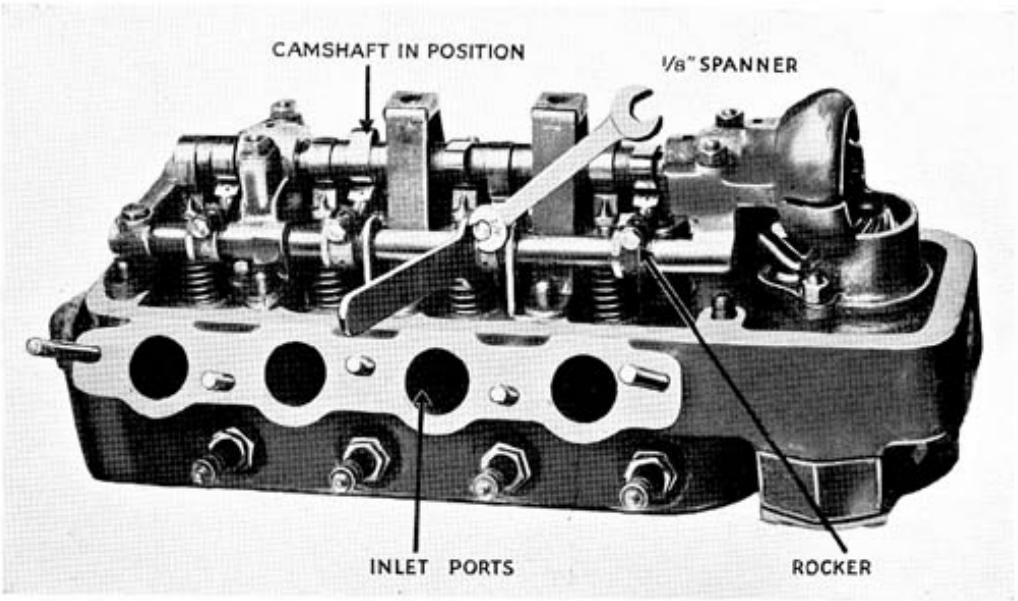


Figure 20.—Showing the two spanners in position on one of the rockers for the purpose of adjustment.

cylinder head is replaced. On the one side of the Rocker will be found a hexagon bronze nut and in the Rocker itself a locking screw. Slacken off the locking screw with the $\frac{1}{8}$" Whitworth Spanner provided and insert the feeler gauge between the Valve Rocker and the Cam. After seeing that the peak of the Cam for that particular valve is pointing upwards, engage the Rocker Adjusting Spanner on the bronze nut and rotate until the feeler gauge can just be withdrawn easily. Now, holding the spanner engaging the bronze nut exactly in this position, tighten up the locking screw as shown in Illustration No. 20. The clearance should then again be checked to make sure that no movement of the setting took place while the lock screw was being tightened up. When adjusting the Rockers it is essential to ascertain that the thickened portion of the bronze nut is downwards and not upwards. If this is correctly assembled the clearance decreases with a downward movement of the adjusting spanner, but if incorrectly a similar movement increases the clearance and the eccentric requires turning around, this being done by continuing to rotate it by pressing the spanner handle downwards until the clearance does close.

Replacing the Cylinder Head. When the valves have been replaced and the head reassembled ready for fitting, it is first of all necessary to thoroughly clean the gasket and remove any carbon deposit adhering to its edges, and to coat both sides of it with an even film of Castille soap or other type of suitable jointing compound. If the gasket has been in any way damaged during the removal of the cylinder head, do not attempt to use it again, but immediately procure a new one. See that any new gasket does not burr up around the stud holes and that the cylinder bore openings are clear of the cylinder bore

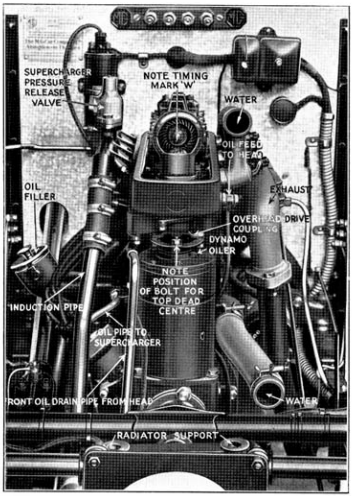


Figure 21.—Is a view of the power unit from the front, notice should be taken of the bolt on the verticle drive universal coupling indicating the approximate position of T.D.C. when Nos. 1 and 4 pistons are at the top of their stroke and the distributor Rotor is pointing to No. 1 segment, in relationship to the camshaft bevel timing marks. The drive coupling and the camshaft bevel should be in these positions before replacing the cylinder head.

themselves. The gasket can then be located over the studs in the cylinder block and gently pushed into position on to the upper face of the cylinder block. It will be found convenient to use a short length of tubing (a box spanner does quite well) over the studs to push the gasket in position. This should be done very gently, taking care to keep the gasket parallel with the cylinder head and not to force one end or one side down before the other.

Turn the camshaft until the timing marks on the spiral bevel drive gears coincide, and rotate the engine until numbers one and four are at the very top of their stroke, with the metal electrode on the distributor rotating arm pointing towards No. 1 contact stud (No. 1 cylinder is the one nearest the radiator). This stud is easily located by tracing the high tension lead from the sparking plug for No. 1 cylinder to its junction on the distributor cover. On removing the distributor cover the position of the metal electrode on the end of the distributor rotating arm can be seen, and its position relative to this stud noted. That the pistons are exactly at the top of their travel can be ascertained by removing the rectangular plate on the clutch housing (just in front of the gear lever), when a mark will be found on the face of the flywheel, bearing the numbers 1|4. This mark should be exactly in the centre of the opening in the clutch housing.

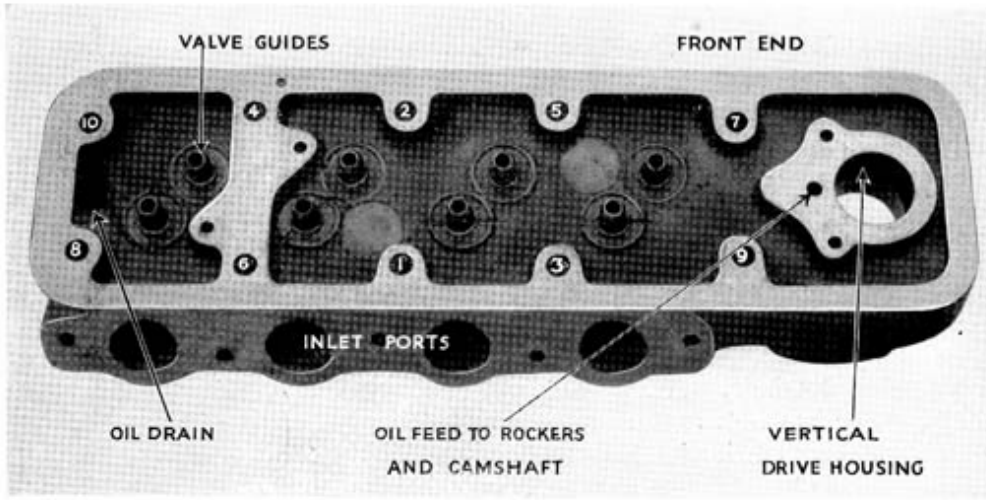


Figure 22.—Indicating the sequence in which the cylinder head stud nuts should gradually be tightened.

Having made sure that the pistons and camshaft are in their correct positions, the head may be lowered into position on to the cylinder block. The two holes in the flexible coupling should now almost coincide with those on the drive yoke of the dynamo (see Illustration No. 21). Replace the ten cylinder head nuts and tighten them up in the rotation indicated in Illustration No. 22, giving each a quarter of a turn at a time until all are tight.

The flexible coupling bolts should now be replaced, as should the oil pipes, exhaust and water manifolds, carburetters, controls, petrol pipe, sparking plugs, high tension cables, and the valve cover. When replacing the oil pipe on the left hand side of the head, make sure that the oil restrictor pin is in place and that it is clean (see Illustration No. 33).

Before replacing the oil pipe on the supercharger oil pump (see Illustration No. 19), **the engine should be started up and allowed to run slowly for a few moments until the oil begins to flow, when it should be connected up at once, failure to observe this instructon may result in an airlock in the oil pipe and subsequent starving of the blower.**

Fill the radiator with water, start up the engine and let it run quietly until it is thoroughly warm. Then, switching off again, remove the valve cover and go over each of the cylinder head nuts in turn, giving each a final tightening up. It will be found that now the engine is warm an extra half turn or so can be given to each nut. Do not attempt to speed up the engine until this final tightening has been effected. Start up the engine and ascertain that oil is exuding from the small oil passage drilled in each rocker-arm, and lubricating the cam surfaces. If oil is coming freely from these oil passages, the valve cover can be replaced, together with the bonnet, and the car is ready for the road.

About 100 miles after the cylinder head replacement, it is advisable to go over the cylinder head nuts once again (when the engine is warm) to ensure that they are absolutely tight, and also check the valve rocker clearances.

Rocker Clearance. The good tune of engines is frequently spoilt through the owner seeking silence by cutting down the rocker clearance. In order to maintain good tune over long periods it is advisable to set the rocker clearance one or even two thousandths more than the amount indicated earlier. *This may increase the valve gear noise but will undoubtedly lead to improved maintenance of tune over lengthy periods.*

It is particularly important to check the clearances 100 miles or so after grinding, as the valves have a tendency to "bed down," and clearances should be checked subsequently every 2,000 miles.

Engine Bearings. The mileage which may be covered before the main and big-end bearings require attention will depend entirely upon the care given to correct lubrication and the way in which the car is driven, particularly when new. Owners are not recommended to undertake this overhaul themselves, particularly when the standardised charges allow such jobs to be done cheaply and efficiently by M.G. agents all over the country.

Clutch. The clutch is provided with two friction surfaces. The driving surfaces comprise two rings of bonded asbestos fabric, one attached to the flywheel cover-plate and the other attached to the pressure plate. Six driving pins pass through the flywheel, pressure plate and flywheel cover-plate, all of which consequently revolve together.

The driven surfaces comprise both sides of a single steel disc splined to the driven shaft. Driving pressure for the clutch is derived from six helical springs housed between the pressure plate and the flywheel.

The clutch must be run dry, and persistent slipping of the clutch is usually an indication that oil has found its way into the clutch compartment, in which case it will be necessary to remove the drain plug in the bottom of the clutch housing and drain away any oil which may be present. Oil which may then be still adhering to the surface of the clutch plates will soon be burnt away after a little use.

If the clutch is allowed to slip continuously the centre driven plate very quickly becomes excessively hot, and the heat and friction will very soon destroy the surfaces of the fabric facings.

Clutches are correctly adjusted at the Works before the car is delivered. In the early life of the car, however, a certain amount of bedding down of the friction surfaces takes place, which will permit the pressure plate to take up a position nearer the withdrawal mechanism, and thus reduce the necessary clearance between the withdrawal levers, the withdrawal race and the lever restraining springs. If this clearance is completely taken up and the withdrawal levers actually bear either against the restraining springs or against the withdrawal race, it will be realised that a great deal of the spring pressure which should be forcing the friction surfaces together will be dissipated at these two points, thus preventing the clutch springs from exerting their full pressure on the clutch plates. When this occurs, slipping of the clutch will take place, and it will be necessary to readjust the clutch withdrawal mechanism in order to obtain the required clearance.

Removal of the small rectangular plate in the top of the clutch housing will give access to the adjustment for the withdrawal levers. The withdrawal lever restraining springs are for the purpose of preventing the withdrawal levers from being forced against the withdrawal race under the influence of centrifugal action and thus produce undue wear of the race itself and the ends of the levers. They are carefully positioned at the Works and should not be interfered with. If on inspection it is found that there is no clearance at all between the levers and their springs, the lock nut on each lever should be released and the adjusting screw slackened back by means of a screwdriver until at least a 10-thousandths feeler gauge can be inserted between the end of the adjusting screw and the pressure pin beneath it, and there is a clearance of 3/32 of an inch between the end of each lever and the face of the clutch withdrawal race. **It is of utmost importance that each of these levers should be so adjusted that they all have exactly the same clearance between their inner ends and the face of the clutch withdrawal race.**

Any clean piece of strip metal 3/32 inch thick can be inserted and used as a gauge between the two to ensure correct adjustment.

If difficulty is experienced in obtaining the necessary clearance between the adjusting screws and their pressure pins when the clearances at the ends of the withdrawal levers are correctly set, the withdrawal lever restraining springs should be gently opened out by inserting a screwdriver behind them.

Tighten up the adjusting screw lock nuts, taking care not to disturb the setting just obtained, the clutch adjustment is complete. If this procedure has been correctly carried out, each lever should have an appreciable amount of play when the clutch is fully released.

The clutch plate is carried on the splined end of the driven shaft, and may stick when the fabric facings are allowed to become much worn. A drop or two of paraffin on the spline will rectify matters, but care must be taken not to use too much or allow any to reach the fabric facings.

Adjustment to Steering Gearbox. The adjustments are two in number, which control all that can be required. They are as follows :—

(1) Adjustment for end play of cam.

(2) Adjustment of fit between follower and cam.

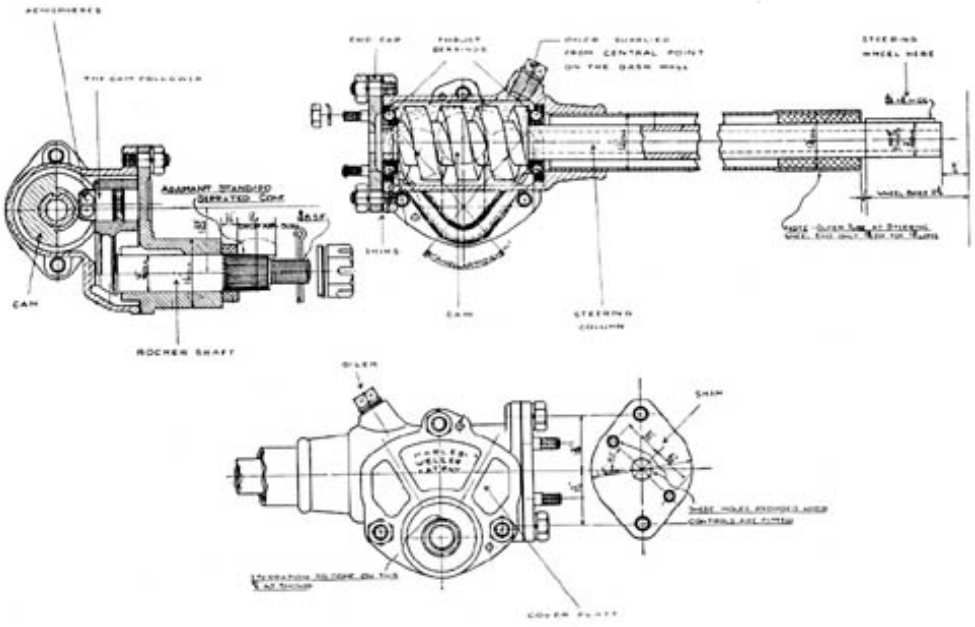


Figure 23.

Adjustment 1. Referring to Illustration No. 23, it will be noted that a series of of shims are located between the end cap and the face of the steering box. Remove one or more of these shims as required until the end play disappears, care being taken to see that when the end cap is securely rebolted, the thrust bearings are still quite free to rotate. Care should also be taken to see that the joint between the end cap and the box is properly re-made if oil leakage is to be avoided. The gear should be filled up with oil to replace any loss during adjustment.

Adjustment 2. Adjustment for play between the follower and track although very seldom required, and not at all until the Car has been in use a considerable time, is effected by renewal of the hemispheres, those on one or both sides of the follower being changed according to the degree of adjustment required. Remove cover plate and drain off sufficient oil to expose the cam and its track.

Withdraw the follower from its bearing on the rocker shaft.

Replace one pair of hemispheres from one side of the follower by a new set, and then insert the follower unit into the cam track in its mid position, i.e., approximately midway between the two ends of the cam. This, for the moment, should be done independent of the rocker shaft, which should be moved over to one side to leave the centre portion of the cam track exposed.

Should further adjustment be required, the remaining set of hemispheres should be replaced in like manner.

Correctly adjusted, the follower unit should be a free sliding fit in the centre portion of the track to ensure a free passage of oil between the surfaces, but only a minimum of sideplay should be permitted. Too close a fit will result in a stiff steering. This point determined, it now only remains to replace the follower unit through the rocker shaft and into the track. This is most easily done with the rocker shaft over in the extreme lock position, as the track is purposely made slightly wider at these points. A little care should be exercised here, and the hemispheres may with advantage be slightly tilted in their seatings to give a lead-in effect when entering the track. A slight to and fro movement of the steering wheel in conjunction with a light pressure on the back of the follower facilitates this assembly.

When inserting a new set of hemispheres see that they are quite clean and free from grit before inserting them into the follower. A smear of thick grease in the seatings will check any tendency for them to fall out.

The cover plate and its shims should next be replaced, taking care to remake the oil joint properly, and the gear filled up with fresh oil.

General Notes. The shims between the cover plate (shown in Illustration No. 23) and the box should not be removed. They are intended for initial assembly only. A certain amount of end play is called for, and is desirable in the rocker shaft, and no attempt should be made to take up this by removing the shims.

Should the thrust bearings be, for any reason, taken off the shaft, care should be taken to replace them the right way round. The right way round is when the word ' thrust ' stamped in one side of the inner race of the bearing is up against the end of the cam.

Fitting Drop Arm to Rocker Shaft. Should it be necessary to remove the drop arm from the rocker shaft at any time, we recommend that before doing this, both these items should be marked so that they can be fitted together again afterwards in the same relative position.

In case this marking has been omitted or in case the marking has become obliterated, we give below the correct method of fixing this, and we would draw attention to this matter, which is of some importance. Should this operation not be properly carried out, almost certainly the available lock will be limited in one direction or the other, and damage may result to the internal mechanism of the gear.

The steering column, complete with steering box, but without the drop arm attached, should (if it has been removed) first be fitted in place in the car, taking care to tighten up all fixings holding the unit to the car, including that on the dashboard, the steering wheel being placed in its final position.

Next, the lower end of the drop arm carrying the ball pin should be fixed correctly to the drag link, but the top end should not yet be connected to the rocker shaft of the steering box.

Now jack up the front wheels and place them approximately in the straight ahead position.

If the steering wheel is rotated gently, you will find that its movement is limited by internal stops in the steering box at each end of the

travel of the internal mechanism of the gear. The number of turns of the steering wheel required to bring the gear from one end of its travel to the other should be counted. Then, commencing from one of these stops, take the wheel back half the complete number of turns available, which will bring the steering mechanism into its central position.

Now, with the gear mechanism in its central position, the front wheels set pointing slightly as though the car were turning a left hand corner, fit the serrated cone in the top of the drop arm to the rocker shaft. The reason the front wheels are set in this position is because the from straight ahead to full left lock than when going from straight ahead to full right lock.

Before tightening up, however, the following check should always be carried out.

The front wheels still being jacked up, with the steering wheel pull the steering right over to lock, either right or left. With the steering wheel and front wheels in this position, drop the drag link off the drop arm, and see whether you can move the steering wheel any further in this same direction. If you can, everything is in order, and the same procedure should then be followed on the other lock.

Should further movement of the steering wheel be unobtainable, it means the front axle stops are not operating, and some adjustment must be made as follows :—

If there is movement of the steering wheel available on one lock, but not on the other, the drop arm should be put on the next serration on the rocker shaft, which may put matters right.

If no serration will give free movement of the steering wheel at both locks, then the front axle stops must be looked to and altered so that there is.

The amount of free movement available after dropping the drag link off the drop arm, should be the same at both locks, and this is the condition at which to aim.

The instructions given in this section may appear complicated, but in reality the operation is one of the simplest character.

It will be appreciated that the movement of the rocker shaft and drop arm is restricted by the internal stops fitted in the steering box, and it is therefore necessary to fix the drop arm and connect the same up to the front wheels on the one hand, and to the steering box mechanism on the other hand, so that the necessary movement of the front wheels from lock to lock is obtained at the same time as the follower is travelling from end to end of the cam track, but not far enough in either direction to hit the internal stops in the steering box.

The whole of the instructions in this section are designed to attain this end.

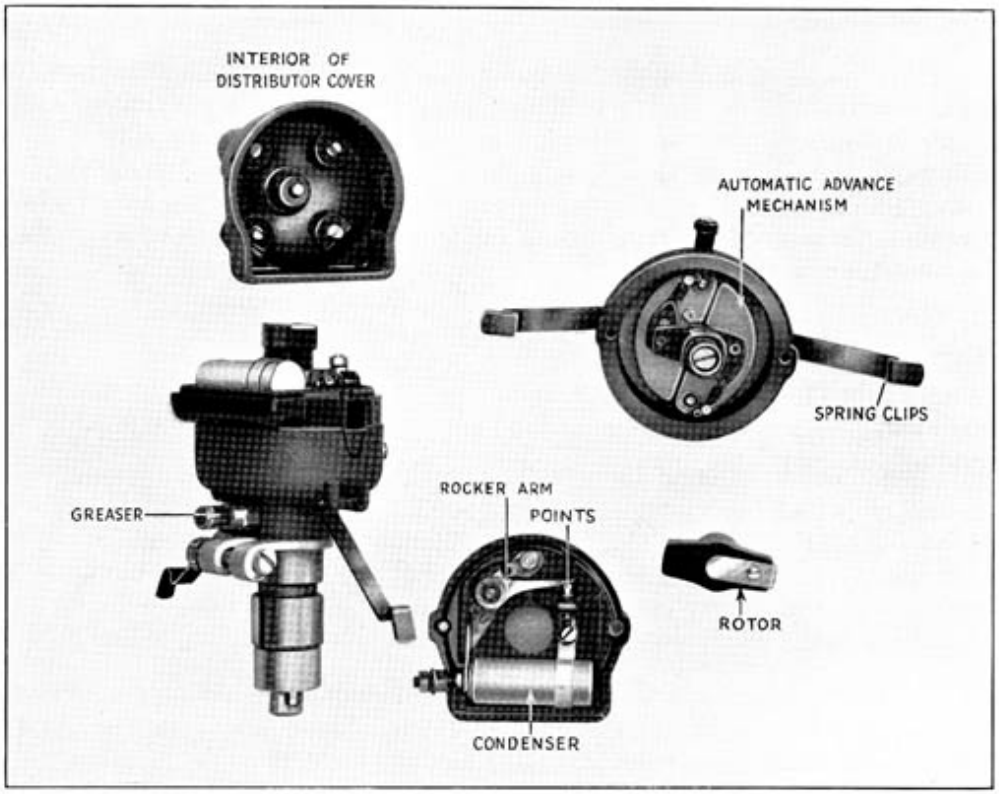
Shock Absorbers. These are correctly set for average loads before the car leaves the Works, but a little looseness may become apparent after the first few hundred miles, rendering adjustment necessary. This is effected by means of the large hexagon nut with pointer attached, which is turned *clockwise* (ordinary right-hand thread) to tighten the shock absorber. The dial is graduated 0, 2, 4, 8, and the pointer should not be moved more than one degree at a time, testing repeatedly (preferably at speed on a rough road)

until the best setting is found. It is important that the two Hartfords on the same axle be equally adjusted, and they must on no account be lubricated at any point.

Ignition. Little instruction need be given on this subject.

The High Tension distributor is very accessible. It is provided with an oiler to lubricate the spindle, and only then machine oil should be employed, one or two drops every thousand miles being sufficient.

The contacts can be inspected by unclipping the two springs when the cover carrying the High Tension Leads can be removed. The ignition timing should be set so that when a piston is on top dead centre the points of the make and break just start to open with the distributor at full retard. The points may require adjustment from time to time, and a spanner is provided with the Tool Kit for this purpose. The clearance between the points should be 15-20/1000 of an inch.



Figures 24.—View of the Distributor with cover removed, showing automatic advance. The joints between the pump shaft and the shaft driving the distributor are offset, so that should it become necessary to remove the distributor it can only be replaced with the shaft in one position relative to the pump drive shaft.

Illustration No. 24 shows the distributor with the cover removed. The centre spindle of the High Tension distributor carries a " Bakelite " Arm called the " Rotor " in the illustration. It can only fit on the spindle one way. If this part is removed, it affords an excellent thief proof device, but care should be exercised to see that it does not become chipped or in any way damaged, not to mention lost after it has been removed. The ends of the High Tension Wires are soldered to brass discs in order to make good contact with the terminals inside the cover. See that the terminal screws are always tight.

Misfiring may be caused by any of the following :—

1. Dirty sparking plug or plugs.
2. Bad connection to High Tension Leads.
3. Bad connection from High Tension Distributor to Coil.
4. Improper adjustment of or burnt make and break points.
5. Dirt between make and break points.
6. Defective Coil.

These causes exclusively deal with the electrical side. There is one other remote cause of electrical failure, namely, bad earth contacts from the battery to the frame. Other causes of misfiring can be attributed to Carburetter and incorrect valve adjustment.

Engine Dismantlement. The removal and replacement of the cylinder head has already dealt with but it is perhaps advisable to describe the drive and the timing of the overhead valve gear a little more fully.

The first thing that should be borne in mind is that considerable care has been exercised in the design of the engine to render the operation of valve timing as simple as possible. It must be taken for granted that the drive from the crankshaft through the dynamo is correct, and it follows therefore that when the dynamo is in a certain position there is a definite relationship between the arms of the coupling on the top of the dynamo and the position of the piston in the cylinder.

The firing order is 1, 3, 4, 2. When the cross head of the dynamo is in such a position that the bolts are fore and aft and the distributor rotor is pointing to No. 1 contact, then the engine is on top dead centre on No. 1 cylinder.

The cross head coupling attached to the dynamo is connected to the coupling driving the vertical spindle by means of laminated steel discs, and when the overhead valve camshaft cover is removed it will be seen that there is a mark on the driving bevel gear wheel which meshes with the camshaft gear wheel, and if ever the camshaft is removed, provided nothing else has been disturbed, these marks only have to coincide for the timing to be correct.

It also follows that if one wants to find the top dead centre to check the ignition, or set the High Tension distributor, that top dead centre can be found by turning the dynamo coupling as mentioned above.

The form of coupling employed permits the cylinder head being removed without disturbing the timing in any way. It is only necessary to undo two bolts when the coupling between the dynamo and the cylinder head is disengaged.

Timing Dismantlement. The following operations will deal with a number of parts, such as Oil Pump, High Tension Distributor, Brackets, and dismantlement of Timing Gears, prior to dealing with the most important subject of engine knowledge, namely lubrication. All the various parts are so co-related in the case of the Midget Engine that the description may appear to be somewhat disjointed, but it will be found that the illustrations will materially assist and are in fact more informative than any amount of text.

Refer to Illustration No. 25, this shows a view of the Engine as seen from below. It is obvious that it is a comparatively easy matter to withdraw the oil pump at any time. However, when the pump is removed it is necessary to put the engine at T.D.C. No. 1 as described below Illustration No. 21 and to remove the distributor, and note carefully the position of of the slots in the oil pump drive shaft. The slots in the drive sleeve have to register with the tongue on the distributor shaft. They will " go " one way only.

In order to obtain a correct idea of how the oil pump and the Distributor are related to one another, these components are shown in Illustrations Nos. 24 and 25 after having been removed from the engine. The crankshaft drives the oil pump. There is a slot slightly off centre in the extension to the oil pump driving gear wheel which receives a tongue attached to the spindle driving the High Tension Distributor. It follows therefore that if the Distributor is removed at any time it can only be put back in one way.

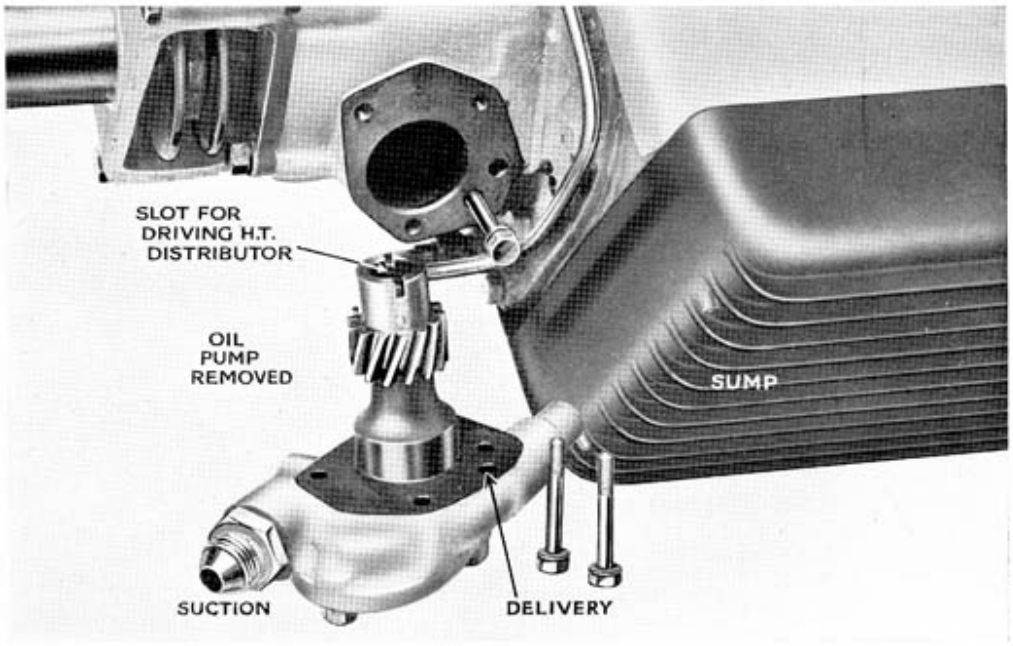


Figure 25.—View of the oil pump removed from the engine. The pump is held in position by three bolts, and care should be exercised whenever the pump is removed and refitted, to make a good joint so as to prevent any joining compound finding its way into the delivery or release holes. The underneath side of the sump can be seen in this illustration, showing the manner in which it is ribbed for cooling.

The pump spindle is fitted with gear wheel pinned on to the driven shaft. The pump is attached by means of studs and is driven by a gear wheel fitted to the crankshaft.

Illustration No. 26 shows how the front end engine bearer has first of all been removed from the front end engine cover. The oil retaining flange is removed and then the front end engine housing withdrawn by the removal

of four bolts disclosing the front end of the crankshaft as seen in the Illustration. The front end thrust of the crankshaft is taken through a hardened steel washer butting up against the bronze washer which in turn butts against the front end housing and the correct assembly of the crankshaft in the housing is obtained by interposing a number of shims (shown vertically above the hole in the crank case) between the housing cover and the cast iron case.

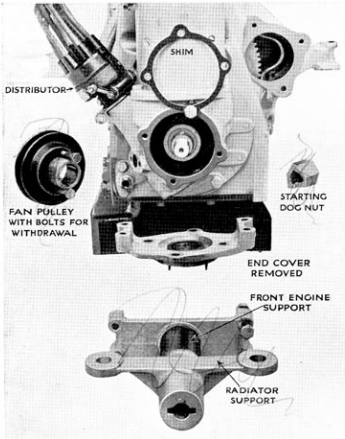


Figure 26.—This illustration is only intended for workshop use, in case it is ever necessary to dismantle the timing gears or crankshaft. It will be noted that a shim is employed between the timing case and the end cover. The thickness of these shims is of great importance as it governs the front end thrust of the crankshaft.

It may be necessary at some time to remove the dynamo. This is a comparatively simple matter if reference is made to Illustration No. 27. The front end extension of the crankshaft is fitted with two gears, a helical bevel and a worm. The helical bevel drives the dynamo, and here again we find the necessity for correctly meshing gears. This is taken care of by a

number of interposed thin metal shims. The dynamo gear is attached to the spindle by means of a bolt and tab washer, the gear being held in position on the shaft by means of a key. The gears are suitably marked for re-meshing, but the dynamo cannot be put back wrong if No. 1 piston is put on top dead centre and the coupling on the top of the dynamo placed on so that it points accurately fore and aft as already described.

There are three small items which really only concern the Repair Shop. They relate to the removal of the gear wheels from the crankshaft and the front end housing of the base chamber. After the dynamo has been removed it is possible to withdraw the worm drive from the crankshaft by tapping it with a suitably soft tool such as a piece of brass through the dynamo housing. It is a parallel fit on the crankshaft and is held in position by a key.

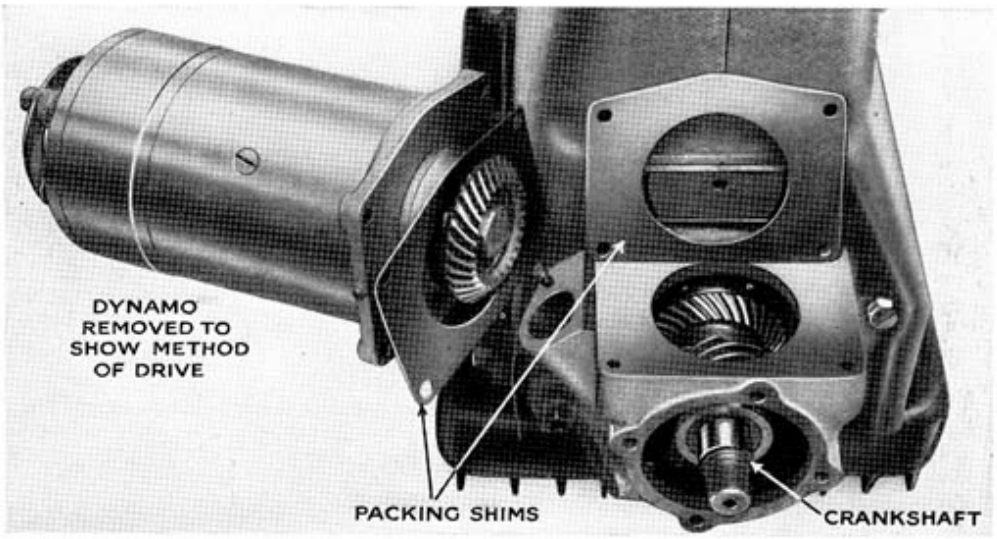


Figure 27.—Front end of the engine, showing the dynamo removed from the engine. The dynamo drive can be seen quite clearly and also the worm wheel which is fitted to the crankshaft for driving the oil pump and high tension Distributor.

Illustration No. 28 shows the necessity of employing a puller to remove the helical bevel pinion from the crankshaft. The holes in the pinion are tapped $\frac{1}{4}$" B.S.F.

To remove the front end housing it is also necessary to use a means of withdrawal in the form of two $\frac{5}{16}$" B.S.F. bolts.

We then see in Illustration No. 26 the front end of the crankshaft after the front end housing has been removed and the manner in which the shaft is supported in a ball bearing. This illustration also shows the two keys on the crankshaft on to which the two gear wheels fit.

On looking at the front end housing can also be seen the front bearing, which is a ball race specialy designed to carry loads both in radial and thrust direction, and can be removed from the housing after taking out the four fixing screws shown in Illustration No. 26.

The rear main is of a different type, being a circular bronze bearing white metal lined. In this bearing runs the flywheel hub or boss.

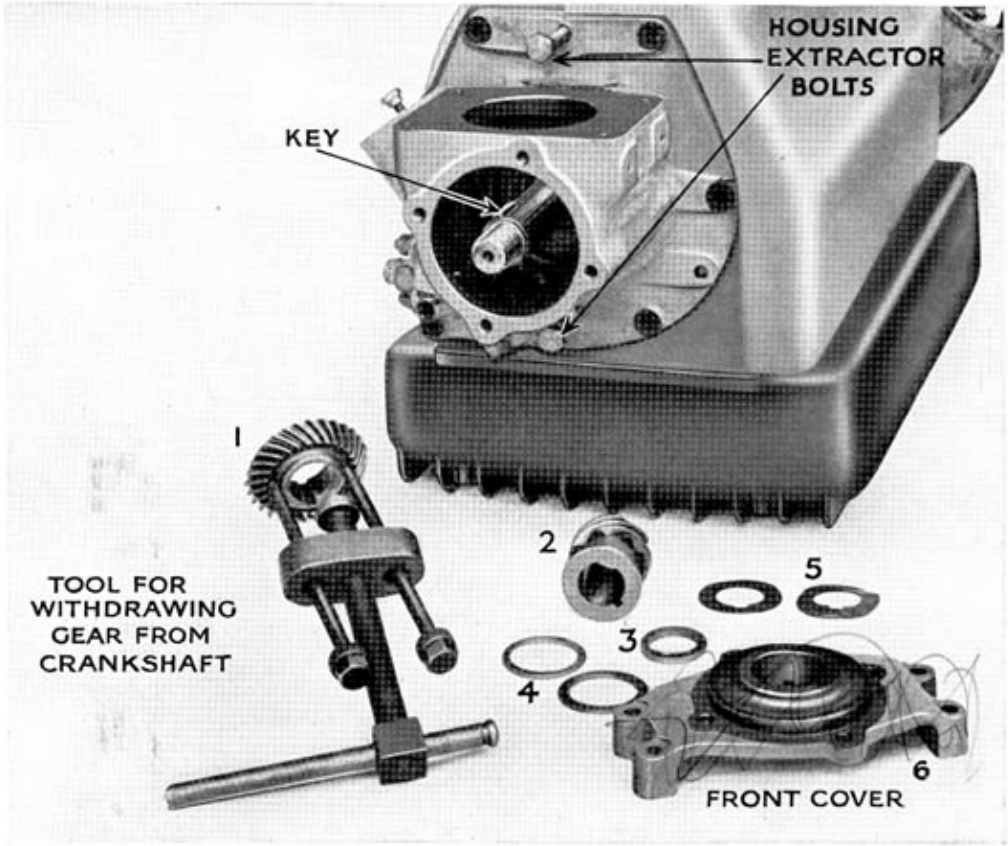


Figure 28.—View of the component attached to the front end of the crankshaft. The helical bevel wheel is a tight fit on the shaft, held in position by a key, and it is necessary to utilise a wheel removal tool, similar to that shown, in order to extract this. The principal parts are as follows :—

1. Helical bevel wheel .
2. Worm wheel for driving oil pump.
3. Distance column.
4. Thrust washers.
5. Shims.
6. Cover with thrust face.

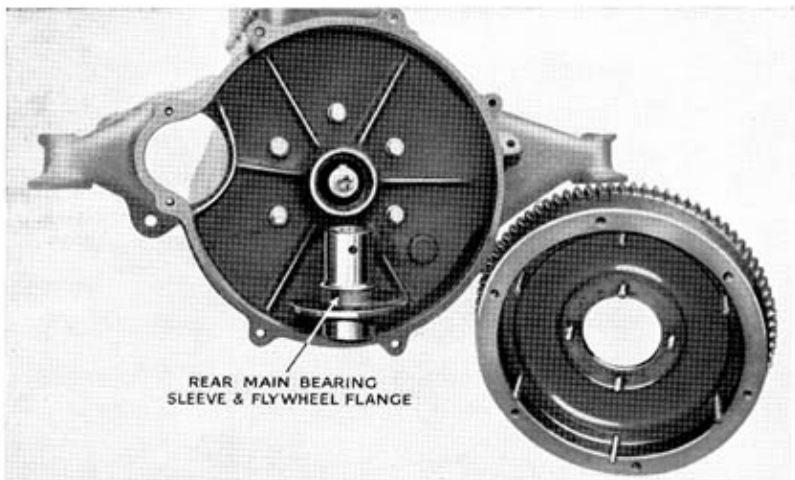


Figure 29.—Rear of the flywheel bell housing, showing rear main bearing sleeve and flywheel flange removed as well as flywheel itself.

Illustration No. 29 shows the flywheel removed and the flywheel boss and bearing sleeve removed from the crankshaft. The flywheel boss is held on the crankshaft by means of a castellated nut, and a special shaped cotter, which latter is held in position by a collar and spring steel clip which registers into a groove inside the boss.

In order to remove the crankshaft flange, it is necessary to employ a tool similar to that shown in Illustration No. 30.

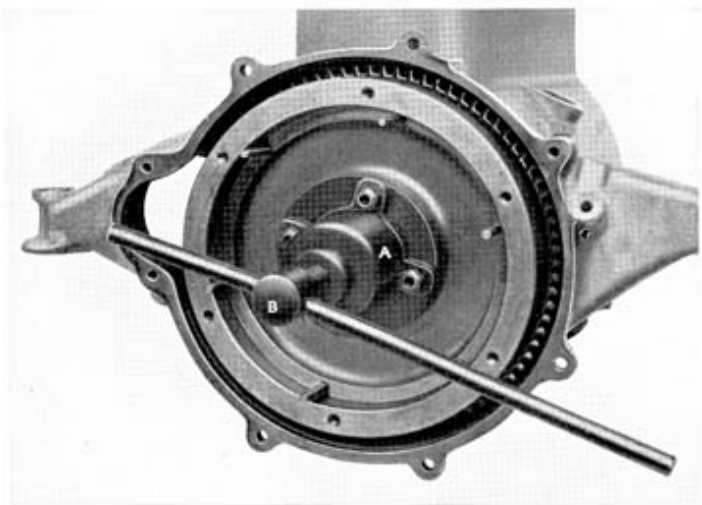


Figure 30.—In order to remove the crankshaft flange it is necessary to employ a tool similar to that shown in this illustration.

Engine Lubication. The engine sump holds one gallon of oil and is replenished through an easily accessible filler on the off side of the engine. The oil level in the sump is quickly ascertained by means of the " dip-stick," which is just beside the oil filler; this has two marks on it, the upper one showing the level with the sump full, while the lower one is the danger line. *To take a reading the engine should be switched off;* the dip-stick is withdrawn, wiped clean, reinserted to its full length, withdrawn again, and then read. These precautions are necessary, as when the engine is running the oil in the sump is churned up, and splashes on the dip-stick may give a false reading.

The oil level should be inspected every day before starting out, or every 100-150 miles on a long tour, and although it need not always be absolutely full, the level should be kept well up, especially when the car is new and never allowed to fall lower than half-way between the " full " and " danger " marks. At the same time overfilling should be carefully avoided as this causes the oiling up of the plugs.

A gear-type pump is carried at the front of the engine and driven from an inclined shaft. The Oil Pump shown in Illustration No. 32 in complete and dismantled form causes the Oil in the sump to be sucked through the gauze strainer into the Pump Body and delivered to the Main Bearing by an internal duct, the overhead gear being fed with an external pipe. The Pump is fitted with a cover plate and having a bye-pass relief valve incorporated in

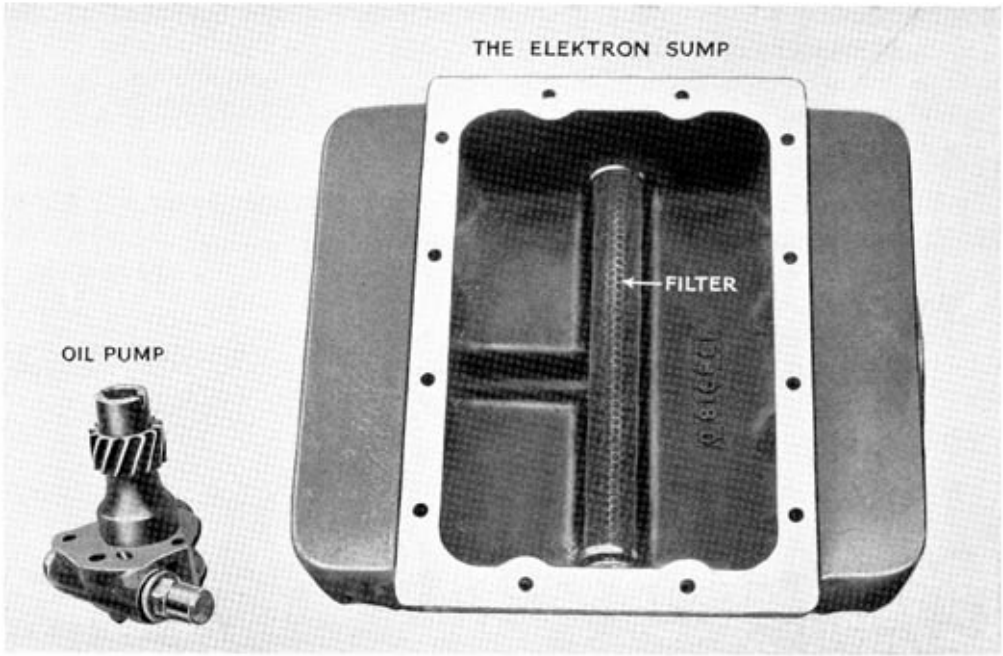


Figure 31.—General view of the interior of the elektron after it has been removed from the engine. The detachable oil filter is shown in position, and alongside, the oil pump.

the Body of the Pump. The relief valve as can be seen consists of a cover which encloses a spring and maintains the small piston up against a seating in the pump body until such time as either the force of the Oil through pressure or cold non-fluidity forces the piston off its seating. Whenever this occurs there will be either the corresponding drop in Oil pressure, or the release of excess oil will maintain the oil pressure at a point pre-determined by the Makers dependent upon the resistance of the spring. It is obviously possible to increase the tension of the spring by introducing washers in the cap, or obtaining a stronger spring, but no such alterations should be effected without first obtaining advice from the Works.

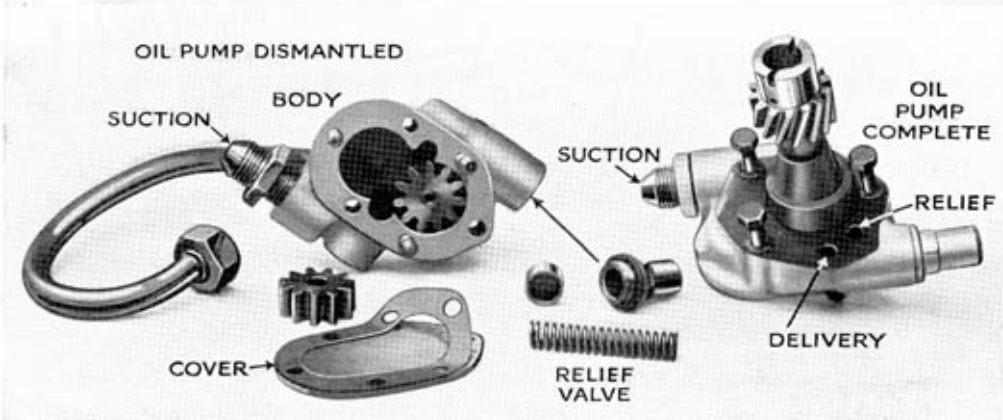


Figure 32.—View of a complete oil pump removed from the engine, showing the point where the suction pipe is attached, and the delivery and relief holes in the face of the body of the pump. A relief valve is shown in the centre of the illustration in detail, consisting of a plunger, spring and dash pot. On the near side of the illustration the plate is removed, showing the gears employed.

The pump draws its supply of oil from the bottom of the sump through an internal filter and large diameter suction pipe and delivers oil at high pressure into an internal oil duct, which runs across to the off side of the engine, where it feeds into the forward end of another internal duct running to the rear crankshaft bearing. Oil grooves in this bearing and drilled passages in the crankshaft conduct the oil to each big-end. These are in consequence fed with oil under high pressure. An external pipe from the pump delivery duct extends vertically to the cylinder head where it encounters a restrictor pin.

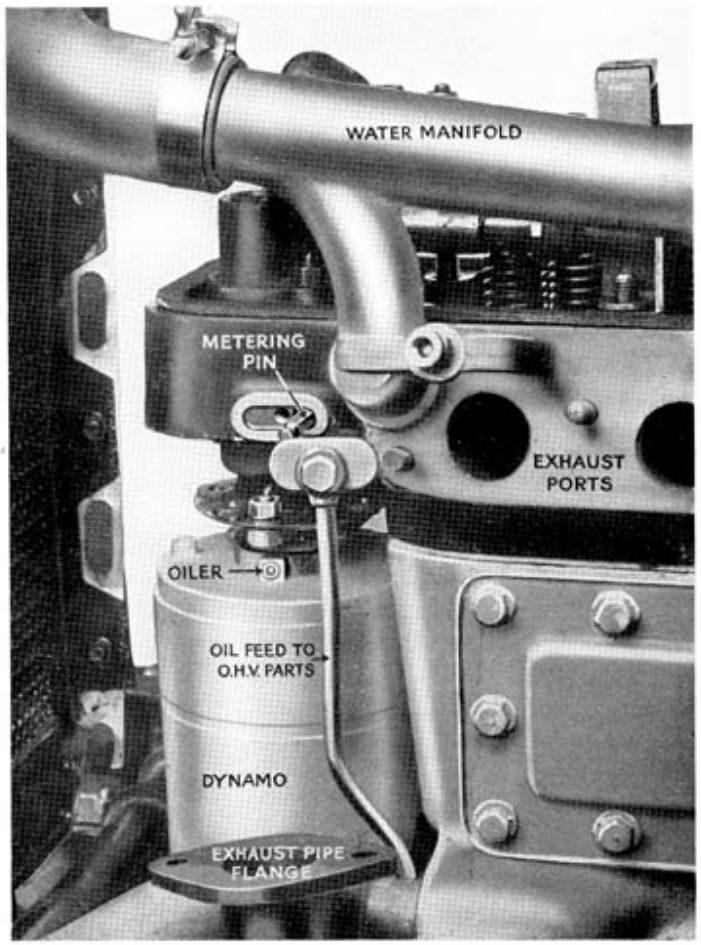


Figure 33.—The oil restrictor or metering pin is here shown withdrawn from its housing in the cylinder head. It is imperative that it should be kept absolutely clean.

The Oil Restrictor. The Restrictor or metering pin is for the purpose of regulating the oil feed to the overhead valve gear, and should on no account be damaged or interfered with (see Illustration No. 33).

Oil passing the pin enters a drilled passage in the cylinder head which registers with a similar passage drilled in the front camshaft bearing bracket, communicating with the camshaft bearing itself and each of the valve rocker shafts. The valve rocker shafts are drilled at intervals to correspond with the valve rockers, whose bushes are grooved, feeding drilled passages in the rocker-arms which lubricate the faces.

The rocker shafts in addition feed the rear camshaft bearing with a generous supply of oil, and a duct in the forward camshaft bearing impinges a constant stream of oil on the camshaft drive gears. Surplus oil from the valve gear finds its way back to the engine sump down a drain passage and external pipe at the rear of the cylinder block, and by a similar drain passage and pipe into the auxiliary drive cover at the forward end of the crankshaft, where it lubricates the dynamo drive and inclined shaft gears, finally passing through the crankshaft ball race on to the oil filter in the crankcase.

At the end of the first 100 miles and every subsequent 500 miles this restrictor pin should be withdrawn by passing a piece of stiff wire, hooked at its end, through the hole which can be seen in the end of the pin. The restrictor and its housing should be carefully cleaned before replacement. On no account file the pin, alter its shape or otherwise interfere with it.

Draining the Sump. Owing to dilution by petrol, a certain amount of which always works past the pistons into the sump, and chemical decomposition caused by heat, the best oil gradually loses its lubricating properties, and must therefore be periodically drained out and renewed. This should be done at least every 1,500 miles, and preferably every 1,000; it is false economy, particularly in a small high speed engine like the M.G. Midget, to run with old " worn out " oil.

To drain the sump the following procedure is adopted. First of all get the engine thoroughly warm so that the oil is as fluid os possible (immediately after a run is a good time). In front of the sump will be found the main suction pipe from the filter unit to the pump. By disconnecting the pipe from the filter the oil can be drained out of the sump, but as the filter must eventually be removed for cleaning this may as well be removed right away, for by so doing it will greatly speed up the operation. After the oil has all been drained the filter should be cleaned and replaced. When refixing the suction pipe to the threaded end of the filter great care must be taken to see that the pipe is fitted correctly. Incorrect refitting at this point will cause an air leak in the oil feed, and the pump will suck air instead of oil, resulting in a seizure if the engine is run for any length of time.

Clutch Thrust. Access to this is obtained by removing the cover plate on the clutch housing, when the lubricator will be found underneath. A few drops of engine oil should be dropped in every 500 miles.

Gearbox and Back Axle. The oil level in the gearbox and in the back axle should be inspected every 500 miles and replenished if necessary through the combined inspection and filler caps, situated, in the case of the gearbox, on the near side, and in the case of the back axle, on the rear of the differential housing.

The gearbox and back axle should always be filled up when warm—i.e. immediately after a run—and a short stick should be inserted into the filling orifices to make sure that congested oil clinging inside the spout does not give a false level reading.

Overfilling must be avoided, because excess of oil in the gearbox may work through to the clutch and cause serious slipping, while excess in the back axle may work along to the brakes and seriously impair their efficiency. There is no danger of this if the fillers are correctly used, because their positions on the gearbox and axle housings determine the " full " level automatically.

The gearbox and back axle should be drained after the first 1,000 miles, and subsequently every 2,000 miles. When refilling the gearbox requires one pint of oil and the back axle one and a half pints. The drain plugs will be found at the bottoms of the housings, and it is easiest to drain immediately after a run when the oil is warm and flows freely.

Clutch. The operation of the clutch on the modern motor car is comparatively speaking fool-proof, that is to say when the clutch pedal is pushed down the power from the engine in disconnected, but when the pressure on the pedal is released the clutch engages. From a point of view of actual maintenance there are only two items in connection with the clutch that the owner need trouble about—one is periodical lubrication of the clutch withdrawal ball race or thrust, secondly, adjustment of the set screws attached to the withdrawal arms in order to give the necessary clearance between the clutch plates when the clutch is disengaged and equally to prevent slipping when engaged.

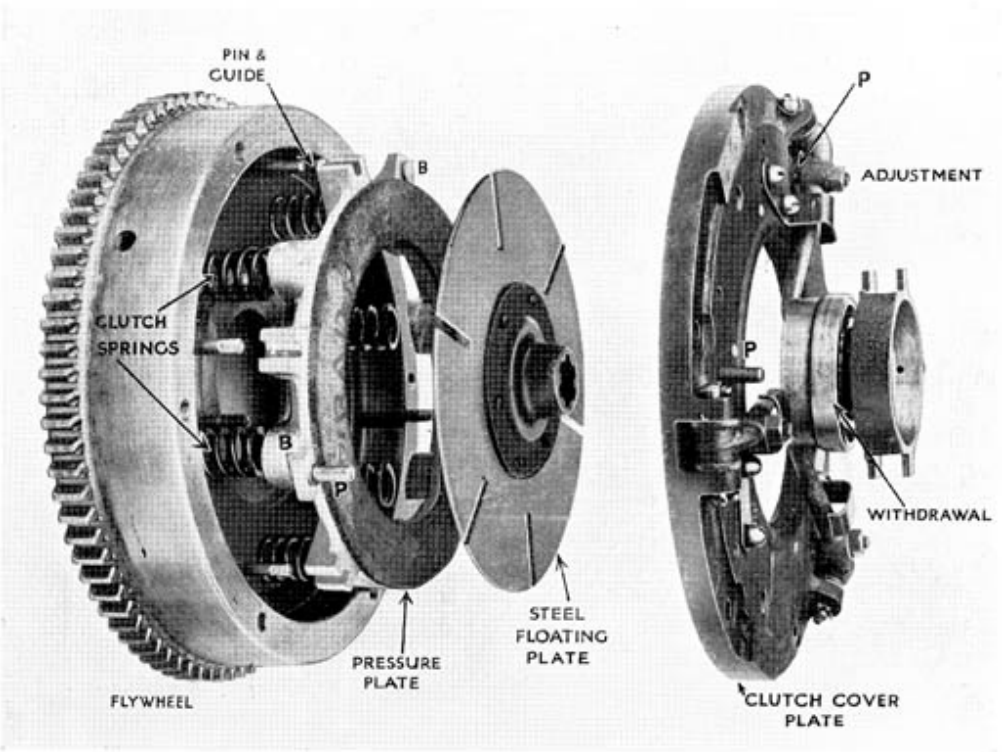


Figure 34.—Various components of the clutch after dismantlement. You will see that the springs cause the pressure plate to grip the floating plate against the clutch cover plate. Withdrawal is effected by forcing the pin against the buttons B, which has the effect of compressing the springs, thus releasing the floating plate from engagement.

The withdrawal only needs a little lubricant, too much is worse than none at all. Excess will be flung on to the clutch plates which will cause slipping. Do not put more work on the withdrawal bearing than is necessary by pressing the foot on the clutch pedal when driving. To do so will overheat the withdrawal and induce clutch slip.

Clutch Operation. In order that the owner may understand the relationship of the various parts, reference should be made to Illustration No. 34, for each part has been photographed in its correct relationship. The parts

are also shown in Illustration No. 35, in this case each one on its own. Various terms are employed to describe the Clutch parts by different people, but in this Works they are described as follows :—

First there is the flywheel; next to it the pressure plate; next to that the floating plate, and behind this the clutch cover plate.

The driving plate is made of steel, and is a sliding fit on the front end extension of the Gear Box shaft. The clutch cover plate and the pressure plate are each fitted with Feredo discs, the ferodo being attached by means of rivets suitably countersunk. There are six clutch springs which fit into recessed cups on the flywheel side of the pressure plate, and the flywheel is fitted with six register pins that pass through slots in the pressure plate, and when the whole clutch is bolted up register through holes in the clutch cover plate. These pins are shown in Illustrations Nos. 34 and 35.

It stands to reason that when the clutch is bolted up solid as shown in Illustration No. 36 that the pressure of the springs will force the pressure plate into contact with the floating plate, and grip the latter between the pressure plate and the clutch cover plate. It is essential that the ferodo rings must be free from any lubricant so that they can work effectively, and one can visualise that letting in the clutch with a jerk may rough up the friction faces. Alternatively, by letting the clutch continually slip, the centre plate will become overheated, which will in turn have a detrimental effect on the clutch surfaces.

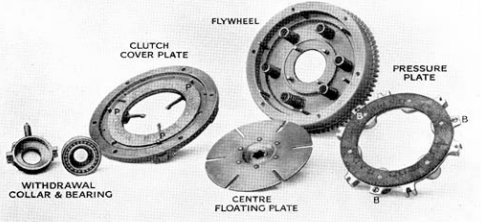


Figure 35.—The various parts of the clutch which are suitably lettered to identify each one. It will be seen that the pressure plate and the clutch cover plate are faced with Feredo. The pins which pass through the clutch cover plate, and the three buttons on the pressure plate which contact with the withdrawal pins. The withdrawal collar and bearings are also noticed. The flywheel has six guide pins which register with slots machined in the pressure plate and eventually pass through the clutch cover plate, the clutch cover plate thus being carried to the flywheel by means of long bolts shown in Illustration No. 34.

Clutch Withdrawal. In order to effect the disengagement of the clutch, it is necessary to force the pressure plate out of engagement with the floating plate by compressing the clutch springs. It will be seen on reference to Illustration 35 that on the inner side of the clutch cover plate there are three short plungers, which, when the clutch is assembled, come in contact with the three hardened steel abutments marked B in Iluustration No. 35. The Plungers are marked " P " in the same illustration. These plungers are

controlled by the adjusting screws carried in the withdrawal arms, which can be clearly seen in Illustration No. 34. Pressure on the clutch pedal forces the withdrawal arms forward, and in turn these force the adjusting screws against the plungers " P " which in turn force the clutch pressure plate towards the flywheel, thus compressing the clutch springs. It will be seen that the pressure and cover plates are fitted with Ferodo discs or plates which are riveted in position. It is essential that the aluminium rivets be well countersunk in the Ferodo if ever the clutch is relined.

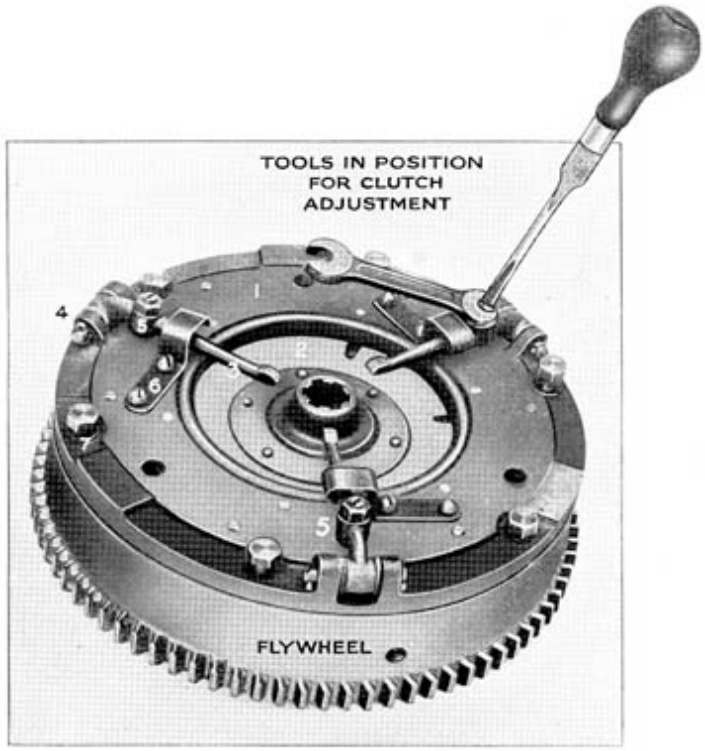


Figure 36.—This illustration should be studied because it shows the complete clutch removed from the engine, and the manner in which a spanner and screwdriver are employed to adjust the amount of travel on the withdrawal pins. The parts are numbered and are as follows :

1. Clutch cover plate.
2. Centre floating plate.
3. Withdrawal lever.
4. Fitting for withdrawal lever.
5. Adjusting set screw.
6. Spring steel clip to prevent withdrawal lever movement.
7. One of the bolts holding the clutch cover plate to flywheel. Whenever the clutch is taken to pieces two long bolts should be procured otherwise when undoing the bolts the springs may cause the clutch cover plate to fly back and damage the threads of the remaining bolts.

The action of the clutch thus having been described, it simply remains to show how adjustment is effected, and the reason for the three small clips shown in Illustration No. 36. The clips are only intended to prevent the clutch withdrawal arms going too far back, or floating outwards against the withdrawal collar. It is also necessary to limit the travel of the clutch pedal so as to avoid the clutch being pushed out too far. As the clutch gradually wears ,the thickness of the friction rings will decrease, which will cause the floating plate to come nearer to the clutch cover plates. This necessitates

the clutch withdrawal set screws being adjusted to give a clearance between them and the withdrawal plungers. The correct clearance between the set screws and the plunger is .010" (ten thousandths of an inch) when the clutch pedal is out of engagement.

In Illustration No. 36 a spanner and screw driver are shown on the adjusting set screws.

Universal Joint and Propeller Shaft. The tubular propeller shaft is fitted at either end with Hardy Spicer Universal Joints. The front end of the propeller shaft is castellated and this fits inside the castellated end of the Universal Joint. The object of this is to allow for the end movement of the propeller shaft due to the flexion of the rear springs and the rise and fall of the axle.

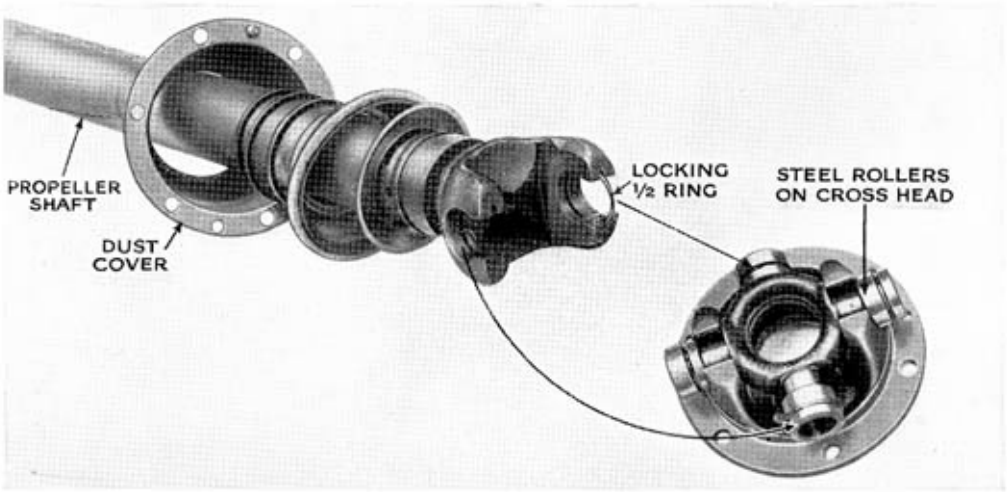


Figure 37.—Various components of the Hardy Spicer Universal Joint. On the right hand side is the flange having two jaws, and carrying the cross head of the universal joint on steel rollers, the other two pins of the cross head being supported in the jaws of that portion of the joint which is attached to the propeller shaft. To prevent the steel rollers from being flung outwards the jaws are supplied with half rings which fit into the grooves on the rollers. The whole of the universal joint is entirely enclosed by covers held in position by a spring.

It is necessary to keep this sliding coupling joint lubricated, and for this purpose a nipple is provided at either end, access to which is provided in the tunnel. The universal joint proper consists of a plate carrying two jaws, a cross head with hardened steel roller bushes, and the opposite set of jaws attached to the propeller shaft. The entire universal joint is enclosed by a pressed steel cover and a spring loaded dust excluder cover. The hardened steel rollers are grooved to receive semi-circular wire rings which prevents them floating outwards. It is essential that this joint should be packed with Hardy Spicer grease. For this purpose use the small gun provided in the tool kit, which is filled with this grease when the car is supplied.

Rear Axle. The external appearance of the rear axle can be seen from Illustration No. 38. The casing consists of a steel stamping forming what is known as the " Banjo." The complete differential assembly including the driving bevel and crown wheel are mounted on the front cover plate. The rear cover plate carries the oil filler extension. A drain plug is provided beneath the axle for draining this from time to time.

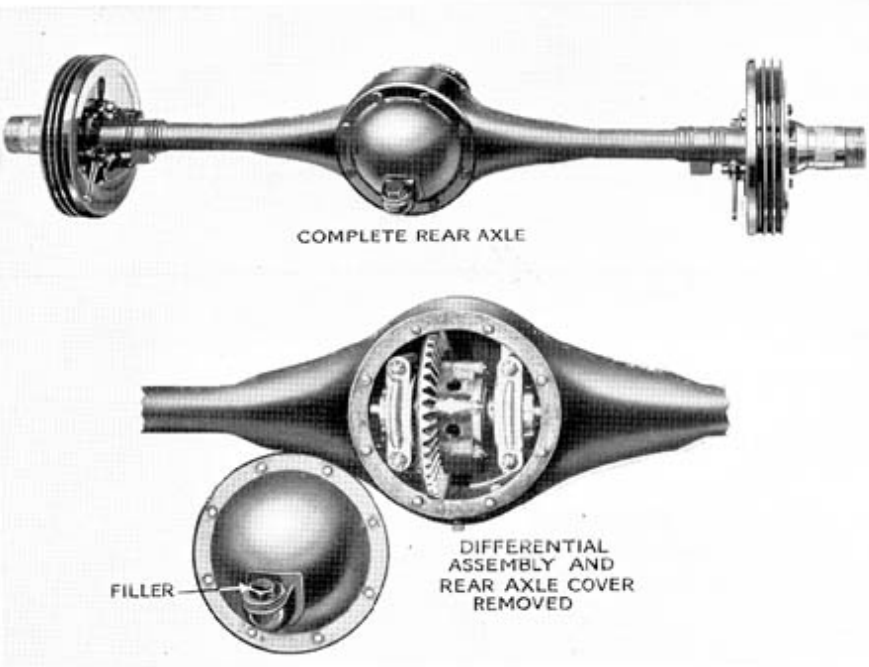


Figure 38.—General view of the rear axle, and delow this a view of the rear cover removed showing the differential assembly and crown wheel bolted in position.

Illustration No. 38 shows the interior of the axle with the gears in position after the rear cover has been removed. It will be seen that the complete differential assembly is clamped in position by two bridge pieces, having nuts of the " ring " type on either side; the object of these nuts is to permit of lateral movement of the unit in order to obtain correct meshing of the bevel gears. Once these have been set at the Works there is practically no necessity

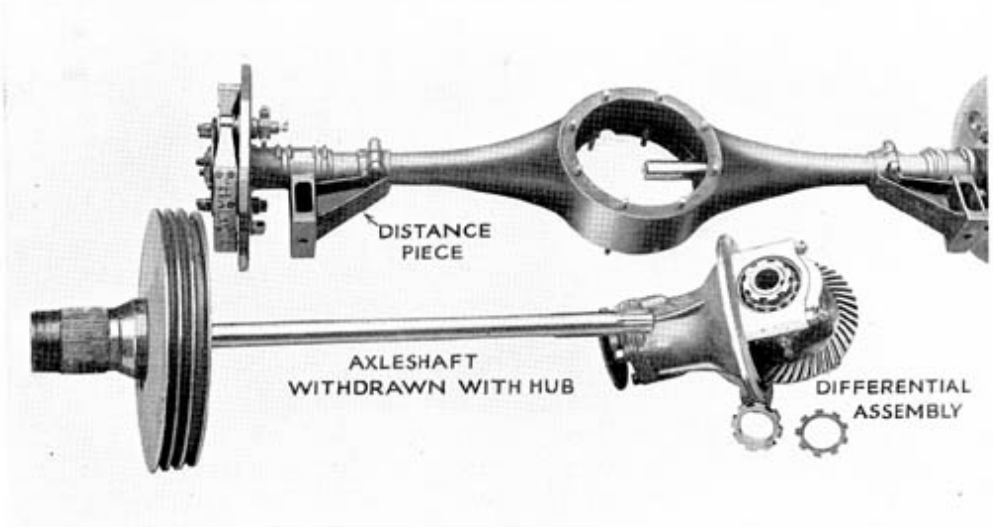


Figure 39.—Entire view of the back axle removed from the frame showing the complete differential assembly removed and the axle shaft withdrawn, complete with hub. The castellated nut beneath the differential assembly is intended to show how the lateral adjustment of the differential is effected and located in position by means of a tab washer.

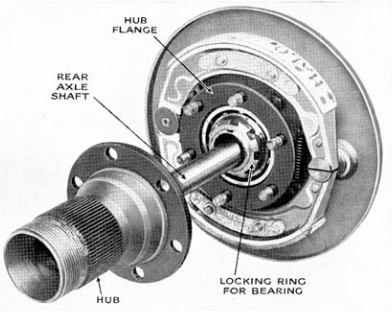


Figure 40.—General view of the rear hub partially withdrawn from the axle. The hub runs on a ball bearing and is locked in position in the hub flange by means of a castellated nut and tab washer. The brake pull-off springs will be noticed.

ever to remove them, but in the case of an accident it may be found necessary to re-adjust the mesh for the bevel gears. Of course there must be two adjustments for the meshing of the bevel gears, namely, the lateral adjustment of the crown wheel and the end adjustment of the driving bevel, permitting it to mesh correctly with the crown wheel.

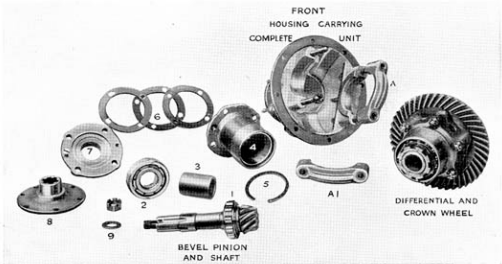


Figure 41.—The components of the differential showing the latter removed from the housing and the driving bevel pinion and shaft dismantled from its housing. The numbered parts are :—

1. Bevel Pinion Roller Bearing and Shaft.
2. Bevel Pinion Bearing (Hoffman).
3. Distance Piece for Bevel Pinion Bearing.
4. Bevel Pinion Housing.
5. Spring Ring.
6. Bevel Pinion Housing Shims.
7. Cap for Bevel Pinion Housing.
8. Propeller Shaft Flange.
9. Propeller Shaft Flange Slotted Nut and Washer.
A. Diff. Bearing Cap.
A1. Diff. Bearing Cap.

Illustration No. 39 is a picture of the rear axle casing with the complete differential assembly removed, and one axle shaft and hub removed as well. Before the differential can be withdrawn, it is necessary to withdraw the axle shafts.

Axle Dismantlement. First remove the wheels and brake drums. The hub and ½ shaft can be withdrawn by refitting a wheel and pulling outwards and the view obtained in Illustration No. 40 will be visible. This shows that the axle shaft passes through the hollow axle casing, and the inner hub flange runs on a large ball bearing. This bearing has to be periodically lubricated which is effected by forcing a little grease through a nipple on the inside of the hub recess. Under no circumstances should Gear Oil be used for this bearing, but on the other hand a grease of the nature of vaseline is essential, as for example Shell R.B. This grease will remain in the bearing and not be flung out and find its way on to the brakes. The ball bearing is locked on the axle tube by means of a ring nut and tab washer. If ever the ring nuts have to be slackened they can be driven off by a brass drift and hammer. Steel punches should never be used, except in absolute emergency.

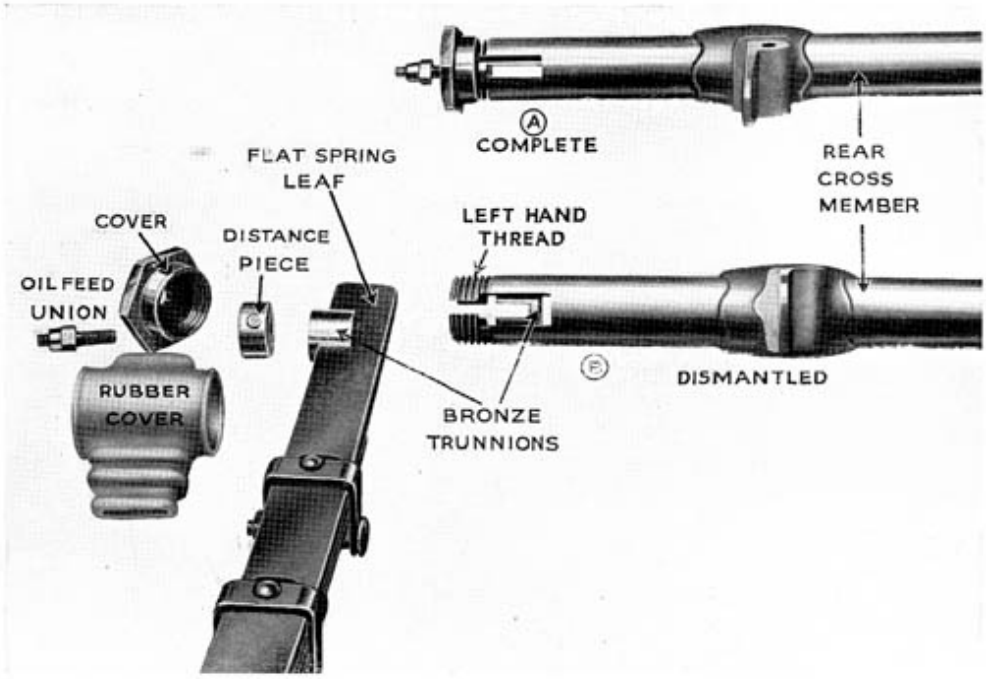


Figure 42.—This picture enables the chassis suspension to be clearly understood. The front ends of the springs swivel in the conventional manner, but as shown above the rear ends slide in bronze trunnions in the spring anchorages. Note the protecting and oil retaining rubber cover.

Differential. After the axle shafts have been withdrawn it is possible to remove the complete differential. The helical cut crown wheel is shown on the right hand side of the illustration, after being removed from the aluminium housing and the bridge pieces which hold it in position. The driving bevel assembly has also been dismantled; this runs on one roller and one ball bearing, the bearings being spaced apart by a distance collar. A number of shims are provided to take care of the correct meshing of the driving bevel with the crown wheel. The rear end plate enclosing the whole assembly is provided with tapped holes ¼" B.S.F. to act as means of with-

drawal. A circular steel ring will be noticed having a gap in it which registers in the front of the driving bevel housing thus preventing any forward motion of the roller bearing should subsequent wear take place. If ever the differential assembly needs attention the whole unit should be returned to the Factory where it can be properly looked over and correct adjustment of the gears be effected.

Suspension. The suspension of the chassis can be clearly understood if Illustration No. 42 is examined. There are no shackles in the ordinary sense of the word. Instead, however, the rear end of the front and rear springs slide in phosphor bronze trunnions in the spring anchorages. The front end of both front and rear springs are pivotted upon fixed points. As a spring compresses or expands due to load or riding over inequalities, the rear end of the springs slide to and fro. The main leaf of the spring is accommodated in phosphor bronze blocks capable of rotating in their housings. The manner in which this is effected is shown in Illustration No. 42 which shows a rear tubular frame cross member with the phosphor bronze slotted bushes in position. These are held in place by a distance piece and the whole assembly locked up by a large nut. A greaser nipple is provided which screws into the distance piece and finally the whole assembly is enclosed by means of a moulded rubber cover as seen in the illustration. The bronze bushes are capable of rotating inside the tube and the spring is also capable of end movement in the slots of the bushes.

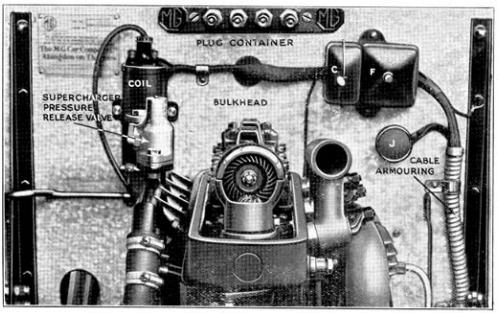


Figure 43.—General view of the layout of electrical equipment in the M.G. Midget J model. " C " and " F " are cut-out and fuse box, and " J " is the junction box.

The electrical equipment on the M.G. Midget J3 Model is the direct result of many years of experiment with various types of installations, and we believe that its simplicity of design, together with the incorporation of high efficiency components which have proved capable of meeting the exacting demands of a high speed motor car, will give lasting and trouble free service.

The accompanying wiring diagram may appear a little complicated to the average car user, and are really only intended to act as a guide in the case of dismantlement of all the wiring system. They show, nevertheless, the run of the wires from the contact breaker to the coil, and from the coil to the junction box. It will also be seen from these illustrations that the wiring is carried out on the earth return system, that the negative terminal of the battery is earthed, and there is an automatic earth from the lamps, starter and dynamo. There are, however, three separate earths that have to be made, namely from the tail lamp, horn switch and junction box.

The principal points connected with the electrical equipment on which the owner will require instruction are the instrument board, the fuses and the various components.

On the left of the instrument board is a panel containing an ammeter, a switch controlling the side and tail and head lamp illumination; this panel also contains the ignition warning lamp, and oil gauge which gives a direct reading in lbs. per square inch. The ignition warning lamp is a simple 2½ volt bulb. The instrument on the extreme right of the board is the supercharger pressure gauge. There are a number of connections that, of course, have to be made from the junction box to the switchboard and these are indicated on the wiring diagram. Note the " On " and " Off " positions for the dynamo in the PLC Switch. In the centre of the facia board the combined Horn and Dipping switch is fitted, together with a small but

efficient panoramic mirror. The Speedometer, located in the right hand side of the facia board, is a composite instrument, recording not only m.p.h. but also engine r.p.m. in 3rd and top gears. The wiring of the car is carried in armoured tubing at all essential points and the connections are made behind the combined junction and cut-out.

A good view of the junction box is shown in Illustration No. 44. It is fitted with a number of glass barrel fuses, and holes are provided in the body of the box to carry spares. The fuses control the side and tail lamps, the head lamps, auxiliaries such as the horn and one marked " B " which is for the dynamo field. The cut-out which is mounted on the same base as the fuses, is provided with a cover and under normal circumstances need never be touched, its operations being entirely automatic.

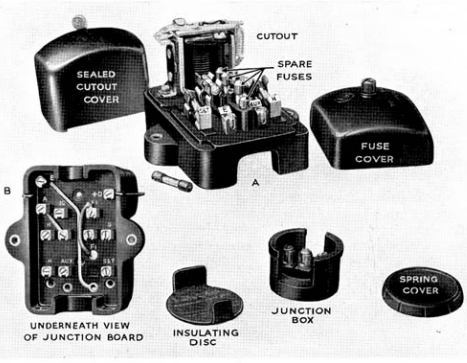


Figure 44.—Details of the combined cut-out and junction box " A " seen from above, the underneath of which is shown at B. Reference to the wiring diagram shows, it will be noticed, that the earth terminal is connected up by a strip for convenience. Spare glass fuses are carried in the special holder, the value of the fuses being indicated on the wiring diagram. These are of 25 amperes with the exception of the field fuse, which is 4.5 amperes.

A small circular junction box is placed beneath the cut-out which forms a convenient connection point for wires to the horn and off side head lamp, in order to be able to control the latter through the dipper switch. It will be seen on referring to the wiring diagram that the lower terminal of the junction box is coupled to the horn and switch, and the upper terminal to the dipper switch and off side head lamp.

Dynamo. The dynamo is mounted on a platform at the front end of the engine and forms part of the overhead camshaft drive. Two views of the dynamo can be seen in Illustration No. 45. On the left hand side it will be seen that the pinion is held on to a shaft by a bolt having a very wide head and also a tab washer which registers into the withdrawal holes of the bevel pinion. The two holes in this pinion are drilled and tapped $\frac{1}{4}$" B.S.F. in

order to facilitate removal at any time with the aid of two bolts, one of which is shown in the illustration. The dynamo has been specially designed to meet the requirements of high engine revolutions, and is particularly robust in constructional and electrical details, and beyond an occasional inspection of brushes should require but little attention. The brushes and attendant gear are readily accessible on removing the cover as shown in Illustration No. 45.

Brushes. It is very important to make sure that the three brushes work freely in their holders. This can easily be ascertained by holding back the spring and gently pulling each flexible lead, when the brush should move without the slightest suggestion of sluggishness. The brushes should be clean and should " bed " over the whole of their working surface; that is to say, the face in contact with the commutator should appear uniformly polished. Dirty brushes may be cleaned with a cloth moistened with petrol.

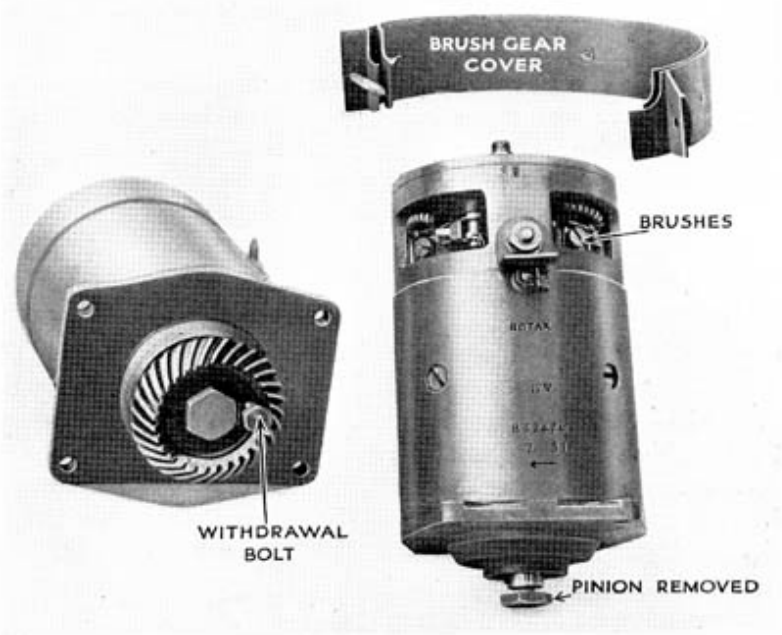


Figure 45.—Two views of the dynamo showing the Brush cover removed, and the method of withdrawing the gear from the shaft by two ¼" B.S.F. bolts.

If any of the brushes become so badly worn that it is necessary to replace them, this is accomplished by releasing the brush lead eyelet by removal of of the screw, then, while holding the spring lever back out of the way, withdrawing the brush from its holder. The new brush can then be fitted by reversing the operation.

When ordering new brush replacements state whether they are main or control brushes, and for what type of machine they are required.

The brush springs should be inspected occasionally to see that they have sufficient tension to keep the brushes firmly pressed against the commutator when the machine is running. It is particularly necessary to keep this in mind when the brushes have been in use for a long time and are very much worn down.

Owners are cautioned that it is unwise to insert brushes of a grade other than that supplied with the machine, or to change the tension springs. The

arrangement provided has been made only after many years' experience, and will be found to give the best results.

Commutator. The surface of the commutator should be kept clean and free from oil and brush dust, etc.; neglect of this precaution will result in the commutator becoming blackened, causing sparking to occur at the brushes, and consequent shortening of the life of the machine. The best way to clean the commutator is to insert a fine duster, held by means of a suitably shaped piece of wood against the commutator surface, slowly rotating the armature by the starting handle at the same time.

If the commutator has been neglected for long periods, it may need cleaning with fine glass paper, but this is more difficult to do, and should not be necessary if it has received regular attention. The grooves between the commutator segments should be examined occasionally and any deposit of copper or carbon dust may be cleaned out by means of a thin saw blade or similar article. It is strongly recommended, however, that this operation should be entrusted to a competent electrical engineer if ever necessary.

Lubrication. As the bearings are packed with grease before leaving the Works, very little attention is needed. A few drops of oil, however, may be added through the lubricators provided, say, every 1,000 miles. The reader is cautioned that far more trouble has been caused by excessive oiling than by too little. (After the car has run about 10,000 miles the dynamo should be removed, cleaned and adjusted and the bearings re-packed with grease. This should be entrusted to the nearest Lucas/Rotax Service Depot.)

Never attempt to make any alteration to the electrical equipment without first disconnecting the battery lead, on replacement watch ammeter for any undue discharge.

Dynamo Field Fuse. A fuse is provided in the dynamo field circuit to protect the machine in the event of anything being wrong in the charging circuit, e.g., a loose or broken battery connection. If the dynamo fails to charge the battery at any time (indicated by the ammeter giving a discharge reading during daytime running), inspect the fuse and if it has blown, replace it. If the new fuse blows after starting up, the cause of the trouble must be found, and we advise that the equipment is examined by a Lucas/Rotax service Station. Replacement fuses must be of the same size as those originally fitted, i.e. 4.5 amps.

The fuse is one of the four cartridge type fitted in the junction box on the engine side of the dash (see Illustration No. 48), and is marked " E." The size of the fuse is marked on a coloured paper slip which can be seen inside the fuse.

Removing the Dynamo. In order to obtain easy access to the dynamo for removal it is necessary to take off the radiator. Remove the two bolts fastening the radiator to the chassis frame, slacken the nuts at the rear end of the bonnet rod and release it from its bracket. Remove water return pipe from cylinder head and loosen clips holding bottom water hose.

N.B.—It is unnecessary to interfere with any of the oiling system to remove dynamo.

Between the projecting portion of the cylinder head and the top of the dynamo will be found a circular flexible coupling. Remove the nuts on each of the four coupling bolts in turn, leaving the bolts in position, so that the coupling can be rotated by use of the starting handle to bring each bolt into a position where the nut may easily be reached.

Having removed all four nuts, take off the valve gear cover and turn the engine by the starting handle until the timing marks on the spiral bevel gears coincide. These will bring the driving yoke on the cylinder head across the engine, and the driving yoke on the dynamo parallel to the engine centre line. The bolts themselves may now be withdrawn, care being taken not to lose the distance washers, which must be replaced in the same position. Removal of the bolts enables the flexible coupling to be withdrawn.

Detach the two cables on the distributor side of the dynamo noting from which terminal they are removed.

Now unscrew the four set screws which attach the dynamo to its platform at the front of the engine thus releasing the dynamo. Lift the dynamo approximately a quarter of an inch and tilt it towards the near side of the car until the driving yoke on the dynamo is just clear of that on the cylinder head The dynamo can then be tilted forwards and easily withdrawn.

Replacement of the dynamo is effected in the reverse way, but it is necessary to make sure that the engine timing has not been disturbed while the dynamo was removed. Removal of the rectangular cover plate in the clutch housing should reveal the timing mark on the flywheel for Nos. 1 and 4 cylinders, exactly in the centre of the opening. Place the brass packing pieces which fit under the dynamo base in position on the dynamo platform, making sure that you replace the same number that you took off. If for any reason the dynamo is replaced by another, it may be necessary to re-adjust the mesh of the driving gears to obtain silent running by suitable selection of the packing shims used. Turn the dynamo spindle until the timing mark on the dynamo drive gear coincides with the centre line of the dynamo and is at the rear, that is, ready for engagement with the correspondingly marked teeth of the drive gear on the crankshaft. The holes in the dynamo coupling yoke will then be parallel with the engine centre line. Tilting the dynamo towards the near side of the car and holding the dynamo coupling yoke in this position, insert the drive gear into the opening of the dynamo platform and swing the dynamo backwards and downwards into position. The gears can be felt to be meshing properly if the coupling is slightly oscillated as the dynamo is replaced, but do not overdo the oscillations or you may engage the wrong teeth.

See that the bolts in the dynamo base are coinciding with the holes in the dynamo platform, and then observe if the dynamo coupling yoke is exactly parallel to the engine centre line. If it is not, withdraw the dynamo, reset the coupling yoke and re-insert the dynamo. No difficulty should be experienced in getting the dynamo in position with the correct teeth in mesh, as the distance between one tooth and the next is sufficient to make an appreciable difference to the position of the dynamo coupling yoke, a difference which is immediately discernible.

Having satisfied yourself that the correct gear teeth are in mesh, replace the screws in the dynamo base, taking particular care to tighten them up evenly a partial turn at a time until all are quite tight. Now make a final test. The flywheel mark 1-4 should show exactly in the centre of the inspection cover opening with the distributor rotating arm pointing towards No. 1 cylinder. (This can be readily found by tracing the high tension lead from No. 1 sparking plug to its junction on the distributor. Removal of the distributor cover should show the distributor arm directly beneath it.) The dynamo coupling bolt holes should be exactly fore and aft and at right angles

to the coupling yoke on the cylinder head, and the timing marks on the camshaft driving gears should be coinciding.

If all the foregoing are correct, replace the flexible coupling and coupling bolts, taking care to replace the distance washers in exactly the same position as they were originally. Tighten up the nuts firmly and rotate the engine slowly by hand. If the distance washers are in the correct position, the flexible coupling should run absolutely true. If it does not do so, note where the error is and adjust the distance washers accordingly. Then replace the valve cover and attach the dynamo cables on to their correct terminals.

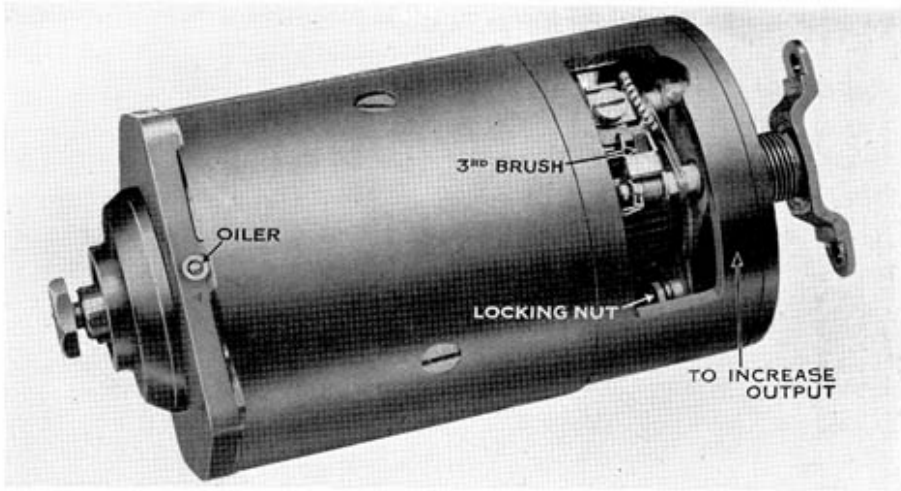


Figure 46.—A view of the dynamo showing the position of one of the lubricating holes, the third regulating brush and its locking nut, and the upper coupling for driving the overhead valve gear. The instructions should be read carefully concerning the care of the commutator and brushes and the regulation of the dynamo output.

Third Brush Regulator. The output of the dynamo, that is to say, its rate of charge, is controlled by a Third Brush which is shown quite clearly in Illustration No. 46. It is inadvisable for anybody who is not an electrician to tamper with this, but in case the Amp. Meter reads more than 2 amps. when all the head lamps are on, or in the event of its reading less than 6 amps. when no lights are alight, the Third Brush can be moved relative to the armature by slackening off the nut marked " locking nut " and turning the brush gear either towards the direction of rotation of the armature to increase the rate of charge or in the opposite direction to decrease the charge rate. **It is very important that the indicated charging rate must not exceed 8 amps. with all lights off or severe damage will be done to the dynamo and cut-out.** The Third Brush is to be found on the near side of the car and on the same side as the small ball covered lubricator. Never omit to tighten up the lock screw after any adjustment has been effected.

When replacing the brush cover care must be taken that the cover does not make contact with dynamo terminal (sympton, no charge).

Starter Motor. The armature spindles of these machines are fitted with a pinion which, on rotation, runs into engagement with the geared ring on the flywheel. Immediately the engine begins to fire, the pinion is automatically thrown out of mesh.

If, for any reason, the pinion wheel on the motor does not engage with the flywheel teeth, examine the screwed sleeve on the armature spindle to see that it is free from dust; if necessary wash over with paraffin. Occasionally, give it a few drops of thin machine oil.

As in the case of the dynamo, the surface of the commutator must be kept clean and free from oil, brush dust, etc.

The starter is designed for starting the engine under normal conditions, but any unnecessary or additional loading will considerably diminish the life of the machine and battery. In order to facilitate starting in cold weather, it is advisable to flood the carburetter, and, before using the electric starter, crank the engine over slowly by the starting handle for two or three revolutions; this will break the oil film and considerably diminish the load for starting.

In the event of the engine refusing to fire after being turned by the starter, make sure that the ignition switch is " on."

It is not advisable to use the self starter with the Ignition Lever in the full advance position. It is better to put the Ignition Lever half advance and if necessary increase the amount of advance while the Starter Motor is spinning the engine. With coil ignition this is not usually necessary.

Battery. It is of the utmost importance that the battery should receive regular attention, as upon its good condition depends the satisfactory functioning of the ignition, starting motor, and the lamps.

At least once a fortnight 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 well above the plates. If, however, acid solution has been spilled, it should be replaced by a diluted sulphuric acid solution of specific gravity 1.320. 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 which is generated by the plates. It is advisable to complete the inspection by measuring the specific gravity of the acid, as this gives a very good indication of the state of charge of the battery. An instrument known as a hydrometer is employed for this purpose; these can be bought from your Dealer or from any of the Lucas/Rotax Service Stations.

For the battery fitted to the J models the specific gravity readings will be 1.285—1.300 for a fully charged battery, about 1.210 when half discharged and about 1.150 when fully discharged.

Should the quantity of distilled water required to top up be excessive, overcharging should be suspected. Additional symptoms will be, furious " gassing " of the cells when the dynamo is charging, a gradual but distinct increase in the intensity of the illumination of the headlamps as the dynamo output builds up, and a noticeable heating up of the battery after, say, a two hours' daylight run.

The remedy is either to reduce dynamo output, withdraw field fuse in the junction box for a while, or, put P.L.C. switch in " Off " position for a period of daylight running. It should always be remembered that overcharging can and ultimately will appreciably reduce the useful life of a battery.

The symptoms of an undercharged battery are too well known and need not be dealt with in these pages except to emphasise the necessity to maintain the battery in a *normal* condition at all times.

If one cell gives a reading very different from the rest, it may be that electrolyte has been spilled or has leaked from this cell, or there may be a "short" between the plates. In the latter case, the battery should be examined as soon as possible by a Lucas/Rotax Service Station.

Finally, see that the tops of the cells are clean and dry, and that the battery posts and cable lugs are thoroughly impregnated with vaseline before replacing and tightening up. More batteries are damaged by neglect of this simple precaution than by any other agency, often with attendant damage to all the other components of the installation.

If the equipment is laid by for several months, the battery must be given a small charge from a separate source of electrical energy about once a fortnight, in order to obviate any permanent injury to the plates.

Under no circumstances must the acid be removed from the battery and the plates allowed to dry, as certain chemical changes take place which result in loss of efficiency.

The battery must never be left in a fully discharged condition, and, unless some long runs are to be taken, it is advisable to have the battery removed from the car periodically and inspected, when it should be charged from an independent source of supply if found necessary.

Ammeter. The centre-zero ammeter which is incorporated in the instrument panel indicates the actual current flowing into or out of the battery. For instance, suppose two amperes are consumed when the side and tail lamps are switched on, and the ignition coil takes one ampere, then if the dynamo is generating at seven amperes the meter will show four amps. on the charge side of the scale. This is the current in excess of the lamp and ignition load which is available for battery charging purposes.

Fuses. The separate fusing of the various circuits ensures that a short circuit in any one does not affect the rest of the electrical equipment. This is particularly important when coil ignition is fitted. It will be noticed that the fusing of the lamps is such that there is no risk of the driver being plunged into total darkness. If both the headlamps, or the side and tail lamps, or all the units connected to the auxiliary accessory terminal fail to function, examine the particular fuse protecting them.

Remove the fuse from its holder and see whether there is a break in the fuse wire. Before replacing the fuse, inspect the units that have failed, for evidence of short circuits or other faults that may have caused the fuse to blow.

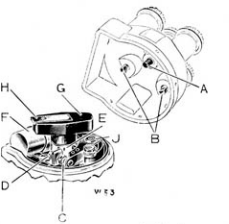
If a fuse blows repeatedly, and the cause cannot be traced we advise that the equipment is examined by a Lucas/Rotax Service Station.

The Cut-out. The function of the cut-out is to close the charging circuit, as the increased engine speed when the car is starting causes the dynamo voltage to rise above that of the battery. When the engine slows down, the dynamo voltage falls below that of the battery, and the reverse action takes place, i.e. the cut-out opens and thereby prevents the battery from discharging itself through the dynamo.

The question is sometimes asked whether the operation of the cut-out in any way depends upon the state of charge of the battery. There is no such relation between the two; the sole function of the cut-out is to switch on the dynamo with rising engine speed and to disconnect it when the engine slows

down to below a certain speed. The cut-out is accurately set before leaving the Works and does not need any adjustment, and therefore the cover protecting it is sealed.

Very little attention is needed to keep the ignition equipment in first class condition. We advise that it is inspected occasionally, and the following instructions on lubrication, cleaning and adjustment should be carried out.



A—Carbon brush.
B—Electrodes.
C—Contacts.
D—Locking nut.
E—Rotating cam.
F—Condenser.
G—Rotating distributor arm.
H—Metal electrode.
J—Contact breaker pivot.

Distributor. These distributors incorporate an automatic control device which relieves the driver of constant adjustment of the hand ignition control. This device, which consists of a centrifugal governor, is housed in the distributor body. It is packed with grease before leaving the Works and needs no attention beyond very occasional lubrication. Occasionally remove the distributor moulding by pushing aside its two securing springs. See that the electrodes are clean and free from deposit. If necessary, wipe out the distributor with a dry duster and clean the electrodes with a cloth moistened with petrol. See that the carbon brush " A " is clean and moves freely in its holder. Clean the outside of the moulding, particularly the spaces between the terminals. Next examine the contact breaker; it is important that the contacts " C " are kept free from any grease or oil. If they are burned or blackened, they must be cleaned with very fine emery cloth and afterwards with a cloth moistened with petrol. Care must be taken that all particles of dirt and metal dust are wiped away. Misfiring may be caused if the contacts are not kept clean.

The contact breaker gap should be about 15 thousandths and is carefully set before leaving the Works. Provided that the cam is kept clean and that the instructions on cam lubrication are carried out, the contact breaker gap will only need adjustment at very long intervals. It is not advisable to alter the setting unless the gap varies considerably from the gauge supplied. If adjustment is necessary, proceed as follows :—When the contacts are fully opened, slacken the locking nut " D " on the stationary contact screw, and rotate it by its hexagon head until the gap is set to the thickness of the gauge. After making the adjustment, care must be taken to tighten the locking nut.

Lubrication. (1) **Distributor Shaft.** The distributor shaft is lubricated from an oiler. Add a few drops of thin machine oil every 1,000 miles.

(2) **Cam.** About every 3,000 miles, give the cam the slightest smear of vaseline.

(3) **Contact Breaker Pivot.** Every 5,000 miles, place a single drop of oil on the pivot " J " (Illustration on page 50) on which the contact breaker works.

(4) **Automatic Advance Mechanism.** About every 3,000 miles lift off rotating distributor arm and add a few drops of thin machine oil. Do not remove screw, 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.

Coil.—The coil unit is not adjustable in any way, and requires no attention beyond seeing that the terminal connections are kept tight, and the moulded coil top is kept clean.

Warning Lamp.- A warning lamp is provided in the instrument panel, which gives a red light when the ignition is " ON " and the car is stationary. The warning lamp will also light when the engine is running very slowly, due to the fact that the dynamo is not running at sufficient speed to generate a high enough voltage to actuate the cut-out.

The Detection and Remedy of Ignition Faults.—If a failure of ignition or misfiring occurs, unless the cause is at once apparent the owner is strongly recommended to proceed in accordance with the following routine which should quickly enable him to locate the trouble.

Before proceeding with the examination, make sure that the trouble is not due to defects in the engine, carburetter, petrol supply, sparking plugs, etc.

Engine will not Fire.- Switch on the ignition, turn the engine and observe the ammeter reading. The engine should be turned by hand if it is known that the battery is in a low state of charge.

If an ammeter reading is given which rises and falls with the closing and opening of the contacts, then the low tension wiring is in order. If the reading does not fluctuate in this way, a short in the low tension wiring is indicated, or the contacts are remaining closed. When no reading is given, a broken or loose connection in the low tension wiring is indicated, or the battery may be exhausted.

Examine the high tension cables, *i.e.*, cables from the coil to the distributor, and from the distributor to the plugs. If the rubber shows signs of deterioration or cracking, the cable should be renewed. Remove the distributor moulding and examine the contacts; if necessary, clean them as described on page 50. Turn the engine over by hand, and see that the contacts come together.

If a fault is indicated in the low tension wiring, examine the cables from the switch or junction box to coil, and from coil to distributor. See that the battery terminals are tight and that the cables from the switch-box to the battery are secure. The battery may be dismissed as the cause of the trouble if the lamps will light.

Test the coil independently of the distributor as follows :—Remove the cable from the centre distributor terminal, and hold it about ¼in. from some metal part of the chassis and turn the engine. The sparking should be strong and regular if the coil is functioning correctly.

Misfiring and Bad Starting.—Examine the high tension cables and the plugs. If necessary, adjust the gaps to the correct setting (about 20 thousandths of an inch). Sooty or oiled plugs may be dismantled and washed out with petrol.

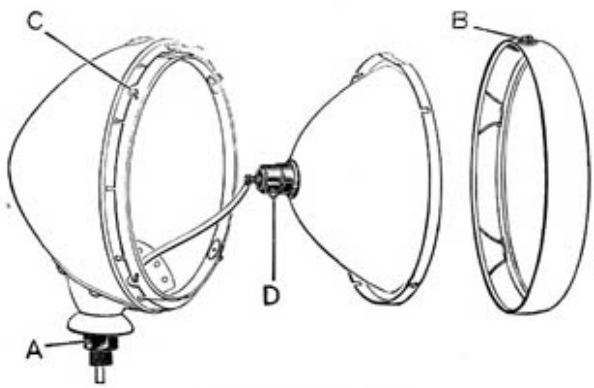
The plugs and high tension cables may be tested by removing the plugs in turn and allowing them to rest on the cylinder head and observing whether a spark occurs at the points when the engine is turned by hand. It should, however, be noted that this is only a rough test, since it is possible that a spark may not take place when the plug is under compression.

Remove the distributor moulding and see that the electrodes and contacts are clean. If necessary, clean them as described on page 50. See that the contact gap setting is correct.

If after carrying out the examination suggested, the trouble cannot be found, we advise that the equipment should be examined by the nearest Lucas/Rotax Service Depot, the addresses of which are given later.

Headlamps.—The headlamps are provided with a patented universally adjustable mounting which allows the beam of light to be set to the best advantage. This adjustment is obtained by slacking the hexagon locking nut " A " (Illustration below), turning the lamp to the desired position and then locking it by tightening up the nut.

The near side headlamp is set to throw its beam to the near side of the road and the off side (set straight) can be turned off or on independently.



Headlamp Dismantled.

A—Locking nut for adjustable mounting.
B—Screw head.
C—Reflector fixing screw.
D—Clamping screw.

Removing the Front and Reflector.—The headlamps are constructed with detachable fronts, parobolic reflectors and focussing devices. To remove a lamp front, give the screw head at the top of the lamp about a quarter of a turn—a coin will serve as a screw driver. This movement presses a cam against the body and pushes the front away from the body, enabling it to be removed. To replace, turn back the screw head and locate the cam between the two lugs on the body, then push the front into place. The reflector is secured by means of four fixing screws " C." Lamps are correctly focussed when sent out from the Works, but if a bulb is replaced it may be necessary to adjust the focus of the lamp. Accurate focussing is imperative if the maximum results are to be attained. The method of focussing is as follows :—

Remove the front as above, remove the screws holding reflector and then carefully draw forward the reflector until the lamp holder is exposed. This holder is fixed by the screw " D " and may be moved backwards

or forwards when the screw is loosened. Each lamp must be focussed separately, care being taken that lamps are properly set in line, not pointing up or down. Correct focussing adjustment is obtained by reflecting lamps on to a wall or, preferably, a white object at a distance of about 100 yards, sliding the holder backwards or forwards until the light reaches its highest point of brilliancy with total absence of shadows. Then tighten screw and replace the reflector and front.

Wiring Headlamps.—Remove the front and reflector as described in a previous paragraph. Then depress the washer on the bulb holder terminal against the spring until the cable hole is exposed. Thread the cable end through the hole, release the pressure on washer, when the cable will be securely held in position and good contact made. Cables should not be pushed too far through the terminal, as there is a danger of shorting on to the reflector or body of the lamp.

Side-lamps.—The fronts of the wing lamps are secured by small grub screws; when these are removed the fronts can be withdrawn by first pulling the top forward.

Tail-lamp.—The tail-lamp is fixed on to the car by means of a flanged base. To replace a bulb turn the front portion of the lamp to the left and withdraw it from its base.

When replacing see that the studs locate with the slots in the lamp front, then push it home to lock it in position. Should it be necessary to re-wire the tail-lamp, unscrew the coupling nut " B," when the cable covering shell " C " and the cable plug " D " can be withdrawn from the lamp; pass the cable through the shell and the rubber washer " E." Thread the bared end of the lead into the terminal socket and secure by the screw " G." Replace the cable plug in its holder and secure by tightening the coupling nut " B."

Replacement of Bulbs.—When the replacement of any bulb is necessary we strongly advise that Lucas/Rotax bulbs are used. The filaments are arranged to be in focus and give the best results with the lamps fitted. The following are the correct bulbs to use:—Head lamps, B.A.S. No. 35; Side and tail lamps, B.A.S. No. 10S.

Cleaning Lamps.—The reflectors are protected by a transparent and colourless covering, which enables any accidental finger marks to be removed with chamois leather or a soft cloth without affecting the surface of the reflector. Do not use metal polishes on Lucas Reflectors. Ebony black lamps can be cleaned with a good car polish. Chromium plated lamps will not tarnish and only need wiping over with a damp cloth to remove dust or dirt.

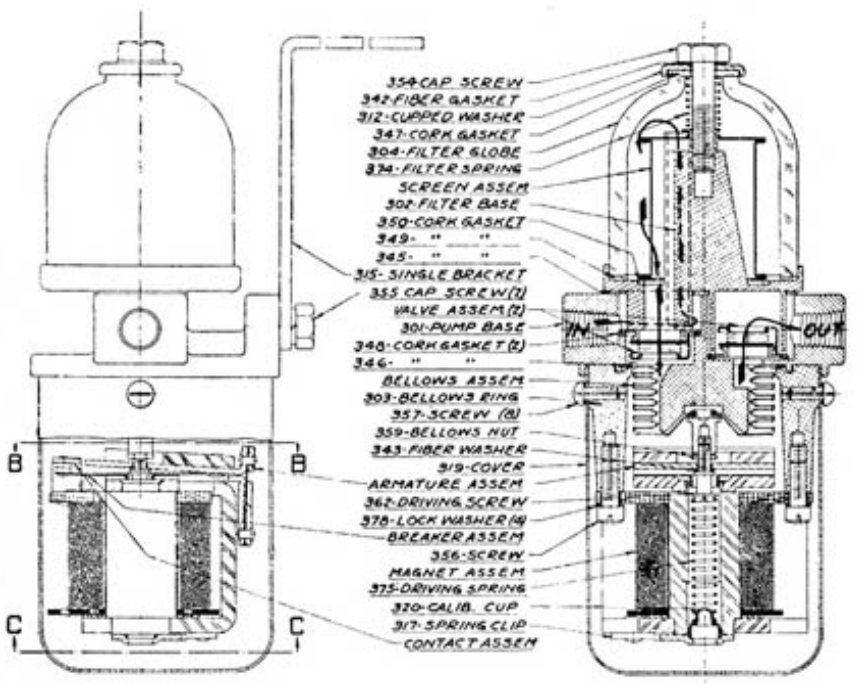
Klaxon H.F. Horn. All electric horns, before being passed out of the Works, are adjusted to give the best performance, and they will give long periods of service without any attention; no subsequent adjustment is required.

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 connection or short circuit in the wiring of the horn, or a blown fuse. It is also possible that the performance of a horn may be upset by the horn becoming loose on its mounting. If the cause of the trouble cannot be located, do not attempt to dismantle the horn, but return it to a Klaxon Service Depot for examination.

The Autopulse.

Description. The Autopulse is an electric fuel pump for petrol motors of all types. It is operated entirely by battery current and delivers just the right amount of fuel to the carburetter.

Operation. The Autopulse has been designed to function independently of the motor. This feature allows the carburetter to become filled with petrol before any attempt is made to start the engine. The Autopulse is entirely automatic in operation and starts pumping the instant the ignition switch is turned on. As soon as the carburetter is full, back-pressure develops and automatically stops the action of the pump. As the petrol is taken from the carburetter the back-pressure is relived and the pump automatically starts.



MAINTENANCE INSTRUCTIONS.

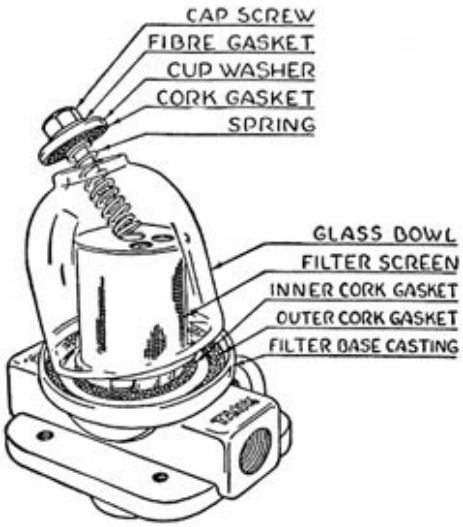
The Autopulse does not require lubrication and must not be oiled.

To Clean Filter. The glass bowl on the top of the Autopulse may or may not hold a small amount of fuel at all times, but in either case it is not a sign of faulty operation. A fine mesh screen has been provided which will not allow even water to pass through until a level of approximately one inch has been reached. When the level in the glass has reached this point, the filter should be emptied.

Remove the cap screw at the top, which will allow the glass to be lifted off. *Remove* screen and clean thoroughly to eliminate dirt which will clog the mesh. While not absolutely necessary, it is recommended that new

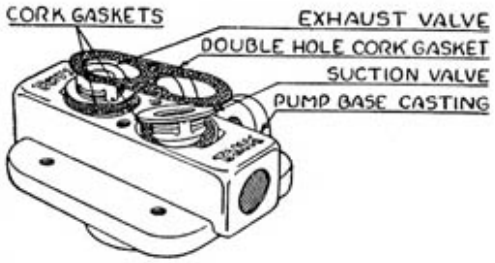
gaskets be installed at the time of cleaning the filter. Worn or damaged gaskets must be replaced, otherwise air leaks will result, causing unsatisfactory operation of the Autopulse. Replace all parts carefully following the illustration showing the location of each part.

After all parts have been replaced turn the glass bowl slightly toward the right with the hand to ensire a good gasket seat and then finish tightening the cap screw to complete the assembly.



While we recommend that replacement parts if needed be installed by an authorised M.G. Agent, the following service instructions are given for those desiring to make repairs who are not familiar with the construction of the Autopulse.

To Change the Valves. If after the Autopulse has been in service for some time, the pump continues to operate after the ignition switch has been turned on and before the engine is started, this condition, if not due to loose connections, is probably caused by the leaking of the suction valve.



This trouble may be remedied either by replacing the valve itself or by removing small particles of dirt which may be causing the valve to stick.

The valves are located directly under the filter base casting, and may be removed as follows :

First remove the cap screw on the top of the pump—lift off the glass and screen in accordance with instructions given under " To Clean Filter."

On the base casting of the filter, you will notice two brass screws which should be removed, in order to separate the filter casting from the pump base.

The valves are then exposed and may be replaced otr cleaned, whichever the case may be.

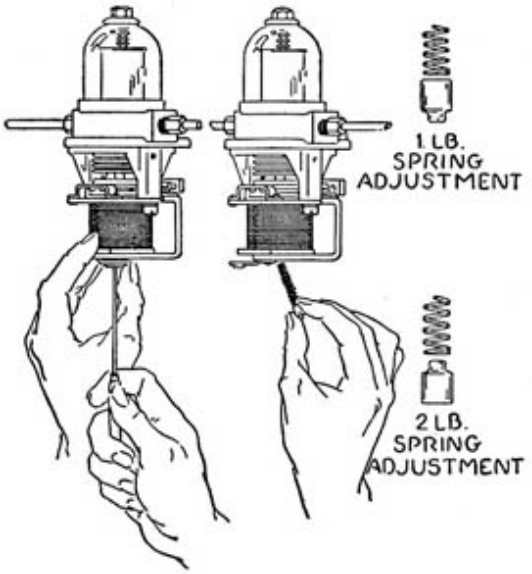
Be sure that the cork gaskets in the bottom of the valve cavities are in good condition.

In replacing the valves, the one one the TANK side should be inserted with the flange upward, and the one on the CARB. side with the flange downward. (See Illustration.)

Before replacing the filter casting, the double hole gasket on the bottom should be inspected, and if broken or damaged, should be replaced.

Care should be taken in replacing screws and gaskets, in order to avoid the possibility of air leaks.

To Replace Bellows. If the fuel is found to be leaking from the cover on the lower part of the pump check carefully to see that the leak is not from the pipe connections. Examine the bellows and if wet a new bellows should be installed.



Remove shell by taking out the two brass screws on the sides.

Remove spring in the bottom of the pump by compressing with a thin tool or nail and forcing the spring clip to one side. (See Illustration.)

Using a small $\frac{1}{4}$" magneto wrench, loosen the nut on the driving screw below the bellows stud. (See Illustration.)

Insert a thin, narrow screwdriver into the hole on the bottom of the pump from which the spring was taken, and loosen the driving screw. (See Illustration.)

Remove coil and armature by taking out two screws in the arms of the casting extending down below the bellows.

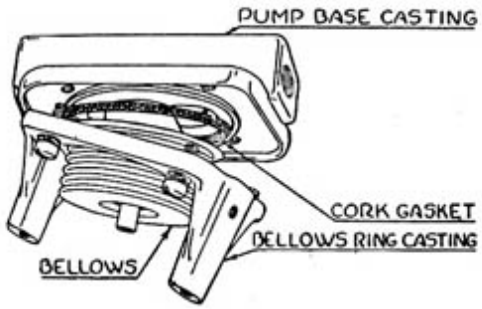
The Armature and Magnet will then be free from the balance of the pump.

Four screws located in each corner of the bellows ring should be taken out, which will allow the bellows ring and bellows to be removed.

A new Bellows may be installed and the parts replaced.

In setting the driving screw, which regulates the stroke of the pump, a gap of about .040 of an inch should be left between the bottom of the armature and the top of the magnet.

The lock nut on the driving screw should be tightened against the bellows stud, in order to hold this in position.

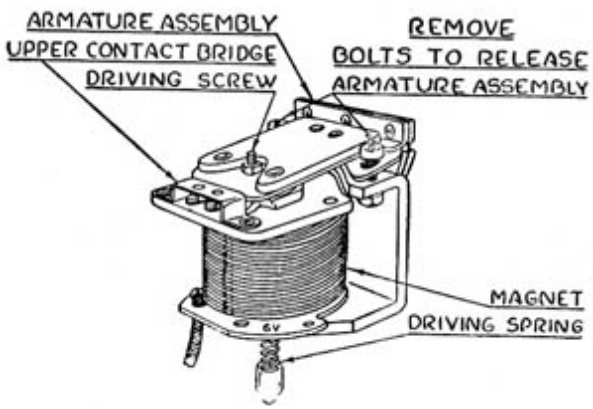


To Replace Armature. If after considerable service, the lower contact points have become badly worn, it is recommended that the armature be replaced.

Inasmuch as the replacing of the armature or magnet requires a special tool for the centering of the two parts, this work should be attempted only by Authorised M.G. Agents.

Remove shell, magnet, armature and spring in accordance with instructions given under the heading " To Replace Bellows."

Remove the two bolts and nuts holding the armature to the magnet and install a new part.



Before tightening the two bolts holding the armature to the magnet insert a sleeve .341" outside diameter by .316" inside diameter through the bottom hole in the magnet so that the cup on the breaker spring holding the lower contact points will have clearance on all sides after the bolts are tightened. Remove sleeve and tighten driving screw in place.

As stated in the instructions " To Replace Bellows," a gap of about .040 of an inch must be left between the bottom of the armature and the top of the magnet when the driving screw is replaced.

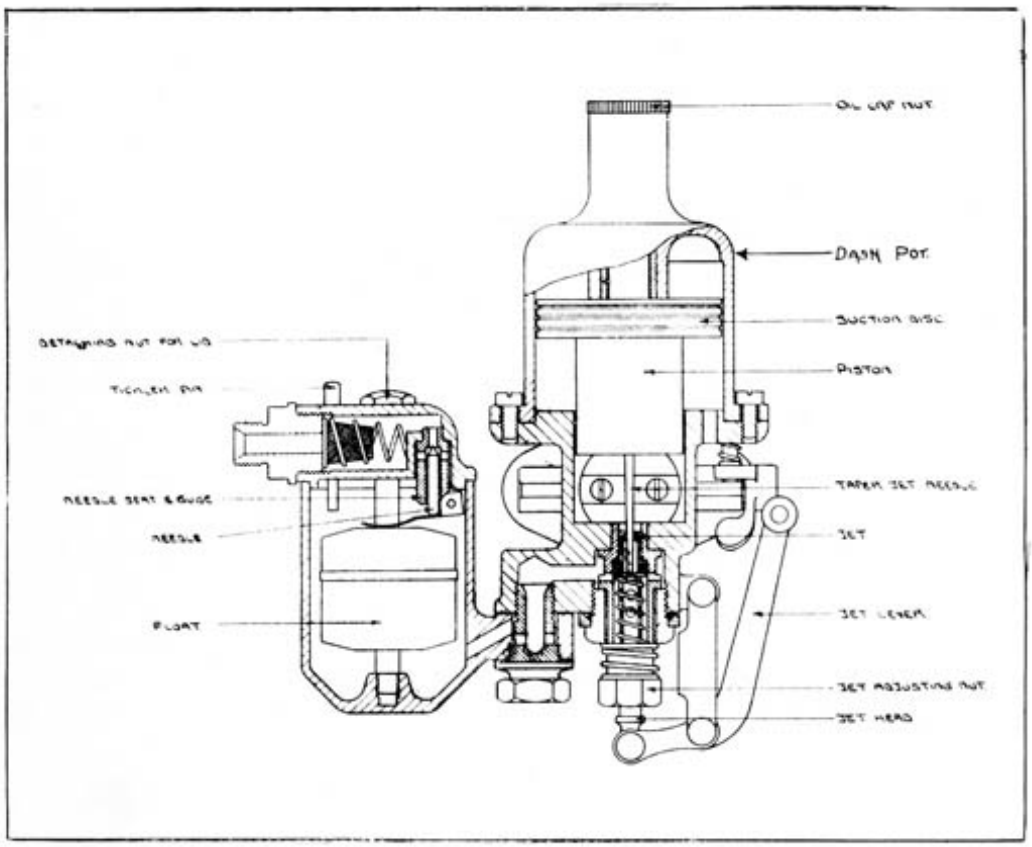
To Replace Magnet. If as a result of a short circuit, the Autopulse will not operate, or if the upper contact points are badly worn, the magnet should be replaced.

Follow instructions given under the heading " To Replace Bellows " and remove the shell, magnet, armature and spring.

Remove the two bolts and nuts holding the armature to the magnet and install a new magnet assembly.

In replacing parts follow carefully the instructions given under " To Replace Armature."

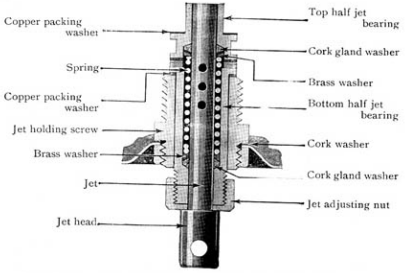
If the Autopulse has not been shorted, and only new upper contact points are required, those having proper facilities for riveting may replace the upper contact bridge only.



The Carburetter. The functioning of the carburretter can be followed in detail by reference to illustration. The petrol flow to the jet is governed by a float mechanism, where the rising petrol lifts the float, forcing it against the guide and needle of the petrol valve in such a way that when the petrol reaches a pre-determined level, the flow is automatically cut off. The lid of the float-chamber man readily be letached after removing the petrol pipe, and undoing the nut in the centre of the top.

Petrol from the float-chamber is led to a jet, the size of whose orifice—and consequent delivery—is regulated by means of a tapered needle attached to a the lower end of a piston controlled by the suction from the engine. As this suction increases the needle is gradually withdrawn from the jet, enlarging its effective opening and permitting it to pass more petrol.

The jet is so mounted that it may readily be moved up or down relative to the tapered needle, in order to weaken or strengthen the mixture over the whole working range, by a lever operated from the mixture control lever on the near side of the dash. This control provides an enriched mixture to ensure easy starting and even running when the engine is cold. The minimum jet opening can accurately be set by means of the adjusting nut, which forms an abutment for the enlarged head of the jet.



An enlarged section of the jet assembly. It will be noticed that the junction between the jet and the jet bearing is rendered perfectly petrol-tight by means of two cork washers which are forced against the sides of the jet by a coil spring and conical washers. If the jet is dismantled great care must be taken not to lose these washers.

The carburetter is extremely simple, and its adjustment is equally simple if it is remembered that the jet is of a fixed standard size and cannot be altered. The only possible adjustment, other than the slow-running adjustment, is the fitting of a new needle of a different size. Since a needle of the correct size is fitted at the Works before the car is dispatched, this adjustment should not be required, and the suction chamber is therefore sealed.

Sources of Trouble. There are only four troubles which may affect the functioning of the S.U. carburetters.

1. The piston may be sticking and not functioning properly.
2. There may be dirt or water in the carburetter.
3. The float mechanism may have become deranged, and the carburetter is in consequence flooding.

Piston Sticking. The suction piston consists of the piston proper forming the choke; the suction disc, into which is inserted the hardened and ground piston rod working in a bearing in the suction chamber; and a tapered needle regulating the jet opening. If the piston is sticking this can easily be ascertained by inserting a finger in the air intake and raising the piston. The piston should come up quite freely and return to its seat with a click as soon as it is released.

A large percentage of the carburetters returned to the Works for correction have had the jet removed and replaced without being correctly centred. On no account should the jet be tampered with.

It is quite an easy matter to bend the needle if the piston is at any time removed, in which case it will bind on the jet and cause the piston to stick. To ascertain if the needle is bent—providing the jet is not out of centre—remove it from the piston, refit the suction chamber on to the body of the carburetter and see if the piston falls freely. If the needle is bent the only satisfactory remedy is to replace it by a new one.

Float-Chamber Flooding. This is usually obvious from the quantity of petrol flowing over the float-chamber and dripping from the air inlet. Flooding is generally caused by foreign matter finding its way on to the seating of the float-chamber needle. It can sometimes be removed by flooding the carburetter with the tickler pin, thus permitting the incoming petrol stream to wash away the particles of grit, otherwise access to the needle is obtained by removing the float-chamber top as previously described. To take out the needle it is necessary first of all to take out the pin which holds the needle guide in position. After taking away the guide the needle will drop straight out; the seating should on no account be ground in.

General. It will be realised from the foregoing that the S.U. carburetter is a very simple instrument and easily managed when understood. On the other hand, considerable damage can be done if it is not treated correctly.

We would emphasise that the four troubles previously outlined are the only ones that can be caused by defects in the carburetter, and if these points are in order the carburetter should on no account be dismantled or altered, since the trouble must lie elsewhere.

Front Fairing. This is held in position by two screws. To remove the fairing these two screws must be taken right out, the fairing then hinges down from the front end.

The equipment is kept in the space directly behind the seats, suitable strips and clips being provided for fixing purposes.

Tyres. The Tyres being one of the most expensive items in the upkeep of a Car, should receive special attention in order that you may receive the utmost service from them.

The most important factor is the maintenance of the correct air pressure, and this should be checked regularly in all five tyres with a reliable pressure gauge once every week, whether the car is used or not. Remember that it is the air that carries the load.

Dunlop Tyres, 4.00" for 19" rims are fitted to the M.G. Midget, and the makers recommended pressures are as follows :—

Front Wheels, 27 lbs. per square inch.
Rear Wheels, 27 lbs. per square inch.

These pressures relate to a car with the two front seats occupied. When rear seats are occupied pressure should be increased in the rear tyres to about 30 lbs.

Oil and Grease. Tyres should never be allowed to stand in a pool of oil, grease or petrol, as these substances are detrimental in their effects on rubber. Any oil or grease should be removed from the tyre as soon as it is noticed, by the use of a rag.

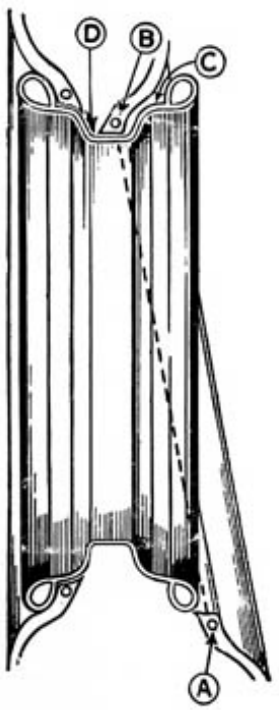
To Remove Tyre. First deflate by removing all the valve parts and push both cover edges into the well of the rim at the part diametrically opposite the valve, then lever the cover edges near the valve over the rim edge. No force is required to do this, but the edges of the cover opposite the valve must be in the well of the rim.

To Fit Tyre. Push one edge of the cover over the edge of the rim. It will go quite easily if the part first put on is pushed right down into the well of the rim.

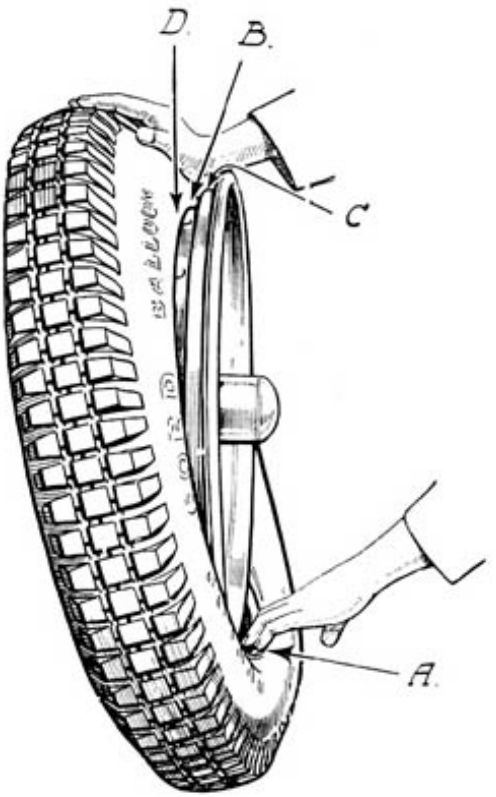
Very slightly inflate the inner tube, do not distend it, place it in the cover with the valve through the hole in the rim. Fit the second edge of the cover, starting at a point diametrically opposite the valve and pushing the edge down into the well of the rim. If this is done the last few inches can be fitted without using levers.

If levers are used do not use force, as this may damage the beads of the tyre.

When inflating see that the edges of the cover are seated evenly round the rim. This can be checked by the line provided on the cover.



A tyre and rim in section, showing on the left the two wired edges of the tyre in position on the shoulders of the rim. The tyre cannot blow off, because the edges are inextensible—neither can the tyre edges be lifted by levers from the rim shoulders over the rim edges. *But* by pushing both the tyre edges down off the rim shoulders into the depressed centre of the rim at "D" then the tyre edge can be easily lifted off the rim at "A." This is an easy and simple operation, and requires no force.



You cannot *pull* the tyre edge at "A" over the rim edge until the tyre edge at "B" is pushed off the rim shoulder "C" down into the well "D," then tyre edge at "A" comes over the rim easily.

Remember the tyre edges are inextensible—force will only damage the tyre and cannot stretch the edge.

TOOLS FOR THE MODEL J2 (Two-Seater).

1 Tool Roll.
1 10" Screwdriver in roll.
1 Adj. Spanner ,, ,,
1 Pair 6" Pliers ,, ,,
1 Tappet Spanner ,, ,,
1 ,, $\frac{3}{8}\times\frac{5}{16}$,, ,,
1 ,, $\frac{1}{2}\times\frac{7}{16}$,, ,,
1 ,, $\frac{1}{4}\times$,, ,,
1 Contact Breaker Spanner.
1 Grease Gun.
1 Tyre Pump.
1 Starting Handle.
1 Hammer for Hubs in roll.
1 Special Engine Spanner in roll.
1 Grease Gun (Hardy Spicer).
1 Plug Spanner.
1 Spanner, $\frac{1}{8}$" Whit. S.E.
1 Spare Lodge Plug.
1 Carrier for above.
1 Licence Holder.
1 Jack with Handle.

TOOLS FOR THE MODEL J1 (Four-Seater and Salonette).

1 Tool Roll.
1 10" Screwdriver in roll.
1 Adj. Spanner ,, ,,
1 Pair 6" Pliers ,, ,,
1 Tappet Spanner ,, ,,
1 ,, $\frac{3}{8}\times\frac{5}{16}$,, ,,
1 ,, $\frac{1}{2}\times\frac{7}{16}$,, ,,
1 ,, $\frac{1}{4}\times$,, ,,
1 Contact Breaker Spanner.
1 Grease Gun.
1 Tyre Pump.
1 Starting Handle.
1 Hammer for Hubs in roll.
1 Special Engine Spanner in roll.
1 Grease Gun (Hardy Spicer).
1 Plug Spanner.
1 Spanner, $\frac{1}{8}$" Whit. S.E.
1 Spare Lodge Plug.
1 Carrier for above.
1 Licence Holder.
1 Dip Stick.
1 Jack with Handle.

The tools on the J2 Two-Seater Model are neatly packed away behind the seat squab, and on the J1 Four-Seater and Saloon Models in the tool box which is accessible when the bonnet is lifted.