The Manual of the



Magnette

(Two- & Three-Carburetter Models)

Price 15/-

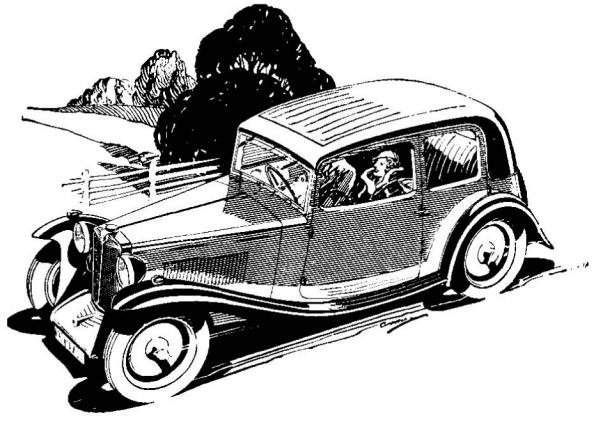
Instruction Manual

for the

Magnette

(KA/KD TYPES)

Two- and Three-Carburetter Models



The M.G. Car Company Ltd.

Telephone 251 *Telegrams "Emgee"*

Abingdon-on-Thames

MISCELLANEOUS DRIVING HINTS

Do read this *Manual* thoroughly and carefully and follow out the instructions laid down.

Do use the gears freely, particularly on hills and when accelerating after corners, in traffic, etc.

Do free the engine by hand when cold before using the starter.

Do not race the engine when it is cold ; this will shorten considerably the life of pistons and bearings, and may even result in piston seizure. At the same time do not allow it to idle, this is equally injurious. The best warming up speed is 1000 r.p.m.

Do not run the engine with the mixture control in the rich position longer than necessary.

Do avoid " harsh " driving, particularly when braking ; the M.G. brakes are smooth and powerful and need never be " stamped on."

Do please drive slowly in the vicinity of the factory when visiting us.

Do retard the ignition before starting the engine.

Do write to us or come and see us (by appointment, please) when in any difficulty.

Do not allow the engine to " pink."

Do not slip the clutch except when actually starting off or changing gear ; change down in traffic, to bottom gear if necessary.

Do not subject the tyres to glancing blows from the kerb when drawing up beside the pavement ; this may interfere with wheel alignment and have a serious effect on steering and tyre life.

Do not lean on open doors.

Do not under any circumstances allow the oil level to fall below half full ; it is best to keep it always up to three-quarters at least.

Do not mix different brands of oil in the sump.

Do not allow the engine to labour.

Do not forget to top up the battery regularly.

Do not forget to turn the petrol tap back to the main position after refilling the tank.

Do not leave the headlamps alight when the car is stationary at night ; this drains the battery unnecessarily and is very discourteous to other road users.

Do not try to improve your car's performance by altering the ignition timing or interfering in any way with standard settings and adjustments. The makers know best.

Do not forget to lubricate clutch thrust.

Do always quote model, year, engine and chassis numbers when writing. **This is very important.**

See Hints at the end of Pre-selector Gearbox section.

FOREWORD

The object of this Instruction Book is to place the owner in possession of as much detailed information as is possible concerning the "K" Type M.G. Magnette. It is intended first of all in the early chapters to afford a pictorial survey of the chassis generally, and the book is so arranged that all the essential information and instructions necessary to maintain the car in efficient condition are contained in the early part. The remaining chapters contain more detailed information which it is hoped will prove of interest to most owners, including details of both the manual and pre-selector type gearboxes.

The time arises when a car has to be dismantled, and it is then that the reference to the Instruction Book can be of considerable value, as it points out both to the owner and repair shops, unacquainted with the construction of the car, the correct method of procedure.

There are a number of adjustments that have to be carried out from time to time such as adjusting the valves and brakes, and more detailed information is given upon these points separately. The book is provided with a comprehensive index, to which reference should be made, as it is quite possible that either illustrations or reading matter concerning the same parts may come under different headings. Should at any time the owner fail to find the particular instruction he requires in the Instruction Book, it is hoped he will not hesitate to communicate with the Service Department at Abingdon, who will always be only too ready to afford any assistance they can at any time.

SECOND EDITION REVISED MARCH, 1934.

GENERAL INFORMATION

R.A.C. Rating : 12 h.p. **Tax :** £12 per annum.

K.A. Reference.	K.D. Reference.
Bore : 57 mm.	**Bore :** 57 mm.
Stroke : 71 mm.	**Stroke :** 71 mm.
Cubic Capacity : 1087 c.c.	**Cubic Capacity :** 1286 c.c.

Valve Timing (see page 29).

	K1 Tourer.	K2.	K1 Saloon.
Inlet opens	15°	15°	T.D.C. Before T.D.C.
Inlet closes	55°	55°	47° After B.D.C.
Exhaust opens	50°	50°	40° Before B.D.C.
Exhaust closes	20°	20°	7° After T.D.C.

Engine Firing Order : 1, 4, 2, 6, 3, 5.

Plugs : 14 mm.

	Saloon.	Four-seater.	Two-seater.
Weight (unladen) ...	21 cwt. 1 qr.	19 cwt. 1 qr.	17 cwt.
Wheelbase	9′ 0″	9′ 0″	7′ $10\frac{3}{16}$″
Track	4′ 8″	4′ 8″	4′ 8″
Overall Length ...	12′ $6\frac{1}{2}$″	12′ $6\frac{1}{2}$″	11′ 8″
Overall Width ...	4′ $10\frac{1}{2}$″	4′ $10\frac{1}{2}$″	4′ $10\frac{1}{2}$″
Overall Height ...	4′ $9\frac{1}{2}$″	4′ 6″	4′ 6″

Gear Ratios.	Saloon with pre-selector box.		Four-seater and Two-seater with manual box.	
Top		5.78—1		5.78—1
3rd	1.34—1	8.44—1	1.36—1	7.86—1
2nd	2.0 —1	12.9 —1	2.14—1	12.38—1
1st	3.4 —1	22.55—1	3.58—1	20.7 —1

Marked Tyre Size : 4.75″×19″ Fort Dunlop. Actual effect in dia.=27.5″.

Tyre Pressures.

Two-seater	35 Fronts.	37 Rears.
Four-seater	33 ,,	35 ,,
Saloon	35 ,,	37 ,,

Back Axle Ratio : 5.78—1 K1 and K2.
Electrical Equipment : 12-v.
Headlamps : Lucas L150, Bulbs BAS35.
Sidelamp and Tail-lamp : Bulbs BAS105.
Battery Specific Gravity : 1285—1300 fully charged.
Horns : Lucas Altette HF317.

IMPORTANT POINTS CONCERNING LUBRICATION

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 dipstick. **Under no circumstances should the car be driven fast on the lower gears or exceeding 40 miles an hour on top gear during the first 500 miles.** At the end of this period the engine oil should be drained and the base chamber refilled with new oil. The oil filters (one in the sump and the Tecalemit unit), which will be referred to later should be removed, the suction filter in the sump washed out with petrol, and the spare Tecalemit element should be fitted in place of the used one.

It is inadvisable to run a cold engine fast until the oil has had an opportunity of 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 may drop 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. The gear type pump lubricates the whole of the engine including the valve gear.

The gearbox and rear axle are provided with hexagon-shape filler caps. Indication of the height level to which oil should be filled is provided, preventing overfilling. It must be remembered that the car should not be moved in any way when the gearbox and back axle are filled, otherwise additional lubricant may be carried round by the teeth of the gears, thus causing the housings to contain more oil than they need and above the proper level.

Chassis fittings are conveniently lubricated from six oil nipples, three on either side of the car, which are to be found on the brackets supporting the dashboard. The bonnet has to be lifted and the nipples fed with gear oil by means of the **large oilgun.** Reference to the plates attached to the dashboard 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 anchorages, the steering box and column and the brake cross shaft. The brake operating spindles which pass through the brake-drums require no lubrication. The steering head pins and the track rod and other steering ball socket joints need lubricating separately. **Only use Shell Gear Oil in the large oilgun.**

A two-colour lubricating chart is provided herewith indicating the lubrication that is carried out from the central dashboard 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 only point that cannot be normally seen is the clutch thrust lubricator, but this will be dealt with on page 60, from which it follows that the clutch inspection cover has to be removed before the thrust can be lubricated, which requires attention every 2000 miles minimum.

The following lubricants are recommended by the Company :

Approved Engine Oils.—Every M.G. Magnette is tested on Duckham's Adcol "NP5" Aero and the sump and spare quart tin are filled with the same brand when the car is issued new. We very strongly recommend the use of this oil, both in Summer and Winter.

On the rare occasions when this oil cannot be obtained the following oils are approved for use :—

Duckham's Adcol " NP3 " Summer and Winter.
Wakefield Castrol " XL " Winter, " XXL " Summer.
Filtrate Sports Winter and Summer.
Mobiloil " AF " Winter, " D " Summer.
Pratts' Essolube Racer Summer and Winter.
Price's Motorine " C " de Luxe Summer and Winter.
Shell Triple or Aero Shell Summer and Winter.
Speedolene Aero Engine Oil Summer and Winter.
Sternol " WW " Heavy Summer and Winter.

Under no circumstances are a mineral and vegetable base oil to be mixed in the engine.

Gearbox and Back Axle.—As in the case of engine oils, we recommend the use of Duckham's oil, the particular brand for the gearbox and back axle being:—

Pre-selector Gearbox. **Duckham's Adcol " NP3."**
Filtrate " S.C."
Wakefield's Castrol " F."

Manual Gearbox and Back Axle.

Duckham's Gear Oil " N."	Pratts' Super Gear Oil.
Castrol Swanshot Gear Oil.	Price's Motorine Amber " B."
Filtrate Gear Oil.	Shell Gear Oil.
Mobiloil " C " (Gearbox " CW ").	Speedolene " H."

Hub Grease. Duckham's Adcol " HBB."

Universal Joints. Duckham's Hardy Spicer Grease.

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 instructions of the lubricating system of the engine will be found on pages 48 and 51, which deal 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 50.

We will now leave the general lubrication summary with the advice to **use only recommended oils whenever obtainable.** Keep the receptacle that is used for filling clean and covered, and also wash round back axle and gearbox filler caps before these are unscrewed. **The gearbox and back axle should be refilled for preference after the car has been running some time, so that the lubricant has had a chance to become fluid.**

THE M.G. MAGNETTE

CHASSIS DETAILS

General Survey. As soon as the owner receives his car it is advisable to make himself familiar with its general mechanical details, and in order to assist in this as much as possible, it has been thought advisable to take a general pictorial survey of the chassis, in particular those parts that cannot be seen after the body has been fitted.

The view shown in Illustration No. I is perhaps a little unconventional to some people, but it is the view obtained by looking at a chassis from underneath. The petrol tank is not in position, but the undershield beneath the gearbox and front passenger's compartment can be seen. Certain views taken from below will be described later, more particularly the front and rear axles.

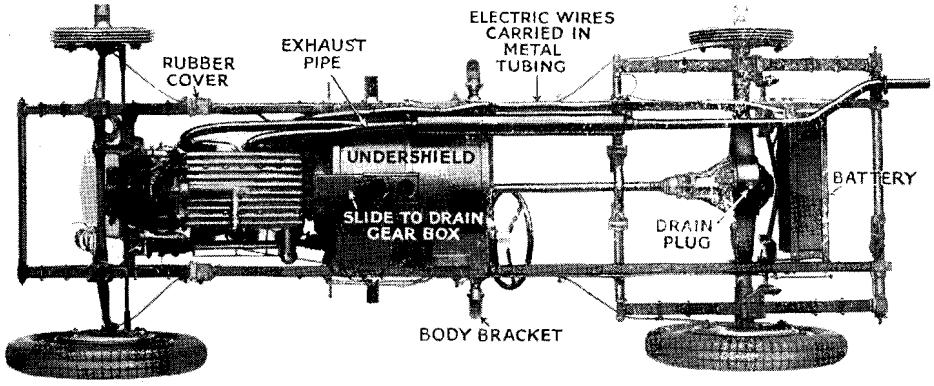


Illustration 1.—View of the M.G. Magnette chassis as seen from below. As the position of batteries differs on models, these must be considered as of one type only. It is possible to see from this illustration the position of the slide to obtain access through the undershield which is fitted only with manual type gearboxes to drain the gearbox. The suspension can be examined and the manner in which the wiring is carried out in flexible metal tubing.

It will be noticed that the undershield is fitted with a slide, which should be pushed forward in order to obtain access to the gearbox drain plug, which can be removed by using a box spanner. The body is mounted on extension brackets attached to the outside of the frame, these extension brackets can be seen in the illustration. It will also be seen that semi-elliptic springs are fitted fore and aft.

In order to obtain a better view of the chassis, it has been found desirable to remove unnecessary fittings such as wings, wheels, etc.

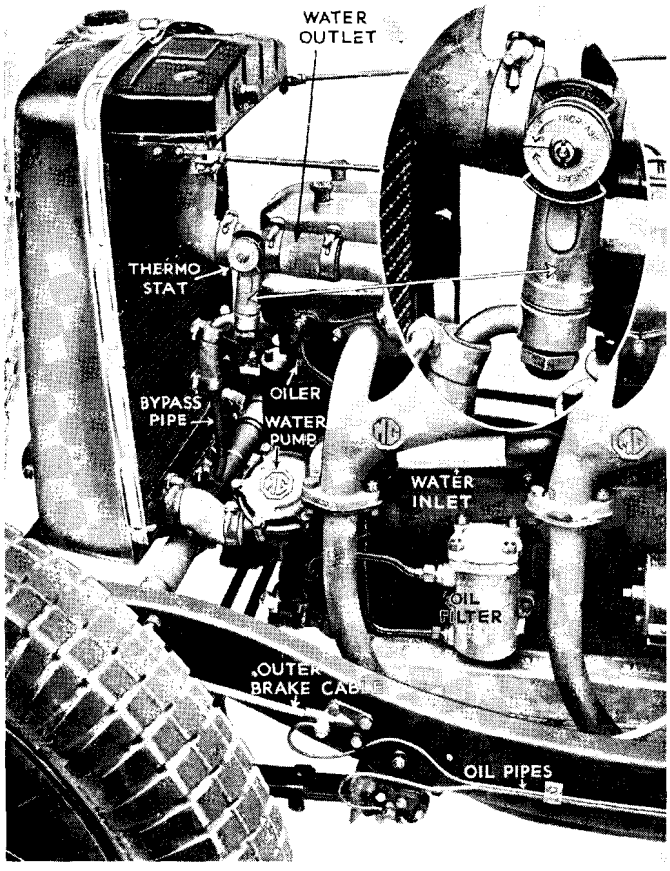


Illustration 2.—Near-side front view of the engine mounted in the frame, showing the position of the dynamo and water pump, the manner in which the frame is upswept over the axle and details of the suspension. Note the position of the oil filter. The insert shows the thermostat for controlling the temperature of the water.

Illustrations Nos. 2 and 3 are two separate views of the near-side of the engine. No. 2 particularly shows the upsweep of the frame over the front axle, the mounting of the radiator and the two water connections to the engine. Cooling is by water pump, which is driven direct from the timing gears. The water pump is shown in the illustration coupled to the radiator by means of a rubber hose.

On certain models an adjustable thermostat is fitted to control the water temperature.

It will be seen from this illustration that the dynamo, which is placed vertically and driven from the front end of the engine, has a coupling at its upper extremity which in turn operates the overhead camshaft.

This illustration indicates the position of the oil relief valve, which is situated on top of the oil pump, and the relationship of the latter to the Tecalemit oil filter.

A rubber buffer is placed between the frame and the front axle, and the position where the brake cable passes through the frame will be seen, as well as the oil pipes which lubricate the spring anchorage.

One small pipe in front of the engine should be noted. This is the oil delivery pipe from the pump to the overhead valve gear. This particular unit will be dealt with separately.

Illustration No. 3 shows another view of the near-side of the engine and chassis and the manner in which the exhaust manifold and water outlet pipe are bolted to the cylinder block. It will be seen that the exhaust manifold is formed into two branches which unite at a point underneath the undershield which is in front of the silencer, as can be seen by referring to Illustration No. 1.

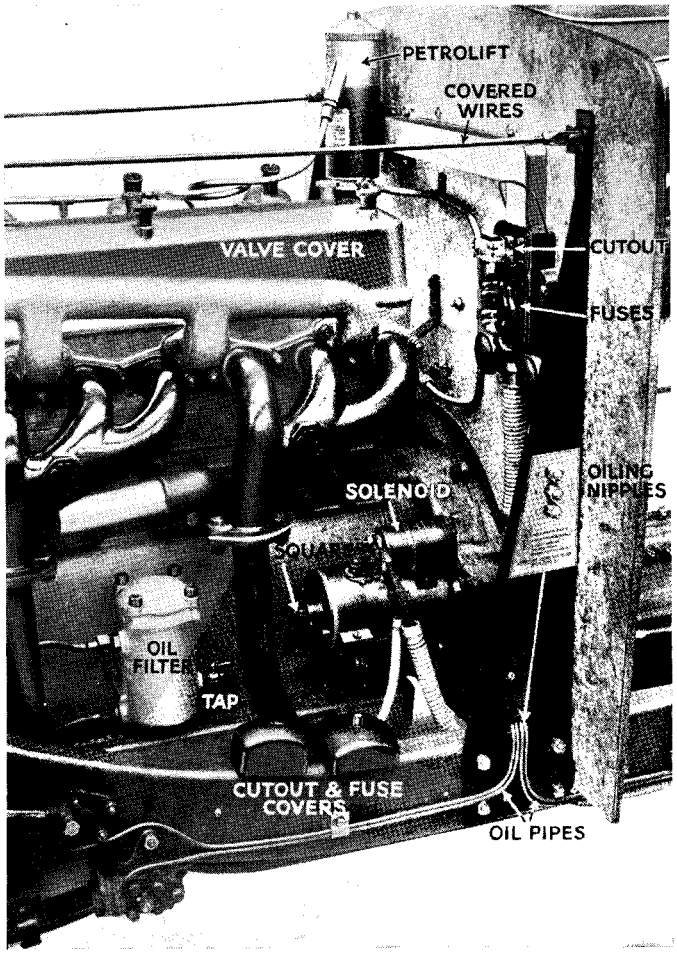


Illustration 3.—Rear view of the near-side of the engine, showing position of the self-starter operated through the solenoid. The centralised position of the oiling nipples will be seen on the dashboard bracket from which pipes convey lubricant, as shown on the oiling diagram. The electrical wires are enclosed and the cut-out and fusebox covers have been removed to disclose these fittings on the dashboard.

The Tecalemit oil filter can be seen and the tap has been replaced by a plug on later models.

The self-starter is situated on this side of the engine, being attached to the flywheel housing, the action of the self-starter being controlled by a solenoid. A number of details of the electrical equipment can be seen, including position of the cut-out and fuses, the wires from which are carried in a covered casing.

We will now pass to Illustration No. 4, which is a view of the off-side of the engine, as shown when fitted in the frame. The oil filler, as will be seen, is situated towards the rear end of the engine, and just in front of this a dipstick is provided in order to test the level of the oil in the engine from time to time. Whenever the dipstick is removed, first of all wipe it clean, insert, and a correct reading can be taken after removal. The oil gauge on the dashboard which indicates the engine oil pressure is coupled up to a tap situated close to the oil dipstick, as shown in the illustration, which makes it possible to cut off the oil from the gauge, should necessity arise.

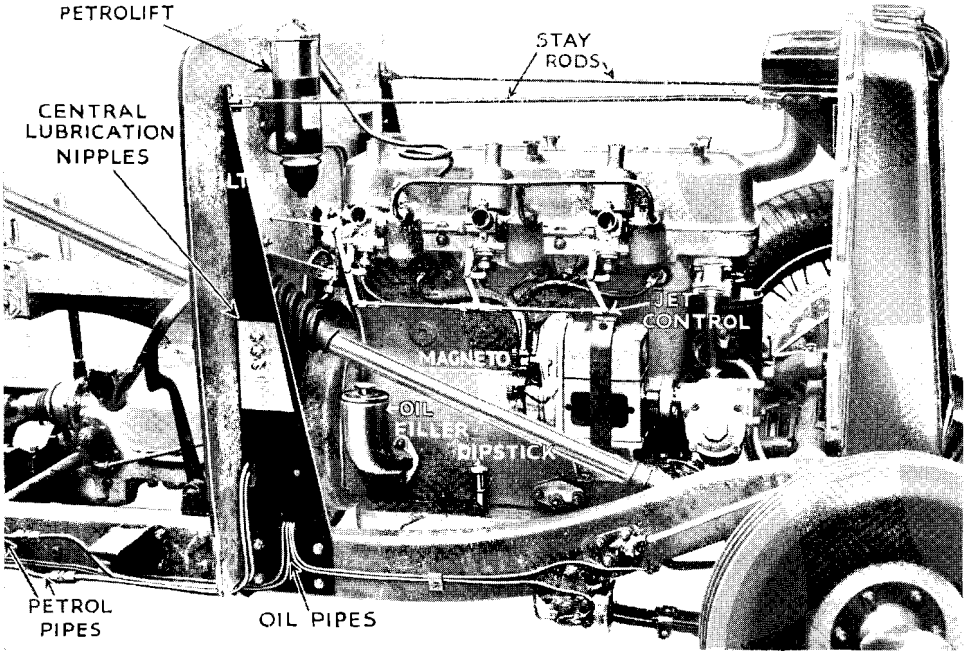


Illustration 4.—General off-side view of the engine and chassis before the body is mounted. The central lubrication nipples and pipes are clearly shown, as well as the petrol feed pipe to the change-over tap; the bottom bowl of the Petrolift acts as a filter. It will be noted that the carburetters are set slightly at an angle, giving access to the sparking plugs.
The lubrication details can also be studied, viz. the position of the engine oil filler and dipstick.

At the top left of the illustration, the Petrolift will be noticed, which is electrically operated. The lubrication of the spring anchorages and certain other parts are carried out from the centrally located oil nipples A, B and C attached to the dashboard bracket. These will be seen on referring to the oiling chart, those on the near-side being marked D, E and F.

There is a description upon the plate on the dashboard bracket, carrying three nipples, which are referred to in the oiling chart as A, B and C, indicating the correct lubrication and part which each nipple supplies. The pipes can be seen in the illustration attached to the side member of the frame. The radiator and dashboard are tied together by means of stay rods which are adjustable.

This illustration also shows the magneto and the three carburetters in position. The carburetters are supplied with petrol from the Petrolift, which is provided with a filter which consists of a metal bowl at the base of the Petrolift. The removal of the filter is effected by unscrewing the bottom nut. The petrol feed pipes will be seen on the left-hand bottom corner of the illustration ; unions are situated just behind the body bracket to permit of their removal from time to time.
(Later models are fitted with a petrol pump, details of which are to be found at the end of this manual.)

Momentary reference should be made to the jet control levers of the three carburetters. If ever jets are adjusted, it is necessary to remove the pins in the jet control rods, so as to give effect to the adjustments, but this matter will be referred to later.

Illustration No. 5 is a close-up view of the off-side of the front of the engine and contains a number of points with which the owner should familiarise himself. There is first of all an oil level dipstick, which has already been referred to, the next important point is the water drain tap which empties the radiator ; this tap is actually beneath the radiator and is only indicated in the illustration to draw attention to it. In addition to this drain tap, it will be seen on Illustration No. 31 that there is another tap towards the rear of the cylinder block. It is necessary when draining the water to turn on both the taps, so as to be sure of draining the cylinder block as well. Remove radiator cap while draining and leave it off till the radiator is refilled.

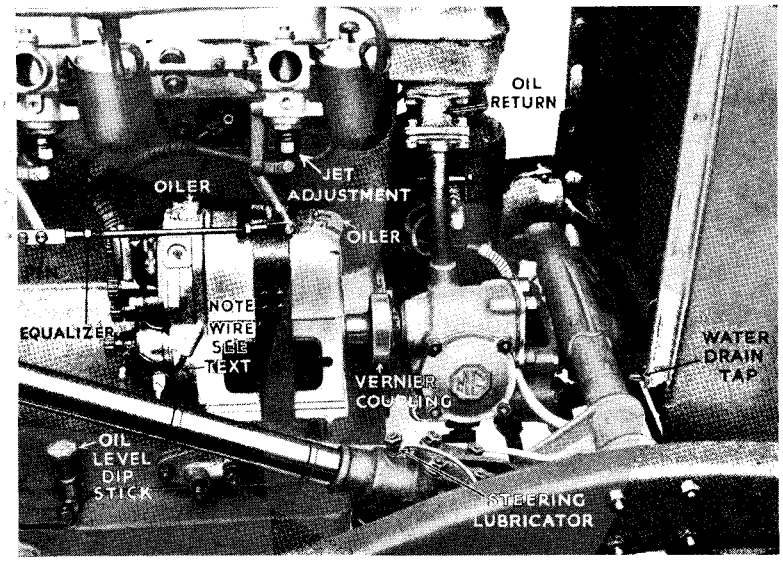


Illustration 5.—A more detailed view of the components of the off-side of the engine. The water drain tap is placed below the radiator (also shown in Illustration No. 14). The position of the magneto drive through vernier coupling can be studied. It will be noted that there is an external wire coupling from the interior of the magneto to the contact breaker and cover. Never attempt to start the engine with the contact cover off. The jet control to the carburetter can be seen, and if ever it is necessary to adjust the jets, it is necessary to remove the pins from the levers and adjust the equaliser rod.

The magneto is mounted on a bracket and driven through a train of gears by means of coupling with vernier adjustment, so that if ever the magneto is removed, it can be replaced without altering the timing gears. It is fitted with two points for lubrication (this should be carried out sparingly and with special oil), the oiling holes being covered by spring-loaded caps.

Special attention is drawn in the illustration to a wire which passes to the rear contact breaker cover. This wire is attached to the same terminal as the earth or switch wire, and it is **impossible** to start the engine if ever the contact breaker cover is left off.

No mention has so far been made of the lubrication details of the engine, except the fact that oil is delivered from the pump to the overhead valves operating mechanism. It stands to reason, of course, that oil which is so delivered will have to be returned to the sump, and this is effected by means of two external pipes, one of which is shown in Illustration No. 5. The oil return conducts oil in the magneto timing gearcase, so that this is virtually automatically lubricated.

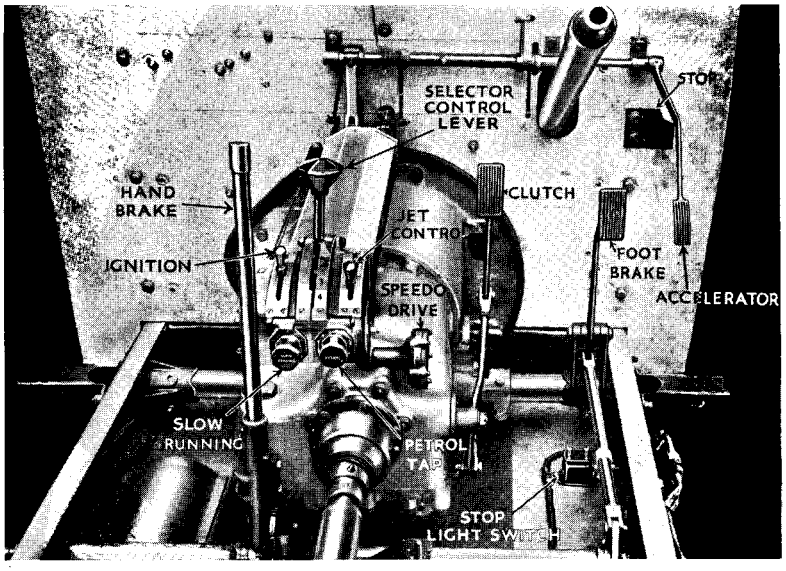


Illustration 6.—Central view of the chassis, showing the gearbox mounting (pre-selector model); the details of all the various levers can be studied and the location of the stop light switch.

The next point in Illustration No. 5 is the steering gearbox, which is attached to a bracket on the front cross member of the frame. It will be seen that the steering box is lubricated from the central lubricating nipple C.

The next illustration, No. 6, deals particularly with the view of the dashboard, steering column, clutch, brake, and accelerator pedals, gearbox and the general controls of the car, including ignition control. The ignition and jet controls are operated by two small levers situated alongside the change speed lever. The hand brake lever is on the near-side of the gearbox.

The actual illustration is of a chassis fitted with pre-selected gearbox, and the gear control lever will be seen at the end of the remote control tunnel. The owner should realise that the petrol tap is brought close to him, whereby the control of the main and reserve petrol feeds can be switched over while the car is in motion by simply turning the knob on the right-hand side of the tunnel. The slow-running control is placed on the opposite side. Both controls are clearly marked. The stoplight switch controlling the stoplight to the rear of the car is coupled direct to the foot brake-rod.

The speedometer is driven from the rear of the gearbox immediately in front of the universal joint. The latter is coupled to the front end of the propeller shaft by means of a splined telescopic joint, allowing for the rise and fall of the rear axle and the movement of the rear springs.

Continuing the general survey of the portion of the chassis which is entirely covered by the body, reference should be made to Illustration No. 7. A separate illustration, No. 8, has been prepared to cover the lubrication points more clearly, as well as the petrol feed line in the off-side of the frame.

Illustration No. 7 shows the gearbox attached in the frame by means of a tubular cross member which passes through the bell housing which unites the engine to the gearbox. It also shows the change speed lever and the remote control.

In order to prevent any fumes from the engine entering the driving compartment of the car, the flywheel housing is fitted with a rubber ring which seals the space between it and the metal covered dashboard. In both types of gearbox employed in this chassis, the filler orifice is situated on the near-side.

The adjustment for taking up wear of the hand brake is effected by means of a thumb screw adjuster situated at the base of the hand brake lever, clockwise rotation being applied to tighten the brake. Extension body brackets are mounted on the frame as shown. The electric wires from the battery are carried in a metal conduit situated underneath the frame on the near-side. The propeller shaft is normally entirely covered by a shaft tunnel, the forward mounting of which is shown in Illustration No. 7. This shaft tunnel has a hole drilled in it through which the **small** oilgun is introduced to lubricate the front universal joint.

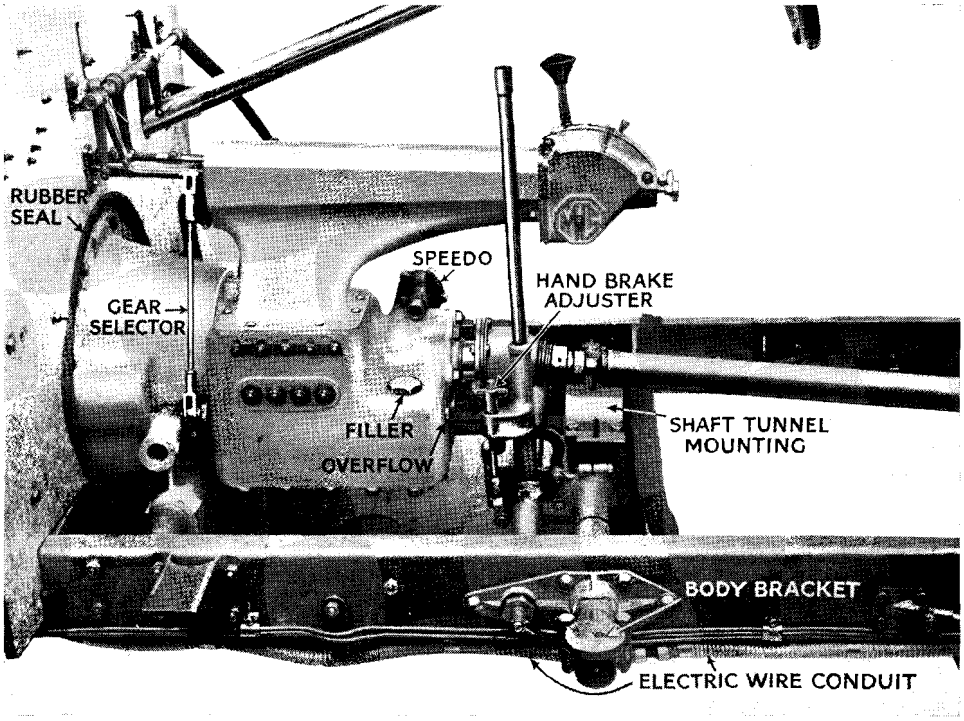
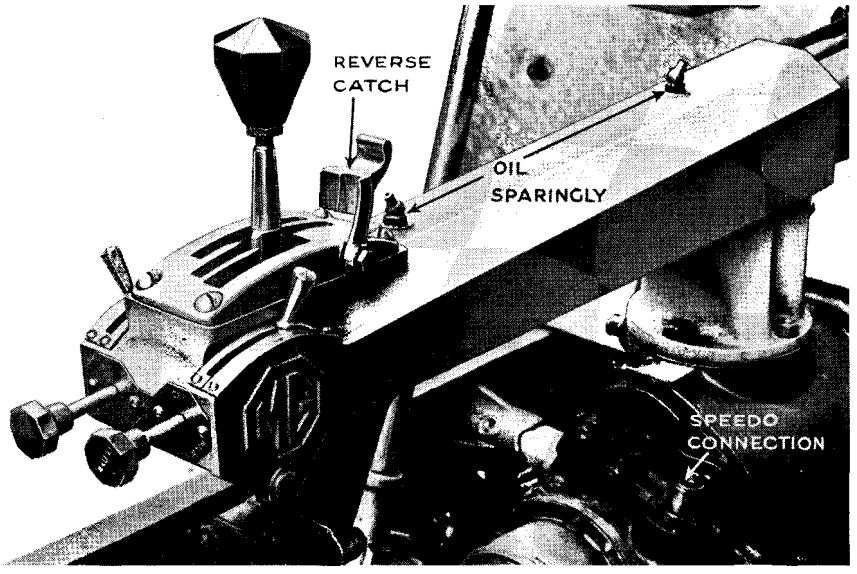
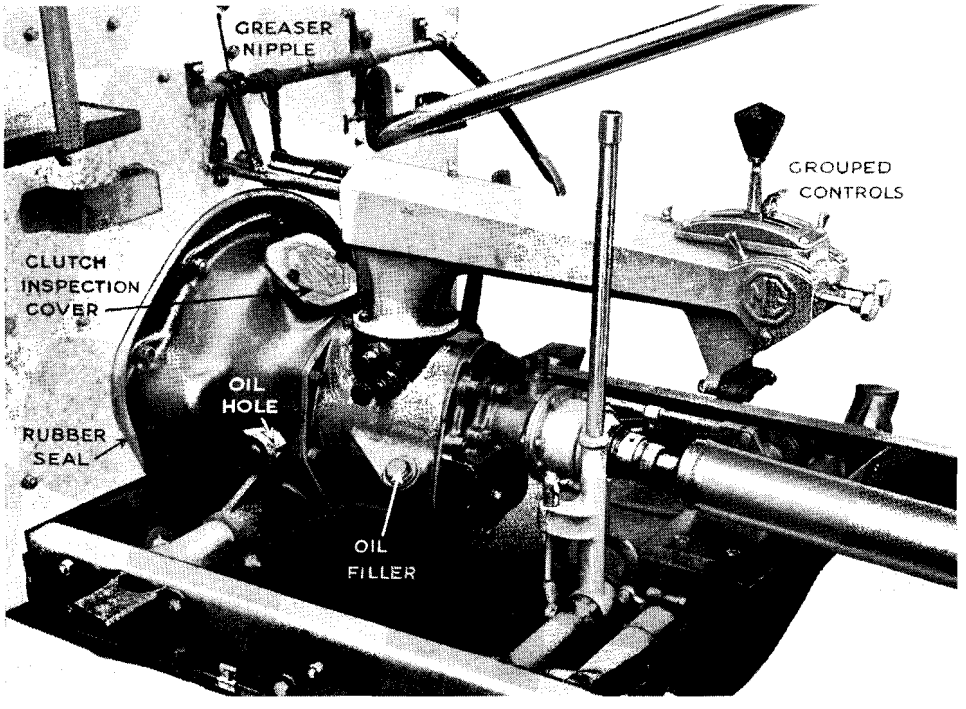


Illustration 7.—View of the near-side with the central portion of the chassis showing the gearbox and pre-selector gear control. The filler plug should be noted, and when this is used the overflow plug must be unscrewed so as not to overfill the gearbox. Various other details of the chassis can be seen, viz. body mounting bracket, electrical wire conduits, the hand brake adjuster and the bracket to which the shaft tunnel is mounted.



Gearbox extension with remote gear control showing reverse catch and speedometer connection.



General view of manual gearbox mounted in the frame, showing oil filler and grouped controls.

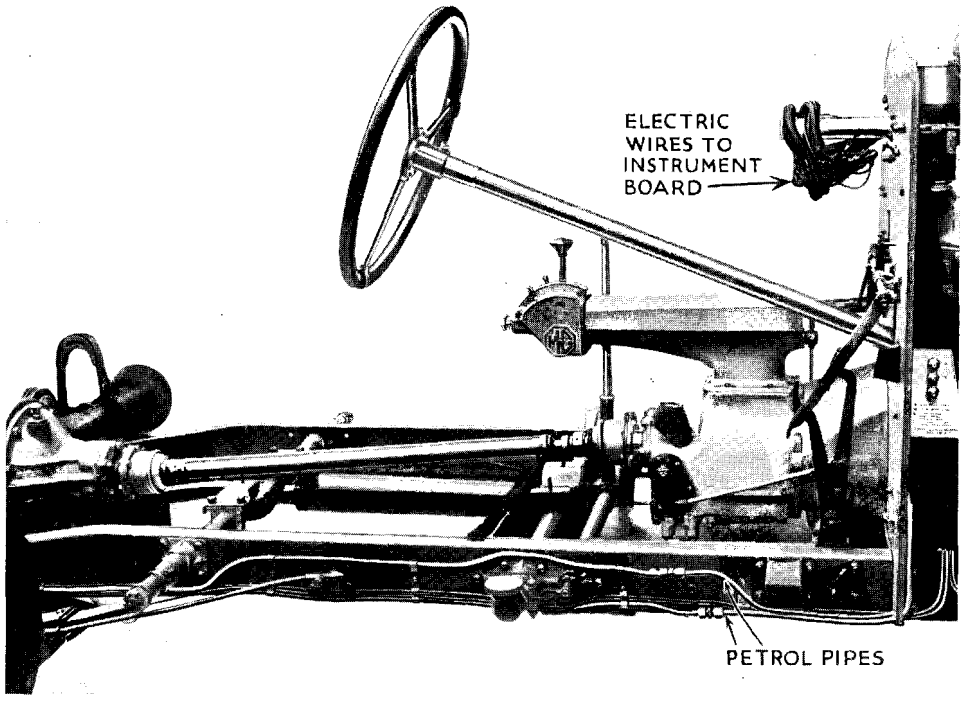


Illustration 8.—Off-side view of the M.G. Magnette chassis, showing position of petrol feed pipes and unions and the manner in which the electric wires are carried out in a conduit to the instrument board. It should be realised that universal joints are enclosed beneath the shaft tunnel, and that they require lubrication occasionally through holes suitably provided.

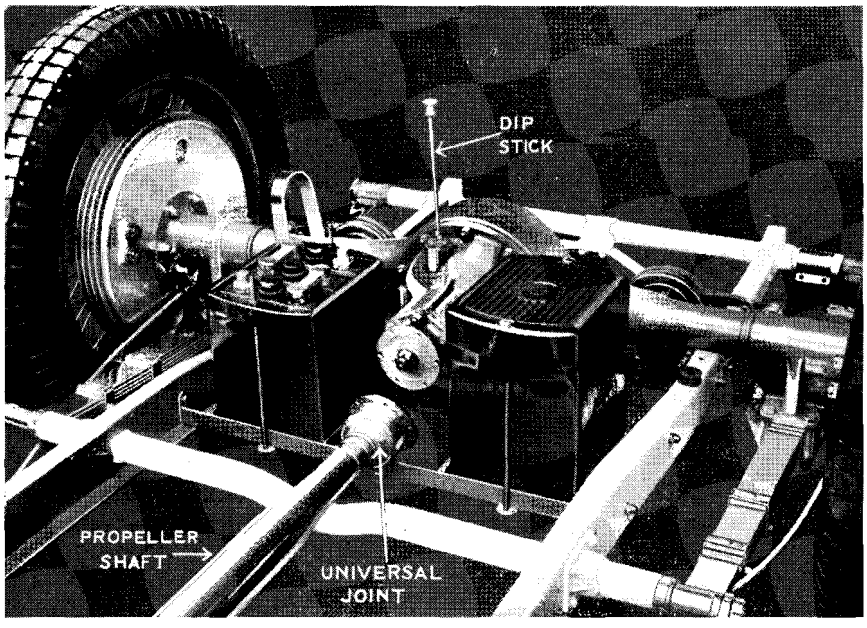


Illustration 9.—View of the rear end of the chassis, showing location of the batteries when these are fitted forward of the axle in two 6-volt units. The tubular propeller shaft has purposely been disconnected from the axle to indicate the flange fitting; access to the batteries and rear axle filler and dipstick can easily be obtained under the rear seat.

A separate illustration, No. 8, has been prepared to cover the lubrication points more clearly, as well as the petrol feed line in the off-side of the frame.

It will be seen in this illustration that the clutch pedal is directly coupled to a lever on the gearbox by means of a rod, which in the case of pre-selected boxes does not actually operate a clutch as in the ordinary accepted sense of the term. The effect, however, is the same, as it disengages the transmission of power from the engine to the rear axle.

The rear cross member has extensions on either side in which the rear end of the rear springs are located, as seen in Illustration No. 9. The petrol tank is, in point of fact, actually supported in the body. The two petrol feed pipes couple up the main and reserve supplies.

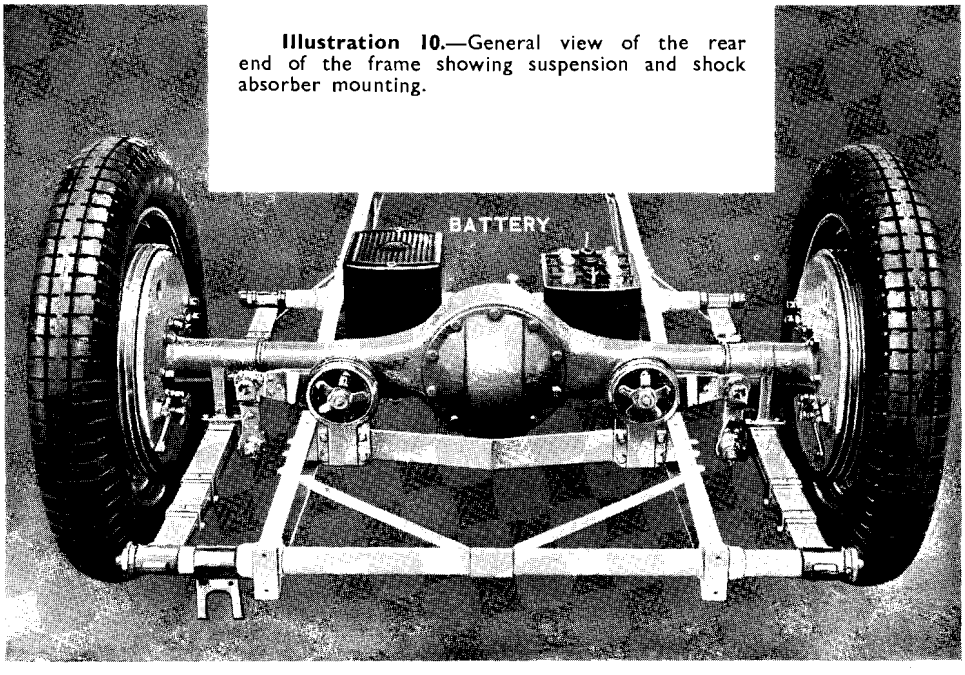


Illustration 10.—General view of the rear end of the frame showing suspension and shock absorber mounting.

Illustration No. 9 is a view of the rear end of the frame as seen after the body has been removed. It shows the propeller shaft uncoupled from the rear axle ; the position of the batteries will be noticed and the fact that two 6-volt units are employed, coupled in series to make a 12-volt unit. Care should be exercised to see that the nuts which hold the battery lids in position are secure, after the batteries have been filled up with distilled water on regular occasions. The fact that the battery is temporarily out of sight sometimes leads to its neglect. Removal of the rear seat pan will afford access to the batteries and to the rear axle filler, which is combined with a level dipstick to show exactly how much oil the axle actually contains.

Illustration No. 10 is the opposite view of the rear axle seen from the rear of the chassis. Particular instructions will be given subsequently of points that can be seen in this illustration, including the shock absorbers, rear brakes, and spring anchorage lubrication.

Illustration No. 11 is a close-up view of the rear end of the chassis, showing particularly one side of the rear axle. It will be noticed that there is a rubber-lined rebound clip which limits the travel of the rear axle upwards when passing over very bad roads, and there is a rubber buffer on the frame as well to cushion any shock in the opposite direction. It will be seen that the shock absorbers are mounted on a stabilising cross member, the tension of the shock absorbers being obtained by tightening the central nut in a clockwise direction.

The brake cable passes to the anchorage underneath the axle, and the manner In which the rear brakes are applied can clearly be seen.

Illustration No. 12 is a view well worth studying, as it shows that the springs are attached to the rear axle and the manner in which the lubrication pipes convey oil to the points of suspension from the central dashboard nipples.

On previous illustrations the batteries are situated in front of the axle. In some models they are situated behind the axle in the manner shown.

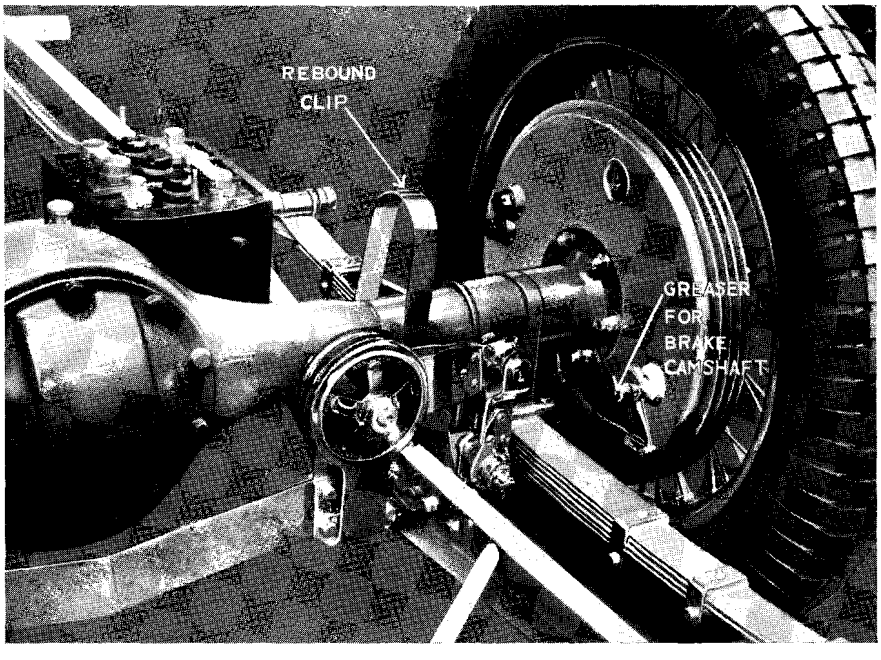


Illustration 11.—Close-up view of the rear axle showing detachable cover-plate. The shock absorbers are mounted on the cross member and the rebound of the axle is limited by the clip.

On later models the greaser is not provided for the rear brake camshaft.

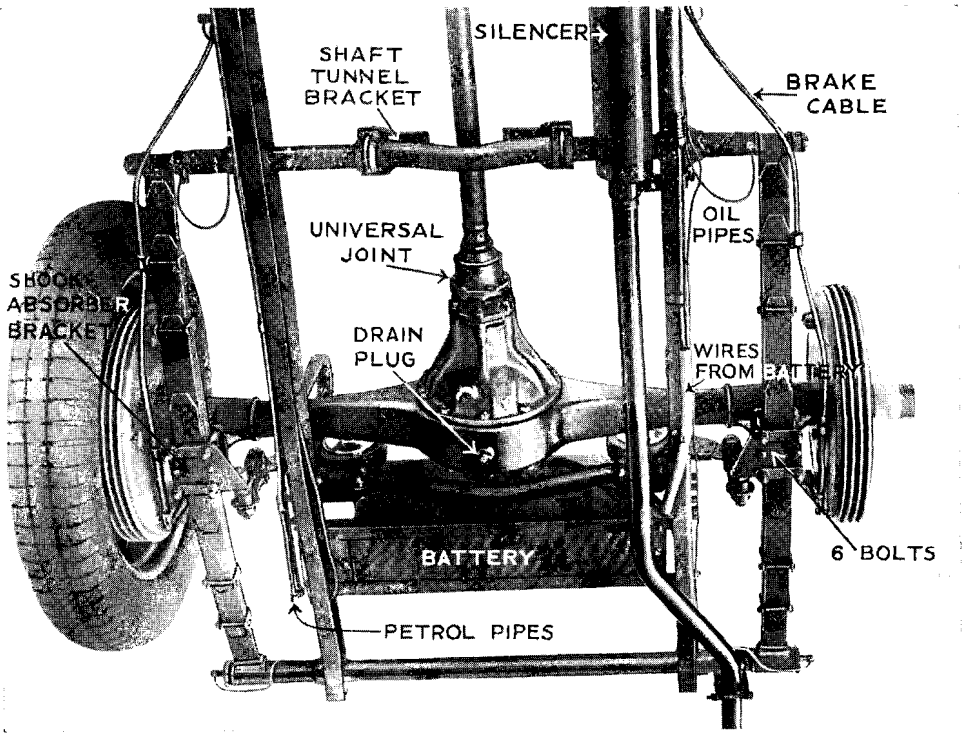


Illustration 12.—View of the chassis as seen from below. The shock absorber bracket forms part of the rear spring mounting. The springs are attached by means of four large bolts, the two smaller bolts preventing the leaves from separating. The brake cable attachments to the rear brakes will also be noted, as well as the petrol pipe unions at the rear end of the line. Rear axle drain plug should be noted.

Steering. As the majority of the parts of the steering layout are normally out of view, it is as well that the owner should become familiar with the design and principle, so as to be able to carry out his part of lubrication, and in the event of any accidental damage occurring to see exactly how the parts are mounted. The steering box proper is attached to a bracket on a cross member of the frame and is fitted with a drop arm which is coupled to a transverse pull and push rod. This will be seen in subsequent illustrations, but the view shown in Illustration No. 13 is of the steering bracket and the off-side steering arm, which is in turn coupled to the steering head and the track rod. Every articulating joint of the steering is 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.

It is essential that anyone removing one of the divided track rods should see that it is replaced the correct way round.

On examining the track rod it will be found that the ball joint at one end of the rod is loaded by a coil spring, and at the other end by a coil spring washer.

The end with the double coil spring washer should be fitted to the triple steering arm.

The end with the coil spring should be fitted to the steering knuckle arms.

The draglink from the steering gear to the triple steering arm is fitted as standard with the long ball end at the steering gear, and the short ball end at the triple steering arm. This could be reversed without doing any harm, but as there is no object in reversing it, the standard position should be adhered to.

All steering connections should be lubricated with gear oil.

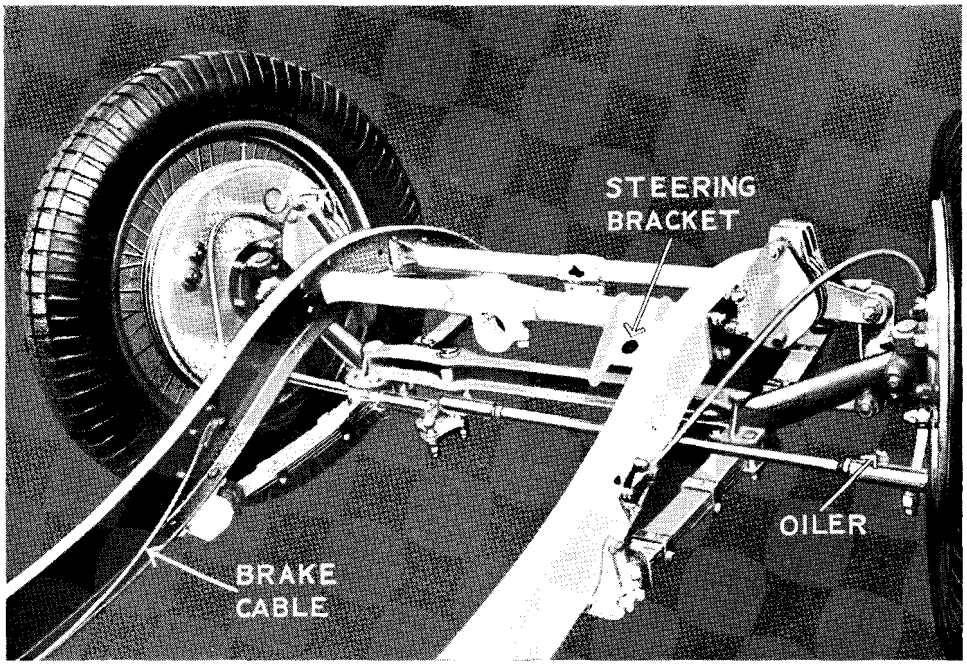


Illustration 13.—Front end view of the frame after the engine has been removed ; the brake cables pass through the chassis as shown. The front cross member is utilised to support the engine and the steering bracket is indicated: the oiling nipples on the steering rods should be examined.

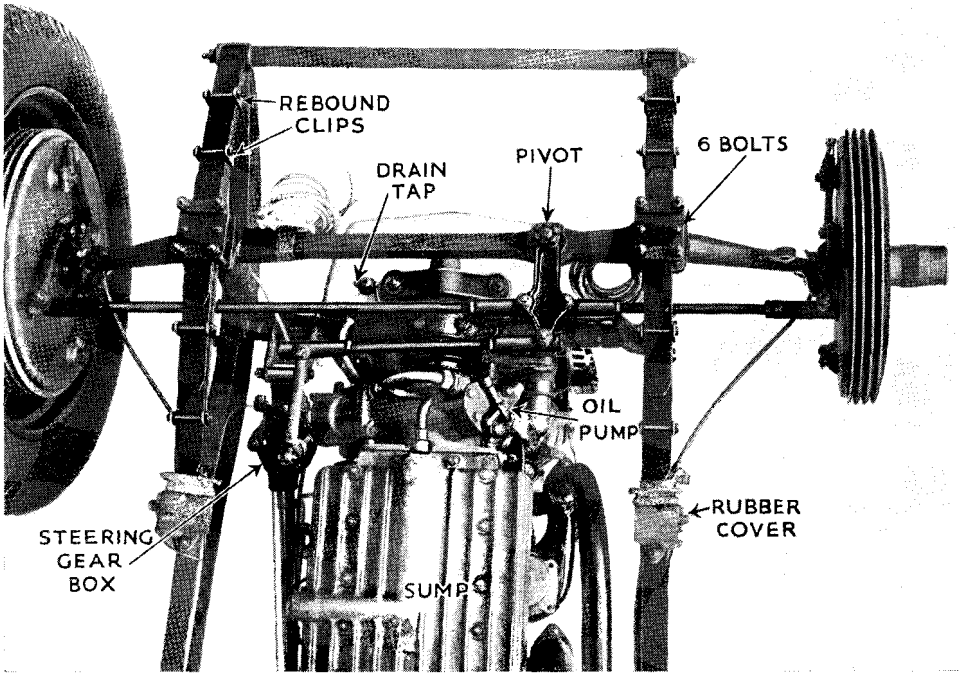


Illustration 14.—View of the front end of the chassis as seen from below. The spring mounting will be noted, including rebound spring clips. General steering lay-out can be examined, including the pivot lever which passes through the axle body. Particular note should be made of the position of the radiator drain tap and the bolts on the underneath side of the sump to secure it to the crankcase.

Steering on the M.G. Magnette differs from conventional layout. It will be noticed that in Illustrations 13 and 14 a pivot is formed on the off-side on the front axle between the spring perches to accommodate the main steering arm. This special shaped arm is connected to the drop arm of the steering by means of a short coupling tube, and its lateral movements in one direction or the other cause the pivot lever to operate the track rods which are attached to it by means of ball socket joints. Each of the articulating joints is provided with a lubricating nipple which requires attention from time to time ; in fact, reference to the oil chart shows that they should receive lubrication by the oilgun every 1000 miles.

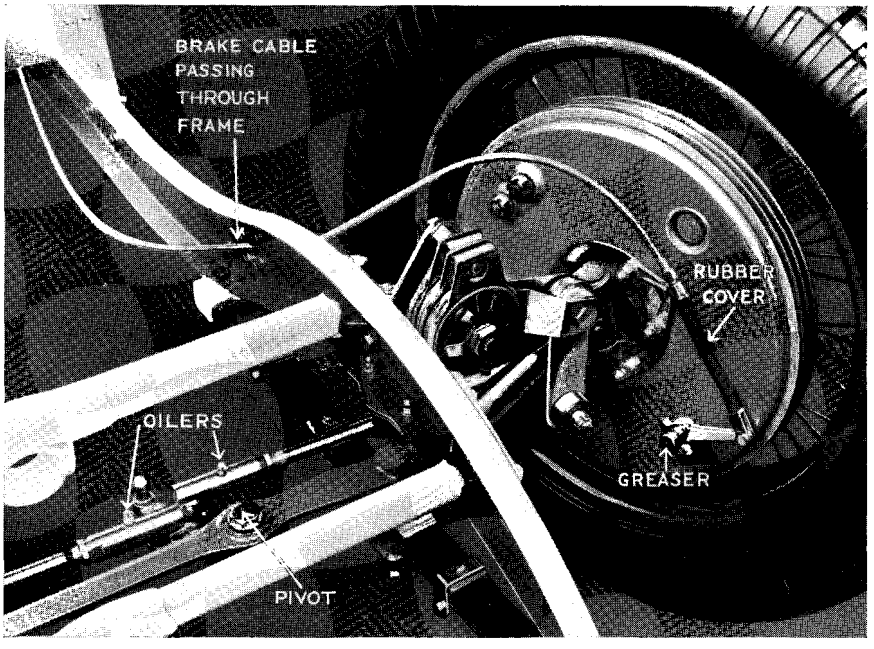


Illustration 15.—View of the near-side front end of the chassis, showing the steering head and shock absorber, and sub-divided track rod with the lubricator nipples. It will be seen how the brake cable passes through the frame, terminating in a rubber-covered end. The greaser on the brake camshaft is not used on later models, and the shock absorbers are parallel with the chassis instead of transverse.

Illustration No. 13 also affords an excellent opportunity of seeing how the brake cables pass from inside the frame through a bracket attached to the outside of the frame, and lubrication of these points ensures the inner brake cables being continually lubricated.

Illustration No. 14 is a view taken from beneath the front of the car. While it is primarily intended to show the underneath side of the steering box, the pull and push rod, track rod, and steering arms, yet at the same time it affords an excellent opportunity to examine the underneath side of the engine, timing case, oil pump, extension bracket which supports the radiator, and the attachment of the front axle to the spring by means of four bolts at each side, in addition to the two bolts which prevent the leaves from separating.

Particular care should be taken to note the position of the radiator drain tap.

Illustration No. 15 is a view of the front axle and near-side front wheel and steering head. The position of the pivot pin can easily be discerned as well as the lubricators on the pivot pin arm. The actual attachment of the shock absorbers varies in different models, but the principle employed is the same ; in most cases

they are attached to the wing bracket supports. The passage of the brake cable through the frame will be noted and also the rubber-covered end of the brake cable. The brake actuation lever is attached to the operating camshaft. Always be careful to make sure when lubricating the steering head that the lubricant exudes from the thrust races, as, in addition to lubricating the steering head pins, foreign matter, as well as water, will be expelled.

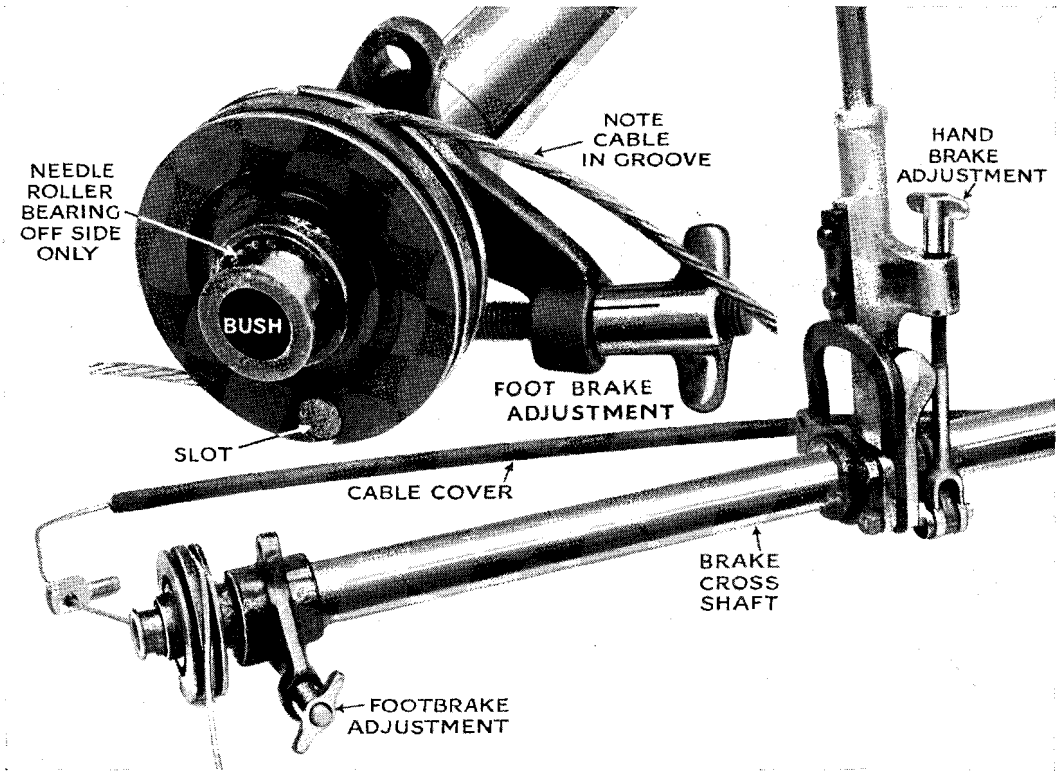


Illustration 16.—Views of the brake cross shaft, showing the hand and foot brake adjustments, and the manner in which the cross shaft is supported at one end on a needle bearing.

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. 12 and 15 that the brakes are applied through the agency of steel cables which pass through covered outer cables from either side of the centre of the chassis to the brake-drums, the final application being shown in Illustration No. 15. *A sketch is provided on page 22 showing diagrammatically how the brakes are applied.* A cross shaft is placed in the middle of the chassis, anchored at either end, and supported in the centre to a tubular cross member of the frame. This can be seen by referring to Illustration No. 7, which more particularly illustrates the hand brake. The 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. 16.

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

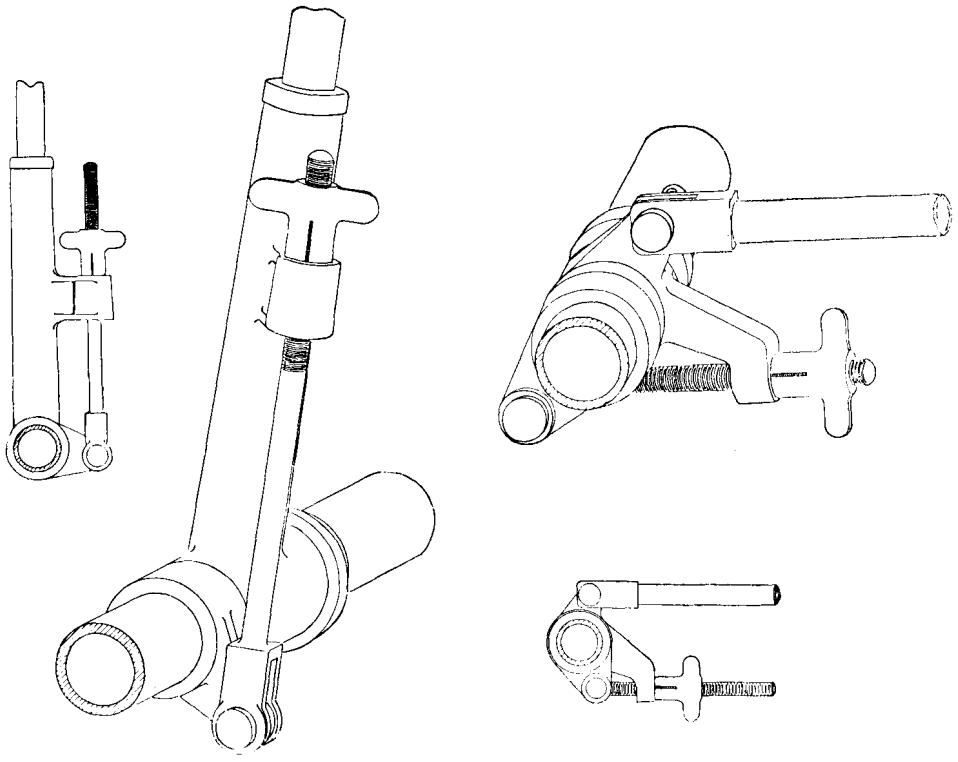


Illustration 17.—Details of the foot and hand brake major adjustments. To tighten the brakes the thumb nuts should be turned in a clockwise direction.

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 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 lock nut for this adjustment.

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

The whole of the brake cross shaft is lubricated from one of the dashboard nipples, and in order to give perfect freedom for the rotation of the cross shaft, it is mounted at one end on what is termed a needle or roller bearing. These are shown in Illustration No. 16. 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 reassemble the needle bearing, the inner shaft should be covered with grease and the rollers embedded 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.

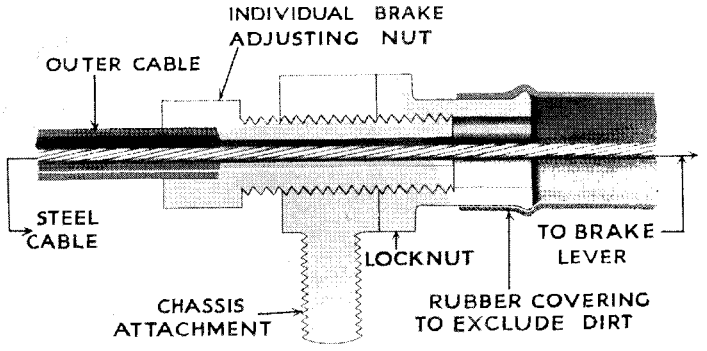


Illustration 17 a. — Independent brake adjustment for each wheel, see text on page 20.

The front and rear brake-drums of the car are identical in design. 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. 18, take off the nuts with a $\frac{5}{16}$ in. 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 Illustration No. 18, and in the right-hand side of the illustration the brake-shoes with the pull-off spring can be seen.

The countersunk screw in the fluted portion of the front hub is intended to permit the split pin of the hub nut being easily removed and replaced through the hole in the hub, when the complete hub is to be removed.

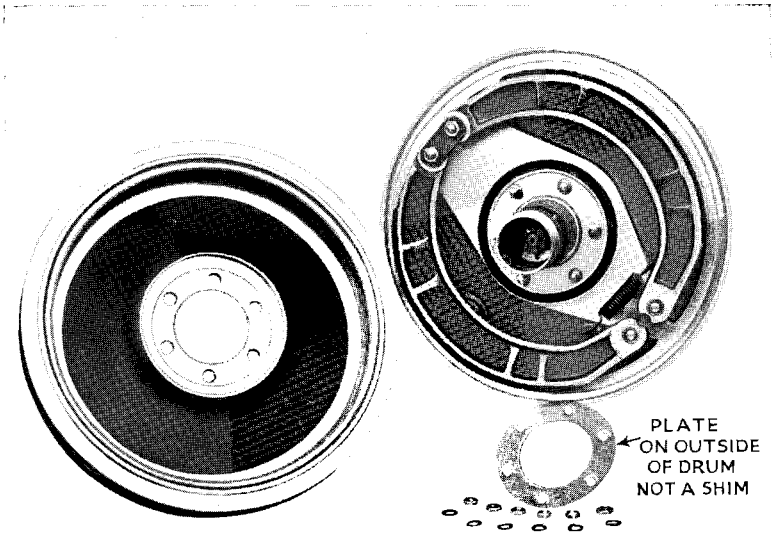


Illustration 18.—View of front hub after the brake-drum has been removed, showing the type of brake employed.

Brake Anti-squeak 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. 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. These are fully illustrated below.

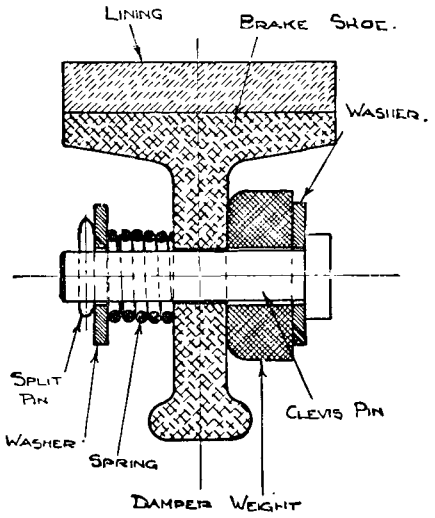
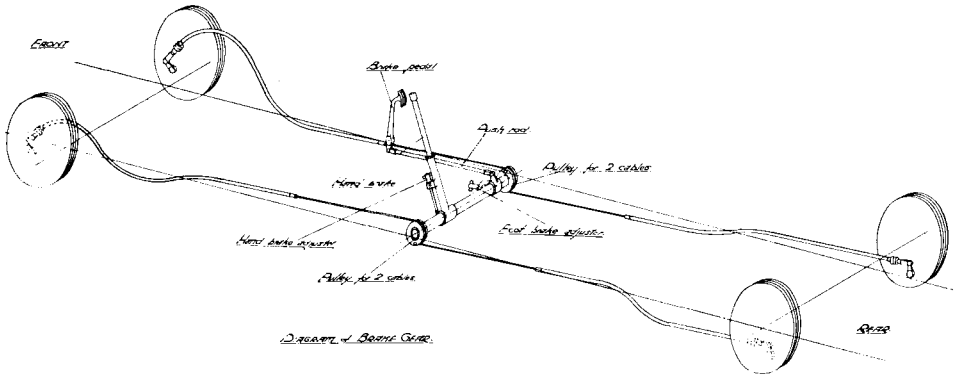


Illustration 19.—Sectional view through a brake-shoe, showing the lead weight attached to the brake-shoe, and the various component parts for same.



Showing diagrammatically how the brakes are applied.

Running Adjustments. Before dealing with the detailed description and dismantling of the various units of the chassis, the owner may require to know particulars of adjustments which he can effect.

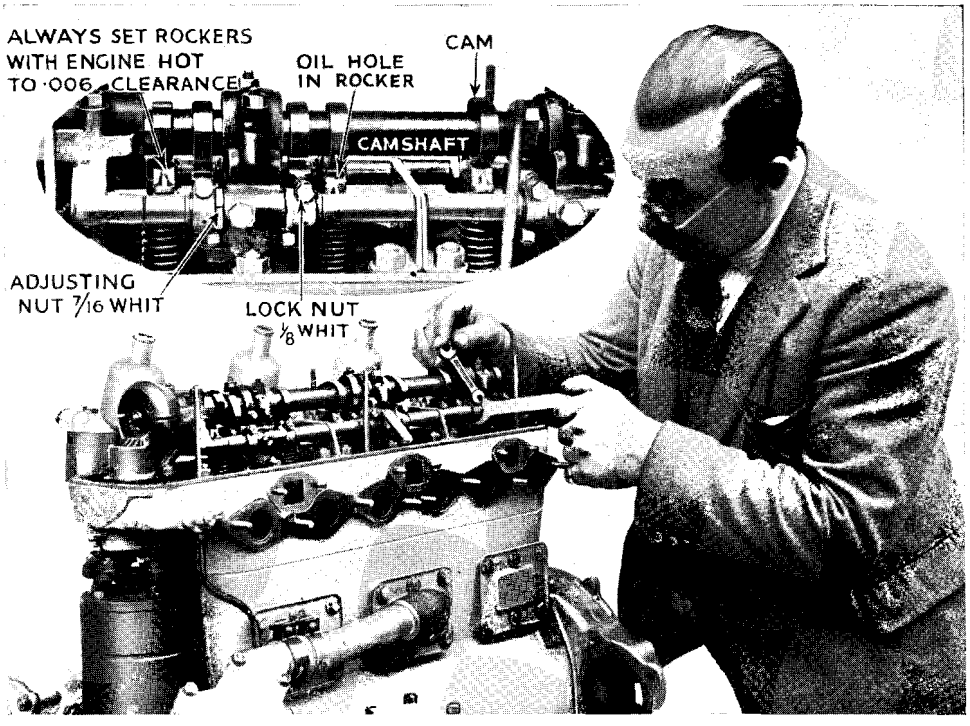


Illustration 20.—View of an M.G. Magnette engine, showing the operator in the act of adjusting the valve clearance. The removal of cover discloses the fact that the valve gear is operated by single camshaft. By utilising an eccentric bush the valve clearance can be accurately set : this should never be undertaken unless the engine is hot.

Tappet Adjustment. Before the owner has had an opportunity of reading through the whole manual he may require to adjust his valves, and in order that he should know what is taking place, a careful examination of Illustration No. 20 will make the matter clear. He will probably be aware that there is a necessity to have a definite clearance between the cam and the valve rocker ; the various parts are distinctly marked in the illustration. It is of course important to see that the valve is properly seating when any adjustment is attempted, and this can easily be seen by the position of the cam in relation to the rocker. There is a single camshaft operating both the inlet and the exhaust valves. These are easily distinguished from the fact that all the exhaust valves are on the *near*-side of the engine and the inlet valves on the *off*-side of the engine. The valve rockers are attached to separate shafts at their outer extremity, and are provided with eccentric bushes. The opposite extremity of the rocker is wedge shaped, so that if the nut which forms parts of the eccentric bush is rotated, the wedge end of the rocker will either advance or recede from beneath the cam, and present a thicker or thinner section to the face of the cam when this rotates. The rocker is locked in position on the eccentric by means of a locking screw, and in Illustration No. 20 a spanner is shown in position ready to slack off the locking set screw. The eccentric bush can then be rotated inside the rocker boss to give the required clearance. See that the bush does not rotate while the locking screw is being tightened.

Correct clearance between the valve rocker and the face of the cylindrical portion of the cam should be .006 in. when the engine is hot.

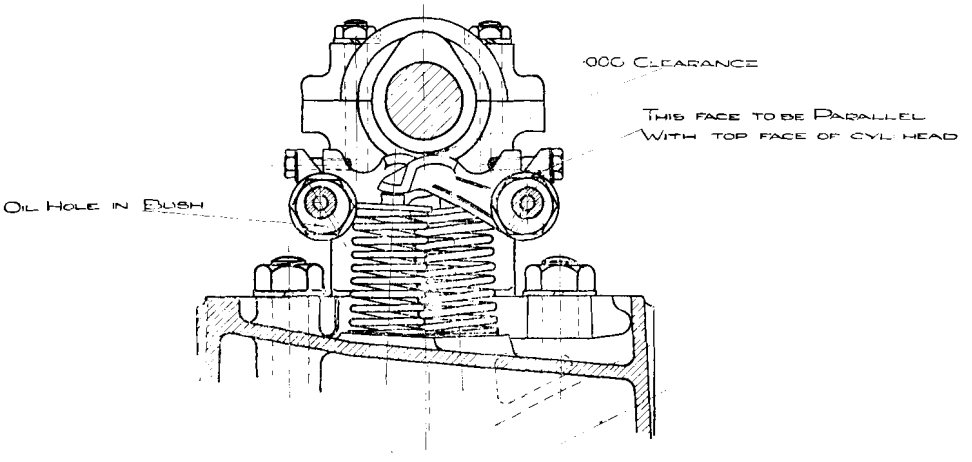


Illustration 20a.—Sectioned view of the cylinder head showing the correct position of the rocker eccentric, and the point at which the rocker clearance should be checked.

It may be found that after grinding in valves the power will drop off unless the length of the valve stem is also adjusted. A special gauge has to be employed for this purpose, consisting of a horse-shoe shaped piece of metal which, when resting on the cylinder head, gauges the exact length of the valve stem that protrudes through the guide. Such a tool is only necessary in the case of extreme accuracy being required, and should only be carried out by an M.G. Service Depot, the ordinary adjustment being capable of taking care of normal needs. It may, however, be necessary after the valves have been ground-in several times.

THE CORRECT VALVE ROCKER CLEARANCE IS .006 in. FOR BOTH INLET AND EXHAUST.

INSTRUCTIONS FOR TWO-CARBURETTER MODELS

MAGNETTE

(See *Sectional Illustration on Page Twenty-five*)

Carburetter.—Separate instruction concerning the S.U. is provided with the car, but the following particulars specifically apply in the case of the M.G. Magnette.

To afford a richer mixture for slow-running, the jet control nut should be unscrewed.

By screwing the jet adjusting nut upwards, the petrol consumption can be cut down if the owner is satisfied with a lesser degree of acceleration and speed, and sometimes in hot weather general all-round better carburation can be obtained by thus cutting down the petrol supply. Screwing up too much may cause popping through too weak a mixture.

A little machine oil should be injected into the dashpot or suction chamber brass cover screw every thousand miles, to lubricate the piston guide rod ; three drops of machine oil is advised for this purpose.

Under no circumstances should the body of the piston be lubricated.

By inserting the finger through the air inlet to the carburetter, the piston can be lifted inside the body of the carburetter, and should rise and fall freely.

The use of the strangler, or, as it is correctly called, the jet control, is intended only for starting when the engine is cold, and should be employed as little as possible. The effect of using the jet control is to enrich the mixture when starting. If it is left in operation longer than is necessary the cylinder walls will be bathed with surplus petrol, which will soon have a damaging effect on the pistons and other parts of the engine as well.

Reference to Illustration No. 21 shows the jet control lever in position. The jet adjustment nut is in point of fact only a stop against which the jet head rests when the jet control lever is pulled backwards, so that it stands to reason that if any adjustment of the jet has to be effected, this has to be carried out on each separate carburetter. It follows that as all the three jet control levers are coupled up, and if only one jet nut is unscrewed, unless the jet controls are slackened off first, all the other carburetters will have been adjusted similarly to any individual one.

The two screws that hold the piston body in which the piston and suction disc operate should be removed, so that the piston and its guide rod can be cleaned. Extreme care should be exercised in removing the pistons, so as not to damage the taper jet needle in any way. Mark the suction chamber before removal and replace it the same way as originally fitted. Do not change the suction chambers from one carburetter to another.

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.

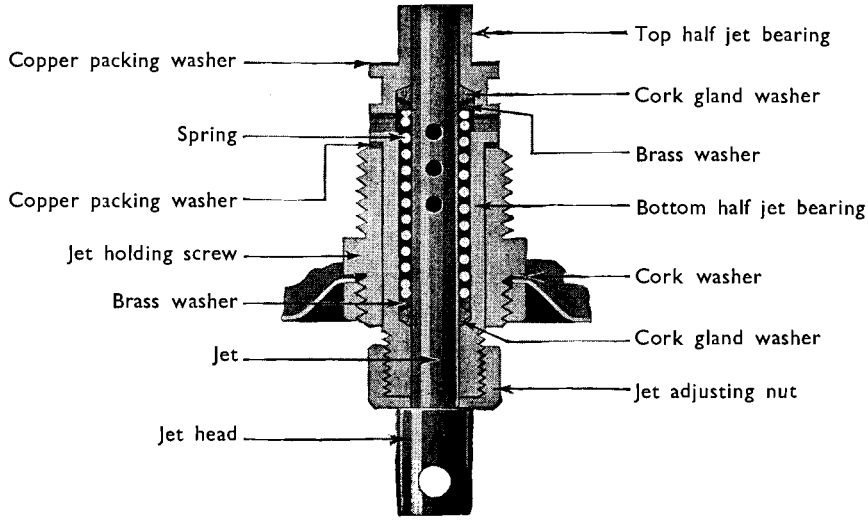
4. The carburetters may require synchronising.

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. 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.



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.

Synchronisation of Carburetters.—Before attempting to adjust the carburetters, it is advisable to check over the following items.

Ignition timing. Set the 1 and 6 mark on the flywheel in the centre of the clutch inspection opening. No. 1 piston is then at T.D.C. Distributor and plug points should be checked for cleanliness and gap, i.e. .015 in./.020 in. on distributor and .018 in. on plugs, also valve clearance should be .006 in. between base of cam and rocker.

Having checked these items, remove the dashpot covers and the dashpots from the carburetters, disconnect the jet coupling rod and screw the jet adjusting nuts right up. On pushing the jets up to the full weak position the correct petrol level should be 1 mm. below the top of the jet. If this is not so, and assuming the floats are in good condition and not punctured, the level can be adjusted by bending slightly the guide controlling the float needle, up to raise or down to lower, whichever is required. Next proceed to set the needle in the dashpots.

In the case of the " L " needle, the shoulder should be flush with the dashpot or piston. Refit the dashpot and cover to the carburetters, making sure that, when screwed down tight, the dashpots will fall on to their seatings with a click. Screw down the jet adjusting nuts two complete turns and screw off slow-running rod and butterfly adjusting screws so that they are not in use. Then slacken one butterfly flexible coupling bolt, press both butterflies hard closed and re-tighten bolt, making sure neither butterfly moves during this operation.

Screw down the butterfly adjusting screws to allow engine to run at three hundred to four hundred r.p.m. with ignition fully retarded. It has been observed that the suction type screen wiper valve screw is usually left open by car owners, the wiper action being only controlled by the start and stop lever. The screen wiper valve screw should therefore be left open when adjusting the carburetters, as there is occasionally a slight leak at this point.

Allow engine to warm up to normal running temperature before attempting to do the final adjustments. When that is attained the mixture may be judged by the exhaust note. If the engine is hunting, which is due to rich mixture, screw one of the jet adjusting nuts up, making sure that the jet is pushed up also.

If this makes no improvement, return it to its original position and try the same process with the other. On the other hand, if the exhaust note is irregular the mixture is too weak and the jet adjusting nuts should be screwed down, first one and then the other.

Having obtained somewhere near the correct mixture a check can be made by opening the throttle suddenly, when both carburetters should spit back a light spray of petrol. (For maximum performance it is advisable to set the adjusting nuts one flat on the rich side of the setting.)

A fairly good check can be obtained for the synchronisation of the butterflies by opening the throttle by hand and noting the height of the pistons one with the other through the mouths of the carburetters while the engine is running.

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.

INSTRUCTIONS FOR THREE-CARBURETTER MODELS

Carburetter. Separate instruction concerning the S.U. is provided with the car, but the following particulars specifically apply in the case of the M.G. Magnette. In normal use the needle numbers are—D6 either end, O7 in the centre carburetter, with dashpot N377B.

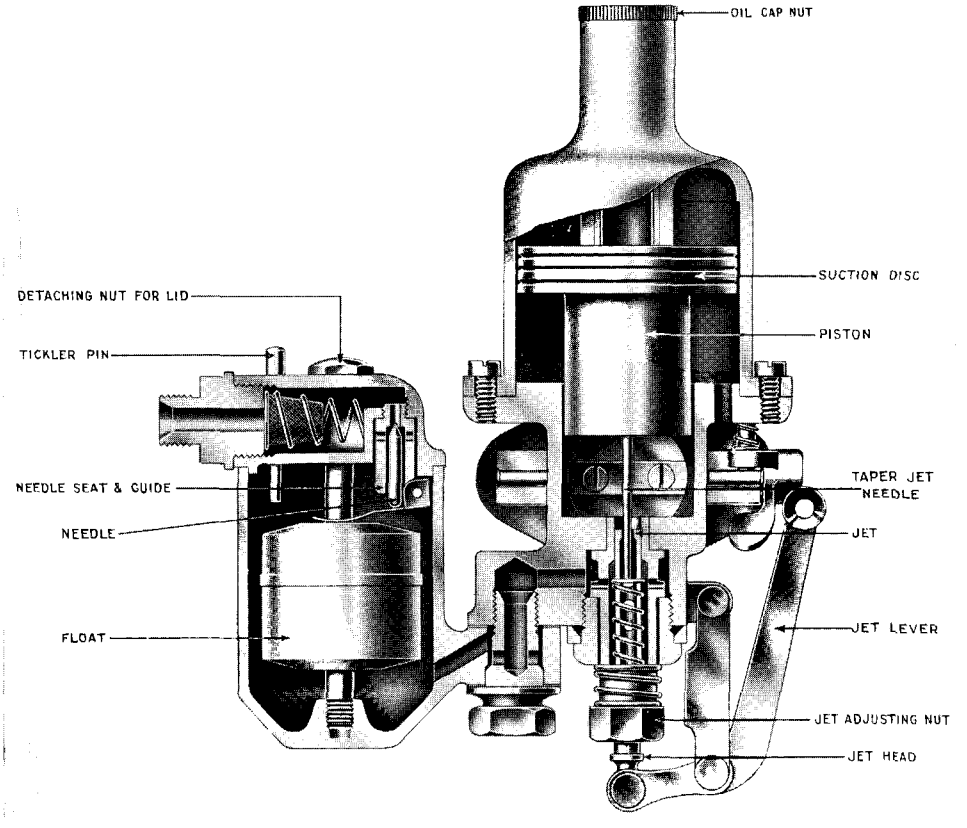


Illustration 21.—Sectional view through an S.U. carburetter, showing how the taper needle is locked into a piston which is caused to rise by the suction of the engine and so increase the orifice of the jet, thereby governing the petrol flow. It will be realised by this illustration that the effect of screwing the jet adjusting nut up or down has actually no effect on the jet itself; it is simply an abutment for the jet head which is controlled by the jet lever. The two screws holding the suction disc outer chamber in position should be removed from time to time, and the suction disc and piston carefully cleaned with a dry rag; under no circumstances should oil be used on the suction disc. The oil cap on the top of the suction disc chamber simply lubricates the spindle which guides the suction disc during its up and down travel.

The steel adjusting screw on the outside of the carburetter is only intended for slow-running adjustment and does not alter the mixture.

To afford a richer mixture for slow-running, the jet adjusting nut should be unscrewed.

By screwing the jet adjusting nut upwards, the petrol consumption can be cut down if the owner is satisfied with a lesser degree of acceleration and speed, and sometimes in hot weather general all-round better carburation can be obtained by thus cutting down the petrol supply. Screwing up too much may cause popping through too weak a mixture.

A little machine oil should be injected into the dash-pot or suction chamber brass cover screw every thousand miles, to lubricate the piston guide rod ; three drops of machine oil is advised for this purpose.

Under no circumstances should the body of the suction disc or piston be lubricated.

By inserting the finger through the air inlet to the carburetter, the piston can be lifted inside the body of the carburetter, and should rise and fall freely.

The use of the strangler, or, as it is correctly called, the jet control, is intended only for starting when the engine is cold, and should be employed as little as possible. The effect of using the jet control is to enrich the mixture when starting. If it is left in operation longer than is necessary the cylinder walls will be bathed with surplus petrol, which will soon have a damaging effect on the pistons and other parts of the engine as well.

Reference to Illustration No. 5 shows the jet control lever in position. The jet adjusting nut is in point of fact only a stop against which the jet head rests when the jet control lever is pulled backwards, so that it stands to reason that if any adjustment of the jet has to be effected, this has to be carried out on each separate carburetter. It follows that as all the three jet control levers are coupled up, and if only one jet nut is unscrewed, unless the jet controls are slackened off first, all the other carburetters will have been adjusted similarly to any individual one.

The two screws that hold the piston body in which the piston and suction disc operate should be removed, so that the piston and its guide rod can be cleaned. Extreme care should be exercised in removing the pistons, so as not to damage the taper jet needle in any way. Mark the suction chamber before removal and replace it the same way as originally fitted. Do not change the suction chambers from one carburetter to another.

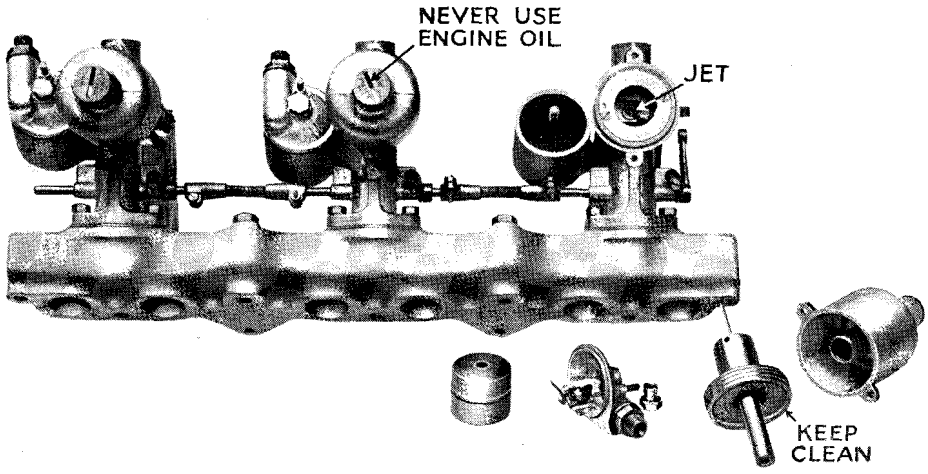


Illustration 21a.—View of the inlet manifold with the carburetters attached. The right-hand carburetter is partially dismantled, showing the suction disc removed from the suction chamber and the relative position of the jet and needle. To lubricate the spindle engine oil should never be used ; only very light machine oil.

The two accompanying illustrations, Nos. 21a and 21b, show the actual carburetter arrangements on the M.G. Magnette. It is seldom that the float-chamber requires dismantling, but it is very simply effected by removing the nut on the top of the float-chamber and removal of the petrol pipe union.

The jet control arrangements are shown in Illustration No. 21b.

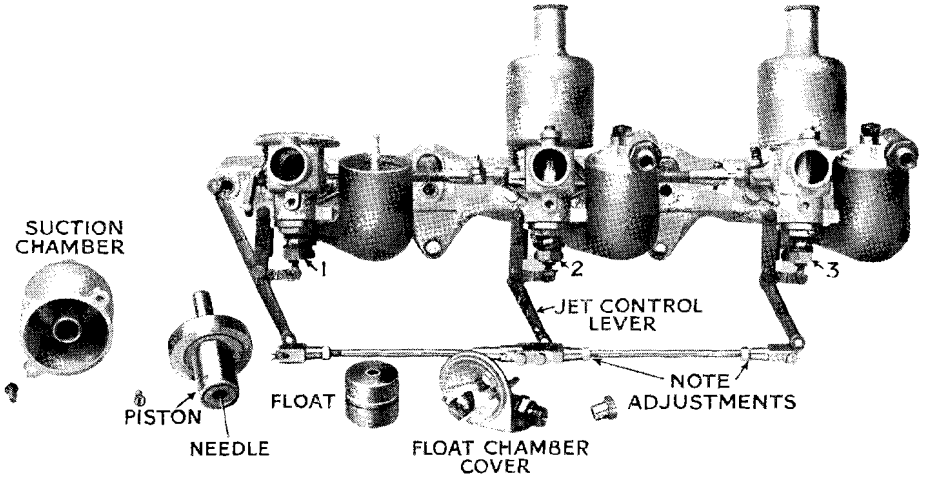


Illustration 21b.—Another view of the carburetters, showing one of them partially dismantled. The principal feature of this illustration is the adjustment of the jet control lever. The nuts 1, 2 and 3 can be screwed up or down, but if any modification is made to any individual carburetter, the rod which couples up the jet control levers must be uncoupled and the rods shortened or lengthened so that the control levers force the jet heads up against the abutments 1, 2 and 3.

The three jet adjusting nuts are marked 1, 2 and 3, and when the jet control levers force the jet head up against the nuts 1, 2 and 3, the carburetters are set for normal running. If nut No. 3, for example, is screwed downwards, and the jet control lever is not altered to correspond, the Nos. 1 and 2 jets will only rise to the same extent as No. 3, and the effect of the adjustment, if so carried out, will only be to enrich all the three carburetters instead of, say, No. 3 only. It is necessary to remove the pins from the front and rear carburetters and alter the position of the yoke ends, so that the pins which couple them to the jet control levers pass through freely. It is possible with three carburetters to effect changes in adjustment, and it is a matter that should not be lightly undertaken if the operator has not had much experience.

Other points that may require adjustment from time to time are the brakes, which have already been dealt with, and the clutch (when fitted), which will be dealt with under its own heading, but the following notes will indicate the nature of the adjustments which are carried out with the aid of a spanner and screwdriver.

COIL IGNITION INSTRUCTIONS

The high-tension distributor with automatic advance mechanism is very accessible. It is provided with an oiler to lubricate the spindle, and only a few drops of thin machine oil should be put in every 1000 miles.

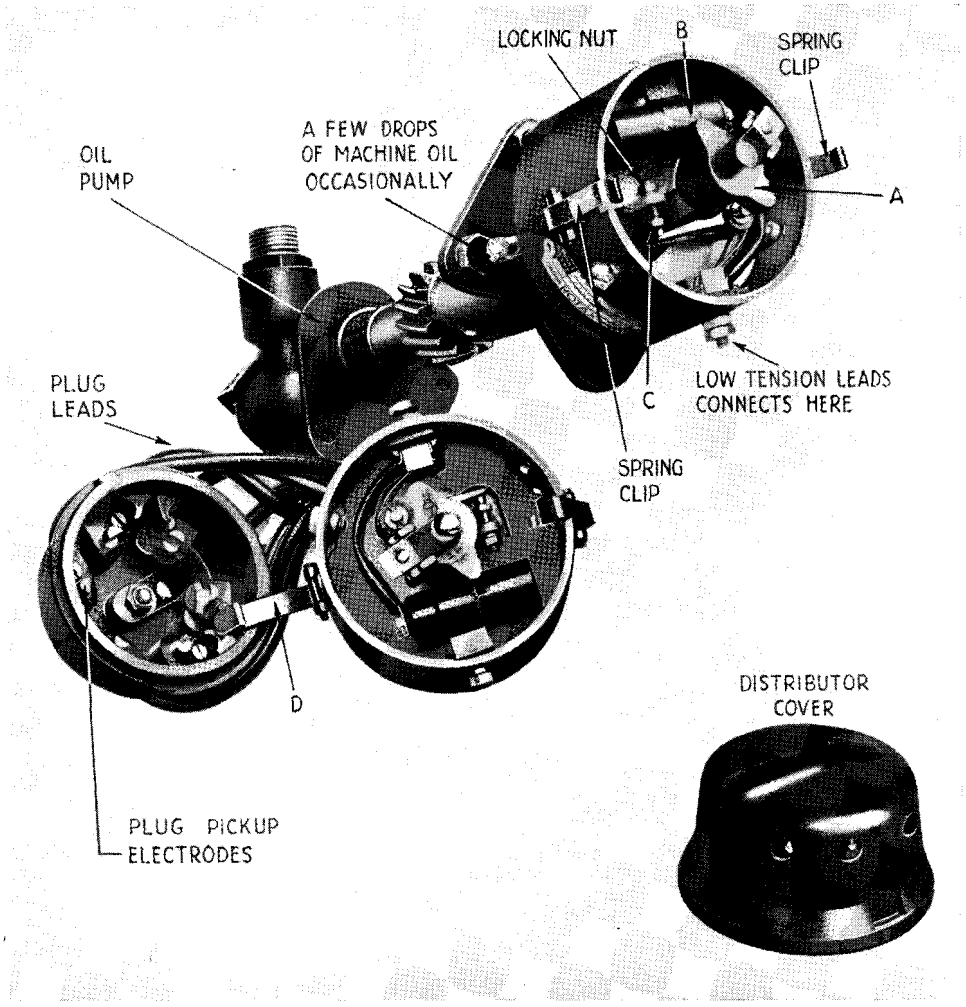


Illustration A.—The distributor and oil pump.

The contacts can be inspected by unclipping the two springs, when the cover carrying the high-tension leads can be removed. Should for any reason it be necessary to check or adjust, the ignition timing should be set so that No. 1 piston is on top dead centre, measured on the flywheel when the 1 | 6 marking is in the centre of the clutch inspection aperture and the inlet valve of No. 6 is opening and the contact breaker arm pointing towards No. 1 plug segment. Then, after slackening the securing bolt, rotate the body of the distributor and set the contact breaker arm so that the fibre heel on the contact breaker arm is on the apex of the cam on the rotor. 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. They are carefully set before leaving the Works. 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 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.

The centre spindle of the high-tension distributor carries a " Bakelite " arm called the " rotor." It can only fit on the spindle one way. If this part is removed (it simply pulls off) it affords an excellent thiefproof 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 cables are secured by means of pointed contact screws which pierce the rubber insulation to make good contact with the cable strands, at the same time securing the cables tightly in the terminals. The screw heads are located on the inside of the distributor moulding.

The automatic advance 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. 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, or by any of the following :—

1. Dirty sparking plug (correct plug gap 20/1000 inch).
2. Cracked porcelain.
3. Bad connection to high-tension leads.
4. Bad connection from high-tension distributor to coil.
5. Improper adjustment of make-and-break points.
6. Dirt between make-and-break points.
7. 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 improper valve adjustment, the latter having been already dealt with on pages 23-24.

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

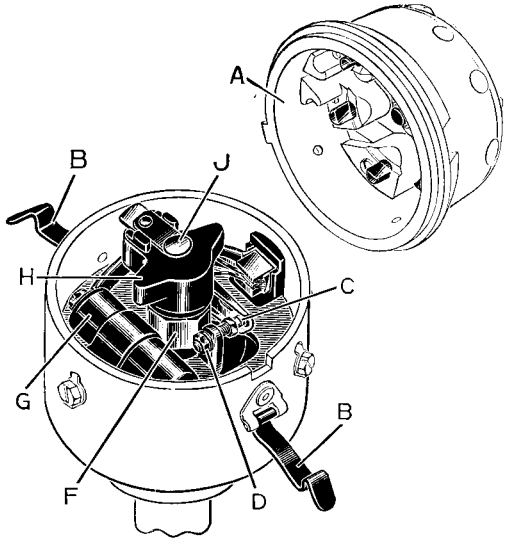


Illustration B.—Distributor and Contact Breaker.

A—Distributor moulding.
B—Securing springs for moulding.
C—Contacts.
D—Lock nut.
F—Rotating cam.
G—Condenser.
H—Rotating distributor arm.
J—Spring contact.

Distributor.—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 is clean. 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 may 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 is carefully set before leaving the Works, and a gauge is provided on the spanner dispatched with each distributor. 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. 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. Add one or two drops of thin machine oil through the oiler provided about every 1000 miles.

(2) **Cam.** About every 3000 miles, give the cam the slightest smear of vaseline.

(3) **Automatic Timing Control.** About every 3000 miles withdraw the rotating arm " H " (Illustration No. B) from the top of the spindle by lifting it off, and add a few drops of thin machine oil. Do not remove the screw exposed to view, as there is a clearance between the screw and the inner face of the spindle through which the oil passes to lubricate the automatic timing control.

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 xxxi. 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 switchbox 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 $\frac{1}{4}$ in. 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 xxxi. See that the contact gap setting is correct.

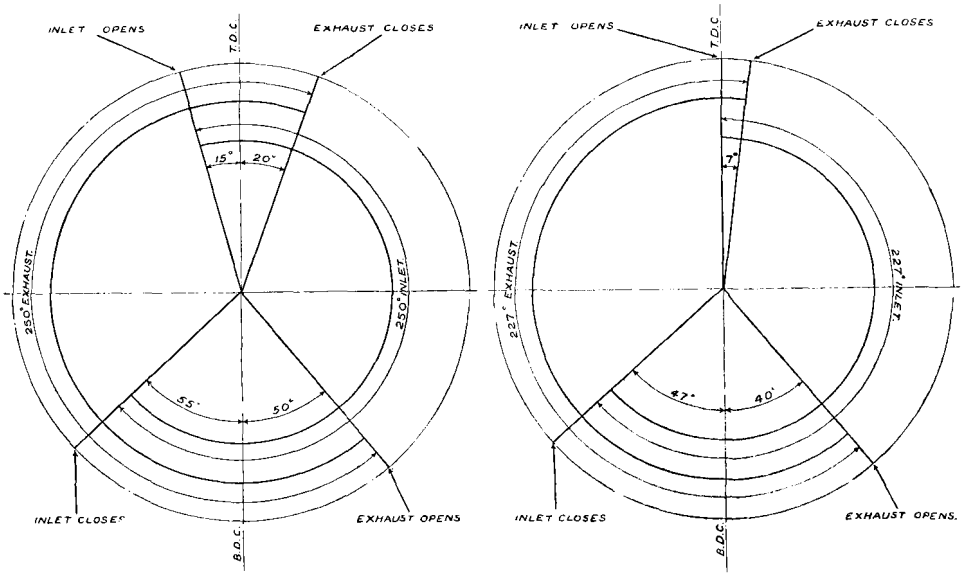
If after carrying out the examination suggested, the trouble cannot be found, we advise that the equipment should be examined by the nearest Lucas/Rotax Service Depot, the addresses of which are given later.

FOR CARS WITH MAGNETO IGNITION

Ignition. Little instruction need be given on this subject, as a special handbook is provided on the magneto itself. The principal points for the owner to note are the gap clearance of the contact breaker points, and the fact that they should be clean and the rocker-arm free on its bush. Only a very occasional lubrication is required, and a high-quality machine oil introduced into the oiling apertures, two or three drops at a time.

The magneto is attached by means of set screws fitted to the base, which register with holes in the plate, and is also secured by means of a strap, which can be seen by referring to Illustration No. 5.

VALVE TIMING DIAGRAMS



"K1" TOURER AND "K2" OR "K3" MODELS

"K1" SALOON

Valve timing diagram for the K.1 Tourer and K.1 Saloon. It will be seen that these vary materially and must not be confused.

General description of the M.G. Magnette Engine. In order that the owner may become familiar with all the details of the power unit, illustrations have been prepared showing the complete engine unit removed from the chassis.

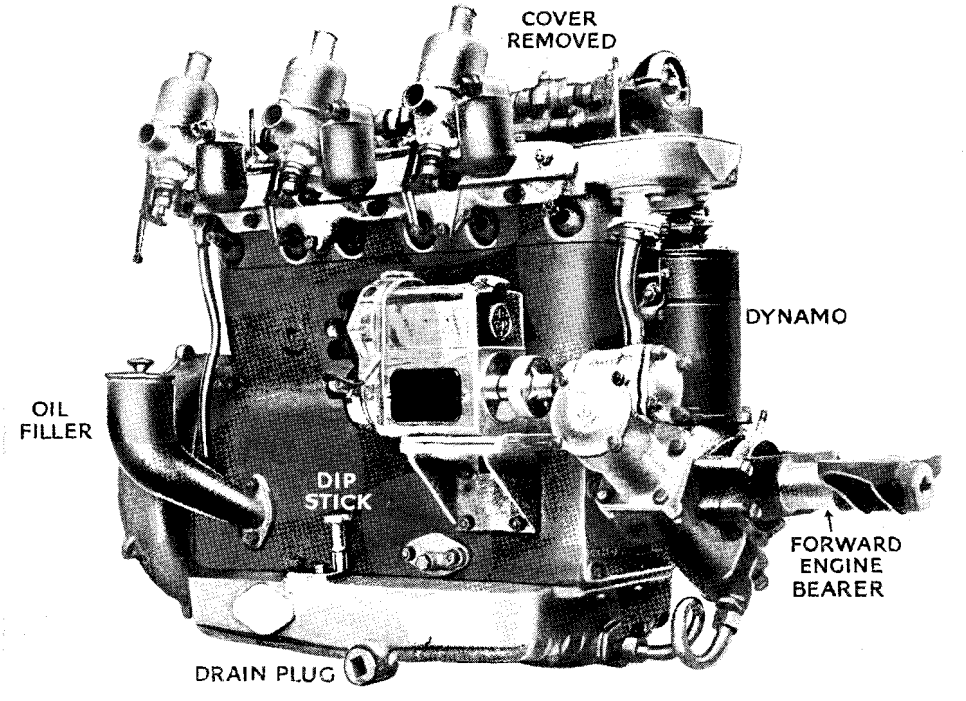


Illustration 22.—Three-quarter view of the engine removed from the frame, showing front engine bearer member. The sump drain plug can be seen, as well as the position of the dipstick.

Illustration No. 22 is a view of the off-side of the engine suitably lettered to indicate the various parts. More detailed instruction will be subsequently given concerning the items of magneto and dynamo. The principal points of interest in this illustration are the location of the oil filler and the sump. The majority of the details shown in this illustration have already been covered in Illustration No. 5, but this particular illustration shows the sump or oil container of the engine and its drain plug, which consists of a brass nut having a square plug hole. A special tool is provided in the tool kit for removing this drain plug. It will be seen in this illustration that there is a return oil feed pipe from the front and rear end of the cylinder head.

The near-side of the engine, Illustration No. 23, shows a good deal more than can be seen when the engine is in the chassis.

There is a front extension on the extreme left of the illustration which acts for the dual purpose of starting handle bracket and radiator support as well as front engine bearer.

The water inlet pipe from the pump to the cylinder block is also visible.

It will have become obvious that the front end of the crankshaft is fitted with gearing which in turn drives the oil pump. The oil is sucked up by the pump from the sump and delivered to the oil filter, where it passes through a specially prepared inner body, to be delivered to the main bearings and the overhead valve, camshaft and rockers. The manner in which the oil is delivered to the two centre and rear main bearings will be seen subsequently, as well as the details of the oil filters.

The filter is fitted with a cover-plate, the removal of which gives access to the felt element that has to be changed and cleaned periodically.

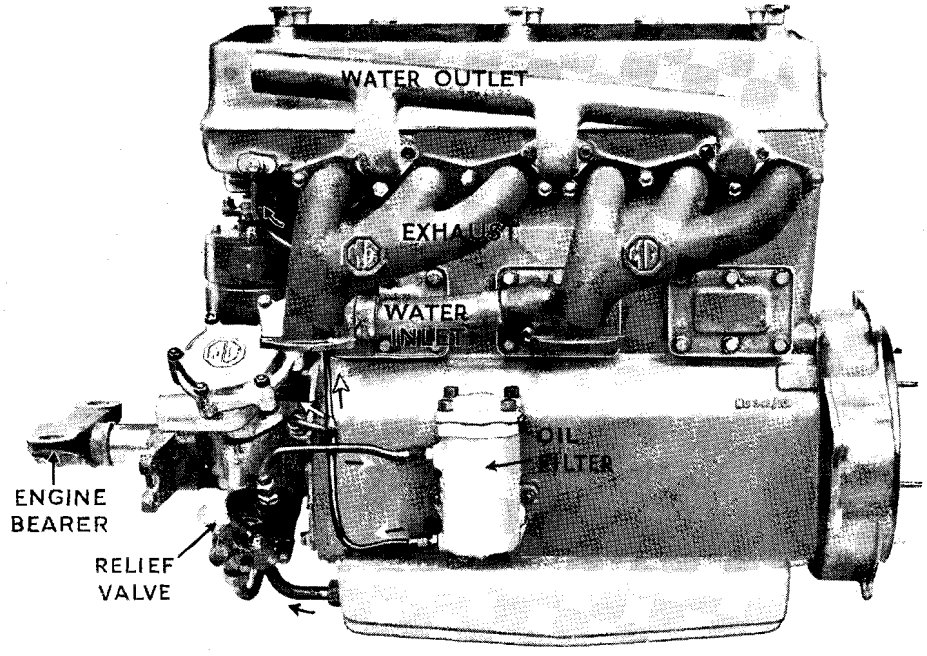


Illustration 23.—Near-side view of the engine removed from the frame. This first of all shows the water inlet and outlet pipes and the two exhaust branches ; it further shows the position of the oil pump and the fact that oil is drawn from the sump and delivered by the pump to the oil filter, whence it is delivered internally to three main bearings. The front main bearing is fed by the pipe as shown, the extension of which feeds the overhead valve rocker gear.

Illustration No. 24 is a front view of the engine, showing in more detail the position of the oil and water pumps.

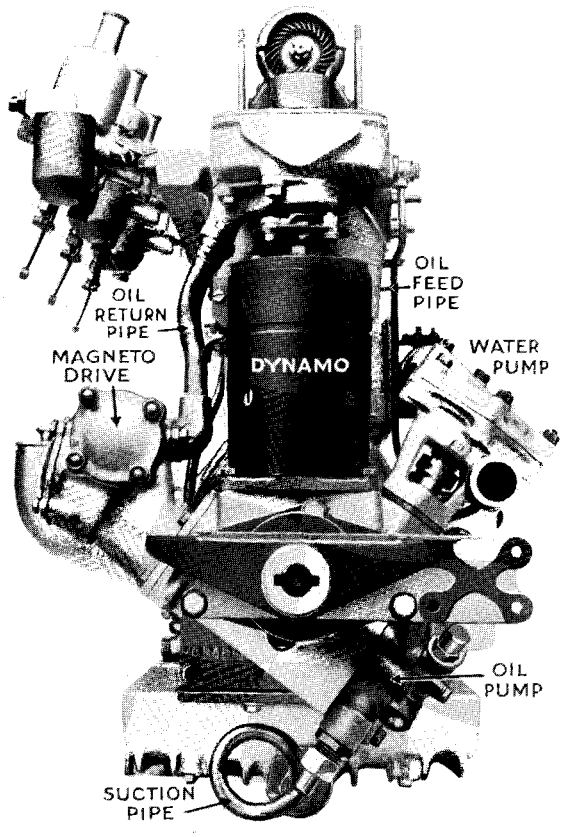


Illustration 24.—A view of the front of the engine showing the dynamo in position between the crankshaft gears and overhead valve mechanism ; the oil feed pipe to the latter will be noted, and the surplus lubricant is conveyed back to the sump through the large pipe which feeds the magneto drive. The position of the oil and water pumps can be seen.

It will be noticed that the dynamo is placed vertically in front of the engine and the armature shaft is utilised to drive the overhead valve gears. The magneto drive gear is seen on the left-hand side of the illustration and the return oil pipe feed which conveys part of the surplus oil back to the magneto drive, at the same time being of sufficient diameter to effect a release for crankcase fumes and is in point of fact what is commonly known as a " breather pipe." An oil feed pipe is shown on the off-side of the engine which serves to feed the overhead valve gears with oil. This is attached to the cylinder head and should always be removed whenever the head is lifted, very carefully, because behind the nut and flange there is a detachable metering or restriction pin, which controls the amount of oil that passes through the orifice.

If ever the pin is removed, as can be seen on referring to Illustration No. 33, it will be noted that it has a flat machined on it which meters the amount of oil passing to the valve gear.

Illustration No. 25 shows the water and exhaust ports after the manifolds have been removed and the copper and asbestos washers which are fitted between them and the cylinder head. If ever the manifolds are removed, the washers should be inspected and cleaned, as well as threads on the studs by which the manifolds are refitted. The nuts holding the manifolds to the studs should be gradually tightened so as to get a uniform pressure and prevent any possible chance of leakage through distortion.

Illustration No. 25 also shows the valve operating parts after the cover has been removed.

The valve cover is held in position by six nuts which should be tightened up evenly so that a good joint between the cover and the cork washer fitted on top of the cylinder head is formed. It will be noticed that the two bosses on the top of the valve cover are slotted, so as to form breathers.

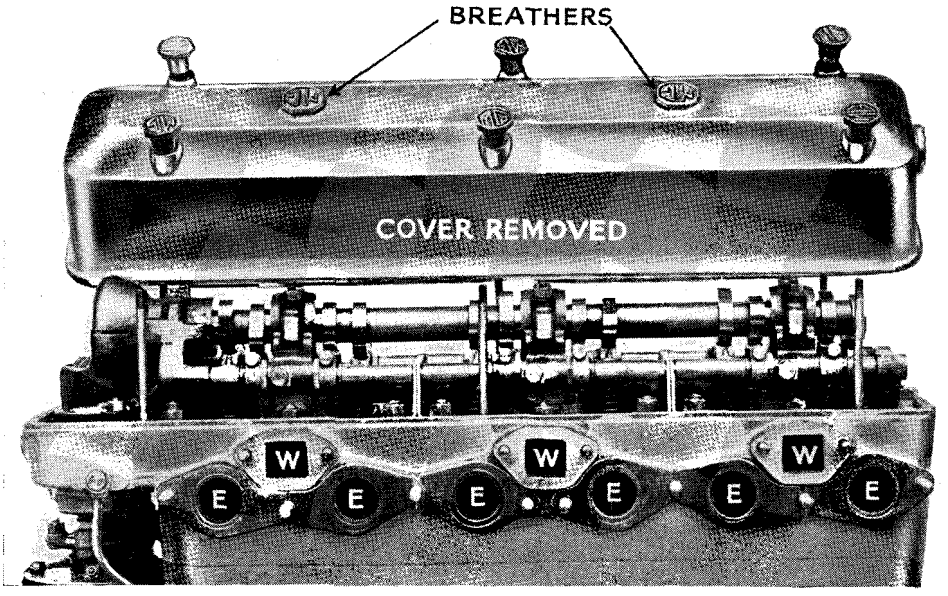


Illustration 25.—View of the overhead valve mechanism as seen after removal of the cover. This is held in position by six nuts, and these should be tightened equally to make the cover fit evenly on the cork washer. The slots in the valve cover can be seen acting as crankcase breathers. It is possible to see how the exhaust pipes and water outlet pipe are attached to the engine and the type of washers employed.

Action of the Electric Starter. The engagement consists of a coarse threaded shaft on which a pinion is fitted. When the starter button is pressed the starter motor rotates quickly, causing the pinion to be rotated, but owing to the form of this pinion it has a tendency to travel along the starter extension shaft, and thus engage with the teeth of the flywheel, the shock being taken up by a recoil spring.

The moment the engine starts up and the self-starter button is released the flywheel rotation causes the pinion to travel back along the starter shaft out of engagement.

The front end of the self-starter shaft is provided with a square end, and it is possible in the case of only a slight jam to rotate this spindle with a spanner and thus disengage the starter pinion from the flywheel. The above explanation will be made clearer on examining Illustration No. 26, which shows the starter removed from the engine. It is held in position by two studs and one bolt, and there is a distance plate between the starter housing and the flywheel housing. The flywheel teeth can be seen and also the spiral thread on the extension of the starter shaft, along which the engaging pinion travels to and fro ; the recoil or buffer spring is clearly visible.

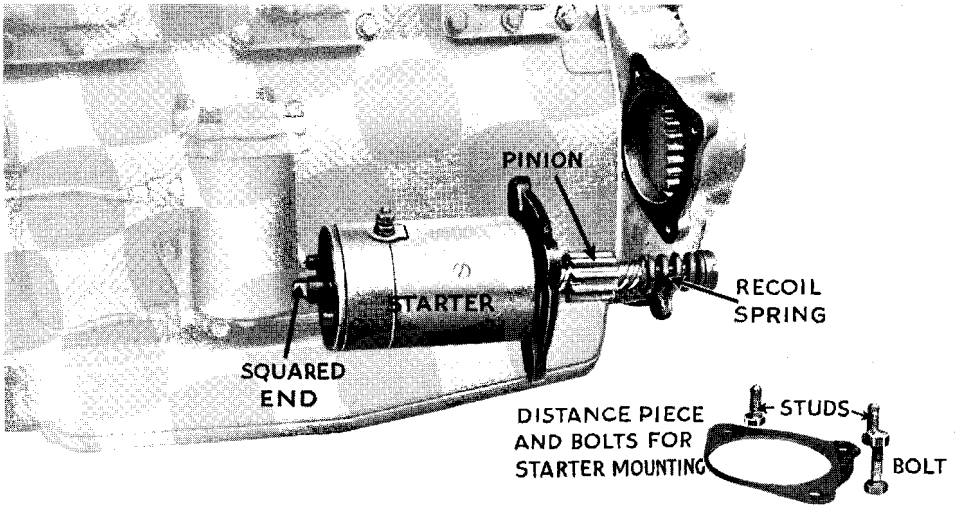


Illustration 26.—Self-starter removed from the engine to show the method of attachment. The forward end of the self-starter spindle has a squared end on to which a spanner can be fitted, in the case of a slight jam of a pinion in the flywheel. The squared end should be turned clockwise, i.e. in the same direction as the engine.

Before dealing with the internal dismantling of the engine, it may be as well to clean up the exterior fittings by referring to the method in which the engine is mounted in the frame at the front end, and the removal of the self-starter.

The self-starter has already been illustrated in Illustration No. 3, and Illustration No. 26 shows the starter after removal of the engine.

A solenoid is fitted on the top of the self-starter.

Should, through accident, the solenoid stick and the starter continue to revolve, it is possible to pull the smallest of the wires on the solenoid off, which will break the electrical circuit. This might also be necessary in the event of the self-starter switch jamming.

Engine Mounting. It has been seen in Illustration No. 7 that a steel tube passes through the bell housing of the flywheel and is supported in two brackets, one on either side, in order to secure the rear end of the engine unit in the frame. The front end mounting, however, is entirely different.

The frame is provided with a front tubular cross member, which is shown in Illustration No. 27, in its relationship to the engine. A central bracket is attached to the cross member, and by means of a bridge piece the front end of the engine extension bracket is attached to the cross member, bushes being interposed to afford a certain amount of resiliency to the mounting, and isolate the engine from road shocks. Reference back to Illustration No. 14 shows the front cross member in the frame, and the means whereby the radiator is attached thereto. This illustration is particularly instructive in case it is necessary at any time to remove the radiator. The radiator proper is mounted on the front engine extension by means of two studs and nuts and interposed fibre washers.

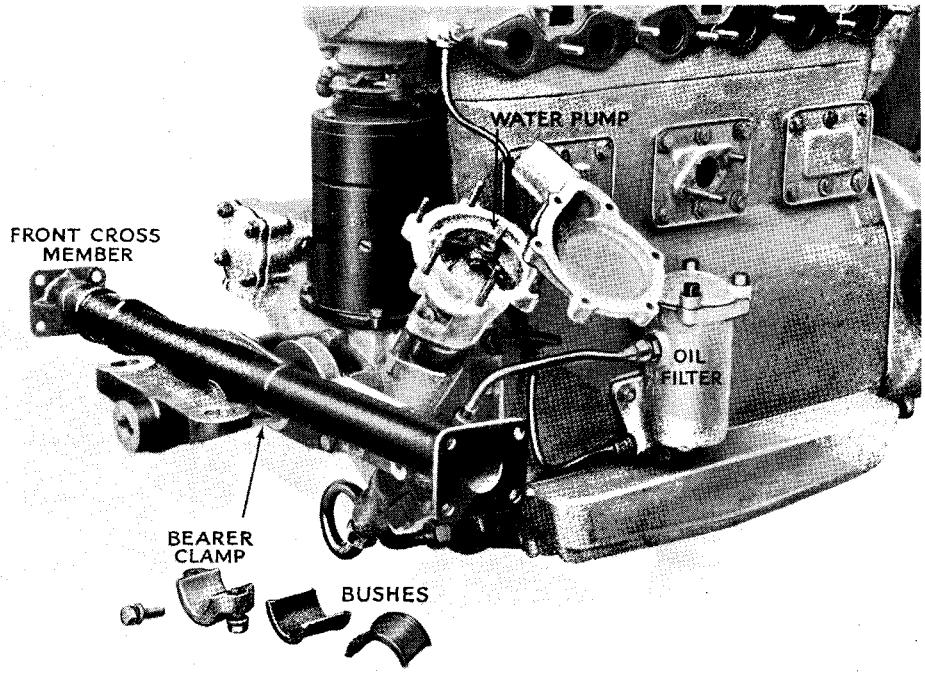
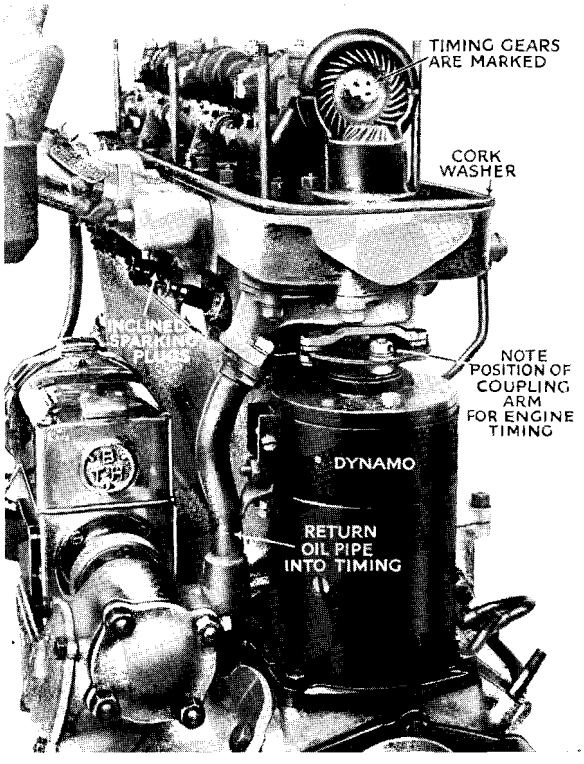


Illustration 27.—The frame front cross member has been photographed in its relation to the front engine bearer. It will be noted that there is a bearer clamp which holds the engine in position and attaches it to the cross member, bushes being employed as shown.
The top cover of the water pump has been removed to expose the pump impeller.

Engine Dismantlement. The principal external components of the engine having been dealt with, it is now proposed to describe (in dismantling the engine pictorially) the construction of the engine and the method employed.

The first feature in dismantling is obviously the cylinder head. This comprises the timing of the valves, the dismantling of the valve gear, the grinding of the valves, the relationship of the cylinder head to the cylinder block, and the method of driving the camshaft.

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, 4, 2, 6, 3, 5.

Illustration 28.—This should be carefully studied because it has to do with the timing of the valves and shows the relative position of the arm of the dynamo coupling when two of the pistons are on top dead centre. The valve cover cork washer can be seen and the type of gears employed to drive the camshaft.

When the cross head of the dynamo coupling is in the position shown in Illustration No. 28, that is to say with the bolt through the coupling attached to the dynamo towards the front of the car, then No. 1 piston is on top dead centre.

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 top dead centre to check the ignition, or for any other purpose, it can be found by turning the dynamo coupling, as shown in the above illustration.

To check which cylinder is on the firing stroke, it is necessary to remove the valve cover and inspect the position of the camshaft.

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 to disengage the coupling between the dynamo and the cylinder head.

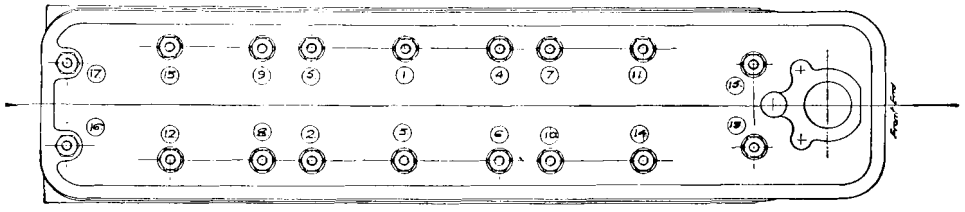


Diagram showing the order in which the cylinder head nuts should be screwed down on M.G. Magnette engines.

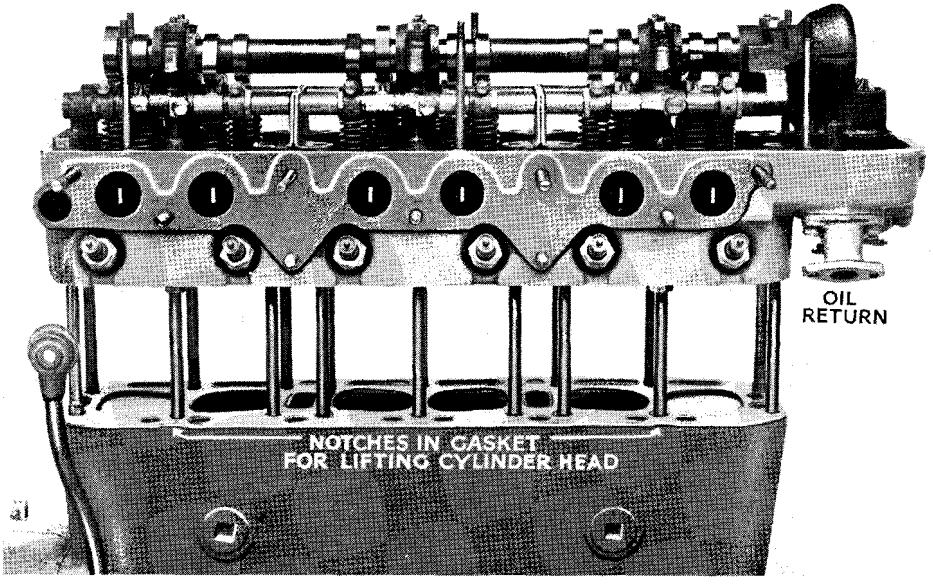
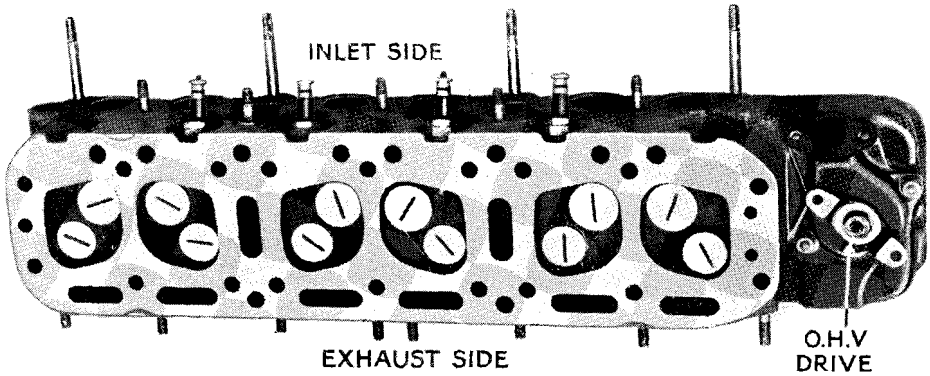


Illustration 29.—View of the cylinder head partially removed from the cylinders. This is a view of the inlet side of the engine ; the pipe on the left-hand side of the illustration is a return feed from the head to the base chamber. It will be noted that there are notches in the gasket, so that a tool like a screwdriver can be inserted to help to lift the cylinder head.

Cylinder Head Removal. Whenever the cylinder head has to be removed it is obvious that the oil delivery pipe and return pipes will have to be disconnected. There are 18 cylinder head holding-down bolts, and Illustration No. 29 shows the cylinder head partially removed. A copper and asbestos gasket is fitted between the cylinder head and the cylinder block, and if ordinary care is employed, there is no reason why this should be damaged in removal.



COMBUSTION CHAMBERS SHOWING VALVES

Illustration 30.—Interior of cylinder head, showing the position of the valves, the shape of the combustion spaces and the holes through the cylinder head through which the holding-down studs pass, as well as the passage ways conveying water to the head. The coupling for the overhead camshaft will also be seen.

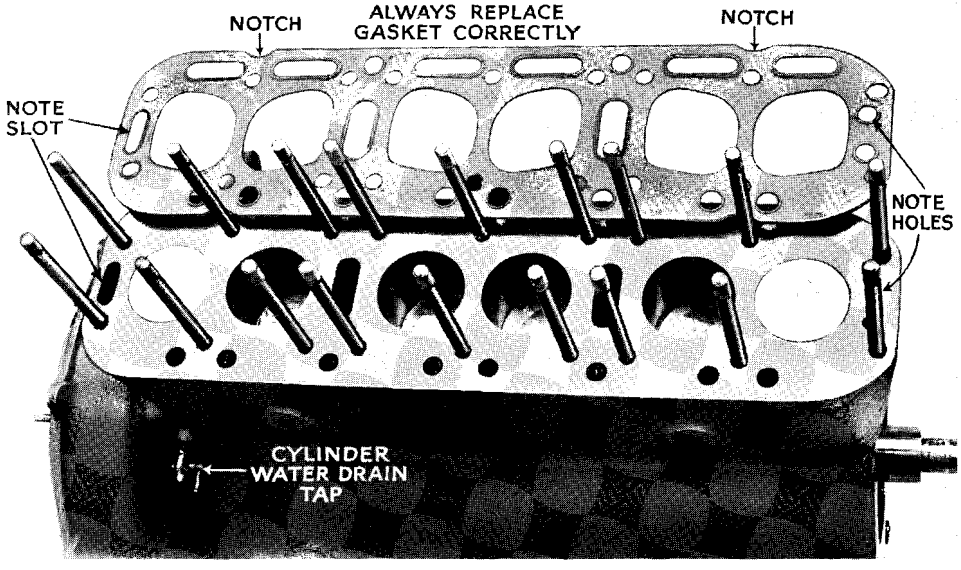


Illustration 31.—Plan view of the cylinder block and the gasket. It should be noted that the gasket should only be fitted the correct way. An important feature of this illustration is the cylinder head water drain tap which has to be open when the entire water system is to be emptied, as, for example, in Winter time as a precaution against frost.

After the cylinder head has been removed the combustion chamber side presents the view seen in Illustration No. 30. Each valve is numbered in relation to the number on the face of the cylinder head, and valve grinding can be effected either by holding the valve in a suitable clamp from above, or by means of the screwdriver from the combustion chamber side. It is as well to study this illustration from another point, namely the possible necessity of changing a valve spring. In a case of emergency a rod can be inserted through the sparking plug hole, after the sparking plug has been removed, which will prevent a valve dropping into the cylinder, but should a spring break it is preferable to remove the head in order to change the spring. As has been previously stated, there are 18 cylinder head studs, and Illustration No. 30 shows the holes through which the studs pass. The remaining holes in the head are for the free travel of water from the cylinder body through the gasket to the cylinder head. The right-hand side illustration shows the coupling attached to the pinion shaft which operates the overhead gears.

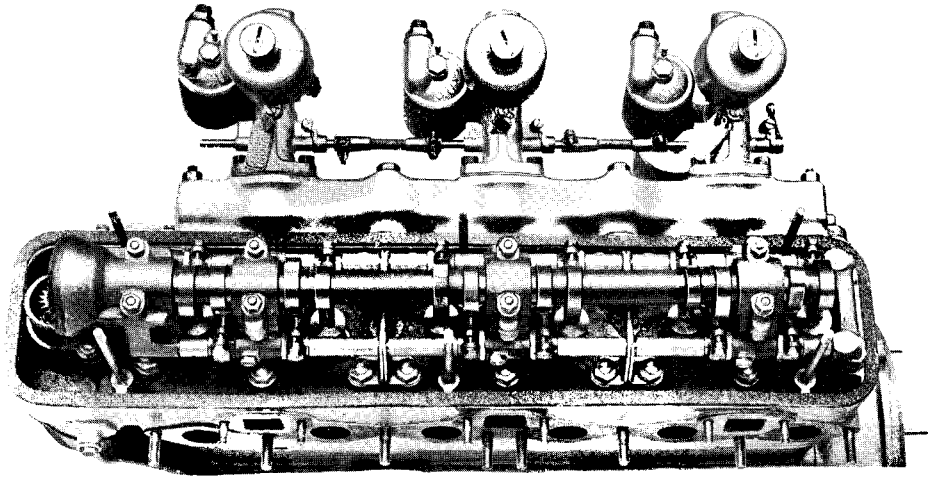


Illustration 32.—Plan view of the cylinder head, showing the camshaft and rockers in position.

A plan view of the cylinder block after the head has been removed, Illustration No. 31, is worthy of careful consideration. It shows the cylinder head studs in position and the cylinder head gasket resting alongside. Before an attempt is made to replace a gasket, it should be carefully noted that there is only one way in which the gasket must be fitted. There is in the first place a slot at one end, while there are holes at the other end for the passage of water, and the shape of the gasket must conform to the contour of the combustion chamber. This illustration affords an opportunity of noticing notches made in the gasket which afford a method of inserting a screwdriver or similar tool between the head and the cylinder block, in order to break the joint, which may have become very tight due to the presence of carbon and jointing compound.

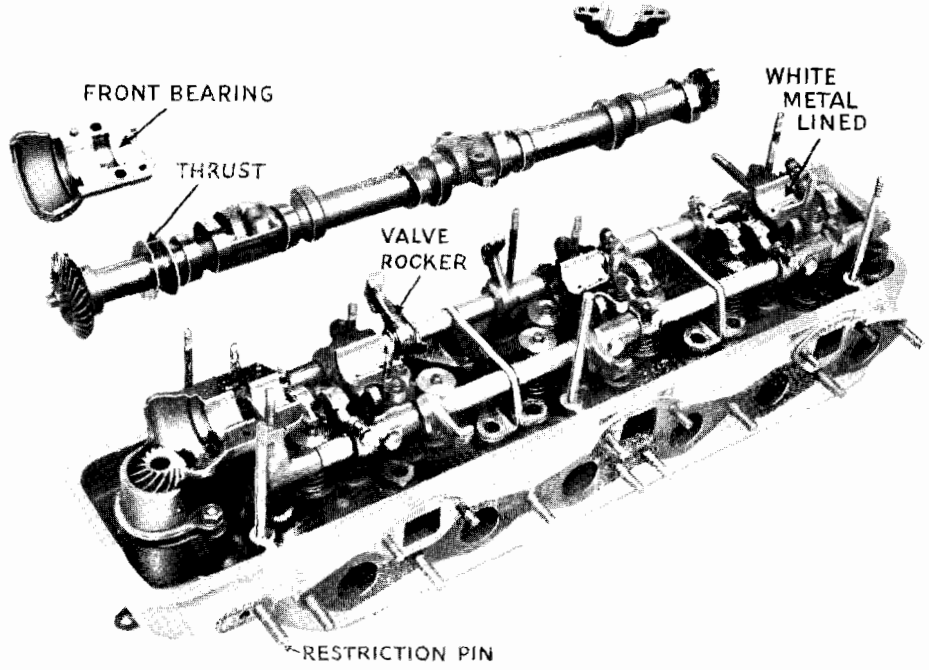


Illustration 33.—A very detailed view of the cylinder head, showing camshaft removed from its four bearings, which are white-metal lined. On the left lower side of the illustration the restriction or metering pin will be noticed. This pin has a flat machined upon it to control the amount of oil that passes to the overhead valve gear. Oil is delivered to the front bearing of the camshaft and then through the rocker-shafts to lubricate the rockers and remaining bearings.

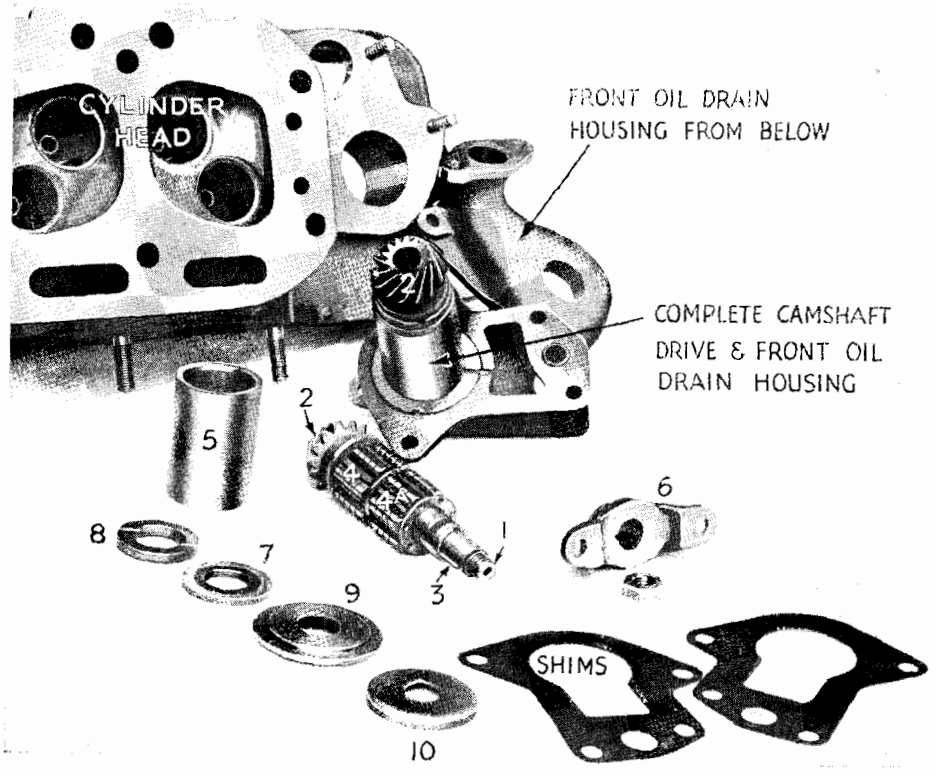


Illustration 34.—View of the underneath side of the cylinder head, with complete camshaft drive removed. A separate unit has been dismantled, the parts being as follows :—

A number of shims are employed in the original assembly. These should never be dismantled.

1. Camshaft driving shaft.
2. Camshaft driving bevel pinion.
3. Camshaft driving bevel pinion key.
4. Hyatt roller bearing.
4a. Hyatt roller bearing.
5. Bevel pinion bearing sleeve.
6. Universal joint fork for bevel pinion.
7. Bevel pinion washer.
8. Bevel pinion thrust washer.
9. Bearing retainer plate.
10. Bevel pinion oil thrower.

Part not numbered :—
Oil drain housing (front).

Illustrations Nos. 32 and 33 need very little explanation as they afford to those interested a detailed view of the cylinder head as seen from above, with the valves in position. In the latter illustration the camshaft is removed and the articulating rockers and the rocker-shafts can be inspected.

The camshaft is held in position in four white metal bearings by bearing caps, and oil is introduced into the bearings along each of the rocker-shafts, as well as supplying the drilled rockers. The surplus oil, as has been previously explained, drains back into the sump. It will be noticed that some of the cylinder head holding-down bolts pass through brackets that support the rocker-shafts in position and a $\frac{5}{16}''$ size spanner is required to slacken the holding-down bolts.

By swinging the valve rockers out of position it is possible to remove the valve cups and cotters after the camshaft has been lifted. Particular note should be made of the thrust on the front end of the camshaft, and be sure that this registers properly when the latter is reinstated.

The number of washers will be seen on the camshaft, consisting of a steel disc and a spring steel washer. These fit on the front side of the front bearing next to the bevelled gear, and take the thrust of the drive of the shaft.

Before leaving the cylinder head the details of the overhead valve gear drive can be seen by reference to Illustration No. 34. The complete camshaft drive assembly on the left-hand side of the illustration is bolted to the cylinder head by four studs and nuts, and in order to ensure correct meshing of the driving pinion with the camshaft gear wheel a number of shims are employed between the face of the cylinder head extension and the assembly housing. These are in point of fact a Factory fitting, but care should be exercised, if ever a unit is removed, to see that the shims are neither damaged nor omitted. The caption beneath the illustration suffices to describe it.

Engine Components. The following operations will deal with a number of parts, such as oil pump, magneto and bracket, and dismantling 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 M.G. Magnette 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.

Take Illustration No. 35. This shows a view of the engine as seen from below. There is the sump, the oil pump, the front engine bracket, the dynamo, magneto drive, and suction filter.

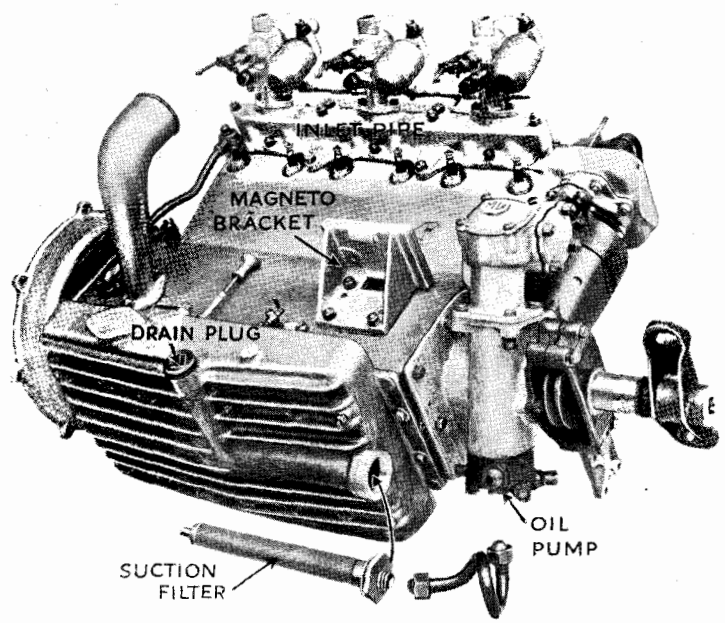


Illustration 35.—This illustration is primarily intended to show the position of the suction filter inside the engine, also how the magneto bracket is bolted to the base chamber. It will be noted that the oil pump is driven by the timing gear off the same shaft that drives the magneto gears.

REMOVING AND CLEANING THE SUCTION FILTER

The suction filter consists of a tube surrounded by a fine mesh gauze through which the oil in the sump has to pass prior to being drawn into the oil pump. The filter should be removed from time to time and thoroughly washed in petrol. When replacing it, make sure that the fibre washer between the nut and the sump is not damaged. It is also necessary to see that the short snail-shaped pipe between the suction filter and the oil pump is properly tightened up, because a very small leak at this point would be fatal to the oil circulation.

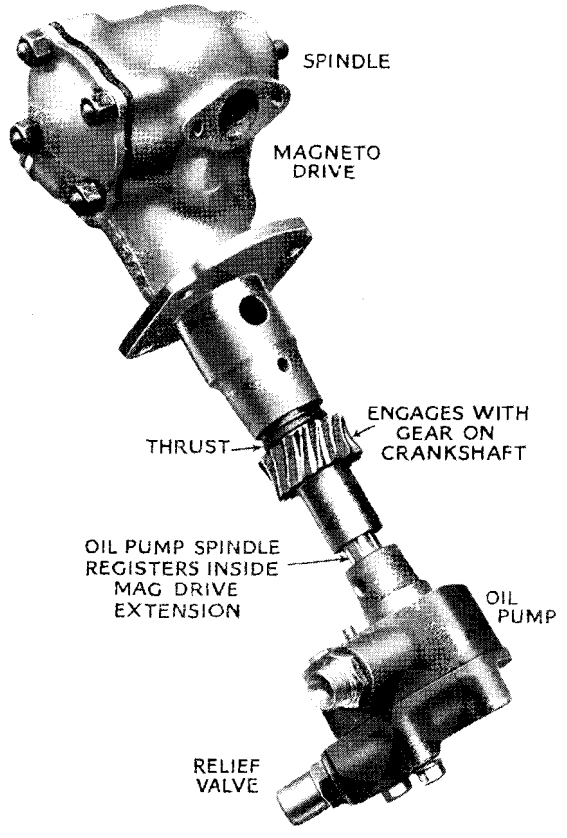


Illustration 36.—Magneto drive and oil pump removed from the engine. It will be seen that these are driven by the same shaft. The oil pump spindle registers inside the extension of the magneto drive.

METHOD OF DRIVING AND DISMANTLING THE OIL PUMP AND MAGNETO DRIVE (IF FITTED)

Reference to the above illustration shows the pump actually removed. The pump is attached by means of five studs. The upper end of the pump spindle is castellated and registers inside the lower extension of the magneto drive, which is shown in Illustration No. 36 coupled to the pump, thus forming a single unit and driven by the gear which engages with the gear on the crankshaft.

In order to remove the magneto drive, it is first of all necessary to undo the bolts which secure it to the timing cover, disconnect the magneto and give the housing a half turn in order to disengage the gears, as it will be noticed that they are a true worm. If ever the magneto drive is removed, it is necessary to remove the oil pump first, and when the oil pump is replaced care should be exercised to see that the splines register without force.

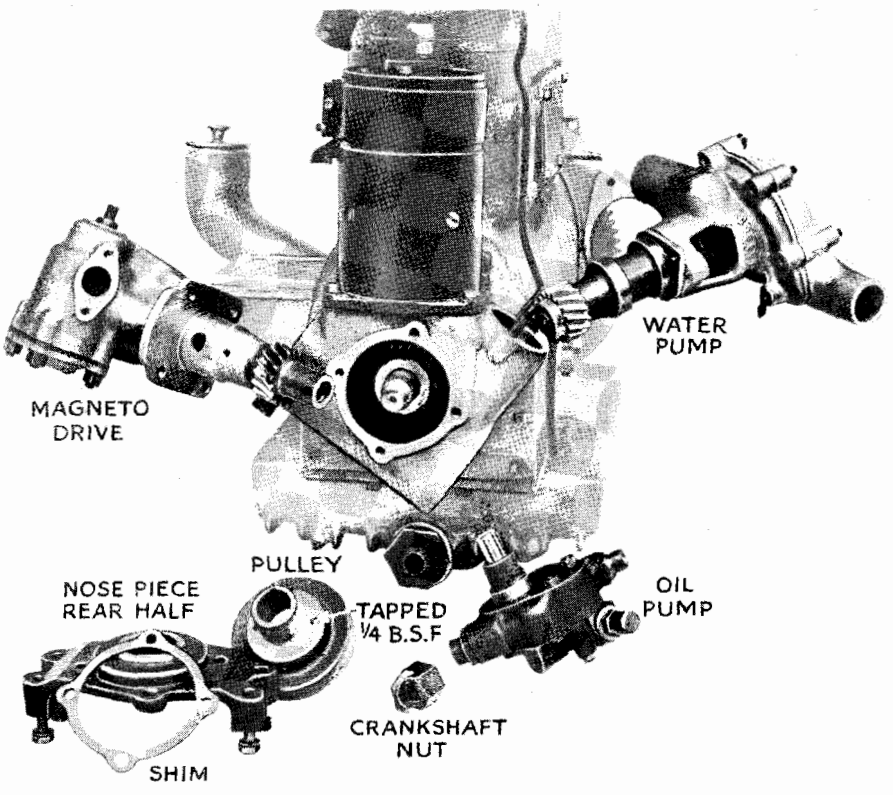


Illustration 37.—Oil pump, water pump and magneto drive removed from the engine. To remove the fan pulley, it is necessary first of all to unscrew the starting handle dog nut and, by using two $\frac{1}{4}$" B.S.F. bolts, the pulley can be withdrawn from the crankshaft.

Illustration No. 37 shows how the front end engine bearer has first of all been removed from the front end engine cover. The pulley is removed by using $\frac{1}{4}$ in. B.S.F. bolts, which act as drawers, and then the front end engine housing can be withdrawn by the removal of four bolts, disclosing the front end of the crankshaft, as seen in Illustration No. 37. The forward end thrust of the crankshaft is taken through a hardened steel washer butting up against the white metal of the front main bearing. The rearward thrust is taken by interposing steel and white metal washers between the housing and the timing gear.

It stands to reason that before the pulley can be removed the nut on the front end of the crankshaft which acts as a starting handle dog, and shown at the bottom of Illustration No. 37, must first of all be removed.

It should be highly improbable that the magneto drive need ever be dismantled, as it is copiously lubricated and runs on ball bearings. It consists, as can be seen in Illustration No. 38, of the housing in which there are a pair of spiral gears attached to the vertical and horizontal shafts.

The lower extremity of the vertical shaft is fitted with worm gear, and there is a thrust washer placed between the vertical gear and the shaft housing. The magneto coupling is shown on the right of Illustration No. 38, consisting of a star coupling, which is bolted on to the magneto shaft and registers inside a flexible body of the other half of the coupling, which is attached to the magneto drive spindle. The magneto can be removed simply by slipping the two couplings out of engagement, after undoing the strap and set screws, but whenever this is done it is as well to mark how they come out so that they can be properly re-engaged in relation to the proper firing order.

It is always possible to increase the amount of advance of the magneto by slackening the nut on the vernier coupling referred to, and rotating the latter slightly and then tightening the nut, but as it is set when it leaves the Works is best for all-round running.

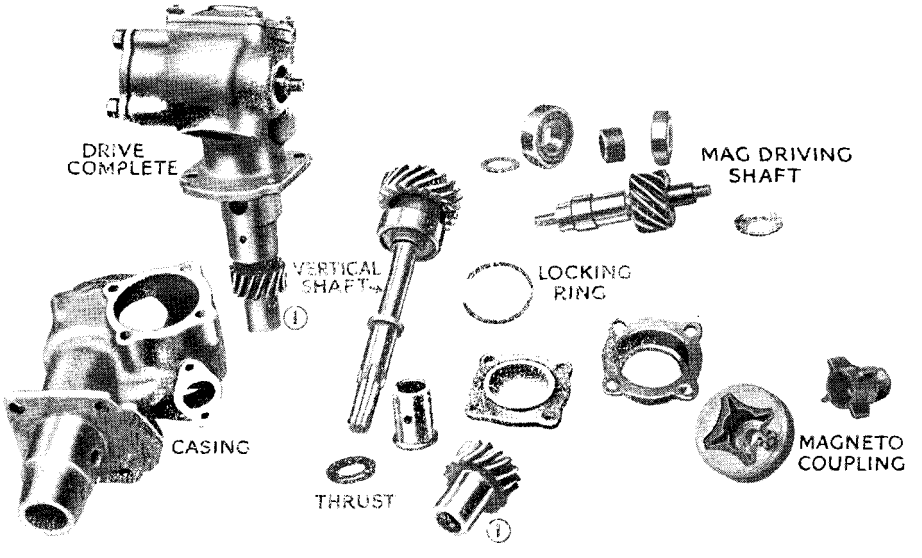


Illustration 38. Details of the magneto drive, showing a complete drive on the left, and the component parts have been dismantled to show the manner in which the shafts are supported. The magneto coupling has a moulded rubber inset into which the portion of the coupling attached to the magneto fits.

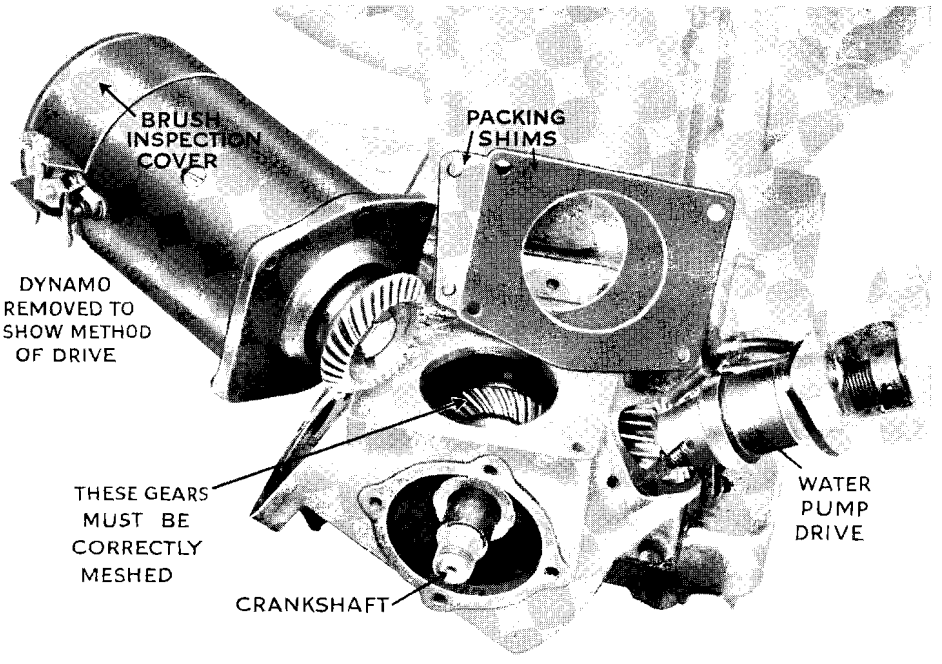


Illustration 40.—This shows the manner in which the dynamo is driven. In order to correctly mesh the drive gears it will be noted that packing shims are interposed between the dynamo body and the timing case. The water pump is driven by a separate gear in front of the bevel which drives the dynamo.

DYNAMO DRIVE. Full details of the method of removing the dynamo are given under the heading of the electrical section on page 92. It may be necessary at some time to remove the dynamo. This is a comparatively simple matter if reference is made to Illustration No. 40. 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 assembling gears, which 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 indicated in Illustration No. 28.

Water Pump. Illustration No. 41 shows the complete water pump after removal from the engine, and below this the pump will be seen dismantled. The principal point of which the owner has to take care is the packing gland adjustment. This consists of a brass bush screwed at one end to register inside the pump body and hold the gland, consisting of special pump packing, in position that will prevent water creeping along the pump spindle and leaking. The packing gland nut can be tightened by inserting a small piece of rod in the holes drilled in the nut and using the side of the pump body as a fulcrum.

In order to remove the pump from the engine it is necessary to unscrew the two nuts that hold it in position, and after the removal of the rubber hose connections it can be withdrawn by giving it a gentle pull. Care must be exercised, however, in reinstating it to see that the gears mesh, before any pressure is put on the pump in replacing it. Should any foreign matter find its way into the pump the impeller will rotate on the shaft. It is held in position by a small bolt. The slot in the shaft is larger than the diameter of the bolt to allow for endwise adjustment.

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 wheel 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.

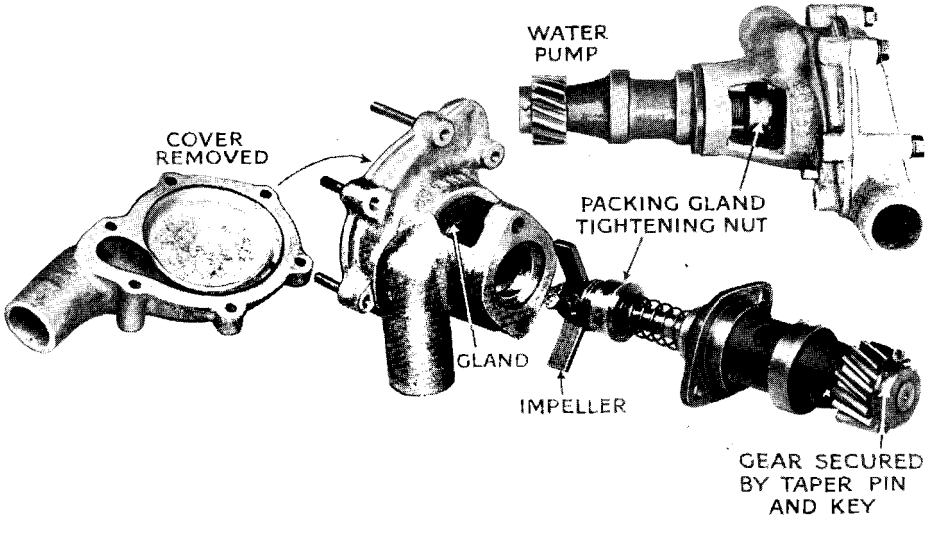


Illustration 41.—View of the water pump completely dismantled. The principal point of interest to the user is the packing gland tightening nut. The gland needs no lubrication and should only be tightened sufficiently to prevent leaks, should they occur.

SEE SEPARATE SECTION DEALING WITH COIL IGNITION AND DISTRIBUTOR.

Illustration No. 42 shows the necessity of employing a puller to remove the helical bevel pinion from the crankshaft. The holes in the pinion are tapped $\frac{1}{4}$ in. B.S.F.

To remove the front end housing it is also necessary to use a means of withdrawal in the form of two $\frac{5}{16}$ in. B.S.F. bolts. These are shown in Illustration No. 42.

We then see, in Illustration No. 48, the front end of the crankshaft, also the two keyways on the crankshaft on to which the two gear wheels fit.

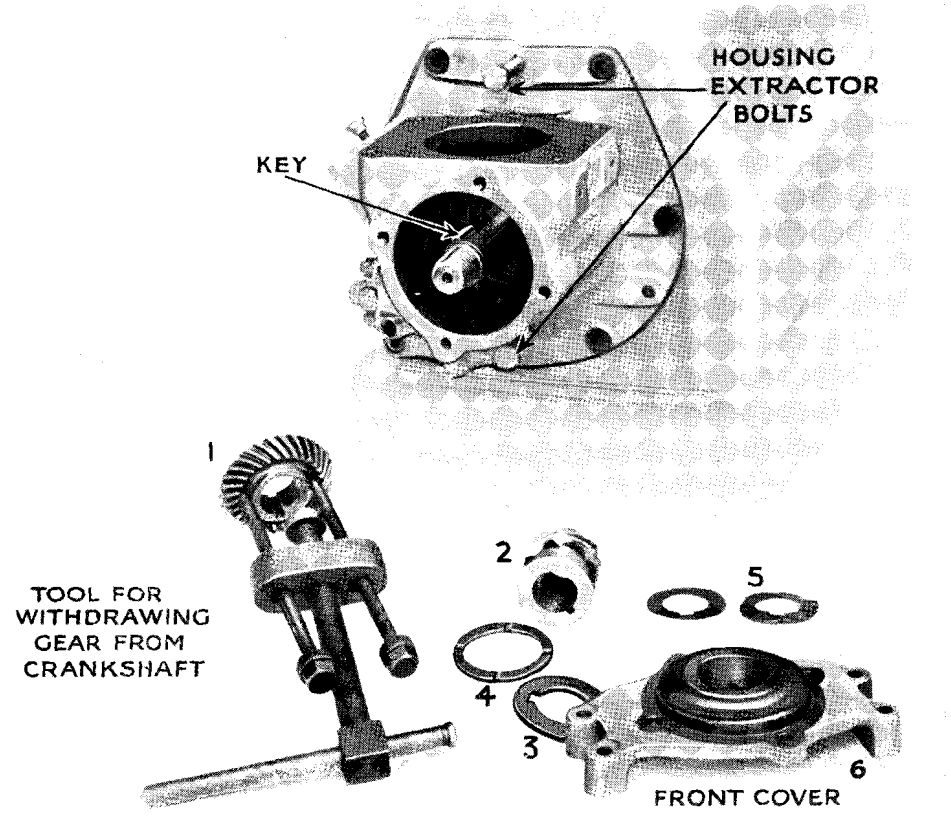


Illustration 42.—View of the components attached to the front end of the crankshaft. The helical bevel wheel is a tight fit on the shaft, held in position by a key, and it is necessary to utilise a wheel removal tool, similar to that shown, in order to extract this. The principal parts are as follows :—

1. Helical bevel wheel.
2. Worm wheel for driving oil pump.
3. Distance collar.
4. Washer with thrust face.
5.—Packing shims.

Engine Lubrication. The actual lubrication of the engine is very simple. 5 quarts of oil are contained in the sump when filled to its proper level.

The oil flow can be followed by referring to Illustration No. 43. Here we see the sump, oil suction pipe, and the pump. Oil is delivered from the pump to the oil filter, which is shown attached to the near-side of the engine and having two connections 1 and 2. The oil filter is also shown removed in this illustration, with

the connections 1 and 2 marked thereon. In point of fact the holes that can be seen on the removed oil filter marked "oil feed holes" couple up with holes drilled across the crankcase, so that the oil that is forced by the pump into the oil filter is cleansed and is delivered internally to the two centre and rear main bearings. The oil feed passes through the union No. 2 to deliver oil by means of an external pipe to the front main bearing and the overhead valve gear.

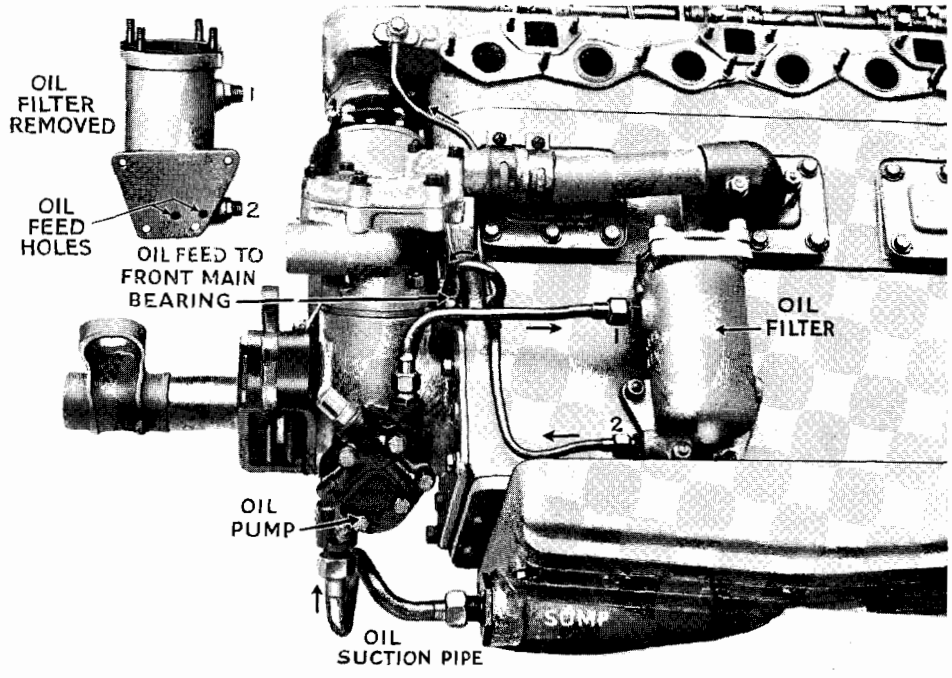
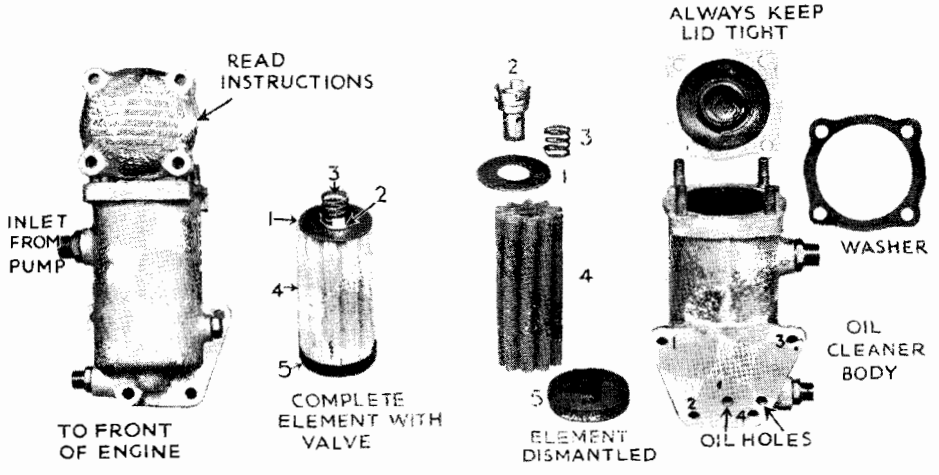


Illustration 43.—View of the front part of the engine showing the position of the oil pump, which is connected to the sump by the oil suction pipe, and the external view of the oil filter which has unions marked 1 and 2. After oil has passed through the element inside the filter it is delivered through two small holes which communicate with the main bearings of the engine, as well as the pipe to the pressure gauge on the dashboard.



The Tecalemit oil filter, referred to on this page, shown in complete form and also dismantled. The various figures serve to indicate the position of the various components to assist assembly when fitting a new element.

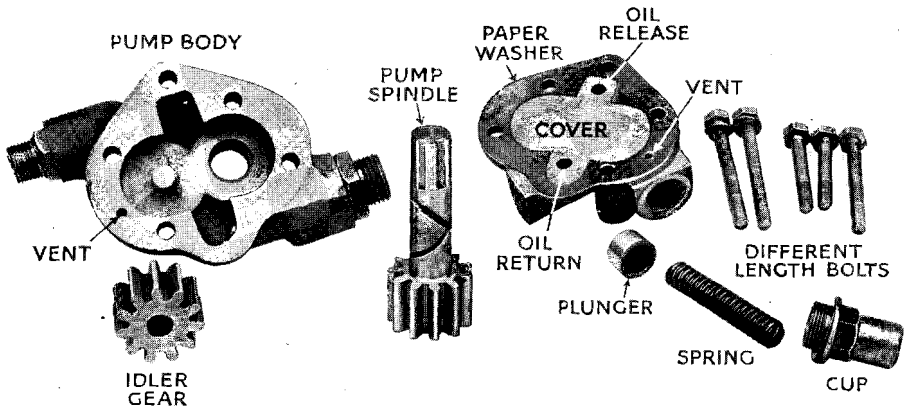


Illustration 44. The components of the oil pump, which is of the gear type. The gear on the pump spindle engages with the idler gear.

The principal part of the pump to examine is the relief valve, which consists of a plunger, spring and hollow cap nut. When the oil pressure registers a pre-determined limit, the spring is compressed and allows the plunger to uncover a passage which will cause the pressure of the pump to drop. There is no adjustment to the amount of pressure ; this is determined at the Factory, and is governed by a spring.

The pump is of the gear type, fitted with a cover-plate and having a by-pass relief valve incorporated in the body of the pump. The relief valve, as can be seen in Illustration No. 44, 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 non-fluidity in cold weather forces the piston off its seating. 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 the advice from the Works.

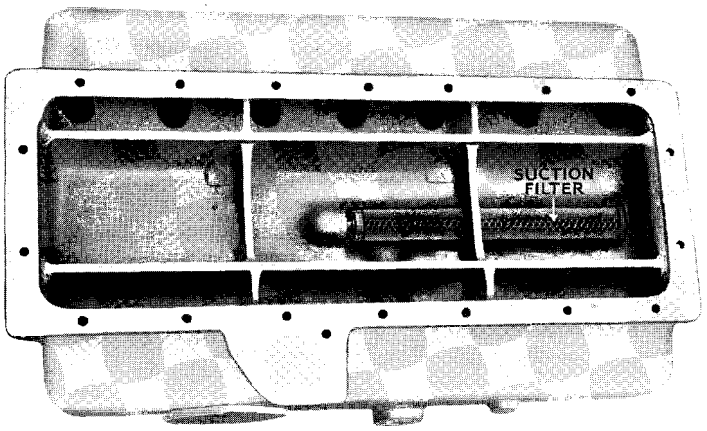


Illustration 45.—View of the interior of the sump, showing how it is baffled to prevent surging. The suction filter is shown in position. If ever this is removed, be careful to see that it is screwed up tightly against the fibre washer at the front. It is fatal to get an air leak.

Oil that is forced to the main bearings finds its way under pressure to the big-end bearings through holes drilled in the crankshaft, whence in the usual course it is thrown out by centrifugal force finding its way upwards to lubricate the pistons and gudgeon pins. The path of the oil can better be followed if the dismantling of the engine is now continued.

Before proceeding with the details of the oil circulation it is as well to examine the interior of the sump, from which it will be seen that there are a number of baffles to take care of oil surging, and also the manner in which the suction filter registers in a boss in the centre of the sump.

Illustration No. 46 shows a view of the crankshaft in position after the sump has been removed. The crankshaft runs in four main bearings, the front and rear bearings being white metal lined bushes and the two centre bearings being of white metal cast direct in the split steel housings. Examine for a moment the crankshaft after removal. Owing to the size of the balance webs of the crankshaft it is necessary to employ split housings to accommodate the two centre main bearings and to register these in the barrel type crankcase. These housings are held in position by long bolts which pass through them, and a view of the crankshaft after it has been removed is shown in Illustration No. 47, which shows the crankshaft, front end housing with its bush for the front main bearing, the rear end housing of the crankcase and the split centre main bearings, and the manner in which the bolts pass through them.

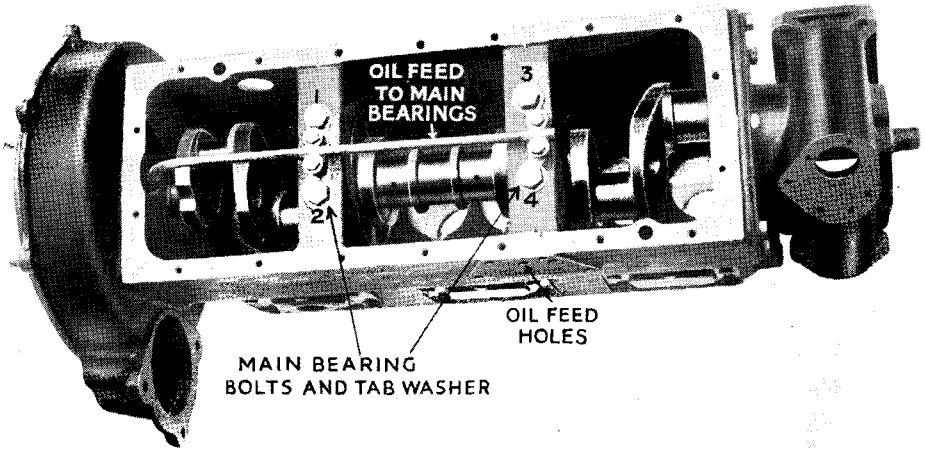


Illustration 46.—View of the base chamber after the sump has been removed, showing the crankshaft in position in the main bearings. The oil feed pipe to the three main bearings can be seen and also the heads of the bolts 1, 2, 3 and 4, which pass through the centre supports of the crankcase in which the main bearing housings are fitted and lock these in position.

As has been stated already, the front main bearing is fed with oil by an external pipe, and it is now possible on examining Illustration No. 46 to see how the oil feed holes on the side of the base chamber correspond with the large front cross web coupling up the two halves of the crankcase and, of course, integral therewith. The two centre and rear main bearings receive their supply from the oil pipe that can be seen in the illustration.

The crankshaft centre main bearings are fitted into housings which will be shown later, and these housings are held in the crankcase by means of long bolts, Nos. 1, 2, 3 and 4, the bolts being prevented from turning by the use of tab washers.

There is one other point that should be noted in this illustration, namely the position of the oil feed to the main bearings. It has been shown in Illustration No. 46 that the centre and rear main bearings are fed by one pipe, which delivers oil to the main bearing housings and to a union below the rear main bearing. The oil then goes via the bearing feeds as marked 1, 2, 3 and 4 in Illustration No. 47.

The rear main bearing is, however, differently designed. An examination of the rear end of the crankshaft, as shown in Illustration No. 48, will disclose the fact that the crankshaft has a tapered rear end, and is fitted with a key. A flange is fitted on to this with an extension. The object of the flange is to act as a mounting for the flywheel. A white metal lined bush is fitted over this extension and registers inside the rear end of the flywheel housing.

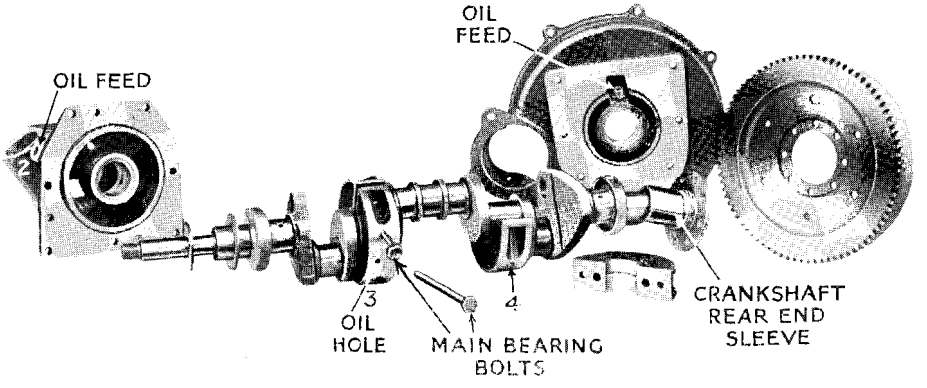


Illustration 47.—View of the crankshaft removed from the engine and its relation to the front end housing. It will be noted that the two centre main bearings are split in two halves. The rear end of the crankshaft is fitted with a sleeve to receive the flywheel. The front end main bearing is white-metal lined.

Before dealing with the rear main bearing and its construction, it may be as well to examine the crankshaft, two views of which are shown in Illustration No. 48, the main journals being indicated by the letter " M " and the big-end journals indicated by numerals, 1, 2, 3, 4, 5, 6. A close examination of the illustration will show that the shaft is drilled so that oil can pass through the holes in the shaft from the main to the big-end bearings. The front end of the crankshaft is slotted to receive two keys, on which the timing gears are fitted. The rear end of the crankshaft, however, can be seen in two positions, 1 and 2, in Illustration No. 48, showing that on one side there is an oval slot with a hole in it, and on the other side there is a key, the purpose of which will be made clear on examining Illustration No. 49.

First of all the flywheel is attached to the crankshaft by utilising the flange No. 2 in Illustration No. 49. This flange has a hole in it on one side and a keyway cut on the inside. The external extension of the flange fits inside the rear main bearing and is secured to the tapered end of the crankshaft by means of a key, and is locked in position by a nut which can be seen on the end of the crankshaft in Illustration No. 48.

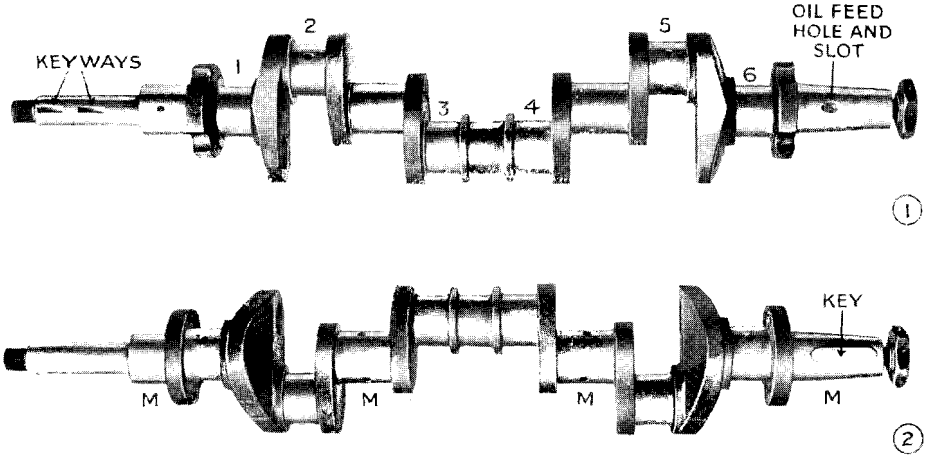


Illustration 48.—Two views of the crankshaft: (1) the front end of the shaft is provided with two keyways on to which the timing gears are fitted: at the rear end can be noted the oil feed hole and slot. The lower illustration (2) shows four main bearings marked "*M*" and also the long key at the rear end to register the rear journal and flywheel flange on the shaft.

The hole in the flange 2 registers with the oil feed hole in the slot in the crankshaft 3, so that the lubricant which is delivered to the union on the rear main bearing 1 passes through hole 2 and into the hollow crankshaft in order to lubricate the big-end bearings.

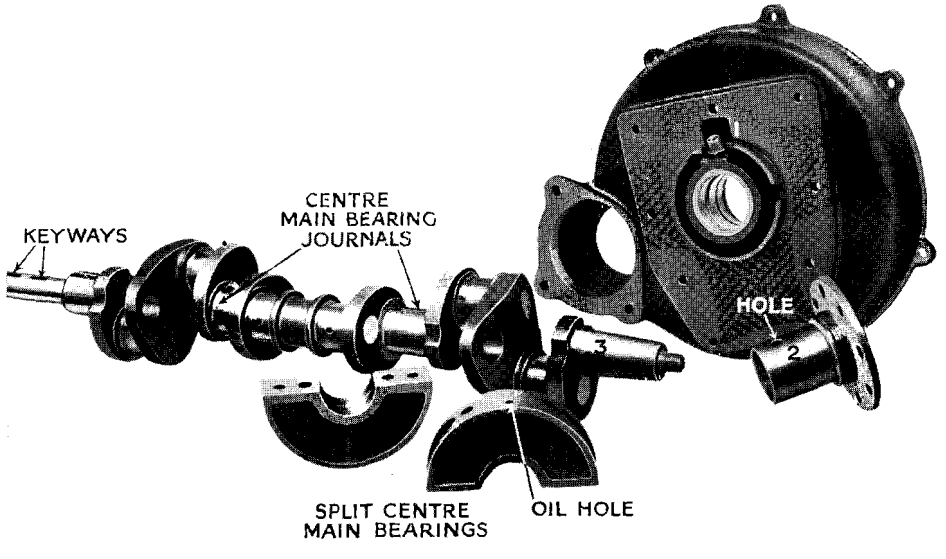


Illustration 49.—This is primarily intended to show the manner in which the crankshaft 3 passes through the flywheel housing, the actual journal of the shaft being the sleeve 2. The main bearing 1, which is really upside down, receives oil through the nipple; this passes through the hole of the sleeve 2, which registers with the slot in the crankshaft shown in Illustration 48.

In order to remove the crankshaft hub it is necessary to employ a tool similar to that shown on the right-hand side of Illustration No. 50. It has already been shown that the flywheel, hub, and bearing sleeve are fitted on to the crankshaft by means of a taper and key ; this type of flywheel actually illustrated is used when a normal clutch is employed, but the method of flywheel attachment is similar in all cases.

Note :—Should the owner have the misfortune to run a bearing—in other words, through insufficient lubrication the bearings become molten—it will be found that part of the white metal will actually run into the oil channel ways in the crankshaft and block these. Cases have been known where the bearing has been refitted, and omission to clear the crankshaft has only resulted in the bearing running immediately after reassembly. If ever a bearing runs, it is necessary to see that all the ducts through the crankshaft are cleaned out, and it may even be necessary to remove the blanking plugs and pass drills of correct size through the holes. It may be found, however, that only a small quantity of white metal has run into the oil ways, and if a syringe of thin oil is squirted through these oil ways it is possible to see if they are clear.

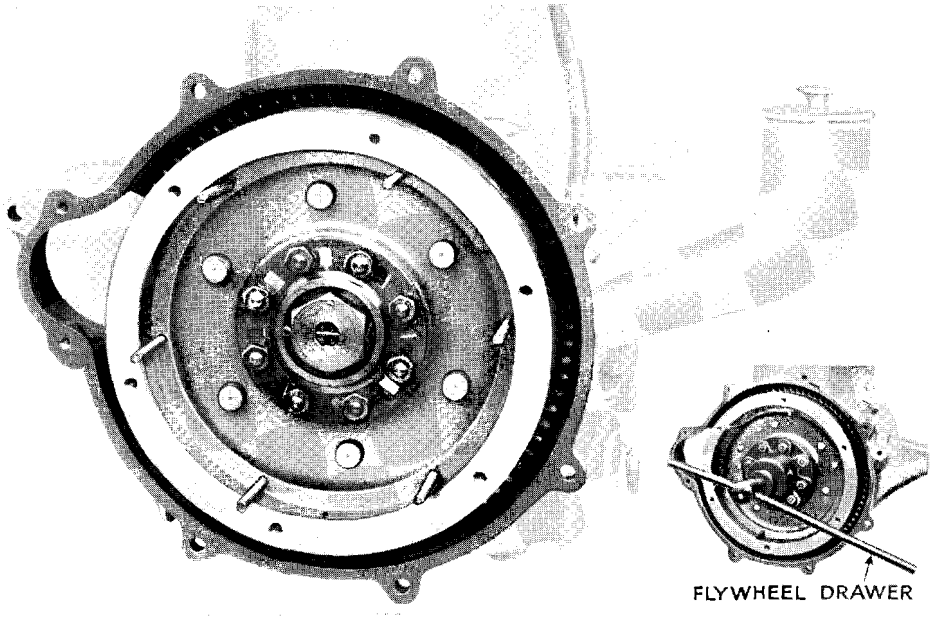


Illustration 50.—Rear view of the flywheel in position on the crankshaft. The flywheel is bolted to the detachable rear crankshaft flange, which latter is held in position by the large hexagon nut and split pin. It is necessary to use a withdrawal tool to remove the flange ; this is shown on the right-hand side of the illustration.

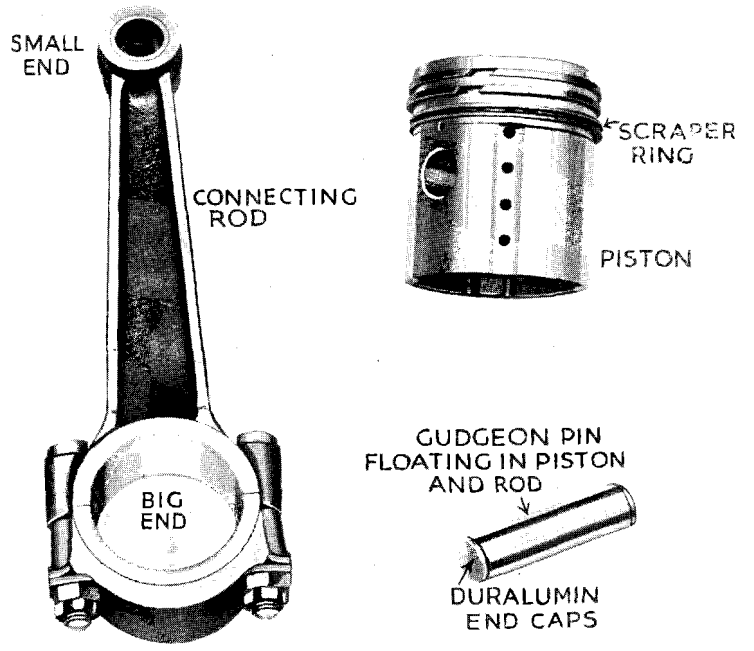
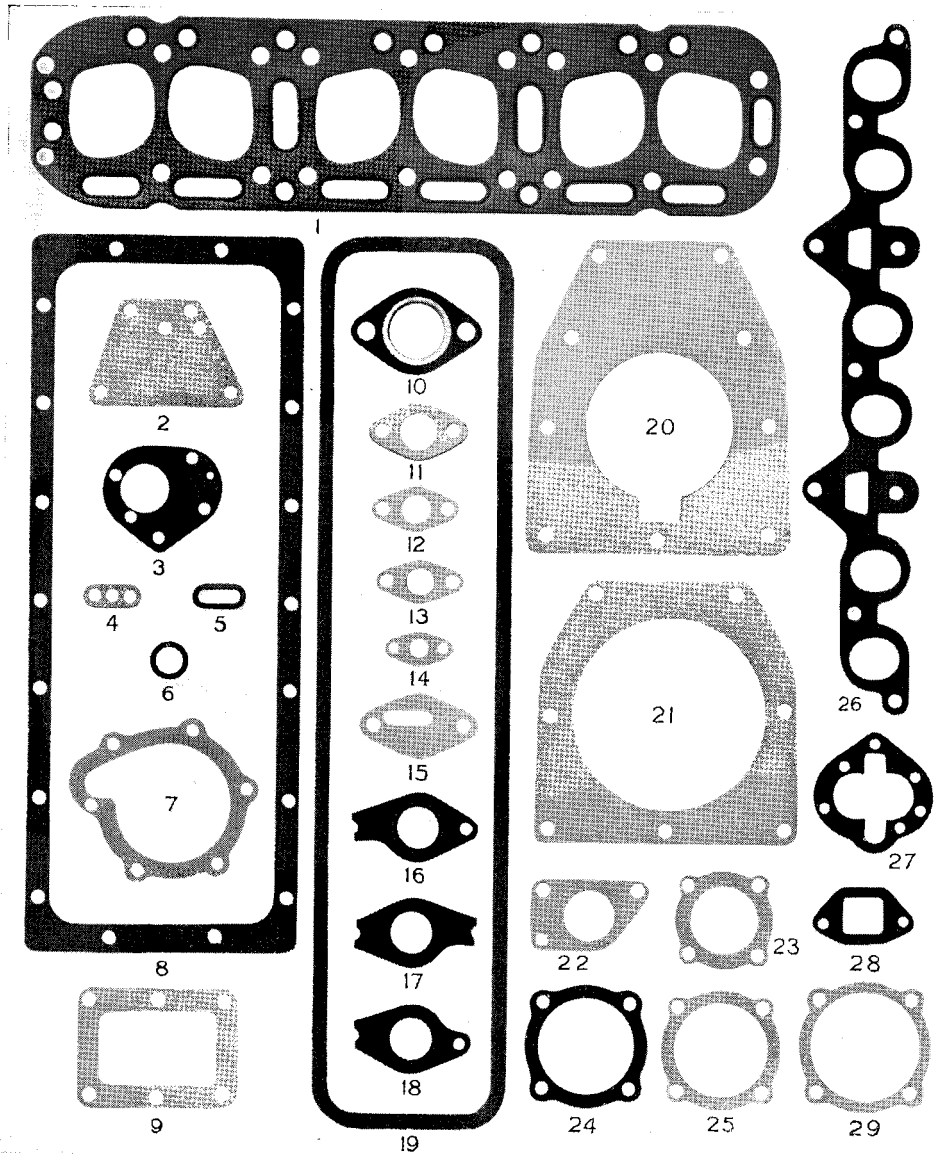


Illustration 51.—The gudgeon pin is hardened and ground and is free to float in piston and connecting rod. It is fitted with duralumin end caps to prevent scoring the cylinder walls.

Connecting Rods, Pistons and Gudgeon Pins. Illustration No. 51 shows the type of connecting rod employed. The pistons are of aluminium alloy fitted with three rings (the lower one being a scraper ring). The gudgeon pin is free to rotate in the piston boss and the small-end bearing of the connecting rod. Duralumin end caps are pressed into the gudgeon pins so that these can contact with the cylinder walls without in any way damaging them. White metal is cast direct into the connecting rod for the big-end bearings, and it will be noticed that the bottom cap is of generous proportions and is held in position by means of two bolts. The heads of the big-end bearing bolts are so formed that they register with the connecting rod and are thus prevented from turning round.



Various types of washers used.

1. Cylinder head gasket.
2. Oil filter body joint.
3. Joint for oil pump.
4. Main oil feed flange joint.
5. Cylinder head feed pipe joint.
6. Cylinder head drain pipe joint (top rear).
7. Water pump joint.
8. Joint for oil base.
9. Joint for cylinder jacket cover-plate.
10. Exhaust flange gaskets.
11. Carburetter flange gasket.
12. Cylinder head drain pipe joint (front bottom).
13. Ditto (front top).
14. Ditto (bottom rear).
15. Joint for oil gauge adaptor.
16. Exhaust manifold joint (front).
17. Ditto (intermediate).
18. Ditto (rear).
19. Valve cover joint.
20. Joint for bell housing.
21. Joint for front bearing housing.
22. Joint for oil filler.
23. Joint for magneto bearing cap.
24. Joint for Tecalemit filter cap.
25. Joint for magneto drive casing.
26. Induction manifold gasket.
27. Joint for oil pump cover.
28. Joint for water outlet pipe.
29. Joint for engine hose piece.

FOR CARS FITTED WITH MANUAL TYPE GEARBOX

Clutch. The operation of the clutch on the modern motorcar is comparatively speaking fool-proof ; that is to say, when the clutch pedal is pushed down the power from the engine is 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.

Access to the clutch withdrawal collar is obtained by removing the clutch cover-plate. 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. Always use non-separating grease. 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.

Before proceeding with a description of the clutch, it is as well for a moment to study the details shown in Illustration No. 52, which is the clutch housing as seen when removed from the flywheel housing. In the first place there is a withdrawal shaft consisting of a " U " shaped member attached to a shaft which finds a bearing in either side of the housing. This shaft is attached to the clutch pedal, so that when the latter is pushed forward the " U " shaped bracket will force the clutch withdrawal sleeve forward ; this clutch withdrawal sleeve comes into contact with the friction-faced disc which is attached to the three withdrawal arms, which has the effect of separating the clutch plates and compressing the springs which cause the centre plates to be gripped between the Ferodo faces attached to the pressure plate and clutch cover-plate. It will be noticed in Illustration No. 52 that there is a splined shaft passing through the clutch withdrawal collar, and this shaft enters into the centre plate of the clutch, the centre being also splined as shown.

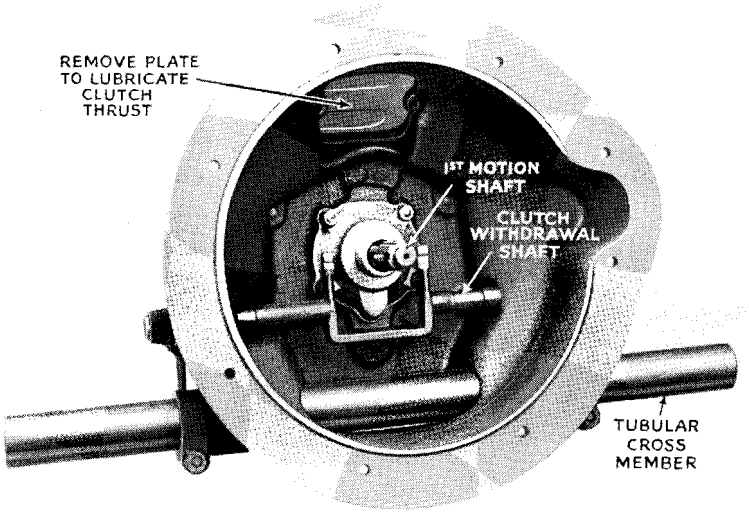


Illustration 52.—View inside the clutch housing showing the withdrawal mechanism, and the lubrication point is shown in Illustration No. 56.

Clutch Operation. In order that the owner may understand the relationship of the various parts, he is referred to Illustration No. 53, for each part has been photographed in its correct relationship. The parts are also shown in Illustration No. 54, in this case each one on its own. Various terms are employed to describe the clutch parts by different people, but in the M.G. Works they are described as follows :—

First there is the clutch cover-plate ; next to it the floating plate ; next to that the duralumin centre-plate with fabric facing on either side ; then another steel floating plate which contacts with the pressure plate, the rear of which is formed into a series of cups to house the clutch springs, and behind this the flywheel.

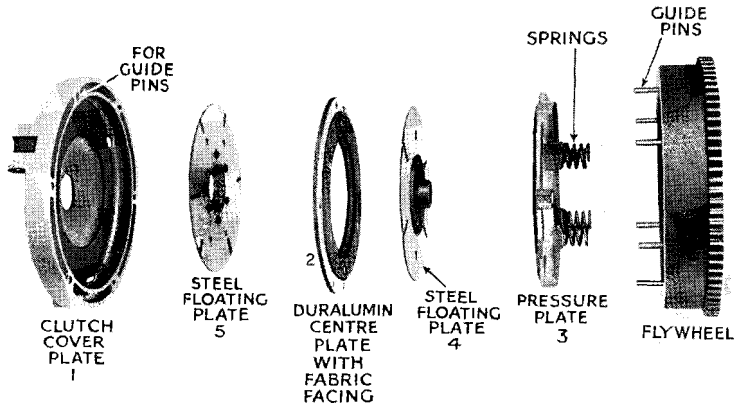


Illustration 53.—Various components of the clutch, showing that there are two floating steel plates and that the pressure plate is nearest the flywheel.

The driven plates are made of steel, and, as has been previously explained, are a sliding fit on the front end extension of the gearbox shaft. The clutch cover-plate, centre plate, and the pressure plate are each fitted with Ferodo 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 guide 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. 53 and 54.

It stands to reason that when the clutch is bolted up solid as shown in Illustration No. 56 the pressure of the springs will force the pressure plate into contact with the driven 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 Ferodo faces. Alternatively, by letting the clutch continually slip, the centre plates will become overheated, which will, in turn, have a detrimental effect on the clutch surfaces.

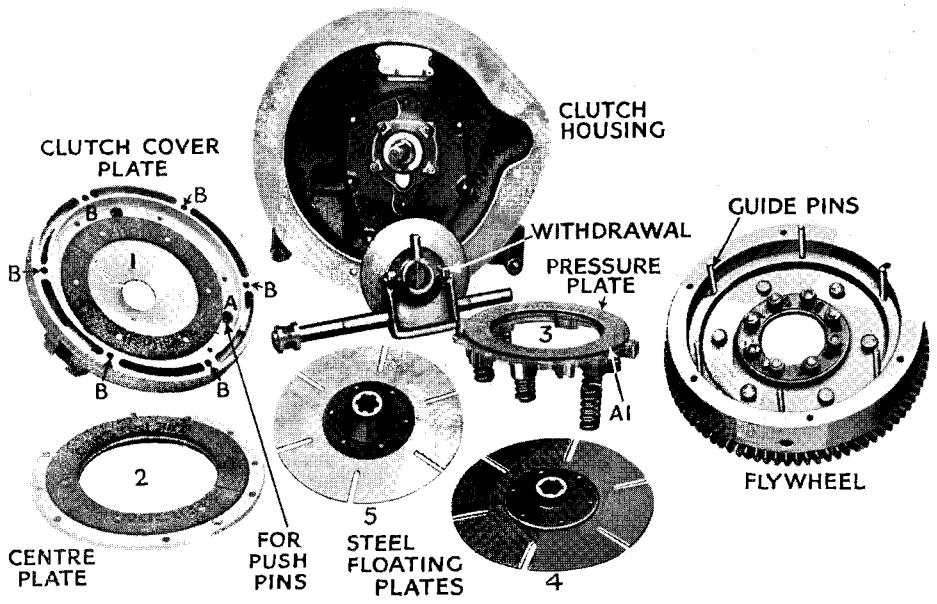


Illustration 54.—Inner view of the clutch and its components. The clutch cover-plate is bolted to the flywheel and the centre plate 2 registers over the guide pins in the flywheel. The pressure plate 3 is forced rearwards by the action of the springs, when it grips the floating plates 4 and 5 between the friction surfaces on the plates 1, 2 and 3. When the clutch is pushed out, three push pins pass through holes, one of which is marked " A " in the plate 1, and forces pressure plate 3 towards the flywheel, thereby compressing the clutch springs.

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 No. 54 that on the inner side of the clutch cover-plate there are three holes, one of which is marked A, in which short plungers register, which, when the clutch is assembled, come into contact with the three hardened steel abutments marked A1 in Illustration No. 54. These plungers are controlled by the adjusting screw carried in the withdrawal arms, which can be clearly seen in Illustration No. 55. Pressure on the clutch pedal forces the withdrawal arms forward, and in turn these force the adjusting screws against the plungers, which in turn force the clutch pressure plate towards the flywheel, thus compressing the clutch springs.

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 springs marked I shown in Illustration No. 55. The springs are only intended to anchor the withdrawal plate to the withdrawal arms. 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 Ferodo rings will decrease, which will cause the floating plates to come nearer to the clutch cover-plate. This necessitates the clutch withdrawal set screws being adjusted to give a clearance between the fabric face and withdrawal disc. The correct clearance is $\frac{3}{32}$ in. when the clutch pedal is out of engagement.

In Illustration No. 55 a spanner and screwdriver are shown on the adjusting set screws, access being obtained through the aperture in the upper housing marked for " clutch oiling and inspection."

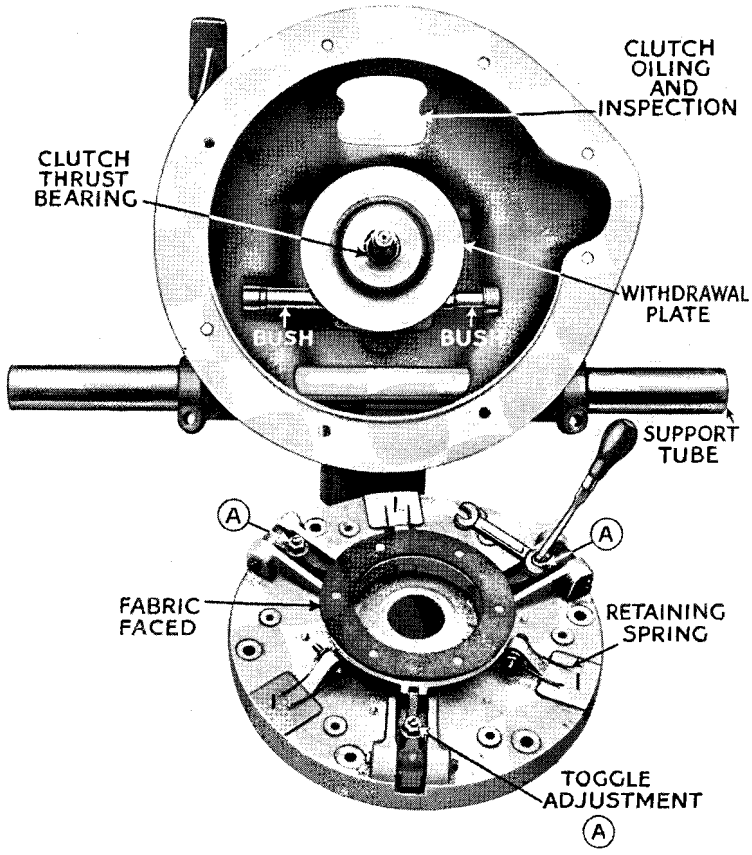


Illustration 55.—Clutch cover-plate as seen from the exterior of the clutch, and above this the clutch housing and withdrawal mechanism. The withdrawal plate is moved forward by the action of the clutch pedal and presses upon a fabric faced ring in the centre of the cover-plate ; this forces the small set screw " A " forward sufficiently to disengage the clutch. The set screws are fitted into what are known as " toggle arms," which can be adjusted by a spanner and screwdriver through the clutch inspection cover.

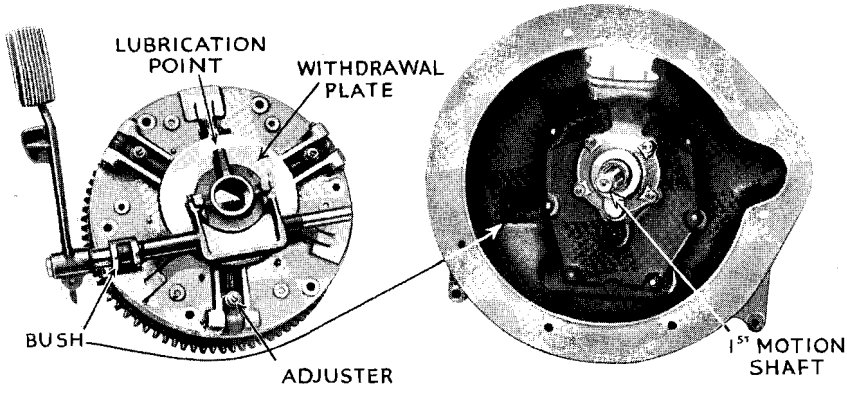
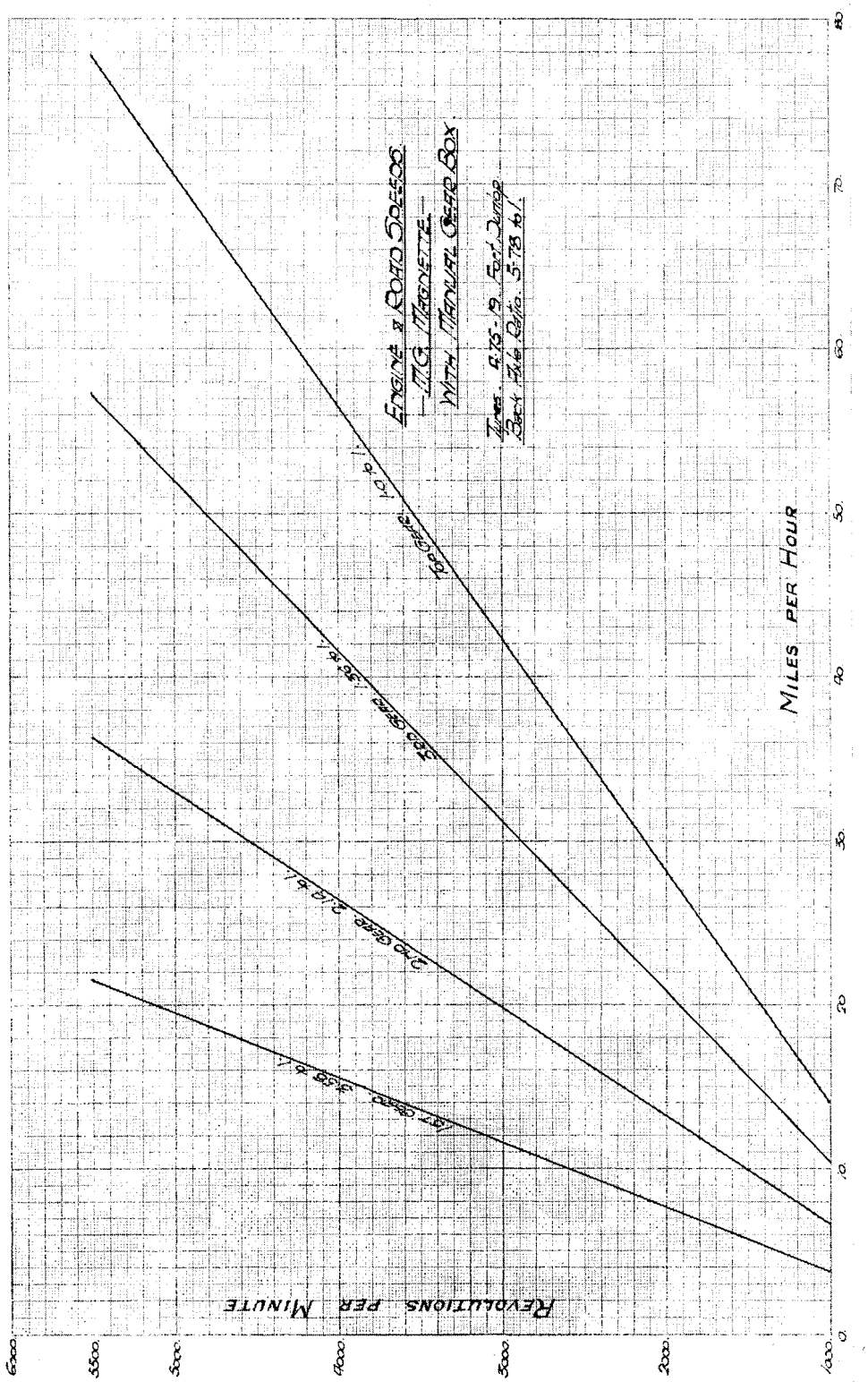


Illustration 56.—In order to show the clutch withdrawal and the action of the clutch pedal, inspect the left-hand illustration. The clutch pedal is coupled to a shaft having a central portion in the shape of a " U," this registers in the withdrawal plate. The right-hand end of the illustration shows the first motion shaft of the gearbox, the forward extension of which passes through the clutch and engages with the steel floating plate by means of splines. The whole clutch mechanism is lubricated from a point behind the clutch withdrawal collar and through the inspection cover. Use small grease gun with non-separating grease.



DON'T FORGET TO LUBRICATE THE CLUTCH THRUST RACE EVERY 2000 MILES (cars with manual gearbox only).

Manual Gearbox. It is thought desirable to deal with the gearbox at some length as it differs in many respects from the orthodox type of box. It has been seen that the change speed lever is fitted to an extension to the gearbox lid, and this is shown removed in Illustration No. 57. The gearbox affords four speeds and reverse. The gate is marked so that it is easy for anyone to see where the 1st, 2nd, 3rd and top speed gears are. In order that the reverse gears shall not be inadvertently engaged, the gate is provided with a stop clearly visible. The gears are operated by a series of forks coupled to selector rods. These are shown in Illustration No. 59.

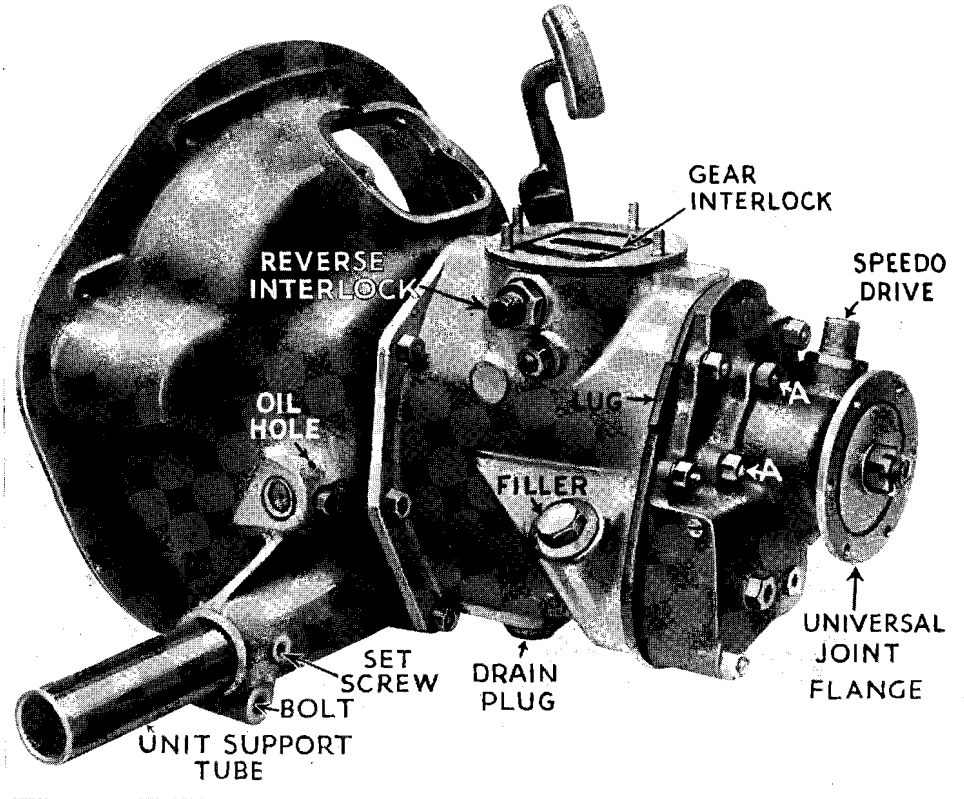


Illustration 57.—The external view of the gearbox, showing the position of the oil filler. The gearbox is bolted to the flywheel housing, through which the unit support tube passes. The position of the drain plug can be seen and also the small holes of the flywheel housing connecting with the bushes, carrying the clutch withdrawal shaft.

Illustrations Nos. 57 and 58 also give the owner an idea of the manner in which the selector rods are locked in position when the gear lever is placed in any of the forward or backward positions. The exterior view of the gearbox should be studied, as it shows the filler on the side of the box which acts as an automatic high level, and the drain plug beneath the box which can be removed through the trap door in the undershield by means of a box spanner.

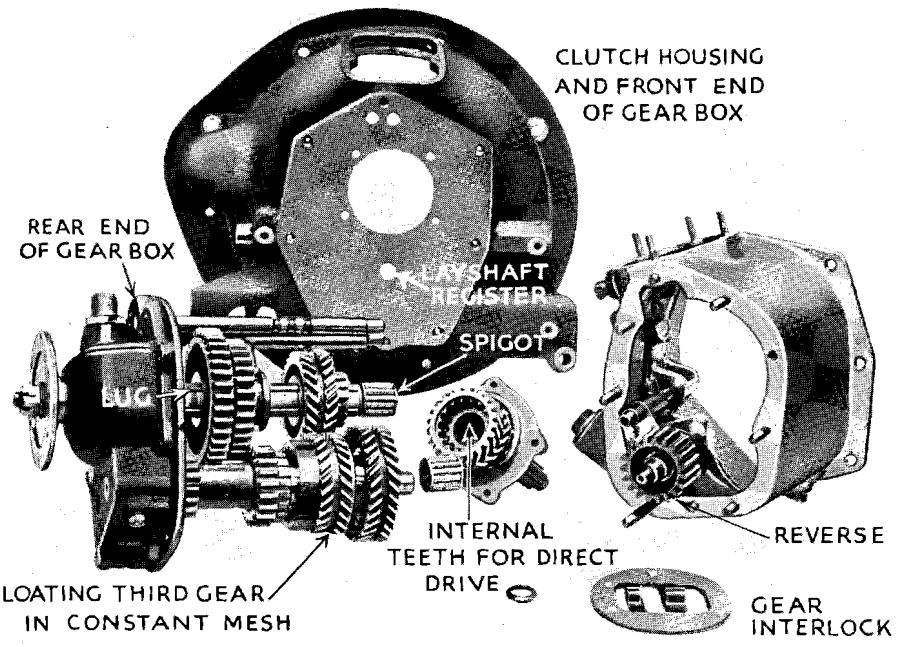


Illustration 58.—View of the gearbox partially dismantled, showing the flywheel housing. The centre housing carries the reverse gear and the main and layshafts built up on to the rear end cover. It will be noted that the spigot on the end of the mainshaft has a roller bearing and the layshaft is also mounted on roller bearings.

The third speed gear on the layshaft is always in constant mesh with the third speed on the mainshaft.

The rear end of the engine and forward end of the gearbox are supported in the frame by the tubular member which is located in the bell housing by means of a bolt and set screw on either side. Examination of the illustration will show that the clutch withdrawal shaft is supported in the bell housing. Bushes are located therein by means of set screws, and there is an oil hole in either side of the housing for lubrication of the withdrawal shaft ends.

In dismantling the gearbox there is no necessity to remove the nuts marked A, and it will be noticed that the rear end housing of the gearbox is provided with lugs, so that the rear end cover cap is removed by tapping on the lugs instead of introducing a tool and damaging the facing.

Steel balls register in slots in the selector rods, and as the gear lever is moved to and fro the balls ride out of one slot and re-engage in another, according to the position of the lever. Looking at Illustration No. 58, the user can obtain an excellent idea of the gearbox layout, apart from the gears themselves. It consists of three principal parts ; the front end of the gearbox is formed by the bell housing, the centre of the gearbox acts as casing and a support for the reverse shafting, and the rear end of the gearbox supports the shafts and their gears.

It will be seen that the first and second speed gears, which are on the left of the picture, are of the straight tooth variety, whereas the constant mesh gears and the third speed gears have the teeth cut at an angle, or what is usually called "double helical."

The principal point to note in this illustration is the gear on the lower or layshaft, which is indicated in the illustration as "floating third gear," which is always in constant mesh with the third speed pinion on the mainshaft.

Top gear is obtained in the ordinary way by sliding the third gear on the mainshaft forward, so that the splines on the hub of the gear mesh internally with the constant mesh pinion on the first motion shaft, and it will be noted that the spigot bearing is of the roller type. When, through the movement of the change speed lever, the third speed gear on the mainshaft is caused to slide rearwards, the nature of the tooth engagement will automatically cause the third speed gear on the layshaft to move backwards in unison ; it is then that the gear on the layshaft, which has internal cut teeth, engages with a set of teeth on the front of the second speed pinion. When any other gear is engaged except third gear this third gear on the layshaft simply rotates on its sleeve.

In order to make the matter clearer, the user should now refer to Illustration No. 59, which shows the layshaft train of gears locked up on a tube removed from the layshaft itself. The layshaft is fitted with roller bearings at either end and over these roller bearings the complete layshaft is fitted.

The internal mesh dog engagements of the direct drive on the mainshaft and the third speed free sliding gear on the layshaft should be examined.

If momentary reference is made to Illustration No. 56 it will be noticed that the mainshaft protrudes through the gearbox, passing through the gearbox front end cover.

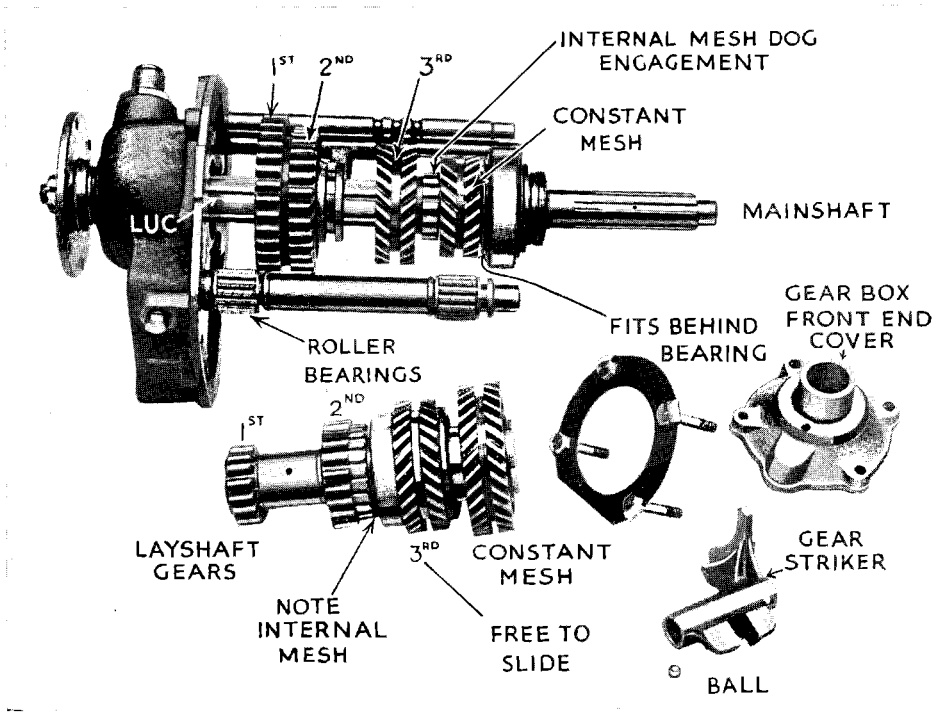


Illustration 59.—Another view of the gearbox components. The complete layshaft gears have been removed from the layshaft. Note the internal mesh engagement of the top gear on the mainshaft and the third gear on the layshaft.

This cover will be seen in Illustration No. 59, and alongside this will be found a steel ring with four bolts passing through it. It will be noted that this steel ring is placed behind the front ball bearing on the mainshaft to act as an oil retaining washer, and it will be also noticed that the ring has a number of lips formed upon it to act as registers for the bolts by which the front end gearbox cover is secured. A small hole is drilled on the lower portion of the front gearbox cover, permitting a certain amount of lubricant to pass through to lubricate the clutch thrust, which fits over the extension of the cover.

A gear striker to operate the gears is shown at the lower right-hand corner of Illustration No. 59. It will be noticed that there are two rods above the mainshaft which have grooves in them. These grooves are intended to register the striker in its proper position by the aid of steel balls which fit into a recess in the gear striker.

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 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.

It is necessary to keep this sliding coupling joint lubricated, and in Illustration No. 64 the nipple for this purpose is provided, access to it being obtained through a hole in the shaft 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. This can be seen by referring to Illustration No. 64. 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 prevent them floating outwards. It is essential that this joint should be packed with Hardy Spicer grease, and a one-pound tin would last a very considerable time. The small gun provided in the tool kit should be kept for lubricating the universal joint and clutch thrust.

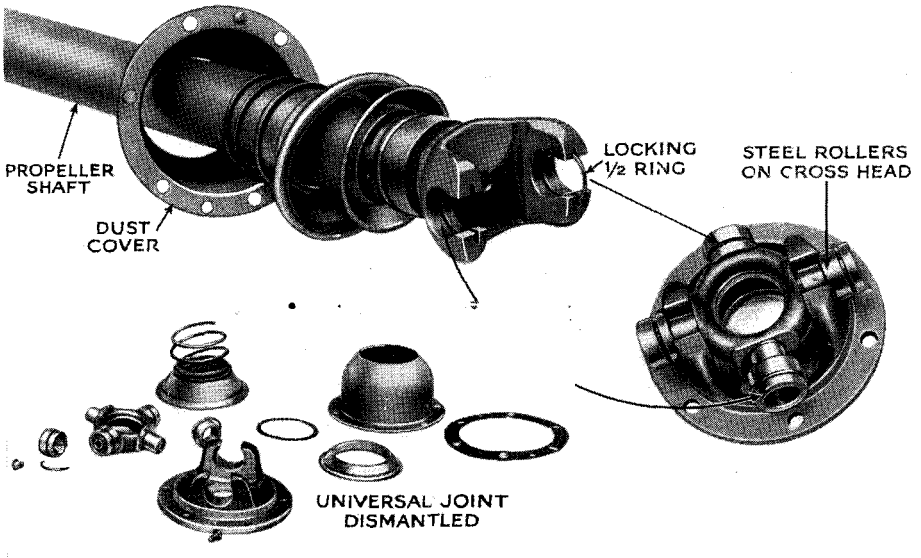


Illustration 64.—Various components of the Hardy Spicer universal joint. On the right-hand side is the flange having two jaws and carrying the cross head of the universal joint on steel rollers, the other two pins of the cross head being supported in the jaws of that portion of the joint which is attached 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.

Rear Axle. The external appearance of the rear axle can be seen from Illustrations Nos. 65 and 65a. 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 is purely for inspection and dismantling purposes. A drain plug is provided beneath the axle for draining this from time to time.

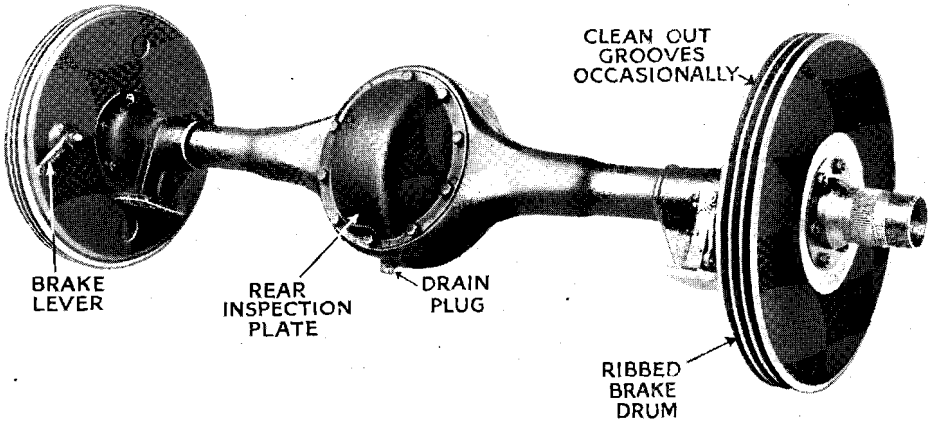


Illustration 65.—View of the rear axle removed from the chassis which needs no description.

The principal detail of the rear axle that the user should note is the manner in which the rear axle is filled with lubricant. Access to the rear axle is obtained underneath the rear seat, and the view obtained will be as shown in Illustration No. 65a.

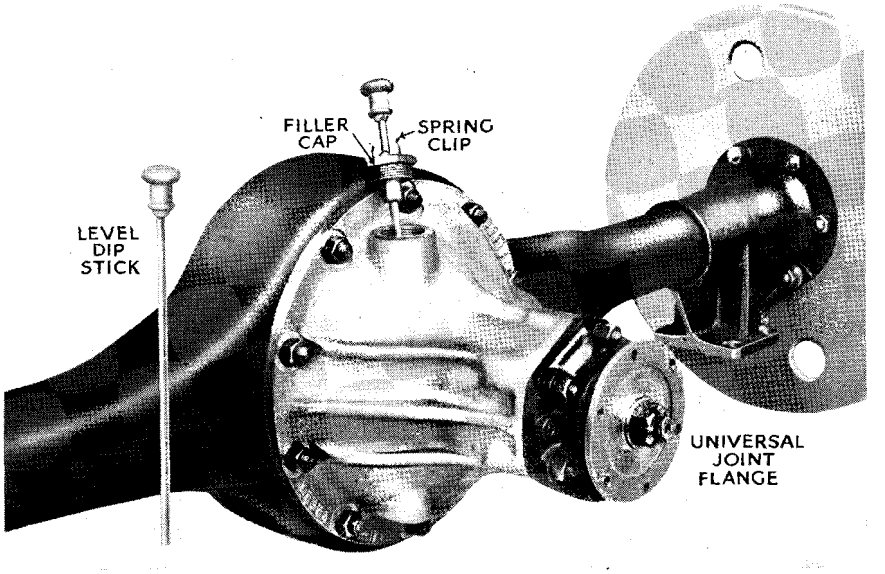


Illustration 65a.—Another view of the rear axle, showing the front end housing, on to which the differential assembly is mounted. The rear axle is filled by removing the filler cap which can be seen, but the level in the axle can be tested simply by withdrawing the level dipstick.

It is always advisable when testing the level of the oil in the rear axle to do this after the car has been running for some time, so that the lubricant has had a chance of liquifying. By pulling out the level dipstick, cleaning it, and then taking a reading, it is possible to see whether the gear oil is up to the right level. Under no circumstances should the car be pushed or the rear wheels rotated while the level is being checked, otherwise a certain amount of the lubricant will be carried round by the gear teeth and the reading nullified.

It is better to pour in a small quantity and again check the level. This is effected by unscrewing the filler cap through which the level dipstick passes. Always be sure to press the level dipstick down sufficiently for it to register inside the spring clip. **If, after filling the axle and checking this by means of the dipstick, it is found that too much lubricant has been inserted, it is essential that the drain plug should be unscrewed and sufficient let out to reduce the level to its proper height, otherwise the oil will run along the axle shafts and possibly through the bearings on to the brakes.**

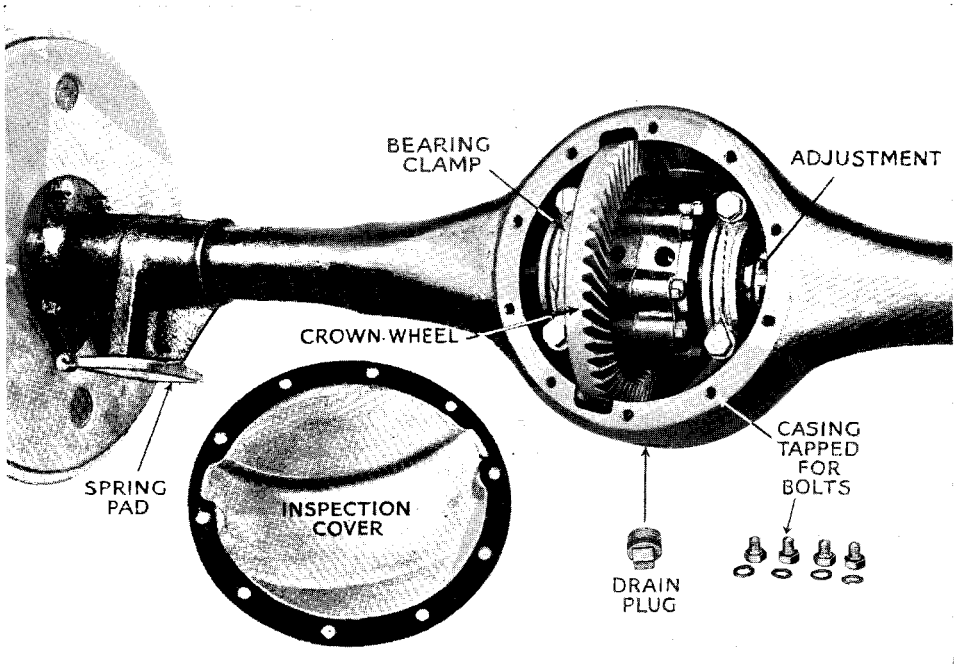


Illustration 66.—View of the differential assembly that can be obtained by removing the inspection cover. The bearing clamps should be noted and the position of the lateral adjustment.

Illustration No. 66 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 ever to remove them, but in the case of an accident it may be found necessary to readjust 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.

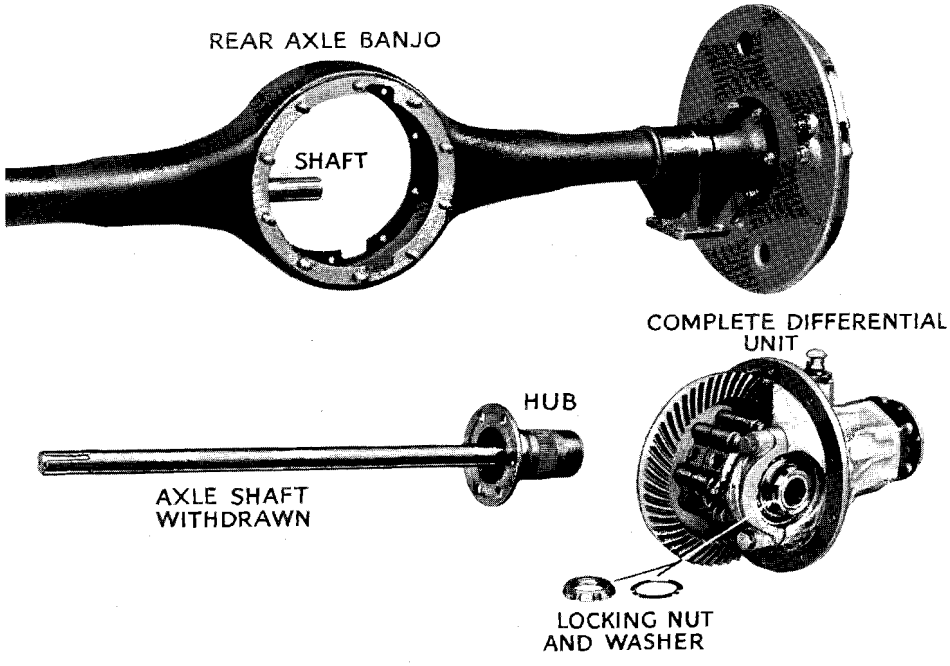


Illustration 67.—Rear axle partially dismantled showing how complete differential unit can be removed, after the axle shafts have been withdrawn with the hubs.

Illustration No. 67 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 both the axle shafts.

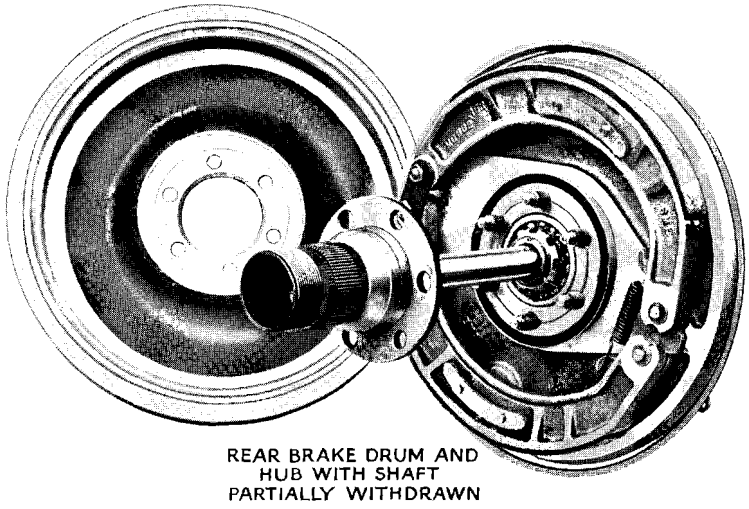


Illustration 68.—This shows that after removal of the brake-drum it is possible to withdraw an axle shaft. This operation may necessitate the use of withdrawer.

Axle Dismantling. First remove the wheels and brake-drums. The hub and half-shaft can be withdrawn by refitting a wheel and pulling outwards, and now examine Illustration No. 69 carefully. 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.

Before the bearing housing is removed it is as well to examine Illustration No. 69, which shows the correct type of tool to use for removing the bearing nut. Primarily, the illustration is intended to show the components of an axle shaft, the outer bearing on which it runs in conjunction with the rear hub housing. It will also be noticed that there is a felt washer used to prevent oil leakage in the axle. It is essential that the lock washer which holds the bearing nut in position should have the inner key to register in the keyway with the axle tube intact, as well as the outer lips for registering in the grooves in the bearing nut.

This illustration affords another opportunity of examining the brakes, including the shape of the cam used, the return spring between the shoes and the pivot pins on which the shoes articulate. The brake-shoes are held in position by thin nuts, which are split-pinned.

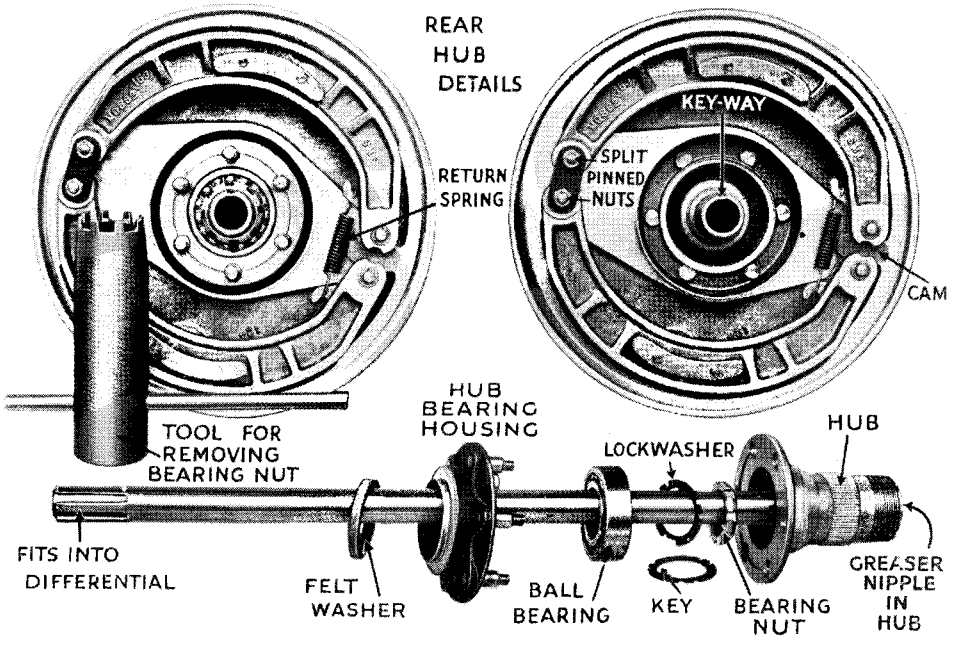


Illustration 69.—The left-hand illustration shows the type of tool employed for removing the rear axle hub bearing nuts. These bearings are held in position and locked with a tab washer. The components of an axle shaft are shown along the bottom of the illustration. The brake mechanism can be inspected in this illustration.

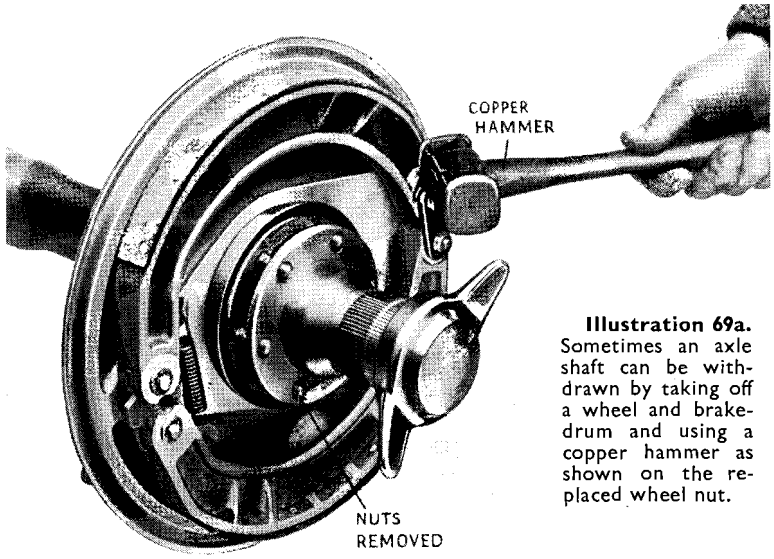


Illustration 69a. Sometimes an axle shaft can be withdrawn by taking off a wheel and brake-drum and using a copper hammer as shown on the replaced wheel nut.

Sometimes a hub will become a very tight fit ; that is to say, the hub flange will adhere to the hub bearing housing. In such cases it is possible to remove the shaft by fitting a wheel locking nut on the hub, giving it a good blow with a copper hammer on alternate ears.

It is as well to know that the outer ball bearings are provided with felt washers, or glands, to prevent the grease in the back axle creeping along the axle shafts.

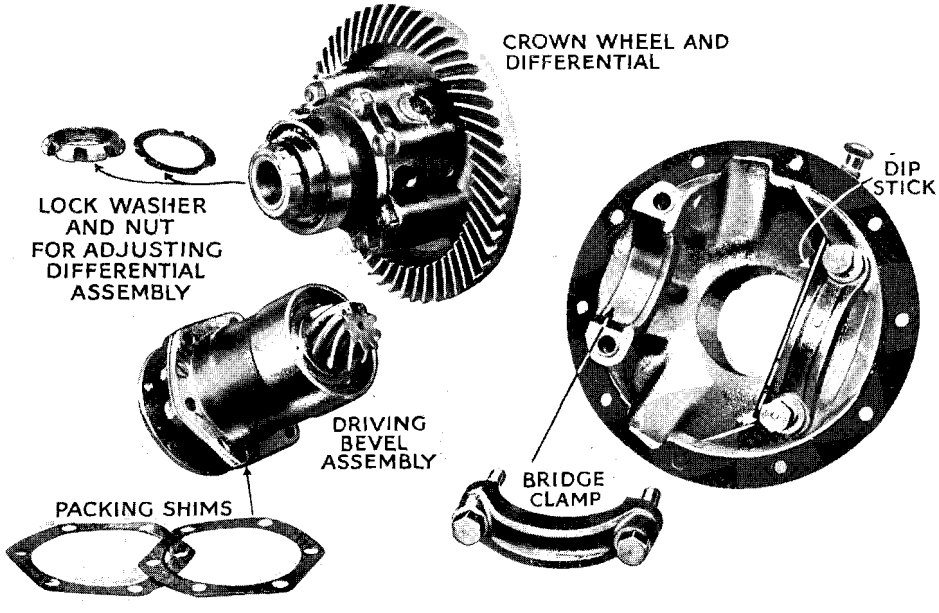


Illustration 70.—Differential and crown wheel assembly removed from its housing, showing the bridge clamp and the lateral adjustment by ring nuts. The driving bevel assembly is also shown. The correct mesh of the gears is obtained by using shims.

Differential. After the axle shafts have been withdrawn it is possible to remove the complete differential which is shown in Illustration No. 70, after being removed from the aluminium housing and the bridge pieces which hold it in position. The driving bevel assembly has also been dismantled in Illustration No. 71 ; 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 $\frac{1}{4}$ in. B.S.F. to act as means of withdrawal. 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.

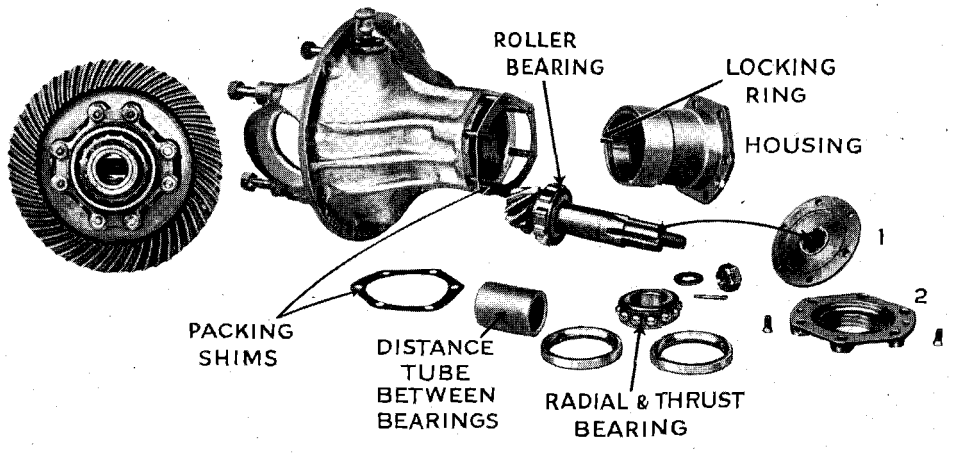


Illustration 71.—The crown wheel and differential are shown on the left removed from the housing, and the driving bevel assembly is shown dismantled. The bevel shaft is mounted on a roller bearing at one end and radial and thrust bearing at the other.

Suspension. As was mentioned in the opening chapters, no useful purpose could be served by repeating illustrations, and in consequence it is necessary occasionally to refer readers back to an illustration to make the point clearer.

Refer for a moment to Illustration No. 3, which shows the rear end of the front spring, and to Illustration No. 10, which shows the rear end of the rear spring. There are no shackles employed in the M.G. Magnette.

The rear end of the front and rear springs slide in phosphor bronze blocks in the spring anchorages. The front end of both front and rear springs are pivoted 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 top leaf of the spring is accommodated in split phosphor bronze blocks capable of rotating in their housings. The manner in which this is effected is shown in Illustration No. 72, 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.

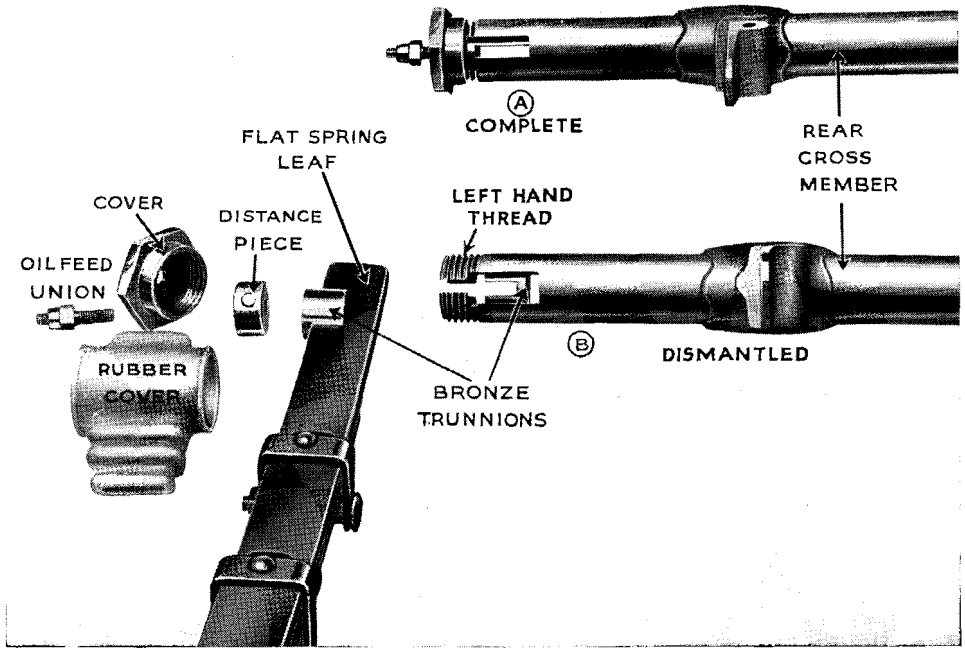


Illustration No. 72.—The component parts of the rear spring assembly. The trunnions, it will be seen, are in two parts to allow the spring to be withdrawn from the housing in the chassis frame. Note also the distance piece and cover-plate. The entire assembly is enclosed in a rubber cover and lubricated centrally from the dash wall nipples.

Wheel Removal, Brake Details and Front Hubs. The brakes on the front and rear axles are similar in design, and the two views, 73 and 73a, are of the front hub, partially dismantled.

Metal parts that have been bolted tight for a considerable time have the effect of causing an adherence of two parts, making the ordinary efforts to separate them of no avail. In the case of a hub, it is possible to make a hub drawer by tapping a wheel cap in the manner shown in Illustration No. 73. *Note :* The rear hub is fitted on to the rear axle shaft under considerable pressure, so that the type of drawer illustrated is only suitable for the front hubs.

To remove a front hub it is necessary to remove the stub axle nut. This can be effected by first of all removing the plug which is found in the serrated portion of the hub, and through this hole the split pin which locks the nut in position can be extricated. It is sometimes possible by putting on a wheel to pull the whole hub off. The component parts of a front hub are shown in Illustration No. 73a.

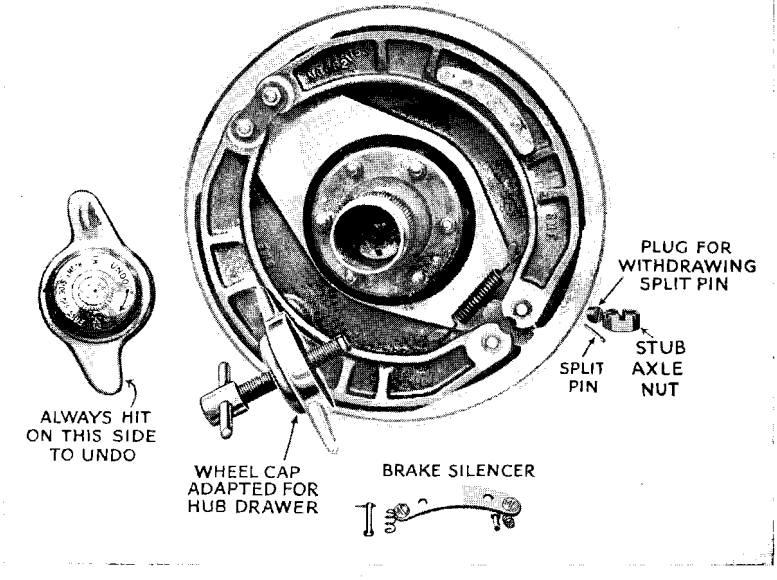


Illustration 73.—Details of the brake gear and wheel cap adapted for front hub withdrawal. Examination of the steel locking cap nuts show which is right-hand and left-hand, and the way the nut should be hit with the hammer in order to loosen it.

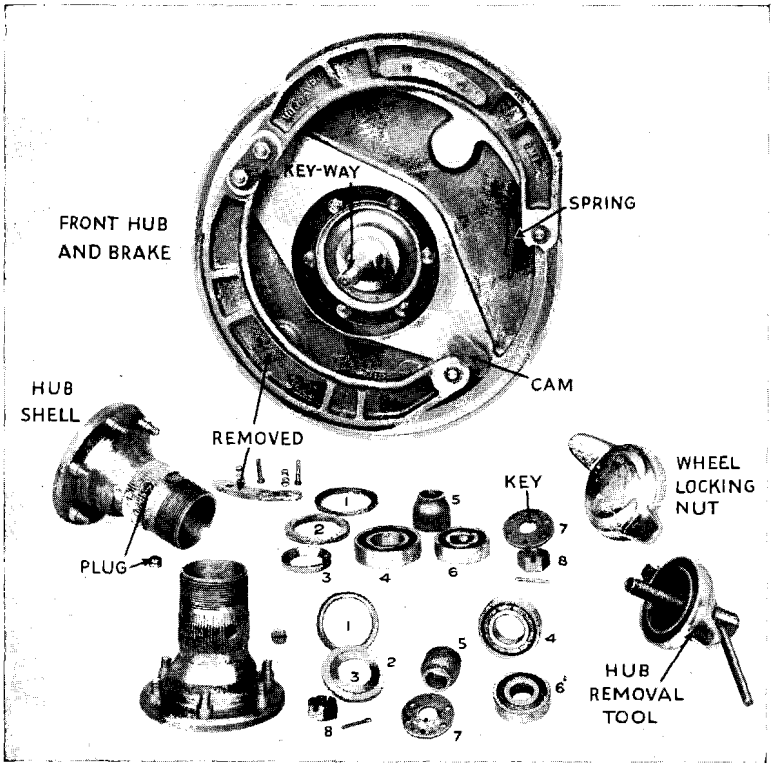
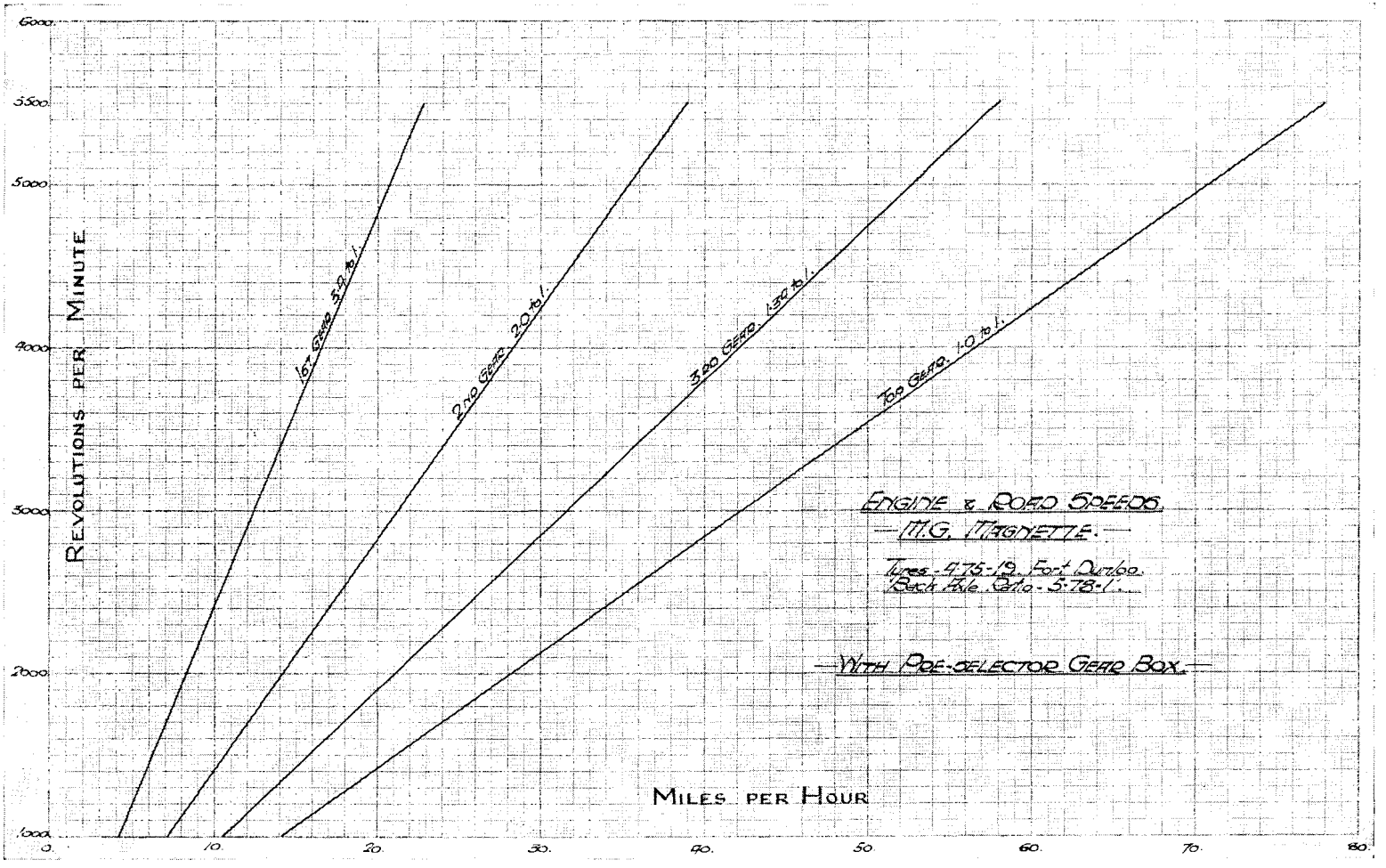


Illustration 73a.—Complete details of a front hub. To remove a hub it is necessary to take out a plug in the hub shaft, extract the split pin from the stub axle nut, then, after removal of the nut, the hub complete with bearings can be withdrawn. The numbered parts are : 1 and 3, inner and outer gauges of the felt retaining washer 2; 4 and 6 are the inner and outer ball races; 5 is a distance piece; 7 is a washer with a small key registering in the keyway in the stub axle; and 8 is the axle nut.

There is first of all the oil retaining felt washer 2, and the inner and outer steel casings 1 and 3. The large ball bearing 4 is then fitted on to the stub axle, next to this comes the tubular distance piece 5, and then the small ball bearing 6, which is fitted into the outer portion of the hub, the whole unit being locked up by the nut 8 and the washer 7, which has an integral key which registers in a keyway on the top of the stub axle. The tube spanner is necessary to tighten up the axle nut 8, which must be subsequently split-pinned.

It will be noticed by Illustrations Nos. 73 and 73a that the wheel locking nuts are shaped in a particular manner, and also the threads on the near-side and off-side hub are dissimilar, a left-hand threaded cap being fitted on the off-side. When removing a wheel the blow with the copper hammer should always be dealt on to the straight side of the extension of the cap, and not on the side which is decidedly angular. Both in Illustrations Nos. 73 and 73a the brake silencers have been removed to show how they are fitted, consisting of, as they do, a plate, two springs, and two pins which are split-pinned in position.


6000.
5500.
5000.
4000.
3000.
2000.
1000.
REVOLUTIONS PER MINUTE
1st Gear 3.9 to 1.
2nd Gear 2.0 to 1.
3rd Gear 1.30 to 1.
Top Gear 1.0 to 1.
ENGINE & ROAD SPEEDS
—M.G. MAGNETTE.—
Tyres - 4.75-19. Fort Dunlop.
Back Axle Ratio - 5.78-1.
—WITH PRE-SELECTOR GEAR BOX.—
MILES PER HOUR
0.
10.
20.
30.
40.
50.
60.
70.
80.

CLUTCH INSTRUCTIONS FOR CARS FITTED WITH THE PRE-SELECTOR GEARBOX

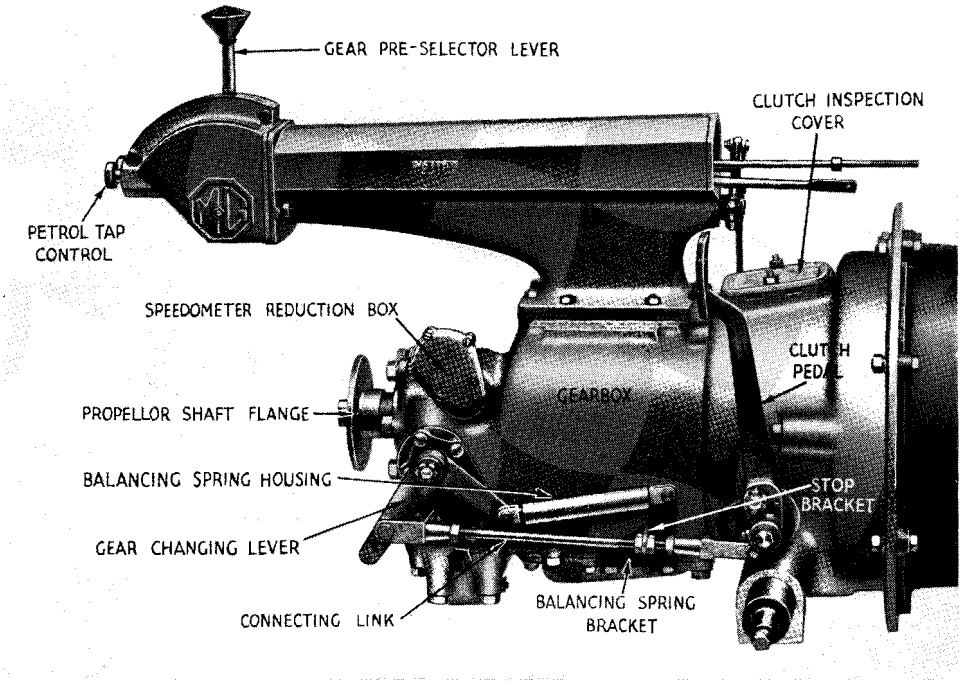


Illustration 74.—Showing the clutch connecting link and the method of adjustment.

Clutch. Before proceeding with adjustment it is as well for a moment to deal with the synchronisation of the main clutch with the pre-selector gearbox clutches. The main clutch is connected to the pre-selector clutches by a link motion, so arranged that on depressing the clutch pedal the first movement disengages the main clutch when further movement changes the gear previously selected, and of course it must therefore follow that on releasing the clutch pedal the pre-selector clutch engages first, followed by the main clutch. Under no circumstances is it advisable to alter the adjustment of the link motion unless such adjustment be carried out by fully qualified repair depôts.

Clutch Adjustment. There are four clutch withdrawal arms with which the withdrawal bearing comes into contact. When the clutch pedal is in the engaged position the clearance between the withdrawal race and withdrawal fingers should be $\frac{3}{16}$". Illustration No. 74 shows the link mechanism between the pre-selector gearbox and main clutch. The adjustment to reduce or increase the clearance between the withdrawal arms and withdrawal race is effected from the outside of the gearbox ; it will be easily seen that by adjusting the clutch pedal forward the withdrawal race would be brought closer to the withdrawal levers, and conversely by adjusting the clutch pedal towards the rear, the withdrawal race would be brought away from the withdrawal levers. In Illustration No. 74 it will be seen that the connecting link between the clutch pedal mechanism and the gear changing lever is threaded for a portion having a nut fitted either side of a stop bracket, this bracket coming against a stop on the balancing spring bracket, and if these nuts are slackened and the bracket moved towards the rear the clutch pedal will be adjusted forward, or if the bracket is moved forwards the clutch pedal will be allowed to move farther back, care being taken to keep the adjustable stop bracket square with its stop and that the nuts are properly tightened up after adjustment.

Clutch Lubrication. The clutch thrust race has a special grease retainer and is packed with non-separating grease when the clutch is assembled. This lubricant is sufficient for a very long mileage, and attention at this point is unnecessary.



CLUTCH INSTRUCTIONS FOR CARS WITH MANUAL GEARBOX ARE ON PAGES 57-60.

Pre-selector Gearbox. The latest type pre-selector gearbox, manufactured under Wilson patents, fitted to M.G. Magnette gears requires comparatively little instruction. It is as well, however, for the owner to know what is taking place inside the box during the operation of " de-clutching " and selecting the gears.

The gears work on what is known as the epicyclic principle, or, as they are sometimes called, planetary gears. The gear wheels are always in constant mesh, and the action of the gears takes place by the contraction of a number of brake bands which grip a series of brake-drums or annulli, depending upon the position of the selector lever ; or in other words, the selector lever predetermines which gear will be operated when the " clutch " pedal is pressed down while the engine is running, and then the pedal let up in the ordinary way. The term " clutch " pedal is used in the sense that it is the medium which disengages the power from the engine and, while having the same effect as an ordinary clutch, operates, of course, in an entirely different manner.

How to operate the Controls. *To start.* Before starting the engine, see that the hand brake is applied, make sure that the gear is in neutral by moving the pre-selecting lever to the neutral position, and depressing the pedal to its full extent and releasing it. Then start the engine and move the pre-selecting lever to the first gear position (or reverse, should it be required) and depress the pedal to its full extent and release it, controlling the final part of the upward stroke of the pedal as one would when engaging a normal clutch. The car will begin to move in the gear selected.

To change gear. Whilst the car is moving forward in 1st speed, select 2nd, and when this speed is required relieve the accelerator pedal, depress fully the " clutch " pedal and release it, controlling the final part of the upward stroke of the pedal as when starting.

Proceed similarly for the engagement of 3rd and 4th speeds.

When changing up, it is advisable to relieve the foot from the accelerator pedal, and when changing down the accelerator pedal should remain partly depressed, and by this method it will be found that the smoothest changes are effected. Should the gear fail to engage on account of the pre-selector lever being between the positions indicated, move pre-selector to the correct position, depress and release clutch pedal a second time.

It is usual to run on top with 3rd selected and ready for an instantaneous change when required. It should, however, be remembered that complete declutching for any purpose will then cause the engagement of 3rd speed, and the engine should be accelerated to ensure a smooth change.

There is no need to change speed merely because the selector has been moved, and selection can be made long before the change is actually required. " Select Early " should be kept in mind and driving will become much simpler.

A slight pressure on the pedal will give free engine position.

To reverse. Although reverse may be selected while the car is moving forward, on no account should it be engaged until the car has been brought to rest. The engagement of reverse is effected by the depression and release of the pedal as explained above.

A safety catch is incorporated on the selector lever to prevent reverse being selected by accident.

To stop. Depress and hold the clutch pedal right down before the car comes to rest. If it is wished to proceed immediately, select 1st speed and engage clutch as described in paragraph "To start." If on the other hand a prolonged stop is expected and the driver wishes to release his left foot, neutral must be selected before the pedal is allowed to return. When neutral is engaged the pedal will remain partly depressed.

When changing down care should be exercised to see that the speed of the car is not greater than the equivalent engine speed ; for example, if the car is running at 30 miles an hour it would not be advisable to change from top into 1st gear, because this would cause the engine to run at a much greater speed than that for which it is designed, and it would be exactly the same thing as coasting down a steep hill on 1st gear with the clutch out, and after the car has attained a momentum of 30 miles an hour it would be inadvisable to let the clutch in.

Before attempting to follow the operation of the gears it is as well for the owner to study the four illustrations A, B, C, D, which show the exterior of the gearbox from four points of view.

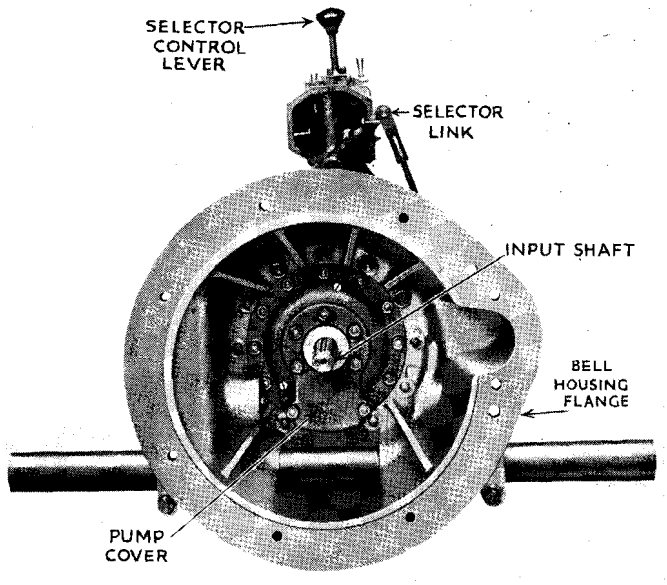


Illustration A.—View of the gearbox units attached to the bell housing. The input shaft is coupled to the flywheel by means of a short coupling shaft having rubberised fabric joints.

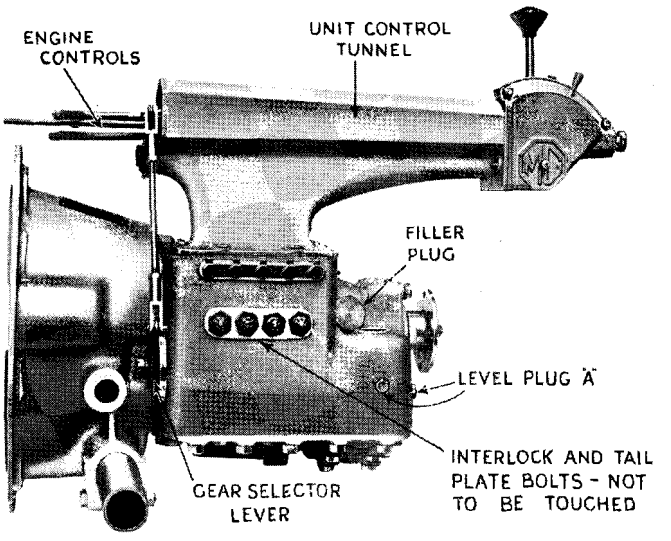


Illustration B.—Near-side of the gearbox showing the position of the unit control tunnel and the gear selector lever. The principal points in this illustration which concern the user are the position of the gearbox filler plug and the level plug "A." **Under no circumstances must heavy oil be used in the gearbox, and it should not be over-filled.**

Illustration A is a view of the bell housing or flywheel housing as seen after this has been removed from the engine. The mainshaft is in two parts, so that it is possible for the front end to rotate and for the rear end to remain stationary—that is to say, the in-put shaft, which can be seen in the illustration protruding through the front end cover of the gearbox, is coupled up to the flywheel by a short length of shaft and rubberised fabric joints. It will be noted that the in-put shaft is splined.

The illustration also serves to show the tubular cross member by which the unit is supported in the frame. In Illustration A the remote control tunnel supports the selector link which effects the gear selection.

The shape of the front end gearbox cover should be noted as it contains the oil pump cover. The object of the pump is to maintain the circulation of oil throughout the whole of the working parts of the gearbox, but the operation of the pump will be described later. It will be noticed, however, that there are three rows of nuts in the illustration, the inner circle being used to attach the pump to the housing, the middle row for attaching the housing to the body of the gearbox, and the outer for attaching the bell housing to the gearbox.

We will now pass to Illustration B, which is a view of the gearbox as seen from the near-side. The first point that should be noted in this illustration is the filler plug, which has been shown removed from the filling orifice. Below this will be found the level plug A. These two items can be more clearly seen by referring to Illustration D. Under no circumstances should the gearbox be filled without removing the level plug A.

The oil should be changed when the car has completed the first 1000 miles. It should be replenished every 1000 miles, and every 3000 miles the plug at the bottom of the gearbox should be removed and the old oil drained out, and the gearbox subsequently refilled up to the proper level. **Under no circumstances should thick oil be used.**

The action of the gear selector lever can be followed in Illustration B. When the selector control lever is drawn backwards the gear selector lever is moved downwards so that it registers with the aid of a spring-loaded ball in recesses in a plate.

It will be noticed that the rod between the unit control and the gear selector lever is threaded at either end to permit of adjustment should same be necessary on the selector control lever and the gear selector lever. There is no reason for adjustment in the ordinary sense of the word, but if the unit has to be dismantled at any time, the adjustment is provided should the position of the gear selector lever not synchronise with the position of the selector control lever.

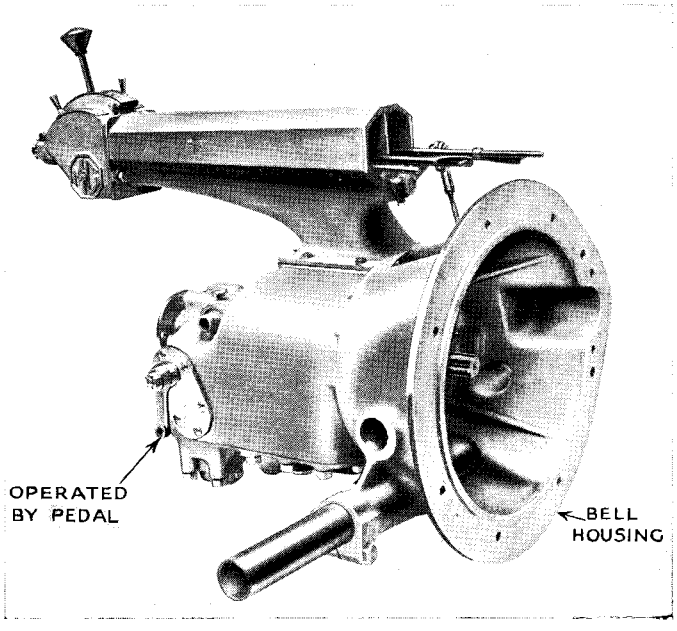


Illustration C.—Off-side of the gearbox showing the method of suspension and the short lever which is coupled up to the "clutch" pedal. When the lever is moved it has the same effect as a clutch, although its operation is entirely different.

There are two plates and two rows of nuts to be seen on the near-side of the box which, under no circumstances, require attention.

We will now pass to Illustration C, which is a view of the opposite side of the gearbox ; the principal point to note being the lever which is controlled by the pedal. This lever operates what is known as the busbar rocking lever. The action of the busbar will be explained later, but, in short, it consists of a plate coupled up to a spring ; the plate or busbar is caused to move up or down inside the gearbox, depending whether it is being pulled up by the action of the spring or pushed down by the action of the pedal.

The last illustration of the exterior of the gearbox shows what has been previously described as seen from the rear of the box. Illustration D shows the filler plug and level plug A ; the selector control lever operating in a slot which, besides having the number of the gear marked on it, has stops which make the pre-selection a matter of some simplicity. A little experience in handling the box makes it clear that a slight rocking movement is necessary when the control lever is moved forwards and backwards to make a change of gear. The remaining control levers are neatly arranged around the selector control lever for ignition, carburation and shutting off petrol.

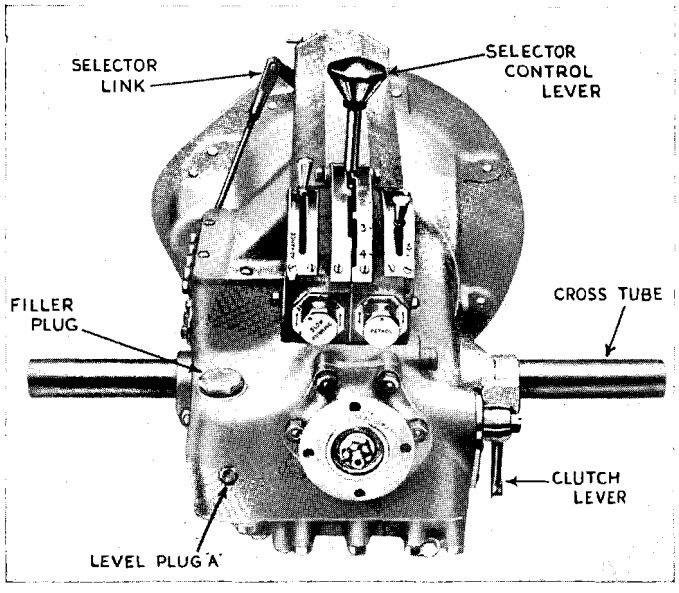


Illustration D.—Rear end view of the gearbox unit showing the controls. A selector control lever is coupled up to the selector link through the control tunnel, and if ever this is dismantled care should be exercised to see that the adjustment with the length of the selector link rod is not altered. The remaining controls operating through the tunnel are the engine slow-running, petrol tap change-over and the ignition and jet control.

There are two things that the owner will probably want to know at the outset namely what happens inside the gearbox when the selector lever is moved to and fro, and also what happens when the pedal is pushed down and then let up again. These two questions can be answered as follows. If the engine is not running, or if the engine is running and the pedal is not being pushed out, movement of the control lever simply rotates a camshaft inside the gearbox without causing anything to happen, and secondly when the clutch pedal is operated it causes a lever to rise and fall in the gearbox to either grip or slacken the brake bands which will be referred to later. The operations of these two units will be seen on referring to Illustration E. Here we see the gearbox upside down after the contents have been removed.

Previous reference has been made to the in-put and out-put shafts. They can be seen in Illustration E, wherein the in-put shaft registers in a spigot bush inside the out-put shaft. The train of gears, brake bands and drums have been removed so as to show the shafts and to afford a view of those parts of the gearbox which otherwise could not be seen.

The first question asked was, What does the camshaft do? The camshaft does not have cams similar to those employed in operating engine valves, but they consist of nicks in circular discs permitting any one of the series of five selector springs to fall into the notch in the cam depending upon the position of the selector lever. When the lever is put into position of 1st gear selection the camshaft rotates, allowing the notch in No. 1 cam to let the selector spring No. 1 stand proud of all the others, and it is the action of this spring which will cause the brake band of No. 1 train of gears to come into operation through the action of the operating struts. A number of small levers will be seen below the camshaft which act as gear interlocks, making it impossible for two gears to be engaged at once. Their action is entirely automatic, and the manner in which they are worked will be described later.

The second question which was asked earlier was, What is the action of the clutch pedal inside the gearbox? Illustration E answers this question in so far that it shows that the "clutch" pedal causes a lever inside the box to move up and down.

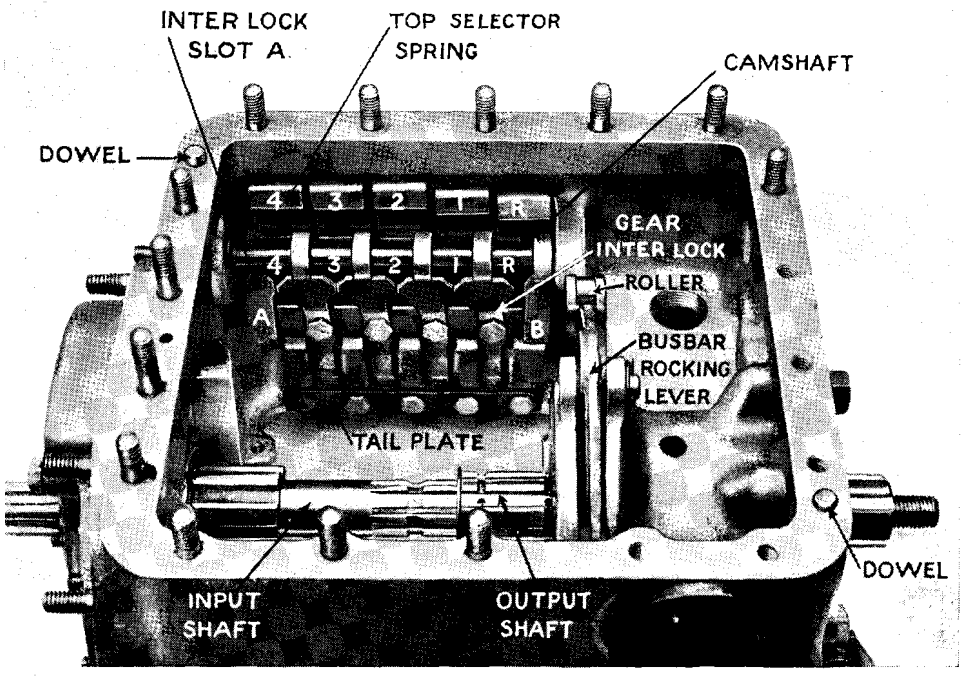


Illustration E.—Interior of the gearbox, showing the input and output shafts, but without the actual gears and bands.

To understand the gearbox properly, it is necessary to read the text. The action of the pedal is to cause the busbar rocking lever to rise and fall. On referring to illustration F the roller on the end of the rocking lever comes in contact with the boss (2) on the busbar. Illustration B shows the external view of the interlock and tail-plate bolts.

In this illustration the following parts can be seen: the camshaft, the selector springs and the gear locks. These three parts control the actual gear to be engaged. Rotating the camshaft by moving the selector control lever to and fro permits the selector springs engaging with the operating struts shown in Illustration F, and the action of the gear interlock device prevents more than one gear being engaged at once.

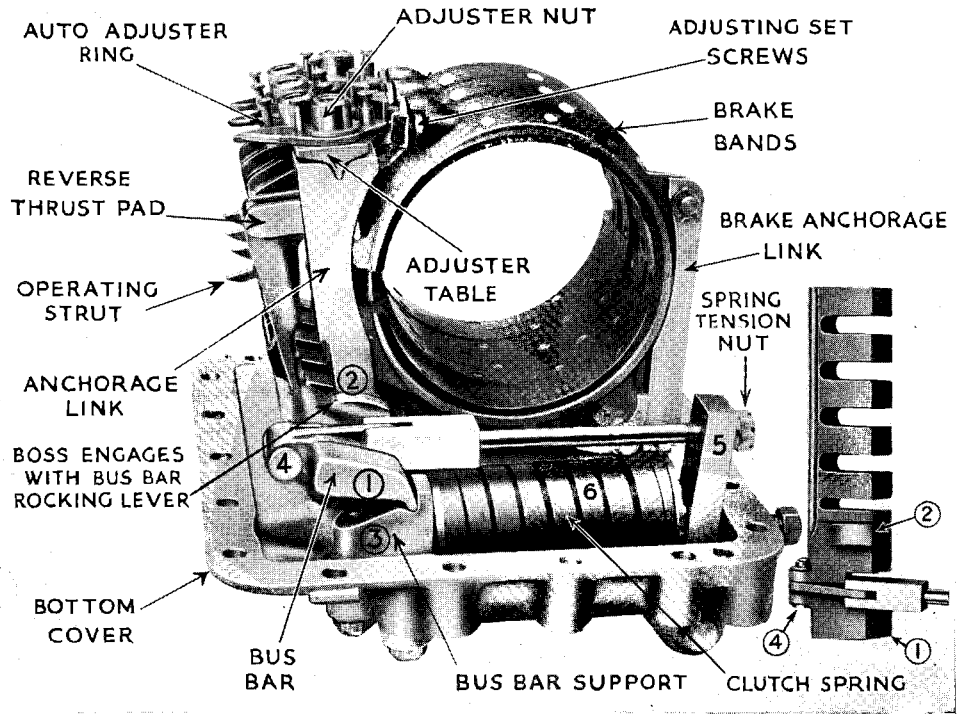


Illustration F.—This is a view of the base of the gearbox on to which the brake band assembly is mounted on anchorage links. Operating struts are caused to rise and fall by the action of a busbar which is under the control of the spring 6; the busbar terminates at (1), making knife-edge contact on the bracket (3) when the clutch pedal is in its normal position. Expansion of the clutch spring pulls on the point (4), causing the busbar to rise with it and contract the selector brake band. The mechanism on the top of the anchorage link consists of an automatic adjusting device, to take care of any wear in the bands and give uniform pressure. When the clutch pedal is pressed down, the busbar rocking lever forces the busbar outwards, thus freeing the brake band until the pedal is let up again.

This lever is known as the busbar rocking lever. It will be noted that at the inner extremity of this lever there is a steel roller let into the fork end of the lever. Before passing to the next illustration it will be remembered that Illustration E is the view of the gearbox taken from below, and is really, so far as the reader is concerned, upside down. With this in mind pass to Illustration F and first of all look at the part marked 1 Busbar, and then carry the eye along to the point marked 2, which is a raised track on the busbar which engages with the busbar rocking lever shown in Illustration E.

When the pedal is pushed down the rocking lever moves downwards, pressing upon the point of the busbar marked 2. The busbar pivots on supports (3), and it will be noted that the point of support has a knife edge. The outer extremity of the busbar, at the point 4, is coupled by means of a link to the spring compression lever 5, which is clearly under the action of the spring 6. It follows, therefore, that when the pedal is pressed down the busbar is forced downwards, thereby compressing the spring, and when the pedal is let up or back, the spring 6 causes the busbar to rise, carrying with it one of the operating struts which through the action of the various linkages at the top will cause one of the brake bands to contract. The busbar has a groove running the complete length, and when the selector lever is in neutral the 1st and reverse struts are engaged, and owing to the action of the gear interlock neither strut can reach the engaged position and the busbar will remain partly depressed.

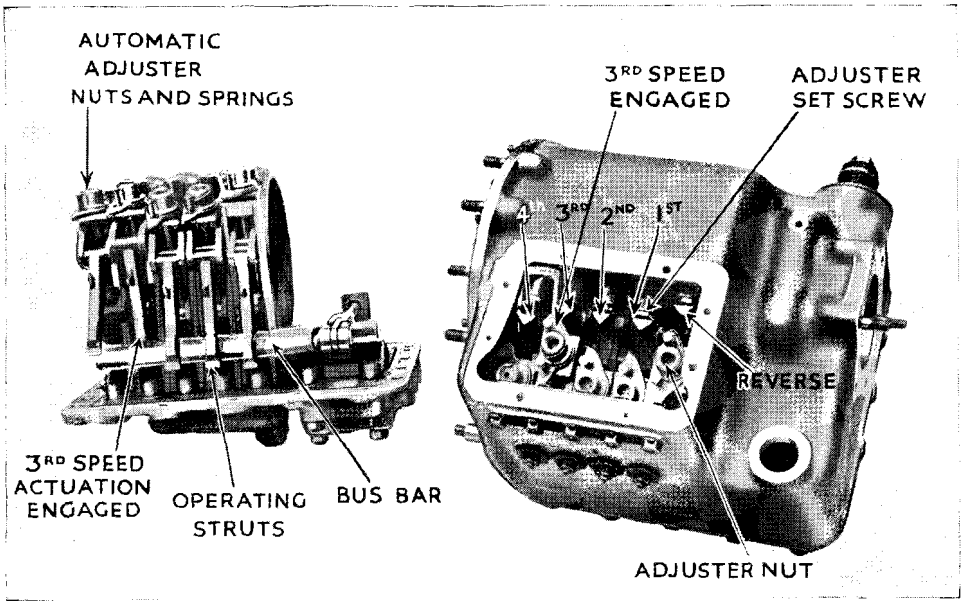


Illustration G.—The left-hand illustration will make the action of the busbar and operating struts quite clear. It will be seen that the second strut from the left is engaged by the busbar and is forced upwards, while the other struts are free of the busbar and do not engage with it at all. The action of the busbar rising can be seen by referring to the right-hand illustration. It will be noted that the adjuster set screws on the bands are all free of the adjuster nut, except the third gear, which has been forced up against the adjuster set screw by the action of the busbar.

A side view of the bands and operating mechanism can be examined after the gearbox casing has been removed from the base plate. In Illustration G the busbar, through the action of the spring, is in the up position, and it will be noted that the 3rd speed actuating strut has been engaged with the groove in the busbar, and has been forced upwards while the other operating struts are entirely free of the busbar's action. The whole action of the busbar is to spring load the brake band contracting levers or linkages so as to cause the bands to grip the drum.

The first question that was asked was, What was the action of the camshaft? This action will now be made clear when it is realised that the flat springs inside the box, which are allowed to move forward when they drop into a notch in the cam, come in contact with the operating struts, with the result that when the pedal is pushed out and the busbar is allowed to fall, the spring will force the operating strut sufficiently far forward to engage with the groove in the busbar and allow the particular pre-selected gear to come into operation. Carrying this further, the true understanding of the pre-selector gearbox will be grasped. Suppose, for example, that the car is running in 3rd gear, the busbar will be up and the 3rd speed brake bands will be contracted. The action of rotating the camshaft by moving the selector lever will have no other effect than causing the springs to move forward and backward, with the result that they will simply press up against the operating struts which are lying idly in the box. These operating struts cannot engage with the busbar because, on referring to Illustration G, it will be seen that it is necessary for the busbar to drop considerably first. When the busbar does, however, drop through being forced down by the pedal, and another gear has been pre-selected, the small spring contained in the linkages of the operating struts will throw the strut that has previously been in operation outwards free of the busbar, and then the action of the flat selector springs on the

side of the box will cause the next pre-selected gear strut to be forced forward or towards the busbar, so that it in turn will engage with the groove of the busbar and in turn will be forced upwards and cause the particular band of the pre-selector gear to be contracted.

On the right-hand side of Illustration G it is possible to examine the interior of the gearbox as is shown when the top cover is removed. The top cover is formed in the case of the M.G. Magnette by the unit control tunnel mounting, and in this illustration the 3rd speed engagement that was shown previously is viewed from above. The two further points that can be seen in this illustration are what are known as the adjuster set screws and the adjuster nuts. The object of these is to permit of the wear that takes place on the brake bands being automatically compensated for by a corresponding shortening of the link which is attached to the brake band at the lower extremity and to the adjuster nut at the upper extremity.

Illustration H is a close-up view looking inside the gearbox after removal of the cover. It will be noted that the adjuster nuts can be seen in Illustrations F and G, screwed on to a link, and beneath the nut there is what is

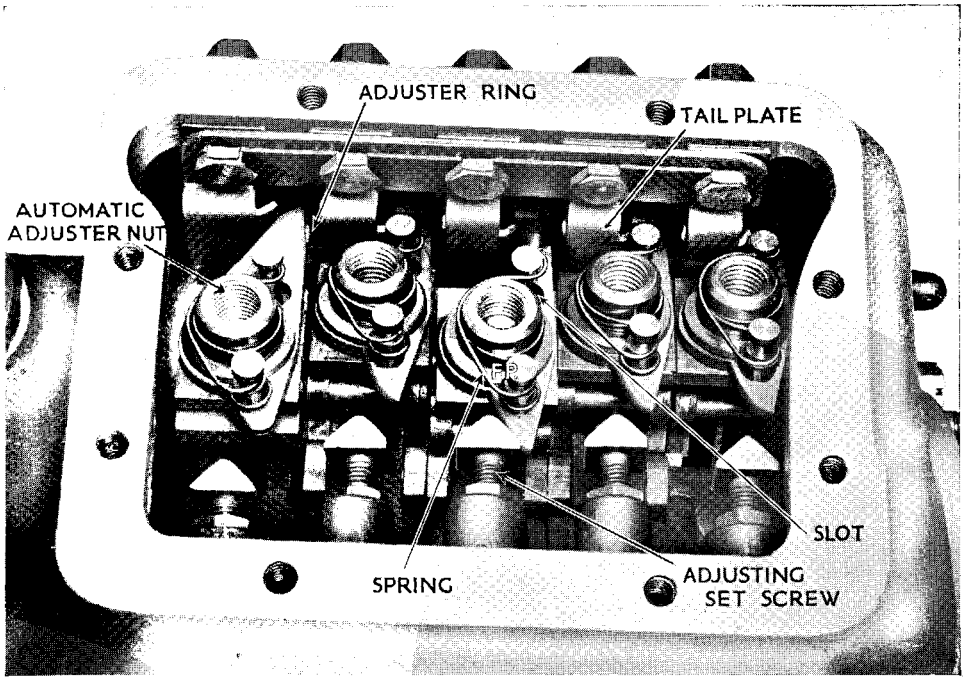


Illustration H.—View that can be obtained after removal of the gearbox cover lid. Follow the arrows to these parts : automatic adjusting nut, adjuster ring, adjusting set screw, tail plate, and spring, then note the slot in the adjuster ring, and the part marked FP, i.e. fixed pin, in the opposite half of the adjuster ring. Unless proper advice is obtained from somebody who knows definitely what the action of the adjusting set screw really is, under no circumstances should these be touched. They have a definite function to perform, but it has nothing to do with the actual contraction of the brake bands ; they form stops up against which the adjuster ring abuts, so that when a gear is engaged, the adjuster ring is forced up against the stop and a certain angular motion is imparted, causing the adjuster plate to pivot around the nut to the limit of the slot. The manner in which the spring is actually round the nut, when the clutch pedal is pushed out, will cause the adjuster ring to move outwards against the tail plate and rock the adjuster ring in the opposite direction, when it comes in contact with the adjuster set screw. This to and fro action causes the spring surrounding the automatic adjuster nut to grip it, which will cause it to rotate slightly on its bolt and so shorten its length of travel and automatically maintain proper adjustment.

If there is any semblance of drag or lack of quick response, when the clutch is let in "pump" clutch pedal, which means pushing it in and out fully several times quickly to take up any slack.

known as an auto adjuster ring and below this an adjuster table. The auto adjuster ring has a special shaped pin let into one side of it and a hole on the other side through which a pin, riveted into the adjuster table, passes. Surrounding each nut there is a spring specially coiled. The object of this spring is to grip the circular adjuster nut. This is effected by the shape and an action of the adjuster ring. It will be noticed that these are tapered at either end. The centre adjuster ring is contacting with what is known as the brake band adjuster screw. Reference to Illustration F will show these screws and their relationship to the brake band. They are virtually abutments or stops against which the adjuster ring rests when any particular gear is engaged. In Illustration H the centre gear is obviously engaged. As wear takes place the two angular faces of the adjuster set screw and adjuster ring at the time of engagement will cause the adjuster ring to pivot slightly. This action, owing to the shape of the spring, will cause it to rotate around the adjuster nut. When another gear is engaged and the whole unit is forced outwards, the opposite end of the adjuster ring will come in contact with what is known as the tail plate and rock the adjuster ring in the opposite direction and tend to tighten it round on the thread of the link. By this means the brake bands are being constantly kept in correct adjustment, and should for any reason a band slip when engaged, it is only necessary to move the pedal fully about twenty times to and fro for the automatic adjuster to take up the slack.

As in every other form of mechanism, excessive wear can be caused by abuse, and it is advisable in changing up to allow the engine speed to be reduced before the next gear is engaged, which is done by lifting the accelerator pedal while the clutch pedal is depressed and not re-accelerating before the bands have had time to grip the drums.

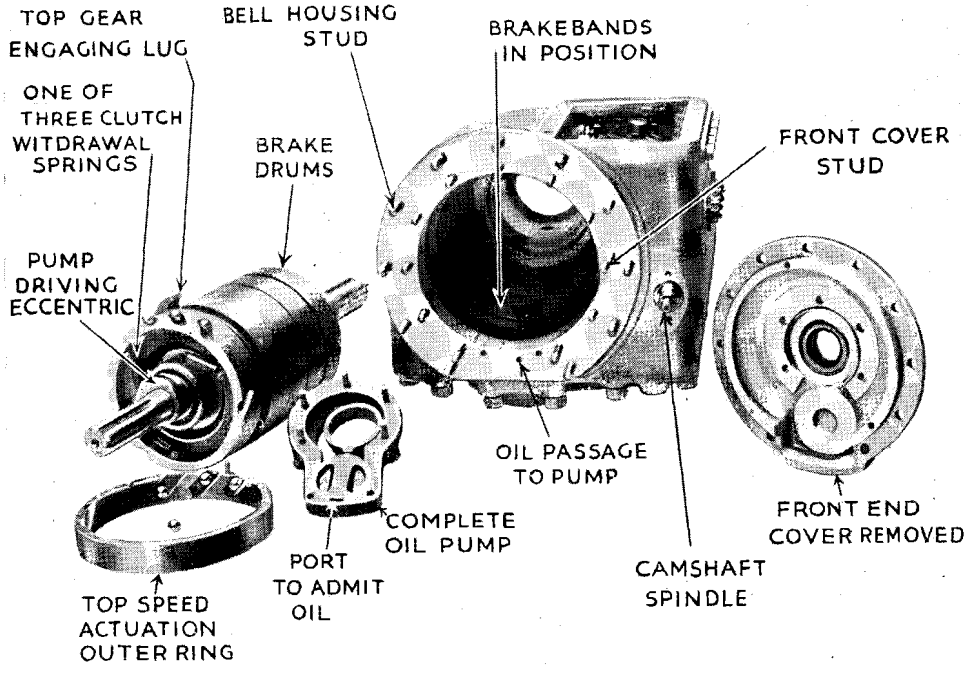


Illustration K.—The front end of the gearbox with the cover removed and complete brake-drum assembly withdrawn to show the brake bands in position. The oil pump is fitted on to the front cover and is driven by an eccentric on the front end input shaft. Oil is drawn from the gearbox and is delivered to the hollow shaft, so that all the gears are constantly lubricated.

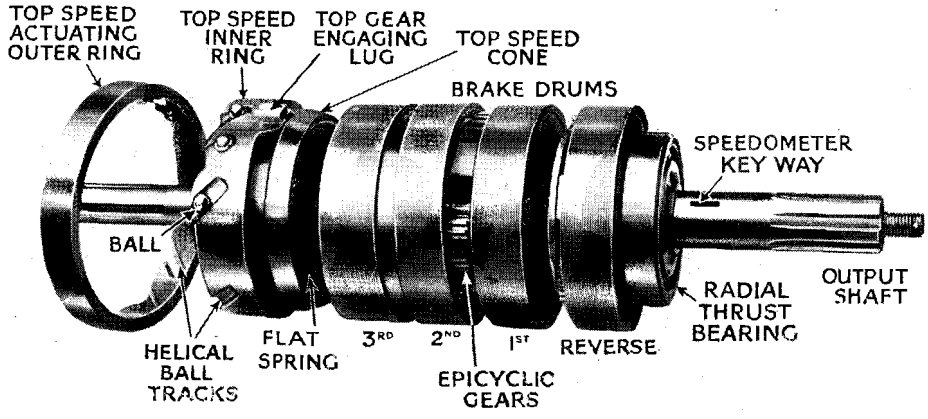


Illustration L.—Complete set of brake-drums and epicyclic gears. The parts have been slightly strung out to show the internal gears, the top speed cone engagement with the third speed drum, and the manner in which the top speed is actuated by its steel balls, forcing the top speed inner ring forward under the action of the helical ball tracks, and the top speed actuating outer ring.

Having thus described the details of the operation of gear selection and the manner in which the bands are caused to contract, Illustration K should now be studied. The next point is to see how the gears are built up into a unit on the in-put and out-put shafts, and how the various gears are operated. Illustration K shows a gearbox partially dismantled. The front end cover of the gearbox has been removed, and is shown on the right-hand side of the illustration. This forms a housing for the oil pump, which can also be seen complete with its housing. The front end of the in-put shaft is provided with a cam-shaped extension or eccentric which fits inside the pump plunger extension, so that with every revolution of the engine a plunger which fits into an oscillating housing is caused to rise and fall. This sucks up oil through a small hole in the body of the gearbox, and as the pump oscillates and closes up the suction hole, the downward stroke of the pump plunger forces oil up through the hollow plunger into the hollow gearshaft, and is so distributed throughout the whole inner works of the box.

After the front end cover has been removed it is possible to withdraw the complete train of gears and shafts as shown, presuming that the box has been removed from the chassis. The brake-drums can be clearly seen, which operate through the action of the brake bands of the reverse, 1st, 2nd and 3rd speed gears. The top speed, however, is differently operated. On the left-hand corner of Illustration K the mechanism of the top speed can be seen. There is, in point of fact, an actual conical engagement of the top speed cone and the Ferodo facing of the inside of the 3rd speed brake-drum. This is not brought about directly by spring pressure, but by the action of the top speed actuating outer ring, which is held stationary up against the front end cover by means of three set screws and the steel balls which are positioned in helical slots.

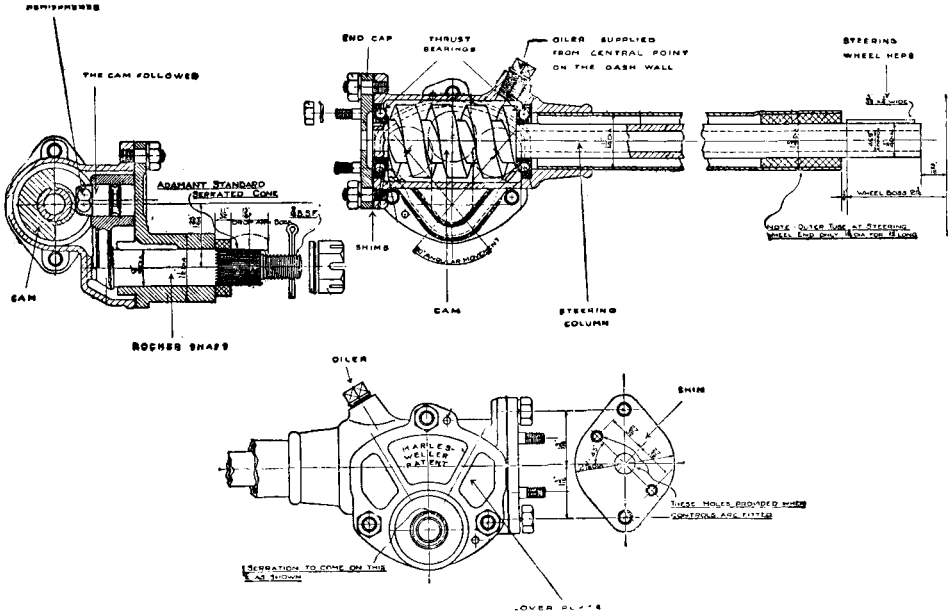
Reference to Illustration L shows the train of gears, brake-drums or annulli after the drums have been slightly drawn apart to show the inner planetary gears. This illustration also shows the top speed cone and the helical ball tracks which, when top speed is engaged, cause the cone to travel forward on the shaft and engage with the Ferodo facing on the inside of the 3rd speed brake-drum. When top gear is engaged, the whole train of gears and drums rotate as a single unit, there being no gear movement at all. It will be seen from this illustration that the shaft is supported by radial and thrust bearings, the rear end bearing, however, only being visible. The rear end of the out-put shaft is provided with a keyway for fitting a gear wheel to drive the speedometer.

The following points should be carefully observed by the Driver :—

1. Always feel that the pre-selector lever is well in its notch opposite the desired gear before actuating the pedal.
2. Always depress the pedal to its full extent when making a change of gear, and do not rest your foot on the pedal after the change is made.
3. Always remember that it is the end of the upward stroke of the pedal which decides the smooth engagement of the gear. Therefore, control this part of the stroke of the pedal carefully with your foot.
4. Before leaving the car always make sure that neutral is not only selected but engaged by fully depressing the clutch pedal with neutral selected.
5. **IMPORTANT.—K. Type cars fitted with the pre-selector gearbox have an oil pump fitted inside, which operates only when the car is in gear. These cars therefore must not be towed, unless the propeller shaft is disconnected. Failure to do this will cause the gearbox to seize, as when the gear lever is in the neutral position the oil pump does not function and seizure takes place.**

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.



Various sectional views of the Marles-Weller steering gear, parts of which are referred to in the text.

Adjustment 1.—Referring to the illustration it will be noted that a series 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 independently 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 re-make the oil joint properly, and the gear filled up with fresh oil.

General Notes.—The shims between the cover-plate 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 draglink, 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 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. Then fit the serrated cone in the top of the drop arm to the rocker-shaft.

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 draglink off the drop arm, and see whether you can move the steering wheel any farther 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.

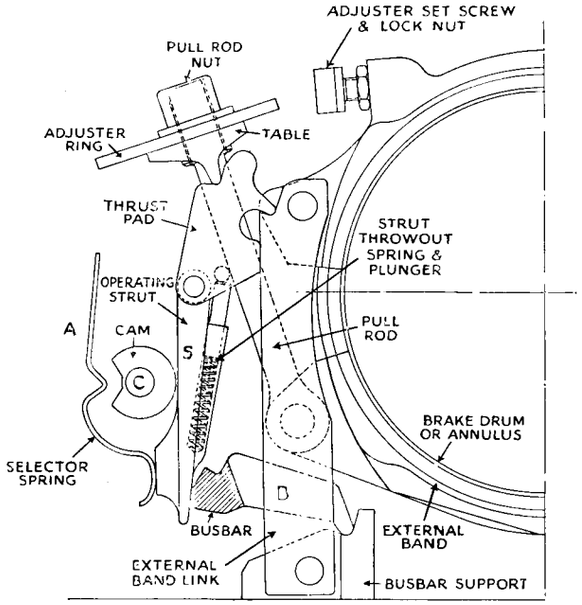
The amount of free movement available after dropping the draglink off the drop arm should be the same at both locks, and this is the condition at which to aim.

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

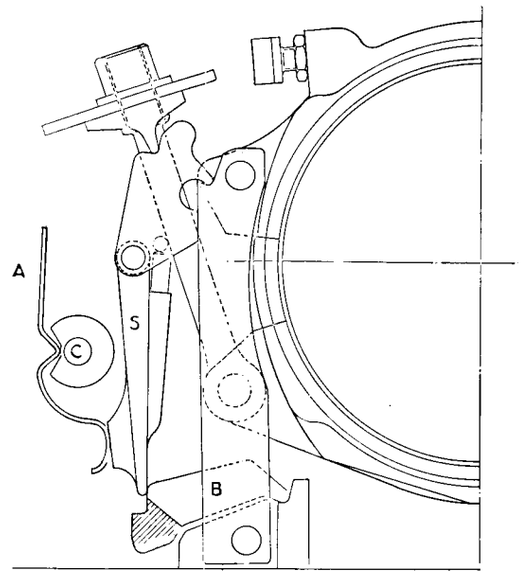
It will be appreciated that the movement of the rocker-shaft and drop arm is restricted by the internal stops fitted in the steering box, and it is therefore necessary to fix the drop arm and connect the same up to the front wheels on the one hand, and to the steering box mechanism on the other hand, 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.

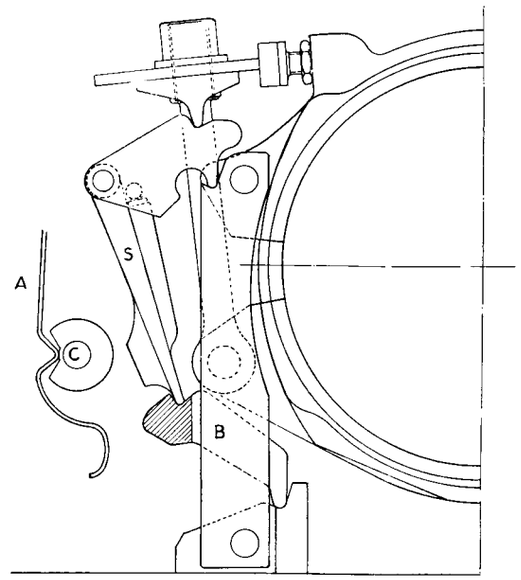
SHOWING DIAGRAMMATICALLY THE CAMSHAFT AND BUSBAR ACTION



A. Busbar in neutral position, first speed selected.



B. Pedal depressed, busbar down, the strut engaging with the busbar.



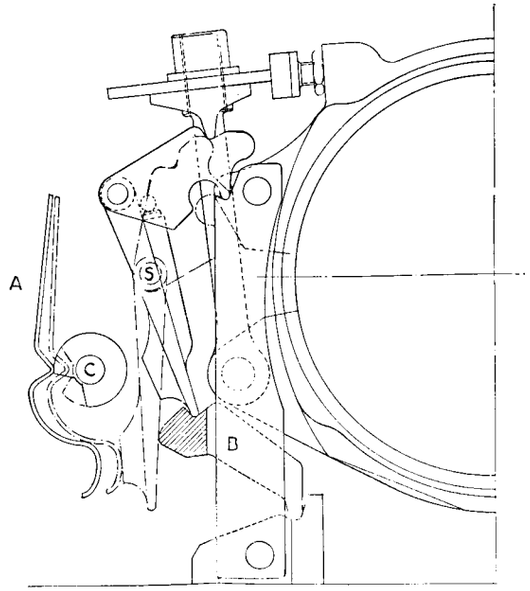
C. Pedal raised, first speed engaged, busbar up.

Camshaft and Busbar Action.—Now refer to a series of illustrations A to E which show what actually takes place in the various phases of gear selection engagement, starting with neutral, followed by selection of first gear, first gear in operation, and then second gear selected, whilst first gear is operating and finishing in the intermediate position when the pedal is pushed down preparatory to engaging second gear.

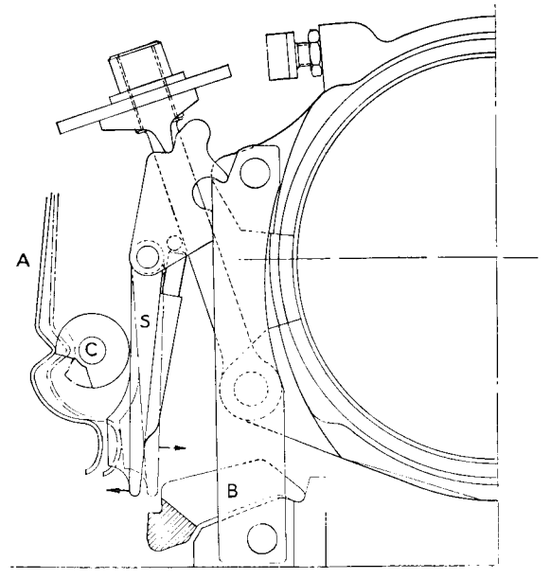
These series of illustrations clearly show the action of the busbar during the gear-changing operations, the same lettering has been followed throughout and the parts lettered are as follows :—

A. Selector spring.
B. Busbar.
C. Camshaft.
S. Operating strut.

The action of the selector spring A forces operating strut S towards the busbar and the operating strut carries a throwout spring to disengage the strut, when it is not selected. It will be noted that when the busbar rises, the pull rod and table take up a new position.



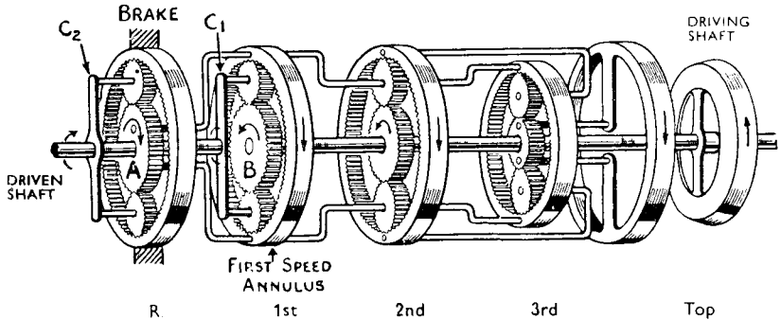
D. First speed in operation, second speed selected.



E. Pedal depressed for change of gear, busbar down, struts changing position.

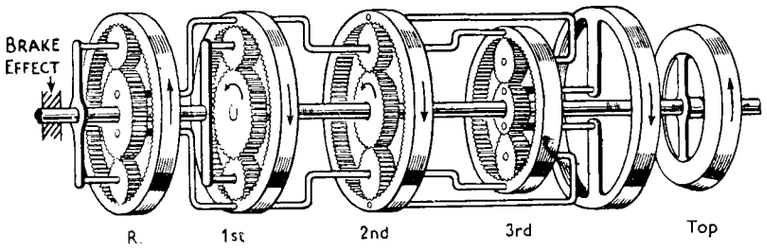
SERIES OF OPERATIONS OF THE PRE-SELECTOR GEARBOX

FIG. 4. REVERSE GEAR DRIVE



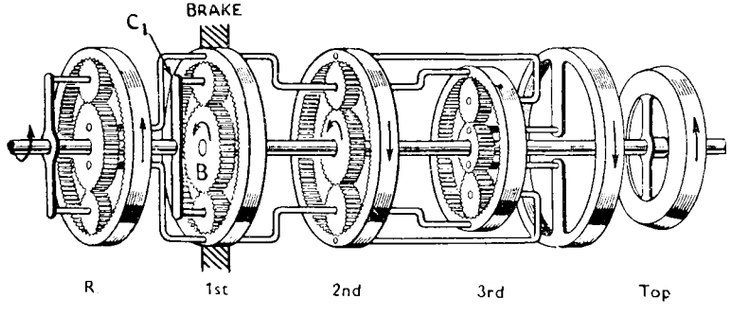
Reverse. The drive enters at B and passes through the first speed annulus to the reverse sun wheel A in the reverse direction. The reverse annulus is locked and consequently the reverse carrier plate is turned in the reverse direction, the carrier plate being splined rigidly to the output shaft.

FIG. 4A. NEUTRAL



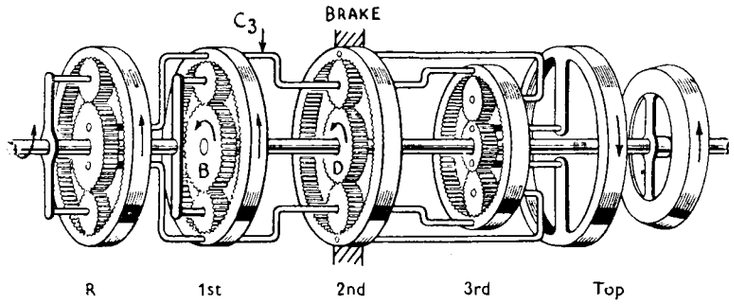
Neutral. The brake effect on he driven shaft is due to the rolling resistance of the tyres and the oil resistance in the transmission and of course to the road wheel brakes when they are applied.

FIG. 4B. FIRST GEAR DRIVE



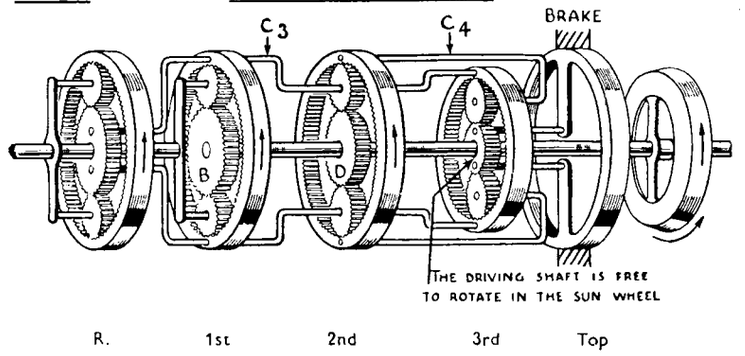
First Gear. The drive enters through the sun wheel B and the annulus is locked, consequently the carrier plate C1, which is connected rigidly to the output shaft, is turned in the same direction at a lower speed, with a consequent increase in torque due to the simple train of epicyclic gears.

FIG. 4C. SECOND GEAR DRIVE



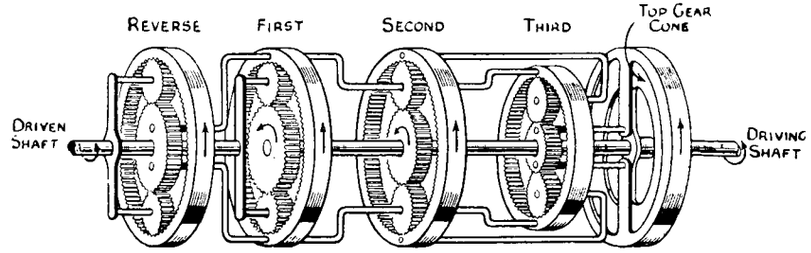
Second Gear. Sun wheels B and D are both driven by the same shaft and each transmits a proportion of the drive. The ratio is obtained by compounding the epicyclic trains of first and second speed, while the driven member is still the plate carrier C1 in illustration of first gear drive.

FIG. 4D. THIRD GEAR DRIVE.



Third Gear. The brake is applied to the third speed annulus which holds the third speed sun wheel stationary. The drive enters at the sun wheels B and D. The planet carriers C3 and 4 transmit the drive, which is passed on to the first speed annulus and from thence to the carrier C1 and so to the driver's shaft.

FIG. 4E TOP GEAR DRIVE



Top Gear. The top gear cone engages the third speed brake-drum and prevents any relative motion taking place between the gears, consequently the whole train of gears revolves as one unit, giving direct drive.

N.S. HEAD LAMP.
N.S. HORN.
SIDE LAMP.
O.S. HEAD LAMP.
O.S. HORN.
SIDE LAMP.
DYNAMO.
SPLICE.
CUT-OUT.
FUSE-BOX.
FRAME HARNESS.
AMMETER.
DASH LAMP.
KEY SWITCH.
PANEL SW.
SWITCH PANEL.
MAGNETO.
PETROL PUMP.
INTERIOR LIGHTS.
REVERSE LIGHT
PANEL HARNESS.
REVERSE.
HORNS.
O.S. INDICATOR.
JUNCTION BOX.
BATTERY +.
N.S. INDICATOR.
O.S. HEADLAMP.
6-CORE PANEL CABLE.
3-CORE FRAME CABLE.
INDICATOR SWITCH.
HORN & DIP SWITCH.
STARTER SOLENOID.
STARTER.
BRAKE STOP SW.
6-VOLT BATTERY.
6-VOLT BATTERY.
MAIN BATTERY + CABLE.
REVERSE AND TAIL LAMP.
DIRECTION INDICATOR AND STOP LIGHT.

ELECTRICAL SECTION

Electrical Equipment. A view of a facia board will be seen on referring to Illustration No. 75, and it will be seen that there are several electrical fittings in addition to the instrument panel. The form of the facia board and the positions of the controls vary in different models, but the instruments remain fundamentally the same in each case. The instrument panel contains a centre zero ammeter, ignition lock switch, dynamo and lights switch, dashlamp switch, dashlamps and a remote control solenoid switch for the starter motor. The ignition locking switch is so arranged that when in the " off " position it is impossible to start the car or alter the position of the light switch. This is particularly useful when leaving the car unattended in a public place. Front and rear views of the panel are given in Illustrations Nos. 76 and 77, while the wiring can easily be traced on the wiring diagram.

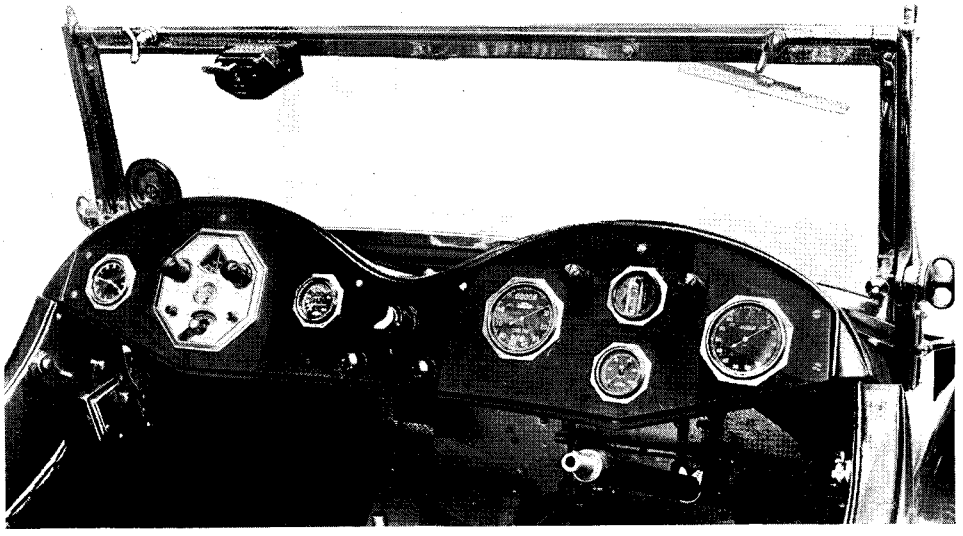


Illustration 75.—Facia board showing position of the various instruments.

Dynamo. The dynamo is mounted on a platform at the front end of the engine and forms part of the overhead camshaft drive. Reference to Illustrations Nos. 24 and 28 shows its actual application and Illustration No. 40 shows how it is driven and removed. Two views of the dynamo can be seen in Illustration No. 91. 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 key way in the armature spindle. The two holes in the pinion are drilled and tapped $\frac{1}{4}$ in. 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 requires but little attention, the brush gear can be examined by slackening off the screw holding the cover in position. The cover is shown in the illustration above the dynamo.

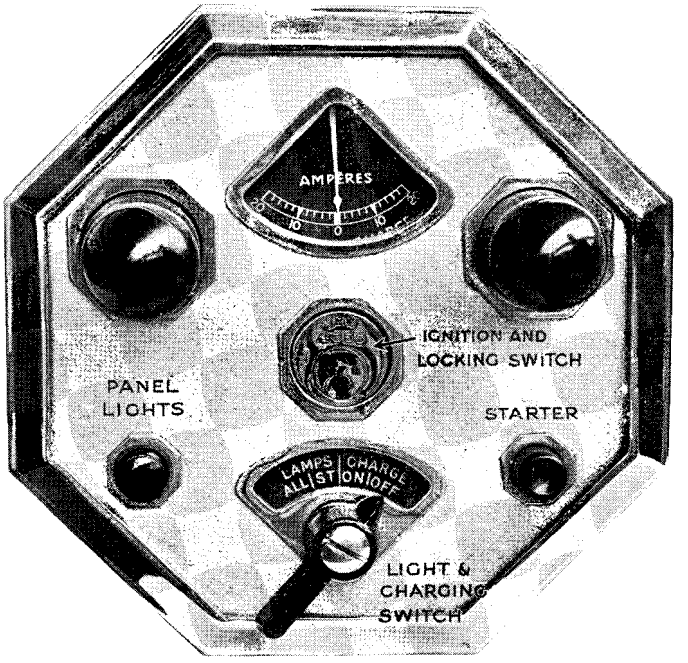


Illustration 76.—Front view of switchboard and instrument panel. The key locks the ignition, lights and starter.

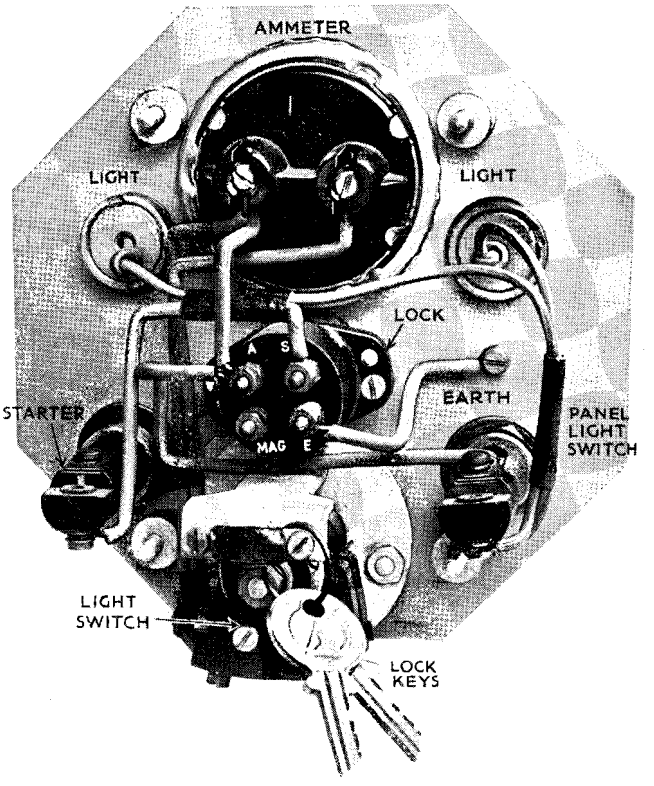


Illustration 77.—Rear view of instrument panel showing wiring and the position of the magneto earth wire terminal.

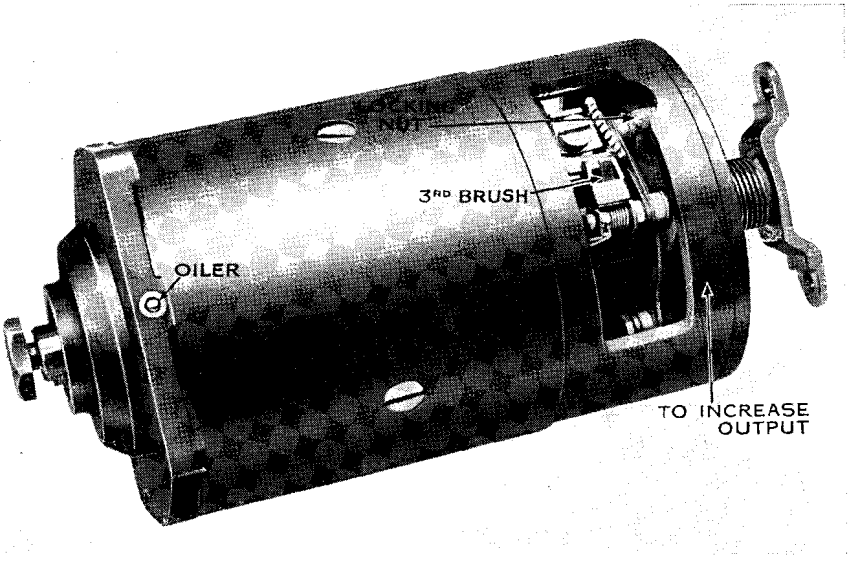


Illustration No. 78.—A view of the dynamo showing the position of one of the lubricating holes, the third regulating brush and its locking nut, and the upper coupling for driving the overhead valve gear. The instructions should be read carefully concerning the care of the commutator and brushes and the regulation of the dynamo.

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.

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 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.

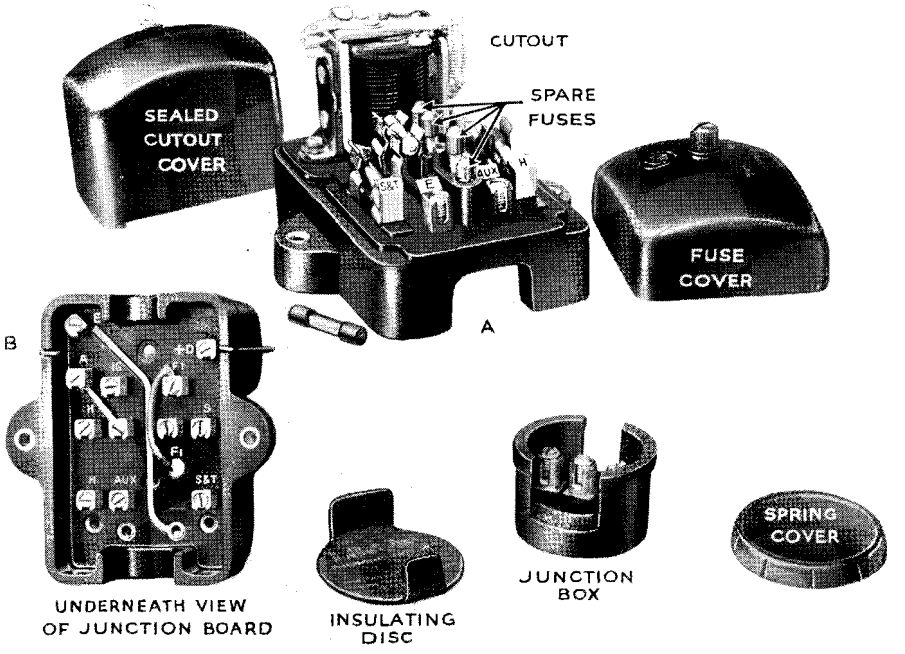


Illustration No. 79.—Details of the electrical fitting A and the junction board seen from above, the underneath of which is shown at B. Reference to the wiring diagram shows, it will be noticed, that the earth terminal is covered up by a strip for convenience. Spare glass fuses are carried in the special 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 5 amperes.

Readers 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.

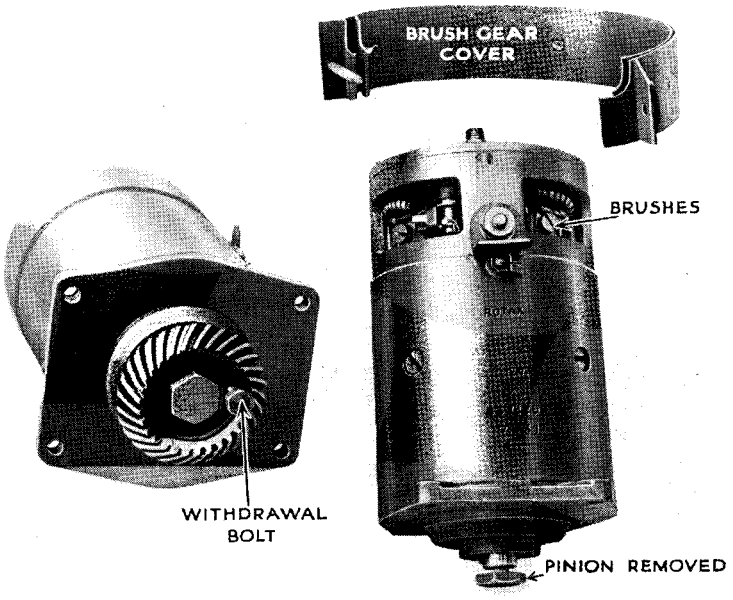


Illustration No. 80.—Two views of the dynamo showing the brush cover removed, and the method of withdrawing the gear from the shaft by two $\frac{1}{4}$ in. B.S.F. bolts.

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. Generally speaking, this should not be undertaken by anyone other than a qualified electrician, as extensive damage can be unconsciously done by anyone not familiar with the operation.

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, viz.— 4.5 amps.

In the case of the M.G. Magnette model the fuse is one of the four cartridge type fitted in the junction box on the engine side of the dash (see page 90), 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 advisable to take off the radiator. Remove the lock nuts and nuts from the radiator bolts carried through the engine nose piece extension, and the bolts retaining the yokes of the bonnet tie-rods. 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 6 cylinders, exactly in the centre of the opening. Place the brass packing shims 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 readjust 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—6 should show exactly in the centre of the inspection cover opening with the magneto high-tension rotor pointing towards No. 1 cylinder lead. (This can be easily 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 high-tension rotor 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.

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. 78. It is inadvisable for anybody who is not an electrician to tamper with this, as all machines are adjusted to an output of 9 amperes before leaving the Factory, and any marked variation from this standard usually indicates some other factor at fault, which must be cleared before normal conditions are possible for the dynamo. Should, however, the indicated rate of charge increase to a value above 10 amperes **with all lights out,** it is necessary to reduce this at once, as a continuation of high output will rapidly destroy the machine. This may be done by moving the third brush or control brush in a direction opposite to that of rotation. To move the brush it is necessary to slacken the stud marked " Locking Nut " in Illustration No. 78, and when the adjustment has been effected, it is important to make sure that the stud is tightened.

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 2000 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 M.G. or Lucas/Rotax Service Depot.)

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, then if the dynamo is generating at seven amperes the meter will show five amps. on the charge side of the scale. This is the current in excess of the lamp and other load which is available for battery charging purposes.

A flickering of the instrument needle is caused by the petrol pump, but should cease when the pump is switched on and the engine is not running after the pump has filled up. Shortage of petrol or air leak on the suction side will cause the petrol pump to keep on operating.

Fuses. The separate fusing of the various circuits ensures that a short in any one does not affect the rest of the electrical equipment. 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.

Junction Box. This 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, separate fuses for the headlamps, another fuse for auxiliaries such as the horn and a further fuse marked E, 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.

A small circular junction box is placed beneath the fusebox and cut-out, which forms a convenient connection point for wires to the horn, off-side headlamp, direction indicators and main battery positive pick-up. The scheme of connections in this unit can be best understood by referring to the wiring diagram.

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 M.G. Magnette 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.

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 terminals are tight and smeared with vaseline.

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 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 charged up from an independent electrical supply.

Headlamps. The **L.150** headlamps manufactured by Messrs. Joseph Lucas Ltd. are specially designed to give the highest illuminating factor without unduly overloading the electrical installation. The near-side lamp is equipped with a permanently deflected reflector and is always in circuit when the headlamp switch is on. The off-side lamp has a straight focus reflector, and while primarily wired in the same circuit as the other, can also be controlled by the dipping switch. The lamps are carefully focussed before leaving the Factory so that the near-side lamp will throw a slightly open beam and thus effectively illuminate the road and kerb up to about 40 yards, while the off-side beam is relatively closely focussed to throw

a penetrating light straight ahead. By a careful association of the Biflex reflector principle and diffusing glass in the front, the " black spots " are entirely eliminated while good side lighting and a clear and steady beam ahead are ensured.

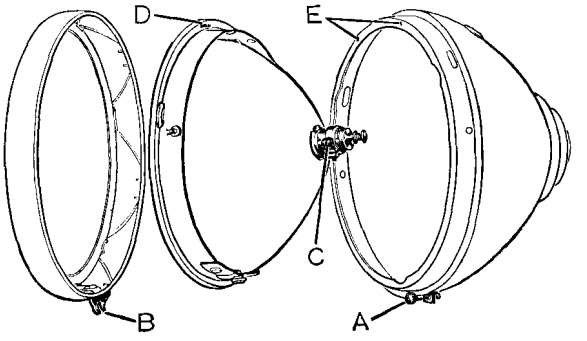


Illustration 81.—Headlamp dismantled.

A. Front fixing screw.
B. Slot.
C. Clamping screw for focussing adjustment.
D. Reflector securing screw.
E. Alternative locations for reflector securing screw.

It should be noted that when the bulb is changed it is usually necessary to re-focus the beam. This can be effected by removing the front by slacking off the retaining screw A at the bottom of the lamp, and then removing the reflector which is held in position by three small screws, when the small cheese-head screw holding the bulb holder can be loosened. The bulb holder can then be moved either forwards or backwards until the correct beam is obtained. It is essential that the cheese-headed screw should be effectively tightened when the correct focus is obtained, otherwise the light will be erratic.

Wiring Headlamps. Remove the front and reflector. Then depress the insulating 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.

Sidelamps. 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.

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 :—Headlamps, 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.

Direction Indicator. The Saloon model is equipped with a combined direction indicator and stop lamp. The stop lamp is wired in the usual manner and is controlled by the brake pedal. The direction indicator is so connected that a red warning lamp situated in the centre of the switch is brought into circuit when either of the indicator lamps are operated. Thus it is impossible to unconsciously leave either of the indicators "on."

Bulb replacement is effected by removing the case of the lamp when the lamp holders are easily accessible.

Self Starter. This has already been described in some detail on page 34 which has more particular reference to the dismantling of this unit, but the following instructions may be of some assistance in case the starter is not functioning properly.

Starter Motor. The starter motor is a specially designed four-brush machine with very high start and run torque. It is brought into operation by the solenoid or relay fixed to its yoke, which in turn is controlled by the small push switch in the instrument panel referred to elsewhere. Beyond an occasional inspection of the brushes and the usual cleaning instructions, the starter should require very little attention. It is, however, important that the engine should never be started with the ignition advanced, as, owing to the high starting torque of the starter, a back-fire would possibly damage the spindle.

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."

Magneto. Beyond strict observance of the makers' instructions with regard to lubrication, the magneto should require very little attention. It is advisable to periodically remove the distributor moulding and thoroughly clean with a soft cloth moistened with petrol. The contact points are accurately adjusted before leaving the Works, and provided that the correct lubrication instructions are observed, should not require any attention for a long period. Should the points become foul through any foreign matter getting on them, they should be removed and cleaned and on replacement the gap should be set to the gauge supplied with the magneto spanner.

It is particularly important to see that the switch wire terminal on the magneto is at all times tight, as this not only anchors the switch wire but also the link cable between the low-tension coil and the contact breaker.

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.

Examine the high-tension cables, i.e. cables from the magneto 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 previously described. Turn the engine over by hand, and see that the contacts come together.

Should all appear to be in order, carefully check the switch cable from the magneto to the magneto switch for evidence of earthing out. If there is still no spark the fault will probably be in the magneto itself and must be investigated by an electrician.

Misfiring and Bad Starting. Examine the sparking plugs. If necessary, adjust the gaps to the correct setting (about 18 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.

Lucas Altette Horns (Type HF317). 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 horns become uncertain in their action, giving only a choking sound, or do not vibrate, it does not follow that they have 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 Lucas/Rotax Service Depot for examination.

The S.U. Petrol Pump. This instrument is constructionally very simple and it is very improbable that it will give any trouble at all. Should it, however, cease to function, the trouble will probably be due to :—

1. The pump plungers (C or K) sticking, due to dirt or grit getting between the pump plungers and the body. Often a blow on the pump with the fist is sufficient to get it working, when the dirt will pass right through. Should it not do so, the remedy is to remove the filter bowl (U) and foot valve (Y), also the top cap of the pump and the cork float, when it will be possible to push the plunger (C) through the bottom, after which a clean rag can be drawn through the bore of the pump. Note when assembling the plunger of the pump that the valve (E) is on top.

If the above is found to be in order

2. First of all remove the top cap (V) from the pump to see if the float-chamber contains petrol. If it does then the trouble is not due to the pump.

3. If the pump continues to make a pumping noise without delivering petrol, it is due to one of the following causes :—

   (*a*) Lack of petrol in the tank.

   (*b*) Air leak, which may be due to

      (1) a bad joint between the filter bowl (U) and the casing, in which event tightening up will generally correct. If it does not do so a new washer will have to be fitted, or

      (2) a loose petrol union in the suction pipe, that is to say any point between the bottom union of the pump and the petrol tank. The washer between the filter bowl and its bolt (T) should also be inspected.

   (*c*) Foot valve (F) held up. This is a very rare source of trouble. To rectify remove the filter bowl (U), filter (H) and foot valve (Y) by means of a tommy bar through one of the holes. The foot valve can then be cleaned. A second filter (X) will be found in the foot valve underneath the priming tube.

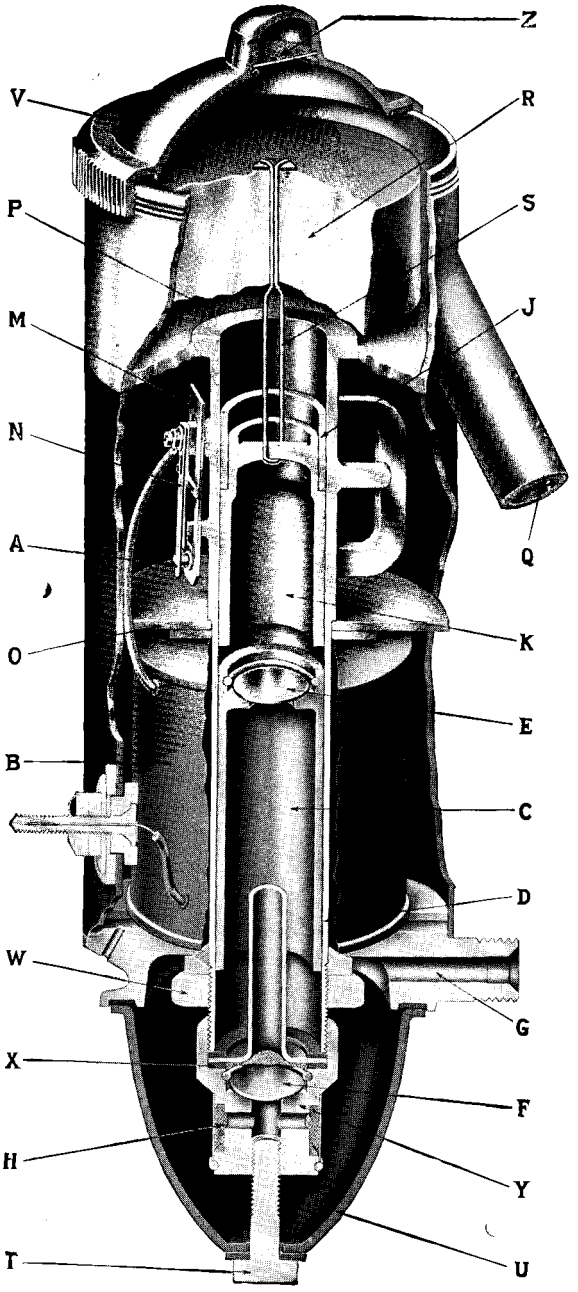


Illustration 82.—Sectional view of S.U. petrolift.

V. Top cover.

R. Cork float.

F. Plunger.

T. Bolt holding U. Filter bowl. Unscrewing Y. Foot valve permits removal of C. Plunger and F. Valve and E. Valve.

4. If the pump works very slowly without delivering petrol, it is due to :—

   (*a*) Blocked petrol pipe or filters, in which case the filters or pipe must be cleaned out.

   (*b*) Batteries run down, in which case fill the float-chamber of the pump with petrol. This will probably enable the engine to be started up by hand, and as the dynamo comes into action it will boost up the batteries sufficiently to run the pump.

5. Should the pump not work at all, providing the plunger has not stuck, the trouble will be due to :—

   (*a*) A bad electrical connection. To test this remove the terminal from the pump and flash the wire across the pump body. If there is a bright flash this is in order. If not, the trouble is due to the batteries being run down or bad connections somewhere in the system.

The electrical apparatus is to all intents and purposes absolutely foolproof. Practically the only thing that can cause this to cease to function is a broken wire. If reference is made to the diagram the connections will be seen exactly. To gain access to the electrical part of the pump it will be necessary to remove filter bowl (U), foot valve (Y), unscrew the large hexagon nut (W) holding the inlet ring, when the casing can be drawn off and the internal parts of the electrical equipment and connections inspected. Care must be taken to see that the cork gland washer which makes a petrol-tight joint between the inlet ring and electrical equipment is in perfect condition. A new cork gland washer is advisable.

When the casing is removed care must be taken to see that the wires are not broken, and particularly that the top wire does not come across the rocking contact plate (M). A simple test for the contacts being in working order, providing the bottom plunger has not stuck, is to remove the cap (V) from the top of the pump and lift the float (R) up and down its full stroke. If listened for intently the rocker plate can be heard to click as it breaks the contact.

If after being re-assembled the pump works, but does not deliver petrol, it should be primed by pouring a small quantity of petrol into the top chamber. If petrol is not available a few squirts of thin oil down the tube of the pump after removing the float (R) and top plunger (K) will have the same effect. Please note the oil must be thin.

The petrol pump is unconditionally guaranteed (except for obvious mishandling) by the makers, The S.U. Carburetter Co., East Works, Bordesley Green Road, Adderley Park, Birmingham, to whom all queries should be addressed.

The Electric Petrol Pump.—The pump is fitted on the off-side of the dash wall and consists of three main assemblies, the body, the magnet assembly and the contact breaker. The body is composed of a hollow brass stamping " A " into the bottom of which the filter " B " is screwed. The inlet union " C " is screwed in at an angle on one side. The outlet union " D," which is screwed into the top, tightens down on to the delivery valve cage " E," which is clamped between two fibre washers " F " and " G." In the top of the cage is the delivery valve, a thin brass disc " H " held in position by a spring clip " I." Inserted in the bottom of the cage is a light spring " J," which rests on the suction valve " K," the latter being a similar disc resting on a seating machined in the body. Holes connect the space between the valves to the pumping chamber, which is a shallow depression on the forward face of the body. This space is closed by a diaphragm assembly " L," which is clamped at the outside between the magnet housing " M " and the body, and in the centre between a brass plate " K1 " and the steel armature " O." A bronze rod " P " is screwed through the centre of this and passes through the magnet core to the contact breaker which is located at the front end.

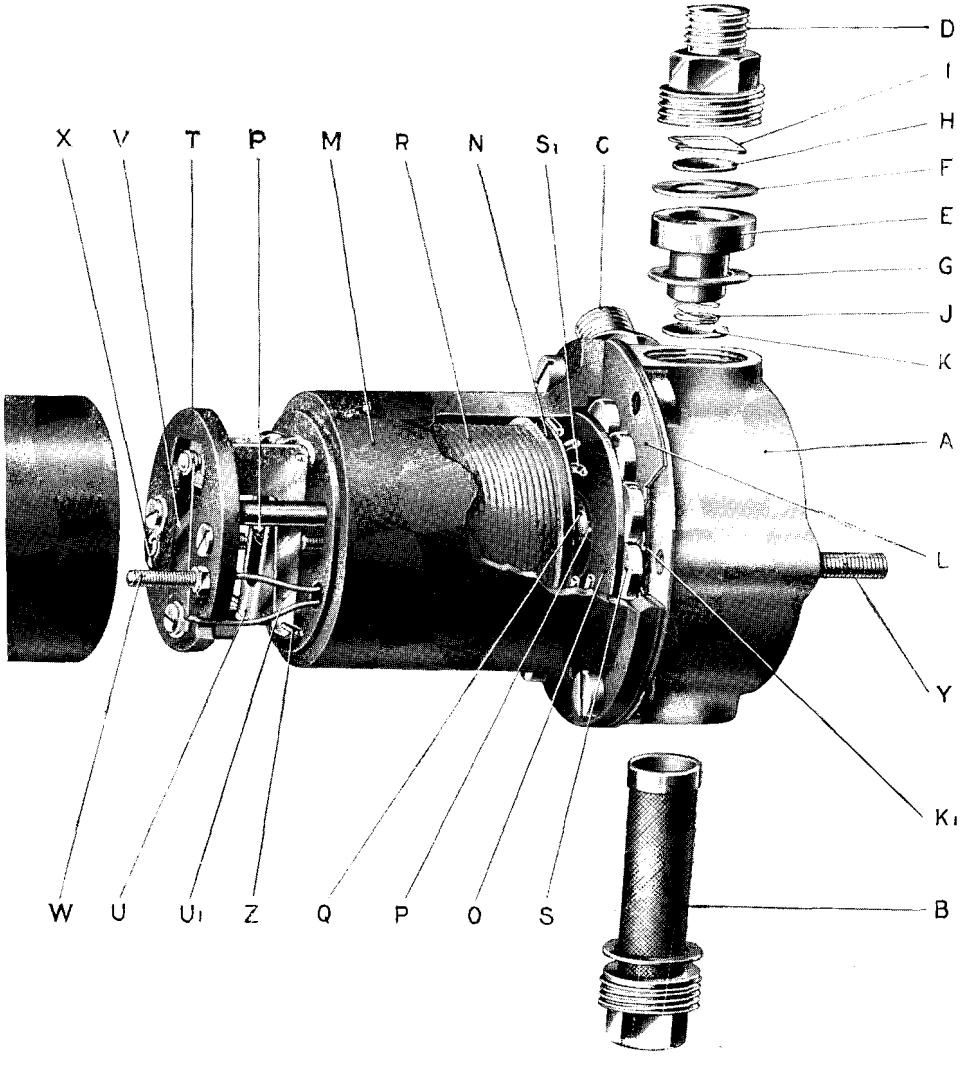


Illustration 83.—A view of the S.U. pressure petrol pump with part of the cover cut away to show the magnet. The various letters are referred to in the accompanying text.

The magnet consists of a cast iron pot having an iron core "Q," on which is wound a coil of copper wire which energises the magnet. Between the magnet housing and the armature are fitted eleven spherical edged brass rollers "S." These locate the armature centrally within the magnet at all times and allow absolute freedom of movement in a longitudinal direction.

The contact breaker consists of a small bakelite moulding carrying two rockers "U" and "U1," which are both hinged to the moulding at one end and are connected together at the top end by two small springs arranged to give a "throw over" action. A trunnion is fitted into the centre of the inner rocker, and the bronze rod "P" connected to the armature is screwed into this. The outer rocker "U1" is fitted with a tungsten point which makes contact with a further tungsten point on a spring blade "V." This spring blade is connected to one end of the coil and the other end of the coil is connected to the terminal "W." A spring "S1" is interposed between the armature and the end plate of the coil.

A short length of flexible wire is connected to the outer rocker and to one of the screws which hold the bakelite moulding on to the magnet housing, in order to ensure a good earth. In the case of double pole pumps this wire is taken to a further terminal and the rocker mechanism is insulated by fibre bushes. Two fibre bushes are in any case fitted to one of the spindles of the "throw over" mechanism of all pumps in order to silence the operation of the contact breaker.

THE ACTION OF THE PUMP. When the pump is at rest the outer rocker lies in the outer position and the tungsten points are in contact. The current passes from the terminal, through the coil, back to the blade, through the points and to earth, thus energising the magnet and attracting the armature. This comes forward, bringing the diaphragm with it and sucking petrol through the suction valve into the pumping chamber. When the armature has advanced nearly to the end of its stroke the "throw over" mechanism operates, and the outer rocker flies back, separating the points and breaking the circuit. The spring "S1" then pushes the armature and diaphragm back, forcing petrol through the delivery valve at a rate determined by the requirements of the engine. As soon as the armature gets near the end of this stroke the "throw over" mechanism again operates, the points again make contact, and the cycle of operations is repeated.

The spring blade rests against a small projection on the bakelite moulding, and it should be so set that when the points are in contact it is deflected back from the moulding. The width of the gap at the points is of no importance.

If the magnet is removed from the body for any reason care should be taken that the rollers "S" do not drop out. If the armature and centre rod have been unscrewed it will be necessary to reset these. In order to do this the magnet should be held in the left hand and the first finger used to hold the spring blade out of contact with the rocker. The armature should be screwed in as far as possible and should then be screwed back gradually and pressed in and out until it is found that when it is pushed in the "throw over" mechanism operates. It should then be turned back a further four holes. The setting is now correct. The six screws which hold the magnet to the body may then be screwed into place, but before tightening these down the hinge pin "Z" on which both rockers pivot should be pulled out, thus allowing the inner rocker and the armature and diaphragm assembly to move further back. The screws may now be tightened and the hinge pin replaced.

TESTING FOR ELECTRICAL FAULTS

In the unlikely event of trouble, disconnect the lead from the terminal and strike against the body of the pump to see if it sparks and therefore if any current is available in the wire. If there is no current the trouble must be looked for elsewhere. If the current is there remove the bakelite cover and touch the terminal with the lead. If nothing happens and the points are in contact and a spark cannot be struck off the terminal it is probable that there is some dirt on the points. If on the other hand the points are not in contact look to see if the tips of the inner rocker " U " are in contact with the magnet housing. If they are not it indicates that the armature has not gone right back. To cure this loosen the six screws which hold the magnet housing to the body, make sure that the diaphragm is not sticking to the magnet housing by passing a penknife down the side of it and remove the hinge pin " Z." The six screws may then be tightened up again, when it will probably be found that the tips of the inner rocker are making contact with the magnet housing. If they are not it will be necessary to remove the whole magnet assembly, dismantle it and see if any foreign matter has caused a jam.

NOISY PUMP INDICATIONS

If the pump becomes noisy, look for an air leak on the suction side. To do this, first of all make sure that the filter and inlet union are tight, and also see that there is sufficient petrol in the tank. If this does not cure it, it is probable that the leak is somewhere in the pipe line, and the simplest way to test for this is to replace the suction pipe with a short length of piping and let the pump suck petrol out of a can. If the pump functions satisfactorily under these conditions the fault must be elsewhere. If the pump goes on beating without delivering any petrol it is probable that a piece of dirt has lodged under one of the valves. This may be removed by unscrewing the top union from the body and lifting the valve cage out. If the pump struggles to pump and gets very hot, it is probable that there is an obstruction somewhere in the pipe line or the filter may require cleaning.

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 4.75 in. for 19 in. rims (long chassis), 4.40 in. for 19 in. rims (short chassis), are fitted to the M.G. Magnette, and the makers' recommended pressures are as follows :—

2-Seater—	Front Wheels	35	lb.	per	sq.	inch.	Back Wheels	37	lb.	per	sq. inch.
4-Seater—	,,	,,	33	,,	,,	,,	,,	,,	35	,,	,,	,,
Saloon—	,,	,,	35	,,	,,	,,	,,	,,	37	,,	,,	,,

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 about 5 lb.

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 r m. 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.

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.

Body Hints. The body of the M.G. Magnette is attached to the frame on the special body brackets. It is advisable after the car has run a few thousand miles to see that these body bolts are tight, and they should be kept tightened from time to time. The hinges and the striking plates of the doors should be oiled occasionally with a little " Three in One " oil. This will prevent rattles and squeaky closing of the door. It may be found that the doors may require adjustments which will soon cure any rattles that may develop.

As soon as the owner obtains his car he should lift the back seat cushion and the rear seat pan and see for himself where the batteries are located, the position of the rear axle filler cap and the points for rear shock absorber adjustment.

It is essential that only Hardy Spicer grease should be used for the universal joint, and in this connection a special small gun is provided for the purpose.

The propeller shaft is enclosed by the shaft tunnel in which there are holes at either end for lubricating the nipples on the universal joints.

Petrol Tank. This is housed at the back of the chassis on the K2 Two-seater and inside the body in the case of the open Four-seaters and Saloons. The filler is positioned outside the body, on the off-side.

Luggage Platform. This is a very neat fitting consisting of a portion of the rear panel of the body provided with two supporting arms which, when folded outwards and downwards, register into brackets and are held in position by thumb nuts.

Hood on Four-seaters. It is essential to fold the hood so that it refits in the envelope which is held in position by five lift-the-dot fasteners and straps, otherwise the folds of the hood might obscure the rear number-plate. When folding the hood the material should be folded outwards from between the sticks, except, of course, the one with the window in it, and then the hood bag will go on easily.

Bonnet Fasteners. To undo the bonnet fasteners these should simply be turned in an anti-clockwise direction, which is sufficient to overcome the spring tension ; when the bonnet is being fastened the bonnet fasteners should simply be pushed downwards, when they will engage with the brackets provided for same.

Sliding Roof on Saloons. It will be noticed that this is held in position by two knurled nuts, and if these have been undone it is necessary to lift the roof heading out of engagement before it can be taken backwards. It is advisable to supply a little lubricant to the slide occasionally, and if the car is used in dusty districts the channels should also be cleaned out from time to time. The car should never be driven with the nuts holding the sliding portion of the roof slack.

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    Telephone : 75229.

11. **LIVERPOOL. W. Watson & Co. (Liverpool) Ltd., 7 Mount Pleasant.**
    Telephone : 5480 Royal (4 lines). *Telegrams :* "Berliet, Liverpool."

12. **MANCHESTER. H. O. Serck Ltd., Lyon Street, Garratt Street, Oldham Rd.**
    Telephone : Gollyhurst 1541 (2 lines). *Telegrams :* "Serckrad."

13. **MANCHESTER. Pendleton Radiator Co., 72a Broad Street.**

14. **NORTHAMPTON. Central Sheet Metal Co., 12a St. Michael's Road.**
    Telephone : 676.

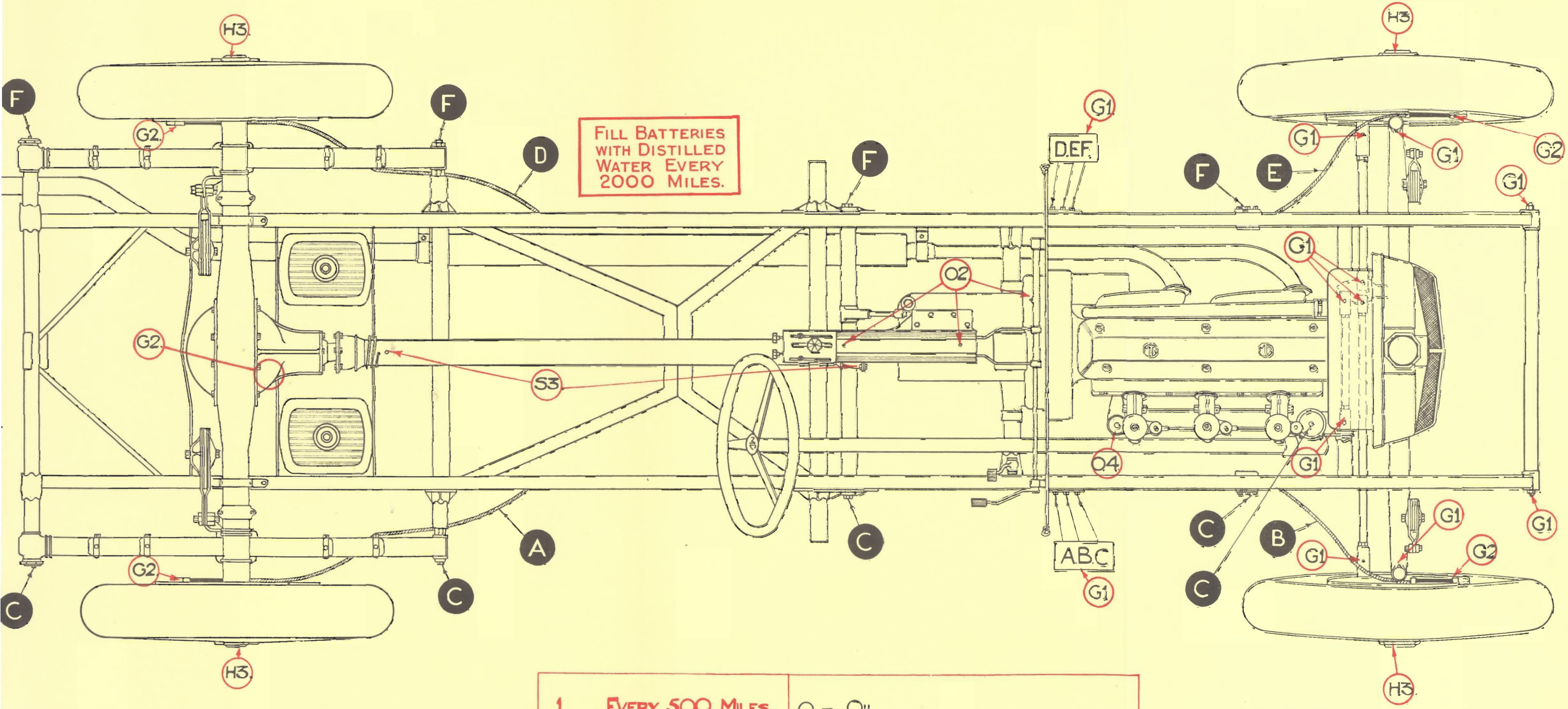
15. **NORWICH. W. F. Smith & Sons, 90 King Street.**
    Telephone : Norwich 30.

16. **PERTH. Leslie & Murray, St. Catherine's Road.**
    Telephone : 770.

17. **PLYMOUTH. Edmund Metal Works, Sutton Road.**
    Telephone : 2181. *Telegrams :* "Edmund Metal Works, Plymouth."

18. **WOLVERHAMPTON. Baggott's Motor Fittings, Steelhouse Lane.**
    Telephone : 110.

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1	EVERY 500 MILES.	O. = OIL.
2	" 2000 "	G. = GEAR OIL.
3	" 10000 "	S. = HARDY SPICER GREASE.
4	AS REQUIRED.	H = HUB GREASE.

ON CARS WITH THE MANUAL TYPE GEARBOX THE CLUTCH THRUST RACE SHOULD BE LUBRICATED WITH NON-SEPARATING GREASE EVERY 2000 MILES.