HANDBOOK

OF THE

25/30 H.P.
ROLLS-ROYCE CAR

("WRAITH")

WITH INSTRUCTIONS FOR RUNNING AND MAINTENANCE

Number XIX.

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Liable to Alteration without Notice

Number XIX.

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THE information contained in this book has been arranged to facilitate reference by condensing all essential driving and upkeep instructions in the first two chapters. Numerous references to other parts of the book are provided, whereby any particular instruction may be amplified if required.

Subsequent chapters include explanations of the working of the various units or components of the chassis, and include detailed directions for lubrication and maintenance.

Drivers should therefore familiarise themselves with the first two chapters in order to operate the car successfully, referring to the remainder of the book at leisure, or if necessary.

In connection with certain proprietary components, viz., the battery, wheels and tyres, the permanent jacks, fuel pumps and fuel gauge, separate instructions approved by the respective makers of these articles will be found incorporated as pamphlets at the end of the book.

A set of special spanners and tools is supplied with the chassis. It is most desirable that these should be used when effecting any adjustment, as otherwise vital parts may be seriously damaged.

It is strongly recommended that this book be carefully studied, and the instructions faithfully followed, to ensure the greatest satisfaction.

ROLLS-ROYCE LIMITED

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SERVICE FACILITIES FOR ROLLS-ROYCE CARS

Our interest in your Rolls-Royce car does not cease when you take delivery of the car. It is our ambition that every purchaser of a Rolls-Royce car shall continue to be more than satisfied.

With this end in view, we have appointed Special Retailers throughout the world, who have established properly equipped Service Stations, staffed by men who have been specially trained in servicing Rolls-Royce cars.

In addition, on the staff of Rolls-Royce Limited, there are experts whose sole duty it is to maintain contact with the Special Retailers, and they are available at all times to be called in for consultation on any matters affecting your car.

If, therefore, you require any assistance, we ask that you should immediately contact our nearest Special Retailer, who will be only too pleased to place his facilities at your disposal. If necessary he will call in for consultation our expert in that area. It is earnestly hoped that this arrangement will prove of mutual benefit, as we shall thus be kept in constant touch with our Customers, who may be spared the trouble of a long journey to one of our Company's Service Stations.

In the event of it being more convenient to call on us direct for assistance, our Main Service Station at Hythe Road, Willesden, London N.W.10, and the one at our factory at Crewe, Cheshire, England, will be ready at all times to help. (See maps at end of Handbook.)

THE SECRET OF SUCCESSFUL RUNNING

Before a Rolls-Royce chassis is sold it is very carefully tested and adjusted by experts. It will run best if no attempt be made to interfere unnecessarily with adjustments.

An owner would do well to instruct his driver as follows :—

Lubricate effectively, in strict accordance with the advice given in this book, and do not neglect *any* part.

Use only those oils which are recommended by Rolls-Royce Ltd., who have made prolonged and searching tests of oils. Considerable harm and expense may result from the use of unsuitable oils.

Inspect all parts regularly, but take care not to alter any adjustments unless really necessary.

CHASSIS NUMBER PLATE ON FRONT OF DASHBOARD.

For Foreign Customs purposes the Chassis Number is also stamped on the frame, on the right-hand side, in line with the rear edge of the front tyre.

The Engine Number is stamped on the arm of the crankcase which carries the water pump, on the left-hand side.

LEADING PARTICULARS OF CHASSIS.

Engine .. .. Six cylinders, $3\frac{1}{2}''$ (89 m/m) bore, $4\frac{1}{2}''$ (114 m/m) stroke, 4,257 c.c., 29.4 H.P. on R.A.C. rating. Cylinders cast in one block. Detachable cylinder head with overhead valves operated by push rods. Pistons of Rolls-Royce patented aluminium alloy. Engine-gearbox unit rubber mounted in frame.

Engine Lubrication Pressure feed to all crankshaft and connecting rod bearings. Dual relief valve providing a positive low-pressure supply to valve rocker shaft, thence to rockers, push rods and tappets, etc. Gear-type pump, suction strainer, and by-pass filter on delivery side accessibly located at side of engine.

Ignition System Battery ignition with automatic timing control.

Carburetter .. Down-draught pattern with accelerator pump, economiser jet and efficient provision for starting and idling.

Air intake silencer, with which is incorporated a special air cleaner element.

Fuel System .. 18-gallon tank at rear of chassis. Supply by electric pumps. Fuel level gauge and warning light on instrument board. The warning light indicates when fuel is low.

Cooling System By centrifugal pump circulation and fan, with thermostatically controlled shutters in front of the radiator. Water temperature thermometer on instrument board.

Electrical Equipment 12-volt, approximately 60 ampere-hour battery; constant voltage control dynamo of Rolls-Royce manufacture; starter motor, also of Rolls-Royce manufacture.

Clutch .. .. Single dry plate type, direct foot-operation.

Gearbox .. Four-speed and reverse; side-control; direct drive on top; synchromesh on second, third and top gears. Speedometer and brake servo-motor drives incorporated.

Gear Ratios—

Rear Axle Ratio.	1st Speed.	2nd Speed.	3rd Speed.	4th Speed (Direct).	Reverse.
8 : 34	13.17 : 1	8.46 : 1	5.70 : 1	4.25 : 1	13.17 : 1

Propeller Shaft Large diameter, open; fitted with needle-bearing universal joints.

Rear Axle .. Hypoid gears, full floating, road wheels entirely carried on axle tubes.

Rear Suspension By long semi-elliptic springs enclosed in leather gaiters and lubricated from the chassis system. Controllable hydraulic dampers.

Front Suspension Independent; enclosed helical springs in combination with controllable hydraulic dampers.

Hydraulic Shock Dampers Of Rolls-Royce design and manufacture; degree of damping automatically controlled to suit speed by governor and pump mounted on gearbox; over-riding hand control on steering wheel.

Steering .. Cam-and-roller type.

Brakes .. .. Pedal-operated, internal expanding, on all four wheels, operation assisted by mechanical servo which is equally effective for both forward and backward movement of car. Handbrake lever operates on rear wheels.

Frame .. .. Box section side members with special " X " cross-bracing member.

Chassis Lubrication Centralised system by foot-operated pump and reservoir on dashboard.

Lifting Jacks .. Permanently fitted, hydraulic jacks, controlled by hand-pump conveniently situated for operation from front seat.

Road Wheels .. Wire type, 17" well-base rims, provided with self-locking, knock-off type hub caps; Dunlop 6.50" by 17" tyres.

Dimensions .. Total length overall, including rear bumper .. .. 203" = 16' 11".
Width of car .. .. .. 74" = 6' 2".
Wheelbase .. .. .. 136" = 11' 4".
Track: Front .. .. .. 58.5" = 4' $10\frac{1}{2}$".
Rear .. .. .. 59.5" = 4' $11\frac{1}{2}$".
Turning circle .. .. .. 46' 6".

Weight .. .. Chassis complete with tyres, battery, fuel, oil and water, but excluding spare wheel, lamps and other accessories:—Approximately 3,082 lbs.

CHAPTER I.

Starting the Engine and Driving the Car.

Summary of Starting Instructions—Starting the Engine—Throttle Control—Ignition Control—Fuel Feed—Change-over Switch for Fuel Pumps—Fuel Gauge—Gear Changing—Controllable Shock Dampers—Battery Charging—Lighting Control and Switch—Automatic Control of Radiator Shutters—Overheating—Water Level in Radiator—Frost—Fitting of Snow Chains.

Summary of Starting Instructions.

Check that gear lever is in neutral.

Switch on ignition by turning master and ignition levers on switchbox to **On.**

If making a start from cold, set thumb lever on instrument board to **Start.**

Set hand throttle lever at the bottom of its quadrant.

Depress starter button firmly and to its full extent.

As soon as possible after engine starts, set hand throttle lever a little over half-way up its quadrant and move thumb lever to **Normal.**

When making a start with a warm engine, leave thumb lever at **Normal** and set hand throttle lever a few notches up its quadrant.

Starting the Engine.

No fuel tap is provided, this being unnecessary, as will be later explained.

The action of switching on the ignition also switches on the electric fuel pumps, and a few pulsations of the latter may then be heard.

A small red warning lamp on the instrument board will be illuminated when the ignition is switched on, but will go out when the engine speed is sufficient to cause the cut-out contacts to close.

On no account should the accelerator pedal be "jiggled" when using the starter motor—or indeed at any time. Such movement

brings into action the accelerator pump provided on the carburetter and causes liquid fuel to be injected into the carburetter.

The thumb lever control on the instrument board is arranged to provide a suitably rich mixture for starting from cold, and it should only be turned to **Start** under these conditions. Normally, it should stand at **Normal.** It is not intended for varying the mixture strength under running conditions.

It will be observed that when starting from cold the hand throttle lever is to be set in the closed position, i.e., at the bottom of its quadrant. The reason for this is that there is an interconnection between the throttle lever on the carburetter and the instrument board thumb lever which causes movement of the latter to **Start** to open the throttle simultaneously the required amount.

When starting the engine for the first time in the day it is a good plan to form the habit of depressing the chassis oil pump pedal once at this stage. Subsequently it should be depressed once every 200 miles. If the car is to be driven only a few miles, however, half a pumpful will be sufficient at the first starting.

When the engine is cold a high oil pressure will be shown on the gauge, due to the greater viscosity of the oil at low temperatures. The pressure will fall, however, as soon as the oil becomes warmer.

A starting handle is carried in the tool kit. In the event of it being used, it should be removed afterwards from the bracket and returned to the tool kit.

(In cold weather starting will be greatly facilitated by the use of a thinner oil. See page 29.)

Throttle Control. Under normal running conditions, the hand throttle control should be carried right back at the closed position. An adjustable stop is provided on the carburetter for the throttle lever, which is so adjusted that the engine will idle reliably in these circumstances when the accelerator pedal is released.

Ignition Control. Control of the ignition timing is entirely automatic. no hand control being provided.

Fuel Feed. Fuel is supplied from the main tank to the carburetter by means of a dual electric pump mounted in the frame. A pamphlet dealing with the pumps will be found at the end of this book.

The total capacity of the main tank is eighteen gallons. A green warning lamp on the instrument board becomes illuminated when the supply is down to about two-and-a-half gallons.

As already mentioned, no fuel tap is necessary. The equivalent condition exists when the fuel pumps are switched off, that is, when the ignition is off.

Change-over Switch for Fuel Pumps. In addition to the ordinary ignition switch which also switches on the pumps, a change-over switch is arranged on the instrument board in order to provide a ready means of checking that each half of the double fuel pump is operating correctly.

Normally, the switch should stand at **BOTH** when both halves of the pump should be working.

Occasionally a few miles' running should be done with the switch moved to the **A** position, which cuts out one half of the pump. No difference in running should be noticeable. The test should then be repeated with the switch in the **B** position, which cuts out the other half and switches on the half first cut out.

In the circumstances described, failure or defective running of the engine only evident when the switch is on one side indicates that one half of the pump is faulty, and Messrs. Rolls-Royce Ltd., or one of their Service Depots, should be consulted at the earliest opportunity.

The connections of the change-over switch are shown in the Electrical Wiring Diagram, Fig. 31.

Fuel Gauge. The electric fuel gauge on the instrument board is graduated to register the total quantity of fuel in the main tank. The gauge is inoperative when the ignition is switched off.

Special contacts carried by the tank unit cause the green warning lamp to light when only about two-and-a-half gallons of fuel remain in the tank.

Gear Changing. The position of the gear lever for each of the four speeds and the reverse is shown in Fig. 1. When reverse is required, the top of the lever must be depressed. This releases a catch, and enables the lever to be moved into the reverse gate.

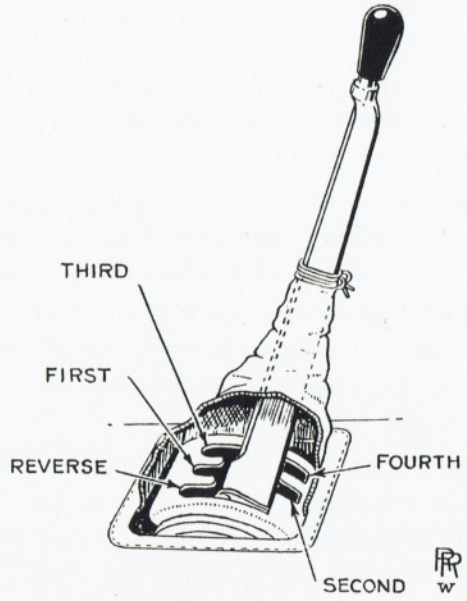

FIG. 1. PERSPECTIVE VIEW OF GEAR LEVER GATE.

A special synchronising device is fitted to second, third and fourth gears. Any change *into* these gears—up or down—is facilitated by this easy-change mechanism. All that it is possible to ensure by such a synchronising mechanism is that the gear members to be engaged cannot be brought together until they are both rotating at the same speed. It does not synchronise the engine and clutch shaft speeds. This must be done by the driver before re-engaging the clutch, otherwise there will be an unpleasant jerk, causing unnecessary wear and tear of the clutch and strain on the transmission.

It is necessary to depress the clutch pedal fully when changing gear. The gear lever should then be moved gently into the required gear position and, before re-engaging the clutch, the engine should be speeded up when changing down, or allowed to slow down when

changing up, so that its speed shall suit the car speed on the required gear.

The change from second to first must be made in the usual manner by double-clutching.

Controllable Shock Dampers. In order to provide comfortable riding at all speeds, a centrifugally-controlled pump is fitted which causes the damper loadings to increase with the road speed. In addition, there is a lever above the steering wheel, marked **Riding Control,** the effect of which is superimposed on that of the governor.

For ordinary town work, or touring with moderate loads, it will be found that the damper loadings as set by the governor are adequate when the hand lever is either at **Soft** or mid-way. On the other hand, at high speeds or with heavy loads, improved riding comfort will be obtained by moving the lever to **Hard.**

Battery Charging. There is no independent hand control of the battery charge, this being rendered unnecessary by the provision of an automatic output regulator which, in combination with a shunt wound dynamo, adjusts the charge rate to suit the state of charge of the battery. When the latter is low in charge the ammeter on the instrument board will show a higher reading towards **Charge** than it will when the battery is well charged up. In making such a comparison, however, other factors which affect the ammeter reading must be taken into account, chiefly engine speed and current-consuming apparatus in use at the time.

Whenever the master switch and the ignition switch are **On,** and the engine is running at speeds above idling speed, the battery is being charged at a rate to suit its state of charge at that particular moment. This can be checked by reference to the ammeter.

Further information regarding the electrical system is given in Chapter X.

Lighting Control and Switch. As already mentioned, movement of the master switch and ignition switch to **On** not only switches on the ignition and charge, but brings into operation the electric fuel pumps and the electric fuel gauge.

The ignition switch also switches on a red warning lamp on the instrument board, which is automatically put out when the engine is running at a speed sufficient to cause the dynamo to excite up to battery voltage. This red lamp consequently serves two purposes, viz. :—

(*a*) when alight it shows the driver that the ignition switch is on, and, therefore, warns him to put it off if he be leaving the car, and,

(*b*) when it becomes extinguished this indicates that the dynamo is exciting. (It does not follow that the dynamo is charging the battery. This can be ascertained by reference to the ammeter. See page 107.)

The master switch controls the head, side and tail lamps, alternative "on" positions being provided, viz. :—

S and **T**.—Side and tail lamps on.

H, **S** and **T**.—Head, side and tail lamps on, and

PL.—"Parking Lights" on, e.g. side and tail lamps on—accessories off.

In addition, a foot-operated switch is provided by means of which one head lamp beam may be dipped and the other switched off when required. Normally, the left-hand lamp beam will be dipped and the right-hand beam extinguished, but for use on the Continent this arrangement needs to be reversed. Reversal can be effected by operation of a change-over switch inside each lamp.

Automatic Control of Radiator Shutters. The radiator shutters are controlled automatically by means of a thermostat in the upper radiator tank.

A thermometer is provided on the instrument board to indicate that the shutters are operating properly and that there is no shortage of water.

The hand-operated ventilators on the sides of the bonnet should be left open in hot weather.

There is provision for quickly disconnecting the thermostat from the shutters in the event of defective operation. To do this the spring-loaded pin, **K**, Fig. 29, should be raised, and the end of the lever, **L**, disengaged from the thermostat rod. The shutters should then be left wide open.

Overheating. On long ascents which call for full throttle it is often preferable to change into a lower gear and reduce the throttle opening, to prevent boiling of the water.

Adjustment of the fan belt may be necessary, and this should receive attention.

Water Level in Radiator. The radiator filler cap, which is located beneath the bonnet on the left-hand side, should be removed frequently for inspection of the water level, but it *must not be removed when the engine is running.*

As long as water is visible through the filling orifice when the engine is hot, there is sufficient in the system. Only clean, preferably soft, water should be used.

Frost. It is recommended that an anti-freeze solution be used in the water system during frosty weather. (See page 97.) The system must then be topped up with a similar solution.

If plain water be used and if the car has to stand exposed to frost with the engine not running, it is of vital importance that the system should be drained by opening the drain tap on the water pump inlet pipe and releasing the filler cap.

Also, after a frost and *before attempting to start, or even move, the engine again,* hot water should first be poured over the water pump, as otherwise damage may be caused to the pump rotor by the presence of particles of ice within the casing. Warm water can be used with advantage for re-filling the radiator.

Fitting of Snow Chains. In the event of chains being necessary, they should be fitted to the rear wheels only.

A Parsons chain known as the "Special Rolls-Royce Type" is available.

It is recommended that these should be obtained through Messrs. Rolls-Royce Ltd., in order to ensure the supply of the correct type.

When fitting these special chains, it is *essential* to commence by fastening the one hook on the inside of the wheel and always to take up the adjustment on the outside, where two fastening clips are provided. The tensioning springs which are supplied to go on the outside of the wheel must always be fitted.

CHAPTER II.

Periodic Lubrication and Attention.

Lubricants Recommended.

Engine.

Rolls-Royce Ltd. recommend a first quality oil of viscosity S.A.E. 30 for the engine for all-the-year-round use.

Under extreme Winter conditions, the use of a lighter grade oil of S.A.E. 20 viscosity would provide easier starting and satisfactory lubrication.

The following oils are recommended:—

	S.A.E. 20	S.A.E. 30
B.P.	Energol 20	Energol 30
Wakefield's ..	Castrolite	X.L.
Shell	X.100—20	X.100—30
Vacuum	Mobiloil Arctic	Mobiloil "A"

Equivalent oils to the above are also marketed by:—Sternol Ltd., Alexander Duckham & Co. Ltd., Esso Petroleum Co. Ltd., Gulf Oil (Great Britain) Ltd., and Dalton & Co. Ltd.

Gearbox. Use a viscosity 30 oil as above.

Rear Axle. Wakefield's Special Castrol Hi-press S.C.

Steering Box. Use a viscosity 30 oil as above.

Propeller Shaft. Vacuum Mobilgrease No. 2.

Chassis Oil Pump. Use a viscosity 30 oil as under "Engine" above.

Front Suspension and Hydraulic Shock Dampers. Use a viscosity 20 oil as under "Engine" above.

Water Pump Bearing and Gland. Either, Vacuum Mobilgrease No. 6, or, Shell Retinax A.

Wheel Hub Shells. Vacuum Mobilgrease No. 2.

Capacities.

Engine	14 pints	approx.
Gearbox	5 pints	,,
Rear Axle	2 pints	,,
Chassis Oil Pump	2 pints	,,
Water Cooling System	22 pints	,,
Fuel Tank	18 gallons	,,
D.W.S. Hydraulic Jacks	4 pints	,,

General.

In addition to the points supplied with oil by the centralised lubrication system, there are others which, for various reasons, it is impracticable to feed in this way, and which must, therefore, be oiled by hand.

In the notes which follow, these points are classified as far as possible under mileages and arranged in a definite order, having regard to their relative location on the chassis.

It is important that careful attention should be given to their lubrication with a view to reducing wear and eliminating mysterious squeaks and rattles.

These notes are followed by others covering the periodic operations and adjustments which are necessary.

Cleaning Untarnishable Surfaces.

The radiator is of "Staybrite" steel, and other bright, external fittings are chromium plated.

On no account should abrasives or polishing preparations of any kind be used on such surfaces.

The proper course is to treat these surfaces exactly as one would treat high-class, varnished coachwork, namely, wash with clean water and polish with a clean wash-leather.

Any other procedure is very liable to scratch the surfaces.

Points for Regular Attention according to Use of Car.

1.—**Engine Oil.**—Inspect oil level when engine is not running and top up as necessary with correct oil. Do not run engine with indicator below "Min." mark. (See page 46.)

2.—**Radiator Water.**—Inspect water level in radiator *when engine is not running*, and maintain so that water is visible when the filler cap is removed and the engine is hot. Use clean, preferably soft, water.

3.—**Ignition Distributor Drive, Contact Breaker and Governor.**—Remove distributor cover and inject one or two drops of thin oil into oil hole. (See page 109.) Also, apply *one drop* of thin oil to pivot pin of rocker arm.

4.—**Cam of Contact Breaker.**—Smear a trace of *grease* on the cam surface.

5.—**Tyre Pressures.**—Check the tyre pressures.

These should be—Front, 25 lbs./sq. in. } Cold.
Rear, 30 lbs./sq. in. }

6.—**Brakes.**—Check brake adjustment by turning external wing nuts *with the fingers only*, until cam action prevents further movement, then turn back to bring wings into line with chassis fore and aft. This gives correct clearance for shoes.

On no account use force when turning nuts. (See page 75.)

7.—**Battery.**—Check level of acid in each battery cell and top up with distilled water if necessary.

8.—**Chassis Lubrication.**—Depress oil pump pedal once while engine is being started for the first time in the day, and subsequently once every 200 miles. (If the car is to be driven only a few miles, half a pumpful will be sufficient at first starting.) Replenish reservoir as necessary, but do not over fill. Leave one inch between oil level and bottom of filler plug.

9.—**Testing Petrol Pumps.**—This should be done while the car is running on the road, the special switch provided on the instrument board being turned for a few minutes to both the **A** and the **B** positions separately, proving that both units of the pump are working. In the event of pump failure, the engine will stop.

Every 5,000 Miles.

LUBRICATION.

1.—**Water Pump.**—Remove pump bearing lubricator cap, fill one-third full of *water pump grease*, and screw right down, preferably when the engine is warm. (See page 93.)

2.—**Starter Motor.**—Remove plug on side of reduction gear casing and fill to plug orifice with *engine oil*. (Y1, Fig. 37.)

3.—**Dynamo Bearings.**—Inject two or three drops of engine oil with the oil-can into each dynamo bearing lubricator. (See page 102.)

4.—**Steering Box.**—Remove plug and fill casing with correct oil to mouth of plug orifice. (See page 86.)

5.—**Bonnet Fasteners and Locks.**—Carefully lubricate with the oil-can, bonnet ventilators, fasteners and locks.

6.—**Gearbox.**—Inspect oil level in the gearbox by means of dipstick. If necessary, replenish with correct oil to level of mark on dipstick. (Dipstick passes through filler plug.) (See page 82.)

7.—**Rear Axle.**—Drain axle when warm, and refill with two pints of oil. (See page 84.)

Warm oil before inserting.

None but the recommended oil must be used. (See page 29.)

8.—**Brake Connections, etc.**—Lubricate with engine oil, all joints and pins of Brake Ropes, Rods and Connections.

9.—**Control Mechanism.**—Apply a few drops of engine oil to controls on Steering Wheel (oil hole), Accelerator Pedal (lubricator) and Countershaft, Clutch Pedal Mechanism (see page 80), Radiator Shutter Control, and all other under-bonnet control points and bearings.

Other Attention every 5,000 Miles.

1.—**By-Pass Oil Filter.**—Replace by-pass oil filter element on right-hand side of engine with a new one. See that cover joint is oil-tight thereafter. (See page 44.)

2.—**Valve Rocker Clearances.**—These should be .006″ for inlet and exhaust *with the engine cold.*

Check and re-set if necessary. (See page 53.)

Before removing valve rocker cover, release pinch bolt on carburetter inlet, release the three rocker cover nuts and swing air inlet pipe away from air silencer. Lift off cover and silencer together.

3.—**Air Cleaner.**—Remove cleaner element from front end of air silencer by unscrewing three small setscrews and taking off end cover. Carefully wash element in petrol or paraffin and afterwards oil with *engine oil*. (See page 70.)

4.—**Spark Plugs.**—Remove and clean. Set gaps to .025″.

Every 10,000 Miles.

1.—**Engine Oil Sump Strainer.**—When engine is warm drain crankcase and remove and clean crankcase oil strainer. Refill with fresh oil to correct level. (See page 45.)

2.—**Dynamo.**—Remove end cover, inspect brush gear and remove brush dust. See that brushes move quite freely in their holders and that there is no oil or grease present. (See page 102.)

3.—**Front Suspension, Hydraulic Shock Dampers and Damper Control Unit.**—Inspect oil level and add more oil if necessary by means of the small syringe.

Use only correct oil. (See page 29.)

The filler spouts for the front suspension are located near base of radiator on either side under bonnet. Oil level should be visible when cap is removed. (See page 87.)

In the case of dampers and control unit, fill slowly to mouth of orifice. (See pages 89 and 91.)

4.—**Universal Joints and Propeller Shaft.**—Inject grease by means of grease gun into lubricator located at the centre of each universal joint and also into lubricator on sliding joint at forward end. (See Fig. 24.)

5.—**Fuel Strainers.**—Remove and clean gauzes of strainer on rear frame cross member in front of tank. Drain strainer sump and wipe out with a piece of clean, damp wash leather. (See page 59.)

Also, remove and clean gauze strainer on fuel inlet to carburetter float chamber, taking care, first, to see that ignition is switched off and fuel pumps are therefore inoperative. (See page 60.)

Every 20,000 Miles.

1.—**Gearbox.**—Drain out all the oil when warm by removing both drain plugs and refill with fresh oil up to mark on dipstick. (See page 82.)

2.—**Fuel Tank.**—*Release* (but do not *remove*) drain plug at bottom of main tank to allow any accumulated water to escape. (See page 58.)

3.—**Chassis Lubrication System.**—Remove and discard three felt strainer pads located, respectively, one at base of chassis oil pump (see page 35), and one on each side of the front suspension (see page 37). Replace witn new pads.

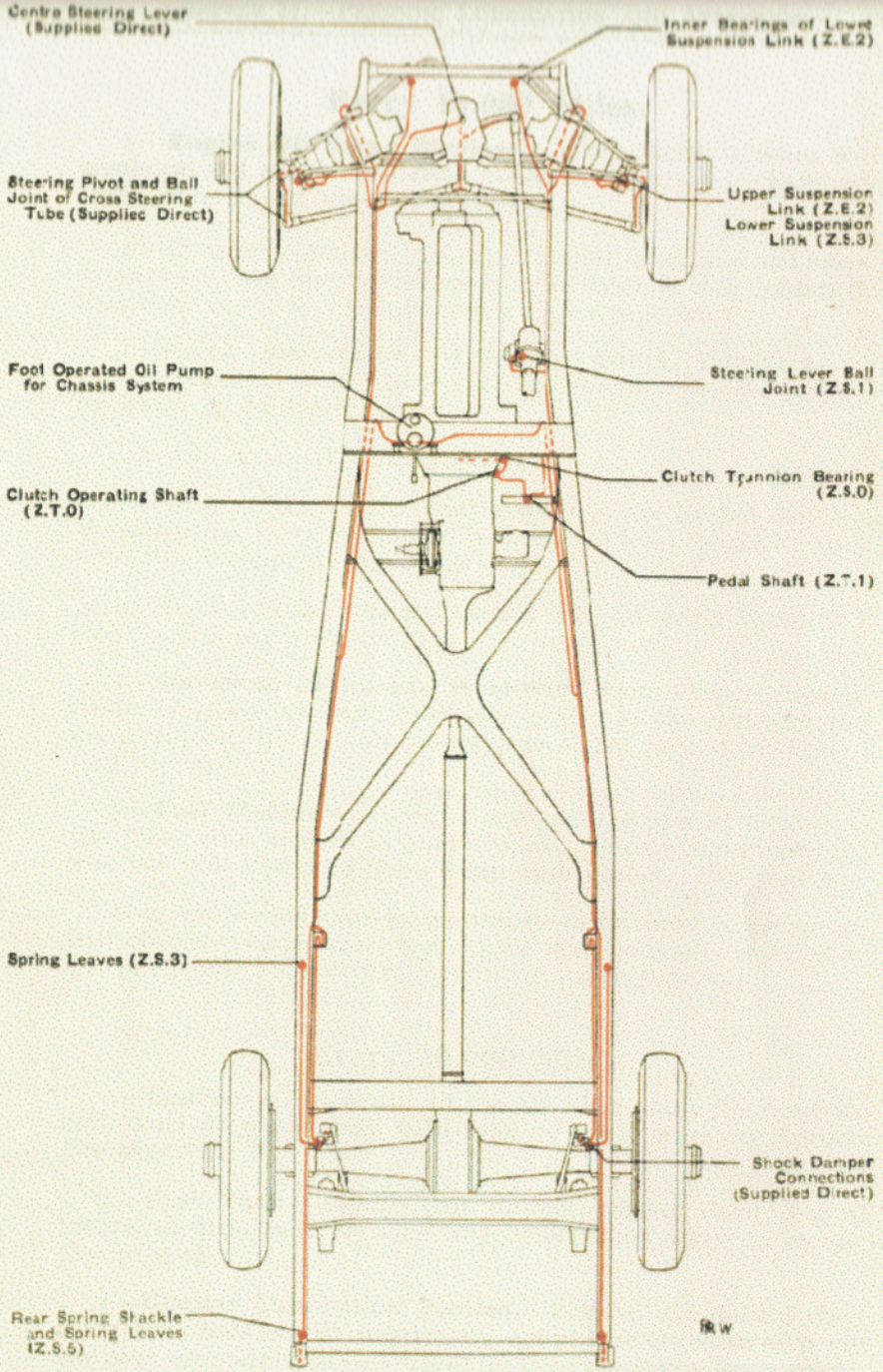

FIG. 2. DIAGRAM OF CHASSIS LUBRICATION SYSTEM.

CHAPTER III.

Centralised Chassis Lubrication System.

General—Foot-operated Oil Pump—Drip Plugs—Front Suspension System.

General. A foot-operated pump, with which is combined an oil reservoir, is located on the front of the dashboard, and supplies oil under pressure for chassis lubrication.

A diagram of the complete system is given in Fig. 2, the piping being coloured red. Red discs indicate the positions of drip plugs, and the rating of each is given in parentheses against the description of the part lubricated.

Foot-operated Oil Pump. The chassis oil pump is shown in Fig. 3. Normally no attention to the system is necessary beyond filling of the reservoir with *engine oil* (viscosity 30 ; see page 29), after removal of the filling plug, **A**, as directed on page 31. It should not be filled above 1 inch from the top of the filler cover.

When the reservoir is nearly empty it will be found that the pedal returns instantly after depression, due to the presence of air in the system.

On the other hand, if the pedal takes an abnormal length of time to return to its raised position, this may indicate that the felt strainer located at the bottom of the reservoir is choked. Under these circumstances a new felt strainer must be fitted.

This is arranged at the bottom of the reservoir and is removed by disconnecting the two unions, **B**, and unscrewing the cap, **C**. An aluminium distance washer, the felt strainer pad, and a wire gauze support can then be taken out.

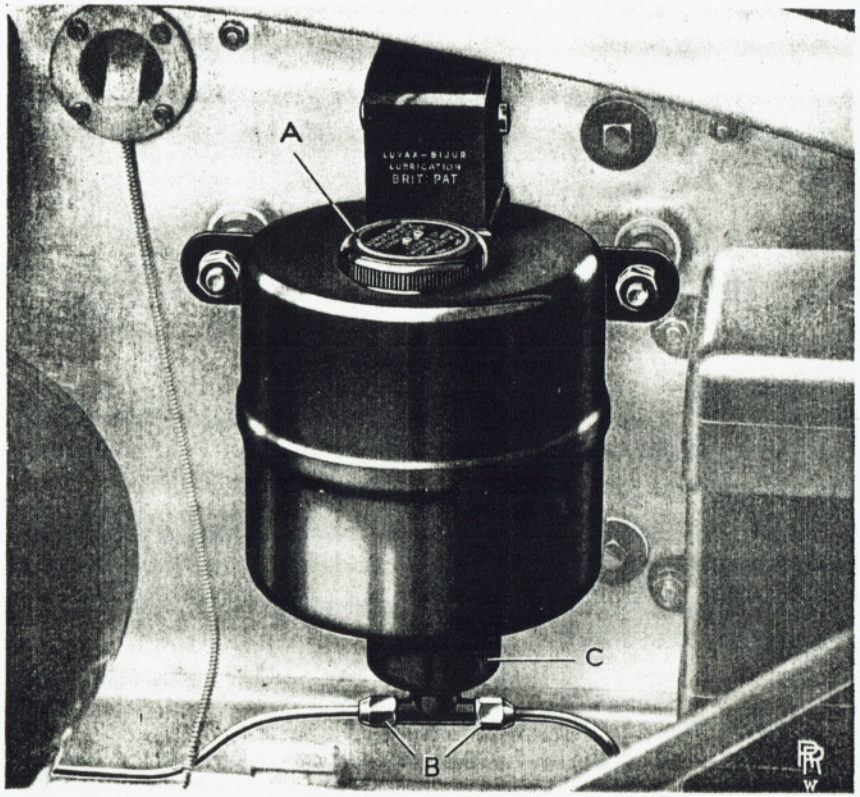

FIG. 3. FOOT-OPERATED CHASSIS OIL PUMP.

When replacing the parts, the wire gauze support should be re-fitted in the cap first, followed by a *new* felt pad, and, finally, the aluminium distance washer *with its recessed face towards the felt pad.* Packing washers are provided on either side of the aluminium washer, and it should be observed that these are in position.

Normally, the felt strainer pad should be discarded and a new one fitted every 20,000 miles, as directed on page 34.

It should never be necessary further to dismantle the pump.

Drip Plugs. The drip plugs are non-adjustable and non-demountable, and are lettered and numbered to indicate their shapes and relative rates of oil emission respectively, a higher number indicating a greater rate.

The drip plugs never require cleaning, and, being non-demountable, no attempt must be made to take them apart. If one is suspected of being defective, it should be replaced with a new plug of the same rating.

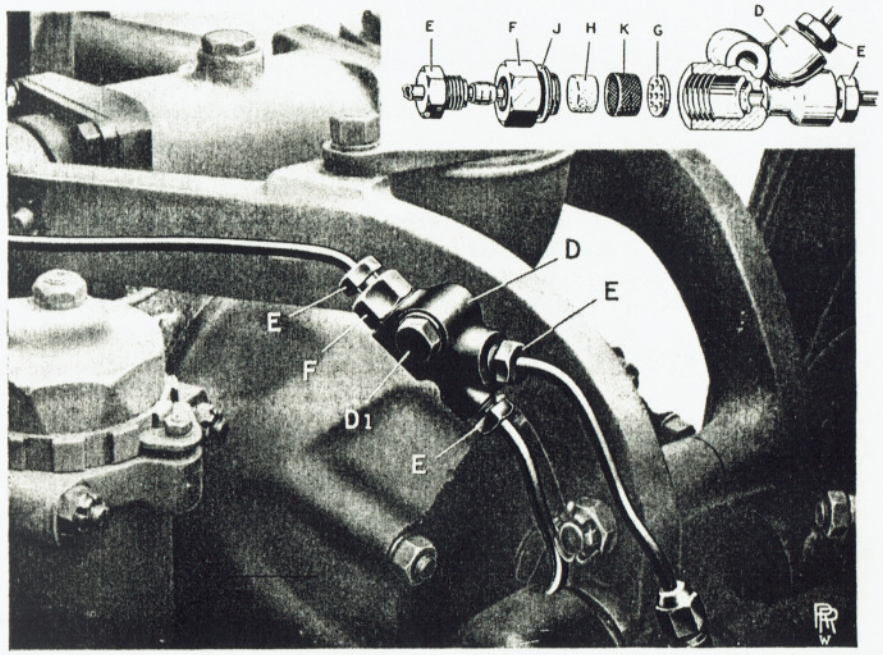

FIG 4. STRAINERS ON FRONT SUSPENSION.

Front Suspension System. A small felt strainer is fitted in the connection mounted on the rear of each of the upper triangle levers as shown at **D** above.

The felt strainers must be renewed every 20,000 miles, as directed on page 34, the procedure being as follows :—

(1) Jack up front of car and remove front wheels.
(2) Carefully clean the outsides of the connection and fittings with a brush and paraffin to prevent ingress of dirt during dismantling.
(3) Disconnect three pipe unions, **E**, and spring out ends of pipes.
(4) Release set-screw, **D1**, and remove connection, **D**.
(5) Unscrew plug, **F**, taking care not to loose the joint washer, **J**.

The felt strainer and perforated backing plate can now be removed.

All parts should be carefully cleaned and freed of every trace of dirt or grit before replacing. The perforated backing washer, **G**, must be replaced in the connection, **D**, before fitting the new felt strainer, **H**, with its gauze cover, **K**, towards the washer.

In re-assembly, care must be taken to replace the aluminium joint washer, **J**, between the plug and connection.

Owing to the construction of the ball joints of the rear shock damper connections and of the steering joints—the bearing pads being spring-loaded—there is no need for the inclusion of drip plugs in the pipe lines supplying these points. Hence, oil under pressure is taken direct to the joint balls, as indicated in the diagram, Fig. 2.

CHAPTER IV.

Engine Lubrication System.—Removal of Cylinder Head.

Crankshaft—Connecting Rods—Oil Pump—Relief Valves—Valve Rockers, Push Rods and Tappets—Camshaft—By-Pass Oil Filter—Oil Sump Strainer—Oil Level Indicator—Oil Pressure—Dismantling Relief Valves—Decarbonising—Sequence of Operations for Removing Head—Cleaning Pistons and Head—Removing the Valves—Grinding in the Valves—Replacing Cylinder Head—Reassembling—Adjusting Valve Rocker Clearances.

The engine oiling system is illustrated diagrammatically in Fig. 5.

Recommended oils will be found on page 29.

A gear-type pump is located on the left-hand side of the crankcase lower half, and is driven by skew gearing from the dynamo and water-pump driving shaft.

A gauze strainer is arranged in the crankcase lower half, through which the pump draws its supply, and a by-pass filter is provided on the delivery side of the pump.

Oil under pressure is delivered to all the crankshaft and connecting rod bearings by a pipe which runs inside the crankcase, the connection to this pipe being outside the crankcase, on the left-hand side.

Crankshaft. From the internal pipe a connection is taken to each of the seven main crankshaft bearings, which are white-metal lined steel shells.

The crankshaft journals and the crankpins are bored for lightness and to act as oil conduits, the ends of the holes being plugged with caps, and the crankpin and crank journal holes being in communication through the medium of smaller holes drilled through the webs and plugged at their outer ends.

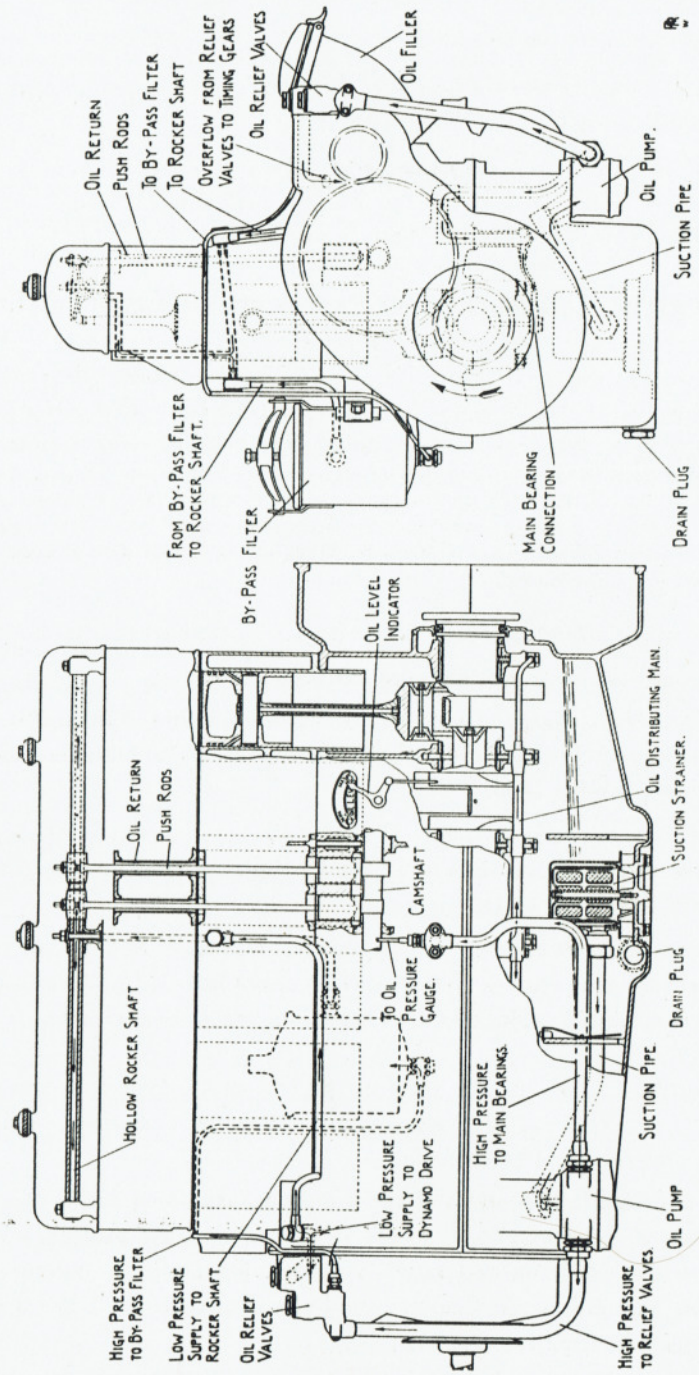

FIG. 5. ENGINE LUBRICATION SYSTEM.

All the main bearings have circumferential oil grooves communicating with the oil-feed pipes, radial oil-holes being drilled in the crank journals to register with these grooves.

By these means oil is conveyed to the interior of the crankshaft, whence it finds its way to the crankpin bearings through further radial holes in the crankshaft at these points.

Connecting Rods. The big end bearings are solid shells of special Rolls-Royce aluminium alloy bearing metal. Each rod is drilled up its centre to convey oil to the gudgeon pin bearing, the drilling passing through the big end bearing shell via a hollow dowel pin. Two radial holes in the crankpin ensure communication twice per revolution with the oil way up the connecting rod.

Thus, all the main crankshaft bearings and all the connecting rod bearings are supplied with oil under pressure.

Oil Pump. The gear-type oil pump is shown in position on the engine at **A**, in Fig. 6. Oil is drawn through a strainer, **K**, Fig. 8, in the bottom half crankcase and delivered to the crankcase oil conduit through pipe, **C**, the latter also being connected to the instrument board pressure gauge.

Relief Valves. A second delivery pipe, **C1**, conveys oil to a double relief valve located in an accessible position on the timing gear case, as seen at **D**, Fig. 6. A sectional view of the valves is given in Fig. 7.

The two valves are in series, and their combined effect is to regulate the pressure of the main high-pressure supply to the crankshaft and connecting rod bearings to approximately 30 lbs. per square inch.

Oil from the pump reaches the valve casing by port, **C2**, Fig. 7, whence a connection, **E1**, is taken to the by-pass oil filter (described later).

Oil passing the high-pressure valve, **E**, enters the low-pressure chamber, **F2**, from which a port, **F1**, leads to the dynamo drive shaft bearings and via pipe, **G** (Fig. 6), to the valve rocker shaft. The pressure in chamber, **F2**, is controlled by the valve, **F**, and released oil from the latter is taken to the timing gear wheels by a port, **F3**.

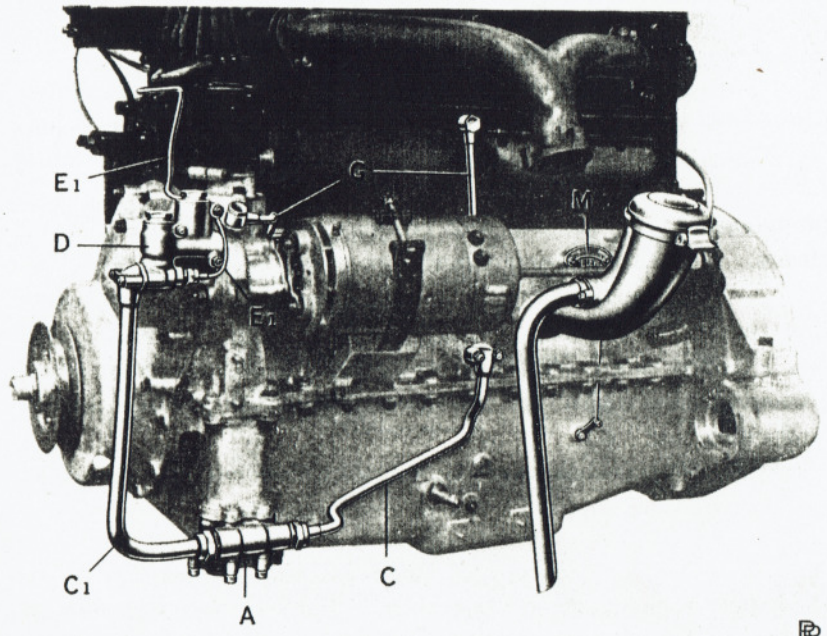

FIG. 6. ENGINE OIL PUMP RELIEF VALVE, FILLER AND LEVEL INDICATOR.

In order to ensure a supply of oil to the low-pressure system under all conditions of running, small slots are cut in the seating of the high-pressure valve, **E**.

Valve Rockers, Push Rods, and Tappets. The centre pedestal of the rocker shaft is drilled and communicates through an oil hole in the head with a union on the left-hand side, to which pipe **G** is connected.

The rocker shaft is drilled radially where each rocker works to lubricate the bearings of the latter. The rocker arms are also drilled, the holes running through the bearing bushes. By this means oil is fed on to the push-rod ball ends and the ends of the valve stems.

Each valve guide is provided with a packing gland, held in position by the spring, which prevents excess of oil from percolating down the valve guides.

Oil is returned from the rocker casing to the crankcase through the push-rod tunnels and lubricates the camshaft bearings and valve tappets.

Camshaft. The camshaft is driven by single helical gears and carried in seven plain bearings. The latter are lubricated by oil draining from the rocker casing, each bearing being provided with a hollow dowel, as shown in Fig. 5, into which oil flows from the tappet chamber.

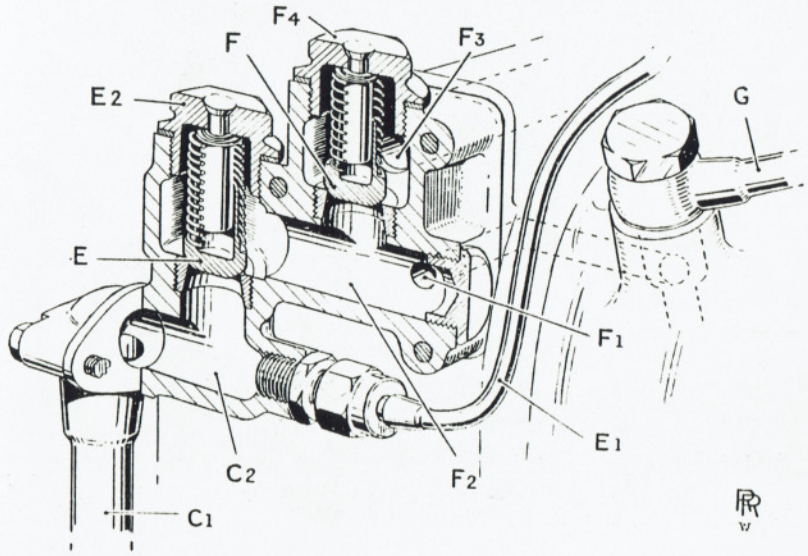

FIG. 7. SECTION OF OIL RELIEF VALVES.

By-Pass Oil Filter. A special filter is provided on the right-hand side of the crankcase, as shown at **H** in Fig. 8, which is fed with oil under maximum pressure from the relief valve casing by pipe, **E1**. The filter element restricts the flow of by-passed oil and so ensures that the by-passing effect of the filter shall not appreciably rob the main pressure system.

A proportion of pressure oil being thus continuously forced through the filter, it follows that the whole of the crankcase oil passes through the filter in a short time.

Oil from the filter is conveyed by a pipe, **J**, to the same conduit

as that to which the low pressure supply pipe, **G**, Fig. 6, is connected, thus supplementing the supply to the auxiliary system on its way back to the sump.

Every 5,000 miles, as directed on page 33, the filter element should be discarded and replaced with a new one. It is not

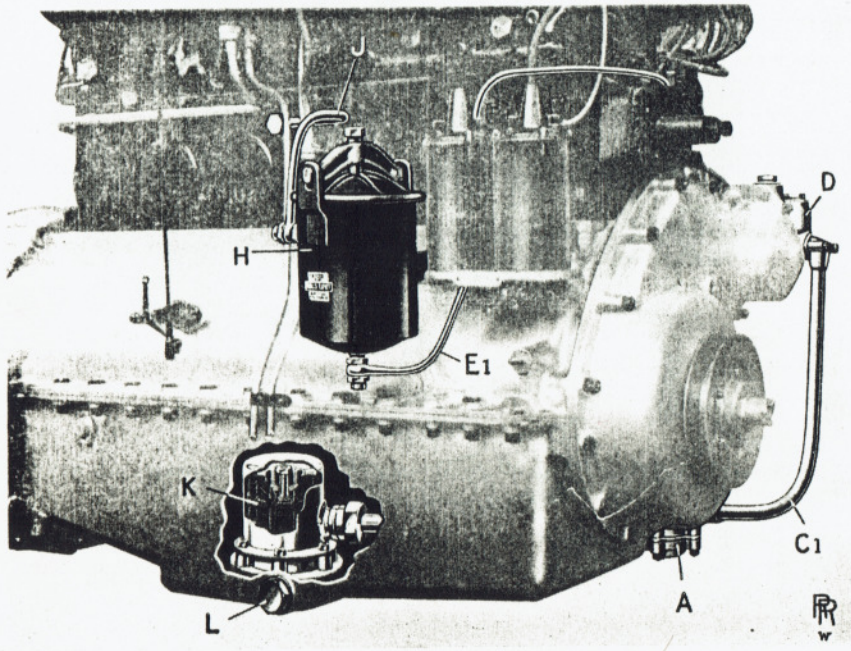

FIG. 8. BY-PASS FILTER AND SUCTION STRAINER.

practicable to clean the filter element, and no attempt must be made to do so.

To remove the element, the screw, **H1**, should be released and the yoke, **H2**, removed. The cover, **H3**, can then be taken off and the element lifted out.

When fitting the new element care must be taken to ensure that the cork washer fitted under the cover, **H3**, is in position, and that screw, **H1**, is well tightened. On next running the engine, it should be noticed that there are no oil leaks around the filter cover.

Oil Sump Strainer. A suction strainer gauze is carried in the bottom of the lower half crankcase, as shown at **K**, in Fig. 8.

Under normal circumstances and with proper attention the by-pass filter will maintain the oil in a clean condition.

Owing to the risk of dilution of the oil, however, it is advisable to drain the sump and renew the oil every 10,000 miles, as directed on page 34. At the same time the suction strainer should be removed and cleaned.

To drain the oil a plug, **L**, Fig. 8, is provided, which should be unscrewed and the oil allowed to drain out.

The six nuts which hold the strainer carrier plate in position on the crankcase bottom should then be unscrewed, when the strainer can be removed downwards.

The gauze should be removed from the carrier and cleaned by brushing with a stiff brush, dipped in paraffin, not by wiping with a fluffy cloth, which is liable to leave particles clinging to the gauze.

The strainer carrier can only be refitted in one position on the crankcase studs, one of the latter being unequally spaced to ensure this.

It should be noticed that the joint washer is in position between the carrier-flange and crankcase. An aluminium washer is fitted on the drain plug, **L**.

Oil Level Indicator. On the left-hand side of the crankcase, adjacent to the oil filler, is a small pointer, **M**, Fig. 6, which is operated by a float within the crankcase to indicate the oil level.

Its reading should only be taken when the car is standing as nearly level as possible.

The level will be found to fall appreciably after starting up the engine. This is due to the fact that a certain amount of oil is held in suspension when the engine is running.

The amount of oil should be maintained at " Max." as nearly as possible, when there will be approximately 14 pints of oil present.

The engine should never be run with the pointer below the " Min." mark.

Oil Pressure. Under normal conditions of engine temperature and speed, the instrument board pressure gauge should read approximately 30 lbs.

On starting the engine from cold, however, a higher oil pressure will be indicated, but this need not cause alarm, as the gauge is arranged to carry the overload and the pressure will fall when the engine becomes warmed.

When the engine is idling and is hot, the pressure may fall to 4 lbs., but provided that it increases as the engine speed increases, this is in order.

The car must on no account be run if the gauge reads as low as this *continuously*.

Such a persistently low pressure, which may be accompanied by fluctuations of the gauge needle, may be due to one or more of several causes.

In the first place, it should be ascertained that there is sufficient oil in the sump by referring to the oil level indicator.

If this is found to be in order, the trouble may be due to a particle of foreign matter having lodged on one of the relief valve seatings and prevented the valve from closing (see below), or the crankcase strainer may require cleaning. If the latter is the cause, then it will be necessary to drain the crank-chamber for removing and cleaning the strainer, as described under " Oil Sump Strainer."

Dismantling Relief Valves. If it should be suspected that the relief valves are not working properly, they can be inspected by removing the plugs, E2, above the high-pressure valve, and F4, above the low-pressure valve. (See Fig. 7.)

In each case the valve spring will be found retained on the cap.

The valves can then be lifted out and valves and seats cleaned and inspected.

No attempt must be made to alter the spring settings by interfering with the springs themselves or by varying the washers under the plugs.

Care must be taken to replace all parts in a perfectly clean state.

Decarbonising. When decarbonising becomes necessary, it is preferable that the car should be returned to the makers or the work entrusted to an official Rolls-Royce Service Station. Alternatively, the makers should be advised, and they will be pleased to send a competent man at the customer's expense to assist in the work.

In case neither of these courses is possible or convenient, the notes which follow will be found useful.

Do not attempt to turn engine by means of the fan.

Before undoing any electrical connections, the negative earthing terminal of the battery should be disconnected from the battery.

On no account should petrol, benzole, or other highly inflammable liquid be used for cleaning down the engine, as this practice has resulted in cars being destroyed by fire.

Sequence of Operations for Removing Head.

(1) Remove bonnet by withdrawing small bolt from bracket for hinge pin on dashboard and removing external cap of bracket.

(2) Drain water system (release filler cap).

(3) Paint with paraffin six nuts holding exhaust manifold to head and three nuts of downtake pipe.

(4) Release clip bolt of intake pipe on top of carburetter, release three nuts securing rocker cover and remove intake pipe.

(5) Unscrew three nuts of rocker cover and remove cover complete with air silencer attached.

(6) Unscrew six nuts securing exhaust manifold to head and three bolts of downtake pipe; remove spherical washer between manifold and downtake; remove manifold.

(7) Remove jacket thermometer bulb in left-hand side front of head by unscrewing large union nut and withdrawing bulb, care being taken not to fracture or bruise either the bulb or its tube, and secure the whole in a safe position. Any damage to tube or bulb will render the thermometer useless.

(8) Remove top radiator water pipe.

(9) Unscrew seven nuts securing valve rocker shaft pedestals to head. Unscrew gradually so that reaction of compressed valve springs lifts shaft evenly.

Do not lose spherical washers under nuts.

Take care when removing assembly that parts do not slide off rear end of shaft.

(10) Lift out tappet push rods, observing that these are numbered for replacement from 1 to 12, No. 1 being at the front of the engine.

(11) Remove three fan bracket nuts on head which support H.T. wires—one at bottom of bracket and two at top; disconnect two wires from coil; disconnect all spark plug wires.

(12) Remove two inlet manifold nuts which support H.T. wire tube; lift off complete tube and wires and lay along left-hand side of engine.

(13) Disconnect throttle and choke controls at carburetter.

(14) Disconnect fuel supply pipe at float chamber and vent pipe on float chamber cover (replace standpipe in cover together with aluminium washers).

Also disconnect water heating return pipe and drain pipe unions at "hot-spot" below carburetter.

(15) Remove 14 nuts securing inlet manifold, including two on water inlet connection at centre.

(16) Remove manifold complete with carburetter.

(17) Remove fan and bracket by unscrewing two nuts immediately behind pulley.

(18) Remove spark plugs.

(19) Unscrew gradually the 31 nuts securing head, commencing with those at the ends and working inwards. Repeat operation several times, only turning each nut a small amount each time.

(20) Lift off head evenly, or it will bind on the studs.

The joint gasket should be removed and discarded, a new one being used when the head is replaced.

Cleaning Pistons and Head. The valves should be left in position while scraping the cylinder head in order to protect the valve seats.

The pistons being made of aluminium, great care is necessary not to score them when scraping off carbon deposit. Only a blunt, rounded tool should be used, and applied with very

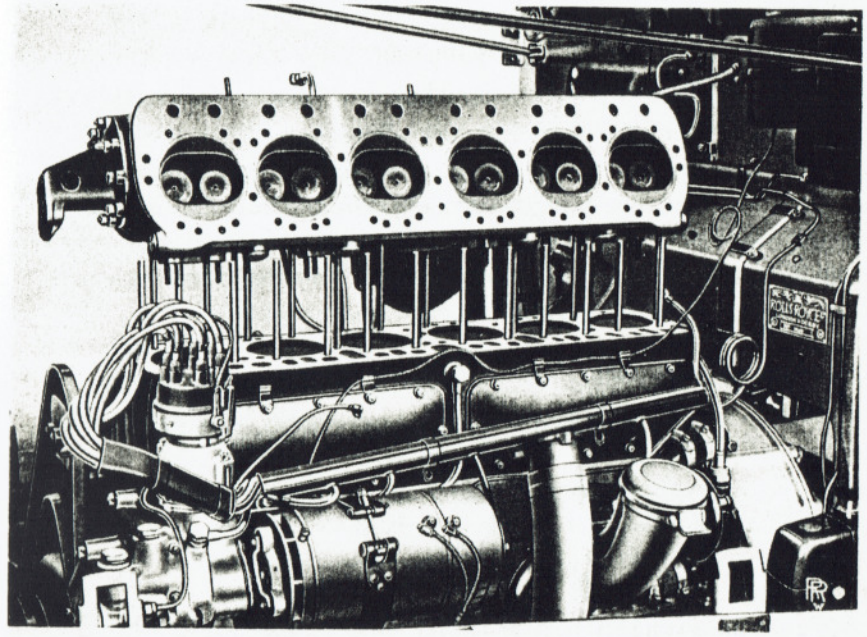

FIG. 9. CYLINDER HEAD REMOVED FOR DECARBONISING.

moderate pressure. Precautions must be taken to prevent carbon getting into the water holes of the cylinder blocks.

Emery cloth, sand paper or other abrasives must not be used on or near the pistons.

Removing the Valves. A special tool is provided in the kit for compressing the valve springs. The method of using this tool is shown in Fig. 10, which also shows the arrangement of the valve spring washers.

The locking nut, **Mn**, on the tool should first be unscrewed sufficiently to release a split taper collet which grips the spindle, **Ns**, and the bent portion of the latter inserted through the spark plug hole, after which the holder, **Mh**, should be screwed into position. The spindle should then be turned and simultaneously pulled away from the engine, so that it is bearing on the head of the appropriate valve as shown in the illustration, and the locking nut, **Mn**, tightened while holding the spindle in position by means of the tommy bar, **Tb**.

The hexagon nut, **On**, and jaw, **Oj**, should now be removed from the sleeve, **Os** and the latter screwed on to a rocker pedestal stud

adjacent to the springs to be removed. It should be tightened by means of a box spanner on the hexagon, **Ox**.

The jaw, **Oj**, and nut, **On**, should next be lubricated and replaced, the jaw being arranged on the valve washer as shown.

When tightening the nut, **On**, to compress the spring, it may be found that the valve spring washer, **Pt**, does not leave the split taper sleeve, **Rs**, readily. The jaw should, therefore, be given a sharp tap above the washer, and this will free it from the split sleeve, **Rs**,

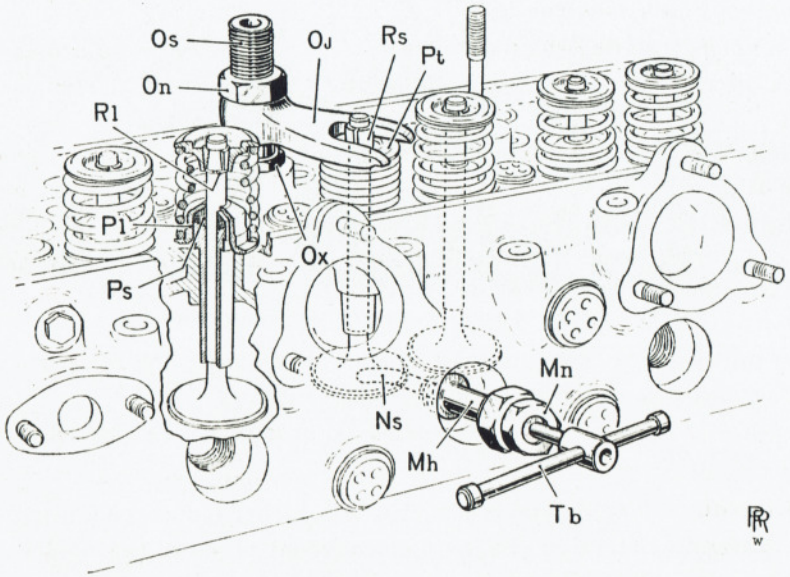

FIG. 10. COMPRESSING VALVE SPRING WITH SPECIAL TOOL.

the parts of which can then be removed. They should preferably be kept in pairs as removed and restored, ultimately, to the same valve. The heads of the inlet valves are larger than those of the exhaust valves.

The small spring ring, **Rl**, must be removed carefully from the valve stem.

When unscrewing the nut, **On**, the jaw, **Oj**, should be repeatedly tapped to free it from binding on the sleeve, **Os**, under the reaction of the valve spring.

The locking nut, **Mn**, should next be released, a spanner being held on the holder, **Mh**, and the valve may be removed.

The lower washer, **Pl**, which acts as a packing gland, and the asbestos packing washer, **Ps**, can also be removed.

The tool can be used, if necessary, for replacing a valve spring when the head is in position on the engine, the holder being inserted through a spark plug hole on the right-hand side. Under such circumstances it is obvious that care must be taken not to disturb the holder, **Mh**, until all parts are refitted to the valve stem, otherwise the valve may fall into the cylinder.

Before inserting the tool in the spark plug hole of No. 3 cylinder, it is necessary to remove the fuel pipe to the carburetter float chamber.

Grinding in the Valves. This should be done by assembling on the valve, after insertion in the head, a washer, **Pt**, and conical washer, **Rs** (Fig. 10). The valve can then be manipulated quite easily by means of the washer, the first and second fingers being placed under the latter and the thumb against the end of the valve stem.

Each valve should be ground in the seat where it has been working.

A good quality grinding paste should be used, the valve being rotated backwards and forwards in different positions, and pushed from its seat occasionally. Only a light pressure should be applied, or valve and seat will become scored.

Care must be taken not to allow any grinding paste to get on the valve stems or in the guides.

After this operation, the cylinder head and valves should be well washed in paraffin to remove every trace of grinding compound, valve guides and ports being syringed through with paraffin.

The valves, springs, small spring rings, and washers can then be replaced, the special tool being used to compress the springs. If any spring rings are strained in removal or replacement they must be discarded and new ones fitted. Care must be taken that the asbestos packing washers and glands are in position, and that the valves are replaced in the seatings from which they were removed and in which they were ground.

The valve guides should be lubricated with a little engine oil.

Replacing Cylinder Head. Before replacing the head, the joint faces should be carefully wiped to remove all particles of foreign matter. The new joint gasket should be greased and placed on the cylinder block and the head carefully lowered in position.

Too much emphasis cannot be laid upon the necessity for exercising care in tightening the nuts which secure the head.

These should be screwed down very gradually, commencing with those at the centre of the head and working outwards towards the two ends. This process should be repeated several times, the nuts being turned only a comparatively small amount at each stage. By this means the pressure on the joint faces will be evenly distributed and the joint rendered sound.

Reassembling. The general order for reassembling is approximately the reverse of that for removing the head.

Before replacing the rocker shaft, all the rocker adjustments must be released as far as possible by unlocking each locknut, **S** (Fig. 11), and turning the ball contact screw, **T**, in an anti-clockwise direction with the special spanner provided. This will avoid the risk of bending the push rods as the rocker shaft is secured in position.

If the rear rocker pedestal should have been allowed to slide off the shaft, care must be taken to replace it with its slot on the same side as that of the front pedestal, i.e. towards the left-hand side.

As mentioned, the push rods are numbered for replacement. Each must be inserted with its ball end downwards, care being taken that it enters the recess in the tappet. The rockers themselves are also marked, but it should not be necessary to remove these from their shaft. The spherical washers must be replaced under the nuts of the pedestals and these nuts tightened gradually to avoid straining the shaft.

The exhaust manifold should be provided with *new* joint gaskets, and also *new* corrugated joint rings, one on either side of the spherical washer at the joint of the downtake pipe.

If the joint washers of any of the inlet manifold joint faces should have been damaged on removal, new ones must be fitted at all faces, after having first scraped away pieces of the old washers.

The nuts of all manifold joints must be tightened evenly and gradually.

The fan belt should be in position when replacing the fan and its bracket; the belt must not be strained over the pulley after re-mounting the fan. The lower of the two bolts should be inserted first, and, to facilitate this, the bracket may be gently levered upwards by means of a short bar operated from the left-hand side of the engine, the top of the engine suspension bracket being utilised as a fulcrum. The belt should be just gently tight, not overstrained.

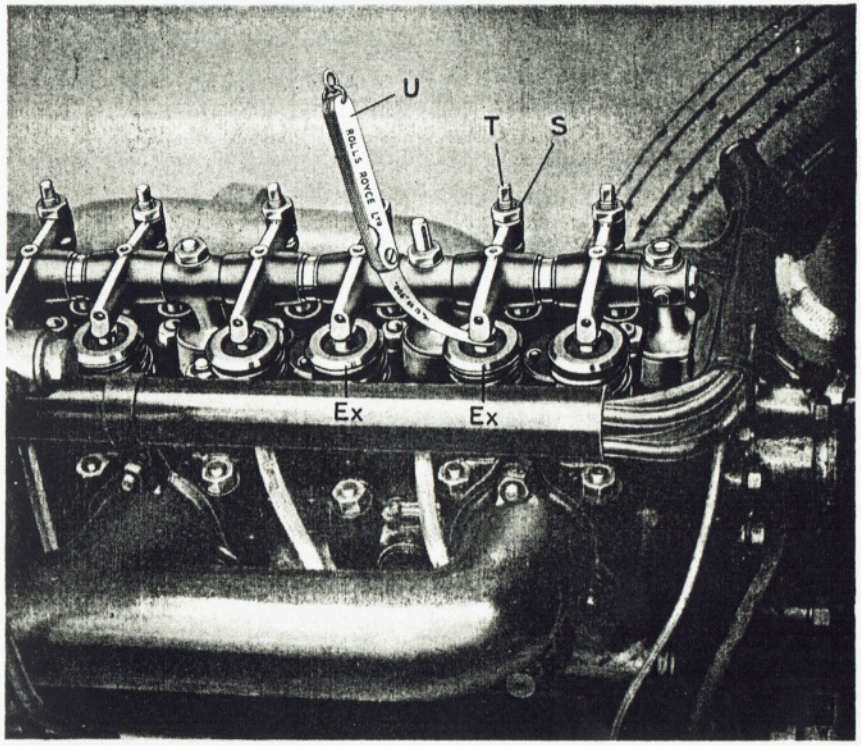

FIG. 11. ADJUSTING THE VALVE ROCKER CLEARANCES.

Adjusting Valve Rocker Clearances. The method of adjusting the valve rocker clearances is illustrated above.

The ball-ended contact screw, **T**, is screwed into the rocker and

locked by a nut, **S**. On releasing the nut the screw can be turned by means of the special spanner provided.

When first re-setting the clearances subsequent to removal and replacement of the cylinder head, as described, it is only necessary to ensure that there is ample rocker clearance at each valve. The locknuts may then be temporarily tightened. After filling up the radiator with water, and seeing that the correct quantity of oil is in the engine, the latter may be started up and allowed to run until warm.

Next, the rocker cover should again be removed, and also the rocker shaft, and all the cylinder head securing nuts carefully re-tightened, working from the centre outwards, as before. The joint gasket will now have become further compressed, and the rocker clearances must be more carefully set.

The correct clearances are .006″ for the inlet and also for the exhaust valves with the engine cold. A feeler gauge is provided in the tool kit, and is shown in position at **U** for measuring the clearance. The exhaust valve rockers are marked **Ex** in Fig. 11.

Before commencing to adjust a valve rocker, it should be ascertained that that particular tappet is well away from the cam, which is best done by turning the crankshaft by hand until the valve has opened and closed, and then cranking round half a revolution beyond this point.

As each contact screw is adjusted, its locknut should be tightened up.

It is very important that the cylinder head nuts should be tightened again after the engine has done sufficient running to become thoroughly warmed. In order to do this the valve rocker shaft must be removed.

It will subsequently be necessary to re-set the rocker clearances as already described, owing to the fact that the joint gasket will have become further compressed, with a consequent reduction of the clearances.

It is advisable to repeat this inspection of the clearances during the next few hundred miles of running, readjusting if necessary.

Further, if the car should have been returned to the makers for decarbonising, or any other purpose involving removal of the cylinder head, it is very desirable, afterwards, that the owner should inspect the rocker clearances when he has run the car a certain amount.

In spite of the fact that the car will have been carefully tested after overhaul, the amount of running involved may have been insufficient to ensure that the joint gasket has entirely settled down.

When checking the rocker clearances at all times and every 5,000 miles, as directed on page 33, a feeler gauge must be used as described. It is not sufficient merely to estimate the clearance by moving each rocker.

CHAPTER V.

Fuel Feed System and Carburation.

The Fuel System—Fuel Pumps—Failure of Supply—Fuel Tank—Strainers—Fuel Gauge—Action of the Carburetter—Accelerator Pump—Economiser Jet—Strangler Control for Starting—Faulty Adjustment of Carburetter—Setting of Idling Adjustments—Diagnosis of Faults—Float Feed Mechanism—"Hot Spot"—Air Silencer and Cleaner.

The Fuel System. The fuel supply from the 18-gallon tank at the rear of the chassis is by means of a double electric pump, **A**, Fig. 12, mounted inside the right-hand side chassis frame member below the driver's seat.

A pipe is arranged along the right-hand side frame member conveying fuel from the tank to the pumps. The pipe is seen at **A1** in Figs. 12 and 13. A strainer is provided on this pipe line, being located on the rear frame cross member immediately in front of the tank, as shown in Fig. 13.

Location of a strainer on the suction side of the pumps ensures that the latter, as well as the carburetters, are protected from the deleterious effects of dirt or sediment in the fuel.

From the strainer the fuel passes to the suction side of the pumps and is delivered to the carburetter float chamber by way of pipe, **A2**, Fig. 12, and another strainer located at the float chamber.

Fuel Pumps. The fuel pumps, **A**, are of the electric, solenoid-operated, diaphragm type, and comprise two independent pumps complete with diaphragms, solenoids, contact trip mechanisms, and suction and delivery valves. Both pumps deliver into a common chamber and are simultaneously rendered operative when the ignition switch is turned **On** and the master switch is in one of its "on" positions.

Duplicate pumps are provided primarily to ensure reliability. They also ensure that there shall be no starvation of fuel at maximum engine demands.

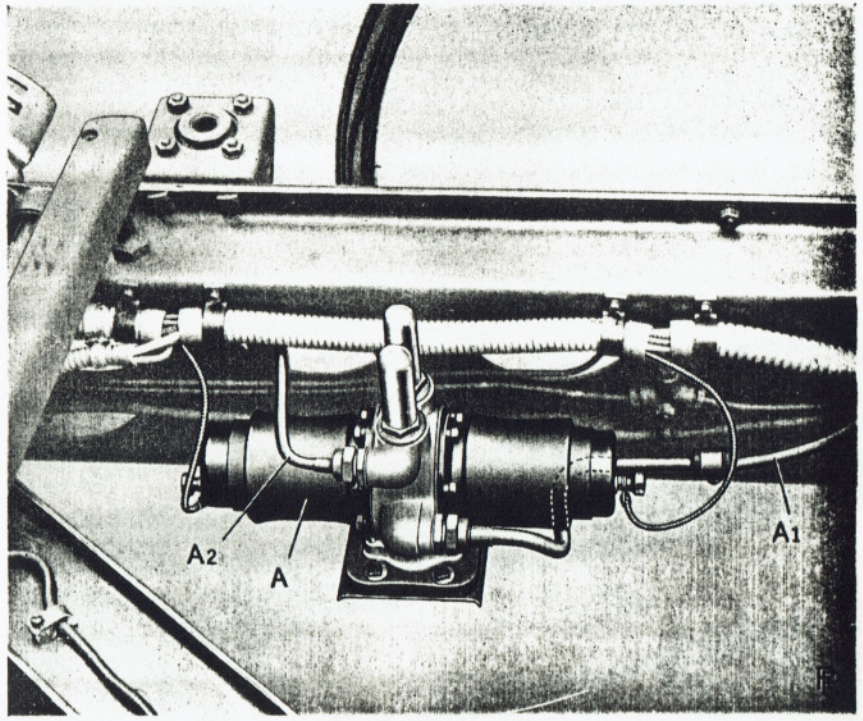

FIG. 12. ELECTRIC FUEL PUMPS.

If it should ever be necessary to disconnect fuel pipes at the pumps, it is important first to release the cover of the suction strainer (see page 59). This will prevent loss of fuel by syphoning, due to the location of the pumps below the level of the main tank.

A change-over switch is arranged on the instrument board in order to provide a ready means of checking that each half of the pump is operating correctly (see page 23).

The current supply for the pumps is taken through the ignition fuse, No. 3, in the distribution box.

Further information regarding the pumps will be found in a pamphlet at the end of this book.

Failure of Supply. Failure of fuel supply to the carburetter is likely to be indicated by audible and rapid operation of the pumps.

The most likely cause is shortage of fuel in the tank causing the green warning lamp to light. In this condition surging of the fuel in the tank may sometimes uncover the suction pipe. Another possible cause is the presence of air leaks on the suction pipe line, e.g., at the strainer. (See page 60.)

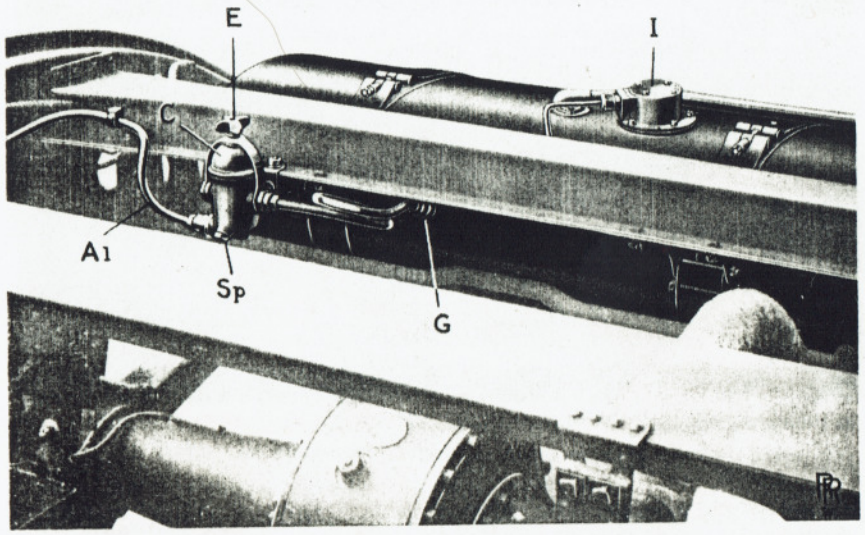

FIG. 13. FUEL TANK AND STRAINER.

Fuel Tank. The 18-gallon fuel tank is shown above. The fitting, **G**, carries the suction pipe. Normally, there should be no occasion to disturb these parts.

Every 20,000 miles, as directed on page 34, the drain plug at the bottom of the tank should be released. It is not necessary to remove the plug. It need only be unscrewed a turn or so, and must afterwards be securely re-tightened. This will flush out any accumulation of

sediment or water. The precaution is especially important when touring on the Continent.

The large filler spout is closed by a hinged cap which is released by pulling the toggle lever outwards. A suitable air vent is provided by a pipe connected with the filler spout, which terminates somewhere outside the bodywork.

Strainers. The strainer, shown dismantled below, is provided with two circular gauzes located above a large settling sump. Fuel passes upwards through these gauzes, and dirt settles on their lower faces and in the sump.

The filter should be cleaned every 10,000 miles, as directed on page 34.

To do this, the wing nut, **E**, must be released, stirrup, **F**, swung forwards, and the cover, **C**, removed. The knurled nut, **Fn**, should

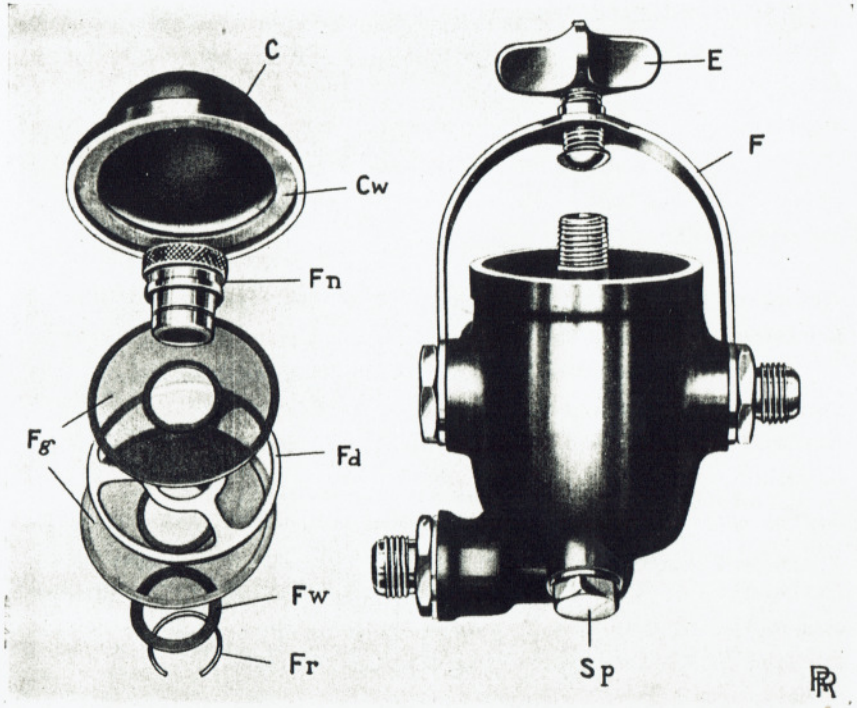

FIG 14 FUEL STRAINER DISMANTLED.

then be unscrewed and removed, carrying with it two gauzes, **Fg**. These are held apart by a distance piece, **Fd**, and retained on the nut by a spring ring, **Fr**, and washer, **Fw**. The spring ring should be removed and the gauzes taken off and cleaned in petrol. Before replacing them, the strainer sump should be drained by removing the plug, **Sp**, and wiped out with a clean, damp wash leather.

When refitting the cover, **C**, care must be taken that the cork washer, **Cw**, is sound and properly in position and the nut, **E**, tightly screwed up. Any leaks on this—the suction—side of the pumps, although they may not be apparent by leakage of fuel, will impair the proper functioning of the pumps by admitting air to the latter.

In addition, a small gauze strainer, shown at **B**, in Fig. 16, is arranged on the carburetter. This also should be removed and cleaned every 10,000 miles as directed on page 34.

Removal is effected by unscrewing the union nut, **B1**, which carries the gauze, **B**. The latter should be cleaned in petrol.

When refitting the parts, care must be taken that the two aluminium washers are in position, one on either side of the union, **B2**.

Fuel Gauge. The fuel gauge registers when master and ignition switches are "**ON**," and is dealt with in a pamphlet at the end of this book. The tank unit of the gauge is enclosed within a cover, **I**, Fig. 13.

Action of the Carburetter. The carburetter is a down-draught model of the plain tube type with an economiser jet. It is provided with a mechanically-operated accelerator pump and an extra jet coupled with the throttle control, for acceleration and for full power running conditions, respectively, as will be described.

The action of the carburetter will be understood by reference to the accompanying illustrations, in which Fig. 15 is a *diagrammatic* sectional view, Fig. 16 shows the carburetter partly dismantled and in Fig. 17 it is seen in position on the engine. Like references are used for the same parts in all three illustrations.

Referring more particularly to the diagram, Fig. 15, fuel flow to the float chamber, **J**, is controlled by the usual float, **J1**, and needle

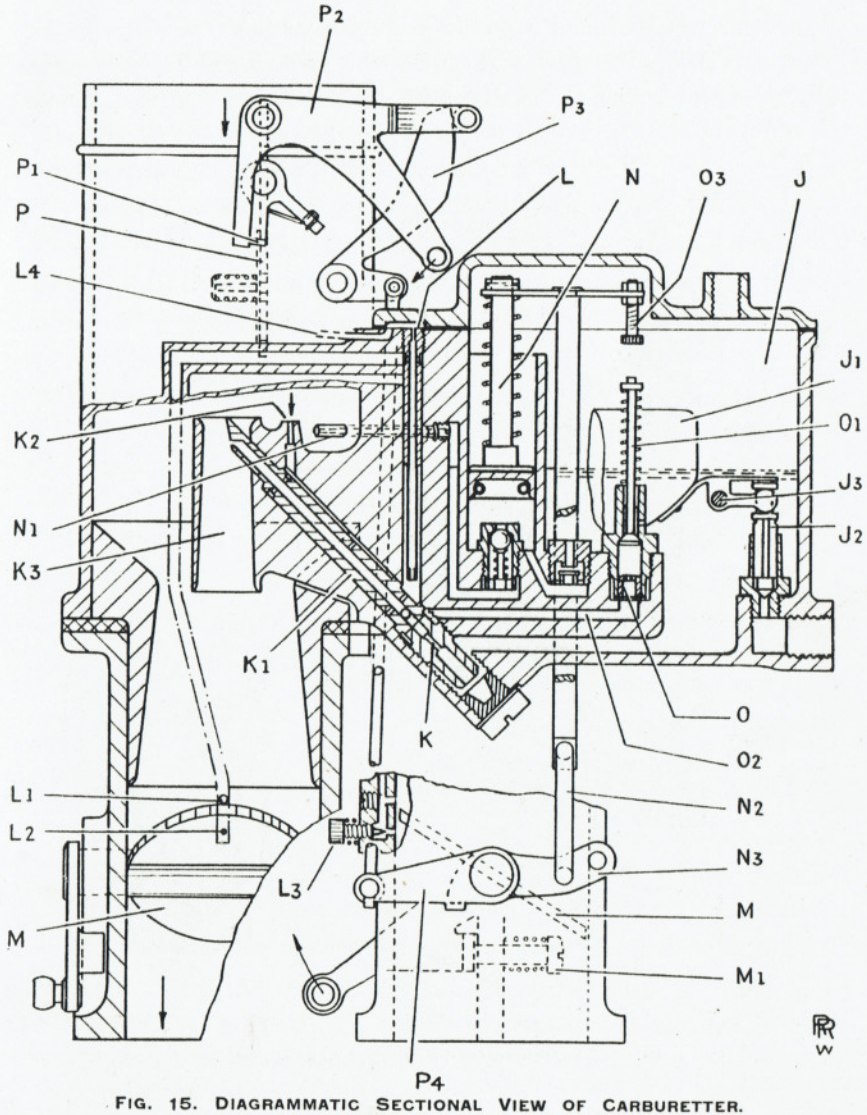

FIG. 15. DIAGRAMMATIC SECTIONAL VIEW OF CARBURETTER.

J—Float Chamber; **J1**—Float; **J2**—Needle Valve; **J3**—Fulcrum Pin of Float; **K**—Main Metering Jet; **K1**—Emulsion Jet; **K2**—Main Air Bleed; **K3**—Inner Venturi Tube; **L**—Pilot or Slow Running Jet; **L1**, **L2**—Slow Running Discharge Holes; **L3**—Slow Running Mixture Adjustment; **L1**—Slow Running Air Bleed; **M**—Throttle Valve; **M1**—Throttle Stop Screw; **N**—Accelerator Pump Plunger; **N1**—Pump Metering and Delivery Jet; **N2**—Pump Coupling Link; **N3**—Lever fixed on Throttle Spindle; **O**—Economiser Metering Jet; **O1**—Economiser Valve; **O2**—Fuel Passage from Economiser Jet; **O3**—Tappet for Economiser Valve; **P**—Strangler Valve; **P1**—Projection on Strangler Operating Lever; **P2**—Strangler Control Lever; **P3**—Cam coupling Strangler Control to Throttle; **P4**—Lever free on Throttle Spindle.

valve, J2. The main fuel metering orifice, K, is located at the base of the emulsion jet, K1, which projects into the throat of the small or inner venturi tube, K3. Air is admitted through a "bleed" orifice, K2, and this air is mixed with the fuel forming an emulsion within the jet, K1. The main air flow is downwards from the air silencer, and by means of the inner venturi tube the velocity of the air is raised considerably and the emulsion drawn from the jet, K1, is effectively

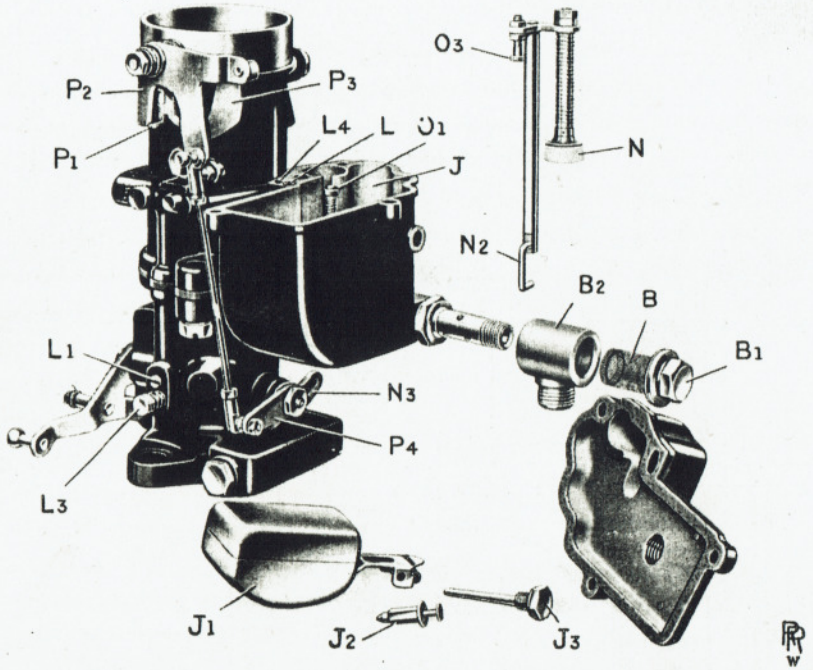

FIG. 16. CARBURETTER PARTLY DISMANTLED.

pulverised and mixed with the ingoing air. Air also passes around the inner venturi, between its outer walls and the inside of the outer venturi tube, thus forming an annular blanket of air around the central core of mixture. This serves to keep the mixture in the centre of the airstream and the liquid fuel from depositing on the walls until the "hot spot" is reached.

The main metering jet, K, the air bleed, K2, the two venturis

and the size and location of the air bleed admission holes in the sides of the emulsion jet, K1, are all so proportioned that the required quality of mixture is maintained between small and large throttle openings.

In order to provide for slow running and idling, under which conditions the air velocities through the main venturi tubes are too low to effect reliable carburation, a pilot or slow running jet, L, is arranged to deliver mixture to two holes, L1 and L2, in the carburetter body adjacent to one edge of the throttle valve, M, when this is in the closed position.

Bleed air is admitted to the idling system through a small orifice in the top of the slow running jet. A hole, L4, places the top of the slow running jet, L, in communication with the inlet side of the carburetter. A further object of this hole is to prevent syphoning of fuel through the holes, L1 and L2.

Adjustment of the idling mixture is effected by a needle valve, L3, controlling the hole, L2. As this hole is situated on the engine-side of the throttle when the latter is closed to the idling position, it follows that reducing the hole reduces the mixture strength and increasing the hole increases the mixture strength. In combination with the adjustable throttle stop screw, M1, both the quality and the quantity of the idling mixture can be controlled accurately.

During idling, hole L1 acts as an air bleed, but when the throttle is opened slightly the position of the hole relative to the throttle edge is changed and the direction of flow through the hole reversed. Mixture is then supplied by both holes.

The size of the pilot jet, L, in conjunction with the sizes and positions of the two holes, L1 and L2, are selected to ensure smooth, slow running and an uninterrupted change-over from the pilot to the main jet as the throttle is opened.

Accelerator Pump. Under conditions of running when the throttle is moderately or fully open, the insides of the induction passages are wet with fuel deposited from the main mixture stream. The condition is unavoidable and is not detrimental with a correctly designed manifold and "hot spot." Under closed-throttle conditions, however, the passages are dry, or more nearly

so, owing to the reduced pressure in the induction system in conjunction with the smaller quantity of mixture flowing.

Sudden opening of the throttle, therefore, may cause a temporary breakdown in the carburation due to the deposition of liquid fuel or "wetting" of the interior surfaces robbing the mixture stream, and until this "wetting" has taken place the mixture equilibrium in the manifold will not be stabilised. The condition is aggravated by the inertia of the fuel in the various passages.

To meet these conditions, a pump, known as the accelerator pump, is provided, which is coupled to the throttle operating mechanism in such a manner that opening movement injects the necessary amount of additional fuel into the mixture chamber.

The pump plunger, **N**, is arranged in a compartment of the float chamber. It draws fuel from the latter through a disc valve and delivers it past a ball valve and a metering jet, **N1**. The plunger is coupled by a rod and link, **N2**, to a lever, **N3**, fast on the throttle spindle. Closing movement of the throttle, **M**, raises the plunger positively and draws fuel into the plunger cylinder. Opening movement of the throttle, however, does not positively force the plunger downwards to expel the fuel, but does so through the medium of a spring. The tension of this is such that a very sudden opening movement compresses it against the plunger which subsequently falls more or less gradually, thus ensuring that the mixture is maintained in proper proportions until the main emulsion jet comes into action.

The result is instantaneous response to throttle opening and good acceleration or "pick-up."

If the accelerator pump plunger should be removed for any purpose, *special care must be taken when replacing it to make certain that the cup leather on the plunger is properly in place when the plunger is pushed in below the bottom of the long slot in the side of the pump cylinder. Lack of care in this respect may result in damage to the cup leather and prevent correct functioning of the accelerator pump.*

There are two alternative positions provided for connection of the link, **N2**, with the lever, **N3**. That recommended as being the more satisfactory is the inner hole, as the link is shown connected in Fig. 15.

Economiser Jet. A further characteristic feature of the carburetter is the provision of what is known as an "economiser jet." This consists of an additional jet which is only brought into action when the throttle is well opened.

It is well known that there is a considerable difference in the fuel mixture strength necessary, on the one hand, for the most economical running, and on the other, for maximum power.

The presence of this economiser jet enables both conditions to be met. The main metering jet, **K**, being selected for economical cruising conditions, gives a mixture on the lean side consistent with smooth running, full power requirements being met by additional fuel from the economiser jet.

The economiser metering jet is shown at **O**, in Fig. 15. It is controlled by a valve, **O1**, normally kept closed by a spring. When the throttle is nearly fully opened, the stem of this valve is depressed by the same member as that which operates the accelerator pump. The additional fuel flows to the main jet by way of passage, **O2**.

The precise throttle position at which this jet is brought into action is carefully predetermined and should never need readjustment. A useful guide in the event of re-setting becoming necessary, due, for instance, to accidental derangement, is as follows:—

A $\frac{5}{16}$" diameter rod or mandrel should be inserted into the lower or outlet end of the carburetter, between the throttle valve and the barrel. The throttle should then be lightly closed against the rod and the adjustment, **O3**, provided on the economiser jet operating arm, so set that the valve spindle and operating tappet are just in contact.

Strangler Control for Starting. To ensure easy starting from cold, a strangler or choke valve is arranged on the upper or inlet end of the carburetter. It is of a special kind designed to eliminate the risk of over-strangling or "choking." Control is from a thumb lever on the instrument board, the dial plate of which is marked **Start** and **Normal.**

The strangler valve is shown dotted at **P** (Fig. 15). Its spindle is mounted off-centre and a projection, **P1**, on the operating lever is kept in contact with an arm of the control lever, **P2**, by a light spring.

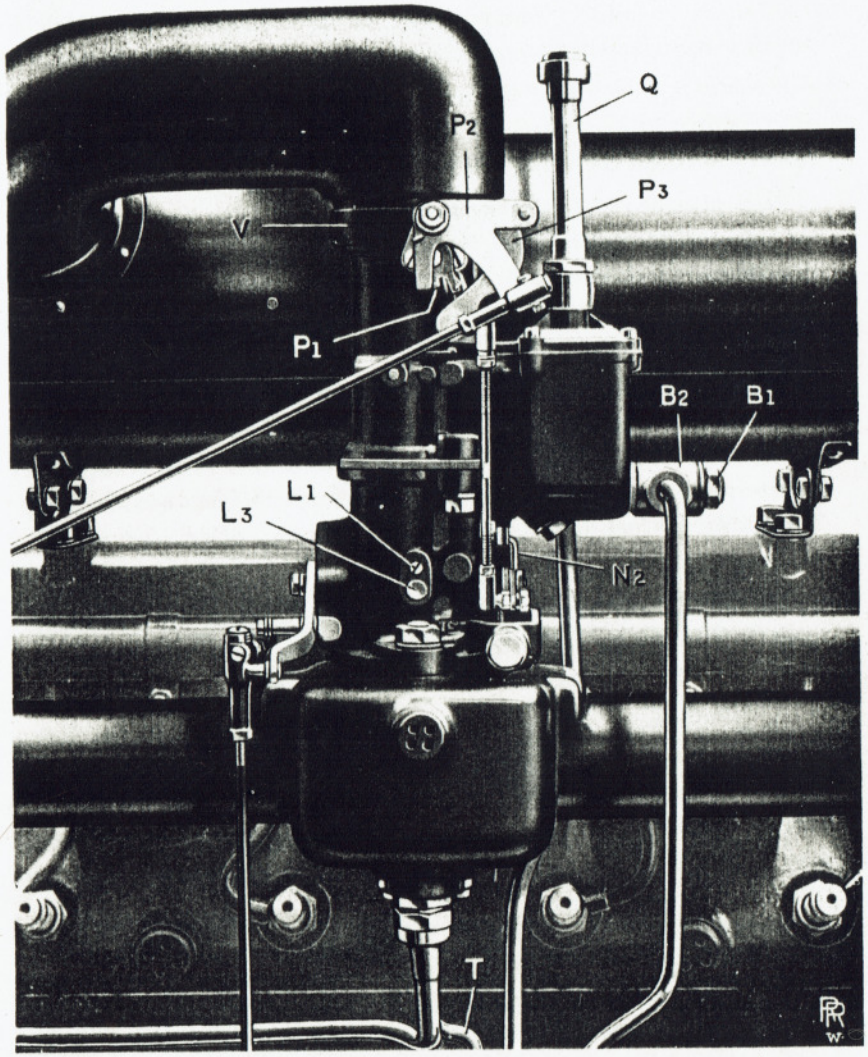

FIG. 17. CARBURETTER IN POSITION ON ENGINE.

As a result, suction of the engine, or more correctly, atmospheric pressure, tends to open the valve, acting against the larger offset area of the valve and against the spring and separating the projection, P1, from the control lever arm. A lightly spring-loaded disc valve is fitted

in the strangler valve itself which tends to open under back-fire conditions.

An engine usually starts more easily from cold if the throttle be set a certain small amount open, this degree of opening being invariably more than that required for normal idling when the engine is warm.

To ensure the correct amount of opening and thereby to relieve the driver from the need for precise setting of the hand throttle control, with the risk of false starts, the strangler control is interconnected with the throttle lever to cause the throttle to open the required amount when the instrument board control lever is set to **Start.**

The strangler control lever, P2, carries a roller which makes contact with a cam, P3, forming part of another lever. The latter is coupled by a rod with a lever, P4, freely mounted on the throttle spindle. A projection on this lever makes contact with a projection on the accelerator pump operating lever, N3, and causes the throttle to be opened by a predetermined small amount when the strangler control is set to **Start**.

There is consequently no need for the driver to set the hand throttle control lever open when using the strangler. On the contrary, it is necessary that the hand control should be at the bottom of its quadrant in order to avoid interference with the degree of opening as determined by the operating cam.

An adjustment of this degree of opening movement is provided by the rod which couples cam, P3, to lever, P4, this rod being formed as a turn-buckle having left- and right-hand threads. Readjustment should not normally be necessary, but if the original setting is disturbed it may be restored as follows :—

Release throttle stop screw, M1, until the throttle is entirely closed and then bring the screw back until it just makes contact with the throttle lever without moving the latter. Next, adjust the coupling rod so that operation of the strangler control causes the throttle to be opened by an amount equivalent to a gap of .060" between the stop screw and the throttle lever.

It will subsequently be necessary to re-set the stop screw as later described.

Faulty Adjustment of Carburetter. There should be no necessity for any variation of the adjustments of the carburetter as fixed by the makers. Great care is taken during testing of the car to secure the best settings, and these should not, under normal circumstances, be altered.

All jets and air bleeds are marked with a number indicating the size of the orifice. *These orifices should not be reamed or tampered with in any way.* If replacements are required, application should be made to Rolls-Royce Ltd. for parts with the same numberings.

There are certain external adjustments, however, which are dealt with in the following paragraph.

Setting of Idling Adjustments. The idling adjustments should only be re-set when the engine is well warmed up. There are two adjustments, namely, the throttle stop screw, M1, and the idling mixture adjustment screw, L3.

With the hand throttle lever in the closed position, the throttle stop screw, M1, should be adjusted to give the desired engine speed. The mixture regulating screw, L3, should then be turned in and out until a position is found where the engine rhythm is most regular. Screwing *in* gives a *weaker* mixture, and screwing *out* a *richer* one. If a satisfactory position cannot be found, the idle discharge holes, L1 and L2, should be inspected by removing screw, L3, and the small plug at L1 (Fig. 16). The pilot jet, L, may be removed for inspection by taking off the float chamber cover.

After setting the mixture adjustment screw, it may be found necessary to re-set the throttle stop screw.

Diagnosis of Faults. In the event of faulty running or misfiring developing, a systematic investigation of possible causes should be made, e.g., the correct functioning of the ignition system, cleanliness and setting of the ignition plugs, sufficient fuel in the tank, cleanliness of the fuel strainers and correct operation of the fuel pumps; all these should be checked.

If such investigations leave the carburetter itself under suspicion, the following points should be investigated :—

For loss of maximum speed.—Check that the throttle valve can be fully opened, and see that the economiser jet, O (Fig. 15), and

valves are free from obstruction. To extract these parts, remove float chamber cover and float, withdraw split pin from link, N2, and take out link and withdraw pump plunger, N. The economiser valve may then be unscrewed and withdrawn.

Flat spot at small throttle opening.—Adjust idling to give more even engine rhythm (see page 68). If flat spot is still evident, examine idle discharge holes (L1 and L2) and pilot jet (L) for stoppage.

Flat spot at half throttle opening.—Withdraw main jet (K) and examine for stoppage. Check accelerator pump for stoppage.

High fuel consumption.—Check fuel level in float chamber. (See below.) If correct, and all jets are as set by the makers, the most probable cause is a sticking or leaking economiser valve. Remove and examine for foreign matter, which may be removed by blowing through valve orifice.

Float Feed Mechanism. The float chamber cover is held in position by three screws and is provided with a cork joint washer. A special form of vent, Q, Fig. 17, is fitted, and also a drain pipe to carry off fuel if flooding occurs.

The float can be removed by unscrewing the fulcrum pin, J3, Figs. 15 and 16.

A flexible pipe conveys fuel from the pipe on the chassis frame to the engine. *On no account must the fittings on the pipe itself be disturbed.*

The standard setting of the fuel level is $\frac{3}{4}$" below the top face of the float chamber. Normally, it should not be necessary to alter this. If readjustment should at any time become necessary, however, alteration can be effected by carefully bending the float arm where it meets the float. Bending the float *up* will raise the level, and vice versa.

"Hot Spot." A "hot spot" is provided in the induction manifold below the carburetter, the manifold at this point being hot-water jacketed.

A fuel drain from the manifold (pipe T, Fig. 17) is arranged which incorporates a non-return valve normally kept closed by engine suction.

Air Silencer and Cleaner. A cleaner is arranged within the front end of the air silencer to prevent the passage of dust and grit to the engine.

The cleaner comprises a metal wool element through which the air passes on its way to the carburetter. It is removed by unscrewing the three small set screws on the front end of the silencer and taking off the end cover of the latter.

Every 5,000 miles, as directed on page 33, the cleaner element should be removed and carefully washed in petrol or paraffin.

(When touring on the Continent this should be done every 2,500 miles.)

After cleaning, the element should be oiled with engine oil.

When replacing the valve rocker cover complete with silencer, care must be taken not to overtighten the bolt of band, **V**, Fig. 17, as this may distort the carburetter body and cause the strangler valve spindle to bind in its bearings.

WARNING.—On no account should the engine be kept running for any appreciable period with the car in a closed garage. There is then a grave danger of people in the garage being asphyxiated owing to the presence of poisonous gases in the exhaust.

Consequently, particular care should be taken always to open the garage doors wide before starting the engine.

CHAPTER VI.

Care and Adjustment of the Four-Wheel Brakes.

General Description — Possible Variations — Adjustments — Adjustment of Hand Brake—Adjustment of the Servo—Lubrication —Oil on Brakes.

General Description. The Rolls-Royce four-wheel braking system comprises a servo motor of the dry, disc-clutch type which is equally effective for backward movement of the car as for forward movement. Further, even should the servo be out of action, the rear pedal-operated brakes still provide a reasonable braking capacity by direct action.

Pressure on the pedal applies the rear brakes direct in the usual manner and also engages the servo, but does not directly operate the front brakes, this being done only by the servo. The effect of the latter is distributed between the front and rear brakes, being therefore added to the direct pedal effort in the case of the rear brakes. With the leverages provided, this results in about 55 per cent. of the total braking being imposed on the front wheels.

The proportioning of the servo pull to front and rear brakes respectively is effected by a special "T"-shaped balancing lever. A separate equaliser is provided for both pairs of front and rear brakes to ensure even braking on both sides of the car.

A diagrammatic representation of the whole system is shown in Fig. 18, a more detailed view of the servo and its connections being given in Fig. 21.

A shaft operated from the pedal by rod, **A1**, passes behind the gearbox, and on the left-hand side extremity of this shaft is mounted a lever coupled by the rod, **A2**, with a lever, **L1**, on the servo motor shaft. The lever, **L1**, has inclined teeth or cams formed on the face of its boss, these teeth engaging, through the medium of steel balls,

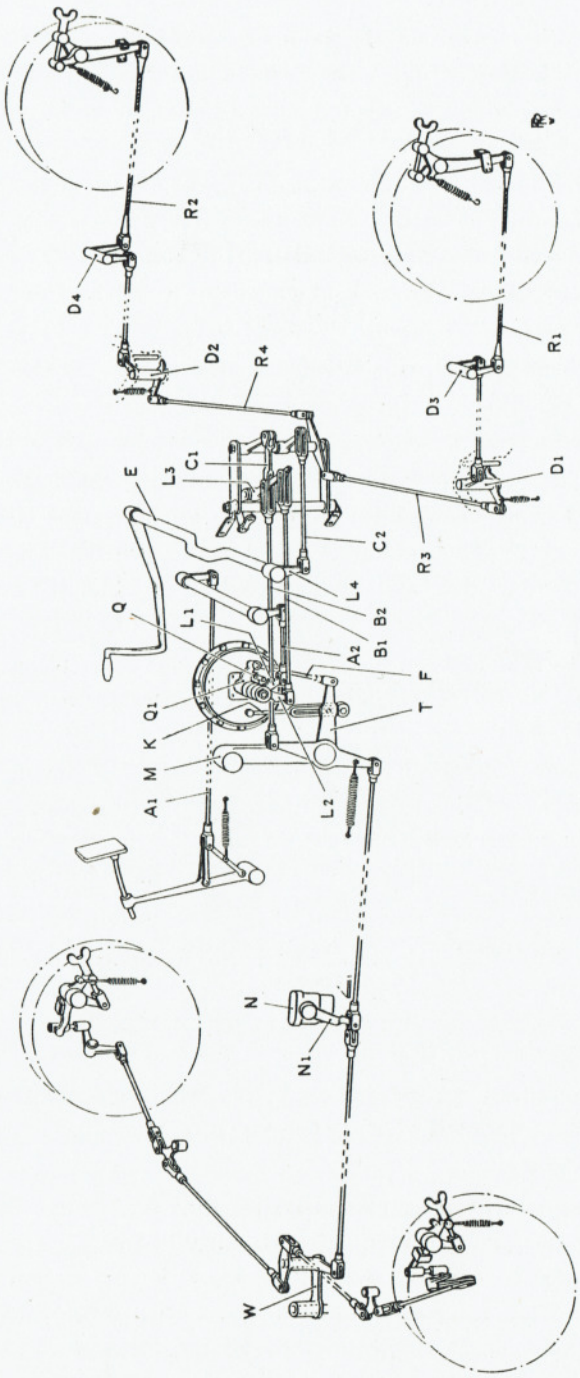

FIG. 18. DIAGRAM OF ROLLS-ROYCE FOUR-WHEEL BRAKE SYSTEM.

similar teeth formed on the boss of another lever, **L2**. From the latter a rod, **B1**, actuates the rear brakes through the medium of the lever, **L3**, which is pivoted on a bracket mounted on the "**X**" member of the frame.

The driven member of the servo carries a pin, **Q**, which engages a freely-mounted lever, **Q1**, coupled by a rod, **F**, with the "T"-shaped balancing lever, **T**. Another rod, **K**, pivoted on the driven member of the servo engages lever **T** by means of a slot and pin.

When the car is moving forward, lever **T** is operated to apply the brakes by rod, **F**, this being actuated by pin, **Q**, and lever, **Q1**. The rod, **K**, is meanwhile inoperative owing to its slotted end. On backward movement of the car, lever **T** is operated by rod **K**, the stop **Q** separating from the lever **Q1**.

From the balancing lever, **T**, rod **B2** is coupled by a slotted jaw with lever **L3**. The combined pedal and servo effort is then communicated to the rear equaliser by the forked link, **C1**.

The rear equaliser is a "T"-shaped balancing lever similar in principle to that marked **T**, and equalises the effort to rods, **R3** and **R4**, thence by levers, **D1**, **D2**, **D3** and **D4**, to the rear brake ropes, **R1** and **R2**.

The hand brake lever is mounted on a shaft, **E**, carrying a lever, **L4**, coupled by a rod, **C2**, to an additional arm of the balancing lever for the rear brakes, which it thereby operates by direct manual effort.

Slotted jaws are provided at appropriate points as shown, to eliminate unnecessary movement of mechanism not directly involved.

The front brakes are actuated by the lower arm of the lever, **T**, the pull being transmitted by way of a rod and lever, **N1**, to another balancing lever, **W**, which equalises the effort to each front brake.

In order to prevent noisy contact of the front brake shoes with their drums, a hydraulic damping device, **N**, is mounted on the engine crankcase and coupled to the front brake operating rod by lever, **N1**. The setting of this should not be altered.

Initial movement of the pedal engages the servo through the medium of two star-shaped buffer springs, **Z** (Fig. 21), the inclined teeth on the bosses of levers, **L1** and **L2**, with the steel balls between them, riding upon one another and tending to separate the two levers

axially. Further movement of the pedal causes both levers to move together and actuates the rear brakes in the ordinary way.

These movements occur whether the car is standing or moving forwards or backwards, and result in the rear brakes being applied immediately the pedal is operated without any lag for the servo to take up its duty.

The degree of braking available without the servo assistance enables a driver to shunt the car in awkward places with perfect assurance that his brakes will respond without delay to the pedal movement.

When the car is running, in either direction, the servo actuates the front brakes and also adds its effort to the direct pedal effort on the rear brakes, operating through the medium of the "T"-shaped balancing lever, the long arm of which is pulled upwards by one or other of the coupling rods depending on the direction of movement of the car.

The hand brake operates on the rear brakes only, as explained.

Possible Variations. As already mentioned, the leverages are so proportioned that the total braking effort is distributed in a pre-determined ratio between the front and the rear brakes.

This distribution, though independent within reasonable limits of any maladjustment on the part of the user, depends, nevertheless, upon the condition of the brakes themselves. For instance, if oil should reach the rear brakes, and so reduce their co-efficient of friction, a greater proportion of the braking would be thrown upon the front wheels, which is not desirable.

Conversely, if the front shoes become oily, the balance of distribution will be upset in the other direction.

It is therefore very necessary that oil should be kept from the brake surfaces, particularly in the case of the rear brakes.

Precautions to be observed in this connection are :—

(*a*) Periodically and regularly to check that the oil escape holes in the rear brake covers are clear.

(*b*) To fill the axle box only when it is warm after running, and to warm the oil before pouring it in.

Adjustments. The only adjustments requiring periodic attention are in the form of simple wing nuts, one on each brake drum, for operation by hand.

It is important that these should receive frequent attention at intervals depending upon the use of the car, as directed on page 31.

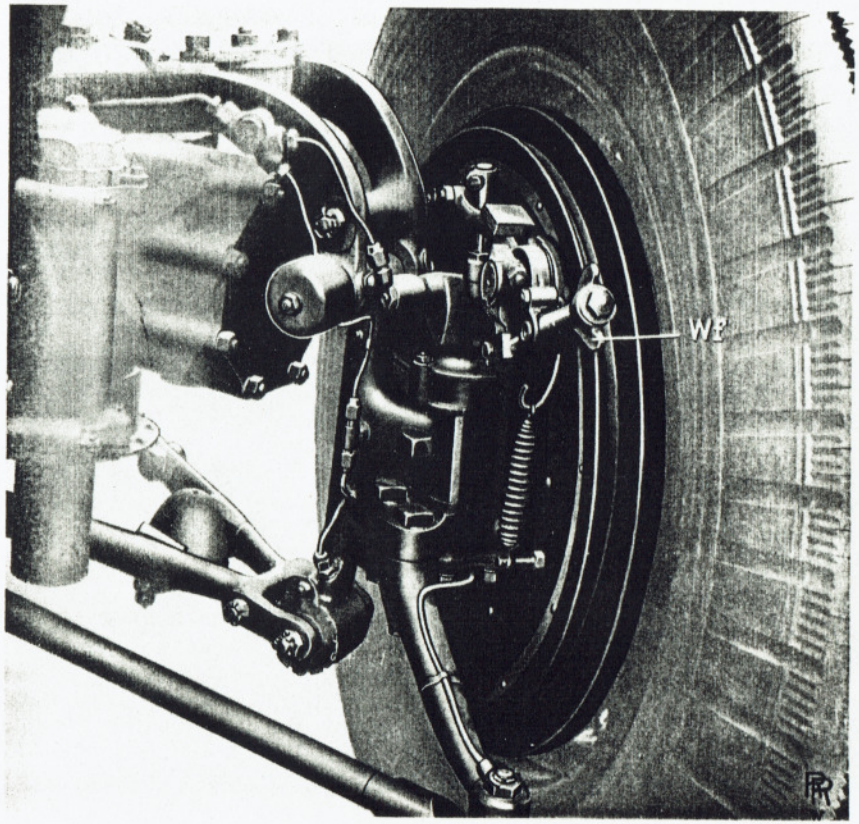

FIG. 19. FRONT BRAKE ADJUSTMENT.

The method of utilising the wing nut adjustment is dealt with in the succeeding paragraphs.

It is very important to observe that under no circumstances should adjustment be attempted at any other points, for instance, by altering the lengths of brake rods or ropes. These are all carefully determined during the erection of the chassis, with a view to utilising

to the best advantage the lengths of the various levers, taking into consideration the total movement of such levers from the time when the brakes are new until the facings are completely worn out.

Any alterations to the lengths of these rods or ropes will virtually shorten the lengths of some of the levers, and will interfere with the correct functioning of the system.

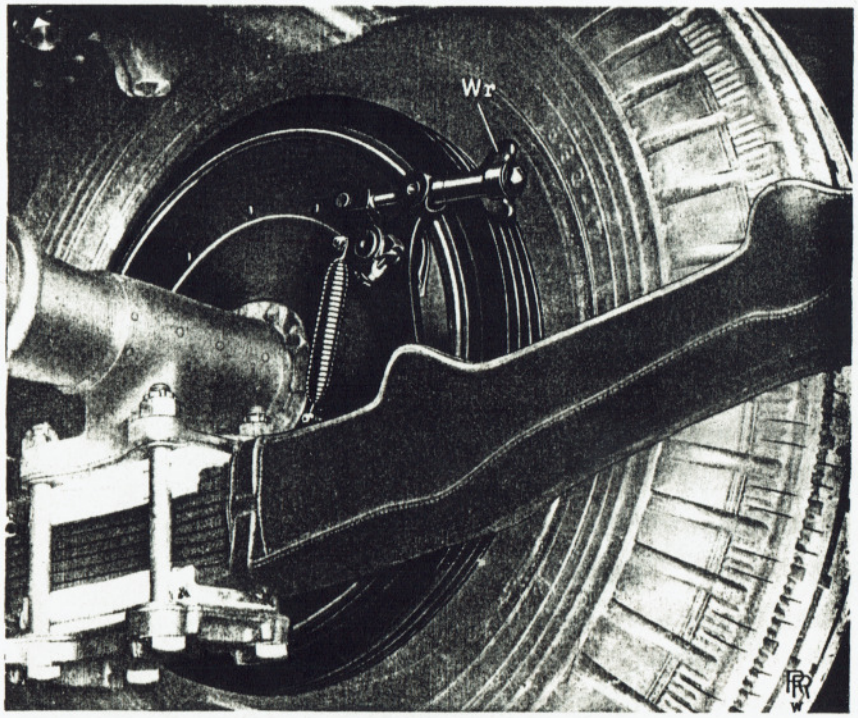

FIG. 20. REAR BRAKE ADJUSTMENTS.

The wing nut adjustment for the front brakes is shown at **Wf**, Fig. 19, and that for the rear brakes at **Wr**, above.

Only the fingers must be used in turning these nuts. They are formed with cam-shaped bosses bearing on cylindrical trunnions in such a way that rotation of the nut through 90° from the position shown causes the brake shoes to be moved towards the drum as the cams ride over the trunnion. This movement is carefully predetermined, and is equal to the normal clearance between shoes and drum when the shoes are in

the off position. Screwing on the nut through a further 90°, that is, a total of half a turn, allows the shoes to return to an off position which is half a turn of the adjustment nearer to the drum. The adjustment is self-locking.

The nut should be screwed up until the cam action described prevents further rotation with the fingers, owing to the shoes being applied to the drums. The setting will then be correct, and the adjustment locked if the nut be turned *back* one-quarter of a turn.

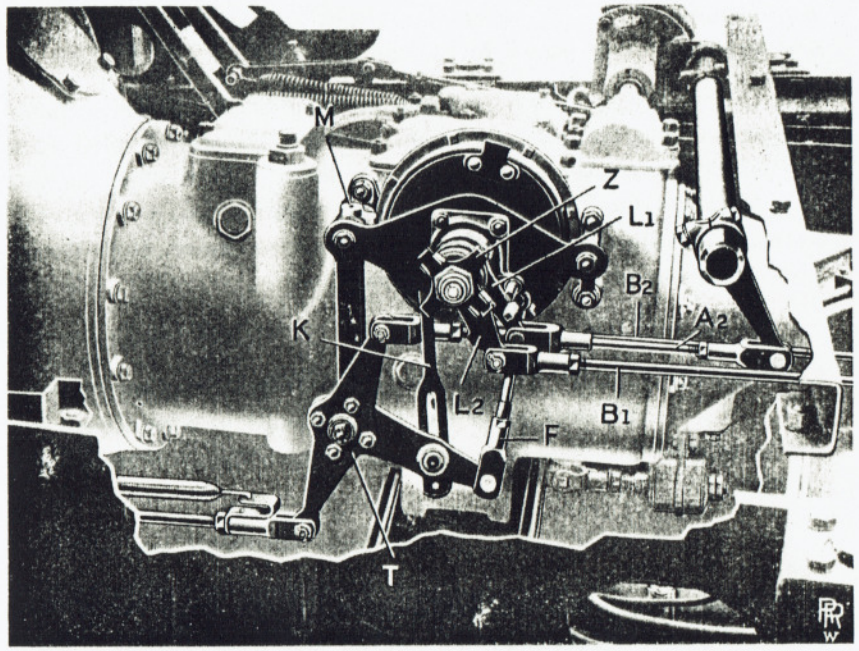

FIG. 21. THE SERVO MOTOR AND ITS CONNECTIONS.

It must again be emphasised that on no account must force be used in turning the nuts, as this will defeat the object of the described arrangement and result in badly adjusted, probably dragging, brakes.

Also, after effecting an adjustment, it must be observed that the wing nut rests in a position in line with the car, i.e. with the wings pointing fore and aft.

As explained on page 74, movement of the pedal when the car is standing does not apply the front brakes, which are operated solely by the action of the servo. Under such circumstances pressure on the pedal will only apply the rear brakes.

Adjustment of Hand Brake. As explained earlier in this Chapter, the hand brake lever operates the rear brakes, and adjustment of these is effected by the wing nuts. No other adjustment is required.

Adjustment of the Servo. The servo is of the dry disc-clutch type, and is shown in Fig. 21.

An adjustment for wear of the friction surfaces is provided, but there should be no need for adjustment until such time as the brakes themselves require re-lining. As the operation is of a delicate nature and requires specialised knowledge, it is strongly advised that adjustment should be effected only by Messrs. Rolls-Royce Ltd., or by one of their Service Stations.

Lubrication. The need for hand lubrication of various parts of the mechanism has been reduced to a minimum by the use of self-lubricating bearing bushes at the fulcrums of practically all levers.

The only points which do require hand lubrication are the jaws, joints and sliding joints of the rods, links, ropes, etc. The fulcrum of the suspension link of the balancing lever, **T**, indicated at **M**, in Figs. 18 and 21, is provided with an oil hole protected by a small spring-loaded ball.

Oil should be applied to the points mentioned every 5,000 miles, as directed on page 32.

The outer end of the servo shaft is supported in a ball bearing which is filled with grease in the first instance, and needs no attention between overhauls of the chassis. Similar remarks apply to the ball bearing cams which operate the servo, as explained earlier in this Chapter.

Spouts are arranged on the brake covers just below the rear axle, in order, as far as possible, to drain away oil which otherwise might reach the brake surfaces. These spouts should be inspected frequently and kept clear of any obstruction.

Oil on Brakes. If, owing to overfilling of the axle casing, or choking up of the oil drain channels referred to, the brakes become oiled up and ineffective, it will be necessary to remove the hubs, in which event application should be made to Rolls-Royce Ltd.

CHAPTER VII.

Clutch, Gearbox, Propeller Shaft and Rear Axle.

The Clutch—Clutch Pedal Mechanism—Clutch Pedal Adjustment—Gearbox—Universal Joints—Rear Axle.

The Clutch. The clutch is of the single dry-plate type and requires no special attention.

A part-sectional view is given in Fig. 22.

The clutch shaft is spigoted at its forward end in the crankshaft on a ball bearing shown dotted at **A**. This bearing is filled with grease during erection and requires no attention between overhauls of the chassis.

The withdrawal thrust ball race, **B**, and its associated moving parts are lubricated from the centralised chassis lubrication system by means of an oil cup, **C**, into which oil is fed by a pipe, **C1**.

Clutch Pedal Mechanism. Owing to the relative movement in the frame of the engine-gearbox unit permitted by its flexible mounting, a special system of levers is utilised to transmit the pedal effort to the lever on the clutch housing. The object of this mechanism is to ensure accurate control of the clutch pressure plate during its process of engagement, and thereby to secure smooth engagement.

The system of levers referred to is shown in Fig. 22.

The pedal lever, **D**, is mounted on a shaft secured to the frame side-member and carries two arms, **D1**. These are coupled by parallel links, **E**, to a three-armed lever, **F**, which is anchored in a fore and aft direction to the clutch housing by links, **F1**. The lower arm of lever, **F**, is connected by an adjustable coupling, **G**, with the clutch

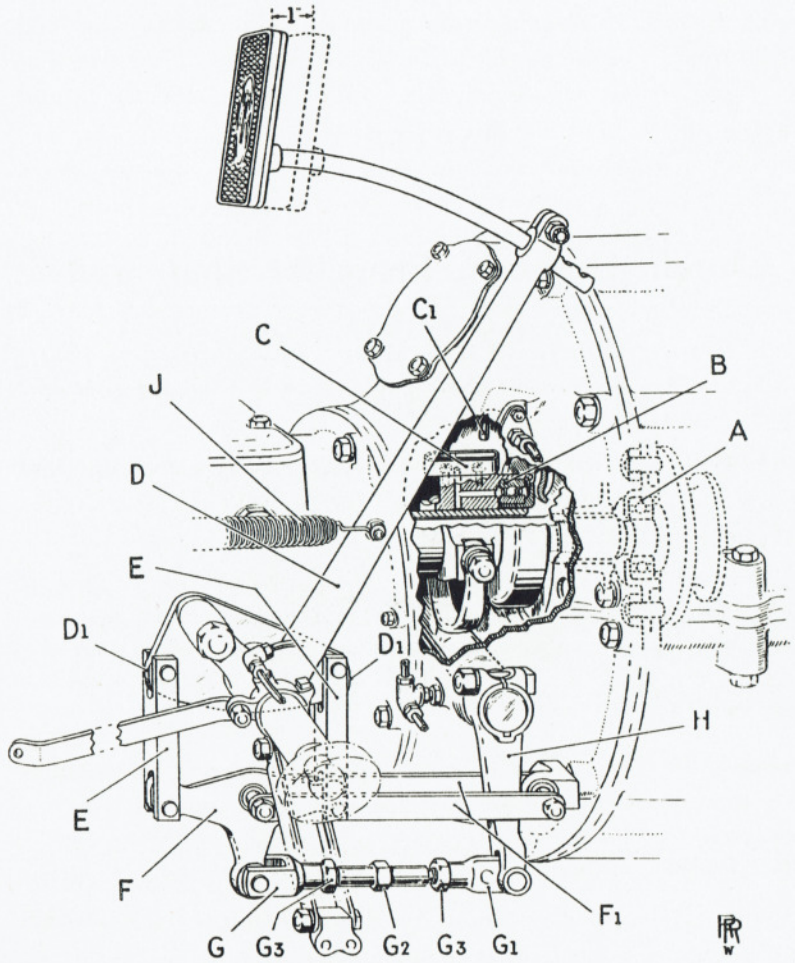

FIG. 22. CLUTCH CONTROL MECHANISM.

lever, **H**. The coupling, **G**, and links, **F1**, are parallel and of approximately the same length.

The result is that the effects of engine movements relative to the pedal lever are neutralised, such movements resulting only in slight oscillations at the points of articulation of the mechanism.

It is important that the various joints should be lubricated with the oil can every 5,000 miles, as directed on page 32. The fulcrum of the pedal lever is lubricated from the centralised system.

Clutch Pedal Adjustment. The only point where any adjustment is provided, or is ever likely to be necessary, is at the coupling, **G**, connecting the pedal lever with the clutch operating lever.

There must always be a certain amount of " free " or idle movement of the pedal, as is easily tested by pressing the pedal lightly. It should be possible to move it about 1", as indicated in Fig. 22, measuring horizontally towards the dashboard, before the withdrawal sleeve is felt to be in contact with the toggle levers.

The coupling comprises a jaw, **G**, and an eye, **G1**, united by a turn-buckle, **G2**, having left-hand and right-hand threaded ends, and locked by locknuts, **G3**.

To effect an adjustment, the floor boards must be removed to gain access to the coupling and the two locknuts, **G3**, be released. The turn-buckle, **G2**, can then be rotated with a spanner to obtain the correct free movement, the locknuts being subsequently re-tightened.

When testing and setting this adjustment, the aluminium pedal plate must be in position, because it is this part which acts as the stop limiting upward movement of the pedal under the action of its external spring, **J**.

Gearbox. Synchromesh of the " positive " type is provided to facilitate engagement of second, third and fourth speeds.

The two main shafts of the gearbox are supported in three bearings each. The extra bearings contribute largely to the permanent silence of the gears, and, in the case of the third motion shaft, relieve the spigot bearing of much of its load.

Oil is inserted into the box by unscrewing the filler plug shown at **K**, Fig. 23. Recommended oils are given on page 29.

It is important that the filling-up should be done when the gearbox is warm after running as otherwise a false level may be obtained.

Oil should be poured in until the level reaches to the mark, **L1**, on the dipstick, **L**, the filler plug being re-inserted for testing the level. The box must not be over-filled.

The oil level should be inspected every 5,000 miles, as directed on page 32.

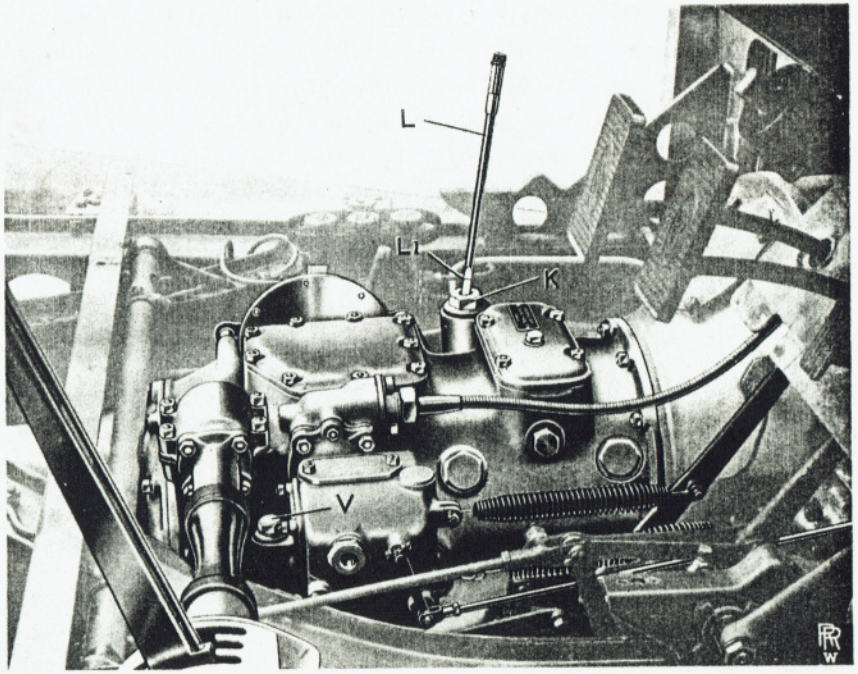

FIG. 23. GEARBOX AND CASING OF DAMPER GOVERNOR.

Every 20,000 miles all oil should be drained out by removing the *two* drain plugs, and fresh oil inserted, as directed on page 34.

A worm-driven connection is provided on the gearbox for the speedometer, the drive ratio being suited for the speedometer which is supplied.

Universal Joints. The propeller shaft universal joints are of a special type with needle roller bearings. Each joint is provided with an oil-gun lubricator, **Q**, Fig. 24, located at the centre of the cross-piece.

The driven portion of the forward joint is provided with serrations which engage similar serrations within the propeller shaft to permit the necessary degree of telescoping movement

This sliding joint is also lubricated by means of an oil-gun lubricator, shown at **M**, below. Every 10,000 miles, as directed on page 34, grease should be injected by means of the oil-gun into the two lubricators, **Q**—one at the front end of the propeller shaft and one at the rear—and also into lubricator **M**.

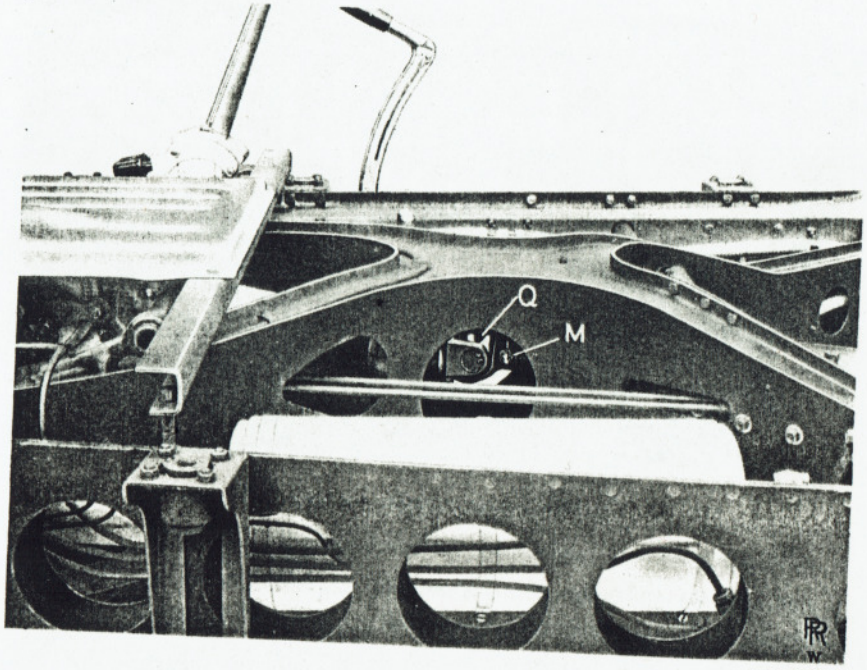

FIG. 24. SLIDING JOINT OF PROPELLER SHAFT.

Rear Axle. The rear axle is of the full-floating type, the road wheels being mounted solely on extensions of the axle tubes.

The final drive is by off-set hypoid bevel gears, which possess the advantages of being silent in running, and, owing to the off-set disposition of the pinion, of enabling a lower body position to be obtained without decreasing the ground clearance.

It is important that no other oil than that recommended should be used in the rear axle. (See page 29.)

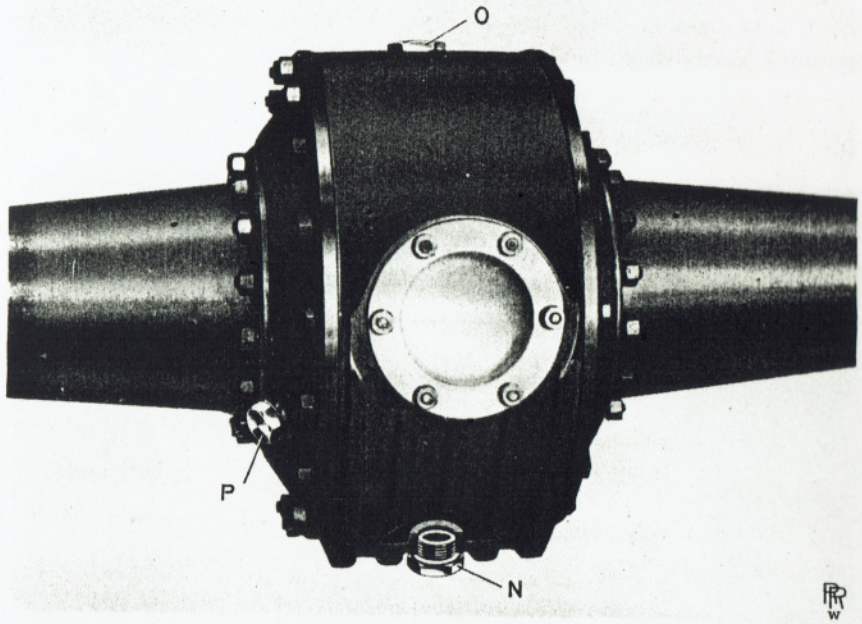

FIG. 25. OIL PLUGS IN REAR AXLE CASING.

The casing must be drained every 5,000 miles as directed on page 32, and re-filled with fresh oil to the correct level.

It is improbable that any topping-up will be necessary in the intervals.

The drain plug, **N**, should be removed with a box spanner, preferably when the casing is warm, and all the oil allowed to drain out.

Plug, **O**, may then be removed for re-filling purposes. Two pints of fresh oil should be poured in through the filler hole, which quantity should cause oil just to commence running from the overflow or level hole, **P**.

Care must be taken to see that the washers are in position when replacing the plugs.

CHAPTER VIII.

Steering, Shock Dampers and Road Springs.

Steering Box and Column—Front Suspension—Warning, Front Suspension Springs—Steering Arms and Joints—Rear Hydraulic Shock Dampers—Rear Shock Damper Connections—Stabilisers—Rear Road Springs.

Steering Box and Column. The steering mechanism is of the cam-and-roller type, and requires no attention beyond inspection of the oil level.

The cover of the box is provided with a filling plug.

Every 5,000 miles, as directed on page 32, this plug should be removed, preferably when the box is warm, and the level of oil inspected. If necessary, oil should be poured in until it is on the point of overflowing from the plug orifice. (For correct oils see page 29.)

With the steering wheel in its normal central position, a hole will be found in its boss, adjacent to the upper arm, into which the nozzle of the oil can should be inserted to reach an oil hole provided in the control carrier. This operation should be included when lubricating the controls every 5,000 miles, as directed on page 32.

Front Suspension. Each wheel is independently sprung, the suspension consisting of the two upper and two lower radius arms of different lengths set at a trailing angle, between which a vertical yoke is carried, and on this the stub axles are pivoted.

Attached to each of the upper radius arm fulcrum pins is a vertical

lever passing inside a housing and engaging with the main coil springs which carry the load of the front end of the car.

These springs encircle a shock damper which consists of a piston operating in a cylinder full of oil, the latter being displaced from one end of the cylinder to the other past spring-loaded valves.

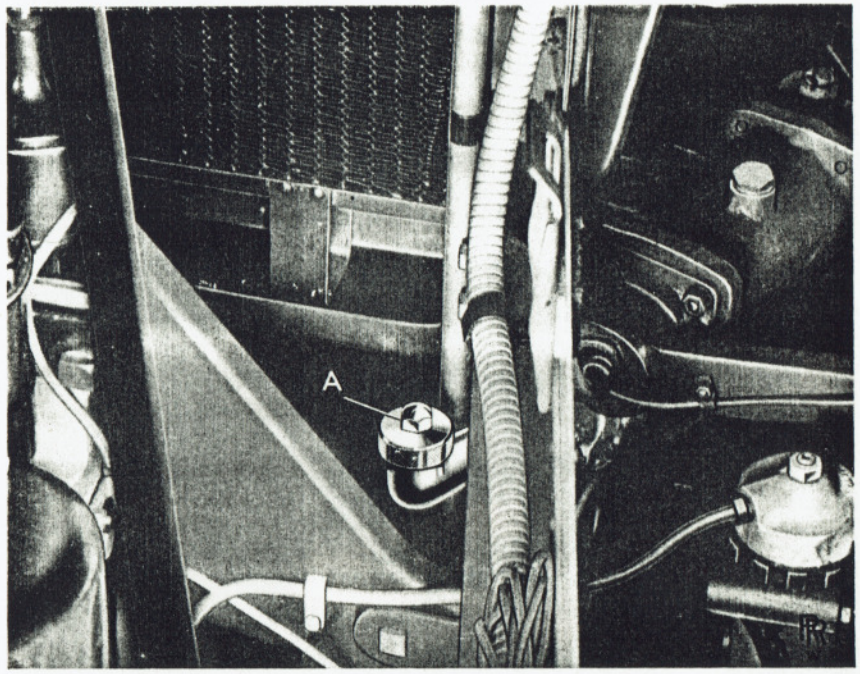

FIG 26. OIL FILLER ON FRONT SUSPENSION.

The loading of these valves, and hence the degree of damping, is automatically controlled in unison with that of the rear dampers to suit the speed of the car by means of a small pump and centrifugal governor described later.

The level of the oil in the spring cylinders should be maintained so that it is just visible through the filler spouts, one of which is shown at **A**, above.

The level should be inspected every 10,000 miles, as directed on page 34.

It is of vital importance that only perfectly clean oil of the correct brand should be used, and this should be strained through a fine gauze before using.

Straining is greatly facilitated if the oil be first warmed to about 75° C.

The importance of the above cannot be over-emphasised, as a very small particle of foreign matter in the oil may lodge under one of the valves and impair the effectiveness of the shock damper.

Lubrication of the steering pivot bearings is effected from the centralised chassis lubrication system. Separate strainers are fitted in the small connections bolted to the rear of the two upper radius arms, one on each side of the car, as described on page 37.

WARNING.

Front Suspension Springs.

No attempt must be made to remove the coil springs of the front suspension.

These are enclosed in cylindrical casings or " pots " bolted to the main frame. One is clearly seen in Fig. 19.

Special appliances are required when removing these casings, because the powerful springs which they contain are compressed when in position.

Therefore any attempt to remove the casings without such appliances involves risk of personal injury in addition to damage to parts.

Any necessary dismantling or adjustment of the suspension must be effected only by Messrs. Rolls-Royce Ltd., or one of their Service Depots.

Steering Arms and Joints. The steering gear should be examined occasionally to see that all bolts are tight and joints well lubricated.

If any nuts be found loose, and only being retained by their split cotters, the latter should be removed, the nuts screwed up tightly, and new cotters fitted.

The ball joints of the cross and side steering tubes are lubricated from the chassis oil pump, as described in Chapter I. and illustrated in Fig. 2.

The bearing pads of all joints are spring loaded, being self-adjusting for wear. They should not normally require attention except when the car is undergoing a general overhaul.

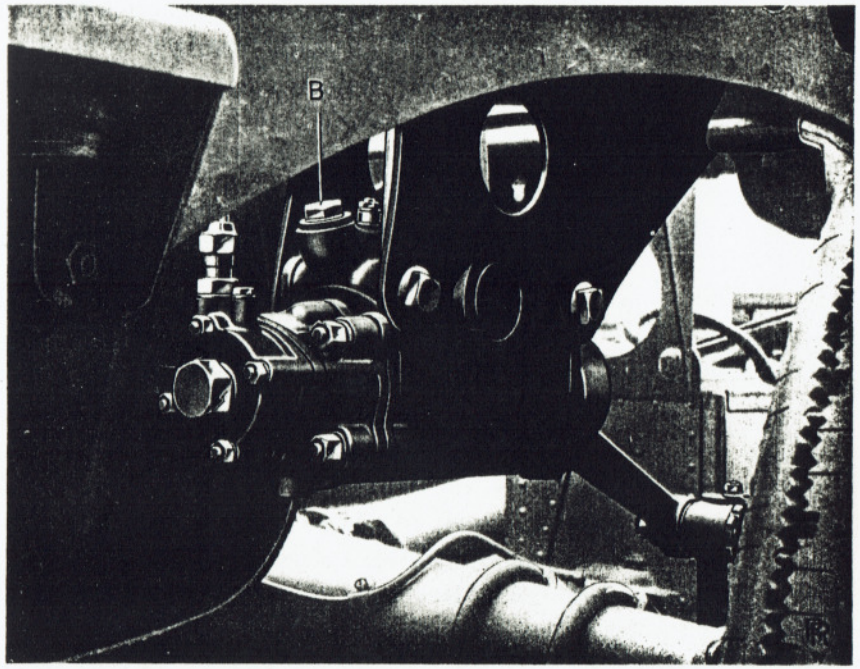

FIG. 27.
REAR HYDRAULIC SHOCK DAMPER.

Rear Hydraulic Shock Dampers. Hydraulic shock dampers of Rolls-Royce design and manufacture are fitted to the rear axle, one of the dampers being shown above.

Unless it is obvious that the effectiveness of the shock dampers has become reduced, or undue leakage of oil is apparent, no attention whatever will be necessary for 10,000 miles of running.

After 10,000 miles' running, it is necessary to inspect the oil level in the shock dampers as directed on page 34.

For this purpose a filling plug, **B**, Fig. 27, is provided, arranged at such a height in the casing as to control the maximum oil level.

As it is of vital importance that only perfectly clean oil of the correct brand should be used, the following precautions must be observed :—

(*a*) Before attempting to remove the plug, **B**, both the plug and the shock damper casing adjacent to it must be cleaned very carefully with a brush dipped in paraffin, in order to avoid the possibility of dirt entering the hole when the plug is removed.

(*b*) Only a recommended oil must be used (see page 29), and before inserting this, it should be strained through a fine gauze. Straining is greatly facilitated if the oil be first warmed to about 75° C.

The importance of such cleanliness cannot be over-emphasised. A very small particle of foreign matter in the oil may lodge under a valve and impair the effectiveness of the shock damper.

The plug, **B**, can then be removed with a box spanner, and the oil level restored, if necessary, to the bottom of the plug hole, the oil being poured in *very slowly* to avoid entrapping bubbles of air. It will be found most convenient to add oil by means of the small syringe provided in the tool kit. When replacing the plug, care must be taken that its washer is in position.

Each shock damper consists of a piston operating in a cylinder which is maintained full of oil, the latter being displaced from one end of the cylinder to the other, past spring-loaded valves. The loading of these valves, and hence the degree of damping, is automatically controlled in unison with the speed of the car by means of a small pump and centrifugal governor carried in a casing bolted to the gearbox. The pump maintains a pressure of oil in a system of piping coupled to both front and rear dampers, and the governor varies this pressure with the speed of the car. The hydraulic pressure operates to vary the loading of the springs on the damper valves, resulting in higher damper loads at higher speeds. In addition, there is a hand lever above the steering wheel marked **Riding Control,** the effect of which is superimposed on that of the governor and pump.

The pump and governor casing is charged with the same kind of oil as that used in the dampers.

The level should be inspected after 10,000 miles of running, as directed on page 34, by removing the plug, **V**, Fig. 23, the same precautions as regards cleanliness being observed as when filling the dampers. Oil should be injected with the syringe until the level reaches to the thread in the filler spout.

It must be observed that oil is not actually pumped into the dampers, and there should be no wastage of oil from the pump unit or pipe line. Such wastage or leakage will impair the functioning of the control.

As it is of such importance that the shock dampers and also the governor casing should be maintained always full of oil, evidence of undue leakage should at once be reported to Rolls-Royce Ltd.

Rear Shock Damper Connections. All joints of the damper connections are lubricated from the centralised chassis oiling system, as described in Chapter I. and illustrated in Fig. 2.

The ball joints are spring loaded and self-adjusting, and should need no attention between general overhauls of the chassis.

Stabilisers. In order to reduce the tendency of the car to "roll" on corners, a steel, torsion-rod stabiliser is provided at each end of the chassis. That at the rear forms a coupling rod between the two shock dampers and extends across the frame just in front of the fuel tank.

The front stabiliser is carried in rubber bearings and is coupled to the wheel mountings by links with rubber pads.

No attention is necessary.

Rear Road Springs. The forward ends of the rear springs are pivoted to the frame by means of special rubber bushes requiring no lubrication.

The shackle pins at the rear ends are of the threaded type and are lubricated from the chassis lubrication system. The advantage of

threaded bearing pins is that they do not develop end-play as the result of wear.

The springs themselves are encased in leather gaiters, and, by means of a special arrangement of oil holes and grooves in the leaves, the ends of the three longest leaves of each spring are lubricated by surplus oil from the eye of the master leaf.

Owing to this arrangement, in combination with absorbent material inside the gaiter, the springs are entirely self-lubricating and remain free from squeaks.

It is advisable occasionally to inspect the bolts which secure the springs to the axles to see that no nuts have worked loose.

When doing this it is not sufficient merely to satisfy oneself that the split cotters are still in position. The nuts should also be tested with a spanner. If any be found loose, the cotter must be removed before tightening.

After tightening, the nuts must be refitted with split cotters.

CHAPTER IX.

Water Cooling System.

Water Pump—Water Pump Gland—Overheating—Radiator Shutters—Radiator Mounting—Water Level—Mascots—Frost and Anti-freeze Mixtures—Fan.

Water Pump. The centrifugal water circulating pump is situated on the left-hand side of the engine, being driven from the rear end of the dynamo. A section of the packing gland is shown in Fig. 28.

A special double packing gland is provided, which is designed to facilitate lubrication, and thereby reduce wear and also the possibility of leakage.

A screw-down greaser, **A**, is fitted for lubricating this gland and the pump bearings. It should be filled one-third full of water pump *grease* every 5,000 miles, as directed on page 32, and screwed right down, preferably when the engine is warm.

Water Pump Gland. Referring to Fig. 28, the gland packings, **B** and **C**, are separated by the rings, **D** and **E**, which telescope into one another and are pressed apart by the coil spring, **F**. The latter maintains pressure on both portions of the packing, thereby automatically taking up wear and bedding down of the packings, and rendering the gland self-adjusting.

In the course of erection, a washer, **G**, is fitted under the shoulder of the gland nut, **H**, to limit the extent to which it can be tightened up, and, during testing of the chassis, the nut is followed up as far as this washer permits. Thereafter, the spring, **F**, is relied upon to maintain water tightness.

It is improbable that any leakage or other trouble will be experienced over long intervals of running, provided always that the gland be properly and regularly lubricated, as instructed on page 32.

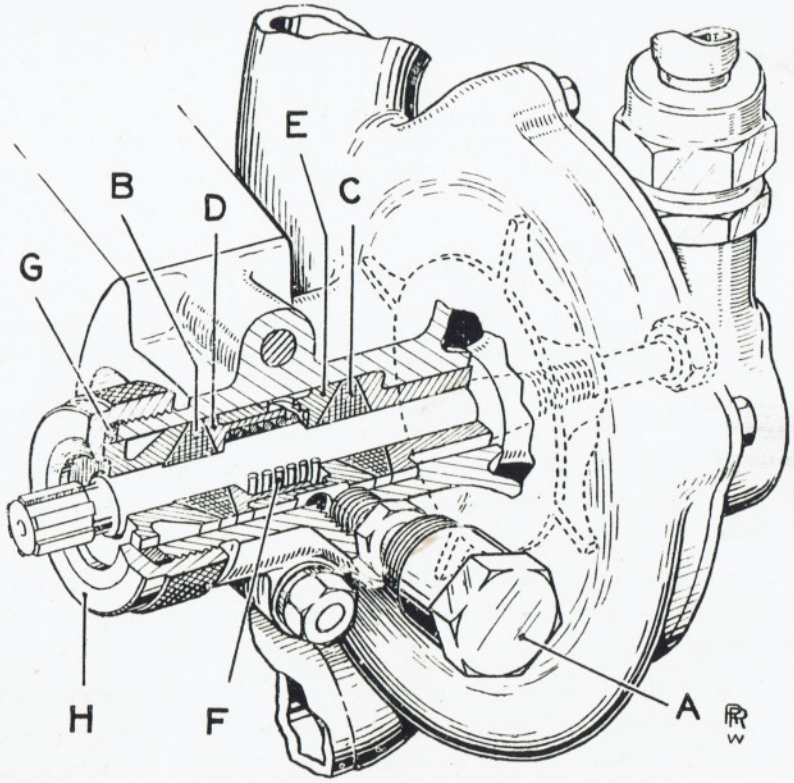

FIG. 28. SECTION OF WATER PUMP GLAND.

Overheating. Overheating may be due to one or more of the following causes :—

(*a*) The thermostat may have failed (see opposite page).
(*b*) The shutter mechanism may be jammed.
(*c*) The fan belt may need adjustment (see page 99).
(*d*) The continued ascent of a long steep gradient under adverse circumstances at full throttle and too high a gear. There will be less tendency to overheating if the gear be changed to the next lower and the throttle opening be reduced.
(*e*) There may be shortage of water in the system.
(*f*) The bonnet ventilators may require to be opened. (See following paragraphs.)

Radiator Shutters. The thermostat which operates the radiator shutters is shown at **J**, below. It is arranged to maintain an average water temperature of approximately 75° to 85° C.

Reference to the instrument board thermometer will indicate that the thermostat is operating correctly and that there is no shortage of water.

Hand-operated ventilators are provided on the sides of the bonnet which should be left open in hot weather.

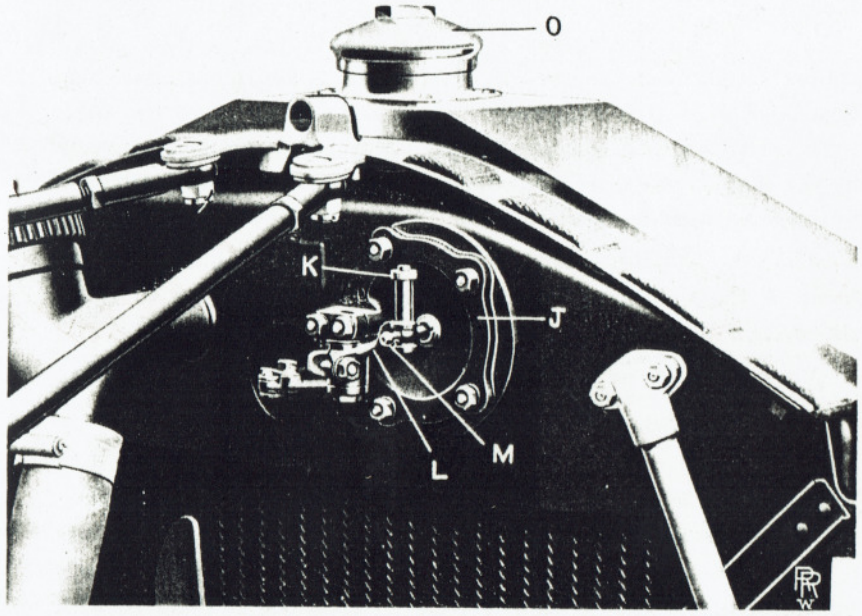

FIG. 29. THERMOSTAT CONTROL OF RADIATOR SHUTTERS.

In the event of faulty operation of the thermostat, the latter may be disconnected from the shutters. This is effected by raising the spring-loaded pin, **K**, and disengaging the end of the lever, **L**, from the thermostat rod. A knob, **M**, is provided to facilitate re-engagement.

The shutters may then be pushed open by means of the lever, **L**. They must not be moved by direct hand-operation of the shutters themselves.

If the pin, **K**, should be disengaged for any reason when the thermostat is in correct working order, it will be difficult to re-engage with the system cold. Engagement will be facilitated, however, if the engine be first warmed up to a temperature at which the shutters would normally commence to open.

The joints of the shutter control mechanism and the bonnet ventilators should be lubricated with the oil can every 5,000 miles, as directed on page 32.

Radiator Mounting. The radiator comprises two main units, namely, the outer shell and the radiator matrix itself, the complete assembly being mounted on a single central rubber support, and secured by two diverging tie rods to the dash-board. The shell is diagonally braced and connected to the wings by tubes which carry the headlamps. The radiator matrix is secured in the shell at three points, which are arranged to provide freedom for expansion under heat.

The object of this special construction is to avoid sideways movement of the radiator assembly due to road shocks, and to isolate the matrix from such shocks.

No lubrication or attention is necessary in connection with the mounting.

Water Level. The radiator filler is located under the left-hand side of the bonnet, as shown at **S**, in Fig. 30. Owing to its location on the return pipe from the engine, a warning notice is impressed on the cap to the effect that it must not be removed when the engine is running. Hot water is likely to be forced out in such circumstances.

There is sufficient water in the system as long as the level is visible through the filler spout when the engine is hot. Clean, preferably soft, water should be used.

The cap, **O**, Fig. 29, is a dummy, and the screwed fitting may be used if desired to carry a mascot of the approved type, as mentioned on the following page.

A drain tap is situated on the pipe connecting the pump with the bottom of the radiator. It is in the off position when the handle points downwards.

On no account must any strong alkaline compound be used to clean out the water system. Several such compounds are available, but their use must be carefully avoided, owing to the fact that they have a detrimental chemical action on aluminium.

Mascots. A heavy or cumbersome mascot should not be carried on the radiator cap, as it is liable to cause damage to the top of the radiator shell.

A special mascot of a distinctive type, and designed exclusively for use on Rolls-Royce cars, can be obtained at an extra cost on application to the makers.

Frost and Anti-freeze Mixtures. When there is any likelihood of the car being exposed to a temperature below freezing point, the cooling system should be drained by opening the drain tap situated on the pump inlet pipe and releasing the filler cap.

Before attempting to turn the crankshaft for starting after exposure to frost, *hot water should be poured over the water pump* to thaw any particles of ice which may be present in the casing, and which would probably damage the impeller. Hot water should also be used for filling up the radiator.

Any of the following anti-freeze compounds may be used, viz., either ethylene glycol (" Bluecol ") or Price's " Zero," or di-ethylene glycol, mixed with soft water, the amount of compound used depending upon the lowness of the atmospheric temperature likely to be encountered.

The following table gives an approximate indication of the amount of frost protection ensured by different strengths of mixture :—

Freezing point	22° F.	12° F.	2° F.	−3° F.
Degrees of frost	10° F.	20° F.	30° F.	35° F.
Ethylene Glycol (" Bluecol ") ..	3½ pts.	5½ pts.	7 pts.	8 pts.
Price's " Zero "	4½ pts.	7 pts.	8½ pts.	9½ pts.
Di-ethylene Glycol	4 pts.	6½ pts.	8 pts.	9 pts.

If di-ethylene glycol be used, care must be taken not to splash it on wings or paint work, which it will injure.

When it is decided to use one of these mixtures, the system must be drained and the desired amount of compound thoroughly mixed with an equal quantity of soft water before being added to the radiator. The total capacity of the system being 22 pints, the radiator should then be topped up with soft water.

The rubber connections must be carefully examined and replaced if unsound, as any leakage will necessitate replenishment with anti-freeze mixture.

When using an anti-freeze mixture as described, a similar mixture should be used for topping-up purposes.

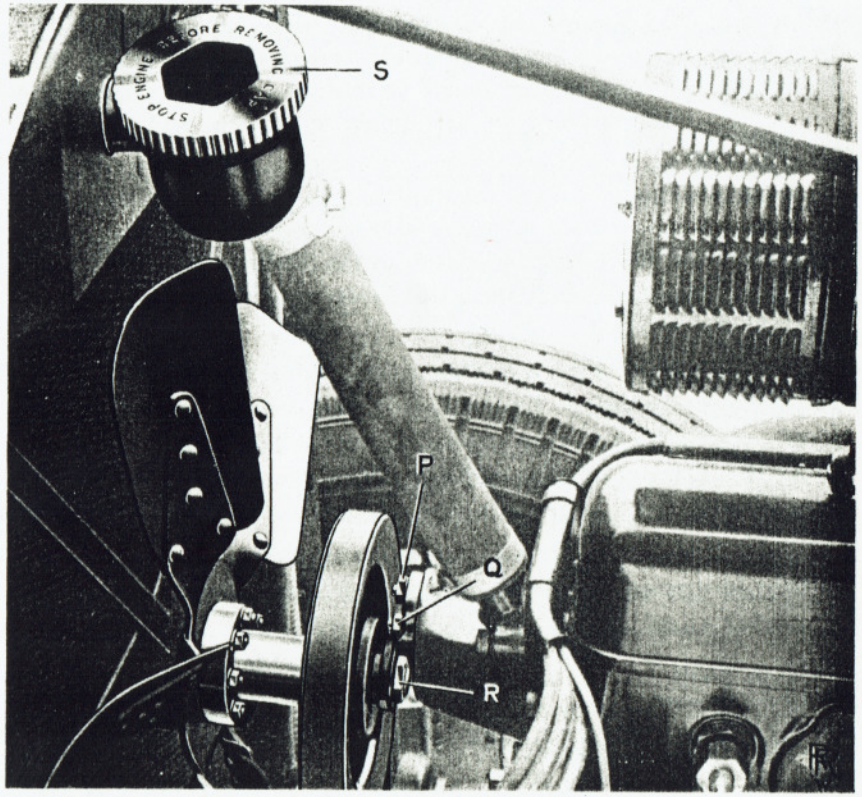

FIG. 30. FAN BELT ADJUSTMENT.

Fan. The fan and its bracket are shown in Fig. 30. The bearings of the spindle are packed with grease and require no attention between overhauls of the chassis.

Normally the belt should not require adjustment. An adjustment is provided, however, and is effected by releasing the two nuts, **P** and **Q**, and moving the bracket upwards by means of a spanner on the hexagon, **R**, operated from the left-hand side of the car. The tension should be such that the belt can be moved transversely, with the fingers, at a point equidistant from the pulleys, through a total distance of about $\frac{3}{4}''$.

If it should be necessary to remove the belt for any reason, it must not be strained over the pulley. The bracket itself must be removed by unscrewing the nuts, **P** and **Q**.

The fan must not be forcibly turned by hand as this will cause bending of the blades and may result in a damaged radiator.

CHAPTER X.

Electric Lighting, Starting, and Ignition Systems.

General—Dynamo—Output Regulator and Cut-out—Distribution and Fuse Box—Switchbox—Ammeter—Battery and Connections—Battery Ignition—Firing Order of Cylinders—Spark Plugs—Electric Horns—Electric Fuel Pumps and Gauge—Change-over Switch for Fuel Pumps—Additio of Electrical Apparatus—Starter Motor—Starter Motor Switch—Use of Starter Motor—Battery Discharge—Charging in Garage from External Source—Electrical Fault Location—Recommended Lamp Bulbs—Head Lamps.

General. The equipment comprises a dynamo, distribution box with fuses, automatic cut-out, automatic output regulator, switchbox, ammeter, a 12-volt, approximately 60-ampere-hour, accumulator in container, a starter motor with relay-operated switch, two electric horns with two-tone push-button switch at head of steering column, an electric fuel gauge, dual electric fuel pumps, and battery ignition, consisting of coil with ballast resistance, and combined low-tension contact breaker and high-tension distributor, and the necessary wiring encased in metal tubing. There is provision for the connection of additional accessory apparatus as later described. Provision is also made for a stop light and a reversing light.

Incorporated with the battery ignition is a governor, which effects automatic control of the battery ignition timing.

The instrument lights are controlled by a dimmer switch.

An inspection lamp is provided under the bonnet which has a plug for fitting to a combined socket and switch (Z and Z1, Fig. 33), mounted on the front of tlie dashboard.

The wiring diagram (Fig. 31) shows the units with their electrical connections, the various wires being indicated in colours to correspond with those of their actual coverings. The sizes of the wires are

rting, and

ms.

Cut-out—Distribution and
and Connections—Battery
Plugs—Electric Horns—
Switch for Fuel Pumps—
otor—Starter Motor Switch
Charging in Garage from
Recommended Lamp Bulbs

dynamo, distribution box
utomatic output regulator,
ximately 60-ampere-hour,
with relay-operated switch,
button switch at head of
al electric fuel pumps, and
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There is provision for the
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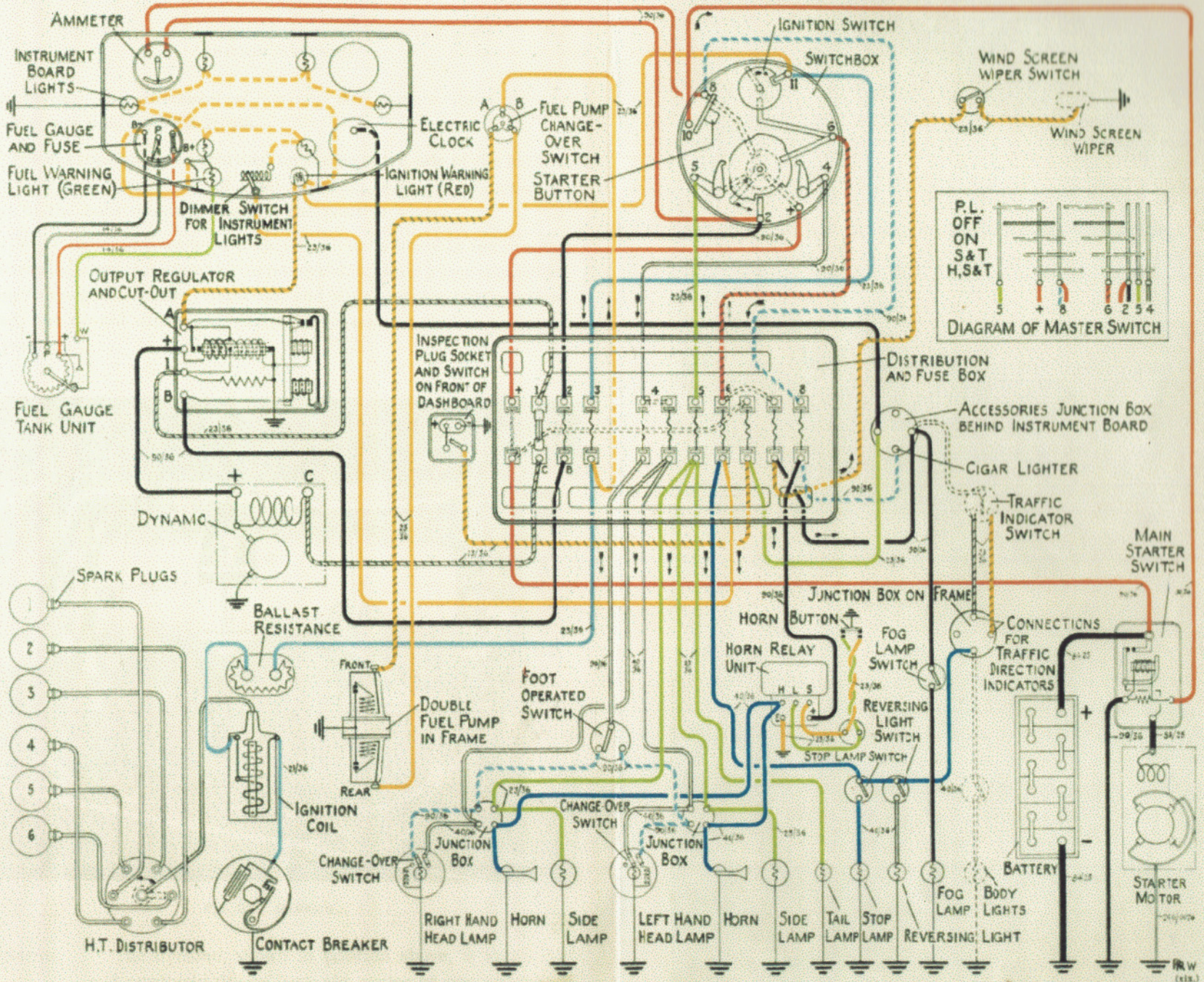


FIG. 31. ELECTRICAL WIRING DIAGRAM.

also given. The directions of current flow, where these do not reverse, are indicated by arrows.

The electrical system is earthed on the negative side of the battery to the chassis frame, and all hand-switching, with the exception of that of the horn relays, is done in the positive leads.

Before doing any work on a chassis which is likely to involve the electrical system, it is advisable to remove the chassis frame connection from the negative battery terminal, and so render the whole system dead, but do not disconnect whilst any charge or discharge current is passing.

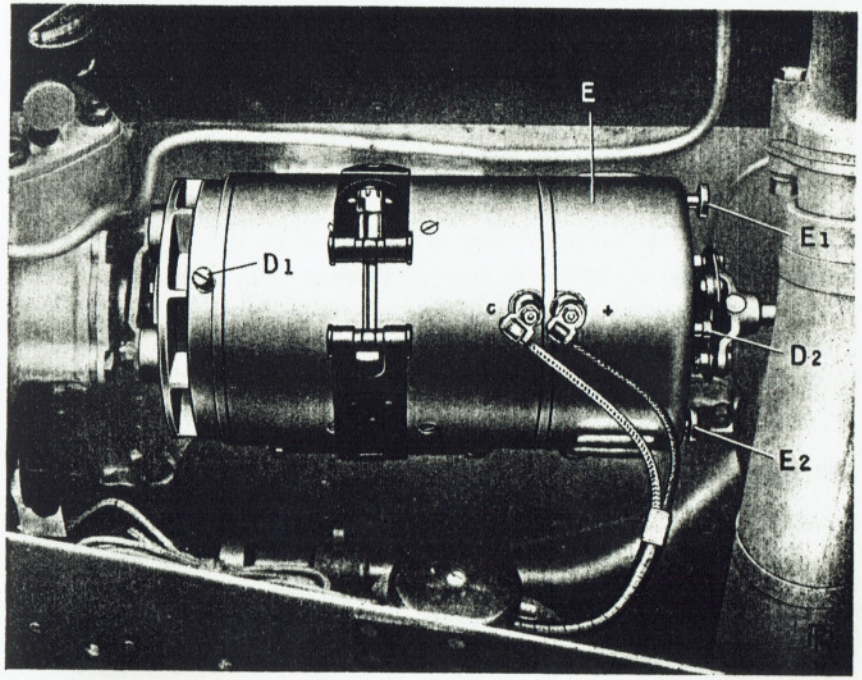


FIG. 32. DYNAMO.

Dynamo. The dynamo, shown in position above, is air-cooled and positively driven from the engine at one-and-a-half times engine speed. It is of the shunt-wound type, the excitation of the field being automatically regulated, in a manner to be described

later, in order to adjust the charge rate to suit the dynamo speed and the state of charge of the battery.

There are two external connections, the actual leads being coloured and the dynamo marked as follows :—

Lead.	*Colour.*	*Corresponding mark on Dynamo.*
Positive	Black	+
Field	Black and white ...	C

The other end of the field winding is connected to the positive brush, the negative brush being internally earthed to the dynamo carcase. The positive lead is taken to the correspondingly marked terminal of the output regulator, and the field connection to the No. 1 fuse terminal marked " C " in the distribution box.

There is a provision for lubrication of the bearings in the form of small oil cups, **D1** and **D2** (Fig. 32).

A little engine oil should be injected at each lubricator every 5,000 miles, as directed on page 32.

Every 10,000 miles, as directed on page 34, the end cover, **E**, should be removed by unscrewing the knurled nuts, **E1** and **E2**. This will expose the commutator and brushes, which should be inspected. Deposits of brush dust, moisture or oil should be suitably removed, and note taken of any appreciable wear of the brushes.

Cleanliness of the commutator and freedom of the dynamo brushes in their holders are the most important points in the maintenance of the dynamo.

Premature failure or excessive wear, however, indicates some definite fault in the machine, which should be returned for correction. In normal circumstances the brushes should last until the chassis is returned for general overhaul. In the event, however, of a new set of brushes being required, application should be made to Rolls-Royce Ltd.

The fitting of new brushes requires expert knowledge and care. Consequently, the work should be done by Rolls-Royce Ltd. Emphasis is laid on this point, as cases have arisen of faulty operation of the dynamo due to inexpert fitting of brushes.

When it is necessary to disconnect the wires to the dynamo, care must be taken to ensure their correct replacement, which is facilitated by the colouring and lettering adopted.

Output Regulator and Cut-out. The output regulator, **F**, Fig. 33, and cut-out, **G**, are located on the front of the dashboard and are shown with the cover removed. The output regulator operates to control the dynamo output by varying the field excitation in accordance with the speed of the engine.

The device consists of an electro-magnetically operated armature, the field of which is excited by two windings, a shunt and a series.

There are two sets of contacts, one of each pair being carried at either end of the armature. A light spring normally holds one set of contacts in engagement, and both windings operate to separate these contacts.

The series winding is on the main positive lead from the dynamo, and the shunt winding is connected virtually across the dynamo brushes.

When the dynamo speed is low, the spring-held contacts remain closed and connect the dynamo field windings direct across the dynamo, providing maximum charge rate. As the speed rises, the increased excitation of the shunt winding of the regulator separates the spring-held contacts and this causes a resistance, **H** (Fig. 33), to be included in the dynamo field circuit, which resistance was previously short-circuited by these contacts. The dynamo voltage will then fall slightly and allow the contacts to close again. This action is repeated rapidly ; the armature, in fact, vibrates, opening and closing the spring-held contacts.

Further increase of speed " breaks " these contacts for a longer period than it " makes " them until they cease to engage and those at the other end of the armature make contact. When this occurs the dynamo field becomes short-circuited, the excitation, and hence the output, ceasing. The resulting fall of dynamo voltage causes these other contacts to separate again, restoring the dynamo output by permitting limited excitation of its field through the resistance. This action is repeated rapidly and the armature vibrates as before, but this time on those contacts which are normally separated.

The charging current indicated on the ammeter is dependent on the state of charge of the battery, other factors—such as engine speed and consuming apparatus in circuit—being constant. If the battery is well up in charge, the rate of charge will be low; if low in charge the rate will be correspondingly higher.

In assisting the action of the shunt winding, as stated, the series winding of the regulator protects the dynamo against giving an excessive output at high speeds when the battery is very low in charge or the system is otherwise loaded. Under these circumstances, the series winding, being heavily excited by the main current, is able, with the reduced assistance from the shunt, to cause the spring-held contacts to separate and vibrate when a certain predetermined maximum dynamo output current is exceeded.

The regulator requires no attention, and no adjustment of any kind must be attempted.

If any defects in operation should develop, as described under "Electrical Fault Location" (page 116), which are traceable to the regulator, it must be detached bodily and returned to Rolls-Royce Ltd. for correction.

The cut-out or automatic charging switch, **G**, is operated when the dynamo speed rises high enough for the dynamo to be excited up to battery voltage, because its shunt coil is connected across the main terminals of the dynamo. This closes the cut-out contacts and so connects the dynamo positive terminal with the battery positive via the regulator, switchbox and fuses, as shown in the wiring diagram (Fig. 31). The return path of the current is through the chassis frame, both the battery and the dynamo negative terminals being earthed to the frame.

The series coil is so connected that, when carrying the charging current, it assists the shunt coil in holding the contacts firmly together.

When the dynamo slows down, and its voltage falls below that of the battery, the current reverses through the series coil, and the effect of the shunt winding becomes neutralised, which results in the contacts falling apart.

The automatic cut-out is carefully adjusted by Rolls-Royce Ltd.

in the first instance, and should only be touched in exceptional circumstances.

Distribution and Fuse Box. This unit is shown below with its cover removed. The fuses comprise three different kinds, easily distinguishable, as follows :—

(1) The emergency fuse, **J**, should be three strands of No. 28 S.W.G. tinned copper wire, and is only intended to be an emergency protection against dead earths on the wiring.

(2) The dynamo field fuse, **K**, of 4.5 amperes capacity, is of the cartridge type. A spare fuse, **K1**, is provided in the inside of the box cover.

(3) All the remaining fuses are one strand of No. 28 S.W.G. tinned copper wire.

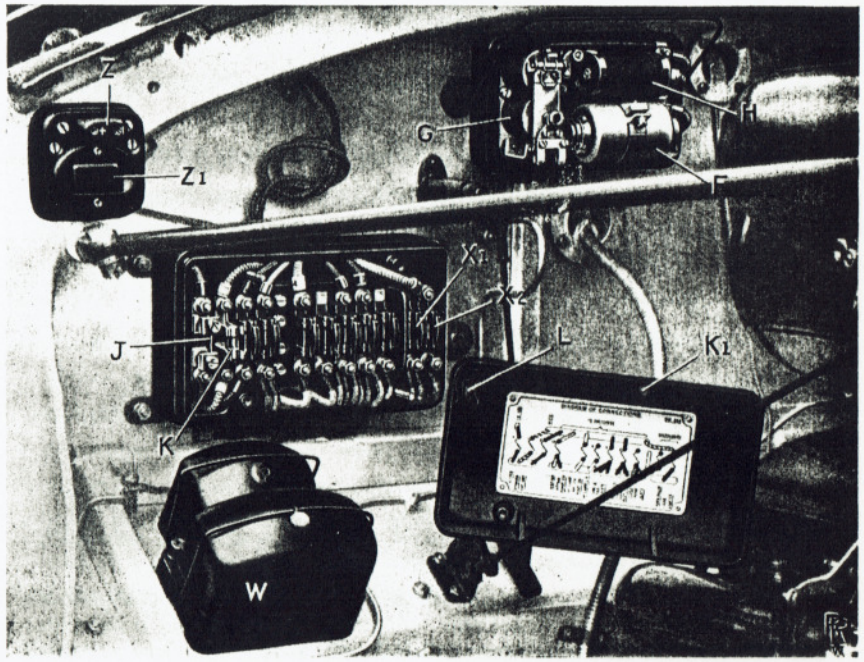


FIG. 33.
DISTRIBUTION BOX, OUTPUT REGULATOR AND CUT-OUT WITH COVERS REMOVED.

Spare wire of this gauge is provided on a reel, **L**, in the inside of the box cover.

The cartridge type dynamo fuse, **K**, affords protection to the

system in general, and the dynamo regulator and cut-out shunt windings in particular, in the event of the regulator failing and allowing the voltage of the dynamo to rise above normal.

Special care should be taken that all fuses are gripped firmly in their holders, as a loose contact may in itself cause the fuse to melt or prevent the dynamo from exciting.

Be certain particularly that the emergency fuse is in order.

Switchbox. Carried on the right-hand end of the instrument board, this unit includes :—

(*a*) Master switch and lamp switch combined.
(*b*) Ignition switch.
(*c*) Push-button switch for starter motor.
(*d*) A lock which can be locked and the key withdrawn either :—
(1) When the master switch is in the " off " position ; or
(2) When the master switch is in the " P.L." (" parking lights ") position.

No attempt must be made to lock the switch in other positions.

With the master switch in the " off " position, all accessories and lighting circuits, with the exception of the clock and inspection lamp socket, are rendered inoperative. Movement of this master switch to the " on " position renders these accessories available.

The various combinations controlled are clearly indicated, as follows :—

OFF.—All circuits off except that for clock and inspection lamp plug socket.
ON.—Accessories available.
S and **T.**—Side and tail lamps on and accessories available.
H, **S** and **T.**—Head, side and tail lamps on and accessories available.
P.L.—" Parking lights," side and tail lamps on, clock and inspection lamp socket on. (No reading is shown on ammeter and all other accessories are " off.")

A separate ignition switch is provided, marked **ON** and **OFF**. Normally, this switch can be left in the " on " position, and the switching to start and stop the engine can be carried out on the master switch.

No independent charge position is provided owing to the presence

of the output regulator. Whenever the master switch is on, connections are made which cause the dynamo to charge the battery through the regulator, as elsewhere described.

Operation of the push-button switch for the starter motor completes a relay circuit, which in turn causes the main starter switch to close.

Ammeter. The ammeter is an instrument with a central zero and 20-ampere range, a needle deflection to the right indicating Charge, and left Discharge.

Electrically, it is so connected as to indicate all current passing in or out of the battery, except the current required by the clock, the inspection lamp, the horns and accessories supplied through fuse No. 8, and the heavy current for the starter motor ; also, the current required by side and tail lamps with master switch in **P.L.** position. Thus the dynamo output, less the current required to operate the battery ignition, the fuel pumps and the fuel gauge, is exactly indicated if no other consuming apparatus be switched on. If lamps or other apparatus be on, the reading gives the balance in or out of the battery.

As already explained under " Output Regulator," the charge-rate varies in accordance with the state of charge of the battery. Consequently, no alarm need be felt if the charge indicated on the ammeter is quite small, especially after a considerable period of running with no extra consuming apparatus, such as lamps, in use.

This will probably indicate that the battery is well charged. Under these circumstances, switching on the head lamps may cause a discharge reading to be shown, but this will only occur for a short time, as the dynamo will quickly respond to the slight drop in battery voltage due to the discharge and readjust the output accordingly.

An unnoticed reversal of the ammeter connections causes the charge and discharge indications to be reversed.

Battery and Connections. (For detailed instructions concerning the battery as a unit, see the pamphlet inserted at the end of this book.)

The necessary care must be taken to secure clean and sound electrical connections of cable terminals to battery terminals. To clean terminals, use paraffin (not abrasives), and afterwards apply

lanolin, or, if this is unobtainable, pure vaseline should be used. To remove corrosion, use a solution of ammonium carbonate in the first instance, applying this with a rag.

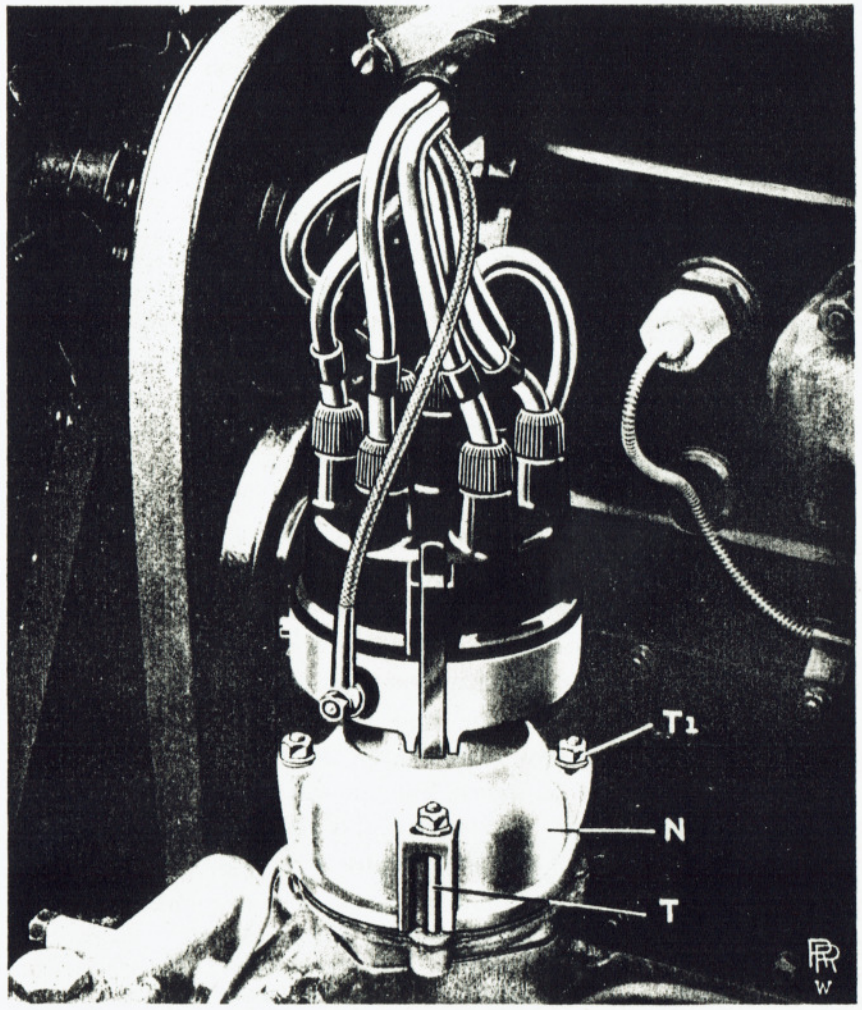


FIG. 34. CONTACT BREAKER AND HIGH-TENSION DISTRIBUTOR.

Battery Ignition. The battery ignition contact breaker and distributor are in a very accessible position, as shown above. A view of the rocker arm is given in Fig. 35.

A condenser, **U**, is connected across the contact points. The

insulated terminal of the condenser is connected to the insulated contact and forms the terminal for the main low-tension connection.

An oil hole, **M**, is provided for lubricating the ball bearing of the main spindle and also the centrifugal mechanism for controlling the timing which is contained within the casing, **N**, Fig. 34. One or two drops of thin oil should be injected at intervals depending upon the use of the car, as directed on page 31. At the same time, one

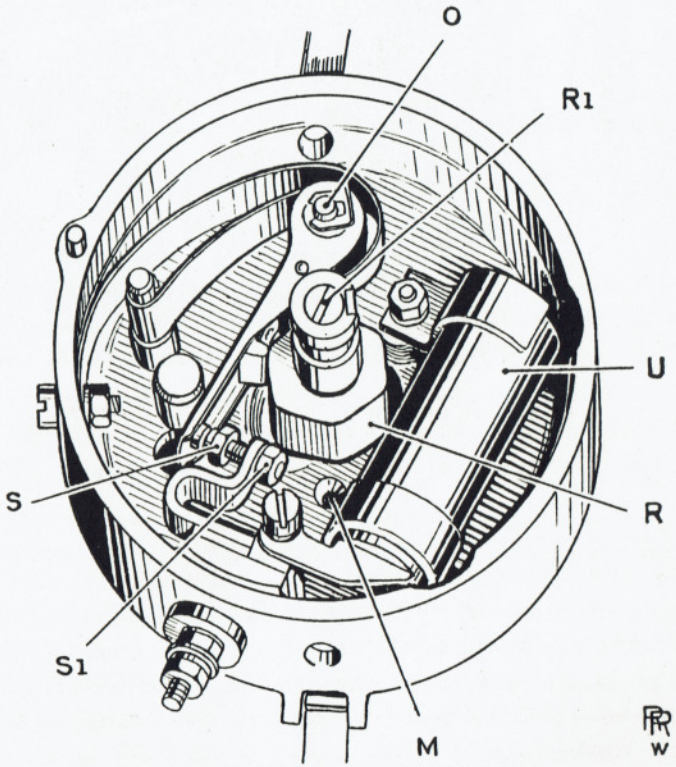


FIG. 35. LOW-TENSION CONTACT BREAKER

drop of oil should be applied to the pivot pin, **O**, of the rocker arm, and a trace of grease smeared on the cam, **R**.

The oil injected at hole, **M**, serves in addition to maintain an oil seal at the base of the ignition tower to protect the contacts from oily vapour from the crankcase, which is liable to cause pitting. For this reason, it is important, when lubricating the parts mentioned,

to do so sparingly and with care, in order to avoid the possibility of lubricant ultimately reaching the contacts.

The high-tension distributor requires no attention beyond an occasional wiping of the interior with a clean, dry rag.

Two coils are situated on the other side of the engine, as shown at **P** and **Pr** respectively, in Fig. 36, one only being in use and the other being provided as a stand-by. The change-over is effected by transferring the two low-tension wires and the one high-tension wire to the other coil.

A ballast resistance, **Q**, Fig. 36, is connected in series with the low-tension winding of the coil. Its function is to limit the current taken by the coil at low speed, or if the ignition accidentally be left on while the engine is stopped. It also secures practical equality of intensity of secondary spark at all speeds.

The outsides of the coil casings should be kept clean. Misfiring is occasionally caused by an accumulation of dirt around the terminals and on the coil casings.

The correct gap for the contact points when the heel of the rocker arm is on a peak of the cam is from .017″ to .021″. Adjustment is effected by releasing the locknut, **S1**, and turning the contact screw, **S**.

Two adjustments are provided for resetting the ignition timing in the event of this having been disturbed, namely, a coarse adjustment between the cam, **R**, and the taper spindle on which it fits, and a fine adjustment by the provision of slotted holes for the studs, **T**, Fig. 34, which secure the casing to the engine crankcase. These slotted holes permit rotational adjustment of the casing on the crankcase. Timing is effected by reference to the marking on the clutch casing and flywheel, which can be seen on removal of the clutch pit cover.

Owing to the fact that a friction-damped spring drive is used for driving the valve gear and all auxiliaries, and that the starting handle operates to turn the crankshaft through the medium of this spring drive, it is important that the crankshaft be rotated for timing purposes from the flywheel end. Also, the starting handle should not have been used at all since the engine was last running.

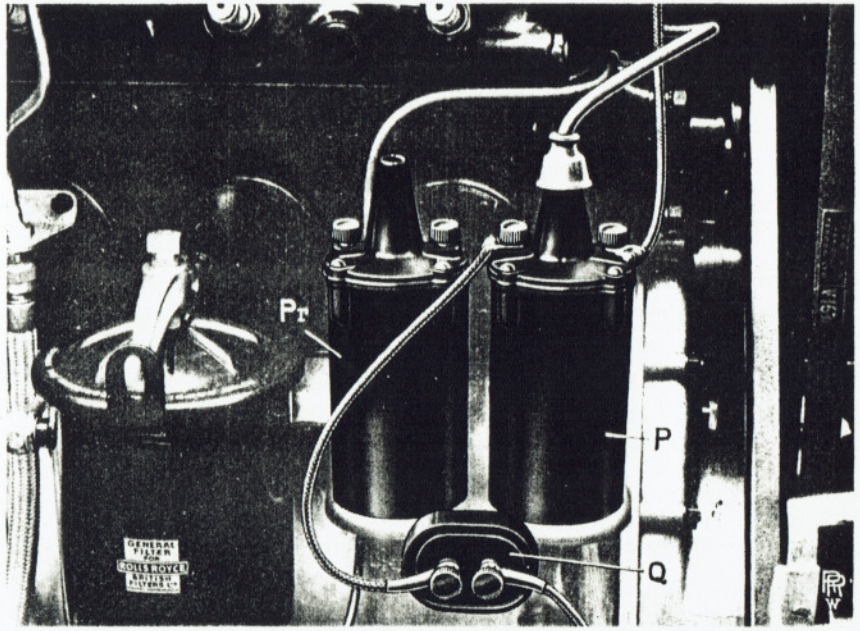


FIG. 36. IGNITION COILS AND BALLAST RESISTANCE.

To carry out the operation of retiming, the crankshaft should first be turned until the mark " IGN " on the clutch casing registers with the pointer when No. 1 piston is at the top of its firing stroke.

The contact breaker cam, **R**, should next be placed on the tapered end of its shaft so that a peak is about to lift the rocker arm when the shaft turns in its normal direction, namely, anti-clockwise, while, at the same time, the high-tension rotor is opposite No. 1 distributor contact. Screw, **R1**, securing the cam may then be tightened.

The best method of determining precisely when the contact points separate is by reference to the ammeter. The four nuts, **T1**, should therefore be released for final setting and, with the ignition switched on and someone watching the ammeter, the distributor head should first be turned anti-clockwise as far as the slotted holes permit and then slowly turned clockwise (i.e. in a direction opposite to that of normal movement of the cam) until the required cam peak just

breaks the contacts as indicated by the reading of the ammeter. Nuts, T1, may then be finally tightened.

If it should be found impossible to secure the required " break " in this manner, then that is an indication that the cam, **R**, requires to be more accurately set upon its shaft, in order to bring the " break " within the range of movement permitted by the slotted holes.

If it should be necessary to remove the complete distributor, the four nuts, T1, should be removed, when the head may be lifted out.

The base of the spindle carries a tongue which engages a slot formed by leaf springs on the driving shaft. It is therefore possible to re-engage the tongue with the shaft 180° from its correct position. Such an error can be avoided by observing that the high-tension rotor points inwards towards the engine, i.e. towards No. 1 distributor contact, when engaging the drive, No. 1 piston having been set on the top of its firing stroke, as explained.

Ignition timing variation during running is entirely controlled by the centrifugal governor mechanism referred to no hand control being provided.

A small casing on the dashboard, marked 'Ignition Spares", contains a spare low-tension rocker arm, complete with springs and contact point, and also a spare contact screw.

Firing Order of Cylinders. The firing order of the engine is 1, 4, 2, 6, 3, 5, No. 1 being the front cylinder.

Spark Plugs. The spark plugs are 14 m/m. They should be removed and cleaned every 5,000 miles, and the width of the gaps checked, as directed on page 33. These should be .025".

Electric Horns. Two tuned, wind-tone horns are provided, operated through a sealed relay, **W**, Fig. 33, mounted on the front of the dashboard.

The horn button over the steering-wheel, is marked **Loud** and **Soft,** pressure on one side or the other controlling the intensity of the sound emitted.

No adjustments should be attempted. In the event of derangement, or deterioration of the tone, Messrs. Rolls-Royce Ltd., or one of their Service Depots, should be consulted.

Electric Fuel Pumps and Gauge. Pamphlets concerning these units are inserted at the end of this book.

Reference to the wiring diagram (Fig. 31) will show that they are supplied with current through the ignition switch, consequently are only operative when this switch is closed.

To indicate that fuel replenishment is necessary, a green warning light on the instrument board comes into action when the petrol level falls to about 2½ gallons.

Change-over Switch for Fuel Pumps. In addition to the ignition switch which switches on the pumps, a change-over switch is arranged on the instrument board in order to provide a means of checking that each half of the double fuel pump is operating correctly, as explained on page 23.

Addition of Electrical Apparatus. If current-consuming apparatus be fitted additional to that provided on the chassis, this must only be connected to the system at the points specially provided for the purpose. Connection at other points may overload a fuse and cause it to blow or be attended with risk of damage to the added apparatus and wiring in the event of a short-circuit on the new system, or may even expose the whole car to risk of fire.

The special points provided for the purpose are the two fuses, X1 and X2, Fig. 33, marked " Accessories " in the distribution box, or the accessories junction box fitted behind the instrument board.

If a cigar lighter be installed, this should be connected to No. 8 fuse, X2, or to the point fed by this fuse in the junction box.

All other additional apparatus should be connected to fuse, X1, or the point fed by this fuse in the junction box.

Starter Motor. The starter motor is shown at **Y** below. A small planetary reduction gear is arranged in a casing behind the motor, the effect of which, in combination with the flywheel gear, is to provide a total reduction gear ratio between motor and crankshaft of 16.1 : 1.

A plug, Y1, in the side of the gear casing should be removed every 5,000 miles, as directed on page 32, and engine oil injected until it

reaches the mouth of the plug orifice. The oil so injected also lubricates the driving end bearing of the armature shaft.

Ordinarily, the brushes will last a very long time. In the event, however, of replacements becoming necessary, application should be made to Rolls-Royce Ltd.

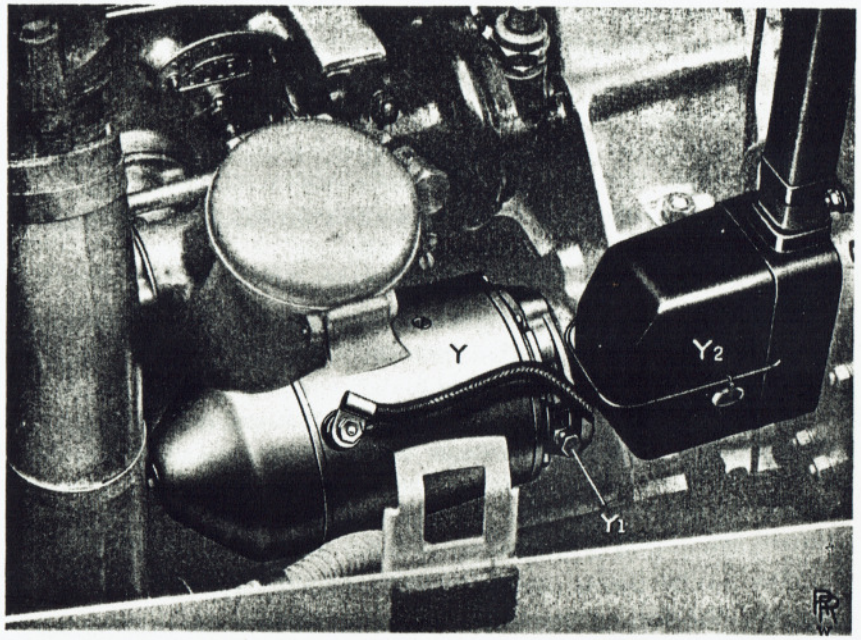


FIG. 37. STARTER MOTOR AND SWITCH.

The fitting of new brushes requires expert knowledge and care. Consequently the work should be done by Rolls-Royce Ltd. Emphasis is laid on this point, as cases have arisen of faulty operation of the motor due to inexpert fitting of brushes.

When replacing the starter motor in the chassis, it is important to be sure that clean and sound electrical connection of cable to motor is re-obtained, owing to the heavy current which this has to carry. This also applies to electrical connection of the motor carcase to the crankcase.

Starter Motor Switch. The main starter switch, Y_2, Fig. 37, is mounted on the front of the dashboard, and is relay-operated. Closing of the push-button switch on the instrument board energises an electro magnet which closes the main contacts.

In order to protect the main copper contacts from damage due to sparking, auxiliary carbon contacts are provided to take the break. These make contact first and break last.

No attention should be necessary to the switch between general overhauls of the chassis.

Use of Starter Motor. Careless use of the starter will reduce the life of the battery, whereas careful use will make very little difference to that life. That is to say, the heavy motor current is not detrimental to a healthy, charged battery—it only becomes detrimental to a cell which for any reason is low in charge, density or voltage. Several dozen starts may be made on a fully-charged healthy battery without detriment. On the contrary, it is very important, if the engine does not start reasonably quickly, to look for the cause rather than continue to use up the battery output, with the risk of damage to one or more cells, remembering that the battery may not always be fully charged at the time.

If the starter appears to be sluggish in its action, and such sluggishness is traceable to the battery, no further attempt should be made to use the starter until the battery has been duly inspected and fully charged in accordance with subsequent recommendations.

Battery Discharge. Care should be taken to avoid an inadvertent discharge of the battery.

Such a discharge may occur if there is an earth in the wiring system, instruments or fittings, or if the ignition switch be left on in error and the engine happens to come to rest with the low-tension contacts in engagement. Provision is made for the latter contingency by the red warning lamp which will remain illuminated until the ignition switch be turned off.

It should be made a practice, when taking leave of the car, always to observe that the warning lamp is not illuminated, that no switches are left on, and that no discharge is shown on the ammeter.

Charging in Garage from External Source. It is possible to charge the battery in position on the car, making use of a flexible lead and two-pin plug, which fits the inspection plug socket, **Z**, Fig. 33, the latter being switched on by means of switch, **Z1**. The socket holes are marked + and − respectively, and, in addition, are made of different sizes in order clearly to distinguish them. The master switch should be left **OFF.**

Be certain that the direction of current is correct. In the absence of experience, or in any uncertainty, an electrical expert should be consulted.

Where it is a frequent occurrence for the car to be parked for long periods in the dark, small consumption side lamp bulbs should be used, i.e., bulbs of 4 watts only.

In the event of the battery becoming completely discharged due to a circuit having been left on by accident, it would be advisable to charge the battery from an external source before using the car.

Where a suitable direct current supply is available it is recommended that it be made a rule to leave the battery on charge at trickle rate (about half an ampere) when the car is in the garage for any long period of time, as such a procedure will assist in keeping the battery in a thoroughly good condition. If the supply be alternating, a small capacity combined transformer and metal rectifier unit is especially suitable for this purpose. Care should be taken that the charging circuit be electrically sound and properly protected by a fuse.

(For full instructions concerning charging of the battery from a power source either on or off the car, refer to battery pamphlet inserted at the end of this book.)

Electrical Fault Location. An electric torch hand-lamp should be carried when much night running is being done, in addition to the inspection lamp which is connected to the socket, **Z**, Fig. 33.

In case of faulty operation, proceed to investigate as follows :—

(1) Failure of any part of the system separately may be due to a blown fuse in the distribution box.

(2) Failure or incorrect operation of the system may be due to the fusing of the emergency battery fuse (**J**, Fig. 33), due to an earth.

Repeated failure of a properly fitted fuse indicates a fault on the system.

If dynamo does not charge :—

(1) Ascertain whether dynamo or regulator is at fault by removing regulator cover and connecting terminal **I** to earth, and terminal **A** to +. This will short-circuit the regulator. Then start engine gently and increase speed slowly. If dynamo is in order, the output will be delivered and the defect will lie in the regulator or cut-out.

Alternatively, test dynamo by disconnecting both main terminals, + and **C**, connect **C** to earth and connect inspection lamp terminals across dynamo terminals, gently speed up engine, and if dynamo is in order lamp will light.

(2) Dynamo brushes may be sticking, due probably to oiliness. Clean brushes and holders with rag moistened with petrol.

(3) Cut-out contacts may be burnt or sticking.

(4) Inspect field fuse No. 1 and armature fuse No. 2, in distribution box.

If dynamo output is low, this may be due to battery being fully charged, but if low with lights on, i.e., ammeter indicates an abnormal discharge, the regulator may be sticking in such a manner as permanently to insert the field resistance.

If dynamo gives an excessive charge and blows fuse (No. 2) when speeded up, this may be due to regulator sticking or to a break in the regulator shunt coil circuit. Check regulator wiring connections.

In the case of defective operation which is traceable to the regulator, the unit must be removed and returned for rectification to Rolls-Royce Ltd.

If, with the fuses intact, and the lights in order, the ignition :—

(*a*) Misses.

(1) First confirm right condition of sparking plugs.

(2) Assure correct condition of contact breaker points, and adjust gap .019″ to .021″, if necessary.

(3) If missing still continues, test ignition circuit as below.

(4) Dirty ignition coil casing. (See page 120.)

(*b*) Fails.

(1) With battery ignition switched on, see by ammeter, while engine is cranked, that coil is taking current intermittently. If no current, test availability of battery voltage on ballast resistance terminals then at coil terminals.

If, with battery in order, starter motor is sluggish or does not turn, examine commutator and brushes. Clean oily brushes and holders with a rag moistened with petrol. If motor turns without turning engine, check freedom of engine with starting handle. If found in order, trouble probably lies in Bijur drive and Rolls-Royce Ltd. should be consulted.

If battery will not retain charge :—

(1) Ascertain that no circuit is left switched on.

(2) See that no cell of the battery leaks acid.

(For further notes concerning the battery, see instruction pamphlet at the end of this book.)

Recommended Lamp Bulbs.

Head lamps (Lucas R.100 type)—12 volt, 48 watt, XHE Osram "V" filament, shadow etched (Large Bayonet Cap).

Side and tail lamps—12 volt, 6 watt, S.C.C.

Stop lamp and reversing lamp—12 volt, 24 watt, S.C.C.

Instrument lights and warning lights—16/18 volt, 3 watt, M.E.S.C.

Inspection lamp—12 volt, 9 watt, S.B.C.

Direction indicators—12 volt, 3 watt, Lucas T123 Festoon.

Head Lamps. Both head lamps are fitted with dipping mechanism and each contains a change-over switch.

Operation of the foot switch will normally dip the **left** hand head lamp beam and switch off the **right** hand head lamp beam.

For Continental use, however, the change-over switch in each head lamp should be switched over. Operation of the foot switch will then dip the **right** hand head lamp beam and switch off the **left** hand head lamp beam.

CHAPTER XI.

Storage and Recommissioning of Cars.

1.—After jacking up both rear wheels, as directed in (3), run engine gently for a few minutes, with a gear engaged.

When engine is cold inject about two tablespoonfuls of engine oil through spark plug holes of each cylinder and turn crankshaft by hand a few times to distribute oil over cylinder walls.

2.—Crank engine over by hand once a week during storage. It must *not* be run under its own power.

3.—Jack up both axles to take all weight off tyres, using wood blocks or other suitable packing*. Do not deflate tyres, but cover up to exclude light.

4.—If any danger of freezing, drain water system. Otherwise leave water in.

5.—Drain all fuel from main tank, rear strainer and carburetter.

6.—Clean all bright parts and lightly smear with vaseline.

(*Note.*—In the case of parts having untarnishable finish, such vaselining is both unnecessary and undesirable.)

7.—Wash down and polish coachwork, extend hood in the case of an open touring car, and cover the whole with a light dust sheet.

8.—The storage place should be dry, well ventilated, and preferably heated.

9.—Remove battery and properly charge from an external source. Give a subsequent freshening charge from an external source every four or five weeks.

* A jacking pad is provided on the centre of the front suspension "pan".

If the storage period is likely to exceed three months, the engine crankcase and also the gearbox and rear axle should be drained and filled up to the correct level with a *pure mineral* oil, e.g. Vacuum "BB" or Wakefield's Aero "C." One of these oils should also be used for injecting into the cylinders under such circumstances.

Before putting the car into service again the following operations should be performed :—

1.—Drain engine crankcase and refill to correct level with *fresh* engine oil.

2.—Prime cylinders with engine oil.

3.—If previously drained, refill water system to correct level with clean, preferably soft water.

4.—If gearbox and rear axle have been filled up with a pure mineral oil, as directed for long period storage, drain and refill with correct oils.

5.—Run engine gently for a time after starting up.

6.—Remove and clean spark plugs.

Tanks should be completely drained when it is known that the car will be laid up for a period of *six weeks* or more.

Owing to the fact that motor spirits undergo deterioration with time, thereafter causing them adversely to affect inlet valves and the moving parts of the carburetter, it is undesirable to keep fuel tanks half-filled with fuel in a warm atmosphere such as a showroom or garage.

CHAPTER XII.

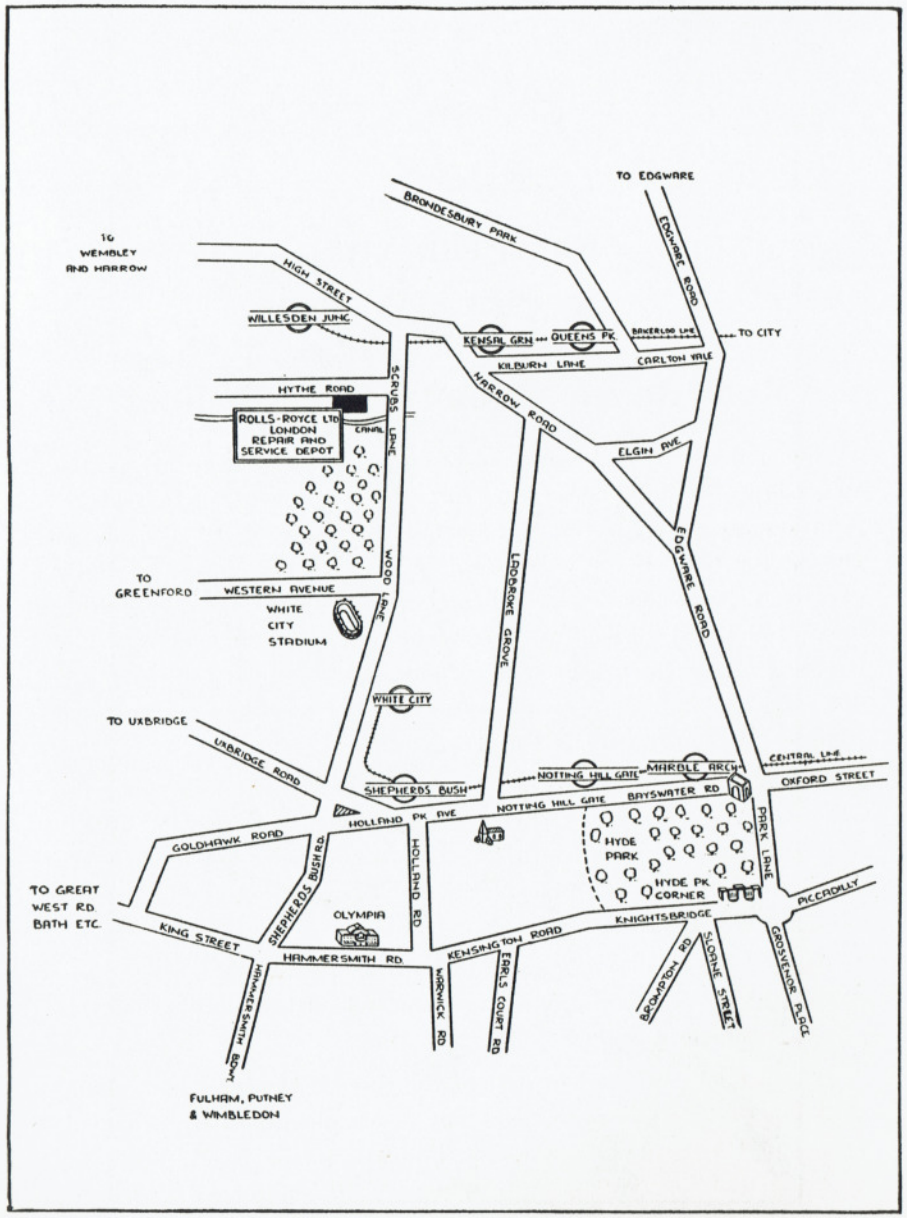
Rolls-Royce School of Instruction.

To enable the maximum satisfaction to be obtained from the ownership of a Rolls-Royce car, Instructional Courses of two weeks' duration are held on the maintenance of the Rolls-Royce chassis. During the Course, the mechanical features of the chassis are fully explained, particular emphasis being stressed on the points requiring lubrication or adjustment, at the same time instruction is given in the handling of the car on the road, where a high standard of driving is demanded. Suitable cars are maintained by the School for instructional purposes.

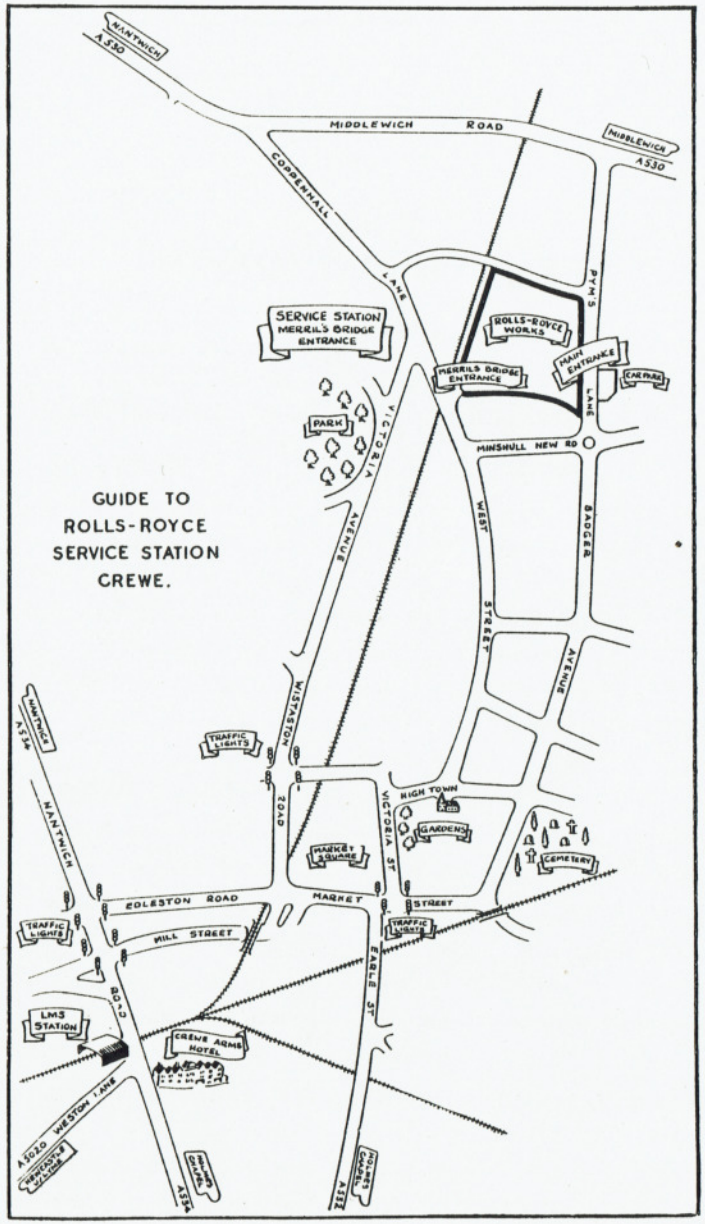
The Course is intended for chauffeurs who are undertaking the care of Rolls-Royce products for the first time, and also for drivers who have had previous Rolls-Royce experience on other models. In this latter case shorter periods can be arranged, although in most cases the full Course is desirable.

In the past, owner-drivers and/or members of their families have frequently attended the Courses with beneficial results, and suitable arrangements may be made by application.

The School is located in part of the Service Department building at Willesden. Further particulars may be obtained from the Principal, School of Instruction, Rolls-Royce Limited, Hythe Road, Willesden Junction, London N.W.10. (Telephone No. LADbroke 2444.)



GUIDE TO LOCATION OF MAIN SERVICE STATION.



GUIDE TO LOCATION OF CREWE SERVICE STATION.

INSTRUCTIONS

FOR THE CARE OF

DUNLOP WHEELS AND TYRES

ON THE

ROLLS-ROYCE 25/30 H.P. CAR

"WRAITH"

For the convenience of Rolls-Royce owners who use their cars on the Continent, the Dunlop Rubber Co. Ltd. supplies lists giving names of all Continental firms which carry stocks of Dunlop Tyres. Application should be made to the Dunlop Rubber Co. Ltd., Fort Dunlop, Erdington, Birmingham 24.

(8½ H)

(For Handbook No. XIX.)

Care of Dunlop Wheels and Tyres.

Wheel Hubs—Lubrication of Wheel Bearings—Tyre Equipment—Wired Tyres—Replacement Tyres—Spare Tyre—Handling of Wired Tyres on Well-base Rims — Fitting and Removal Instructions for Wired Type Tyres on Well-base Rims — Special Note — To Remove Tyre—To Fit Tyre—Care of Tyres—Inflation of Tyres—Cuts—Mileage and the Modern Tyre — Speed — Acceleration — Braking — Tyre Wear and Noise—Balancing the Road Wheels—Dunlop Service —Dunlop Service Depots.

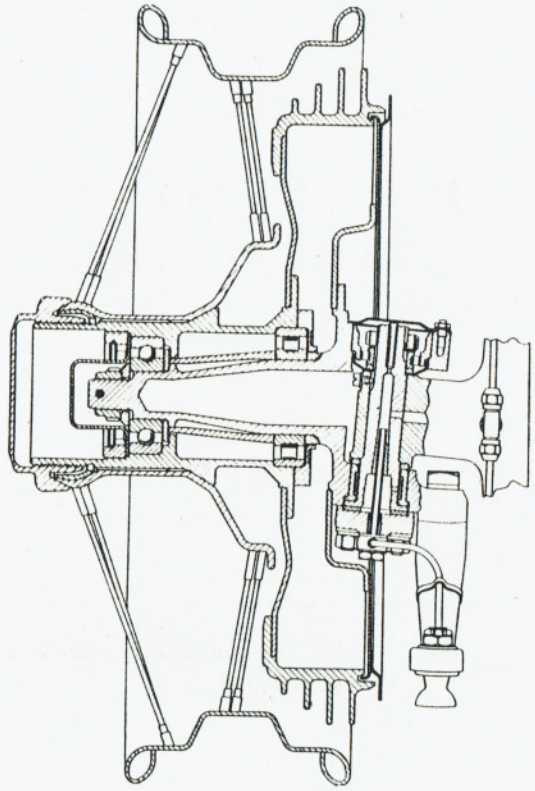


FIG. 1. SECTION OF FRONT HUB.

Wheel Hubs. Although the hub caps are designed to be self-locking, being provided with right-hand threads on the near-side wheels and left-hand on the off-side, on no account must they be permitted to run untightened, as this will cause irreparable damage to the serrations and screw threads.

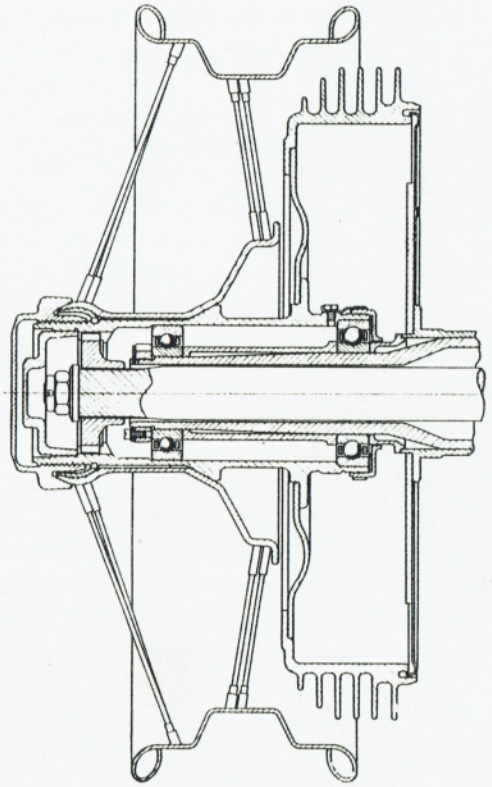


FIG. 2. SECTION OF REAR HUB.

In order to enable them to be thoroughly tightened with the special spanner and hammer provided, the engaging surfaces of both hub and cap must be well lubricated with grease, and must also be perfectly clean and free from grit.

Further, a wheel must be jacked up when its cap is being tightened in order to relieve the hub of the weight of the car.

Care must be taken when driving close to a high curb to avoid catching the projecting spokes of wire wheels. Very serious damage may thus be done to the wheel.

Lubrication of Wheel Bearings. The wheel bearings are filled with ball-bearing grease in the first instance, and should run a long period without attention.

Sections of the front and rear hubs are given in Figs. 1 and 2 respectively.

Tyre Equipment.

Wired Tyres. Wheels with 17″ well-base rims and Dunlop Fort "C" tyres, size 6.50–17, are fitted.

Replacement Tyres. When ordering new outer covers, specify Dunlop Fort "C" tyres.

With regard to inner tubes, it is only necessary to state the size and to mention "well-base." Tubes made for flat base rims should not be used.

Spare Tyre. Owing to the ease with which the wired tyres are removed and fitted, in combination with their large size and high quality, there is no necessity to carry more than one spare tyre, which will be fitted, of course, to the spare wheel. It is only necessary to carry as spares one or two inner tubes.

Handling of Wired Tyres on Well-base Rims. The Wired tyre and Well-base rim in conjunction with one another provide ease in the removal or fitting of a tyre not found in any other tyre and rim arrangement.

Fitting and Removal Instructions for Wired Type Tyres on Well-base Rims.

Special Note. Inextensible wires are incorporated in the edges of wired type tyres. Therefore, do not attempt to stretch the wire edges of the tyre cover over the rim edge.

Force is entirely unnecessary, and may be dangerous, as it merely tends to damage the cover edges and serves no helpful purpose.

Fitting or removing will be quite easy if the wire edges are carefully adjusted into the rim base; if it is not found to be easy, the operation is not being correctly performed.

To Remove Tyre. Remove all valve parts, and push both cover edges into the base of the rim at the part diametrically opposite the valve, then lever the cover edges near the valve over the rim edge.

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

A red spot on the outer cover wall indicates its lightest part, and the cover should be fitted so that the red spot is at the valve position.

Very slightly inflate the inner tube—do not distend it—place it in the cover, with the valve through the hole in the rim. (Take care that the valve, which is fitted in the side of the tube, is on the correct side of the rim.)

Fit the second edge of the cover, commencing at a point diametrically opposite the valve, and pushing the edge down into the base of the rim.

FIG. 3.

You cannot pull the cover edge at "A" over the rim edge until the cover edge at "B" is pushed off the rim shoulder "C" down into the well "D" then the cover edge at "A" comes over the rim easily.
Remember, the cover edges are inextensible—force will only damage the cover and cannot stretch the edge.

Small levers may be gently used to ease the last few inches over the rim edge.

Whilst inflating, see that the edges of the cover are seated evenly round the rim.

Care of Tyres.

Tyres constitute one of the biggest items in car maintenance. No other justification is necessary for emphasising the need for reasonable care in their selection and treatment.

It will be apparent, from the very nature of their service and constitution, that the influences governing their life are many and various—but almost invariably, be it noted, within the motorist's control, either wholly or in part.

The Dunlop Company would be only too happy to advise motorists on any problem or difficulty in connection with the use of tyres, and any enquiry addressed to any of the Company's Sales and Service Depots, or direct to the Supervisor of Service, Fort Dunlop, Birmingham 24, will receive prompt and careful attention.

Inflation of Tyres. The pressures for the 6.50–17 Dunlop Fort "C" tyres should be as follows:—

Front tyres, open and closed cars—25 lb. per sq. inch } when
Rear tyres, open and closed cars—30 lb. per sq. inch } cold

The nature of the materials used, and the method of manufacture, do not permit the production of tyres which are always perfectly balanced throughout the whole circumference.

Consequently, front tyre pressures must not be allowed to fall below 25 lb. per sq. inch, because any reduction may spoil the steering at high speed and will certainly render it heavy for traffic work, while the resultant increase of comfort will not be very noticeable to passengers in the rear seats.

The pressures being comparatively low, it is important that they should be carefully maintained if maximum tyre life is to be secured. It is therefore recommended that the pressure be tested weekly by means of a gauge applied to the valve stem orifice.

The Dunlop No. 1 pencil type gauge and the Schrader pressure gauge No. 5050 are suitable types of testers.

It is a practice with some motorists to reduce the inflation pressure when the tyres get hot through running, or in hot weather.

This is wrong, and tends to create the very condition it is desired to avoid, since the lower the pressure the greater the internal friction, and consequently the greater the heat developed in the tyre itself.

An extremely hot tyre is generally evidence of too little air pressure, and should be the signal for testing the inflation with a view to remedying the deficiency. Atmospheric conditions are best disregarded entirely since their effect is negligible.

Cuts. Any cut sufficiently deep to penetrate one or more plies of casing material is a menace to the whole structure, and, if neglected, will inevitably develop into a burst, the severity of which is out of all apparent proportion to the extent of the original damage.

The destructive processes are, however, easily explained. Practically any material manufactured from cotton—which is the basis of all tyre fabrics, however described—only retains its strength so long as it remains unbroken; if but two or three strands are severed, the material can be torn through with little effort.

This is actually what occurs in the case of tyres, which are subjected not only to the strains of running, but to the pressure of the inflated inner tube.

The actual burst, however, is delayed owing to the resistance of the unbroken plies of the material, and in all probability, if these are protected by repairing the exterior of the cover and reinforced by strengthening the inside, serious effects would be avoided. Unfortunately, however, in many cases water is allowed to penetrate through the cut to the casing, and rapid deterioration of the surrounding material, already weakened at this point, results in its eventually giving way.

Covers should be periodically examined, and all cuts, other than superficial ones, should be cleaned out and filled with Dunlop Tread Cut Filling, or similar material.

Severe cuts, particularly those which penetrate the casing as well as rubber, will necessitate more extensive repairs, and such work should be placed in the hands of thoroughly competent repairers.

Mileage and the Modern Tyre.

Scientific investigations of the actual effect of the following major factors have recently been made, and the results are surprising:—

Speed. Car-owners vary greatly in the speed at which they habitually drive. The rate of tread wear at 45 m.p.h. is double that at 35 m.p.h.

Acceleration. Many motorists like to make the most of the rapid acceleration of which modern cars are capable. The effect of this on tyre wear is not susceptible to accurate measurements, but it has been proved that wheel slippage is almost always set up, causing temporarily ultra-rapid tread wear due to abrasion against the road surface.

Braking. Some owners use their cars in far more congested districts than others, where constant braking is necessary, others are in the habit of using their brakes constantly—"driving on the brakes"—whereas yet others seldom use their brakes except in an emergency.

A test vehicle was run at 35 m.p.h. and stopped every quarter of a mile. This wore off half the tread rubber in 108 miles. The same car, driven at the same speed, but stopped every mile, wore off half the tread in 3,100 miles.

The rapid improvement in car performance during the past few years has brought these particular factors into prominence.

Tyre Wear and Noise. Covers which have been used on the rear wheels and subjected to violent braking should not be used on the front, because wear may have rendered the tread somewhat irregular.

If, when new tyres have been fitted to the front, and wheels and tyres have been properly balanced, and both tyres equally and correctly inflated, it is found that the steering then possesses undesirable characteristics, other covers should be tried if possible.

Dunlop Fort "C" tyres have been specially designed to give silence in running, while every effort has been made to retain the non-skidding properties of the tread to the fullest extent.

IMPORTANT.

Balancing the Road Wheels. It is most important, in view of the high speeds attainable, that the front road wheels should be properly balanced. Therefore it is necessary to have all wheels balanced and to rebalance a wheel after changing its tyre.

An out-of-balance effect is usually present in the complete wheel and tyre due to:—

(a) the valve and its patch on the inner tube; and

(b) unavoidable irregularities in the outer cover due to movement of the material during vulcanizing.

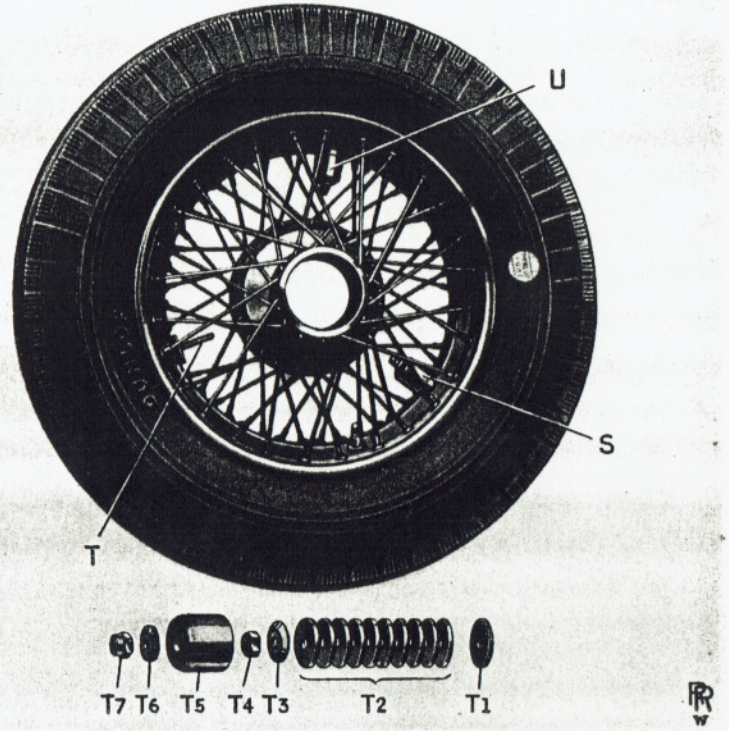


FIG. 4. WIRE WHEEL WITH BALANCE WEIGHTS.

A red spot on the outer cover wall indicates its lightest part, and the cover should be fitted so that the red spot is at the valve position.

To correct such out-of-balance, three bolts are provided, spaced at equal intervals around the wheel rim, as shown at **S, T** and **U** in Fig. 4, and each carries a number of lead washers, enclosed by a metal cover.

One of the bolts, **T,** is shown with its cover and washers dismantled. The parts are assembled on the bolt in the following order:—

1. Rubber washer **T**1, which acts as a seal against the ingress of water.
2. Lead balancing washers **T**2, up to ten in number on any one bolt.
3. Steel washer **T**3.
4. Nut **T**4 for retaining lead washers.
5. Cover **T**5.
6. Steel washer **T**6.
7. Cap nut **T**7, for retaining cover.

To balance a wheel, all the lead washers should first be removed from each bolt, the other parts being fitted as indicated above.

The front of the car being jacked up, the wheel must be turned gently and allowed to come to rest.

The lowest point of the tyre should then be marked.

The operation should be repeated, and if the original mark returns to the bottom position, one or more lead washers should be added to the bolt on the opposite side of the wheel.

If the mark made on the tyre is adjacent to the bolt, then one lead washer should be fitted on each of the other two bolts.

On the other hand, if no bolt should lie on the vertical centre line through the marked point on the tyre, the washers of the two bolts farthest from the mark must be altered; for instance, if the distance of one bolt from the centre line is approximately twice that of the other, two lead washers should be fitted on the bolt nearer to the centre line and one lead washer on the other bolt.

This process should be continued until the wheel will remain in any position in which it may be brought to rest, the number of lead washers being kept down to a minimum consistent with good balance of the wheel.

Dunlop Service.

It is the constant endeavour of the Dunlop Company to market mileage, not tyres.

The design of Dunlop Tyres is the result of years of scientific research by Dunlop technical experts in half a dozen Dunlop factories throughout the world; the raw materials are drawn mainly from Dunlop Rubber Estates and Dunlop Cotton Mills, and their quality is rigidly controlled at every stage; lastly, the equipment of the Dunlop factories is the last word in modern and efficient labour-saving machinery.

Users of Dunlop Tyres have, therefore, a right to expect every satisfaction from the Company's products; any user who considers that he has not obtained the utmost value for his money is earnestly requested in his own interests to inform the Company, so that an investigation can be made. It is the universal experience of all tyre manufacturers that a considerable proportion of premature failures is due in some way to the conditions of use and not to the tyres themselves; thus it is necessary to discover and remove the cause of the unsatisfactory service, otherwise the trouble is likely to continue with other tyres.

A fully equipped Service Department is maintained at all Dunlop Depots, staffed by tyre experts who have at the same time an intimate knowledge of the user's requirements. Through this organisation, the wide experience of the Dunlop Company on tyre and wheel problems of all kinds is always at the disposal of motorists entirely without cost or obligation. Application can be made personally or by letter to the Supervisor of Service, Fort Dunlop, or to any of the Service Depots detailed on the next page, and all motorists can rely on receiving courteous attention and practical help on any matter they care to raise.

DUNLOP RUBBER CO. LTD.

Service Depots.

FORT DUNLOP, BIRMINGHAM 24.

Telephone: ERDINGTON 2121 (P.B.X.) *Telegrams:* "DUNLOPS PHONE BIRMINGHAM"

DEPOTS.

ADDRESS.	TELEGRAMS.	TELEPHONE.
ABERDEEN: 52-60 Leadside Road.	*Pneumatic Phone Aberdeen.*	Central 3474
BELFAST: Dunlop House, Upper Arthur St.	*Pneumatic Phone Belfast*	24866
BIRMINGHAM: Dunlop House, Livery Street, 3.	*Dunlopdum Phone Birmingham.*	Central 8585
BRISTOL: 150 Temple Street, 1.	*Pneumatic Phone Bristol.*	22366
CARDIFF: Penarth Road.	*Pneumatic Phone Cardiff.*	8241
COVENTRY: 15 Queen Victoria Road.	*Pneumatic Phone Coventry.*	2166
EDINBURGH: 4-8 Canning Street, 3.	*Inflator Phone Edinburgh.*	23232
GLASGOW: 48-60 North Wallace Street, C.4.	*Pneumatic Phone Glasgow.*	Bell 1412
LEEDS: York Place, 1.	*Pneumatic Phone Leeds.*	29701
LEICESTER: St. Mary's Mills.	*Pneumatic Phone Leicester.*	Westcotes 34231
LIVERPOOL: 24 Cornhill, Park Lane, 1.	*Inflator Phone Liverpool.*	Royal 6140
LONDON: Dunlop House, 1 Albany St., N.W.1.	*Inflator Phone Norwest London.*	Euston 3434
(DEPOTS FOR SOLID AND GIANT PNEUMATIC TYRES): 120 Wicklow Street, W.C.1.	*Inflator Phone Norwest London.*	Terminus 1074
13 Britannia Street, King's Cross, W.C.1.	*Dunlopdum Brixton London.*	Brixton 6416
159 Acre Lane, Brixton, S.W.2.	*Dunrubco Green London.*	Tideway 2451
94 Greenwich High Road, S.E.10.	*Inflator Phone Manchester.*	Ardwick 3361
MANCHESTER: 12 Ardwick Green South, Ardwick.	*Inflator Phone Newcastle.*	21041
NEWCASTLE-ON-TYNE: College Avenue, near Armstrong College.	*Pneumatic Phone Norwich.*	2430
NORWICH: 99 Chapel Field Road.	*Pneumatic Phone Nottingham.*	40034
NOTTINGHAM: Dunlop House, 221-225 Lower Parliament Street.	*Dunlop Phone Plymouth.*	4146
PLYMOUTH: 14-17 Manor Street.	*Pneumatic Phone Sheffield.*	22192
SHEFFIELD: 21 Hollis Croft, Broad Lane, 1.	*Pneumatic Phone Southampton.*	3111
SOUTHAMPTON: 9-10 St. Mary Street. *(DEPOT FOR SOLID TYRES):* Liverpool Street, The Avenue.		3111
THE IRISH DUNLOP COMPANY LIMITED:		
CORK: Dunlop House, Lower Glanmire Road.	*Pneumatic Cork.*	613
DUBLIN: Dunlop House, Lower Abbey Street, C.8.	*Pneumatic Dublin.*	62723

INSTRUCTIONS

for the Operation

of the

D.W.S. Permanent Hydraulic Jacking System

as fitted to the

25/30 H.P. ROLLS-ROYCE CAR "WRAITH"

(For Handbook No. XIX.)

The D.W.S. Permanent Hydraulic Jackson System.

This equipment consists of four hydraulic jacks, two of which are mounted on the front end of the chassis frame and two mounted on the rear axle. These jacks, which are of special telescopic design, can be used either to raise the car as a whole or to raise front or rear independently.

The system is so designed that the car can be raised from the ground by the operator whilst seated inside the car.

The simple and sturdy construction of the D.W.S. Hydraulic Jacking System precludes the possibility of any damage arising from rough usage. When raising the front of the car on a gradient, the hand brake must be firmly applied. When raising the rear under such conditions, it is advisable to arrange a block against the front wheels. If desired, the car can be raised with confidence on all jacks simultaneously on any reasonable gradient, and will be found to be perfectly rigid under these conditions.

The D.W.S. Hydraulic Jacking System will be found invaluable to the owner-driver or chauffeur as a simple and effective means of carrying out many operations which previously meant a visit to either the service station or a garage, such as:—

(1) Changing wheels in the event of tyre trouble without the necessity of passengers leaving the car.

(2) Raising the car clear of the ground and removing all the wheels, thus simplifying washing and interchanging of wheels to synchronise tyre wear.

(3) Fitting chains when snow and ice are encountered.

METHOD OF OPERATION.

The illustration, Fig. 1, shows the general layout of the pump in position, from which it will be clear that the valve knob for selecting the front jacks is situated forward of the release valve, and the valve knob for the rear jacks is situated behind the release valve, thus making the selection a simple matter even in the dark.

To use the front and rear jacks separately, *close* the release valve and jack valve not required by turning the valve knobs as far as they will go in the opposite direction to the arrow (see Fig. 2).

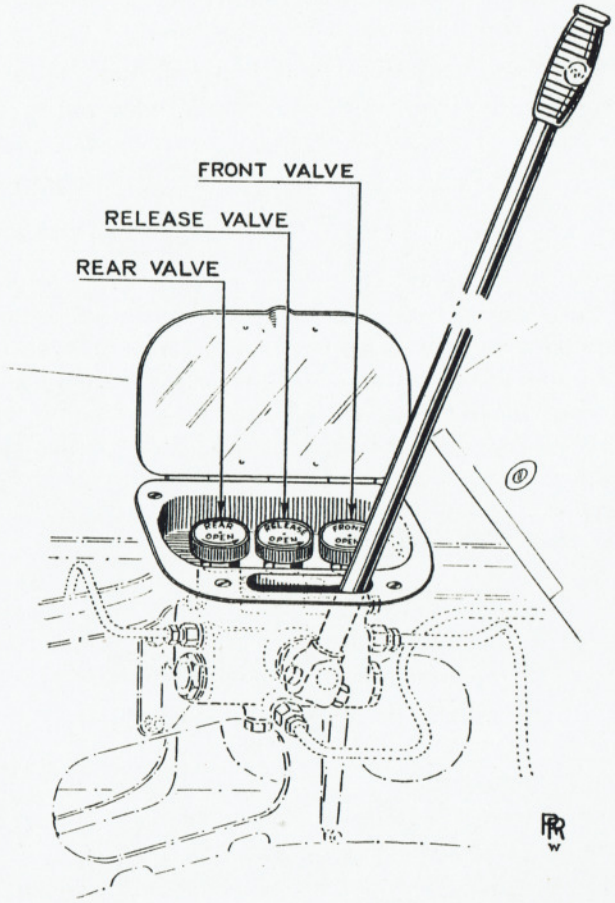
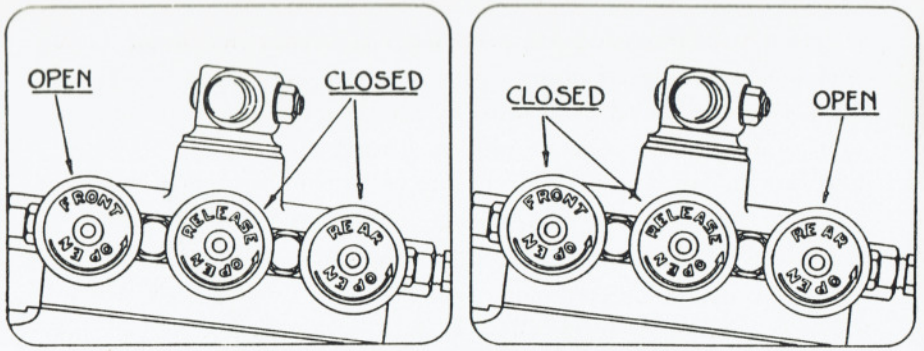


FIG. 1. GENERAL VIEW OF THE PUMP WITH THE HANDLE IN POSITION.

A nominal pressure only is required to seat these valves, and force should not be used.

Slide the handle over the lever at the side of the pump, and operate to and fro. This operation can be speeded up by holding the handle half-way down until the jacks reach the ground, when it will then be found easier to use the grip at the top of the handle.



USING FRONT ONLY. FIG. 2. USING REAR ONLY.

To lower the car—turn the release valve in the direction of the arrow; if the release valve is fully opened, the jacks will automatically return into their housing in approximately half a minute. To raise front and rear jacks together, close the release valve, leaving both jack valves open (see Fig. 3) and repeat the pumping operation. IT IS IMPORTANT THAT ALL VALVES SHOULD BE LEFT OPEN AFTER USE in order to avoid confusion when the jacks are next required. This also avoids any possibility of the jacks being prevented from fully returning.

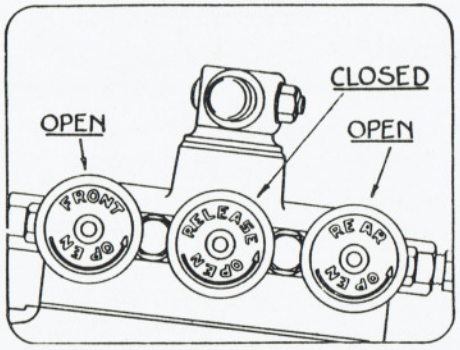


FIG. 3. USING FRONT AND REAR TOGETHER.

GENERAL INFORMATION.

The D.W.S. Hydraulic Jacking System requires no maintenance apart from occasional inspection of the fluid level in the reservoir tank, which is mounted on the front of the dashboard, and topping up if required. The reservoir tank should be drained every twelve months, as a certain amount of fluid evaporation may have taken place, thereby

lowering the efficiency of the fluid. This condition will be more pronounced in hot countries.

The reservoir tank is drained by removing either the drain plug or pipe union at the bottom or side of the pump body (see Fig. 4), and care should be taken in replacing either of these parts in order to avoid leaks. The fluid container should not be filled above the bottom of the neck, which can be readily observed through the filler opening.

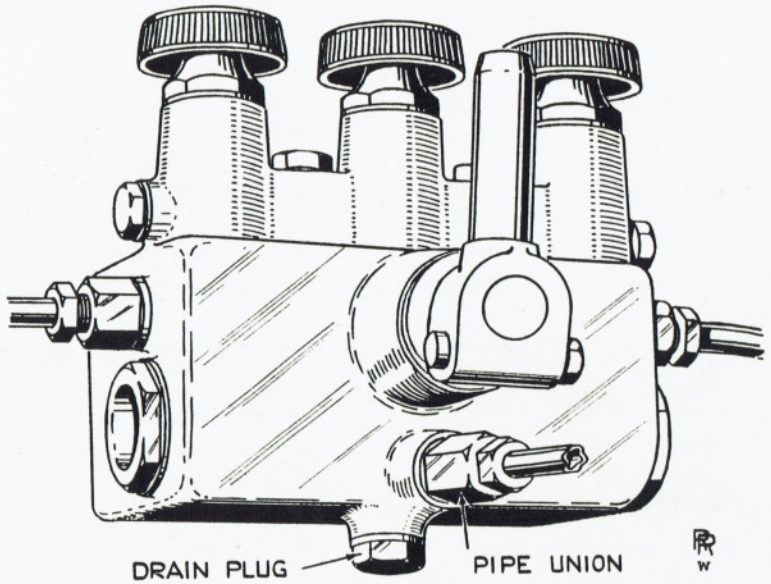


FIG. 4. VIEW OF PUMP SHOWING DRAIN PLUG AND PIPE UNION.

After refilling, the car should be raised on all four jacks and released in order to expel any air which may have become trapped during filling. The fluid level should then be again examined, and topped up if required. It is important that every care should be taken to avoid dirt getting into the reservoir.

IMPORTANT.

A special fluid for topping up and refilling is obtainable from Rolls-Royce Service Depots, and it is recommended that if possible this should be used. If this is not possible, however, then Wakefield's "Castraulic" may be used instead.

NOTE:—Both these fluids attack paintwork and consequently care must be taken not to spill the fluid when refilling the reservoir..

SMITH'S JACKING SYSTEMS LTD.
Branch of S. Smith & Sons (Motor Accessories) Ltd.
EDGWARE ROAD
CRICKLEWOOD, LONDON, N.W.2

Telephone: Gladstone 6671. Telegrams: "Toggle Gold."

INSTRUCTIONS

for the Care and Maintenance

of the

S.U. High-Pressure Double Capacity Electric Fuel Pump

as fitted on the

25/30 H.P. Rolls-Royce Car
"Wraith."

(8½ H.)

(For Handbook No. XIX.)

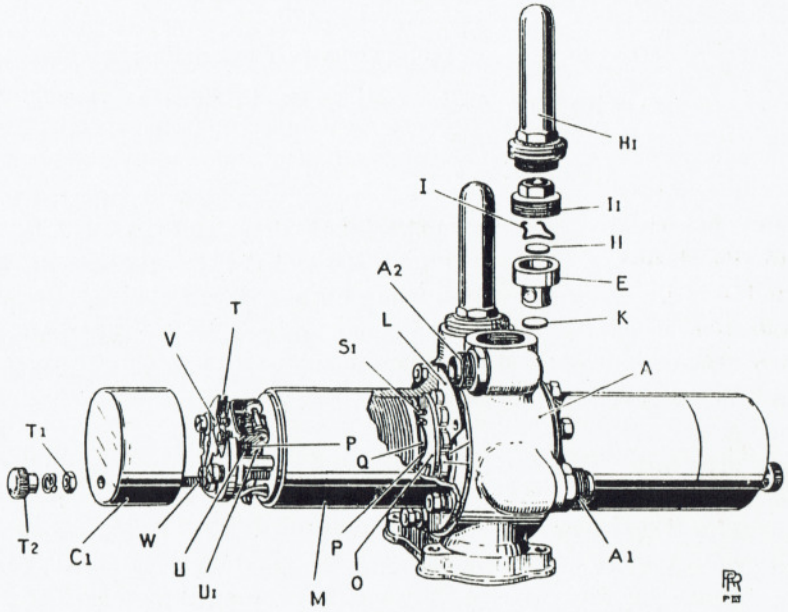
The S.U. High-Pressure Double Capacity Electric Fuel Pump.

The Construction of the Pump. The pump consists of five main assemblies, the body, A, two magnet assemblies, M, and two contact breaker assemblies mounted upon bakelite moulding, T. The body is composed of a hollow aluminium alloy casting, into the bottom of which two drain plugs are inserted and provided with a flange surrounding these drain plugs, for bolting to the dashboard or other mounting. The inlet and outlet unions, A1 and A2, are screwed into the body on one side, facing in opposite directions. On the top of the pump are two bosses, and screwed into these are two air vessels, H1. Within these bosses the inlet and delivery valves together with their cages are retained.

The valve assembly comprises an inlet plate valve, K, retained upon a seating formed in the main casting, A, by the delivery valve cage, E. The delivery valve cage houses the delivery valve, H, which is identical with the inlet valve, K, and is retained within its cage by means of a wire clip, I. The cage, E, is retained by means of the retaining ring, I1, provided with a hexagon on its upper face. The retaining ring, I1, is provided with a central hole through which fuel is delivered, passing within the main casting to the boss wherein the outlet union, A2, is screwed. Finally, the air vessel, H1, closes the bore wherein the valve assemblies are mounted.

Holes connect the space between the valves of each valve assembly to one of the pumping chambers, which are shallow depressions in the main faces of the body. The spaces within these depressions are closed by the diaphragm assemblies, L, which are clamped at the outside between the magnet housings, M, and the body, and in the centre between brass plates, K1, and armatures, O, of steel. Bronze rods, P, are screwed to the centre of these and

pass through the magnet cores to the contact breakers which are located at the far ends. The magnets consist of cast-iron pots having iron cores, Q, on which are wound copper wire coils which energise the magnets. Between the magnet housings and the armatures are fitted, on each side, eleven spherical-edged brass rollers, S. These locate the armatures centrally within the magnets at all times and allow absolute freedom of movement in a longitudinal direction.



PART SECTIONAL VIEW OF PUMP.

The contact breakers consist of small bakelite mouldings, T, carrying each two rockers, U and U1, which are both hinged to the mouldings and are connected together at their top ends by small springs arranged to give a "throw over" action. Trunnions are fitted into the centre of the inner rockers, and the bronze rods P, connected to the armatures, are screwed into these. The outer rockers, U1, are fitted each with two tungsten points which make contact with further tungsten points on spring blades, V. These spring blades are connected to one of the ends of the coils, the other ends of the coils being connected to terminals, W. Bakelite end covers, C1, enclose the contact breaker mechanisms and are secured to the

terminals, W, by means of small nuts, T1. Finally, connection is made to the electric supply system through cables secured to the terminals, W, by means of terminal nuts, T2.

Springs, S1, are interposed between the armatures and the end plates of the coils.

Short lengths of flexible wire are connected to the outer rockers and to screws which hold the bakelite mouldings on to the magnet housings, in order to ensure a good earth.

Fibre bushes are fitted to the spindles of the outer rockers of the "throw over" mechanisms in order to silence the operation of the contact breakers.

The Action of the Pump. The action of the pump is as follows :—Each half of the pump works independently of the other. Considering one pumping element only, when the pump is at rest the outer rocker lies in the outer position remote from the main body, and the tungsten points are in contact. Current passes from the terminal through the coil back to the blade, through the points and so to earth, thus energising the magnet and attracting the armature. This moves 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 urges the armature and diaphragm back, forcing petrol through the delivery valve at a rate determined by the requirements of the engine, that is to say, at the rate permitted by the opening of the carburetter float chamber needle valves. As soon as the armature attains a position 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 air vessel, H1, serves to smooth out the pulsation of the delivery.

The spring blade rests against 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 not of vital importance.

Diagnosis of Faults. In the event of trouble, remove the contact covers, C1, and investigate each side separately.

It is suggested that a test be made with a 12-volt lamp from the cable to the pump body, A. If there is no light when the ignition is switched on, the earth connection to the pump body, A, by way of the pipes should be examined, and if there is still no light the fault must lie in the wiring from the battery to the pump and should be looked for. If current is found available between the cable and the pump body and the points on the arms U and U1 are in contact, there may be dirt between the points. These should be wiped clean. If the pump still refuses to work there must be a fault in the magnet winding or connections on the contact breaker.

If all these points are in order, the ignition should be switched on, and one of the terminals touched with its lead, the cover being removed and the other side of the pump being disconnected. The inner rocker of the contact breaker should then move forward until, when it is near the end of its forward stroke, the toggle mechanism should operate and the outer rocker should throw back, separating the points. If it does not do so, it indicates that the inner rocker is unable to come sufficiently far forward and the probable cause of this is shrunken diaphragm. To rectify this, loosen the six nuts which hold the magnet housing to the body, and make sure that the diaphragm is not sticking to the magnet housing by passing a penknife down the side of it between the diaphragm and the housing. Insert a matchstick behind one of the fibre rollers on the outer rocker, thus holding the points in contact. If a current is then passed through the pump the magnet will be energised and will pull the armature forward, and while it is in this position the six nuts should be tightened. Shrinkage of the diaphragm material may result from the car's having been stored for a long period without fuel having been present in the pump. If this treatment does not rectify the trouble it will be necessary to remove the whole magnet assembly, dismantle it, and see whether any foreign matter has caused a jam.

On re-assembly, the diaphragm should be screwed in until the points do not break when it is pressed right home. The brass distance pieces having been inserted behind the diaphragm, it should then

be screwed back (anti-clockwise), hole by hole, until the points just break when it is pressed slowly and firmly home.

It should then be turned anti-clockwise a further four holes on the diaphragm edge and bolted on to the pump body, care being taken to see that the brass distance pieces are lying flush with the flange of the magnet housing, and that the diaphragm is held back to the end of its stroke with a wire or small screw-driver under the inner arm, U, while the six nuts are tightened up. If it is found on releasing the arm, U, it does not move back on to the magnet pot casing, it should be gently assisted to do so.

If the pump becomes noisy, inspection should be made for an air leak on the suction side. In order to do this, it should first be ascertained that the filter and inlet union are tight and also that there is sufficient petrol in the tank. If these precautions do not effect a cure, it is probable that there is a leak somewhere in the pipe line, and the simplest way to test for this is to replace the suction pipe from the pump with a short length of piping and let the pump draw petrol directly from a separate receptacle. If the pump functions satisfactorily under these conditions, the fault is clearly situated in the pipe line itself. If the pump continues to beat without delivering petrol, it is probable that foreign matter has become lodged under one of the valves. This may be removed by unscrewing the air chamber, H1, the retaining ring, I1, and the valve and valve cage assembly, which may then be cleaned. If the pump struggles in its work and becomes very hot, it is an indication that there is an obstruction somewhere in the pipe line, the probability being that the filter requires cleaning.

THE S.U. COMPANY
East Works,
Bordesley Green Road
Adderley Park, BIRMINGHAM, 8
Telephones—East 1662 and East 1663
Telegrams—" Flexcarbur, Birmingham "

INSTRUCTIONS

FOR THE CARE AND MAINTENANCE OF

The Smith Electric Petrol Gauge

AS FITTED ON THE

25/30 h.p. Rolls-Royce Car "Wraith"

(8¼ H.)

(For Handbook No. XIX.)

The Smith Electric Petrol Gauge.

THE gauge has been developed with a view to meeting the demand for a petrol gauge reading direct on the instrument board and free from the disadvantages attendant on gauges which depend on air pressure and metal tubing for their operation. The instrument itself is divided into two parts :—

1. The Dashboard Meter.
2. The Tank Attachment.

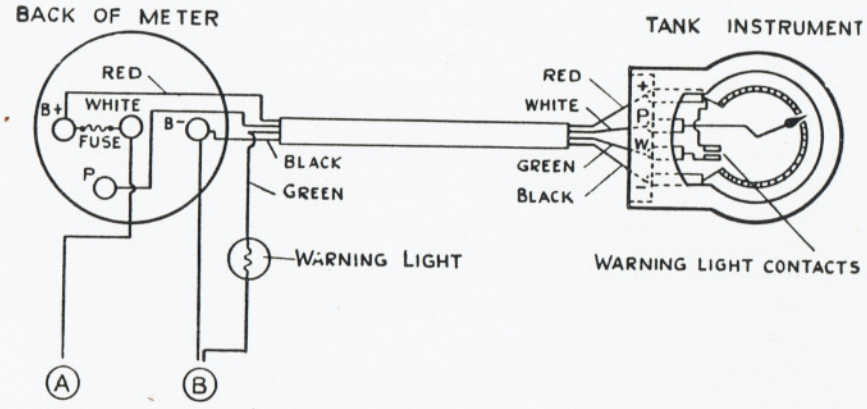
Dashboard Meter. This consists of a neat circular case with a pointer and dial marked in gallons and containing two coils wound on special low hysteresis iron formers. These coils are placed so as to exert a magnetic force on a soft iron armature carried by the same spindle to which is attached the indicating pointer. One of these coils, known as the " Control Coil," tends to make the pointer remain in a mid-position, and the other coil, known as the " Deflecting Coil," causes the pointer to be deflected in accordance with the amount of petrol in the tank. The control coil is connected directly across the battery when the instrument is in operation, while the deflecting coil has a pressure applied to its terminals from the potentiometer according to the position of the float. The advantage of using two coils in this way is that the instrument is practically independent of fluctuations in battery voltage.

Tank Attachment. This consists of a float carried on an arm, which is connected by a pair of light gears to a vertical spindle. The top end of this spindle is attached to a contact arm travelling over a resistance, which is connected as a potentiometer. By means of this device, varying pressures are applied to the deflecting coil in the dashboard meter, thus causing the pointer in the meter to deflect in accordance with the height of the petrol in the tank.

The tank attachment is provided with a light pair of contacts which are actuated by a sliding contact. This sliding contact is attached to the vertical spindle which carries the contact arm for the potentiometer. The contacts are arranged so that the warning lamp is lit when there are approximately 2½ gallons of petrol in the tank.

To Test Meter (Gauge). Connect the positive terminal of a battery to the terminal marked **B** + on the meter, then connect one lead of a voltmeter to the negative of the battery ; the other voltmeter lead should then be connected, firstly, to terminal **B** — on the meter, and secondly to terminal **P** on the meter. In both instances a voltmeter reading should be obtained, which indicates that the wires inside the instrument are not broken.

DIAGRAM OF CONNECTIONS FOR ELECTRIC PETROL GAUGE



A. Connected to the terminal No. 3 (ignition) fuse on the distribution board. The gauge therefore only reads when the ignition is on.

B. Connected to the earth terminal on the back of the metal instrument board.

To Test Tank Attachment. (*a*) Connect the positive terminal of a battery to the terminal + on the tank attachment, and connect one lead of the voltmeter to the negative battery terminal ; the other voltmeter lead should be connected to the terminal marked — on the tank attachment, and a voltmeter reading should be obtained, showing that there is a circuit through the resistance.

(*b*) Connect the positive battery terminal to the terminal marked + on the tank attachment, and the negative battery terminal to one side of the voltmeter ; the other side of the voltmeter should then be connected to the terminal marked **P** on the tank attachment, and

a voltage reading should be obtained whatever the position of the float. Should the voltage reading drop to zero, it would show that the unit is faulty.

(*c*) Connect the positive terminal of the battery to the terminal marked + on the tank attachment, and connect one lead of the voltmeter to the negative battery terminal. The other voltmeter lead should be connected to the terminal marked **W** on the tank attachment, and full battery reading should be obtained on the voltmeter, with the float arm in a zero position. When moving the float arm away from this position, the voltmeter reading should remain until a position equal to 2½ gallons has been reached, when the voltmeter reading should drop to zero.

To Test Cable. Connect the positive terminal of a battery to the end of one of the cores, and the negative battery terminal to one side of the battery voltmeter; the other side of the voltmeter should then be connected to the other end of the same core, and a full battery reading should be obtained. Repeat this test with the other three cores. Should a voltmeter reading not be obtained, it will show that there is a break in the core under test.

SPECIAL NOTE. IMPORTANT.

1. Great care must be taken when either connecting up or disconnecting the Gauge that the terminal **P** (or white wire) is not short circuited to either **B** + or **B** — or the red wire or black wire. Neglect of this precaution may result in the potentiometer being burnt out.
2. On no account should the float arm be bent other than as supplied. The float arm provides both top and bottom stops which prevent the contact arm over-travelling the potentiometer.
3. Please give the following details in all communications dealing with apparatus:—
   Year, and model of car.
   Code numbers of meter and tank attachment.

S. SMITH & SONS (MOTOR ACCESSORIES), LTD.
CRICKLEWOOD, LONDON, N.W.2
London Showrooms—**179-185 Great Portland St., W.1.**
ALSO AT
26, Cox St., Livery St., Birmingham; 14a, Jackson's Row, Deansgate, Manchester; 19, West Regent St., Glasgow; 18, Sussex Place, Belfast; 34, Lower Abbey St., Dublin.

INSTRUCTIONS

for the Care and Maintenance of the

Starting, Lighting, and Ignition Batteries

FOR

25/30 H.P. Rolls-Royce Car
"WRAITH"

PETO & RADFORD "DAGENITE"
(*For List of Addresses see inside front page*)

and EXIDE
(*For List of Addresses see inside back page*)

PETO & RADFORD

(*Proprietors—Pritchett & Gold and E.P.S. Co. Ltd.*)

50, Grosvenor Gardens, London, S.W.1

Telephone: Sloane 7164. *Telegrams:* "Dagenite", Sowest, London.

WORKS - - - - - - - - DAGENHAM DOCK, ESSEX

LONDON SERVICE & REPAIR DEPOT. - 107A PIMLICO ROAD, S.W.1

Telephone: Sloane 6114. *Telegrams:* "Dagenite", Knights, London.

GLASGOW - - - - - - - - 158 CLYDE STREET, C.1

Telephone: Central 4886. *Telegrams:* "Dagenite", Glasgow.

MANCHESTER - - - - - - 18 PRINCESS STREET, 1

Telephone: Central 6167. *Telegrams:* "Dagenite", Manchester.

Care and Maintenance of Batteries.

Model.	Battery Maker's Type Designation.*		Voltage.	Normal Charging Current.
	P. & R. Dagenite.	Exide.		
Rolls-Royce 25/30 H.P. "Wraith"	6-HZD11-G	6XCKR11SL	12 volts.	5 amperes

*Please quote full title when ordering a replacement battery or spare parts.

First Charge. If the battery is received in a dry condition it will be necessary to fill the cells with acid solution and charge the battery before it is put into use.

In such cases it is strongly recommended that the necessary charging should be undertaken by an experienced battery man, for instance, by a Service Agent or Depot associated with the battery maker, because unless the first charge is carried out properly the battery will never give satisfactory service.

Topping Up. In the majority of cases, however, the battery will have already been charged and the cells filled with acid solution. Under normal operating conditions the level of the solution will gradually fall in each cell, mainly owing to evaporation losses. One of the most important features of satisfactory maintenance is to see that the level of the acid solution is not allowed to fall to such an extent that the tops of the separators and plates are exposed.

The level of the acid solution should be adjusted periodically by removing the vent plug in the centre of each cell lid and adding distilled water to each cell until the level of the solution is approximately $\frac{3}{8}$ in. above the tops of the separators. This process is known as "topping-up".

It is difficult to lay down a hard and fast rule as to how frequently "topping-up" will be required, because this varies so much according to the use to which the car is put and also the temperature in which it operates.

It is suggested that the owner should make constant observations after acquiring the car in order to ascertain how frequently "topping-up" is necessary. A little experience will show how often, with average use, this is necessary. It must be remembered that "topping-up" will be necessary more frequently in hot weather than in cold. On long trips abroad with big mileages each day in hot weather, it must be very much more frequent, and under such conditions it is extremely important that extra attention be given to the battery in this respect.

Normally it should never be necessary to add sulphuric acid to the cells, unless it is definitely known that some of the acid has been lost owing to slopping or spilling. The addition of acid to the battery should only be done by an experienced battery man who at the same time will carry out any necessary adjustments to the acid gravity.

Specific Gravity of Electrolyte. Various acid specific gravity figures are given for reference in the following table, and they apply to both makes of batteries given on the first page of these instructions.

Acid gravity figures are taken by means of an hydrometer.

Climate.	Specific Gravity of Sulphuric Acid Solution (corrected to 70°F.).		
	Filling-in for first charge.	Fully charged.	Fully discharged.
Temperate	1·340	1·280 (1·270—1·285)	1·110 (Approx.)
Tropical (i.e., where the temperature is frequently 90°F. or over)	1·260	1·210 (1·200—1·215)	1·100 (Approx.)

Charging. The output of the generator on the car is controlled so as to vary with the state of charge of the battery. Overcharging the battery is thus automatically avoided. The generator will, under ordinary running conditions, provide enough current to

ensure recharging of the battery, but in special cases, e.g., when the car is frequently standing with the lights on and daylight running is of short duration, it may be necessary to take the battery off the car from time to time for a bench recharge. This recharge can be done by any well equipped garage or else by a service agent or battery depot.

In cases where running conditions result in the battery being only slightly undercharged, it should not be necessary to remove it from the car for a bench recharge, because it can be charged whilst still in position on the car by utilising the inspection lamp socket and switch on the front of the dash.

This assumes that a suitable charging apparatus is available which provides a *direct current* at correct voltage. The charging current must not be allowed to exceed the figure given for normal charging in the table at the commencement of these instructions.

The holes in the inspection lamp socket are of dissimilar diameters in order to prevent reversal, and they are also clearly marked positive and negative, but in addition to these precautions a careful check should be made to ensure that the positive pin of the plug is connected to the positive lead of the charging source, and likewise the negative pin of the plug to the negative lead of the charging source.

If the starter becomes sluggish it is an indication that the battery is either reaching a discharged condition or that a fault is developing in one or more of the cells. If a recharge fails to rectify this condition, the battery should be examined by a battery service agent or depot.

General Maintenance. The battery must be well secured in its box so that it cannot move.

The cable terminals should be well coated with lanolin or pure vaseline (not grease) before putting the battery into service.

The top of the battery should always be kept clean, and as far as possible, dry; attention should be given immediately to the least sign of corrosion occurring on the terminals.

Keep the terminals and connectors well covered with lanolin or pure vaseline, all contact surfaces clean and firmly screwed up, but do not use abrasives for cleaning, e.g., file, emery paper, and sand paper.

Do not inspect the battery with the aid of a naked light, and on no account disconnect any of the battery terminals or connections when a charge or discharge current is passing, for such a course incurs risk of explosion and involves personal risk.

The battery must never be allowed to remain in a discharged condition. A battery not in active service should be kept in condition by fully charging it and then giving it a freshening charge at least once every two months. It should be given a thorough charge before being put back into service.

Disconnect the cables from a battery not in service, so that it does not lose its charge owing to any slight leak in the car wiring.

If the battery is to be stored for a long time or if it is not possible to give it the necessary freshening charges, or if the battery is to be despatched abroad, the best procedure, which is not, however, as good as keeping the battery in a charged condition, is as follows:—

(1) Fully charge the battery.
(2) Allow battery to discharge through side and head lamps for about five hours.
(3) Remove terminals, clean, apply lanolin or vaseline, and store or despatch these separately.
(4) Empty out electrolyte and allow battery to drain.
(5) For storage, place in a cool dry place with vent plugs well tightened up.

When putting the battery again into commission, fill in with acid of 1·100 specific gravity, and give a full charge. The specific gravity at the end of the charge will be lower than in an ordinary first charge, and should be adjusted accordingly.

ROLLS

ROYCE

ROLLS-ROYCE 25/30 H.P. ("WRAITH") CAR HANDBOOK No. XIX

HANDBOOK

OF THE

25/30 H.P. ROLLS-ROYCE CAR

("WRAITH")

WITH INSTRUCTIONS FOR RUNNING AND MAINTENANCE

Number XIX.