THE ROLLS-ROYCE SYSTEM OF PERIODIC INSPECTION.

Our interest in the Rolls-Royce Cars does not end at the moment when the owner pays for, and takes delivery of, the car. Our interest in the car never wanes. Our ambition is that every purchaser of a Rolls-Royce Car shall continue to be more than satisfied.

With this end in view, there are on the staff of Rolls-Royce Ltd. experts whose sole duty it is to call, by appointment, on the owners or drivers of Rolls-Royce Cars, with a view to ascertaining whether they are satisfied with their cars.

These calls can be made at the owner's residence, not only in Great Britain, but also in certain countries abroad.

A consultation between the owner or driver, or both, and one of these inspectors is invariably of benefit to users of Rolls-Royce Cars, and these visits have been highly appreciated in the past by both owners and drivers.

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.

LEADING PARTICULARS OF CHASSIS.

Engine .. .. Six cylinders, $3\frac{1}{4}$″ bore, $4\frac{1}{2}$″ stroke, 3,669 c.c., 25·3 H.P. on R.A.C. rating. Unit construction with gearbox, monobloc with detachable head, overhead valves operated by pushrods, Rolls-Royce battery ignition with automatic advance, magneto provided as a stand-by, forced lubrication, cooling by pump circulation, Rolls-Royce automatic expanding carburetter.

Electrical Equipment 12-volt Rolls-Royce dynamo, starter motor, and other units. 50 ampère-hour battery.

Clutch .. .. Single dry plate.

Gearbox .. Four-speed and reverse, side control ; speedometer and brake servo-motor drives incorporated.

Back Axle .. Spiral bevel drive, full floating, road wheels entirely carried on axle tubes.

Brakes .. .. Internal expanding, servo operated, on all four wheels. Independent hand brake operating on rear wheels.

Road Springs .. Semi-elliptic, front and rear.

Wheels .. .. Dunlop detachable well-base wire wheels, with Dunlop cord, wired type tyres, 6″ for 19″ rim.

Wheelbase .. 132″.

Track .. .. $56\frac{1}{4}$″.

Petrol Tank .. 14 or 18 gallons capacity, at rear of chassis. Vacuum feed.

Chassis Lubrication Centralised system, pedal-operated pump.

Weight .. .. Chassis complete with tyres, battery, petrol, oil and water, but excluding spare wheel, lamps and other accessories—approximately 2,800 lbs.

HANDBOOK

OF THE

CHASSIS

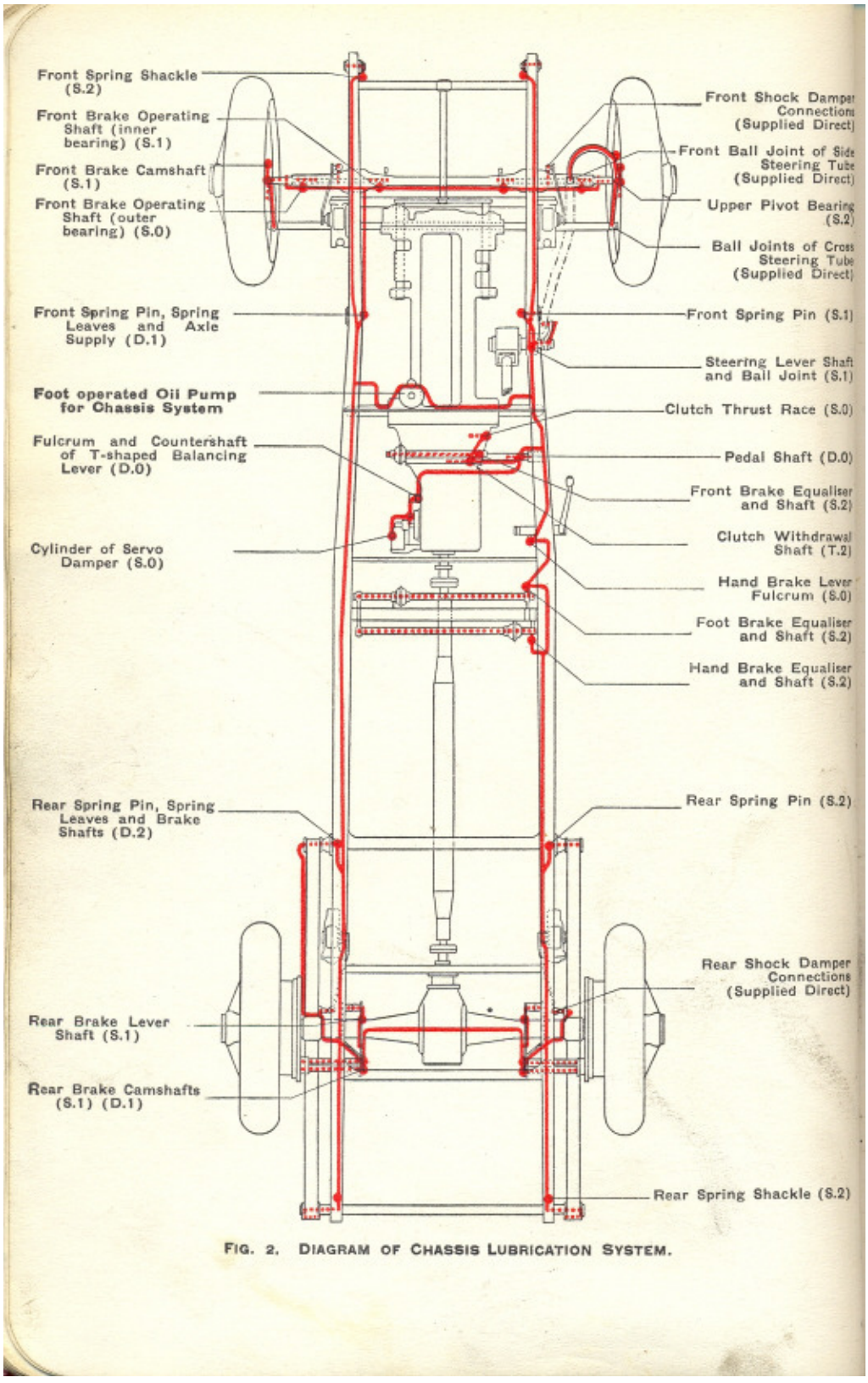

FIG. 2. DIAGRAM OF CHASSIS LUBRICATION SYSTEM.

CHAPTER I.

Centralised Chassis Lubrication System.

General—Foot-operated Oil Pump—Drip Plugs—Front Axle System —Use of Foot-operated Oil Pump—Use of Hand-operated Oil Gun.

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 to a system of small-bore brass pipes extending throughout the chassis. The oil is conveyed to points situated on the axles by means of flexible spiral coils of pipes located within the spring anchorage pins and pipes inside the spring gaiters.

The distribution of oil injected into the system at each stroke or "shot" of the oil pump is controlled by metering valves or "drip plugs" located one at each lubrication point. These limit the quantity of oil to a certain number of drops per shot, as predetermined to meet the requirements of that particular bearing.

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 one of the recommended oils after removal of the filling plug, **A**. This should be done every 2,000 miles, as directed on page 130.

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, which may be due to the use of an unsuitable or dirty oil. As oil from the pump has to pass through this strainer on its way to the system, choking of the strainer prevents or delays discharge of the pump.

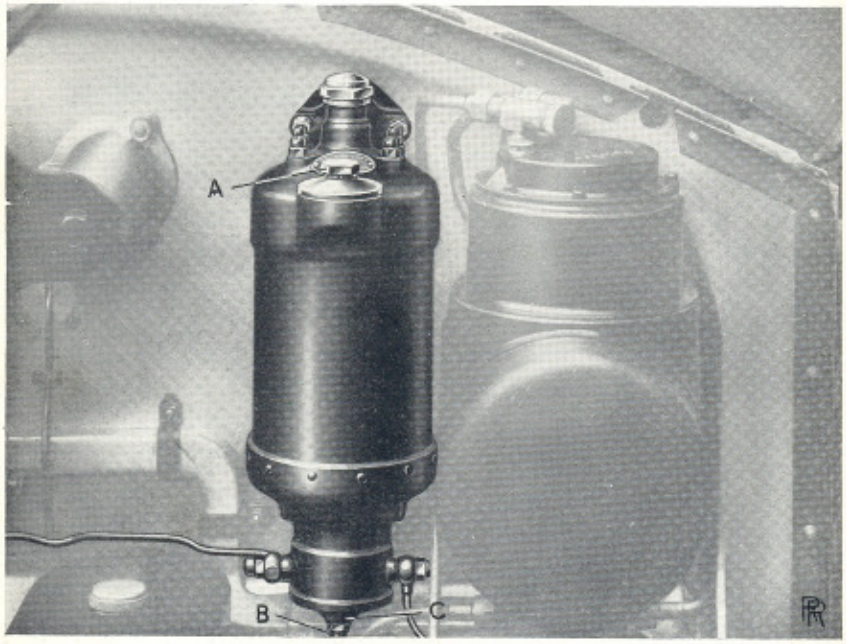

FIG. 3. FOOT-OPERATED CHASSIS OIL PUMP.

Under these circumstances, the cap nut, **B**, should be unscrewed, and the cover, **C**, removed. The felt strainer pad and its perforated backing plate can then be taken out. The pad should be discarded and a new one fitted.

When replacing the parts the perforated plate should first be fitted on the stud, followed by the felt pad and then the distance piece. Care must be taken to see that the vellumoid packing washer is in position between the cover, **C**, and the casing, and also that the aluminium washer between the nut and the cover is replaced before tightening the nut.

Normally the felt strainer pad should be discarded and a new one fitted every 20,000 miles, as directed on page 133.

Under no circumstances must any attempt be made further to dismantle the pump. If any defect in operation should develop, which is not rectified by renewing the strainer pad as directed, the whole unit should be removed from the dashboard and returned to Rolls-Royce Ltd. for correction.

Drip Plugs. The drip plugs are non-adjustable and non-demountable, and are numbered S0, S1, or S2, in the case of single connection plugs, or D0, D1, or D2, in the case of double connection plugs, to indicate their relative rates of oil emission, a higher number indicating a greater rate.

Each plug is drilled with a gauged hole in which is located a rod of predetermined diameter to permit the required quantity of oil to pass between it and the walls of the hole.

A spring-loaded non-return valve is incorporated with each plug to retain oil in the pipe line and bearing after the pump has completed its stroke. A felt strainer pad is also included, the object of which is to exclude from the bearing any particles of scale or dirt dislodged from the interior of the pipe. The strainer arranged under the pump effectually prevents dirt in the oil from reaching the system.

The drip plug strainers never require cleaning, and, the plugs being non-demountable as explained, 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.

Front Axle System. Owing to the fact that certain points requiring lubrication are situated on the stub axles, special provision has to be made to convey oil under pressure beyond the pivot pins without risk of loss or failure. This is done by means of small stand pipes which are fitted in the lower covers of the stub axles, and project upwards into the hollow pivot pins. By this means, not only is oil under pressure safely conveyed from the axle beam to the stud axles, but at the same time leakage between the pipe and the bore of the pivot pin can be predetermined and is utilised to lubricate the lower pivot pin bearings.

The arrangement renders it necessary to provide separate strainers and non-return valves to replace those normally fitted in the standard drip plugs. For convenience these are located on the ends of the axle, as shown at **G** in Fig. 4, which also shows the component parts inset.

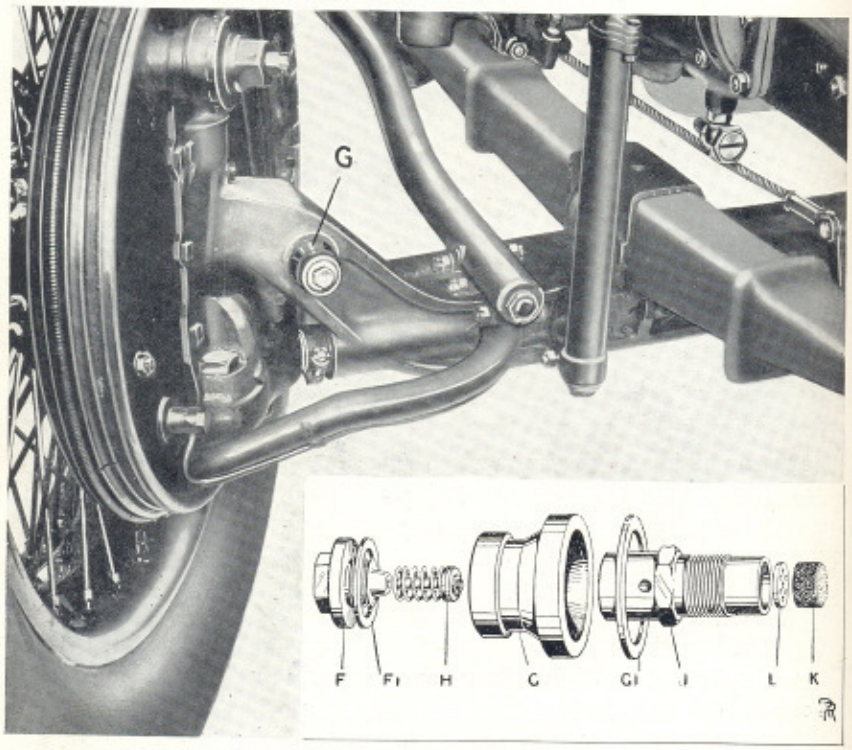

FIG. 4. STRAINERS AND NON-RETURN VALVES ON FRONT AXLE.

The felt strainers must be renewed every 20,000 miles as directed on page 133, the procedure being as follows :—

(1) Carefully clean the outsides of the fittings with a brush and paraffin to prevent the ingress of dirt during dismantling.

(2) Unscrew plug, **F** and remove cap, **G**, taking care not to drop the small valve, **H**, and its spring.

(3) Unscrew union, **J**, in the inner end of which will be found the felt strainer, **K**. This should be removed and discarded, a new one from the spares being utilised.

All parts should be carefully cleaned and freed of every trace of dirt or grit before replacing. The perforated backing washer, **L**, must be replaced in union, **J**, before fitting the new felt strainer with its gauze-covered side towards this washer.

Aluminium packing washers are provided and must be carefully replaced as follows :—

(1) Between union **J** and the inner end of recess in axle.
(2) **G1**, between cap **G** and axle.
(3) **F1**, between plug **F** and cap **G**.

Owing to the construction of the ball joints of the shock damper connections and certain 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.

Use of Foot-operated Oil Pump. When starting the engine for the first time in the day, it should be made a rule always to depress the oil pump pedal twice. This may be done conveniently immediately after operating the starter switch and while the engine is warming up, just before starting the car. Afterwards, one charge of oil should be given approximately every 100 miles of running, and an extra charge when negotiating wet or muddy roads.

The time taken for the pedal to return after depression will be found to vary largely with conditions of atmospheric temperature and the time the car has been running. Under normal conditions it should take about five minutes, but when the weather is very cold, resulting in a great increase in the viscosity of the oil, this time may be considerably increased. On the other hand, under warm conditions, the charge may be delivered in half a minute. Such variations need cause no concern, however, because they do not interfere with the distribution and metering of the oil to the various points as fixed by the rating of each drip plug.

As already explained, if the pedal should immediately return for the whole or part of its stroke, this is an indication that there is air in the system. A few consecutive strokes of the pump will expel such air, provided that there is sufficient oil in the reservoir.

Use of Hand-operated Oil Gun.

There are four points on the chassis which must be lubricated by means of the hand oil gun, namely, two on the propeller shaft, one on the fan, and one on the front engine mounting.

On no account should a high pressure be applied at any of these points, as it may cause serious damage.

Further notes in connection with lubrication of the universal joints are given on page 76.

CHAPTER II.

Engine Lubrication System.—Removal of Cylinder Head.

Crankshaft—Connecting Rods—Oil Pump and Relief Valve—Valve Rockers, Push Rods and Tappets—Camshaft—Oil Sump Strainer—Oil Level Indicator—Oil Pressure—Dismantling Oil Pump and Relief Valve—Removal of Cylinder Head for Decarbonising—Removing Rocker Cover and Shaft—Removing Exhaust and Inlet Manifolds—Removing Cylinder Head—Cleaning Pistons and Head—Grinding in the Valves — Replacing Cylinder Head — Reassembling — Adjusting Tappets.

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

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

A gauze strainer is arranged in the crankcase lower half, through which the pump draws its supply.

Oil is delivered to all the crankshaft and connecting rod bearings at from 15 to 20 lbs. per square inch pressure by a pipe which runs inside the upper half crankcase, the connection to this pipe being outside the crankcase, on the right-hand side.

Crankshaft. From the internal pipe, three leads are taken to the two end and the centre main crankshaft bearings respectively.

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.

The three main bearings to which oil leads are carried have circumferential oil grooves communicating with the oil-feed pipes,

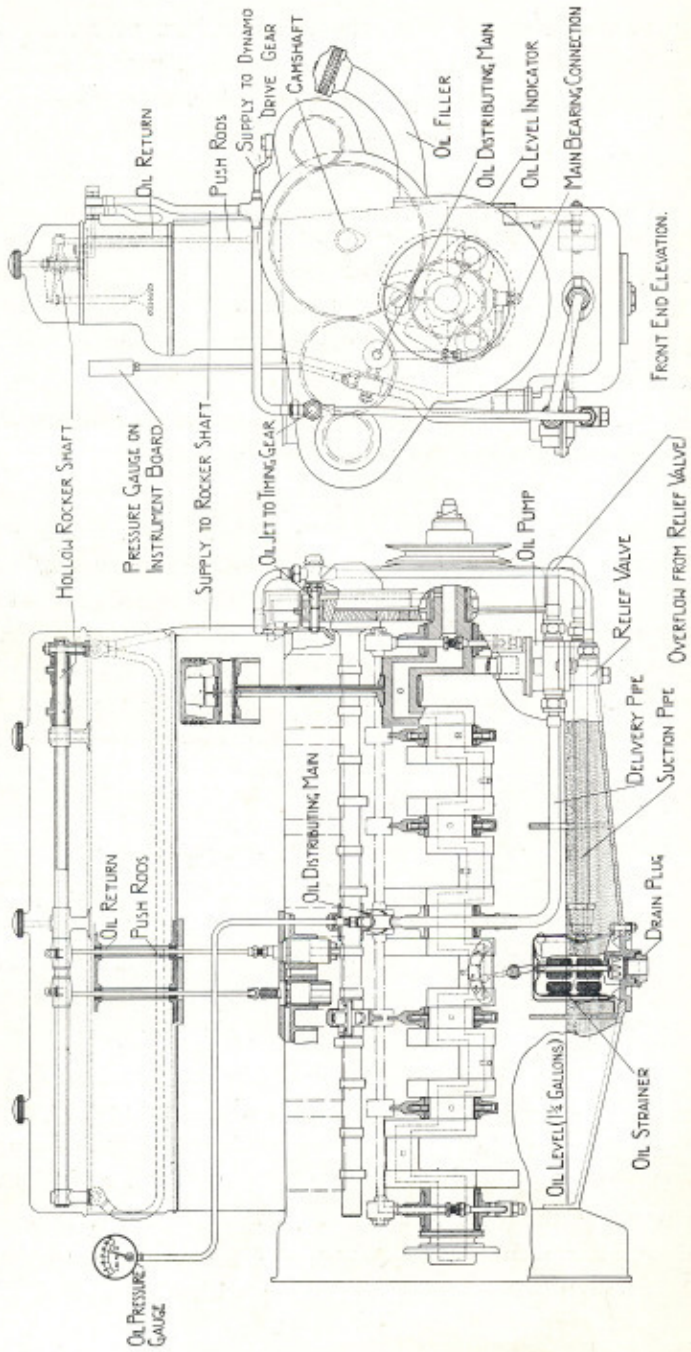

FIG. 5. ENGINE LUBRICATION SYSTEM.

radial oil-holes being drilled in the crank journals to register with these grooves. Oil is thereby conveyed to the interior of the crankshaft, whence it finds its way to the four other main bearings and the crankpin bearings through further radial holes in the crankshaft at these points.

Connecting Rods. The big ends of the connecting rods are grooved internally, the groove registering with a radial hole in the crankpin. Each connecting rod is fitted with an oil pipe, communicating, at the lower end, with this oil groove, and, at the upper end, with the gudgeon-pin bearing bush.

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

Oil Pump and Relief Valve. The oil pump is shown in position on the engine in Fig. 6. Oil is drawn from the strainer through pipe **H**, and delivered to the crankcase oil conduit through pipe **J**, the latter also being connected to the instrument board pressure gauge. Incorporated with the pump is a relief valve. The released or overflow oil is taken by a pipe, **K**, to the timing gear wheels, a connection, **L**, on the timing gearcase being provided with a jet which sprays oil on to the gear teeth.

Valve Rockers, Push Rods, and Tappets. From connection, **L**, a pipe, **E**, is taken to the cylinder head, for feeding oil into the hollow rocker shaft.

For this purpose, the front and rear pedestals of the shaft are drilled, and communicate through oil-holes in the head with unions on the left-hand side, to which pipe **E** 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 valve tappets.

Camshaft. The camshaft is carried in seven bearings, that at the front end being a ball journal, and the others plain gun-metal bearings. The latter are formed with recesses and oil-holes on their sides, which are designed to catch oil splashed in the crankcase and convey it to the bearing surfaces.

Oil Sump Strainer. The oil strainer is carried in the bottom of the lower half crankcase. It is shown removed in Fig. 7.

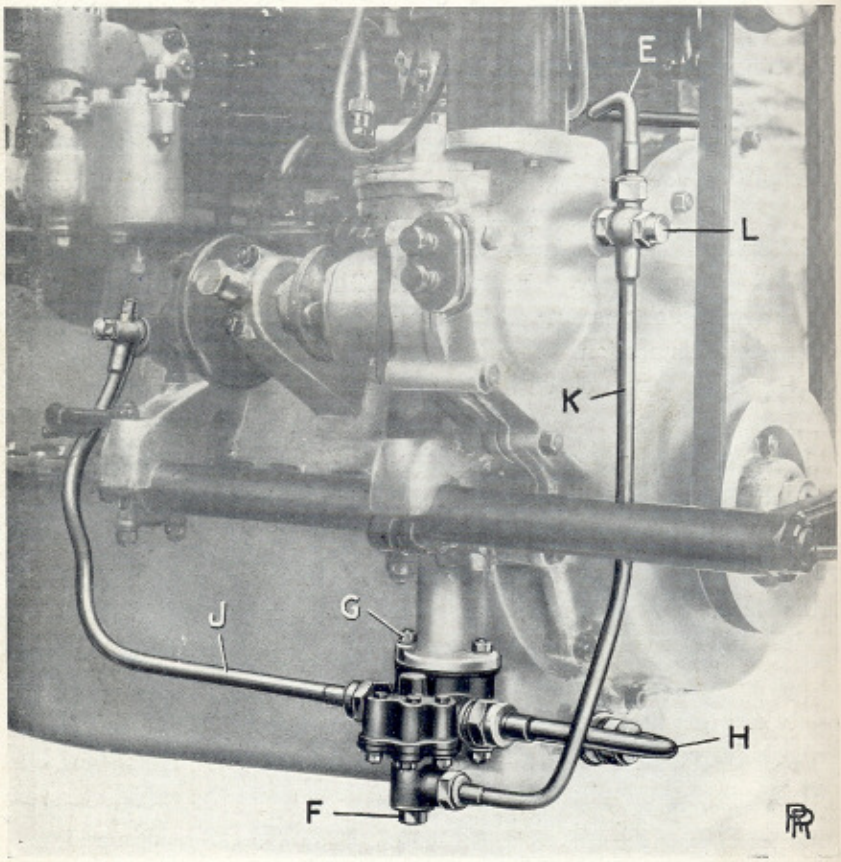

FIG. 6. OIL PUMP.

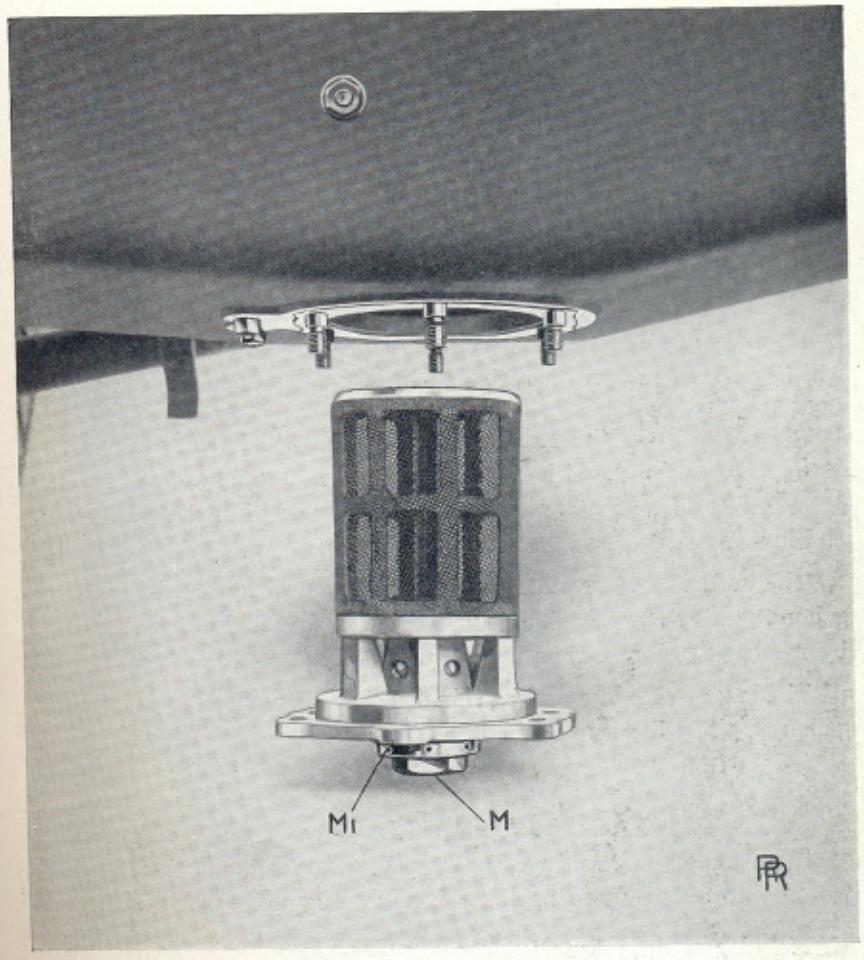

FIG. 7. OIL SUMP STRAINER REMOVED.

When required to be removed for cleaning, it is necessary first to drain the oil from the crankcase. For this purpose a plug (**M**, above) is provided in the strainer supporting plate, which should be unscrewed, after removing its split cotter, and the oil allowed to drain out.

The six nuts which hold the strainer in position should then be unscrewed, when the strainer can be removed downwards, as shown above.

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

It must be observed that the strainer carrier can only be refitted in one position on the crankcase studs, one of the latter being larger than the others to ensure this.

It should be noticed that the joint washer is in position between the strainer-flange and crankcase. An aluminium washer is fitted on the drain plug. When the latter is screwed up it should be locked by means of a split cotter passed through one of the holes (**M1**, Fig. 7), whichever may happen to register with a hole through the plug.

Oil Level Indicator. On the lower half crankcase will be found a small pointer, with a dial marked in fractions of a gallon. This pointer is operated by a float within the crankcase, and indicates the quantity of oil in the engine.

The amount of oil should be maintained at one-and-a-quarter gallons as nearly as possible, by the addition of oil through the filler by means of a strainer funnel when necessary.

The engine should never be run with less than three-quarters of a gallon of oil in the crankcase.

Oil Pressure. On starting the engine from cold, a high 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 to about 15 to 20 lbs. when the engine becomes warmed.

On no account should the car be run with the gauge showing *consistently* less than 7 lbs. pressure. Such a low pressure, which may be accompanied by fluctuations of the pressure 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 the relief valve seating and prevented the valve from closing, or the 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."

After this operation, the correct quantity of fresh oil having been added to the crankcase, it may sometimes be found that the oil pressure fails to build up on next running the engine. This will probably be due to the presence of air in the suction and delivery pipes of the oil pump.

A convenient method of releasing this trapped air is to slacken off the nut which holds the upper end of pipe **J** (Fig. 6) to the crankcase while the engine is running, care being taken to tighten it again after a few seconds.

Failure of the oil pressure may also be due to air leaks in the suction pipe from strainer to oil pump.

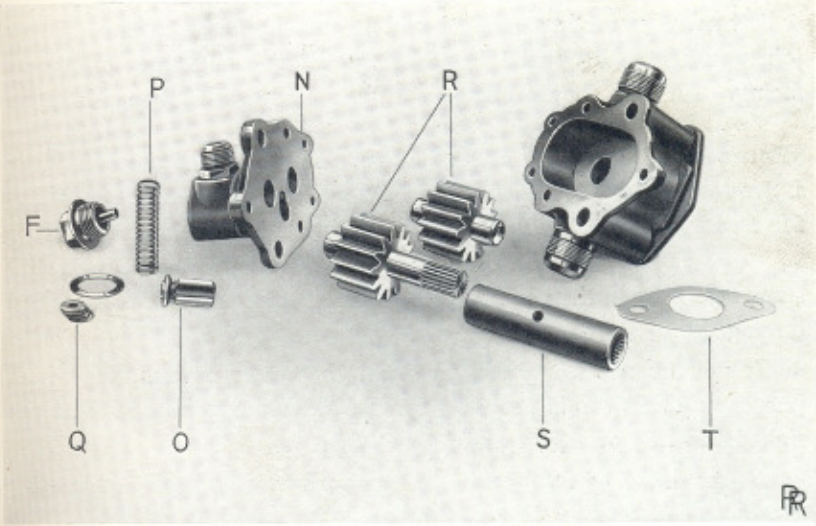

FIG. 8. OIL PUMP DISMANTLED.

Dismantling Oil Pump and Relief Valve.

The relief valve is easily removed by unscrewing plug **F**, shown in Figs. 6 and 8. Care must be taken that the valve **O** and spring **P** (Fig. 8) do not drop out when removing the plug.

It will be noticed that plug **F** is fitted with adjustment washers, **Q**, which have been added to bring the spring pressure on the relief valve to the correct amount to maintain the required oil pressure.

These adjustment washers must not be modified or left out when replacing the parts.

After cleaning the valve and its seat, the parts can be replaced, and the plug **F** screwed up, taking care that the aluminium washer is not omitted.

Should it be required to dismantle the oil pump for cleaning or inspection, the three oil unions should be disconnected—the crank-chamber having first been drained of oil—and the two nuts **G** (Fig. 6) unscrewed. The pump, complete with its hollow drive shaft, **S** (Fig. 8), can then be removed. By unscrewing the five small bolts securing the casing cover **N**, the latter may be removed, and the gear wheels, **R**, taken out.

When reassembling, care should be taken that a suitable paper joint washer, **T**, is fitted between the pump flange and crankcase facing. All nuts should have a spring locking washer beneath them.

***Removal of Cylinder Head for Decarbonising.** When decarbonising becomes necessary it is best to drain old oil from the crankcase, preferably when the engine is hot. For this purpose the drain plug should be taken out. The oil sump strainer can then be removed, cleaned, and replaced, as described on page 30.

It will be necessary also to drain the water system, for which purpose a drain tap is provided on the water pump inlet pipe at the right-hand side of the engine.

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.

* If it is not convenient to return the car to the makers when this operation becomes necessary, Messrs. Rolls-Royce Ltd. will always be pleased to send a skilled mechanic to assist in the work on receipt of a request to this effect, the expense of doing so being borne by the owner.