THE EIGHT LITRE BENTLEY

INSTRUCTION BOOK

Instruction Book No. *Chassis No.*

BENTLEY MOTORS Ltd.

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Price 21/-

GENERAL INFORMATION.

TAX.—£45 0 0 per annum, £12 7 6 per quarter, £4 2 6 per month.

R.A.C. RATING.—44.99 H.P.

BORE.—110 mm.

STROKE.—140 mm.

NUMBER OF CYLINDERS.—6.

CUBIC CAPACITY (Piston displacement).—7,982.81 cubic centimetres.
— 487.14 cubic inches.

WHEELBASE.—12′ 0″ and 13′ 0″.

OVERALL LENGTH OF CHASSIS.—13′ 0″ Wheelbase—17′ 9″.
12′ 0″ Wheelbase—16′ 9″.

TRACK.—4′ 8″.

GROUND CLEARANCE.—Front (Track Rod) 8¾″. Rear Axle 9″.
Battery Box 7½″

TYRES.—7.00 × 21″.

TYRE PRESSURES.—Fronts 35-40 lbs. per sq. in.; Rear 35-40 lbs. sq. in.

PETROL TANK CAPACITY.—26 gallons.

ENGINE—Oil Capacity to level, 20 quarts.

GEAR BOX capacity, 9 pints.

REAR AXLE capacity, 6 pints.

COOLING SYSTEM, capacity, 6½ gallons.

GEAR RATIOS.

Top Speed—Back Axle	3.533	3.785	4.071
Third Speed	4.75	5.09	5.47
Second Speed	6.32	6.78	7.29
First Speed	11.45	12.27	13.19
Reverse	10.33	11.07	11.90

RECOMMENDED MAXIMUM ENGINE SPEEDS ON INDIRECT GEARS ARE :

		Equivalent Speed in m.p.h.		
1st gear	3,000 revs.	27.34	25.5	23.7
2nd gear	3,000 revs.	49.5	46.2	43.0
3rd gear	3,500 revs.	77.0	72.0	67.0

VALVE CLEARANCES (when hot), .008″.

SPARKING PLUG GAPS.—Magneto Ignition .020″. Coil Ignition .025″.

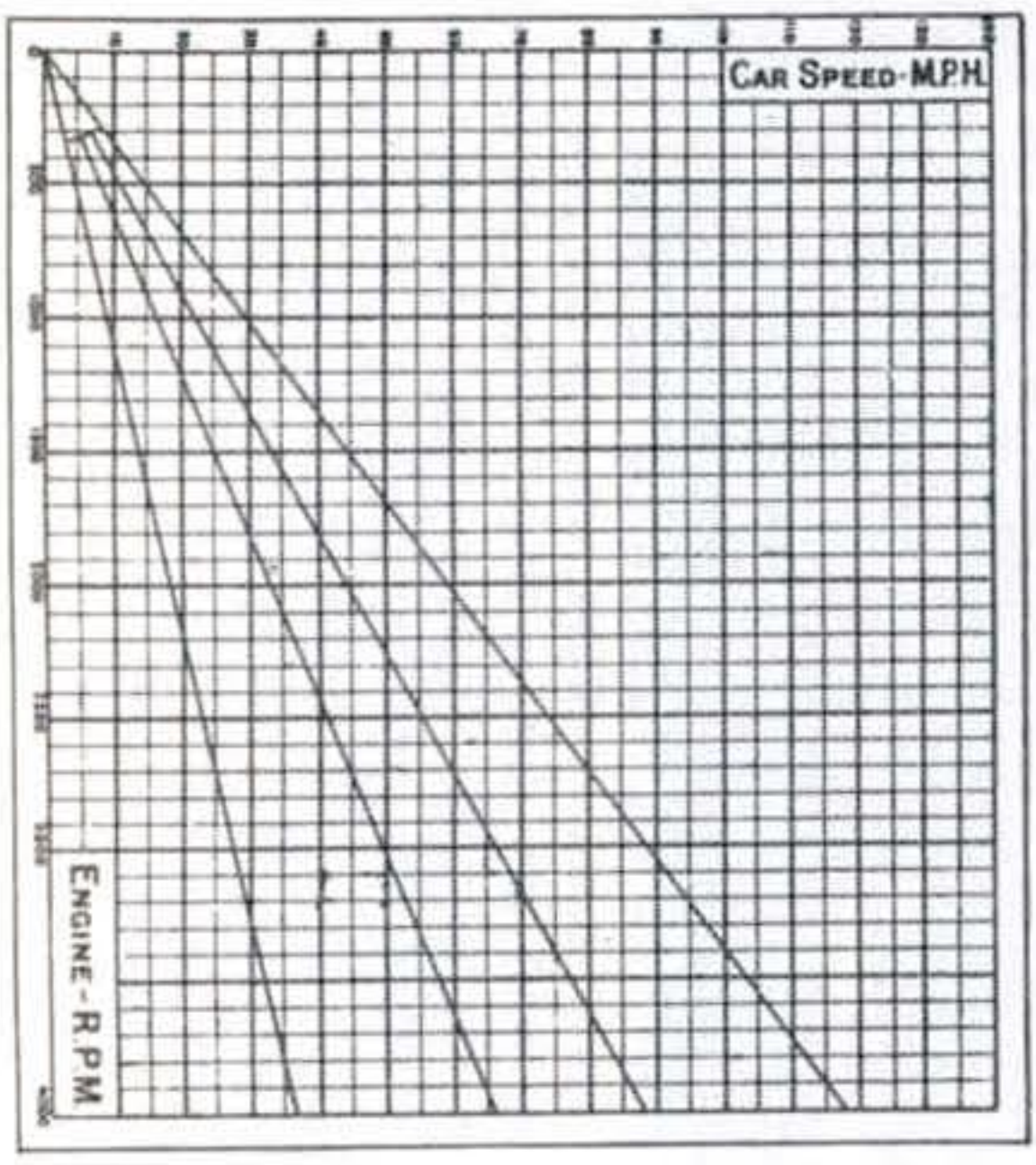
CONTACT BREAKER GAPS.—Magneto .012″. Distributor .020″.

LUBRICATION NOTES. *The following oils and greases are recommended :—*

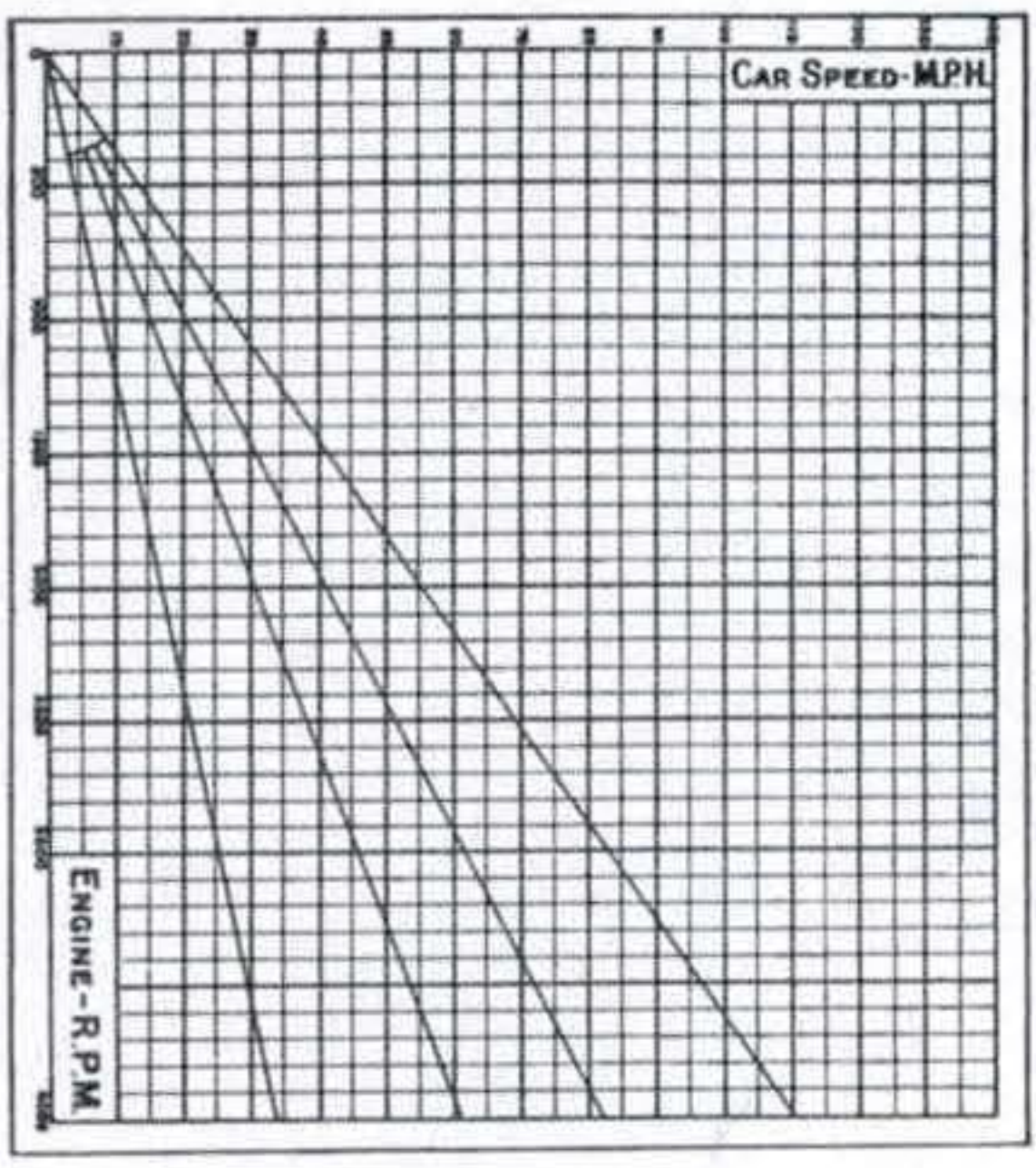
Engine	AeroShell.
Gear Box	Super Shell Heavy.
Rear Axle	Whitmore's Compound Grade "9."
Water Pump	Shell R.B. grease.
U/Joints	Spicer Special lubricant.
Electrical	DelcoShell R.B. grease.
	Magneto "3 in 1"
Tecalemit oil tank	AeroShell.

NOTE.—Oil pressure in engine should not drop below 35 lbs. per square inch at 40 m.p.h. on top gear.

CAR SPEED AND ENGINE REVOLUTION CHARTS



REAR AXLE RATIO			**3.533 : 1**
Pinion, Number of Teeth			15
Gear			53
GEAR BOX	Fox Ratios	Overall Ratios	
Top	1	3.533	
3rd	1 345	4 75	
2nd	1.792	6 32	
1st	3 242	11.45	



REAR AXLE RATIO			**3.785 : 1**
Pinion, Number of Teeth			14
Gear			53
GEAR BOX	Box Ratios.	Overall Ratios.	
Top	1	3.785	
3rd	1.345	5.09	
2nd	1.792	6 78	
1st	3 242	12.27	

TYRES.—Size, 7 × 21 ins. Revs. per mile, 575.

REAR AXLE RATIO			**4.071 : 1**
Pinion, Number of Teeth			14
Gear			57
GEAR BOX	Box Ratios.	Overall Ratios.	
Top	1	4 071	
3rd	1.345	5.47	
2nd	1.792	7.29	
1st	3.242	13.19	

GENERAL LUBRICATION SUMMARY.

It is obvious that such details as inspection of oil level, water and petrol will automatically be attended to by any careful driver.

The general lubrication of the car can be seen at a glance by referring to the oiling diagram given at the end of this book. Certain oils and greases are specified after considerable testing and these should always be employed. Under no circumstances should the gear box or rear axle be filled with any other than the specified lubricants. Oils of different brands should not be mixed. In case of emergency and a different brand of oil having to be used, an early opportunity must be taken of changing the oil in the engine.

The Oiling Chart sets out the brand of lubricant each part requires and the approximate mileage is given as a guide for replenishment, thus :

"Check level at 4-C" means check at 5,000 miles, and if any lubricant is required use Whitmore's Compound Grade No. 9, or

"Delco F2.—1 TURN" means give the Delco grease cup one turn every 1,000 miles.

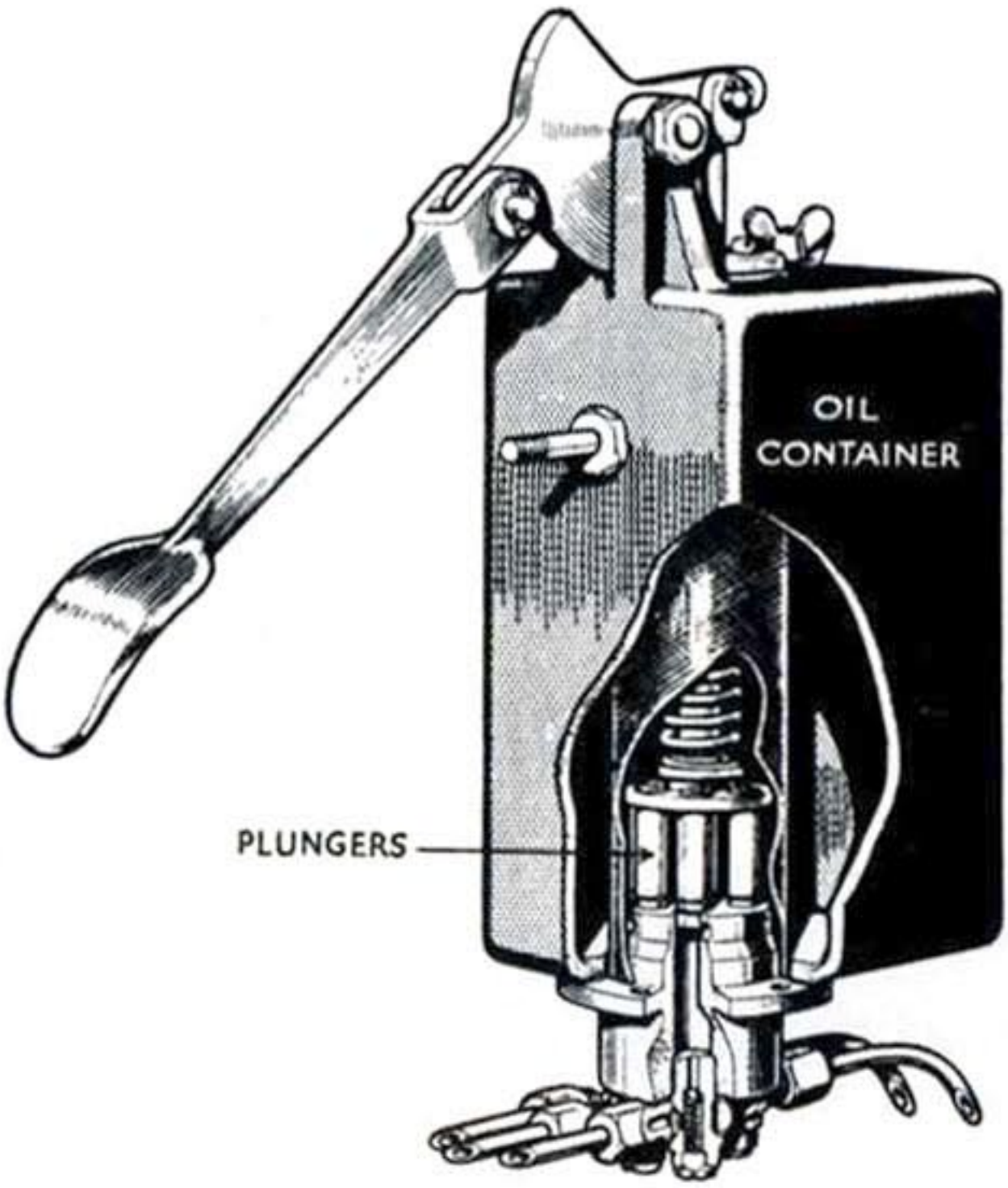
Indication Letter on Chart	Brand	Part Lubricated
A	AeroShell	Engine
B	Shell Super Heavy or Wakefield's Castrol R.	Gear Box
C	Whitmore's Compound Grade 9	Rear axle
D	Shell Gear Oil	Grease Gun Points
E	Spicer Special Lubricant	Universal Joint
F	Shell R.B. Grease	Water Pump, Delco, Front Hubs
G	Sewing machine oil or "3 in 1"	Magneto, Starter, Carburettor
CENTRAL LUBRICATION	AeroShell	Chassis

AeroShell oil is recommended for use in the engine and central oiling system for winter and summer. If this oil is unobtainable the following are suitable :

Duckham's	N.P.4
Price's	Motorine B. de Luxe
Vacuum	Summer "B" / Winter "BB"

It is a good plan when filling oil into the engine to fill the Tecalemit dash tank at the same time. The fillers are side by side.

The front brake camshafts and the clutch thrust bearing sleeve must be lubricated with caution. They do not require much and considerable inconvenience can be caused if, through over-oiling, the lubricant gets on the clutch or brake linings. The crankshaft vibration damper is automatically lubricated from the engine. The front hub can be run for 20,000 miles with safety without refilling, and no lubrication at all is needed for the rear hubs. In refilling the front hubs great care must be exercised in not using too much lubricant.



CHASSIS LUBRICATION.

The principal features of Tecalemit Central Lubrication are the independent pump plunger arrangement for each main outlet from the pump and the method of feed restriction at the points to be lubricated. The pump is supplied with five main outlets, each of which discharges lubricant from an isolated chamber at a pressure of 150–200 lbs. per square inch to from 8 to 10 points. The lubricant is never wasted because the regulator plugs on the bearings are designed to allow only a predetermined quantity of oil to pass in a given time. A large filter inside the container prevents the ingress of any foreign matter to the pump chambers.

DESCRIPTION OF THE PUMP.

The pump chamber is secured to the bottom of the rectangular container and in the bottom of this chamber are screwed the housings for the spring loaded ball discharge valves. When the foot pedal is depressed, the main pump rod, which runs through the oil container, is lifted against a strong helical spring. This spring butts at the bottom on a flat plunger disc attached to the bottom of the main pump rod. The pump plungers are secured to this plate and operate in separate chambers in the pump body.

When the pressure on the foot pedal is released, the spring forces the plungers down and lubricant is forced from each chamber through a spring loaded ball valve to the main outlet pipes. The oil is filtered before entering the pump chambers by passing through a fine mesh gauze which surrounds the main pump rod spring and top of the pump body. The container is filled through a hole in the top which is kept covered by a cap and wing nut.

REGULATOR PLUGS AND PIPING.

The end of each pipe is terminated by an annular fitting through which the plug or locating bolt is passed to engage in the thread tapped in the housing or bearing. Oil passes into the annular space made by the ring assembled on the plug, thence through a filter in the head of the plug. Variation in the amount of oil supplied to the various bearings is obtained by the length of the feed regulator. This consists of a cylindrical part on which is cut a shallow spiral groove or thread of special form. This part is made a tight fit in the centre bore of the plug, the result being that the oil is obliged to pass round the shallow spiral groove on its way to the bearing. The amount of oil which passes through the regulator in a given time is governed by the length of the spiral groove.

At the outlet orifice of the feed regulator a non-return valve is fitted consisting of a dished fabric disc held in place by a brass washer. This valve seals the outlet when the pump is not operated, and keeps the pipe line full of oil, thus avoiding the possibility of air getting into the pipes and creating airlocks.

INSTRUCTIONS FOR SERVICING TECALEMIT CENTRAL LUBRICATION.

In the event of it becoming necessary to remove either the pump or any of the pipes from the chassis, great care should be taken to see that the restriction feed plugs, washers and pipes do not come in contact with any dirt or dust. When the pipes are replaced on the chassis the connection and the pipe to the pump should be made first and the pipe line primed by the pump. Make sure that the connection on the other end of the pipe is undone, to allow the air in the pipe to escape.

GENERAL SURVEY OF EIGHT-LITRE SIX-CYLINDER

As soon as the owner receives his car he will desire to become acquainted with certain details of the chassis which are not readily seen. It has been thought advisable to take a general pictorial résumé of the car to make the acquaintanceship reasonably thorough and to avoid as far as possible particularising on any subject which will be dealt with separately in the book. The main things the owner has to know are the filling of fuel, oil, and water, and the location of various parts that are otherwise hidden by the body, wings, etc.

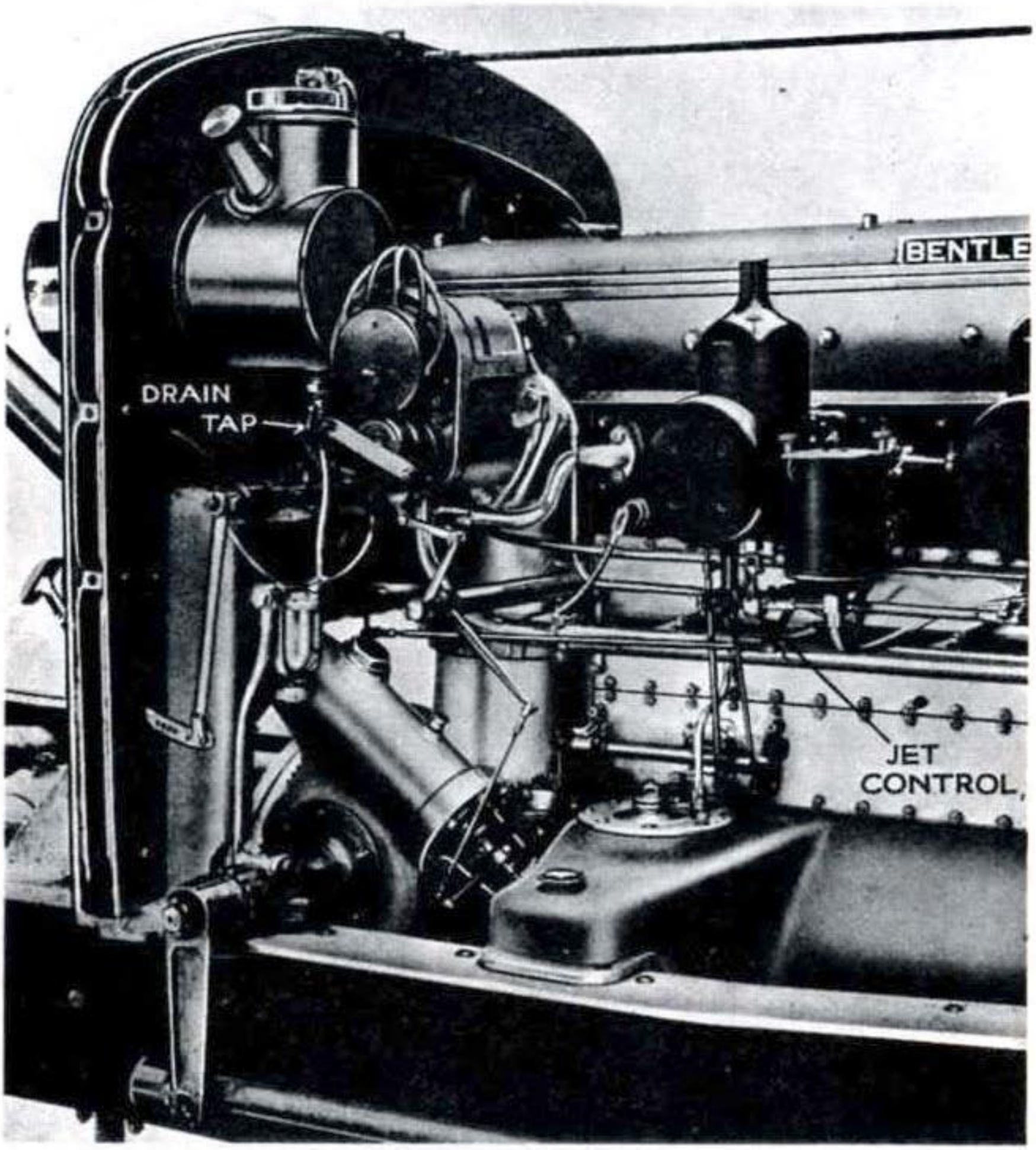


Fig. 1.

Fig. 1 is a good point to start and it shows the Autovac tank on the offside of the dashboard, which contains approximately one gallon of petrol and can be primed through the filler neck underneath the bonnet. Below this Autovac will be found the petrol drain tap. The petrol feed from the Autovac is taken by a short pipe to the petrol filter, from which the petrol flows by gravity to a pair of carburetters.

Magneto and carburetter controls are shown in some detail and also the pipe leading to the vacuum servo from the rear end of the induction manifold.

The owner should familiarise himself with the effect of the jet control of the "SU" carburettor, which consists of a lever placed on the top of the steering column, operating on sleeves underneath each carburettor, which enriches the mixture for starting. It has a similar effect to strangling and should be used as little as possible.

The most important detail for the owner to study is the height of oil in the basechamber and the point where the basechamber is filled. The filler is situated on the nearside bearer arm, and the level indicator is immediately behind it (shown on Figs. 2 and 3).

The filter in the oil pressure supply system is situated in the offside rear engine bearer arm (see Fig. 1).

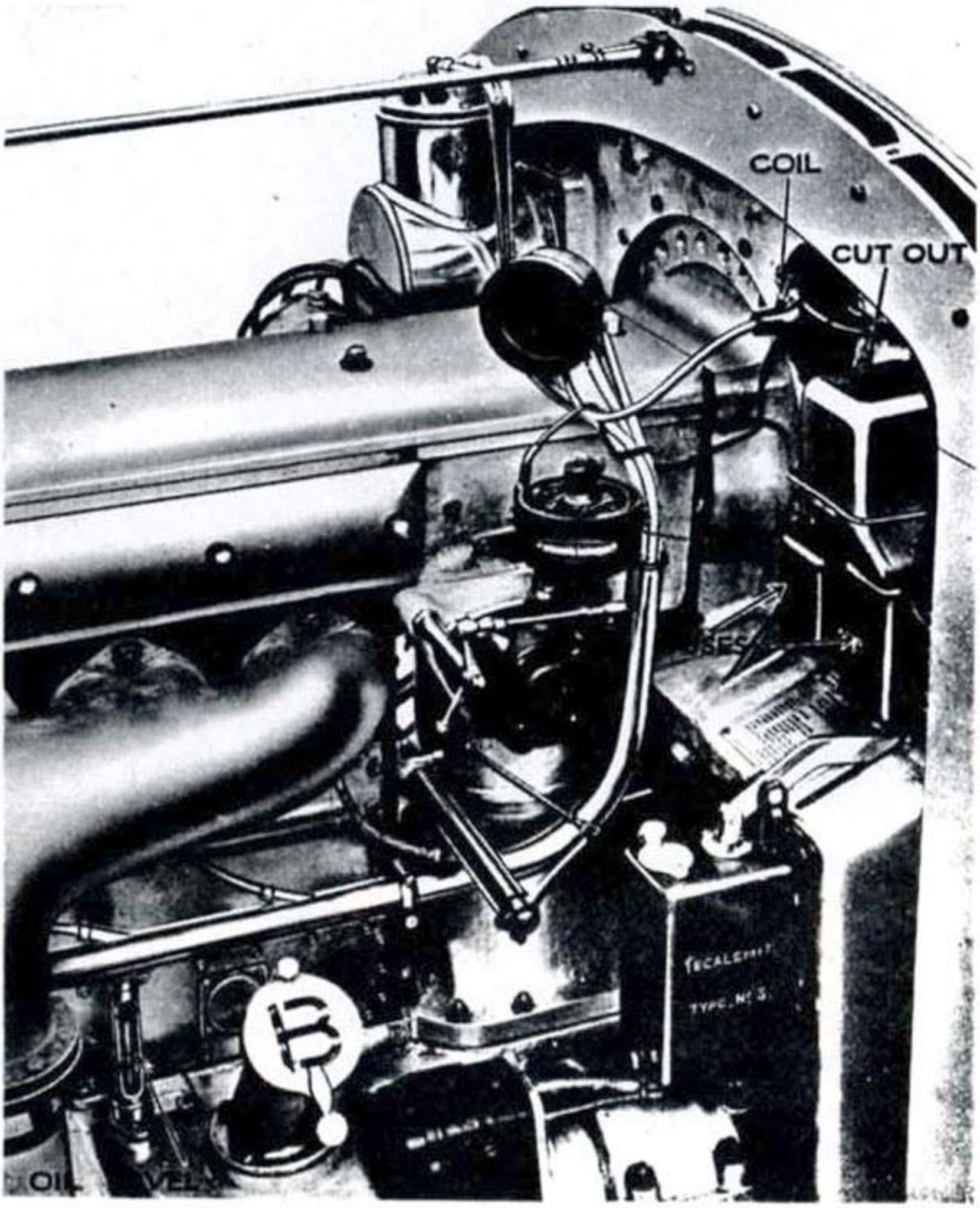


Fig. 2.

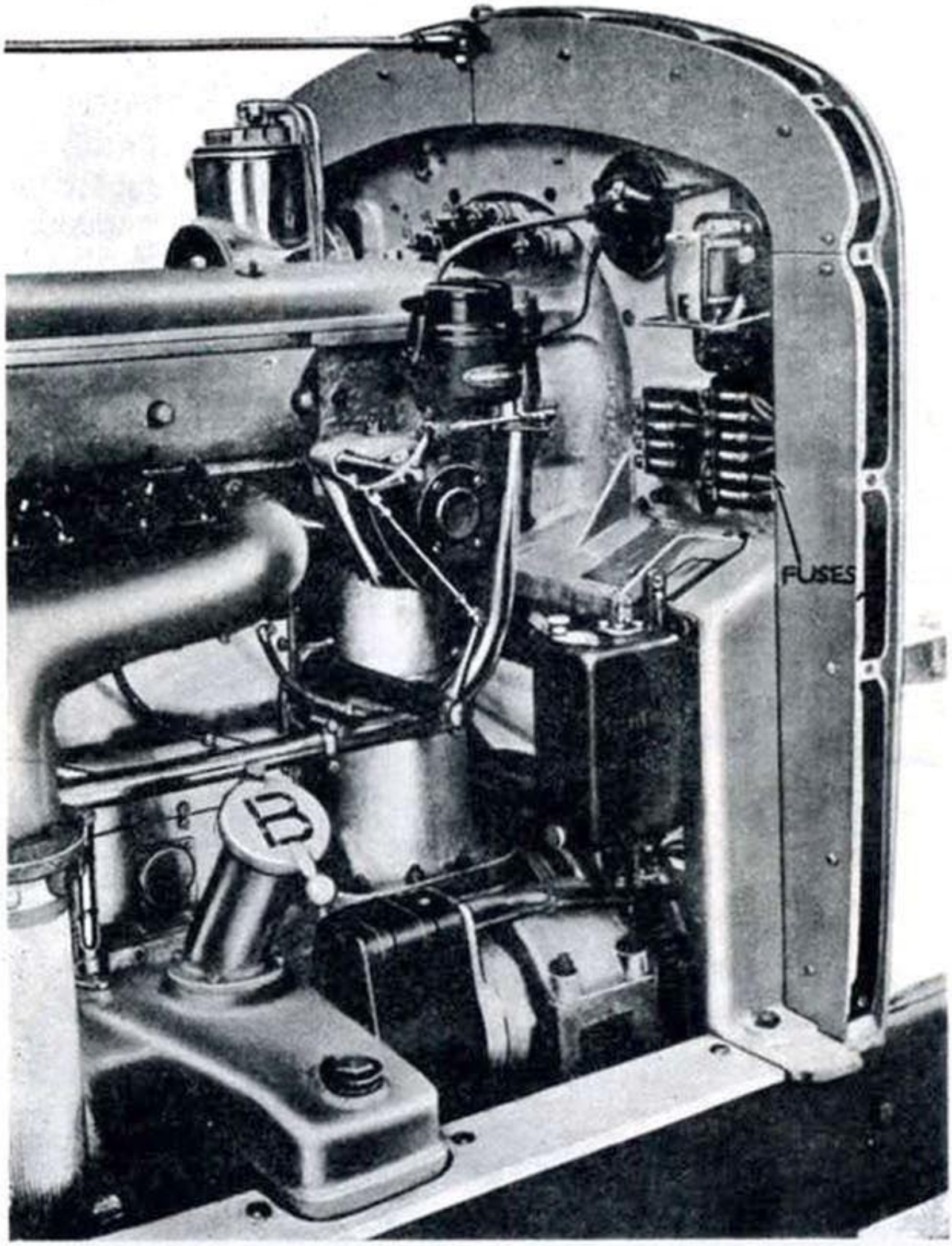


Fig. 3.

Note Position of Fuses, the covers having been removed.

The coil ignition layout consisting of high-tension distributor in Fig. 2 will be seen with cover removed and the coil mounted on the dashboard.

The next item of interest on this illustration is the Tecalemit central lubrication oil container and pump, which is operated by a pedal extending into the driving compartment on the near side, and above this are situated the cut-out junction and fuse boxes for the electrical installation. The cut-out and fuse box covers have been removed in the illustration.

Fig. 2 has been taken slightly from above, and in order to supplement the user's knowledge. Fig. 3 has been taken lower down, in order to disclose the details of the base of the Tecalemit central oiling pump.

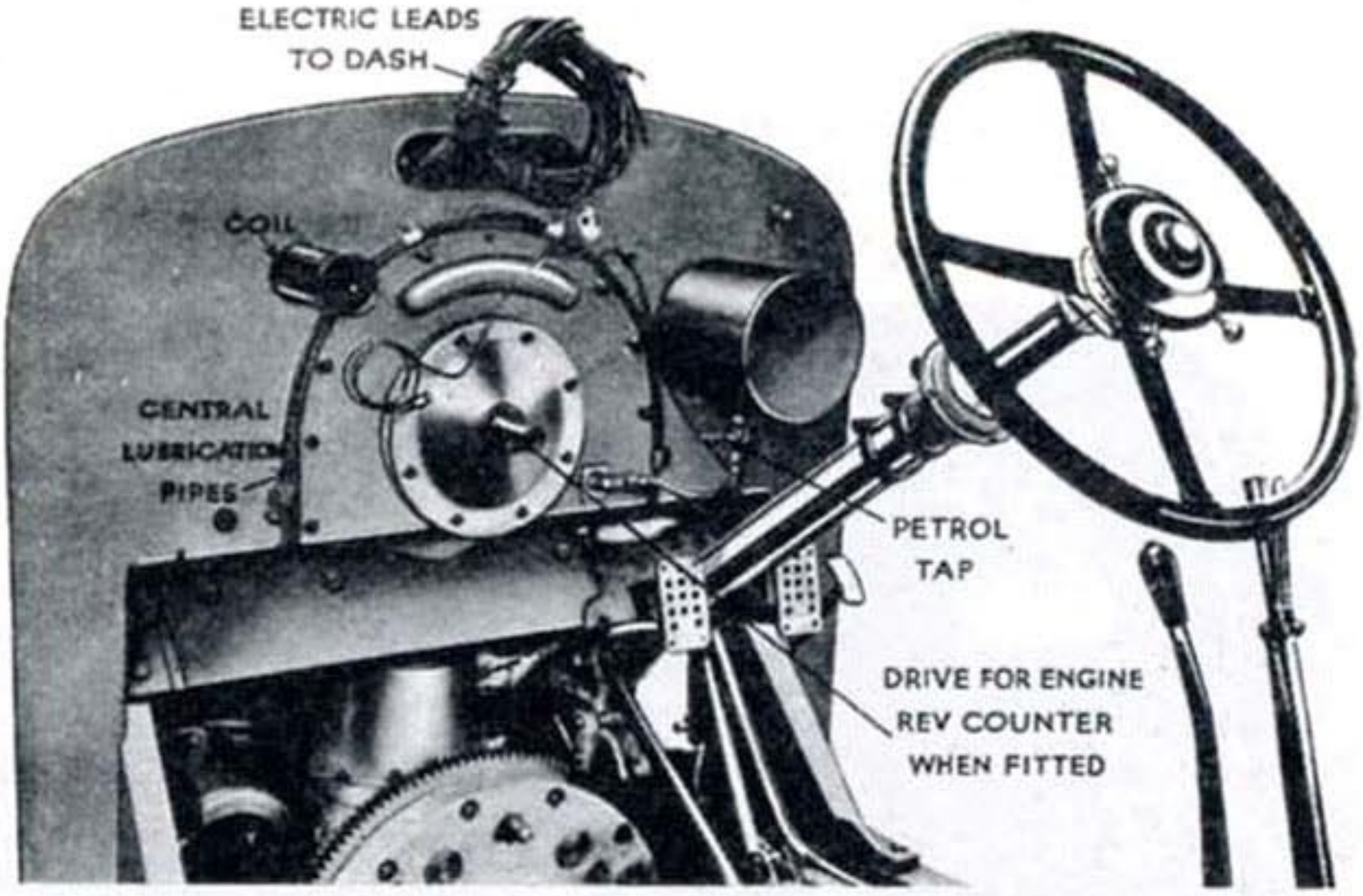


Fig. 4. VIEW OF THE DASH WITH BODY REMOVED.
Note position of petrol tap beneath Autovac tank.

A general exterior view of the clutch and gearbox is seen on referring to Fig. 5 overleaf. The gearbox is mounted on two tubular cross bearers and the gate in which the change speed lever works forms part of an extension of the gearbox. The clutch is of the single plate type entirely enclosed with external adjustment which is practically never needed.

The lubricators for the clutch withdrawal is shown in this illustration, the location of the Dewandre Servo Motor can be seen situated on the right-hand side of the gearbox.

The dashboard proper is made of an aluminium casting with cover plates on the front, and these are formed in such a manner as to conceal the wires that are conducted via the dashboard to the junction and fuse boxes, a number of wires can be seen entering the dashboard on the left-hand side, close to the self-starter.

The next view, which is one that the owner will seldom have an opportunity of seeing, is taken from the rear of the chassis and shown in Fig. 6. First of all this shows on the extreme left the gearbox and dipstick to indicate the oil level,

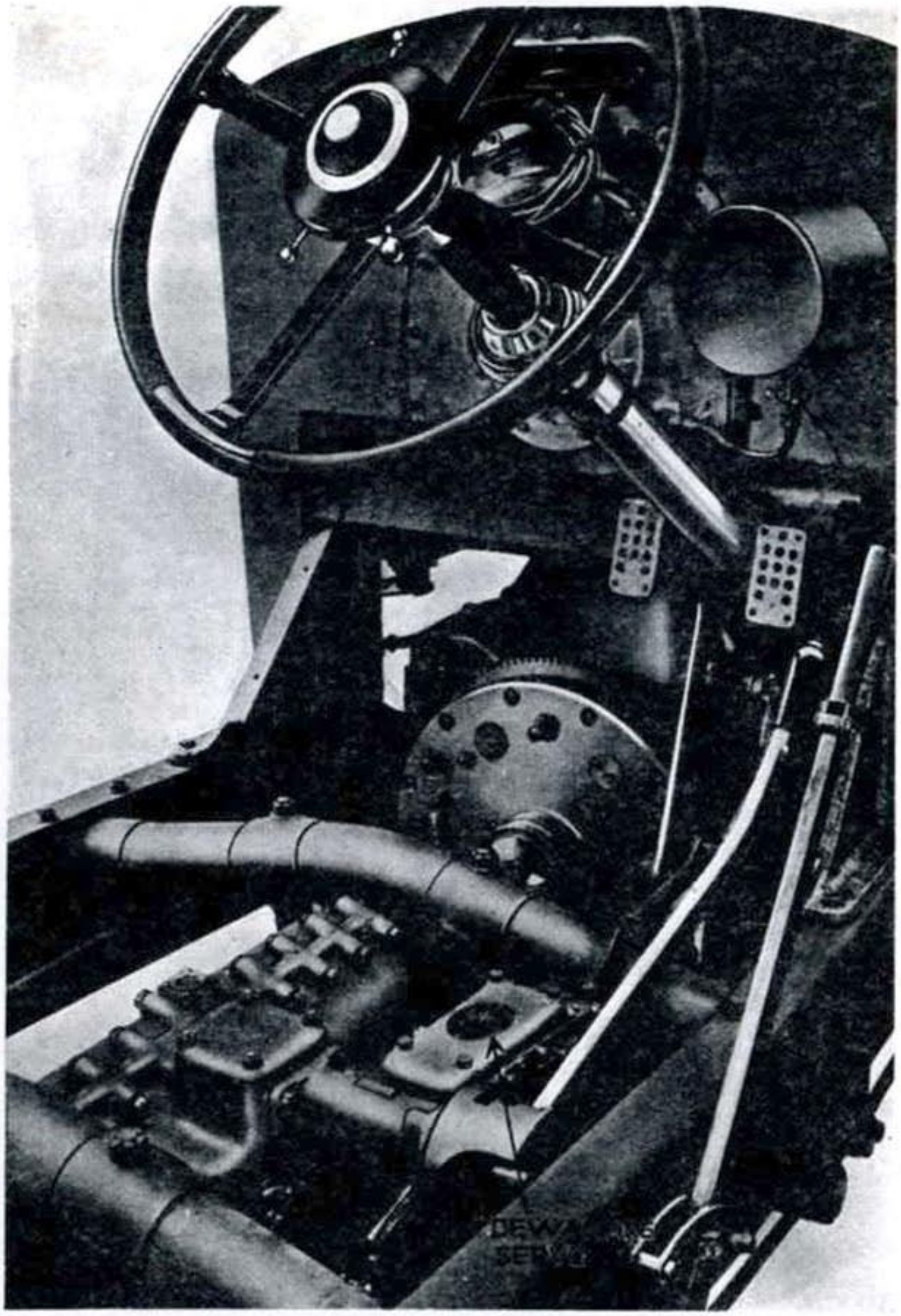


Fig. 5. VIEW OF CLUTCH, GEARBOX AND DEWANDRE SERVO.

as well as the method of suspension of the box at the rear end and the Hardy-Spicer universal joint and tubular propeller shaft.

The foot brakes are Servo operated and the compensator cross shaft is clearly shown. The adjustment for equalising the pressure on the rear shoes when operated by the hand brake can be seen and consists of the right and left handed threaded bolt with hexagon centre coupling up the yoke end to the adaptor piece, attached to the brake cable. This illustration also shows

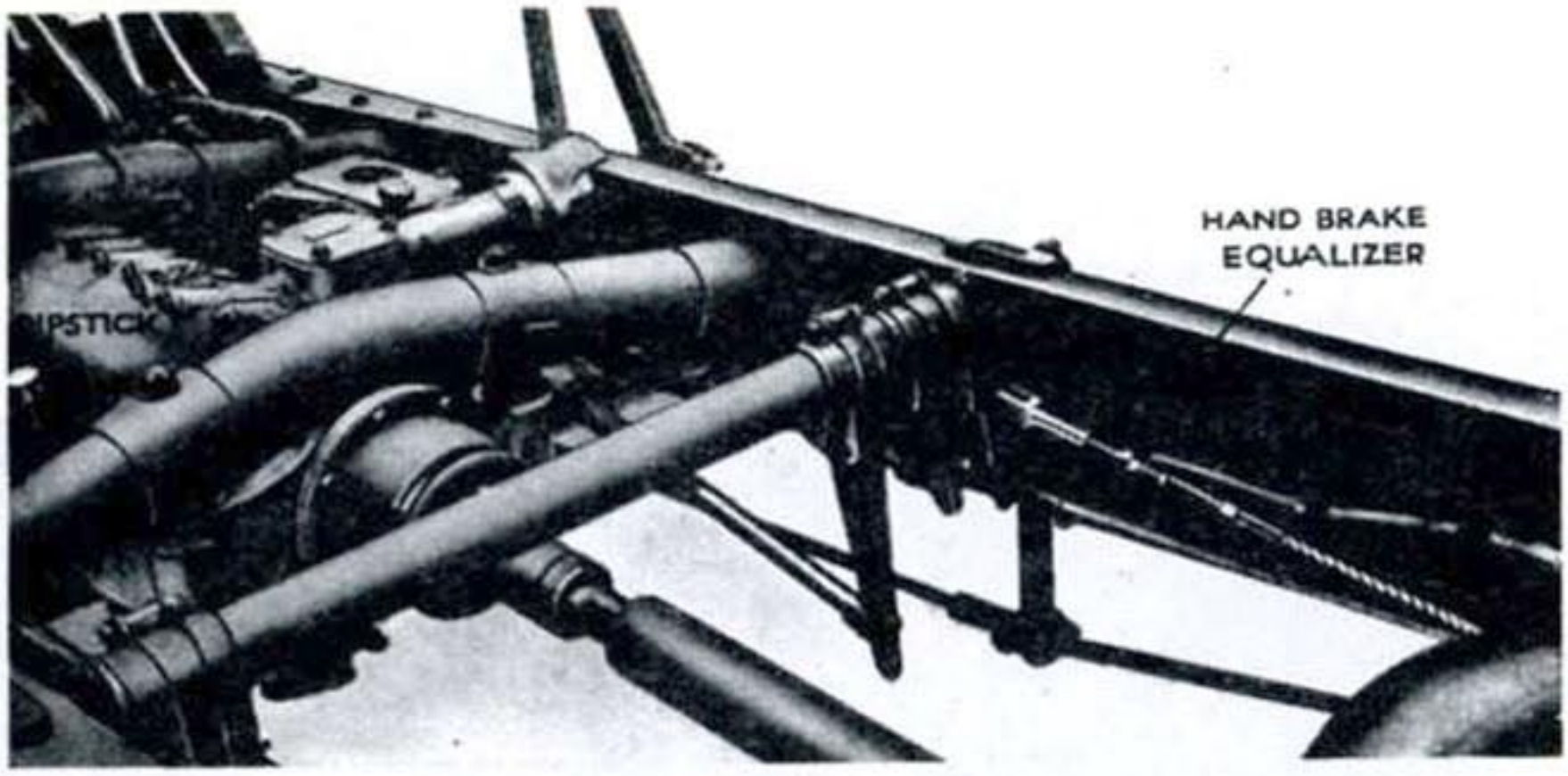


Fig. 6. VIEW OF CHASSIS AMIDSHIPS.

how the electric wiring is carried out, being supported right along the frame by insulated bridge pieces.

We now pass to what can be seen when the floorboards are

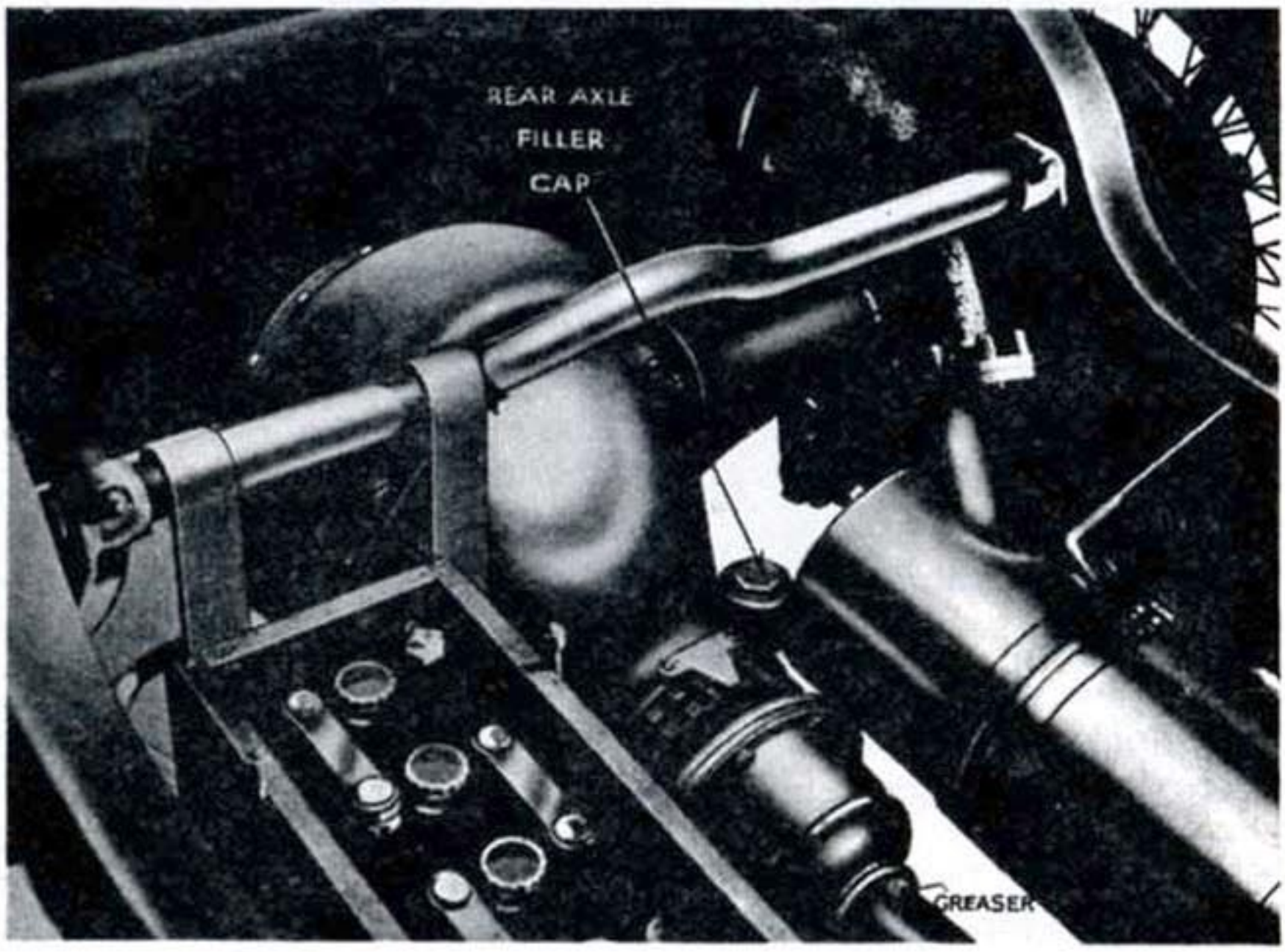


Fig. 7. VIEW OF REAR AXLE, BATTERIES AND REAR OF SILENCER.

lifted in the rear compartment of the car (Fig. 7). First of all we have the battery on the offside of the car and the silencer and outlet pipe on the nearside. Next the main body of the axle with oil filler situated immediately behind the silencer. The rear axle adjustment for the meshing of the gears will be seen in this illustration, but under no circumstances should this be touched or the seal broken.

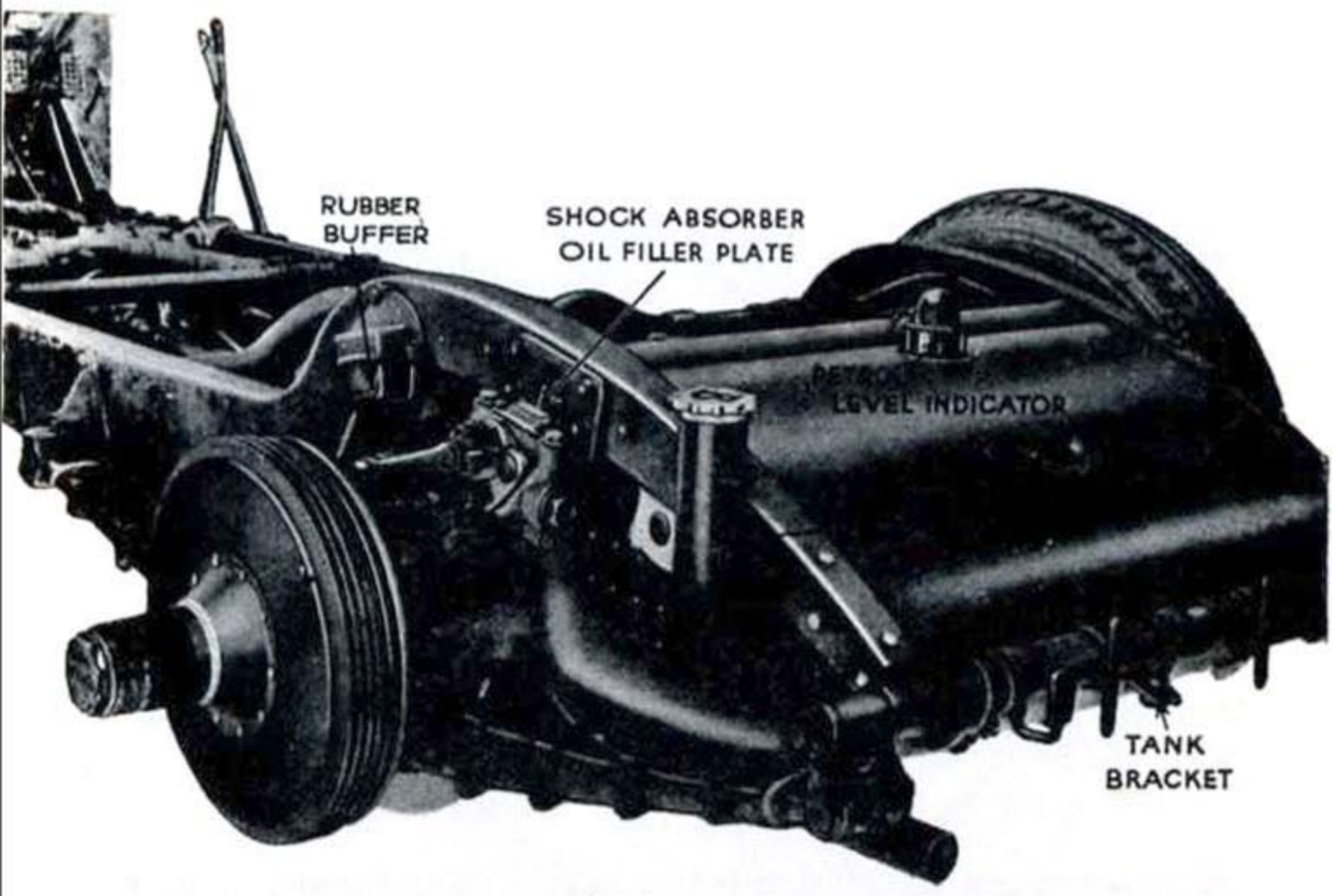


Fig. 8.

There is a point however that this illustration should indicate, viz., the lubricator on the rear end of the propeller shaft through which special lubricant obtainable from the Service Department is forced into the universal joint. It is only necessary to give a few strokes of the oil gun to this joint every 5,000 miles.

It is necessary to top up the batteries with distilled water every month at least, oftener on long journeys in hot weather. To neglect this may easily ruin the battery.

The rear end of the chassis is shown in Fig. No. 8, with the wheel removed. There is so much to be seen in this illustration that it is as well to refer the reader to the notes on the illustration, rather than to describe these.

The shock absorbers should be well washed before the cover plate is removed for refilling with AeroShell.

FUEL TANK.

The tank is mounted on trunnions and is carried between the rear dumb irons. Its capacity is 25 gallons. Baffles are fitted to prevent the fuel surging from one side to the other. There is a drain plug, incorporated with which is a large gauze filter, which enables the contents to be completely drained. There is also a small plug, which should occasionally be removed to allow water and sediment to drain out. The Hobson petrol gauge unit is mounted in the centre of the tank. The tank filler is in the form of a goose-neck on the nearside of the tank, and is so placed that the tank can easily be filled when the luggage grid is in use.

GENERAL DESCRIPTION OF THE ENGINE.

The owner will have familiarised himself with the external details of the engine as can be seen in the chassis and from the illustrations that have already appeared in the book. There are, however, certain aspects of the engine which can only be illustrated when the engine is out of the chassis and after removal of certain pipes and fittings.

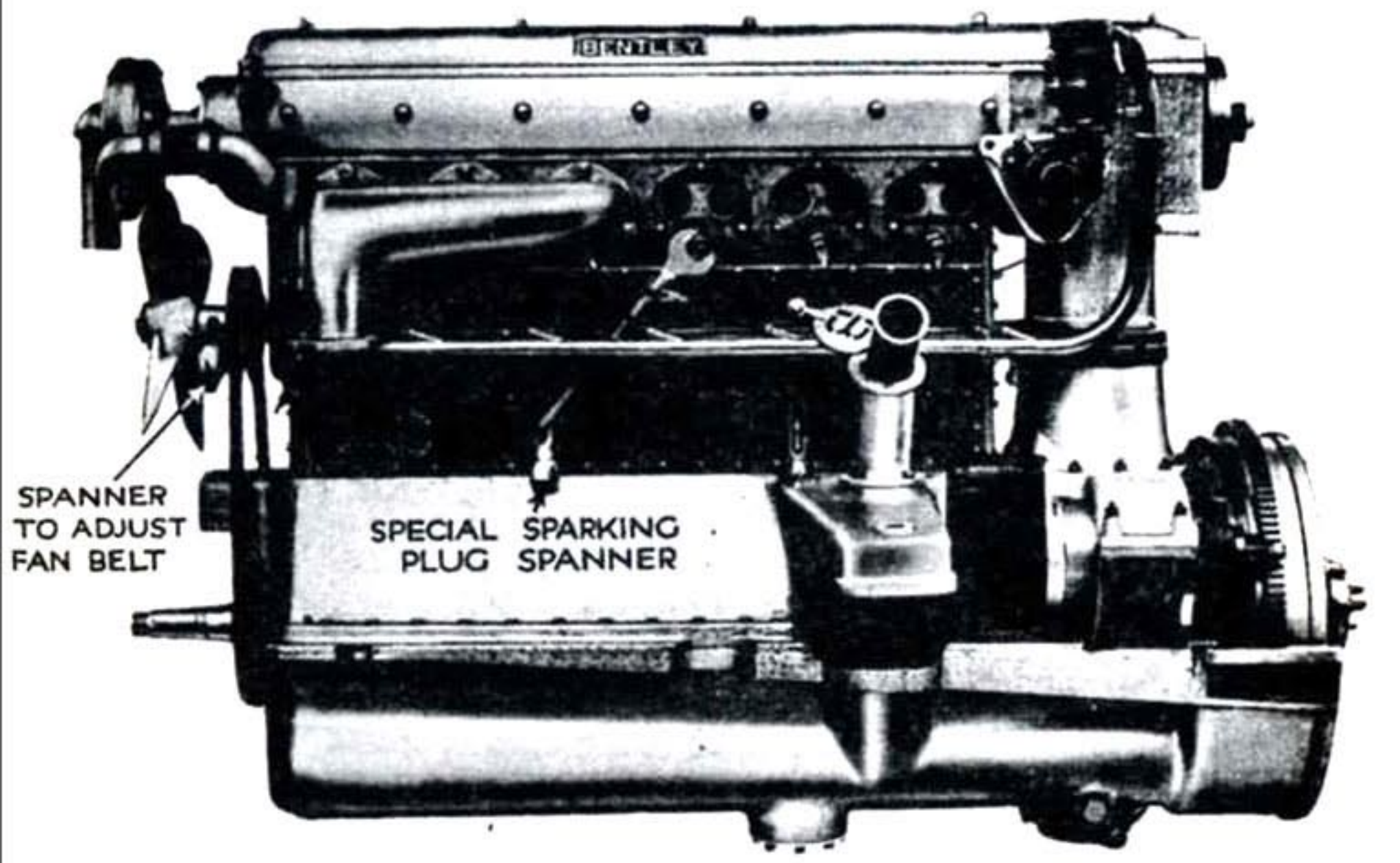


Fig. 9.

NEAR SIDE OF ENGINE WITH ONE EXHAUST MANIFOLD REMOVED.

Take the view shown in Fig. 9, which affords a very excellent study of the Bentley 8 Litre. It is as well to start with one component and then pass to the next, take for example the details of the engine lubrication. First of all there is the filler cap, which consists of an extension or arm provided with a spring-loaded cap and a gauze strainer of sufficient coarse mesh to allow oil to be poured in quickly, but to trap any large particles of foreign matter. Behind the filler is situated the oil level indicator working in a guide; on looking below this, one notices a boss on the sump with a plate bolted to it, which permits the removal of the float, the upward extension of which acts as a level indicator. Now look to the right of the sump, and another boss will be found, below which is the gauze filter for the oil pump. This part when attached to the engine is fitted with two drain plugs, one for the sump itself which is the upper drain plug and the lower nut drains the interior of the filter.

The self-starter is clamped in a bracket on the right-hand side of the near side engine arm, so that at any time it is removed for repairing or cleaning it is a very easy matter.

In Fig. 9, for the purpose of clearness, the rear exhaust manifold has been removed to show the sparking plugs. A spanner is shown attached to No. 4 sparking plug. It is double-ended, and it will be found from experience which is the best end to employ for certain plugs.

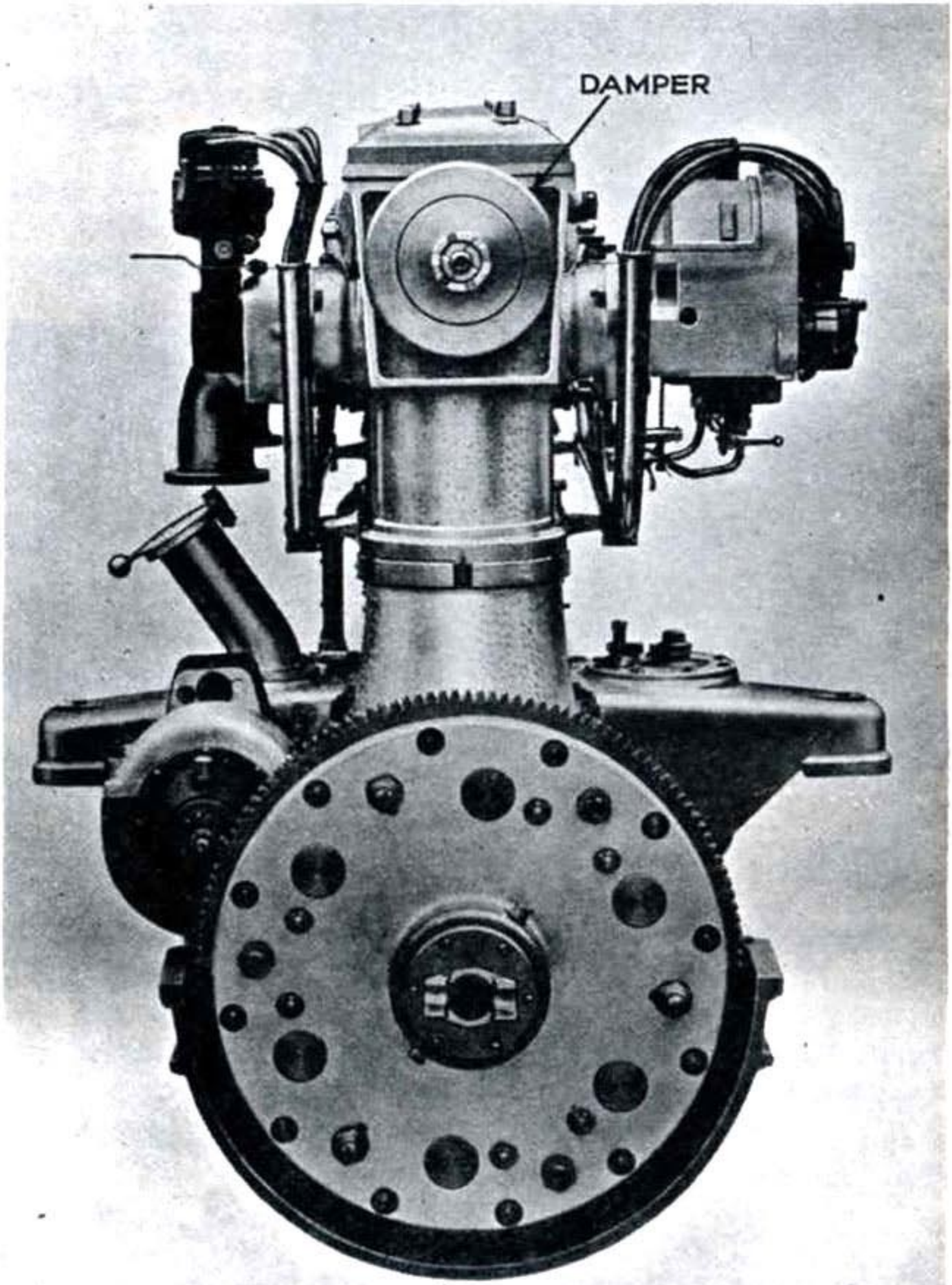


Fig. 10. REAR VIEW OF ENGINE AND CLUTCH.
Note damper on rear end of camshaft.

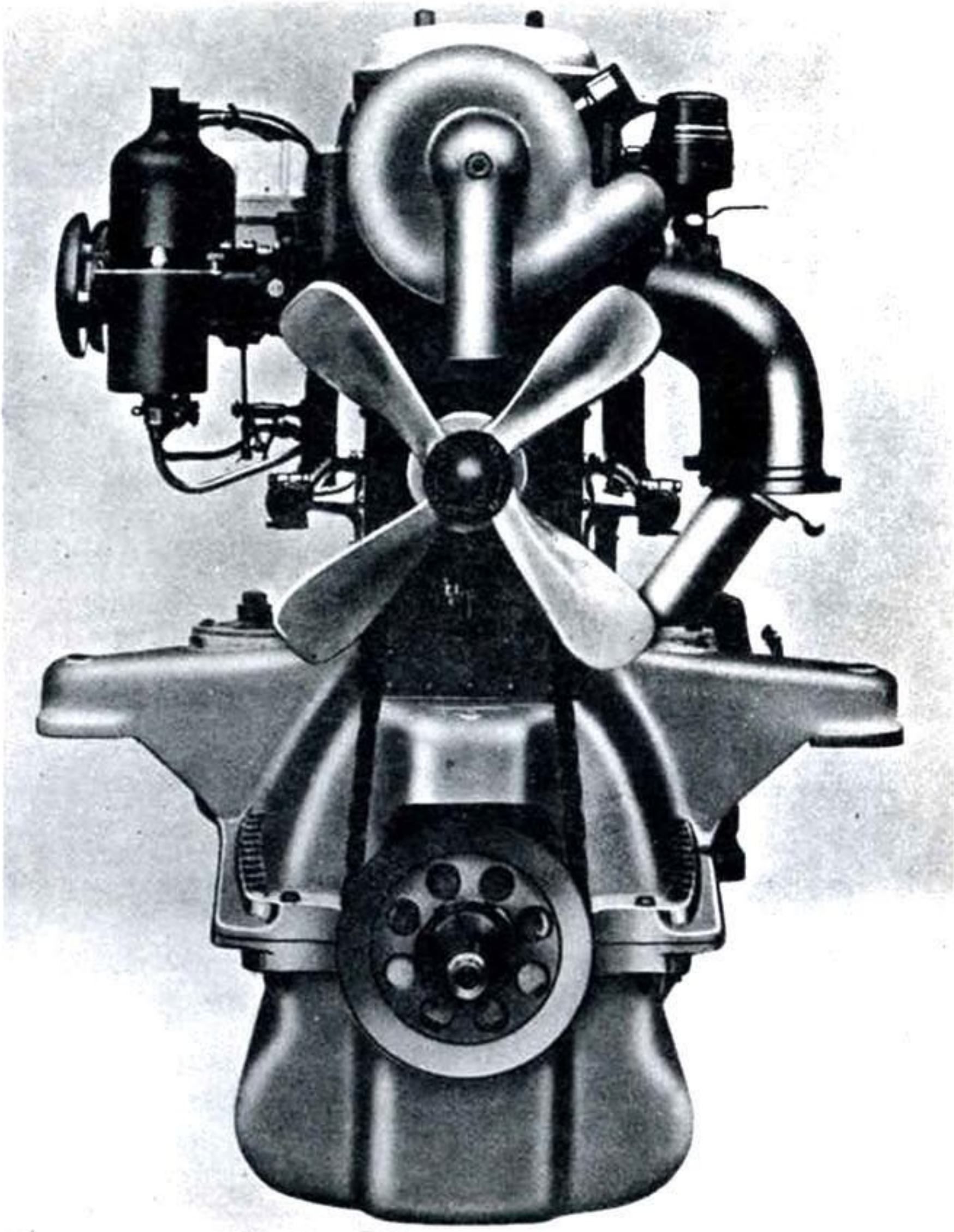


Fig. 11. FRONT VIEW OF ENGINE SHOWING FAN AND WATER PUMP.

The rear end of the engine shows the magneto on one side and the distributor for the high-tension ignition on the other. At the rear of the cylinder block the camshaft damper will be noted.

Now pass to the front end of the engine (Fig. 11) showing water pump being driven from the front extremity of the camshaft, and below this the fan, driven by a belt from a pulley at the front end of the crankshaft. The extension of the latter, as can be seen, is fitted with a keyway on to which in turn is fitted a crankshaft vibration damper. Refer to Fig. 9.

to see the method of adjusting the fan belt with the aid of a large flat double-ended spanner supplied with the tool kit. The fan spindle being slightly offset at the point where it screws into the cylinder block plate has a slightly eccentric movement; it is locked into position by means of a locking nut.

The water pump is provided with a greaser, which it is essential should be filled with a high melting point grease, as Shell R.B. Grease.

Now pass to the opposite side of the engine shown in Fig. 12. In order to better visualise the engine without manifolds the induction pipe has been removed and superimposed alongside the valve covers, obviously upside down. It will be seen that the induction side of the engine is one large port fed by two carburetters, the removal of the manifold

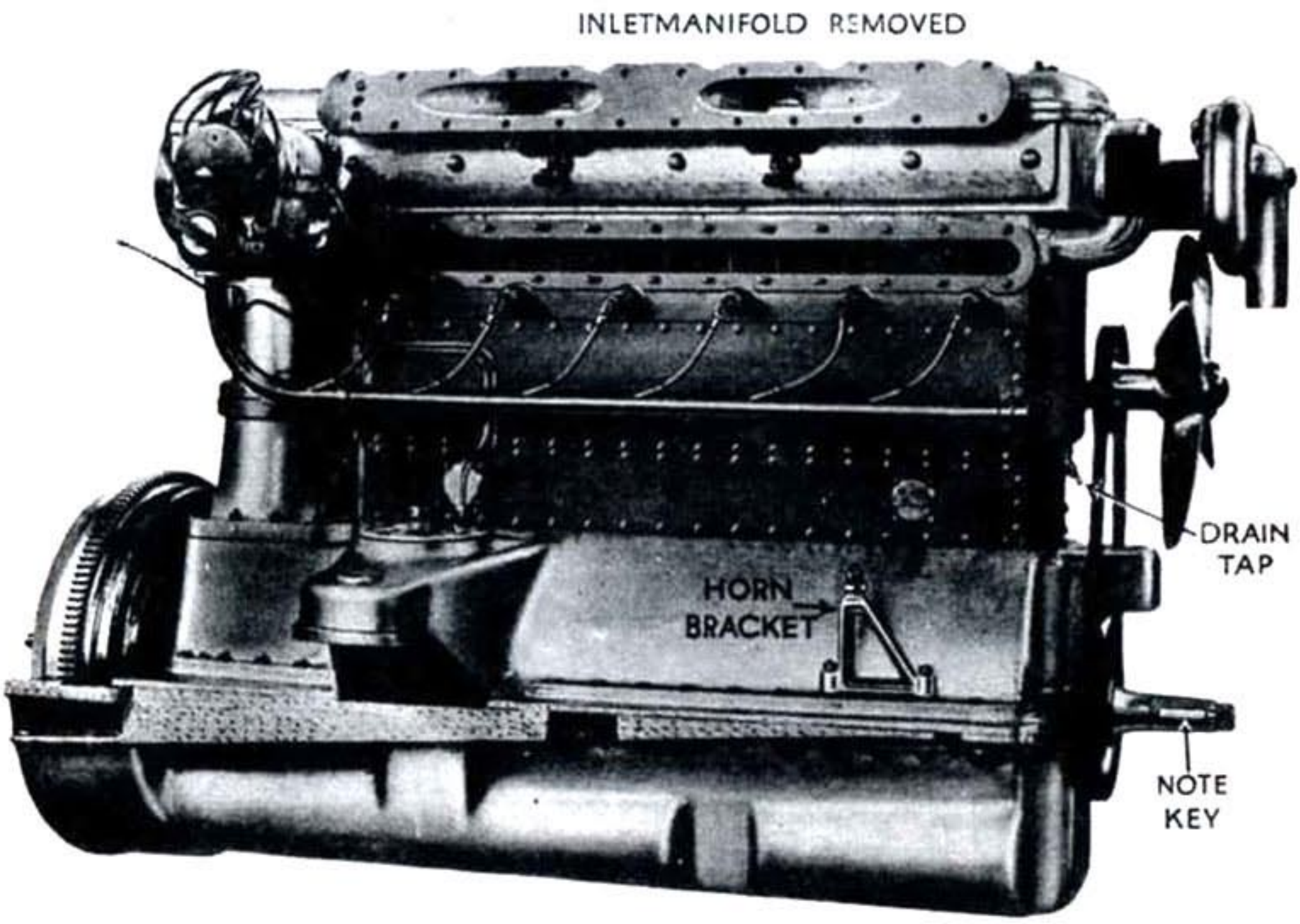


Fig. 12. INLET SIDE OF ENGINE WITH MANIFOLD REMOVED.
Note Drain Plug for emptying water from Cylinders.

disclosing the valve stems. The rear engine bearer arm contains the main oil filter and oil relief valve, which is described in detail under the heading of lubrication. The magneto will be seen in position attached by a triangular plate, the engine side of which is provided with slots, so as to afford a means of setting the magneto accurately for the best firing position.

It will be noted that the sump is formed into an extension at the rear to act as a clutch bowl and prevent any road dirt finding its way on to the self-starter ring.

The small triangular bracket attached to the lower half of the crankcase at the forward end is for carrying the electric horn. In this illustration, there is another view of the water pump and the outlet pipe leading from the front end of the cylinder.

The owner should notice in this illustration a small drain tap situated behind the fan, and actually at the lowest point of the water jackets surrounding the cylinder, for draining. Particular attention should be paid to seeing that this tap is closed before the engine is started up, when the system has been refilled with water after draining.

The cylindrical casing at the rear end of the block contains the eccentric gear for driving the overhead camshaft.

Under no circumstances should this part be interfered with.

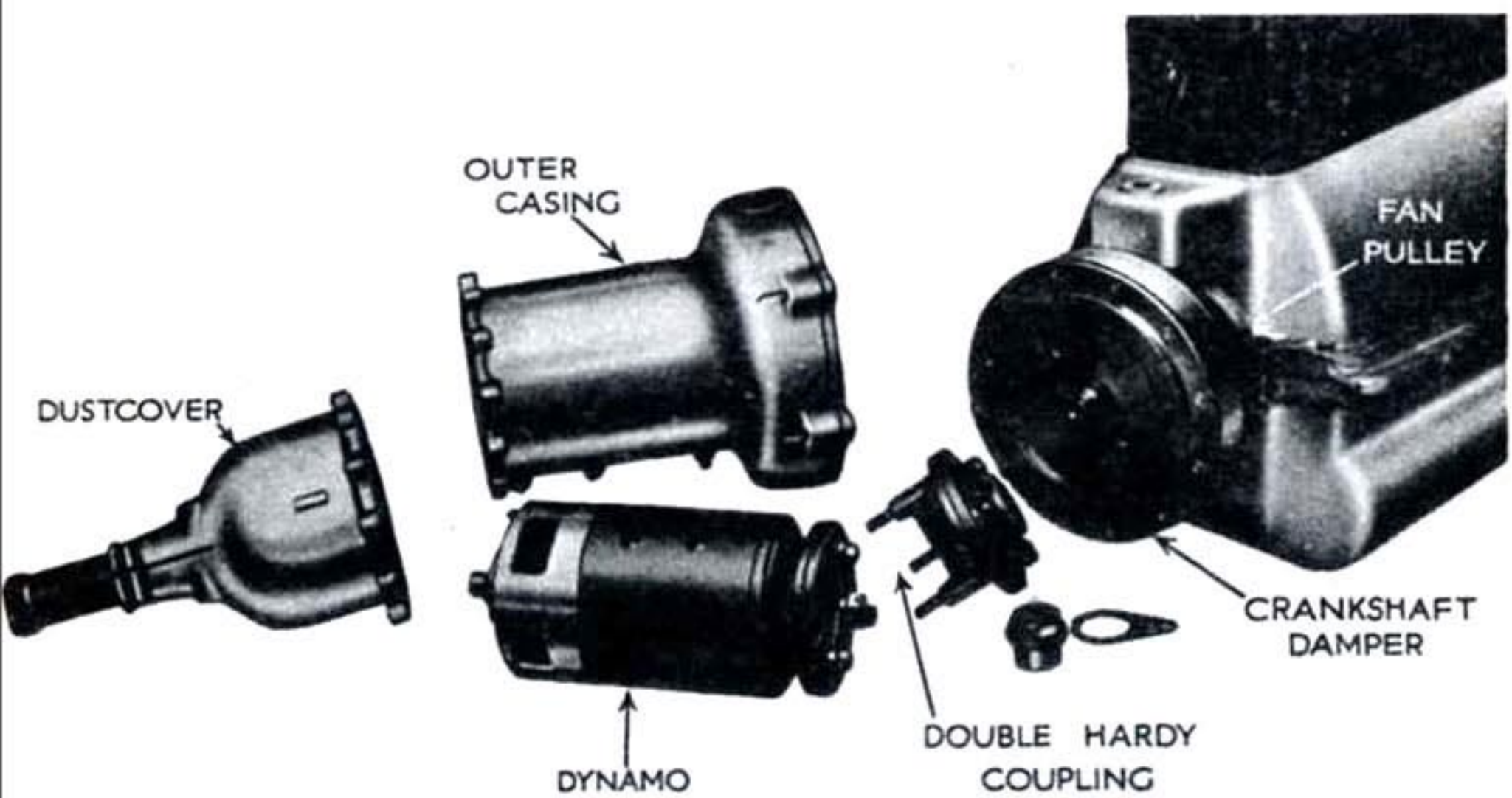


Fig. 13. SHOWING METHOD OF DRIVING THE DYNAMO AND THE TYPE OF CASING EMPLOYED.

DYNAMO MOUNTING

The dynamo is contained in an extension housing bolted to the front cross member of the frame and provided with a front end cover, the front extension of which forms the support of the starting handle.

The dynamo is driven from the front of the crankshaft by two "Hardy" joints, one of which is secured to the crankshaft and the other to the dynamo. It is possible to detach the front "Hardy" coupling from the three-point spider, as shown in Fig. 13, the rear coupling being secured by a special nut and tab washer.

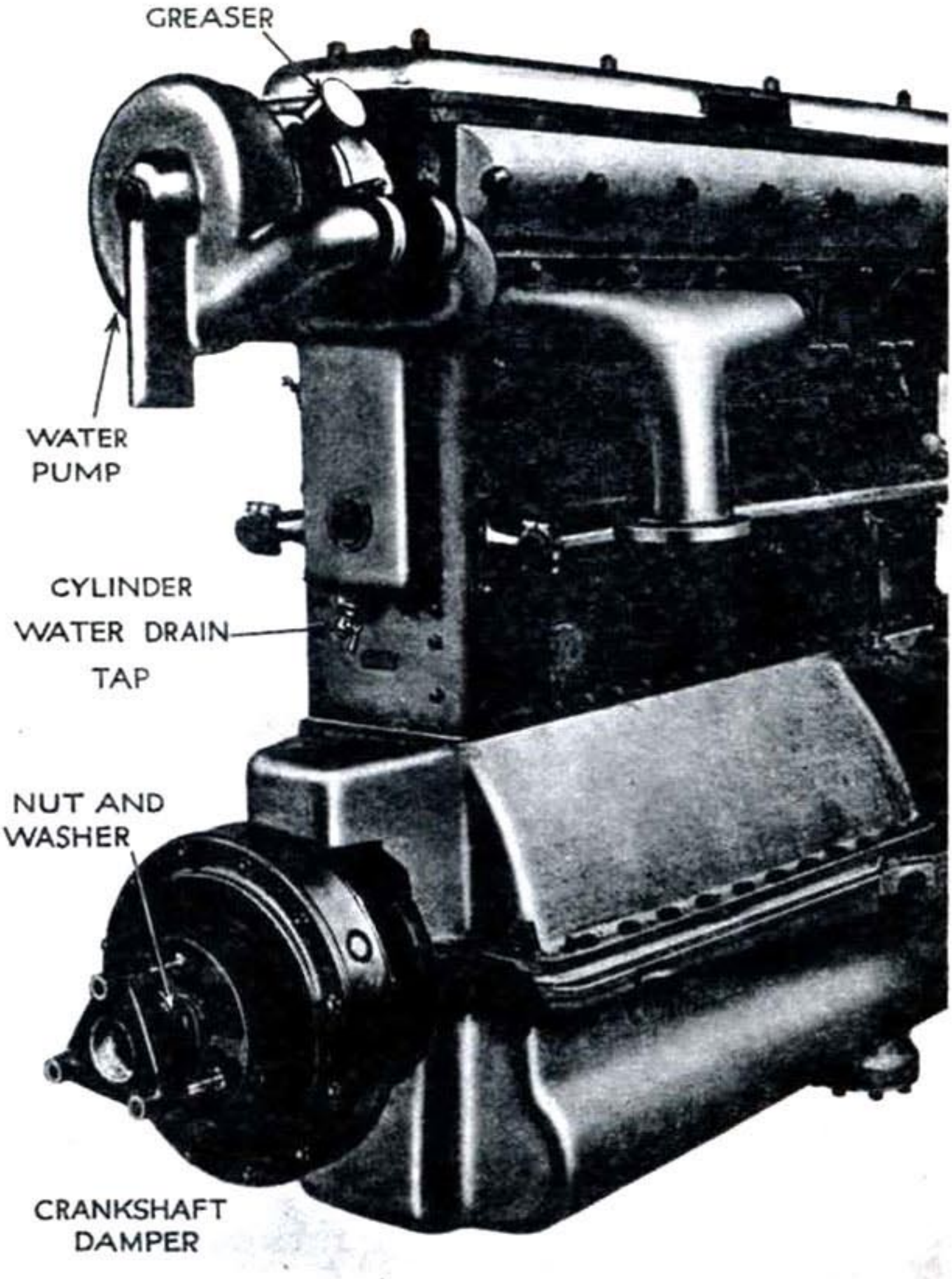


Fig. 14. CRANKSHAFT DAMPER AND DYNAMO COUPLING.

In this illustration, the front end of the crankshaft will be seen with the vibration damper fitted. This damper needs no lubrication, the front end of the crankshaft being hollow and cross drilled to provide a small supply sufficient to lubricate the damper.

The damper consists of a self-contained unit that automatically comes into operation and needs no attention. Should the coupling, however, have to be removed it is as well to realise that there is a large nut with a special shaped washer shown in Fig. 13 that has to be removed, the nut and spider being clearly shown in Fig. 14. This view also shows the boss on which the fan spindle is mounted and the cylinder drain tap as well.

INTERIOR DETAILS OF THE ENGINE.

We now pass to the interior of the engine and illustrate those parts which, to the average owner, are interesting to know and understand, but leaving out details which only concern the Service Station. It cannot be too strongly emphasized that it is the wish of Messrs. Bentley Motors for full use to be made of the Bentley Services, which not only comprise the London Service Station, but the Service Depots in Glasgow, Leeds and Paris, given in the early part of the book, and also the services of the Bentley travelling inspectors. A clear understanding of the engine lubrication will make the owner more interested in his engine.

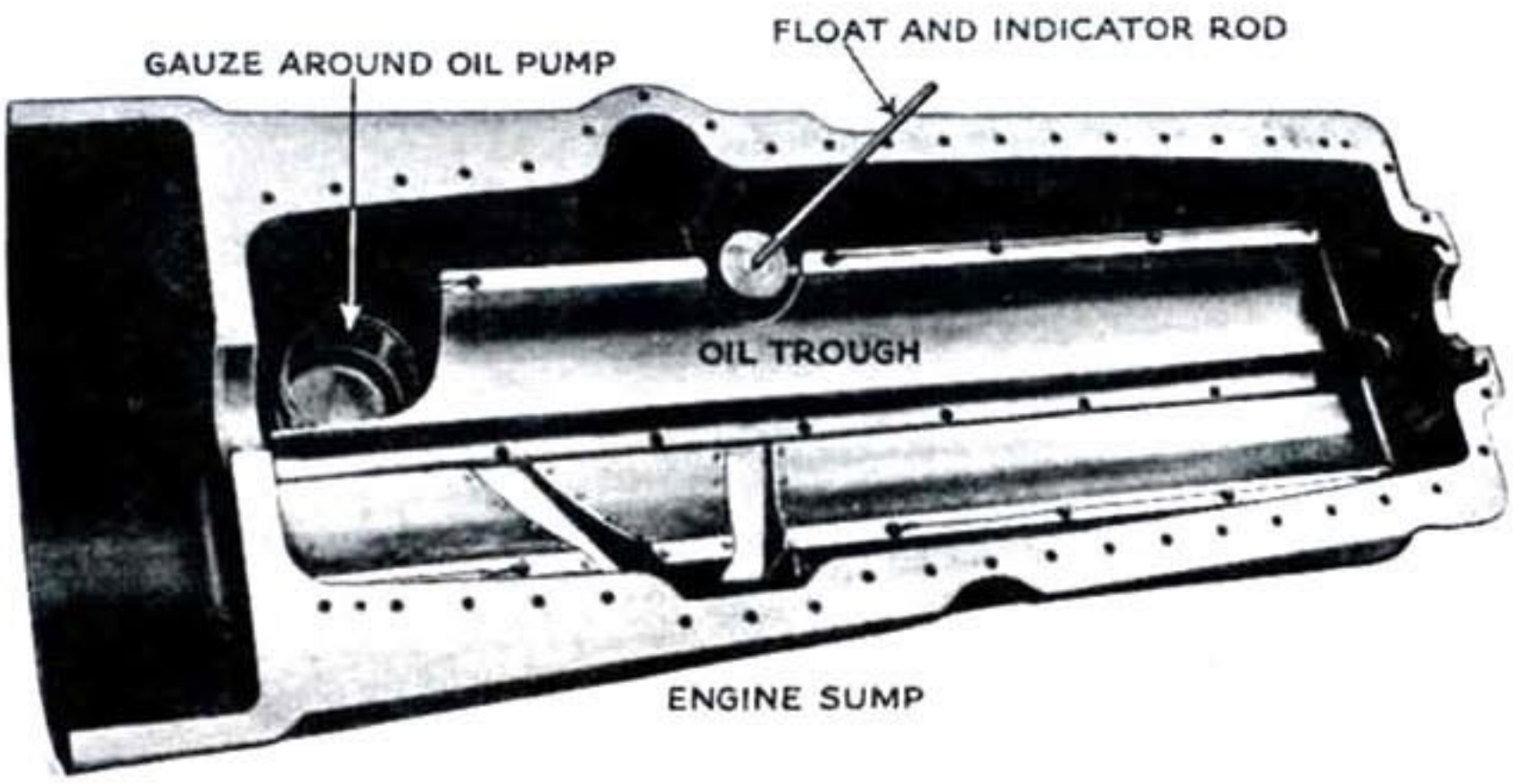


Fig. 15. INTERIOR VIEW OF THE ENGINE SUMP REMOVED FROM THE ENGINE.

ENGINE LUBRICATION.

In the first place he will realise that the oil, when filled into the engine through the breather, passes through a gauze strainer, and should be maintained up to a proper level in the sump. The interior view of the sump is shown in Fig. 15. This shows the metal shield or trough which prevents surging of the oil in the basechamber, due to rapid acceleration or deceleration or when going round corners.

The strainer for the oil pump is placed immediately below the pump and is detachable. The sump and strainer can both be emptied, and to afford a better idea of how this is done the view of the underneath side of the engine, Fig. 16, should be examined.

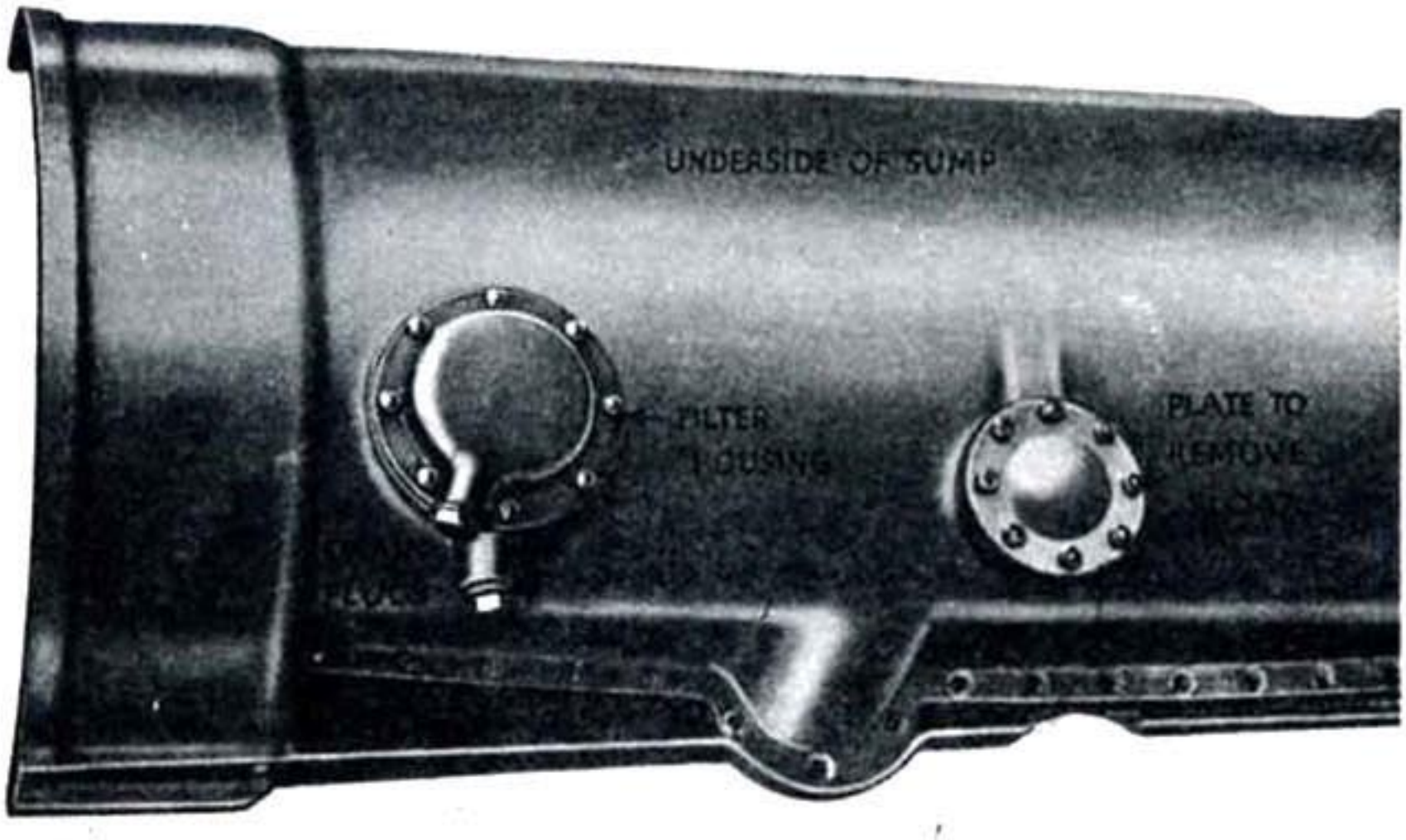


Fig. 16. ENGINE SUMP SEEN FROM BELOW.

A gear type of pump is mounted inside the engine, which sucks oil from the basechamber and delivers it by a pipe to the main oil filter situated in the offside engine bearer arm. The oil is strained in its passage through this filter and is then conducted by another pipe to a central tube, whence in turn it is conducted to the main bearing caps, oil being thus delivered to the big end bearings through the hollow drilled crankshaft. Sufficient oil is thrown up by the rotation of the connecting rods to lubricate the cylinder walls, pistons, and gudgeon pins.

Two illustrations (Figs. 17 and 18) have been prepared showing the side and plan view of the crankshaft in position and how the oil is pumped to the strainer, and thence to the oil gallery feeding the crankshaft bearings.

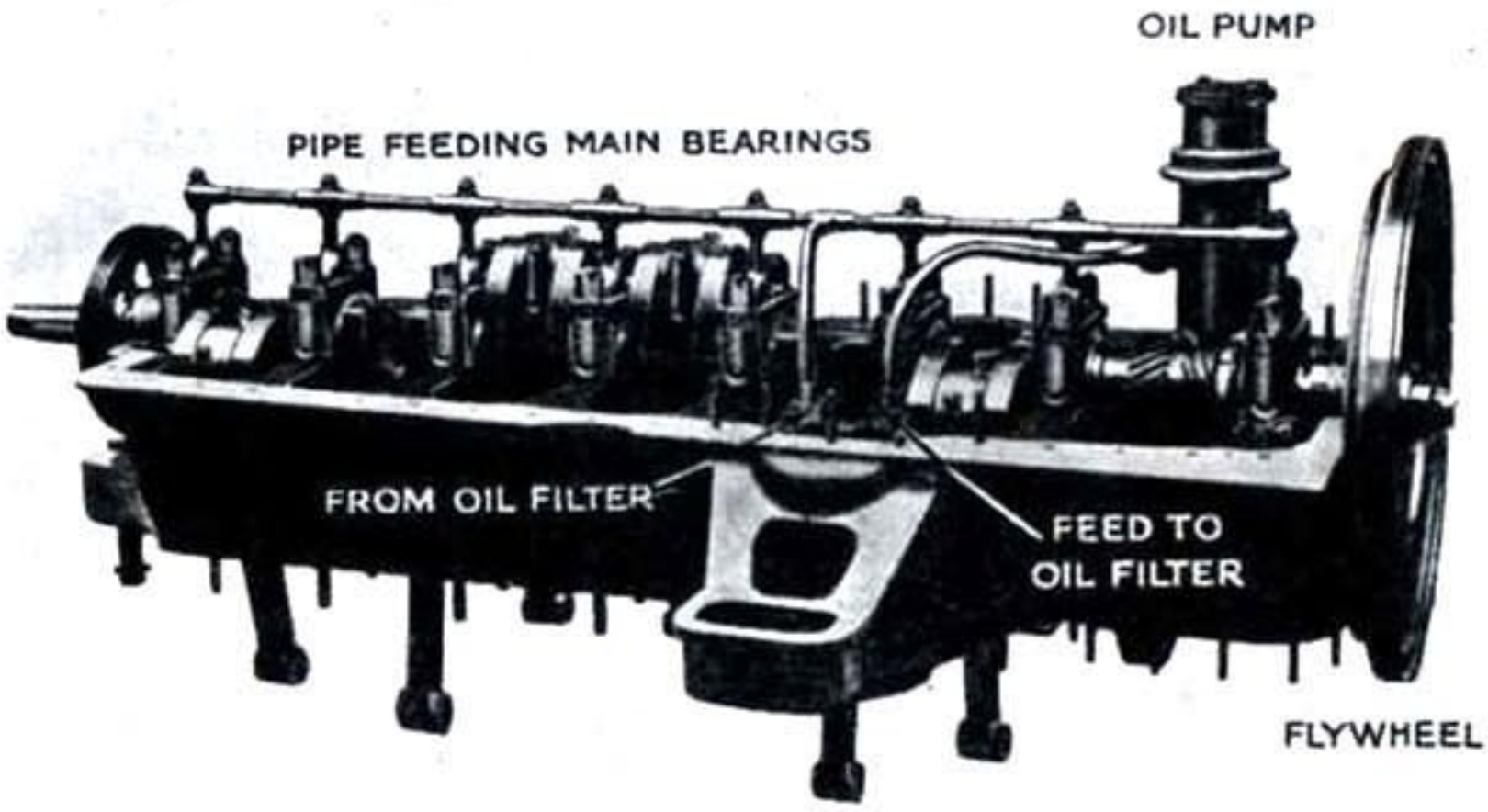


Fig. 17. ENGINE LUBRICATION DETAILS TO BE SEEN WHEN THE SUMP IS REMOVED.

OIL STRAINER AND RELIEF VALVE.

The body of the oil strainer and relief valve are only accessible for removal when the sump has been dismantled, together with the oil pipe connections within the sump. In order to understand the working of this part the illustration of the body has been prepared (19) which shows the inlet and outlet oil pipe unions, and in addition to the relief valve in position a

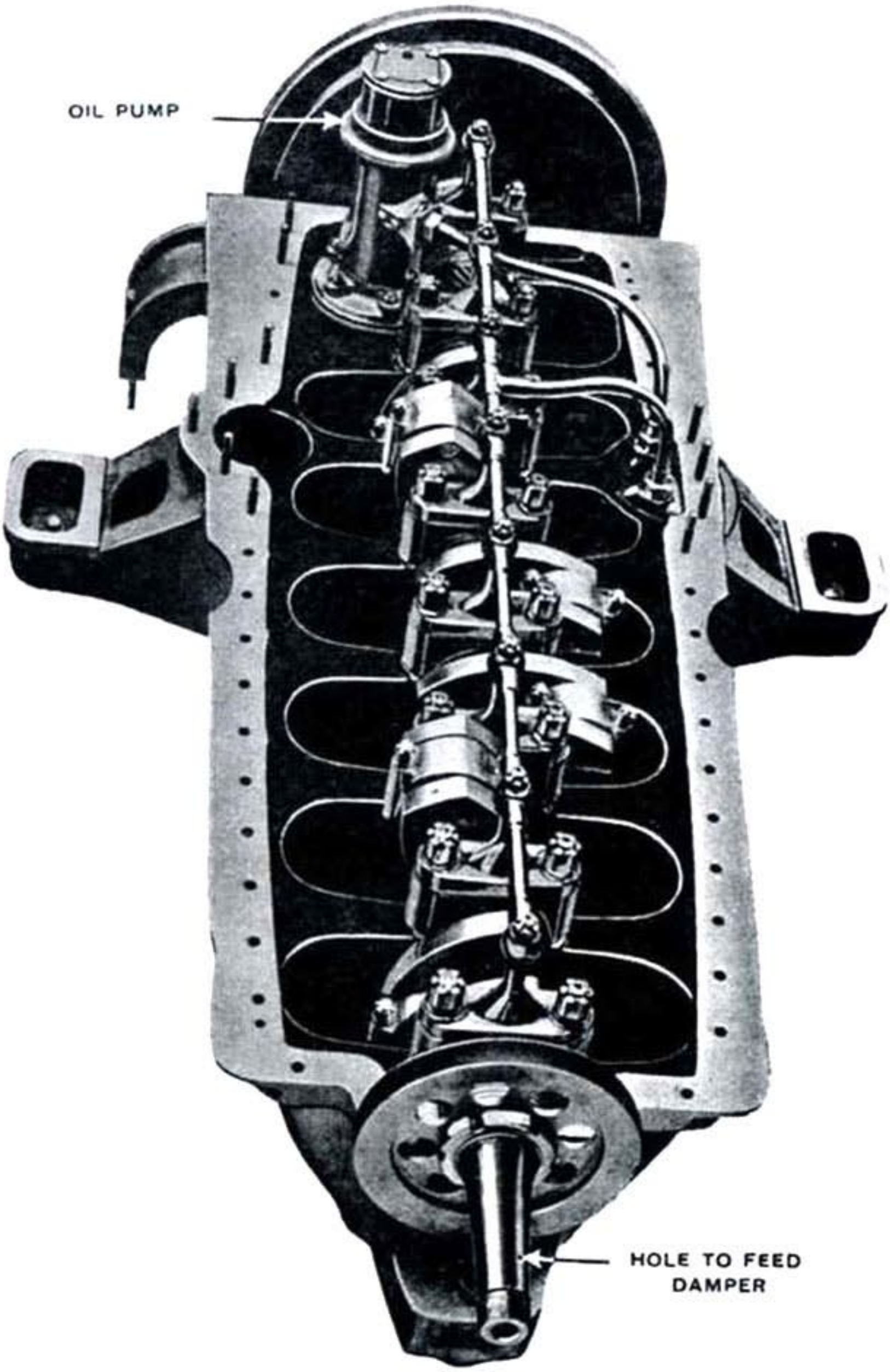


Fig. 18. OIL FEED PIPES FROM PUMP TO MAIN BEARINGS.

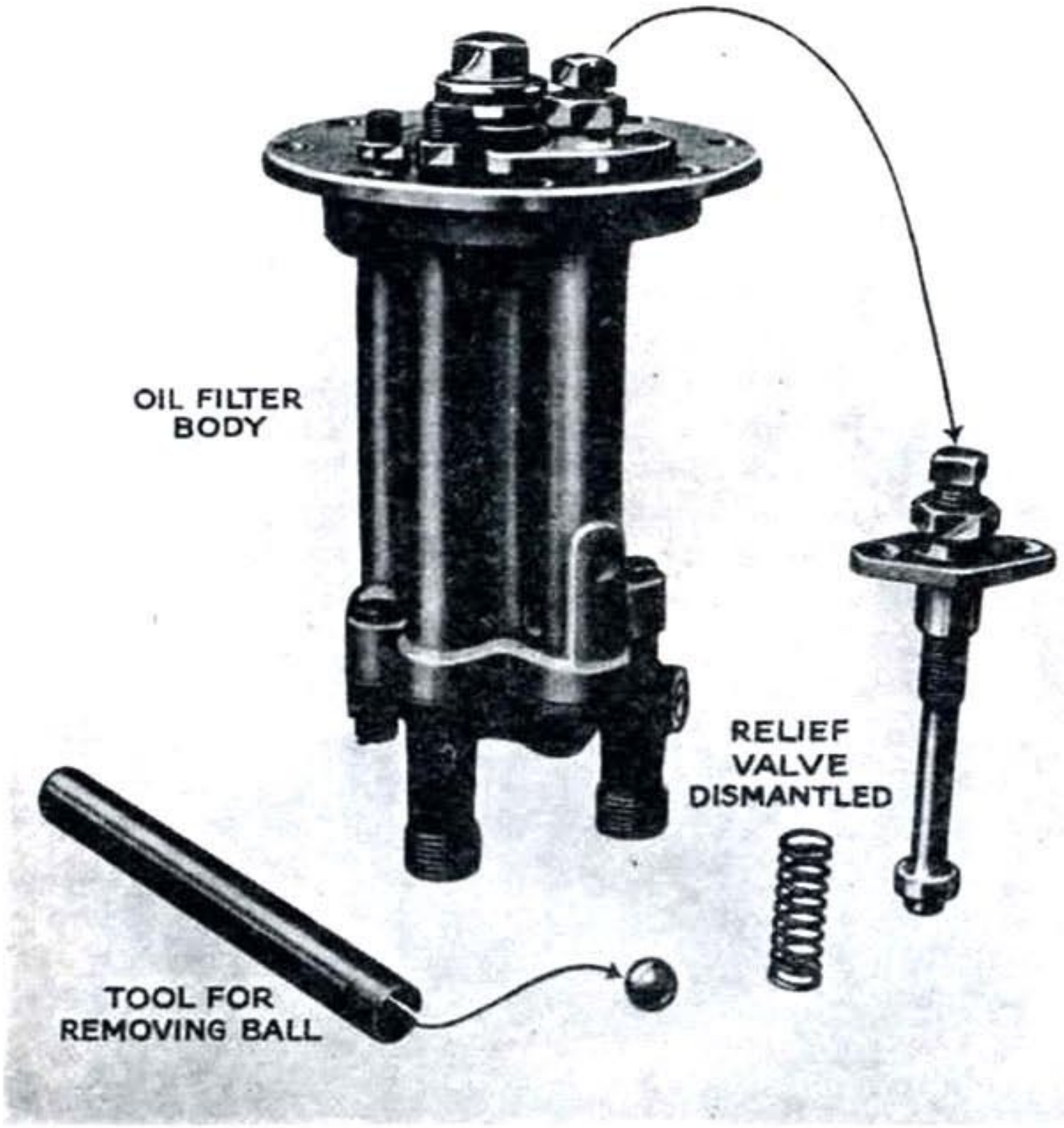


Fig. 19. OIL FILTER BODY AND OIL RELIEF VALVE.

dismantled relief valve is shown alongside. This consists of a flange plate through which a rod passes, threaded at the upper extremity, and so formed at the bottom as to register with a spring. This spring presses a steel ball on a seating inside the strainer body. By screwing the adjustment down, the oil pressure is increased and vice versa to decrease the pressure.

Owing to variation of viscosity with temperature the oil pressure cannot be gauged when the engine is cold, but when the engine is hot, and the oil has had time to circulate, the gauge should not register less than 35 lbs. per square inch at 40 m.p.h. It is possible that a drop in pressure may be due to several causes, the principle one is for dirt or foreign matter to have found its way under the ball of the relief valve. Unscrewing the adjustment and running the engine for a few seconds may effect a clearance; should this not prove the case, a special tool is provided in the kit, consisting of a tube with split end.

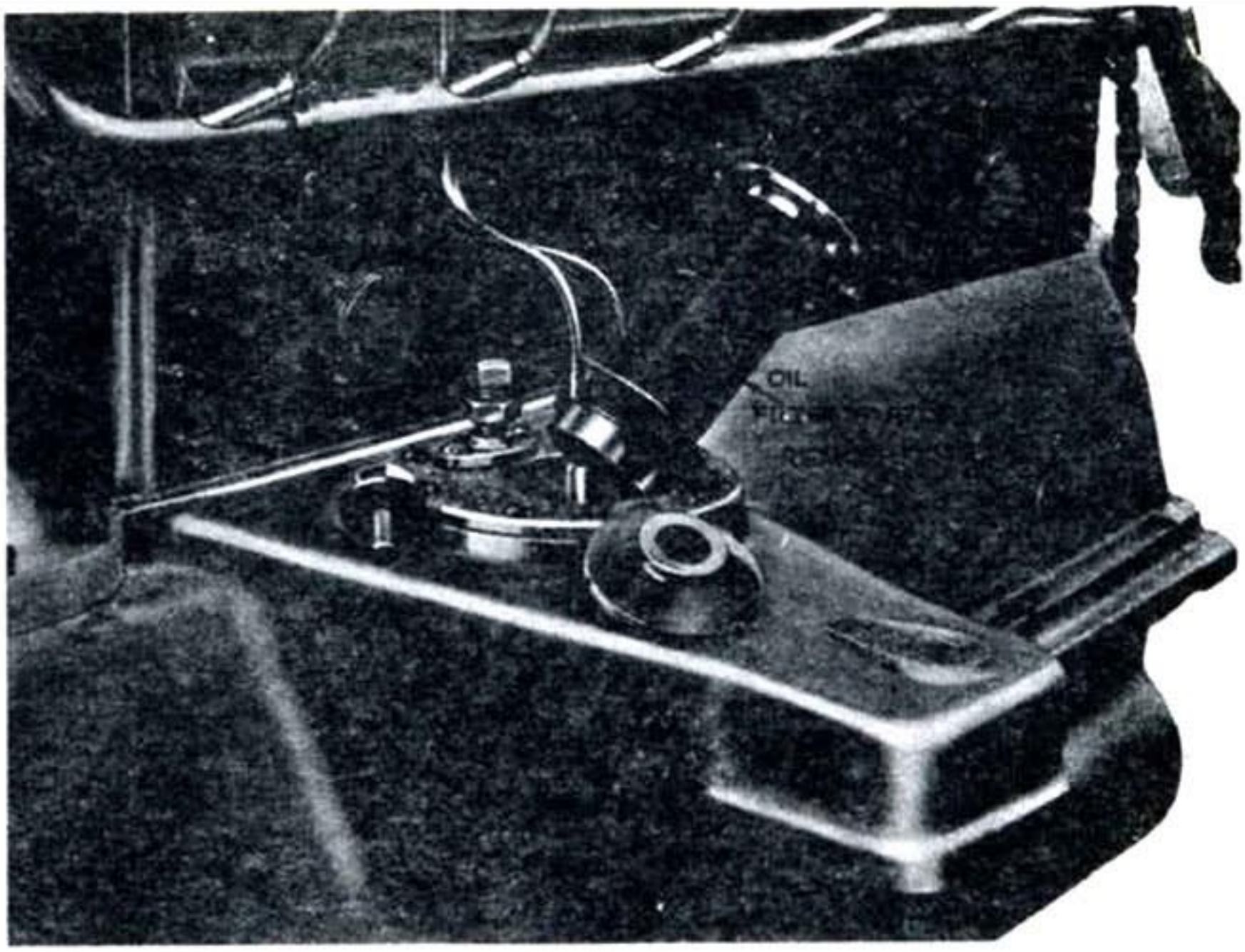


Fig. 20. MAIN OIL FILTER BEING REMOVED FOR CLEANING.

which is inserted after the relief valve has been withdrawn. A slight downward pressure will pick up the ball, which upon removal will slide down the other end of the tube. The seating and ball can then be cleaned, but under no circumstances should any metal tool be used to clean the seating, nor any rag left behind.

The action of the filter is comparatively simple, and method of dismantlement is shown in Fig. 20. First remove the centre nut, then the flange plate, which holds the gauze strainer down on to its seating, lift the cap, and then the gauze strainer can be removed for cleaning.

The oil passes up through a stand pipe inside the strainer, and then the oil is forced through the strainer gauze, leaving the impurities inside. It stands to reason, if the strainer is not cleaned at reasonable intervals, it may become clogged, with the result that there may be not only a drop in oil pressure, but a possible starvation of the oil feed to the bearings.

If the relief valve has been cleaned and properly refitted and the strainer cleaned and replaced properly with the washers, and the oil pressure be unsatisfactory, the owner should get into touch with the nearest Service Station or the Works for them to ascertain the cause. *Certain parts of the engine have been purposely sealed, and the Company will under no circumstances be responsible if any of the seals are broken, except by themselves or with their permission.*

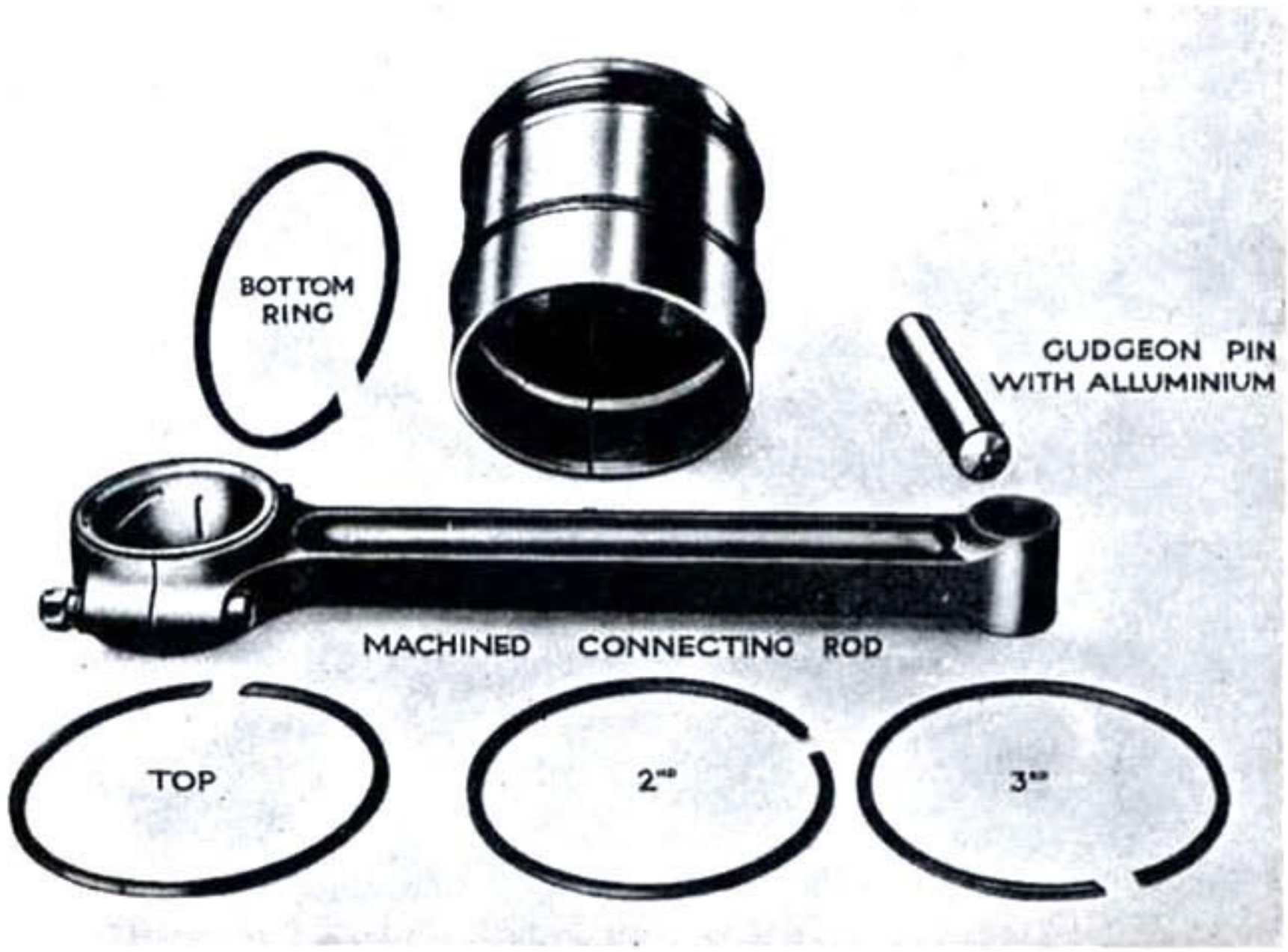


Fig. 21. TYPE OF PISTON AND PISTON RINGS EMPLOYED.

Owners may be interested to know the type of pistons, connecting rods and gudgeon pins fitted to the engine, and these are shown in Fig. 21. The connecting rod is machined all over. The piston is of aluminium with two ordinary and two scraper rings and the gudgeon pin is free to float in both piston bosses and small end of the connecting rod, side thrust against the cylinder wall being taken care of by aluminium buttons which are shown in the illustration. These buttons are fitted tightly in the gudgeon pins and cannot be removed.

RADIATOR SHUTTERS AND CONTROL.

The radiator is fitted with a series of shutters which control the amount of air that passes through the honeycomb section. The header tank to the radiator is fitted with a thermostat, which operates according to the temperature of the water in the radiator. As the temperature increases the thermostat forces the diaphragm outwards which in turn, being coupled to a lever, controls a rod which passes through the radiator and opens the shutters. This thermostat is shown clearly in Fig. 22. It is calibrated at the Works, and should need no further attention.

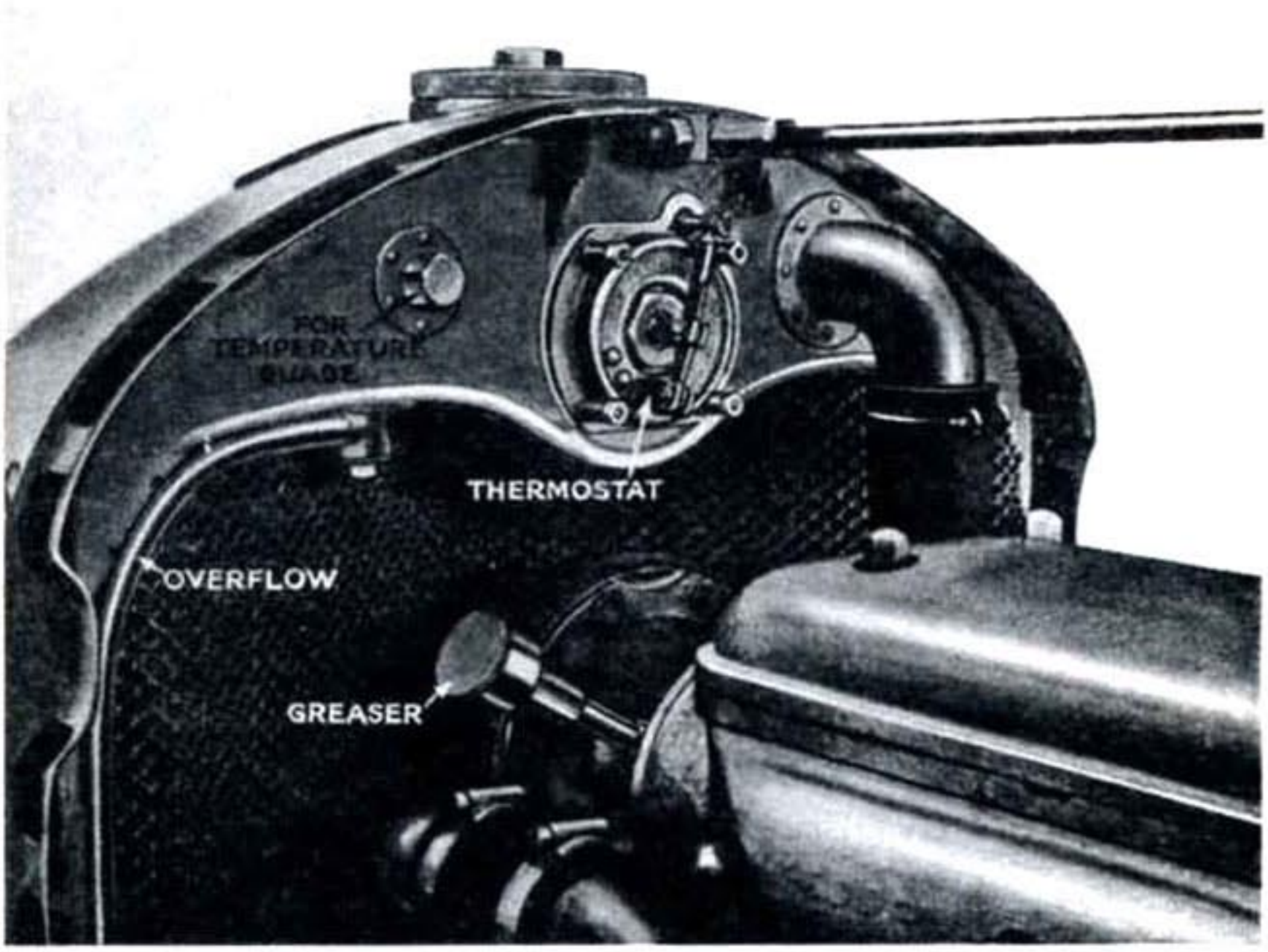


Fig. 22. THE THERMOSTAT IS COUPLED TO THE RADIATOR SHUTTER. THE LARGE PUMP GREASER IS VERY HANDY.

The radiator is extended on either side of the dynamo, and both extensions require draining during frost, and at the same time the tap behind the fan pulley must also be open to completely drain the cylinder block. The pump body drains automatically.

FUEL FEED SYSTEM.

The feed of fuel to the engine is by Autovac. This is automatic in action and is so constructed that the fuel is drawn from the tank at the rear of the chassis by reason of the suction in the induction pipe. The tank holds 25 gallons. The Autovac is fitted in a small tank of one gallon capacity, and is mounted on the off side of the dash, the cylindrical portion of the tank passing through the latter. In the unlikely event of the Autovac failing, a filler with a screw cap is fitted, so that the tank itself can be filled from an outside source in case of necessity. Underneath the tank a drain tap is provided ; this should occasionally be opened to allow any sediment or water to escape. The tap being of small diameter, it is possible that if there is much foreign matter it will not flow, and to free it it will be necessary to insert a wire or thin nail. A filter is fitted on the pipe between the Autovac and the carburettor, and is mounted on the dash. (*See Fig.* 1). A tap to control the supply of fuel to the carburettor is under the Autovac tank (*See Fig.* 4). There are two connections to the top of the Autovac, one being from the main tank at the rear of the chassis, and the other to the top of the induction manifold, whereby the necessary suction to operate it is obtained.

The action of the Autovac is as follows :

It is divided into two chambers, the inner or vacuum chamber being the instrument itself, and the outer chamber being the reserve tank from which the carburettor is fed and into which the inner chamber empties itself. Communication between the two chambers is by a drop valve at the base of the inner chamber. The upper or inner chamber being connected with the induction manifold, a partial vacuum is created in it, thus closing the drop valve and drawing up fuel from the main tank at the rear of the chassis. As the upper chamber fills a float rises and, when it reaches a certain height, two valves are operated, one cutting off the suction the other admitting air and destroying the vacuum, the drop valve thereby falling and allowing the fuel to fall into the outer chamber. This being open to the atmosphere, the fuel flows to the carburettor by gravity. As the float falls with the outflow of fuel, the suction valve closes and the operation of drawing in fuel is repeated. The float used is patented and is self-draining. The float stem is hollow, having a hole inside and outside the body of the float. Any fuel entering the float is automatically evacuated through the stem during the suction period ; during the period of atmospheric pressure air flows in, enabling the float to function as when air-tight.

The Autovac is very reliable in action and it is very exceptional for it to require any attention. Very excessive fuel consumption

may be traced to the fact that the suction valve on top of the instrument is not closing properly and is allowing fuel to be sucked straight through into the induction pipe. Should this fault occur, it can be traced by disconnecting the suction pipe on top of the induction manifold immediately after the engine has stopped running, when, if fuel is being sucked through, the pipe will be found to be wet. This can sometimes be remedied by giving the top of the Autovac a few sharp taps with a piece of wood. If this is found to be of no avail, it is not advisable to dismantle the Autovac, but a Service Station should be communicated with, and a replacement instrument will be sent. If at any time it is found necessary to dismantle the Autovac, great care must be taken that the cork washers round the top are not damaged, as the whole action depends upon an air-tight joint at this point.

EXHAUST SYSTEM.

The exhaust system consists of two separate manifolds, each serving three cylinders, two exhaust pipes leading through a single pipe to a silencer, and a tail pipe from the silencer to the rear of the chassis. The silencer has two baffles with holes drilled in them. The tail pipe is connected to the side of the silencer and is swept up over the axle and terminates in an open pipe. The system, not including the manifolds, is lagged with asbestos. The brackets supporting the silencer from the cross members of the frame are so designed as to allow for the expansion of the parts due to heat.

On those chassis to which an exhaust cut-out has been fitted, it should be borne in mind that it is for use only on the Continent and it is illegal to use it on the highroads of Great Britain.

CARBURETTORS.

Twin S.U. Carburettors of the vertical type are fitted, mounted on a common induction manifold.

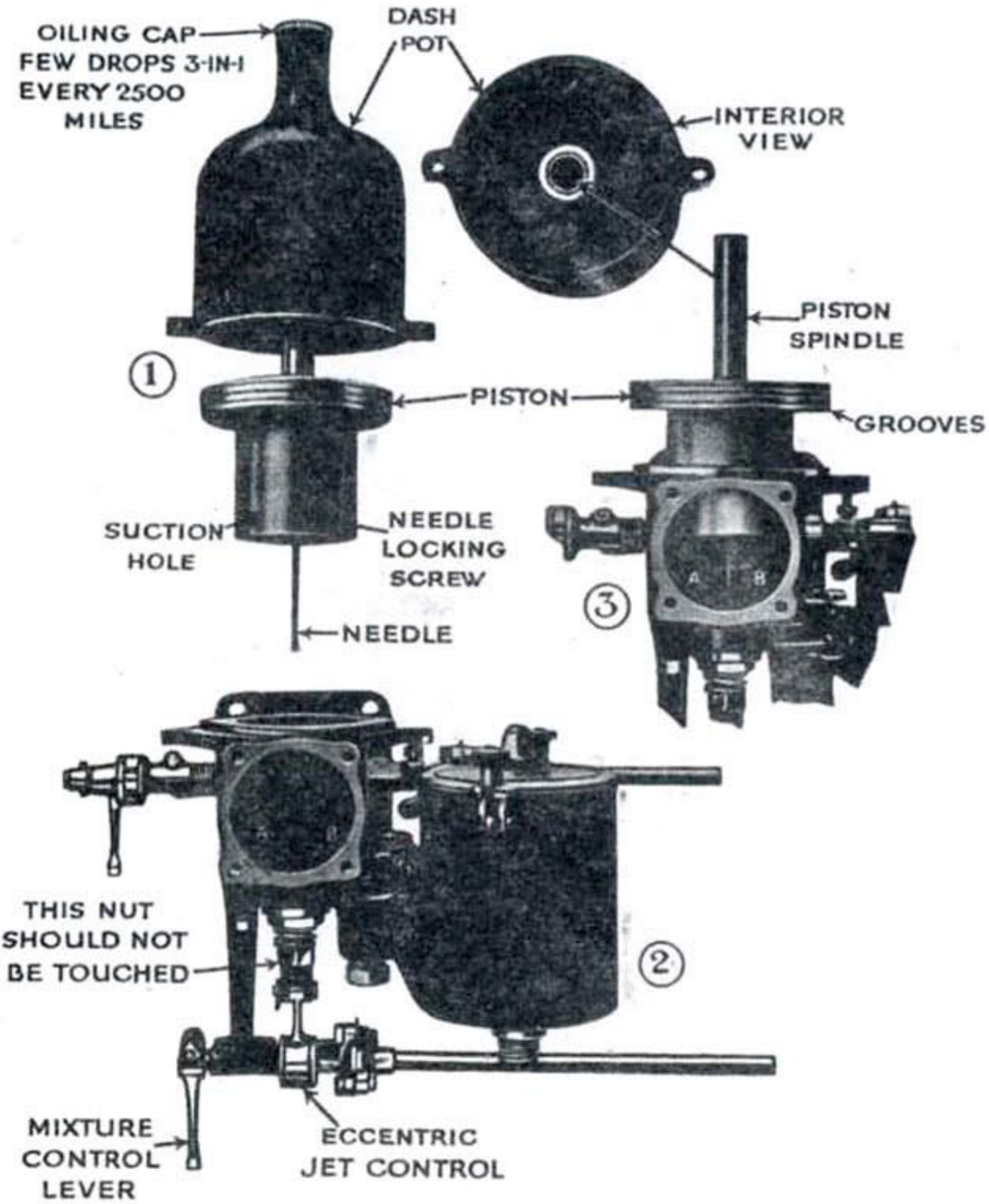


Fig. 23.

1. Shows the needle locked in the piston extension and the piston rod withdrawn from the suction chamber.
2. Is a general view of the carburettor with dashpot removed. The controls can be clearly seen.
3. Is a view of the carburettor with the needle and piston partly lifted to show how the needle enters the jet. The Holes A and B are an air suction release to allow a free passage of air through the carburettor when the engine is running slowly and gas is taken from the slow running device only

This carburettor may be described as follows :—
A taper needle is held centrally in the lower end of a piston. The upper end of the piston is connected by means of a piston spindle which passes through the carburettor body to a suction disc which is an air-tight sliding fit in a suction chamber or dashpot. A passage connects the latter with the induction system. A butterfly throttle is fitted between the engine and this passage, the piston acting as an air controller in the induction pipe on the side of the passage further away from the throttle. The taper needle passes centrally through a movable jet, the position of which can be altered by the driver, by means of a control lever on the top of the centre of the steering wheel. The suction chamber is set vertically to the carburettor, and the chamber together with piston and taper needle can be withdrawn by removing the two screws which secure it to the carburettor body. A slow running device is provided with separate feed to each carburettor and shown in detail on page 66. The carburettors are quite independent with the exception that they are mounted on the same manifold and the throttles are interconnected.

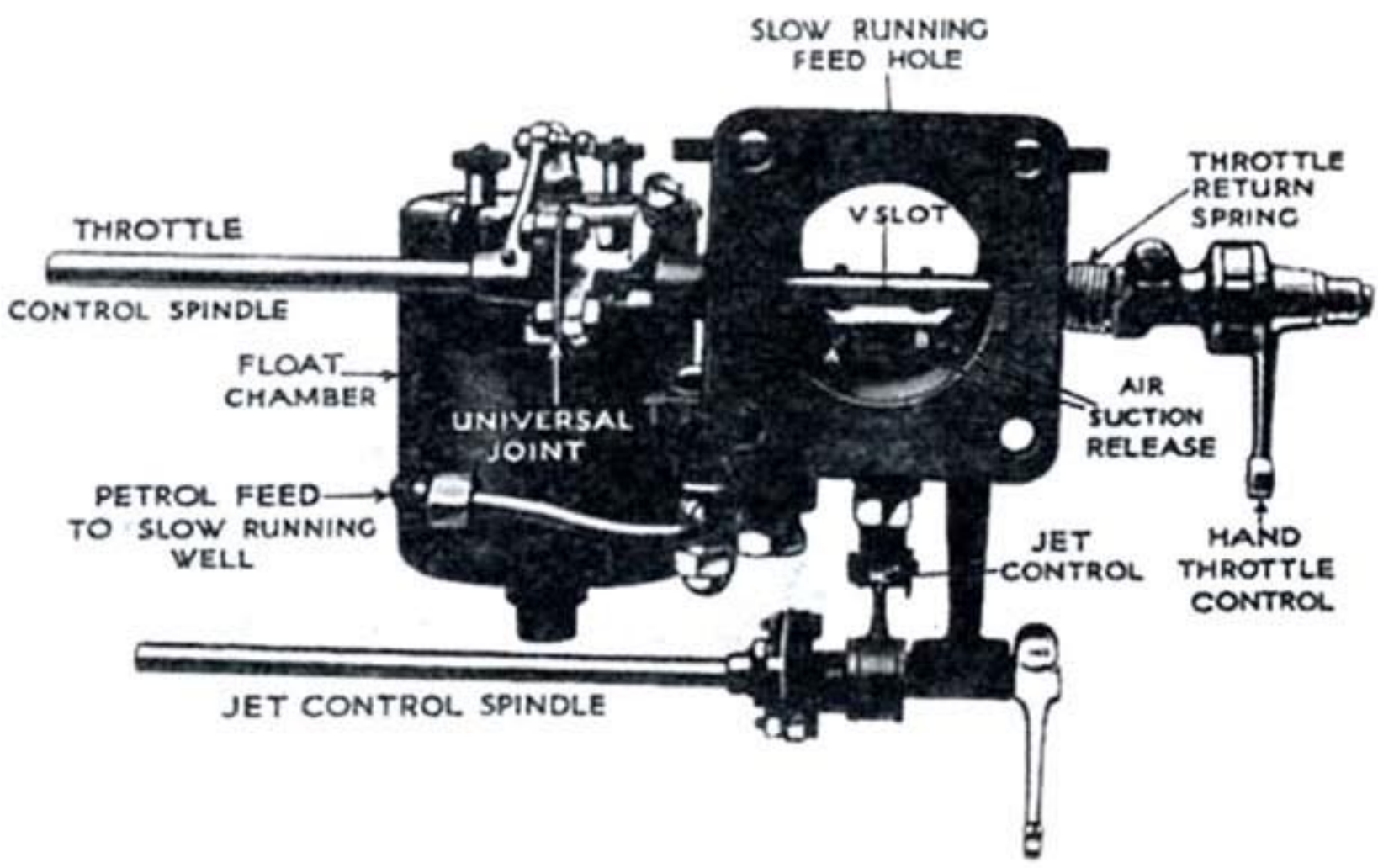


Fig. 24. S.U. CARBURETTOR DETAILS.

It is very important to see that the small hole for the "slow running" is not obstructed when fitting a new washer to the flange.

ACTION OF S.U. CARBURETTORS.

When the engine is stationary, the piston obstructs the air passage in the carburettor. On the engine being turned with the throttle slightly open, a depression is caused in the air passage between the throttle and the piston. The suction chamber being connected with this part of the air passage, the depression acts on the suction disc, which rises, bringing with it the piston and taper needle. This allows air to be sucked in under the piston and over the jet, which is partially opened by reason of the needle being tapered. A state of balance is maintained whereby the piston rises and keeps at a certain height dependent on the engine speed and throttle opening. When the engine is stopped, the piston falls by its own weight. When the throttle is in the slow-running position, the velocity of air over the jet is not sufficient to give a correct mixture for slow running with the jet in the normal position, and it is then that the slow running device operates.

The position of the jet relative to the needle can be adjusted by the centre control on top of the steering column. The position of the control lever to obtain a rich mixture is marked on the control box cover.

The carburettors are adjusted to give maximum power when the lever is in the full weak position, and once the engine is warmed up, the lever should be left in this position. Care should be taken with regard to this, as the mixture range is very great, so that by leaving the control lever in the rich position for longer than is necessary, there is a likelihood of sooting up the sparking plugs.

It is important that these carburettors should never be flooded, as, apart from this being unnecessary, the fuel will get into the cylinders, owing to the position of the carburettors, and will wash the oil film from the walls.

SLOW RUNNING DEVICE.

A special slow running apparatus has been designed, and consists of a single diffuser unit (which in itself is a small carburettor) mounted centrally between the two carburettors, direct on the induction pipe. Petrol is fed from the rear carburettor to a small well situated under the diffuser. This feed

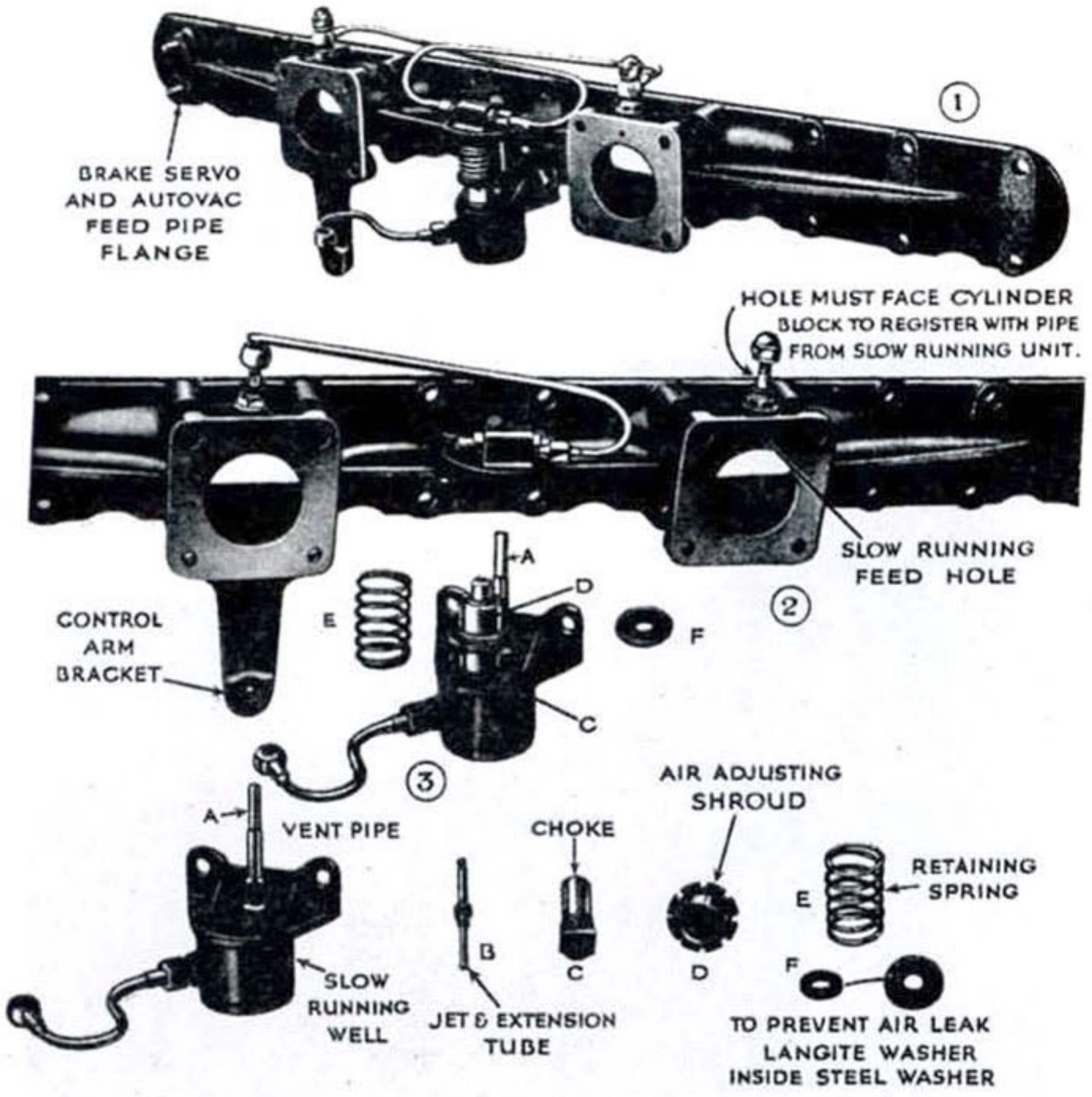


Fig. 25.

1. Manifold minus carburettors but with slow running device installed.
2. Another view of the manifold.
3. Slow running device assembled and dismantled—*See text below.*

supplies a pilot jet B, around which is the air adjusting shroud D. The mixture is then led through two pipes, one to each carburettor, and enters just above the top of the butterfly valves. All passages have been graduated carefully, to give a good mixture for slow running purposes. The adjustment is very simple. The knurled portion of the air adjusting shroud D which encircles the choke C is screwed down to strengthen the mixture, and screwed up to weaken. Attempts to dismantle this unit should not be undertaken except by a skilled mechanic. The parts are clearly described in the illustration. The vent pipe A is to allow for expansion of petrol in the slow running well. The external spring E, pressing against the washer F, prevents air leaks.

CLUTCH.

The clutch is of the single plate type, having a central duralumin disc, with a friction ring riveted on each side. The clutch runs in a dry condition, and its action is as follows: The driven friction plate on each side is flexibly mounted by means of two Hardy discs on the spider at the end of the clutch

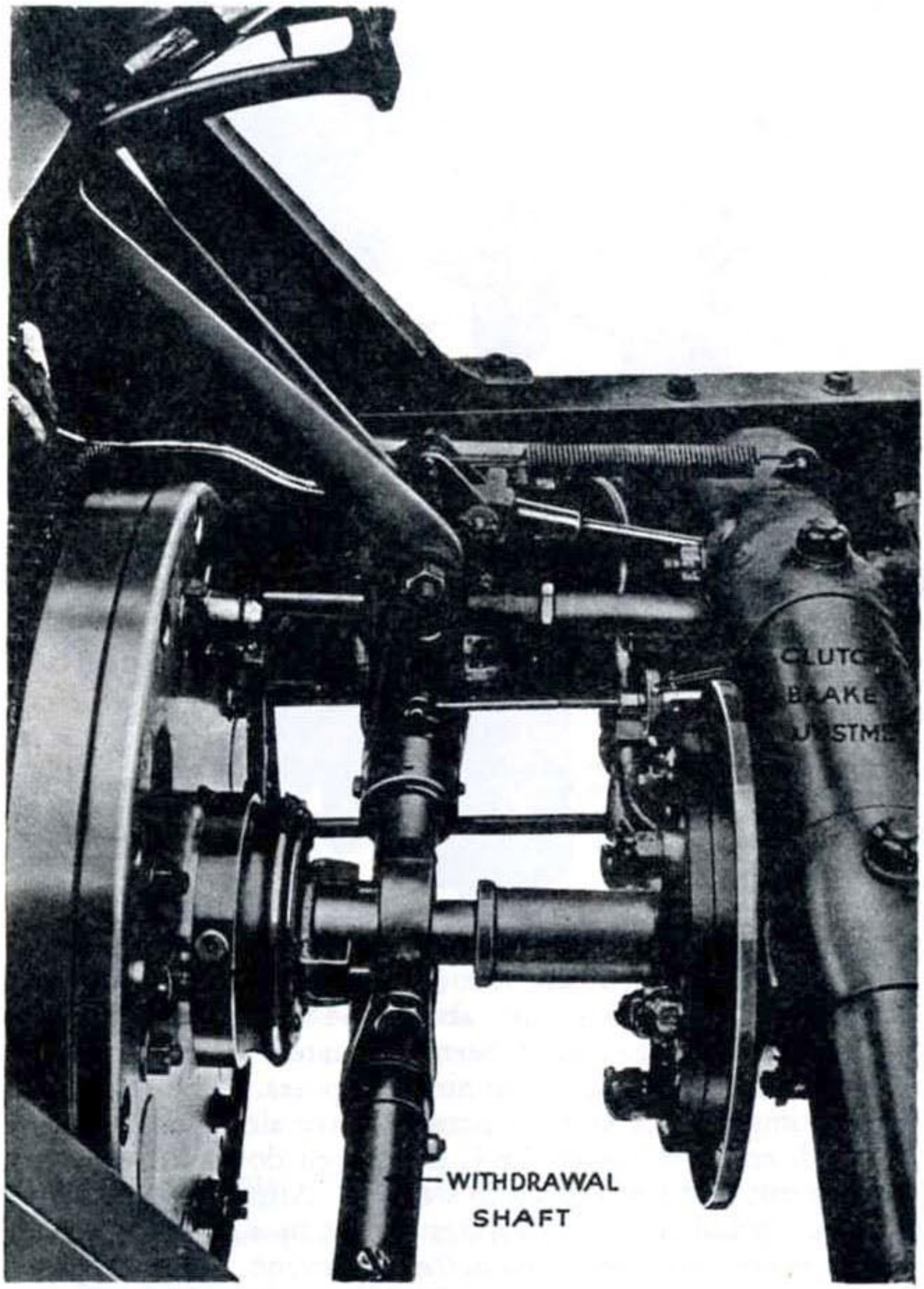


Fig. 26. GENERAL EXTERIOR VIEW OF CLUTCH AND WITHDRAWAL GEAR.
The clutch brake adjustment is visible, also the pedal adjustment.

shaft, which connects the clutch with the gearbox. The end of the clutch shaft is recessed to carry a self-aligning ball bearing mounted on the end of the clutch spigot, which is an integral part of the crankshaft. A metal presser plate, which takes the pressure of the six powerful coiled springs, is located by, and slides on, three driving pins fitted in the clutch cover and secured by three nuts and tab washers on the outside of the cover. Located in cups in the cover are the six clutch springs which bear on the presser plate. Three clutch withdrawal levers are pivoted on brackets bolted to the inside of the cover. The lower ends of these bear against the thrust bearing housing, and the upper ends are forked, the presser withdrawal pins passing through the forks. The inner ends of the pins have shoulders which take the pressure of the presser plate, the other ends passing through the clutch cover; an adjusting nut is screwed on to these ends, the nut having an extension which passes through and slides in the clutch cover, the ends of the extension butting against the fork of the withdrawal lever. A ball bearing is fitted in the outer end of the thrust bearing housing; into this is fitted the thrust ring which takes the pressure of the withdrawal forks on the clutch pedal cross shaft operated by the clutch pedal. This fork is so compensated that each arm must bear with equal pressure on the thrust ring, so that there is no tendency to throw the clutch out of alignment. When the clutch is engaged, the driven disc on which the friction material is mounted is clamped between the metal driving disc and the face of the flywheel. When the clutch pedal is pressed, the fork on the cross shaft bears against the thrust ring, the pressure being transmitted through the bearing to the bearing housing, the ends of the three clutch withdrawal arms resting against the end of the housing are forced forwards and the forks at the other ends are forced back, bringing with them the withdrawal pins and the metal driving plate, thus releasing the pressure on the driven plate.

Two oiling nipples are fitted in the gun-metal outer cover of the thrust housing. Two are fitted for convenience, but only one need actually be utilised. The clutch thrust bearing is lubricated at this point, and only a small quantity of Shell Gear Oil must be forced in; if too much lubricant is used there is a chance of it penetrating into the clutch housing and causing clutch slip.

The clutch requires no other attention, and no adjustment may be carried out without advice being obtained first;

this does not, of course, apply to the clutch pedal adjustment for altering the position of the pedal, which is quite straightforward. This clutch pedal is split in two sections which are bolted together. As the clutch wears there is a tendency of the pedal to come nearer the driver, it is very necessary for freedom to be left between the pedal and the floorboards (*not less than half an inch*) by slacking off the clamping bolt, shown in Fig. 26. Lack of clearance will cause clutch slip and seriously damage the friction surfaces.

CLUTCH STOP.

The clutch stop (*see Fig.* 26) consists of a metal ring, mounted on the rear side of the Hardy disc on the clutch shaft. A spring plate is anchored at one end to a bracket on the front nose-piece of the gearbox. The other end is connected by a link to a point on the clutch pedal arm, a few inches from its lower end. Mounted on the spring plate is a pad of friction material. As the clutch pedal is pushed forward, this pad is pressed against the metal ring, acting as a brake on the clutch shaft. The degree of fierceness of the stop is easily adjustable by turning the "knurled" hand-wheel, which forms part of the link mentioned above, having first loosened the lock nut securing it. A coil spring is contained in the barrel which is an extension of the "knurled" hand-wheel, and the link expands against the pressure of this spring as the clutch pedal is pushed forward, increasing the pressure of the pad on the ring. This avoids making the stop too definite in action. The clutch stop requires no attention, except periodical adjustment to take up wear on the friction pad. The stop is adjusted to be light in action when the chassis leaves the Works, but drivers can adjust to suit their individual tastes.

CLUTCH SLIP.

First make sure that there is about $\frac{1}{2}$ in. clearance between the clutch pedal lever and the underside of front floor boards at the point where the pedal comes through the boards. If the floor boards are fouling on the pedal lever when the clutch is home, slip is bound to develop. Slacken the nut and the actual pedal lever can be set to give correct clearance. A new car should, in particular, be watched for this. Should the above not be the cause of the slip, it may be necessary to dismantle the clutch. This should be undertaken, if possible, by a Service Station.

GEARBOX.

This is an entirely new design and is mounted on stout cross members giving three-point suspension, provision being made for proper alignment with the engine.

The principal points with which the owner has to concern himself are the methods of filling and draining the gearbox and ascertaining the quantity of oil contained in it at any time. It will be seen by referring to Fig. 27, that the casing is split vertically instead of horizontally, and on the near side of the casing there is a dipstick.

The Gearbox ratios are given on page 37.

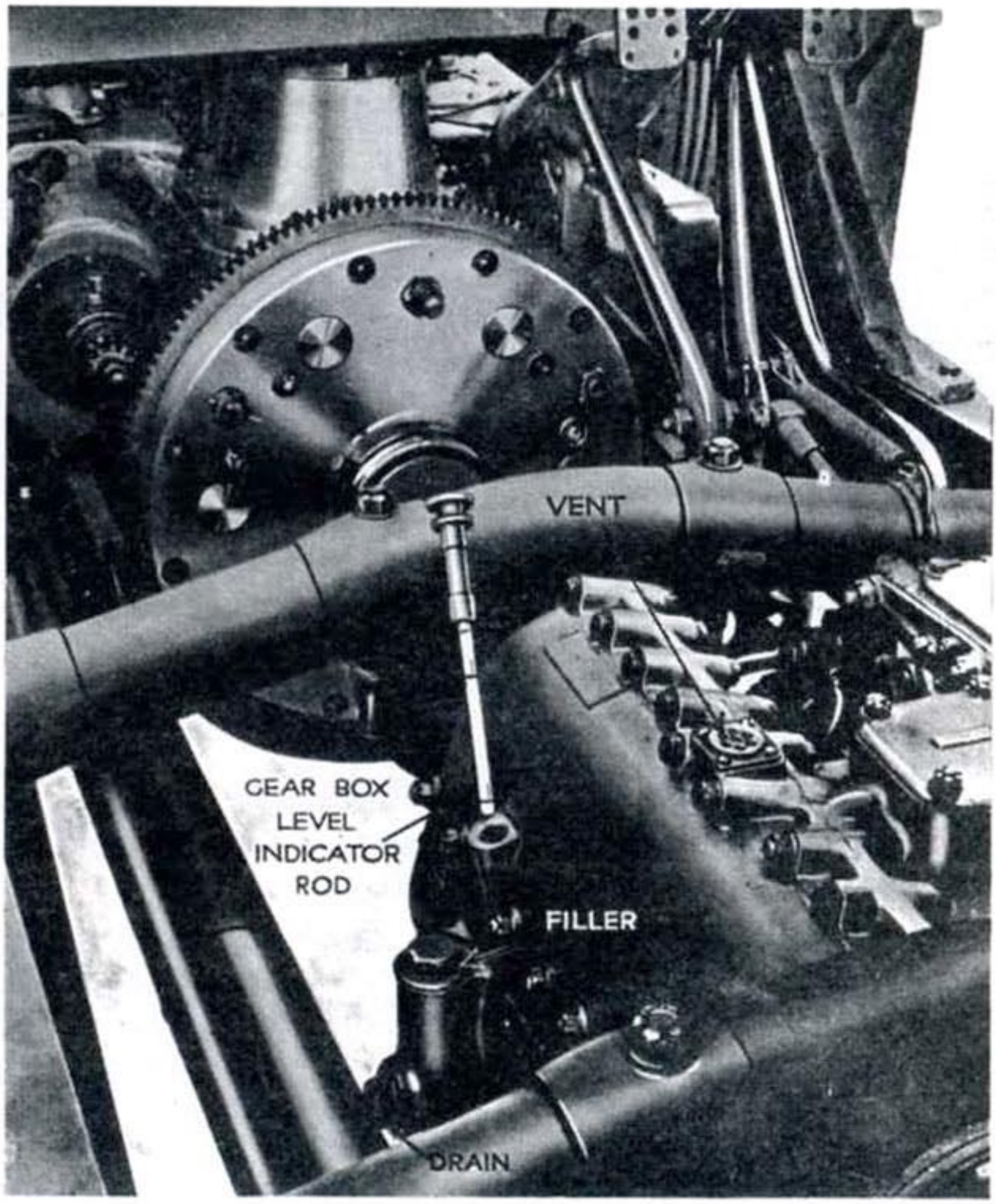


Fig. 27. VIEW OF THE GEARBOX, SHOWING OIL FILLER AND LEVEL INDICATOR ROD.

BRAKES.

Fig. [—] shows rear wheel brake with hub removed, type of brake shoes employed pivoted above, and operated by means of cams contacting against hardened steel plates.

The brake operating shaft is mounted on two roller bearings and these are packed with grease when assembled at the Works and sealed by felt washers, consequently they do not require any attention in use.

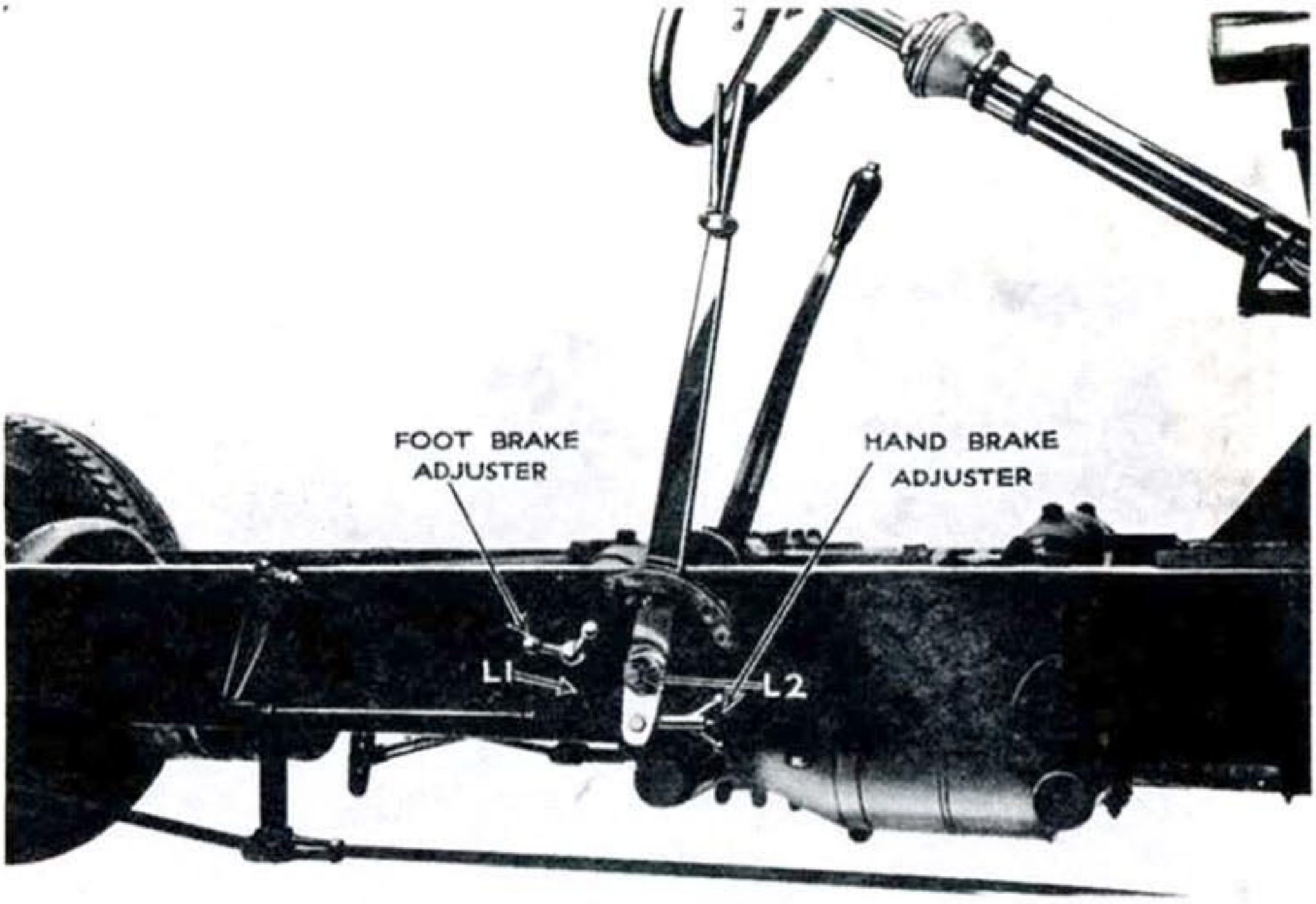


Fig. 32 SHOWING HOW BOTH FOOT AND HAND BRAKE ADJUSTMENTS ARE GROUPED TOGETHER.
L1 and L2 are small lubricator nipples.

OPERATION OF THE BRAKES.

The four-wheel brakes are pedal operated and the hand lever operates only on the shoes in the rear wheels.

In order to obtain greater braking effort for a given pressure on the pedal, a Dewandre Vacuum Servo System is fitted. There is only one adjustment necessary for the foot brakes in order to take up wear; this is accomplished by means of a large butterfly nut fitted outside the frame on the offside, to the rear of the hand brake quadrant. The adjustment of the hand brake is at the lower end of the hand-brake lever by similar means. These adjustments are shown in Fig. 32. Once the foot brakes are correctly set they will run for very long periods without any attention except the one adjustment for taking up wear.

The adjusting butterfly nuts are screwed in a clockwise direction for taking up wear and automatically located in position every half revolution.

A balance gear is fitted across the frame behind the gearbox; this ensures that the braking effort is correctly distributed between all four brake drums (*See Fig.* 33). It consists of a hollow shaft mounted on spherical bearings and carrying three complete compensators. Each of these consists of two arms, through the top ends of which passes the cross tube. The sides of the arms are kept in contact with a distance piece by bolts having Thackeray washers at both ends, so that there is friction between the arms, but not

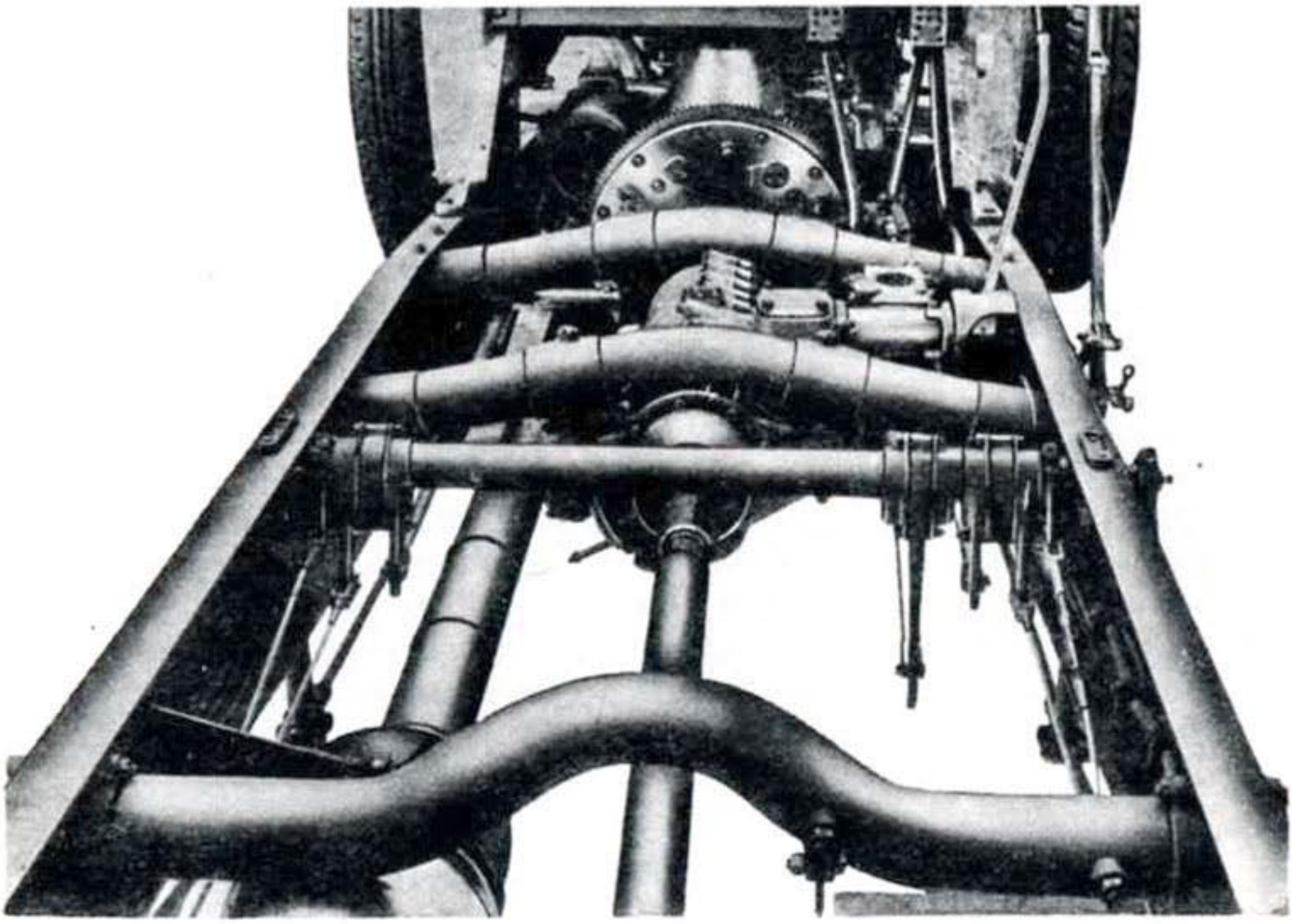


Fig. 33. VIEW OF THE CENTRE OF THE CHASSIS SHOWING THE BRAKE COMPENSATING MECHANISM.

sufficient to prevent movement between them; the relative movement of the two arms is controlled by a whiffletree or balance arm, so that as one moves forward the other moves backwards (shown in Fig. 34 in partly dismantled form). The whole compensator shaft is centralised in the frame by springs fitted at either end. The compensator on the offside end of the shaft balances the braking action between the offside

front brake and the offside rear brake. The compensator on the nearside of the shaft balances the action between the nearside front brake and the nearside rear brake. The centre compensator balances the action of both nearside brakes with both offside brakes. Thus the brakes are compensated in pairs and as a whole. Through the centre of the hollow compensator shaft passes another shaft on which are mounted the arms which actuate the hand brake which acts on the rear drums only; this brake is not compensated but an adjustment is provided for equalization, see Fig. 6. The cam actuating the front shoes is operated by a shaft having a universal joint at both ends, the inner end being mounted on a bracket on the top flange of the frame, and the design is such that allowance is made for the plunging action of the shaft as the axle rises and falls over a rough road, and for varying conditions of load. Two pull-off springs are fitted between each pair of rear shoes, the method employed allowing the tension of the springs to be adjusted, though this is not ordinarily necessary, unless the shoes have been removed. The front shoes have a fulcrum pin at their lower ends and have, therefore, only one pull-off spring.

Fig. 34. PRINCIPAL COMPONENTS OF THE BRAKE EQUALIZER

THE DEWANDRE VACUUM SERVO BRAKING SYSTEM.

The Dewandre Vacuum Servo Braking System is fitted as standard. The object of this device is to lessen the considerable muscular effort which is required to obtain the powerful braking necessary with a heavy and high-powered car.

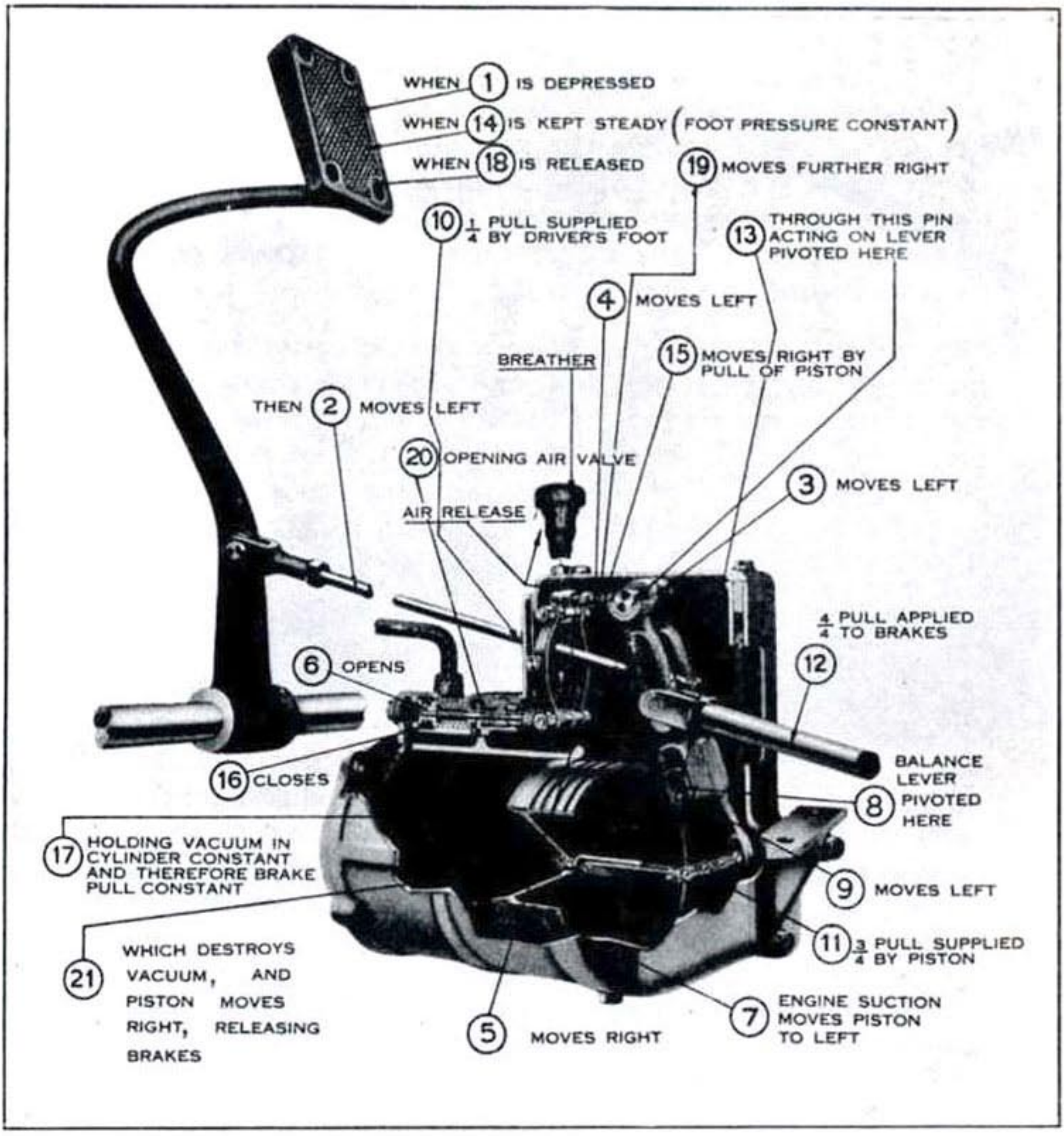
The Servo is operated by the Vacuum which is created in the induction pipe when the engine is running and the throttle is closed. It is used to operate, through suitable valve gear, a piston working in a cylinder which exercises a pull on the brake mechanism, supplementing the pressure exerted by the driver. By means of very ingenious mechanical movements this additional power is made progressive, so that every ounce of pressure applied by the driver on the brake pedal produces its proportional assistance from the Servo.

Suppose, for example, that without the Servo the brake pedal requires a movement of 4 ins., and a physical pressure of 100 lbs. to attain a certain braking result ; whilst with the Dewandre Servo the same movement of the pedal will be necessary, the physical effort required to attain the same result will be four or five times less, the assistance rendered by the Servo being always proportional to the movement of the pedal.

The Servo is fitted between the frame and the gearbox on the off side and is a self-contained unit comprising the suction cylinder and piston with valve gear and operating levers all enclosed in a dust-proof case. The method of mounting is shown in the diagram on page 75: the sectional illustration shows the general arrangement of the device, whilst the series of notes numbered 1 to 21 taken in sequence indicate very clearly the method of operation. No adjustments of any kind are required to keep the Servo in working order, the only adjustment the braking system requires being ordinary pedal adjustment to compensate for wear in the brake liners, in exactly a similar manner as if the Servo were not fitted. The Servo mechanism is lubricated from the central lubricating system.

UNIVERSAL JOINTS AND PROPELLER SHAFTS.

The propeller shaft is made of weldless steel tubing. The universal joints at either end of the shaft are so designed that they are oil-tight, and will run for a very considerable mileage without wear. To allow for the plunging action of the rear axle as it rises and falls when the car is on the road, the front end of the propeller shaft slides in splines in the universal joint. Nipples are fitted through which the joints may be lubricated.



DEWANDRE SERVO MOTOR IN SECTION.

STEERING GEAR.

The steering is by worm and sector, the former being mounted on two ball bearings and the latter being mounted on the steering shaft which has a plain bearing. Adjustments are provided for taking up the end play in the steering column, meshing the worm and sector, taking up end float in the sector shaft, and altering the rake in the steering column. It is important that none of these adjustments should be tampered with, without the permission and advice of the Service Department, as the adjustments are very delicate, and improper adjustment may

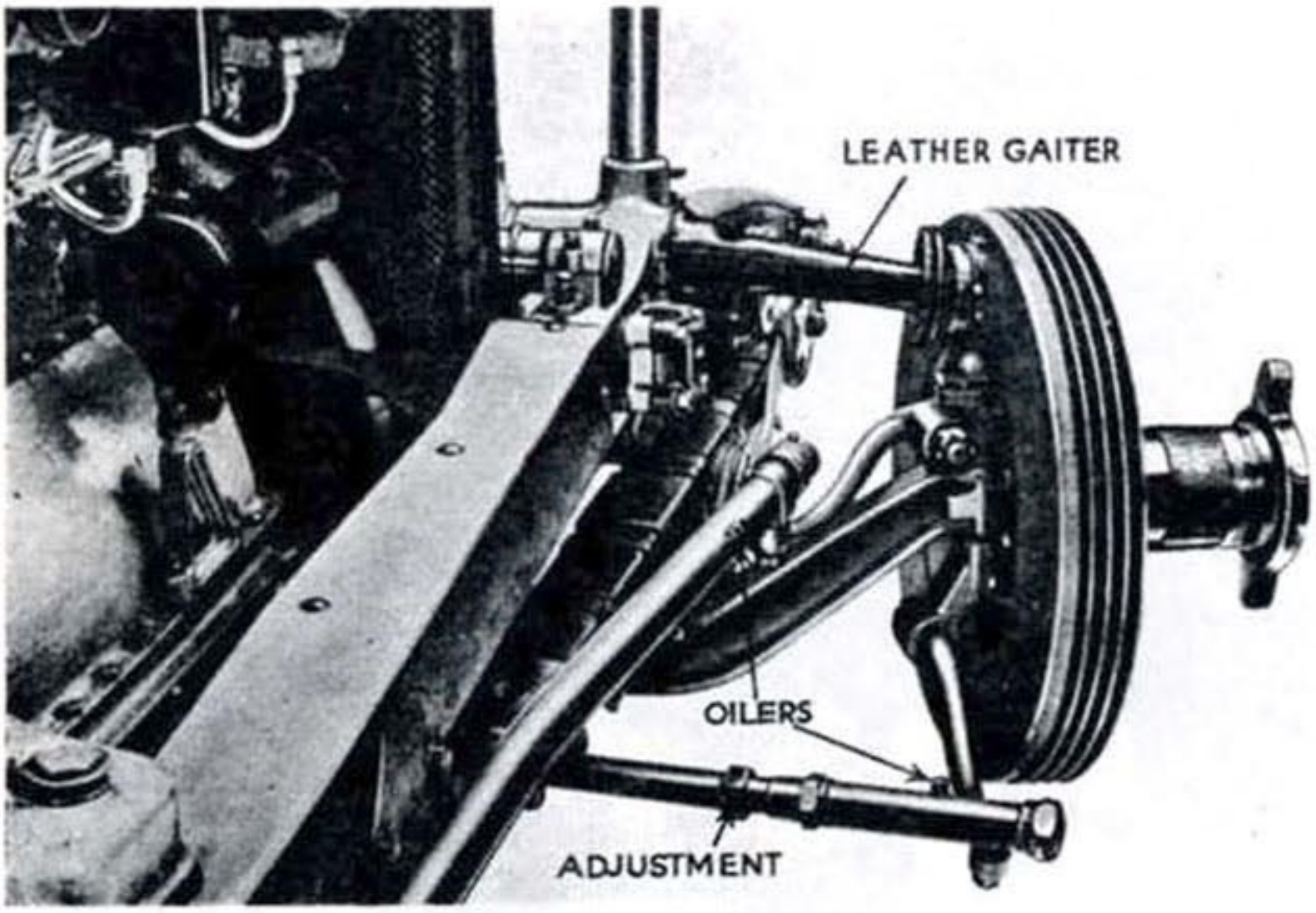


Fig. 36. FRONT AXLE WITH WHEEL REMOVED SHOWING ADJUSTMENT POINT OF TRACK ROD AND OILING NIPPLES.

cause costly damage to the worm and sector, apart from the fact that the character of the steering will be lost. The rake of the column cannot be altered without the meshing of the worm and sector being disturbed, therefore, any alteration of rake must not be attempted without advice. The large plug on the steering box covers the adjustment for taking up the end play in the steering column, and is not for lubrication. A Tecalemit nipple is fitted for the latter purpose (*See Fig.* 1). The steering box is oil tight. The steering column is supported by a bracket from the dash, and rotates in a ball bearing. The control tubes operating the mixture, throttle, and ignition controls pass down the centre of the steering column, the button for the electric horn, is in the centre of the steering wheel.