Oil Sump.

Under normal circumstances, and with proper attention, the oil 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 5,000 miles, as directed on page 33.

To drain the oil, a plug (**1**, Fig. **10**) is provided in the crankcase sump, which should be unscrewed and the oil allowed to drain out when the engine is warm.

On replacing the plug, ensure that the joint washer is sound and in position.

Oil Level Indicator.

In order that a quick check may be obtained, the petrol gauge on the instrument panel has been so arranged that by depressing the switch (see Fig. **1**), it will register the approximate quantity of oil in the engine sump.

The gauge is electrically connected to a float unit fitted into the right-hand side of the crankcase sump (**2**, Fig. **10**).

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

The amount of oil should be maintained at **"Full"**, this corresponding with the **"Max"** mark on the dipstick, and showing that there is approximately 16 pints of oil present. A red line on the gauge indicates "minimum", and the engine should never be run with the oil level below this mark.

Oil Pressure.

Under normal conditions of engine temperature and speed, the instrument board pressure gauge should read approximately 25 lbs.

On starting the engine from cold, however, a higher oil pressure will be indicated, but this need not cause alarm, as the pressure will fall when the engine becomes warmed up.

When the engine is idling and 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 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 preventing the valve from closing. If the latter is suspected, the relief valve should be inspected and cleaned as directed on page 43.

Oil Temperature.

An oil temperature gauge is fitted on the facia board. The temperature reading may be from 80° C. to 110° C., depending on atmospheric temperature and conditions of driving.

CHAPTER V

The Fuel System

The Fuel System—Fuel Pumps—Faulty Operation of Pumps—Fuel Tank—Fuel Filters—Fuel Gauge—The Carburetters (Action)—Carburetter Adjustment— Air Cleaners.

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 (**1** and **2**, Fig. **11**), mounted inside the right-hand side chassis frame member below the rear floor.

A pipe is arranged along the right-hand side frame member conveying fuel from the tank to the pumps. The pipe is seen at (**4**). A filter is provided on this pipe line, being located on the frame cross-member immediately in front of the tank, as shown in Fig. **12**.

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

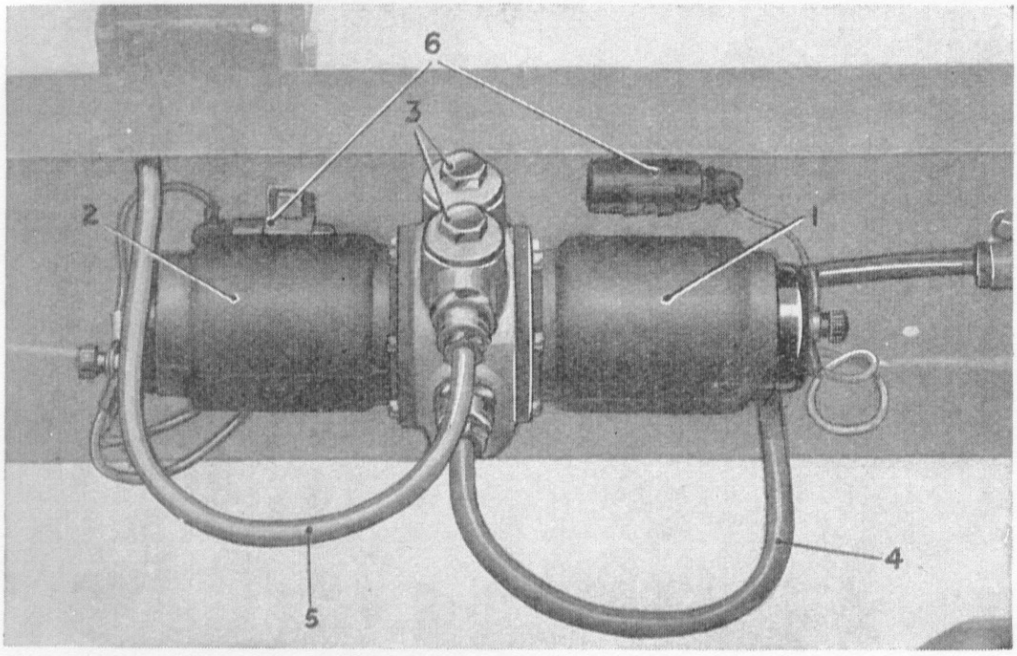

Fig. 11.—FUEL PUMPS.

1. Fuel pump.
2. Fuel pump.
3. Valve caps.
4. Inlet pipe.
5. Outlet pipe.
6. Suppressor condensers.

From the filter the fuel passes to the suction side of the pumps, and is delivered to the carburetter float chamber by way of a pipe (**5**), and another strainer located at the float chamber.

Fuel Pumps.

The fuel pumps (**1** and **2**, Fig. **11**) 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 and master switches are **"On"**.

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

If it should ever be necessary to disconnect the fuel pipes at the pumps, it is important first to release the cover of the rear filter. (See page 49.) This will prevent loss of fuel by syphoning, due to the location of the pumps below the level of the main tank.

The current supply for the pumps is taken through the ignition fuse.

Faulty Operation of Pumps.

This would cause failure, or shortage, of fuel supply to the carburetter, and may be due to one or more of the following causes:—

1. *Shortage of fuel in the tank.*—This should have caused the green warning lamp to light, but if the tank has been allowed to run dry, the pumps will tick continuously and noisily. On severe gradients and side slopes, these symptoms may occur before the tank is completely empty, due to surging of fuel in the tank, which may uncover the suction pipe.
2. *Air leak on the suction side.*—Either at the filter or on the pipe line. A slight air leak will cause the pumps to work rather faster than normal, but if sufficiently bad to cause a complete air lock, the pumps will tick continuously and noisily as if short of petrol.
3. *Pump valves not seating.*—The delivery valves do not give any easily detectable signs of their functioning. If a suction valve is not seating, the pump will tick continuously when the engine is switched on but not running. It is probable that foreign matter is lodged under one of the valves.
   If the above is suspected, remove the caps (**3**, Fig. **11**); the valves and valve cap assemblies may then be lifted out and cleaned.
4. *Sluggish operation of the pumps.*—Check that the electrical connection and contact points are clean and in proper order. Verify, by alternately disconnecting the pipes at the unions, that it is the pump, and not due to a blockage in the pipe line. If with the pipes disconnected the pumps still work sluggishly, the unit should be removed and returned to Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers" for overhaul.

Note—The pumps will not work with both petrol pipes disconnected; in such circumstances the pumps must be earthed to the chassis frame.

Fuel Tank.

The fuel tank is of 18 gallons capacity.

Every 20,000 miles, as directed on page 36, 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 two, and must afterwards be securely retightened. This will flush out any accumulation of sediment or water.

Fuel Filters.

The rear filter, shown in Fig. **12**, 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 20,000 miles, as directed on page 36.

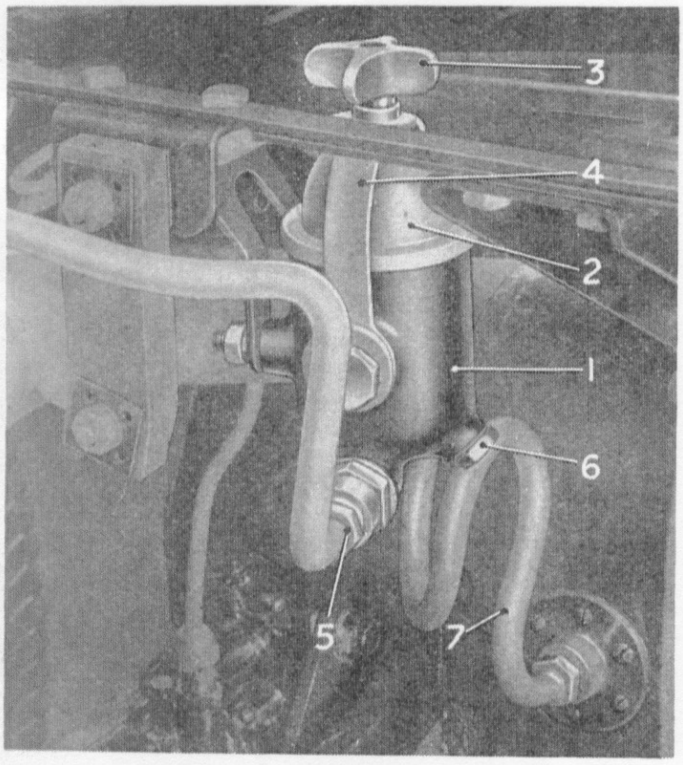

Fig. 12.—REAR FILTER.

1. Body.
2. Cover.
3. Cover nut.
4. Yoke.
5. Outlet pipe.
6. Drain plug.
7. Inlet pipe.

When refitting the cover, care must be taken that the cork washer is sound, and properly in position, and the nut (**3**, Fig. **12**) 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.

In addition, a small gauze filter is fitted in the petrol union on each carburetter. These should be removed and cleaned every 20,000 miles, as directed on page 36.

Removal is effected by unscrewing the two union nuts (**1**, Fig. **13**). The filter gauzes can then be removed and cleaned in petrol.

When refitting the parts, care must be taken to replace each gauze with its open end outwards and that the aluminium joint washers are in position on the unions.

Fuel Gauge.

The fuel gauge registers when the master and ignition switches are **"On"**.

As mentioned on page 45, this gauge also registers the amount of oil in the engine sump, when the appropriate switch is depressed.

The Carburetters (Action).

Two carburetters of the conventional S.U. type are fitted as shown in Figs. **13** and **14**, one being shown in section to illustrate the principal parts.

This type of carburetter automatically adjusts both its choke and jet area in accordance with the demand of the engine as determined by the degree of throttle opening, the engine speed, and the load against which the engine is operating.

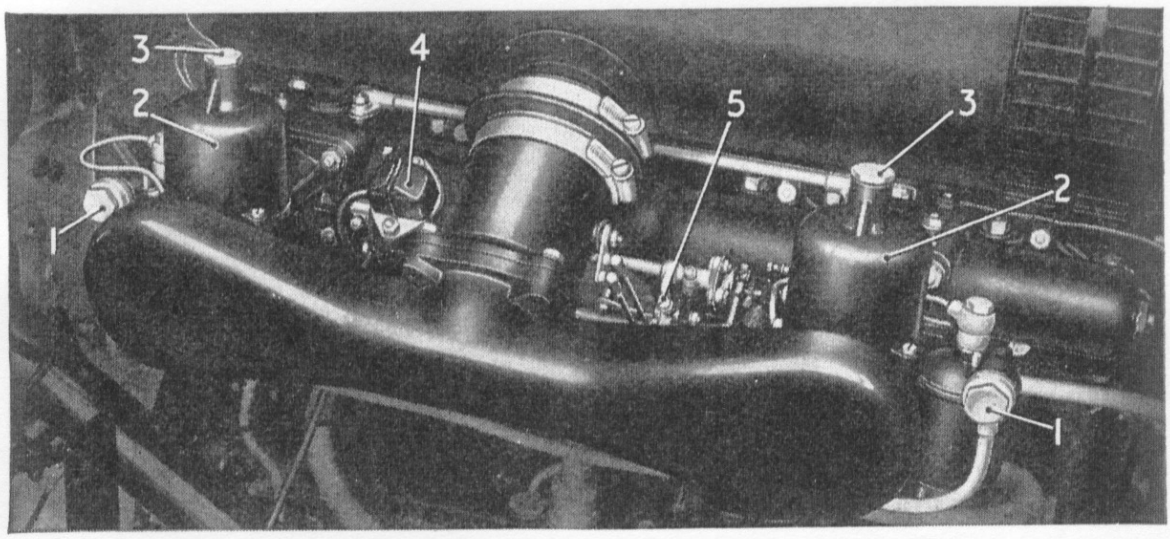

Fig. 13.—CARBURETTERS IN POSITION ON ENGINE.

1. Fuel inlet and filter.
2. Air valve chamber.
3. Hydraulic piston.
4. Solenoid.
5. Idle Adjustment Screw.

This is effected by using the manifold depression to levitate a piston or air valve carrying a tapered needle which regulates the fuel passage. The upper side of the piston is connected by passage ways to the base of the piston facing the throttle valves, and is thus subject to the depression in the throttle body.

As the air flow through the carburetter increases, so the depression between the piston and the throttle valve increases, thereby causing the piston to rise and admit more air, and consequently the needle to be withdrawn from the jet, thus allowing more fuel to flow. Similarly, as the air flow falls, due to reduced engine requirements, so the piston falls, maintaining a state of balance whereby the piston

keeps at a certain height, dependent on engine speed and throttle opening. An approximately constant air velocity, and hence an approximately constant degree of depression, is maintained in the region of the fuel jet, even under idling conditions and so obviates the necessity for a separate idling jet. A single jet only is employed in the carburetter.

Automatic Air Valve.

The top portion of the guide spindle carrying the air valve piston is hollow, forming a well surrounding a small stationary damper piston, suspended from the suction chamber cap by means of a rod. The hollow interior of the spindle contains a quantity of thin engine oil, and the slight retarding effect upon the movement of the air valve assembly, occasioned by the resistance of this small piston, provides the momentary enrichment desirable when the throttle is abruptly opened. The damper piston is of a composite construction and offers little resistance to the passage of the oil during the downward movement of the main piston.

Every month, as directed on page 32, the oil reservoir cap nut (**3**) (Fig. **13**), should be unscrewed and the plunger withdrawn, *great care being taken to avoid damage to the plunger rod by bending;* the reservoir should be topped up, if required, with the recommended oil, so as to maintain the level of the oil to the top of the guide rod only. The plunger should then be replaced, taking care that no dirt or grit is present. A slight steady pressure may be required to displace the oil sufficiently to allow the engagement of the thread of the oil reservoir cap nut.

If it is suspected that the automatic air valve is not working correctly, the air intake should be removed, and a check made by lifting the piston with the fingers, when it should be noted that the piston falls quite freely on to its seat when released.

If any sticking or sluggishness is apparent, it will be necessary to dismantle the air valve assembly: first remove the hydraulic piston damper, next remove the three screws, and lift off the air valve chamber. The piston valve can be then lifted out, *the utmost care being taken not to bend or damage its depending needle valve, or to bruise the valve in any way.* The valve, chamber and guide should be carefully wiped with a piece of clean cloth dipped in petrol, and the piston rod ONLY lubricated with a few drops of thin oil.

No polishing paste or abrasives should be used to clean the valve or valve chamber.

The suction disc (**5**, Fig. **14**) does not touch the walls of the valve chamber, there being a small clearance, and it is centralised solely by the piston rod working in the guide. Therefore, any sluggishness in movement is probably due to dirt in the guide, or on the valve chamber walls.

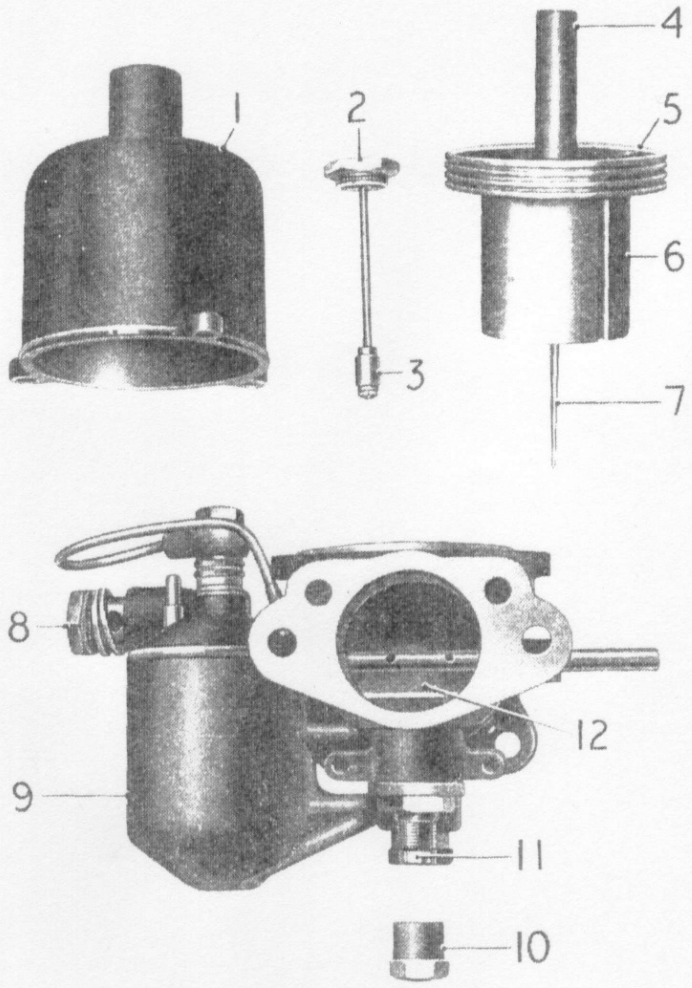

Fig. 14.—CARBURETTER—EXPLODED VIEW.

1. Air valve cylinder.
2. Oil cap nut.
3. Hydraulic damper piston.
4. Piston guide rod.
5. Suction disc.
6. Piston, air valve.
7. Needle valve.
8. Fuel inlet and filter.
9. Float chamber.
10. Cap nut.
11. Mixture adjustment screw.

When replacing the valve, it will be noticed that there is a slot which must engage a tongue provided on the carburetter body. The air valve chamber can only be replaced in one position, the three screw holes being unevenly spaced to ensure this.

If the above treatment does not effect a cure, the fault may be due to a bent jet needle or alternatively to the needle fouling the jet. If this is suspected it is recommended that communication is made with Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers".

The needle valve is secured in position by means of a grub screw and if it should be necessary to remove this, as, for instance, when replacing an accidentally damaged needle, it must be particularly noticed that the location of the valve is determined by a shoulder. The valve should be pushed into the piston until this shoulder is just flush with the lower face and the grub screw tightened.

If a needle should be accidentally damaged, a new one must be obtained from either Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers". Code letters are stamped on the end of the needle, denoting the needle characteristics, and it is essential that only one of the same coding is fitted.

Throttle Control.

The quantity of mixture for slow running is determined by means of an adjustable screw stop on the front carburetter (**5**, Fig. **13**) which limits the closing movement of both throttles. This is so adjusted that the engine will idle slowly but reliably when the accelerator pedal is released, no hand control being provided.

Automatic Choke Control.

The automatic system consists of:—

(i) An out-of-balance butterfly valve in the common air intake pipe, indirectly coupled to a diaphragm which is subject to induction pipe depression.

(ii) A small electro-magnet wired in parallel in the starter relay circuit, which holds the butterfly closed when starting.

(iii) A cam for "fast idle", loose-coupled to a pick-up lever connected to the butterfly valve spindle.

(iv) A thermostatic spring unit housed in a suitable recess in the water jacketing of the induction manifold.

As the engine cools, the thermostatic spring also cools, and gradually gains tension. The thermostatic spring is, however, unable to close the choke valve until the throttle stop screw has been lifted from the fast idle cam.

It is therefore necessary to depress the accelerator pedal slightly and then allow it to return to its normal position before attempting to make a start.

On releasing the accelerator pedal, the throttle opening is greater than that for normal idling, by virtue of the extra stop resting on the "fast idle" cam.

When the starter button is operated, the electro-magnet, wired in parallel, is energised and the armature on the butterfly spindle holds the butterfly valve in the fully closed position. Immediately the engine fires and runs and the starter button is released, the circuit to the electro-magnet is broken, and therefore the power to hold closed the butterfly valve is disconnected.

As soon as the engine is running, the depression created in the induction pipe is exerted on the diaphragm which transmits its energy to the loose lever on the butterfly spindle. This in turn catches up on a peg and turns the spindle to open the butterfly valve a predetermined amount, against the loading of the thermostatic spring.

Assuming that the accelerator pedal has not been moved, the engine will continue to run at a speed determined by the starting position of the "fast idle" cam. The engine coolant jacketed pocket

holding the thermostatic coil units will gradually warm up and transmit heat to the coil. This in turn will wind up and gradually release the load on the butterfly, which will gradually open.

With the depression of the accelerator pedal for the drive away, the "fast idle" stop on the throttle shaft will move away from the cam and the cam will fall on to the pick-up lever coupled to the butterfly spindle. The loading of the thermostatic spring and the off-set of the butterfly have been so arranged that any air flow greater than that required for a "fast idle" automatically opens the butterfly sufficient for engine requirements.

Float Feed Mechanisms.

These are of the usual "top feed" pattern, whereby, as the level of the petrol rises in the float chamber, a lever bearing on the top of the float moves the conical seat "needle" upwards on to its seating, so shutting off the supply.

If it is required to dismantle the float chambers, it will be more convenient to remove them bodily—after disconnecting the fuel pipes, and the small air bleed pipe to the cover—by unscrewing the hexagon plugs which secure each to their respective carburetter bodies.

When the covers are removed, care must be taken that the fulcrum pins of the levers do not fall out. They are normally retained by means of the walls of the float chambers.

The chambers should be wiped out with a piece of clean wash-leather before being refitted. When replacing them, care must be taken to see that the packing washers are in position, one above and one below the boss which couples each to the carburetter body.

Further Dismantling of Carburetter.

It should never be necessary to remove any other parts of the carburetter than those referred to in the foregoing pages.

The jet assembly securing nut should not be disturbed, as the refitting of this requires special tools to ensure that the jet is accurately centralised relative to the taper needle valve.

Adjustment of Controls.

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

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