CHAPTER III

Fuel System

The Fuel System - Fuel Pumps - Petrol Fillers - Action of the Carburetter - Accelerator Pump - Economiser Jet - Strangler Control for Starting - Adjustment of Carburetter - Setting of Idling Adjustment - Diagnosis of Faults - Float Feed Mechanism - "Hot Spot" - Air Silencer and Cleaner.

The Fuel System.

The fuel supply from the 18 gallon tank at the rear of the chassis is by means of a double electric pump mounted on the front of the dashboard.

A filter is arranged on the rear frame cross member immediately in front of the fuel tank, and the supply pipe is carried along the off-side frame member, to another filter and thence to the carburetter float chamber.

A green warning lamp on the dashboard, operated by special contacts on the tank unit of the level gauge, is illuminated when the fuel level falls to about two-and-a-half gallons.

Fuel Pumps.

The fuel pumps are of the electric solenoid-operated, diaphragm type. Both pumps deliver into a common chamber and are simul-taneously rendered operative when the ignition is switched on.

Duplicate pumps are provided primarily for reliability.

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

Petrol Fillers.

The rear filter 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 is shown dismantled for cleaning in Fig. **13**. It should be cleaned every 20,000 miles, as directed on page 24.

To do this, the wing nut, **E**, must be released, stirrup, **F**, swung forwards, and the cover, **C**, removed. The knurled nut, **F**n, should then be unscrewed and removed, carrying with it two gauzes, **F**g. These are held apart by a distance piece, **F**d, and retained on the nut by a spring ring, **F**r, and washer, **F**w. The spring ring should be removed and the gauzes taken off and cleaned in petrol. Before replacing them, the filter sump should be drained by removing the plug, **S**p, and wiped out with a clean, damp washleather.

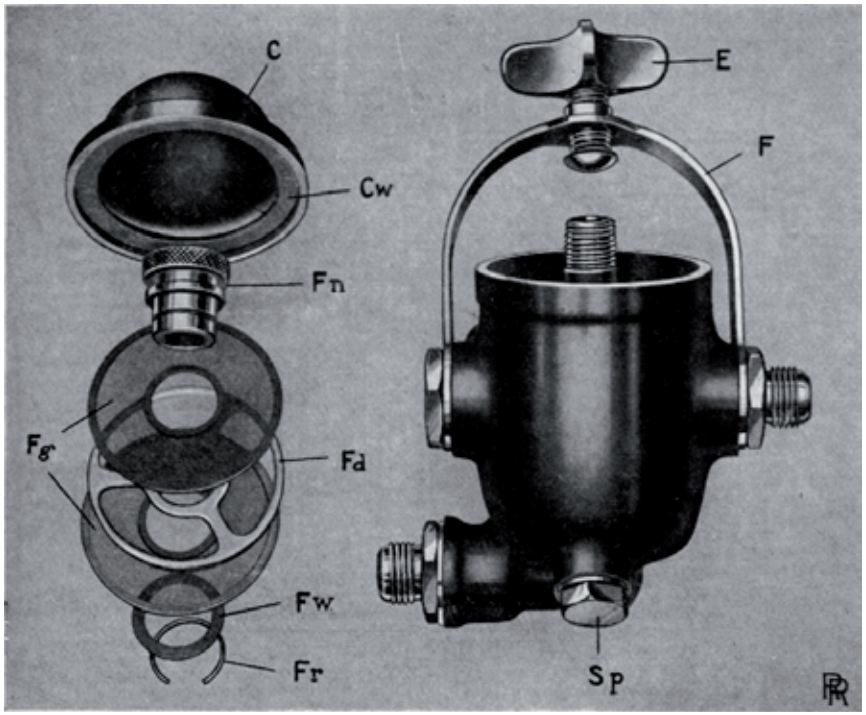

Fig. 13. - FUEL STRAINER DISMANTLED.

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

In addition, a small gauze filter, shown at **B** in Fig. 16, is arranged on the carburetter. This should be removed and cleaned every 5,000 miles, as directed on page 22.

Removal is effected by unscrewing the plug, **B**I, when the gauze, **B**, can be removed and cleaned in petrol.

When refitting the parts, care must be taken that the aluminium washer is in position on the plug.

Action of the Carburetter.

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

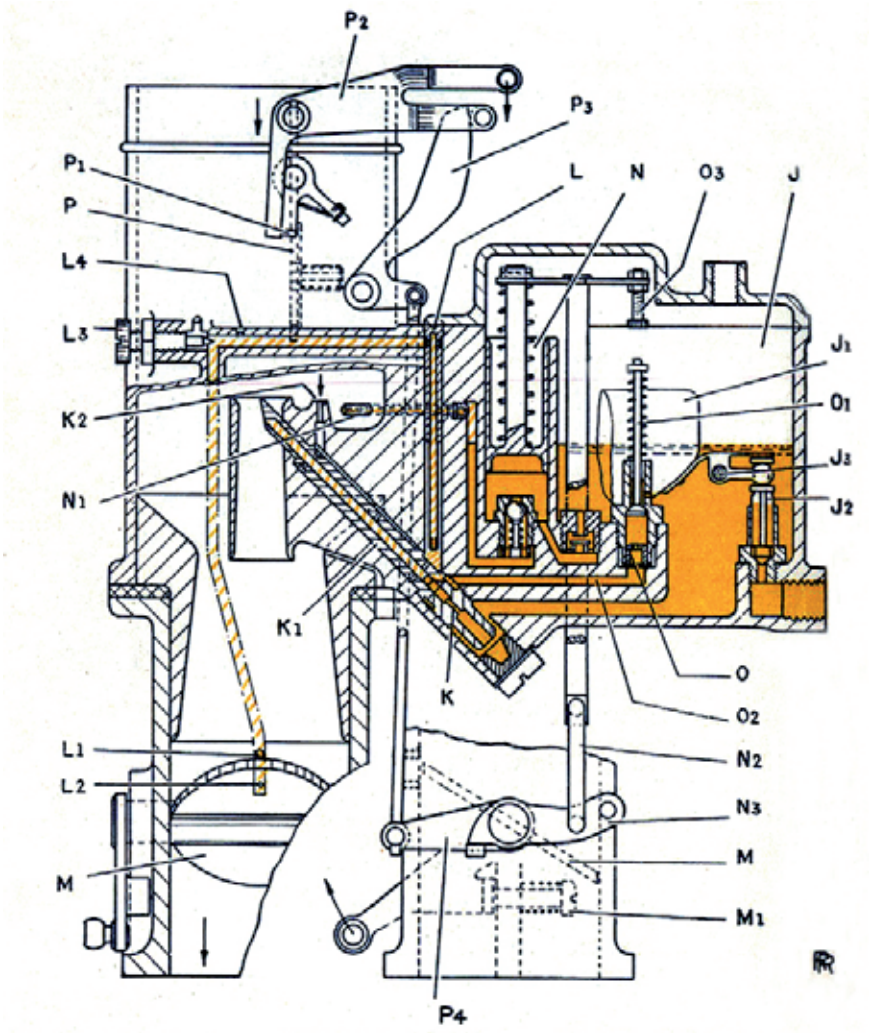

Fig. 14 - DIAGRAMMATIC SECTIONAL VIEW OF CARBURETTER.

J- Float Chamber.
J1- Float.
J2- Needle valve.
J3- Fulcrum pin of float.
K- Main metering jet.
K1- Emulsion jet.
K2- Main air bleed.
L- Pilot or slow running jet.
L1, L2- Slow running discharge holes.
L3- Slow running mixture adjustment.
L4- Anti-syphonic air bleed.
M- Throttle valve.
M1- Throttle stop screw.
N- Accelerator pump plunger.
N1- Pump metering and delivery jet.
N2- Pump coupling link.
N3- Lever fixed on throttle spindle.
O- Economiser metering jet.
O1- Economiser valve.
O2- Fuel passage from economised jet.
O3- Tappet for economiser valve.
P- Strangler valve.
P1- Projection on strangler operating lever.
P2- Strangler control valve.
P3- Cam coupling strangler control to throttle.
P4- Lever free on throttle spindle.

The action of the carburetter will be understood by reference to the accompanying illustrations, in whci Fig. 14 is a diagrammatic sectional view, Fig. 15 shows the carburetter partly dismantled, and in Fig. 16 it is seen in position on the engine. Like references are used for the same parts in all three illustrations.

Referring more particularly to the diagram, Fig. 14, fuel flow to the float chamber, J, is controlled by the usual float, JI, and needle valve, J2. The main fuel metering orifice, K, is located at the base of the emulsion jet, KI, which projects into the throat of the small or inner venturi tube. Air is admitted through a "bleed" orifice, K2, and this air is mixed with the fuel forming an emulsion within the jet, KI. The main air flow is downwards, from the silencer, and by means of the inner venturi tube the velocity of the air is raised considerably and the emulsion drawn from the jet, KI, is effectively pulverised and mixed with the ingoing air. Air also passes around the inner venturi between its outer walls and the inside of the outer venturi tube, thus forming an annular blanket of air around the central core of mixture. This serves to keep the mixture in the centre of the airstream and the liquid fuel from depositing on the walls until the "hot spot" is reached.

The main metering jet, K, the air bleed, K2, the two venturis and the size and location of the air bleed admission holes in the sides of the jet, KI, are all so proportioned that the required quality of mixture is maintained between small and large throttle openings.

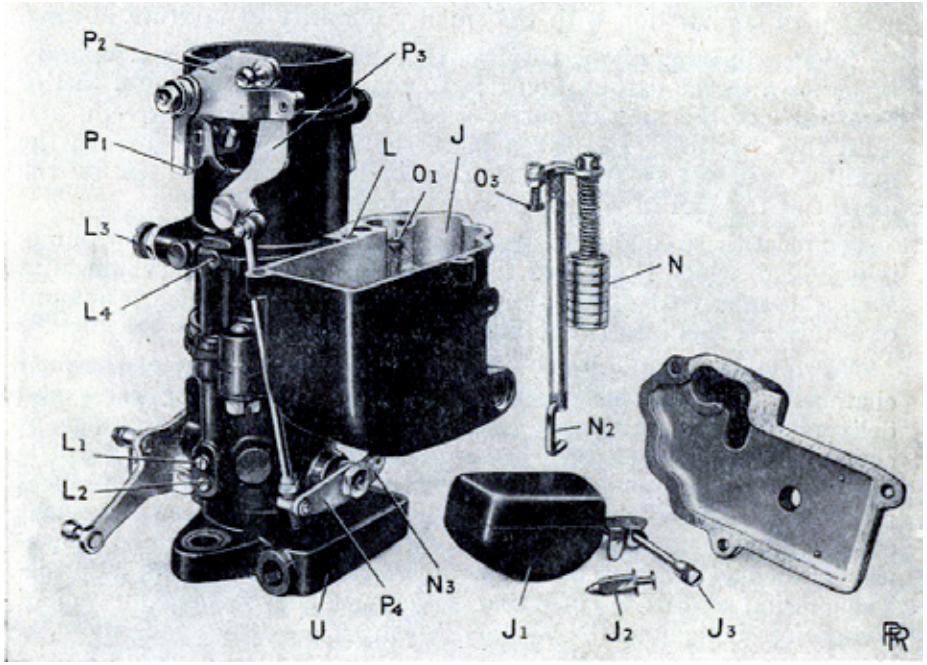

Fig. 15. - CARBURETTER PARTLY DISMANTLED

In order to get from slow running and idling, under which conditions the air velocities through the main venturi tubes are too low to effect reliable carburation, a pilot or slow running jet, **L**, is arranged to deliver mixture to two holes, **L**1 and **L**2, in the carburetter body adjacent to one edge of the throttle valve, **M**, when this is in the closed position. Bleed air is admitted to the idling system by an adjustable needle valve, **L**3, which also serves as a means of adjusting the quality of the slow-running mixture. In addition another and non-adjustable air bleed, **L**4, is provide in order to prevent flooding through the slow running holes by syphonic action in the event of the adjustable air bleed, **L**3, being inadvertently screwed right in to shut off the bleed air at the point.

The size of the pilot jet, **L**, in conjunction with the sizes and positions of the two holes, **L**1 and **L**2, are selected to ensure smooth, slow running and an uninterrupted change-over from the pilot to the main jet as the throttle is opened.

Accelerator Pump.

Under conditions of running when the throttle is moderately or fully open, the insides on the induction passages are wet with fuel deposited from the main mixture stream. The condition is unavoidable and is not detrimental with a correctly designed manifold and "hot spot". Under closed-throttle conditions, however, the passages are dry, or more nearly so, owing to the reduced pressure in the induction system in conjunction with the smaller quantity of mixture flowing.

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

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

The pump plunger, **N**, is arranged in a compartment of the float chamber. It draws fuel from the latter through a disc valve and delivers it past a ball valve and a metering jet, **N**1. The plunger is coupled by a rod and link, **N**2, to a lever, **N**3, fast on the throttle spindle. Closing movement of the throttle, **M**, raises the plunger positively and draws fuel into the plunger cylinder. Opening movement of the throttle, however, does not positively force the plunger downwards to expel the fuel, but does so through the medium of a spring. The tension of this is such that a very sudden opening movement compresses it against the plunger which subsequently falls more or less gradually, thus ensuring that the mixture is maintained in proper proportions until the main emulsion jet comes into action.

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

There are two alternative positions provided for connection of the link, **N**2, with the lever, **N**3. That recommended as being the more satisfactory is the inner hole, as the link is shown connected in Fig. **14**.

Economiser Jet.

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

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

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

The economiser metering jet is shown at **O**, in Fig. **14**. It is controlled by a valve, **O**1, normally kept closed by a spring. When the throttle is nearly fully opened, the stem of this valve is depressed by the same member as that which operates the accelerator pump. The additional fuel flows to the main jet by way of passage, **O**2.

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

A ⅜" diameter rod or mandrel should be inserted into the lower or outlet end of the carburetter, between the throttle valve and the barrel. The throttle should then be lightly closed against the rod and the adjustment, **O**3, provided on the economiser jet operating arm, so set that the valve spindle and operating tappet are just in contact.

Strangler Control for Starting.

To ensure asy staring from cold, a strangler or choke valve is arranged on the upper or inlet end of the carburetter. It is of a special kind designed to eliminate the risk of over-strangling or "choking". Control is from a thunb lever on the instrument board, the dial plate of which is marked **Start** and **Run**.

The strangler valve is shown dotted at, **P**. Its spindle is mounted off-centre and a projection, **P**1, on the operating lever is kept in contact with an arm of the control lever, **P**2, by a light spring. As a result, suction of the engine, or more correctly, atmospheric pressure, tends to open the valve, acting against the larger offset area of the valve and against the spring and separating the projection, **P**1, from

the control lever arm. As an additional safeguard against over-strangling a lightly spring-loaded disc valve is fitted in the strangler valve itself which also tends to open under engine suction.

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

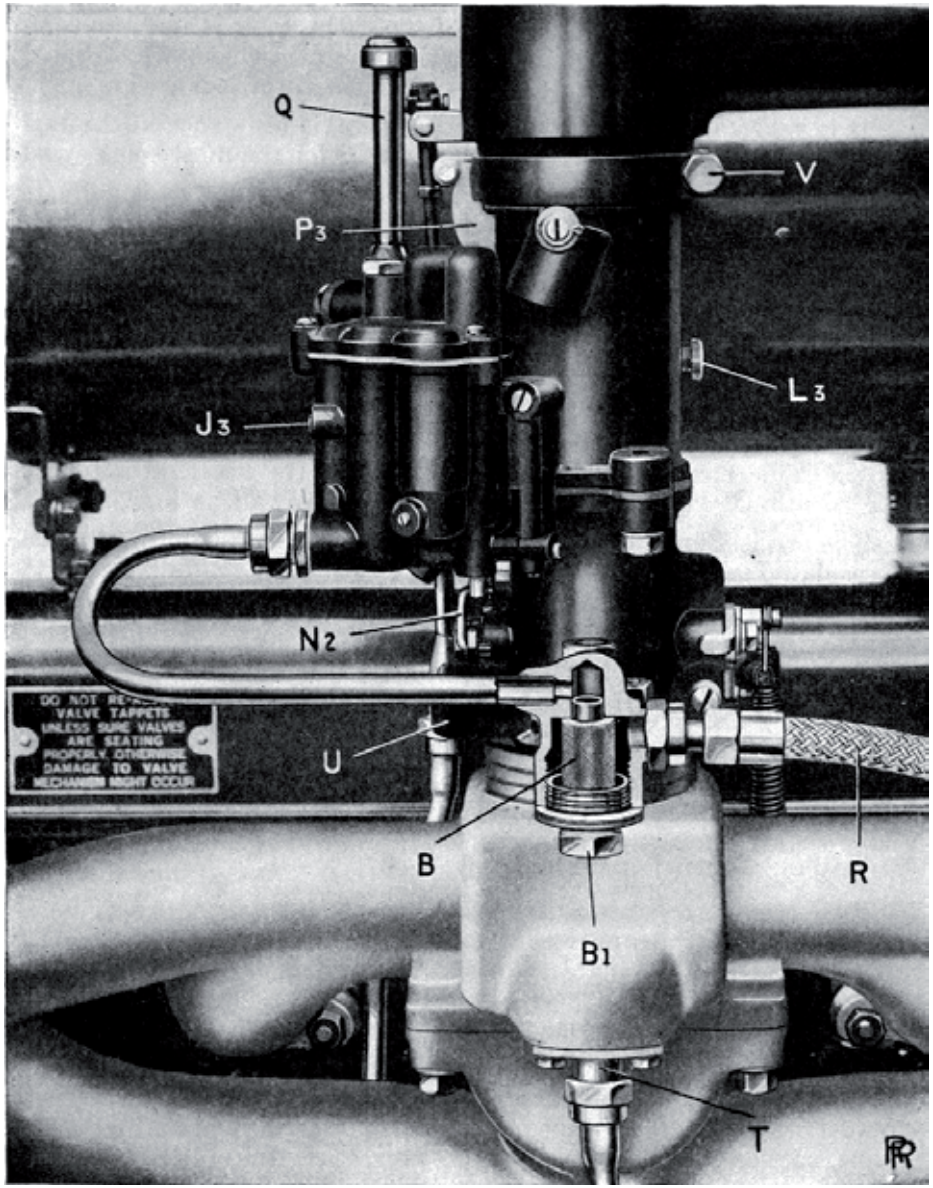

Fig. 16. - CARBURETTER IN POSITION ON ENGINE

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

The strangler control lever, **P**2, carries a roller which makes contact with a cam, **P**3, forming part of another lever. The latter is coupled by a rod with a lever, **P**4, freely mounted on the throttle spindle. A projection on this lever makes contact with a projection on the accelerator pump operating lever, **N**3, and causes the throttle to be opened by a predetermined small amount when the strangler control is set to **Start**.

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

An adjustment of this degree of opening movement is provided at the point where the rod is coupled to lever, **P**4. Readjustment should not normally be necessary, but if the original setting is disturbed it may be restored as follows :-

Release throttle stop screw, **M**I, until the throttle is entirely closed and then bring the screw back until it just makes contact with the throttle lever without moving the latter. Next, set the adjustment between the rod and the lever, **P**4, so that operation of the strangler control causes the throttle to be opened by an amount equivalent to a gap of .060" between the stop screw and the throttle lever.

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

Adjustment of Carburetter.

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

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

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

Setting of Idling Adjustments.

The idling adjustments should only be re-set when the engine is well warmed up. There are two adjustments, namely, the throttle stop screw, **M**I, and the idling mixture adjustment screw, **L**3. The latter is locked by a lock nut.

With the hand throttle in the closed position, the throttle stop screw, **M**1, should be adjusted to give the desired engine speed. The mixture regulating screw, **L**3, should then be turned in and out until a position is found where the engine rhythm is most regular. Screwing *in* gives a *richer* mixture, and screwing *out* a *weaker* one. If a satisfactory position cannot be found, the idle discharge holes, **L**1 and **L**2, should be inspected by removing the small plugs seen in Fig. **15**. The pilot jet, **L**, may be removed for inspection by taking off the float chamber cover.

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

Diagnosis of Faults.

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

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

For loss of maximum speed. - Check that the throttle valve can be fully opened, and see that the economiser jet, **O**, Fig**. 14**, and valves are free from obstruction. To exract these parts, remove float chamber cover and float, withdraw split pin from link, **N**2, and take out link and withdraw pump plunger, **N**. The economiser valve may then be unscrewed and withdrawn.

Flat spot at small throttle opening. - Adjust idling to give more even engine rhythm (see page 37). If flat spot is still evident, examine idle holes, **L**1 and **L**2, and pilot jet, **L**, for stoppage.

Flat spot at half throttle opening. - withdraw main jet, **K,** and examine fro stoppage. Check accelerator pump for stoppage.

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

Float Feed Mechanism.

The float chamber is held in position by three screws and is provided with a cork joint washer. A special form of vent, **Q**, Fig.**16**, is fitted, and also a drain pipe to carry off fuel if flooding occurs.

The float can be removed by unscrewing the fulcrum pin, **J**3, Figs. **15** and **16**.

A flexible pipe, **R**, conveys fuel to the float chamber. *On no account must the fittings on the pipe itself be disturbed.*

The standard setting of the fuel level is ⅝" below the top face of the float chamber. Normally, it should not be necessary to alter this. If readjustment should at any time become necessary, however, alteration can be effected by carefully bending the float arm where it meets the float. Bending the float *up* will raise the level, and vice versa.

"Hot Spot".

A "hot spot" is provided in the induction manifold immediately opposite the carburetter by virtue of the fact that the induction manifold is bolted direct to the exhaust manifold at this point. The joint should not be disturbed.

A fuel drain, **T**, Fig. **16**, is arranged which incorporates a non-return valve normally kept closed by engine suction. The pipe is united with that from the float chamber cover and also with another one from the tray, **U**, Figs, **15** and **16**, below the carburetter to trap any leakage fuel.

Air Silencer and Cleaner.

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

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

Every 5,000 miles, as directed on page 22, the cleaner element should be removed and carefully washed in petrol or paraffin.

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

Every 20,000 miles, as directed on page 24, the element should be renewed.

A short pipe connects the carburetter intake with the silencer and it should be noticed that this pipe can be removed by merely releasing the bolt, **V**, Fig. **16**. There is no need to disturb the large serrated nut on the other end of the pipe.

Care must be taken not to overtighten the bolt, **V** as this may distort the carburetter body and cause the strangler valve spindle to bind in its bearings.

CHAPTER IV

Adjustment of Brakes

General - Adjustment of Brakes - Adjustment of Hand Brakes - Adjustment of Servo

General.

The only points in the sytem where any adjustment is provided or is necessary are the following: -

I.	Foot brakes, front and rear.	A wing nut adjustment (Figs. **17** and **18**), which is for hand operation only.
2.	Hand brake	The threaded rods coupled to the cam operating levers below the rear axle (Fig. 18).
3.	Servo	The serrated adjusting nut on the end of the servo shaft (Z, Fig. 19).

These adjustments are dealt with in detail in the succeeding paragraphs.

It is very important to observe that under no circumstances should adjustment be attempted at any other points, for instance, by altering the lengths of other brake rods or any of the ropes. These are carefully determined during the erection of the chassis, with a view to utilising to the best advantage the lengths of various levers, taking into consideration the total movement of such levers, from the time when the brakes are new until the facings are completely worn out.

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

Adjustment of Foot Brakes.

The wing nut adjustment for the front brakes is shown at **W**f, Fig. **17**, and that for the rear foot-operated brakes at **W**r, Fig. **18**.

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

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

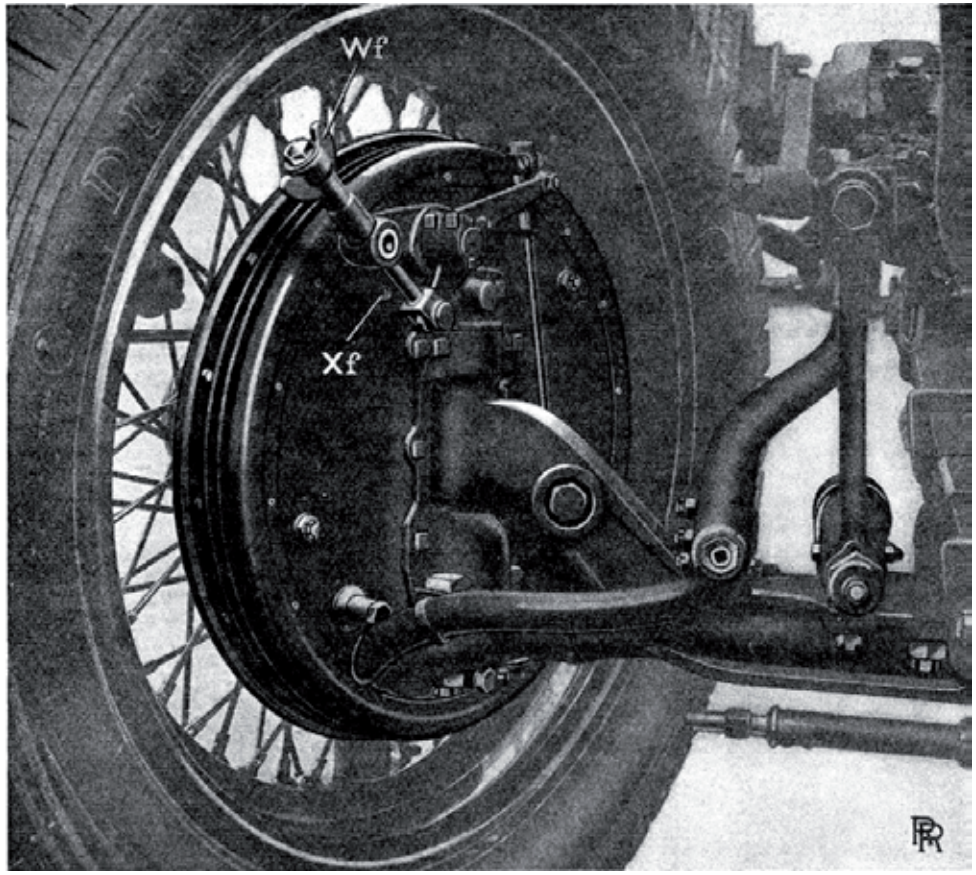

Fig. 17. - FRONT WHEEL BRAKE ADJUSTMENT.

When making or testing the adjustment, it is preferable that the wheel should be jacked up and rotated by hand. One is then able both to hear and to feel when the shoes make contact with the drum.

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

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

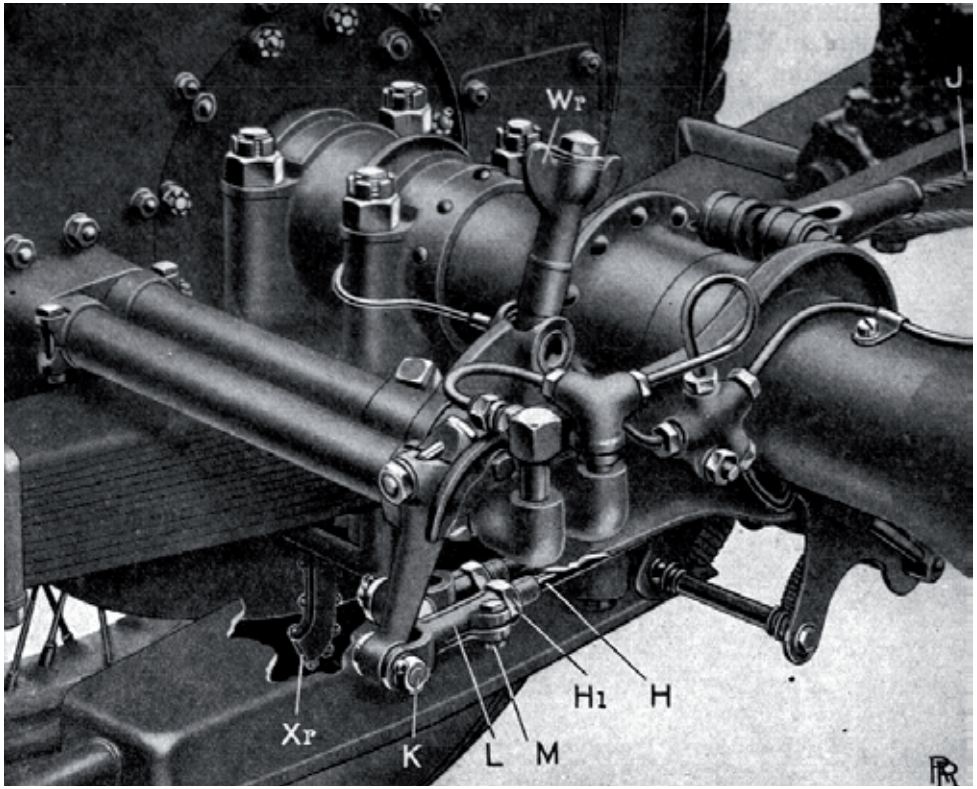

Fig. 18. - REAR BRAKE ADJUSTMENTS.

It should be noted that the movement of the brake pedal when the car is standing does not apply the front brakes, which are operated solely by the action of the servo. Under such circumstances, pressure on the pedal will only apply the rear brakes.

Adjustment of Hand Brakes.

All adjustment of the hand brake is effected at the outside rods beneath the rear axle, one of which is shown at **H** above.

With the hand brake lever right off, the adjustment should be tested by pulling the brake rope, **J**, with the hand and measuring the travel of the rope necessary to just apply the brake. This travel should not be less than 1".

Adjusting is effected by removing the pin, **K**, from the jaw, **L**, this pin being secured by a collar and split cotter, releasing the locknut, **H**1, slackening the small nut, **M**, and screwing the jaw further on to the rod, **H**, to an extent depending on the amount of adjustment required.

Usually this should be the same on both sides.

Care should be taken to replace the pins, **K**, securing them with split cotters and collars, then to re-tighten the nuts, **M**, and finally the locknuts, **H**1.

Adjustment of the Servo.

The servo is of the dry, disc-clutch type, and should run 20,000 miles without the need of any adjustment.

If adjustment is necessary, it is effected by screwing up the nut, **Z**, below.

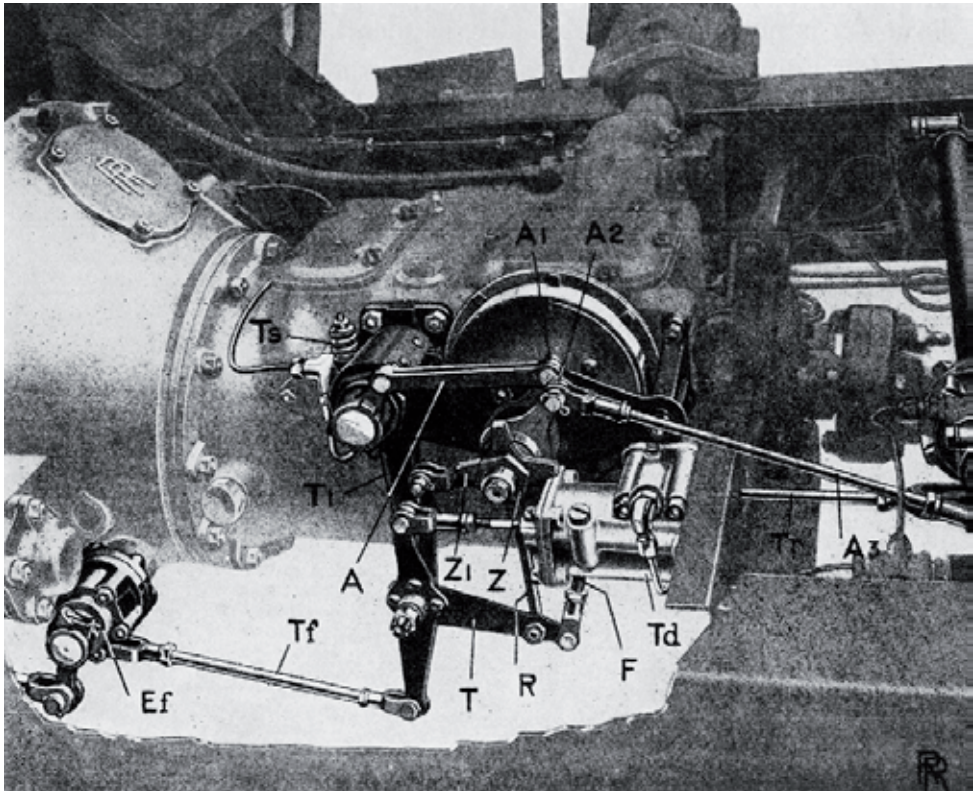

Fig. 19. - THE SERVO MOTOR AND ITS CONNECTIONS.

This nut is locked by 25 rounded serrations formed on its face, which engage similar serrations on a washer, which is secured against rotation relative to the shaft. The depth of these serrations is carefully proportioned to give the correct clearance of the servo, the nut being turned so that the teeth lightly ride over each other and engage again.

On no account should force be used in this operation, as such treatment would nullify the object of the teeth, namely, to determine the correct clearance.

After effecting adjustment in this way, care should be taken to see that the serrations are in proper engagement.

The adjusting nut should not be screwed up more than one serration - that is, 1/25 of a turn - without testing the servo adjustment.

To do this the pedal should be depressed lightly by hand sufficiently to engage the servo and compress the buffer springs, **Z**1, but just short of moving the lever **A**2 rotationally.

The pedal travel should then be not less than ½" measured at the top of the pedal towards the dash.

It must be realised that this movremnet is entirely due to operation of the servo, and does not alter the rear brake clearances. Hence, lever A2 is not moved rotationally, as mentioned.

After adjustment, the servo clearance should always be checked again by measuring the pedal movement, as explained.

Emphasis is laid on this point, as obviously a dragging servo, due to abuse of the adjustment provided, would result in dragging of the brakes on all wheels.

CHAPTER V

The Clutch

Adjustment of Clutch

Adjustment of Clutch.

The only point where any adjustment is provided is at link, **D,** coupling the pedal lever to the clutch operating lever.

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

The link, **D,** , is coupled to the jaw, **E**, by means of a screwed sleeve, **F**, having left- and right-hand threads and provided with a hexagon, **F**2.

To effect an adjustment, the foot and floor boards must be removed to gain access to the link, the locknuts, **D**1 and **F**1, released. The sleeve, **F**, can then be rotated with a spanner to obtain the correct free movemnent, the locknuts being subsequently retightened.

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

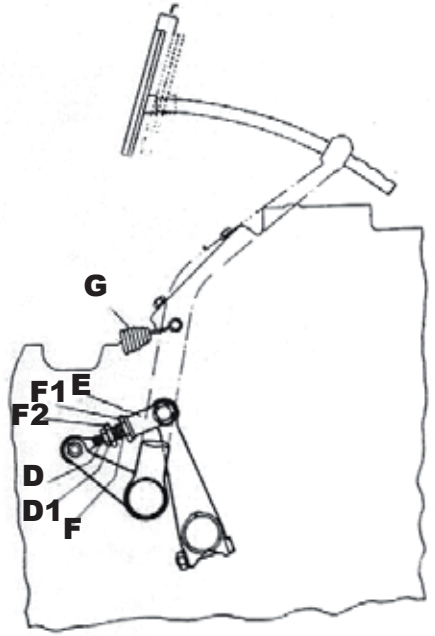

Fig. 20. - CLUTCH ADJUSTMENT