FUEL AND CARBURATION

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/P2.

Mdx/DER

Subject :

HORIZONTAL CARBURETTER
20/25 H.P.

Date of Issue 2nd June, 1947.

IMPORTANT

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Commencing with Chassis No:GYD-25, this carburetter superseded the original Rolls-Royce expanding type which had been fitted to all previous models in the 20 h.p. and 25 h.p. range.

The change to this type of carburetter obtained the following improvements:-

(a) Improved breathing.

(b) More reliable idling by the inclusion of "throttle edge" slow running feed.

(c) Cold starting made possible without the fitting of the auxiliary "starting carburetter".

The information regarding this carburetter is divided into six sections.

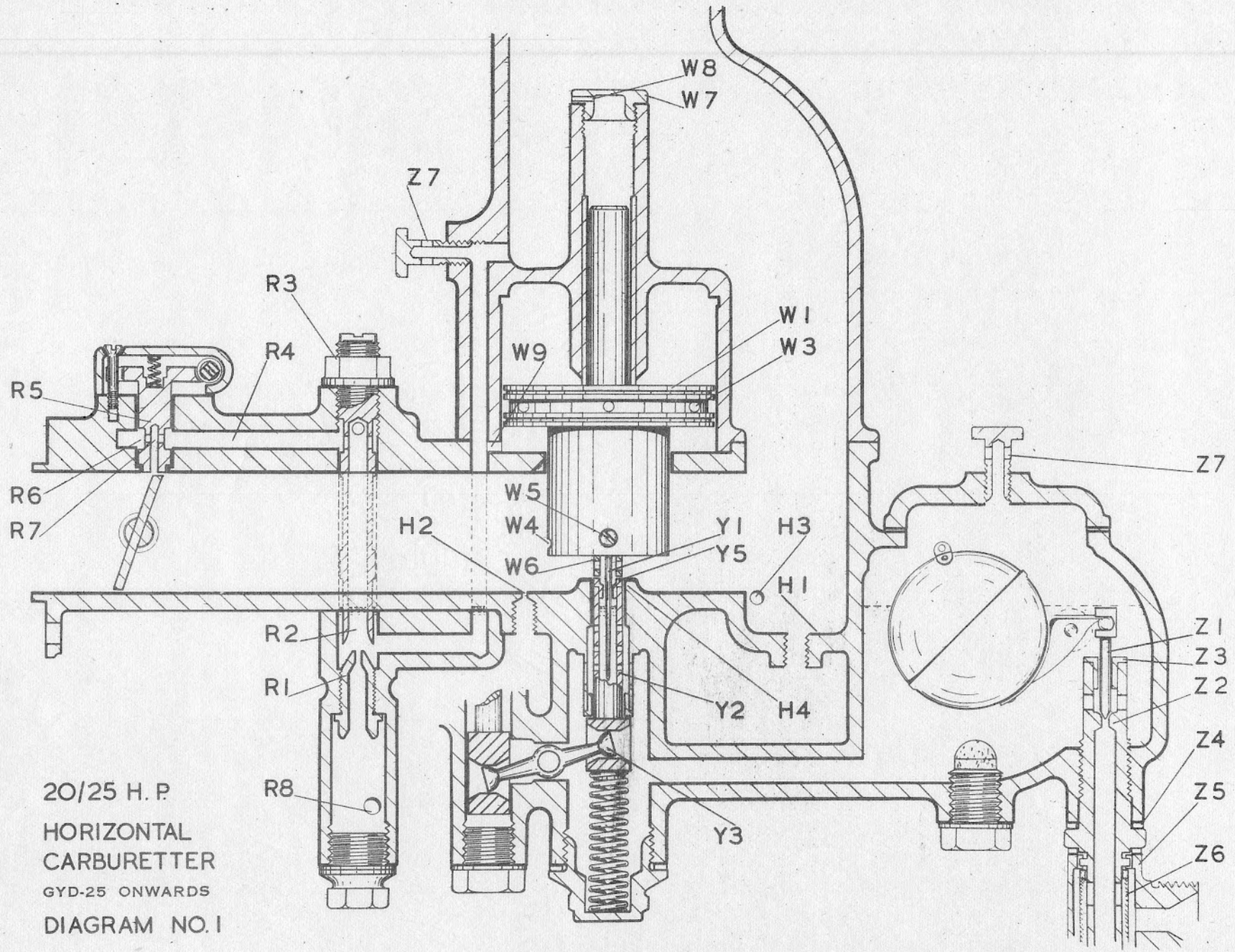
DESCRIPTION:

The reference numbers refer to the Diagram Nos: 1 and/or on Pages 3 & 4.

The carburetter is of the horizontal, expanding choke type, and includes some S.U. features.

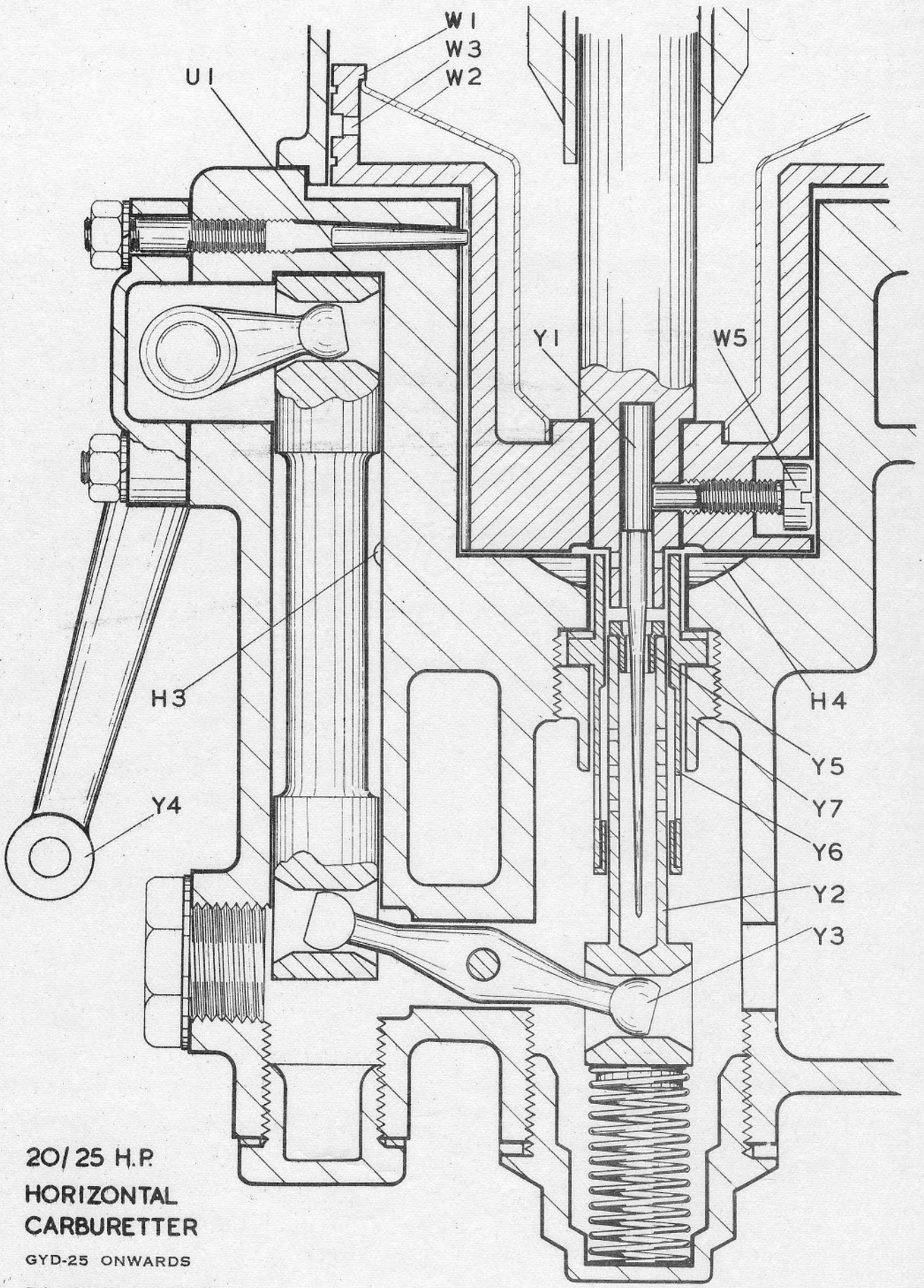
Float Chamber.

The float chamber houses a spherical hollow brass float which pivots in two special setscrews, suitably bored to provide the bearings. The float operates a needle valve (Z.1) downwards against a seating formed in a carrier (Z.2), the needle valve being located in a brass bush (Z.3) pressed into the carrier from the top. The whole assembly is screwed into the float chamber from below against an aluminium washer (Z.4). The lower (external) extension of the carrier provides attachment for the fuel feed pipe connection (Z.5) which houses a gauze filter (Z.6). A vellumoid joint washer is fitted between the float chamber lid and float chamber top face. The atmospheric vent (Z.7) is by means of a pipe connection between the top of float chamber lid and the carburetter air intake. On the original version of this carburetter the vent was obtained through a small drilling from the float chamber wall to the vertical air passage which provides the atmospheric supply from the intake to the slow running jet. Most carburetters were subsequently modified to obtain the increased venting made possible by the external pipe, in which case the original passage is plugged. A hexagon headed drain plug at the base of the float chamber contains a cork buffer to limit the range of the float in a downward direction.



GENERAL LAYOUT

continued: RR/P2.



20/25 H.P.
HORIZONTAL
CARBURETTER
GYD-25 ONWARDS
DIAGRAM NO.2

MAIN JET ARRANGEMENT

Continued: RR/P2.

Throttle Edge Bleed.

This unit consists of a cylindrical plug (R.5) of two external diameters housed in suitable borings in the throttle housing. The smaller diameter of the plug is inserted inwards towards the throttle where the inner face of the larger diameter provides a locating stop against the corresponding counterbore in the housing. The plug has an annular groove (R.6) around the waist of larger diameter for the reception of mixture from the passages in the casting communicating with the idle jet mixture chamber. A hole (R.7) drilled through the reduced diameter of the plug at this point meets with a drilling from the inner end face, this hole being off-set from the centre but lying parallel to the central axial line of the plug. The plug is loaded in position by a coil spring. Rotational adjustment is obtained through the medium of a worm and sector, the sector being integral with the plug.

Throttle.

The butterfly throttle consists of a forged aluminium disc secured in a steel spindle by two countersunk headed screws. The spindle is carried in two phosphor bronze bushes. A groove is cut in the front end face of the spindle to provide an external indication of the throttle position after assembly. The chamfered edge of the throttle disc is provided with a small flat to clear the throttle edge bleed plug. An external screw with lock nut provides an adjustable stop for the setting of idling speed.

Fuel Drains.

A small sump (H.1) is formed in the main casting where the vertical air intake forms an elbow with the main horizontal bore of the carburetter. A banjo plug at this point provides attachment for a drain pipe, this plug also receives an inclined pipe from a small drain hole .046" diameter (H.2) drilled on the throttle side of the main jet. A passage drilled through the casting (H.3) provides a return into the petrol drain pipes from the main jet actuating plunger in the event of flooding.

ACTION.

Idling.

Fuel is supplied to the idle jet from the float chamber through a communicating passage (R.8) in the casting. The idle jet is of fixed aperture .025", the mixture strength being corrected initially by altering the position of the choke tube in relation to the nozzle of the jet, greater clearance at this point allows more air to pass into the idling mixture stream and vice versa. After adjustment, the choke position is secured by means of the lock nut.

Further control of the idling mixture is obtained by varying the location of the mixture exit orifice (R.7) relative to the throttle edge, but although a change in mixture strength will inevitably result from adjustment at this point, the correct use of this variation is to provide a smooth changeover during the progression of throttle opening from idling conditions, through slow running to the higher engine speeds, as follows :-

Movement of the orifice away from the engine side of the throttle edge (to the right - Diagram 1) will require a larger throttle opening and high engine speed to be obtained before the influence of this jet diminishes, in other words, the main jet will be spraying before the idle jet mixture has commenced to fade. Conversely, movement of the orifice towards the engine will cause a weak flat spot due to the idle jet mixture failing before the main jet is in action. These variations constitute the legitimate use of this adjustment, the object being to provide the earliest but smoothest changeover position.

Continued: RR/P2.

The change in idling mixture strength caused by varying the position of the throttle edge bleed orifice can be appreciated in one brief example - if, to prolong the changeover period an adjustment of the orifice has been made away from the engine, the demand on the idling mixture will be maintained as the throttle is progressively opened, but at the same time this greater throttle opening will result in an increased air flow into the engine, thereby creating a weakness of the mixture and necessitating a richening adjustment at the idle jet choke.

It will be noted that the idle jet (R.1) is below the petrol level i.e. submerged, the object being to provide a well of petrol for starting. As soon as the engine is running this head of fuel disappears, further supply being metered by the idle jet.

Main Jet.

As the speed of the engine is increased due to further throttle opening the depression applied to the idling system is progressively transferred to the main choke area which is formed between the lower face of the air valve piston and a small ramp (H.4) formed in the main carburetter casting around the main jet.

During slow running the piston is held away from this ramp by a small tubular extension of the guide shaft (W.6) resting on the top of the main jet. (Diagram 1). The depression created at this point is applied to the main jet through the transverse holes drilled in this distance piece. Further increase in engine speed creates sufficient depression around the base of the piston to exhaust the chamber above the air valve head through hole (W.4). Atmospheric pressure applied to the underside of the piston head through duct (W.9) causes the piston to rise, which action enlarges the effective choke area and the main jet aperture simultaneously. The choke area and main jet aperture are, therefore, closely related to the engine speed and the throttle opening.

Cold Starting.

For cold starting purposes the main jet is lowered by the action of the thumb lever on instrument board through lever (Y.4), this allows the air valve piston to seat on ramp (H.4) and completely blanks off the air intake, in other words, it acts as a strangler.

The range of the control lever is greater than the amount required to seat the air piston on the ramp in the manner described, and the further movement is used to lower the jet away from the taper needle to create a larger aperture for cold starting conditions.

Positive steps are provided to limit the range of movement of the main jet in either direction. In the NORMAL position (Diagram 1) it will be seen that the shoulder of the main jet sliding sleeve (Y.2) is prevented from further upward movement by contact with the flanged bush in the lower extremity of the carrier (Y.6). In the START position (Diagram 2), the limit of movement is obtained when the actuating plunger makes contact with the top face of its housing in the carburetter body.

DISMANTLING.

The removal of the carburetter from the engine is straightforward and the air silencer should be dismantled after removing the telescopic breather connection from the rocker cover. The petrol feed pipe can be disconnected taking care of the aluminium washers and the filter. The controls may then be disconnected, the carburation control at the yoke pin end of lever (Y.4), the throttle control at the top ball end and the throttle return spring, which is best disconnected by removing the cheese head screw with plain and spring washer to allow the anchor plate to come away with the spring.

Continued: RR/P2.

The carburetter is secured to the engine by three special $\frac{1}{4}$" B.S.F. collar nuts with 1-B.A. hexagons. The carburetter should then be withdrawn and the petrol drain pipe removed.

The carburetter can best be held by attachment to a stiff flat plate, $3\frac{1}{2}$" x 12" approximately. From the centre of the plate and some 2" distant from one end two concentric circles should be described, one of 2.5" diameter and the other of 1.825" diameter. Three $\frac{1}{4}$" clearance holes should be drilled equally spaced on the larger diameter circle, two of these holes should lie parallel to the long centre line of the plate. The metal should then be removed inside the circle of 1.825" diameter. This arrangement will permit the attachment of the carburetter at the spigotted flange of the throttle bore with three $\frac{1}{4}$" bolts and nuts, and the carburetter will assume a normal horizontal position when the other end of the plate is secured in the vice.

Following this, dismantling may be proceeded with in the sequence enumerated below:-

IT IS ESSENTIAL TO AVOID DAMAGE, THAT GOOD FITTING BOX OR RING SPANNERS SHOULD BE USED ON ALL CARBURETTER NUTS AND PLUGS.

(1) All external pipes should be removed.

(2) Remove the hexagon plug at the top of the air valve piston guide.

(3) The air intake should then be removed, four 2-B.A. bolts, nuts and spring washers, when lifting the air intake it should be remembered that this unit contains the cylinder in which the automatic air valve is housed, and a straight lift is necessary without rocking, and support should be given as early as possible to the piston which may commence to rise with the cylinder. The piston should next be removed, taking care not to damage the needle.

(4) The float chamber lid should be removed and then by removing the two pivot setscrews the float will become free for detachment.

(5) The carburetter should then be inverted and the four plugs should be removed, the main jet plug and spring, the plug below the main jet actuating plunger, the plug below idling jet and the drain plug to the float chamber, this latter plug contains the cork buffer.

(6) The main jet should be removed in the following manner :-

First remove the bearing plate retaining operating lever (Y.4), the plug (Y.8) giving access to the fulcrum lever should then be removed, also the pivot pin, 2-B.A. hexagon and aluminium washer. The fulcrum lever should be pushed inwards towards the main jet, this will allow the actuating plunger to fall out of position and the fulcrum lever to be extracted through the plug hole away from the main jet, the main jet may then be withdrawn.

(7) The float chamber needle seating should be extracted carefully noting the aluminium joint washer, the thickness of which decides the petrol level.

(8) The slow running jet can be removed - 2-B.A. hexagon, and also the adjustable choke tube should be dismantled by releasing the locknut and by screwing the assembly out bodily from the top.

Continued: RR/P2.

It should not be necessary to proceed any further with dismantling, although in the event of the jet needle showing signs of bearing on the side of the main jet it will be advisable to remove the carrier sleeve (Y.6) by the 5/16" hexagon housing nut. The aluminium washer under the flange should be carefully retained as this provides for the height adjustment.

Should the throttle exhibit evidence of sticking the spindle should be removed for burnishing by slackening off the throttle stop screw, and then removing the two countersunk headed screws that secure the disc in the spindle, on removal of the disc the spindle may be withdrawn. It is not anticipated that the throttle edge bleed will require dismantling.

CLEANING AND ATTENTION.

The cleaning of all components and internal passages should now be possible. The air valve piston should be wiped clean and it should then be tested for freedom of fit in the cylinder, sticking is most likely to occur in the normal "at rest" position of the piston which is about a $\frac{1}{4}$" up the cylinder from the lowe spigot face.

It is imperative that any trace of corrosion at this point should be removed, otherwise during cold starting the piston will refuse to drop, although the carburation lever on instrument board is placed in the START position. A chec should also be made to ensure that clearance exists between the outer diameter of the piston head and the cylinder wall throughout the working range.

RE-ASSEMBLY.

Re-assembly of the carburetter should be followed in reverse order to th dismantling sequence, no difficulty will then arise, although the following points should be carefully noted during erection.

(1) The throttle spindle and disc should be re-assembled. The disc must be erected so that the flat on the chamfered edge is adjacent to the throttle edge bleed hole, and the disc should be centralised by the fingers before tightening the two countersunk screws.

After assembly the throttle should be perfectly free when operated by the lever.

(2) The main jet carrier sleeve should be replaced in position, the thickness of the aluminium washer under the flange being such that the top face of the carrier is flush with the machined face at the top of the ramp.

For centralising purposes, a mandrel is necessary approximately 15" long .499"diameter for 12" of the length, the remaining 3" being reduced to .249" diameter, preferably of ground finish. It is essential that these dimensions are true and concentric throughout the length of the bar.

The air intake should be bolted securely into position on the carburette body and the mandrel inserted from the top down the bearing for the air valve piston guide, the small end of the mandrel entering the carrier sleeve and locating it in a central position whilst the housing nut (Y.7 is securely tightened. The mandrel and the air intake should then be removed.

(3) The main jet and its operating mechanism should be replaced in reverse order to the dismantling sequence given in Para. (6) Page 7. It should be noted that the fulcrum lever is true as bending is likely to have occurred in the event of serious carburetter gumming. This lever is symmetrical and will fit either way. The foregoing sentence applies also to the actuating plunger.

Continued: RR/P2.

(4) The jet needle should be replaced in the piston valve by pressing the needle right home before securing the screw. The depth of the bore in the piston guide that receives the needle shank is .9" measured from the lower face of the tubular extension and the needle should be inserted at full distance. The piston, perfectly clean and dry, except for a smear of light oil on the guide stem, should be replaced in the carburetter body and the intake fitted and secured by the four 2-B.A. bolts, nuts and spring washers.

(5) The idle jet and choke tube may be replaced.

(6) The float should be replaced and the aluminium washers under the heads of the pivot screws positioned to centralise the float and to permit an end float of .020" to .025". It should be noted that the needle valve is located on the float operating pin so that the open end of the slot faces towards the float, as shown in Diagram 1. (It is possible to reverse this positioning of the needle, in which case fouling will take place.)

(7) After replacing the needle seating with the aluminium joint washer in position, the plug at the base of the float chamber should be replaced with the cork buffer in position. (It should be noted that this plug has the same thread diameter as the two plugs fitted to the main jet actuating plunger housing, and care should be taken to see that an exchange has not been made.)

(8) Before re-fitting the float chamber lid with a vellumoid joint E.59777 the level may be checked $\frac{7}{8}$" below the top face of the float chamber under an 18" head of fuel. Adjustment is carried out by varying the thickness of the aluminium washer between the hexagon of the seating carrier and the float chamber body, the range of washers being E.60581/2/3/4/5.

(9) When the re-build of the carburetter is completed and the fuel level checked the basic setting of the idle system should be effected, as follows :-

(a) The throttle edge bleed should be set in the centre of its range by screwing the worm lightly to either end of its travel, then turn back seven complete turns.

(b) The idle choke should be screwed down until contact is made with the top of the jet, then turn back $1\frac{1}{2}$ turns and secure with lock nut.

General Assembly Notes.

No jointing compound should be used in the assembly of the carburetter.

Except for the vellumoid joint below the float chamber lid, there are no paper joints or gaskets.

Provided that the joints and faces are good - the various screw plugs should make a petrol tight joint without excessive pressure - the flanges in most cases are of thin section and liable to fracture if undue force is exerted upon them.

RE-FITTING TO ENGINE.

After completing the assembly the carburetter should be re-fitted to the engine.

A vellumoid joint E.60272 is used between the carburetter flange and the engine cylinder block.

Continued: RR/P2.

After connecting the throttle control, it should be observed that sufficient clearance exists to allow the throttle butterfly to seat when the hand throttle lever is at the bottom of the quadrant and the throttle stop screw is screwed back out of contact. The throttle stop screw should then be adjusted, as follows :-

The screw should be taken forward until contact is made with the throttle lever in the closed position, then give a further complete turn and lock nut.

The carburation control rod should be adjusted to such a length that the yoke pin is a free floating fit in the carburetter lever (Y.4) when the thumb lever on instrument board is in the NORMAL position. This will ensure that when the lever is placed in the START position the actuating plunger in the carburetter is at the top of its stroke thereby ensuring that the main jet and air valve piston have been lowered the maximum amount for COLD STARTING.

The foregoing adjustment is important as it is essential that the range of movement of the main jet in either direction should be to the limits described in Para. 7. Page 6, otherwise difficult COLD STARTING will be experienced, or alternatively, excessive consumption will be registered in the NORMAL position.

CARBURETTER TUNING.

Reliable tuning is only possible when all other engine conditions are satisfactory, and the engine warmed up to the normal running temperature - 75° to 80°C.

Idling.

The hand throttle lever should be brought back to the idling position and with the carburation lever on NORMAL, the idle choke should be released until the engine speed commences to fade, and then screwed in the reverse direction until even running is restored, when the lock nut should be secured.

The throttle edge bleed plug should then be turned clockwise a half to one turn on the worm screw to move the throttle edge bleed towards the early side. The engine speed should then be increased gradually to check for flat spots in the smooth progression from idling to fast running, if satisfactory on the run up, the whole sequence of adjustment may be repeated and a similar test made. Should a flat spot occur, then the throttle edge plug should be taken back a little and the test repeated, but the sequence of adjustment should be at all times in the above order, i.e. set the idle choke at idling then move the throttle bleed to the early side, a maximum of one turn of the worm screw per trial. Test by a gradual increase of engine speed, then make a slight final adjustment of the idle choke at idling if signs of richness are evident. An adjustment of the throttle stop screw may also be necessary.

It should be observed that the above method of setting fixes the mixture strength at the idle choke first, and by advancing the throttle edge bleed afterwards, the tendency will be to create a slight richening of the mixture at idling which is desirable. It will be found that the optimum setting for the throttle edge bleed plug lies somewhere between one and a half turns forward to one and a half turns backward of the worm screw from the central position.

Main Jet.

If the carburetter has been assembled and the controls adjusted in accordance with the notes given under RE-ASSEMBLY & RE-FITTING TO ENGINE, it is not anticipated that any correction will be necessary at the main jet, provided that the correct needle is in use, as follows :-

The original needle was numbered XC-2 this was subsequently replaced by needle XB-8 in the interests of enhanced performance, this was finally superseded by needle XC-3 which is capable of similar performance but with improved economy. It will be found in general that the fitting of the XC-3 needle is an advantage in

the rectification of complaints of poor consumption, and with everything else in perfect order, a consumption in excess of 16 m.p.g. should be expected. To obtain these results, however, the following factors must be correct :-

(1) The metering orifice in the main jet bush (Y.5) should be free from any signs of wear caused by bad centering and contact with the needle. The true diameter should be .105"

(2) The main jet housing must be flush with the top of the ramp.

(3) The control must permit the main jet shoulder to contact the lower face of the housing bush when the thumb lever is at NORMAL.

(4) The jet needle must be right home (.9") in the piston guide.

(5) The air valve piston must be completely free throughout its range of travel.

(6) The fuel level in float chamber should be .875" from top face.

It is extremely unlikely that any complaint of the carburetter will be made if the above settings are correct. In the event of trouble, however, improvement on consumption may be obtained by lowering the needle in .005" stages from its normal position in the piston, a trial being made after each adjustment.

In the interests of standardisation such an adjustment is inadvisable and good carburation should be achieved by the correct initial setting.

Cold Starting.

Difficult cold starting may be due to any or all of the following reasons :-

(1) Control rod adjustment incorrect, causing failure of lever (Y.4) to make the full travel.

(2) Sticking air valve piston - failure to fall to lowest position on operation of control lever.

(3) Faulty starting technique.

The essential points to observe when starting the engine from cold are :-

(a) Throttle lever in the half-way position of the quadrant.

(b) Thumb lever at START.

(c) Ignition lever retarded, but advanced immediately the engine fires.

(d) Joggling of the accelerator pedal is quite unnecessary.

Continued: RR/P2.

NOTE: Some of the parts relevant to this type of carburetter are listed below to be of assistance when new parts are ordered.

PART NO:	TITLE:	NO: OFF.
E.60068	Main Casting.	
E.60069	Air Intake and Cylinder.	
E.60080	Air Valve Piston Guide Stem.	
E.60073	Air Valve Piston.	
E.60248	Air Valve Piston Guide Bush. (Cast Iron)	
E.59780	Hexagon Plug, Air Valve Piston Guide.	
E.59798	Jet Needle Securing Screw.	
XC-3	Jet Needle.	
E.59784	Main Jet Housing.	
E.59783	Main Jet Housing Bush.	
E.59782	Main Jet Housing, Securing Nut.	
E.59787	Main Jet Sleeve.	
E.59797	Main Jet Bush.	
E.59781	Main Jet Spring. (Phosphor Bronze)	
E.60074	Idle Jet.	
E.60075	Idle Choke Sleeve.	
E.60077	Throttle Butterfly.	
E.60071	Throttle Spindle.	
F.60081	Bush, Throttle Spindle.	
F.59302	Screws, Countersunk (Throttle).	
E.60437	Float Chamber Lid.	
E.59777	Vellumoid Joint, Float Chamber Lid.	
E.60575	Needle Seating Carrier, Petrol Inlet.	
E.60577	Float Needle Valve Bush.	
E.60578	Float Needle Valve.	
E.60579	Gauze Filter, Petrol Inlet.	
E.59776	Float Chamber Drain and Buffer Retaining Plug.	
E.60628	Float Buffer. (Cork)	
330/2986	Rotherham Winkley Pattern Lubricator No: 1. ($\frac{1}{4}$" x 26 T.P.I.)	
E.60272	Vellumoid Joint. (Cylinder Block Face)	
EB.885	Washers, Banjo Pipe Connections.	9
E.27487	Washers, Drain Plugs.	3
E.27488	Washer, Slow Running Drain Plug.	1
E.27491	Washer, Main Jet Drain Plug.	1
E.81656/7/8/9/60	Washers, Adjusting Float Pivots. (End Float (.020" - .025"))	2
E.60195/6/7/8	Washers, Adjusting Main Jet Housing Carrier.	1
E.60581/2/3/4/5	Washers, Adjusting, Petrol Level.	1
E.58561	Washer, Jet Actuating Lever Pivot Pin.	1

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/P1(α)

Supplement to RR/P1.

Mdx.1/SF.

Subject : SEMI-EXPANDING CARBURETTER
LARGE CHOKE TYPE
PHANTOM II FROM CHASSIS 101-TA ONWARDS.

Date of Issue 13th. January, 194

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

The large choke carburetter was a completely modified version of the previous type, designed to increase still further the breathing capacity. Except for a few small pieces the parts are NOT interchangeable with the earlier model.

The action of the carburetter remains the same, the essential differences of construction being dealt with in the following paragraphs, in conjunction with the illustration on Page 3.

Main Carburetter Casting.

This is considerably modified to give a cleaner run of fuel passages, particularly the main jet feed and to provide larger capacity at the air valve port.

Float Chamber.

Similar to the early type but with increased float clearance, the needle valve seating carrier (J.1) screws into the lid from the underside, adjustment for level being made by a range of aluminium washers (J.2).

Main Jet Control.

The control mechanism is similar in principle but with different components. A drilled passage affords communication between the upper housing of the control mechanism and the float chamber for venting purposes.

Main Jet.

Similar taper needle but of different dimensions, the sliding sleeve (K.1) is drilled right through to allow fuel passage, which necessitates a forked fulcrum lever (K.2).

Main Jet Guide.

The main jet carrier is a flanged, stainless steel sleeve (M.1) fitted upwards in the main casting and secured by a large brass nut (M.2) and aluminium washer at the top. This nut carries a standtube (M.3) which surrounds the taper needle to prevent loss of fuel at this point. Due to the simplification of the main jet assembly this standtube is now on the metered fuel side of the jet. This means that under high engine speed conditions, air would be drawn into the metered fuel at this point, with detrimental effect to the mixture. To prevent this occurring two slots are provided in the outside diameter of the stainless steel guide sleeve which are adequate to maintain a head of unmetered fuel in the standtube at all times.

The steel main jet carrier has a two diameter bore through the centre to provide a bearing for the main jet and its associated bronze coil spring. A transverse hole is drilled right through both walls of the steel carrier, one side of which receives a special dowelling setscrew (M.4) which,

Continued: RR/P1(a)

when in position, ensures that the hole in the opposite wall is in line with the fuel passage (P.1) leading from the main jet to the main discharge tube.

Main Discharge Tube.

Similar in action to the previous type, but all the components used in its construction are of different dimensions. (It can easily be distinguished from the earlier type by the fact that the main exit orifices (P.2) at the top are six in number, as against four.) Further identification is provided by the inclusion of four equally spaced holes (P.3) (.1378" diameter) drilled in the lower part of the main standtube just above the threaded portion. These holes provide the main passage for the fuel flow as the lower open end of the standtube is sealed by a cap nut (P.4) and aluminium washer, this nut also secures the assembly in position.

The compensating holes and idle feed holes in the main diffuser standtube are identical in number and diameter to the previous model.

Idling Jet.

Same arrangement and components as on previous model.

Throttle Edge Bleed.

Identical with the later version of previous model, i.e. worm and sector type.

Throttle.

Throttle disc of larger diameter; spindle of greater length.

Air Valve.

Completely changed, the air valve piston is solid with a large diaphragm (S.1) at the base to cover the circular air port in the carburetter body. The piston is lifted by virtue of the different pressures existing on either side of this diaphragm. The head of the piston acting solely as a pneumatic damper to prevent too rapid movement and/or flutter of the piston. The cylinder is open ended at the base and has a large spigot (S.2) to provide suitable location into the carburetter body. There are no atmospheric vents at this point. The piston guide arrangements are similar to the previous model and the top of the guide is covered by a knurled cap under which an atmospheric vent is drilled to permit free working.

Fixed Choke Tube.

Similar to early model, but a different piece number.

NOTE: There are no fuel filters either on or in this type of carburetter.

DISMANTLING.

In general the instructions covering the previous model should be carried out, with the following alterations.

Main Jet Guide.

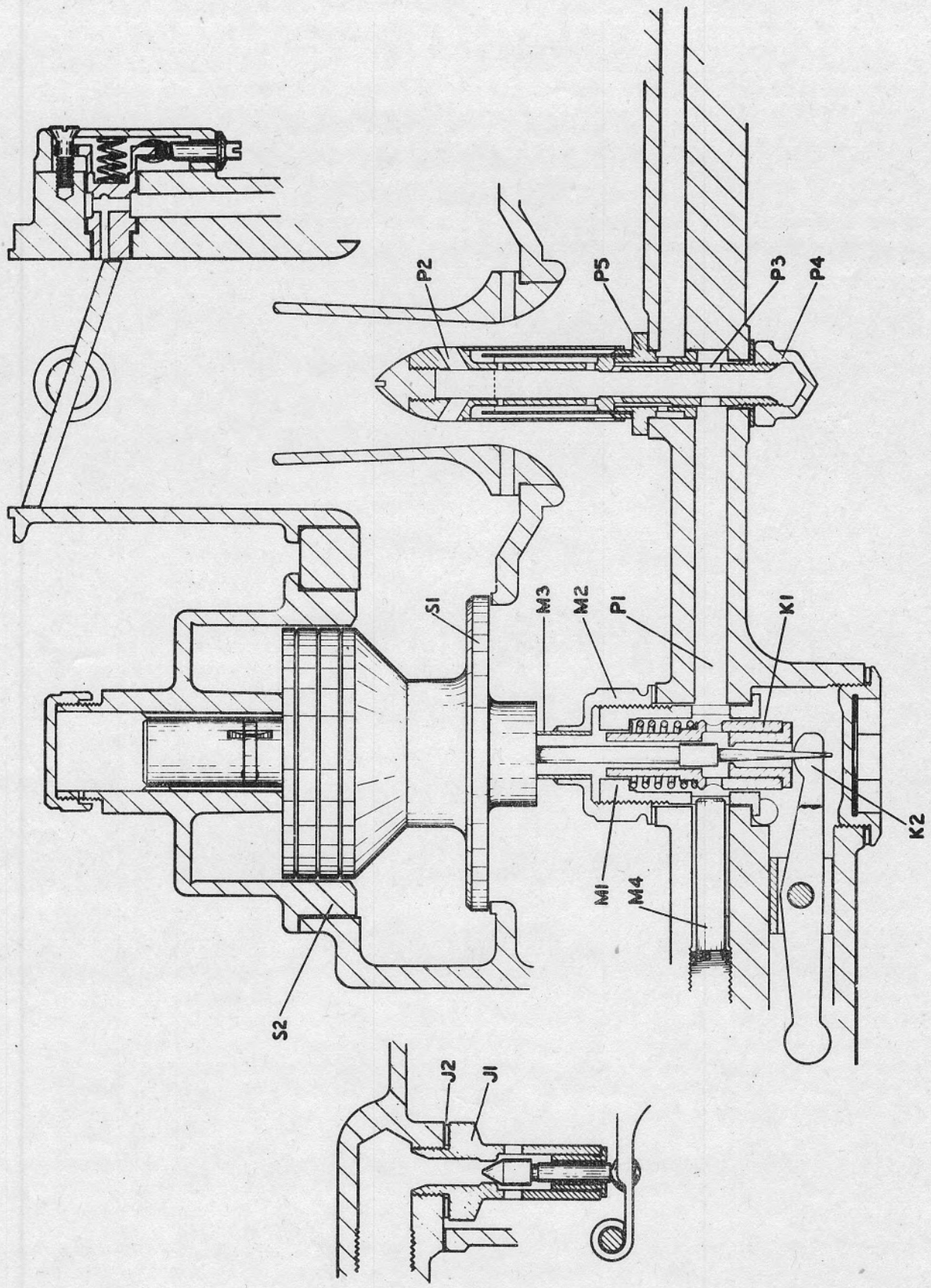
After dismantling the air valve, the main jet guide may be removed by unscrewing the large nut (M.2) with a long box spanner from the top. The setscrew (M.4) locating the steel guide sleeve should be removed, when the sleeve will press out from the top.

Main Diffuser Standtube.

On removing the cap nut the main diffuser standtube will tap out complete with outer baffle. Great care must be taken when spanner pressure is applied to cap nut to see that the threads are free, otherwise a breakage will occur across the four main fuel supply holes just above the thread.

Continued:

RR/P1(a)



SEMI-EXPANDING CARBURETTER
PHANTOM II 101-TA ONWARDS

DIAGRAMMATIC ILLUSTRATION

continued: RR/P1(a)

After removal of the main standtube in this manner the flanged bush (P.5) carrying the inner baffle tube will remain in position, in most cases. The extraction of this piece requires great care owing to its deep spigot and good fit. If sufficient care is not exercised in drifting it out damage will be caused in the receiving bore in the main carburetter casting.

RE-ASSEMBLY.

The erection of the carburetter may be carried out in accordance with the previous instructions. Two points, however, require special attention.

(1) The large drain plug (E.82871) with internal hexagon must be fitted with an aluminium washer of the correct type (E.83447), with a minimum thickness of .045". This is important, otherwise the lower end of the taper needle may foul and prevent the air valve piston seating properly on its diaphragm.

(2) The main jet control mechanism should be erected as follows, assuming that the parts have been completely dismantled.

Pinch Bolt	E.88687
Nut	E.79932
Lever	E.84148
Hexagon Guide Sleeve	E.82839
(Threaded Actuating Sleeve	E.83365)
& Spindle.	E.83364)
Threaded Plunger	E.83361

Fit the plunger to the actuating sleeve and screw right home with the fingers, then turn back one complete turn. Engage into the slotted bush in the carburetter with the small hole in the plunger facing the idle mixtrure control, making sure that the cross pin engages into the slot in that position. Then screw home the hexagon guide sleeve, at the same time pressing down the squared top of the actuating sleeve stem, making sure that the cross pin is floating freely in its guide. When the guide sleeve is screwed right home, turn the squared end of the actuating stem ANTI-CLOCKWISE until a stop is felt (only very light spanner pressure is needed) then turn back approximately 25 minutes, which should bring the groove in the top of the square at right angles to the centre line of the engine. If the groove is parallel to the engine at this point, the hexagon guide sleeve should be unscrewed and the actuating sleeve with the plunger extracted in one piece and the plunger slowly unscrewed and re-engaged on the next start, (the easiest way to accomplish this is to keep the two members pressed together at the point of disengagement, and rotate the plunger until a click is heard, which signifies the next start being suitable for engagement) then repeat the procedure laid out at the beginning of this paragraph from "screw right home, etc.".

In the event of the squared stem of the actuating sleeve being unmarked, the instruction in the preceding paragraph should be followed as far as "turn back approximately 25 minutes", this will give a satisfactory basic setting. After screwing home the guide sleeve, the lever and pinch bolt should be fitted and nipped after making the basic setting.

Owing to the dimensional changes on the main jet control mechanism no attempt should be made to screw the squared actuating sleeve CLOCKWISE for any distance, otherwise the cross pin will rise out of the slot.

Continued: RR/P1(a)

NOTE: Part numbers peculiar to this carburetter are listed below to be of assistance when new parts are ordered.

PART NO:	TITLE:
E.83947	Carburetter Body.
E.84160	Throttle Body.
E.83989	Throttle Spindle.
E.83990	Throttle Disc.
E.83988	Choke Tube.
E.83968	Diffuser Base (Bronze).
E.83973	Diffuser Standtube.
E.19193	Diffuser Standtube Nut.
E.83958	Air Valve Cylinder.
E.83957	Air Valve.
E.83975	Air Valve Guide.
E.85996	Main Jet Taper Needle.
E.83977	Main Jet Standtube.
E.83984	Main Jet Carrier.
E.83980	Main Jet Carrier Securing Nut.
E.83982	Main Jet.
E.83744	Main Jet Spring.
E.83365	Threaded Actuating Sleeve)
E.83364	and Spindle.)Main Jet Control.
E.83361	Threaded Plunger)
E.83978/9	Fulcrum Lever.
E.83956	Float Chamber Lid.
E.83719	Float Chamber Lid Centre Plug.
E.83987	Petrol Inlet Valve Seat.
E.75759	Washer, Main Jet Carrier.
E.81514	Washer, Main Jet Dowel Setscrew.
G.73346	Washer, Diffuser Standtube Nut.
E.83992/3/4/5/6	Washers, Adjusting Valve Seat.
E.83986	Washer, Vellumoid.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/P1.

Mdx.1/SF.

Subject :

SEMI-EXPANDING CARBURETTER
PHANTOM II.

Date of Issue 2nd December, 1946

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

Commencing with Chassis No. 102-MY, this carburetter superseded the original expanding type which had been a feature of all Rolls-Royce cars for the preceding 30 years.

The changes were mostly concerned with bringing the carburetter into line with modern practice and obtaining enhanced engine performance due to the following improvements:-

(a) Increased breathing capacity at full throttle.
(b) Improved mixture distribution at all speeds.
(c) Economical carburation for cruising obtained by small fixed choke suitable for that condition.
(d) More reliable idling obtained by the inclusion of "throttle edge" feed, which also permitted the deletion of the throttle governor.
(e) Cold starting made possible without operation of auxiliary "Starter Carburetter", which was, however, retained for use under extreme conditions of cold.

The information regarding this carburetter is divided into six sections:-

The supplement RR/P1(a), covering the improved version of this carburetter known as the Large Choke Type fitted from Chassis NO:101-TA and onwards, should be referred to before undertaking adjustments on that type.

DESCRIPTION:

The reference numbers refer to the diagram on page 4. In the interests of simplicity only parts on which reasonable doubt may exist are identified in this way.

The carburetter is of the updraught type, the petrol head being maintained in a single float chamber.

Float Chamber:

The float chamber houses a spherical hollow brass float which pivots in two special setscrews, suitably bored to provide the bearings. The float operates a needle valve (A.1) upwards against a seating formed in a carrier, the needle valve being retained in position by a brass bush (A.2) pressed into the carrier from the lower end. The whole assembly is screwed into the float chamber lid, from the top, against an aluminium washer (A.3), the chamber above being sealed by a large

plug and joint washer. A vellumoid joint washer is fitted between the float chamber lid and float chamber top face. The atmospheric vent (A.4) is a small drilling through top of float chamber wall which communicates with the intake entry of the carburetter. At the base of float chamber a banjo bolt (A.5) is fitted to provide a feed for the separate starter carburetter. A passage in the casting allows fuel to flow freely from the float chamber to the base of the main jet.

Main Jet.

The main jet aperture is formed between a taper needle (B.1)(carried by a depression operated piston air valve) and a sliding sleeve (B.2) loaded downwards by a bronze coil spring against one end of a fulcrum lever (B.3). The other end of this lever being located by a plunger (C.1) threaded at the top with a R.H. four-start thread and held against rotation by a transverse peg (C.2) working in an appropriate slot cut in the surrounding guide. The upper end of the plunger is engaged with an internal R.H. four-start thread cut in a rotatable sleeve (C.3) which passes out through the top of the carburetter body and carries a clamping lever (C.4) connected through the medium of ball-end control rods to the mixture lever on the steering column. A small L-shaped drilling (C.5) through the threaded portion of the plunger prevents a hydraulic lock occurring between the plunger and sleeve. Fuel passing through the main jet aperture flows through drillings in the carburetter body casting to a well at the base of the main discharge tube. Due to the downward sweep of fuel passage into this well, a small horizontal drilling (D.2) prevents an air lock forming at this point.

The main jet sliding sleeve is located in a carrier (B.4), flanged and threaded at the lower end and secured in the main carburetter body by a large brass nut, an aluminium washer making a joint between the flange and the upper face of the main casting. A standtube sweated into the upper bore of the jet carrier has a reduced internal diameter at the base to provide a guide for a parallel bearing land (B.5) on the taper needle; the height of the standtube prevents loss of fuel through the clearance at this point.

Main Discharge Tube.

This assembly is of convential diffuser pattern consisting of a main standtube (D.3) with surrounding tubular baffles; the main standtube is flanged and threaded at the base and is secured in a vertical position by a nut and aluminium joint washer against suitable faces machined in the main carburetter body. The top of the standtube is sealed by a threaded plug (D.4) with a streamline head, screwed and sweated in position. Four radial holes each drilled at an angle into the flange at the top of standtube below this plug, communicate with central passage and provide the necessary exit orifices for the fuel emulsion. The top flange of standtube is turned to a smaller diameter just below the fuel exit holes to provide a bearing for an outer brass tube which is sweated into position at this point. This outer sleeve is drilled near the base with four equally spaced holes(D.5) for the admission of air.

Trapped between the lower flange of standtube and carburetter body is a small bronze flanged distance piece (D.6) which provides a support for an inner baffle tube which is sweated in position; a larger diameter provides a guide for the outer sleeve carried by a main standtube. The internal diameter of this distance piece is sufficiently large to pass fuel from the main standtube through inclined holes (D.7) drilled in the standtube

Continued: RR/P1.

below the lower flange, via flutes machined on the outer diameter of the main standtube to the passage (E.1) in the main casting leading to the idling jet.

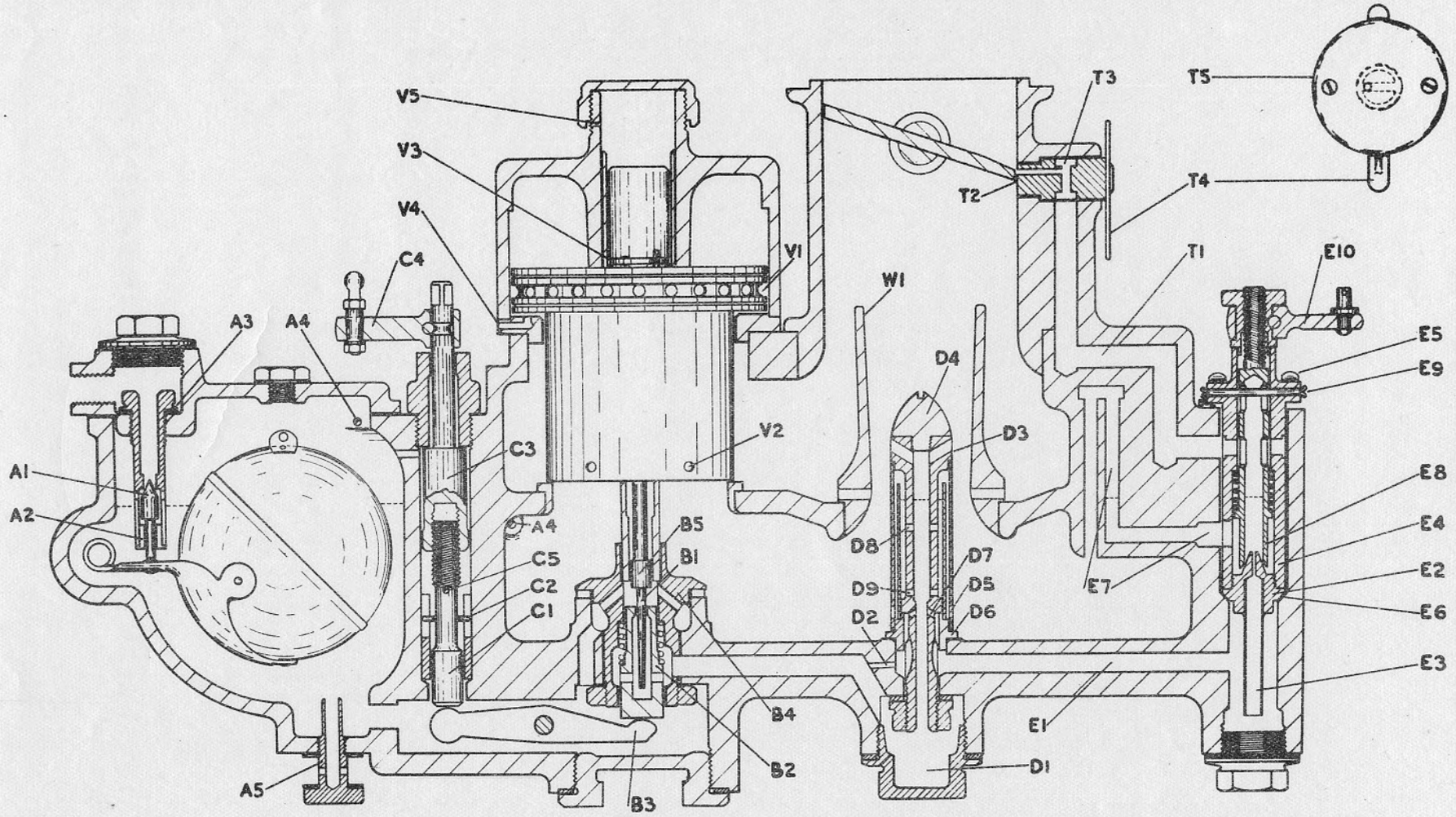
Idling Jet.

The idle jet comprises a flanged brass plug (E.2), drilled .031" for fuel metering and carries a brass diptube (E.3) sweated into a counterbore of larger diameter below the jet orifice. The lower face of the jet plug flange is chamfered to provide a seal on assembly into main carburetter body. The jet plug is screwed upwards into a hollow cylindrical carrier (E.4) secured into a vertical bore in the main casting by a forked spring plate (E.5), the pressure of which urges the whole unit downwards on to an angle seating (E.6). The flange which provides the spring plate bearing is grooved on the outer diameter for location by a dowel screwed into main casting. A hole at the lower end of carrier lines up with a passage (E.7) in the main casting for the access of atmosphere (it will be noticed that this passage is in inverted U-tube form to prevent loss of fuel, due to the air inlet being below petrol level), and at a higher position on the outer diameter of the carrier an annular groove is suitably drilled for the passage of mixture. The central bore through the jet carrier provides a bearing and guide for an inner sliding sleeve (E.8) counterbored at the lower end to receive a small brass venturi, this inner sleeve has transverse slots at two levels, the lower slot providing a passage for the mixture, whilst the upper slot receives a pin (E.9) secured in the main carrier to prevent rotation. The upper end of this inner sleeve is solid and threaded with a L.H. four-start thread engaged with a suitable nut to which is clamped a lever (E.10), the lever being ganged to the main jet control. A coil spring is inserted between a suitable face formed in the inner bore of carrier and flange on the outer diameter of the inner sliding sleeve to maintain loading between the lower face of control nut and the top face of the carrier. The mixture is fed through suitably drilled passages (T.1) in the main casting to the throttle edge.

Throttle Edge Bleed.

This unit consists of a cylindrical plug (T.2) of two external diameters housed in suitable borings in the throttle riser body. The smaller diameter of the plug is inserted inwards towards the throttle where the inner face of the larger diameter provides a locating stop against the corresponding counterbore in the housing. The plug has an annular groove (T.3) around the waist of larger diameter for the reception of mixture from the passages in the casting communicating with the idle jet mixture chamber. A hole drilled through the reduced diameter of the plug at this point meets with a drilling from the inner end face, this hole being off-set from the centre but lying parallel to the central axial line of the plug. A spring blade (T.4) is riveted to the outer end of the plug and by bearing against the rim of a circular platform (T.5) attached to the main body, provides the necessary load to maintain the plug in position. The lower arm of this spring blade is dimpled to engage with one of 25 notches cut in the lower edge of the backing plate rim.

On later versions of this carburetter the throttle edge bleed plug is loaded by a coil spring. Rotational adjustment being obtained through the medium of a worm and sector.



SEMI EXPANDING CARBURETTER
PHANTOM II 102-MY TO 101-TA

DIAGRAMMATIC ILLUSTRATION

Continued: RR/P1.

Throttle.

The butterfly throttle consists of a duralumin disc secured in a steel spindle by two countersunk headed screws. The spindle is carried in two phosphor bronze bushes. A groove is cut in the rear end face of the spindle to provide an external indication of the throttle position after assembly. The chamfered edge of the throttle disc is provided with a small flat to clear the throttle edge bleed plug.

On earlier versions of this carburetter the throttle spindle is supported in caged roller bearings.

Air Valve.

The air valve piston is fabricated from a hollow cylindrical brass casting with an inner wall of thin brass pressing secured by riveting to the lower end of the piston body and by a spun rim at the piston head, sealing being finally made by sweating. The head of the piston is grooved round the periphery, and between the upper and lower lands thus formed, a series of holes are drilled (V1.), which communicate - through the cavity formed between the inner and outer walls - with four equally spaced holes (V.2), drilled through the outer wall near the base of piston body. A steel guide shaft is riveted in a vertical position through the centre of the piston assembly. This guide stem is drilled upwards through part of its length to provide a housing for the taper needle which controls the main jet aperture. This needle is anchored by a parallel cross pin, which allows the needle to swivel and float thereon giving a universal action. The cross pin is retained in position by a thin sheet steel circlip (V.3) located in a groove machined in the outer diameter of the guide stem. The air valve operates in a cylinder secured to the main carburetter body by two 1-BA nuts and spring washers, these nuts are 2-BA size on hexagon. An aluminium adaptor ring spigotted top and bottom forms an accurate location between the cylinder and carburetter body. Three equally spaced L-shaped holes (V.4) provide the necessary communication between the interior of the cylinder and atmosphere. An integral projection is formed in the centre of the cylinder casting which is bored to receive a flanged cast iron guide to provide a bearing for the air valve piston guide stem. The top of this passage is sealed by a screwed cap below which is drilled a small hole (V.5) for atmospheric venting.

Fixed Choke Tube.

A small aluminium choke tube (W.1) surrounds the main discharge tube. This venturi is swaged into position in the main carburetter body, drain holes being drilled near the base of the choke tube to prevent petrol building up in the well formed at this point.

NOTE: There are no fuel filters fitted either on or in this type of carburette

ACTION.

For simplicity, the action of the carburetter is dealt with in three separate stages, viz: Idling, Cruising and Fast Running. It will be appreciated, however, that in practice, each succeeding stage must overlap to provide smooth, balanced mixture strength throughout the range of engine running conditions and it should also be clearly understood that the breathing demands of the engine

Continued: RR/P1.

upon the carburetter will be a function of both engine speed and throttle opening. In other words the intake conditions existing at full throttle with engine speed held down by load are entirely different from full throttle, high engine speed running. In the following text increased throttle opening implies increased engine speed.

Idling.

The idling fuel feed is obtained from the three holes (D.7) (.0625" diameter) drilled below the small flange in the main diffuser standtube, passing downwards through the flutes via horizontal passage in the body casting to the IDLE JET. This jet is of fixed aperture (.031"), the mixture strength being varied by altering the position of a small choke in relation to the nozzle of the jet, greater clearance at this point allows more air to pass into the idling mixture stream and vice versa. This choke is provided with an external adjusting nut at the top and by means of a lever (E.10) clamped to this nut the control is carried to a carburation lever on the steering wheel control quadrant marked NORMAL and RICH. The initial running setting is carried out with this lever in the NORMAL position. The RICH position of the lever being used for cold starting and for a brief period during warming up.

Further control of the idling mixture is obtained by varying the location of the mixture exit orifice relative to the throttle edge, but although a change in mixture strength will inevitably result from adjustments at this point, the correct use of this variation is to provide a smooth changeover during the progression of throttle opening from idling conditions, through slow running, to the higher engine speeds, as follows. Movement of the orifice downwards from the lower throttle edge will require a larger throttle opening and higher engine speed to be attained before the influence of this jet diminishes, in other words, the main jet will be spraying before the idle jet mixture has commenced to fade, and conversely movement of the orifice upwards will cause a weak flat spot due to the idle jet mixture fading before the main jet is properly in action. These variations constitute the legitimate use of this adjustment, the object being to provide the earliest but smoothest changeover position. The change in idling mixture strength caused by varying the position of the throttle edge bleed orifice can be appreciated in one brief example - if, to prolong the changeover period an adjustment of the orifice has been made downwards, the demand on the idling mixture will be maintained as the throttle is progressively opened, but at the same time this greater throttle opening will result in an increased air-flow into the engine, thereby creating a weakness of the mixture and necessitating a richening adjustment at the idle jet choke.

It will be noted that the idle jet (E.2) is below the petrol level, i.e. submerged, the object being to provide a well of petrol for starting. As soon as the engine is running this head of fuel disappears, the supply being metered by the idle jet.

From Chassis 160-PY the lever on the steering column quadrant was used for the Riding Control. The carburation lever being operated by a lever on the instrument board, the RUNNING position of which was equivalent to NORMAL, the other two positions of the lever giving RICH.

Cruising.

Under cruising conditions the mixture supply is provided by the main diffuser tube, fed from the main jet. The strength of mixture being determined by the main jet aperture in relation to the fixed choke surrounding the main diffuser. In common with all choke assemblies the fuel/air ratio will be correct for one engine condition only, the tendency being for the mixture

Continued: RR/P1.

to strengthen as the demand increases. This necessitates some form of compensation, which in this case is provided in the diffuser itself, in the following manner.

It will be seen that the inner tubular baffle is open at the top and subject to atmospheric pressure through the holes (D.5) drilled at the base of the outer baffle tube, and as progressive opening of the throttle transfers the demand from the idling assembly to the main diffuser, the head of petrol standing in the well between the main diffuser standtube and the inner tubular baffle will be depleted gradually due to the increasing depression applied to the exit orifices of the main standtube. As this well of petrol diminishes, the top ring of holes (D.8) will be uncovered, admitting air at atmospheric pressure and thereby reducing the value of depression applied to the main jet aperture. Further depletion of this well will result in a similar air bleed occurring through the lower ring of holes (D.9), to be followed still later by the exhaustion of the idling jet well through the small inclined holes (D.7) which were used in the first place to feed fuel to the idle jet under idling conditions. (In acting as a compensating air bleed to the main diffuser the fuel head in the idle jet assembly will be almost completely drained, and to allow for the immediate resumption of supply after deceleration a diptube (E.3) is fitted below the idle jet.)

Fast Running.

With continued increase of throttle opening and engine speed, the breathing demands of the engine cannot be met by the fixed choke assembly, and at this time the depression applied to the top chamber of the carburetter is sufficient to exhaust partially the cylinder cavity existing above the air valve piston head, via holes (V.2) at the bottom of the piston body which are in communication with the ring of holes around the piston head. Atmospheric pressure applied to the three L-shaped holes in adapter ring will then cause the piston to rise, this movement uncovering the large circular port below the air valve piston body and admitting a supply of air. This extra air supply must be suitably compensated by an increased fuel supply from the main diffuser. This is effected by the taper needle attached to air valve piston being lifted simultaneously, thus increasing the aperture of the main jet.

The main jet aperture can be manually increased by lowering the jet sleeve in relation to the taper needle. This is effected through a fulcrum lever operated by the external lever (C.4) clamped to main jet control. This lever is ganged to the idling choke control lever (E10.) and is connected to the carburation lever on the steering column quadrant for use during the warming up of the engine only.

DISMANTLING.

The following instructions describe the dismantling of the carburetter in detail for the purpose of overhaul and cleaning subsequent to storage. It is not suggested that this work will be found necessary in every case, each individual carburetter will have to be treated on its merits. The dismantling will be found to be straightforward if the following procedure is adopted.

continued: RR/P1.

After the removal of the unit from the engine, the carburetter can best be held by attachment to a stiff flat plate, $3\frac{1}{2}$" x 12" approximately, drilled at one end to fit the three 1/4 B.S.F. studs on the carburetter face that takes the air intake elbow, the other end of the plate being secured in the vice. Following this, dismantling should be proceeded with in the sequence below:-

IT IS ESSENTIAL, TO AVOID DAMAGE, THAT GOOD FITTING BOX OR RING SPANNERS SHOULD BE USED ON ALL CARBURETTER NUTS AND PLUGS.

(1) Remove the petrol drain pipe to avoid damage.

(2) The throttle body should next be removed - four 1/4 B.S.F. nuts and spring washers - under one of these will be found the bracket carrying the throttle return spring, the spring may now be unhooked at the other end, if necessary.

(3) Remove the large plug at the top of the float chamber lid, this will expose the hexagon head of the needle valve seating carrier which should be unscrewed, care being taken of the aluminium adjusting washer beneath the head. Removal of the float chamber lid should now be effected, this is secured by two 2-BA setscrews with spring washers; also a 2-BA stud fitted with a special nut, spherical on the lower face which fits into a concave plain washer to secure the forked spring, clamping the idling choke assembly into position. The spring should be removed, also the small tubular distance piece beneath it.

With the float suitably supported, the two pivot screws should be removed from either side of float chamber and the float extracted.

(4) To facilitate re-assembly, a vertical mark should be 'scribed' on the outside of the air valve cylinder, adaptor ring and carburetter casting, then remove the knurled/slotted cap at the top and after releasing the two 1-BA nuts and spring washer, the cylinder can be lifted upwards. Care should be taken here in case the spigotted adaptor ring and/or the piston comes away with the cylinder, in which case suitable support should be given to prevent the piston falling out as the cylinder is lifted clear from the carburetter.

(5) The ganging link between the two mixture control levers should now be disconnected and the main jet control withdrawn by unscrewing the large hexagon below the control lever, following this the idling mixture control assembly may be lifted bodily out.

(6) The base of the passage carrying the main jet control meets with a shorter tunnel set at right angles. The hexagon headed plug and aluminium washer at the end of this passage should be removed (this plug should be carefully noted to avoid confusion on assembly with a similar plug of greater length, to be removed later). The large plug with internal hexagon at the base of the carburetter should be unscrewed. At right angles to this plug and on a slightly higher plane will be found the hexagon head of the fulcrum pin, which should be unscrewed. The fulcrum lever may then be pushed out of the tunnel from the jet end, care being taken of the main jet sleeve which if free, will be urged out by the action of the loading spring. The slotted bush carrying the fulcrum lever may be withdrawn.

Continued: RR/P1.

(7) The removal of the large nut from the underside of main jet carrier will enable the carrier to be withdrawn, care being taken of the large aluminium joint washer located between the flange and upper carburetter face. (This nut may require soaking before unscrewing, if corroded, as the jet carrier is dowelled for location and excessive pressure in handling the nut may do serious damage.)

(8) The plug below the main diffuser standtube should be removed to give access to the nut securing the diffuser assembly in the carburetter. (The greatest care should be taken here in the event of corrosion between the threads, if not dealt with by easing fluid the standtube will shear at the inclined holes below the inner flange.) After removal of the nut and washer the diffuser assembly can be withdrawn.

(9) The drain at the base of the idle jet well can be removed. This plug must be noted to avoid transposition with the plug at the end of the fulcrum lever passage.

(10) The throttle edge bleed plug should be removed by unscrewing the two 5-BA screws holding the circular platform, taking care of the small tubular distance pieces behind the platform. After removal of the platform the plug will withdraw.

On later types the cover housing the worm and sector should be removed - three countersunk screws - care being taken of the coil spring between the cover and the plug.

CLEANING AND ATTENTION:

The cleaning of all internal passages should now be possible, although in the event of severe gumming and corrosion it may be necessary to proceed with further dismantling as follows:-

(a) The idling mixture control assembly, the removal of which was treated in Para. No. 5 - Sheet No. 8, should be further dismantled by unscrewing the idle jet from the carrier, a good fitting 2-BA box or ring spanner is essential. If the jet is immovable after reasonable pressure, it may be eased by tapping the carrier lightly with a hide hammer on the outside surrounding the thread.

The metering orifice .031" in the jet should be cleared. In all handling of this jet, great care must be taken to avoid damage to the chamfered seating.

The sliding choke tube should be worked in cleaning fluid until perfectly free - in bad cases it should be removed by the extraction of the cross pin (E.9) at the top - this pin is parallel and may be extracted by closing the split at either end - after removal of the choke tube the spring can be examined and cleaned. At the same time the spigot end bearing of the control nut should be cleaned to ensure easy rotation after assembly.

(b) On withdrawing the main diffuser standtube (Para. No. 8 - Sheet No. 9) it will be found that this member is in two parts, one part comprising the inner main standtube to which is sweated at the top, the outer baffle tube. If this member is inverted, the three .062" inclined holes feeding the idle jet can be examined. If these are free from gumming, etc., it may be assumed that the higher compensating holes are clear also, but in the event of gumming in the holes that are visible, the outer baffle tube should be unsweated, and the two rings of compensating holes cleared.

Continued: RR/P1.

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Continued: RR/P1.

(b) upper four holes .039" diameter, lower four holes .055" diameter. The outer baffle should be re-sweated into position, noting that a complete seal is made and that the ring of holes are at the base of the tube. It is necessary also to ensure that this outer tube is perfectly concentric throughout its length with the stem of the main standtube, otherwise difficulty will be experienced in fitting the flanged distance piece carrying the inner baffle tube. It should be possible to fit this freely into position against the stop provided by the small flange on the main standtube.

(c) The taper needle in the air valve piston should be removed by carefully opening the circlip (V.3) to allow the cross pin to be removed. After suitable cleaning this can be re-fitted making sure that the needle is quite free to swivel on the pin, care being taken that the circlip falls back completely into the groove on replacement.

(d) The threaded plunger can be unscrewed from its operating sleeve in the main jet mixture control assembly, which was removed from the carburetter body as per Para. No. 5 - Sheet No. 8. The pinch bolt securing the mixture control lever should be removed and the lever will then slide off the control spindle to be followed by the hexagon headed guide sleeve which should be properly cleaned together with the spindle to ensure free rotation.

(e) The throttle disc should be removed - two 5-BA countersunk screws - the spindle is parallel and may be withdrawn complete with levers. The bushes should be cleaned out and the spindle lightly polished on the bearing surfaces.

On the earliest type of this carburetter, the throttle spindle is "stepped"- reduced in diameter at either end - to receive the roller bearings and after removal of the throttle disc, the bearing cover plate at either end should be freed - countersunk screws - to enable the shaft to be withdrawn from the lever end.

(f) On the top of the carburetter body casting adjacent to the bore that receives the air valve cylinder, will be found a disc (not shown on diagram) secured in the centre by a 5-BA countersunk screw. This disc seals off the two vertical drillings which form the legs of the inverted U - tube mentioned on Sheet No. 2 under Idling Jet, as this is an air passage no attention should be required. In the event of inspection of these passages being considered desirable, it will be found on removal of the 5-BA countersunk screw that the disc is, in fact, a special type of pedestal washer and due to paint in conjunction with its original close fit, extraction can only be made by tapping one or two threads with a 4-BA plug tap for the insertion of a 4-BA bolt, to enable some slight leverage to be obtained. (It is essential that a plug tap be used to avoid any possibility of cutting into the 5-BA thread in the casting below.)

RE-ASSEMBLY.

Re-assembly of the carburetter should be followed in reverse order to the dismantling sequence, no difficulty will then arise, although the following points should be carefully noted during erection.

(1) The throttle spindle and disc should be re-assembled. The disc must be erected so that the flat on the chamfered edge is adjacent to the throttle edge bleed hole, and the disc should be centralised by the fingers before tightening the two 5-BA countersunk screws, (in the event of the pedestal washer - Para.(f) Sheet No. 10 - being removed, care should be taken to

avoid the substitution of the 5-BA screw with a throttle spindle screw. The throttle spindle screws are slightly longer and of higher duty material.) After assembly the throttle should be perfectly free when operated by the lever.

(2) On re-assembling the diffuser standtube, a thin aluminium washer (E.27487) should be fitted between the flange and the carburetter body and another aluminium washer (G.73346) between the nut and the lower carburetter face.

On the original versions of this carburetter washer (E.27487) was not fitted, but to ensure a petrol tight joint, its inclusion is desirable.

On some of the later carburetters, the top (E.27487) was fitted and the lower washer (G.73346) was deleted. On re-erection, it is advisable to include this washer on all carburetters although care must be taken to see that it is the correct piece number, as a washer of greater width would obstruct the fuel passage.

IMPORTANT DIMENSIONS.

E.27487	.025" thick (maximum)
G.73346	.700" outside diameter (maximum)

(3) The main jet carrier should be replaced with aluminium joint washer (E.30109) between the flange and the top face in the casting, care being taken to avoid trapping the washer in the spigot and also to see that the slot in the lower flange is correctly located on the dowel. (Not shown on diagram.)

The main jet should be replaced after this operation and with the bronze coil spring (E.82853) in position it should be possible to move the jet quite smoothly in the carrier. The slotted bush carrying the fulcrum lever should be inserted with the slot facing downwards, (this is important - if the bush is inverted the lever cannot obtain the full range of travel.) The bush should be lined up by the insertion of the fulcrum setscrew which should be temporarily withdrawn to allow the lever to be fitted. The circular end of the lever should be positioned under the control assembly, that is, the half-round end of the lever must be under the main jet.

(4) The air valve piston should be inserted in the cylinder with a little Light oil rubbed into the guide stem and the adapter ring re-fitted to the cylinder, noting that the spigot fits snugly into the lower bore, and that the corresponding holes in both pieces are in line to receive the studs, and with the 'scribe' marks in their proper relative positions, the whole assembly can be secured in the main carburetter body casting, taking care that the taper needle slides freely into the guide tube in the main jet carrier.

(5) The idling mixture assembly should be built with the steel coil spring (E.82869) in position between the sliding choke tube and the carrier. On pressing the choke upwards against the spring the cross pin can be inserted and the movement of the choke tested for perfect freedom when pulled up against the spring by hand, if satisfactory, the split end of the cross pin may be opened out.

Continued: RR/P1.

The four-start threaded nut must be re-engaged on such a start that when the nut is screwed down flush with the top of the threaded stem the small groove cut in both pieces forms one direct line. After which the assembly can be replaced in the main casting, noting that it presses firmly on to the chamfered se ting and that the semi-circular recess in the top flange locates on the dowel screw.

(6) The main jet control having been dismantled and cleaned as per Para. (d) Sheet No.10, the six pieces constituting this assembly should be:-

Pinch Bolt	E.83687
Nut.	E.79932
Lever.	E.82908
Hexagon Guide Sleeve.	E.82839
(Threaded Actuating Sleeve	E.83407 &)
& Spindle.	E.82913)
Threaded Plunger.	E.83407

The assembly should commence by fitting the plunger into the four-start thread of the actuating sleeve. The correct start is the one which, when the plunger is screwed right home with the fingers, places the small cross pin in the plunger at right angles to the groove cut across the square top of the actuating sleeve spindle. It may be found that none of the four starts allow an exact 90° position to be obtained, but the nearest to a right angle should be selected. After engaging the correct start and with the plunger screwed right home the two members should be held together in this position whilst the plunger is inserted into the carburetter housing with the small leak hole in the plunger facing towards the idle mixture control. (Great care must be taken here to see that the cross pin on the plunger correctly enters the slot in the internal bush.)

The guide sleeve may now be threaded on and with light finger pressure on top of the actuating stem the sleeve should be screwed down with the fingers until it commences to take the actuating sleeve with it. At this point the operating lever should be replaced and the pinch bolt inserted noting that the head of the bolt locates against the shoulder machined on one side of the lever. At this stage the ganging link should be connected to the idling control lever. The tightening of the guide sleeve should then be continued with the fingers until the hexagon head meets the top carburetter face - there is no washer between these faces - a final nip being given by spanner.

(7) On re-fitting the float a check should be made for end float at the pivots, this should be .004" to .008". Adjustment being made by varying the thickness of the aluminium washers under the heads of the pivot setscrews, the five alternative washers being E.81512/3/4/5/6. When this operation is successfully completed and the float checked against possibility of fouling walls, the float chamber lid can be replaced with vellumoid joint (E.82844) in position. Care should be taken to fit the distance piece under the forked blade also the special washer on top of the spring with the concave seating uppermost to receive the spherical face of the special 2-BA nut (E.70269).

(8) On re-assembling the throttle edge bleed plug see that the notches on the circular platform are on the lower face and that the long spring blade points downwards, the adjustment should be left in the centre of its range, viz:-

Continued: RR/P1.

Early Type - With long spring blade pointing vertically downwards.

Late Type - Lightly turn the worm screw clockwise until a stop is felt, then turn back six complete turns.

(9) When the rebuild of the carburetter is completed, the fuel level should be checked. A convenient method of doing this is by attaching a short length of pipe to the banjo connector (A.5) under the float chamber. This pipe should be bent around the outside of the float chamber with a small vertical extension of glass tube.

The head of petrol necessary for checking is 18 ins. and the measurement is taken from the top face of the float chamber. The correct level being 1.050" to 1.075"

Adjustment is carried out by varying the thickness of the aluminium washer under the hexagon head of the needle seating carrier, the range of washers being E.31373 - E.31374 - E.31375 - E.31376.

General Assembly Notes.

No jointing compound should be used in the assembly of the carburetter.

Except for the vellumoid joint below the float chamber lid, there are no paper joints or gaskets.

Provided that the joints and faces are good - the various screw plugs should make a petrol tight joint without excessive pressure - the flanges in most cases are of thin section and liable to fracture if undue force is exerted upon them.

REFITTING TO ENGINE.

After completing the assembly, the carburetter should be re-fitted to the engine:-

No joint or jointing is fitted between the carburetter flange and the induction manifold hot-spot, care should be taken to see that the spigot makes correct engagement.

After connecting the throttle controls it should be observed that sufficient clearance exists to allow the butterfly to seat when the hand throttle lever is at the bottom of the quadrant.

On the early version of this carburetter (with roller bearings) the setting of the control is more involved due to the throttle governor, but again the main requirements will be that the throttle is fully closed when the hand lever is at the base of the quadrant. A good rule in both cases is to adjust the controls so that when moving the hand lever from the quadrant base, the throttle does not commence to open until the third notch.

There are no throttle stops fitted to this carburetter and a check should be made, by watching the slot at the rear end of throttle spindle to see that accelerator pedal does open the throttle fully.

The mixture control should be connected up and the original adjustment restored in the following manner.

Continued: RR/P1.

Idling Control:

With the mixture lever on NORMAL or RUNNING (according to type) the pinch bolt on idling control should be freed and the knurled nut turned until the head is flush, at this time the small grooves should coincide, when it will be noted that they are at right angles to the centre line of the engine.

Main Jet Control:

With the mixture lever on NORMAL or RUNNING, the pinch bolt on the main jet control should be slackened and the squared end of the stem turned clockwise until further turning is impossible (a spanner may be used, but very little pressure is required), then turn back (anti-clockwise) half a turn or slightly more until the groove across the top is at exact right angles to the engine centre line.

On both the above instructions it is assumed that the four-start thread was correctly engaged in accordance with the instructions given on Sheet No. 11 Paras. 5 & 6, otherwise the correct setting cannot be attained, particularly in the case of the main jet control.

If owing to the fitting of new parts, or the non-existence of marking, the above procedure is not possible, a preliminary basic setting can be obtained on both controls, as follows:-

Idling Control:

Turn knurled nut clockwise until the lower face of nut commences to leave the top face of the carrier against which it normally rests (this point is where the sliding choke tube contacts the nozzle of the idle jet (maximum rich) then turn back 30/40 minutes, and secure pinch bolt.

Main Jet Control:

Turn squared stem clockwise until the actuating sleeve bottoms on plunger thread, then turn back 30 minutes.

Throttle Edge Bleed:

As previously mentioned this should be set in the middle of its adjustment range.

CARBURETTER TUNING:

Reliable tuning is only possible when all the other engine conditions are satisfactory - ignition system, compressions and valve gear must be in first-class order before tuning can be attempted.

After re-fitting the carburetter to the engine and adjusting the controls to the previous instructions, the Air Silencer should be fitted and the engine started and warmed up to the normal running temperature - 75° to 80° Centigrade.

The hand throttle lever should be brought back to the idling position and with the carburation lever on NORMAL or RUNNING (according to type) the pinch bolt securing the Idle Control Lever should be slackened and the knurled nut turned anti-clockwise antil the engine speed diminishes or hesitation occurs. The nut should then be turned back until even running is restored and the pinch bolt lightly tightened.

Continued: RR/P1.

The throttle edge bleed plug, which was previously set in the centre of its range, should now be moved towards the early side by moving the spring blade (early type) a notch or two towards the front of the car, or by turning the adjusting screw (late type) a half to one turn clockwise, the engine speed should then be inreased gradually to check for flat spots in the smooth progression from idling to fast running, if satisfactory on the run-up, the whole sequence of adjustment should be repeated and a similar test made. Should a flat spot occur, then the throttle edge plug should be taken back a little and the test repeated, but the sequence of adjustment should be at all times in the above order, i.e. set the Idle Control knurled nut at idling, then move the throttle bleed to the early side, a maximum of two notches per trial, test by running up the engine then make a slight final adjustment of the Idle Control knurled nut at idling if signs of richness are evident. It should be observed that the above method of setting fixes the mixture strength at the idle jet choke first, and by advancing the throttle edge bleed afterwards the tendency will be to create a slight richening of the mixture at idling which is desirable. It will be found that the optimum setting for the throttle edge bleed plug lies somewhere between two notches rearward to three notches forward of central position (early type) or its equivalent on the screwed type. When the idling and changeover conditions are satisfactory the pinch bolt on idling control lever should be properly tightened.

For the setting of the main jet the pinch bolt on control lever should be slackened and the throttle lever moved up the quadrant (engine running) until the piston valve commences to lift (this can be observed by removing the knurled cap over piston guide). The throttle lever should then be brought back until the piston has just returned to its seat, when the squared end of the actuating sleeve stem on control should be turned anti-clockwise (weakening) until engine speed hesitates or diminishes. The squared end should then be turned clockwise until even running is restored, then the engine should be slowed down whilst the pinch bolt is secured.

Further tests should be given on the road, where faulty running up to 10m.p.h. top gear can be attributed to idle control and/or throttle edge plug adjustment. Incorrect adjustment at either of these points will be responsible also for fault acceleration up to 15m.p.h. top gear.

From 15m.p.h. (top gear) to 35m.p.h. carburation will be influenced by adjustment of the main jet, whilst speeds over this figure are the joint responsibility of the main jet and/or the air valve position.

Notes on Tuning.

The various stages of mixture supply in this carburetter are so broad in their action that it is fairly easy to obtain smooth engine running with incorrect adjustments (usually on the rich side), but it will be seen that these conditions can only result in a high petrol consumption. Correct tuning should give reliable idling, smooth changeover, adequate power conditions with the minimum petrol consumption and with an engine in good condition an average overall consumtion of 10 m.p.g. should be aimed at, with care this figure may be improved upon.

Mention has been made previously of early types of this carburetter with roller bearing throttles. These were fitted exclusively to special chassis prior to 102-MY, and in these cases the throttle governor was retained. When tuning these particular carburetters a much more critical ear is necessary as the governor will be making constant automatic changes in the throttle position with each carburetter adjustment. Excepting for this the previous instructions on tuning remain true.

Continued: RR/P1.

Note: Some of the parts relevant to this type of carburetter are listed below to be of assistance when new parts are ordered.

PART NO:	TITLE:	No. Off:
E.83047	Main Casting	
E.82871	Main Jet Drain Plug	
E.83720	Diffuser Drain Plug	
E.83720	Needle Valve Cover Plug	
E.55803	Fulcrum Lever Plug	
E.83375	Plug bottom of Slow Running Jet	
E.81339	Inlet Union Float Chamber	
E.82874)	(Valve Seating Petrol Inlet	
E.82846)	(Petrol Inlet Valve Guide	
E.82847)	(Petrol Inlet Valve	
E.82849)	(Copper Stud	
E.82872)	(Bracket on Lower Half of Float	
E.83421)	(Lower Half of Float	
E.83413)	(Upper Half of Float	
E.83065	Diffuser Base (Bronze)	
E.83321	Diffuser Standtube	
E.83072	Diffuser Standtube Nut	
E.82884	Main Jet Carrier	
E.82853	Main Jet Spring (Bronze)	
E.83187	Main Jet	
E.82856	Main Jet Carrier Nut	
E.83414	Main Jet Taper Needle	
E.83410	Cross Pin, Main Jet Taper Needle	
E.83127	Circlip, Cross Pin	
E.82878	Slow Running Jet	
E.82869	Spring, (Steel) Slow Running Choke	
E.82848	Cross Pin, Slow Running Jet Body	
E.82867	Fork, Spring	
E.82868	Concave Plain Washer	
E.70269	Spherical Nut 2-BA	
D.70507	Distance Tube, Fork Spring	
E.83598	Banjo Union Plug Starter Carb.	
E.81472)	(Union Nut Petrol Drain	
E.76002)	(Nipple, Petrol Drain	
E.51543)	(Petrol Drain Pipe	
E.30109	Washer, Main Jet Carrier	1
E.83447	Washer, Main Jet Drain Plug	1
E.27487	Washer, Diffuser Base	1
G.73346	Washer, Diffuser Standtube Nut	1
E.75759	Washer, Diffuser Drain Plug	1
E.75034	Washer, Petrol Union Inlet	1
E.31373/4/5/6/7	Washers, adjusting Valve Seat	1
E.75759	Washer, Needle Valve Cover Plug	1
E.82844	Vellumoid Washer	1
E.81514	Washer, Float Chamber Lid Centre Plug	1
E.81512/3/4/5/6	Washers, Adjusting, Float Pivots (End Float .004" - .008")	2
E.54180	Washer, Fulcrum Lever Passage Plug	1
E.30110	Washer, Fulcrum Lever Pivot Pin	1
E.27488	Washer, Slow Running Jet Drain Plug	1
E.19541	Banjo Union to Starter Carburetter	2

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/P3

SB/VK/TRY.

Subject : Replacement High Pressure Fuel Pumps for the Rolls-Royce Phantom III Motor Car.

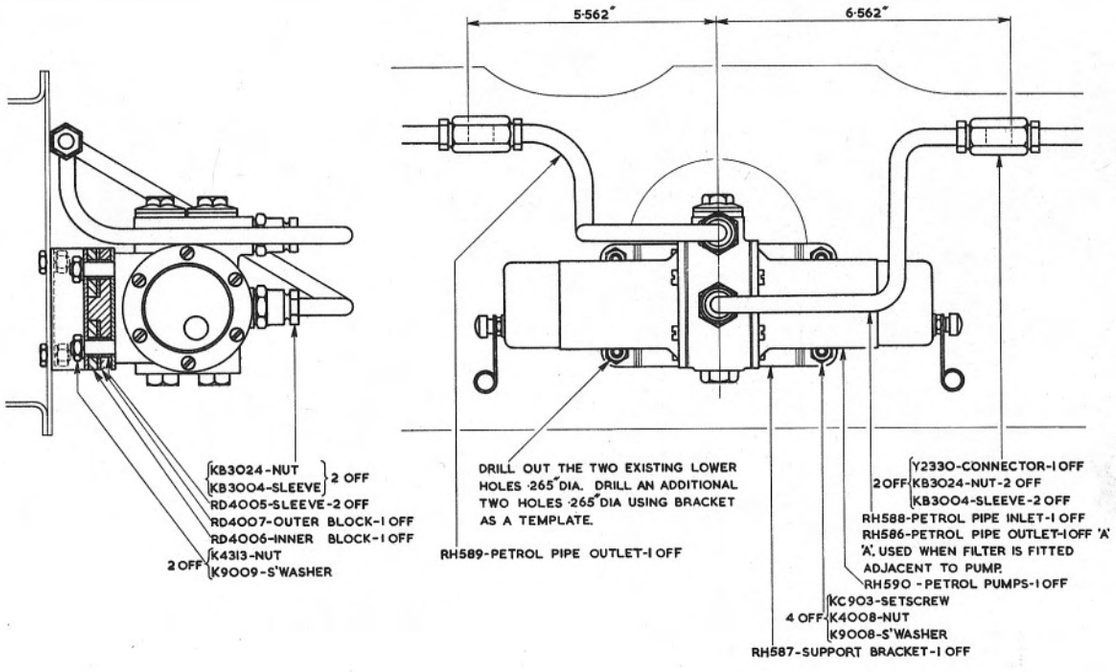
Date of Issue 17th May, 1957.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

Replacement high pressure fuel pumps for the Rolls-Royce Phantom III will in future be of the post-war type RD.6903.

Cars to which this applies can have the fuel filter between the pump and tank fitted in one of two possible positions - either close to the pump but on the outside of the frame, or mounted on the rear frame crossmember adjacent to the fuel tank.



PROCEDURE.

Cars which have the filter on the rear frame crossmember.

Disconnect the wiring and the fuel pipes from the existing pumps, taking care to remove the top of the filter so that fuel is not siphoned from the fuel tank when the inlet pipe is disconnected.

Remove the existing fuel pump mounting bracket and drill the lower bracket mounting holes in the frame to .265" dia. Fit the new pump mounting plate in position with the two newly widened out holes and using it as a template drill the upper two holes in the frame to the same diameter. Fix the bracket securely to the frame.

Next, mount the fuel pump itself to the bracket as illustrated, and replace the outlet union (lower or higher) with another union RD.7510.

The outlet pipe from the pump forward to the engine is to be cut 5.562" from the centre line of the pump and the new outlet pipe (RH.589) fitted between the pump and the shortened outlet pipe with the connector as illustrated.

The inlet pipe from the fuel tank, is then to be shortened to 6.562" from the centre line of the pump and the new inlet pipe (RH.588) fitted between pump and fuel pipe with the connector as illustrated.

Re-connect the electrical wiring and test the pumps for efficient operation.

Cars which have the filter mounted on the outside of the frame, close to the fuel pump.

Proceed as before, but instead of shortening the inlet pipe to the pump, replace it with the new one, RH.586. The pipe passes through the frame tightening holes from pump to filter.

NOTE:

Take the greatest care to remove all filings and foreign matter from the pipes after shortening to prevent any possibility of blockage.

MATERIALS.

Cars with the filter mounted on the frame near crossmember.

Bracket Fixings.	Part No.	No.Off.
Bracket	RH.587.	1
Setscrews	KC.903.	4
Spring Washers	K.9008.	4
Nuts	K.4008.	4

Pump Fixing.	Part No.	No.Off.
Inner Rubber block	RD.4006.	1
Outer Rubber block	RD.4007.	1
Sleeves	RD.4005.	2
Spring Washers	K. 9009.	2
Nuts	K. 4313.	2
Fuel Pump Outlet Union	RD.7510.	1
Outlet Pipe	RH. 589.	1
Outlet Pipe Connector	Y. 2330.	1
Outlet Pipe Sleeves	KB.3004.	3
Outlet Pipe Nuts	KB.3024.	3

Pump Fixing (Continued)	Part No.	No.Off.
Inlet Pipe	RH. 588.	1
Inlet Pipe Connector	Y. 2330.	1
Inlet Pipe Sleeves	KB.3004.	3
Inlet Pipe Nuts	KB.3024.	3

Cars with the filter mounted adjacent to the pump.

Bracket Fixings.	Part No.	No.Off.
Bracket	RH. 587.	1
Setscrews	KC. 903.	4
Spring Washers	K. 9008.	4
Nuts	K. 4008.	4

Pump Fixing.	Part No.	No.Off.
Inner Rubber block	RD.4006.	1
Outer Rubber block	RD.4007.	1
Sleeves	RD.4005.	2
Spring Washers	K. 9009.	2
Nuts	K. 4313.	2
Fuel Pump Outlet Union	RD.7510.	1
Outlet Pipe	RH. 589.	1
Outlet Pipe Connector	Y. 2330.	1
Outlet Pipe Sleeves	KB.3004.	3
Outlet Pipe Nuts	KB.3024.	3
Inlet Pipe	RH. 586.	1
Nipple	K.75999.	1
Nut	E.86492.	1
Sleeve	KB.3004.	1
Pipe Nut	KB.3024.	1