SECTION D

FUEL SYSTEM

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Section D.1

THE FUEL TANK

To Remove

(1) Remove the drain plug from the tank and drain the petrol into a suitable receptacle.
(2) Remove the filler cap.
(3) Disconnect the fuel outlet pipe at its union with the tank.
(4) Unscrew the six nuts surrounding and securing the tank to the underside of the body.
(5) Lower the tank sufficiently to allow disconnection of the tank unit wire (green with black).
(6) Withdraw the fuel tank from the car.

Section D.2

FUEL PUMP

Description (Fig. D.1).

The fuel pump is an AC-Sphinx 'Y' type mechanical pump operated off an eccentric on the engine camshaft. Fig. D.1 shows a sectional view of the pump.

As the engine camshaft (13) revolves, the eccentric (12) lifts the pump rocker arm (16) which is pivoted at (17). The rocker arm pulls the pull-rod downwards (1) together with the diaphragm (3) against the pressure of the spring (2), thus creating a vacuum in the pump chamber (4). Petrol is drawn from the tank and enters at (6) into the sediment chamber (5), through filter gauze (9), suction valve (11) into the pump chamber (4). On the return stroke the pressure of the spring (2) pushes the diaphragm (3) upwards, forcing petrol from the pump chamber (4) through the delivery valve (7) and port (8) into the carburetter.

When the carburetter bowl is full the float will shut the needle valve, thus preventing any flow of petrol from the pump chamber (4). This will hold the diaphragm (3) downward, against the pressure of the spring (2) and will remain in this position until the carburetter requires further petrol and the needle valve opens. The rocker arm (16), operates the connecting link by making contact at (15) and this construction allows idling movement of the rocker arm when there is no movement of the fuel pump diaphragm.

Spring (14) keeps the rocker arm (16) in constant contact with the pushrod and eccentric (12) to eliminate noise.

Section D.3

SERVICING THE PUMP

To Remove from Engine

Start by disconnecting the pipe unions and then remove the two set screws which hold the petrol pump to the engine crankcase. The fuel pump will now readily come away.

To Dismantle the Pump (Fig. D.2).

(1) Unscrew the set bolt (1) and lift off the cover (3).
(2) Lift off the filter gauze (5) and cork sealing washer (4).
(3) Unscrew the five upper chamber securing screws (23) and separate the two halves of the pump body (6 and 21).
(4) Unscrew the three screws (9) and remove the valve plate (11), inlet and delivery valves (8), valve plate gasket (10) springs (7), and delivery valve spring retainer (12).
(5) Remove the diaphragm and pull rod assembly (25)

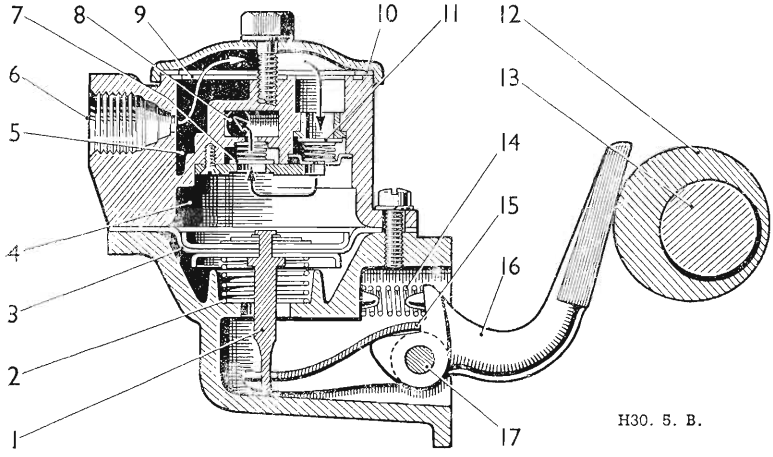


Fig. D.1. Sectioned view of the fuel pump.

1. *Diaphragm pull-rod.*
2. *Diaphragm return spring.*
3. *Diaphragm.*
4. *Pump chamber.*
5. *Sediment chamber.*
6. *Inlet union.*
7. *Delivery valve.*
8. *Delivery port.*
9. *Gauze filter.*
10. *Cork sealing washer.*
11. *Inlet valve.*
12. *Crankshaft eccentric.*
13. *Camshaft.*
14. *Anti-rattle spring.*
15. *Connecting link.*
16. *Rocker arm.*
17. *Rocker arm pivot pin.*

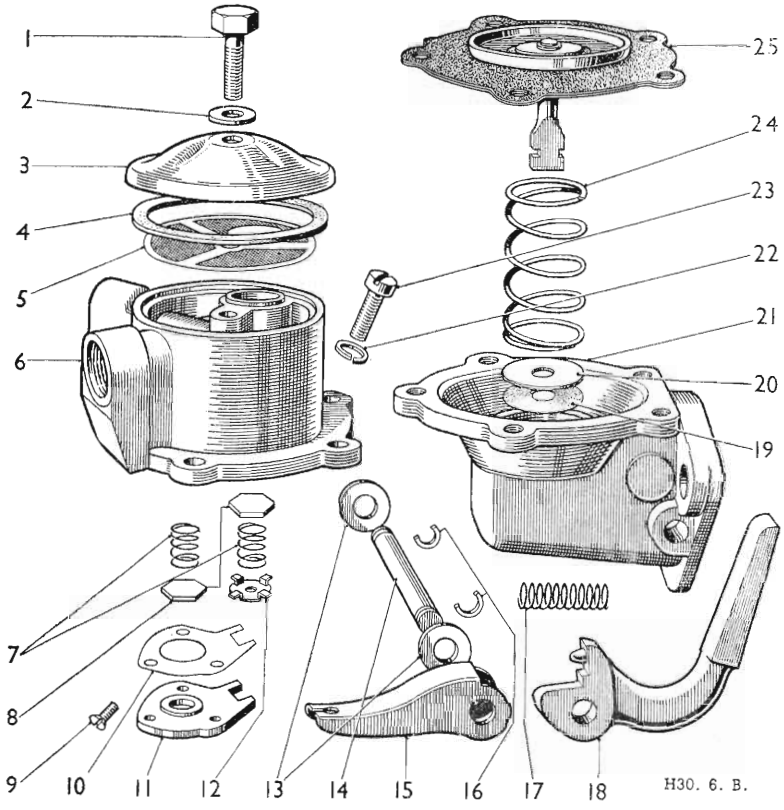


Fig. D.2. Fuel pump exploded.

1. *Cover retaining screw.*
2. *Fibre washer.*
3. *Cover.*
4. *Cork sealing washer.*
5. *Gauze filter.*
6. *Upper casting.*
7. *Valve springs.*
8. *Inlet and delivery valves.*
9. *Valve plate screw.*
10. *Valve plate gasket.*
11. *Valve plate.*
12. *Retainer.*
13. *Packing washers.*
14. *Rocker arm pivot pin.*
15. *Connecting link.*
16. *Retaining clips.*
17. *Anti-rattle spring.*
18. *Rocker arm.*
19. *Fibre washer.*
20. *Metal washer.*
21. *Pump body.*
22. *Spring washer.*
23. *Upper chamber securing screws.*
24. *Diaphragm return spring.*
25. *Diaphragm assembly.*

by rotating it through 90° and pulling it out. This will release the diaphragm spring (24).

(6) Remove the metal washer (20) and fibre washer (19).

(7) Remove the two retaining circlips (16) and washers (13), push out the rocker arm pivot pin (14) which will release the rocker arm (18), link (15) and spring (17).

Re-assembling the Petrol Pump

The following procedure should be adopted, dealing with the upper portion of the pump first (Fig. D.2).

All valves should be swilled in clean paraffin before re-assembly. Apart from the cleaning effect this improves the sealing between the valve and seat.

(1) Place the delivery valve (8) on its spring (7). Place the inlet valve (8) on the valve seat located in the upper casting.

(2) Put valve spring (7) on the centre of the inlet valve (8).

(3) Position retainer (12) on top of the inlet valve spring (7)—this retainer is a small four-legged pressing which retains the inlet valve spring—taking care not to distort the legs.

(4) Lay valve plate gasket (10) in position.

(5) Locate valve plate (11) in position and secure it with three screws (9).

(6) Now use a piece of wire to ensure that the valves work freely.

(7) Place the gauze filter screen (5) in position on top of the casting, making certain that it fits snugly.

(8) Fit the cork sealing washer (4), cover (3), fibre washer (2) and retaining screw (1).

(9) To assemble the lower half proceed as follows: Assemble link (15), packing washers (13), rocker arm (18) and rocker arm spring (17) in the body (21). Insert rocker arm pin (14) through the hole in the body, at the same time engaging the packing washers (13), link and the rocker arm. Then, spring the retaining clips (16) into the grooves on each end of the rocker arm pin. The rocker arm pin should be a tap fit in the body, and if due to wear it is freer than this, the ends of the holes in the body should be burred over slightly.

Note: The fitting of the rocker arm pin can be simplified by first inserting a piece of ·240 in. (6·096 mm.) diameter rod through the pin hole in one side of the body far enough to engage the rocker arm washers and link, then pushing in the rocker arm pin from the opposite side, removing the guide rod as the pin takes up its proper position.

(10) To fit the diaphragm assembly to the pump body: Insert fabric washer (19), metal washer (20) and place the diaphragm spring (24) in position in the pump body.

Place the diaphragm assembly (25) over the spring, the pull rod being downwards, and centre the upper end of the spring in the lower protector washer.

Press downwards on the diaphragm, at the same time turning the assembly to the left in such a manner, that the slots on the pull rod will engage the fork in the link, ultimately turning the assembly a complete quarter turn to the left. This will place the pull rod in the proper working position in the link and at the same time permit the matching up of the holes in the diaphragm with those in the pump body flanges. When first inserting the diaphragm assembly into the pump body, the locating 'tab' on the outside of the diaphragm should be at the 12 o'clock position. After turning the diaphragm assembly a quarter of a turn to the left, the 'tab' should be at the 9 o'clock position. **Note:** Under certain conditions it is possible to insert the diaphragm pull rod too far through the slot in the operating link, with the result that the connecting link instead of engaging the two small slots in the pull rod, rides on the pull rod shoulder.

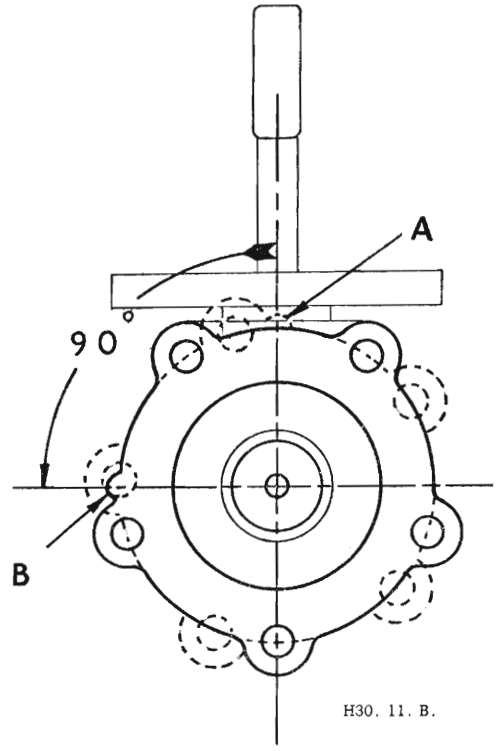


Fig. D.4. When fitting the diaphragm to the pump body, the locating tab (A) should be in the position shown. Turn the diaphragm to the left, so that the pull rod slots engage in the connecting link fork, until it arrives at position (B).

The diaphragm is correctly fitted when the slot in the link engages with the two slots in the diaphragm pull rod after the diaphragm has been turned through 90°.

Correct assembly can be checked by measuring the distance from the top of the pump body to the upper diaphragm protector, when the diaphragm is held at the top of its stroke by the return spring. A measurement of approximately $\frac{9}{16}$-in. (14·29 mm.) indicates correct assembly, whereas one of $\frac{3}{16}$-in. (4·76 mm.) proves that the assembly is unsatisfactory.

(11) The two sub-assemblies of the pump are now ready for fitting together and this is carried out as follows:

Push the rocker arm towards the pump until the diaphragm is level with the body flanges.

Place the upper half of the pump into the proper position, as shown by the mark made on the flanges before dismantling.

Install the cover screws and lockwashers and tighten only until the heads of the screws just engage the washers.

Use a screwdriver to hold the rocker arm at its outward position and while so held, securely tighten the cover screws diagonally.

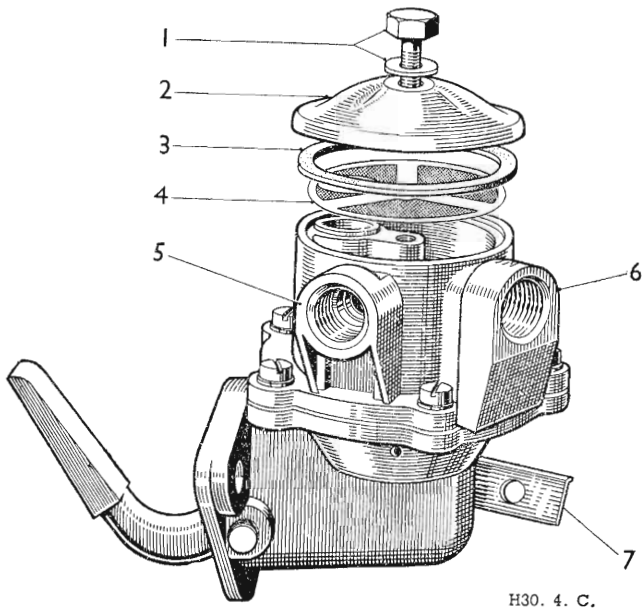


Fig. D.3. Fuel pump top cover exploded.

1. *Retaining screw.*
2. *Cover.*
3. *Cork sealing washer.*
4. *Gauze filter.*
5. *Delivery union.*
6. *Inlet union.*
7. *Priming lever.*

Testing the Pump

The best method of testing the pump is by using an AC-Sphinx bench test stand, on which the suction side of the pump is piped to a tin of paraffin at floor level and the outlet side of the pump connected to a stop tap and pressure gauge.

First, flush the pump through to wet the valves and seats, then completely empty it again by continuing to operate the rocker arm by hand with the suction pipe clear of the paraffin. Now, operate the pump again with the suction pipe in the paraffin. Not more than 20 strokes should be necessary to secure delivery of paraffin from the pump outlet.

Using the same apparatus a second test can be made by working the pump with the tap on the delivery side closed, pressure being recorded on the gauge. After ceasing to work the pump it should take several seconds for this pressure to return to zero, thus denoting that the valves are seating properly. Also, while there is pressure, the outer edge of the diaphragm—visible between the two clamping flanges—should be carefully examined for leakage and the retaining screws tightened if necessary. When working the pump by hand a somewhat longer stroke is obtained and the pressure developed is apt to be higher than when fitted to the engine.

When the above apparatus is not available the petrol pump should be tested as follows, using a can of clean paraffin.

Firstly, flush the pump by immersing it in paraffin and working the rocker arm half a dozen times; then, empty the pump by continuing to operate it while held above the bath. With the pump still clear of the paraffin, place a finger over the inlet union (marked 'In') and work the rocker arm several times. Upon removing the finger a distinct suction noise should be heard, denoting that the pump has developed a reasonable degree of suction. Afterwards the finger should be placed over the outlet union and after pressing the rocker arm inwards, the air drawn into the pump chamber should be held under compression of two or three seconds. This should also be done with the pump immersed in paraffin and the clamping flanges of the diaphragm watched for any signs of air leakage.

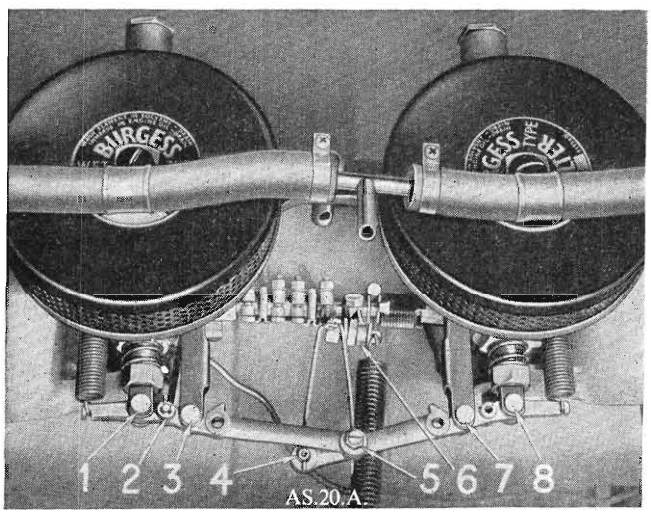


Fig. D.5. Lubrication of the carburetter interconnecting linkages. Apply a few drops of oil to each of the enumerated link joints.

Refitting to Engine

Reverse the procedure outlined for removal from engine. Ensure that the rocker arm is correctly positioned against the eccentric on the camshaft, as there is a possibility of inadvertently getting the rocker arm under the eccentric or to one side when damage will result on tightening the bolts. After refitting, the engine should be run for a short time and pipe unions and pump examined for the possibility of fuel leakage.

Section D.4

THE CARBURETTERS

The two semi-down-draught S.U. type H.I. carburetters are of the variable-jet type, fitted with twin 'Pancake' air cleaners.

A damper is provided in each carburetter, consisting of a plunger and non-return valve attached to the oil cap nut, and operates in the hollow piston rod which is partly filled with oil. Its function is to give a slightly enriched mixture on acceleration by controlling the rise of the piston and to prevent piston flutter.

Section D.5

CARBURETTER ADJUSTMENT

It is first essential to run the engine until it has attained its normal running temperature before commencing any mixture or slow-running adjustments.

The slow-running is governed by the setting of the jet adjusting screws and the throttle stop screws, all of which must be correctly set and synchronised if satisfactory results are to be obtained.

The carburetter throttles are interconnected by a coupling shaft and spring coupling clips which enable them to be correctly synchronised when adjustments take place.

Before blaming the carburetter settings for bad slow-running make quite sure that it is not due to badly set contact points, faulty plugs, bad valve clearance setting or faulty valves and valve springs.

Good slow-running cannot be obtained if the setting for the jets is incorrect. It is therefore advisable to

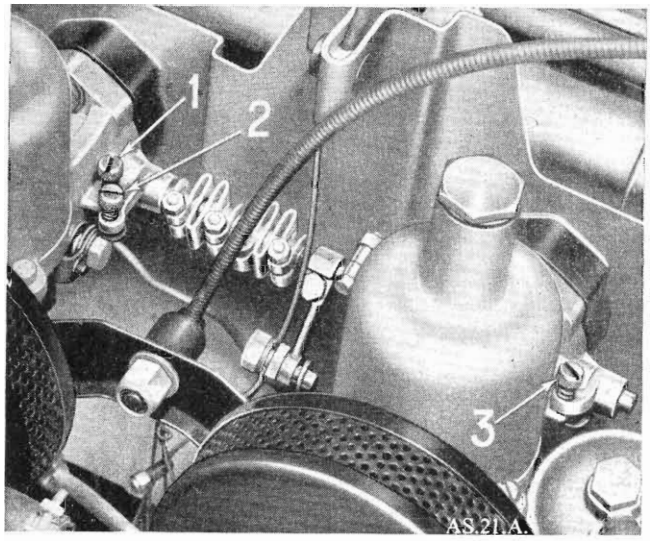


Fig. D.7. 1 & 3. Slow running adjustment screws. 2. Throttle/mixture control interconnecting lever adjustor.

commence any adjustments at this point.

In order to adjust the carburetters successfully it is necessary to remove the air cleaners and intake pipe assembly from the carburetters and engine valve cover and make sure the pistons work freely and the jets are properly centred (see below).

Adjusting the Jets

(1) Slacken off the pinch-bolt of one of the spring coupling clips locating the carburetter interconnecting shaft to the carburetter throttle spindles and also release the two screws securing the choke spring to the jet levers, so that each carburetter can be operated independently.

(2) Release the throttle lever adjusting screws until both throttles are completely closed.

(3) Turn the throttle lever adjusting screw for the rear carburetter clockwise until it is just touching the web on the carburetter body and then give it one full turn. This will set the rear carburetter for fast idling and leave the front one out of action. This can be ensured further by lifting the front carburetter piston a matter of $\frac{1}{2}$ in. (13 mm.).

(4) With the engine running, set the jet adjusting screw for the rear carburetter so that a mixture strength is obtained which will give the best running speed for this throttle opening, taking care to see that the jet head is kept in firm contact with the adjusting nut the whole time.

(5) The correctness or otherwise of this setting can be checked by raising the suction piston with a small screwdriver, or similar instrument to the extent of $\frac{1}{32}$ in. (·8 mm). This should cause a very slight momentary increase in the engine speed without impairing the evenness of running in any way.

If this operation has the effect of stopping the engine it is an indication that the mixture setting is too weak.

If an appreciable speed increase occurs and continues to occur when the piston is raised as much as $\frac{1}{4}$ in. (6 mm.) it is an indication that the mixture is too rich.

(6) When the rear carburetter mixture setting has been carried out correctly release its throttle adjusting screw so that it is clear of the stop and the throttle is completely closed, and lift the piston $\frac{1}{2}$ in. (13 mm.) to render it inoperative. Then repeat the jet-adjusting operations on the front carburetter.

(7) When both carburetters are correctly adjusted individually for mixture strength the throttles of each should be set so as to give the required slow-running and synchronisation.

Slow-running and Synchronisation.

Screw each throttle lever adjusting screw so that its end is only just making contact with the web on the carburetter body, then give each screw one full turn exactly.

Start the engine, which will now idle on the fast side.

Unscrew each throttle lever adjusting screw an equal amount, a fraction of a turn at a time until the desired slow-running speed is achieved.

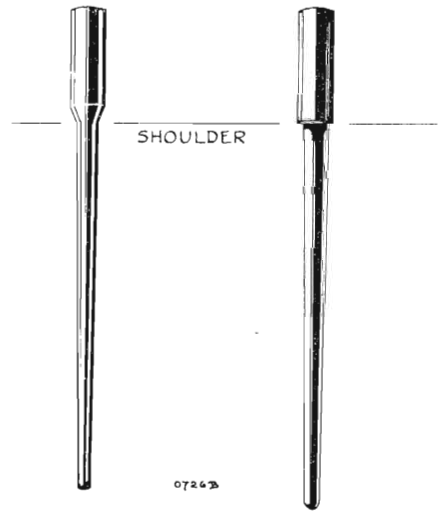
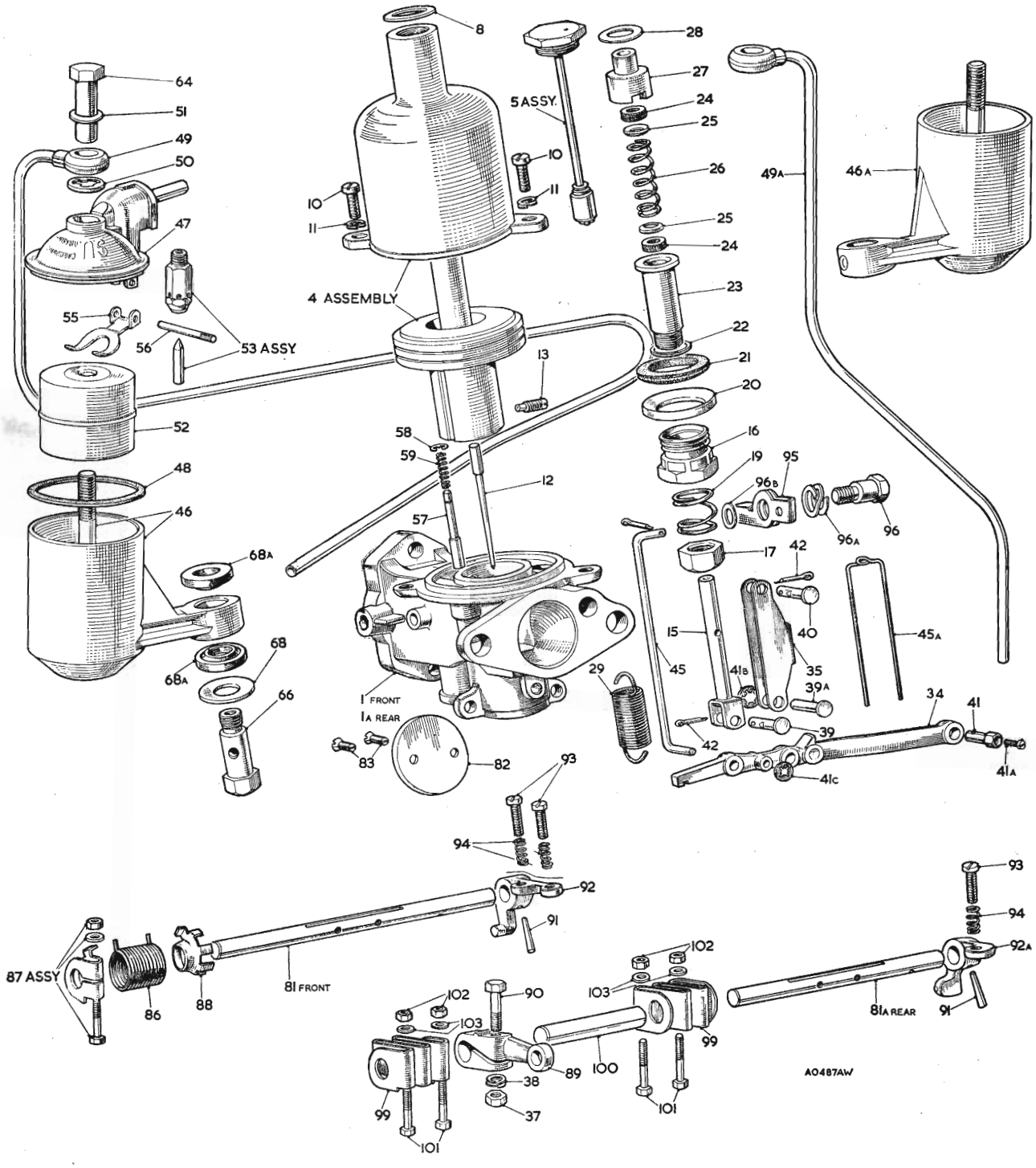


Fig. D.8. The shoulder of the needle should be flush with the underface of the piston. Two types of shoulder are in use and the correct datum point for each is shown.

THE CARBURETTER COMPONENTS



KEY TO THE CARBURETTER COMPONENTS

No.	Description.
1.	*Body—bare—front.*
1A.	*Body—bare—rear.*
4.	*Suction chamber and piston assembly.*
5.	*Oil damper assembly.*
8.	*Fibre washer—oil damper cap.*
10.	*Securing screw—suction chamber.*
11.	*Spring washer—D/C—screw.*
12.	*Jet needle.*
13.	*Jet needle locking screw.*
15.	*Jet with head.*
16.	*Jet sealing nut.*
17.	*Jet adjusting nut.*
19.	*Jet adjusting lock spring.*
20.	*Jet sealing ring—brass.*
21.	*Jet sealing ring—cork.*
22.	*Jet bearing copper washer—bottom half bearing.*
23.	*Jet bearing—bottom half.*
24.	*Jet gland washer—cork.*
25.	*Jet gland washer—brass.*
26.	*Jet gland spring.*
27.	*Jet bearing—top half.*
28.	*Jet bearing copper washer—top half bearing.*
29.	*Jet return spring.*
34.	*Jet lever.*
35.	*Jet link.*
37.	*Nut* (2 *BA*).
38.	*Washer.*
39.	*Pivot pin—short.*
39A.	*Pivot pin—jet link.*
41.	*Pivot pin—jet lever to stirrup.*
41A.	*Screw—cable clamp.*
41B.	*Starlock washer—jet link.*
41C.	*Starlock washer—link rod.*
42.	*Split pin.*
45.	*Link rod.*
45A.	*Stirrup—connecting jet lever.*
46.	*Float-chamber—bare—front.*
46A.	*Float-chamber—bare—rear.*

No.	Description.
47.	*Float-chamber lid.*
48.	*Float-chamber lid washer.*
49.	*Overflow pipe—front.*
49A.	*Overflow pipe—rear.*
50.	*Serrated fibre washer—cap nut.*
51.	*Aluminium packing washer.*
52.	*Float.*
53.	*Float needle and seat assembly.*
55.	*Float hinged lever.*
56.	*Float hinged lever pin.*
64.	*Cap nut—float lid.*
66.	*Holding-up bolt—float—chamber.*
68.	*Washer—steel—holding-up bolt.*
68A.	*Rubber grommet—holding-up bolt.*
81.	*Throttle spindle—front.*
81A.	*Throttle spindle—rear.*
82.	*Throttle disc.*
83.	*Throttle disc screw.*
86.	*Return spring—throttle—front.*
87.	*End clip.*
88.	*Anchor plate.*
89.	*Throttle lever.*
90.	*Bolt* (2 *BA*).
91.	*Taper pin.*
92.	*Throttle stop—front.*
92A.	*Throttle stop—rear.*
93.	*Adjusting screw.*
94.	*Lock spring—screw.*
95	*Rocker lever—front.*
96.	*Bolt—pivot—front.*
96A.	*Spring washer—pivot bolt.*
96B.	*Aluminium washer—cam.*
99.	*Coupling—folded.*
100.	*Connecting rod—throttle.*
101.	*Bolt* (4 *BA*).
102.	*Nut* (4 *BA*).
103.	*Washer* (4 *BA*).

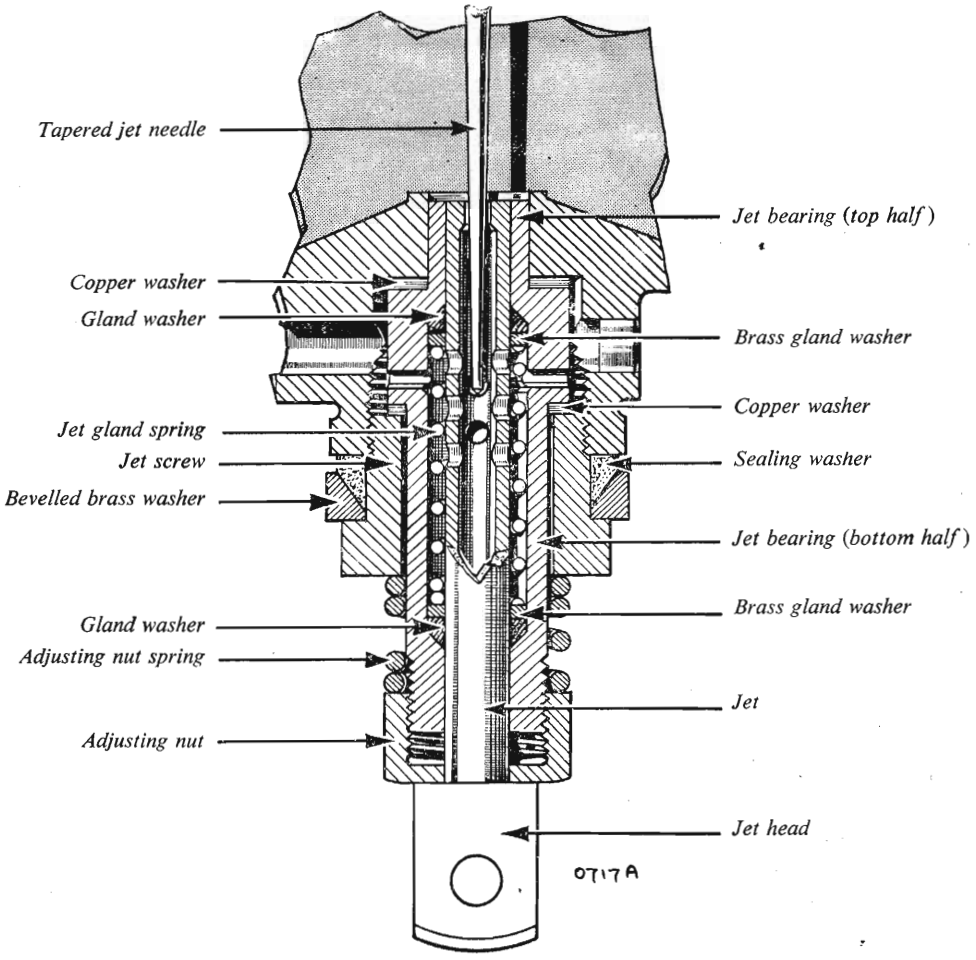


Fig. D.9. Sectioned view of jet assembly.

Correct synchronisation can be checked by listening at each carburetter air intake in turn through a length of rubber tube and notice if the noise produced by the incoming air is the same in both. Any variation in intensity of the sound indicates that one throttle is set more widely open than the other—the louder sound indicates the throttle with the greater opening.

When the same intensity of sound is produced by both carburetters the intercoupling shaft clip should be tightened up firmly to ensure that the throttles work in unison.

Since the delivery characteristics, when both carburetters are operating together, vary somewhat from those existing when each is working separately it will be found necessary to check them again for correctness of mixture strength by lifting the pistons in turn as described in 'Adjusting the jets,' making such adjustments of the jet adjusting nuts as are required to balance the mixture strength and to ensure that it is not too rich.

Fitting New Needles

If the road performance is not satisfactory after the above adjustments have been made, larger or smaller needles may be necessary.

To change the needles, remove the screws and lift off the suction chambers, having marked them to ensure refitting to their respective carburetters. Remove the pistons.

Unscrew the screw at the side of each piston tube and withdraw the needles.

Fit the new needles: a needle should be fitted with its shoulder flush with the face of the piston as shown in Fig. D.8.

The Float-chamber

The position of the forked lever in the float-chamber must be such that the level of the float (and therefore the height of the fuel at the jet) is correct.

This is checked by inserting a $\frac{7}{16}$ in. (11·11 mm.)

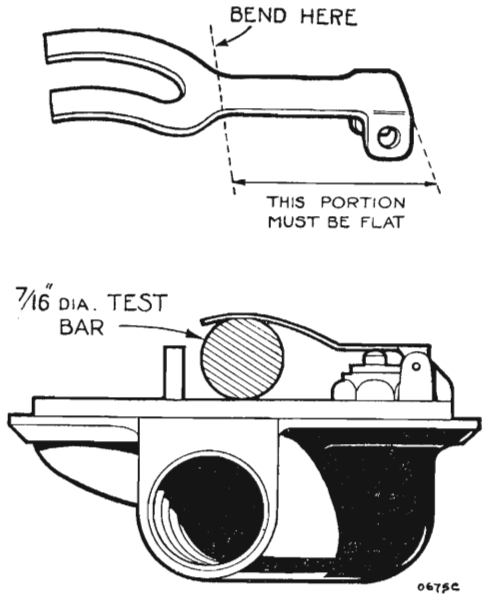


Fig. D.10. The correct method of float lever adjustment.

round bar between the forked lever and the machined lip of the float-chamber lid. The prongs of the lever should just rest on the bar (see Fig. D.10) when the needle is on its seating. If this is not so, the lever should be reset at the point where the prongs meet the shank. Care must be taken not to bend the shank which must be perfectly flat and at right angles to the needle when it is on its seating.

Centring a Jet

First remove the clevis pin at the base of the jet which attaches the jet head to the jet operating lever; withdraw the jet completely, and remove the adjusting nut and adjusting nut spring. Replace the adjusting nut without its spring and screw it up to the highest position. Slide the jet into position until the jet head is against the base of the adjusting nut. When this has been done, feel if the piston is perfectly free by lifting it up with the finger with the dashpot piston removed. If it is not, slacken the jet sealing nut and manipulate the lower part of the assembly, including the projecting part of the bottom half jet bearing, adjusting nut and jet head. Make sure that this assembly is now slightly loose. The piston should then rise and fall quite easily as the needle is now able to move the jet into the required central position. The jet sealing nut should now be tightened and a check made to determine that the piston is still quite free. If it is not found to be so, the jet sealing nut should be slackened again and the operation repeated. When complete freedom of the piston is achieved the jet adjusting nut should be replaced. The adjusting nut should now be screwed back to its original position.

Experience shows that a large percentage of carburetters returned for correction have had jets removed and incorrectly centred on replacement.

Section D.6

SOURCES OF CARBURETTER TROUBLE

Piston Sticking

The piston assembly comprises the suction disc and the piston forming the choke into which is inserted the hardened and ground piston rod which engages in a bearing in the centre of the suction chamber and in which is, in turn, inserted the jet needle. The piston rod running in the bearing is the only part which is in actual contact with any other part, the suction disc, piston, and needle all having suitable clearances to prevent sticking. If sticking does occur the whole assembly should be cleaned carefully and the piston rod lubricated with a drop of thin oil. No oil must be applied to any other part except the piston rod. A sticking piston can be ascertained by removing the dashpot piston damper, inserting a finger in the air intake and lifting the piston, which should come up quite freely and fall back smartly onto its seating when released.

Water or Dirt in the Carburetter

When this is suspected lift the piston: the jet can then be seen; flood the carburetter and watch the jet; if fuel does not flow through freely there is a blockage. To remedy this, start the engine, open up the throttle, and block up the air inlet momentarily without shutting the throttle, keep the throttle open until the engine starts to race. This trouble seldom arises with the S.U. carburetter owing to the size of the jet and fuel ways. When it does occur the above method will nearly always clear it. Should it not do so, the only alternative is to remove the jet.

Float-chamber Flooding

This can be seen by fuel flowing over the float-chamber and dripping from the air inlet, and is generally caused by grit between the float chamber needle and its guide. Remove the float chamber top and withdraw the float lever by extracting its pivot pin. The needle valve will now drop out of its seating and can be checked for cleanliness. If there is no grit or foreign matter on the needle or its seating make certain that the needle is not unduly worn. Should this be the case a new needle valve and seating must be fitted.

Float Needle Sticking

If the engine stops, apparently through lack of fuel when there is plenty in the tank and the pump is working properly, the probable cause is a sticking float needle.

An easy test for this is to disconnect the pipe from the fuel pump to the carburetter, turn the engine with the starter motor to check if the fuel is being delivered; if it is starvation it has almost certainly been caused by the float needle sticking to its seating, and the float chamber lid should therefore be removed, the needle and seating cleaned, and refitted. At the same time it will be advisable to clean out the entire fuel system, as this trouble is caused by foreign matter in the fuel, and unless this is removed it is likely to recur. It is of no use whatever renewing any of the component parts of the carburetter, and the only cure is to make sure that the fuel tank and pipe lines are entirely free from any kind of foreign matter or sticky substance capable of causing this trouble.

Section D.7

THE AIR CLEANERS

Remove the units and wash the gauze in petrol (gasoline) every 6,000 miles (9600 km.) or every 3,000 miles (4800 km.) in exceptionally dusty conditions.

When the gauze is clean and dry, re-oil it with engine oil and allow it to drain before refitting to the engine.

Section D.8

EXHAUST PIPE

To Remove

(1) Disconnect the exhaust down pipe at the manifold by slackening the securing clamp.

(2) Remove the nut and lock nut securing the rear hanging bracket to the underside of the vehicle. This bracket is located on the rear end of the silencer.

(3) Finally release the exhaust pipe from the rubber-mounted hanging bracket situated forward of the silencer. The complete exhaust pipe and silencer assembly may now be withdrawn from the vehicle.

To Install

The installation of the exhaust pipe and silencer is a reversal of the procedure 'To Remove.'

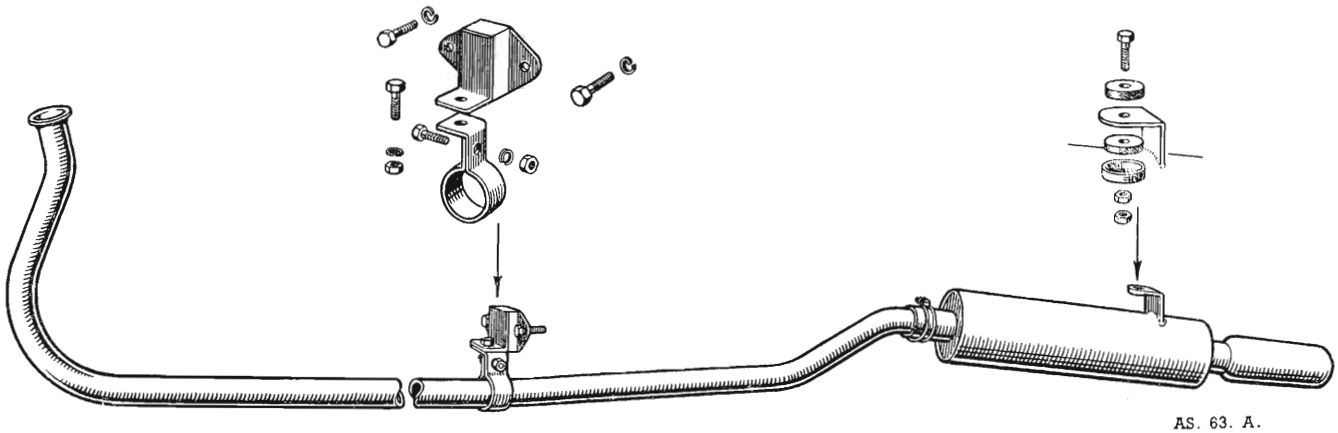


Fig. D.11. The exhaust system exploded.

Section D.10 FAULT DIAGNOSIS

Symptom	No.	Possible Fault
(a) Leakage or insufficient fuel delivery	1	Air vent restricted.
	2	Pipes restricted or partially clogged.
	3	Air leakage at pipe connections.
	4	Lift pump or carburetter filter gauze clogged.
	5	Lift pump gasket damaged.
	6	Lift pump diaphragm damaged.
	7	Lift pump valves sticking or seating improperly.
	8	Fuel vaporising in pipe.
(b) Excessive fuel consumption	1	Carburetters out of adjustment.
	2	Fuel leakage.
	3	Controls sticking.
	4	Air cleaners dirty.
	5	Excessive engine temperature.
	6	Brakes dragging.
	7	Under-inflated tyres.
	8	Excessive idling.
	9	Vehicle overloaded.
(c) Fast idling	1	Rich fuel mixture.
	2	Carburetter controls sticking.
	3	Slow-running screws incorrectly adjusted.
(d) Lift pump noise	1	Pump mountings loose.
	2	Air leak on suction side.
	3	Obstruction in pipe.
	4	Filter obstructed.
(e) Air leak on suction side of pump	1	Suction pipes, pump inlet or pump filter unions loose.
	2	Insufficient fuel in the tank.
	3	Faulty pipe.