

Chapter 41

LUCAS FUEL SYSTEM COMPONENTS BAROMETRIC PRESSURE CONTROL

Contents

	Page		Page
Cleaning	5	Inhibiting	12
Description	1	Inspection	5
Dismantling	3	Rebuilding	6
Dispatch	12	Replacements	9
Fits and clearances	12	Rig tests	10
		Servicing	3

Illustrations

	Fig.		Fig.
Barometric pressure control unit	1	Measuring height of piston projection	8
Diagrammatic relation of B.P.C. and fuel pump	2	Orifice valve leakage test	9
B.P.C. performance graph	3	Valve body leakage test	10
Exploded view of B.P.C.	4	Testing for leaks around the capsule cover joint	11
Key for removing and fitting filter, spring and plug assembly	5	Sealing plate for pressure test after assembling diaphragm and pivot plate	12
Adjusting the rocker lever pre-load	6	Pressure testing fixture on test rig	13
Eccentric sleeve showing maximum adjustment	7	Packing box for B.P.C.	14

The information contained in this chapter has been supplied by Messrs. Lucas, Ltd., and all enquiries regarding their products should be made to them.

THE BAROMETRIC PRESSURE CONTROL maintains at any given value of P_1 (the total pressure in the engine air-intake), a fuel pressure proportional to P_1 . Thus, pump delivery pressure is controlled to suit engine requirements according to speed, altitude, or atmospheric conditions. A decrease in nacelle pressure due to greater altitude or diminished speed will produce a corresponding decrease in pump delivery pressure, so that the pump is called upon to deliver only the fuel which is required by the engine.

Variations of the basic type of unit are available to suit individual installations, the differences being in the calibration values and installation fittings. A typical complete number (B.P.C.12/21R) comprises the basic type designation (B.P.C.12), followed by a stroke number (/21) which is a code reference indicating the customer's installation, and a final letter (R) to indicate the performance schedule to which the particular unit has been calibrated. It follows that installation fittings illustrated in this chapter may differ from those

*This chapter revised by Amendment No. 126
August, 1956*

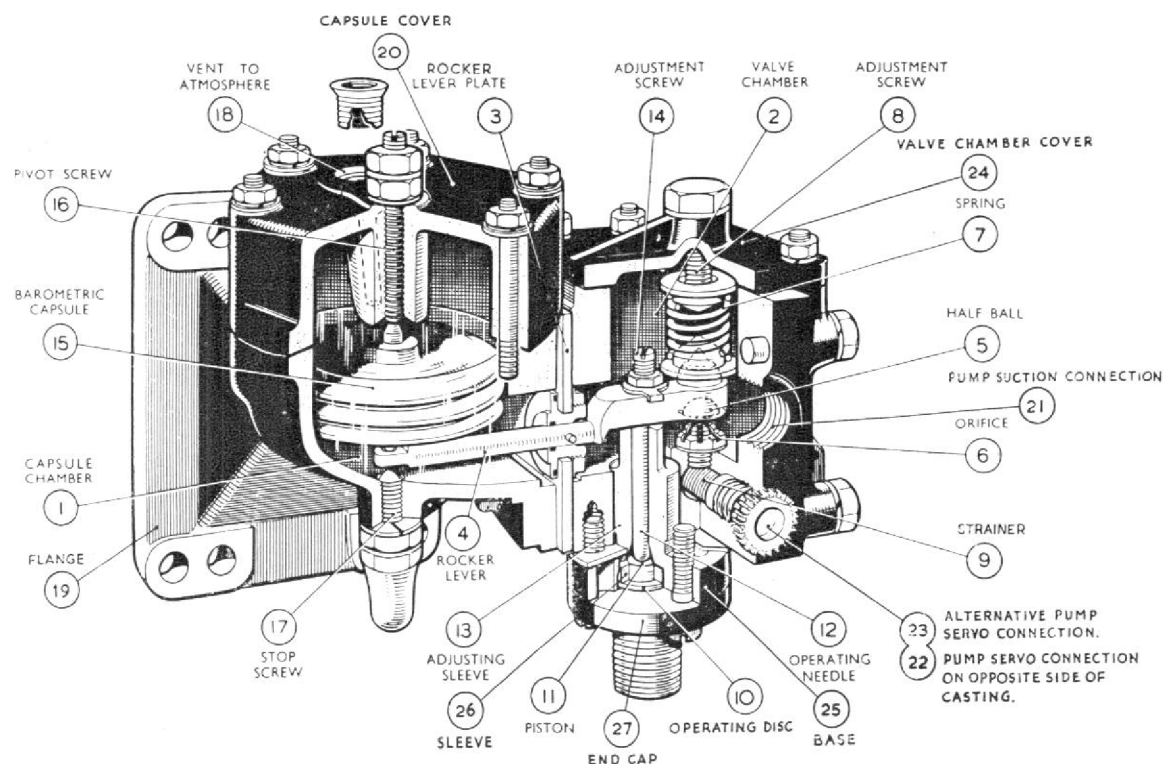


Fig. 1. Barometric pressure control unit.

fitted in a particular installation.

The unit, illustrated in Fig. 1, comprises a body casting, divided into a capsule chamber (1) and a valve chamber (2) by a lever plate (3) carrying a rocker lever (4) which extends into both chambers. The pivot plate acts as a fluid-tight seal between the two chambers. In the valve chamber the rocker lever carries a half-ball (5) which seats on an orifice (6) in the base of the chamber.

A spring (7) suitably compressed by an adjustment screw (8) maintains the half-ball seated. Fuel at servo pressure from the pump is led to the underside of the orifice through a filter (9).

Fuel at delivery pressure from the pump controls the rocker lever through a diaphragm (10), piston (11) and push-rod (12) housed in an adjusting sleeve (13) in the base of the valve chamber. The push-rod operates against an adjustment screw (14) in the rocker lever. It is also eccentrically mounted in the adjusting sleeve so that rotation of the sleeve can alter the moment of the force on the push-rod about the pivot plate, for adjustment purposes.

At its other end the rocker lever bears the lower pivot point of the barometric capsule stack. The upper pivot point is formed by an adjustable screw in the capsule chamber cover, while a stop-screw in the base of the chamber limits downward movement of the rocker lever.

The capsule chamber contains sufficient light oil to cover the capsule stack and act as a vibration

damper. An air inlet (18) in the chamber cover admits engine air-intake pressure to the chamber.

THE OPERATION of the unit is shown schematically in Fig. 2. Opposing moments about the pivot plate are exerted by the fuel delivery pressure and engine air-intake pressure on the rocker lever.

Under normal conditions the system is in equilibrium with the half-ball orifice slightly open and the pump delivery pressure balancing the engine air-intake pressure. The servo orifice is relatively very small and servo pressure on the rocker lever is therefore negligible.

When pump delivery pressure falls below the value required to balance the total pressure P_1 , the servo orifice is closed, pressure on the pump control piston is balanced and the piston moves, under its spring loading, to increase delivery.

Conversely, a rise in delivery pressure will cause the orifice to be opened further and the loss of servo pressure will result in a diminution of delivery until balance is once more restored.

With this arrangement the fuel delivery pressure P_F is related to the total nacelle pressure P_1 by the equation: $P_F = AP_1 + B$ where A is a constant derived from the ratio of the capsule to diaphragm areas and B is the residual spring loading of the system.

The correct functioning of the unit is therefore dependent upon the relation of P_F and P_1 as defined by the engine and atomiser characteristics,

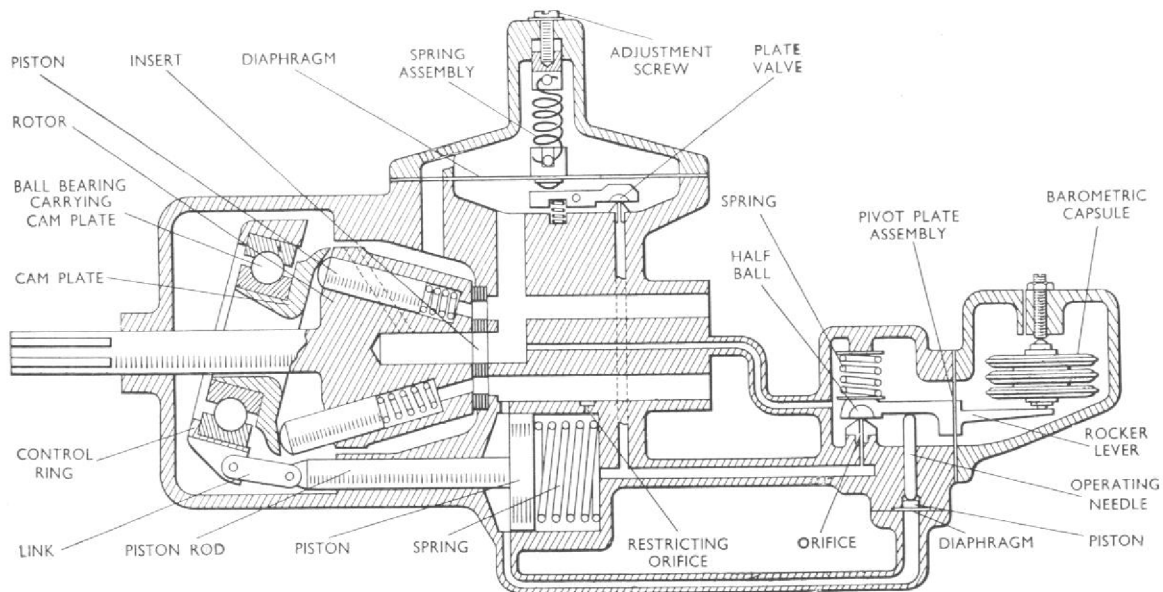


Fig. 2. Diagrammatic relation of B.P.C. and fuel pump.

following a linear relation of this type. At moderate altitudes a good compromise can be obtained by using fixed orifice atomisers and choosing suitable coefficients for A and B. This will be apparent if reference is made to the graph in Fig 3.

Servicing.

NO SERVICING AND ADJUSTMENTS BETWEEN OVERHAULS, beyond checking the unit for leaks, loose or damaged connections and maintaining it in a clean condition with the air pressure connections, etc., free from obstructions, are permitted in the field.

Dismantling.

SPECIAL TOOLS AND A TEST RIG are required for the repair and overhaul of the barometric pressure

control unit. The special tools required are listed below.

REPAIR BY REPLACEMENT B.P.C.—ALL TYPES

Tool or Gauge No.	Description	Used on
T.140539	Assembly fixture	Rocker lever
T.151165	Sealing plate	Diaphragm pressure test.
T.161439	Spanner	Filter assembly
G.48312	Gauge	Piston projection
T.177125	Box spanner	$\frac{1}{4}$ B.S.F. nuts
T.124659	Assembly tool	Capsule
G.46955	Checking gauge	Diaphragm
T.182224	Stripping fixture	General assembly
T.196596/H	Hydraulic assembly fixture complete	General assembly
T.196596	Adapter plate for above	General assembly
T.196218	Clock holder	Rocker lever pre-load
*T.174678	Special box spanner	Valve spring adjusting screw

*Not required for B.P.C./8

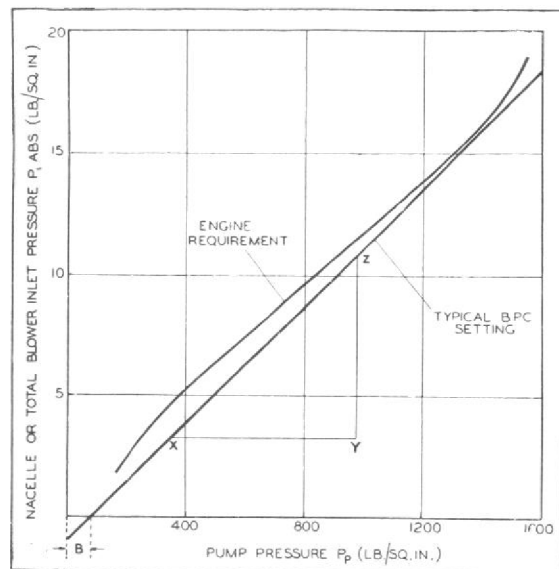
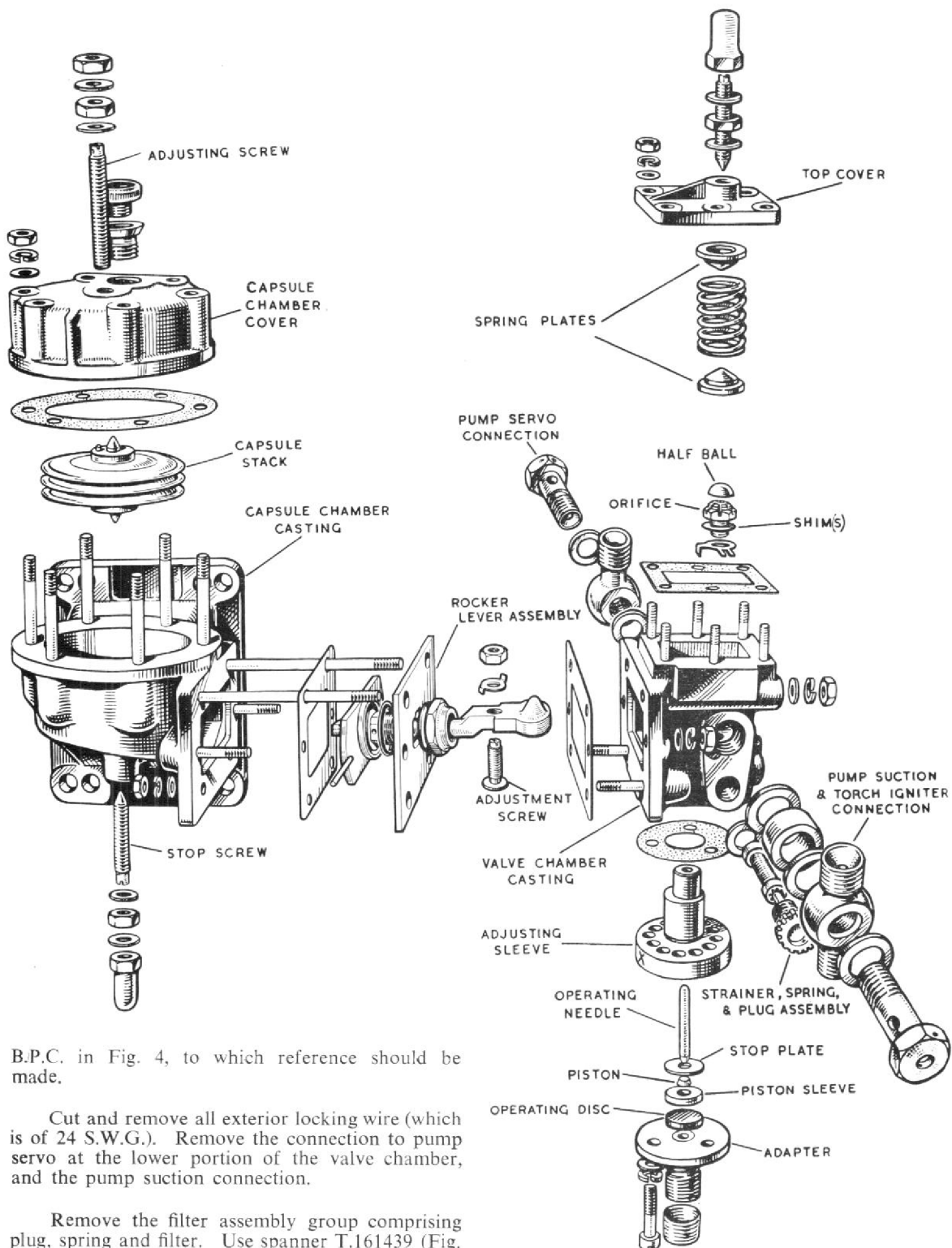


Fig. 3. Graph showing performance of B.P.C.

BEFORE DISMANTLING remove the installation fittings from the unit, and if at all able to be operated, mount it on the test rig as for Final Calibration Test (see page 10 and Fig. 13). If the unit is reported to be leaking, a Valve Body Leakage Test as described on page 8 must be effected, then proceed to calibrate the unit as described on page 10.

Should any peculiarities or damage be discovered during this initial calibration, the motor on the rig must be stopped and the unit completely dismantled as described below.

THE DISMANTLING instructions which follow are supplemented by the exploded view of the



B.P.C. in Fig. 4, to which reference should be made.

Cut and remove all exterior locking wire (which is of 24 S.W.G.). Remove the connection to pump servo at the lower portion of the valve chamber, and the pump suction connection.

Remove the filter assembly group comprising plug, spring and filter. Use spanner T.161439 (Fig. 5) for this purpose. On earlier types these parts were separate.

Extract the three 2B.A. screws, grover washers and plain washers and remove the adapter plate to release the adjusting sleeve assembly, which can then be withdrawn from the valve chamber casting.

Fig. 4. Exploded view of B.P.C.

To dismantle the adjusting sleeve assembly withdraw the operating needle from the sleeve.

Remove the operating disc from the adjusting sleeve assembly, then remove the piston sleeve complete with piston immediately beneath it by gently tapping into the hand.

The capsule chamber is dismantled as follows. Slacken the nut off the upper pivot screw for the capsule stack and remove the screw together with washers. Remove the blank from the vent connection in the capsule chamber cover. Remove the cap-nut and washer from the stop screw and unscrew the latter from the boss in the centre of the bowl of the capsule chamber casting together with the remaining nut and washer. Unscrew the six nuts from the studs securing the capsule chamber cover to the casting, remove the grover washers and plain washers and lift off the top cover, together with the gasket or paper joint. Invert the casting to empty the oil from the capsule chamber, and carefully remove the barometric capsule from its chamber.

The valve chamber casting is next dismantled. Slacken off the spring adjusting screw in the top of the valve chamber cover to relieve the pressure on the spring and to prevent uneven withdrawal of the cover during removal, thus obviating possible damage to the studs. Remove the six nuts, grover washers and plain washers securing the top cover to the valve chamber casting, and lift off the cover. Lift out the spring and spring plates and remove the paper joint or gasket interposed between the top cover and the body casting. Slacken the nut on the adjustment screw positioned on the rocker lever immediately above the adjusting sleeve and screw in the adjustment screw sufficiently to ensure that it will clear the adjacent valve chamber face during the withdrawal of the valve chamber casting.

To separate the valve and capsule chamber castings unscrew the nuts, remove the grover washers and plain washers and withdraw the valve chamber from the capsule chamber. When the two chambers are separated the complete rocker lever

assembly can be withdrawn together with lever plate and gaskets.

Remove the half-ball from the underside of that end of the rocker lever normally extending into the valve chamber.

The rocker lever assembly should be dismantled only in the event of suspected damage to any of the parts, in which case release and remove the nut and washer and withdraw the rocker lever and bush from the rocker lever plate. Remove the rubber sealing ring from the external flange round the bush. Extract the pin and withdraw the lever from the bush; remove the inner rubber sealing ring from the bush.

To remove the orifice, open the tabs of the lock-washer beneath the orifice in the valve chamber casting and carefully unscrew the orifice, using a box spanner. Lift off the orifice together with the shim or shims and tab-washer.

Cleaning.

Prior to complete washing and cleaning, remove all gaskets except that secured to the underside of the adjusting sleeve. This gasket should be removed only if it is damaged, in which case the sleeve face must be cleaned.

Inspection.

THE INSPECTION of detail parts is carried out after they have been thoroughly washed and dried. Distortion checks are not normally necessary, but all parts subject to wear should be checked with the schedule of fits, clearances and repair tolerances (page 12).

INSTALLATION CONNECTIONS. Check that the threads of the bolts for the installation connections are sound and the flats undamaged, also check that the threads of the banjos are sound and the banjos clean. Examine all joint washers for cracks and damage, and ensure that the joint faces of distance pieces are sound.

STRAINER, SPRING AND PLUG ASSEMBLY. Carefully examine the plug and strainer assembly for damage, especially the strainer for breakage and cleanliness, and the threads of the plug for cleanliness and damage. (These parts were separate on earlier types.)

ADJUSTING SLEEVE ASSEMBLY. Carefully examine the piston assembly (which comprises the operating disc, the operating needle, piston, piston sleeve, stop plate and adjusting sleeve) for general soundness. Check the piston to ensure that it conforms to the limits specified in the schedule of fits, clearances and repair tolerances (see page 12).

Thoroughly dry the adjusting sleeve, bore, needle, piston and piston sleeve and ensure that the needle is quite free in the bore of the adjusting sleeve and that the piston is quite free in its bore

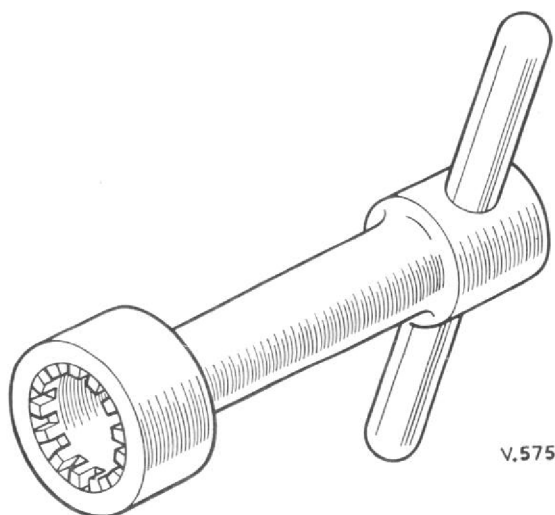


Fig. 5. Spanner T.161439 for removing and fitting filter, spring and plug assembly.

also. If these parts are found to be quite free when dry, it can be safely assumed that all parts will operate freely in paraffin.

The adjusting sleeve must undergo the magnetic crack detection test, and must be discarded if any flaws exist.

The operating needle and piston should be scrutinised very carefully for flaws and damage, and the operating disc for swelling, distortion and damage. If there is any corrosion of the needle, its bore, the piston or its sleeve, the part or parts concerned must be scrapped.

Ensure that the three securing screws have no damaged threads or heads, and that the grover washers and plain washers are not cracked or fractured. Examine the threads of the adapter plate for damage.

MAIN CASTING DETAILS. Carefully examine both valve chamber and capsule chamber castings for general soundness, and ensure that all machined faces are free from damage and scratches likely to prevent an efficient seal.

Ensure that all studs are tight and the threads undamaged, and ascertain that the studs, particularly the longer ones, are not bent or distorted. Scrutinise all internal tappings and ensure that these are clean and free from damage. Examine all nuts and bolts and ensure that the threads are sound and that the flats are undamaged. Carefully inspect all grover washers and plain washers, scrapping any which are distorted, bent or cracked.

Examine the stop screw in the base, and the pivot screw in the top cover of the capsule chamber. Ensure that the pivot point of the lower screw, the centre of the conical seat of the upper screw, and their threads and slotted heads, are sound.

CAPSULE STACK. Ensure that the pivot points of the capsule stack are smooth with complete absence of sharp edges, and that no chipping or other damage has occurred. Inspect the capsules for damage and corrosion and ascertain that no particles of foreign matter exist between them.

Check very carefully that there is no lateral movement when the pivot points of the capsule stack are located correctly with the adjusting screw in the capsule chamber cover and the end of the rocker lever respectively. Similarly ascertain that there is no lateral movement between the pivot point at the other end of the rocker lever and the lower spring plate and between the adjusting screw in the valve chamber casting cover and the upper spring plate.

Examine all pivoting contact points for damage, wear and chipping. Inspect, for indentation and damage, the face of the adjusting screw in the rocker lever, normally in contact with the operating needle. If any wear is evident the screw must be scrapped.

VALVE CHAMBER COVER. Examine the top cover of the valve chamber for damage, particularly to the machined face, which if damaged or scratched might affect the seal or joint between the cover and the valve chamber casting.

Examine the threads of the orifice valve adjusting screw and ascertain that its lower pivoting point is free from damage and that the flats on its head are sound.

HALF-BALL. Ensure that the half-ball swivels freely in its socket in the rocker lever, and that the face of the half-ball is flat. This may be checked by means of an optical flat glass. It is recommended that an Electrical Comparator be used.

ROCKER LEVER ASSEMBLY. Inspect the rocker lever assembly for freedom from damage. See that the lever moves freely in the bush and that the bush is securely attached to the plate with the securing nut undamaged. Examine the adjusting screw thread on the lever and the half-ball recess for signs of fretting and wear.

Ascertain that the rocker lever pivot point upon which the spring plate seats, is clean and locates correctly with its plate.

If the rocker lever assembly was dismantled discard the rubber sealing rings, examine the threads on bush and nut for damage and inspect the hinge pin for wear and fit in the lever and bush. The pin is an interference fit in the lever and a free fit in the bush.

ORIFICE. Examine the thread of the orifice for damage and ensure that it is clean. The lands of the orifice must be smooth and its seating for the half-ball checked for flatness with an optical flat. It is recommended that an Electrical Comparator be used.

MISCELLANEOUS. Examine the shims for cracks and damage.

Examine the helical spring for damage, distortion or sharp edges.

The two spring plates must be clean and must be examined for any signs of damage due to cracks or bruises.

Rebuilding the Unit.

BEFORE REASSEMBLING all parts must again be thoroughly cleaned, while a slight smear of white petroleum jelly on gaskets or paper joints will enable them to be retained in correct location with adjacent parts during assembling.

VALVE CHAMBER CASTING. To facilitate entry into the valve chamber casting, slacken off the adjusting screw in the rocker lever, until the head of the screw is in line with the locating point for the lower spring plate on the end of the rocker lever. Slacken off the rocker lever stop screw in the base of the capsule chamber. Position the rocker lever, diaphragm and pivot plate assembly in the valve chamber casting. Place both valve chamber casting and capsule chamber casting together and temporarily secure with two nuts, grover washers and plain washers.

THE SETTING OF THE HALF-BALL relative to the orifice must be tested, and should be within ± 0.003 to 0.004 in. of the neutral or free position of the rocker lever. This can be checked by adopting the following procedure.

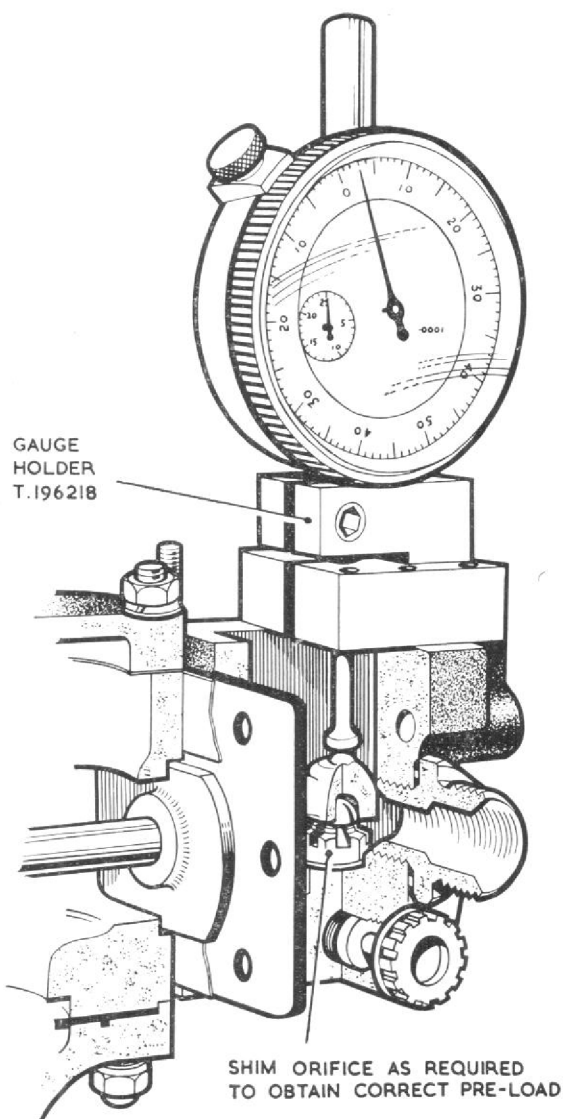


Fig. 6. Adjusting the rocker lever pre-load.

Place the holder T.196218, complete with a dial test indicator on the top face of the valve chamber, as shown in Fig. 6. Adjust the indicator dial to zero with the measuring button resting on the point of the rocker lever spring seating. Lock the dial at the zero setting and remove the complete instrument.

Separate the two castings and insert the orifice as follows. Lower the orifice tab-washer into the base of the valve chamber casting, having already slightly up-turned the tabs. Position two 0.012 in. shims beneath the orifice and screw securely into the base of the valve chamber casting. Prise the orifice tab down against the casting adjacent to the adjusting sleeve bore in the casting, access being gained through the rocker lever plate aperture. Invert the rocker lever assembly to allow the half-ball to be retained in the rocker lever socket. Invert the valve chamber casting to allow the rocker lever to be passed into it and return to the upright position when the half-ball locates with

the orifice. Again temporarily secure the two castings together.

Carefully tighten the stop screw in the base of the capsule chamber until the half-ball is just made to seat on the orifice. Again carefully measure the depth (Fig. 6) except that the orifice and half-ball will now be fitted. This latter dimension must be within ± 0.003 to 0.004 in. of that obtained when the rocker lever is in the free position. Adjust to this setting by the addition or removal of shims.

Finally, separate the two castings of the unit, and lock over the two tabs upwards against the orifice flats.

CAPSULE CHAMBER CASTING. Assemble the two castings together and secure with the six nuts, grover washers and plain washers. Screw up the stop screw in the base of the capsule chamber casting until in contact with the rocker lever, then slacken off a few turns to ensure that the rocker lever is free.

Unscrew the adjusting screw in the centre of the rocker lever in the valve chamber casting, place the tab-washer over it, and screw on the locking nut, adjusting the screw until this shows approximately $\frac{1}{4}$ in. above the nut. Lock over the tab on the rocker lever only. Ensure the correct nut (fine metric thread) is used.

When a new joint washer is required and the old one has been thoroughly removed from the underside of the valve chamber casting, smear a thin layer of "Hermetite" on the base of this casting to ensure the paper joint or gasket is positioned securely. Take great care to ensure that no adhesive compound is allowed to find its way into the bore of the casting which houses the adjusting sleeve.

Invert the unit and temporarily assemble the stop plate, piston, sleeve, needle and eccentric adjusting sleeve in position with the "X" (marked opposite the maximum adjustment hole in the

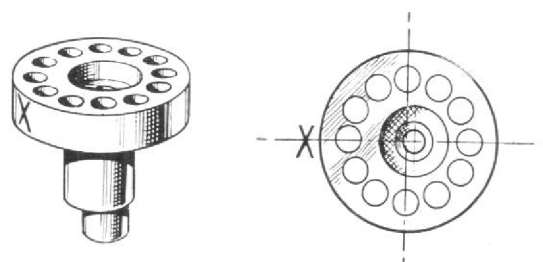


Fig. 7. Eccentric sleeve with maximum adjustment "x" shown.

adjusting sleeve) nearest to the lever plate assembly (see Fig. 7). Temporarily secure the adjusting sleeve assembly with two 2B.A. slave screws and grover washers. Screw in the adjusting screw in the rocker lever until the piston is flush with the sleeve. Tighten the stop screw in the capsule chamber until the half-ball of the rocker lever rests on the orifice.

ADJUSTMENT OF ROCKER LEVER ADJUSTMENT SCREW. Tighten the stop screw a further quarter

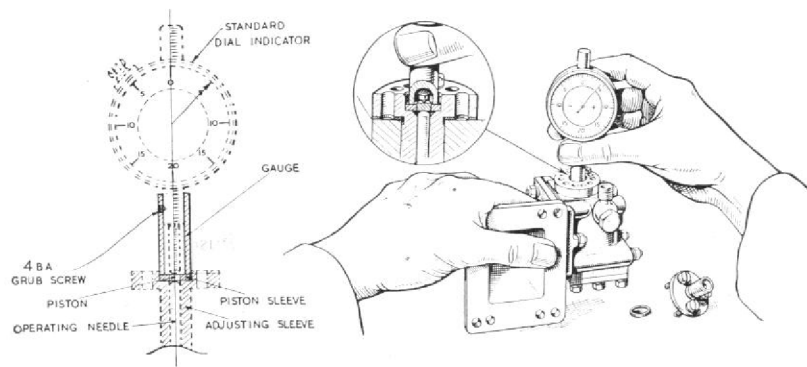


Fig. 8. Measuring the height of the piston projecting above the piston sleeve using the special attachment gauge, G.48312.

turn to ensure that the half-ball rests firmly on the orifice face and then adjust the rocker lever adjusting screw until the piston is 0.004 in. to 0.0006 in. proud of the sleeve. Use the special attachment gauge on the clock spindle (see Fig. 8) for this. With the adjusting screw in this position, tighten the nut and lock by means of the tab-washer. Place the rectangular gasket over the studs in the upper flange of the valve chamber casting.

Locate the two spring plates or cups squarely in the ends of the orifice rocker lever spring and align the lower cup with its location on the upper end of the rocker lever. Lower the cover on the studs and secure with the six nuts, grover washers and plain washers.

Tighten the rocker lever spring adjusting screw fully down and re-check the piston projection, en-

of the two holes in the side of the valve chamber casting, and secure with the special key (see Fig. 5).

ORIFICE VALVE LEAKAGE TEST. Run the pipe line from the hand-pump (Fig. 9) to the servo pressure connection, using a conveniently-sized adapter or union; the normal banjo may be used if necessary. Exert a paraffin pressure of 2000 lb. per sq. in. There must be no leakage through the orifice during this test of approximately one minute's duration.

VALVE BODY LEAKAGE TEST. Blank off the servo pressure connection by means of a blanking plug and secure the valve chamber cover in position. Connect the air pressure line to the pump suction connection of the valve chamber casting, using a union or adapter of convenient size, or the normal banjo connection as shown in Fig. 10 and submerge the unit in a bath of paraffin.

Apply an air pressure of 40 lb. per sq. in. and examine for any bubbles from the casting or joints

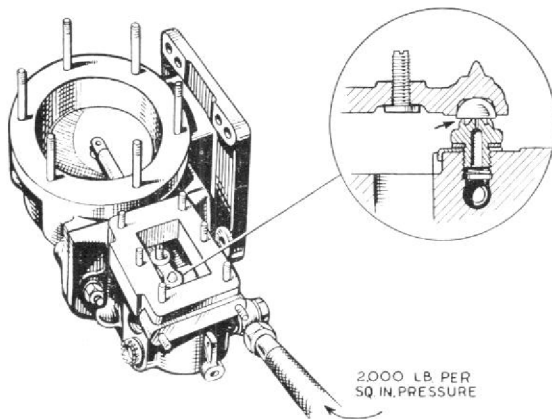


Fig. 9. Orifice valve leakage test.

sure that the lower stop screw is not in contact with the rocker lever.

Remove the adjusting sleeve assembly complete, from the base of the valve chamber casting. Immerse this assembly in the paraffin tank (as in next column) until required for assembly.

STRAINER, SPRING AND PLUG ASSEMBLY. Insert strainer, spring and plug assembly into the smaller

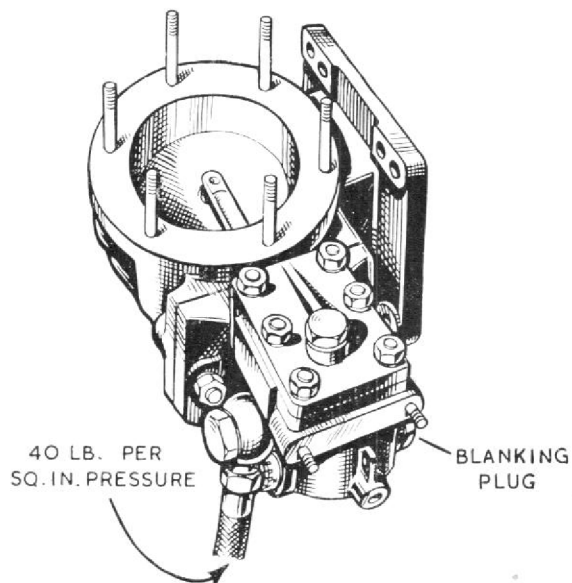


Fig. 10. Valve body leakage test.

which denote leakage. The duration of this test is one minute. Any leakage must be traced and rectified.

After this test is successfully passed ensure that the unit is thoroughly dried by means of a compressed air-line to remove all signs of paraffin. It is possible that any paraffin allowed to remain may be mistaken for a possible leak on subsequent tests. Moreover, the presence of excess paraffin may lead to an accumulation of dirt and foreign matter.

CAPSULE STACK. Lower the capsule stack into the chamber with its lower pivot point in correct location with the rocker lever and with its soldered vacuum seal uppermost. Lower the circular gasket or joint on to the studs of the capsule chamber casting.

With the adjusting screw of the capsule chamber cover screwed fully down so that the cover can be lowered and the screw visibly located correctly with the upper pivot point of the capsule stack, gradually lower the cover and at the same time slacken off the adjusting screw until the cover is tightened fully down with the six nuts, grover washers and plain washers. Loosely position a plain washer and lock-nut on both the stop screw and the pivot screw.

ADJUSTING SLEEVE ASSEMBLY. Thoroughly clean all parts of the adjusting sleeve assembly before building into the valve chamber casting.

Position the seal disc on the piston, in the centre of the eccentric sleeve. Place the adapter plate over the eccentric sleeve with the number facing the boss on the valve chamber casting remote from the stop screw in the base of the capsule chamber.

Place a grover washer and a plain washer on each of the three screws and insert the three screws into the adapter plate, eccentric sleeve and valve chamber casting, and tighten securely.

INSTALLATION CONNECTIONS. Fit the union and joint washers for the pump suction connection of the valve chamber casting.

Place the union, banjo and joint washer into the servo pressure orifice of the valve chamber casting. Fit, and secure all dust caps.

CAPSULE CHAMBER COVER JOINT LEAKAGE TEST. Subject the unit to a 5 lb. per sq. in. air pressure test by placing the plug nozzle in the air vent of the capsule chamber cover and exerting the specified pressure (see Fig. 11). *On no account must this 5 lb. per sq. in. air pressure be exceeded or damage to the unit may result by the capsules becoming disengaged from the pivots.*

Submerge the unit in a paraffin tank and ascertain that no bubbles arise from the joint around the capsule chamber cover joint—these denote leakage and if any exist these should be traced and the leakage rectified. *Slight leakage around the pivot screw in the capsule chamber cover is permissible.*

Replacements.

It is assumed that all disturbed locking wire and split pins will be renewed automatically.

All gaskets, oil seals and joint washers must be renewed once the seal has been disturbed, the exception being that secured to the adjusting sleeve; if sound, this may be used again.

INSTALLATION CONNECTIONS, VALVE CHAMBER CASTING AND TOP COVER, CAPSULE CHAMBER CASTING AND COVER are separately interchangeable.

IF EITHER THE STRAINER, SPRING OR PLUG is damaged the *complete* assembly must be discarded and a replacement fitted.

ADJUSTING SLEEVE ASSEMBLY. All parts of the adjusting sleeve assembly are readily interchangeable but if a replacement needle or piston is fitted check that the piston projection is as specified in page 8.

IF THE CAPSULE STACK is at all damaged fit a complete replacement capsule stack.

IF EITHER THE HALF-BALL OR ORIFICE is replaced check for flatness using an optical flat. It is recommended that an Electrical Comparator be used for checking flatness.

ROCKER LEVER ASSEMBLY. Normally, a rocker lever assembly will be carried as a built-up spare, but assembling instructions are included below should these be required, all parts being separately interchangeable.

The rocker lever and bush should not have been dismantled unless obviously damaged, in which case the sealing ring in the internal recess in the bush must be replaced. The drillings in the lever and bush must be lined up and a new hinge pin driven through. Fit a new rubber sealing ring to the external flange round the bush, insert the assembly through the rocker lever plate and secure

5 LB. PER SQ. IN. PRESSURE

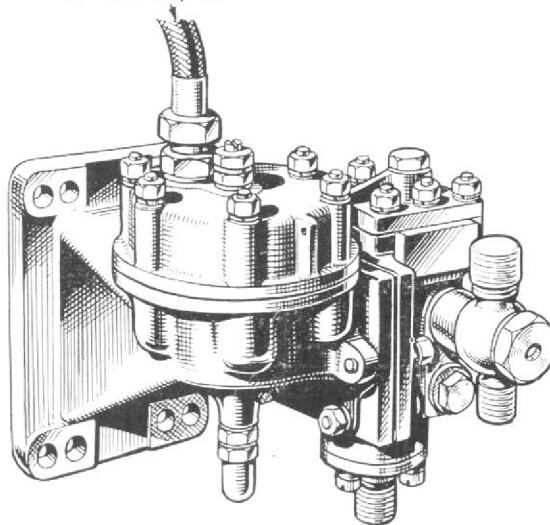


Fig. 11. Testing for leaks around the capsule cover joint.

with washer and nut. The alignment of the lever and bush should be checked by noting whether the lever returns to the neutral position from either side. If it fails to do this fit another internal rubber sealing ring.

Insert the assembly in a suitably blanked-off valve chamber casting (namely, with top cover fitted, and all ports except that to which the air-line is to be connected, blanked off). Carefully align the sealing plate T.151165 with the two studs of the casting and secure with two nuts, grover washers and plain washers and four bolts of convenient length; plain washers, grover washers and nuts. Connect the air-line to the open port using a convenient union or adapter and exert an air pressure of 40 lb. per sq. in. (see Fig. 12) while the unit is immersed in a paraffin bath for at least one minute, and closely watch for any air bubbles rising to the surface through the diaphragm. These will denote leakage.

In the event of leakage, strip the assembly and fit replacement seals or gaskets where necessary.

Rig Tests.

CAREFULLY RECORD all calibration and endurance test results for subsequent entry into the official test record sheet.

THE FUEL used throughout these tests unless stated otherwise is to be kerosene to specification D.Eng.R.D.2482 LATEST ISSUE, the limits of its temperature to be between 20 degrees C. minimum and 50 degrees C. maximum, and checks should be made at regular intervals to ensure that the fuel conforms to these standards.

No test figures are quoted in this text, but they are given in the accompanying Table, to which reference should be made.

CALIBRATION SETTINGS

CODE N (Nominal Amplification Ratio between 63:3:1 and 70:1)

- (a) Flow:—450 gallons per hour.
(b) Pump Delivery Pressure:—1850-1920 lb. per sq. inch.

Fuel pump servo flow to be 11.4 to 11.6 G.P.H. at 1000 lb. per sq. inch, 150 G.P.H. main flow.

Calibration Table

Capsule Pressure Inches Mercury	Pump Delivery Pressure Lb. per sq. inch		Flow G.P.H.
	Minimum	Maximum	
40	1630	1700	450
35	1470	1530	420
30	1315	1365	380
25	1155	1205	360
20	995	1035	300
15	835	865	240
10	670	700	175
5	515	535	120

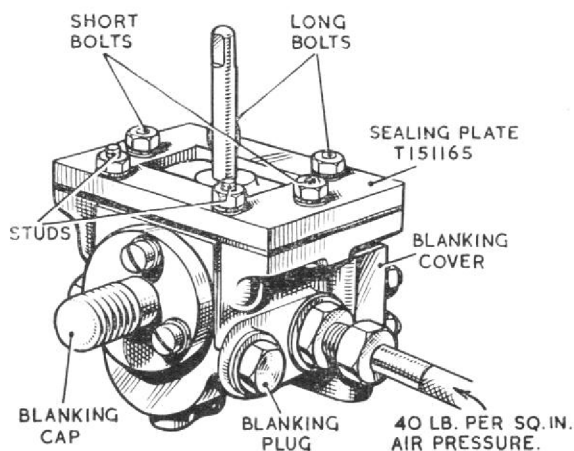


Fig. 12. Use of sealing plate T.151165 for pressure test after assembling diaphragm and pivot plate.

BAROMETRIC PRESSURE CORRECTION PROCEDURE. The barometric pressure control unit regulates the pump delivery pressure in accordance with barometric pressure. As barometric pressure readings vary from day to day, and all recorded pump delivery pressures are to be based upon a standard barometric pressure of 30 in. Hg. Absolute, observed pump pressures must be converted to the standard barometric pressure by pressurising. This is done by applying more or less pressure into the capsule chamber, dependent upon local conditions. If the day barometric pressure is 29.5 in. mercury Abso-

lute, 0.5 in. mercury must be *added* to the specified capsule pressure, while if the day barometric pressure exceeds the standard pressure the excess must be *subtracted* from the specified capsule pressure to obtain the corrected pump delivery pressure. By this means the pump delivery pressure is corrected for ground level conditions.

For altitude conditions, correction is made by employing a manometer fitted with a sliding scale graduated in Absolute divisions. When this scale is set to the prevailing barometric pressure of the day, the corrected pressure may be read straight off after setting the mercury column to the desired capsule pressure.

For any set altitude (denoted by capsule pressure) the pressure difference between standard and day barometric pressure must be added to, or subtracted from, the specified capsule pressure, dependent upon the day barometric pressure being respectively below, or above, the standard barometric pressure. Hence, if the altitude reading is represented by a capsule pressure of 10 in. mercury Absolute and the day barometric pressure is 29.5 in. Hg. Absolute, the manometer mercury levels must be adjusted to give a depression of 19.5 in. Hg. to the capsule chamber.

SETTING THE CAPSULE AND SPRING PRE-LOADS. Connect up on the test rig as shown in Fig. 13. Start the pump motor and adjust the flow by means of the downstream restriction to the figure (a) quoted in the Tables (page 10).

Release the load on the capsule assembly by adjusting the capsule pivot screw until the pump delivery pressure is constant. Set the pre-load of the spring by shimming under the rocker lever spring adjusting screw until the pump delivery pressure is between the required limits (b). Note that a shimming of 0.012 in. is equivalent to approximately 40 lb. per sq. in.

Record the pressure obtained on the test certificate. Ascertain that there is no leakage of fuel from the high pressure adapter at this pressure—any leakage must be traced and rectified.

Adjust the capsule pivot screw until the pump delivery pressure for 30 in. Hg. Absolute (corrected for barometric pressure variation from standard as above) is within the limits (c) quoted.

PRELIMINARY CALIBRATION. Two series of test figures are taken during this calibration, the first after fifteen minutes running, and the second, under the inspector's supervision, after two hours running. Each must strictly conform to the figures contained in the appropriate calibration table, with the exception that readings above 30 in. Hg. Absolute are included in the second test only. These readings are obtained by turning the two-way cock on the test rig sufficiently to give the desired mercury boost pressure to atmospheric pressure.

Set the unit at a capsule chamber pressure of 30 in. Hg., and with the corresponding flow as listed at the head of the calibration table, record the stable pump delivery pressure. Reduce the capsule chamber pressure and the flow to the second calibration point and again record the

stable pump delivery pressure.

Repeat the above process for each calibration point down to the lowest capsule chamber pressure to ensure the full range is covered.

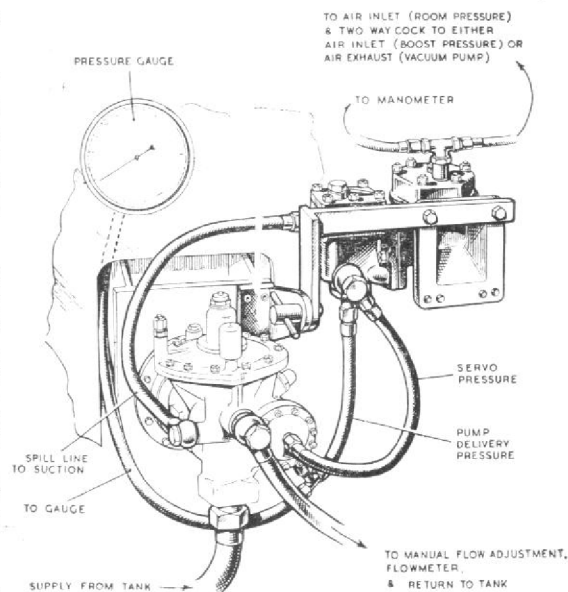


Fig. 13. Pressure testing fixture on test rig in use.

Repeat the above series of readings in the reverse direction, namely, from the lowest to the highest capsule chamber pressure. Note that the corrected pump delivery pressure (see Correction Procedure on page 10) must be, at every calibration point, within the limits specified in the calibration table.

ADJUSTMENTS TO THE PUMP DELIVERY PRESSURE may be effected by removing the three screws, grover washers and plain washers securing the adapter plate and eccentric adjusting sleeve and turning the latter one or more holes as required by moving the adjusting sleeve round. One hole makes a difference of approximately 40 lb. per sq. in. to the pump delivery pressure.

Refit the three screws, grover washers and plain washers to secure the adapter plate and adjusting sleeve. Whenever movement of this eccentric sleeve is effected the capsule and spring pre-loads must be reset (see above).

In every instance the pump delivery pressure recorded at any calibration point during decreasing capsule pressure must not vary by more than 10 lb. per sq. in. from that recorded at the same calibration point during increasing capsule pressure.

On successful completion of this calibration test, set the lever stop screw by adjusting the capsule pressure to the minimum value, namely, 5 in. Hg. Absolute (see calibration table), and adjust the stop screw to half a turn out from the point at which it just makes contact with the lever.

ENDURANCE TEST. Ensure that the unit is inverted during this test to enable any foreign matter to be more readily returned to the suction side of the pump away from the adjusting sleeve assembly.

Set the capsule chamber pressure at 30 in. Hg. Absolute and the corresponding flow as listed in the calibration table.

Steadily drop the capsule chamber pressure from this reading down to the minimum listed in the calibration table and up again to 30 in. Hg. Absolute, thus completing the full cycle. No manual adjustment to the flow is necessary.

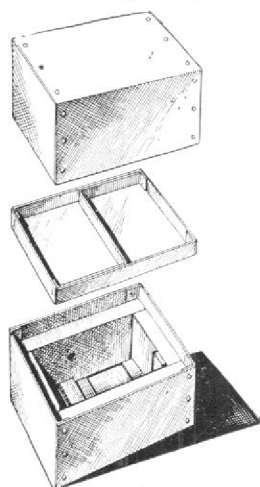


Fig. 14.
Packing box for B.P.C.

Repeat this process for at least sixty cycles, e.g., every two minutes for two hours. A steady change of pump delivery pressure must be observed, but at any particular point this will not necessarily conform with that observed in the preliminary calibration above, since the adjustment to the flow is omitted. Fluctuating readings will denote a sticking piston or needle, or a faulty operating disc or diaphragm and the unit should be stripped and these parts carefully examined. In instances of sticking pistons or needles, these should be carefully examined for roughness, high spots or the presence of foreign matter and cleaned, or replacement parts fitted, and all the above tests repeated.

FINAL CALIBRATION TEST. Repeat the Preliminary Calibration Test procedure above and carefully record the corrected values of pump delivery pressure at each calibration point. These values

must not vary by more than 10 lb. per sq. in. from those recorded during the preliminary calibration test. If this margin is exceeded, investigate the cause as in the Endurance Test above and repeat the tests if necessary.

After successful completion of the final calibration, take note of the position of the eccentric adjusting sleeve and record its position in the form of the number of holes moved from the maximum adjustment position (see Adjustment of Pump Delivery Pressure) and enter on the official test record sheet. Remove the unit from the rig.

Inhibiting.

Remove the hollow bolt, joint washer, banjo, joint washer and distance piece from the upper hole in the side of the valve chamber to allow flushing oil to specification D.T.D.587 (LATEST ISSUE) to be inserted. Fill right up and refit the connection details.

Also remove the blank from the vent connection in the capsule chamber cover, and inject 50 cc of Silicone fluid D.C.200/100 c.s. (specification D.E.D. 2472, LATEST ISSUE) and 50% of paraffin with a force feed lubricator. Fill right up and refit the dust cap.

Preparation for Dispatch.

FINAL WIRE-LOCKING. Complete all installation connections, dust caps, etc., and then wire-lock the unit. Carefully check that the wire-locking is completed satisfactorily.

PACKING. Copy (preferably type-written) all records of the unit on the official test record sheet and place together with the unit in the special cardboard container shown in Fig. 14. The unit is then ready for dispatch.

BAROMETRIC PRESSURE CONTROL

Adjacent Parts	Individual Parts	New Dimensions in.	Permissible Worn Dimensions in.	New Clearances in.	Permissible Worn Clearances in.	Remarks
ROCKER LEVER AND AMPLIFIER VALVE	Rocker lever	0.3150 0.3170	0.321	0.0000 0.0060	0.0060	
	Amplifier valve	0.3110 0.3150	0.309			
ADJUSTING SLEEVE AND OPERATING NEEDLE	Sleeve	0.1385 0.1387	0.1391	0.0007 0.0013	0.0013	Lapped finish.
	Needle	0.1374 0.1378	0.1372			
PISTON AND PISTON SLEEVE	Piston	0.2043 0.2045	0.2039	0.0006 0.0010	0.0012	Lapped finish.
	Sleeve	0.2051 0.2053	0.2057			
VALVE SPRING	Spring	—	—	—	—	To give 20.95 lb. + 0.44 — 0.0 (0.63in. long).
ALL PARTS CAPABLE OF ADJUSTMENT		—	—	—	—	To be adjusted to original limits as on assembly.

This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.

