Chapter 1

FLOW DISTRIBUTOR, TYPE FD 12 SERIES

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RESTRICTED

GENERAL

1. The flow distributor is designed to meter fuel equally to all burners irrespective of the type of burner in use.

2. Variation of the basic type of flow distributor is available to suit individual burner installations the differences being in the number of outlet unions and in the installation fittings.

3. A typical complete type number consists of the basic type designation (FD.12), followed by a stroke number (/14) which is a reference indicating the installation code, and a final letter (G) to indicate the schedule to which the particular unit has been calibrated.

4. These instructions apply to all derivations of the basic type. Specific details and calibration figures for the various types are provided in the appendices to this chapter.

5. It is important that the unit is handled with care at all times and not subjected to severe shock, otherwise the calibration of the unit may be affected or slight distortion may result in sticking of the metering plunger.

6. The importance attached to cleanliness while handling any components cannot be over-emphasized and extreme precautions must be observed at every stage of assembling and testing to ensure that all details are thoroughly clean.

7. To avoid damage to nuts, bolts and unions, box or ring spanners should be used where possible.

8. On time expired units all joint and other sealing washers must be renewed, also any split pins, tab-washers or locking wire whenever they are disturbed.

9. In instances where a unit is to be assembled temporarily, it is recommended that slave unions, nuts and washers should be used; such components however, should be distinguishable to avoid their retention on final assembly.

SPECIAL TOOLS

10. Special tools and test rigs are necessary for the repair and overhaul of the flow distributor. These tools and test rigs are listed in the following table.

Part No.:	*Description :*
T.160988	Adjusting tool—range adjusting screw
T.167552	Adapter—micrometer head—port calibration
T.177125	Spanner—bottom cover retaining nuts
T.190007	Tool—removal and assembly—sealing rings
T.190008	Adapter—test-rig.
T.190009	Guide rod — spring anchorage assembly
T.190010	Tools—removal and assembly—metering sleeve
T.193447	Holder — sealing ring —' flash-line ' removal
T.193448	Mandrel—sealing ring —' flash-line ' removal
—	Test-rig—port calibration
—	Test-rig—performance calibration

CHECKS AND PRECAUTIONS BEFORE DISMANTLING

11. Study any complaints reported with the unit then examine the exterior for any visible sign of damage or interference, with particular attention to the locking wire on the adjusting screw lock-nut. Ensure that all unions have been blanked off com-

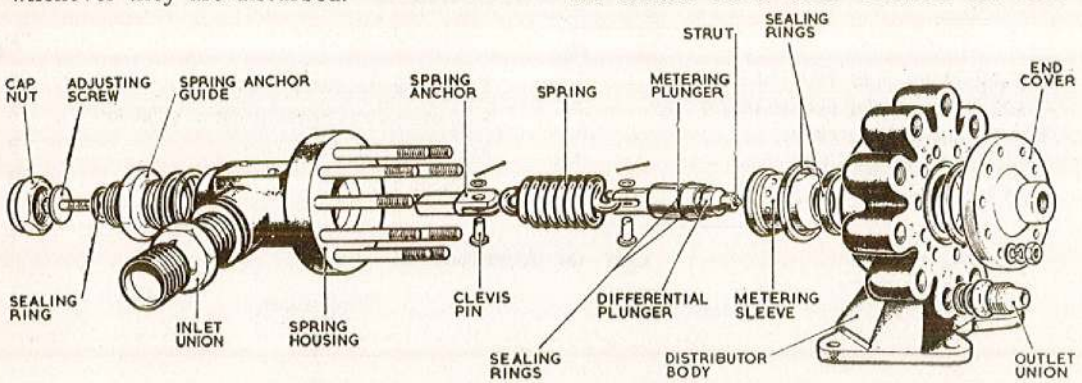

Fig. 1. Dismantled view of the flow distributor

pletely to prevent the entry of foreign matter to the interior of the unit.

12. Remove the installation details (*para.* 15) then, if its general condition is suitable, the unit should be mounted on the performance test rig and a calibration check carried out in accordance with the appropriate test schedule. If the unit has been reported as leaking, however, it should be leak-tested first under the conditions specified in the test schedule in order to locate the source and nature of the leak and to facilitate investigation.

DISMANTLING THE FLOW DISTRIBUTOR

General

13. One or more clean and dry metal boxes should be placed close to the work to receive the components so that they may be stored safely pending inspection.

14. It is recommended that not more than one dismantled unit be present on the bench at any one time; this will avoid an accidental transfer of parts from one assembly to another. Scrap all tab-washers, split pins and lock wires on removal.

Removing the installation fittings

15. Installation connections assembled to this unit comprise unions or adapters, with suitable sealing washers, which are fitted to the inlet and outlet ports and to the drain outlet. Certain outlet adapters may form 'bias-flow' unions to compensate for different lengths of burner feed pipes and are numbered accordingly. When a unit is received it should be complete with dust caps on each union or adapter.

16. Unscrew the fittings and remove them together with their joint washers, which consist of a rubber ring surrounded by a steel ring.

Removing the spring housing

17. Unlock and remove the adjusting screw lock-nut and remove the adjustment screw. Remove the retaining nuts, grover and plain washers from the distributor body end cover, using box spanner T.164149, then remove the cover. Hold the unit with the spring housing uppermost and ease it away from the distributor body. If the studs are to be removed they should be unscrewed with a standard stud-box.

Dismantling the plunger assembly

18. Draw the spring and plunger from the metering sleeve and inverting the assembly, shake out the strut from the bore of the differential plunger.

19. Grip the stem of the differential plunger with a pair of thin-nosed pliers and draw it from the metering plunger.

20. Separate the plunger from the spring and its anchorage. Remove the two split-pins and withdraw the clevis pins from each end of the spring.

Removing the sealing rings

21. Unscrew the spring anchorage guide from the small end of the spring housing, remove the joint ring and steel retaining washer.

22. Remove the rubber sealing rings from the end facings of the distributor body and from the spring anchor guide small face, also that from the bore of the metering sleeve, using the tool T.190007 provided to facilitate this. The ring on the differential plunger also must be removed.

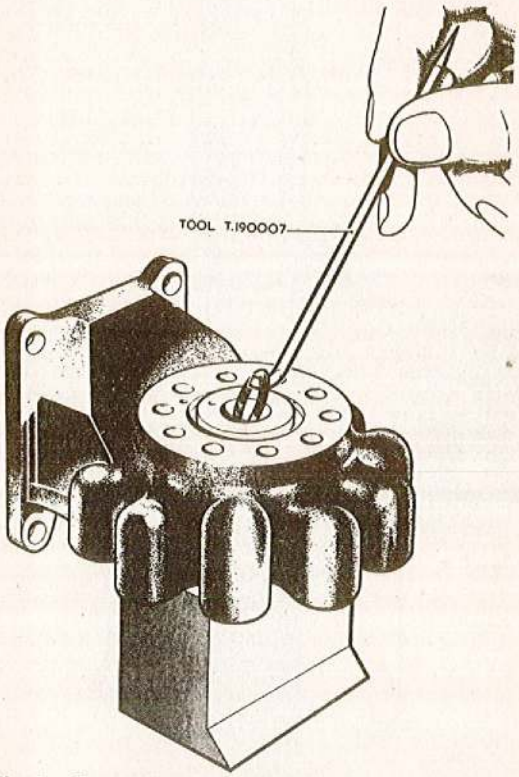

Fig. 2. Removing the metering plunger sealing ring

23. Before discarding sealing rings, see that they have not been the source of leakage or mal-functioning through cuts, deterioration or abrasions.

Removing the metering sleeve

24. It is not necessary generally to disturb the metering sleeve unless either the port calibration is unsatisfactory or the bore is worn unduly or the body sealing ring is permitting excessive leakage.

25. Should it be necessary to remove the sleeve, locate the body on the base T.190010 and with the associated punch, as shown in *fig.* 3, place it in a wheel press, align the punch and ram, then operate the press to eject the sleeve.

26. The rubber sealing ring must be removed from the bore in the body and discarded.

CLEANING

27. If any defect is suspected to be due to the presence of foreign matter, the parts suspected should be inspected before cleaning, otherwise the cause of the defect may be washed away.

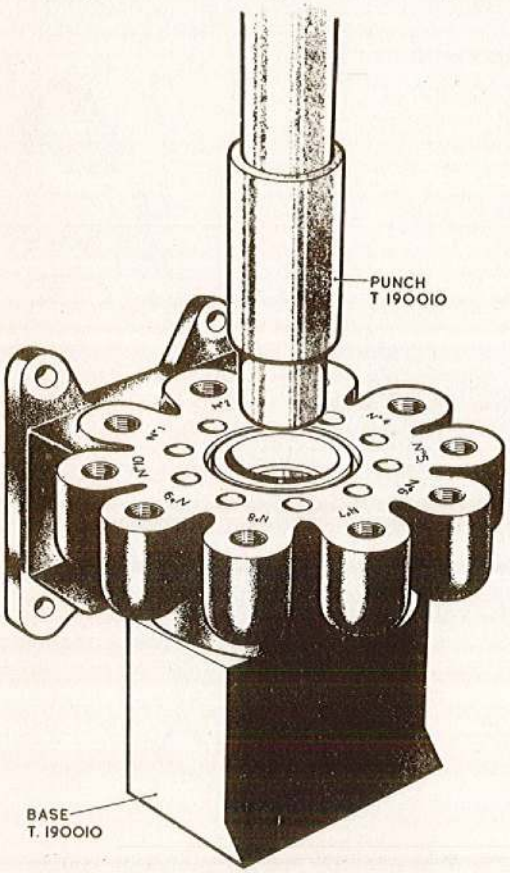

Fig. 3. Removing the metering sleeve

28. All components should be pressure-washed in a kerosine spray supplied by a pump having adequate filtering facilities. Cloth, hard brushes and abrasives must not be used in any circumstances.

29. After cleaning, all components should be dried thoroughly under a compressed air blast, which must be free from water, and placed in dry containers.

INSPECTION

General

30. Visual inspection of the components is described in this section. Where dimensional checks are necessary, the appropriate details are given in the Schedule of Fits and Clearances, Vol. 2, Part 2 of this Air Publication.

31. Every component should be inspected closely for signs of damage or wear and if necessary the part should be discarded and a replacement demanded.

32. Scrupulous cleanliness is essential at all times. It is advisable that the surface of the bench be covered with zinc sheeting or linoleum ; this will assist in maintaining the high standard of cleanliness required.

Distortion checks

33. Distortion checks should not be necessary but if distortion is suspected, a joint face may be checked by means of a surface plate and marking blue whilst the alignment of bores relative to each other or to the joint face should be checked in accordance with general inspection practice.

Permissible wear

34. Details which are subject to wear must be checked dimensionally in accordance with the Schedule of Fits and Clearances.

Redundant parts

35. Tab washers, split pins, gaskets and other consumable parts will be rejected during dismantling. Parts rendered redundant by the incorporation of modifications will be disposed of in accordance with current instructions.

Scores and surface damage

36. In general, scores or surface damage on moving parts and joint faces will impair the operational efficiency of a unit and any part so affected should be rejected.

37. Certain defects however, may be acceptable providing that the Inspector-in-Charge is satisfied that they are insufficient to impair the efficiency and safety of the unit.

Installation connections

38. Inspect all adapters and unions for cleanliness and general condition of their hexagons, threads and sealing faces. The union nipples on the distributor outlet adapters and the seatings in the inlet and drain unions must be free from any damage and scores which may be a source of leakage.

Metering plunger

39. Examine the external surface for scoring. Minute scores which are capable of being polished out with a light application of superfine polishing paper are permissible along the surface of the plunger except for a band approximately 0·125 in. wide measured from the metering edge; no surface damage whatever is permissible within this area.

40. The metering edge is of extreme importance to the efficient functioning of the distributor and inspection should be carried out with the aid of a magnifying glass. Ensure that this edge is clean and free from burrs, nicks and other damage. A razor-sharp edge however, must be removed by a light application of fine emery paper; such polishing must not be allowed to produce a visible chamfer or radius.

41. Ensure that the bore is free from scores. Minute scratches should be polished out with fine emery paper.

42. Inspect the plunger generally for any other defect which may effect the operation of the unit. Check that the clevis pin holes in the fork are free from radial cracks and uneven wear. Ensure that the small axial drilling through the head of the plunger is clean and free from any obstruction.

43. A dimensional check must be made of the outside diameter in accordance with the Schedule of Fits and Clearances. Any wear on this diameter must be compared with any in the metering sleeve bore to determine the total clearance and ascertain that the plunger is suitable for further use.

Metering sleeve

44. Using a small magnifying mirror, examine the sleeve bore for scoring and other damage. Minute scores are permissible provided that they do not run into the edges of the metering ports and can be removed with rouge or fine emery paper. No scoring whatever may be permitted between the run-out of the ports and the edge of the bore and circumferentially between any portion of two adjacent ports.

45. Ensure that the edge of the bore at the flanged end is free from damage, burrs and scores. Any razor-sharpness however, should be polished out with fine emery paper to minimise the possibility of a burr. Take care to avoid producing a chamfer or radius. Scrapers and other tools must not be used to break down this edge.

46. Measure the bore diameter in accordance with the permissible worn tolerances and compare the figure with that of the metering plunger to obtain the working clearance.

Differential plunger

47. Inspect the ground diameters on each side of the sealing ring groove. There should be no severe scores or other surface damage, particularly at the edge adjacent to the closed end of the plunger. Minute scratches should be polished out with fine emery paper to remove any roughness. See that the bore is smooth and free from severe scores.

Differential plunger strut

48. The strut is not so critical a component as the plungers but severe scoring, damage to the conical ends, or roughness at the intersection of the flank and conical ends may cause a tendency for the strut to stick in the plunger bore during opening. As this may affect the performance of the unit the strut should be polished lightly with fine emery paper.

Spring

49. Examine the spring visually for surface defects, cracks, distortion of coils and other damage.

Spring anchorage

50. Examine the spring anchorage for radial cracks emanating from the clevis pin holes. Inspect the holes for wear. See that the threads in the square-section stem are clean.

Adjusting screw and lock-nut

51. Inspect the adjusting screw for damaged threads, flange, spannering square and screwdriver slot. Roughness or severe scoring is not acceptable on the underside of the flange; a damaged surface here may allow fuel to leak across the sealing ring in the spring anchorage guide. It is not advisable to attempt to polish severe score marks from the flange face as out-of-squareness with the thread may result and create a source of leakage.

52. Ensure that the lock-nut hexagon is not damaged and that the threads are satisfactory. Check that the locking wire holes are clear and that their edges are smooth; a sharp edge may cause fracture of the locking wire.

Spring anchor guide

53. Inspect the guide for general condition and see that the hexagon is undamaged. The surface of the flange adjacent to the larger thread should be free from scores as these can be a source of leakage between the face and joint ring. Ensure that the threads are undamaged and that the sealing ring recess in the small end face is clean.

Spring housing

54. Inspect the spring housing generally for signs of damage and cracks, also for the presence of corrosion. See that the small end and fuel inlet boss facings are undamaged and that the threads are in good condition. Severe scoring or damage marks are not permissible on either of these faces or on the large end facing owing to the risk of leakage. Check that the studs are tight, that none are bent and that the threads are in good condition. The locking wire lug on the small end of the housing must be free from cracks and damage and the hole must be clear.

Distributor body

55. Carry out a general examination of the cast surfaces for damage, cracks and corrosion, particularly for radial cracks in the outlet bosses and round the bolt-lugs on the mounting flange. Ensure that the sealing ring recesses and the machined facings are clean and undamaged.

56. If the metering sleeve has been removed inspect the bore of the body for scores or other damage, particularly between the radial outlet drillings, check that the sealing ring has been extracted and ensure that the groove is clean.

57. The counterbore which receives the sleeve flange must be clean with no radial scores on the facing.

58. Ensure that the radial drillings are clean and free from restriction. Inspect the outlet port facings for scores and the threads for serviceability. Check that the sealing ring groove in the facing is clean.

End cover

59. The joint face must be free from scoring or other damage which may permit leakage past the sealing ring. Ensure that the plunger stop is tight and seating properly. Inspect the threads and end face of the central boss for cleanliness and damage, making sure that there are no signs of cracks radiating from the bore due to excessive tightening of the union. Examine the cast surface for signs of corrosion and see that the leakage drain passage is clean and unrestricted.

REASSEMBLING THE FLOW DISTRIBUTOR (INITIAL)

General

60. It is essential that all details, the assembly bench and all tools are clean before commencing to re-build the unit.

61. Prior to assembly it is essential that all sealing rings are immersed completely in kerosine for a period of not less than 24 hours to permit maximum swelling to take place under absorption of fuel.

62. Initially the distributor is re-built with certain slave components to facilitate an intermediate rig-test for calibration of the metering ports; after this the final re-build is carried out followed by final calibration and rig-test.

Distributor body assembly

63. This assembly comprises the body and the metering sleeve and if they have not been separated the following four paragraphs should be ignored.

64. Swill the body and sleeve thoroughly in kerosine and dry in a blast of compressed air. Fit a new sealing ring to the bore of the distributor body, locating the ring securely in the groove.

65. When assembled the sleeve flange face must be below the face of the distributor body; measure them therefore, prior to assembly. The flange must be less than the

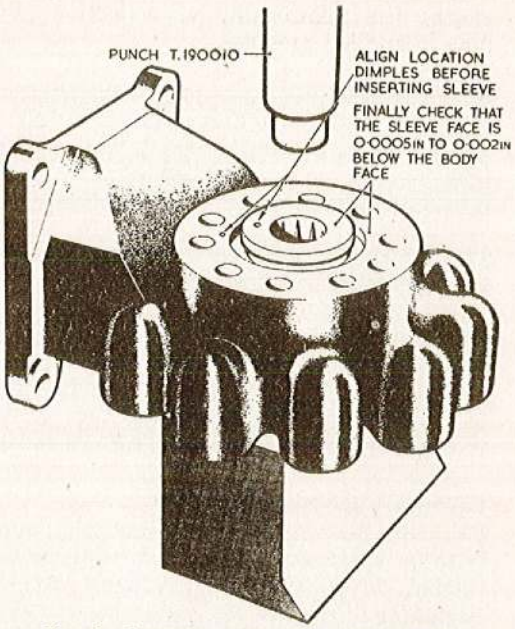

Fig. 4. Inserting the metering sleeve

depth of the counterbore by between 0·0005 in. and 0·002 in.; if otherwise, select another sleeve.

66. The sleeve and body faces are dimpled. By aligning the two dimples, as shown in *fig.* 4, the ports will be in register with the body drillings.

67. Enter the sleeve into the body, align the register mark on the sleeve flange with that on the body facing, and place the body on the locating block of tool T.190010. Locate this assembly and special punch in a manual press. Start the sleeve into the body by operating the ram lightly at first, ensure that the sleeve is entering satisfactorily, then press in firmly as far as possible.

68. Make sure that the sleeve flange is seating correctly on the face of the counterbore and check with a micrometer that the sleeve flange face is between 0·0005 in. and 0·002 in. below the surrounding joint face. Wash thoroughly in the kerosine spray and dry off with compressed air blast.

Fitting the metering plunger

69. Ensure that the components have been cleaned thoroughly. The hooked end of tool T.190007, inserted in the bore of the metering sleeve and rotated in the sealing ring groove, will assist in removing any foreign matter which may be present.

70. Insert a sealing ring into the sleeve bore and, with the hooked end of the tool again, push the ring down until it is located securely in the groove.

71. Insert the plunger into the sleeve until it contacts the sealing ring then check the fit; this must be such that the interference caused by the ring can be felt as a slight drag on the plunger as compared with its normal sliding 'feel' in the plain portion of the bore. A selection of sealing rings is necessary to permit the required fit to be obtained.

72. It may be found that it is necessary to remove the mould 'flash-line' from the sealing ring bore and outside diameter before the correct fit can be obtained.

73. Should the ring fail to seat correctly, trim the outside diameter. Remove the ring from the bore and place it on the special mandrel T.193448. Spin the mandrel in the collet of a power-driven chuck and apply a piece of fine sand-paper or similar medium lightly to the outside of the ring, examining it frequently until the 'flash-line' has disappeared. Clean the ring thoroughly by washing in kerosine before re-fitting it to the sleeve bore.

74. When excessive interference can be felt between the ring and plunger, remove the ring from the sleeve and locate it in the groove in tool T.193447. Secure a fine grinding wheel of not more than 0·50 in. diameter in the power-driven chuck, pass the tool over the wheel then, with the tool held firmly to prevent 'chatter', rotate the tool in the opposite direction with the ring bore lightly touching the wheel.

75. Examine the ring frequently; when the bore 'flash-line' has almost disappeared, re-assemble the ring to the metering sleeve and try the fit of the plunger again. Clean the ring in kerosine before re-fitting it to the sleeve bore. Repeat the process until the required fit is obtained. The plunger must move smoothly with equal friction in each direction and without any intermittent drag or 'chatter'.

Fitting the differential plunger

76. Before the sealing ring is fitted the differential plunger should slide freely in the bore of the metering plunger. With the ring in position the sensitivity of the seal should be similar to that obtained between the metering plunger and sleeve seal.

77. When the differential plunger is satisfactory insert the metering plunger complete with differential plunger into the metering sleeve, omitting the strut as this is not required for initial assembly and preliminary calibration.

78. Position a rubber sealing ring around the sleeve flange in the distributor body.

79. Fit an end cap (dust caps of a suitable size are satisfactory) firmly over each end of a light compression spring having a free length of approximately 2·50 in., a totally compressed length of 1·40 in. (or less) and an outside diameter not exceeding 1·00 in.

80. Place the spring and caps in a slave spring housing, if available or into the spring housing belonging to the unit and assemble this to the distributor body.

81. To complete the temporary assembly the rig-test adapter T.167552, as shown in *fig.* 5, is to be fitted to the outlet facing. A micrometer head is carried in the adapter; this operates on the bottom of the differential plunger and adjustment of the micrometer, in or out, will move the plunger assembly to open or close the metering ports.

82. Before fitting the slave cover, adjust the micrometer to approximately 0·500 in. and fit a sealing ring to the groove in the distributor body outlet facing. Fit the cover to the body and return the assembly with slave washers and nuts.

83. Fit slave unions with sealing washers to the distributor body outlet ports and assemble the test-rig adapter T.190008 to the inlet connection on the spring housing.

84. Connect the unit to the metering port calibration rig as shown in fig. 6.

RIG TEST (PRELIMINARY)

General

85. It is necessary for the flow distributor to pass two rig tests after reconditioning. The first, or preliminary test, is to check the individual and collective calibration of the metering ports. The final test is carried out with the unit assembled completely and checks the relationship of collective port flow to applied pressure.

86. The test procedure for all distributors is similar and a standard basic schedule is applicable to all units; calibration values however, may vary according to the requirements of different engine installations.

87. Specific calibration values are given in the Appendices to this chapter.

88. The fuel to be used in the test-rigs is Aviation Turbine fuel to Specification D.Eng.R.D. 2482 and must be maintained at a temperature of between 20 deg. C. and 26 deg. C. at any time that the rigs are in use.

Calibrating the metering ports

89. The flow through the metering ports is to be measured at several predetermined settings of the metering plunger. At the beginning of the test a leakage check is to be made with the plunger in the closed position.

90. Check that the rig pump delivery is set to minimum flow, that the pressure control

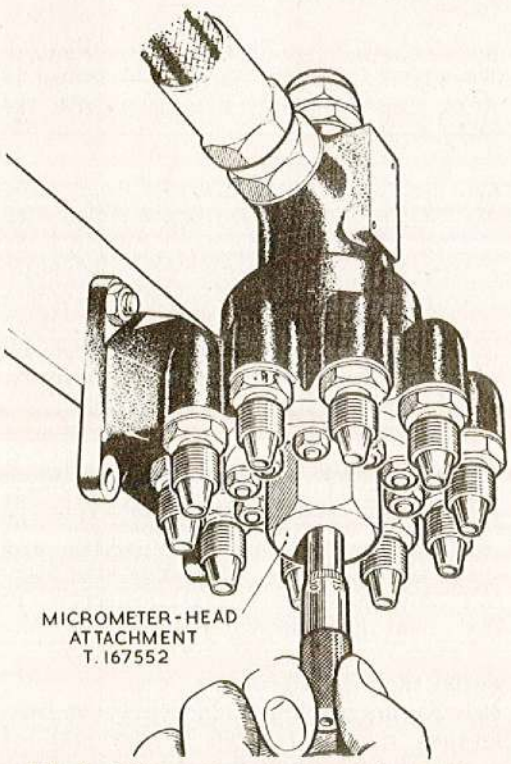

Fig. 5. Micrometer attachment for port calibration

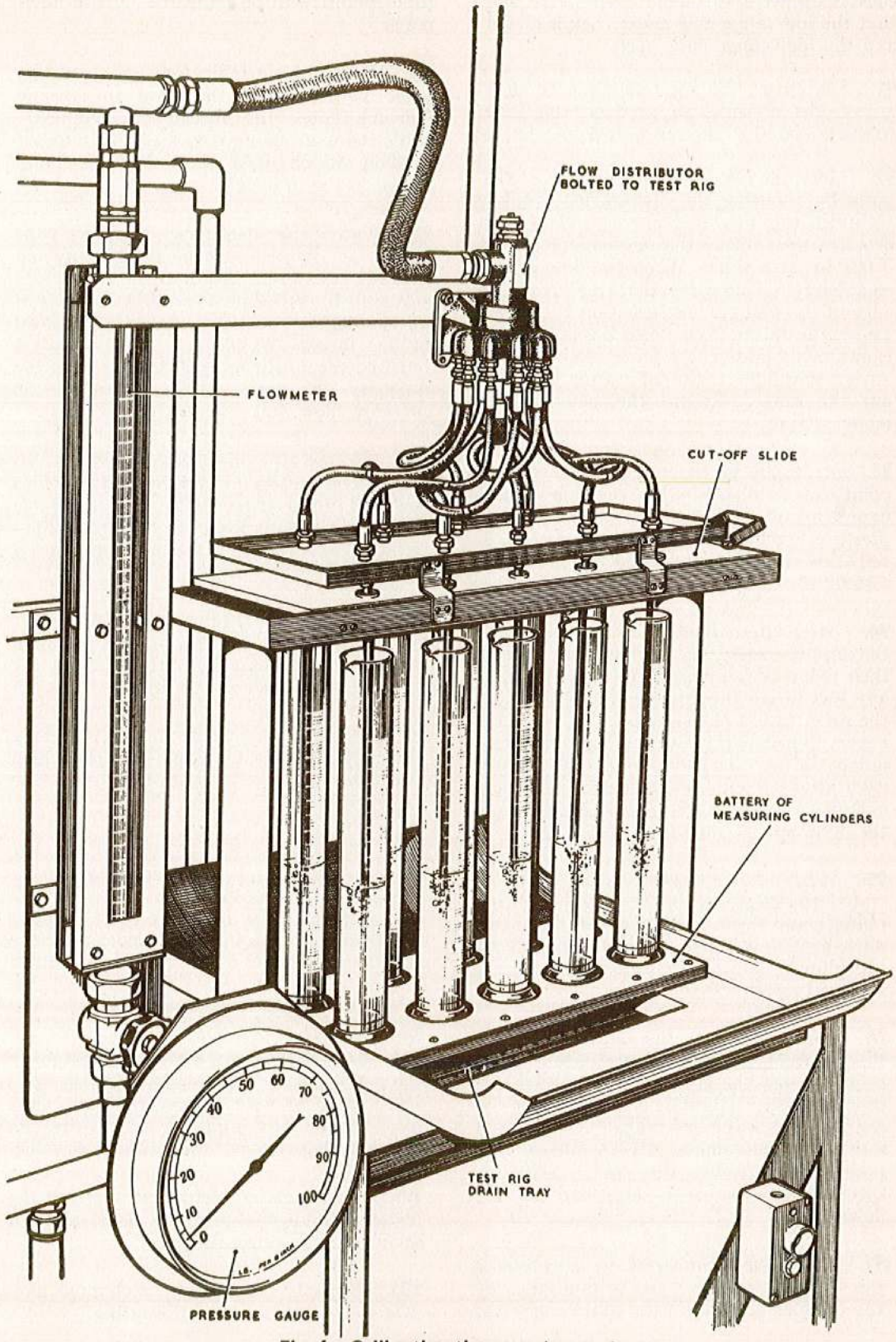

Fig. 6. Calibrating the metering ports

RESTRICTED

cock is adjusted to minimum pressure and that the low-range flow meter cock is closed and the high-range cock open.

91. Switch on the rig pump motor then adjust the controls to produce the inlet pressure stated in the relevant Appendix.

92. Move the metering plunger to close the ports by screwing the micrometer thimble IN until the fuel delivery is reduced to droplets then rotate the micrometer gently 0·001 in. at a time. When the flow ceases completely it indicates that the metering edge of the plunger has sealed off the ports. This is the datum from which the calibration is obtained and must be found exactly since any error will affect the calibration throughout the range. Record the exact micrometer setting.

93. Screw the micrometer thimble IN to a point exactly 0·025 in. less than the datum figure and adjust the rig to produce the input pressure specified in the Appendix. Maintain this condition and allow the unit and test-rig to stabilise.

94. After approximately 15 minutes place the empty measuring cylinders in position then move the sliding cut-off plate to allow any fuel to fall into the cylinders, checking the time with a stop-watch as the slide uncovers the delivery nozzles above the cylinders. Move the slide to the cut-off position after one minute and check that each cylinder has collected no more fuel than the amount specified in the Appendix.

95. If the leakage exceeds the quantity stated the clearance between the metering plunger and sleeve is excessive and the test must be discontinued, the unit stripped and the plunger and sleeve re-inspected as described in para. 39 to 46.

96. Continuing with the calibration screw the micrometer OUT to the datum point again, adjust the rig pump to provide the input pressure specified in the Appendix, change over to the low-range flowmeter and screw the micrometer OUT, moving the plunger to uncover the ports, until the specified flow value is indicated on the flowmeter.

97. The value specified in the Appendix is the flow per port and must be multiplied by the number of ports in the unit to give the total quantity to be indicated by the flowmeter.

98. When the rig indicators are steady at these figures move the slide to let the delivery enter the measuring cylinders; while these are filling record the micrometer reading, which must be within the limits stated in the schedule.

99. Watch the measuring cylinders constantly and immediately the level in any one cylinder rises to the larger of the two values stated in the schedule, move the slide to cut off the delivery to the cylinders. The level of fuel in each of the remaining cylinders must be within the limit stated. Record the quantity in each cylinder against the pressure, flow and micrometer readings.

100. Record the micrometer setting and fuel delivery at each of the required settings specified in the Appendix table, the extreme right-hand column indicating the maximum permissible variation between the measuring cylinders at each setting.

101. Should any reading obtained be outside the limits given in the third and fourth columns, the metering sleeve must be rejected and a new sleeve fitted.

102. When the results are satisfactory record the figures on a test certificate, which must be approved and signed by the inspector.

103. Disconnect the distributor from the test-rig and return it to the assembly bench. Remove the rig-test adapter, then separate the spring housing from the body, extract the slave spring from the housing and the distributor is ready for the final reassembly.

FINAL REASSEMBLY

Spring and plunger assembly

104. If a new spring is to be fitted check the end loops for squareness with the coils and alignment with the centre-line as misplaced loops may impose a side loading on the metering plunger and cause it to stick.

105. Place one loop within the fork of the metering plunger, insert the clevis pin and secure it with a new split pin.

106. Assemble the spring anchorage likewise to the other end of the spring.

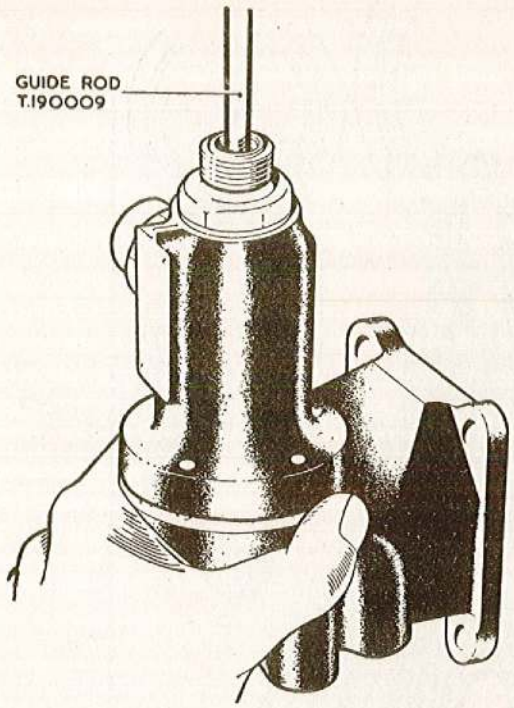

Fig. 7. Final assembly using spring anchor guide tool

Assembling the spring housing

107. Place a rubber sealing ring and a steel outer retaining washer over the large end thread on the spring anchor guide, enter the thread into the small end of the housing and screw in. Ensure that the steel washer is located properly around the rubber washer before tightening the guide, which must be pulled down tightly on to the steel washer.

108. Fit a rubber sealing ring and steel retaining washer to a slave adapter and screw this into the inlet boss.

Assembling the distributor

109. Screw the guide rod T.190009 into the spring anchor and insert the plunger assembly gently into the metering sleeve, taking care to avoid disturbing the sealing ring.

110. Invert the spring housing and the distributor assembly, holding the forked end of the plunger with a finger to prevent the plunger from leaving the sleeve, insert the spring assembly into the housing and lower the distributor so that the free end of the guide rod enters the square hole in the spring anchor guide.

111. Align the studs with the holes in the body so that the fuel inlet boss is located in the correct position relative to the mounting flange of the unit ; this is dependent upon installation requirements and once the unit has been calibrated satisfactorily the body and spring housing cannot be separated without the calibration being disturbed.

112. Turn the unit over again so that the spring housing is uppermost, sealing the outlet of the metering sleeve with a finger to prevent the plunger from sliding out of the bore, then lower the spring housing on to the body until the stem of the spring anchor contacts the anchor guide. Rotate the protruding guide rod to align them and when the anchor stem enters the square hole in the guide lower the housing fully on to the body face, as shown in *fig.* 7.

113. Invert the complete unit and insert the strut into the differential plunger, ensure that the sealing ring is located correctly on the body joint face and fit the end cover, plain washers, grover washers and retaining nuts. Tighten the nuts evenly and uniformly.

114. Using the protruding spring anchor guide tool, move the plunger assembly gently in and out to check that no sticking has arisen through distortion during tightening.

115. Unscrew the guide tool from the spring anchor, insert a rubber sealing washer into the recess in the end face of the guide and fit the adjusting screw which should be screwed in until it contacts the seal ; do not tighten the screw.

116. Fit the adjusting screw lock-nut finger tight.

117. Fit dust caps to the inlet connection and dust plugs to the outlet ports and drain boss to protect the unit until it is to be rig-tested.

RIG TEST (FINAL)

Performance calibration

118. The flow distributor must be mounted on the performance calibration rig as shown in *fig.* 8, and tested in accordance with the appropriate schedule in the Appendices.

119. On this rig the distributor outlet unions are connected to a common collecting

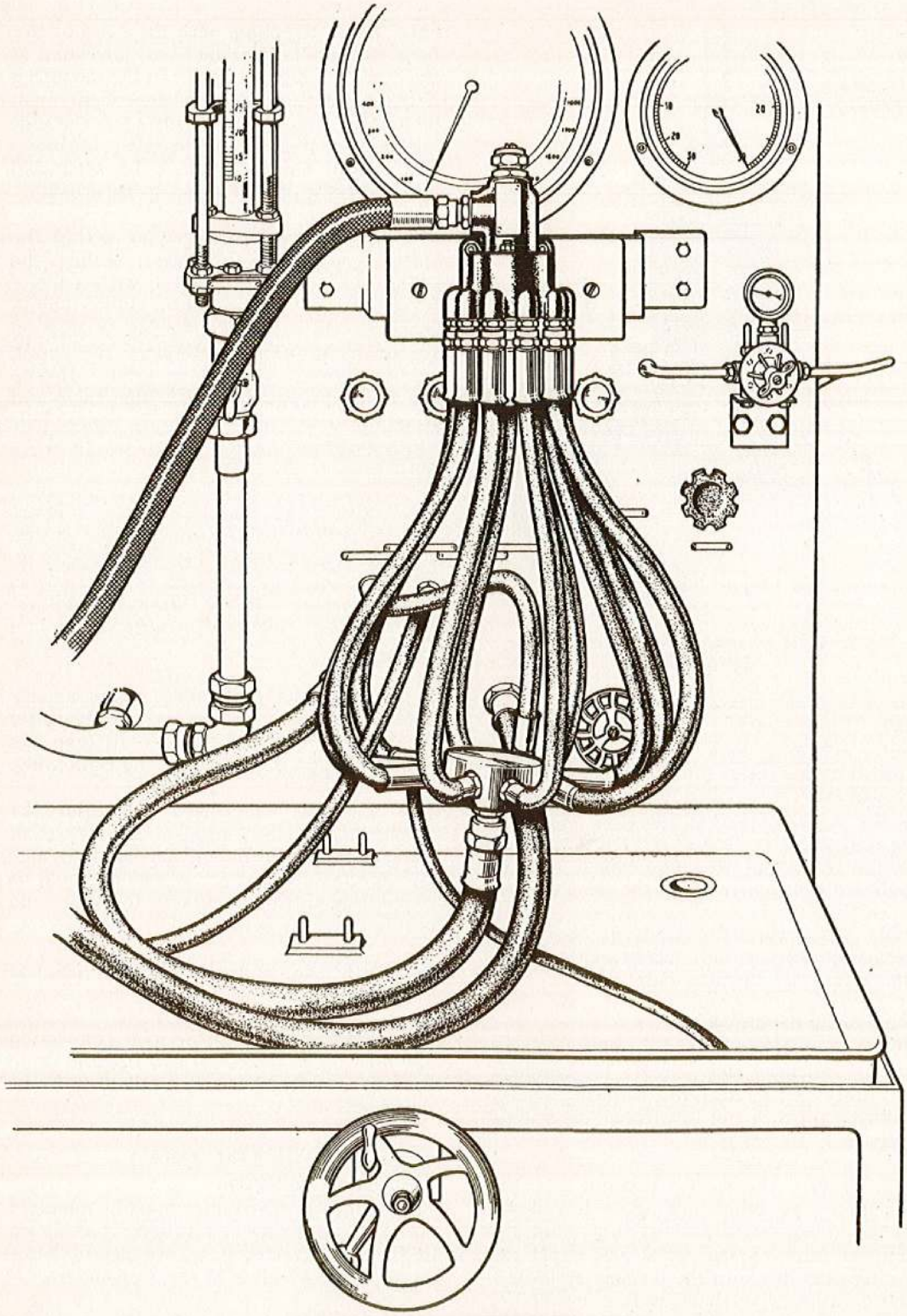

Fig. 8. Performance calibration rig

box having a single outlet pipe which returns the fuel through a pressure tapping point and a manually-variable restriction cock to the rig tank. A pressure gauge connected to the pressure tapping indicates the delivery pressure whilst the cock enables a controllable pressure to be applied downstream of the flow distributor, simulating the combined restriction imposed by the burners in an actual engine installation.

120. When the unit is installed on the rig see that the high range flowmeter cock is OPEN, with the low-range cock CLOSED and check that the flow and outlet pressure controls are set to zero.

121. Start the rig pump and allow it to stabilise by running it for a few moments at idling speed.

122. Open the low-range flowmeter cock, close the high-range cock and adjust the flow to indicate the lowest value stated in the appropriate schedule in the Appendix, noting that the figure specified is for a single port and must be multiplied by the number of ports in the unit to obtain the value to be indicated by the flowmeter. Adjust the delivery restricting cock to raise the delivery pressure to that stated then note the indicated inlet pressure. If this is outside the stated limits increase the flow to a value further up the schedule, adjust the delivery pressure to the new figure and check the inlet pressure again ; if it is not within the stated limits at this value, the adjusting screw setting must be altered.

123. To re-set the adjustment, slacken the lock-nut and using tool T.160988, as shown in fig. 9, turn the screw clockwise to increase or anti-clockwise to decrease the inlet pressure. It has been found advantageous generally to adjust this unit so that the inlet pressure indicated is approximately 10 lb. per sq. in. above the minimum limit. Check that the setting is satisfactory at each end of the range adjusting the screw as required.

124. It may be found that the rubber sealing ring under the screw head will be compressed when the lock-nut is tightened and may alter the adjustment. Before the setting finally is satisfactory with the lock-nut tightened fully, two or three attempts may be necessary.

125. With the unit calibrated to the upper and lower values in the table it is to be performance tested, checking the indicated inlet pressure over the range of values stated in the table. Record accurately in two columns the inlet pressure indicated at each value during a run up and then down the test schedule. This will show, by discrepancy, if drag (hysteresis) occurs with the plunger sealing ring creating a friction which is not equal in both directions of plunger travel.

126. Should severe hysteresis occur it will be necessary to dismantle the unit to inspect the sealing ring for plucking by the plunger or rolling due to the flash-line having been removed unevenly or insufficiently during assembly.

127. Correct the ring so that any uneven-

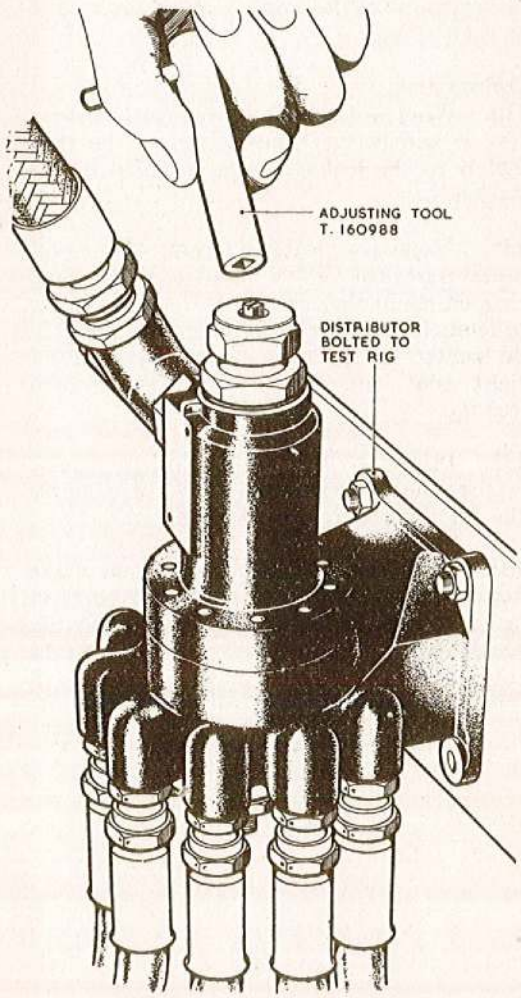

Fig. 9. Adjusting the range

ness is removed, as described in *para.* 74, or if this is not practicable, change the ring. In either event the unit must be re-calibrated as described in *para.* 122 to 125 before proceeding further.

128. If it is found during the tests that the inlet pressure is below the minimum limit specified at the low-pressure end of the range but higher than the maximum limit at the top of the range the spring rating is incorrect and the spring must be changed for one of a higher rating. A lower-rated spring will be required should the indicated inlet pressure be more than the maximum limit stated at the low pressure end of the range and less than the high pressure minimum limit.

129. As soon as the specified conditions are obtained, carry out a complete check from minimum to maximum flow and outlet pressure and a check for hysteresis on the return to minimum flow. Record the results at each stage.

Leakage test

130. When the result of the performance test is satisfactory the unit must be subjected to the leakage tests specified in the Appendix.

131. Excessive leakage from the drain outlet port may be due to a defective sealing ring either in the metering sleeve or on the differential plunger; the defective ring can be located by renewing each in turn with a tight seal and checking the individual leakage.

132. Prior to the final leakage check remove the rig-testing adapters and assemble the installation fittings to the unit.

133. With certain distributors some of the outlet unions may have restricted bores in order to dis-proportion the flow to certain particular burners. These unions must be tested for flow independently of the distributor in accordance with the separate calibration table given in the appropriate schedule in the Appendices. These unions are numbered and they must be fitted to the correspondingly-numbered delivery ports in the distributor body.

134. Dry the exterior of the unit thoroughly with compressed air blast, restrict the delivery to increase the pressure to that stated in the Appendix and maintain this for the period specified. Any leakage other than from the drain connection must be rectified by renewing the offending sealing ring.

PREPARING FOR DESPATCH

Locking

135. After removing the distributor from the test-rig, drain all fuel from the unit and wire lock the spring anchor guide flange, the adjusting screw lock-nut and, where required, the installation fittings with 22 S.W.G. stainless steel wire.

Inhibiting

136. The distributor is to be flushed thoroughly with oil to Specification DTD.587, sufficient pressure being required to move the metering plunger to uncover the ports and allow the oil to issue from the outlet ports.

137. After flushing remove the unit from the inhibiting rig, drain off the surplus oil and assembly dust caps or plugs to the distributor inlet, outlet and drain connections to avoid the ingress of foreign matter to the interior of the unit.

Final inspection

138. Check that all connections have been blanked off, check that the name plate is attached securely and ensure that the information on the plate corresponds with the details of the actual unit.

139. See that the test certificate is complete and approved.

APPENDIX 1

CALIBRATION CODE 'C'

Note;—

Reference must be made to the particular paragraph quoted in the main text.

Port calibration (*refer to para.* 89)

1. Input pressure 5 lb. per sq. in. Plunger set IN to 0·025 in. from datum (*para.* 93).

2. Increase to 30 lb. per sq. in. and maintain for 15 minutes.
   After 15 min. the leakage per port must not exceed 15 c.c. per minute (*para.* 94).

3. Port calibration table (*para.* 96).

Inlet pressure (lb. per sq. in.)	Mean flow per port (g.p.h.)	Plunger travel from opening point datum (in.—micrometer reading)	Maximum variation between measuring cylinders (c.c. per min.)
50	1·0	0·025 to 0·045	100— 75
20	1·1	0·045 to 0·065	100— 85
10	1·6	0·080 to 0·100	100— 91
5	2·2	0·135 to 0·160	100— 94
5	3·35	0·175 to 0·210	100— 95
5	4·5	0·210 to 0·250	200—190
5	5·6	0·240 to 0·270	200—190
5	6·7	0·265 to 0·295	200—190

Performance calibration (*refer to para.* 118)

4. Calibration table (*para.* 122).

Mean flow per port (g.p.h)	Outlet pressure (lb. per sq. in.)	Inlet pressure (lb. per sq. in.)	
		Minimum	Maximum
2	0·5	Record only	Record only
5	7·0	250	270
10	25·0	285	305
15	56·0	315	335
20	100·0	345	365
25	157·0	372	392
30	225·0	405	425
35	306·0	440	460
40	400·0	480	500
60	900·0	—	945

Leakage test (*refer to para.* 130)

5. The leakage from drain must not exceed 15 c.c. per min. at an inlet pressure of 1000 lb. per sq. in. (*para.* 130).

6. There must be no external leakage other than from the drain during a period of 5 min. at a delivery pressure of 1500 lb. per sq. in. (*para.* 134).

APPENDIX 2

CALIBRATION CODE 'E'

Note;—

Reference must be made to the particular paragraph quoted in the main text.

Port calibration (*refer to para.* 89)

1. Inlet pressure 5 lb. per sq. in. Plunger set IN to 0·025 in. from datum (*para.* 93).

2. Increase to 30 lb. per sq. in. and maintain for 15 minutes.
   After 15 min. the leakage per port must not exceed 15 c.c. per minute (*para.* 94).

3. Port calibration table (*para.* 96).

Inlet pressure (lb. per sq. in.)	Mean flow per port (g.p.h.)	Plunger travel from opening point datum (in.—micrometer reading)	Maximum variation between measuring cylinders (c.c. per min.)
50	1·0	0·025 to 0·045	100— 75
20	1·1	0·045 to 0·065	100— 85
10	1·6	0·080 to 0·100	100— 91
5	2·2	0·135 to 0·160	100— 94
5	3·35	0·175 to 0·210	100— 95
5	4·5	0·210 to 0·250	200—190
5	5·6	0·240 to 0·270	200—190
5	6·7	0·265 to 0·295	200—190

Performance calibration (*refer to para.* 118)

4. Calibration table (*para.* 122).

Mean flow per port (g.p.h.)	Outlet pressure (lb. per sq. in.)	Inlet pressure (lb. per sq. in.)	
		Minimum	Maximum
2	0·5	Record only	Record only
5	6·0	220	280
10	25·0	310	365
20	100·0	440	490
30	225·0	550	600
40	400·0	670	715
50	625·0	805	845
55	758·0	885	920
70	1250·0	—	1310

Leakage test (*refer to para.* 130)

5. The leakage from drain must not exceed 15 c.c. per min. at an inlet pressure of 1000 lb. per sq. in. (*para.* 130).

6. There must be no external leakage other than from the drain during a period of 5 min. at a delivery presure of 1500 lb. per sq. in. (*para.* 134).

APPENDIX 3

CALIBRATION CODE 'G'

Note:—

Reference must be made to the particular paragraph quoted in the main text.

Port calibration (*refer to para.* 118)

1. Input pressure 5 lb. per sq. in. Plunger set IN to 0·025 in. from datum (*para.* 93).

2. Increase to 30 lb. per sq. in. and maintain for 15 minutes.
   After 15 min. the leakage per port must not exceed 15 c.c. per minute (*para.* 94).

3. Port calibration table (*para.* 96).

Inlet pressure (lb. per sq. in.)	Mean flow per port (g.p.h.)	Plunger travel from opening point datum (in.—micrometer reading)	Maximum variation between measuring cylinders (c.c. per min.)
50	1·0	0·025 to 0·045	100— 75
20	1·1	0·045 to 0·065	100— 85
10	1·6	0·080 to 0·100	100— 91
5	2·2	0·135 to 0·160	100— 94
5	3·35	0·175 to 0·210	100— 95
5	4·5	0·210 to 0·250	200—190
5	5·6	0·240 to 0·270	200—190
5	6·7	0·265 to 0·295	200—190

Performance calibration (*refer to para.* 118)

4. Calibration table (*para.* 122).

Mean flow per port (g.p.h.)	Outlet pressure (lb. per sq. in.)	Inlet pressure (lb. per sq. in.)	
		Minimum	Maximum
2	0·5	Record only	Record only
5	6·0	220	280
10	25·0	310	365
20	100·0	440	490
30	225·0	550	600
40	400·0	670	715
50	625·0	805	845
55	758·0	885	920
70	1250·0	—	1310

Leakage test (*refer to para.* 130)

5. The leakage from drain must not exceed 15 c.c. per min. at an inlet pressure of 1000 lb. per sq. in. (*para.* 130).

6. The restricting (bias) unions are to be assembled after the distributor has been calibrated. These unions must be selected to provide the individual flows specified in the following table (*para.* 133).

Pressure drop (lb. per sq. in.)	Flow (gal. per hour)	
	No. 4 PORT	No. 9 PORT
100	14·5	20·0
1000	26·0 to 45·0	60·5 to 61·5

7. There must be no external leakage other than from the drain during a period of 5 min. at a delivery pressure of 1500 lb. per sq. in. (*para.* 134).