Chapter 1

ACCUMULATOR, TRIP VALVE AND HIGH PRESSURE COCK TYPE A.C.4/5A.

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LIST OF ILLUSTRATIONS

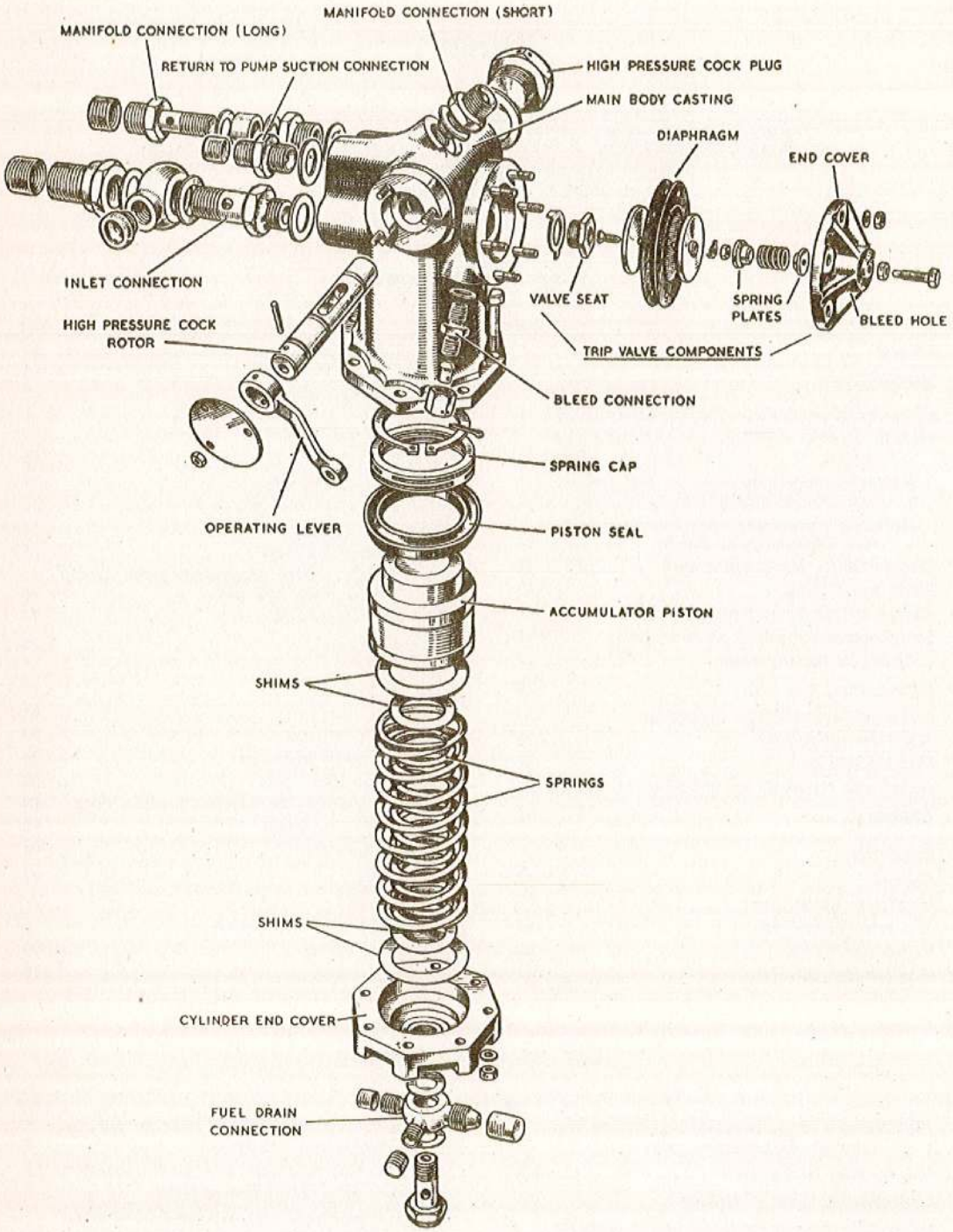


Fig. 1. Exploded view of the combined accumulator, trip valve and high pressure cock

General

1. The A.C.4/5A. type accumulator trip valve and high-pressure cock, a dismantled view of which is given in fig. 1, derives its designation from the basic type A.C.4, the installation code number "5" and the calibration code letter "A". Combined accumulator units of this type are fitted to Rolls Royce Derwent Mk. 5 engines.

2. During the repair of the accumulator unit it is essential that all parts are kept clean. All components must be stored in suitable containers, thus reducing the possibility of loss, damage and corrosion. To prevent damage to nuts and bolts during dismantling and reassembly, box and ring spanners should be used wherever possible.

3. Whenever a joint or seal is broken, the gasket joint washer or seal must be renewed. New split pins, tab washers and lock-wire must always be fitted during reassembly. A list of parts which are separately interchangeable is given under Replacements (*para.* 78).

4. Slave nuts, washers, gaskets and screws should be used when temporarily assembling components; this will prevent damage to sound parts and reduce unnecessary scrap.

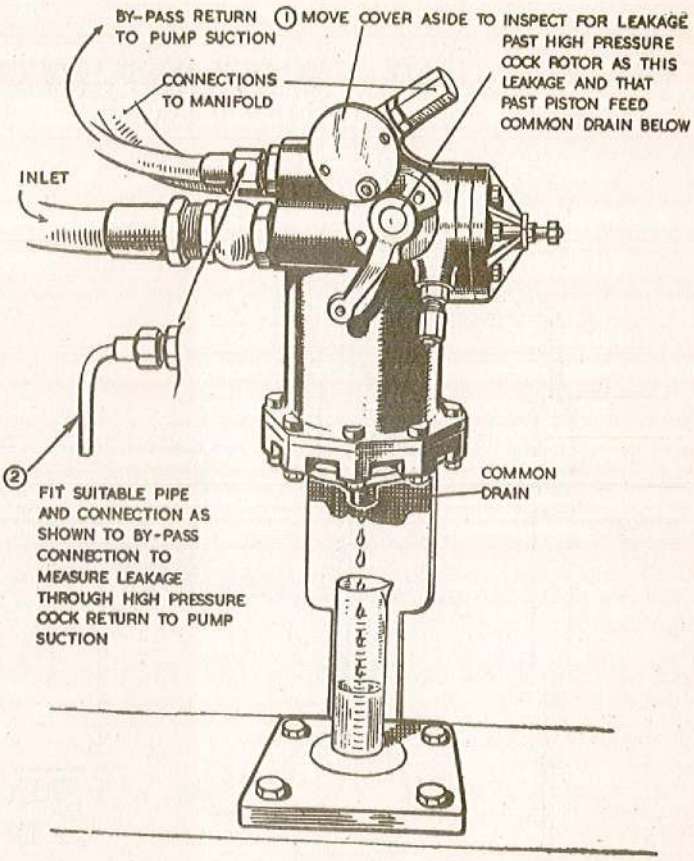


Fig. 2. Unit mounted on test rig

SPECIAL TOOLS

5. Special tools and a test rig are required for the repair and overhaul of the combined accumulator, trip valve and high-pressure cock. The tools required are listed below; fully dimensioned drawings are given in fig. 5, 7 and 9 for the tools which are to be manufactured locally.

Provisioned part No.	Nomenclature
R.44	Test Rig

Manufactured locally	Nomenclature
	Assembling and dismantling fixture for piston assembly.
	Protective guide, for insertion of piston assembly in cylinder
	Indicator rod, for measuring piston travel

CHECKS AND PRECAUTIONS BEFORE DISMANTLING

6. Study any complaints reported with the unit and carefully examine externally for any visible signs of damage or unauthorized dismantling. Ensure that all connections which open to atmosphere have been securely covered to prevent the entry of any foreign matter into the interior of the unit. Examine the inside of the dust caps when removed for signs of metal or extraneous matter. If the presence of any matter

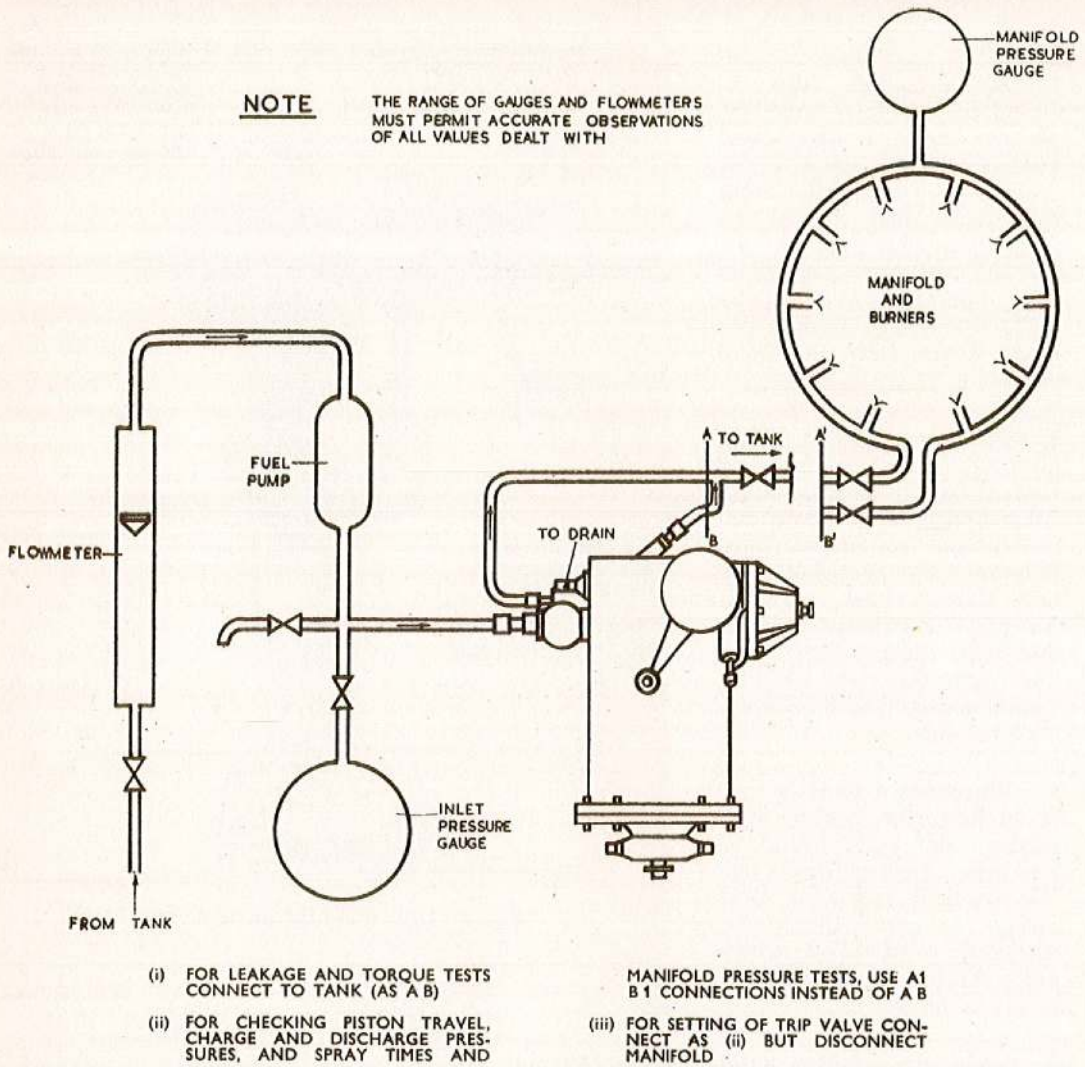


Fig. 3. Diagrammatic layout of test rig

is suspected, flush out the unit on the test rig as shown in fig. 2 before submitting it to the preliminary tests. When flushing the accumulator, blank off the return to pump suction connection, connect a flexible pipe of suitable length to each manifold connection and place the open ends of the pipes in the drip tray. With the shut-off cock open, charge the accumulator piston bore by raising its inlet pressure to that for point " B " as stated in the text for checking the charge and discharge pressures (*para.* 17 *to* 21). Sharply exert a slight extra pressure sufficient to cause the trip valve to open and allow fuel to be ejected back to the drip tray. At the completion of this operation remove the flexible pipes.

7. If the unit appears sound externally, carry out the following functional tests.

(1) Leakage test for high-pressure cock rotor and sleeve.

(2) Torque test for high-pressure cock.

(3) Piston travel check.

(4) Charge and discharge pressure checks.

(5) Spray times and manifold pressure tests.

Note . . .

If, during these tests, parts which may affect later tests are found defective, testing should be stopped and the unit stripped for inspection.

Leakage test for high-pressure cock rotor and sleeve

8. Mount the unit vertically on the test rig (*fig.* 2 and 3), with the fuel drain connection in the lowest position, and connect up as shown. Secure the high-pressure cock in the open position and adjust the flow to 320 gallons per hour on the flowmeter. By restriction of the manifold flow adjust the fuel inlet pressure to 750 lb. per sq. in.

Measuring the leakage round the high-pressure cock rotor to atmosphere

9. With the high-pressure cock still open, place a measuring cylinder under the fuel drain connection and check the leakage, which should be between 20 and 40 c.c. over a period of one minute. Record the exact leakage obtained on the test certificate

10. If the leakage is in excess of 40 c.c. per min. it may be traced to one or both of the following defects ; excessive leakage past the high-pressure cock or accumulator piston. As each spills through the common drain it is not possible to ascertain which part is defective without first partially stripping the unit. As the piston cannot be checked without completely stripping the unit, it will be necessary to check the high-pressure cock for excessive leakage first. This is checked either by removing the plug from the casting at the end of the cock remote from the operating lever, or by moving the circular cover, which retains the cock, aside (*fig.* 2) after which the leakage past the cock can be observed. If the leakage past the cock is not excessive then it must be assumed that the piston is at fault.

Measuring the leakage through the high-pressure cock return to pump suction

11. With the high-pressure cock still open, allow the leakage past the high-pressure cock to drain from the pump suction return connection into a measuring cylinder (*fig.* 2)—this leakage must not exceed 100 c.c. over a period of one minute.

Torque test for high-pressure cock

12. Connect a spring balance to the connecting pin hole in the operating lever of the high-pressure cock and apply sufficient tension, at right angles to the lever, first to close and then to open the cock (*fig.* 4). The torque must not exceed 13·5 lb. in., namely, 6 lb. on the spring balance at 2·25 in. radius (the effective length of the operating lever). Record the actual torque obtained on the test certificate. If this reading is exceeded the rotor is too tight and a replacement must be fitted, during the overhaul of the unit.

Piston travel check

13. Mount the unit on the rig with the drain to atmosphere uppermost, and the high-pressure cock closed. Blank off the outlets to the manifold, and remove the drain connection from the accumulator cylinder end cover. Screw the bush of

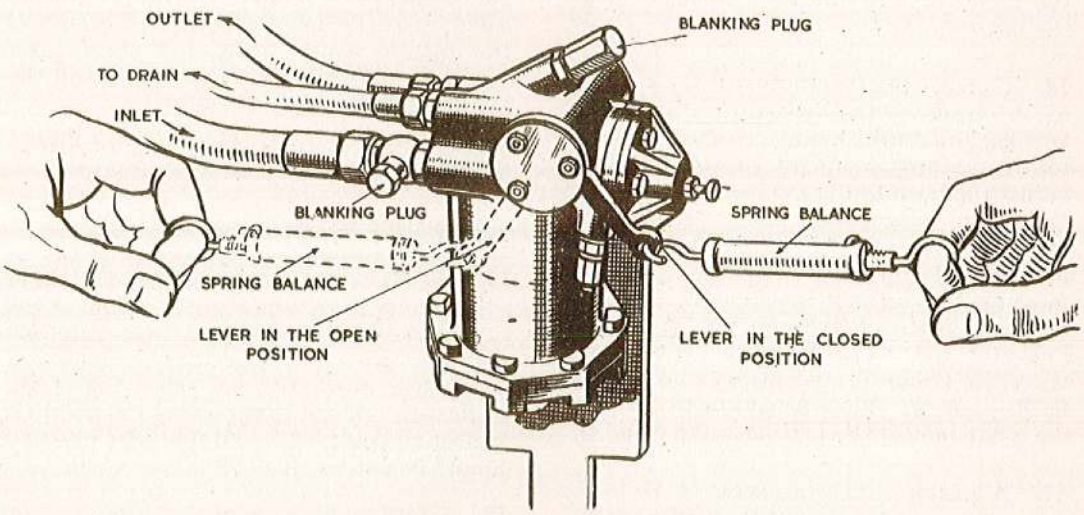
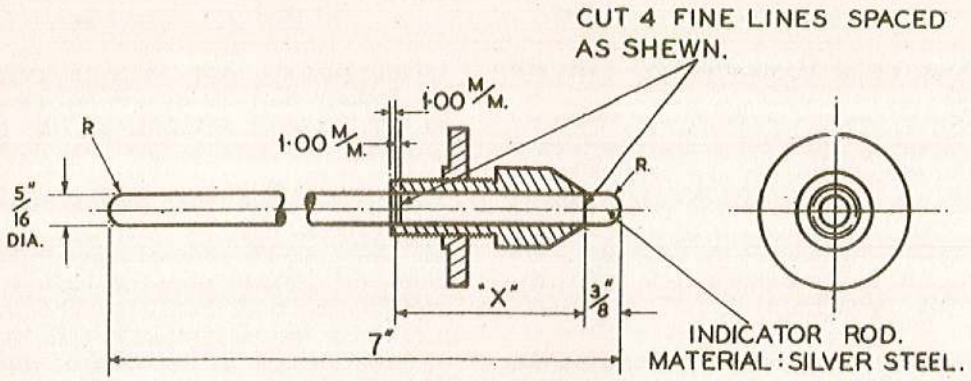


Fig. 4. Using spring balance for torque test on operating lever



TOOL SHOWN ASSEMBLED.

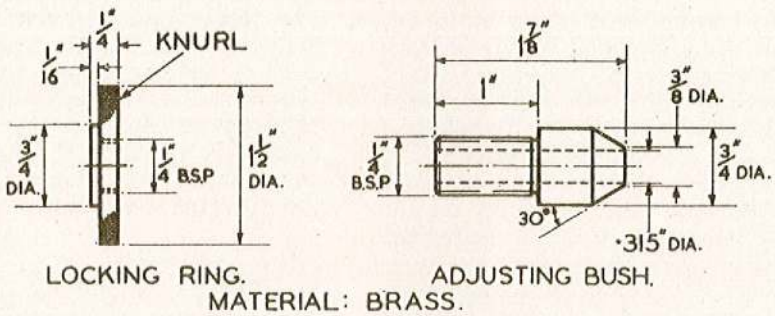


Fig. 5. Indicator rod, bush, and locking ring

the piston travel indicator gauge into the drain connection hole in the cover and lower the indicator rod through the bush on to the piston (*fig.* 6).

14. Connect the inverted unit as shown in fig. 6, ensuring that the piston is at the bottom of its stroke and that the indicator rod is seating correctly on the piston; adjust the bush to the top mark on the rod. Gradually increase the inlet pressure to allow the piston to rise in the cylinder until it reaches the top of its stroke, and accurately measure the distance between the top face of the bush and the top mark on the indicator rod. This distance denotes the travel or stroke of the piston and should be 46±1 m.m. Lines should be marked on the rod to indicate this distance (*fig.* 5 and 6).

15. A piston stroke in excess of 47 m.m. may occur if the abutment on the cover, which forms the piston stop, wears during service. Slight excess movement is permissible, provided that the stop is not too badly worn or damaged, in which case the cover must be renewed. In the event of the piston stroke being too short, new accumulator springs must be fitted and the stroke of the piston rechecked.

16. Similarly, check the travel or stroke of the piston in the reverse direction.

Charge and discharge pressure checks

17. With the unit mounted on the rig (as for the previous test) adjust the inlet pressure to 15 lb. per sq. in. Increase the inlet pressure steadily and note carefully the pressure at which the accumulator commences to charge, i.e., when the piston begins to move upwards; this point is known as point "A", and the inlet pressure should be not less than 23 lb. per sq. in.

18. Continue to increase the inlet pressure until the accumulator is fully charged,

namely, when the piston has just completed its upward stroke (point "B,") and observe the inlet pressure. This pressure must be 55±3 lb. per sq. in.

19. Steadily decrease the pressure until the accumulator commences to discharge, that is, when the piston begins to move back, and observe the inlet pressure (point "C.") This pressure must be 48±2 lb. per sq. in.

20. Continue to reduce the inlet pressure until the accumulator is fully discharged, i.e., when the piston has just completed its stroke, and observe the inlet pressure, (point "D"). This pressure must be not less than 20 lb. per sq. in.

Note . . .
If the differences between the readings observed on the upward stroke and the readings observed on the downward stroke of the piston are too great, check the drag between the piston seal and the accumulator cylinder.

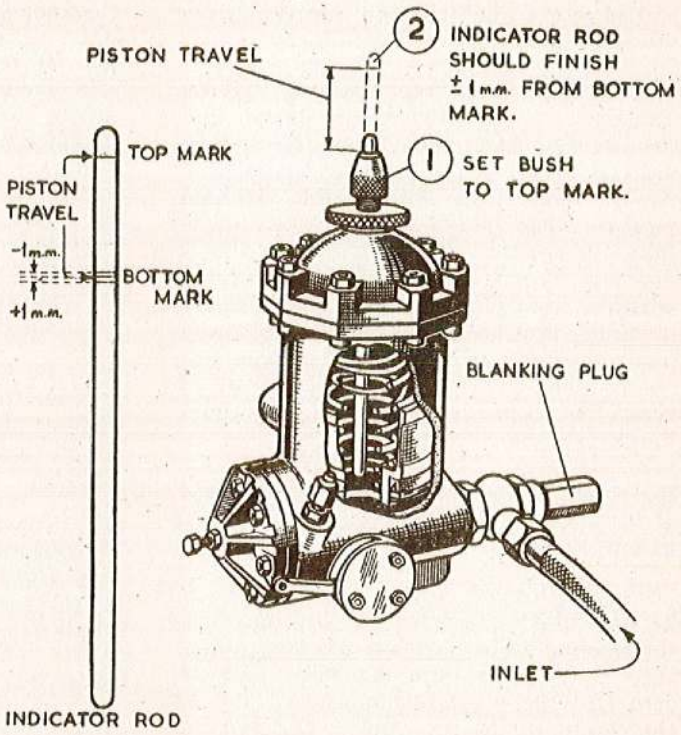


Fig. 6. Checking the accumulator piston travel

21. The difference between points "A" and "D" and points "B" and "C" must not exceed 8 lb. per sq. in. Adjustment can be effected by the insertion or removal of shims from under the accumulator springs; the total thickness of shims must not exceed 3 m.m.—each shim being $\frac{1}{8}$ m.m. thick.

Spray times and manifold pressure tests

22. Refit the fuel drain connection and mount the unit vertically on the test rig with the drain in the lowest position. Secure the high-pressure cock in the open position and connect the unit to the appropriate manifold and burners as shown in fig. 3. For these tests the capacity of the connecting pipes and burners must be approximately 8 cu. in. Ten burners, each with flow numbers of 1·35 are to be coupled to the manifold.

23. This test is carried out at three different flow settings, namely, 25, 35 and 40 gallons per hour and the corresponding times and pressures which must be obtained are tabulated as follows:—

FLOW IN G.P.H.		25	35	40
MAXIMUM TIME INTERVAL FROM START TO SPRAY IN SEC.		12	11	10
MANIFOLD PRESSURE WHEN SPRAYING COMMENCES IN LB. PER SQ. IN.	MAXIMUM	26	26	26
	MINIMUM	23	23	23
MINIMUM DURATION OF SPRAY IN SEC.		3	3	3
MAXIMUM MANIFOLD PRESSURE AT CUT-OFF IN LB. PER SQ. IN.		3	3	3

24. First adjust the flow of paraffin to the first of the three settings. Stop the pump and blow the manifold and burners empty by means of compressed air.

25. Re-start the pump, ensuring that no alteration to the controls is made, and observe the time taken from the re-start until the spraying commences at the burners. At the same time observe the manifold pressure when spraying commences. Carefully observe the duration of spray—this is denoted by the difference in the times recorded from pump re-start until a steady manifold pressure is obtained, and from pump re-start until spraying commences at the burners. The table given in para. 23 gives the permissible pressures and times for these tests.

26. Each of these tests must be repeated at least twelve times for each of the three flow settings.

Closing of the trip valve

27. Steadily reduce the flow by means of the manual adjustment on the pump until the manifold pressure suddenly falls to zero and the cycle re-commences, due to the closing of the trip valve. Observe the manifold pressure at which cut-off occurs; this should not exceed 3 lb. per sq. in., and it should be noted that at this pressure there must be no dribble from the burners.

DISMANTLING THE UNIT

28. A suitably partitioned tray must be available for holding the component parts of each combined accumulator unit. To prevent the accidental interchange of component parts of units during dismantling and re-assembly, only the component parts of one accumulator must be on the bench at one time. Under no circumstances are parts from one accumulator unit to be stored in the same tray as those from other units.

29. Cut all lock-wires except that on the delivery adjusting screw in the centre of the trip valve cover (*note, para.* 36). Remove all dust caps and blanking plugs.

Removing the installation connections

30. To remove the inlet connection, unscrew the nut and withdraw the joint washers and banjo from the adapter. The adapter is not normally removed unless damaged or defective.

31. The return to pump suction connection union is not normally removed unless defective or damaged. To dismantle this part, unscrew the union and remove, together with its joint washer.

32. To remove the long union of the manifold connection, unscrew and remove the union, together with joint washers and distance piece and the manifold union plug and joint washer.

33. The short union of the manifold connection is not normally removed unless it is defective or damaged. If it is necessary to remove this union, unscrew and remove with its joint washer.

34. To remove the bleed connection, extract the split pin, unscrew the nut and remove the blanking nipple. Unscrew the union and remove, together with joint washer.

35. The fuel drain connection is removed by unscrewing the hollow bolt securing the fuel drain banjo from the lower cover plate of the cylinder together with washers and banjo connection.

Trip valve components

36. To remove the trip valve components, unscrew the six nuts retaining the end cover, remove the plain washers and carefully tap the cover away from the main casting, using a hide hammer. Carefully detach the cover from the diaphragm of the trip valve, taking care to avoid damage to the cover face.

Note . . .

The trip valve adjusting screw in the centre of the trip valve cover need not be disturbed if undamaged.

37. Lift off the helical spring and two spring plates. Carefully separate the lower portion of the diaphragm from the machined face of the cylinder and lift the trip valve away.

38. Bend back the locking lip of the tab-washer. Unscrew the nut from the centre screw of the diaphragm and withdraw the screw, tab-washer, reinforcing plate and valve plate from the diaphragm.

39. Bend back the locking lip of the trip valve seat and unscrew the valve seat and remove together with tab-washer.

High-pressure cock

40. Unscrew the plug from the end of the high-pressure cock sleeve, remote from the

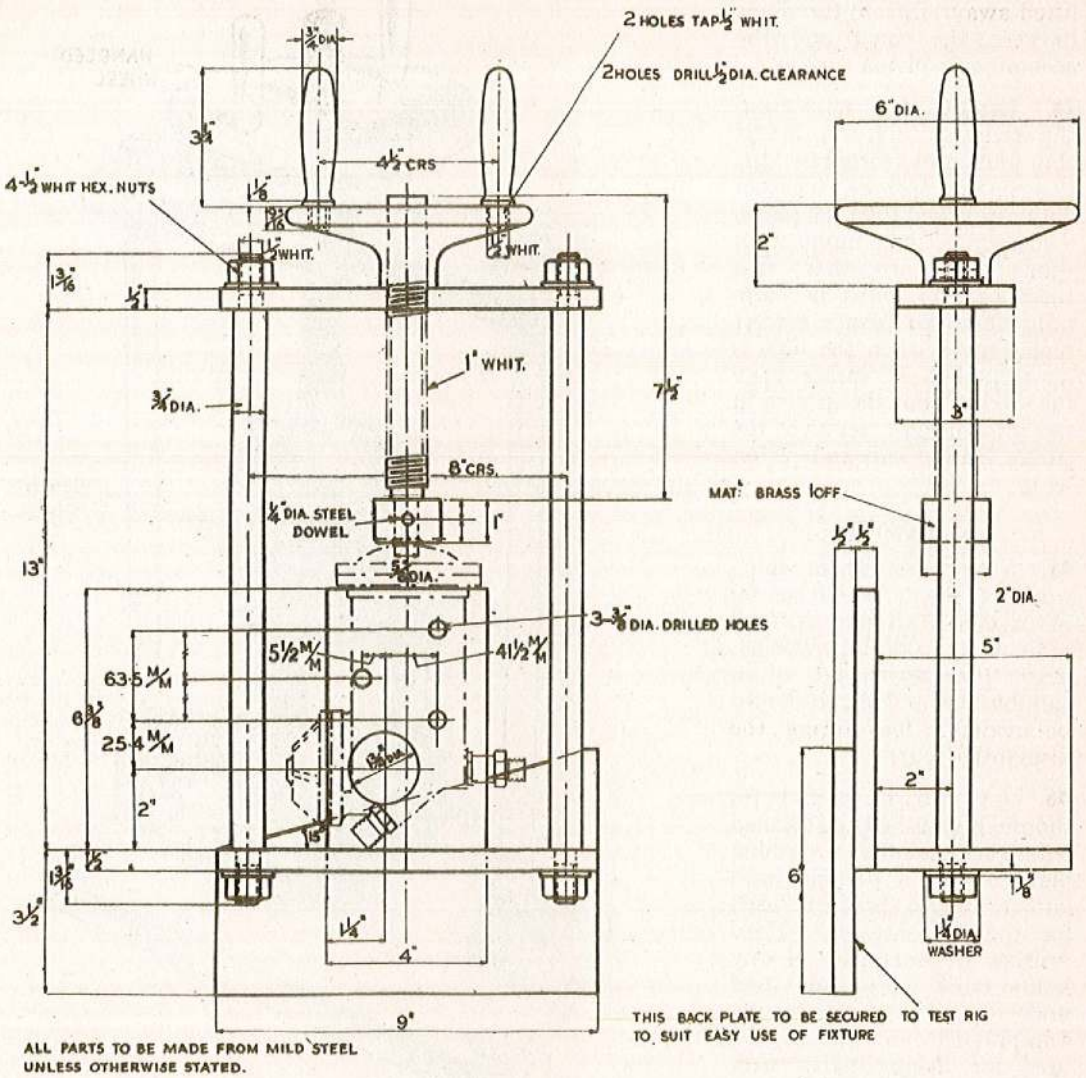


Fig. 7. Assembling and dismantling fixture for accumulator piston and springs

operating lever, and remove together with plain washer.

41. To remove the high-pressure cock unscrew the three nuts securing the circular cover plate, and withdraw the cock by means of the operating lever. The high-pressure cock operating lever is pinned to the high-pressure cock spindle, and this assembly must not be dismantled.

Accumulator piston, springs and cylinder end cover

42. Before removing the accumulator piston, springs and cylinder end cover, mount the unit on the special stripping fixture as shown in fig. 8. Lower the central spindle of the fixture until its lower end locates firmly with the insert in the cylinder end cover. Slacken the eight nuts securing the end cover to the cylinder a little at a time and at the same time turn the handled wheel slightly to allow the accumulator piston springs to ease the cover upwards against the nuts until the nuts are completely unscrewed. Care must be exercised during this operation to ensure that the retaining bolts and cover are not damaged. Remove the bolts.

43. Unscrew the central adjustable spindle of the fixture until the accumulator springs are free and there is sufficient clearance

to allow the end cover to be lifted away. Lift off the shims between the cover and the accumulator piston springs.

44. Remove the unit from the stripping fixture, invert the unit and withdraw the two piston springs, together with shims and then the piston assembly. The number of shims fitted, together with their location, must be carefully noted to ensure correct replacement when the unit is re-assembled. Spring open the circlip from the groove in the piston and remove the circlip, spring cap and piston seal.

CLEANING

45. The bench upon which work is to be carried out should be covered with zinc sheeting or linoleum. Containers which must be clean and of a suitable size and shape should be available for storing the dismantled parts.

46. All parts must be thoroughly washed and cleaned before re-assembly, a washing plant having a paraffin bath and spray gun should be used for these operations. Hard brushes or abrasives of any kind must not be used under any circumstances. Compressed air should be used for drying parts after washing; rag *must not* be used for this purpose. When all parts are thoroughly cleaned and dried, they are to be laid out ready for inspection.

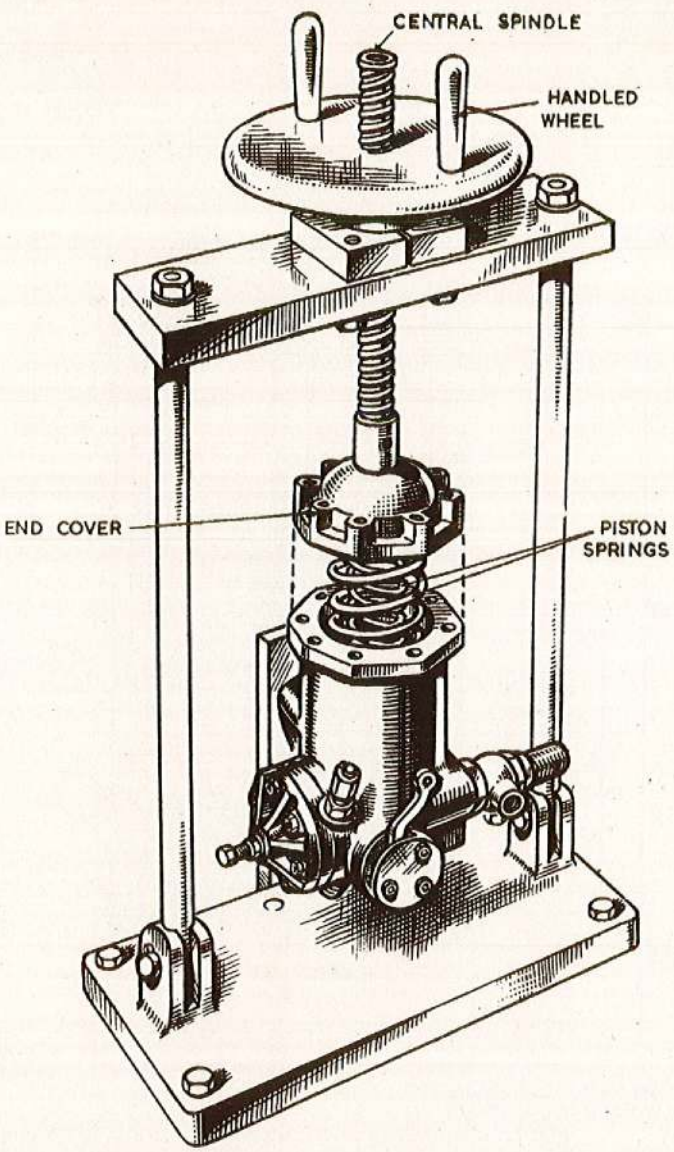


Fig. 8. Use of the special stripping and assembling fixture

INSPECTION

General

47. All viewing and inspection checks are described in this section, with the exception of crack detection and dimensional detail check. A list of dimensions and clearances for new and repair accumulator units is given in the Schedule of Fits, Clearances and Repair Tolerances, Vol. 2, Part 2 of this Air Publication.

48. The detail components are grouped as nearly as possible into sub-assemblies. Separate details which do not form part of a sub-assembly are dealt with nearest to their associated group, and the viewing and inspection checks are listed to correspond with the normal dismantling sequence of operations.

49. Distortion checks are not normally necessary. All parts subject to wear should be checked with the Schedule of Fits, Clearances and Repair Tolerances (*para.* 47).

50. All parts rendered redundant by the embodiment of essential modifications must

be rejected during inspection. All inspectors therefore must have available all information concerning relative modifications. Tab-washers, split pins, gaskets and other consumable parts will be rejected during dismantling.

Installation connections

51. Examine the threads of the inlet connection extension nut and adapter for damage and cleanliness, and ascertain that the joint washers are unbroken and not distorted. Ensure that the banjo is sound and its joint faces flat.

52. Examine the threads of the return to pump suction connection adapter body for cleanliness and freedom from damage. Ensure that joint washer is clean, flat and unbroken.

53. Carefully examine the threads of the manifold connection long union and plug for damage and cleanliness. Ensure that the joint faces of union, plug and distance piece are clean and flat. Inspect all joint washers for distortion and breakage.

54. Ensure that the threads of the manifold connection short union are clean and undamaged, and that its jointing faces are flat and undamaged. Check that all joint washers are free from distortion and breakage.

55. Examine the threads of both the adapter and the blanking nipple nut of the bleed connection for cleanliness and freedom from damage. Carefully examine the blanking nipple for cleanliness and freedom from damage. Examine the joint washer for distortion and damage.

56. Ensure that the hollow bolt of the fuel drain connection is clean and its threads undamaged. Examine the three-way banjo connection for damage to threads, general cleanliness and flatness of jointing faces. Carefully examine all joint washers for distortion and cracks.

Trip valve components

57. Carefully examine the flats, faces and threads of the trip valve end cover nuts for damage, and plain washers for general soundness. Ensure that the face of the cover which seats on the diaphragm is clean, free from damage and scratches and that the bleed hole in the cover is clear. Examine the threads of the trip valve adjusting screw for cleanliness and freedom from damage, also ensure that its spigot, which locates with the upper spring plate, is clean and not damaged.

58. Inspect the spring plates for cleanliness and freedom from damage, ensure that the helical spring is not fractured and that there are no sharp edges at the spring ends. It is important that the coils of the spring do not butt when the diaphragm plate seats down in the open position. To ensure that this does not occur check in the following manner. Insert a 0·5 m.m. shim between spring and spring plate and lower into the trip valve cover. This shim must be of convenient size so that it will pass over the raised boss of the spring plate, yet of smaller overall diameter than the bore of the trip valve cover in which the spring is housed. Place the upper spring plate in position on the spring, locate the diaphragm assembly correctly with it, and firmly depress the diaphragm assembly on to the trip valve cover until the diaphragm plate seats on the cover. It must seat evenly all round. If not the spring will have become solid and must be replaced.

59. Irrespective of condition, all diaphragms must be scrapped during inspection. Ensure that the reinforcing and valve plates are not distorted, corroded or damaged and that the nut and screw have undamaged threads and are generally sound.

60. Carefully examine the threads of the valve seat and ensure that the valve seating is not corroded or damaged. Examine the valve seat for uneven wear which may cause leakage.

High-pressure cock

61. Carefully examine the high-pressure cock rotor for fretting and corrosion, and ensure that all grooves, slots and ports are clean. Slight frettage marks may be removed by polishing lightly with rouge or metal polish. All traces of rouge or polish must be thoroughly cleaned off before re-assembling. Examine the three nuts which secure the end cover for damage to threads and flats and ensure that the cover is not distorted or the holes worn.

High-pressure cock plug

62. Examine the threads of the high-pressure cock plug at the end of the high-pressure cock sleeve in the main casting remote from the operating lever for

damage and cleanliness. Inspect the flats of the head of the plug for damage and ensure that the locking wire hole is not broken.

Accumulator piston, springs and cylinder end cover

63. Examine the inner and outer spring shims for damage. Ensure that the springs are not cracked, and that no sharp edges exist at their extremities.

64. Examine the spring cap for damage, sharp edges and the presence of foreign matter. Inspect the piston for damage marks or scores and check that no burr exists in the circlip groove. Ensure that the circlip is not distorted or damaged. Inspect the piston seal, and if damaged or distorted, it must be rejected.

65. Ensure that the eight bolts and nuts securing the cylinder end cover to the main casting have sound threads and are undamaged. Inspect the plain washers for cracks and damage. Examine the cylinder end cover generally for damage, especially the jointing face for scratches or damage likely to prevent an efficient seal. Inspect the threads of the insert for damage and cleanliness and ensure its jointing face is quite flat and undamaged.

Main cylinder casting

66. Scrutinise the cylinder bore of the main cylinder casting for the presence of foreign matter, scores or marks of any kind likely to affect the piston seal. Examine the high-pressure cock sleeve in the cylinder casting for fretting, corrosion and scores. Carefully inspect all joint faces of the cylinder casting for scratches or other marks likely to affect the seal. Carefully examine all studs for alignment, cleanliness and damage to threads, and check that all studs are tight. Examine all internal tappings for damage and the presence of foreign matter.

Magnetic crack detection

67. The component parts of the accumulator unit are not normally subjected to a magnetic crack detection test unless it is suspected that any part is defective.

RE-BUILDING THE UNIT

General

68. Thoroughly clean all components of the unit as described in para. 45 and 46. When locating gaskets or paper joint washers a thin smear of petroleum jelly on joint faces will enable the gasket to be retained in position during assembly.

Trip valve components

69. Place a tab-washer on the tapped boss in the trip valve chamber of the cylinder casting and tighten the trip valve seat on to it ; lock with the tab-washer.

70. Locate the valve plate below and the reinforcing plate above the new diaphragm and secure with the 4B.A. screw, tab-washer and nut ; lock the nut with the tab-washer.

71. Apply a thin layer of Hermetite to the faces of both diaphragm cover and cylinder casting normally in contact with the diaphragm. Care must be taken to prevent any Hermetite entering any other part of the cylinder and cover, or on the diaphragm assembly except where the faces butt on to the diaphragm.

72. Carefully align the trip valve assembly correctly with the cylinder casting studs, and lower into position. With the spring interposed between them, locate the spring plates, the lower one with the central screw of the diaphragm and the other with the pre-set screw of the trip valve cover. (The setting of this latter screw may not have been disturbed, in which case the lock-nut will be tight and the locking wire still intact.) Lower the trip valve cover on to its 2B.A. studs with its bleed hole facing downwards, first ensuring that this hole (*fig.* 1) is not obstructed, and secure the cover with the nuts and plain washers.

High-pressure cock plug

73. Refit the plug together with its plain washer, to blank off the end of the high-pressure cock sleeve.

High-pressure cock

74. Insert the high-pressure cock rotor into its sleeve in the main cylinder casting, so that the operating lever is positioned in the cut-away section of the boss. Fit the cover plate on to the studs of the cylinder casting and secure with the three nuts.

Installation connections

75. With the distance piece and joint washers arranged as shown in fig. 1, screw and tighten the long manifold connection into its adapter in the cylinder casting. Similarly, arrange the banjo connection and joint washers of the inlet connection as shown in fig. 1 and fit to the adapter ;

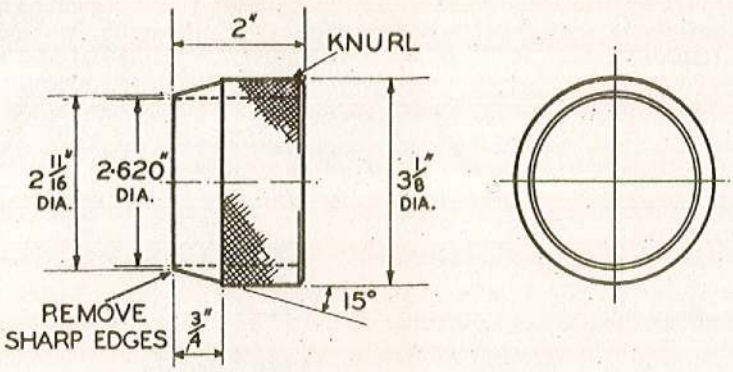


Fig. 9. Protective guide for insertion of piston

screw and tighten the adapter nut union to the connection. Fit the blanking nipple to the bleed connection and secure by its union nut. Where it has been necessary to remove any of the other connections, care should be taken, when reassembling, to ensure that the joint washers fitted between the flange of the adapters and their mating faces are sound and undamaged.

Main cylinder casting, accumulator piston, springs and cylinder end cover

76. Ensure that all components are clean and free from dirt, then assemble as follows :—

OP. 1. Carefully locate the piston seal on the piston, ensuring that the seal faces the correct way, i.e., with the closed end of the U section of the seal against the flange of the piston (*fig.* 10).

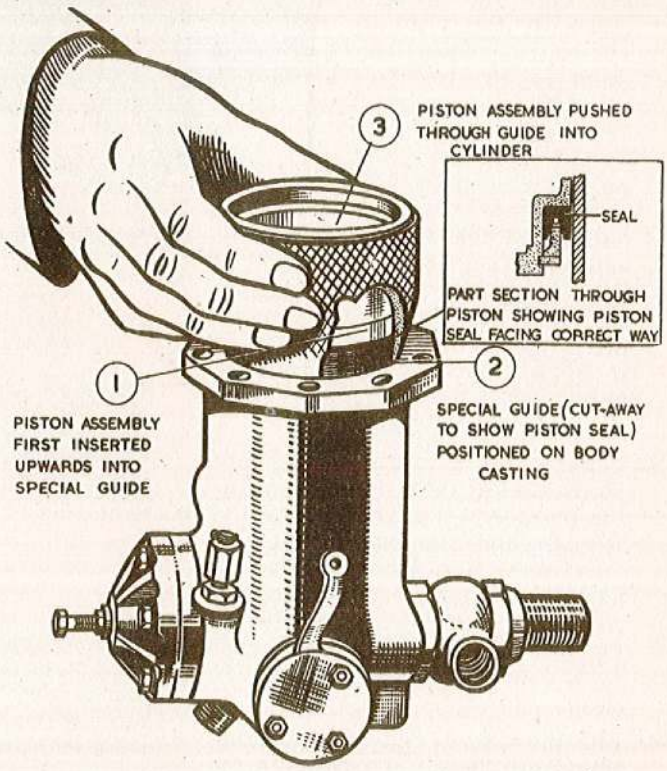


Fig. 10. Use of protective guide for insertion of accumulator piston in main cylinder casting

2. Assemble the spring cap into the recess in the seal and secure both seal and cap with the circlip in the groove of the piston.

3. Place the protective guide on the bench with the tapered end uppermost and place the piston, with the seal uppermost, into the bore of the guide. Push the piston into the guide until the lips of the seal are flush with the end face of the guide, taking care not to damage the seal.

4. Invert the cylinder casting and place the tapered end of the guide into the cylinder bore, push the piston assembly through the guide into the cylinder bore and remove the guide (*fig.* 10).

5. Inject lubricant to specification D.T.D.472 between the piston and bore and reciprocate the piston by hand to ensure that it is quite free in the bore.

6. There should be 0·004 in. diametral clearance between piston and bore; test this clearance with a feeler gauge, as shown in fig. 11.

7. Insert the required number of shims (*para.* 21) into the spring recess in the piston. The total number of shims to be fitted to each spring must not exceed six, and these should, as far as possible, be divided equally between the spring and piston and the spring and cylinder end cover. Each shim is ½ mm. thick and three of each are usually fitted for each spring, but up to six of each may be fitted to both the inner and outer spring, i.e., three either end if necessary.

8. Lower the two helical springs into position inside the piston, and mount the partially assembled unit on the stripping and assembling fixture (*fig.* 8). Grease and foreign matter is likely to accumulate at the extremities of the springs and care must be taken, before fitting to ensure that the ends of the springs are thoroughly clean.

9. Fit the inner and outer spring shims into the spring recesses in the cylinder end cover. These shims can be retained in position, when the cover is inverted for assembly, by smearing with petroleum jelly and pressing into position in the cover with the fingers.

10. Lower the cover, complete with insert, on to the piston springs, carefully aligning the springs with their appropriate recesses in the cover. Locate the central adjusting pillar of the assembling fixture with the insert of the cover and secure the end cover by reversing the procedure described in para. 42 to 44.

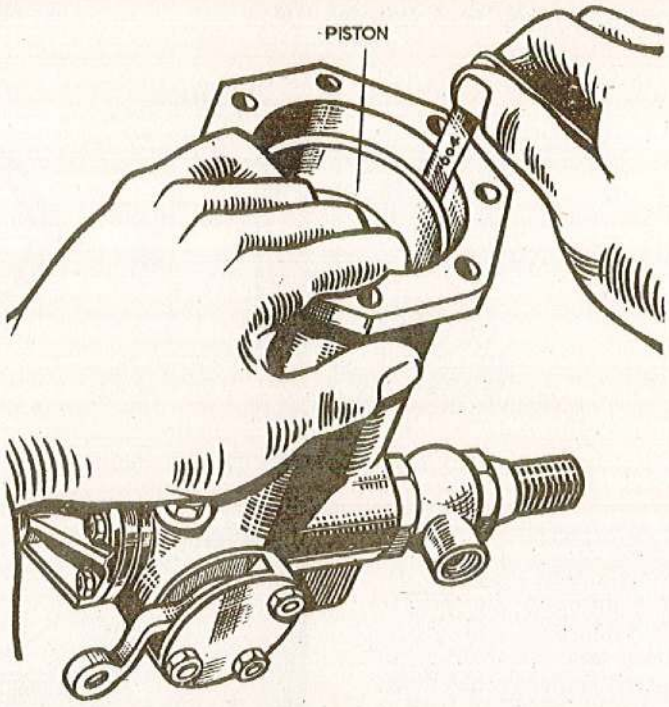


Fig. 11. Measurement of 0.004 in. diametrical clearance between piston and bore

Fuel drain connection

77. Remove the unit from the assembling fixture and refit the fuel drain connection comprising joint washer, three-way banjo, joint washer and hollow bolt.

REPLACEMENTS

78. Paper joints, gaskets and banjo washers must be replaced by new ones whenever a joint or seal is disturbed, and new split pins and locking wire must always be fitted. If tab-washers are disturbed they must be replaced by new washers.

79. All parts are separately interchangeable, with the exception of the high-pressure cock sleeve and the high-pressure cock rotor. The sleeve is shrunk into its bore in the main cylinder casting, consequently these sleeves are not supplied separate from the casting. On initial assembly each rotor is lapped to its mating sleeve, and if it is necessary to replace the rotor the replacement must be lapped to the existing sleeve. If a new sleeve is required, the cylinder casting must be renewed and a new high-pressure cock rotor must be lapped and fitted to the sleeve.

80. All used diaphragms must be scrapped and new ones fitted. If the piston seal is distorted or damaged, it must be renewed.

RIG TESTING

General

81. *Carefully record all test results or subsequent entry on the test record sheet.*

82. The fuel used throughout these tests is paraffin to specification D.Eng.R.D.2482, latest issue; the limits of temperature between 20 deg. C. minimum and 26 deg. C. maximum. The fuel must be checked at regular intervals to ensure that it complies with this specification.

Sub-zero torque test

83. In this test the unit is cooled to a temperature well below freezing point in order to ascertain the torque required to move the high-pressure cock operating lever. For this test a refrigerator is required having a tank of paraffin of sufficient size to accommodate the accumulator unit in a completely immersed condition.

84. Place the unit in the paraffin tank in the refrigerator and ensure that the unit is thoroughly moistened with paraffin before commencing the sub-zero test. Reduce the temperature to between —20 deg. C. and —25 deg. C. and maintain the temperature of the paraffin in the tank within this range for at least one hour before the test.

85. With the hands protected by asbestos gloves, remove the unit from the paraffin tank and, with the unit held in the hand and not mounted on the test rig, carry out the torque test immediately. To effect this test apply a load on the operating lever of the high-pressure cock by means of a spring balance as described in para. 12. The load required either to open or shut the high-pressure cock must not exceed 4 lb. at a radius of 2·25 in., i.e., the effective radius of the operating lever, which represents a torque of 9 lb. in. Carefully record both torque and temperature readings on the test certificate. Immediately the torque test is completed, submerge the unit in a container of clean paraffin, and leave until a temperature of above 0 deg. C. has been reached.

Note . . .

The unit must not be left in the open air to regain normal room temperature or heated in any way to accelerate this process, as condensation will take place and moisture will accumulate on inner and outer surfaces. This moisture is liable to cause corrosion and affect the efficiency of the unit on subsequent operation.

Final setting of trip valve

86. Mount the unit on the rig as shown in fig. 2 except that the manifold connections are disconnected. Ensure that the high-pressure cock is maintained in the open position. Start the rig pump and observe the inlet pressure at which the trip valve discharges, i.e., when the valve trips into the fully-open position. This pressure must be between 55 and 90 lb. per sq. in.

87. Reduce the pressure to zero to allow the trip valve to close, then raise the inlet pressure from zero to 40 lb. per sq. in. and allow any leakage past the closed trip valve to spill from the disconnected manifold connection into a measuring cylinder. The leakage at this pressure must not exceed 3 c.c. per minute. Repeat the test at least twelve times.

Final accumulator tests

88. Repeat the piston travel, charge and discharge pressure checks (*para.* 13 to 21) and accurately record the results obtained on the test certificate.

Final spray times and manifold pressure tests

89. Repeat the spray times and manifold pressure tests (*para.* 22 *to* 27) and record on the test certificate the values of "A" and "B", the duration of spray, and the manifold pressures obtained.

Installation connections

90. Complete the installation connections apart from dust caps and locking wire.

High-pressure test

91. Mount the unit on the test rig as shown in fig. 2. Thoroughly dry the unit externally, secure the high-pressure cock in the open position and start the rig pump. Steadily close the delivery cock of the test rig until the inlet pressure reaches 1,500 lb. per sq. in. This pressure must be maintained for at

least two minutes without any signs of leakage. In the event of any leaks being noted they must be traced and rectified.

INHIBITION

92. Inject flushing oil, specification D.T.D. 561 (latest issue) in the manifold connection (short), working the operating lever for the high-pressure cock during this operation. Seal the union with a dust cap.

93. Invert the unit and remove the hollow bolt from the drain connection. Inject flushing oil to specification D.T.D. 561 (latest issue), replace the hollow bolt and seal the outlets with dust caps.

94. Ensure that dust caps are placed on all exposed threaded ports to prevent the entry of foreign matter into the unit and damage to threads.

PREPARATION FOR DESPATCH

Final wire-locking

95. Ensure that the wire-locking of the nuts retaining the cylinder cover, the trip valve cover and the high-pressure cock circular cover plate is satisfactory and complete, also that the trip valve adjusting screw nut is securely wired to the cover boss, and the bleed nipple union nut split-pinned.

Packing

96. Ensure that the test certificate is complete and satisfactory and include one copy with the complete unit in the approved packing container (*fig.* 12).

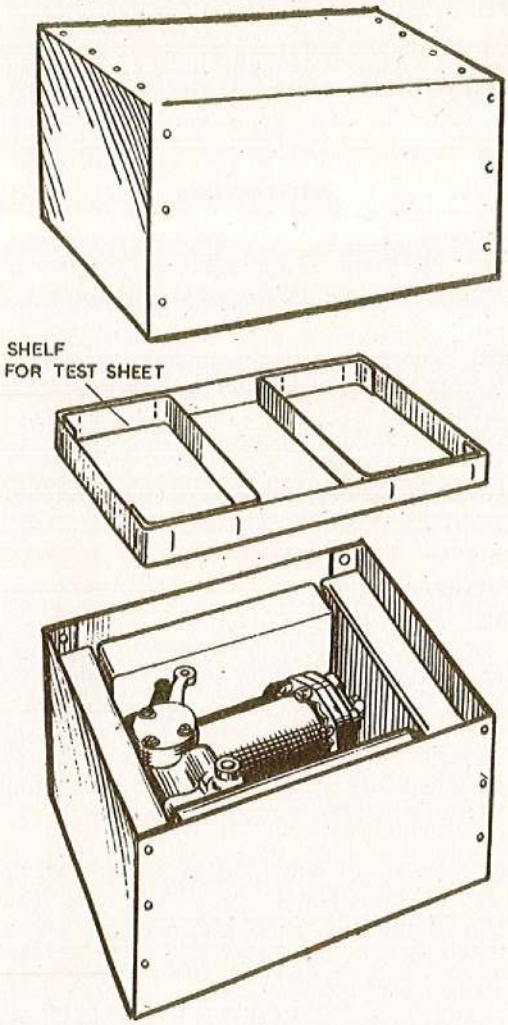


Fig. 12. Special packing box for despatch