Chapter 8

HIGH PRESSURE FUEL PUMPS, TYPE G.D. SERIES

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General

1. These instructions apply to the GD series fuel pumps of the centrifugal governor type. In fig. 35, a GD 7/5E pump is shown as a typical unit. Calibration settings, which vary with the requirements of different engines, are listed in the Appendices to the chapter.

2. A pump should not be dismantled unless complete calibration testing equipment and tools are available.

3. The importance attached to cleanliness cannot be over-emphasized and precautions must be taken in every instance to ensure that all details are thoroughly clean.

4. To allow sound parts to be fitted when the unit is being finally assembled, slave nuts, bolts and washers, etc., should be used when components are being assembled temporarily.

5. Paper joints or gaskets, metal joint washers, sealing rings, etc., must be replaced by new ones whenever the seal is disturbed, and new split pins and locking wire must always be used.

6. Before commencing dismantling, drain the inhibiting oil and remove blanking plates, plugs and unions.

Special tools

7.

Tool No.	*Description*
G.51239	Gauge—parallelism, port insert
G.52326	Gauge fixture—oil seal leakage test
G.56521	Gauge—piston slipper lift

Tool No.	*Description*
G.56528 G.56529 G.56530 G.56531 G.56532	Setting piece—rotor piston diameter
G.61521	Gauge—carbon bearing, small
G.61522	Gauge—carbon bearing, large
G.61531 G.61532 G.61533 G.61534 G.61535	Setting rings—rotor bore diameter
G.67462	Gauge—governor tappet clearance
G.67463	Adapter ring—camplate retaining
G.67464	Gauge—camplate angle
G.67465	Gauge—quill shaft concentricity
G.67466	Gauge—auxiliary camplate lift
G.67467	Gauge—camplate end-float
G.67468	Gauge—camplate minimum angle
G.67469	Gauge—rocker lever tail lift
T.157039	Extractor—circlip, large carbon bearing
T.160988	Box spanner—overspeed governor screw
T.166109	Fixture—dismantling and assembling, amplifier valve
T.175565	Spanner—reach nuts, amplifier valve
T.175579	Bleed tool—priming, rig test
T.190850	Extractor—rotor quill shaft
T.193938	Spanner—orifice assembly locknut
T.193939	Spanner—stall pressure adjustment
T.198170	Extractor—amplifier valve assembly
T.199121	Extractor—carbon bearing, large
T.201740	Assembly tool—control cylinder liner
T.201742	Guide—control piston assembly
T.201745	Stand—rotor assembly
T.201770	Removal and assembly tool—rotor spring guides
T.206237	Fixture—setting amplifier valve
T.210194	Fixture—pressure-drop test, servo strainer
T.210889	Turnkey—rotor
T.217339	Extractor—control cylinder liner
T.217340	Stand—rotor piston
T.217342	Fixture—pressure test, rotor quill oil seal
T.217343	Adapter—inlet, outlet, rig test
T.217346	Extractor—circlip, rotor extension
T.217347	Fixture—dismantling and assembling
T.233890	Fixture assembly—rotor quill shaft

DISMANTLING

Camplate housing

8. Mount the pump on the stripping fixture T.217347 (*fig.* 1) and, using the extractor T.217346, remove the circlip and withdraw the seal spacer and sealing ring, outer carbon-faced seal, spring and shim washer.

9. Release the nuts securing the camplate housing, slackening them in opposing pairs. If the housing does not free itself from the body as the nuts are removed, tap lightly with a hide hammer around the rim to release the joint.

10. The pressure of the rotor piston springs, acting through the camplate trunnion blocks, will make it necessary to hold the housing down until the nuts, grover washers and plain washers have been removed.

11. When the housing is free, hold it central as the pump rotor is now supported only by the main carbon bearing at the opposite end and this may be damaged by any side movement.

12. Lift the housing from the pump body, tapping the trunnion blocks free if necessary and taking care not to foul the rotor carbon bearing on the quill shaft.

13. Remove the camplate housing gasket and lift off the trunnion blocks.

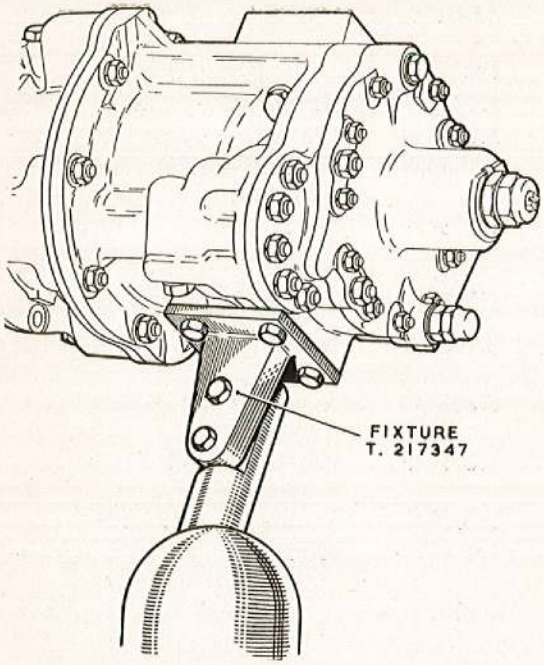

Fig. 1. Dismantling and assembling fixture

14. Extract the circlip from the bore and withdraw the carbon bearing, carbon-faced seal and rubber sealing rings from the housing.

15. It is not advisable to remove the bearing locating dowel unless it is loose or damaged, in which case it must be renewed.

Camplate

16. Remove the cap nut from the maximum flow adjusting screw, slacken the locknut and turn the screw to allow maximum inclination of the camplate.

17. With a fine drift, tap out the retaining peg and withdraw the link pin. Disconnect the other end in a similar manner and remove the link from the camplate and control piston. On some types of pump, the linkage is retained by a threaded pin, nut and tabwasher at each end.

18. Lift out the camplate taking care not to exert any side movement on the rotor shaft.

19. Carefully lift out the rotor assembly from the pump housing and place it on the stand T.201745 (*fig.* 2).

Dismantling the rotor assembly

20. Withdraw the piston and slipper assemblies from the rotor and place them on the stand T.217340 (*fig.* 3). The locating pegs on the stand are numbered and each piston must be transferred to the peg on the stand corresponding to the rotor bore from which the piston was removed. Remove the piston springs and spring seats from the rotor bores.

21. Lift off the auxiliary camplate, thrust ball, shim washers, spring seat and spring.

22. The spring guides are not normally removed from the rotor bores but if it is necessary to remove them they may be

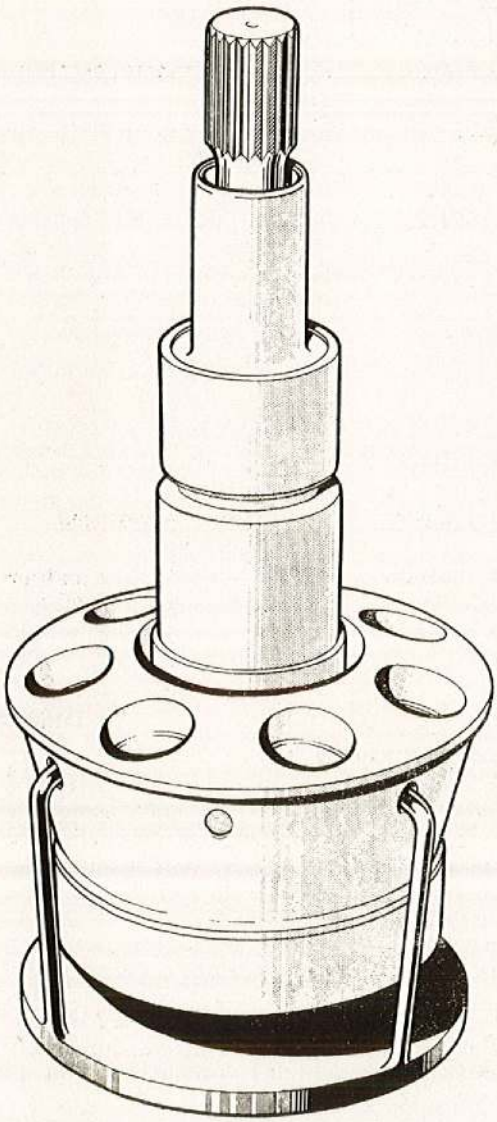

Fig. 2. Rotor stand

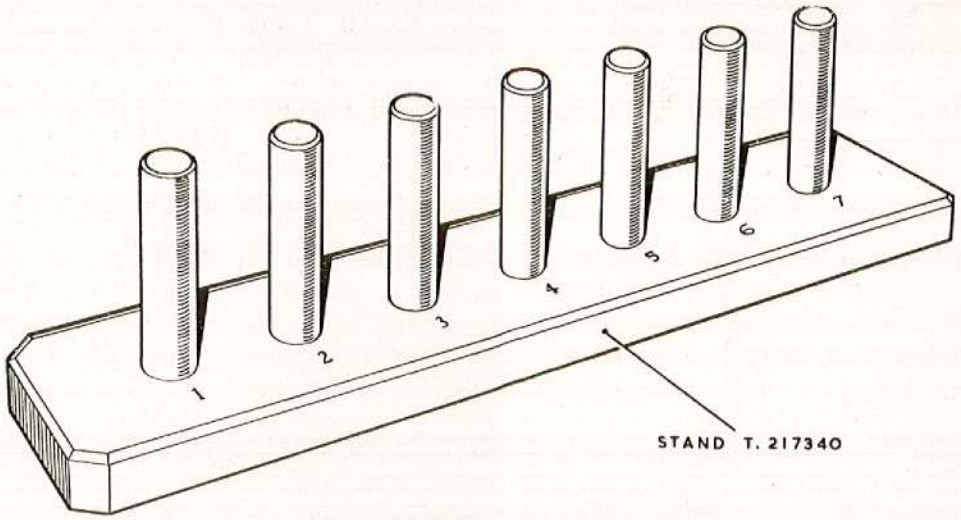

Fig. 3. Stand for rotor pistons

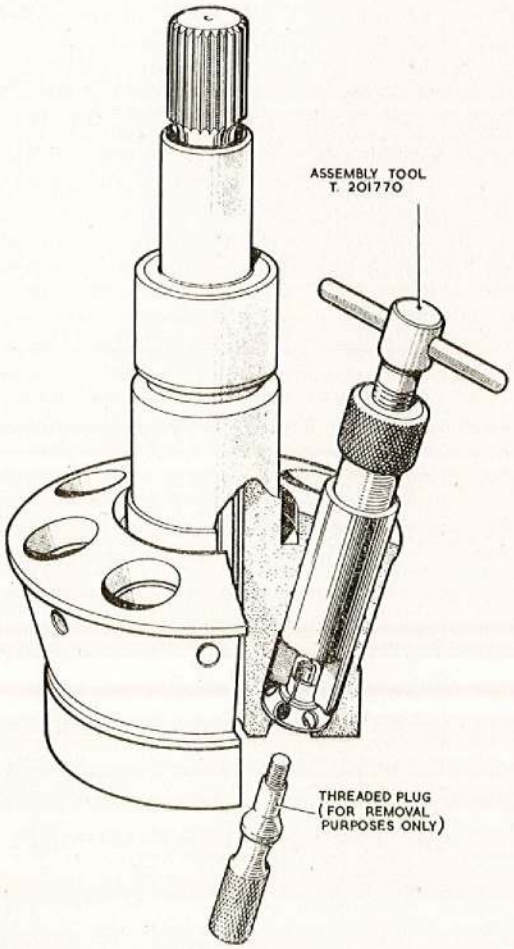

Fig. 4. Removing and assembling the piston spring guides

extracted as shown in fig. 4 using the drift T.201770.

Removing and fitting the rotor drive shaft

23. The drive shaft need not be removed from the rotor unless the shaft is damaged, shows signs of corrosion, or there is leakage past the sealing ring when subjected to the pressure test. To remove the shaft, use a hand press, the baseplate of which must have a hole $1\frac{1}{4}$ in. dia. for clearance, and the tool T.190850 (*fig.* 5).

(1) Position the locating base, with a tufnol locating ring on the baseplate of the press, then lower the rotor, drive shaft downwards, on to the base and place the protective cap over the rotor port insert face.

(2) Fit the drift and sleeve into the axial hole in the rotor. Insert the brass punch into the hand press and lower it on to the drift in the rotor. Apply sufficient pressure to start movement of the drive shaft and free the rubber seal, shim washers and spring ring.

(3) Lift the press, withdraw the drift and using the tool T.190850/4 extract the spring ring, shim washers and rubber seal (*fig.* 6).

(4) Position the rotor on the press as in sub-para. (1), lower the drift and sleeve into the axial hole in the rotor and carefully press the drive shaft fully out of the rotor.

24. When replacing the drive shaft proceed as follows :—

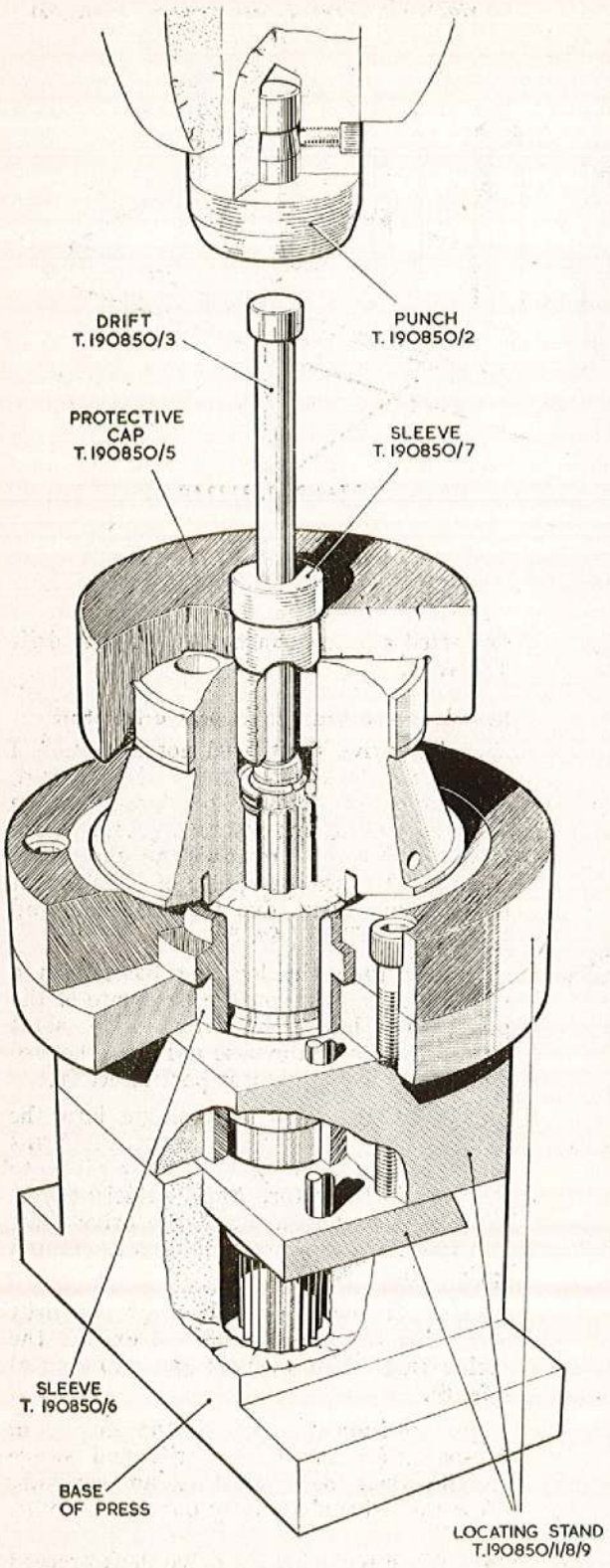

Fig. 5. Removing the rotor drive shaft

(1) Fit a new sealing ring in the drive shaft groove.

(2) Using the fixture T.233890 (*fig.* 7), position the base assembly of the fixture on the hand-press baseplate then mount the rotor in the machine recess, drive shaft uppermost.

(3) Place the locating sleeve over the rotor extension, select the new drive shaft and lower the shaft through the sleeve into the rotor.

(4) Insert the punch into the hand-press ram block, lower the ram so that the brass end of the punch contacts the shaft and apply a load to force the shaft into the rotor bore.

(5) Remove the rotor complete with drive shaft from the press, place the rotor on a surface table and with a vernier height gauge, check the dimension from the base of the rotor to the shaft extremity. The limits are 7·031 in. ± 0·0125 in. for types GD 10/9J and GD 5/3C, and 6·911 in. ± 0·0125 in. for type GD 7/5E.

(6) Mount the rotor horizontally on V-blocks and with a dial test indicator and stand, check the concentricity of the drive shaft at its extremity. If the run-out is more than 0·008 in., remove the drive shaft from the rotor and turn it through 180 degrees in relationship to the spline engagement in the axial bore of the rotor. Re-fit the shaft and again check the height and concentricity. If unsatisfactory, fit a replacement and re-check it.

(7) When satisfactory, place the rotor on the stand T.190850. Insert the shim washer, rubber seals and second shim washer into the axial bore of the rotor, place the retaining spring-ring on the centre spindle T.233890/4 as shown in fig. 8. Lower the ring and spindle into the rotor bore and locate the hollow drift T.233890/5 over the spindle. Place the whole assembly under a hand press, bring the ram block down to contact the drift and apply a sharp load to spread the spring ring into the groove of the drive shaft.

(8) Remove the rotor from the press and repeat the checks for height and concentricity as in sub. para. (5) and (6).

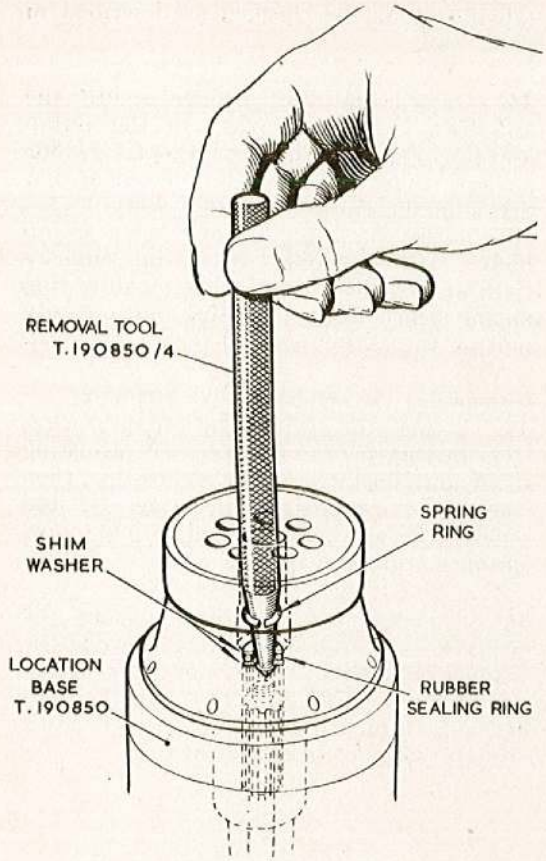

Fig. 6. Removing the drive shaft locking and sealing rings

(9) Before assembling the rotor into the pump body a pressure test must be carried out as described in para. 116.

Removing the port insert

25. With the rotor assembly removed, the carbon bearing and port insert is exposed. To remove these components, disengage the retaining circlip by means of the tool T.157039. Place the fingers of each hand inside the bearing, press firmly on to the walls of the bore and at the same time draw the bearing from the pump housing. If difficulty is experienced, use the extractor T.199121.

26. Withdraw the retaining spider and port insert. The insert locating dowel and carbon bearing locating dowel should not be withdrawn unless they are loose or damaged.

Overspeed control

27. With the assembly facing uppermost, remove the nuts, grover washers and plain washers from the cover plate then lift off the overspeed control assembly. Remove the gasket and transfer-bobbin with sealing rings.

28. On applicable units, remove the

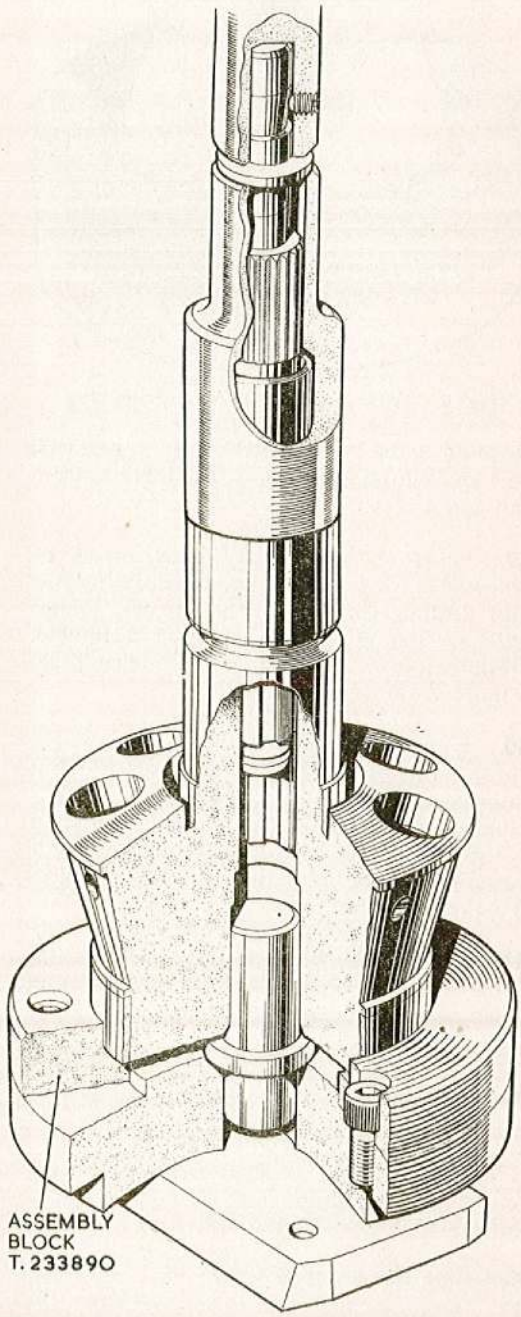

Fig. 7. Assembling the drive shaft to the rotor

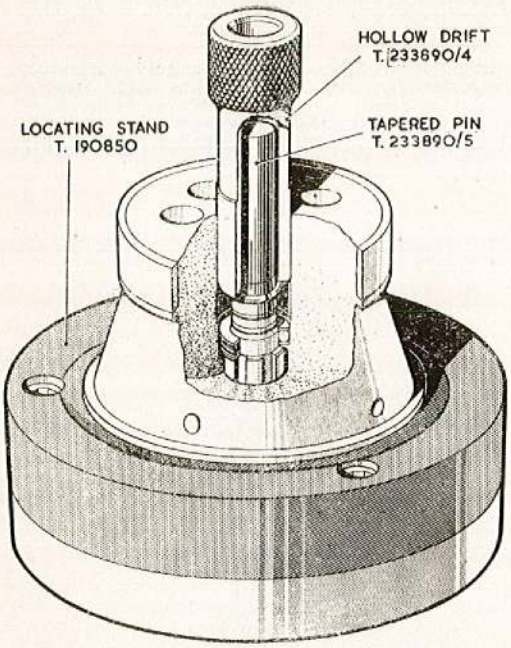

Fig. 8. Fitting the drive shaft spring-ring

solenoid valve as described in para. 193, and any blanking plugs or bleed valves from the end cover.

29. Screw the cap nut from the top of the housing and remove the adjusting screw and sealing ring from the spring anchor guide by using the box spanner T.160998. Withdraw the diaphragm and spring assembly from the housing.

30. Unlock the large nut retaining the spring anchor guide and remove the nut tabwasher, guide and sealing ring. The guide is dowelled inside the cover and if it is tight it should be tapped out with a hide hammer. Do not disturb the dowel unless it is loose or damaged.

31. Extract the split pins from the link pins which secure the spring to the upper and lower spring anchors, remove the washers and withdraw the pins.

32. Lift out the lower spring anchor from the diaphragm centre and remove the tappet screw by bending down the tabwasher and slackening off the locknut before screwing out. The diaphragm is a riveted assembly and must not be dismantled.

Removing the amplifier valve

33. The amplifier valve is exposed when the governor housing has been removed and before any further dismantling takes place it is recommended that the rocker lever tail lift should be checked as described in para. 142.

34. Unlock the nuts which secure the amplifier valve base plate to the pump housing and, using the special tool T.175565 as shown in fig. 9, remove the four reach nuts. Screw in the two extractors T.198170 (*fig.* 10) and lift the assembly out of the pump body. The assembly may feel slightly tight at first due to the rubber sealing ring on the orifice strainer housing but a steady pull on the extractors will release the seal.

Dismantling the amplifier valve assembly

35. Reduce the spring load on the rocker lever by rotating the stall pressure adjusting screw anti-clockwise as far as possible, then compress the spring slightly (*fig.* 11) and remove the retaining pin, adjusting screw, spring seating and spring.

36. Unlock the tabwasher securing the orifice locknut, release the nut by using the spanner T.193938 then remove the orifice and strainer. Take care to retain the half-ball valve which will become free when the orifice is clear of the baseplate.

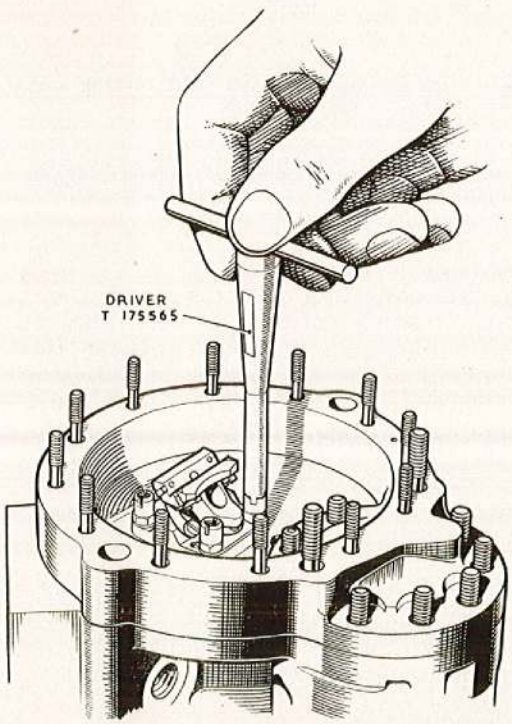

Fig. 9. Removing the amplifier valve reach nuts

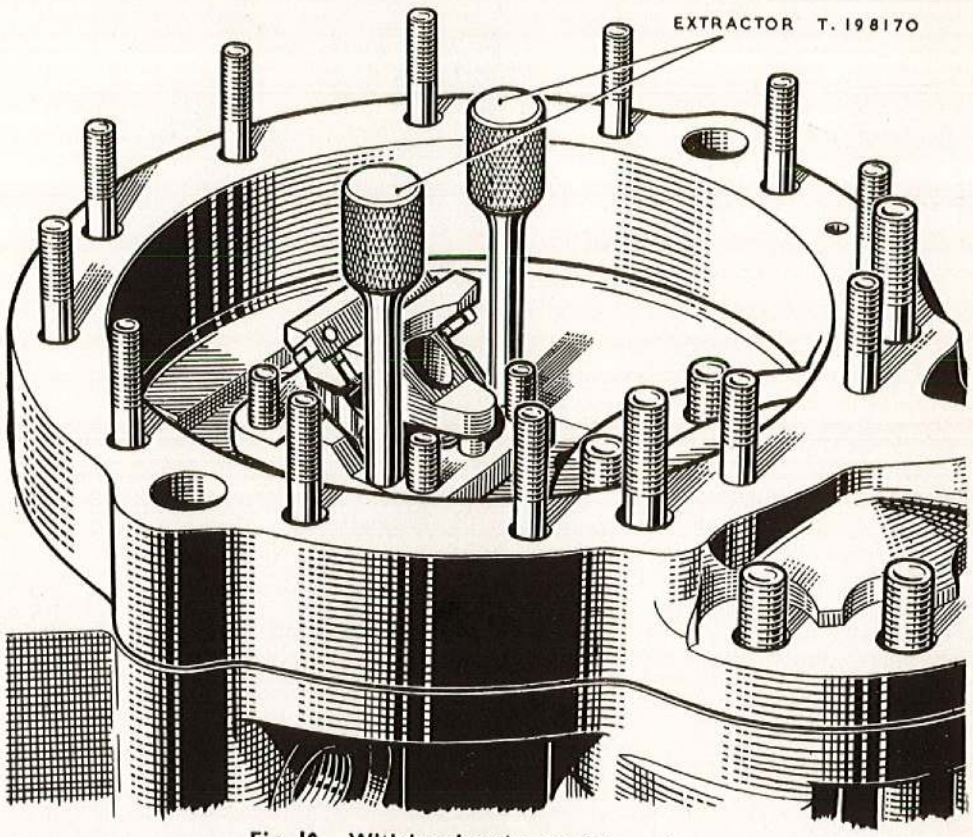

Fig. 10. Withdrawing the amplifier valve

37. Mount the assembly on the fixture T.166109, unlock the tabwashers and remove the set screws which retain the torsion hinges to the baseplate (*fig.* 12).

38. Remove the rocker lever and bridge piece from the baseplate and transfer it to the other side of the fixture. Insert the mandrels to hold the free ends of the hinge blades, unlock and remove the set screws securing the blades to the lever piece. Reverse the lever in the fixture and remove the remaining two blades likewise.

Removing the overspeed control distance piece

39. Unlock the two tabwashers on the integral control cylinder cover then slacken the ring of seven nuts a few threads at a time, otherwise the pressure of the springs will tend to tilt the distance piece and foul the securing studs. Remove all nuts except any two which are diametrically opposite; these two can then be removed while hand pressure is applied against the spring loading. Lift off the distance piece and extract the control piston springs.

40. Withdraw the gasket and bobbins with sealing rings from the pump body mating face.

41. Unlock and remove the no-flow stop screw from the integral control cylinder cover together with tabwasher and any adjusting shims. Note the number of shims.

42. Remove the rubber sealing ring from the control cylinder counterbore in the distance piece and the bobbins and seals from the pump body.

Control piston

43. Slide the piston to the top of its stroke and withdraw the spring seat from the piston crown. Remove the piston from the cylinder.

44. Remove the seal retaining-circlip from beneath the piston head, remove the re-

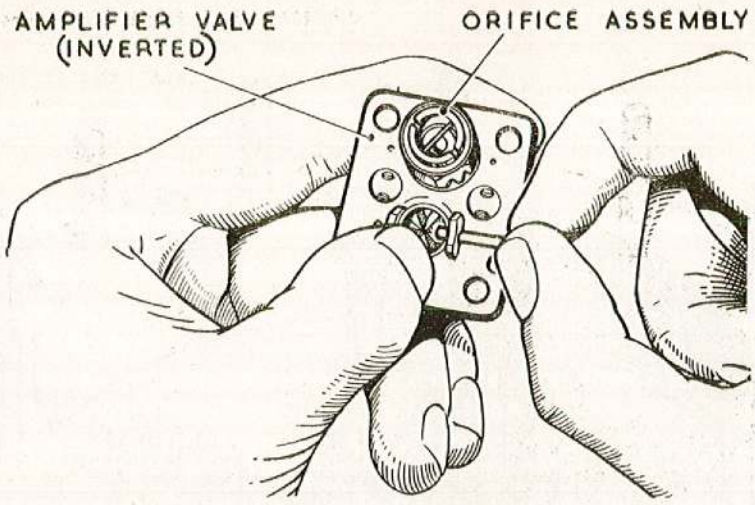

Fig. 11. Removing the stall pressure adjustment

taining ring and draw off the distributor seal. If it should be necessary to prise the seal away, use a tool from which all sharp edges have been removed.

45. Remove the felt sealing ring from the smaller bore in the pump housing.

Control cylinder liner (*fig. 13*)

46. To remove the liner use the tool T.217339, as follows :—

(1) Lower the two lipped blocks into the cylinder bore and engage the lips of each block beneath the liner, at the same time ensuring that the drillings in the two blocks are in alignment.

(2) Lower the extractor on to the housing and screw back the larger of the two knurled nuts.

(3) Screw down the spindle by means of the small knurled nut (left-hand thread)

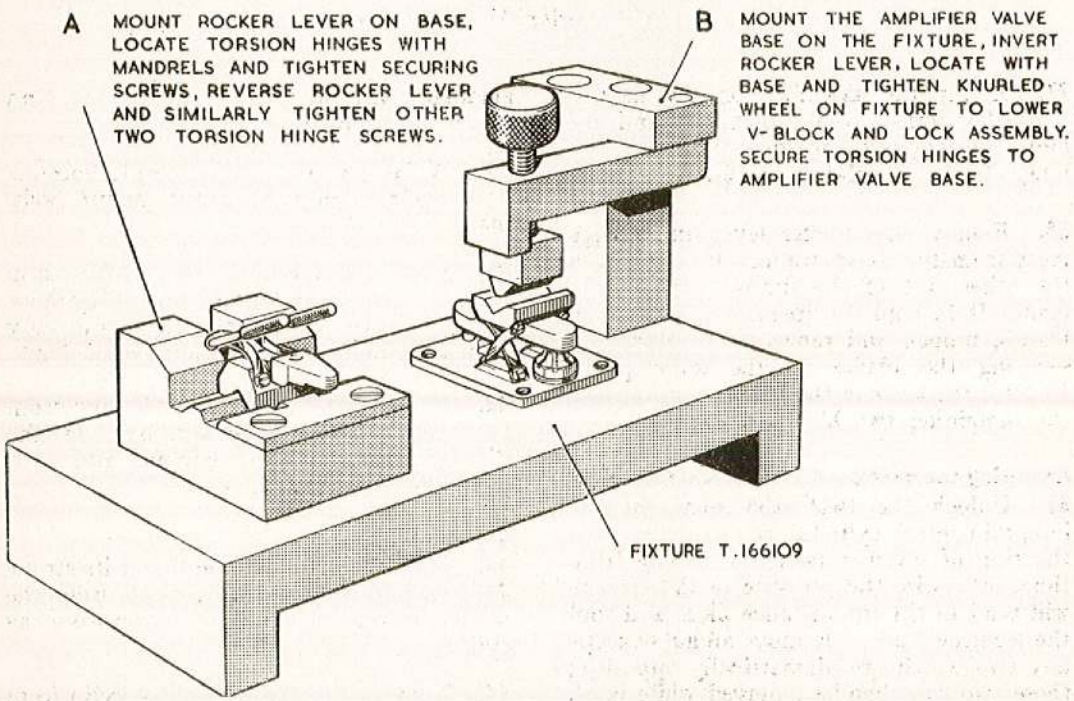

Fig. 12. Amplifier valve assembling and dismantling fixture

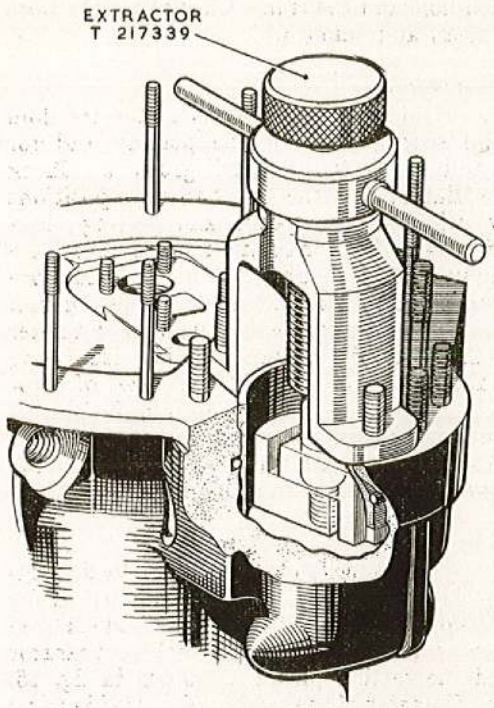

Fig. 13. Removing the control cylinder liner

until it engages in the threaded bore in the lipped block then screw down fully.

(4) Rotate the large nut anti-clockwise to extract the liner.

(5) Remove the large sealing ring from the groove in the control cylinder bore.

Servo pressure restricting orifice

47. The restricting orifice is housed on the pump body adjacent to the control cylinder. Remove the complete assembly by using a standard box spanner. Withdraw the strainer from the retaining plug and ease out the sealing rings.

Remaining details

48. The remaining items in the pump body consists of the retaining studs, dowel pins and blanking plugs. The latter can be removed with standard spanners. Loose or damage studs must only be replaced under an approved repair scheme. Dowel pins are a tight push fit and can be withdrawn with pliers but they should not be removed unless loose or damaged.

49. The solenoid assembly is to be dismantled as described in para. 194.

Cleaning

50. The components should be pressure-washed in kerosine, using an appropriate bath and spray gun supplied by a pump and with adequate filtering facilities. Hard brushes, cloths and abrasives must not be used. After cleaning, the components should be dried thoroughly with compressed air which must be free from water, and then placed in clean dry containers. Particular care is necessary when cleaning components which have a micro-finish on sealing faces. In these instances a nylon brush and methylated spirits should be used to remove the residue of gaskets, etc.

INSPECTION

General

51. Where dimensional checks of components are necessary, the method only is described, the actual dimensions being given in the Vol. 2, Part 2 Schedule of Fits, Clearances and Repair Tolerances.

52. As it is usual during inspection to reject any parts rendered redundant by essential modifications, complete information covering modifications must be at hand.

53. Any new consumable parts should be made available for inspection with the main components.

54. Scores or surface damage on moving parts and joint faces will impair the operational efficiency of the unit, and any part so affected should be renewed.

55. The following components must be tested by means of an approved magnetic crack detection equipment.

Rotor (for cracks on steel journals)
Drive shaft
Camplate
Port insert
Control piston assembly
Auxiliary camplate
Overspeed governor spring
Amplifier valve rocker lever
Control piston springs
Flow adjusting screw
Stall pressure adjustment screw
Piston spring guides

Camplate and housing

56. Examine the housing generally for signs of damage and corrosion, and the joint face of the flange for scores. Inspect the trunnion block pockets for the presence of foreign matter, burrs and scores. Examine the carbon bearing and two carbon-faced seals for chipping and scoring and see that the helical spring, seal spacer and circlip are free from damage and distortion.

57. Ensure that there is no visible damage due to pick-up from the piston slippers or discolouration through overheating. See that the control rod link-pin hole is not worn and that the opposite lug is not damaged through contact with the maximum flow screw. Check that the trunnions and trunnion blocks are not worn beyond the specified limits and test the trunnion blocks and camplate for end float by using the gauge G.67467 as shown in fig. 24.

58. The trunnion blocks are a selective assembly and should have a minimum clearance of 0·002 in. between the block and the joint face of the pump body (*para.* 120).

Rotor assembly

59. Examine the plated port-face on the underside of the rotor which bears against the port insert in the pump housing. This face must be quite flat and clean. Some wear of the plating is permissible but evidence of bronze showing through the plating will necessitate a replacement rotor. Examine both the large and the small bearing surfaces on the rotor and the rotor extension sealing face for signs of pick-up, cracks, or discolouration through overheating. Ensure that the surfaces of the thrust ball are smooth and uncorroded. Inspect the spring seat, the shims and the spring for serviceability.

60 Examine the helical springs of the rotor pistons for sharp edges and fractures. Also ascertain that the spring seats are sound and the pressure feed holes unobstructed. Ensure that all radial drillings from the axial bore of the rotor are clean. Examine the piston spring guides for wear and fractures and any burrs or sharp edges. See that the carbon bearing is free from cracks, is not chipped and that no foreign matter has accumulated on its underside. Check the carbon bearing clearances as described in para. 67 to 70. Inspect the auxiliary camplate for burrs and general damage. See that there are no cracks between the holes, particularly between each hole and the rim. Check that the bore is clean and smooth.

Rotor bores

61. Examine the rotor bores for freedom from scores, wear of the plating and for cleanliness of the oil relief grooves. Check the diameter of the bores in four positions by using a bore gauge and setting rings (*fig.* 14). The maximum worn clearance allowed between any one piston and bore is specified in Vol. 2, Part 2. The bores of the setting rings are identical in diameter to the bores of a new rotor ; five sizes being available for the five different sizes of rotor bore. The gauge is set to zero in the bore of the setting ring and is then inserted in the rotor. The reading obtained indicates the amount of wear in the rotor bore.

Rotor pistons

62. Test the pistons for ease of reciprocation in the bores and also examine them for discolouration on the skirts. Check the pistons for wear using a dial comparator and the setting pieces as shown in fig. 15. The diameter of the setting pieces is identical to that of new pistons ; five sizes being available for the five different sizes of piston as indicated in the illustration. The comparator is adjusted to zero reading on the setting piece then each piston is passed in turn, under the comparator. The reading obtained indicates the amount of wear on the piston.

63. Wipe each piston with clean muslin and place each one in turn on a sheet of clean, white paper when any tendency to surface corrosion or discolouration will be more readily discerned. Examine the spherical face of the the piston slipper which makes contact with the camplate and ensure that the plating is intact and is not severely scored. Ascertain that the hole in the slipper pad is free from obstruction. Check the float of the slipper on the piston by using the gauge G.56521 as shown in fig. 16.

Port insert

64. Examine the insert closely for surface cracks and for chipping at the edges of the ports and around the periphery. Ensure that the working face is unworn and that there is no evidence of the rotor face plating adhering to the insert. The thickness of the insert and the parallelism of the faces relative to each other must be measured in

accordance with the dimensions stated in Vol. 2, Part 2.

65. To check the parallelism of the insert place it in the pump body, ensure that it is located correctly on the dowels, then place the test bar and indicator G.51239 on the pump housing face (*fig.* 17). Check at several points across the face of the insert. If the reading obtained is outside the stated figure, remove the test bar and the port insert, make sure that the face of the insert and its seating in the pump housing, the pump flange and the underside of the test-bar, are all quite clean. Also check the dowels and the dowel holes in the insert and pump body for cleanliness. Replace the insert and test again ; if the result is still unsatisfactory remove the insert and check the seating face in the housing for parallelism relative to the pump flange by lowering the gauge in the test-bar. The same limits apply as for the check on the insert. In the case of a new insert the parallelism must be within 0·0000 in. to 0·00012 in. and after service must not exceed 0·0005 in.

66. If this last test proves the pump housing to be unsatisfactory a new housing must be introduced. If the housing is satisfactory, then a new port insert must be fitted. In either instance the parallelism test must be repeated.

Carbon bearing clearances

67. Examine both carbon bearings for cracks, scores and for chipping at the edges and around the dowel slots. Insert the large bearing into the pump body and check that it is a good sliding fit ; when a new bearing is to be fitted this must be selected to give the required fit. No attempt should be made to ease a tight bearing. Check the small carbon bearing similarly in the camplate housing bore.

68. Check the diametral clearance between the bearings and their corresponding journals on the rotor by using the gauge G.61522 for the large bearing and the gauge G.61521 for the small bearing as shown in fig. 18. The rotor and large carbon bearing is placed first on the gauge G.61522 and secured by the locking lever which expands

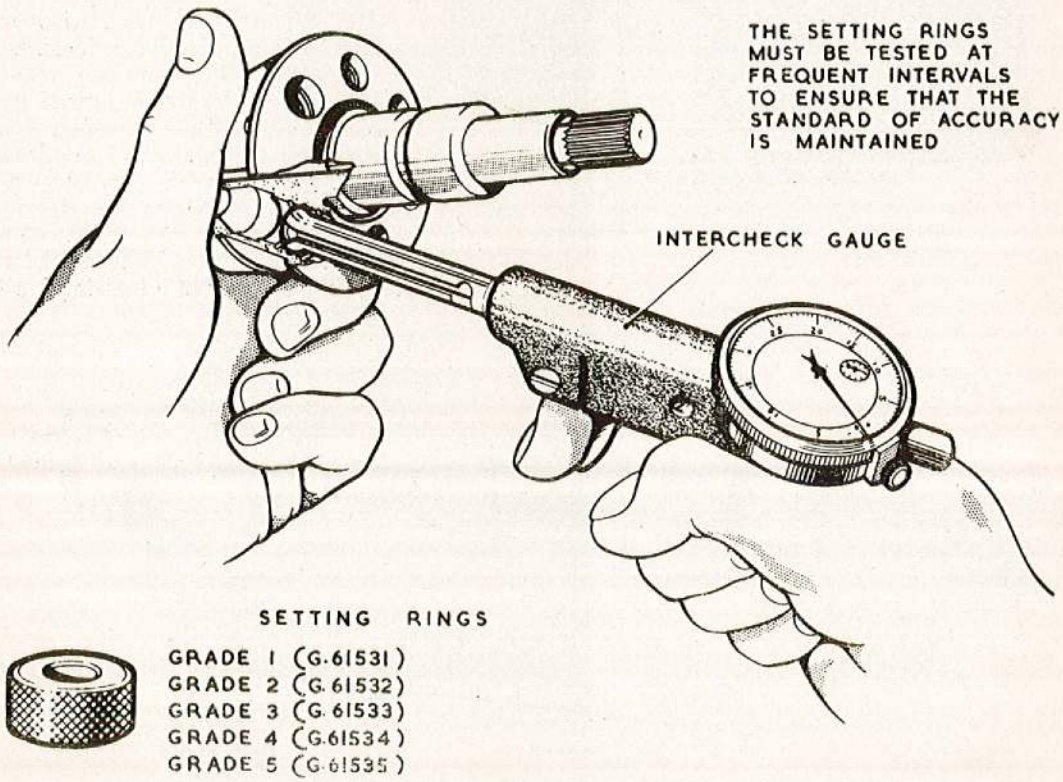

Fig. 14. Checking the rotor bores

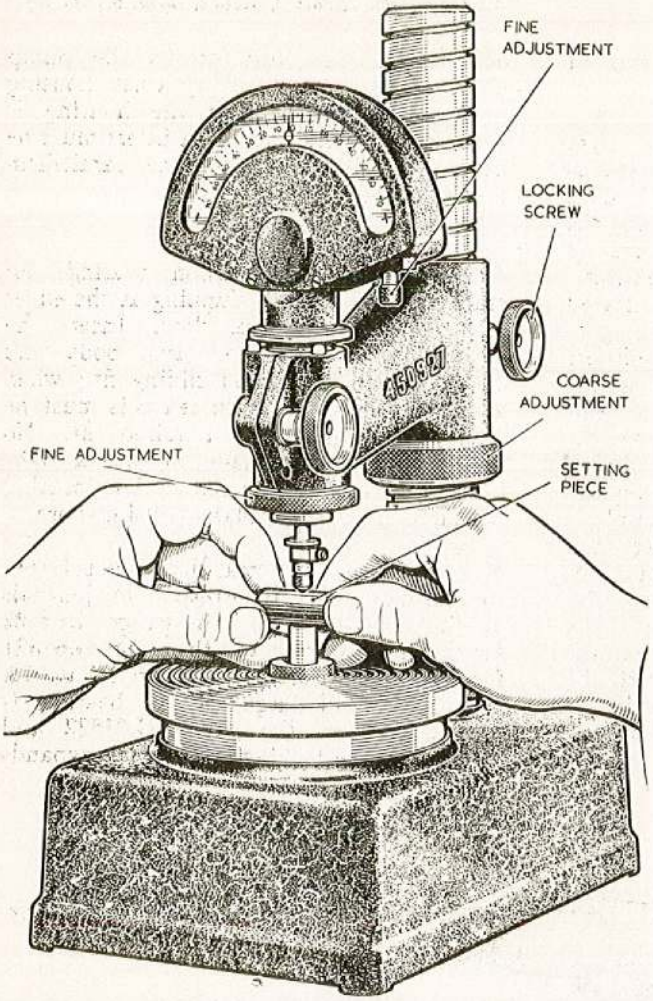

Fig. 15. Checking the rotor pistons

a collet to grip the centre bore of the rotor.

69. To check the clearances, place a finger on the bearing adjacent to the dial test indicator button and press that side of the bearing against the journal to take up all clearance. Set the dial test indicator to zero and then transfer the finger pressure to the opposite side of the bearing when the gauge will indicate the diametral clearance. Repeat the check at one-sixth of a turn intervals until the bearing has been rotated completely, thereby checking for any distortion. The clearance required is 0·005 in. to to 0·006 in., should distortion be present, provided this is not excessive, the mean of six readings is acceptable. If the required clearance cannot be obtained, another bearing must be selected but the new bearing must first be checked for fit in the pump body as described in para. 67.

70. Fit the gauge G.61521 over the rotor tail and place the small carbon bearing on the rotor journal. Check the clearance by the same method as that for the large bearing; the required clearance in this instance is 0·002 in. to 0·003 in. If the bearing is to be changed, the new bearing must first be checked for fit in the camplate housing bore (*para.* 67).

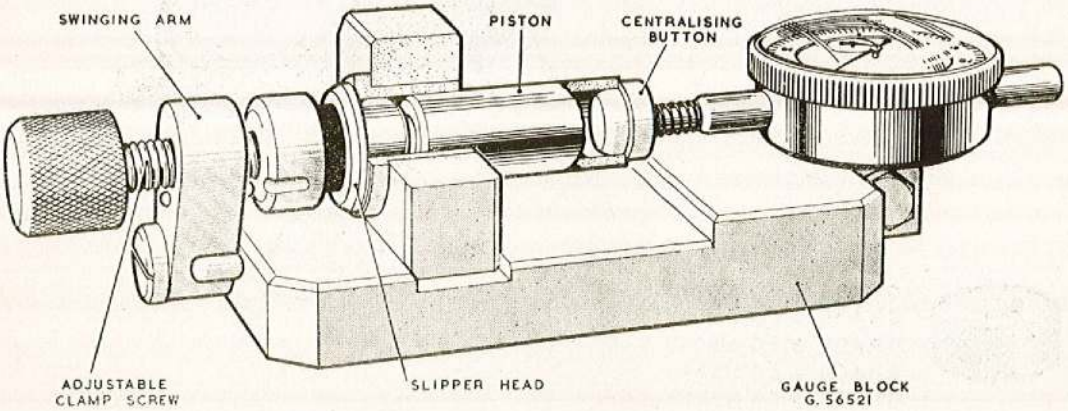

Fig. 16. Checking the slipper piston clearance

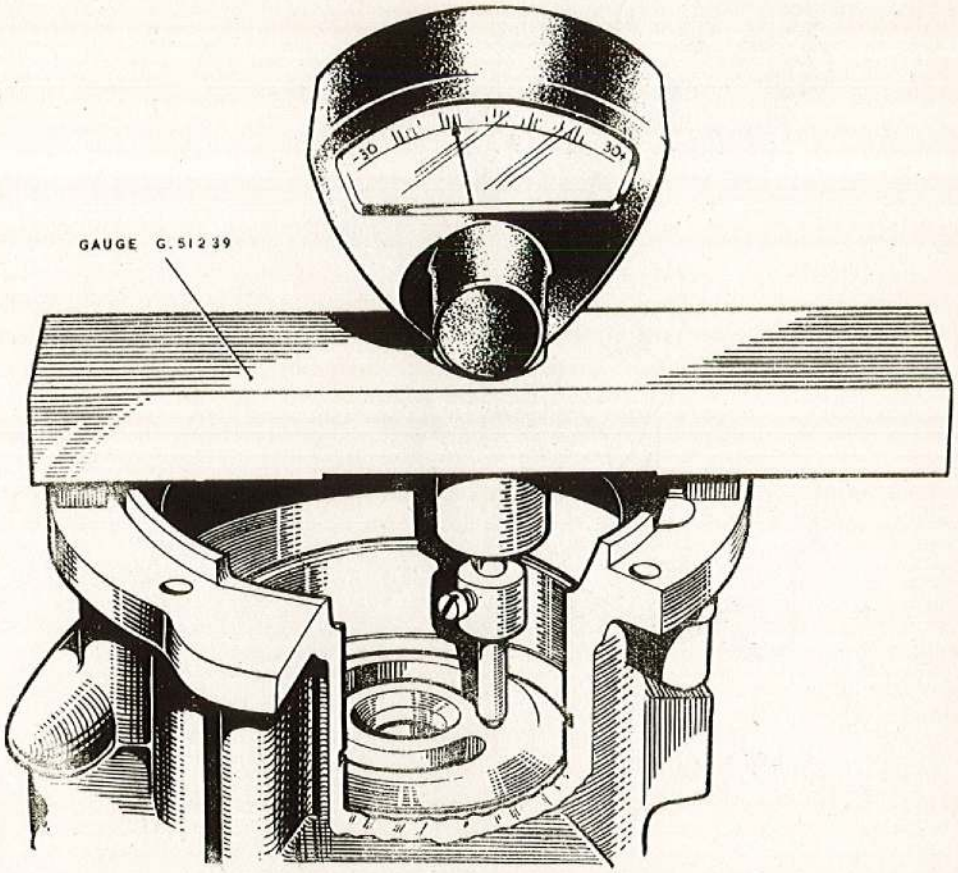

Fig. 17. Checking the parallelism of the port insert

Overspeed control assembly

71. If the assembly has been completely dismantled examine the diaphragm for buckling, and for any sign of cracking or splitting. Check that there is no sign of fuel inpregnation of the diaphragm surface, particularly adjacent to the edge. Inspect the rivets for looseness and the diaphragm centre boss and support plate for damage.

72. Check the diaphragm spring attachment generally for damage, ensure that it is a free fit in the diaphragm centre boss and see that the internal threads are in good condition. Inspect the clevis-pin holes in the fork for wear and for radial cracks around the holes.

73. Examine the tappet screw for wear and pitting on the head; see that the threads of the screw and lock nut are clean and in good condition.

74. Examine the governor spring for surface cracks and corrosion, particularly around the attachment loops, and see that the loops and coils are square and free from distortion.

75. Examine the spring anchors for wear in the clevis-pin holes and for cracking around the fork lugs. See that the stem is smooth and free from damage and that the threads are clean.

76. Examine the adjusting screw for scoring and other surface damage on the underside of the flange as this is a sealing face and damage may cause leakage. See that the threads and the squared end of the screw are in good condition.

77. Examine the anchor guide and also the adjusting screw locknut for serviceability.

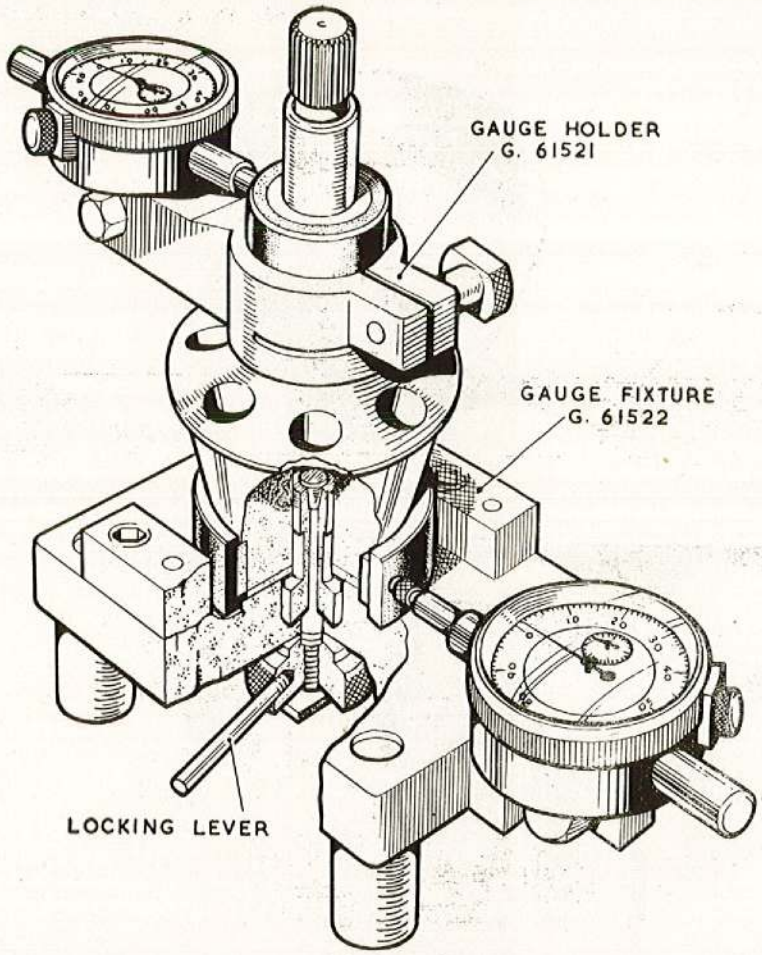

Fig. 18. Checking the rotor carbon bearing clearances

78. Examine the diaphragm cover generally for damage and the joint face for scores. Check that the locating dowel for the anchor guide is a firm fit. Examine the transfer bobbin on units fitted with a solenoid valve.

Amplifier valve

79. Examine the rocker lever generally for damage and ensure that the bridge piece is firmly attached. Check that the half-ball valve recess in the lever is clean and free from damage at the edges. Examine the upper and lower surfaces of the lever tail for wear by the lever stop and diaphragm tappet. See that the tappet holes in the bridge piece are clean and that the threads are serviceable.

80. Examine the baseplate generally for damage and check that the rocker lever stop rivet is secure and unworn. Ensure that the threads in the tapped holes which receive the orifice assembly, and the torsion hinge anchoring setscrews are serviceable. See that the slot which houses the stall pressure adjusting screw, is free from sharp edges or burrs and that the sides are not scored.

81. Examine the half-ball valve for wear on the face and the back and check that it is a free fit in its recess. Using an electro-limit comparator, or similar instrument, check the flatness of the face of the valve; this must be within 0·000002 in. If a measuring instrument is not available, the test may be made with an optical flat. In this instance, not more than two colour bands must be visible.

82, Inspect the orifice assembly for cleanliness, check that the threads are in good

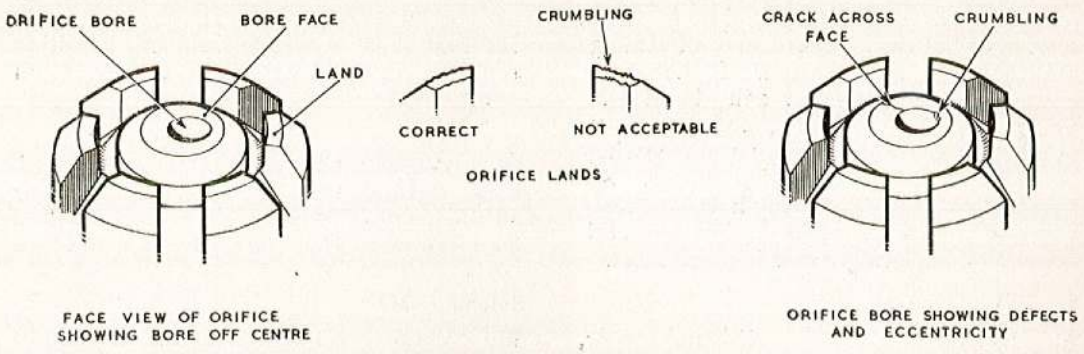

Fig. 19. Enlarged view of orifice defects

condition and examine the orifice and surrounding lands closely for damage, burrs and corrosion (*fig.* 19). Check the lands for wear by the half-ball. Test the orifice face for flatness in a similar manner to that described for the half-ball valve. If an optical flat is used, a colour registration must be obtained on the orifice face and on each land.

83. Examine the stall pressure adjusting screw, spring, spring seating and retaining pin for cleanliness, damage and corrosion; see that the screw threads are serviceable.

84. Examine the torsion hinges for surface cracks and their retaining setscrews for damage.

85. Examine both seating faces of the distance piece for damage or scores. Ensure that all traces of the joint gaskets have been removed and that the facing in the bottom of the counterbore which provides the spring seating is clean.

86. Examine the no-flow stop screw in the control cylinder cover and also any shim washers for serviceability. Examine the bobbin sealing assembly and the large sealing ring groove in the control piston end for possible cause of leakage and see that all fuel passages are unobstructed.

87. Examine the air bleed orifice valve for corrosion and see that the very small bore is not obstructed by the presence of foreign matter.

Control piston

88. Examine the control piston and rod for wear, scores and other damage and ensure that there are no cracks developing around the piston. Examine the circlip groove and see that the seal seating is quite clean. Check that the piston seal retaining ring and circlip are serviceable.

89. Examine the link and link-pins and the stepped bolts for cracks or other damage. Also see that the slot along the shank on the self-locking type is in good condition. Examine any shim washers for cracks or damage.

90. Examine the cylinder liner for wear in the bore and ensure that all traces of the large rubber sealing ring have been removed from the housing.

91. Examine the control piston springs and spring seat for distortion and surface defects.

Servo pressure restricting orifice

92. The details comprise a retaining plug and orifice, strainer and two rubber sealing rings. Examine the retaining plug and orifice for damage and ensure that the orifice bore is quite clean and unrestricted. Examine the strainer element for damage and distortion and see that the end pieces are secure. Test the strainer by using the fixture T.210194 connected to a delivery line; the pressure drop must not exceed 8 lb. per sq. in., at a flow of 50 g.p.h.

Pump housing

93. Examine the housing generally for damage to the casting and studs, see that the joint faces are in good condition and are free from scores or corrosion. Ensure that any traces of joint washers have been removed from the facings, check that all rubber sealing rings have been removed and

that the grooves are clean. Examine the spot faces around the blanking plug holes and see that they are clean and free from scoring or damage. Check that all drillings are clean and unobstructed. If the dowels have been removed see that the dowel holes in the port insert seating and also those taking the dowels for the carbon bearings are clean and free from foreign matter. See that any tabwasher locating holes are clean and that the threaded insert for the maximum flow adjusting screw is serviceable.

Remaining details

94. Examine the flow adjusting screw, locknut, cap nut and washers for serviceability and examine the dome end of the screw for damage or pitting from contact with the camplate lug.

95. Check all blanking plugs for good condition of the faces under the heads as scoring or damage may result in leakage. See that their heads are in good condition and that the lockwire holes are free from sharp edges.

96. Examine all dowel pins for fretting, wear, and any signs of corrosion. Examine all nuts, bolt. studs, setscrews, shims, etc., for cleanliness and good general condition.

Solenoid valve

97. When a solenoid-operated servo isolating valve is fitted, the solenoid is not to be dismantled completely but only sufficiently to gain access to the strainer, strainer housing, orifice assembly and push rod.

ASSEMBLING

BUILDING THE SUB-ASSEMBLIES

Maximum flow-adjusting screw

98. Mount the pump body on the fixture T.217347. Fit the maximum flow adjusting screw by inserting it from the camplate end of the pump body. Fit a new washer and the locknut to the squared end but do not tighten the nut. The remaining washer and cap nut is to be fitted after calibration tests.

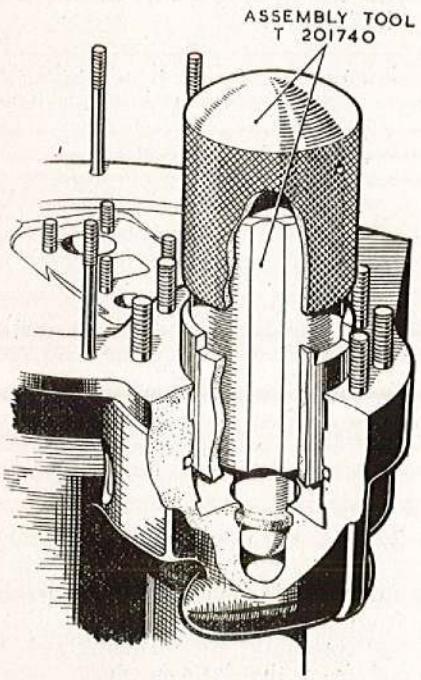

Fig. 20. Fitting the control cylinder liner

Control cylinder liner

99. Before fitting the control cylinder liner, fit the control-rod felt ring, then fit a new sealing ring to the groove mid-way down the large bore. Using the tool T.201740 insert the liner, chamfered end first, as shown in fig. 20.

Port insert and carbon bearing

100. Check that the dowel holes in the insert seating face of the pump housing are quite clean then press the dowels into position. If a new insert is being fitted remove any sharp edges around the ports and central hole by using a fine polishing stone but take care to avoid chamfering the edges.

101. Place the insert in the pump housing, locate it on the dowel in accordance with the location marking and seat it firmly by finger pressure only. When seated, the face of the insert must be checked for parallelism with the pump housing flange as described in para. 65 and 66.

102. When the insert is satisfactory, fit the retaining spider, locating it on the carbon bearing dowel in the face surrounding the insert. Ensure that the bore of the spider engages correctly on the land on the periphery of the insert.

103. Fit the large bearing into the housing, locate the slot in the end face over the dowel in the housing and push down fully. Check the bearing clearance in the housing as described in para. 67 to 69. Fit the bearing retaining circlip.

Control piston

104. Fit the distributor seal, flat side towards the piston face, passing it over the piston rod and pressing it gently with the fingers on to the piston. Follow this with the seal retaining ring, large diameter towards the seal, then secure the assembly by fitting the circlip into the groove.

Camplate housing

105. Fit a new sealing ring to the carbon-faced seal then assemble the seal and sealing ring, location dowel and carbon bearing into the housing ; the carbon bearing should be a push fit in the housing using finger pressure only.

106. Check the carbon bearing clearance as described in para. 67 to 69 then fit the retaining circlip.

Amplifier valve

107. Place the amplifier valve rocker-lever on the assembly fixture T.166109 as shown in fig. 12. Assemble the two inner torsion hinge blades to the lever bridge piece, and locate them with the setscrews and new tabwashers. Before securing the setscrews locate the free end of each blade with a mandrel then tighten and lock the screws. Reverse the lever assembly in the fixture and fit the two outer blades likewise.

108. Place the amplifier valve base plate on the other side of the fixture and transfer the rocker lever to it, reverting the lever to the correct position with the bridge piece at the top. Align the holes in the spring blade with the tapped holes in the base plate and rotate the knurled screw to lower the vee-block lever and align the spring holes correctly. Insert the retaining set-screws, complete with new tabwashers, tighten and lock them. Remove the assembly from the fixture.

109. Fit the locknut and a new tabwasher to the orifice assembly, invert the rocker lever assembly so that the baseplate is uppermost and place the half-ball valve in the lever recess, then screw the orifice assembly into the baseplate until the orifice just contacts the half-ball. Screw the locknut finger tight but do not lock it at this stage.

110. Assemble the spring seating to the stall-pressure adjusting screw and assemble these, together with the spring and retaining pin, to the valve base plate.

Adjusting the amplifier valve

111. The amplifier valve is adjusted before assembly into the pump, by means of the fixture T.206237 (*fig.* 21). Position the amplifier valve on the locating dowels with the rocker lever horizontal inside the upright support and clamp down tightly by means of two knurled screws. Move the dial test indicator until the thimble rests on the tail of the rocker lever, lock in position and set the indicator to zero. The gap between the tail of the rocker should be between 0·025 in. and 0·040 in. with the head of the lever depressed to seat the half-ball firmly on the orifice face. It is recommended that a lift of 0·028 in. will provide the most desirable pre-load. If the gap is incorrect, release the orifice locknut using the spanner T.193938, adjust the orifice assembly with the key provided on the fixture and lock the fixture key by means of the knurled screw. Check the adjustment on the dial gauge and when correct tighten the locknut with the spanner T.193938 and lock the tabwasher. Remove the amplifier valve assembly from the fixture.

Overspeed control

112. Fit the tappet screw complete with locknut and new tabwasher to the diaphragm spring anchor. Insert the anchor and tappet into the diaphragm centre plate, attach the spring loop of the governor spring into the anchor fork, fit a clevis pin and a plain washer and secure it with a split pin. Assemble the spring anchor likewise to the opposite end of the spring. Stretch the spring until the ends of the upper and lower spring anchors rest upon each other and are held in this position by the tension of the spring. Fit the spring anchor guide over the squared end of the upper spring anchor.

113. Fit a gasket on to the diaphragm cover and then lower the diaphragm and governor spring assembly into the diaphragm cover. Rotate the spring anchor guide until the locating dowel engages with the socket provided.

114. Align the holes in the gasket and diaphragm with those in the cover by rotating the diaphragm about its centre. Fit the tabwasher and locknut, tighten the lock-

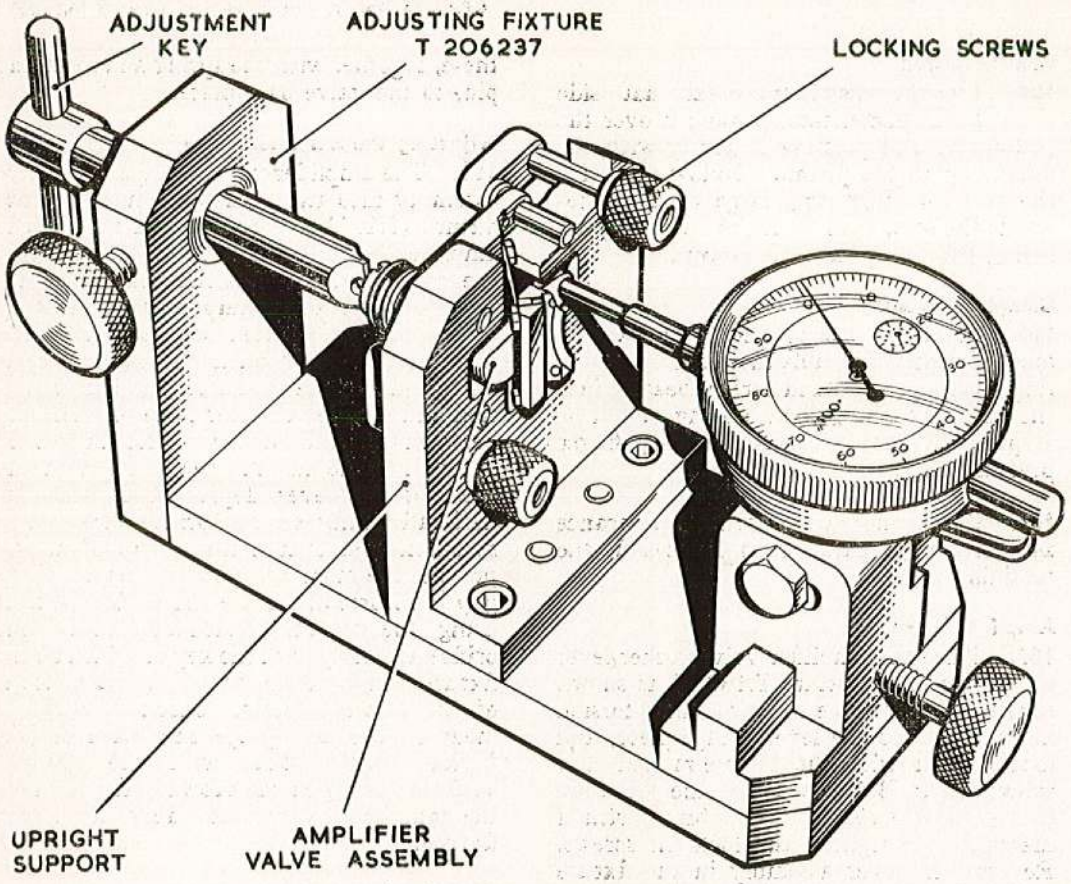

Fig. 21. Adjusting the amplifier valve

nut lightly and do not lock it at this stage.

115. Fit a rubber sealing ring on to the adjusting screw and fit the screw into the upper spring-anchor, passing it through the spring anchor guide and making it finger tight. Screw on the cap nut finger tight only. Fit to the cover all blanking plugs and assembled bleed valves. On applicable units the orifice assembly of the solenoid valve should be fitted and tested at this stage as described in para. 196.

Rotor

116. The method of fitting the rotor drive shaft is identical with that for fitting a new shaft as described in para. 24. Pressure test the sealing ring on the drive shaft by using the fixture T.217342 (*fig.* 22). Immerse the fixture in a bath of kerosine, apply air at a pressure of 4 lb. per sq. in. and check for leakage between the rotor and drive shaft. If satisfactory, raise the pressure to 40 lb. per sq. in. and again check for leakage. No leakage is permissible.

117. If the spring guides have been removed, insert the guides into the rotor piston bores using the tool T.201770 as shown in fig. 4.

118. Assemble to the rotor the piston springs and spring seats, and to the rotor shaft, the spring, spring seat, shims, thrust ball and auxiliary camplate then lower the pistons through the camplate into the rotor bores. The piston and slipper assemblies are selected to suit their respective bores in the rotor and both piston and bore are numbered to correspond.

119. Fit the no-flow stop screw together with a new tabwasher and any adjusting shims in the control cylinder cover end. Tighten down the screw but do not lock the tabwasher at this stage. Place a rubber sealing ring in the control cylinder counter-

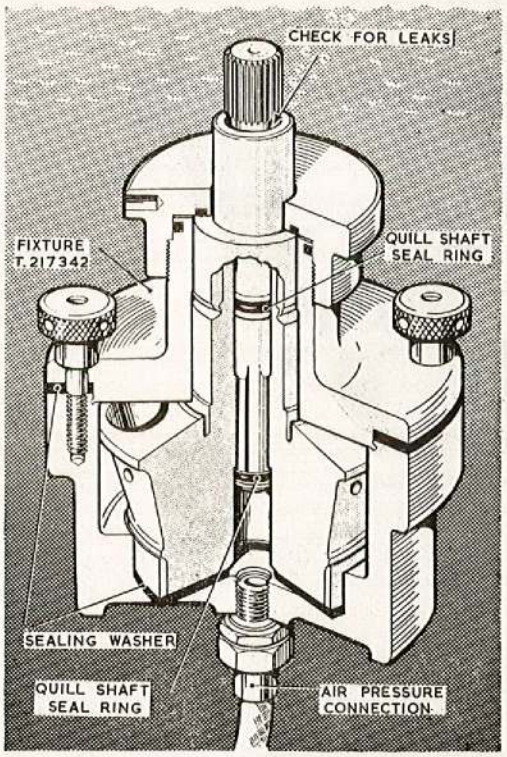

Fig. 22. Pressure testing the drive shaft oil seal

bore, fit new rubber sealing rings to the bobbins and insert the bobbins in the mating face of the distance piece.

BUILDING THE PUMP

Checking the trunnion block clearance

120. The following instructions, para. 120 to 126, apply particularly where new trunnion blocks or a new camplate housing are to be fitted. It is advisable however, to carry out the check where existing components are being refitted to ensure that the assembly is quite satisfactory.

121. Place each trunnion block in the camplate housing and check that it is a good sliding fit. If one block appears tighter than the other, change them over and if there is no improvement, provided that the easier of the two is a good fit, remove the tight block and select another to suit. Should either block be too free in the housing a replacement must be selected.

122. Following the check for tightness place one block into its pocket, check that it is seated on the bottom face of the pocket and, using a depth micrometer (*fig.* 23), check that the upper face of the block is not less than 0·002 in. below the camplate housing joint face. Fit and measure the remaining block likewise. This is to ensure that when assembled, the blocks do not prevent the housing being tightened down correctly on to the joint washer. If the clearance is less than 0·002 in., select other blocks to suit.

123. When the clearance is satisfactory, remove the blocks from the housing and assemble them to the camplate trunnions; the trunnion block which has been selected for the left side of the housing to be fitted to the left-hand trunnion on the camplate and the right-hand block correspondingly.

Checking the camplate end-float

124. Insert the screwed centre portion of the gauge G.67467 into the quill shaft end of the camplate, fit the upper portion of the gauge to the opposite end of the camplate so that the slotted tufnol block aligns with the drilled linkage lug. Screw the knurled nut tightly to the centre bolt then lower the assembly into the camplate housing (*fig.* 24). Fit the dial test indicator and locate the contact point as illustrated,

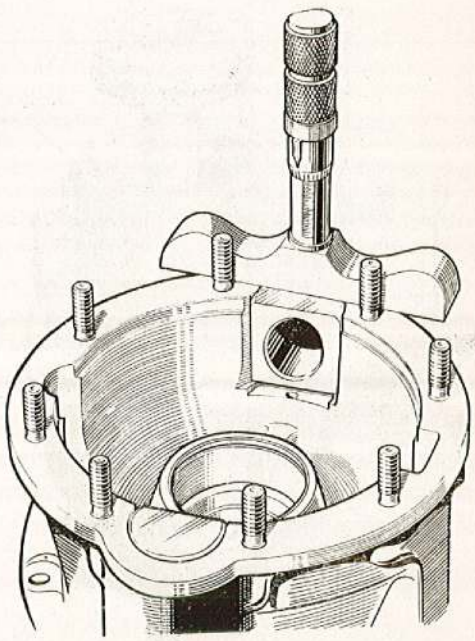

Fig. 23. Measuring the trunnion block clearance

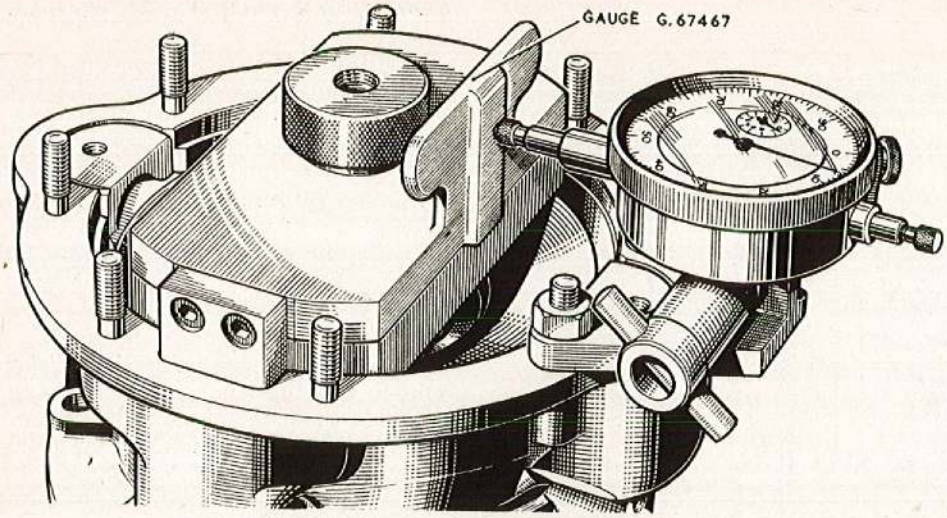

Fig. 24. Checking the camplate end-float

move the camplate along the trunnion axis to take up the play and set the indicator to zero. Move the camplate fully in the opposite direction and note the end float ; this must be 0·006 in. to 0·012 in.

125. If the clearance stated is not obtainable, remove the trunnion blocks, select others and repeat the test.

126. The trunnion blocks are a selective fit and should the clearance prove too great then others should be tried until the correct clearance is obtained.

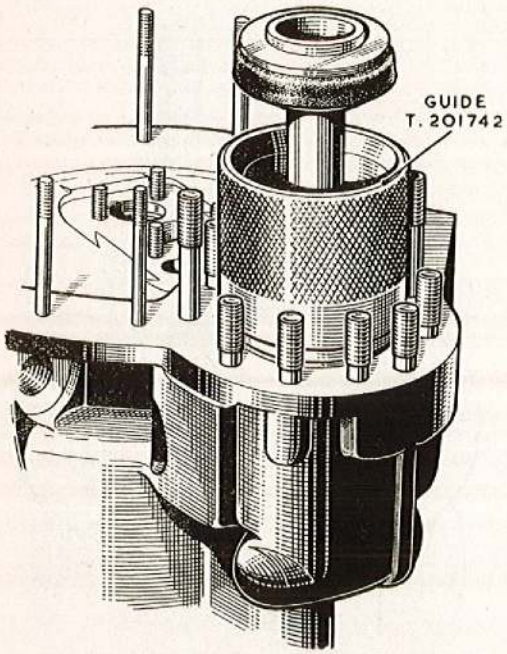

Fig. 25. Fitting the control piston

Fitting the control piston

127. Insert the control piston assembly into the pump body using the guide T.201742 as shown in fig. 25. Guide the piston seal gently into the cylinder liner and push the piston in as far as possible using the tool T.201742 to guide the assembly.

128. Attach the link to the top of the piston rod with the stepped bolt, tabwasher and nut, or on applicable types, the link pin and retaining dowel.

Fitting the rotor

129. Before fitting the rotor assembly ensure that the following checks have been made : bores and piston clearances, parallelism of port insert and carbon bearing clearances. Ensure that the faces of the port insert and rotor are clean, then lower the rotor assembly gently into the pump housing taking care to hold it central as the journal enters the carbon bearing. Avoid forcing the rotor sideways, at this and successive stages, until the camplate housing is fitted.

Fitting the camplate

130. Remove the trunnion blocks from the camplate trunnions and place the camplate assembly over the rotor and rest it on the piston slippers.

131. Rotate the camplate to align the lug

and the control piston link and connect them with the stepped bolt, tabwasher and nut or the link pin and retaining dowel as applicable.

132. Assemble the trunnion blocks to the camplate trunnions, locating the blocks over the pump facing.

133. Place a new gasket on the camplate end of the pump body and fit the adapter ring G.67463 on the gasket, ensuring that the pockets in the ring engage with the trunnion blocks. This ring replaces the camplate housing to enable the camplate to be checked. Fit slave nuts and bolts.

Checking the camplate angle

134. Before checking the auxiliary camplate, fit the turnkey T.210889 to the shaft splines and check that the rotor can be turned evenly without undue tightness.

135. Using the plate gauge G.67464 (*fig.* 26), set the camplate angle at 15 deg. by adjusting the maximum flow screw. When satisfactory, tighten the screw locknut.

Checking the auxiliary camplate lift

136. Check the auxiliary camplate for lift at 15 deg. setting and also at the zero (minimum flow) setting, by using the gauge G.67466 on the rotor shaft (*fig.* 27). Set the dial test indicator to zero, press on the auxiliary camplate with the fingers and take a reading on the dial. The lift should be between 0·004 in. and 0·007 in. If adjustment is necessary, the shims beneath the thrust ball must be varied. Record the lift at the zero setting. Remove the gauge from the pump body.

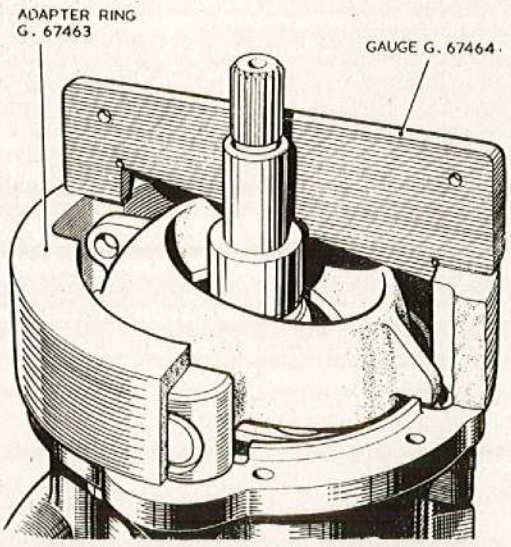

Fig. 26. Checking the camplate angle

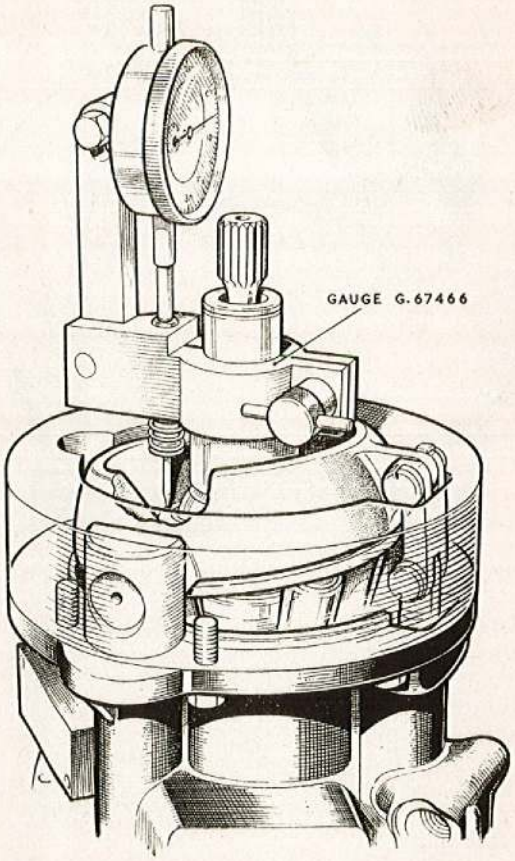

Fig. 27. Checking the auxiliary-camplate lift

Checking the camplate minimum angle

137. With the adapter ring G.67463 still in position, fit the gauge G.67468/1 as shown in fig. 28. Set the camplate in the horizontal position by adjusting the maximum flow screw in the pump body. Fit the no-flow or minimum stop screw, the tabwasher and any previously removed shims to the control cylinder end cover, assemble the cover to the pump body and secure with four equally spaced slave nuts. Check the horizontal position of the camplate then adjust the maximum flow screw until the control piston head contacts the no-flow screw in the end cover. At this point, the inclination of the camplate should be

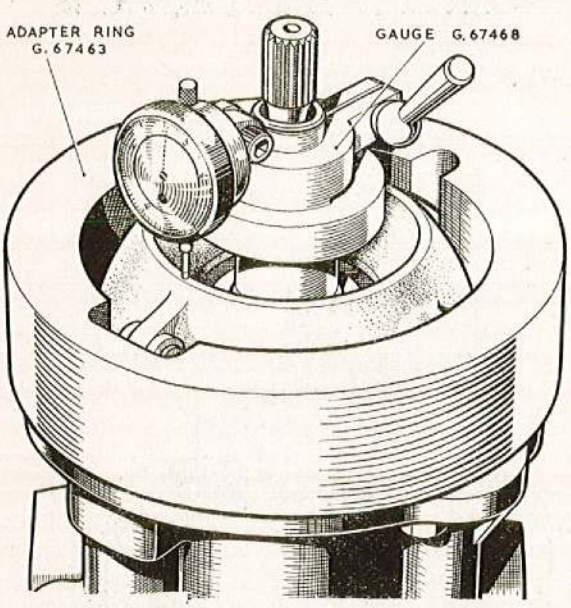

Fig. 28. Checking the camplate minimum angle

0·002 in. to 0·006 in. higher at the maximum flow screw end ; adjustment is effected by removing the control cylinder end cover and altering the shims to suit. There should be no movement of the camplate between the two adjusting screws when correctly set. Finally, remove the end cover, lock the tab-washer and withdraw the gauge from the rotor shaft.

138. Re-set the camplate angle to 15 deg. then remove the adapter ring.

Fitting the camplate housing

139. Lower the camplate housing over the camplate, at the same time ensure that the pockets are located over the trunnion blocks. Hold the housing down on to the pump face, place a nut, grover washer and plain washer adjacent to each trunnion and tighten slightly to hold the housing together. Fit the remaining nuts, grover washers and tighten them evenly. To the centre boss on the camplate housing fit the shim washer, spring, carbon-faced seal and seal spacer with internal sealing ring. Fit the retaining circlip and then check the rotor for ease of rotation by using the turnkey T.210889.

Fitting the distance piece

140. Check that the rubber sealing ring is seated in the control cylinder cover and the bobbins with sealing rings are located in the distance piece mating face. Insert the spring seat and control cylinder springs in the pump cylinder bore and place the gasket and distance piece on to the pump body flange, ensuring that the bobbins locate correctly in the flange counterbore. Hold the distance piece down and fit two nuts and tab washers to the internal studs, and a plain washer, grover washer and nut to each of the five remaining studs around the control cylinder end. Tighten them evenly and lock the two tabwashers.

Fitting the amplifier valve

141. Fit a rubber sealing ring to the orifice body and place the valve assembly on the mounting face and retaining studs in the pump housing. It is advisable to smear the sealing ring with kerosine to facilitate its entry into the housing. Place two double tabwashers on the studs, fit and tighten the reach nuts by using the driver T.175565 but do not lock them at this stage.

Checking the rocker lever tail lift

142. Place the gauge G.67469 on the pump housing and secure it with a washer and nut on two opposite studs (*fig.* 29). Set the dial test indicator and check the lever tail lift as described in para. 111. Record the dimension.

Checking the governor tappet clearance

143. Use the gauge G.67462 (*fig.* 30) to check the clearance between the diaphragm tappet screw and the rocker lever tail. The gauge consists of a clamping ring, sectioned to provide access to the governor tappet and fitted with a sliding plunger which can be locked in position by a knurled locking screw. Mount the clamping ring over the studs on the pump body followed by the gasket and overspeed control assembly. Fit slave nuts and washers. Screw in the adjusting screw to load the spring, release the plunger and allow it to rest on the rocker lever tail then tighten the small internal screw to seat the half-ball on the orifice face. Lock the plunger in position. Insert a feeler gauge between the diaphragm tappet screw and the end of the clamping ring plunger and adjust the tappet to give a clearance of 0·017 to 0·019 in. Tighten the locknut but do not lock it at this stage.

Fitting the overspeed control assembly

144. As applicable to the type of unit, assemble the transfer bobbin and two sealing rings to the counterbore in the face of the overspeed control cover. Place the gasket and control assembly on to the

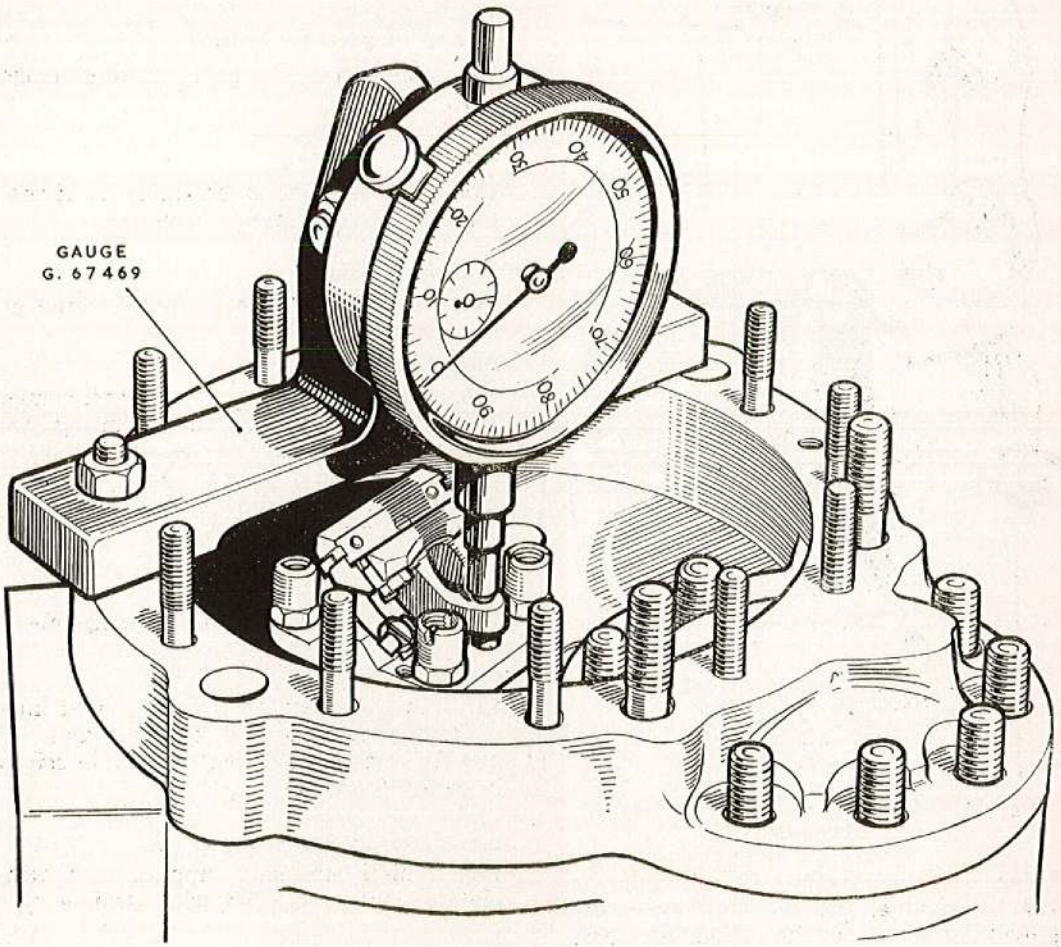

Fig. 29. Checking the rocker lever tail-lift

distance piece, fit a plain washer, grover washer and nut to each of the studs and tighten them evenly.

Fitting the servo pressure restricting orifice

145. Insert the strainer and sealing ring into the orifice body, place a sealing ring around the body groove and screw the complete assembly into the threaded bore on the side of the control piston cylinder.

Remaining details

146. These consist of the air bleed valve and various blanking plugs. Fit the bleed valve and a bonded sealing washer to the distance piece or overspeed control cover as applicable, and the blanking plugs likewise to the pump body.

REPLACEMENTS

Camplate and housing

147. The camplate and housing is normally supplied as a complete assembly.

Rotor assembly

148. If a rotor is unserviceable, a new assembly, comprising rotor, quill shaft, spring guides, springs, spring seats and piston assemblies should be fitted. Auxiliary camplates and thrust balls must not be replaced separately as these are supplied as matched sets.

Carbon bearings

149. Carbon bearings are a selective fit with the body and damaged bearings may be renewed, provided they are selected to come within the specified limits.

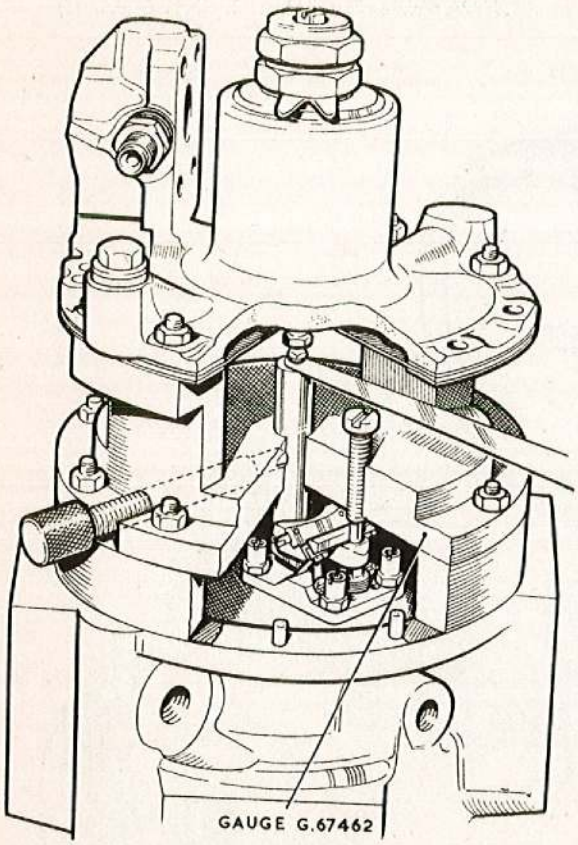

Fig. 30. Checking the governor tappet clearance

Pistons

150. Individual pistons can be renewed provided they are of the correct size (para. 61 and 62). There are five nominal sizes of pistons and the rotor is etched with its corresponding nominal size.

Port insert

151. A replacement port insert may be fitted separately but must be subjected to the parallelism test.

Overspeed governor housing

152. All parts are separately interchangeable.

Diaphragm assembly

153. The diaphragm assembly is riveted together and is supplied complete.

Trunnion blocks

154. The trunnion blocks are a selective fit.

Amplifier valve

155. All parts are separately interchangeable. The tests described during the assembling operations of the amplifier valve (*para.* 107 *to* 111) together with functional tests are the best guide as to whether any parts need replacing.

Control piston assembly

156. All the parts are interchangeable.

Control cylinder liner

157. In the event of a badly scored liner or leakage past the seal, the liner and seal may be removed and replaced as described in para. 46 and 99.

Servo pressure restricting orifice

158. This is normally supplied as a complete assembly together with strainer.

Remaining details

159. All other parts are separately interchangeable, but if a new pump body is required, check the fit of the parts by referring to the previous paragraphs and to Vol. 2, Part 2.

TESTING

PRELIMINARY RIG TESTS

General

160. Fit the test rig adapters T.217343 to the inlet and outlet ports then connect the pump to the rig as shown diagrammatically in fig. 31.

161. Test conditions and performance requirements may vary according to the engine installation; these particular details are given in the appendices to this chapter.

162. Record all calibration and test results for subsequent entry into the pump log book.

163. Before effecting any running tests, prime the pump by means of the bleed valves and using the tool T.175579 (*fig.* 32). Fuel should be allowed to spill until all signs of air have disappeared.

164. After the calibration tests and the governor tests have been made and when the stall pressure has been set, remove the diaphragm cover, diaphragm and overspeed control assembly and check the rocker

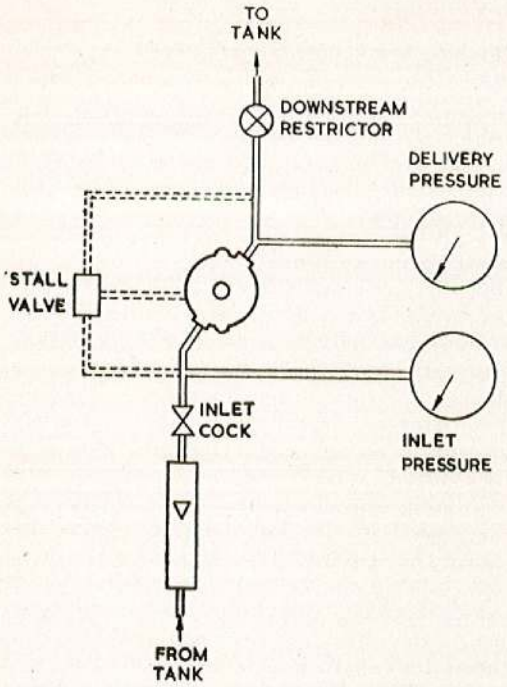

Fig. 31. Diagrammatic lay-out of test rig

lever tail lift (*para.* 142) and the tappet clearance (*para.* 143). Lock the tabwasher on the diaphragm tappet locknut when the adjustment is satisfactory.

Running-in

165. Run the pump at the conditions specified in the Appendix.

Preliminary calibration

166. Before commencing any testing, check the volumetric efficiency (*para.* 179), the governor operating cycle (*para.* 181) and the governor flow recovery time (*para.* 182).

General endurance test

167. Adjust the rig to provide the conditions specified in the Appendix and run the pump for the stated periods. During the first period the temperature of the fuel is to be allowed to rise to the value stated then reduced again before the start of the second period.

Pump cyclic endurance test

168. The number and frequency of the cycles to be regulated as specified in the appendix.

Governor cyclic endurance test

169. Adjust the overspeed governor to the speed stated for Point A in the Appendix then vary the pump speed regularly to operate the governor in accordance with the cyclic frequency specified.

Starting test

170. The rig must be adjusted to the condition required at idling speed. The pump must then be stopped, started and run to idling speed and stopped periodically. The number of starts is specified in the Appendix. After the initial setting at idling speed conditions no further adjustments are to be made during the test. At the end of the test there must be no change in either the flow or delivery pressures.

Performance test

171. Check that the pump has run-in and settled down satisfactorily by making the following tests :—

(1) Stall pressure (*para.* 177 *and* 178).

(2) Volumetric efficiency (*para.* 179).

(3) Governor operating cycle (*para.* 181).

(4) Governor recovery time (*para.* 182).

Strip inspection

172. The pump is to be partially or wholly dismantled for inspection, the extent of this being at the discretion of the inspection authority and determined by the general condition of the pump and the performance

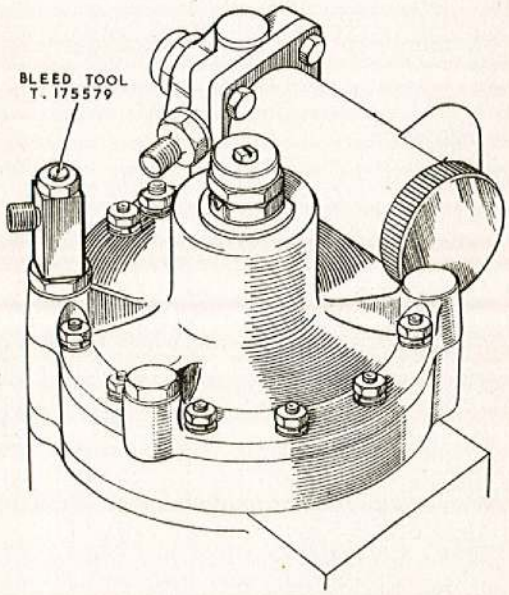

Fig. 32. Bleed tool in position on valve

of the unit during the preliminary testing. If new pistons, rotor, drive shaft, port insert, camplate or auxiliary camplate have been fitted, such components must be crack-tested at this stage.

Final assembly

173. Before final assembly all components must be cleaned as described in para. 50.

174. When assembling the unit all internal locking must be completed, except for those items which may require adjustment during final rig-testing. Installation connections are to be fitted and should not be disturbed after the final leakage test.

FINAL RIG TESTS

Governor cyclic endurance test

175. Repeat the test described in para. 169.

Setting the maximum flow

176. To avoid interference whilst the maximum flow is being adjusted, the governor should be set to the maximum position by rotating the governor setting screw approximately one turn in a clockwise direction. The maximum flow must then be set by running the pump at the condition specified and adjusting the maximum flow screw to obtain the stated flow. The locknut must then be tightened.

Setting the stall pressure

177. Run the pump at the conditions stated in the Appendix then increase the delivery pressure by closing the delivery restrictor cock until the pump stalls, denoted by a rapid decrease in flow. The delivery pressure at which the stall occurs must be within the specified limits.

178. If the stall pressure is above or below the value stated, insert the spanner T.193939 into the aperture in the tail of the amplifier valve rocker lever (*fig.* 33). Clockwise rotation will increase the valve spring loading and consequently the pressure at which the stall occurs; conversely, anti-clockwise rotation will decrease the loading and enable the valve to lift at a lower pressure. The pressure is altered by approximately 50 lb. per sq. in. for each one-quarter turn of the screw, which can be felt by the detent grooves in the head of the screw passing over the locking pin. Stall the pump a number of times; at the end of the tests the pressure must not show any variation.

Checking the volumetric efficiency

179. Run the pump at the stated speed and delivery pressure, record the flow then reduce the delivery to the low value stated and record the flow. Any variation between the two flow values must be within the specified limit.

Checking the governor range

180. Run the pump at the delivery pressure and at the lower of the speeds stated, then, leaving the delivery restrictor cock as set, rotate the governor adjusting screw anti-clockwise until the governor operates, denoted by a rapid decrease in delivery pressure. Set the governor to operate at the stated speed, and by reducing and increasing speed several times check that the governor functions satisfactorily. Increase the speed to the higher value stated and rotate the governor adjusting screw clockwise until the flow recovers then re-adjust the governor until the flow falls and check the operation several times at this point. The adjusting screw locknut should be tightened each time the governor is checked.

Checking the governor cycle

181. Run the pump at the speed and

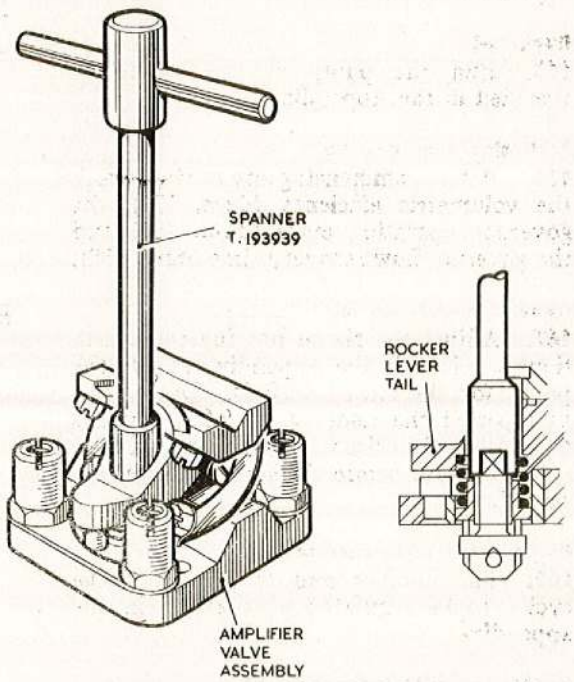

Fig. 33. Adjusting the stall pressure

delivery pressure stated for Point A in the appendix then adjust the governor until the pump governs at these conditions. Check several times that the governor operates satisfactorily at these values. With the governor adjusted correctly, increase the speed until the governor operates then immediately adjust the speed to the value stated for Point B without altering the delivery restrictor cock setting. Point C is obtained by further increasing the pump speed to reduce the delivery pressure below the required value at Point B and then reducing the pump speed until the correct delivery pressure is re-established. Point D is obtained by further decreasing the pump speed until the delivery pressure has recovered to the required value. Check the cycle several times.

Flow recovery test

182. A stop watch is required to check the recovery time. Run the pump at the conditions stated for Point A in the previous test then adjust the speed to obtain the Point C condition. When the speed and delivery pressure are steady, start the stop watch and simultaneously reduce speed as rapidly as possible to the Point D condition. Stop the watch immediately the pump recovers to the delivery pressure stated for Point D. The recovery time must not exceed the period stated in the Appendix. Check the recovery several times to ensure that it is satisfactory.

Solenoid valve cyclic test

183. Connect the pin plug of the valve to a 16 volt D.C. supply and test it by running the pump at the conditions given in the Appendix, energising the solenoid and stalling the pump; the number and frequency of the cycles to be regulated as specified. No leakage is permitted from the solenoid valve when closed.

Fuel pressure test

184. Wipe the exterior of the pump particularly around the joints, and dry it thoroughly with compressed air. Run the pump at the conditions stated. Any leakage other than from the seal drains must be rectified; the drain leakage must not exceed the quantity specified.

Checking the servo flow

185. Connect the servo flow to suction and, using an external stall valve to obtain the delivery pressure, run the pump at the stated conditions and measure the flow. Adjust if necessary by fitting an alternative size of servo pressure supply orifice.

Self-priming test

186. Close the pump inlet cock and run the pump at the stated speed; it must be capable of producing an inlet depression.

Air pressure test

187. Remove the pump from the test rig and drain off all fluid. Connect an air supply line to the pump inlet and blank off all other connections. Submerge the pump in fuel and apply the air pressure specified for the stated period. There must be no leakage.

Oil seal leakage test

188. Bolt the test fixture G.65326 and an appropriate gauge to the pump mounting face, with a joint washer interposed. Remove the oil seal drain plugs and connect the air supply to the union on the fixture Submerge the pump in kerosine and apply the air pressure as specified. There must be no leakage from the oil seal drain.

Final leakage tests

189. Complete all external connections, wirelock and repeat the test described in para. 187.

190. Mount the pump on the test rig and repeat the test described in para. 184.

Solenoid valve insulation test

191. Connect a megger to the valve and test for insulation as specified in the appendix.

Inhibiting

192. Refer to A.P.4471A.

SOLENOID-OPERATED ISOLATING VALVE

General

193. The overspeed control cover plate forms a bracket for the servo isolating valve. This valve has a fixed mounting position, but different locations for the electrical connection may exist.

Dismantling and inspection

194. Remove the four retaining bolts and withdraw the valve assembly from the mounting bracket taking care not to damage the plunger which may slide out from the solenoid body. Lift off the spring and valve plate. To extract the orifice assembly, unscrew the wirelocked cap nut with sealing ring, remove the circlip and withdraw the distance piece, orifice assembly and strainer. Do not disturb the shim washer setting beneath the tabwasher.

195. Examine the orifice for cleanliness, wash thoroughly in kerosine and dry off by means of compressed air. Check the face for any indentation as shown in fig. 19. Clean all other parts and inspect for damage and corrosion. Lightly polishing the end of the plunger is permissible but no abrasives must be used, as the length is set on initial assembly. Check that the rod moves freely in the solenoid guide. Ensure that the sealing ring grooves are clean and undamaged.

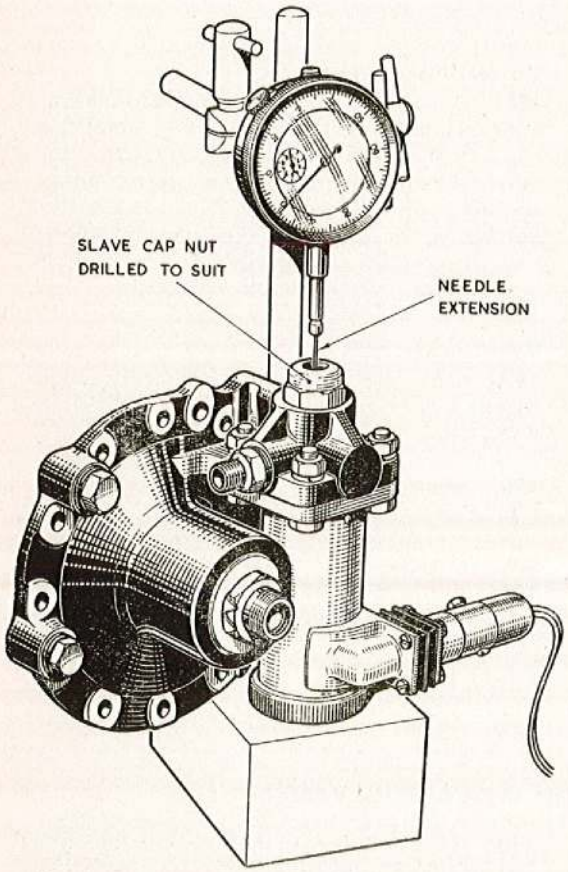

Fig. 34. Checking the solenoid air gap

Assembling and testing

196. For the initial setting of the air gap, use a dial test indicator, surface block and a 16 volt D.C. supply.

(1) Lower the plunger into the solenoid body and place the assembly on the block, with the striker end of the plunger uppermost.

(2) Place a suitably counterbored slave head over the plunger protrusion and lower the gauge to contact the head. Set the dial to zero.

(3) Connect the plug to the 16 volt supply, energise the coil and note the dial reading. This will give the plunger travel, e.g. 0·032 in.

197. Fit the orifice with tabwasher and any previously fitted shims into the bracket on the overspeed control cover and retain in position with a suitably drilled slave cap nut. Place the valve plate and spring over the orifice, assemble the solenoid and plunger to the cover bracket and fit four nuts and bolts.

198. To check the air gap setting,

(1) Set the built-up assembly on the block as shown in fig. 34.

(2) Lower the needle extension through the slave cap nut and orifice to contact the sealing face of the valve plate and adjust the dial to zero.

(3) Connect the plug to the 16 volt supply, energise the coil and note the dial reading, e.g. 0·007 in. By subtracting this dimension from that obtained in para. 196, the air gap will be defined thus, 0·032—0·007 = 0·025 in.

(4) The gap must be 0·010 in. to 0·015 in. Adjust by shims beneath the orifice. When satisfactory remove the slave cap nut, insert the strainer, distance piece and circlip and screw on the normal cap nut and sealing ring.

Static pressure test

199. Fit the transfer bobbin and sealing rings to the pump distance piece and assemble the overspeed cover plate and solenoid to same, interposing the required number of gaskets as fitted on final build.

200. Using slave nuts and bolts, assemble a suitable adapter to the control piston end of the cover and connect the hand pump test rig. At a fuel pressure of 3,000 p.s.i. maintained for a period of 5 minutes there must be no leakage from the outlet con-

nection. In the event of leakage inspect for foreign matter or for damage to the valve plate and orifice lands. Finally, check the solenoid by connecting the plug to a 16 volt D.C. supply and energising 10 times at 3,000 p.s.i. There must be no leakage from the fuel outlet with the valve closed.

201. The component parts of a solenoid are not interchangeable. If unsatisfactory, the solenoid must be removed and a new unit fitted.

202. Make the final tests as described in para. 183 and 191.

KEY

1 SEALING RING
2 SEAL SPACER
3 SPRING
4 DRAIN PLUG
5 CAMPLATE HOUSING
6 GASKET
7 CIRCLIP
8 LINKAGE
9 LINK PIN
10 LINK DOWEL
11 PISTON AND SLIPPER ASSEMBLY
12 PISTON SEAT
13 PISTON SPRING
14 SPRING SEAT
15 CIRCLIP
16 DOWEL
17 RETAINING SPIDER
18 PORT INSERT
19 DOWEL
20 PUMP BODY
21 BLANKING PLUG
22 STRAINER
23 SERVO RESTRICTING ORIFICE
24 BOBBIN
25 FELT RING
26 CONTROL CYLINDER LINER
27 CIRCLIP
28 SEAL RETAINING RING
29 DISTRIBUTOR SEAL
30 SERVO CONTROL PISTON
31 SPRING SEAT
32 SERVO SPRINGS
33 GASKET
34 NO-FLOW STOP SCREW
35 SHIMS (AS REQUIRED)
36 TABWASHER
37 AIR BLEED
38 GASKET
39 DIAPHRAGM
40 GASKET
41 GOVERNOR SPRING
42 SPRING ANCHOR
43 LINK PIN
44 SPRING ANCHOR GUIDE
45 OVERSPEED CONTROL COVER
46 FUEL TRANSFER BOBBIN
47 SOLENOID MOUNTING FLANGE
48 SEALING RING
49 SOLENOID CAP NUT
50 TABWASHER
51 LOCKNUT
52 CAP NUT
53 GOVERNOR SPRING ADJUSTING SCREW
54 PLUGS—ALTERNATIVE AIR BLEED
55 DOWEL—SPRING ANCHOR GUIDE
56 CIRCLIP
57 DISTANCE PIECE
58 STRAINER
59 TABWASHER AND SHIMS
60 SOLENOID ORIFICE
61 SPRING
62 VALVE PLATE
63 SEALING RING
64 PLUNGER
65 SOLENOID VALVE BODY
66 DISTANCE PIECE
67 LINK PIN
68 SPRING ANCHOR
69 TAPPET SCREW
70 REACH NUT (4 off)
71 TABWASHER (2 off)
72 TORSION HINGE SCREW (8 off)
73 ROCKER LEVER
74 HALF-BALL
75 TORSION HINGE (4 off)
76 SPRING SEAT
77 BASE PLATE
78 ADJUSTING SCREW
79 ORIFICE
80 STRAINER RETAINING PIN
81 STRAINER
82 FUEL TRANSFER BOBBIN
83 B.P.C. CONNECTION
84 PLUG—SERVO CONNECTION
85 CAP NUT
86 INSERT—FLOW ADJUSTING SCREW
87 MAXIMUM FLOW ADJUSTING SCREW
88 MAIN CARBON BEARING
89 ROTOR
90 SPRING
91 SPRING SEAT
92 SHIM WASHERS
93 QUILL SHAFT
94 THRUST BALL
95 AUXILIARY CAMPLATE
96 TRUNNION BLOCK
97 CAMPLATE
98 CARBON BEARING
99 CARBON FACE SEAL
100 DOWEL
101 SEALING RING
102 DRAIN PLUG
103 SHIM WASHER
104 CARBON FACE SEAL
105 CIRCLIP

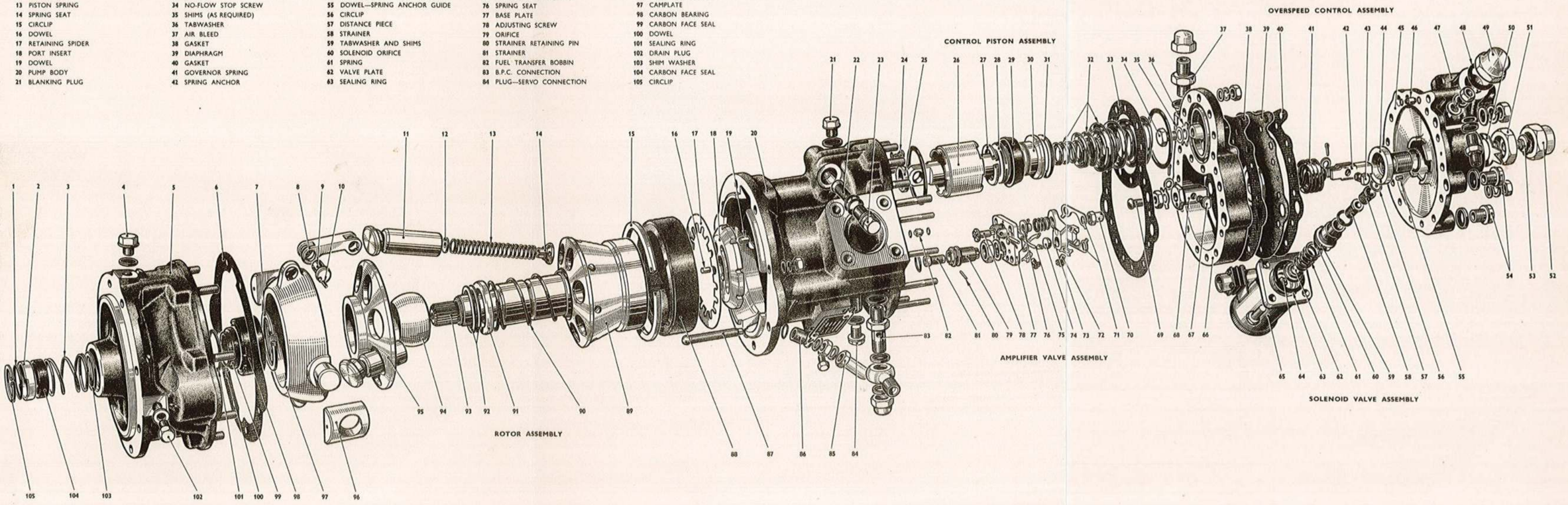

Fig. 35 High pressure fuel pump, G.D.7/5 E

3364 240689 10/57 1,500 C.B.&S.LTD GP.59.

RESTRICTED

APPENDIX 1

CALIBRATION CODE C

Fuel

1. The running-in and endurance tests are to be made on 73 NLAVGAS. For all other tests AVTUR is to be used. Fuel inlet temperature to be 20 to 40 deg. C. and inlet pressure 10 to 15 lb. per sq. in.

Running-in

2. The maximum camplate angle having been set to 15 deg. during assembly, run the pump at the following conditions :—

Speed (r.p.m.)	Delivery pressure (lb. per sq. in.)	Time (minutes)
250	50	2½
500	250	2½
1,000	250	2½
1,000	500	2½
1,500	500	2½
1,500	750	2½
2,000	750	5
2,500	750	5

Set maximum flow adjusting screw to give 1,580 g.p.h. at 3,000 r.p.m. with 100 lb. per sq. in. delivery pressure then :—

3,000	1,000	5
3,300	1,000	10
3,300	1,500	15

Preliminary calibration (*para. 166*)

3. Check the volumetric efficiency, the governor operating cycle and governor recovery time as in para. 14, 16 and 18 of this appendix.

General endurance test (*para. 167*)

4. Run the pump for 1¼ hours at 3,300 r.p.m., 1,200 g.p.h. flow and 1,600 lb. per sq. in. delivery pressure (obtained by external stall valve). During this period the inlet temperature is to be raised to between 36 and 38 deg. C. for a period of 15 minutes and then reduced again.

5. Run the pump for 15 minutes at 3,500 r.p.m., 1,500 g.p.h. flow and 2,000 lb. per sq. in. delivery pressure.

Pump cyclic endurance test

6. Using an external stall valve, complete 12 cycles consisting of :—

(1) 5 minutes at 3,300 r.p.m., 1,200 g.p.h. at 1,600 lb. per sq. in.

(2) 10 minutes at 700 r.p.m., 110 g.p.h. at 1,250 lb. per sq. in.

Governor cyclic endurance test

7. Set the governed speed to the value Point A as in para. 16 of this appendix, then operate the governor control 240 times by varying the pump speed.

Starting test (*para. 170*)

8. With the pump set at idling conditions, i.e., 700 r.p.m. with a flow of 110 g.p.h. at 1,250 lb. per sq. in. delivery pressure, 25 starts from rest are to be made, with no further adjustments to the rig setting.

Performance test

9. (1) Check the stall pressure.

(2) Check the volumetric efficiency.

(3) Check the governor operating cycle.

(4) Check the governor recovery time.

Strip inspection (*para. 172 to 174*)

10. Dismantle the pump, clean, inspect and rebuild.

FINAL RIG TESTS

Governor cyclic endurance test

11. Repeat the test outlined in para. 7 of this appendix.

Setting the maximum flow (*para. 176*)

12. Set the maximum flow to 1,570 to 1,580 g.p.h. at 3,000 r.p.m. and 100 lb. per sq. in. delivery pressure.

Setting the stall pressure (*para. 177 and 178*)

13. Set the stall pressure to operate at 2,300 to 2,500 lb. per sq. in. at 3,300 r.p.m. with the flow restricted to zero.

Checking the volumetric efficiency (*para. 179*)

14. Run the pump at 3,300 r.p.m. at a delivery pressure of 1,000 lb. per sq. in. then reduce the pressure to 100 lb. per sq. in.

The change in flow must not exceed 110 g.p.h. when using petrol or 55 g.p.h. when using kerosine. If a governor make-up orifice is fitted the change in flow may exceed these limits and is to be recorded.

Checking the governor range (*para. 180*)

15. With a delivery pressure of 1,250 lb. per sq. in. check that the governor will operate over the range 2,800 r.p.m. to 3,600 r.p.m.

16. Checking the governor cycle (*para. 181*)

Check point	Speed (r.p.m.)		Delivery pressure (lb. per sq. in.)
	Gasoline	Kerosine	
A	3,450	3,300	1,500
B	3,520 to 3,600	3,370 to 3,450	400
C	3,500 to 3,580	3,350 to 3,430	400
D	3,430	3,280	1,450 to 1,500

Overrun may be adjusted by fitting a suitable make-up orifice.

Flow recovery test (*para. 182*)

17. The pump is to be governed from Point A down to 400 lb. per sq. in. delivery pressure then the downstream restrictor closed to reduce the flow to zero. On opening the restrictor the flow must increase immediately.

18. Check the time taken by the pump to recover from the governed condition at Point C to the condition at Point D. The recovery time is to be within 0·80 to 2·50 seconds.

Solenoid valve cyclic test (*para. 183*)

19. At 3,100 r.p.m., with an operating voltage of 16 volt the solenoid is to be energised 10 times each at half-stall and full-stall, i.e., half flow and zero flow under control of the pump stall valve. There must be no leakage from the solenoid valve when closed.

Fuel pressure test (*para. 184*)

20. Run the pump under the following conditions and check for leakage. There must be no external leakage other than from the carbon-faced seal.

Inlet pressure (lb. per sq. in.)	Speed (r.p.m.)	Delivery pressure	Time (min.)	Seal leakage (cc/hr. max.)
40	3,100	Pump stall	5	20
20	3,100	pressure	5	5

Checking the servo flow (*para. 185*)

21. With the pump controlled by an external stall valve, run the pump at 2,850 r.p.m., 150 g.p.h. flow and 1,000 lb. per sq. in. delivery pressure. The servo flow to suction should be 9·0 to 10·5 g.p.h. when using gasoline and 8·5 to 10·0 g.p.h. when using kerosine.

Self-priming test

22. At a speed of 500 r.p.m., with the inlet cock closed, check that the pump will produce an inlet depression.

Air pressure test (*para. 187*)

23. Apply air at a pressure of 40 lb. per sq. in. to the pump body for 5 minutes, with the pump submerged in kerosine. There must be no leakage.

Oil seal leakage test (*para. 188*)

24. Apply air at a pressure of 5 lb. per sq. in. to the seal pressure test adapter for 5 minutes with the pump and adapter submerged in kerosine. There must be no leakage.

Final leakage test (*para. 189 and 190*)

25. Complete all external connections, wirelock and repeat the test described in para. 23 of this appendix.

26. Remount the pump on the test rig and repeat the test described in para. 20 of this appendix.

Solenoid valve insulation test (*para. 191*)

27. Apply a pressure of 500 volts, the resistance must not be less than 1 megohm.

APPENDIX 2

CALIBRATION CODE E

Fuel

1. 73 NLAVGAS an inlet temperature of 20 to 40 deg. C and an inlet pressure of 10 to 15 lb. per sq. in.

Running-in

2. The maximum camplate angle having been set to 15 deg. during assembly, run the pump at the following conditions :—

Speed (r.p.m.)	Delivery pressure (lb. per sq. in.)	Time (minutes)
250	50	2½
500	250	2½
1,000	250	2½
1,000	500	2½
1,500	500	2½
1,500	750	2½
2,000	750	5
2,500	750	5

Set maximum flow adjusting screw to give 1,580 g.p.h. at 3,000 r.p.m. with 100 lb. per sq. in. delivery pressure then :—

3,000	1,000	10
3,000	1,500	15
3,570	1,500	15

At 3,570 r.p.m. and 100 lb. per sq. in. delivery pressure record the indicated flow.

Preliminary calibration (*para. 166*)

3. Check the volumetric efficiency, the governor operating cycle and governor recovery time as in para. 14, 16 and 18 of this appendix.

General endurance test (*para. 167*)

4. Run the pump for 1¼ hours at 3,570 r.p.m. 1,250 g.p.h. flow and 1,800 lb. per sq. in. delivery pressure (obtained by external stall valve). During this period the inlet temperature is to be raised to between 36 to 38 deg. C. for a period of 15 minutes and then reduced again.

5. Run the pump for 15 minutes at 3,800 r.p.m., 1,600 g.p.h. flow and 1,900 to 2,100 lb. per sq. in. delivery pressure.

Pump cyclic endurance test

6. Using an external stall valve, complete 12 cycles consisting of :—

5 minutes at 3,570 r.p.m., 1,250 g.p.h. and 1,800 lb. per sq. in.

10 minutes at 1,030 r.p.m., 90 g.p.h. and 1,350 lb. per sq. in.

Governor cyclic endurance test

7. Set the governed speed to the value Point A as in para. 16 of this appendix, then operate the governor control 240 times by varying the pump speed.

Starting test (*para. 170*)

8. With the pump set at idling conditions, i.e., 1,030 r.p.m. with a flow of 90 g.p.h. at 1,350 lb. per sq. in. delivery pressure, 25 starts from rest are to be made, with no further adjustment to the rig setting.

Performance test

9. Check the stall pressure.

Check the volumetric efficiency.

Check the governor operating cycle.

Check the governor recovery time.

Strip inspection (*para. 172 to 174*)

10. Dismantle the pump, clean, inspect and rebuild.

FINAL RIG TESTS

Governor cyclic endurance test

11. Repeat the test outlined in para. 7 of this appendix.

Setting the maximum flow (*para. 176*)

12. Set the flow to 1,580 g.p.h. at 3,000 r.p.m. and 100 lb. per sq. in. delivery pressure. At 3,570 r.p.m. record the flow at 100 lb. per sq. in. delivery pressure.

Setting the stall pressure (*para. 177 and 178*)

13. Set the stall pressure to operate at 1,900 to 2,100 lb. per sq. in. at 3,570 r.p.m. and with the flow restricted to zero.

Checking the volumetric efficiency (*para. 179*)

14. Run the pump at 3,570 r.p.m. at a delivery pressure of 1,000 lb. per sq. in. then reduce the pressure to 100 lb. per sq. in.

The change in flow must not exceed 110 g.p.h. when no make-up orifice is used. If a make-up orifice is fitted, record the change in flow.

Checking the governor range (*para. 180*)

15. With the delivery pressure of 1,030 lb. per sq. in. check that the governor will operate over the range 3,300 r.p.m. to 3,800 r.p.m.

16. **Checking the governor cycle** (*para. 181*)

Check point	Speed (r.p.m.)	Delivery pressure (lb. per sq. in.)
A	3,570	1,030
B	3,660 to 3,710	250
C	3,640 to 3,690	250
D	3,550	1,030

Reduce the rig speed to approximately 3,420 r.p.m., set the downstream restrictor to give a delivery pressure of 1,800 lb. per sq. in. then increase the rig speed and record the speed at which the pump now starts to govern. Slowly operate the rig speed control through the complete governor cycle several times and ensure that no inconsistencies occur between the pump speed and delivery pressure.

Flow recovery test (*para. 182*)

17. The pump is to be governed from Point A down to 400 lb. per sq. in. delivery pressure then the downstream restrictor closed to reduce the flow to zero. On opening the restrictor the flow must increase immediately.

18. Check the time taken by the pump to recover from the governed condition at Point C to the condition at Point D. The recovery time is to be within 0·80 to 2·50 seconds.

Solenoid valve cyclic test (*para. 183*)

19. At 3,400 r.p.m., with an operating voltage of 16 volts the solenoid is to be energised 10 times each at half-stall and full-stall. There must be no leakage from the solenoid valve when closed.

Fuel pressure test (*para. 184*)

20. Run the pump at the conditions shown in the following table. There must be no external leakage other than from the carbon face seal.

Inlet pressure (lb. per sq. in.)	Speed (r.p.m.)	Delivery pressure (lb. per sq. in.)	Time (min.)	Seal leakage (cc/hr. max.)
40	3,400	1,800	5	20
20	3,400	1,800	5	5

Checking the servo flow (*para. 185*)

21. With the pump controlled by an external stall valve, run the pump at 3,000 r.p.m., 150 g.p.h. flow and 1,250 lb. per sq. in. delivery pressure. Record the servo flow to suction when the limits should be 9·5 to 11·0 g.p.h.

Self-priming test

22. Check that a speed of 500 r.p.m. with the inlet cock closed, the pump will produce an inlet depression. Record the value obtained.

Air pressure test (*para. 187*)

23. Apply air at a pressure of 40 lb. per sq. in. to the pump body for 5 minutes with the pump submerged in kerosine. There must be no leakage.

Oil seal leakage test (*para. 188*)

24. Apply air at a pressure of 5 lb. per sq. in. to the seal pressure-test adapter for 5 minutes with the pump and adapter submerged in kerosine. There must be no leakage.

Final leakage tests (*para. 189 and 190*)

25. Complete all external connections, wirelock and repeat the test described in para. 23 of this appendix.

26. Remount the pump on the test rig and repeat the test described in para. 20 of this appendix.

Solenoid valve insulation test (*para. 191*)

27. Apply a pressure of 500 volts, the resistance must not be less than 1 megohm.

APPENDIX 3

CALIBRATION CODE J

Fuel

1. The running-in and endurance tests are to be made on 73 NLAVGAS. For all other tests AVTUR is to be used. Fuel inlet temperature to be 20 to 40 deg. C. and inlet pressure 10 to 15 lb. per sq. in.

Running-in

2. The maximum camplate angle having been set to 15 deg. during assembly, run the pump at the following conditions :—

Speed r.p.m.	Delivery pressure (lb. per sq. in.)	Time (minutes)
250	50	2½
500	250	2½
1,000	250	2½
1,000	500	2½
1,500	500	2½
1,500	750	2½
2,000	750	5
2,500	750	5

Set maximum flow adjusting screw to give 1,580 g.p.h. at 3,000 r.p.m. with 100 lb. per sq. in. delivery pressure then :—

3,000	1,000	5
3,500	1,000	5
3,800	1,000	10
3,800	1,500	15

Preliminary calibration (*para. 166*)

3. Check the stall pressure and volumetric efficiency as in para. 12 and 13 of this appendix.

General endurance test (*para. 167*)

4. Run the pump for 1¼ hours at 3,675 r.p.m., 1,200 g.p.h. flow and 1,600 lb. per sq. in. delivery pressure (obtained by external stall valve). During this period the inlet temperature is to be raised to between 36 to 38 deg. C. for a period of 15 minutes and then reduced again.

5. Run the pump for 15 minutes at 3,875 r.p.m., 1,500 g.p.h. flow and 2,000 lb. per sq. in. delivery pressure (obtained by external stall valve).

Pump cyclic endurance test

6. Using an external stall valve, complete 12 cycles consisting of :—

5 minutes at 3,675 r.p.m., 1,200 g.p.h., at 1,600 lb. per sq. in.

10 minutes at 700 r.p.m., 110 g.p.h. at 1,250 lb. per sq. in.

Governor cyclic endurance test

7. Not applicable.

Starting test (*para. 170*)

8. With the pump set at idling conditions, 25 starts from rest are to be made, with no further adjustment to the rig setting.

Performance test

9. Check the stall pressure.

Check the volumetric efficiency.

Strip inspection (*para. 172 to 174*)

10. Dismantle the pump, clean, inspect and rebuild.

FINAL RIG TESTS

Setting the maximum flow (*para. 176*)

11. Set the maximum flow to 1,570 to 1,580 g.p.h. at 3,000 r.p.m. and 100 lb. per sq. in. delivery pressure.

Setting the stall pressure (*para. 177 and 178*)

12. Set the stall pressure to operate at 2,300 to 2,500 lb. per sq. in. at 3,675 r.p.m. and the flow restricted to zero.

Checking the volumetric efficiency (*para. 179*)

13. Run the pump at 3,675 r.p.m. at a delivery pressure of 1,000 lb. per sq. in. then reduce the pressure to 100 lb. per sq. in. The change in flow must not exceed 110 g.p.h. when using gasoline or 55 g.p.h. when using kerosine.

Checking the governor range

14. Not applicable.

Checking the governor cycle (*para. 181*)

15. In cases where a governor assembly is fitted it is to be set at maximum spring tension. At this setting and the pump

running at 4,000 r.p.m. and 1,500 lb. per sq. in. pressure the unit is not to govern. For pumps not fitted with a governor assembly this paragraph is not applicable.

Flow recovery time

16. Not applicable.

Solenoid valve cyclic test

17. Not applicable.

Fuel pressure test (*para. 184*)

18. Run the pump under the following conditions and check for leakage. There must be no external leakage other than from the carbon faced seal.

Inlet pressure (lb. per sq. in.)	Speed (r.p.m.)	Delivery pressure	Time (min.)	Seal leakage (cc/hr. max.)
40	3,400	Pump stall	5	20
20	3,400	pressure	5	5

Checking the servo flow (*para. 185*)

19. With the pump controlled by an external stall valve, run the pump at 2,850 r.p.m., 150 g.p.h. flow and 1,000 lb. per sq. in. delivery pressure. Record the servo flow to suction when the limits should be 9·0 to 10·5 g.p.h. when using gasoline and 8·5 to 10·0 g.p.h. when using kerosine.

Self-priming test

20. Check that at a speed of 500 r.p.m., with the inlet cock closed, the pump will produce an inlet depression. Record the value obtained.

Air pressure test (*para. 187*)

21. Apply air at a pressure of 40 lb. per sq. in. to the pump body for 5 minutes with the pump submerged in kerosine. There must be no external leakage.

Oil seal leakage test (*para. 188*)

22. Apply air at a pressure of 5 lb. per sq. in. to the seal pressure-test adapter for 5 minutes with the pump and adapter submerged in kerosine. There must be no leakage.

Final leakage test (*para. 189 and 190*)

23. Complete all external connections, wirelock and repeat the test described in para. 21 of this appendix.

24. Remount the pump on the test rig and repeat the test described in para. 18 of this appendix.

APPENDIX 3

CALIBRATION CODE J

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6. Using an external stall valve, complete 12 cycles consisting of :—

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10. Dismantle the pump, clean, inspect and rebuild.

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Setting the stall pressure (*para. 177 and 178*)

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Checking the governor range

14. Not applicable.

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15. In cases where a governor assembly is fitted it is to be set at maximum spring tension. At this setting and the pump

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Flow recovery time

16. Not applicable.

Solenoid valve cyclic test

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Fuel pressure test (*para. 184*)

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