Chapter 6

HIGH PRESSURE FUEL PUMPS, TYPE R.H.1/1A

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APPENDIX

LIST OF ILLUSTRATIONS

Introduction

1. The instructions contained in this chapter apply to turbine-driven re-heat fuel pumps Type R.H.1.

2. The complete type number (RH.1/1A) comprises the basic type designation (RH.1), followed by a stroke number (/1) which indicates the particular installation and consequently the installation connections required. The final letter (A) indicates the specific calibration schedule to which the pump is adjusted and tested.

3. A Schedule of Fits, Clearances and Repair Tolerances is provided in A.P.4282A, Vol. 2, Part 2 and the dimensions specified must be adhered to when a pump is being reconditioned.

4. Details of calibration settings and performance tests are given in the appendix to this chapter.

5. The log book which accompanies each pump contains the test and clearance

figures, running times, details of all servicing and reconditioning work effected together with all replacements made since initial assembly.

6. It is essential that information on subsequent reconditioning must be recorded accurately in the log-book.

7. Scrupulous cleanliness is necessary at all times and its importance cannot be over-emphasized.

8. It is recommended that slave nuts, washers, connections and other such items be used in those instances where components are to be assembled temporarily. All joint washers, gaskets, tab-washers and locking wire must be renewed once they are disturbed.

Special tools

9. The special tools required for dismantling and rebuilding a pump are given in the following list. In most instances an illustration of the tool in use is provided adjacent to the appropriate instructions in the text.

Tool No.	*Description*
G.65503	Gauge, concentricity, pump side
G.66548	Gauge, concentricity, air inlet casing
G.71345	Gauge, end-float main bearing
T.131033	Spanner, pump casing plug
T.161439	Key, strainer assembly
T.174675	Box spanner, orifice
T.214154	Lapping tool, non-return valve
T.214155	Compression tool, valve spring
T.214156	Extractor, roller bearing
T.214157	Locking sleeve, rotor shaft
T.214158	Spline spanner, turbine retaining nut
T.214159	Assembly tool, garter seal to housing
T.214160	Extractor, garter seal from housing
T.214161	Extractor, fluid seal housing
T.214162	Assembly tool, main bearing
T.214163	Closing tool, turbine retaining nut cup washer
T.214164	Closing tool, pump impeller securing screw cup washer
T.214165	Support bracket, clearance, 1st stage turbine and nozzle plate
T.214166	Retaining stand, turbine assembly
T.214167	Assembly tool, main bearing to housing
T.215751	Adapter plate, dismantling and assembling
T.215752	Stripping punch, cup-washers
T.216241	Extractor, fuel seal plate
T.216239	Key, rotor shaft
T.216269	Test block, fuel delivery pressure switch
T.220040	Pressure test adapter, non-return valve
T.222112	Transport handle, general
T.223789	Extractor, jacking pump casing
T.224297	Ejector, shaft from air inlet casing
T.224298	Assembly tool, shaft to air inlet casing
T.224375	Dismantling and assembling tool, diaphragm, shut-off cock
T.224376	Mounting block, air inlet casing
T.224377	Assembly tool, fuel seal plate
T.224386	Setting ring and base, solenoid valve gap
T.227410	Driving socket, torque spanner, pump impeller securing screw
T.227411	Locking bush, shaft

Checks and precautions before dismantling

10. Refer to any complaints regarding the unit and then examine the exterior thoroughly, including all exposed threads, for any signs of damage. Check that all external locking is intact and that all connections have been covered during transit.

11. Remove the blanking plates and dust caps and inspect them internally for signs of foreign matter. If it is suspected that any has entered the pump, drain the inhibiting oil from the pump housing (the air turbine section should be dry) and remove the tail spline access plate. Remove the installation fittings.

12. Inspect the pump and, if it appears to be in good order and the shaft turns freely when rotated by hand, with the turnkey T216239, mount the pump on the rig (*fig.* 38).

13. Calibrate and performance test the pump as described in para. 239 to 245 and 247 to 250. The figures obtained will provide a guide to the condition of the unit and will assist in determining which parts may require particular attention. Should any undue noises emanate from the pump, indicating a badly damaged condition, stop the rig immediately.

14. Following these checks a time expired pump must be completely dismantled. If a pump has been returned for the rectification of a defect, it may be necessary to only partially dismantle it.

DISMANTLING

General

15. These instructions are given in the recommended sequence for completely dismantling the pump. The method of removing each sub-assembly is described and is followed immediately in each case by the method of reducing the sub-assembly to its separate details where this is permissible.

16. When a pump has completed only a short running time the extent of dismantling may be discretionary, depending upon the nature of the suspected defect. In such an instance, where it is necessary to disturb other components to gain access to or to permit removal of the sub-assembly under investigation, a cross reference is provided to the appropriate paragraphs.

17. It is recommended that only one set of components be present on the bench at any one time in order to avoid the accidental transfer of parts from one pump to another and to reduce the possibility of shortages of the smaller items on re-build. Tab-washers and locking wires should be discarded as they are removed.

18. The pump should be mounted on the fixture T.215751 as shown in fig. 2. The bracket locates on the four studs on the air inlet flange and should be bolted down firmly with nuts and grover washers. A mounting block must be inserted between the base of the clamping fixture and the bench in order to raise the fixture sufficiently to enable the pump to be swung round, when in the horizontal position, without fouling the bench.

19. The dismantled components should be placed in one or more clean and dry metal receptacles for safe storage pending inspection and re-building.

PUMP CASING ASSEMBLY

20. The pump casing assembly is retained to the air inlet casing by eight tab-washers and nuts, the tab-washers being located in holes in the casing.

21. Unlock and remove the nuts, slackening them a few threads at a time to avoid distorting the casing.

22. If the casing does not free itself from the air inlet casing, tap it lightly with a hide hammer. Should this fail to release the casing, insert the two special stripping tools T.223789 into the steadying bracket retaining bosses shown in fig. 3 and screw in evenly. The other two bosses are blind holes and cannot be used for jacking purposes.

23. Lift off the pump casing assembly and remove the two large sealing rings from the internal bore of the casing.

Shut-off cock assembly

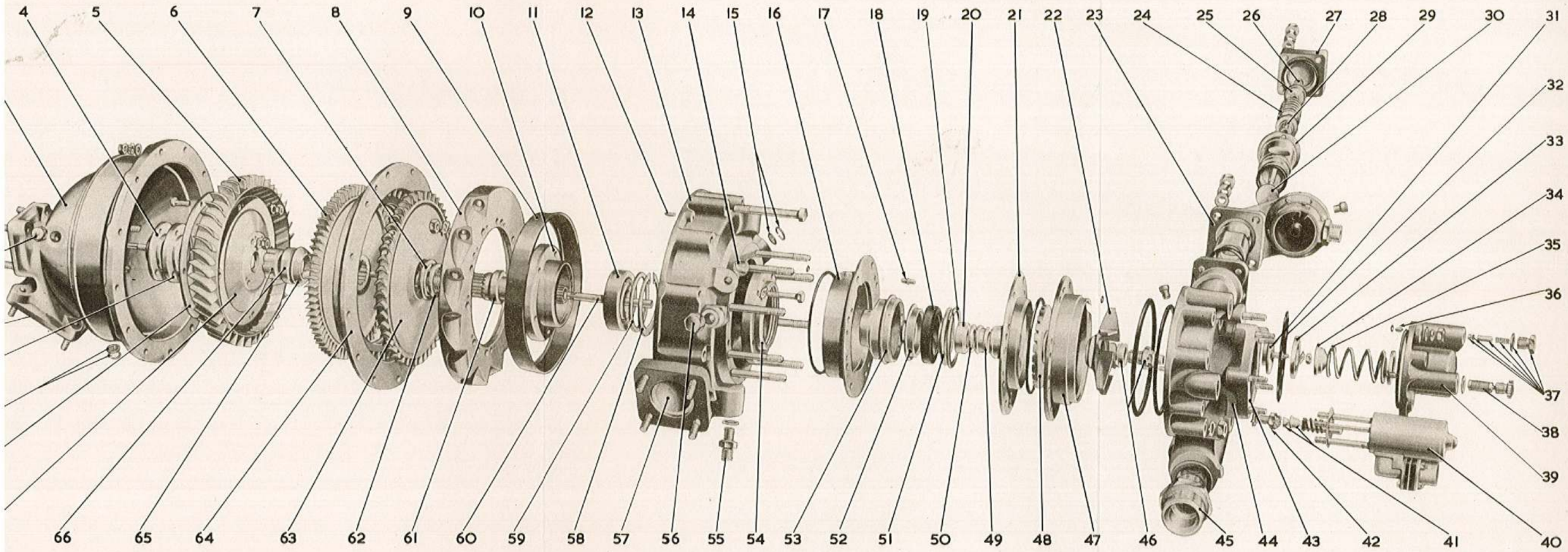
24. Gradually slacken the six nuts retaining the shut-off cock cover to the pump casing and hold the cover down by hand whilst removing the nuts, grover washers and plain washers. Decrease the hand pressure gently and allow the spring pressure to lift the cover free from the securing studs.

25. When removing the cover take care to retain the two transfer bobbins in the seating face. If these have not already fallen out remove them together with the sealing rings. Remove the spring seat, spring and shim washer from the housing and also the rubber sealing ring from the groove in the cover seating face. Gently ease the diaphragm assembly off the six studs taking care not to damage the fabric.

Diaphragm assembly

26. It should not be necessary to dismantle the diaphragm assembly unless it shows signs of damage, corrosion of the metal parts or distortion of the diaphragm.

27. Place the diaphragm assembly on the base T.224375 and locate the two small



ACCESS COVER
AL
) GUIDE VANES
BINE
CATING CONE
NOZZLE PLATE
SING
L

13 AIR INLET CASING
14 GREASE NIPPLE
15 AIR VENT GAUZE AND CIRCLIP
16 FUEL SEAL PLATE
17 COOLING FUEL TRANSFER BOBBIN
18 GARTER SEAL
19 GARTER SEAL RETAINING CIRCLIP
20 GARTER SEAL HOUSING LOCATING CUP
21 HYDRAULIC SEAL HOUSING
22 PUMP IMPELLER
23 FUEL DELIVERY PRESSURE SWITCH
24 OUTLET VALVE SPRING
25 OUTLET VALVE SPRING PLATE
26 OUTLET VALVE COTTER
27 OUTLET VALVE RETAINING COVER
28 LOCATING DOWEL
29 OUTLET VALVE HOUSING
30 OUTLET VALVE
31 SHUT-OFF COCK VALVE PLATE
32 SHUT-OFF COCK DIAPHRAGM
33 DIAPHRAGM SECURING PLATE
34 SHUT-OFF COCK SPRING PLATE
35 SHUT-OFF COCK SPRING AND SEATING
36 SHUT-OFF COCK HOUSING DOWEL
37 SERVO PRESSURE ATTENUATOR
38 SERVO PRESSURE STRAINER
39 SHUT-OFF COCK HOUSING
40 SHUT-OFF COCK SERVO SOLENOID
41 SERVO PRESSURE VALVE
42 SERVO PRESSURE ORIFICE
43 FUEL INLET PORT
44 PUMP CASING
45 FUEL DELIVERY UNION
46 IMPELLER RETAINING NUT AND LOCKING CUP
47 IMPELLER REAR CASING
48 HYDRAULIC SEAL IMPELLER
49 DISTANCE PIECE
50 SHIM WASHER
51 PACKING WASHER
52 GARTER SEAL SUPPORT
53 GARTER SEAL HOUSING
54 MAIN BEARING FRONT LABYRINTH SEAL
55 FUEL SEAL DRAIN
56 ALTERNATIVE FUEL DRAIN BLANKING PLUG
57 AIR INLET PORT
58 MAIN BEARING RETAINING CIRCLIP
59 MAIN BEARING PACKING WASHER
60 ROTOR SHAFT COOLING FUEL TUBE
61 ROTOR SHAFT
62 SHIM WASHER
63 FIRST STAGE TURBINE
64 INTERSTAGE STATOR RING
65 TURBINE REAR LOCATING CONE
66 TURBINE RETAINING NUT AND LOCKING CUP
67 CARRIER RING RETAINING PLATE
68 CARRIER RING RETAINING RING
69 AIR VENT GAUZE AND CIRCLIP
70 FRONT LABYRINTH SEAL
71 AIR EXHAUST FLANGE
72 GREASE NIPPLE

Fig. 1 Dismantled view of pump Type RH.1

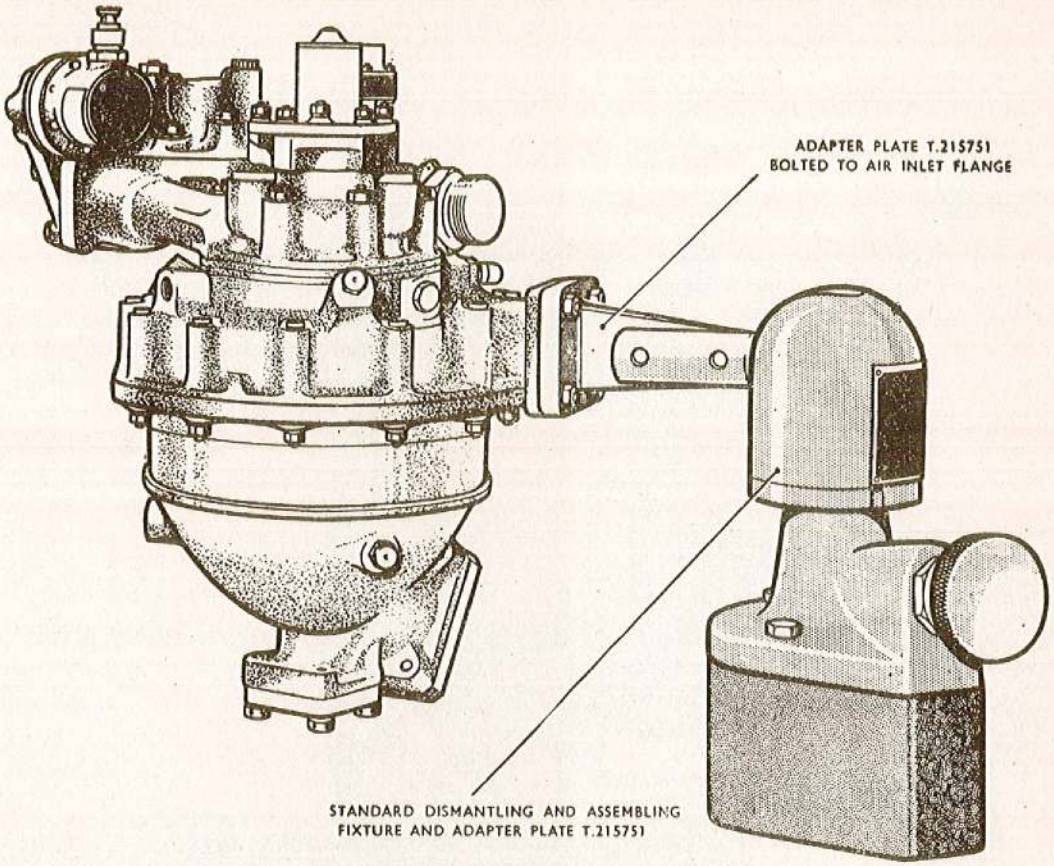


Fig. 2. Dismantling and assembling fixture

recesses in the support plate on the two pegs in the base, as shown in fig. 4, then unlock the tab-washer and remove the securing nut. Remove the diaphragm from the locating base and separate the support plate, diaphragm and diaphragm plate. The diaphragm comprises two layers of fabric which may be separated if necessary.

Servo valve strainer

28. Remove the strainer and plug assembly from the cover by using the spanner T.161439 as shown in fig. 5. The strainer assembly must not be dismantled.

Servo pressure attenuator

29. Remove the plug retaining the attenuator assembly then invert the casing and shake out the helical spring, attenuator orifice plate, sealing ring and spacing washer.

Non-return valve assembly

30. Remove the four nuts, grover washers and plain washers and lift off the non-return valve cover plate from the studs on the pump casing assembly.

31. Draw out the complete non-return valve assembly; if it is tight, insert a wooden stick through the union at the other end of the housing. Do not lose the locating peg which may fall out when removing the assembly.

32. Remove the sealing ring from the external groove at the lower end of the housing and valve guide assembly.

33. Using the tool T.214155 as shown in fig. 6, place the valve assembly in the special locating base, then engage and screw down the cover to compress the spring sufficiently for the cotter plate to be withdrawn. Remove the cover and lift the assembly out of the locating base.

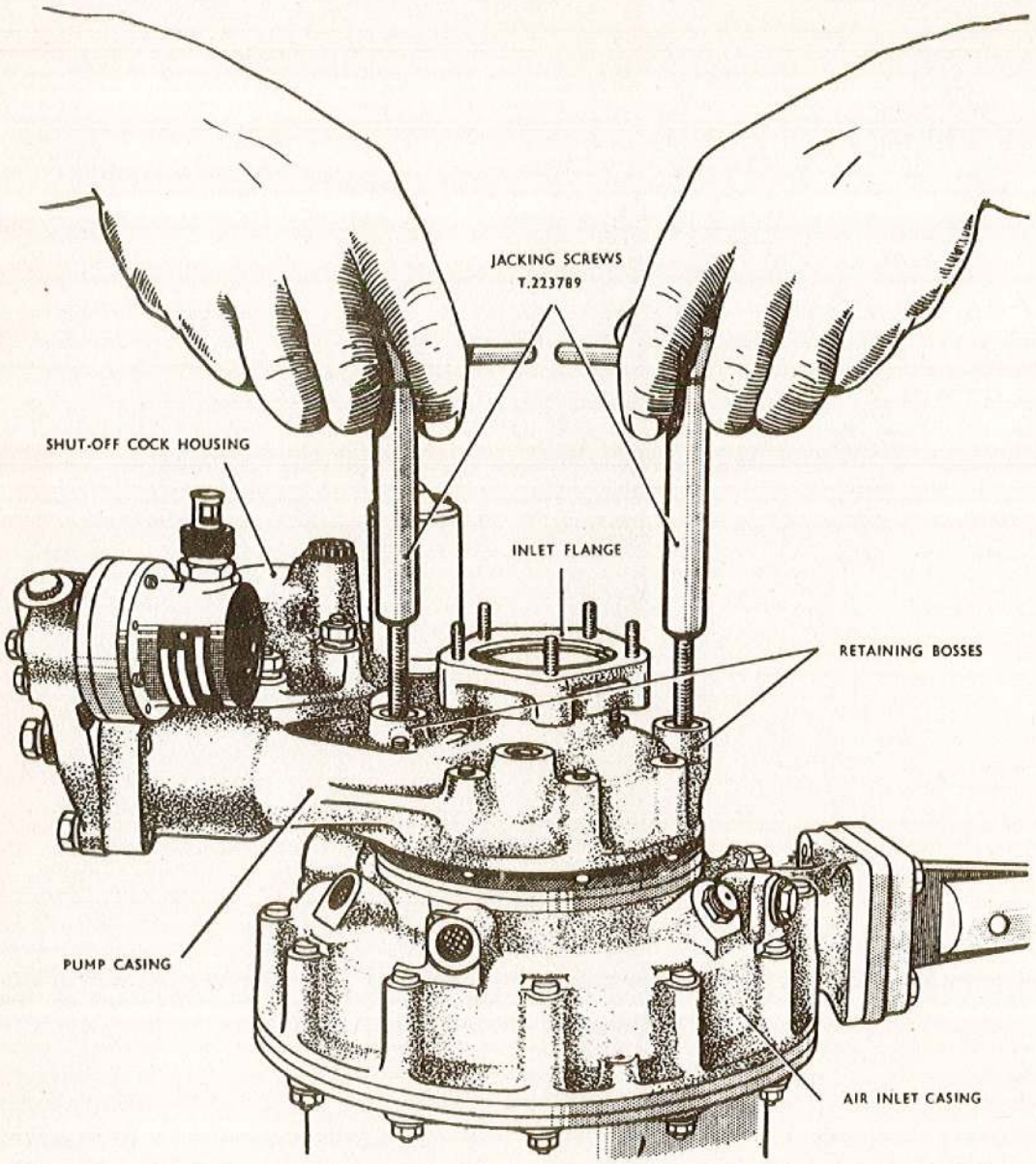


Fig. 3. Removing the pump casing

34. Separate the retaining plate and spring and withdraw the valve from the valve guide and housing. The valve guide must not be removed from the housing.

35. Remove the fuel delivery connection and sealing washer from the other end of the non-return valve casting.

Shut-off cock servo pressure control valve

Solenoid assembly

36. The solenoid assembly is attached to the pump casing by three long studs which pass through the casing and are secured on the underside by nuts and tab-washers.

37. Unlock and remove the three nuts together with the tab-washers and lift off the complete solenoid assembly and sealing washer from the air intake casing.

38. Withdraw the solenoid plunger and spring, invert the pump casing and the half-ball valve will fall out.

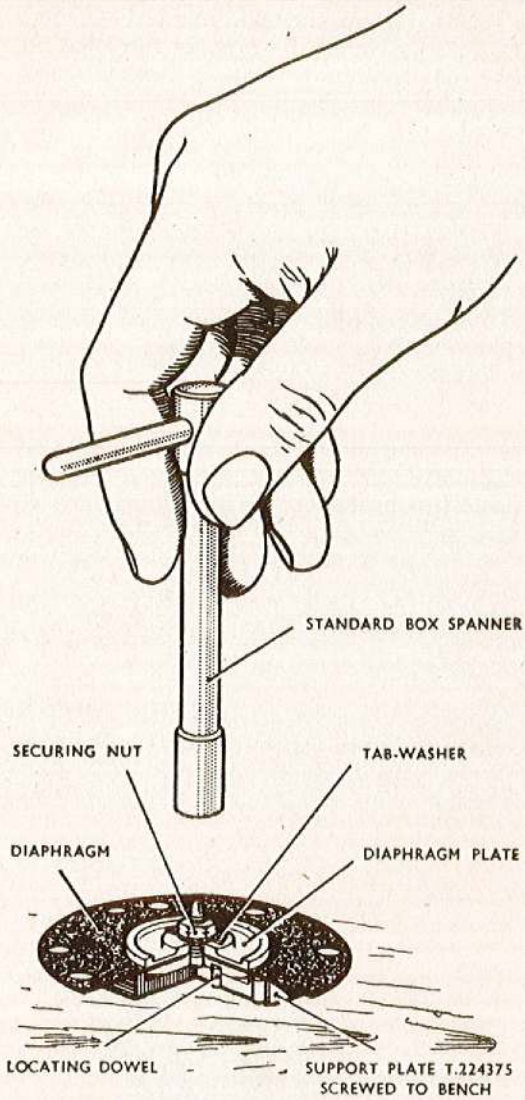


Fig. 4. Dismantling the diaphragm

Valve orifice

39. Unlock the tab-washer and, using the spanner T.174675, unscrew and remove the orifice, tab-washer and shim from the pump casing. Using the spanner T.131033 remove the serrated plug from the end of the fuel passage leading to the orifice.

Fuel delivery pressure switch

40. Remove the four nuts and grover washers and lift off the fuel delivery pressure switch complete with bracket from the pump casing. The electrical leads will already have been disconnected from the switch when removing the pump from the engine.

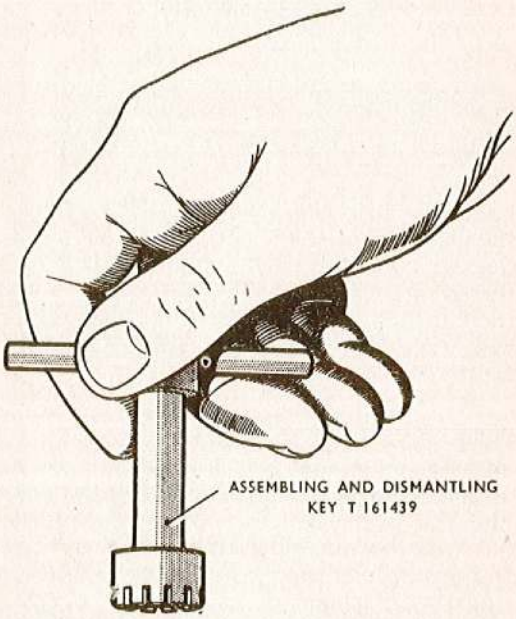
41. It is not necessary to remove the switch from its bracket unless it is damaged and a replacement is necessary, in which case, remove the four securing bolts together with grover washers and plain washers and separate the switch from the bracket.

42. The top cover may be removed by compressing and removing the circlip, the cover can then be lifted off exposing the two terminals and the adjusting screw. The fuel delivery pressure switch must not be dismantled.

AIR INLET CASING

Pump impeller

43. The impeller securing screw has a cup washer peened into grooves on either side.



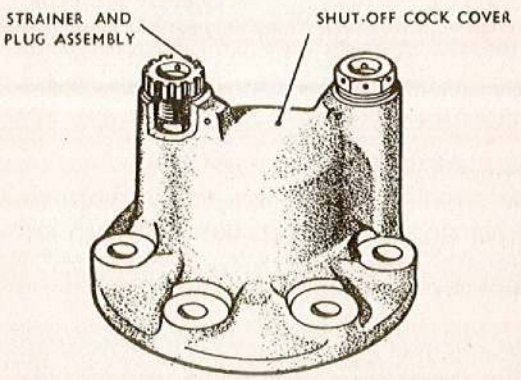


Fig. 5. Removing the servo-valve strainer

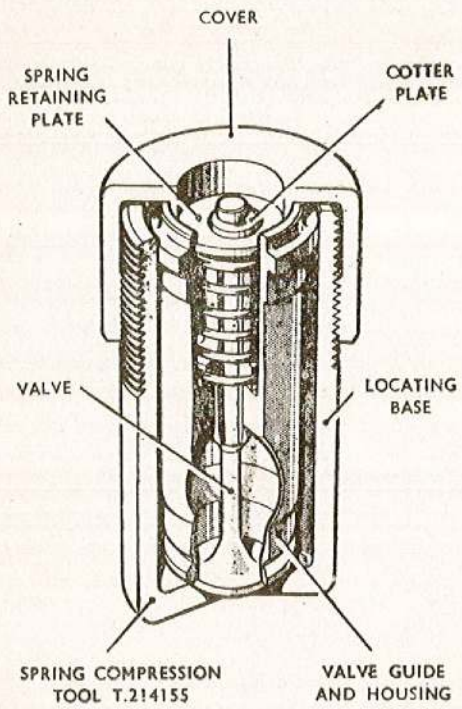


Fig. 6. Dismantling the non-return valve

Using the stripping punch T.215752 unlock the peened portions of the cup washer then slacken and remove the screw (left hand thread) together with the cup washer. Lift the impeller off the splined end of the shaft and withdraw the cooling tube from the centre bore of the rotor shaft.

Pump impeller cover assembly

44. Remove the pump impeller cover assembly by means of jacking bolts screwed into the two diagonally opposite threaded holes in the seating flange; lift it evenly to prevent distortion. The internal sealing ring should come off with the cover and must then be removed. Three small sealing rings must also be removed from the fuel transfer bobbins in the seating flange; these may remain in the seating face or may come off with the cover.

Hydraulic seal impeller

45. Lift off the hydraulic seal impeller from the splined shaft, invert the housing and the distance piece and adjusting washer will fall out.

46. Remove the six transfer bobbins and three small sealing rings from the hydraulic seal housing seating flange.

Hydraulic seal housing

47. Use the extractor T.214161 as shown in fig. 7 to remove the hydraulic seal housing, the internal bore of which is threaded to take the extractor; screw in the extractor and pull the housing free from the air intake casing.

Garter-seal housing assembly

48. Locate the lips of the extractor T.215750 under the flange round the garter seal housing and screw the centre shaft of the tool down until the spigot locates on the end of the rotor shaft as shown in fig. 8. Check that the tool is correctly positioned, then withdraw the housing by turning the centre shaft of the tool.

49. To dismantle the garter-seal housing assembly, extract the spring retaining ring from the housing by inserting a pointed instrument into the drillings round the outer edge of the housing and compressing the ring sufficiently to enable it to be levered out of its seating; these drillings are provided for this purpose. Lift out the backing plate from the housing.

50. The hydraulic extractor tool T.214160 must be used to remove the garter seal from the housing as shown in fig. 9. Place the housing over the stem of the supporting

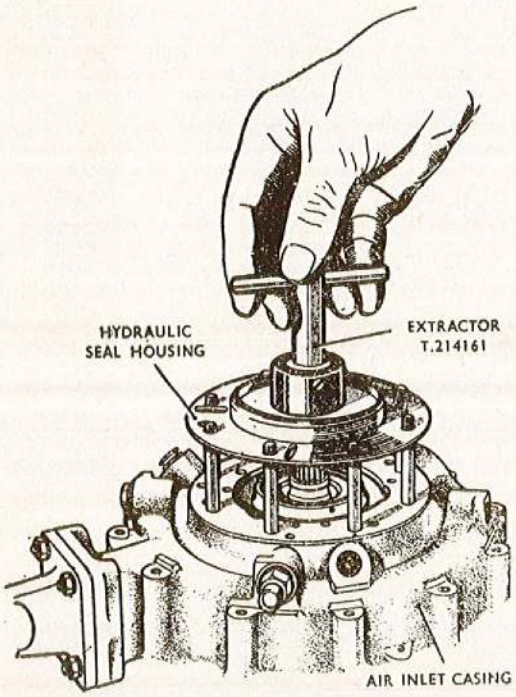


Fig. 7. Removing the hydraulic seal housing

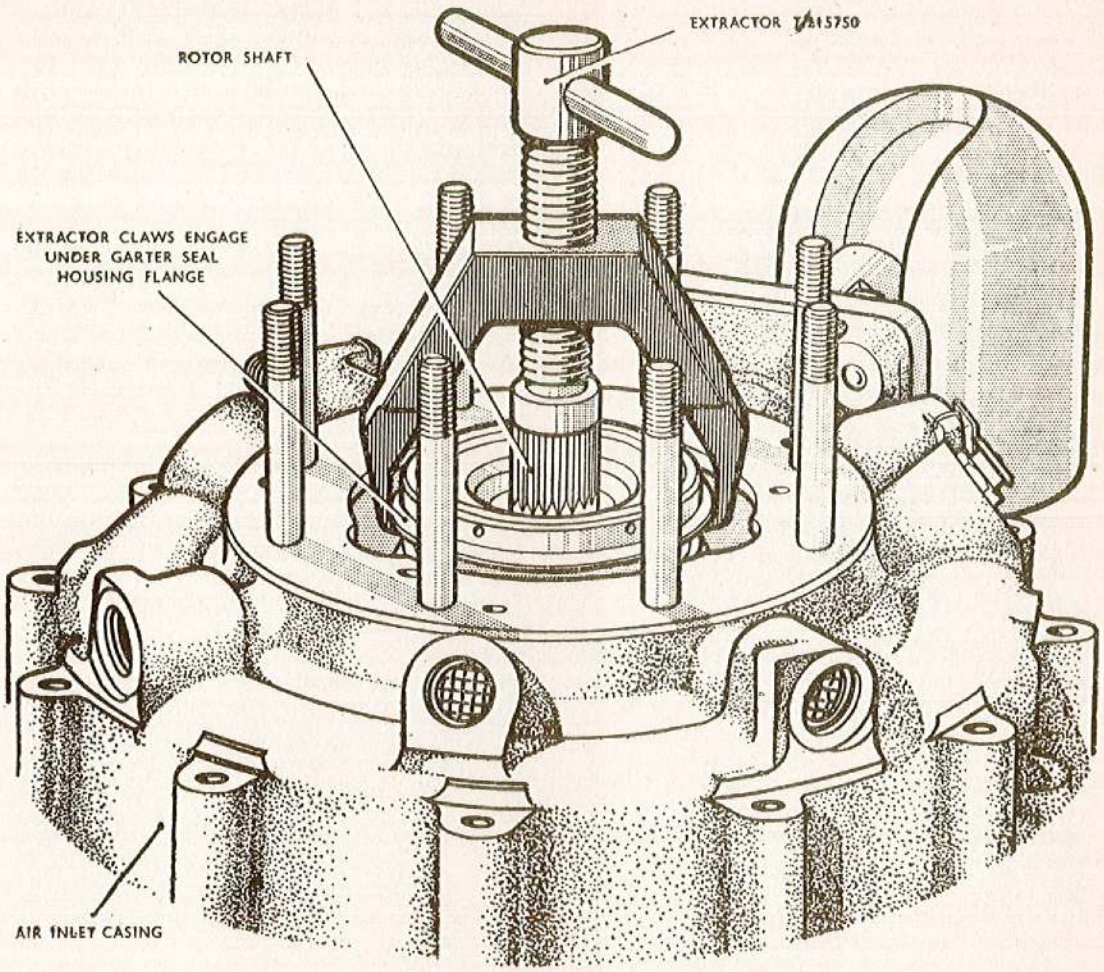


Fig. 8. Removing the garter-seal housing

base then locate the oil sleeve over the stem and push the slotted end of the sleeve through the seal until it seats on the bottom of the housing. Locate the cover over the dowels on the base of the tool and turn slightly to lock it in position. Fill the oil retaining sleeve with light oil, lower the plunger over the stem until it rests on the oil level in the sleeve then press the plunger down by hand to force the garter seal out of housing.

51. Remove the garter seal from the oil retaining sleeve and the shroud from the garter seal housing ; the shroud may remain attached to the seal when it is withdrawn.

52. The sealing ring and its retaining cup on the shaft may withdraw with the garter seal housing, if not, remove them after the housing has been withdrawn and dismantled.

Checking the main bearing for wear

53. Before doing any further dismantling, the main bearing end-float must be checked with gauge G.71345.

54. Remove the four nuts, grover washers and plain washers securing the tail shaft access cover to the exhaust casing assembly, lift off the cover and fit in its place the dial test indicator G.71345/A as shown in fig. 10. Screw the handle G.71345/B firmly into the other end of the shaft and with the pump still mounted on the dismantling fixture push in the rotating assembly, set the D.T.I. to zero then pull the rotating assembly outwards by means of the handle. The

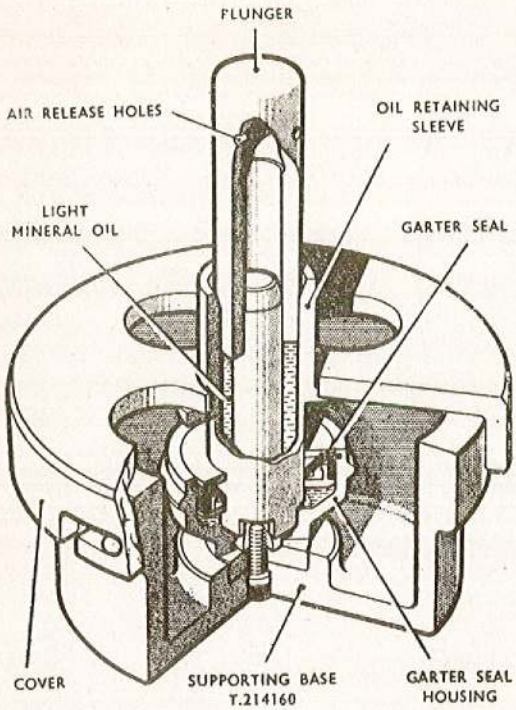


Fig. 9. Removing the garter-seal from its housing

reading will indicate the end-float of the rotating assembly, i.e. the amount of wear in the main bearing; the maximum permissible movement is 0·009 in. Record the end-float of the bearing for later reference, then remove the D.T.I. from the exhaust casing and the handle from the shaft.

Separating the air inlet casing from the exhaust casing

55. Remove the twelve nuts round the exhaust casing assembly together with the grover washers and plain washers. Withdraw the bolts from the air inlet casing and lift off the exhaust casing. The turbine assembly will remain attached to the air inlet casing, whilst the carrier ring, guide vanes and roller bearing assembly will remain attached to the exhaust casing. As the stator ring and shroud will be free between the turbines, take great care to avoid damaging the vanes on any of the assemblies. It is recommended that the stator ring and shroud be bolted temporarily to the air inlet casing with slave nuts and bolts of the appropriate length or with the existing nuts and bolts and the use of distance pieces.

Turbine assemblies

56. Remove the complete assembly from the dismantling fixture and place it on the locking sleeve T.214157, engaging the splines on the pump end of the shaft with those in the locking sleeve as shown in fig. 11. The locking sleeve should be bolted to the work bench. Unlock the cup-washer with the stripping punch T.215752 and remove the splined nut with spanner T.214158 as shown in fig. 11. Discard the cup-washer.

57. Lift off the cone and turbine wheel, remove the slave nuts and bolts and lift off the stator ring and shroud followed by the turbine, cone and adjusting washer. Measure the thickness of the adjusting washer with a micrometer and record this measurement for later reference (para. 206).

58. The stator ring and shroud locating dowels will remain in the air intake casing face and it is recommended that these should not be removed unless they are damaged. The stator ring and shroud is a complete assembly and must not be separated.

Shaft

59. Remove the assembly from the locking sleeve and mount it on the dismantling fixture. Use the ejector T.224297 to remove the shaft from the air inlet casing as shown in fig. 12. Fit the distance pieces followed by the bridge piece over the pump casing studs and secure them with washers and nuts. Screw the ejector shaft down and press out the rotor shaft from the casing, taking care to avoid allowing the shaft to fall out and suffer damage.

Fuel seal plate

60. Insert the lips of the extractor T.216241 through the slots in the internal flange of the fuel seal plate and turn the tool slightly to locate the lips behind the flange. Lower the draw plate over four of the studs on the air inlet casing and make sure that it seats correctly as shown in fig. 13. Turn the knurled nut to withdraw the fuel seal plate together with sealing rings from the air inlet casing.

61. Remove the extractor, detach the sealing ring from the fuel seal plate and the three small sealing rings from the seating face of the air intake housing.

Labyrinth cover

62. Unlock and remove the five bolts securing the labyrinth cover to the air inlet casing and lift off the cover; discard the gasket.

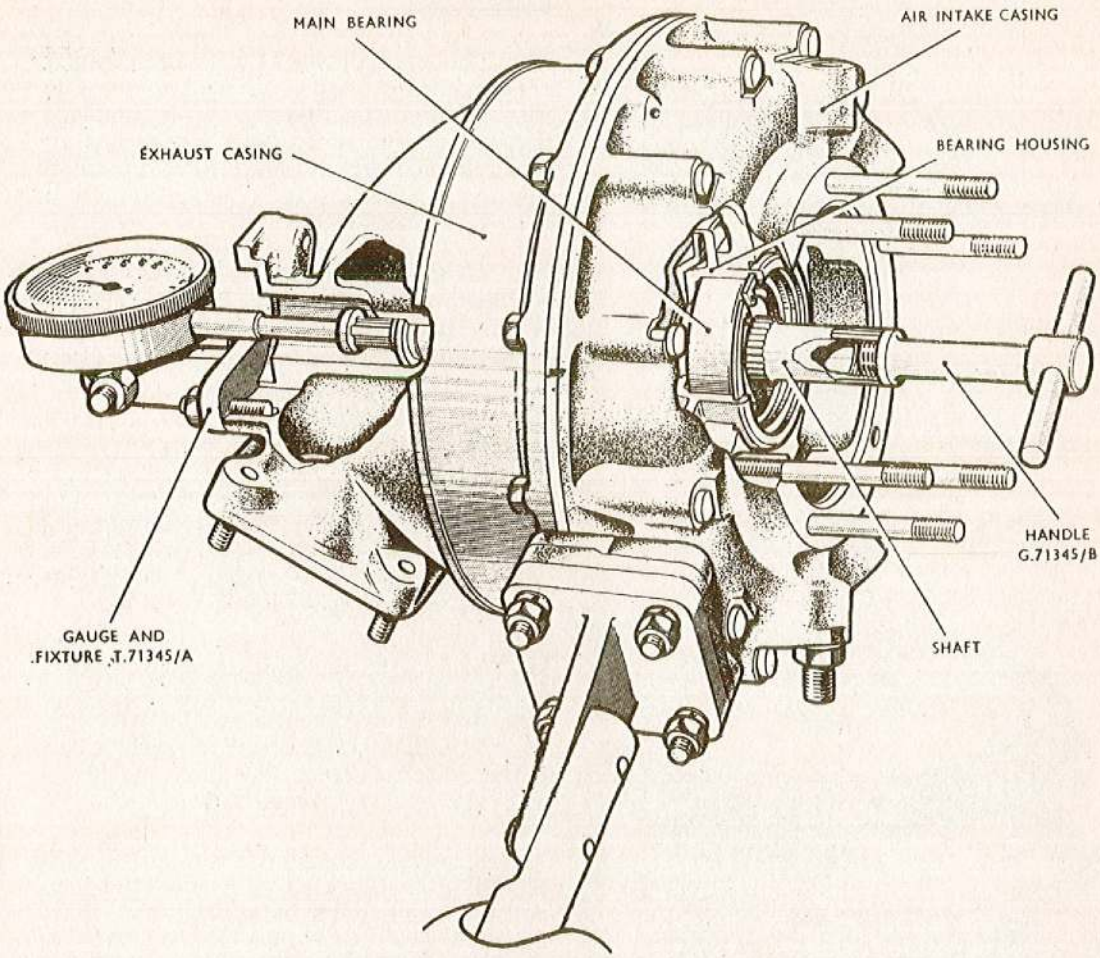


Fig. 10. Checking the main bearing for wear

Ball bearing

63. If the ball bearing housing will not fall out under finger pressure a light tap with a hide hammer will free it. Remove the circlip and lift out the spacing washer; press out the ball race from the housing by using finger pressure only.

Turbine entry nozzle plate

64. Unlock and remove the eight nuts and tab-washers from the studs securing the nozzle plate to the turbine side of the air inlet casing; lift off the nozzle plate and the heat shield.

Remaining details

65. Remove the union and washer and the plug washer from the alternative fuel seal drains and also remove the main bearing grease nipple. Extract the spring rings and lift out the gauze screens from the four air vents.

EXHAUST CASING ASSEMBLY

Carrier ring and guide vanes assembly

66. Unlock and remove the three nuts and tab-washers which secure the guide vane assembly support plate, labyrinth seal and roller bearing housing to the exhaust casing, then lift off the guide vanes assembly and the labyrinth seal.

67. Unlock and remove the four nuts and bolts securing the guide vanes assembly and separate this from the support plate.

Tail bearing

68. Pass the scalloped end of the extractor T.214156 through the roller race, turn it slightly to engage the lips behind the rollers,

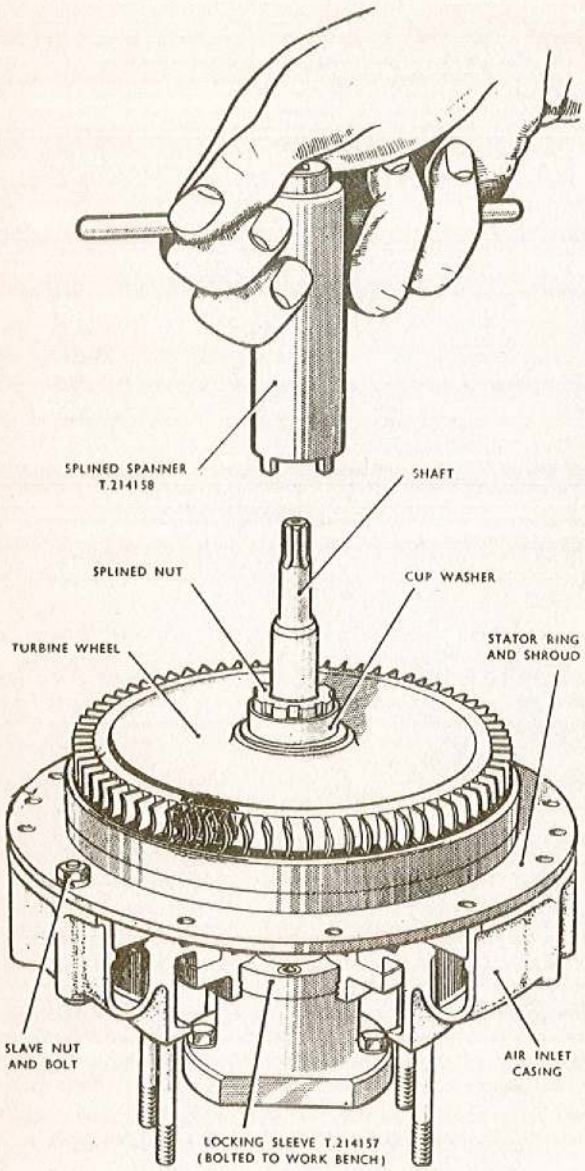


Fig. 11. Removing the turbine retaining nut

locate the draw plate on the three studs and by turning the handle of the tool in a clockwise direction draw the bearing from its housing as shown in fig. 14.

Remaining details

69. Remove the tail bearing grease nipple, circlip and gauze ventilator screen from the bosses on the exhaust casing.

CLEANING

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

71. The components must be cleaned thoroughly by washing in kerosine. It is recommended that they should be pressure washed using an appropriate bath and spray gun supplied by a pump with adequate filtering facilities. Hard brushes, cloths and abrasives must not be used.

72. After cleaning, all components should be dried thoroughly with compressed air, which must be free from water, then placed in clean dry containers ready for inspection.

INSPECTION

General

73. Where dimensional checks of certain components are necessary the method only is described in this section, the appropriate dimensions being given in the Schedule of Fits, Clearances and Repair Tolerances (A.P.4282A, Vol. 2, Pt. 2).

74. Each detail should be inspected closely for signs of damage, corrosion or excessive wear and if considered necessary, with due regard to the function of the component and nature of any defect, the part should be discarded and a replacement demanded.

75. Scrupulous cleanliness is essential with regard to the inspection and assembly bench and to all containers and tools in use. It is advisable that the surface of the bench be covered with zinc, linoleum or bakelized fabric to assist in maintaining the high standard of cleanliness required. Following inspection the details should be placed in containers holding a quantity of light oil for storage pending rebuild.

Redundant and consumable parts

76. It is usual during inspection to reject any parts rendered redundant by modifications and, therefore, complete information covering modifications must be at hand. Tab-washers, cup-washers, locking wire, joint washers and other consumable parts should have been discarded during dismantling ; their new replacements should be available for inspection with the main components.

Scores and surface damage

77. In general, scores or surface damage on moving parts and joint faces will impair the operational efficiency of the unit, hence any

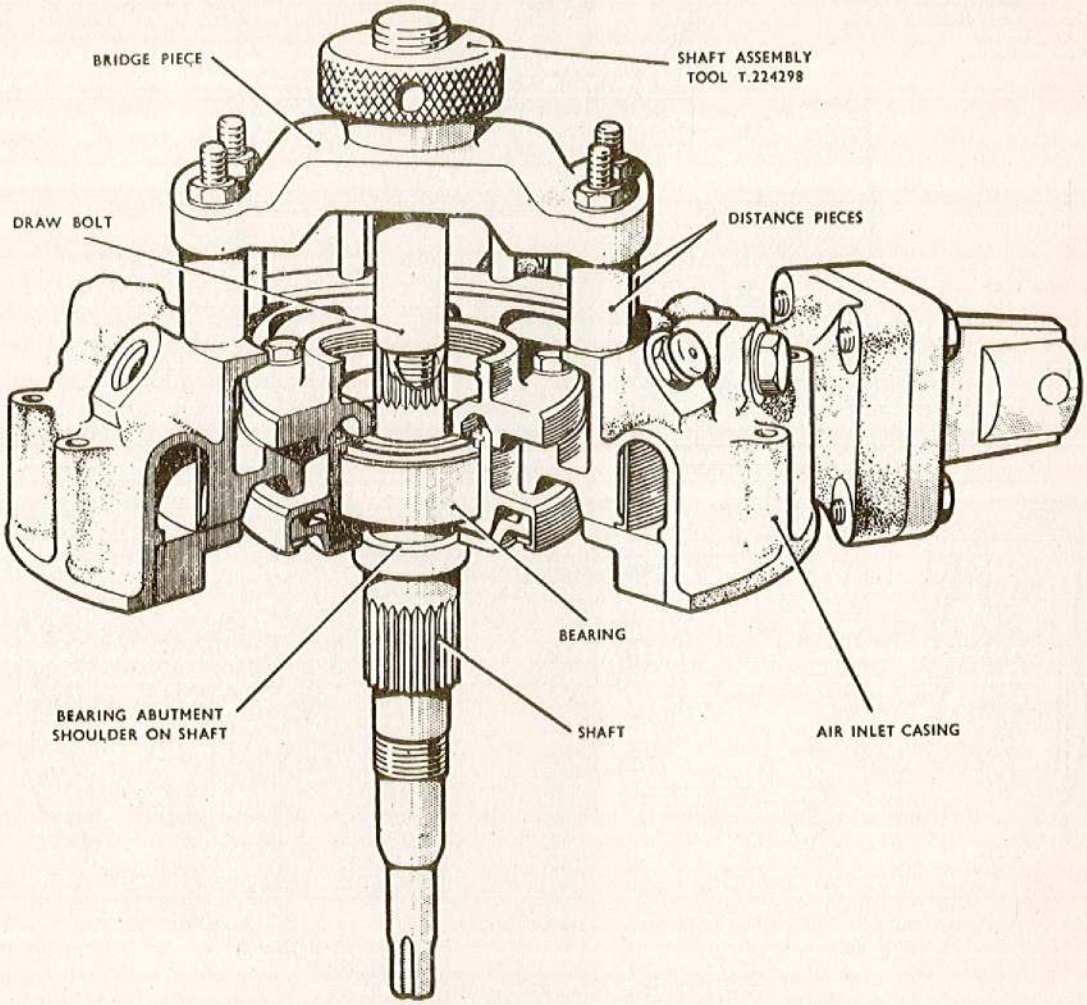


Fig. 12. Removing the shaft from the air inlet casing

part so affected should be renewed. In certain circumstances, however, depending upon the number of hours the pump may have run and the availability of spares, certain defects which will not seriously impair the efficiency and safety of the unit may be acceptable at the discretion of the inspector in charge.

Magnetic crack detection

78. In a case of suspected cracks or wherever there is the slightest doubt concerning the soundness of any components of ferrous origin, they should be tested by means of approved magnetic crack detection equipment. The following components must always be crack-tested when they are being inspected :—

Rotor shaft
Main bearing housing
Garter seal housing
Turbine locating cones
Non-return outlet valve
Non-return valve housing

Installation fittings

79. Inspect all installation fittings for cleanliness and general condition and ensure that threads and joint faces of all adapters and unions are undamaged.

Pump casing

80. Examine the pump casing generally for damage to the casting and studs, see that

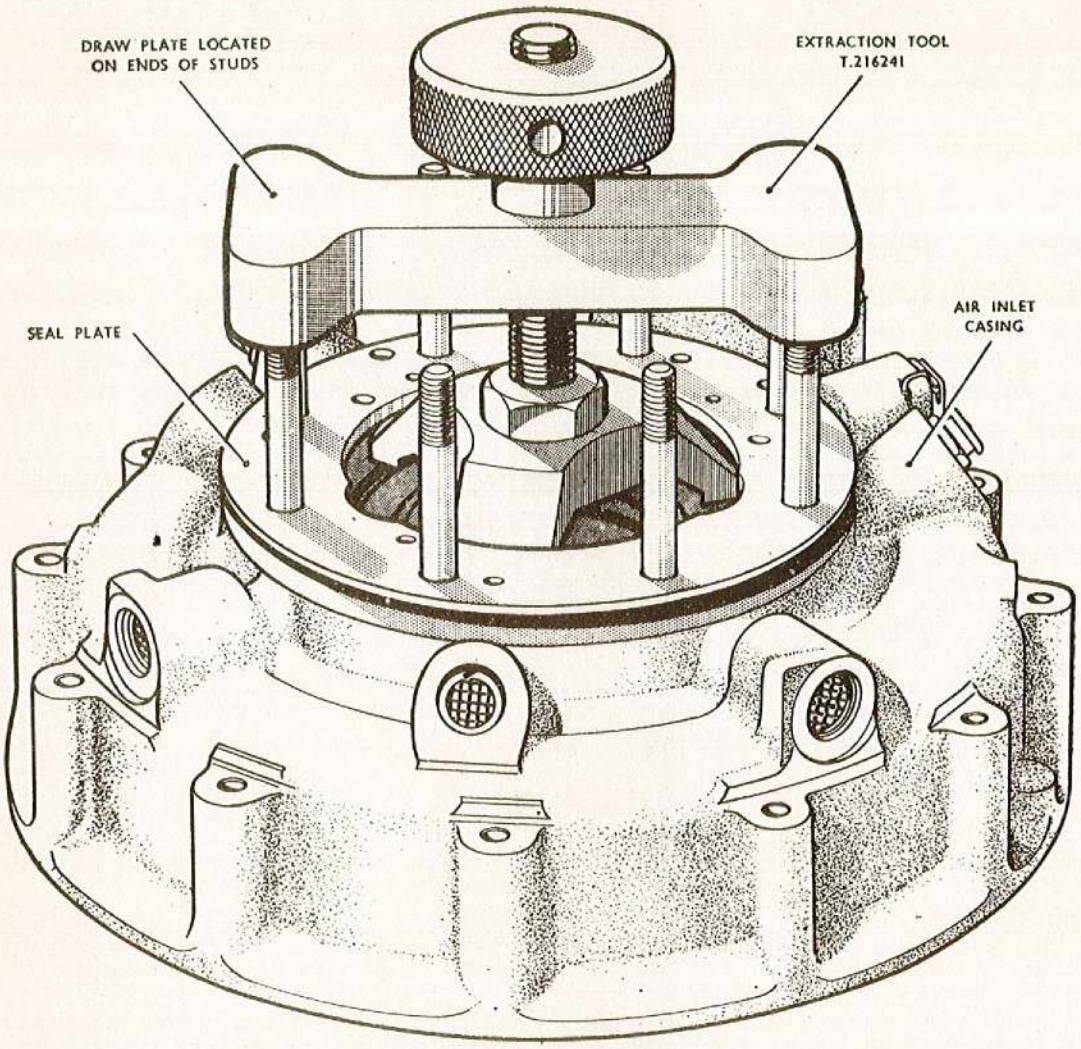


Fig. 13. Removing the fuel seal plate

all joint faces are in good condition and free from scoring or other potential sources of leakage and that no signs of corrosion are visible.

81. Ensure that no traces of joint washers or jointing compound remain on any of the faces and check that all sealing rings have been removed and that their locating grooves are clean.

82. To ensure that all passages are clean and free from any restriction it is recommended that fuel, followed by compressed air is blown through them. Pay particular attention to the fuel passage leading to the shut-off cock servo pressure control valve from which the serrated plug was removed when dismantling. Blow the fuel and air through from the valve end of the passage so that any foreign matter which may be present will be blown out of the passage at the plug end.

Shut-off cock assembly

83. Examine the shut-off cock cover for damage and the joint face for scoring and signs of corrosion. Examine the sealing ring groove and ensure that all traces of the sealing ring have been removed.

84. See that the strainer housing and attenuator housing are absolutely clean and that the threads for the strainer and plug assembly and for the attenuator plug are undamaged.

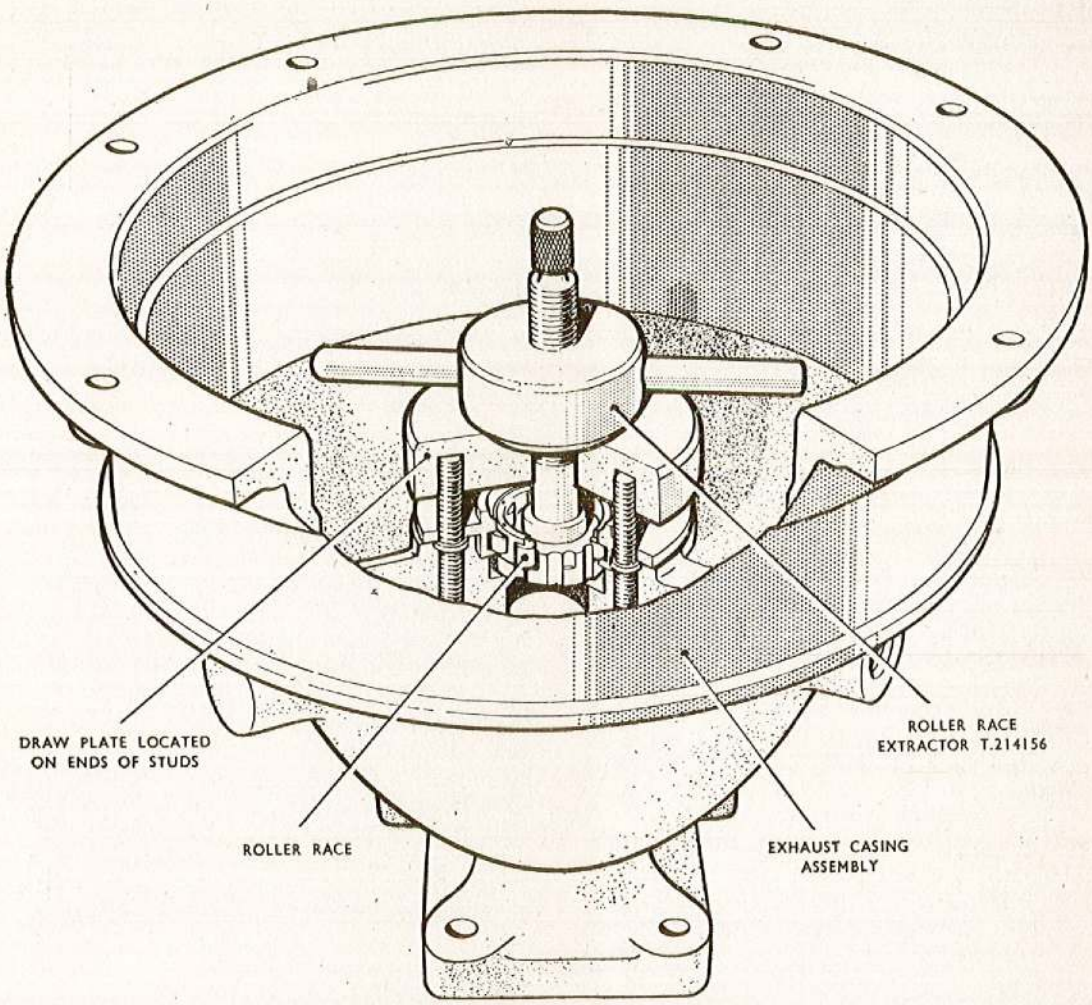


Fig. 14. Removing the roller bearing

85. Examine the diaphragm assembly for buckling and for any signs of cracking or splitting. Check that there is no indentation of the diaphragm surface, particularly adjacent to the edge, as this may be a source of leakage. See that none of the stud holes in the diaphragm have been torn or damaged during removal and that the sealing plugs in the cover have not cut into the surface.

86. If the support plate and diaphragm have been dismantled examine the inner faces of the plates for corrosion and for uneven surface and see that no burrs have been caused round the edges during dismantling.

87. Inspect the shut-off cock spring for surface cracks and corrosion and see that the coils are free from distortion. Examine the shim washer and spring seat for fracture and corrosion and also for excessive wear on the spring seat caused by contact with the push rod.

88. Examine the shut-off cock servo pressure strainer element closely for damage and distortion and see that it is quite clean. Press the strainer up and down in the plug to ensure that the spring loading is intact and check that the ends of the wire forming the element are secure.

89. Examine the servo pressure attenuator thread on the plug for damage and cleanliness and the helical spring for distortion. See that the orifice plate and spacing washer

is absolutely clean and that the small orifice in the plate is free from obstruction. Do not push any instrument into the orifice if it is obstructed but wash thoroughly in clean kerosine and blow through with compressed air.

Non-return valve assembly

90. Examine the non-return valve housing cover plate for damage and corrosion and see that all traces of the sealing ring have been removed from the groove.

91. See that the valve assembly locating peg is not damaged and check its fit in the seating. It should be finger tight with no movement when correctly seated.

92. Check the fit of the cotter plate in the groove round the valve stem and see that it is not distorted.

93. Check the valve retaining plate for burrs and corrosion particularly round the spring seating flange and in the recessed seating face for the cotter plate.

94. Inspect the valve spring for cracks and corrosion and see that the coils are undistorted and the ends of the spring are square.

95. Ensure that the valve stem is not bent and that the cotter plate groove is clear and free from corrosion and burrs. Insert the valve in the guide and check for freedom of movement; no sticking should be apparent and the valve should be a good fit in the guide. Examine very carefully all round the seating face of the valve for burrs, pit marks, scratches, scores and excessive wear.

96. See that the valve housing is clean and that all traces of the sealing ring have been removed. Examine the internal bore of the valve guide for scores and surface damage and see that it is absolutely clean. Inspect the seating face of the valve for burrs, pit marks and scoring.

Shut-off cock servo pressure control valve assembly

97. Ensure that the solenoid electrical pins are not bent and that the casing is not fractured. Using a megohm meter check the winding for continuity and check the insulation between each pin and earth; the resistance should be not less than one megohm at 500 volts.

98. Check that the solenoid plunger is smooth and that the half-ball seating is clean, free from burrs and shows no signs of excessive wear. Ensure that the half-ball seating cup is riveted firmly in the body of the plunger.

99. Examine the solenoid plunger spring for surface cracks, corrosion and distortion of the coils.

100. Inspect the half-ball for undue wear on the face and on the back and check the face for colour registration against an optical flat. Reject the half-ball if more than two colour bands are apparent.

101. Examine the orifice assembly generally for cleanliness, check that the threads are in good condition and examine the orifice and surrounding lands closely for damage, burrs and corrosion, also check for wear by the half-ball. Test the orifice face for flatness, using an optical flat. A colour registration must be obtained on the orifice face and on each land simultaneously.

Fuel delivery pressure switch

102. Inspect the switch generally for cleanliness and see that the circlip holding the top cover in position is not distorted and that its groove is clean. Remove the terminal screws and washers, and see that they are bright and clean to ensure perfect electrical contact when the leads are attached.

Air inlet casing assembly

103. Examine the air inlet casing generally for damage to the casting, studs and bolt holes, see that all joint faces are in good condition and free from scoring or other potential sources of leakage and that no signs of corrosion are visible, particularly on the seating face for the nozzle plate.

104. See that all traces of gaskets and sealing rings have been removed and that all passages are clean, particularly the grease passage to the roller bearing.

105. See that the air vent gauzes, the spring retaining rings and the grease nipple for the main bearing are in good condition.

106. Ensure that the nozzle plate is thoroughly clean and that none of the turbine entry nozzles are partially blocked. Examine the seating faces for scoring and

other damage which might prevent the nozzle plate from seating correctly in the pump.

107. Inspect the heat shield for cleanliness, cracks or distortion. Slight distortion is permissible as it will be corrected when the shield is bolted down under the nozzle plate.

108. See that the pump impeller cover is not distorted and that all traces of the sealing rings have been removed. Examine the transfer bobbins for damage and their fuel passages for obstruction.

109. Examine the hydraulic seal housing for damage and check that the internal thread is in good condition. See that the seating faces are free from scores and other surface damage which might cause leakage.

110. See that the fuel seal plate is clean, that all traces of the sealing ring have been removed and that all faces, edges and drillings are clear and free from burrs or any other defects.

111. Examine the front labyrinth seal for general condition, check that all traces of the gasket have been removed and that the faces are clean and smooth. Inspect the labyrinth grooves for foreign matter and any signs of wear. The labyrinth seal must be renewed if it shows the slightest signs of damage or wear on any of the labyrinth grooves,. in which case the main bearing must be checked for excessive end-float and the bearing and seal assembly for misalignment.

112. Examine the main bearing housing for scores and surface damage and check that the ball race is a tight push fit in the housing. Ensure that the ball race has not been spinning in the housing. The rear labyrinth seal is integral with the ball bearing housing and must be examined at the same time for surface damage and signs of damage or wear on the labyrinth grooves. Also inspect the circlip and spacing washer for damage and distortion.

Rotating assembly

113. See that the impeller securing screw is clean, particularly in its radial drillings. Check that the thread is in good condition and examine the face of the screw, where it seats on the cup-washer, for scores, burrs and other surface damage.

114. Examine the rotor shaft cooling tube for cleanliness, corrosion and distortion.

115. The pump impeller is specially treated to prevent corrosion ; examine the surface therefore for scratches and bruising and inspect the female splines for damage. Check that the impeller is an easy push fit on the shaft.

116. The hydraulic seal impeller has been treated similarly to the pump impeller and should show no signs of corrosion ; examine the surface for damage and see that it is clean. Also examine the splines of the impeller and check its fit on the shaft as for the pump impeller.

117. Examine the garter seal housing generally for surface defects such as scores and corrosion. Inspect the surfaces adjacent to the labyrinth grooves for any signs of wear, indicated by circular scores round the housing. See that the female splines are not damaged in any way and inspect the seal backing plate and shroud for any defect likely to cause damage to the garter seal. If the garter seal is damaged, distorted or shows excessive wear or signs of overheating on the seal lip it must be renewed.

118. Examine the spring ring for distortion and its internal groove in the housing for any damage likely to prevent it from seating correctly. Inspect the cup sealing ring location for cleanliness and see that no remains of the sealing ring are adhering to its inner surface.

119. If the main bearing end float, when being checked as described in para. 53 and 54 was within the permissible limits, inspect it for discolouration caused by overheating and examine the cage for distortion. See that the bearing is thoroughly clean and that it spins smoothly and freely.

120. Examine the turbines generally for distortion and damage. See that the female splines are in good condition, inspect the cone seating faces for any damage likely to cause incorrect seating and see that the spigoted bosses are undamaged. It is not permissible to renew either of the turbines without special equipment (para. 138).

121. See that the turbine securing nut is

serviceable and that the slots are not damaged.

122. Inspect the rotor shaft generally for damage and severe wear particularly in the region of the labyrinth seals ; circular scores round the shaft in these areas will indicate misalignment of the seals or undue wear in the pump bearings. Examine all threads, splines and seating faces for corrosion, burrs and surface defects, also see that the internal bore for the cooling tube is clean.

Exhaust casing assembly

123. Ensure that the stator ring is pegged firmly to the shroud ring and that all the vanes are in serviceable condition. Make sure that no signs of the gasket remain on the face which seats on the air inlet casing.

124. Inspect the exhaust cascade guide vane assembly for damage and distortion, also examine the support plate for any damage likely to cause incorrect seating.

125. Examine the labyrinth seal grooves for signs of wear, obstruction and any surface defects.

126. Examine the tail bearing generally for damage and for discolouration indicative of overheating ; see that the bearing spins freely on the shaft. Check that there is no damage or distortion on the bearing retaining flange and that there are no signs of cracks, also examine the cage for damage.

127. Examine the grease nipple, ventilator screen and retaining circlip for serviceability.

REPLACEMENTS

General

128. Joint washers, sealing rings, locking washers and locking wire must be renewed whenever disturbed.

129. The items mentioned in the following paragraphs are available as built-up assemblies, although individual parts in the assemblies are separately inter-changeable unless stated to the contrary. Items not mentioned are all separately inter-changeable.

Shut-off cock assembly

130. The s.o.c. diaphragm assembly is normally supplied as a complete assembly consisting of support plate, diaphragm, diaphragm plate, tab-washer and nut, but any of these parts are separately inter-changeable.

131. The s.o.c. servo valve strainer and plug assembly must be replaced as a complete assembly. All other parts of the shut-off cock assembly are separately inter-changeable.

Non-return valve assembly

132. All parts of the non-return valve are separately interchangeable ; the fitting of a new valve or housing necessitates lapping the valve and seating. The housing and valve guide are available as a complete assembly and should not be separated.

Shut-off cock servo pressure control valve

133. The solenoid plunger and spring can be replaced individually but the solenoid itself must be replaced as a complete assembly. The orifice and half-ball can be replaced as individual items.

Fuel delivery pressure switch

134. The fuel delivery pressure switch must be replaced as a complete assembly.

Air inlet casing assembly

135. With the exception of the stator ring and shroud all parts of the air inlet casing including the nozzle plate, heat shield, main bearing housing, labyrinth seal, fuel transfer housing, hydraulic seal housing and pump impeller cover are separately inter-changeable. The air inlet casing and the stator ring and shroud are mated and must not be replaced individually.

Rotating assembly

136. Only the ball bearing, garter seal, cup washers, adjusting washers and securing nuts are replaceable on the rotating assembly. Should any other component require renewing the assembly must be returned to the makers for dynamic balancing, unless such equipment is available.

Exhaust casing assembly

137. All parts of the exhaust casing assembly are separately interchangeable with the exception of the small labyrinth seal at the end of the shaft, this must not be withdrawn from the casing.

ASSEMBLING

REBUILDING THE PUMP CASING ASSEMBLY

Assembling the s.o.c. servo pressure control valve

138. Bend down one tab and fit the tab-washer, shim washer and orifice into the housing on the pump casing. Make sure that the bent tab locates in the drilling in the base of the housing. Using spanner T.174675, tighten the orifice but do not lock the tab-washer at this stage.

Checking the pressure control valve gap

139. Measure the distance from the solenoid seating face on the pump casing to the orifice face in the bottom of the orifice bore as shown in fig. 15A and record the measurement.

140. Invert the solenoid and temporarily assemble the plunger and half-ball valve, minus the spring, Using the setting ring and base T.224386 as shown in fig. 15B, place the solenoid on the tool base and the setting ring over the three studs. With a depth micrometer measure the distance from the top face of the ring to the face of the half-ball and record the measurement.

141. Knowing the height of the ring (2·000 in.) subtract the measurement obtained in para. 140; this will give the height of the half-ball valve face above the solenoid seating face. Subtract from this the thickness of the solenoid seating washer.

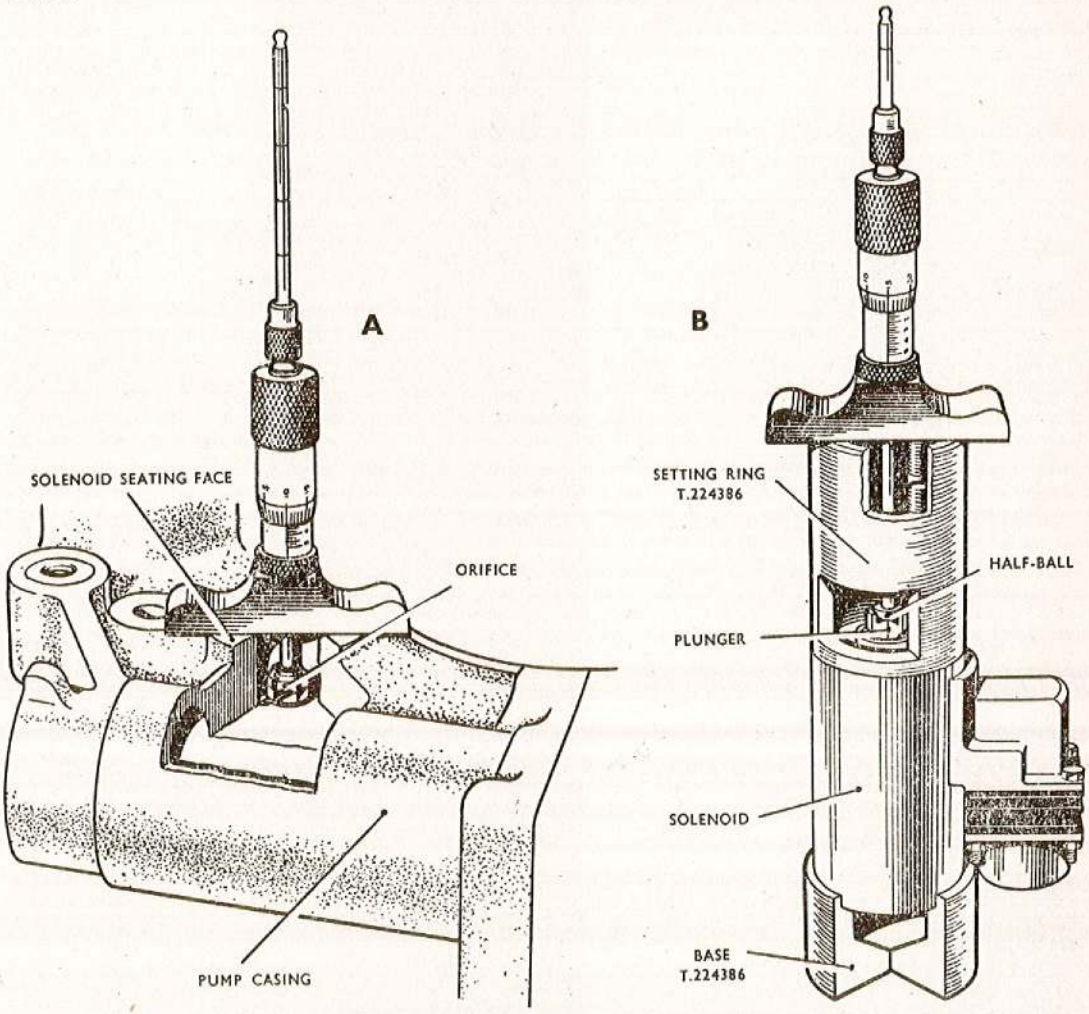


Fig. 15. Checking the solenoid-valve gap

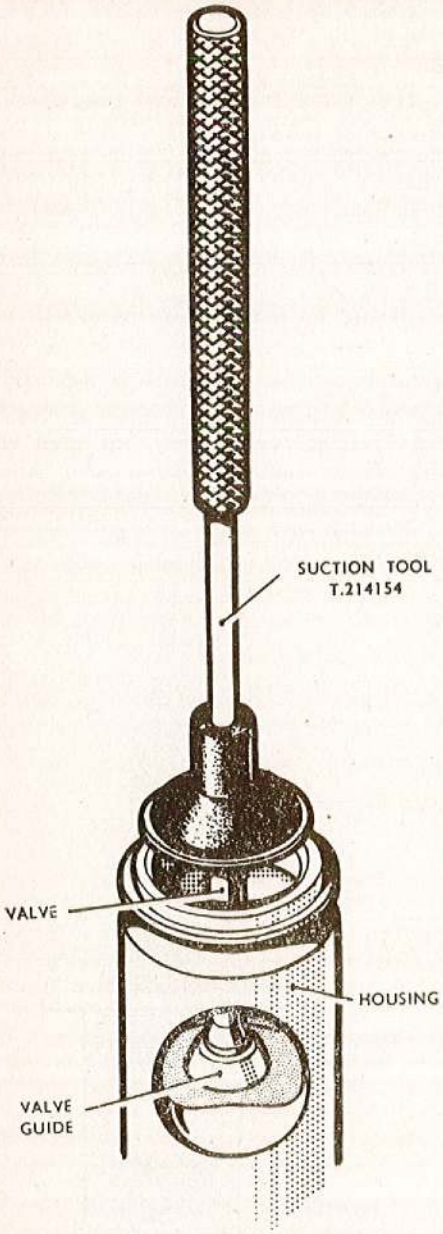


Fig. 16. Lapping the non-return valve

142. Subtract the final measurement found in para. 141 from the measurement obtained in para. 139; this will give the actual existing gap.

143. Shim under the orifice to adjust the gap to between 0·010 in. to 0·015 in., tighten the orifice and bend up the tab-washer.

144. Remove the solenoid from the fixture and withdraw the half-ball and plunger.

Paint the seating face of the solenoid and also the face on the pump casing with jointing compound (Stores Ref. 34B.270).

145. Paint both sides of the solenoid sealing washer with the jointing compound and fit the washer over the three studs on the solenoid.

146. Fit the spring, plunger, and half-ball into the solenoid, taking care not to touch the jointing compound on the face, then assemble the solenoid assembly to the pump casing, passing the three studs through the pump casing, and press down firmly. It will facilitate assembling if the pump casing is turned on its side.

147. Bend down the tabs and fit the tab-washers and nuts to the studs. Locate the tabs in the holes, tighten the nuts and lock the tab-washers.

148. Using tool T.131033, fit and tighten the serrated plug in the end of the fuel passage leading to the orifice.

Non-return valve assembly

149. Check the fit of the non-return valve in the guide and ensure that it does not bind in any position.

150. If the seating faces show any signs of damage or if a new valve or guide is being fitted, it will be necessary to re-lap the valve on its seat as shown in fig. 16. After lapping, thoroughly clean the valve and housing in kerosine to remove all traces of lapping paste.

151. Assemble the sealing ring to the groove round the housing and then smear the ring lightly with white petroleum jelly to facilitate insertion of the housing into the pump casing.

152. Assemble the valve, spring, retaining plate and cotter plate to the housing using the tool T.214155 as shown in fig. 5. Make sure that the cotter plate seats correctly in the groove round the valve stem.

153. Insert the valve assembly into the pump casing taking care to avoid damaging the sealing ring. Align the holes and insert the locating peg by using a small punch and hammer.

154. Assemble the sealing ring to the cover, lower the cover over the four studs and

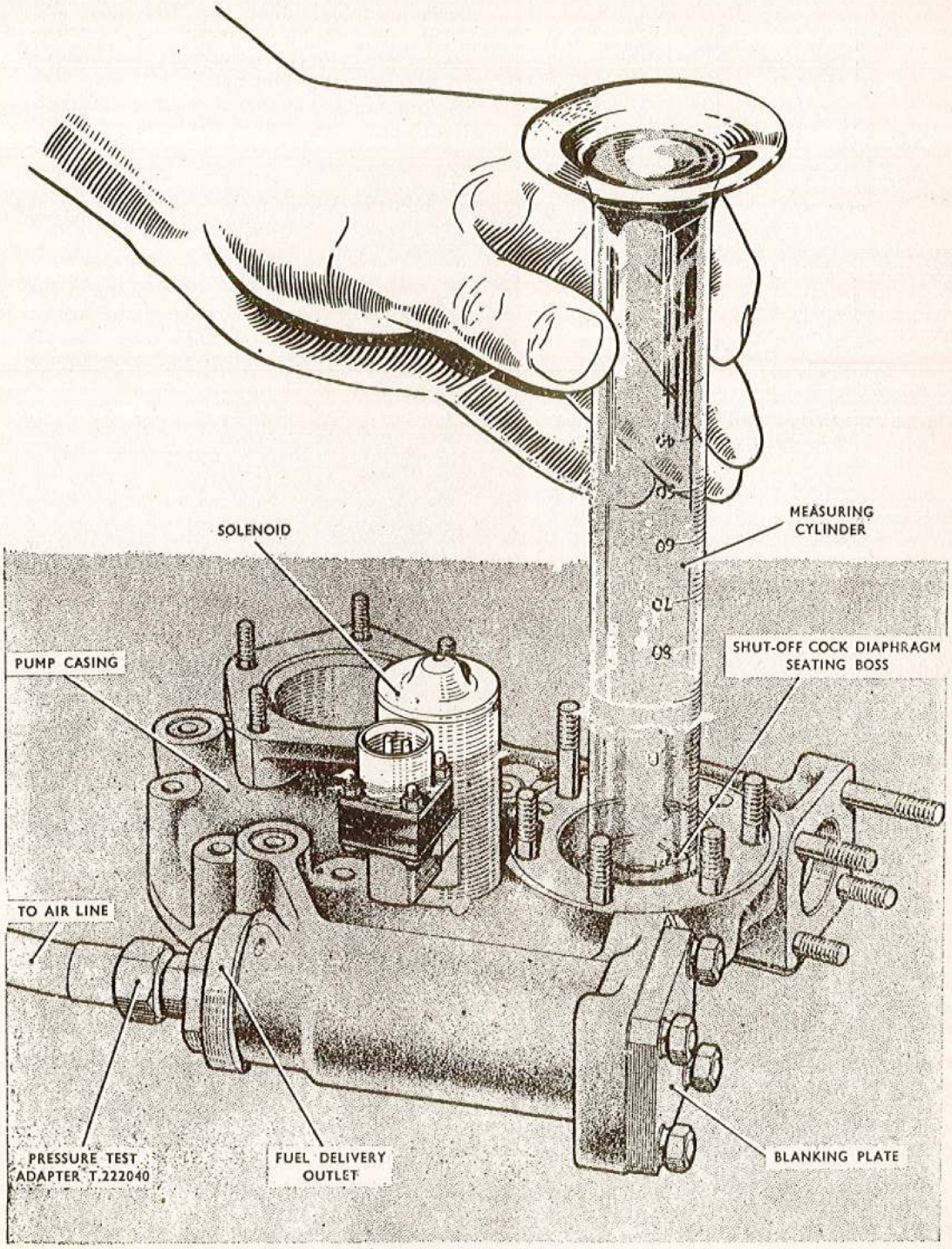


Fig. 17. Checking the non-return valve for leakage

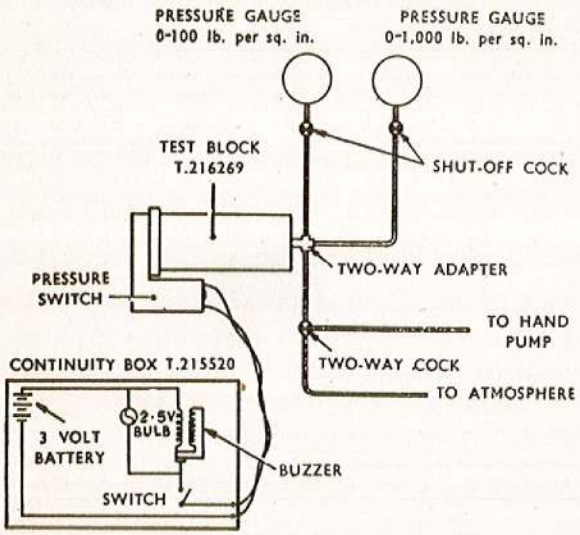


Fig. 18. Checking the opening point of fuel delivery pressure switch

secure it with plain washers, grover washers and nuts. Test for leakage as described in the following paragraphs.

Checking the non-return valve for leakage

155. Fit the adapter T.222040 to the fuel delivery connection as shown in fig. 17 and connect an air supply. Submerge the complete pump casing in fuel and apply an air pressure of 30 lb. per sq. in. Check for leakage through the shut-off cock diaphragm seating boss in the base of the housing.

156. Any leakage must not exceed 20 cc. per minute and this must be measured as follows :—Immerse a measuring cylinder in the fuel and allow it to completely fill, without any air bubbles. With the cylinder still immersed, invert it and hold it above the shut-off cock diaphragm seating boss when the rising bubbles of air will displace fuel from the measuring cylinder and the displacement over a period of one minute can be read directly from the measuring cylinder scale. If this exceeds the value stated the valve must be re-lapped and the sealing ring round the housing and valve guide assembly must be renewed.

157. Remove the pump casing from the fuel tank, disconnect the air line and dry thoroughly by using compressed air.

Assembling the shut-off cock to pump the casing

158. If the diaphragm assembly was dismantled (para. 26) place together the two layers of fabric, align the stud holes and sealing-plug holes correctly and fit the diaphragm on to the the support plate followed by the diaphragm plate. Bend over the locating tab and fit the tab-washers and nut, locating the bent tab in the drilling.

159. Place the assembly on the base T.224375 as shown in fig. 4 then tighten and lock the nut, taking care to avoid disturbing the alignment.

160. Place the two transfer bobbins in the shut-off cock seating on the pump casing, fit the diaphragm assembly over the six studs and press it down gently on to the facing.

161. Insert the sealing ring in the recess in the shut-off cock cover seating face. Lower the spring seat and spring on to the diaphragm push rod, place the adjusting shim washer on the top of the spring and lower the cover over the studs. Press down firmly and secure with plain washers, grover washers and nuts.

Servo valve strainer

162. Insert the strainer and plug assembly in the housing on the cover and tighten it with the spanner T.161439 as shown in fig. 5.

Servo pressure attenuator

163. Insert the attenuator plate, spacing washer and helical spring then fit and tighten the retaining plug.

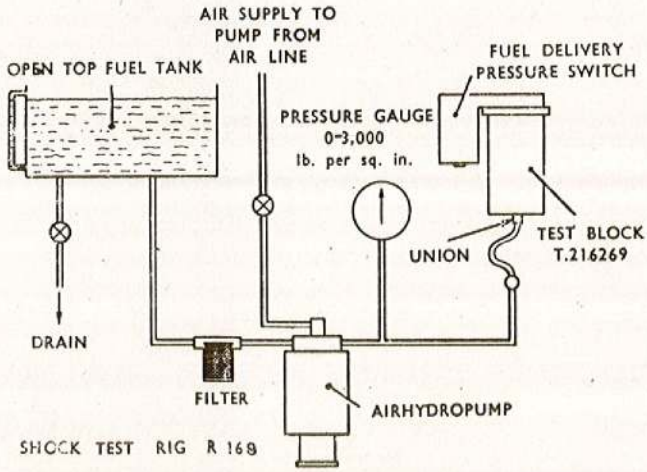


Fig. 19. Shock testing the fuel delivery pressure switch

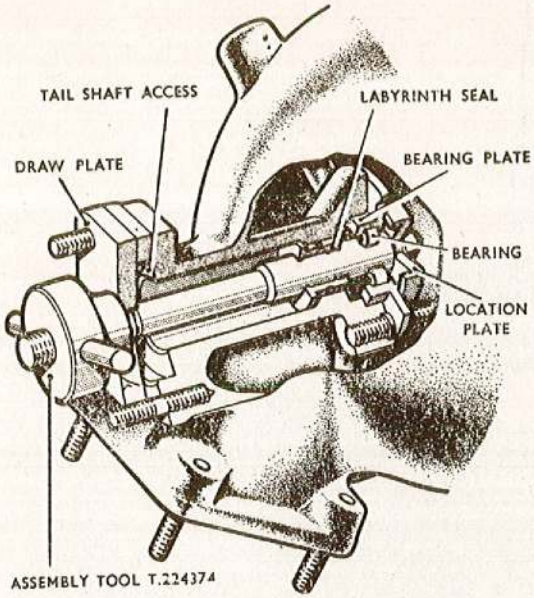


Fig. 20. Assembling the tail bearing to the exhaust casing

Checking the fuel delivery pressure switch

164. The fuel delivery pressure switch must be tested before being assembled to the pump casing. If the switch fails to pass the tests described in the following paragraphs, it must be renewed.

165. Fit a sealing ring to the locating boss on the bracket and assemble the switch to the test block T.216269. Connect a two-way adapter to the test block and two pressure gauges, 0 to 100 lb. per sq. in. and 0 to 1000 lb. per sq. in., to the connections on the adapter as shown in fig. 18. Both gauges must be provided with a shut-off cock.

166. Remove the spring ring from the top of the switch casing, lift off the cover and connect the leads from the continuity box T.215520 to the two terminals on the switch. Fit the assembly to the hand pump and increase the pressure to determine the closing point of the switch. Check that the contacts will close at 40 lb. per sq. in., and also at 100 lb. per sq. in., adjusting the switch to each pressure by pushing down and turning the adjusting screw with a small screwdriver.

167. The continuity box can be obtained under the tool number T.215520 or can be made up according to the electrical circuit shown in fig. 18. It consists essentially of a 3 volt dry battery, buzzer, 2·5 volt bulb, on/off switch and test leads, housed in a small metal box.

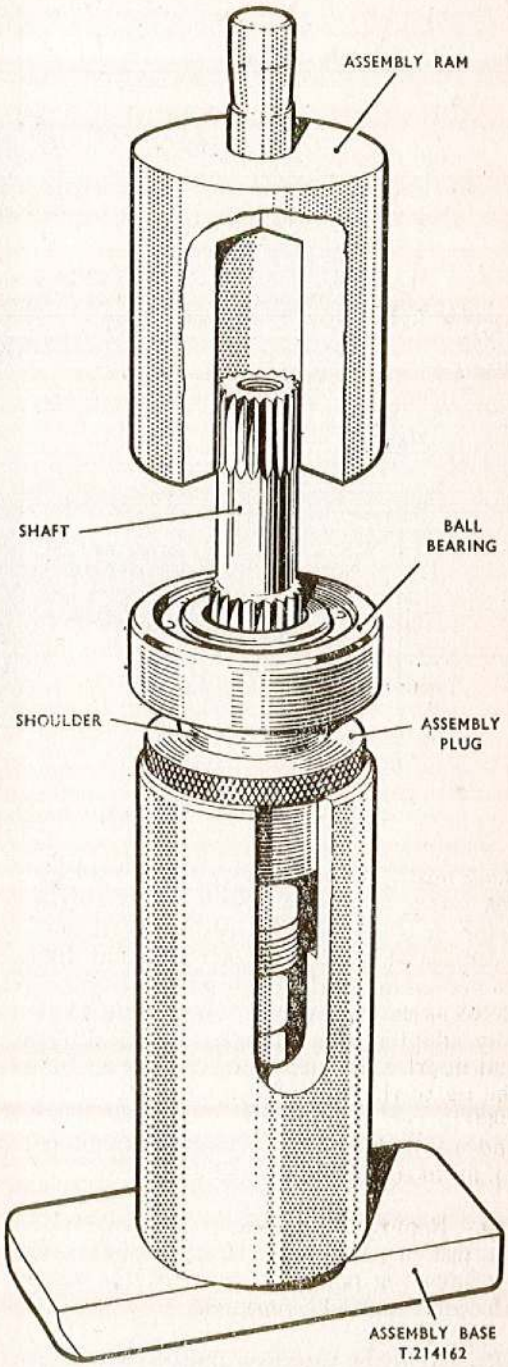


Fig. 21. Assembling the main bearing to the shaft

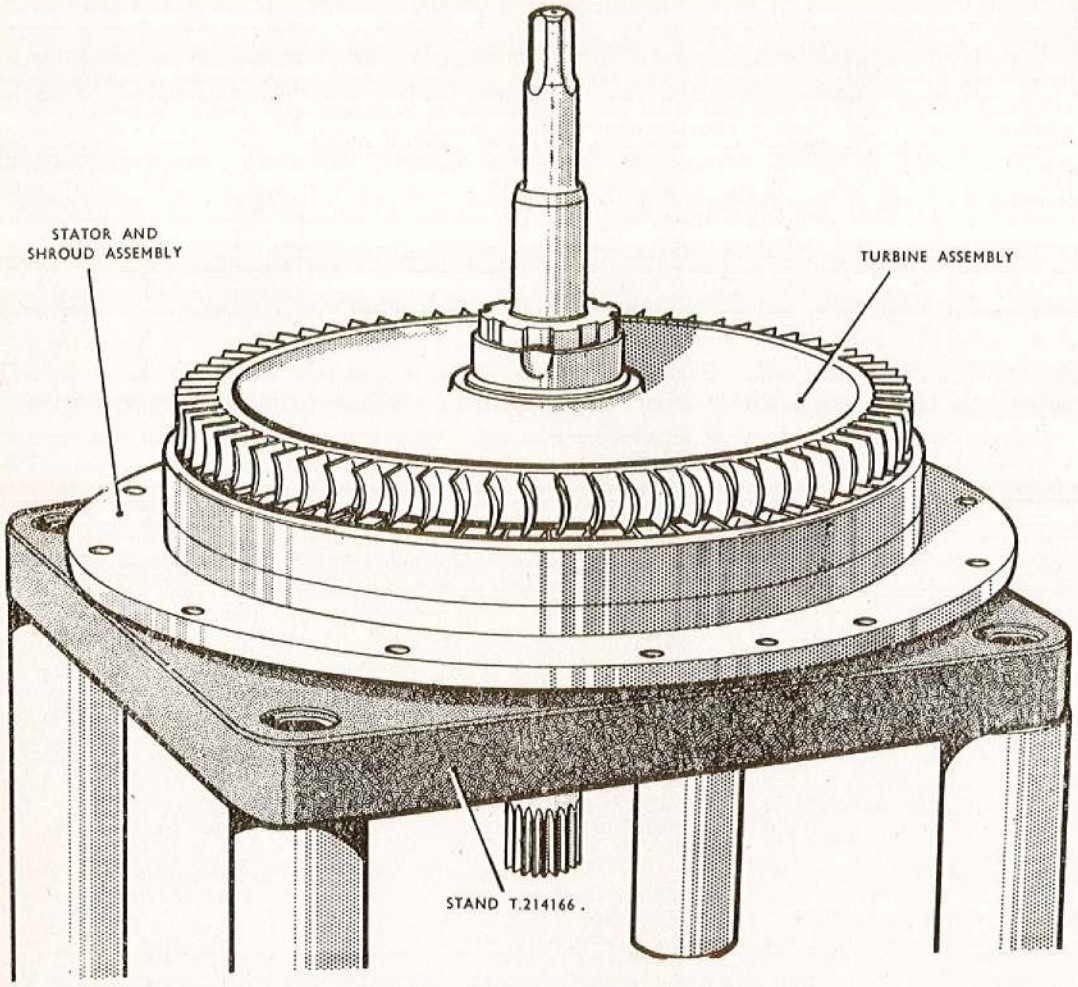


Fig. 22. Turbine assembly stand

Shock testing the fuel delivery pressure switch

168. If a new pressure switch is fitted, before it is assembled to the pump it must receive a shock test of 500 cycles at 1000 lb. per sq. in. on the Solenoid Shock test-rig R.168 as shown in fig. 19. Remove the two-way adapter from the test block T.216269 and insert a union. Connect the lead from the rig to the union, adjust the pressure to 1000 lb. per sq. in. on the rig pressure gauge and vary the pressure from 1000 lb. per sq. in. to zero 500 times (25 minutes).

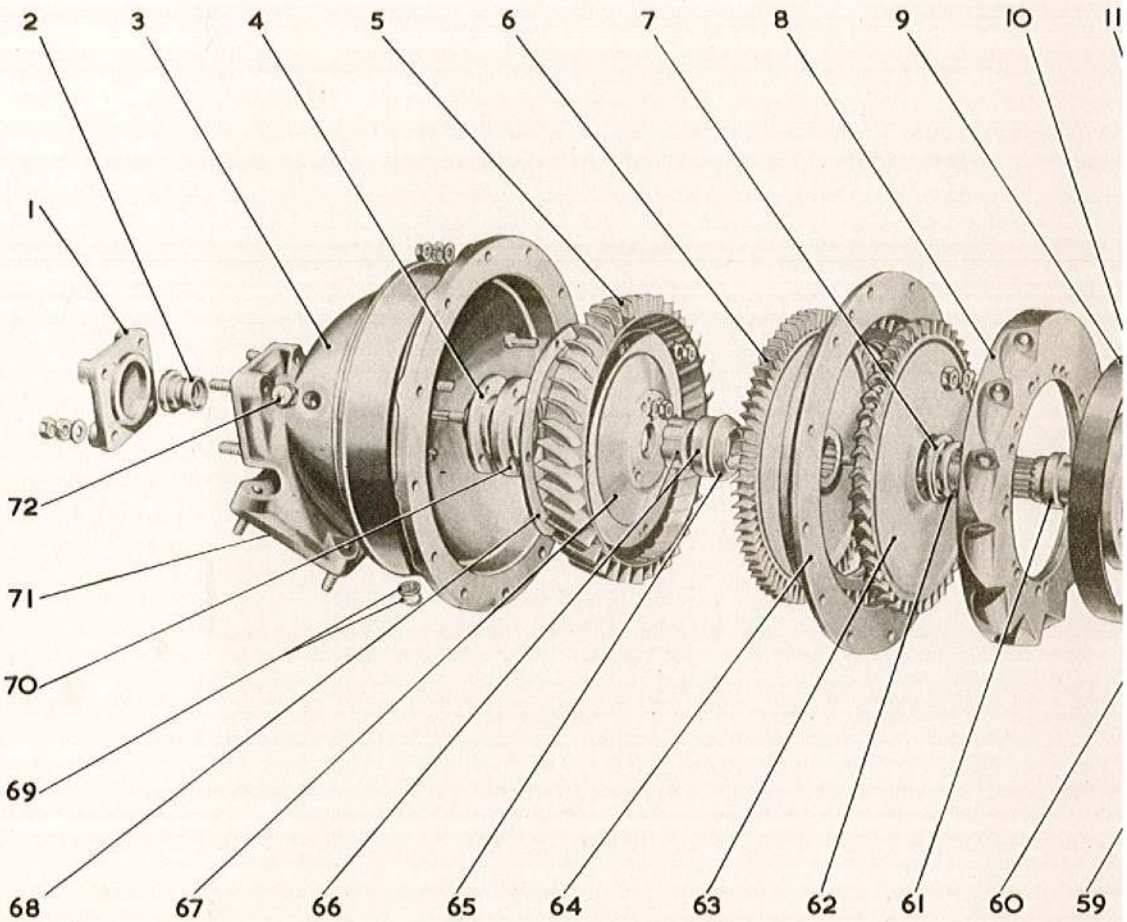
169. Remove from the test-rig, and repeat the test in para. 166. If any alteration in the breaking point has occurred the whole procedure must be repeated.

170. Refit the top cover on the switch and secure it with a spring ring. Fit the switch to the pump casing and secure it with four nuts, plain washers and grover washers. Do not insert the two large sealing rings into the internal recesses in the pump casing at this stage.

171. The pump casing is now completely assembled and should be stored in a clean box until required for the main assembly.

EXHAUST CASING ASSEMBLY

172. Smear the outside diameter of the roller bearing with white petroleum jelly and lower it over the three studs in the exhaust casing assembly. Press the bearing down squarely and enter it into the casing bore. Pass the assembly tool T.224374 through the bearing, taking care to avoid damaging the labyrinth seal in the housing bore, and rest the location plate on the bearing as shown in fig. 20. Locate the



1 TAIL SHAFT SPLINES ACCESS COVER
2 REAR LABYRINTH SEAL
3 EXHAUST CASING
4 REAR BEARING
5 CARRIER RING AND GUIDE VANES
6 SECOND STAGE TURBINE
7 TURBINE FRONT LOCATING CONE
8 TURBINE AIR ENTRY NOZZLE PLATE
9 HEAT SHIELD
10 MAIN BEARING HOUSING
11 MAIN BEARING
12 STATOR RING DOWEL
13 AIR INLET CASING
14 GREASE NIPPLE
15 AIR VENT GAUZE AND CIRCLIP
16 FUEL SEAL PLATE
17 COOLING FUEL TRANSFER BOBBIN
18 GARTER SEAL
19 GARTER SEAL RETAINING CIRCLIP
20 GARTER SEAL HOUSING LOCATING CUP
21 HYDRAULIC SEAL HOUSING
22 PUMP IMPELLER
23 FUEL DELIVERY PRESSURE SWITCH
24 OUTLET VALVE SPRING
25 OUTLET VALVE SPI
26 OUTLET VALVE CO
27 OUTLET VALVE RE
28 LOCATING DOWE
29 OUTLET VALVE HO
30 OUTLET VALVE
31 SHUT-OFF COCK V
32 SHUT-OFF COCK D
33 DIAPHRAGM SECU
34 SHUT-OFF COCK S
35 SHUT-OFF COCK S
36 SHUT-OFF COCK H

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draw plate over the four studs on the tail shaft access flange, then engage and screw down the knob until the bearing is drawn fully into its seating. Remove the tool and see that the bearing is seating correctly.

173. Fit the front labyrinth seal over the same three studs and press into position under a hand press, using only a light pressure and making sure that it seats correctly.

174. Assemble the cascade guide vanes and support ring, securing them together with four tab-washers and nuts ; tighten and lock these. Lower the guide vanes and support ring assembly over the three studs, see that

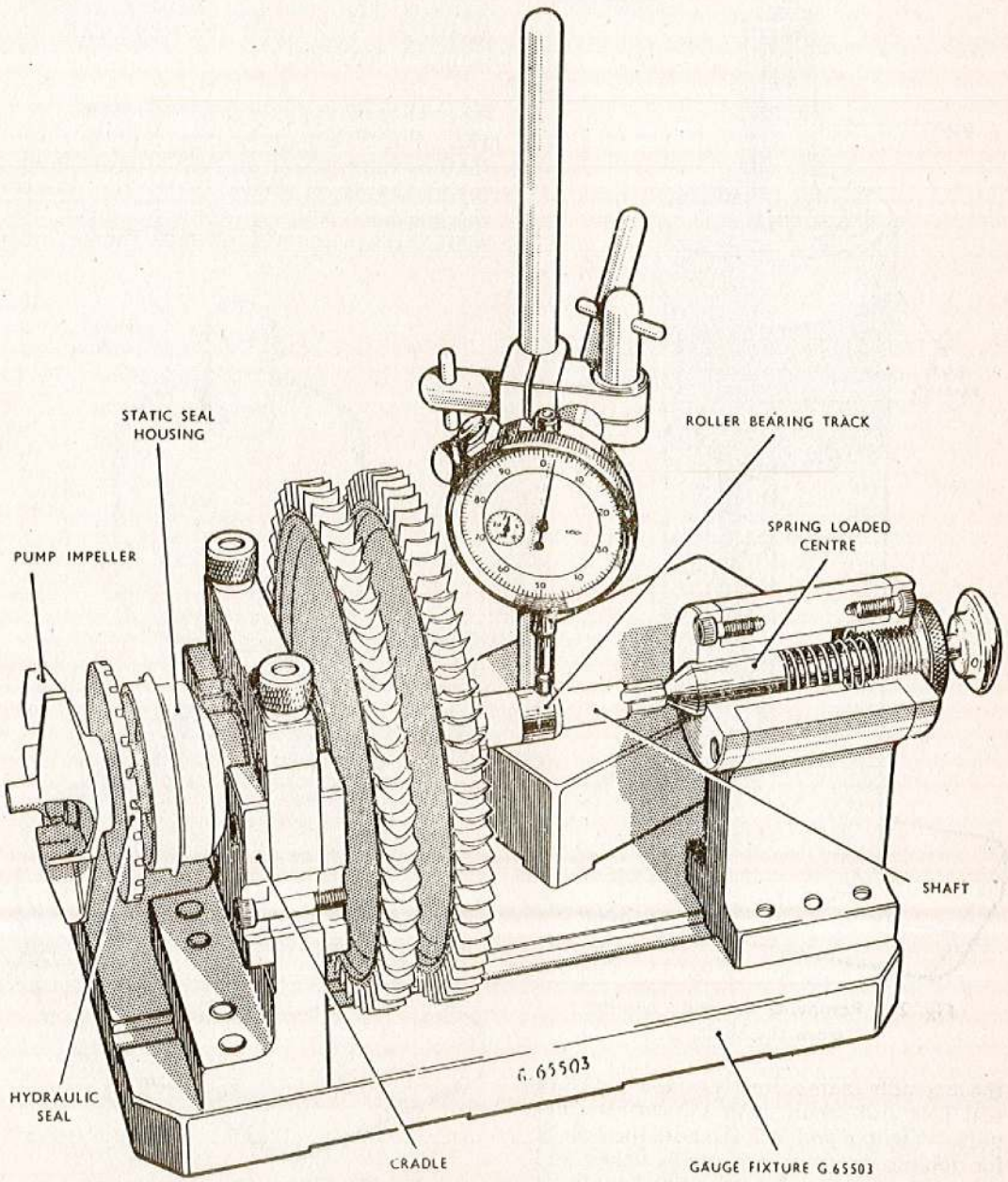

Fig. 23. Concentricity check on turbine assembly

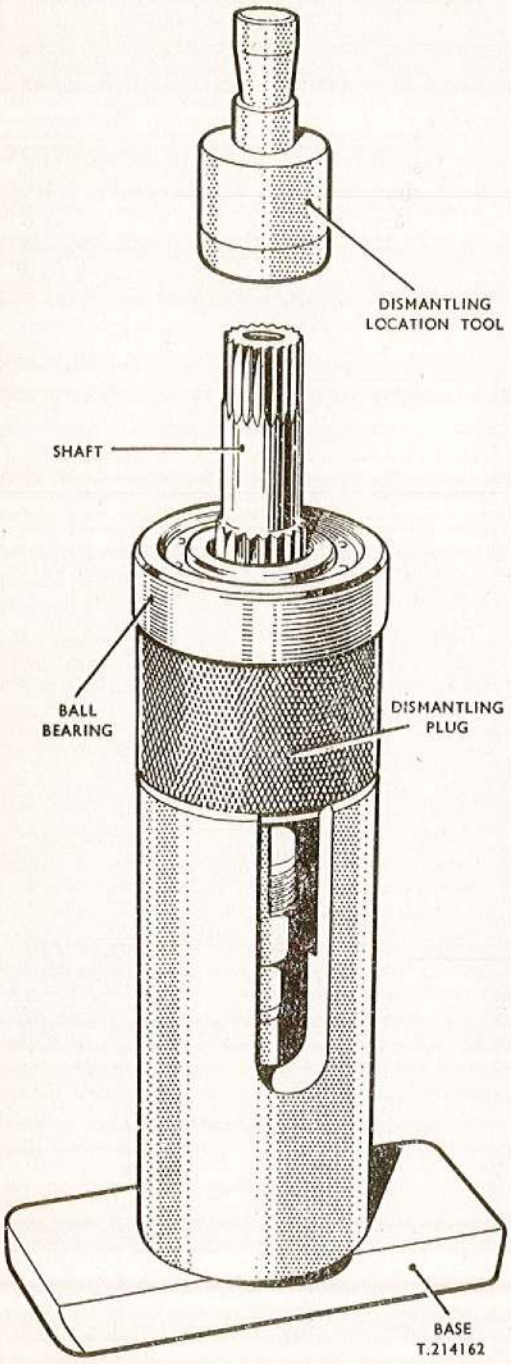

Fig. 24. Removing the main bearing from the shaft

the assembly seats correctly on the labyrinth seal face and secure with tab-washers and nuts. Tighten and lock the nuts then check for fouling between the guide vanes and exhaust casing by passing a 0·0015 in. feeler gauge all round.

175. Fit the grease nipple and the gauze ventilator and circlip to the appropriate bosses on the casing. Do not assemble the tail shaft access cover to the exhaust casing at this stage.

BUILDING THE ROTATING ASSEMBLY FOR CONCENTRICITY CHECKS

Checking the shaft for concentricity

176. Rest the shaft on standard vee blocks, rotate it and using a dial test indicator and stand, check the roller bearing track diameter and the ball bearing location diameter. Both must be concentric to within 0·0005 in.

Assembling the main bearing to the shaft

177. Press the main bearing on to the rotor shaft by using a hand press and the assembly tool T.214162 as shown in fig. 21. Insert the assembly plug into the base, lower the shaft through the plug then fit the bearing

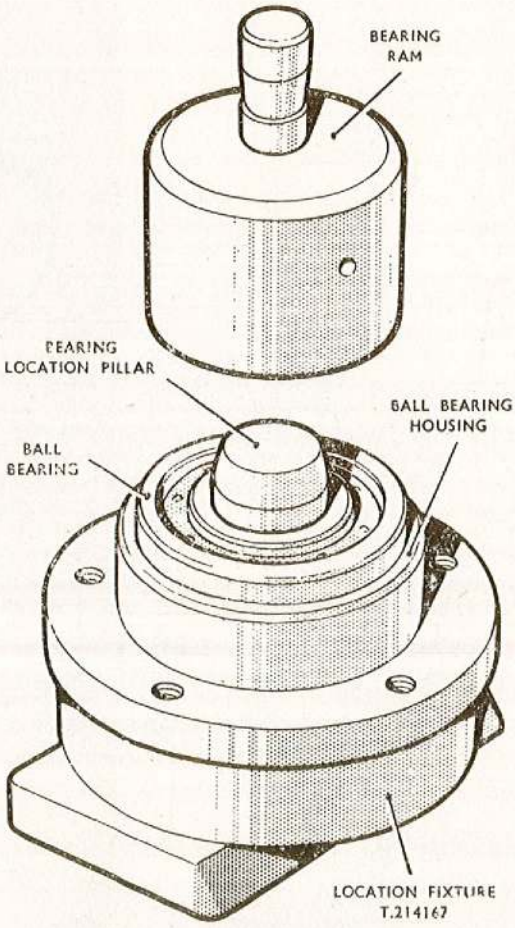

Fig. 25. Fitting the main bearing to the housing

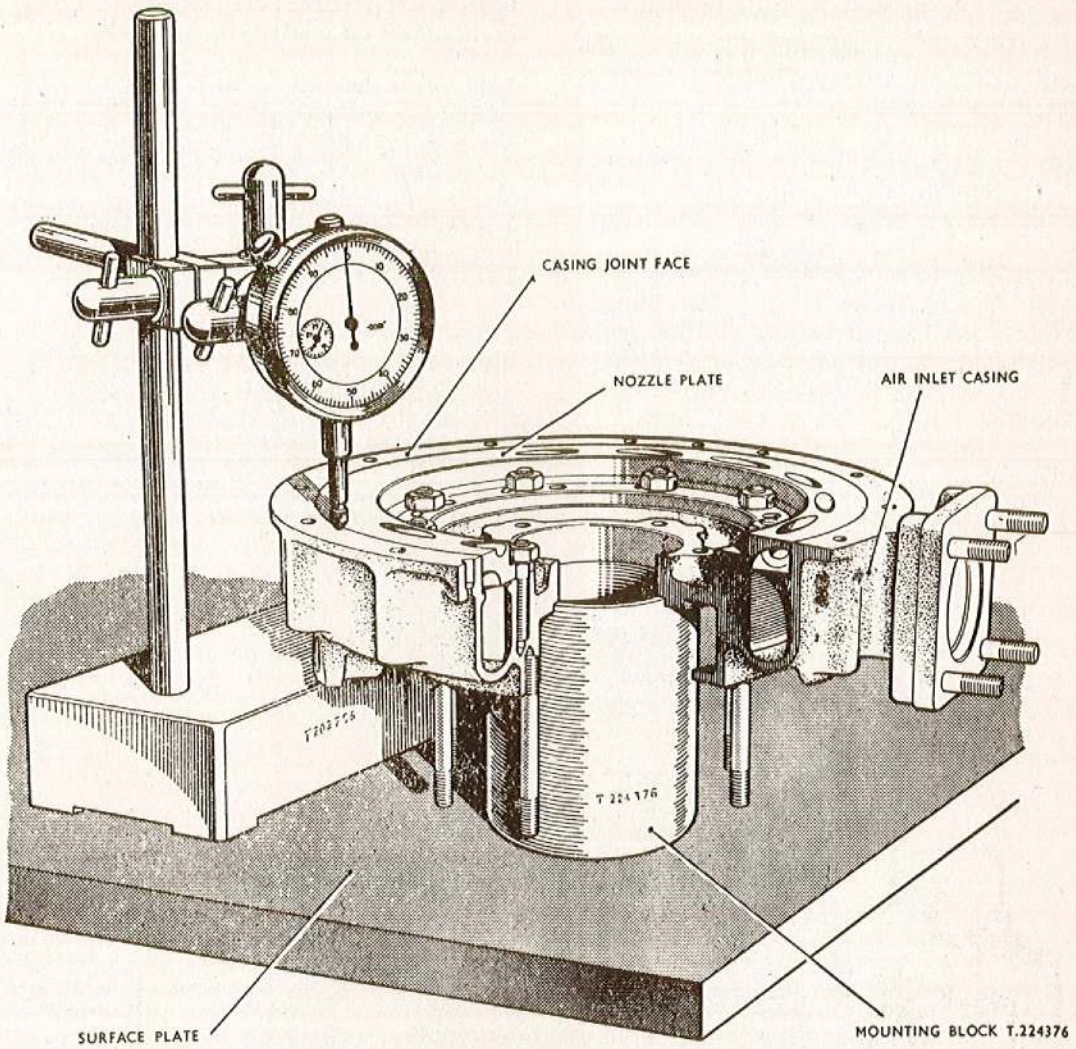

Fig. 26. Checking the seating of the nozzle plate

over the shaft and rest it on the location diameter. Lower the assembly ram on to the bearing and press on the bearing until it abuts the shoulder on the shaft.

Assembling the turbines

178. With the exception of the splined nut all the components on the turbine end of the shaft are marked with an etched line after balancing. When assembled these marks must be aligned with a similar mark on the shaft shoulder.

179. Insert the splined end of the shaft into the locking sleeve T.214157, position the adjusting washer against the shoulder on the shaft then fit the cone, first-stage turbine, second-stage turbine, cone, cup-washer and nut. Screw on the nut lightly, using spanner T.214158, and remove the assembly from the locking sleeve.

Concentricity check

180. Locate the assembly in the fixture G.65503 as shown in fig. 23, using then, a dial test indicator and stand, rotate the assembly and make the following checks :—

(1) Faces of turbines ; run-out must not exceed 0·003 in.

(2) Blade tip diameter of turbines ; run-out must not exceed 0·003 in.

(3) Tail bearing track diameter of shaft ; run-out must not exceed 0·0005 in.

If the run-out exceeds the limits, the entire rotating assembly must be returned for reconditioning.

181. Until the turbine assembly is required for re-building it should be placed on the stand T.214166 as shown in fig. 22.

Assembling the pump impeller and seals

182. The assembly is most conveniently held in the hand for assembling the pump end, take great care not to catch the turbines on anything which might damage or distort the vanes.

183. Each component to be fitted to the pump end of the shaft bears an etched mark which must be aligned with a similar mark on the impeller end of the shaft. The ball bearing is not marked and may be assembled in any position relative to the shaft.

184. Slide the garter seal housing over the shaft (it is not necessary at this stage to fit the seal to its housing) and locate it against the bearing. Fit the locating cup, adjusting washer, distance piece, hydraulic seal, pump impeller, and cup washer and lightly fit the impeller securing screw ; this has a left hand thread.

Concentricity check

185. Load the assembly in the gauge fixture G.65503 as shown in fig. 23 by lowering the bearing into the cradle of the fixture and locating the spring-loaded centre on the end of the shaft. Clamp the bearing down firmly in the cradle and spin the assembly to ensure that it is free.

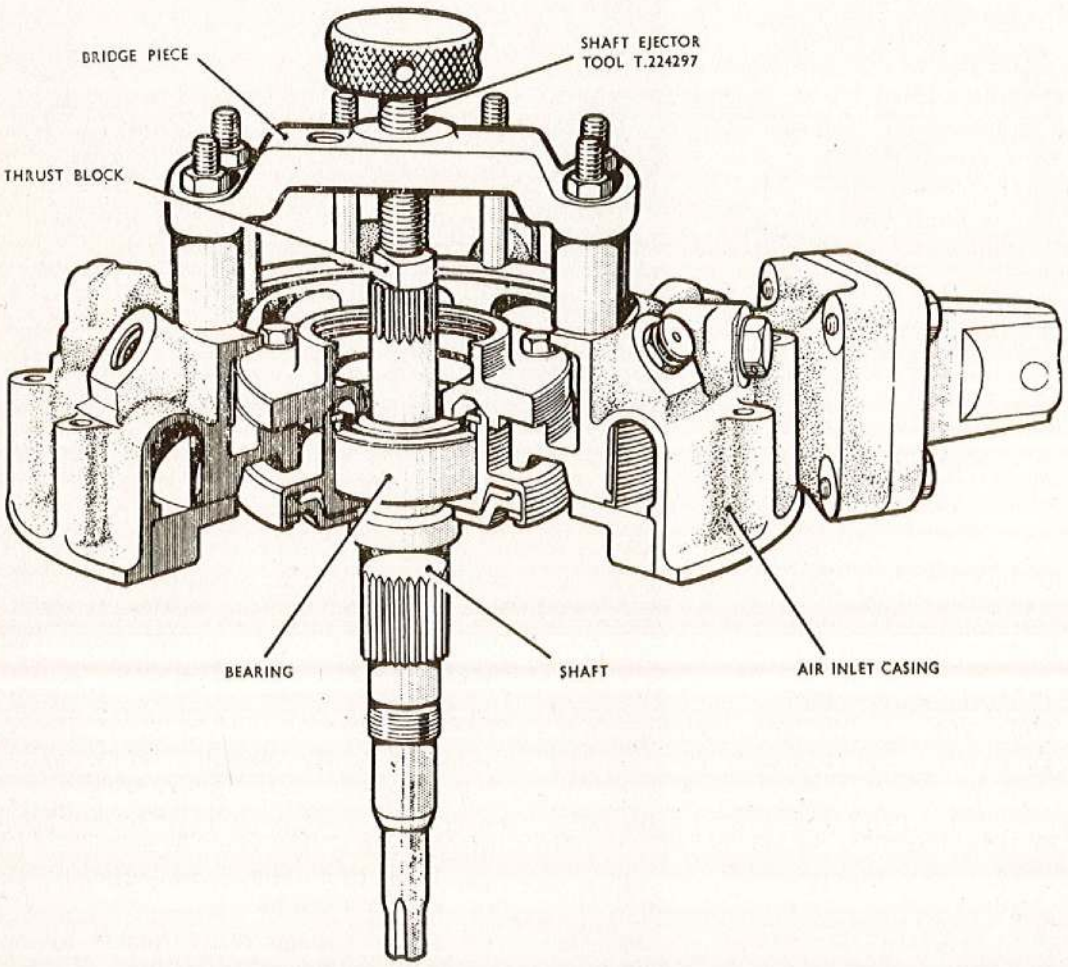

Fig. 27. Assembling the shaft to the air-inlet casing

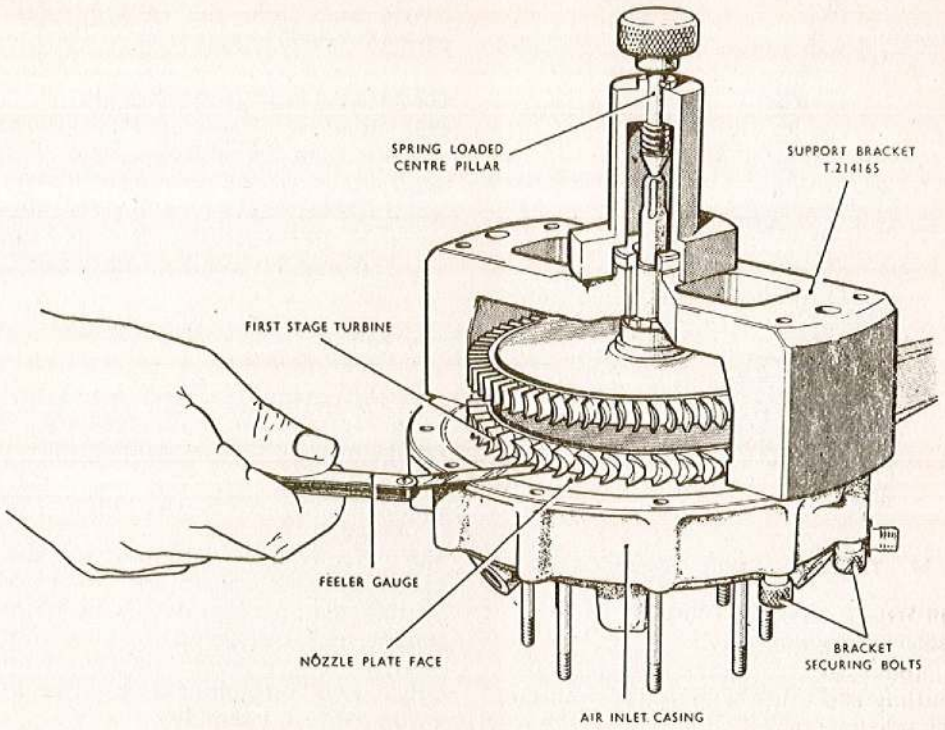

Fig. 28. Checking the clearance between the first-stage turbine and the nozzle plate

186. With a dial test indicator and stand, check that :—

(1) The tail bearing track diameter is concentric to within 0·0005 in.

(2) The boss diameter of the garter seal housing is concentric to within 0·0005 in.

(3) The faces of the hydraulic seal and pump impeller are concentric to within 0·003 in.

If the run-out exceeds the limits stated the entire rotating assembly must be returned for re-conditioning.

Dismantling the assembly

187. Before dismantling, measure the distance across the external rim faces of the turbines. Record this measurement as it will be required later (para. 197).

188. Completely dismantle the rotating assembly by reversing the sequence of operations outlined in para. 178, 179 and 184 and store the components together in a box until required for assembly in the pump. To remove the bearing use the tool T.214162 as shown in fig. 24. Insert the dismantling plug in the tool and press the shaft out of the bearing under a hand press.

Fitting the main bearing to its housing

189. Thoroughly wash and dry the bearing and smear the outside diameter lightly with white petroleum jelly.

(1) Using the tool T.214167 shown in fig. 25, locate the bearing housing on the tool base and lower the bearing over the pillar. Lower the ram on to the bearing then press the bearing fully into the housing under a hand press.

(2) Insert the spacing washer and circlip and ensure that the circlip seats correctly. With a feeler gauge check that the clearance between the spacing washer and circlip does not exceed 0·002 in.

190. If a new bearing has been fitted it may be necessary to renew the spacing washer. The new washer must be of maximum thickness consistent with the circlip seating correctly and the clearance of 0·002 in. not being exceeded.

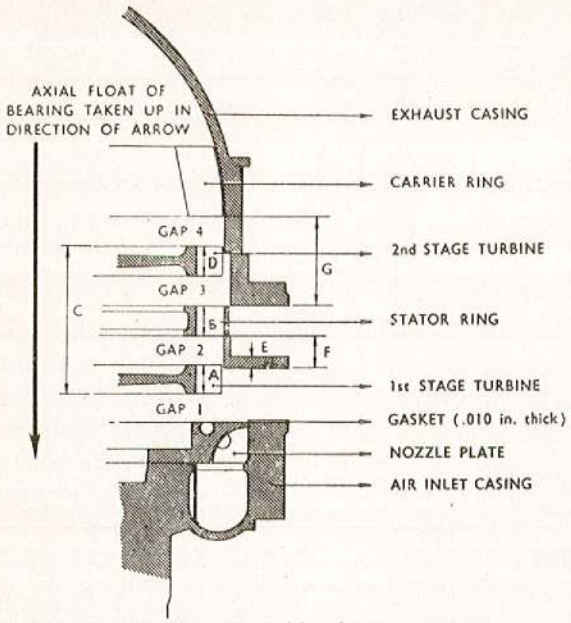

Fig. 29. Turbine assembly clearance gaps

AIR INLET CASING (TURBINE END)

Heat shield and nozzle plate

191. Mount the air intake casing on the dismantling and assembling fixture with the turbine side uppermost. Fit the heat shield, align the nozzle plate bolt holes, one of which is offset, with the studs then lower the nozzle plate into the casing, securing it with tab-washers and nuts.

Checking the fit of the nozzle plate

192. Remove the assembly from the fixture and rest it on the mounting block T.224376 as shown in fig. 26. Using a surface plate and a dial test indicator and stand, check :—

(1) that the nozzle plate is seated squarely and stands proud of the casing joint face.

(2) that the maximum projection does not exceed 0·002 in.

If these requirements are not met, the nozzle plate must be renewed. When satisfactory, lock the retaining nuts.

Assembling the main bearing to the air inlet casing

193. Mount the assembly on the dismantling fixture again and lower the ball bearing and housing into the air inlet casing (taking care to line up the holes correctly) and push into position using finger pressure only. The bolt holes are off-set in order to ensure correct assembly.

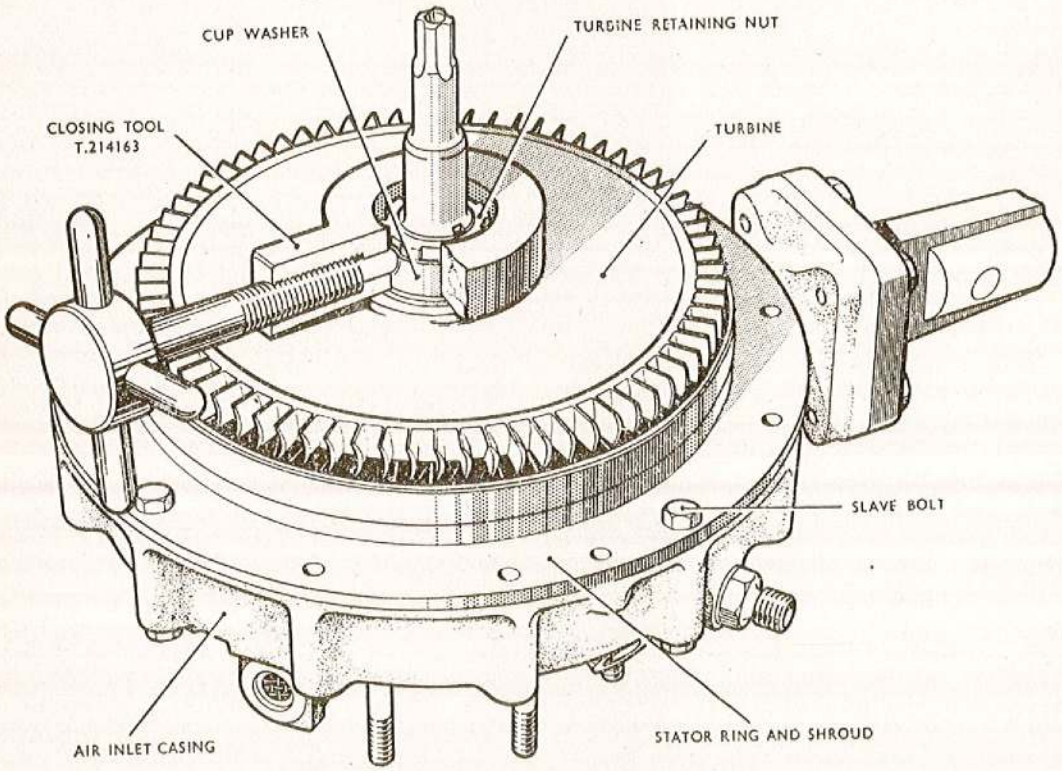

Fig. 30. Locking the turbine retaining nut

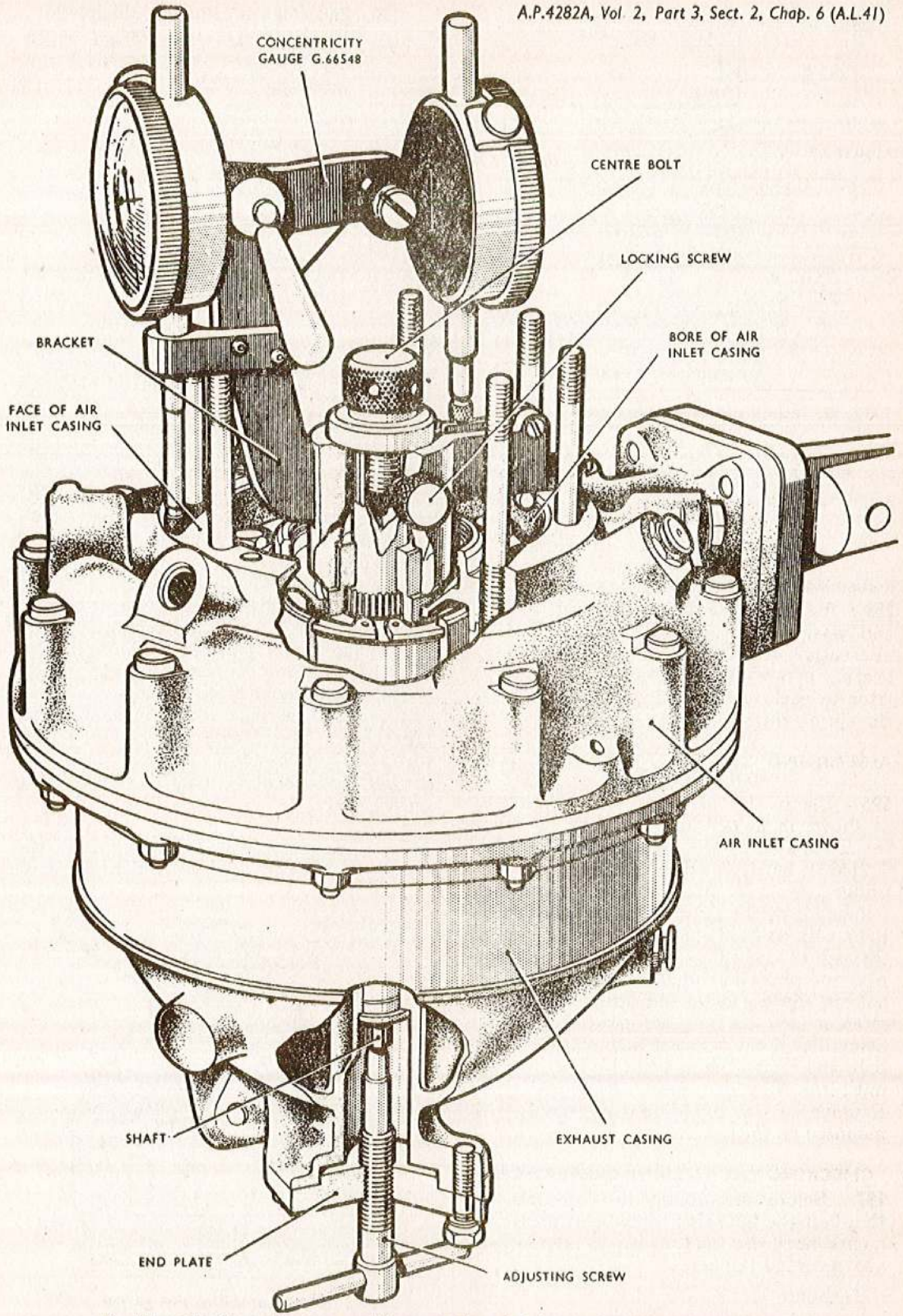

Fig. 31. Checking the face and bore of the air inlet casing for concentricity

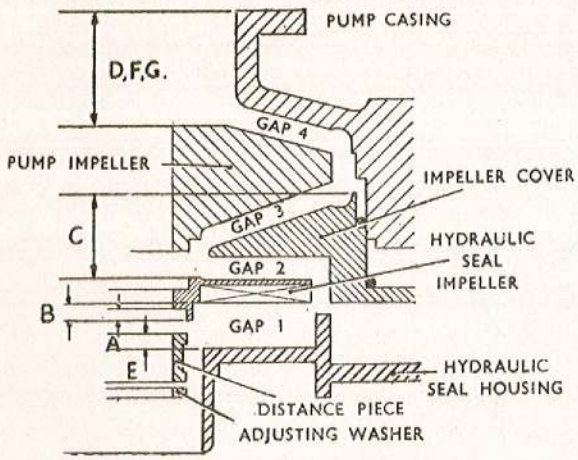

Fig. 32. Pump assembly clearance gaps

194. Turn the assembly over on the fixture and fit the gasket and labyrinth seal. Align the off-set bolt holes, fit the tab-washers and set screws, tighten fully and lock.

Remaining details

195. Assemble the fuel seal drain union and washer, the plug and washer in the alternative fuel seal drain and the main bearing grease nipple. Fit a gauze ventilator to each of the four air vents and fit the spring rings.

ASSEMBLING THE SHAFT TO THE AIR INLET CASING

196. Using the assembly tool T.224298 as shown in fig. 27, and with the air inlet casing fixed to the assembling fixture T.215751, locate the distance pieces and the bridge piece over four of the studs on the pump side of the air inlet casing and secure them with washers and nuts. Pass the shaft through the bearing and hold it in position, pass the draw bolt of the tool through the hole in the centre of the bridge piece and screw it into the threaded end of the shaft. Screw down the knurled nut on the draw-bolt and draw the shaft into the bearing until the shoulder abuts the inner race. Remove the tool and leave the assembly still mounted on the fixture.

CHECKING THE TURBINE CLEARANCES

197. Before assembling the turbines to the shaft the following component measurements must be made with a micrometer and recorded (fig. 29).

Turbines

(A) 1st stage turbine rim thickness

(B) 2nd stage turbine rim thickness

(C) 1st and 2nd stage rotors width i.e. distance across external rim faces (para. 187).

Stator ring and shroud.

(D) Stator thickness

(E) Flange thickness

(F) Depth from joint face to internal stator face.

Exhaust casing.

(G) Depth from joint face to annular face of carrier ring.

198. Remove the assembled air intake casing and shaft from the assembling fixture, mount it on the locking sleeve T.214157 as shown in fig. 11 and assemble to the shaft the adjusting washer followed by the cone, first-stage turbine, second-stage turbine, cone and cup-washer. Fit the turbine retaining nut, running it down with the splined spanner T.214158 and finally tightening with a torque spanner to a loading of 300 lb. in.

199. Remove the assembly from the locking sleeve and place it on the dismantling and assembling fixture T.215751 with the turbine side uppermost. Fit the support bracket T.214165 as shown in fig. 28 to support the tail end of the shaft whilst measurements are taken. The support bracket is bolted to the air inlet casing, one hole being off-set so that the bracket can only be assembled in one position.

200. The shaft is loaded downwards by the spring-loaded centre pillar which bears on

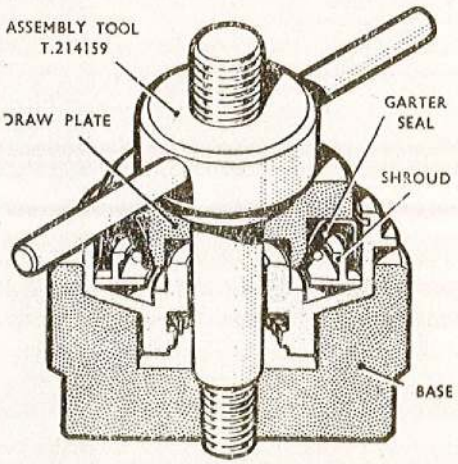

Fig. 33. Assembling the garter seal to its housing

the end of the shaft. With a feeler gauge, measure the gap between the first stage turbine and the nozzle plate face and record the clearance.

201. Add to the clearance half the bearing end-float obtained in para. 61 and record the measurement as gap. 1.

202. Knowing gap. 1 and the component measurements recorded in para. 197 the remaining gaps 2, 3 and 4 can be calculated as shown in fig. 29.

203. The gaps vary in accordance with the axial float of the bearing and as this has been taken up in one direction, all gaps are on extreme limits. Gaps. 1 and 3 are minimum, increased by addition of the axial float to give maximum. Gaps 2 and 4 are maximum, reduced by subtraction of the axial float to give minimum. By adding half the bearing end float (axial float of shaft) to gap. 1 the position of all components is centralised in relation to the other gaps.

204. An allowance of 0·010 in. for the thickness of the gasket between the air inlet casing and stator ring and shroud should be made. The gasket is made from special material and will not compress by more than 0·001 in. under pressure; it can therefore be ignored with regard to the calculation and measurement of the gaps.

205. Referring to fig. 29 and the component measurements obtained in para. 197 the clearances must be calculated as follows:—

Gap. 1 1st stage turbine and nozzle plate (measured with feeler gauge) $+\frac{1}{2}$ axial float.

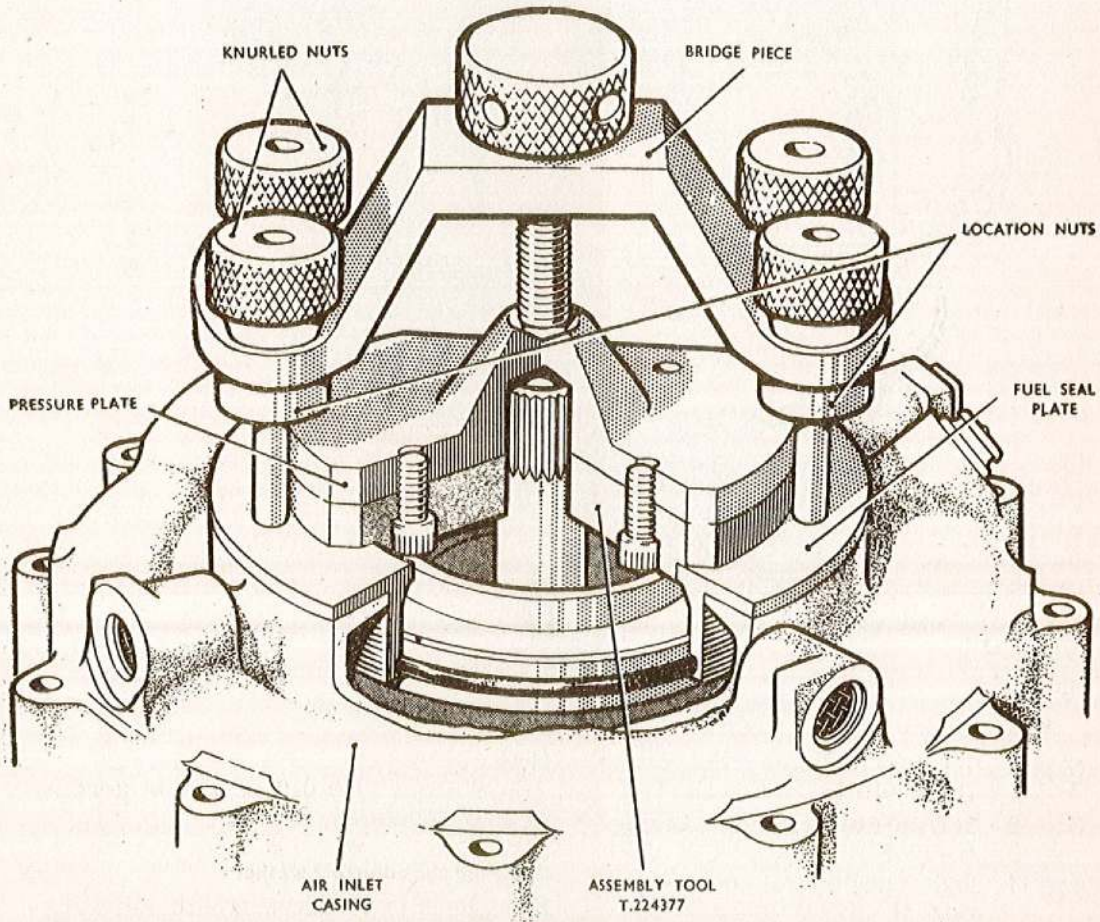

Fig. 34. Assembling the fuel seal plate

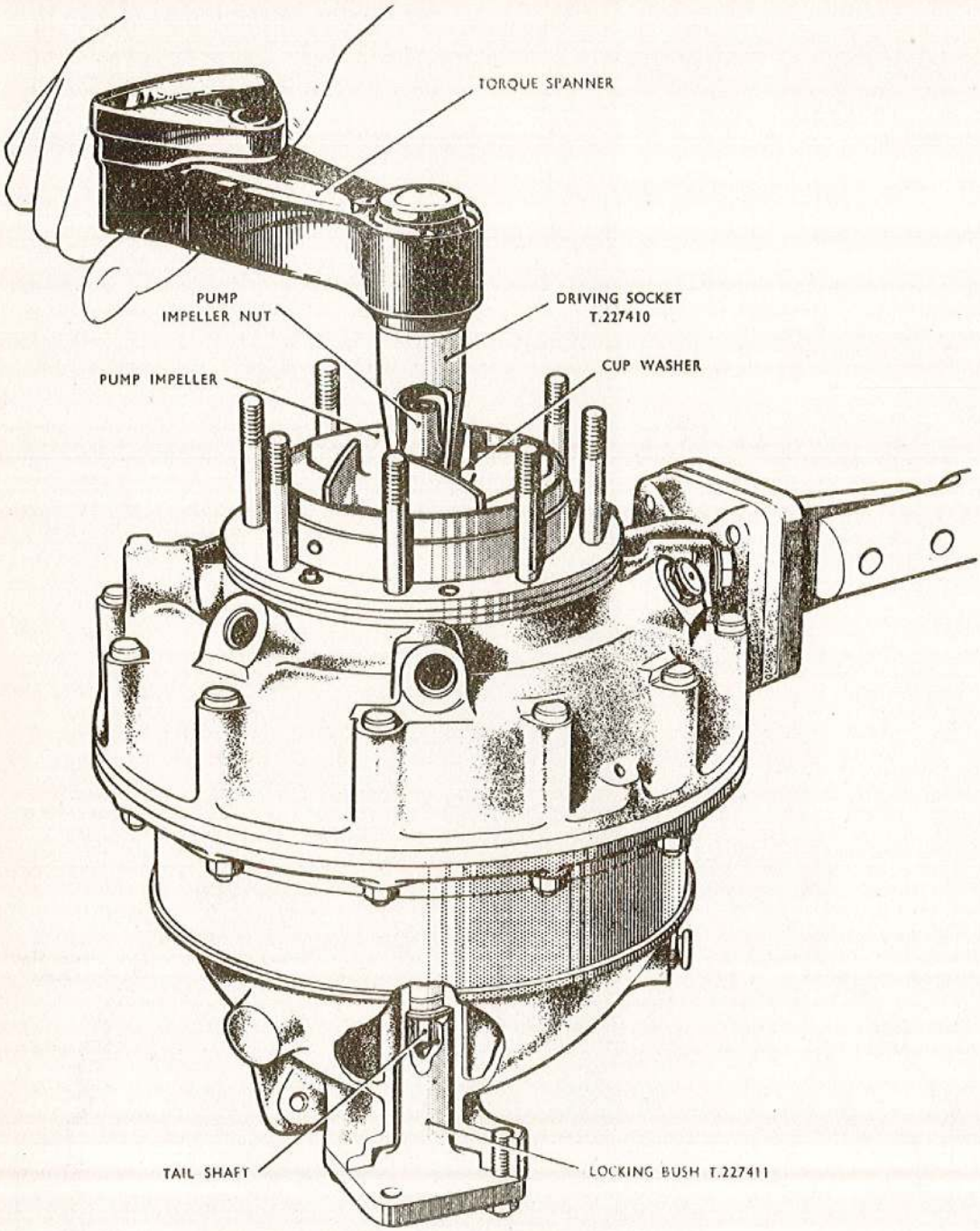

Fig. 35. Tightening the pump impeller securing nut

Gap. 2 1st stage turbine and stator ring (F+0·010 in.)−(A+gap. 1).

Gap. 3 2nd stage turbine and stator ring G−(A+B+D+gap. 2).

Gap. 4 2nd stage turbine and carrier ring (E+G+0·010 in.)−(C+gap. 1).

Note . . .

The allowance of 0·010 *in. shown above is the gasket thickness.*

Checking the adjusting washer

206. Refer to the thickness of the adjusting washer recorded in para. 57 together with

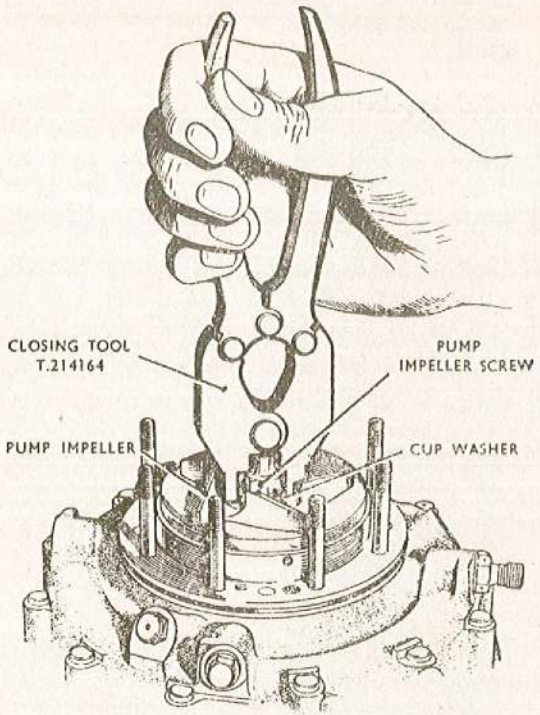

Fig. 36. Locking the pump impeller securing screw

the maximum and minimum clearance figures obtained for the four gaps (para. 203) check that the thickness of the adjusting washer is correct to bring all clearances within the permissible limits of 0·010 to 0·040 in. If incorrect the assembly must be dismantled and the adjusting washer replaced with one of correct thickness.

FINALLY ASSEMBLING THE TURBINE

207. Detach the support bracket from the assembly, remove the assembly from the assembling fixture and mount it on the locking sleeve T.214157. Remove the turbine retaining nut and lift off the cup-washer, cone and second stage turbine.

208. Locate the stator ring and shroud over the dowels on the seating face of the air inlet casing interposing the gasket. Fit two slave nuts and bolts.

209. Assemble the second-stage rotor, cone, cup-washer and retaining nut to the shaft. Screw the nut down by using the splined spanner T.214158 (fig. 11) and finally tighten with a torque spanner to a loading of 300 lb. in.

210. Remove the slave nuts and bolts holding the stator ring in position, assemble the support bracket T.214165 as in para. 199 and, using feeler gauges, check gap. 3 (clearance between stator ring and 2nd stage turbine faces). Use this measurement to check calculated figures (para. 205).

211. Mount the assembly on the assembling and dismantling fixture again and remove the support bracket. Re-fit the two slave bolts to retain the stator ring then lock the cup washer by using the closing tool T.214163 as shown in fig. 30.

ASSEMBLING THE EXHAUST CASING TO THE AIR INLET CASING

212. Remove the slave bolts and assemble the exhaust casing. Ensure that the air outlet and inlet are in correct relationship then fit the twelve D-headed bolts, plain washers, grover washers and nuts and tighten the nuts evenly.

Concentricity check

213. Using the concentricity gauge G.66548 as shown in fig. 31 position the end plate over the studs in the tail shaft access face. Fit and tighten the slave nuts and washers and take up the axial float of the bearing with the adjusting screw. Turn the pump over on the dismantling and assembling fixture and assemble the D.T.I. bracket to the opposite end of the shaft. Screw the centre bolt firmly into the shaft

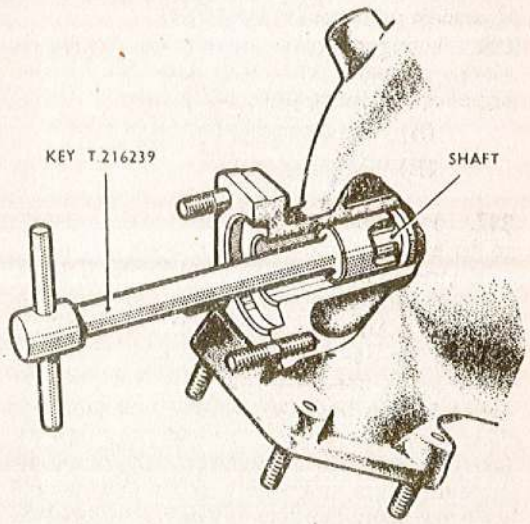

Fig. 37. Checking that the pump shaft rotates freely

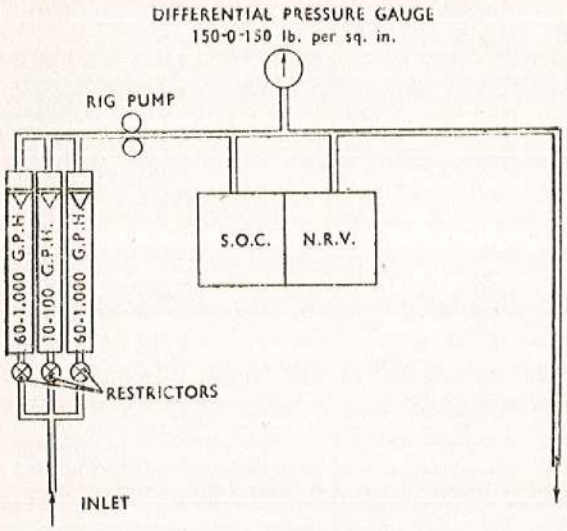

Fig. 38. Checking the shut-off cock and non-return valve

and tighten the two set screws lightly to lock the bracket to the shaft.

214. Set the dial indicators to zero and, by revolving the shaft, run the indicators round the face and bore of the air inlet casing to check for run-out ; this must not exceed 0·001 in. Remove the end plate and bracket.

CHECKING THE PUMP IMPELLER CLEARANCES

215. Before assembling the pump end of the shaft the following measurements must be taken and recorded (fig. 32).

Hydraulic seal impeller clearances

216. Using a depth micrometer and inch blocks measure from the boss face of the impeller (distance-piece side) to

(A) the counterbored face

(B) the flange face

217. Position the hydraulic seal impeller in its housing, fit the pump impeller cover and press them together with the fingers until the flange joint faces are brought into contact. Allow the hydraulic seal impeller to rest on its housing and with a depth micrometer measure from the face of the cover to the boss face of the seal impeller. Now raise the impeller so that its opposite face contacts the adjacent face of the pump impeller cover and with a depth micrometer measure from the face of the cover again to the boss face of the seal impeller. The difference between the two readings gives the hydraulic seal clearance. Record the measurement (C), separate the housing and cover and place the hydraulic seal impeller aside.

Pump impeller clearances

218. Position the pump impeller inside the pump casing and assemble the impeller cover to the pump casing until the joint faces are brought into contact. Measure from the pump inlet face on the casing to the face of the pump impeller with a depth micrometer and with the pump impeller resting on its cover. Raise the pump impeller until its opposite face contacts the adjacent face of the pump casing and measure as before from the pump inlet face down to the pump impeller. The difference between the two readings gives the pump impeller clearance. Record the measurement (D), separate the impeller cover from the pump casing and place the pump impeller aside

Checking the distance piece

219. With the pump assembly positioned pump side uppermost, slide the garter seal housing and its locating cup over the shaft until the seal housing abuts the main bearing. Measure the thickness of the adjusting washer, record the reading and then slide the washer and distance piece on to the shaft. Also assemble the fuel seal plate and the hydraulic seal impeller housing so that the flange joint faces are brought into contact. Rest two measuring blocks on the inner face of the hydraulic seal impeller housing then measure with a depth micrometer from the surface of the blocks to the face of the distance piece whilst loading the bearing downwards by finger pressure. Subtract the reading from the known height of the blocks and the resulting figure will be the amount by which the distance piece projects above the hydraulic seal impeller housing. Record the measurement (E) and remove the measuring blocks.

Calculating the assembled clearances

220. The projection of the distance piece and the difference in level between the counterbored face (A) and the flange face (B) of the hydraulic seal impeller (para. 216) gives gap. 1 (Fig. 32).

If A was greater than B then gap. 1 = N − (A − B).

If A was less than B then gap. 1 = E + (B − A)

Gap 2 is found by subtracting gap. 1 from

the maximum clearance (C) of the hydraulic seal impeller (para. 217), i.e. Gap. 2= C−gap. 1.

221. Assemble the impeller cover to the pump and position the pump impeller over the shaft followed by the cup-washer. With the hydraulic seal impeller omitted it will be possible to bring the adjacent faces of the pump impeller and pump impeller cover into contact by making the impeller securing screw finger tight. Assemble the pump casing and temporarily fit slave nuts and washers. Measure with a depth micrometer from the pump inlet face on the casing to the face of the pump impeller. Record the measurement (F). Remove the pump casing, impeller securing screw, cup washer, pump impeller and pump impeller cover. Fit the hydraulic seal impeller to the shaft and re-assemble the pump impeller cover, pump impeller and cup-washer and tighten the impeller securing screw. Re-assemble the pump casing and temporarily fit slave nuts and washers. Measure from the pump inlet face on the casing as before to the face of the pump impeller with a depth micrometer and record the measurement (G). The difference between the two readings is gap. 3, i.e. gap 3=F−G.

222. The fourth gap is found by subtracting gap 3 from the pump impeller maximum clearance D (para. 218), i.e. gap 4=D−gap 3

223. Remove the pump casing and, using feeler gauges, check gap 3 direct.

224. The gaps vary in accordance with the axial float of the bearing and since this has been taken up in one direction only, all the gaps are on extreme limits, the direction of loading being from the pump end. Gaps 1 and 3 are minimum, increased by the amount of axial float to obtain maximum, and gaps 2 and 4 are maximum reduced by the amount of axial float to obtain minimum, allowing in each case for the amount of the main bearing axial float. The permissible limits on all gaps is between 0·010 in. and 0·040 in.

Selecting the adjusting washer

225. With reference to the maximum and minimum clearance figures obtained for the four gaps the adjusting washer thickness must be such that none of the four gaps is less than 0·010 in. nor more than 0·040 in.

226. Having completed the clearance check it is necessary to remove the pump components from the shaft in order to fit the garter seal, but the components must now be retained as an assembly, otherwise the checks must be repeated.

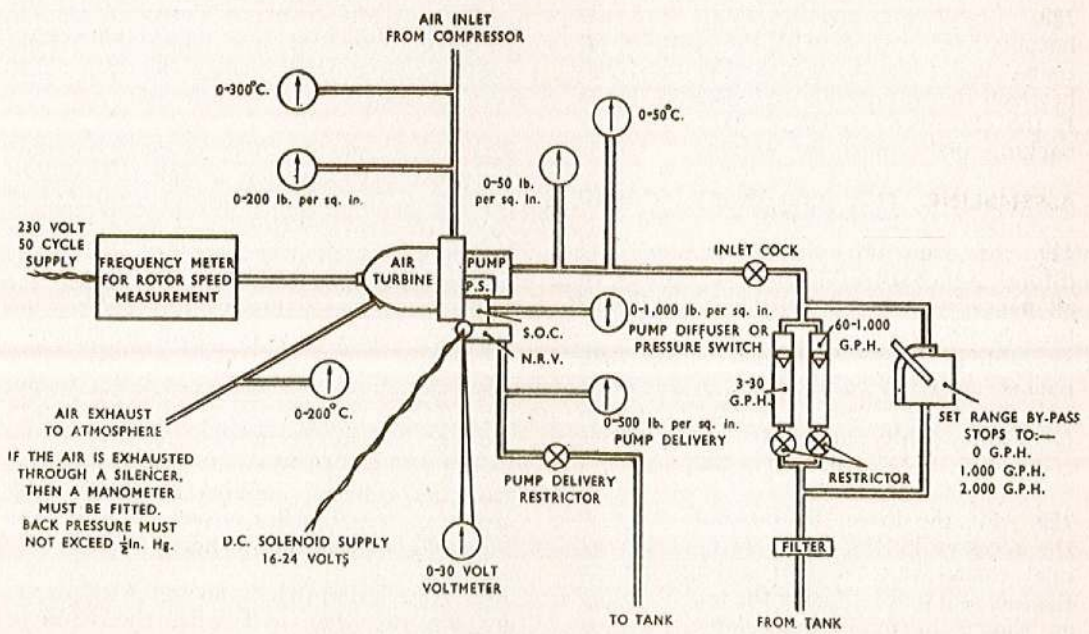

Fig. 39. Diagrammatic layout of test rig

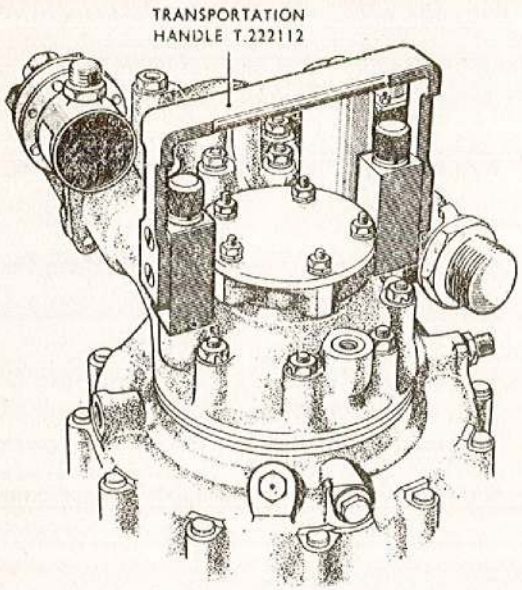

Fig. 40. Transportation handle

FITTING THE GARTER SEAL

227. Locate the shroud inside the garter seal housing and using the tool T.214159 as shown in fig. 33 draw the garter seal into position. Locate the housing in the base of the tool, and position the seal over the housing. Lower the draw plate of the tool on the seal and rotate the centre knob until the seal is pressed firmly into the housing and bottoms on the shroud.

228. Lower the backing plate into the housing and secure it with the spring ring. Using feeler gauges check the clearance between the spring ring and backing plate. If the clearance exceeds 0·005 in. a new backing plate must be selected.

ASSEMBLING THE AIR INLET CASING (PUMP END)

229. An even film of jointing compound (Stores Ref. 34B, 270) must be painted on all flange joint faces and must be allowed to dry to a sticky consistency before assembling. Once assembled, the component must not be disturbed again otherwise it will be necessary to clean the joint faces thoroughly and apply fresh jointing compound. (Also see para. 183).

230. Fit the three small sealing rings to the recesses in the flange face of the air inlet casing and the two sealing rings to the fuel seal plate. Using the tool T.224377 as shown in fig. 34, assemble the seal plate to the air inlet casing, ensuring that the stud holes and drillings are correctly aligned. Lower it over the eight studs in the air inlet casing and rest the pressure plate of the tool on the seal plate. Screw the four location nuts onto diagonally opposite studs, lower the bridge piece over the same four studs and secure it with the four knurled nuts. Screw down the centre bolt until the fuel seal plate is pressed fully onto its seating. Remove the tool, ensure that the seal plate is seating correctly, then assemble to the shaft the garter seal and housing followed by a sealing ring, the locating cup, adjusting washer and distance piece.

231. Assemble the hydraulic seal housing on top of the fuel seal plate, fit the three shouldered-bobbins and fit the three plain transfer tubes together with small sealing rings into the appropriate drillings.

232. Fit the hydraulic seal impeller to the shaft and press it firmly down the splines until it seats on the distance piece.

233. Assemble the pump impeller cover together with large sealing ring in the internal recess and press it down into position.

234. Insert the cooling tube in the bore of the shaft. Fit the pump impeller, cup washer and retaining screw and make the latter finger-tight. Assemble the locking bush T.227411 to the tail shaft access flange and tighten the impeller nut with a torque spanner and driving socket T.227410 to a loading of 150 lb. in. as shown in fig. 35. Remove these tools and using the closing tool T.214164 (fig. 36) indent the cup-washer into the slots in the screw flange.

235. Re-check the rotating assembly end-float by measuring from the tail access cover seating on the exhaust casing to the end of the shaft with a depth micrometer. Take the measurement first with the shaft raised and then with it lowered. The difference between the two readings will be the bearing end-float ; this must be within 0·009 in.

236. Fit the assembled pump casing to the air inlet casing, inserting the two large sealing rings in the internal recesses in the casing and the three small sealing rings for the fuel transfer bobbins in the seating flange of the impeller cover. Tighten the nuts and lock the tab-washers.

237. Check that there is no undue tightness, by rotating the shaft with the turnkey T.216239 as shown in fig. 37, then fit the

tail shaft access cover, washers and nuts finger tight only as the cover will be removed during rig-testing.

238. Lubricate both bearings by injecting grease XG.275 with a gun which delivers 1 c.c. per stroke. The main bearing must receive 20 c.c. and the tail bearing 6 c.c. ; it is important that the bearings are not lubricated excessively.

RIG TESTING

General

239. A basic testing and calibrating procedure is described here which is applicable to all derivations of the basic type of pump covered by this chapter. Specific test conditions and performance requirements, however, may vary according to the requirements of different calibration codes ; these particular details are provided in separate schedules in the Appendix to this chapter.

240. Unless otherwise stated the fuel used throughout these tests is to be aviation kerosine to Specification D.Eng.RD.2482 Latest Issue (AVTUR 100) and is to be maintained at a temperature of 20 to 40 deg. C. The fuel should be checked at weekly intervals to ensure that it complies with the above specifications. The fuel pressure at the pump inlet is to be constant between 15 and 25 lb. per sq. in. throughout the tests unless specifically stated otherwise for a particular condition.

241. The turbine air outlet temperature must not be allowed to fall below 10 deg. C. measured at the exhaust port.

242. After the first five hours running time and at all subsequent five hour periods the bearings must be re-greased with XG275, injecting 12 c.c. into the main bearing and 2 c.c. into the tail bearing.

243. The solenoid is to be energised at 24 volts except where otherwise stated.

244. The pump must not be run continuously below the point at which the non-return valve opens.

Shut-off cock and non-return valve

245. The shut-off cock and non-return valve can be tested separately (fig. 38). With the shut-off cock diaphragm and spring removed and with the specified air pressure applied at the outlet submerge the sub-assembly in kerosine and check for leakage as in para. 155 and 156. Also check the pressure drop across the non-return valve. Re-assemble the shut-off cock, energise the solenoid and set the pressure drop across the whole of the sub-assembly within the specified limits. Adjust by shimming under the shut-off cock spring.

Running in

246. If the shut-off cock and non-return valve have been tested after being assembled to the pump, this operation is unnecessary as sufficient running-in time will have been obtained during their setting and recording. With the solenoid energized at 24 volts and with the pump fully assembled run-in at the specified pressures and times given in the Appendix.

Shut-off cock operation and stall check

247. At the specified pressure and flows, reduce the solenoid voltage to 16 volts and check that there is no change in running conditions, then de-energize the solenoid for 30 seconds and

(1) check that the flow falls to zero

(2) record maximum diffuser pressure and maximum speed attained.

Re-energise the solenoid to 16 volts and check that the original running conditions are restored. After 2 minutes, this test must be repeated.

Overspeed test

248. At the specified pressures close the fuel inlet cock for one minute and record the maximum r.p.m. attained. If the speed exceeds the specified limit, the pump must be shut down immediately. Open the inlet cock and check that the original conditions are restored, then after 2 min, repeat the test.

Seal leakage checks

249. At the conditions specified in the Appendix and without altering the delivery restrictor setting, maintain the fuel inlet pressure and reduce the air inlet pressure to obtain the fuel flow stated in the Appendix. Record the speed and the air inlet pressure at this point, then continue as follows :—

(1) Open up slowly to the specified air inlet pressure and then close down to the

original conditions. Atmospheric drain leakage is not subject to limitation over this range but no fuel leakage from the turbine casing air vents is permitted ; carry out the test twice.

(2) Set the air inlet pressure at the specified figure. The atmospheric drain leakage must not exceed that stated in the Appendix and no other external leakage is permitted.

(3) At the specified fuel inlet pressure and with the pump stationary the atmospheric drain leakage must not exceed that stated in the Appendix. No other external leakage is permitted.

Performance check

250. At the conditions specified, and maintaining the pump delivery restrictor setting, record all pressures, temperatures and flows at the air inlet pressure specified in the Appendix.

Strip inspection

251. The pump is to be partially or wholly dismantled for inspection, the extent of which will be at the discretion of the inspector-in-charge, in accordance with the condition of the pump, the extent of servicing carried out and the behaviour of the unit during the initial tests.

252. All dismantling must be carried out in accordance with the instructions given in this chapter.

253. The complete rotating assembly must be inspected for wear and if a new ball bearing has been fitted it must be removed and examined for cracks, damage to the cage and balls and for pick-up on the ball tracks. All the seals and also the shut-off cock diaphragm must be examined for distortion or cracks. Should it be necessary to disturb the shut-off cock and non-return valve assembly then they must be re-calibrated as in para. 245.

CLEANING

254. Components must be cleaned thoroughly in kerosine, preferably applied by a spray nozzle fed by a pump having adequate filtering facilities. After cleaning, the parts should be dried by compressed air, which must be free from water.

FINAL ASSEMBLY

255. The assembling of components must be carried out as detailed in this chapter. All internal locking must be completed at this stage except for any that may require adjustment during calibration.

FINAL CALIBRATION

Pump assembly

256. The procedures described in para. 247, 249 and 250 are to be repeated.

Fuel pressure switch

257. Mount the test block T.216269 to the switch as in para. 165 and illustrated in fig. 18 and set the switch to make contact at the pressure specified in the Appendix. Increase the pressure from zero to the specified figure and then re-check the switch setting. The final contact pressure must be recorded and must be within the limits stated.

Final leakage test

258. The switch must then be assembled to the pump and checked for external leakage at the conditions stated in the Appendix. The switch insulation must then be tested by checking between each pin and earth with a megohm meter.

INHIBITING AND FINAL INSPECTION

259. Inhibit the pump-side of the unit as detailed in A.P.4471, Vol. 1 but ensure that the air turbine is kept dry. Lubricate the bearings with grease XG275 ; the amount of lubricant required will depend on the length of time the pump has been run, e.g. after two hours running, the main bearing will need 4 cc and the tail bearing 1cc. (see para. 242.)

260. Fit dust caps to the fuel outlet connection and to the drain connection and a transportation gasket and cover to the fuel inlet connection, also fit transportation covers to the air inlet and air outlet connections.

261. To facilitate handling the assembled pump, the transportation handle T.222112 (fig. 40) can be used. It should be bolted to the supporting bosses on the pump casing.

262. Examine the unit for correctness of locking, check that all exposed connections have been sealed and ensure that any spare sealing washers required for use on installation are attached securely. Check that the record certificate has been completed and approved, that all relevant details are entered in the pump log book for future reference and that the pump name plate details are correct.

Appendix 1

CALIBRATION CODE A

Shut-off cock and non-return valve (para. 245)

1. (1) s.o.c. diaphragm and spring removed.

Pump casing submerged in fuel.

Air pressure applied at outlet
30 lb. per sq. in.

Maximum air leakage
20 c.c. per min.

Check pressure drop across non-return valve :—

FLOW (gall. per hr.)	PRESSURE DROP (lb. per sq. in.)	
	Min.	Max.
50	58	64
500	—	70
1000	—	78
1500	—	89
2000	—	113

(2) s.o.c. re-assembled.
Solenoid voltage 24 volts.
Set pressure drop to following limits :—
(Adjust by shimming s.o.c. spring).

FLOW (gall. per hr.)	PRESSURE DROP (lb. per sq. in.)	
	Min.	Max.
50	83	89
500	—	97
1000	—	102
1500	—	108
2000	—	124

2.

Running in (para. 246)

TURBINE INLET PRESSURE (lb. per sq. in.)	FUEL DELIVERY PRESSURES. (lb. per sq. in.)	TIME (minutes)
20	70	2
40	170	2
60	270	2
80	360	2
100	440	2

Shut-off cock operation and stall check (para. 247)

3. (1) Fuel delivery pressure
250 lb. per sq. in.
Fuel flow 1550 gall. per hr.
Fuel inlet pressure 20 lb. per sq. in.
Air inlet temperature
100 deg. C. ± 10.

(2) Solenoid voltage 16 volts. Check conditions as in sub-para. (1)
De-energise solenoid for 30 sec.
Check that the flow falls to zero.
Record maximum diffuser pressure.
Record maximum speed attained.
Re-energise solenoid at 16 volts and check conditions as in item (1).

(3) After 2 minutes, repeat the checks given in sub-para. (2).

Overspeed test (para. 248)

4. (1) Air inlet pressure 100 lb. per sq. in.
Air inlet temperature
100 deg. C. ± 10.
Fuel inlet pressure 20 lb. per sq. in.
Fuel delivery pressure
440 lb. per sq. in.

(2) Close fuel inlet cock :—
Time 1 min.
Record Max. r.p.m. (must not exceed 45000 r.p.m.)
Open fuel inlet cock :—
Check that conditions in sub para. (1) are restored.

(3) After 2 minutes repeat this test.

Seal leakage check (para. 249)

5. (1) Fuel delivery pressure
250 lb. per sq. in.
Fuel flow 1550 gall. per hr.
Fuel inlet pressure 25 lb. per sq. in.
Air inlet temperature
100 deg. C. ± 10.

(2) Maintain fuel inlet pressure at 25 lb. per sq. in.
Reduce air inlet pressure to obtain flow of 5 gall. per hr.
Record :—(a) rotor speed
(b) air inlet pressure

(3) Open up slowly to :—
air inlet pressure
100 lb. per sq. in.
Close down to :—
fuel inlet pressure
25 lb. per sq. in.
fuel flow 5 gall. per hr.
No leakage permissible.

(4) Air inlet pressure 100 lb. per sq. in.
Permissible leakage
20 c.c. per min. (maximum)

(5) Fuel inlet pressure 25 lb. per sq. in.
Permissible leakage
20 c.c. per hr. (maximum)

Performance check (para. 250)

6. Fuel delivery pressure 250 lb. per sq. in.
Fuel flow 1550 lb. per sq. in.
Fuel inlet pressure 20 lb. per sq. in.
Air inlet temperature 100 deg. C. ±10.

AIR INLET PRESSURE (lb. per sq. in.)	FUEL FLOW (gall. per hr.)
100	1680
90	1610
80	1540
70	1470
60	1370
50	1230
40	1060
30	850
20	600

Strip inspection

7. Strip and inspect (para. 251 to 253), clean (para. 286) and finally assemble (para. 287).

Final calibration

8. (1) Pump assembly (para. 256).
Repeat :—
Shut-off cock operation and stall check.
Seal leakage checks.
Performance check.

(2) Fuel pressure switch (para. 257)
Contact pressure
80 lb. per sq. in.
Pressure increase
Zero to 1000 lb. per sq. in.
Check twice
Re-check switch setting
Record final contact pressure (must be between 77 and 83 lb. per sq. in.)

Final leakage test (para. 258)

9. Assemble switch to pump then :—
Check for leakage at conditions stated for overspeed test.
Test insulation. Not less than 1 megohm at 500 volts between each terminal and earth.