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# Chapter 6B

# PUMP, FUEL, SPE.1204 AND 1214 MK. 4

## LIST OF CONTENTS


| | Para. |
|---|---|
| *Introduction* ... ... ... ... | 1 |
| *SPE* 1204 *pumps* ... ... ... | 2 |
| *General* ... ... ... ... ... | 3 |
| **Reconditioning** | |
| *Tools and test equipment* ... ... | 4 |
| **Dismantling** | |
| *Separating the pump assembly from the mounting plate* ... ... ... ... | 5 |
| *Separating the motor from the pump unit* ... ... ... ... ... | 6 |
| *Dismantling the pump unit* | |
| *Removing the by-pass duct assembly* | 7 |
| *Removing the lower bearing assembly* | 8 |
| *Withdrawing and dismantling the bellows housing sub-assembly* ... | 9 |
| *Removing and dismantling the volute assembly* ... ... ... ... | 10 |
| *Removing the outlet duct casting* ... | 11 |
| *Completing the dismantling of the pump casting* ... ... ... ... | 12 |
| **Assembling** | |
| *Pump unit* | |
| *Reaming the carbon bearing* ... | 13 |
| *Preparing the pump casting* ... ... | 14 |
| *Assembling and fitting the outlet duct* ... ... ... ... ... | 15 |
| *Assembling and fitting the volute assembly* ... ... ... ... | 16 |
| *Assembling the bellows gland housing* ... ... ... ... ... | 17 |
| *Shaft component checking and assembling* ... ... ... ... | 18 |
| *Assembling the gland drain duct* ... | 19 |
| *Fitting the motor unit to the pump unit* | 20 |
| *Attaching the electrical conduit* ... | 21 |
| *Assembling the capacitor units* ... | 22 |
| *Assembling the capacitor cover* ... | 23 |
| *Assembling the by-pass duct* ... ... | 24 |
| *Pressure testing the pump assembly* ... | 25 |
| *Assembling the fuel jacket* ... ... | 26 |
| **Testing** ... ... ... ... ... | 27 |


## LIST OF ILLUSTRATIONS

*Fig.* 1 *to Fig.* 14 *appear in Chapter* 6
*Fig.* 15 *to Fig.* 25 *appear in Chapter* 6A


| | Fig. |
|---|---|
| *Sectional view of pump/motor assembly* ... ... ... ... | 26 |
| *Pump conduits and capacitor housing* | 27 |
| *By-pass duct assembly* ... ... | 28 |
| *Exploded view of fuel jacket and by-pass duct* ... ... ... ... | 29 |
| *Exploded view of conduits* ... ... | 30 |
| *Sectional view of pump unit* ... ... | 31 |
| *Exploded view of pump unit* ... ... | 32 |
| *Removal of the bellows gland from its housing* ... ... ... ... ... | 33 |
| *Lead positioning through motor end casing* ... ... ... ... ... | 34 |
| *Lower bearing location tool (reaming bearing)* ... ... ... ... ... | 35 |
| *Outlet duct stud positions and dimensions* ... ... ... ... ... | 36 |
| *Assembling the bellows gland to its housing* ... ... ... ... ... | 37 |
| *Pressure test tools* ... ... ... | 38 |


## LIST OF APPENDICES


| | App. |
|---|---|
| *Pump, fuel, SPE.*1214, *Mk.* 1 ... ... | 1 |
| *Pump, fuel, SPE.*1214, *Mk.* 1*A and Mk.* 2 ... ... ... ... ... | 2 |
| *Pump, fuel, SPE.*1214, *Mk.* 3 ... ... | 3 |

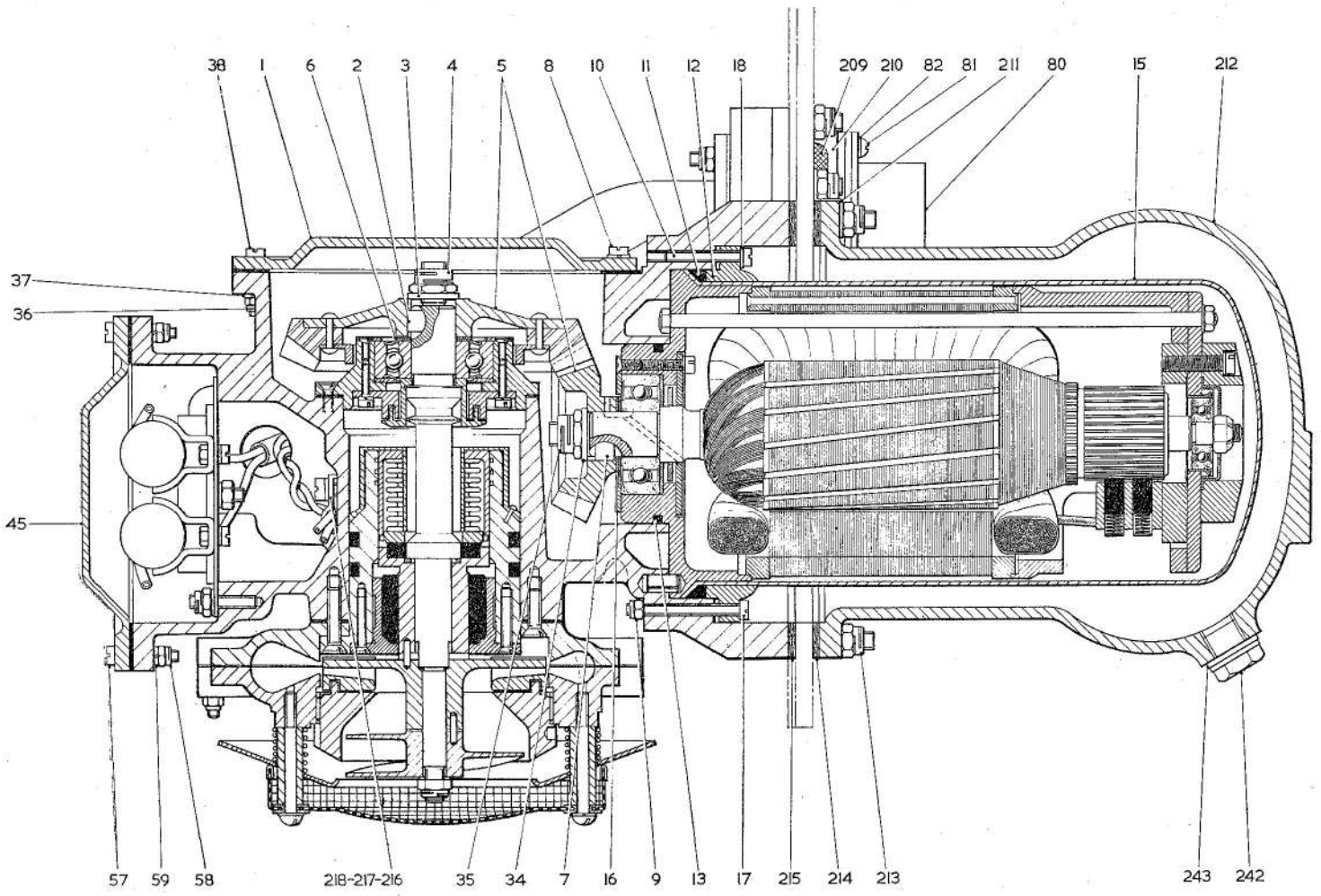



**Fig. 26 Sectional view of pump/motor assembly**

## Key to Fig. 26

| | | | |
|---|---|---|---|
| 1 | GEAR BOX COVER | 45 | CAPACITOR COVER |
| 2 | BEVEL GEAR DRIVE KEY | 57 | CH. HD. SCREW } CAPACITOR COVER |
| 3 | CLAMP WASHER | 58 | SELF-LOCKING NUT } FIXING |
| 4 | SELF-LOCKING NUT | 59 | SPRING WASHER } |
| 5 | PAIRED GEAR AND PINION | 80 | ELECTRICAL CONNECTION |
| 6 | BEVEL GEAR SHIM | 81 | RD. HD. SCREW } ELECTRICAL |
| 7 | PINION DRIVE KEY | 82 | SHAKEPROOF WASHER } CONNECTION FIXING |
| 8 | CH. HD. SCREW (GEAR BOX COVER) | 209 | BREATHER GAUZE |
| 9 | SELF-LOCKING NUT | 210 | BREATHER BLOCK |
| 10 | CH. HD. SCREW (MOTOR CLAMPING) | 211 | BONDING STRIP |
| 11 | SEAL RING (OUTER CASING JOINT) | 212 | FUEL JACKET |
| 12 | BOLT RING | 213 | SELF-LOCKING NUT (FUEL JACKET FIXING) |
| 13 | SEAL RING | 214 | FUEL JACKET GASKET |
| 15 | OUTER MOTOR CASING | 215 | PUMP GASKET |
| 16 | BEVEL PINION SHIM | 216 | CABLE CLEAT |
| 17 | CH. HD. SCREW (MOTOR CLAMPING) | 217 | SHAKEPROOF WASHER } CLEAT FIXING |
| 18 | SHAKEPROOF WASHER | 218 | CH. HD. SCREW } |
| 34 | CLAMP WASHER | 242 | DRAIN PLUG |
| 35 | SELF-LOCKING NUT } GEAR BOX COVER | 243 | DRAIN PLUG WASHER |
| 36 | SELF-LOCKING NUT } FIXING | | |
| 37 | SPRING WASHER } | | |

### Introduction

**1.** This chapter gives details of the operations and procedure required for SPE 1204 and 1214 pumps, and the information is additional to the information given in the basic chapter for the SPE 1200 series. Generally, all the information given in the basic chapter will apply to SPE 1204 and 1214 pumps, and the basic chapter must be used in conjunction with this chapter. Illustration references are consecutive to other illustration references in the series so that reference can be made to any illustration contained in the series.

### SPE 1204 pumps

**2.** Reconditioning instructions for SPE 1204 pumps are generally similar to the instructions for the equivalent marks of SPE 1214 pumps, the only difference being in the by-pass duct casting (fig. 28, item 74). The SPE 1204 pump has no provision for pressure refuelling through the unit and the by-pass duct casting does not include a machined seating face for the by-pass valve plate (73). In all other details SPE 1204 pumps are identical to SPE 1214 pumps.

### General

**3.** The instructions given in this chapter are for the SPE 1214 Mk. 4 pump and appendices are attached at the end of the chapter to cover any difference in procedure which may apply to other mark numbers for this type of pump.

## RECONDITIONING

### Tools and test equipment

**4.** In addition to the special tools listed under Table 1 of the basic chapter the following tools are required for use on SPE 1204 and 1214 fuel pumps.

**TABLE 1**

**Special tools and equipment for SPE 1204 and 1214 fuel pumps**

| Nomenclature | Part No. | Fig. No. |
|---|---|---|
| Location tool: lower bearing reaming | SPE 19484 | 35 |
| Pressure test fixture | SPE 19485 | 38 |
| Gasket (large) | SPE 19486 | |
| Gasket (small) | SPE 19487 | |
| Special nut ($2^5/_{16}$ in. long)—5 off | SPE 19488/A | |
| Special nut (2 in. long)—2 off | SPE 19488/B | |
| Special nut ($1^5/_{16}$ in. long)—5 off | SPE 19488/C | |
| Guide bush (Removal of bellows gland) | SPE 19494 | 33 |
| Pressing sleeve } Assembling | SPE 19516 | 37 |
| Gland location block } bellows gland | SPE 19519 | |
| Gland housing pressure testing fixture | SPE 19518 | 22 |

## DISMANTLING

**Separating the pump assembly from the mounting plate** (fig. 29 and 30)

**5.** Cut and remove the locking wire on all external screws and proceed as follows:—

(1) Remove the four screws (81) and shakeproof washers (82) to detach the electrical connection (80). Disconnect the leads from the plug pins.

(2) Remove the twenty-six self-locking nuts (213) securing the fuel jacket (212) and mounting plate, if fitted, to the pump casting studs.

(3) Withdraw the bonding strip (211), the fuel jacket, the gasket (214), the mounting plate, and the gasket (215) from the pump casting studs.

(4) Unscrew and remove the $1\frac{1}{2}$ in. B.S.P. plug (32) and the bonded seal washer (33) from the fuel jacket, and remove the $\frac{1}{8}$ in. B.S.P. drain plug (242) together with the bonded seal washer (243).

**Separating the motor from the pump unit** (fig. 27, 30 and 32)

**6.** The motor is separated from the pump unit in a similar manner to that detailed in the basic chapter but the terminal nuts (222), shakeproof washers (91) and plain washers (90) are removed to release the

**Key to Fig. 27**

46 RUBBER BAND
47 CAPACITOR TAG
49 LEAD ASSEMBLY
50 CAPACITOR UNIT
51 FIXING SCREW } CAPACITOR FIXING
52 SHAKEPROOF WASHER }
53 CAPACITOR MOUNTING PANEL
55 SELF LOCKING NUT (CAPACITOR PANEL FIXING)
78 LOCKNUT
89 SUPPLY LEAD TAG
90 PLAIN WASHER (4 B.A.)
91 SHAKEPROOF WASHER (4 B.A.)
92 LOCKNUT (4 B.A.)
93 CONDENSER ASSEMBLY
94 CH. HD. SCREW
95 CABLE SHIELD EARTH TAG
97 TERMINAL BLOCK ASSEMBLY
100 SPACING BUSH
102 PANEL ASSEMBLY
219 UPPER GASKET (ELECTRICAL CONDUIT)
220 SELF-LOCKING NUT
221 SHAKEPROOF WASHER (CAPACITOR PANEL FIXING)
222 FULL-NUT
223 CONDENSER ASSEMBLY TAG
224 CH. HD. SCREW (4 B.A.)
225 GLAND DRAIN CONDUIT
226 LOWER GASKET } GLAND DRAIN CONDUIT
227 UPPER GASKET }
229 CH. HD. SCREW } GLAND DRAIN
230 SHAKEPROOF WASHER } CONDUIT FIXING
231 ELECTRIC LEAD CONDUIT
233 LOWER GASKET (ELECTRICAL CONDUIT)
238 RUBBER SLEEVE ($\frac{1}{4}$ IN.)
239 IDENTIFICATION SLEEVE (D)
240 IDENTIFICATION SLEEVE (C)
241 FIELD LEAD TAG

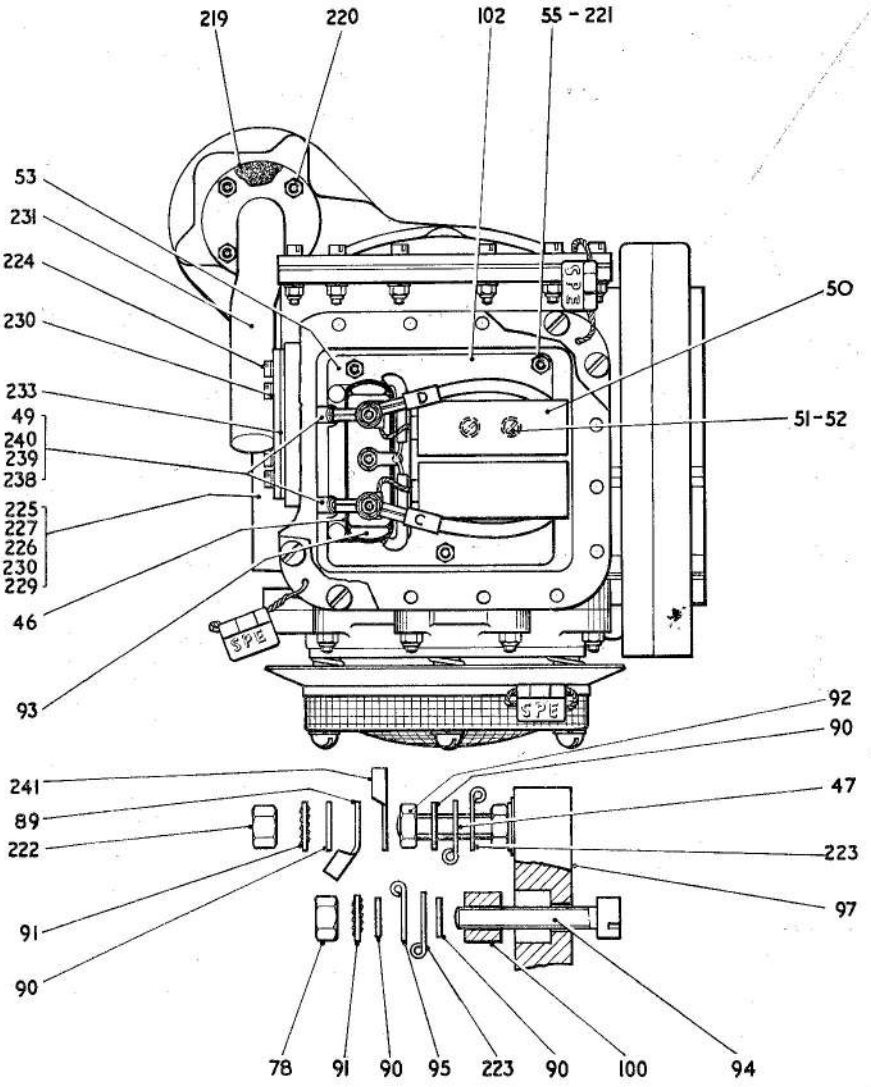



**Fig. 27. Pump conduits and capacitor housing**

supply and field leads before the capacitor panel is removed. The cable sheath earthing wire must also be unsoldered from the central terminal condenser assembly tag. Before removing the motor bolt ring, remove the cheese-head screw (218) and remove the cable cleat (216); collect the shakeproof washer (217).

**Dismantling the pump unit** (fig. 29)

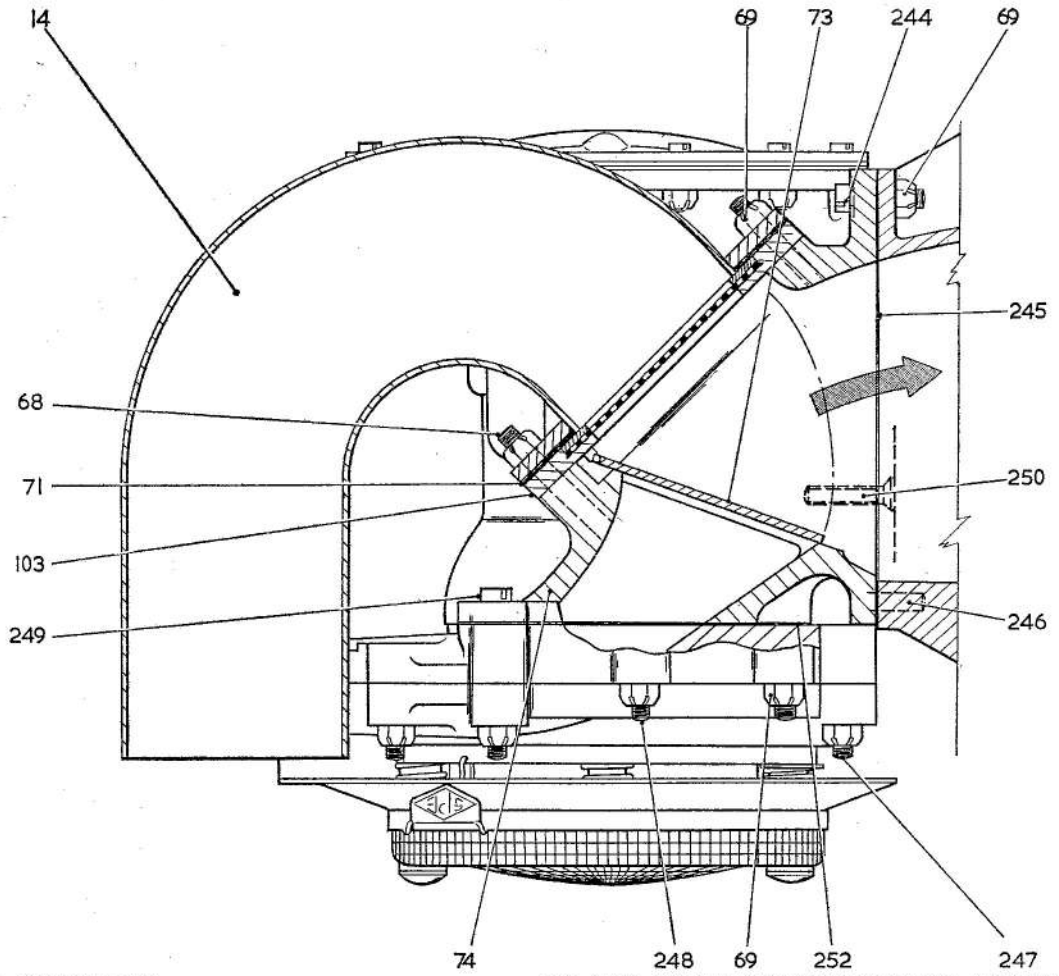
*Removing the by-pass duct assembly*

**7.** (1) Remove the four self-locking nuts (69) and withdraw the by-pass duct (14) from the outlet duct assembly; the seal washer (71) is replaced during assembling and can be discarded.

(2) Withdraw the by-pass valve seat assembly (103) from the studs, and extract the valve plate (73). Remove the second gasket (71).

**Note . . .**

*The valve seat assembly should not be dismantled. If the filter or any other part is damaged, a new assembly should be fitted.*




14 BY-PASS DUCT
68 STUD (BY-PASS DUCT/CASTING)
69 SELF-LOCKING NUT
71 GASKET (BY-PASS DUCT/VALVE SEAT)
73 VALVE PLATE
74 BY-PASS DUCT CASTING
103 VALVE SEAT ASSEMBLY (INCLUDING FILTER)
244 CH. HD. SCREW
245 GASKET (BY-PASS DUCT CASTING)
246 STUD (BY-PASS DUCT CASTING/PUMP CASTING)
247 STUD 1·4 IN. LONG (BY-PASS DUCT/VOLUTE CASTING)
248 STUD 0·9 IN. LONG (BY-PASS DUCT/VOLUTE CASTING)
249 CH. HD. SCREW
250 C/SK. HD. SCREW (OUTLET DUCT SECURING)
252 GASKET (BY-PASS DUCT/VOLUTE CASTINGS)

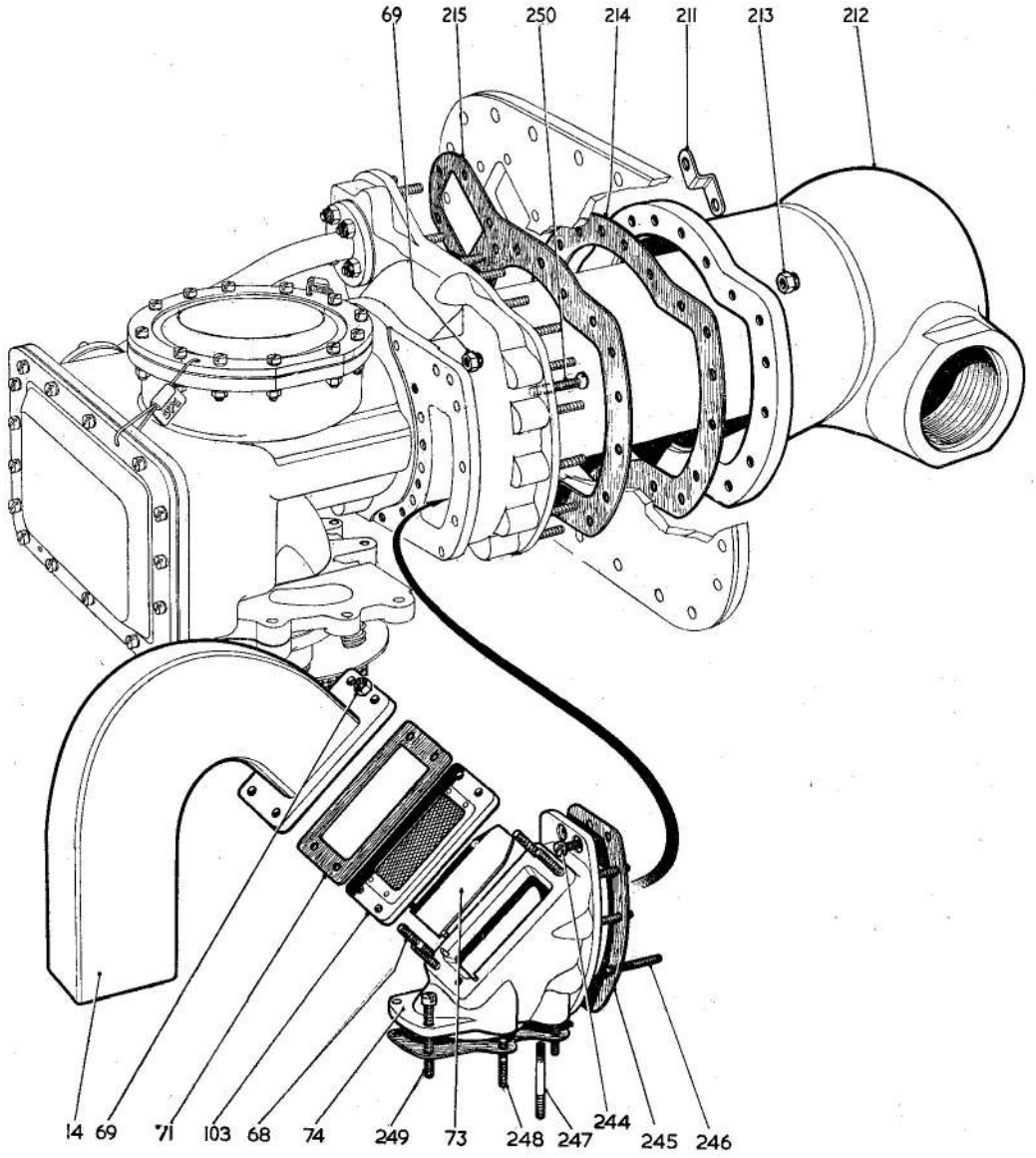
**Fig. 28. By-pass duct assembly**

*Removing the lower bearing assembly* (fig. 32)

**8.** Remove the inlet filter and the impellers using the procedure detailed in the basic chapter. Mushroom headed screws (256) and shakeproof washers (255) are used to secure the inlet filter. Remove the lower bearing assembly as follows:—

(1) Mark the positions of the lower bearing assembly (136) relative to the bellows housing (200), and the bellows housing relative to the volute assembly. Identify each with a common marking so that they can be assembled into the same unit, in their original positions, if they are suitable for further service.

(2) Remove the four screws (258) securing the lower bearing assembly (136) to the bellows sub-assembly (149). Use 6 B.A. screws in the two tapped holes, in the flange, to withdraw the assembly. Do not attempt to remove




**14** BY-PASS DUCT
**68** STUD (BY-PASS DUCT CASTING)
**69** SELF-LOCKING NUT
**71** GASKET (BY-PASS DUCT/VALVE SEAT)
**73** VALVE PLATE
**74** BY-PASS DUCT CASTING
**103** VALVE SEAT ASSEMBLY (INCLUDING FILTER)
**211** BONDING STRIP
**212** FUEL JACKET
**213** SELF-LOCKING NUT (FUEL JACKET FIXING)
**214** FUEL JACKET GASKET
**215** PUMP GASKET
**244** CH. HD. SCREW
**245** GASKET
**246** STUD
**247** STUD 1·4 IN. LONG
**248** STUD 0·9 IN. LONG
**249** CH. HD. SCREW
**250** C/SK. H.D SCREW

**Fig. 29. Exploded view of fuel jacket and by-pass duct**

the carbon bearing from its housing.

*Withdrawing and dismantling the bellows housing sub-assembly* (fig. 32)

**9.** Remove the upper bearing housing, as detailed in the basic chapter, then proceed as follows:—

(1) Remove the five screws (146) securing the bellows housing sub-assembly (149) through the volute assembly to the pump casting. Use 4-B.A. screws in the three extraction holes to facilitate breakage of the seal and withdrawal.

(2) Extract the two seal rings (261) from the housing grooves and discard.

(3) Remove the three drive screws (153) securing the sleeve (202) to the shoulder of the bellows housing. If these screws are broken during withdrawal they should be ground flush with the housing surface after removal of the bellows gland.

(4) Pre-heat the gland housing to 125-150°C. Using the tools illustrated in Fig. 33, press out the bellows gland.

*Removing and dismantling the volute assembly* (fig. 29 and 32)

**10.** (1) Mark the volute and outlet duct assemblies (140 and 74) with a common identification mark so that they can be re-built into the same pump unit on re-assembling.

(2) Remove the four self-locking nuts (110) securing the volute outlet duct assembly (74) to the volute assembly (140). Three of these nuts are attached to the outlet duct studs and the fourth to the cheese-head screw (249).

(3) Remove the four countersunk-head screws (254) securing the volute assembly to the pump casting. Break the seal washers (120 and 252) to separate the components.

(4) The volute assembly need only be dismantled if the seal between the two halves is faulty or if the components are otherwise damaged. To dismantle remove the nine self-locking nuts (141) withdraw the four countersunk-head screws (257) and breaking the seal between the two components, withdraw the lower volute casting off the studs (260 and 137) of the upper casting.

(5) The studs of the upper volute casting assembly should only be removed if damaged.

*Removing the outlet duct casting* (fig. 28)

**11.** (1) Remove the five nuts (69) from the two screws (244) and three studs (246) of the volute outlet duct (74).

(2) Remove the three countersunk-head screws (250) securing the inner side of the outlet duct. These screws are positioned inside the pump casting.

(3) Break the seal washer (245) between the outlet duct and the pump casting.

*Completing the dismantling of the pump casting* (fig. 30)

**12.** (1) The supply lead conduit (231) and the gland drain conduit (225) need only be removed if there is evidence of damage or leakage past the seal washers.

(2) To remove the supply lead conduit (231) extract the five cheese-head screws (224) and shakeproof washers (230) and remove the self-locking nuts (220). Ignore damage to the gaskets (219 and 233) which must be renewed on re-assembly.

(3) To remove the gland drain conduit (225), withdraw the three cheese-head screws (229) and shakeproof washers (230) at each fixing flange. Damage to the gaskets (226 and 227) can be ignored.

(4) Examine pump casting studs (251, 253, 259 and 54, fig. 32) for damaged threads or other faults and remove as necessary.

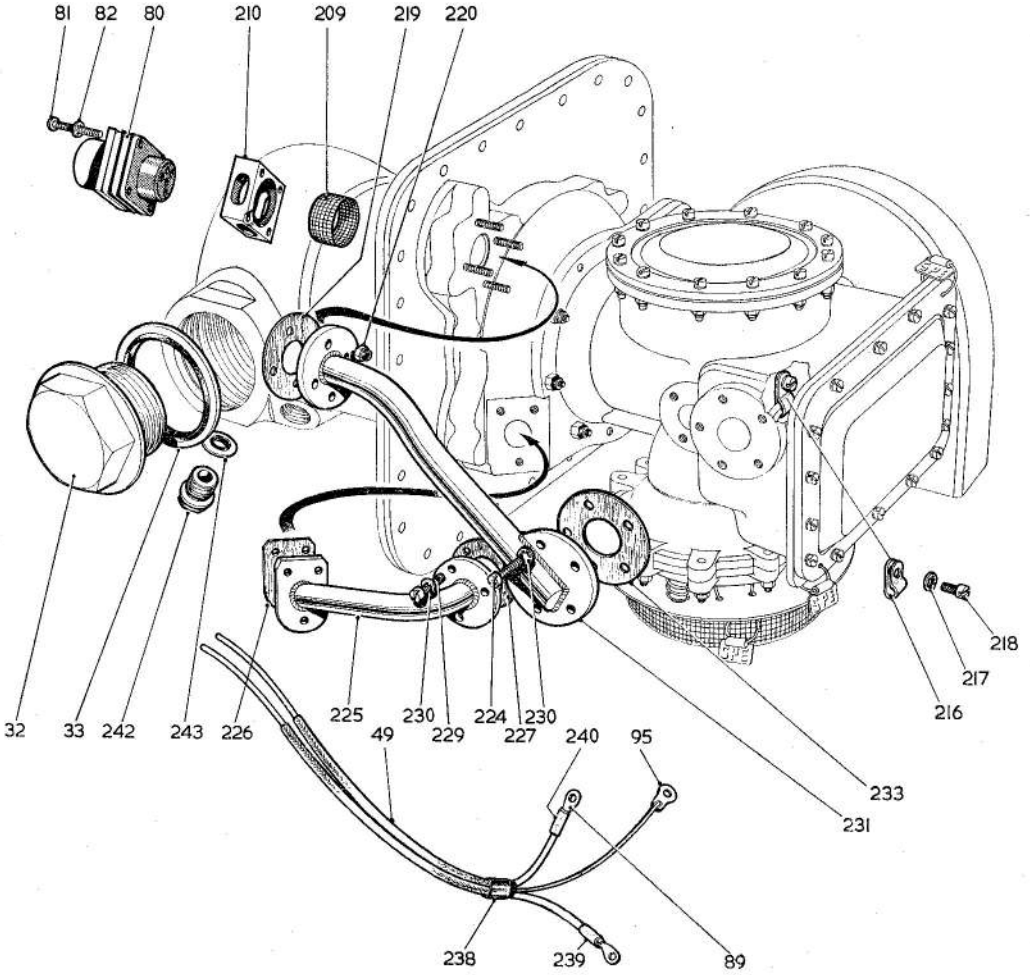
(5) Withdraw the dowel pin (113) only if damaged.

## ASSEMBLING

### Pump unit

*Reaming the carbon bearing* (fig. 32)

**13.** Use the pump casting (105) without a bellows sub-assembly (115) and proceed as follows:—




**32** 1½ IN. B.S.P. PLUG
**33** 1½ IN. BONDED SEAL WASHER
**49** LEAD ASSEMBLY
**80** ELECTRICAL CONNECTION
**81** RD H.D. SCREW } ELECTRICAL
**82** SHAKEPROOF WASHER } CONNECTION FIXING
**89** SUPPLY LEAD TAG
**95** CABLE SHIELD EARTH TAG
**209** BREATHER GAUZE
**210** BREATHER BLOCK
**216** CABLE CLEAT
**217** SHAKEPROOF WASHER } CLEAT FIXING
**218** CH. HD. SCREW }
**219** UPPER GASKET (ELECTRIC LEAD CONDUIT)
**220** SELF-LOCKING NUT
**224** CH. HD. SCREW (ELECTRIC CONDUIT FIXING)
**225** GLAND DRAIN CONDUIT
**226** LOWER GASKET } GLAND DRAIN CONDUIT
**227** UPPER GASKET }
**229** CH. HD. SCREW
**230** SHAKEPROOF WASHER
**231** ELECTRIC LEAD CONDUIT
**233** LOWER GASKET (ELECTRIC CONDUIT)
**238** RUBBER SLEEVE ¼ IN.
**239** IDENTIFICATION SLEEVE (D)
**240** IDENTIFICATION SLEEVE (C)
**241** FIELD LEAD TAG
**242** DRAIN PLUG
**243** DRAIN PLUG WASHER

**Fig. 30. Exploded view of conduits**

(1) Fit the lower bearing housing location tool SPE.19484 (fig. 35) and secure to the pump casting with two 4-B.A. cheese-head screws.

(2) Secure the lower bearing housing assembly (136) to the location tool with four countersunk-head screws (258). Lubricate the carbon bearing with kerosene fuel. Using the special reamer SPE.17378 with a guide bush SPE.17376 and collar SPE.17377 (fig. 3) ream the bearing to size (Table 3). Take great care not to chip the carbon.

(3) Mark the lower bearing housing assembly and the pump casting to ensure that they will be assembled into the same pump unit, with the same positional relationship, at a later assembly stage. Remove the bearing housing and the location tool.

*Preparing the pump casting* (fig. 32)

**14.** (1) Renew any damaged studs (251, 253, 259 and 54) in the pump casting. The twenty-one studs (259) should project 0·9 in., the five studs (253) surrounding the electrical connection position 0·6 in. and the four studs (251) for securing the supply lead conduit should project 0·4 in.

(2) Refit the dowel pin (113), if previously removed so that it projects 3·0 mm. above casting surface.

*Assembling and fitting the outlet duct* (fig. 29)

**15.** (1) Select the outlet duct (74) which is to be paired with the volute assembly of the pump being assembled (para. 16). Renew any damaged studs (246, 247, and 248) in the outlet duct, insert the studs in the positions indicated in Fig. 36; the projection of each stud must be as detailed.

**Note . . .**

*If a new outlet duct or volute assembly are being fitted to the pump, the volute should be pre-assembled as detailed in para.* 16 (1) *and* (2), *and the outlet duct should be positioned on it for levelling. Blend the volute and outlet duct profiles to obtain a smooth un-stepped passage between the two parts. Ensure that all swarf and dust is removed from the assembly. Do not clean the volute assembly by flushing unless the joint between the two castings is tightened down fully.*

(2) Smear the mating surfaces of the outlet duct assembly and the pump casting (105, fig. 32) with Wellseal jointing compound. Position a new gasket (245), paint with Wellseal and secure the duct to the pump casting using self-locking nuts (99) on the studs (101) and on three cheese-head screws (244). Insert three countersunk-head screws (250) inside the pump casting to secure the inner side of the duct assembly. Do not fully tighten the nuts or screws at this stage.

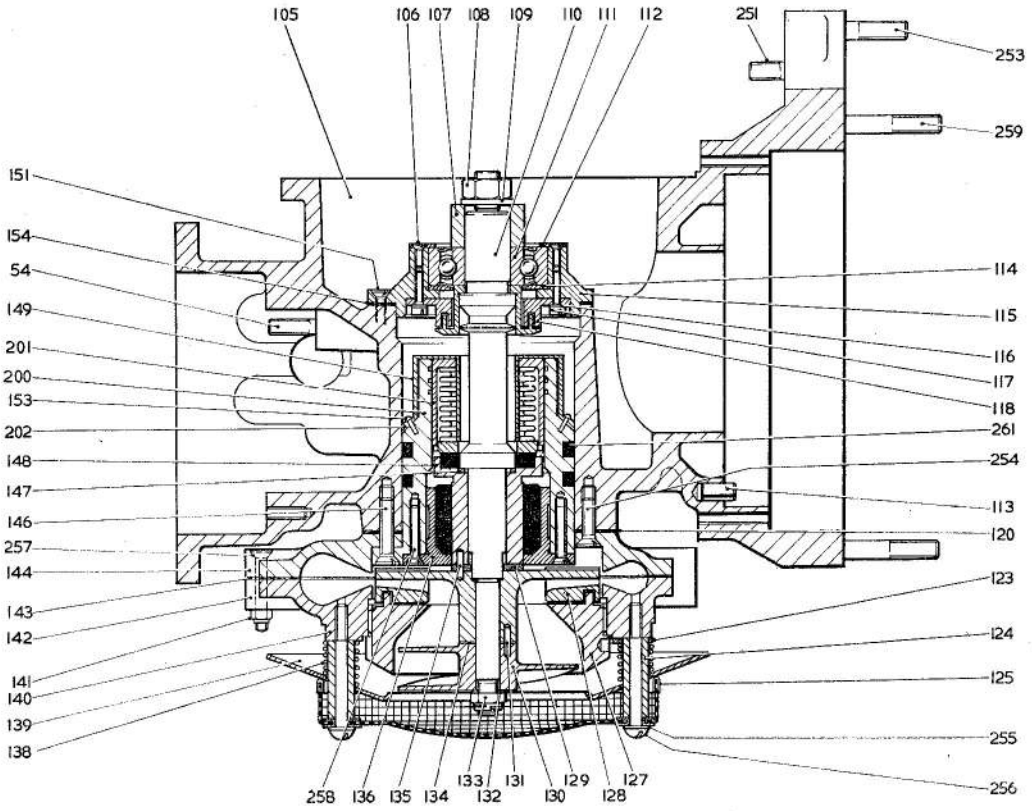
*Assembling and fitting the volute assembly*

**16.** (1) Select the volute components originally assembled to the outlet duct (para. 10) and renew any damaged studs (260 and 137) in the upper volute casting (144). Viewing on the underside of the casting with the straight edge horizontal at the top, insert studs (260) in the first three tapped positions (reading clock-wise) and insert studs (137) in the fourth and fifth positions. All studs should be inserted so that the projecting length is 0·6 in.

(2) Smear the mating surfaces of the upper and lower volute castings (142 and 144) with Wellseal jointing compound. Place a new gasket (143), painted with Wellseal, into position and secure the two components together, using self-locking nuts (141) on the upper casting studs and on the five countersunk-head screws (257). Do not tighten the nuts fully.

(3) Hold the volute assembly in position and check, with feeler gauges, the difference in level between the surface of the upper volute casting and the under surface of the outlet duct.

(4) Smear the mating surfaces of the upper volute casting, outlet duct and pump casting with Wellseal jointing compound. Place a new gasket (126) on the pump casting and place one or more gaskets (252) on the outlet duct to compensate for the difference in level (if any) between the two components (sub. para. (3) above).




**54** STUD (CAPACITOR PANEL FIXING)
**105** PUMP CASTING
**106** C/SK. HD. SCREW (RETAINER PLATE FIXING)
**107** SPACING BUSH
**108** NUT
**109** CLAMP WASHER } SPINDLE CLAMPING
**110** SHAFT ASSEMBLY
**111** UPPER BEARING
**112** RETAINER PLATE
**113** DOWEL PIN
**114** BEARING DUST SHIELD
**115** BEARING HOUSING
**116** SHAKEPROOF WASHER—STAINLESS STEEL
**117** CH. HD. SCREW
**118** THROWER FLANGE
**120** VOLUTE/PUMP CASTING GASKET
**123** HELIX SHROUD LOCKING TAB WASHER
**124** PILLAR
**125** INLET FILTER
**127** HELIX SHROUD
**128** IMPELLER ASSEMBLY
**129** GLAND SEAL/IMPELLER SHIM
**130** IMPELLER HELIX
**131** IMPELLER/HELIX DOWEL PIN
**132** CLAMP WASHER
**133** SELF-LOCKING NUT
**134** IMPELLER/HELIX SHIM
**135** IMPELLER/BELLOWS SEAL DOWEL PIN
**136** LOWER BEARING HOUSING ASSEMBLY
**138** FILTER SPRING
**139** VAPOUR GUIDE CONE
**140** VOLUTE ASSEMBLY
**141** SELF-LOCKING NUT
**142** LOWER VOLUTE CASTING
**143** VOLUTE GASKET
**144** UPPER VOLUTE CASTING
**146** C/SK. HD. SCREW (BELLOWS HOUSING SECURING)
**147** BELLOWS SEAL SHIM
**148** BELLOWS GLAND SEAL BODY ASSEMBLY
**149** BELLOWS HOUSING SUB-ASSEMBLY
**151** C/SK. HD. SCREW (BEARING HOUSING SECURING)
**153** HAMMER HEAD DRIVE SCREW
**154** BEARING HOUSING GASKET
**200** BELLOWS HOUSING
**201** BELLOWS GLAND
**202** BELLOWS GLAND SLEEVE
**251** STUD (ELECTRICAL CONDUIT FIXING)
**253** STUD (MOUNTING PLATE FIXING)
**254** C/SK. HD. SCREW ½ IN. LONG
**255** SHAKEPROOF WASHER
**256** MUSHROOM HD. SCREW
**257** C/SK. HD. SCREW
**258** C/SK. HD. SCREW (LOWER BEARING HOUSING FIXING)
**259** STUD (FUEL JACKET FIXING)
**261** BELLOWS HOUSING SEAL RING

**Fig. 31. Sectional view of pump unit**

## Key to Fig. 32

1 GEAR BOX COVER
2 BEVEL GEAR DRIVE KEY
3 CLAMP WASHER
4 SELF-LOCKING NUT
5 PAIRED GEAR AND PINION ASSEMBLY
6 BEVEL GEAR SHIM
7 PINION DRIVE KEY
8 CH. HD. SCREW (GEAR BOX COVER)
9 SELF-LOCKING NUT
10 CH. HD. SCREW (MOTOR CLAMPING)
11 SEAL RING (OUTER CASING JOINT)
12 BOLT RING
13 SEAL RING
15 OUTER MOTOR CASING
16 BEVEL PINION SHIM
17 CH. HD. SCREW (MOTOR CLAMPING)
18 SHAKEPROOF WASHER
34 CLAMP WASHER
35 SELF-LOCKINK NUT
36 SELF-LOCKING NUT
37 SPRING WASHER } GEAR BOX COVER FIXING
38 CH. HD. SCREW
45 CAPACITOR COVER
54 STUD
55 SELF-LOCKING NUT } CAPACITOR PANEL FIXING
56 SHAKEPROOF WASHER
57 CH. HD. SCREW
58 SELF-LOCKING NUT } CAPACITOR COVER FIXING
59 SPRING WASHER
102 CAPACITOR PANEL ASSEMBLY
105 PUMP CASTING
106 C/SK. HD. SCREW (RETAINER PLATE FIXING)
110 SHAFT ASSEMBLY
111 UPPER BEARING
112 RETAINER PLATE
113 DOWEL PIN
114 BEARING DUST SHIELD
115 BEARING HOUSING
116 SHAKEPROOF WASHER } STAINLESS STEEL
117 CH. HD. SCREW
118 THROWER FLANGE
120 VOLUTE/PUMP CASTING GASKET
123 HELIX SHROUD LOCKING TAB WASHER
124 PILLAR
125 INLET FILTER
127 HELIX SHROUD
128 IMPELLER ASSEMBLY
129 GLAND SEAL/IMPELLER SHIM
130 IMPELLER/HELIX
131 IMPELLER/HELIX DOWEL PIN
132 CLAMP WASHER
133 SELF-LOCKING NUT
134 IMPELLER/HELIX SHIM
135 IMPELLER/BELLOWS SEAL DOWEL PIN
136 LOWER BEARING HOUSING ASSEMBLY
137 STUD
138 FILTER SPRING
139 VAPOUR GUIDE CONE
140 VOLUTE ASSEMBLY
141 SELF-LOCKING NUT
142 LOWER VOLUTE CASTING
143 VOLUTE GASKET
144 UPPER VOLUTE CASTING
146 C/SK. HD. SCREW (BELLOWS HOUSING SECURING)
147 BELLOWS SEAL SHIM
148 BELLOWS GLAND SEAL BODY ASSEMBLY
149 BELLOWS HOUSING SUB-ASSEMBLY
150 BEARING HOUSING GASKET
151 C/SK. HD. SCREW (BEARING HOUSING SECURING)
153 HAMMER HEAD DRIVE SCREW
200 BELLOWS HOUSING
201 BELLOWS GLAND
202 BELLOWS GLAND SLEEVE
251 STUD (ELECTRICAL CONDUIT FIXING)
253 STUD (MOUNTING PLATE FIXING)
254 C/SK. HD. SCREW ¼ IN. LONG
255 SHAKEPROOF WASHER
256 MUSHROOM HD. SCREW
257 C/SK. HD. SCREW
258 C/SK. HD. SCREW (LOWER BEARING HOUSING FIXING)
259 STUD (FUEL JACKET FIXING)
260 STUD
261 BELLOWS HOUSING SEAL RING

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**Note . . .**

*It is advisable to paint all gasket surfaces with Wellseal jointing compound before placing them into position, particularly when more than one gasket is being used.*

(5) Secure the duct to the volute assembly using self-locking nuts (69) on the three studs and on the cheese-head screw (249). Tighten these nuts and those of the volute assembly (sub-para. (2) above). Secure the volute assembly to the pump casting with the countersunk-head screws (254). Peen metal into the screw slots to lock them, ensuring that none projects above the surface of the housing flange. *This is important as the impeller is set to this surface with a clearance of only* 0·008 *in.*

(6) Tighten the nuts (69) and screws (250) securing the outlet duct to the pump casting; in this position metal should *not* be peened into the countersunk-head screw slots for locking purposes.

*Assembling the bellows gland housing*

**17.** (1) If any of the drive screws (153) were broken off during dismantling, check that three new holes have been drilled in the angled shoulder of the housing (200) as detailed in Table 2.

(2) Pre-heat the bellows gland housing (200) to between 125 and 150°C. Smear

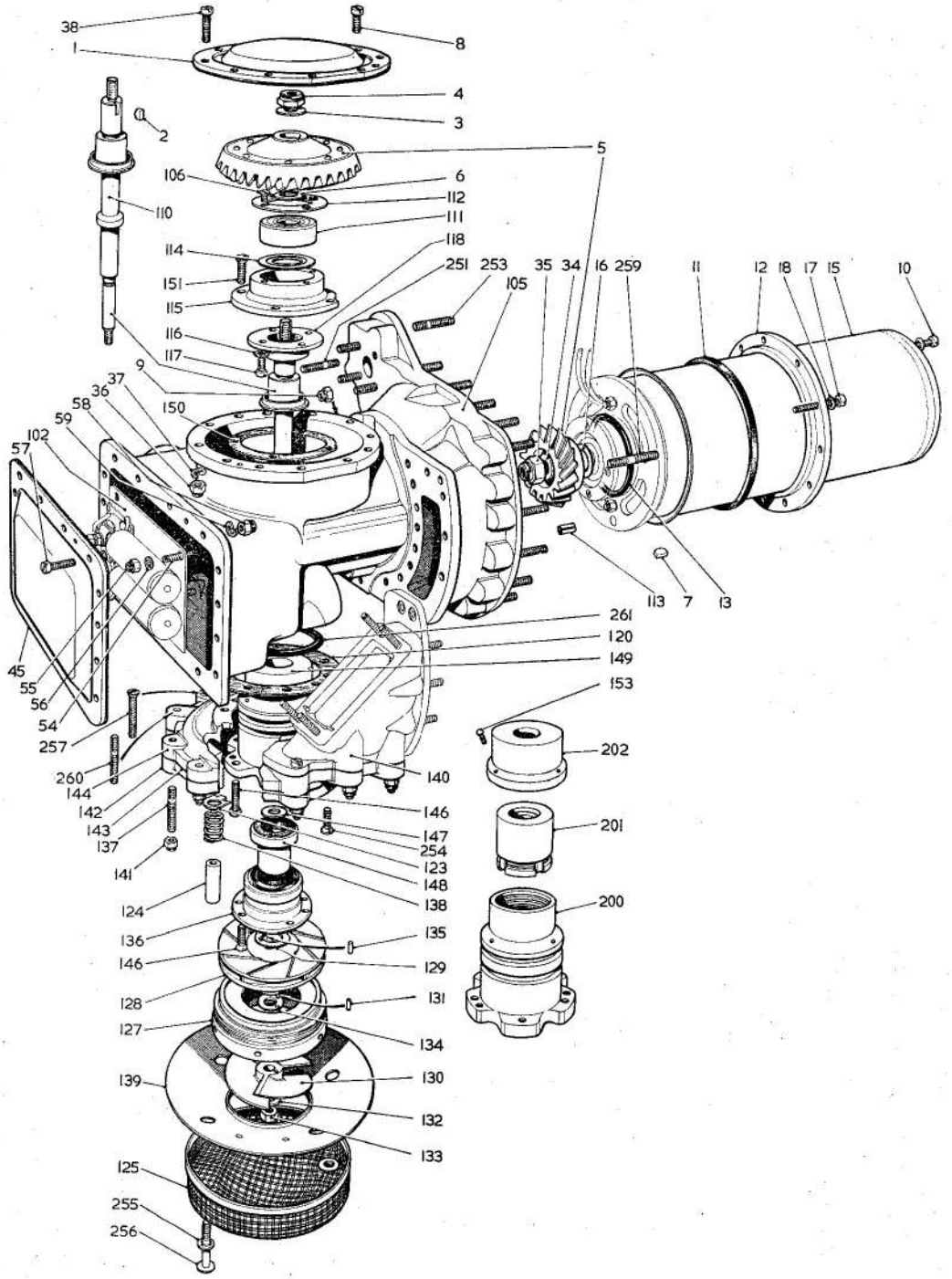



**Fig. 32 Exploded view of pump unit**

the top ½-inch of the bore of the housing with Hermeticoll jointing compound so that the grooves are filled. Using the tools illustrated in Fig. 37, press the re-lapped or a new bellows gland (201) into the housing so that the top face of the gland is flush with the top surface of the housing.

(3) ◄ Using the fixture illustrated in Fig. 22 pressure test the gland housing assembly. Immerse the assembly in water and apply air pressure at 20 lb./in² to the fixture adaptor. Observe for air bubbles indicating leakage between the bellows gland and housing. None is permissible. After this test, remove excess water, using a compressed air jet, then dry the assembly in a ventilated oven.

(4) Position the sleeve (202) over the housing and gland and secure with three hammer-head drive screws (153). ►

(5) Fit two new seal rings (261) in the grooves of the housing and lubricate with a smear of Silicone MS.4 grease, compound XG-250 (Ref. No. 33H/9424829).

(6) Press the bellows into the pump casting, align the securing holes and secure with five countersunk-head screws (146).

*Shaft component checking and assembling*

**18.** Check the shaft components in the manner described in the basic chapter, assemble the upper bearing housing, carry out the bellows gland loading procedure, assemble the centrifugal impeller and helix. and assemble the filter; all the operations for assembling these components are identical to the procedures given in the basic chapter.

*Assembling the gland drain duct* (fig. 30 and 32)

**19.** (1) Smear the mating surfaces of the gland drain conduit flanges (225) the pump casting (105) and both surfaces of the gaskets (226 and 227) with Wellseal jointing compound.

**Note . . .**

*The gaskets should be compressed under a press to* 0·022 *in. thickness before fitting to improve impermeability.*

(2) Secure each flange of the gland drain duct to the casting with three cheese-head screws (229) and shakeproof washers (230).

**Fitting the motor unit to the pump unit**

**20.** The reconditioning and asembling instructions for the motor are identical to the procedures given in the basic chapter. Carry out the following operations as detailed in the basic chapter.

(1) Bevel pinion shimming

(2) Gear alignment

(3) Assembling the outer motor casing

(4) Assembling the gear box cover.

**Attaching the electrical conduit** (fig. 30)

**21.** (1) Thread the field leads marked A and B out through the port in the side of the capacitor housing and through the gasket (233) the electrical conduit (231) and a new gasket (219).

**Note . . .**

*The gaskets should be compressed, under a press, to* 0·022 *in. thickness before fitting to improve impermeability.*

(2) Thread the electric lead assembly (49) through the conduit and gaskets, leaving the tagged end in the suppressor chamber.

(3) Fit a rubber sleeve (238) over the two leads C and D, and fit a ½-inch identification sleeving on each lead.

(4) Fit a ½-inch rubber sleeve (238) over each of the four leads to the electrical connection.

(5) Fit a gauze (209) in the motor breather block (210).

(6) Thread all the leads through the casting, motor breather and the rear moulding of the plug assembly. Solder leads to the appropriate plug pins and assemble the pins to the rear moulding, making sure that the pins of the leads marked A, B, C and D are assembled in similarly marked plug positions; E is not used. Move the sleeves (238) up to the moulding.

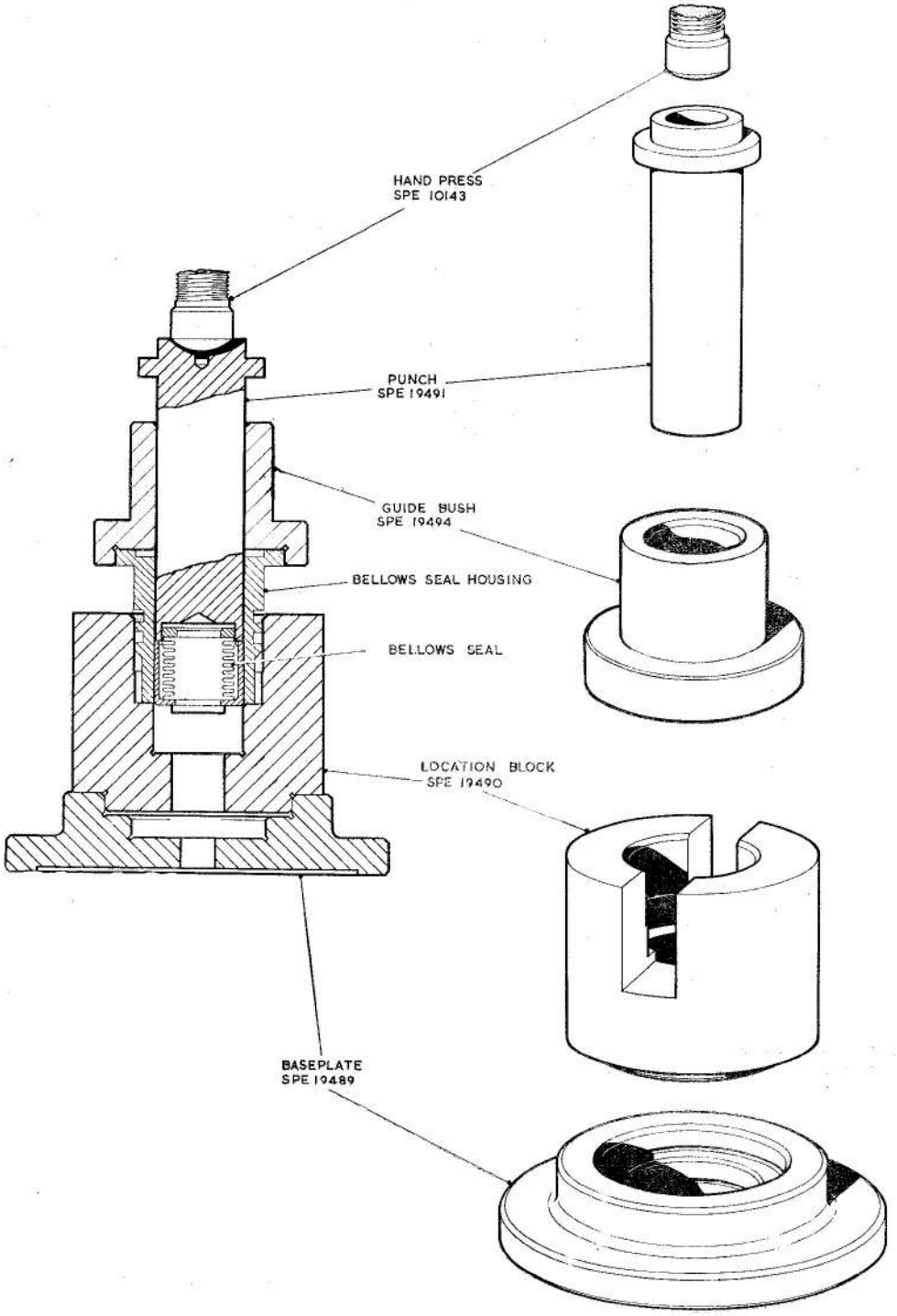



**Fig. 33. Removal of the bellows gland from its housing**

(7) Re-assemble the plug and secure through the motor breather block (210) to the casting with four screws (81) and shakeproof washers (82). Position the plug with pin A uppermost.

(8) Smear the mating surfaces of the pump casting, the electric conduit flanges and both sides of the gaskets (219 and 233) with Wellseal jointing compound. Secure the upper flange of the conduit to the casting with four self-locking nuts (220) and the lower flange with five cheese-head screws (224) and shakeproof washers (230).

**Assembling the capacitor units** (fig. 30 and 27)

**22.** (1) Draw the excess length of leads in the electric conduit back into the capacitor housing. Secure leads A and B to the back wall of the housing using a cable cleat (216) secured by the cheesehead screw (218) and shakeproof washer (217).

(2) Check the connections to the tags (47) of the capacitor units (50). If faulty, fit a new tag or if the capacitor lead is frayed, discard and use a new unit.

(3) Secure the two capacitor units (50) to the panel assembly (53) with the screws (51) and shakeproof washers (52).

(4) Fix the terminal block (97) to the panel assembly with the screw (94), the distance collar (100), two plain washers (90), a shakeproof washer (91) and the locknut (78). Include the centre tag of the condenser assembly (93) and the cable shield earthing tag (part of 49), between the two plain washers.

(5) Fit the condenser assembly around the terminal block, positioning one condenser along each short edge of the block, and retain with the rubber band (46).

(6) Include one condenser tag (223) and one capacitor tag (47) on each of the two outer terminals of the terminal block. Secure with a plain washer (90) and locknut (92).

(7) Using an Avometer or similar instrument check for continuity between the mounting panel and the earthed pole of the condenser; the indicated resistance must be zero.

(8) Complete the build-up of the two outer terminals of the terminal block in accordance with the sequence illustrated diagrammatically in Fig. 14. Each terminal should comprise a capacitor lead tag and a condenser tag clamped by a plain washer and locknut together with the tag of a supply lead (49) and a field lead tag clamped by a plain washer, shakeproof washer and locknut. Ensure that all connections marked 'C' are assembled to one terminal and those marked 'D' to the other.

(9) Arrange the leads to the terminals so that the field leads C and D

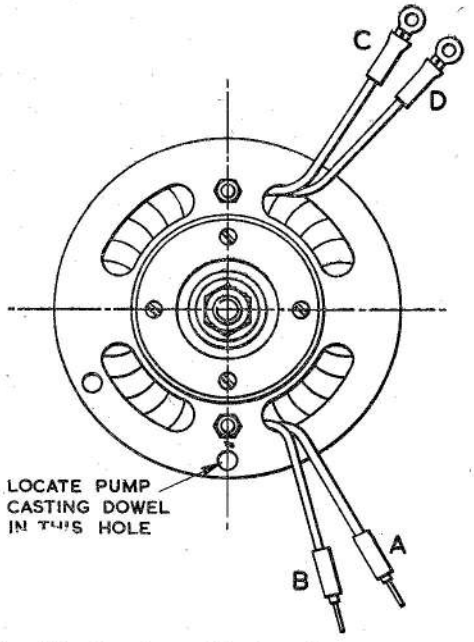



**Fig. 34. Lead positioning through motor end casing**

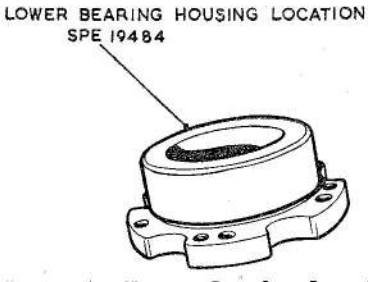



**Fig. 35. Lower bearing location tool (reaming bearing)**

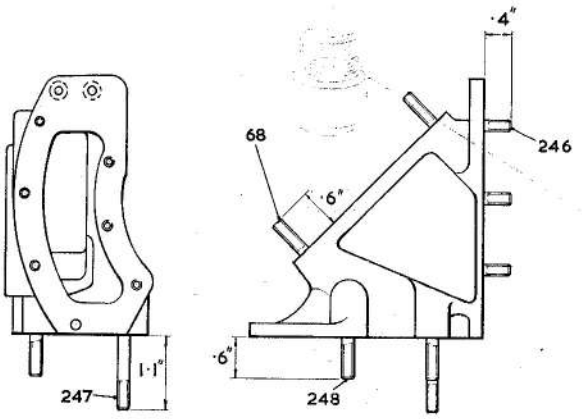



**Fig. 36. Outlet duct stud positions and dimensions**

traverse the capacitors and the supply leads are brought to the terminals through the edge slots in the capacitor panel assembly.

(10) Position the capacitor panel assembly over the studs (54) in the capacitor housing and secure with nuts (55) and shakeproof washers (221). Examine all soldered connections for fractured leads or other faults which may have developed during the assembling process.

**Assembling the capacitor cover** (fig. 32)

**23.** (1) Degrease the capacitor housing flange, dry, and secure the cover (45) with sixteen cheese-head screws (57), spring washers (37) and self-locking nuts (36). The spring washers must be assembled under the nuts.

(2) Tighten diametrally opposite nuts in turn by degrees to ensure even compression of the joint ring.

**Assembling the by-pass duct** (fig. 29)

**24.** (1) Position the valve plate (73) locating the integral hinge pins in the machined seating in the outlet duct.

(2) Fit the by-pass valve seat assembly (103) with the lapped surface uppermost, a new paper gasket (71) and the by-pass duct assembly (14). Secure in position with four self-locking nuts (69).

**Pressure testing the pump assembly**

**25.** Fit the pressure test blanking plate SPE.19485 (fig. 38) and the two gaskets SPE.19486 and SPE.19487 to the studs of the pump casting to cover the electrical connection and the gland drain tapping; secure the cover to the studs with the special nuts SPE.19488/A (5 off), SPE.19488/B (2 off) and SPE.19488/C (5 off). Apply air pressure, at a gradually increasing rate, through a $\frac{3}{8}$ in. B.S.P. adaptor, and pressure test the pump assembly as detailed in the basic chapter.

**Assembling the fuel jacket** (fig. 29 and 30)

**26.** (1) Assemble the water drain plug (242) and the bonded seal washer (243) to the fuel jacket (212).

(2) Fit the plug (32) and the seal washer (33) to either of the two alternative outlets on the fuel jacket, according to the installation requirements.

(3) Fit new gaskets (214 and 215) together with the fuel jacket sub-assembly over the studs of the pump casting. Secure the jacket (212) in four places with self-locking nuts (213), using a suitable spacing bush $\frac{1}{4}$ in. long under each nut. The remaining twenty-two self-locking nuts, together with the bonding strip (211) should be kept in a separate bag for use when the pump is fixed to its mounting plate.

**Note . . .**

*The mounting plate is not normally supplied by the pump manufacturer and may not be attached to the pump when received for reconditioning.*

(4) If the mounting plate is available, it should be assembled between the two gaskets (214 and 215) and secured with twenty-six self-locking nuts (213). Fit the bonding strip (211) between a pump casting stud, near to the electrical connection, and a stud securing the fuel jacket. Bend the strip to suit the requirements. Use Wellseal jointing compound on all gaskets and mating surfaces. Tighten opposite nuts in turn by degrees to ensure even compression of the joint washer.

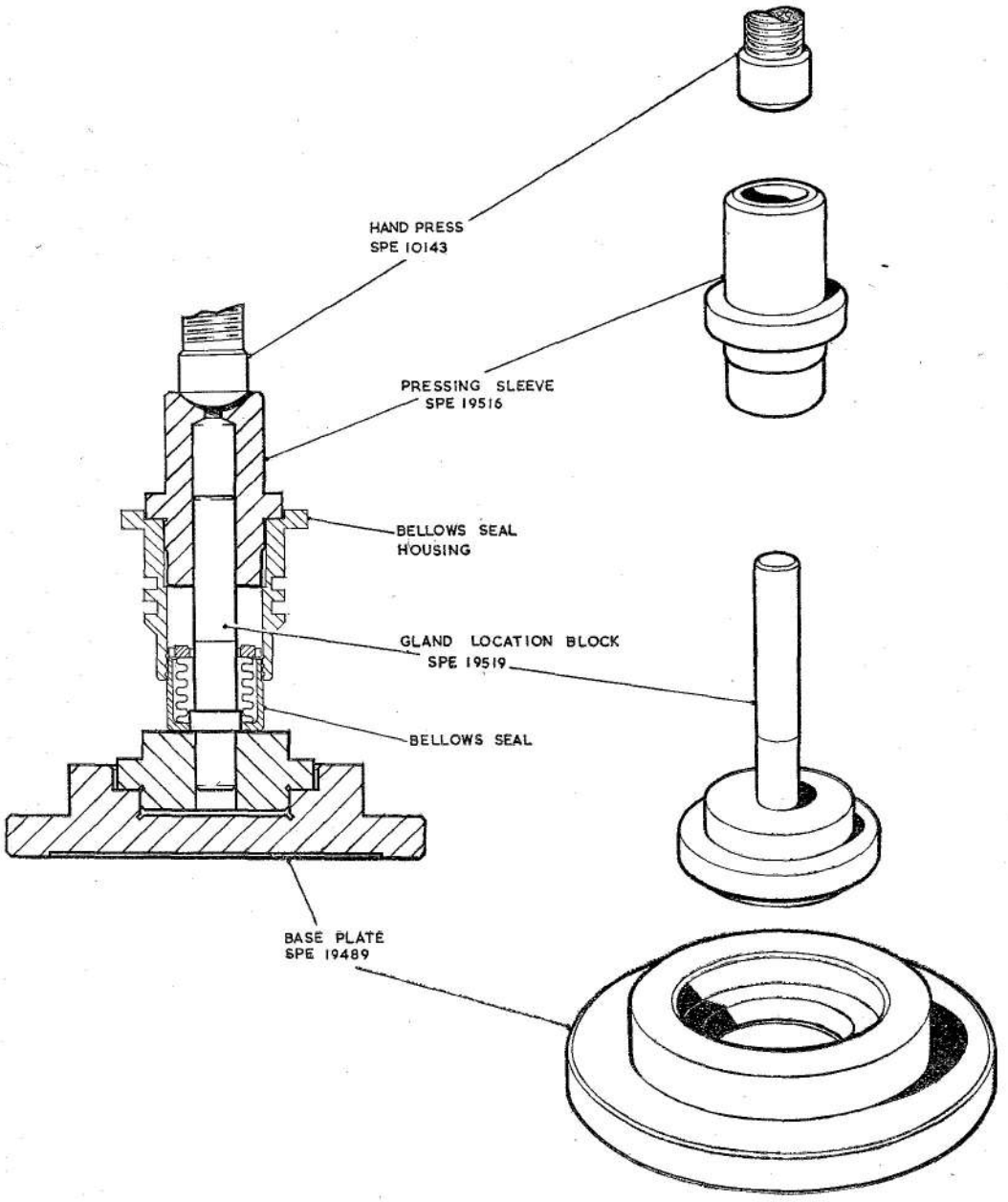



**Fig. 37. Assembling the bellows gland to its housing**

## TESTING

**27.** The completed pump can be tested on the universal fuel pump test rig (Ref. No. 5G/3494) in accordance with the procedure and data given in the basic chapter.

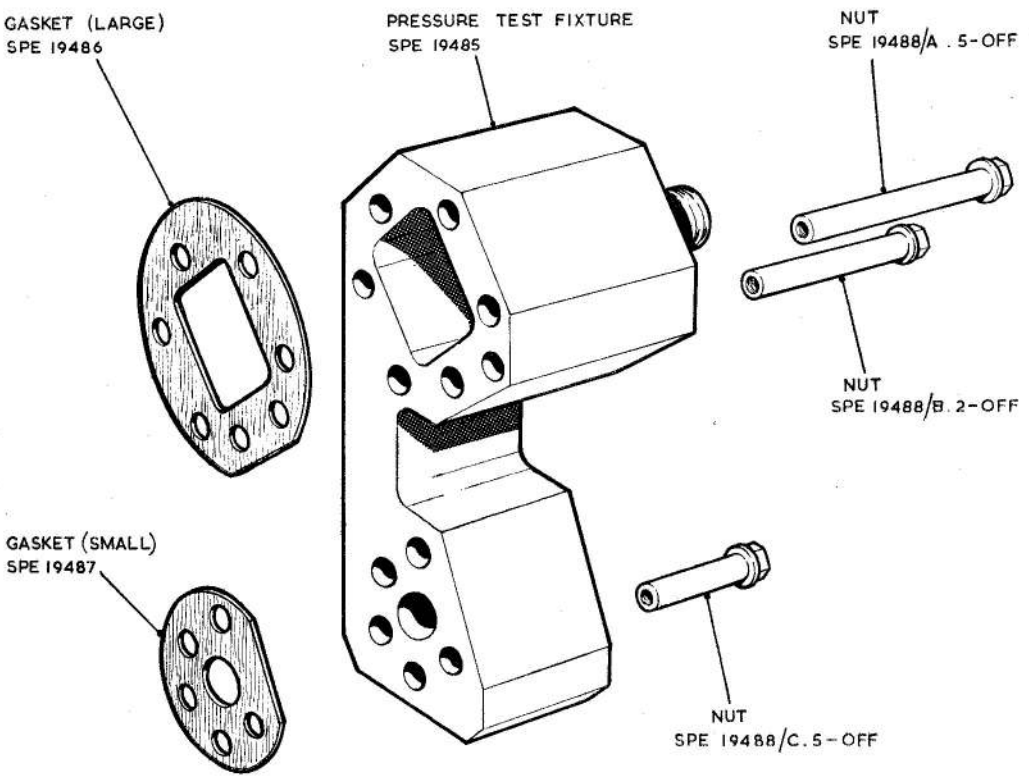



**Fig. 38. Pressure test tools**

# Appendix 1

# PUMP, FUEL SPE 1214 MK. 1

## LIST OF CONTENTS

| | Para. | | Para. |
|---|---|---|---|
| *General* ... ... ... ... ... | 1 | *Assembling the gland drain duct* ... | 8 |
| *Separating the motor and pump units* | 2 | *Attaching the electrical conduit* ... | 9 |
| *Upper bearing assembly* ... ... | 3 | *Assembling the capacitor units* ... | 10 |
| *Bellows housing sub-assembly* ... | 4 | *Capacitor unit covers and gear box covers* ... ... ... ... ... | 11 |
| *Dismantling and assembling the pump casting* ... ... ... ... ... | 5 | | |

## LIST OF ILLUSTRATIONS

| | Fig. |
|---|---|
| *Electric supply lead and gland drain conduits* ... ... ... ... ... | 39 |

### General

**1.** This appendix details the differences between the SPE 1214 Mk. 1 fuel pump and the SPE 1214 Mk. 4 fuel pump. Where no details are given for dismantling or assembling particular components, it can be assumed that the procedures given for a Mk. 4 pump, in Chapter 6B, applies to the Mk. 1 pump.

### Separating the motor and pump units

**2.** The procedure is generally similar to that given for the SPE 1214 Mk. 4 pump but the capacitor and gear box covers have separate gaskets, and in some pumps backing plates may be fitted, in place of the covers with integral bonded seal washers.

### Upper bearing assembly

**3.** The Mk. 1 upper bearing assembly is illustrated in the basic chapter for the SPE 1200 series and the procedures for dismantling and assembling are also given in the basic chapter.

### Bellows housing sub-assembly

**4.** The procedures for withdrawing and assembling a bellows housing sub-assembly is generally similar to the SPE 1214 Mk. 4, but the bellows sleeve (202, fig. 32) is not fitted.

### Dismantling and assembling the pump casting

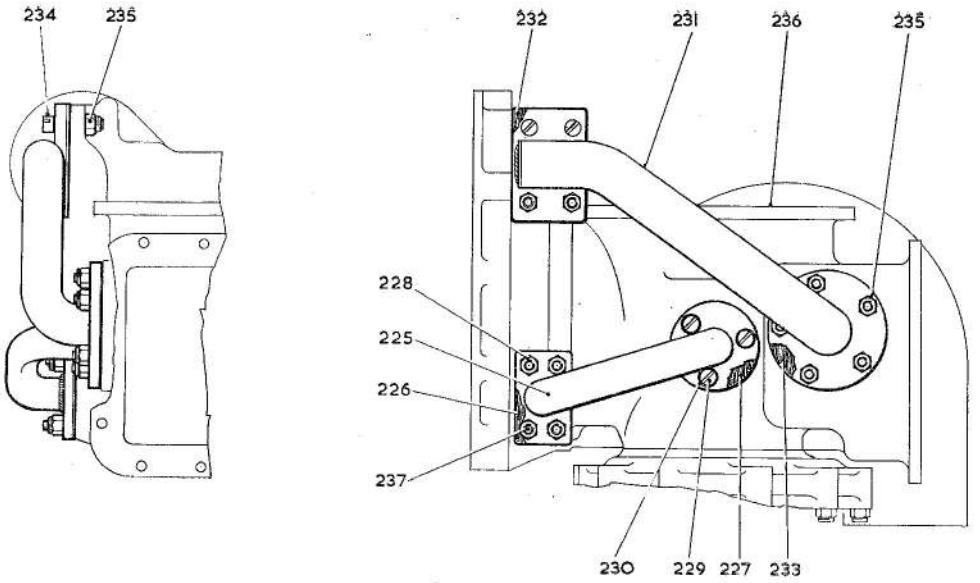
**5.** The supply lead and gland drain conduits on Mk. 1 pumps (231 and 225, fig. 39) need only be removed when there is evidence of damage or leakage past the seal washers. To remove the supply lead conduit (231), remove the nine self-locking nuts (235) and withdraw the two cheese-head screws (234). The gaskets (232 and 233) must be renewed when re-assembling the unit.

**6.** To remove the gland drain conduit (225), withdraw the three roundhead screws (229) and shakeproof washers (230), and remove the four self-locking nuts (228); renew the gaskets (226 and 227) when re-assembling the unit.

**7.** When assembling the pump casting, examine all studs for damage, renew faulty studs as necessary, and proceed generally as for the SPE 1214, Mk. 4 pump. The eleven studs used to secure the electric lead and gland drain conduits must protrude 0·4 in. on the Mk. 1 pump.

### Assembling the gland drain duct (fig. 39)

**8.** (1) Smear the mating surface of the gland drain conduit flanges (225), the




225 GLAND DRAIN CONDUIT
226 LOWER GASKET } GLAND DRAIN CONDUIT
227 UPPER GASKET }
228 4 B.A. SELF-LOCKING NUT
229 4 B.A. CH. HD. SCREW
230 4 B.A. SHAKEPROOF WASHER
231 ELECTRIC LEAD CONDUIT
232 UPPER GASKET } ELECTRIC LEAD CONDUIT
233 LOWER GASKET }
234 4 B.A. CHEESE HD. SCREW
235 4 B.A. SELF-LOCKING NUT
236 PUMP CASTING
237 4 B.A. STUD

**Fig. 39. Electric supply lead and gland drain conduits**

pump casting (236) and both surfaces of the gaskets (226 and 227) with Wellseal jointing compound.

**Note . . .**

*The gaskets should be compressed, under a press, to* 0·022 *in. thickness before fitting to improve impermeability.*

(2) Secure one flange to the pump casting with three cheese-head screws (229) and shakeproof washers (230), and secure the other flange to the studs (237) with four self-locking nuts (238).

**Attaching the electrical conduit** (fig. 39)

**9.** The procedure is generally similar to the SPE 1214, Mk. 4 pump except that conduit (231) is used and is secured in seven positions with self-locking nuts (235) on the casting studs and in two positions with cheese-head screws (234) and self-locking nuts (235)

**Assembling the capacitor units**

**10.** On the original assembly there was no centre terminal on the terminal block, and the lower fixing stud of the panel assembly was used as the earth terminal. The assembling procedure is generally similar to the procedure detailed for the SPE 1214, Mk. 4 and it is recommended that Mk. 1 units should be modified to Mk. 4 standards whenever possible.

**Capacitor unit covers and gear box covers**

**11.** The assembling of both parts is similar to the procedures given for SPE 1214, Mk. 4 pumps, but separate covers and gaskets are used. Sheet metal covers, as distinct from die-cast covers, should have backing strips fitted over the cover flanges. Apply Wellseal jointing compound to the casting, cover and gasket surfaces. It is recommended that Mk. 4 type covers, with integral bonded sealing washers are fitted as replacements for Mk. 1 covers whenever possible.

# Appendix 2

## PUMPS, FUEL, SPE 1214, MK. 1A AND MK. 2

Reconditioning procedure and Test Schedules for the SPE.1214 Mk. 1A and Mk. 2 fuel pumps are generally similar to those detailed for the Mk. 1 pump in Appendix 1 with the exception of the method of assembling the electric and gland drain conduits. On the Mk. 2 pump these conduits are similar to those fitted to the Mk. 4 pump and reference should be made to Chapter 6B for details of fitting. On Mk. 1A pumps the conduits were of interim design and any pumps of this mark should be re-built to include the Mk. 4 conduits.

**Note . . .**

*Although instructions given above enable the pump to be rebuilt to approximately its original specification, it is strongly recommended that whenever possible the unit is re-built to the latest modification standard.*

# Appendix 3

## PUMPS, FUEL, SPE 1214 MK. 3

Reconditioning procedures and test schedules for the SPE.1214 Mk. 3 fuel pump are generally similar to those detailed for the Mk. 4 pump in chapter 6B but separate gear box and capacitor housing covers and gaskets are fitted in place of the covers with an integral bonded sealing gasket. Sheet metal covers, as distinct from die-cast components should also have backing plates or strips fitted over the cover flanges. Use Wellseal jointing compound on the cover, casting and gasket mating surfaces when assembling the covers. It is recommended that the Mk. 4 covers with integral bonded seal washer (fig. 32, item 1 and 45) are fitted as replacements for the Mk. 3 covers whenever possible.

**Note . . .**

*The above paragraph applies at the date of issue of this page. Introduction of modifications affecting the Mk.* 4 *pump and not applicable to the Mk.* 3 *will tend to increase the differences between Mk.* 3 *and Mk.* 4 *pumps.*