

Hamworthy

**Installers Guide
for
Oil Fired Boilers**

**PURBECK Series
P3, P4 & P5**

GENERAL DESCRIPTION

The Hamworthy PURBECK Boiler is a fully automatic Oil Fired Unit designed to give reliable and efficient service. It is suitable for Domestic, Commercial and Industrial Central Heating and Indirect Hot Water Systems.

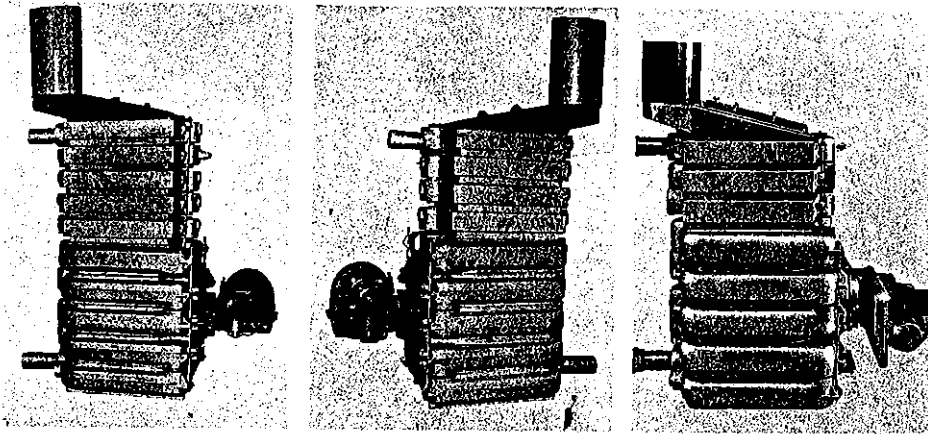


Fig. 2 PURBECK P5

Fig. 3 PURBECK P4

Fig. 4 PURBECK P3

Boilers -- without Casing fitted.

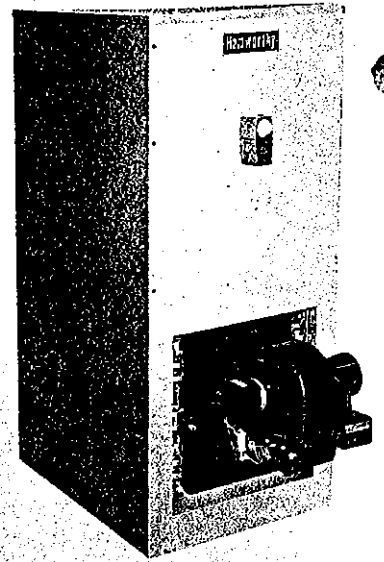


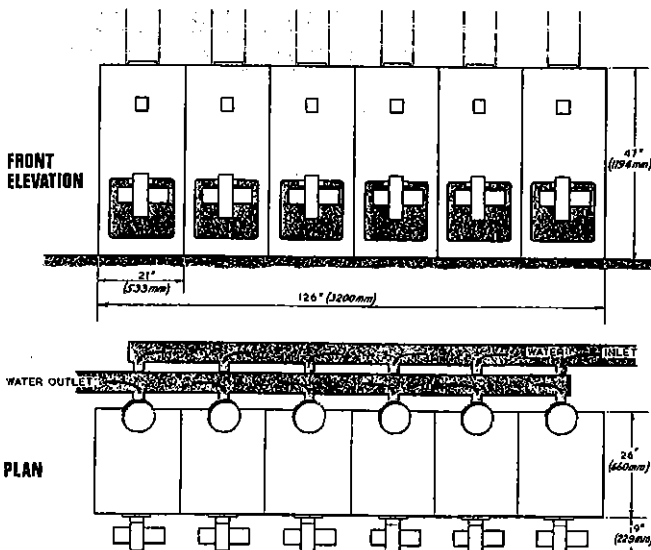
Fig. 1

The Boiler is unique in that the cast iron sections are set above each other on the horizontal plane and by special arrangement of the connecting nipples the water flows in series through each individual section. This method ensures that no hot spots are created in the Boiler and gives a small unit with high output.

Each Boiler is constructed from high grade cast iron and is factory assembled and hydraulically tested. Maximum working pressure of the unit is 60 lbf/in.² (414 kPa).

Installation consists essentially of connecting electrical and water services and chimney.

The base of the Boiler is fully water cooled and no special floor insulation is required. The hinged burner mounting door allows complete access to the combustion chamber for servicing. The flue hood, fitted to the top of the Boiler, has a removable plate giving access to the flue passages for cleaning. Each unit is supplied with a matched Nu-Way C2 35 second Redwood No. 1 Oil Burner. (Alternative burners may be considered if approved by Hamworthy Engineering Limited).



PURBECK BOILERS & MODULAR SYSTEMS

Purbeck Boilers are ideally suited to Modular applications. Because of the unique series water flow characteristic, Boilers can be connected in parallel to give a Modular Unit. This system eliminates the need for large boiler rooms and special foundations. It need not be installed until the building is completed. Installation requires no rigging, cranes or special tools. All equipment will readily pass through narrow corridors, up or down stairways and through 30 in. (762 mm.) doorways.

Fig. 5 TYPICAL MODULAR SYSTEM SHOWING 6-P5 BOILERS, GIVING A TOTAL OUTPUT OF 2.1 MILLION BTU/HR. (615 kW)

Each single Boiler unit or module should be controlled by a control thermostat, (not supplied by Hamworthy Engineering Limited) positioned in the main flow pipework at a distance from the unit or units such that mixing of individual Boiler outlets is complete.

Where five or more Boilers are coupled together, it is recommended that they should be Sequence Controlled. Details can be obtained by contacting Hamworthy Engineering Ltd., Heating Department.

DELIVERY

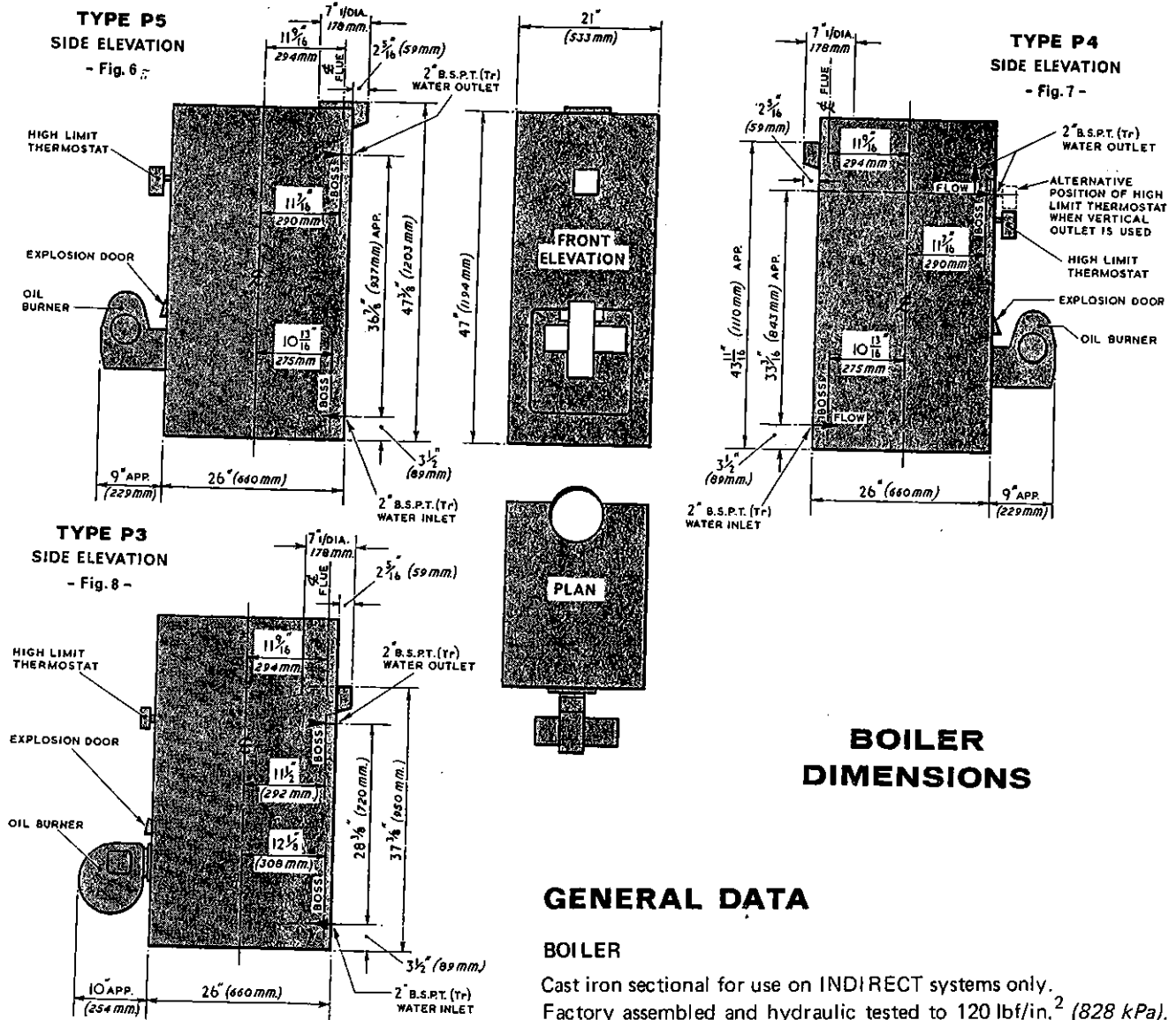
Each Boiler is supplied with the following items:—

1 — Factory assembled Boiler unit complete with Burner mounting door, Flue hood, High limit thermostat and refractory target wall fitted, mounted on wood pallet and enclosed in plywood crate.

Crate Size: 26¼ in. x 20 in. x 44 in. high. (667 mm. x 508 mm. x 1118 mm.)

1 — Carton containing:-
1 off set insulated Flush Casings.

1 — Carton containing:-
Nu-Way C2 Burner.
1 off Flexible Oil Hose.
1 off Oil Filter.
1 off Burner Gasket.



BOILER DIMENSIONS

GENERAL DATA

BOILER

Cast iron sectional for use on INDIRECT systems only.
Factory assembled and hydraulic tested to 120 lbf/in.² (828 kPa).
Suitable for maximum working pressure of 60 lbf/in.² (414 kPa).

TAPPINGS

P.3 & P.5 Boiler	Return Bottom Rear.	2 in. B.S.P.T. (Tr)	All Boilers	High Limit Thermostat fitted
	Flow Top Rear.....	2 in. B.S.P.T. (Tr)		top front.....
P.4 Boiler	Return Bottom Rear.	2 in. B.S.P.T. (Tr)	Drain Cock Bottom Rear.	1 in. B.S.P.T. (Tr)
	Flow Top Horizontal,	2 in. B.S.P.T. (Tr)	Safety Valve Top Front	
	or Flow Top Vertical.	2 in. B.S.P.T. (Tr)	vertical connection....	¾ in. B.S.P.T. (Tr)

Note: When Boilers are installed in modular form it is not necessary to fit a safety valve to each Boiler. A common valve may be fitted providing it cannot be isolated from any of the Boilers it serves.

On P4 Boilers where the front vertical flow outlet connection is used, the safety valve should be fitted to the pipework.

Cleaning Access — Removable plate fitted by 4 off wing nuts to flue hood giving access to convection area of Boiler. Hinged burner mounting plate giving access to combustion chamber.

Pressure Drop

WATER

MODEL	FLOW RATE		PRESSURE DROP				
	g.p.m.	l/m	feet	in.	mm.	lbf/in. ²	kPa
P.3	18	82	1.5	18	457	0.65	4.4
P.4	24	109	2.5	30	762	1.1	7.6
P.5	29	132	4.0	48	1219	1.7	11.7

FLUE PASSAGE

MODEL	OVER FIRE DRAUGHT REQUIRED	PRESSURE DROP ACROSS BOILER	DRAUGHT REQUIRED AT BOILER OUTLET
P4 & P5	0.02 in. – 0.04 in. (0.5mm. – 1mm.) WG	0.10 in. (2.5mm.) WG	0.14 in. (3.5mm.) WG
P3	0.02 in. – 0.04 in. (0.5mm. – 1mm.) WG	0.06 in. (1.5mm.) WG	0.10 in. (2.5mm.) WG

Oil Burner

Nu-Way C2 suitable for 35 sec. Redwood No. 1 fuel oil.

P5	P4	P3
Nozzle Size: 3.0 gal/h.60° semi-solid.	2.5 gal/h.60° semi-solid.	2.0 gal/h.60° semi-solid
Pump Pressure: 130 lbf/in. ² (897 kPa).	130 lbf/in. ² (897 kPa).	135 lbf/in. ² (931 kPa)
Approximate weight: 28 lb. (12.7 kg).	28 lb. (12.7 kg).	28 lb. (12.7 kg)

Boiler

Water Content: 11.5 gal. (52 l.).	10.5 gal. (48 l.).	9.5 gal. (44 l.).
Heating Surface: 47 ft. ² (4.366 m ²).	40 ft. ² (3.716 m ²).	33 ft. ² (3.06 m ²).
Input Rating: 440000 BTU/h. (129 kW).	370000 BTU/h. (108 kW).	275000 BTU/h. (80.5 kW).

Electrical Loading Start Current 7.5A. Run Current 1.1A. (P4 & 5 only).

Thermostat Single High Limit auto re-set.

Target Wall Fitted to rear of combustion chamber to ensure good combustion and low smoke numbers.

Safety Controls The Oil Burner is fully sequenced and automatically shuts down in event of flame failure. It fully complies with BSS.799, Part 3.

Casing

Sheet steel, Grey stove enamelled with white facia, fully insulated.

TABLE 1

MODEL REF. PURBECK	No. OF MODULES	APPROX. OIL USAGE		OUTPUT		APPROX. INSTALLED WEIGHT INCLUDING BURNER		APPROX. DELIVERED WEIGHT. BOILER ONLY		RECOMMENDED CHIMNEY DIA.	
		g/hr.	l/hr.	x 1000 Btu/hr.	kW	lb.	kg	lb.	kg	in.	mm.
3	1	1.9	8.8	220	65	774	352	630	288	7	177
4	1	2.4	10.8	290	85	893	406	690	314	7	177
5	1	2.8	12.9	350	102	952	433	749	340	7	177
2/3	2	3.8	17.6	440	130	1548	704	1260	576	10	254
2/4	2	4.8	21.6	580	170	1790	812	1380	628	10	254
2/5	2	5.6	25.8	700	204	1910	866	1498	680	10	254
3/4	3	7.2	32.4	870	255	2680	1218	2070	942	12	304
3/5	3	8.4	38.7	1050	306	2860	1299	2247	1020	12	304
4/4	4	9.6	43.2	1160	340	3580	1624	2760	1256	12	304
4/5	4	11.2	51.6	1400	408	3810	1732	2996	1360	14	355
5/4	5	12.0	54.0	1450	425	4470	2030	3450	1570	14	355
5/5	5	14.0	64.5	1750	510	4760	2165	3745	1700	15	381
6/5	6	16.8	77.4	2100	612	5710	2598	4494	2040	16	406
7/5	7	19.6	90.3	2450	714	6660	3031	5243	2380	16	406
8/5	8	22.4	103.2	2800	816	7620	3464	5992	2720	18	457
9/5	9	25.2	116.1	3150	918	8570	3897	6741	3060	18	457

INSTALLATION RECOMMENDATIONS

1. All Boilers should be installed to B.S. Codes of Practice CP3002 Pt. 1, 1961.
2. Locate Boilers so that the length of ducting to chimney is kept to a minimum. The following minimum clearance from combustible materials must be maintained:—

Side, Rear and Top . . .	6 in. (152 mm.)	Front	24 in. (610 mm.) for servicing.
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3. Provide a good level floor capable of bearing the weight of Boiler being installed. (See Table 1). The base of the Boiler is water cooled and no further insulation is required other than specified by the Local Authority.
4. Adequate air for combustion must be provided by two openings in the Boiler room structure, one located at low level and one at high level. Allow between 30 & 40 in.² (19300 – 26000 mm.²) free area per 100,000 BTU's (29.3 kW) of Boiler input.
5. Provide 220–240 volt Single phase 50 c/s AC electrical supply, preferably through a double pole fused switchbox installed in the Boiler room. All electrical wiring to be in accordance with I.E.E. regulations.
6. The flue and horizontal ducting must be self-supporting. Under no circumstances should the weight of these components be taken by the flue hood.

7. Boiler Assembly

- (a) Mark floor area to show required position for Boiler.
- (b) Remove crate and manoeuvre Boiler on its wood pallet to the required position.
- (c) Remove wood pallet and set Boiler onto floor.
- (d) Fit flue hood and cover.
- (e) Check burner mounting door and refractory target wall are correctly fitted. The burner mounting door can be set to hinge either to the left or right.

Method of reversing hinge from left to right side.

1. Remove latch bolt.
 2. Remove door by sliding out hinge pins.
 3. Remove explosion door and frame, blanking plate and type label from door face.
 4. Remove refractory wedge by tapping out. Ensure that the main body of the refractory is not disturbed.
 5. Re-fit explosion door and frame in place of blanking plate, the refractory wedge and the blanking plate and type label in place of the door and frame.
 6. Fill space behind bracket with fire cement.
 7. Re-hang door on opposite hand.
 8. Replace latch bolt on opposite hand.
- (f) Connect water services and chimney ducting.

Note: On P4 Boilers, if the front horizontal flow outlet is utilised, the front casing panel **MUST** be fitted prior to the outlet piping.

Installer to supply and fit in the system, control thermostats, pressure relief valves, gauges and thermometers as required.

If the Boiler is to be installed with a connecting horizontal flue, where possible allow at least 24 in. (610 mm.) of vertical flue from the Boiler outlet before joining with the horizontal section. Ensure that the vertical section of the flue fits around the **OUTSIDE** of the spigot on top of the flue hood (7½ in.) (190 mm.) dia. and **NOT** inside, where it could penetrate into the hood and cause a restriction. A draught stabiliser should be supplied by the Installer and fitted into the chimney. On a multi Boiler installation only one stabiliser need be installed, provided it is of sufficient size, either at the base of the chimney, or in the dead end of the horizontal section of the duct.

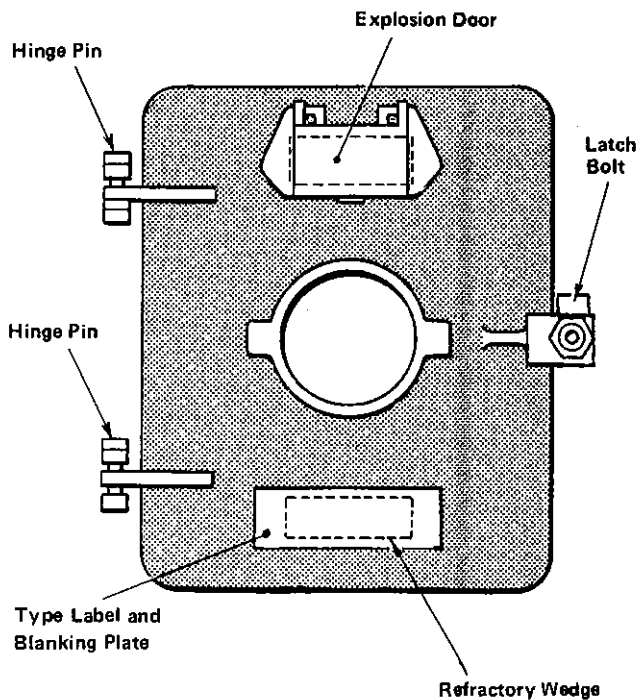


Fig. 9

BURNER MOUNTING DOOR DETAILS

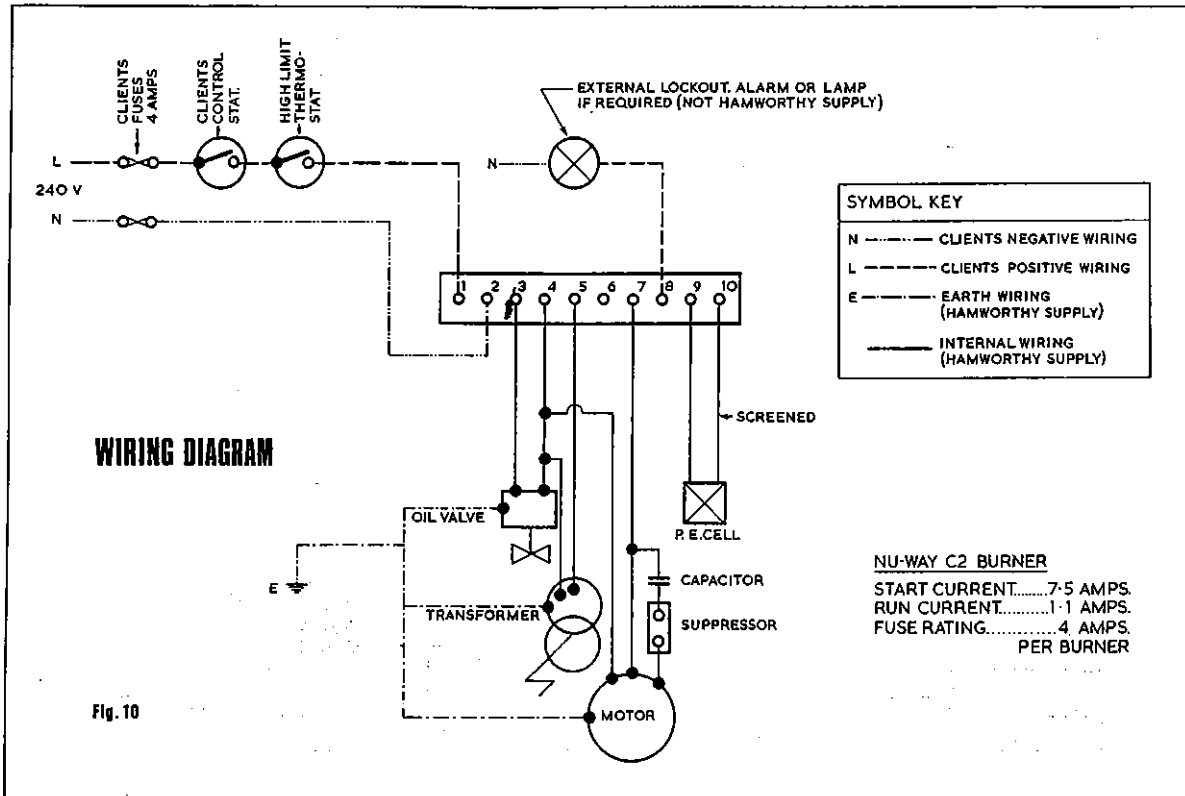
(g) Fit oil burner to mounting door with bolts and gasket provided.

(h) Connect oil pipework using filter and flexible hose provided. Care should be taken to ensure that the hose will 'flex' thus allowing the door to open without disconnecting the pipework. In all instances an isolating valve (not Hamworthy supply) should be

fitted between the main oil supply and the filter.

The oil pump is supplied for a single pipe system. When a two pipe system is required the pump must be adjusted according to the details attached to the oil burner.

(j) Connect electrics in accordance with wiring diagram shown below. Care should be taken to ensure that the incoming cables will 'flex', thus allowing the door to open without disconnecting wires.



(k) Fill system with water in accordance with standard practice. Check for leaks. If the Boiler feed water has a high degree of hardness it is recommended that the water be treated to prevent precipitation of the hardness as scale or sludge in the Boiler water passages. Details of additives can be obtained from any reliable manufacturer of water treatment chemicals or from the local Water Board.

However, it should be remembered that even if the Boiler water is of average hardness, not requiring treatment, subsequent draining of a system for repair, or constant make-up water due to an undetected leak

will cause fresh precipitation and gradual build-up of scale. It is essential therefore that leaks are attended to promptly, and draining is kept to an absolute minimum.

(l) Assemble casing around Boiler.

(m) Fit limit thermostat provided.

Note: On P4 Boilers, if the vertical flow outlet is utilised, the thermostat should be fitted to the top Boiler section by refitting the thermo pocket in the horizontal flow outlet connection using a 2 in. to 3/4 in. B.S.P.T. adaptor.

OIL SUPPLY

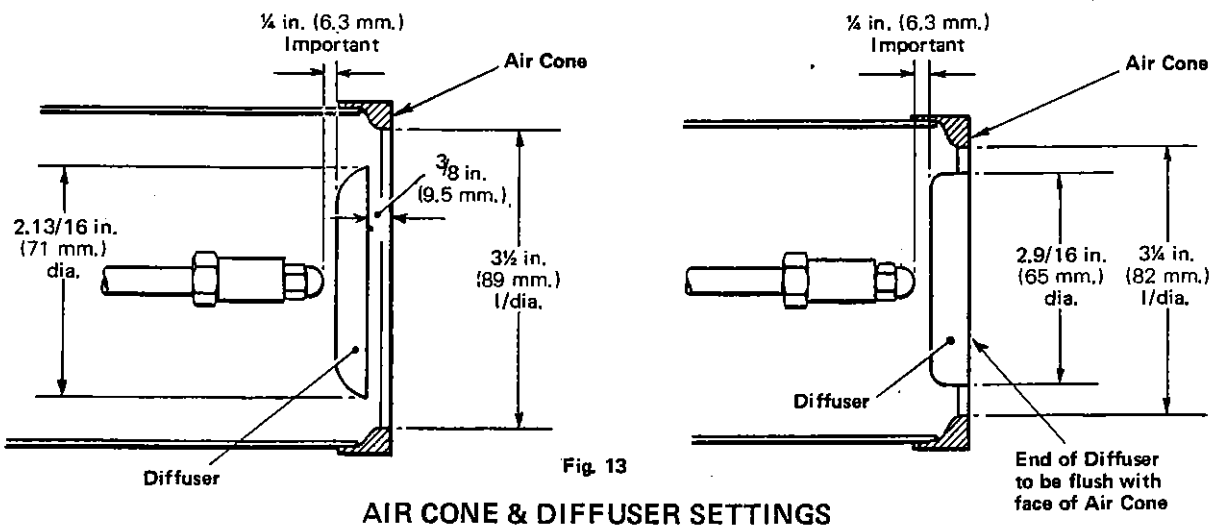
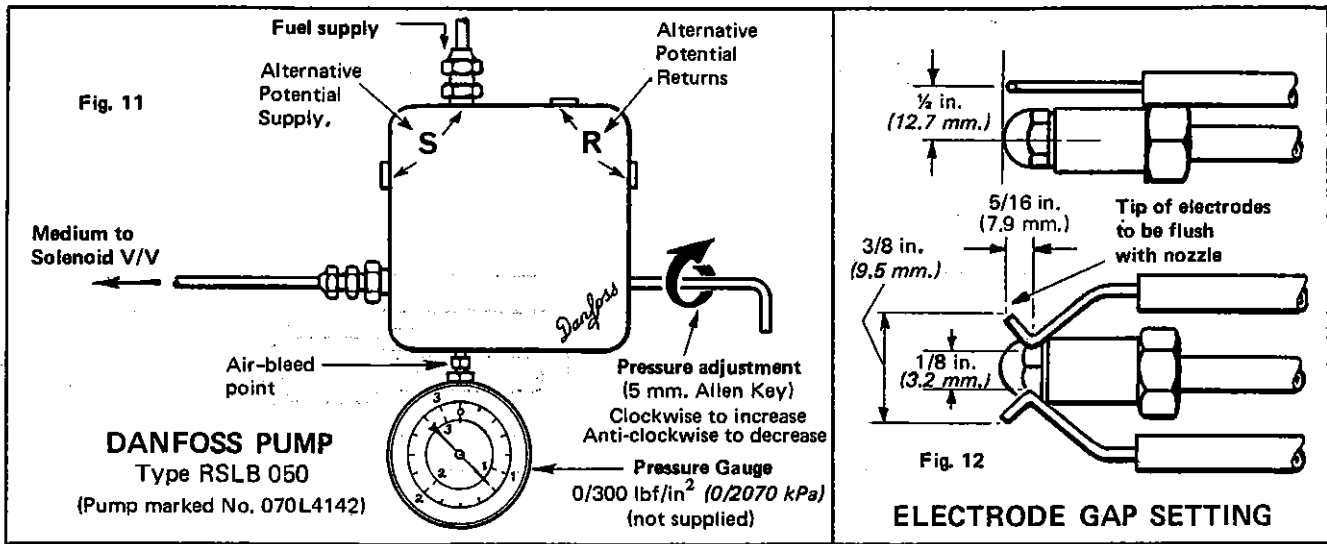
Wherever possible a single pipe gravity feed oil supply system should be installed.

In this case the base of the oil tank should not be below the centre line of the oil burner. Connecting oil pipework to the burner should be 3/8 in. (9.5 mm.) minimum and the length of pipework as short as possible. Care should be taken to ensure that no air locks can form and the minimum amount of bends should be used.

When the bottom of the oil tank is below the centre line of the burner, a two-pipe system should be used.

COMMISSIONING & LIGHTING-UP INSTRUCTIONS

1. Check that the Boiler and system are full of water by momentarily opening pressure relief valve and checking water flows from it.
2. Ensure isolating valves, if fitted, are open.
3. Turn on oil supply and bleed all air from the system. Air can be bled from the oil pump through the pressure gauge port and briefly running the burner motor. (See Fig. 11).
4. Fit oil pressure gauge with range of 0 – 300 lbf/in.² (2070 kPa) to pump. (See Fig. 11).
5. Remove burner inner assembly and check that the electrodes are set in the correct position. (See Fig. 12). Ensure correct nozzle is fitted to burner, and diffuser and air cone are positioned correctly. (See Fig. 13).
6. Set air damper to approximately one-third open.
7. Turn high limit and control thermostats to highest setting.
8. Switch on oil burner electric supply and burner should pre-purge and then ignite.
9. Adjust oil pressure on burner pump by means of adjusting screw. (See Fig. 11 and general data).
10. Adjust air damper on burner until a steady clean flame is burning. Ensure that there is no obstruction to the air inlet damper.
11. Switch off burner and remove pressure gauge.
12. Re-start burner and set control and limit stats to required setting.
13. Adjust draught stabiliser and air damper to give over-fire draught of 0.02 – 0.04 in. (0.5 – 1 mm.) WG. Set burner to give 0 – 1 smoke number (bacharach scale) and 10% CO₂ readings. It is important to ensure that the above smoke number is obtained and maintained throughout the life of the Boiler. Lock the air damper when satisfactory figures have been obtained.
14. Check all controls to ensure they operate correctly.



The C.2. burner may be supplied with } Diffuser Dia: (a) 2.13/16 in. (71 mm.) (b) 2.9/16 in. (65 mm.)
 either of the following combinations:- } Air Cone l/Dia: (a) 3/4 in. (89 mm.) (b) 3/4 in. (82 mm.)

Note: Their relative positions are different, and when size is established they should be located as shown above.

MAINTENANCE & CLEANING

1. **IMPORTANT** Switch off and isolate electric supply and oil supply to burner before attempting cleaning or maintenance.
2. Dust build-up on the Boiler casing and burner unit is undesirable. All components should be kept clean.
3. The nozzle on the oil burner should be replaced at the beginning of each heating season.
4. The oil filter should be cleaned every 3 months, and should immediately be checked if oil tank is allowed to run low. — Replace element at start of heating season.
5. The photo cell and electrodes should be cleaned at least every 2 weeks, and more if the Boilers are running constantly.
6. The Boiler should be inspected for accumulation of soot or other deposits at least once every 3 months. If the Boiler usage is high, this period should be reduced according to individual conditions. Soot should be removed by either brushing or by using an approved chemical cleaner in conjunction with brushing.

TO CLEAN THE BOILER THE FOLLOWING PROCEDURE SHOULD BE ADOPTED:-

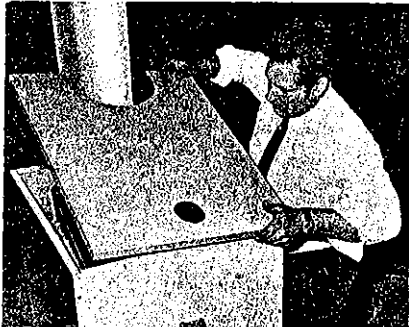


Fig. 14
Remove Top Casing Cover

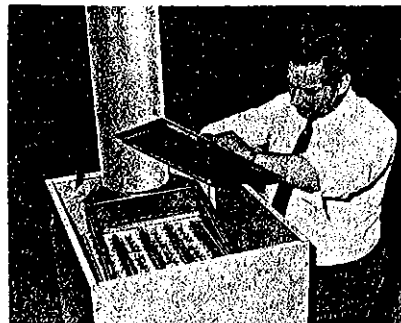


Fig. 15
Remove Flue Hood Cover

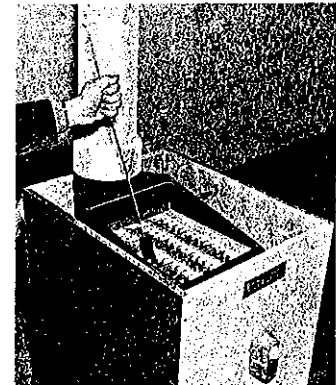


Fig. 16
Brush through Boiler sections using wire or fibre brush 1 in. (25 mm.) diameter bristle.

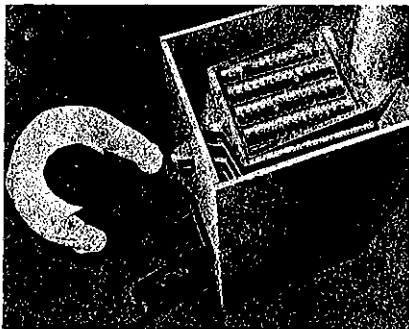
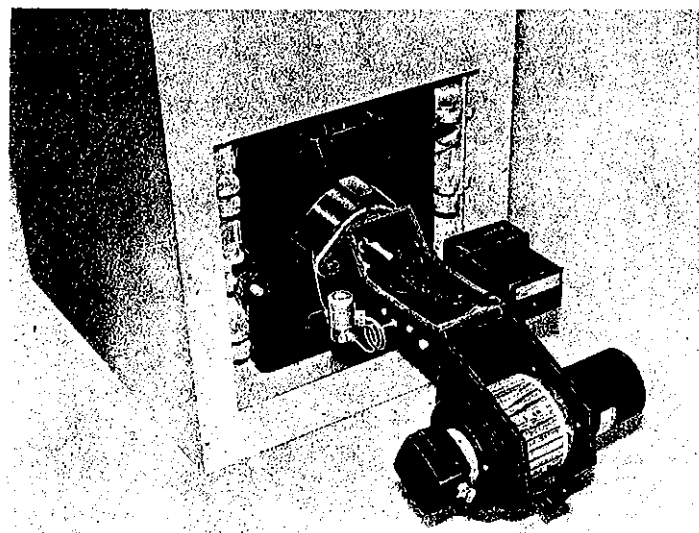


Fig. 17
Brush Base sections and Combustion Chamber and remove deposits

RE-ASSEMBLE ALL COMPONENTS

Fig. 18

The oil burner is designed for ease of maintenance. The fan housing can be hinged back to allow access to the internal components by removing fan-housing locking screw and disconnecting oil feed pipe from pump to nozzle. Failure to disconnect the oil feed pipe will cause fracture of the pipe.



Included in each burner packing carton is a wall chart giving details of routine burner maintenance.

OIL BURNER: Type C2

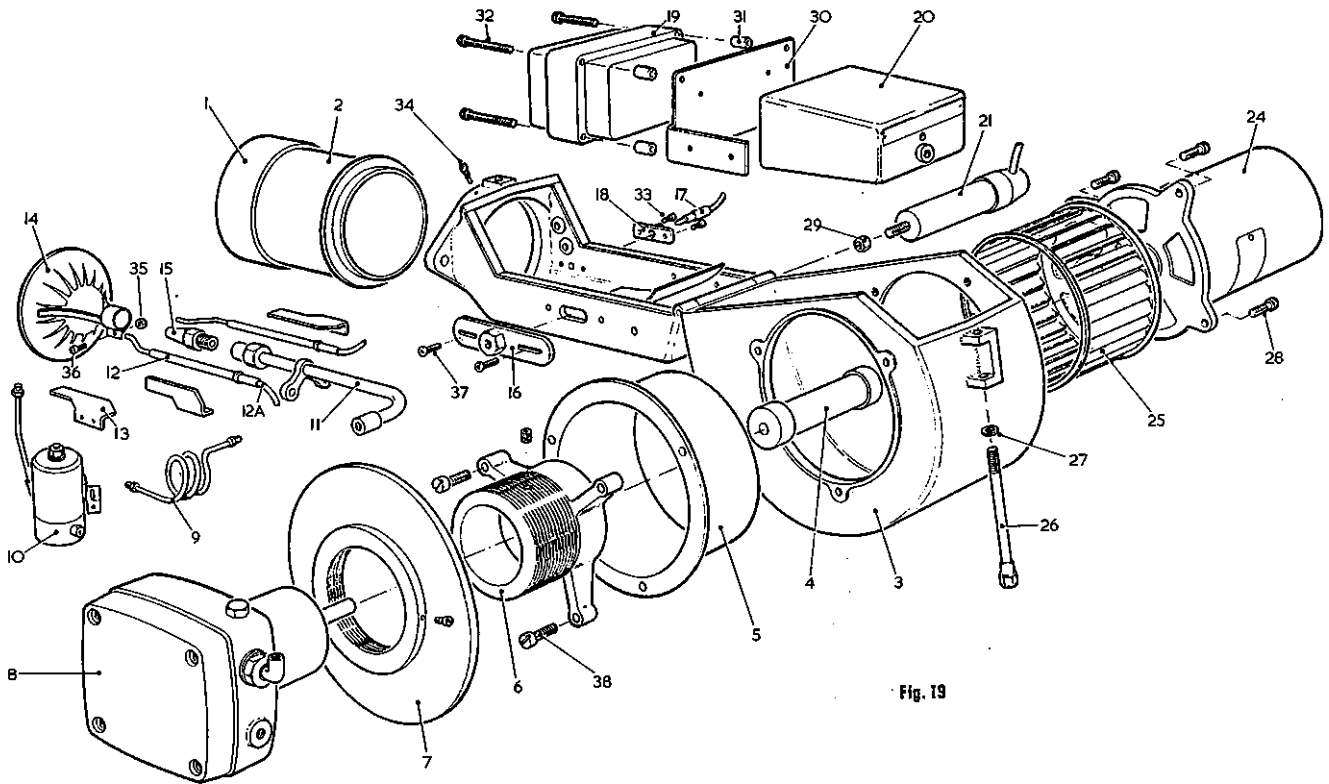


Fig. 19

C2. BURNER PARTS LIST.

Ref. No.	Description
1	Air Cone
2	Draught Tube 4-1/8 in. (105 mm.) o.d. x 3-9/16 in. (90 mm.) i.d.
3	Fan Case (complete)
4	Pump coupling 'Econo'.
5	Air inlet ring
6	Air inlet spider
7	Air Control disc
8	Pump Danfoss 070L 4240/RSLB05D
9	Oil feed pipe - 3/8 in. (9.5 mm.) bundy (c/w fitting)
10	Solenoid valve - Danfoss EVB/1.5
11	Inner nozzle assy. (complete with item 14)
12	Electrodes (PR) - 3/8 in. (9.5 mm.) dia. porcelain
12A	Electrode leads (pair) 200 mm. long including connectors.
13	Diffuser support brkt. (supplied only with item 2)
14	Diffuser 2-7/8 in. (73 mm.) dia. x 1-1/16 in. (27 mm.) hole.
15	Nozzle - size and angle see instruction book.
16	Inner assembly plate
17	P.E. Cell - type QRB-1.
18	P.E. Cell Brkt. type ORB-1.
19	Transformer - Parmeko 18M/A
20	Control Landis & Gyr LAB-1
21	Capacitor - 4 MF (with item 24)
24	Motor 1/5 H.P. (0.15 kW) 2 Pole 1 phase
25	Fan - 5 1/4 in. (133 mm.) dia. x 2-7/8 in. (73 mm.) wide x 8 mm. bore.
26	Casing - locking screw
27	Washer - 1/4 in. (6 mm.) bore
28	Motor fixing screws (6 mm. dia. x 15 mm. set of 3)
29	Capacitor nut (supplied with item 21)
30	Control mounting bracket
31	Transformer spacers (set of 4)
32	Transformer fixing screws 5 mm. x 40 mm. (set of 4)
33	P.E. Cell fixing screws (2 off) (3 mm. x 10 mm.)
34	Draught tube retaining screw (5 mm. x 15 mm.)
35	Nut 4BA.
36	Screw 4BA x 3/8 in. (9.5 mm.) LG. RD. HD.
37	Inner assembly retain screw (set of 2) 5 mm. x 10 mm. LG.
38	Pump spider screws (set of 3) (6 mm. x 15 mm. LG.)

All orders for spares should be accompanied by:-

1. Burner Serial No. which can be found on burner nameplate.
2. Burner Type No.

Replacement parts, when claimed under guarantee, are obtainable from Hamworthy Engineering Limited. Burner spares not under guarantee, should be obtained from Nu-way Heating Plant Ltd., Droitwich Works, Telephone, Droitwich 2331, or from the local O.B.C. stockist.

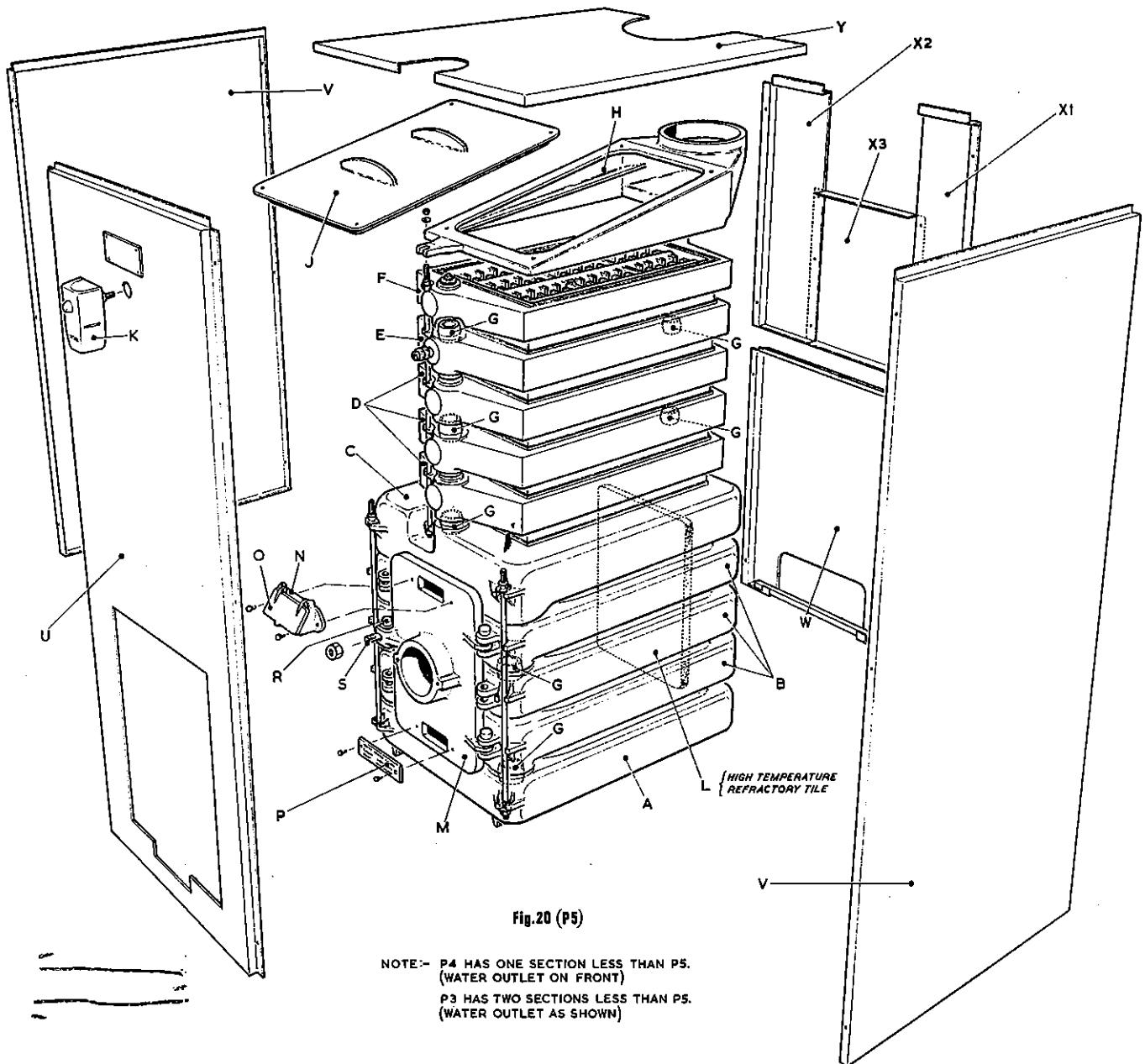


Fig.20 (P5)

NOTE:- P4 HAS ONE SECTION LESS THAN P5.
(WATER OUTLET ON FRONT)
P3 HAS TWO SECTIONS LESS THAN P5.
(WATER OUTLET AS SHOWN)

HAMWORTHY PURBECK PARTS LIST

REF.	NAME OF PART	PART No.	No. REQD. PER BOILER		
			P3	P4	P5
A	Wet Base	330899736	1	1	1
B	'U' Section	330899744	3	3	3
C	Make Up Section	330899751	1	1	1
D	Section Middle	330899447	2	2	3
E	Section Middle Thermo	330899835	-	1	-
E	Section Middle Thermo	330899488	-	-	1
F	Section Top	330898126	1	-	-
F	Section Top	330899777	-	1	-
F	Section Top	330899769	-	-	1
G	Nipple	330502033	9	10	11
H	Flue Hood	33005166	1	1	1
J	Flue Hood Cover	33005141	1	1	1
K	High Limit Thermostat	747433156	1	1	1
L	Target Wall	339903554	1	1	1
M	Burner Mounting Door	330890941	1	1	1

REF.	NAME OF PART	PART No.	No. REQD. PER BOILER		
			P3	P4	P5
N	Explosion Door Mounting Frame	324110124	1	1	1
O	Explosion Door	324120081	1	1	1
P	Blanking Plate	330812127	1	1	1
R	Pivot Pin	332015471	1	1	1
S	Banjo Bolt	331602279	1	1	1
U	Front Panel	330899546	1	1	1
V	Side Panel	330899561	2	2	2
W	Rear Base Panel	330899587	1	1	1
X.1	Rear Top Panel R.H.	330898068	1	1	1
X.2	Rear Top Panel L.H.	330898050	1	1	1
X.3	Upper Rear Cover Plate	330809248	-	1	1
Y	Top Panel	330899538	1	1	1
Z	Stiffener	332017048	1	1	1

All boiler component spares are obtainable from:

Hamworthy Engineering Limited, Combustion Division, Heating Department.
Fleets Corner · POOLE · Dorset · BH17 7LA · Telephone: Poole 5123.

HAMWORTHY CAN OFFER COMMISSIONING, AND BREAKDOWN SERVICES.

For Details, contact your local Hamworthy Office:-

POOLE	Fleets Corner, Poole, Dorset BH17 7LA	Telephone: 020-13-5123
LONDON & SOUTH EAST	Challenger House, 125 Gunnersbury Lane, Acton, London, W.3.	Telephone: 01-993-1133
MIDLANDS	Unit 12, Station Road, Coleshill Industrial Estate, Warks.	Telephone: 0675-62804
NORTH WEST	Unit B5, Bankfield Trading Estate, Sandy Lane, Stockport, Cheshire. SK5 7QL	Telephone: 061-480-0804
NORTH EAST	P.O. Box No. Wallsend, Northumberland, NE28 6QR	Telephone: 0632-629214/5
GLASGOW	163 St. Vincent Street, Glasgow, C.2.	Telephone: 041-221-0063
SOUTH WEST	1/3 Villiers Road, Bristol, BS5 011.	Telephone: 0272-556965

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