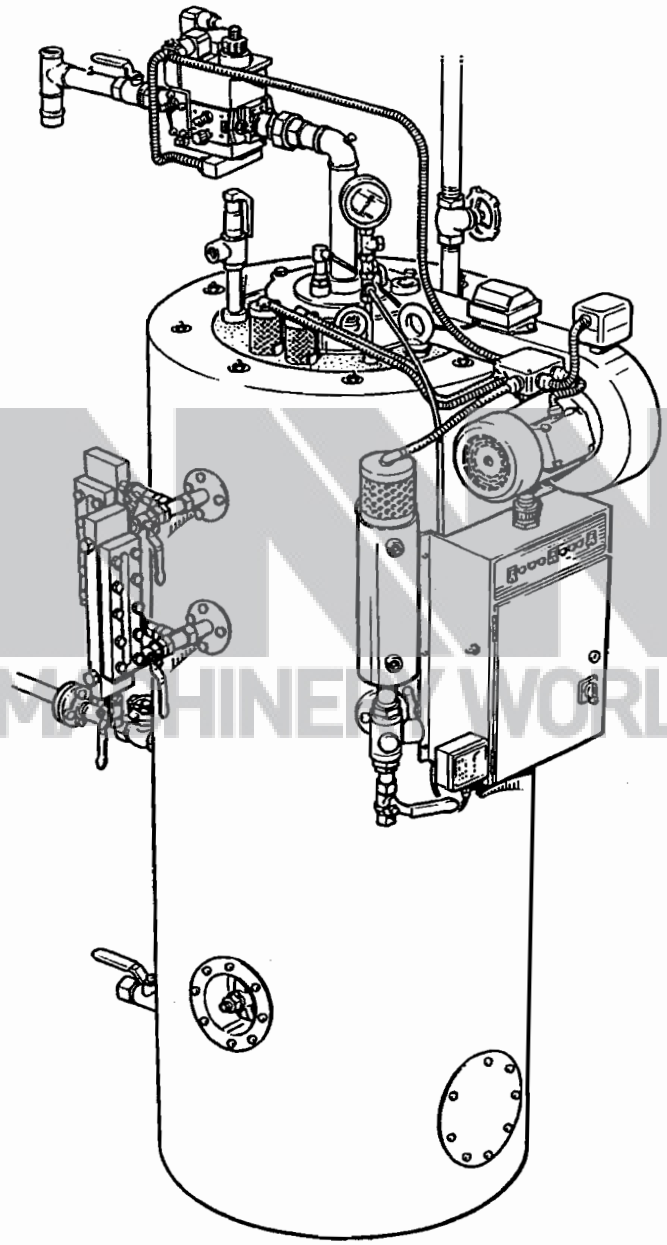
SERIES E - GAS FIRED STEAM BOILER

Fulton®

Fulton Boiler Works (Great Britain) Ltd.

OPERATOR, SERVICE & PARTS MANUAL



SERIES 'E' GAS FIRED STEAM BOILERS

⚠ WARNING

Steam Boilers are a potential hazard possibly fatal if not properly maintained.

CAUTION

It is vitally important that the instructions given in this manual are strictly adhered to.
Failure to carry out the daily, weekly, monthly and six monthly checks could result in a drastic reduction in the life expectancy of the boiler.

NOTE

The Pressure system and Transportable Gas Containers Regulations 1989

Fulton Boilers fall within the scope of the Pressure Systems Examination Scheme and Section 40 of the Health and Safety at Work in 1974.

Regular inspections are therefore required by a 'Competent Person' at intervals not exceeding 14 months.

The scope of the examination and the actual intervals between examinations is at the discretion of the competent person.

It is the responsibility of the user to provide a written scheme of examination for those parts of the system in which a defect may give rise to danger.

Instructions in this manual are provided for the safe operation and maintenance of the boiler and do not cover periodic statutory inspections.

For further information contact:-

(a) A.O.T.C. Associated Officers Technical Committee,
St. Mary Parsonage,
Manchester,
M60 9AP
Telephone:- 0161-8397038

(b) Health and Safety Executive local office.

(c) Your insurance company/broker

LIST OF CONTENTS

⚠ SAFETY

The instructions provided for the operation and maintenance of the boiler MUST be observed. Failure to do so could result in damage to the boiler and serious personal injury.

⚠ WARNING

It is the responsibility of the installer to ensure all parts supplied with the boiler are fitted in a correct and safe manor.

⚠ WARNING

Do not try to do repairs or any other maintenance work you do not understand. Get a Service Manual from Fulton or call a Fulton Service Engineer

⚠ WARNING

Understand the electrical circuit before connecting or disconnecting an electrical component. A wrong connection can cause injury and or damage.

⚠ WARNING

A defective boiler can injure you or others. Do not operate a boiler which is defective or has missing parts. Make sure that all maintenance procedures are completed before using the boiler.

⚠ CAUTION

Obey all laws and local regulations which affect you and your boiler.

⚠ WARNING

Do not change the boiler fuel without consulting the boiler manufacturer.

⚠ WARNING

Non-approved modifications can cause injury and damage. Contact your Fulton dealer before modifying the boiler.

⚠ WARNING

You can be injured if you use faulty lifting equipment. Make sure the lifting equipment is in good condition. Make sure that lifting tackle complies with all local regulations and is suitable for the job

⚠ WARNING

Operating the boiler beyond its design limits can damage the boiler, it can also be dangerous. Do not operate the boiler outside its limits. Do not try to upgradethe boiler performance by unapproved modifications.

SPARE PARTS

See index in Spare Parts Section

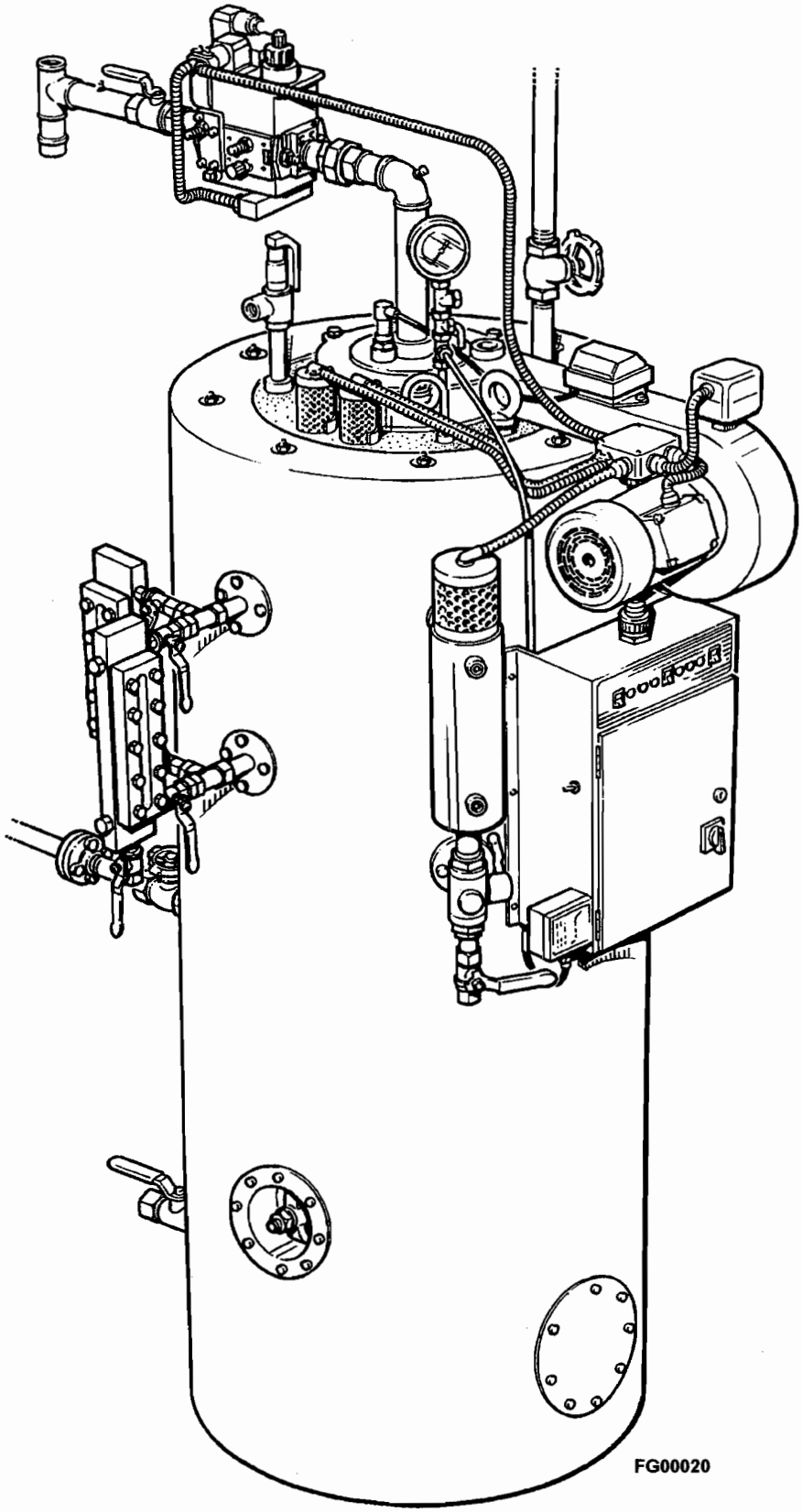


FIG.1 GAS FIRED STEAM BOILER

INTRODUCTION

SECTION 1

1.1 General (Fig. 1)

The Fulton Series E Gas Fired Steam Boiler is a vertical two pass boiler of simple and efficient design and construction. Every care has been taken in the manufacture of the boiler to ensure that quality and reliability standards are maintained. However, satisfactory performance can only be ensured if the installation recommendations, operating routines and maintenance schedules laid out in this manual are adhered to.

For Propane Boilers read **Section 2.19** before proceeding.

1.2 Technical Data

	BOILER MODEL								
	6E	**8E**	**10E**	**15E**	**20E**	**30E**	**40E**	**50E**	**60E**
Performance									
lb/h (F & A 100°C)	210	280	350	525	700	1050	1400	1750	2100
kg/h (F & A 100°C)	96	128	160	240	320	480	635	800	960
Firing Rates									
Approx. BTU input (000)	255	340	424	637	849	1273	1360	2121	2546
Natural Gas 1035 BTU									
cu.ft./h	246	328	410	615	820	1230	1700	2050	2461
cu.m/h	7	9.3	11.6	17.4	23.2	34.8	46.4	58.1	69.6
Electrical Requirements									
FLC (400V, 3ph, 50Hz) amps	4.7	4.7	4.7	4.7	4.9	4.9	6.9	6.9	8.6
FLC (230V, 1ph, 50Hz) amps	12.7	12.7	12.7	12.7	14.9	14.9	19.3	19.3	19.3
The full load current (flc) of the feed water pump motor can vary with the type and duty requirements of the pump supplied. The figures quoted above are given as a guide only.									
Miscellaneous									
Water Content (Imp Gal)	13	15	20	33	64	141	204	204	223
Water Content (Litres)	59	68	91	150	291	640	927	927	1022
Approx. Net Weight (lb)	1540	1590	1785	2130	3135	4480	6728	6728	6944
Approx. Net Weight (kg)	700	720	810	965	1420	2030	3050	3050	3150
Nat. Gas Head Pipe Size (in.)	1	1	1	1.25	1.25	1.5	2	2	2
Required Vertical Clearance (mm) (Floor to Ceiling)	2060	2160	2210	2365	2440	2745	2845	2845	3000

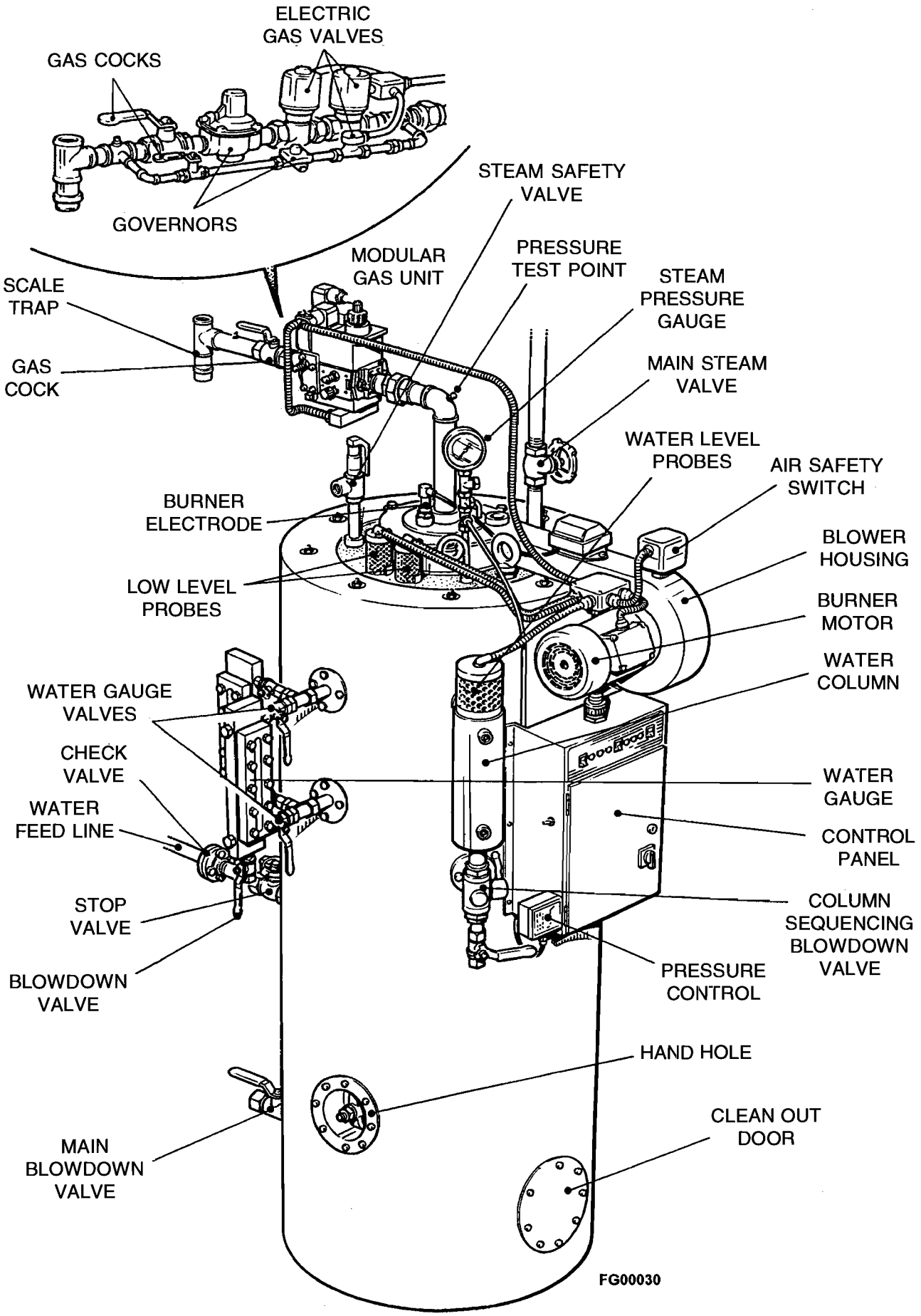


FIG. 2 GENERAL ARRANGEMENT

INSTALLATION

SECTION 2

2.1 GENERAL (Figs. 2 and 3)

The installation of a Series E Gas Fired Steam Boiler should be carried out by competent personnel in accordance with all relevant safety regulations. It is the responsibility of the installer to ensure that these regulations are complied with.

The requirements and instructions contained in this Section generally relate to the boilers being installed to operate on natural or manufactured gas. Where the boiler is to operate on L.P. Gas, special reference should be made to **Section 2.10 - Gas Supply**, and **Section 2.18 L.P. Gas Supply**.

2.2 SITING

The boiler house should be sufficiently large to allow easy and safe access to all parts of the boiler for operational and maintenance purposes. Reference should be made to **Section 5 - General Data** to ascertain the relevant dimensions and special note taken of the required vertical clearance.

The flooring must be level, laid in a non-combustible material and be of sufficient strength to support the boiler.

2.3 VENTILATION

Adequate fresh, clean air is necessary for safe and efficient combustion, and should be provided at high and low level in accordance with BS 6644 1991.

Note:

(a) Ensure there is adequate ventilation in the boiler room. Lack of ventilation will create a high temperature and cause control lockout.

(b) Do not keep exhaust fans running with windows, doors and vents closed, this will interfere with the necessary boiler draught.

(c) Do not store chemicals such as perclorethylene in the boiler house, the fumes may damage the boiler and flue and cause the burner to lock out on flame failure.

Boiler Model	6E	8E	10E	15E	20E	30E	40E	50E	60E
High Level (cm^2)	305	360	420	560	700	980	1260	1540	1820
Low Level (cm^2)	610	720	835	1115	1395	1960	2520	3085	3645

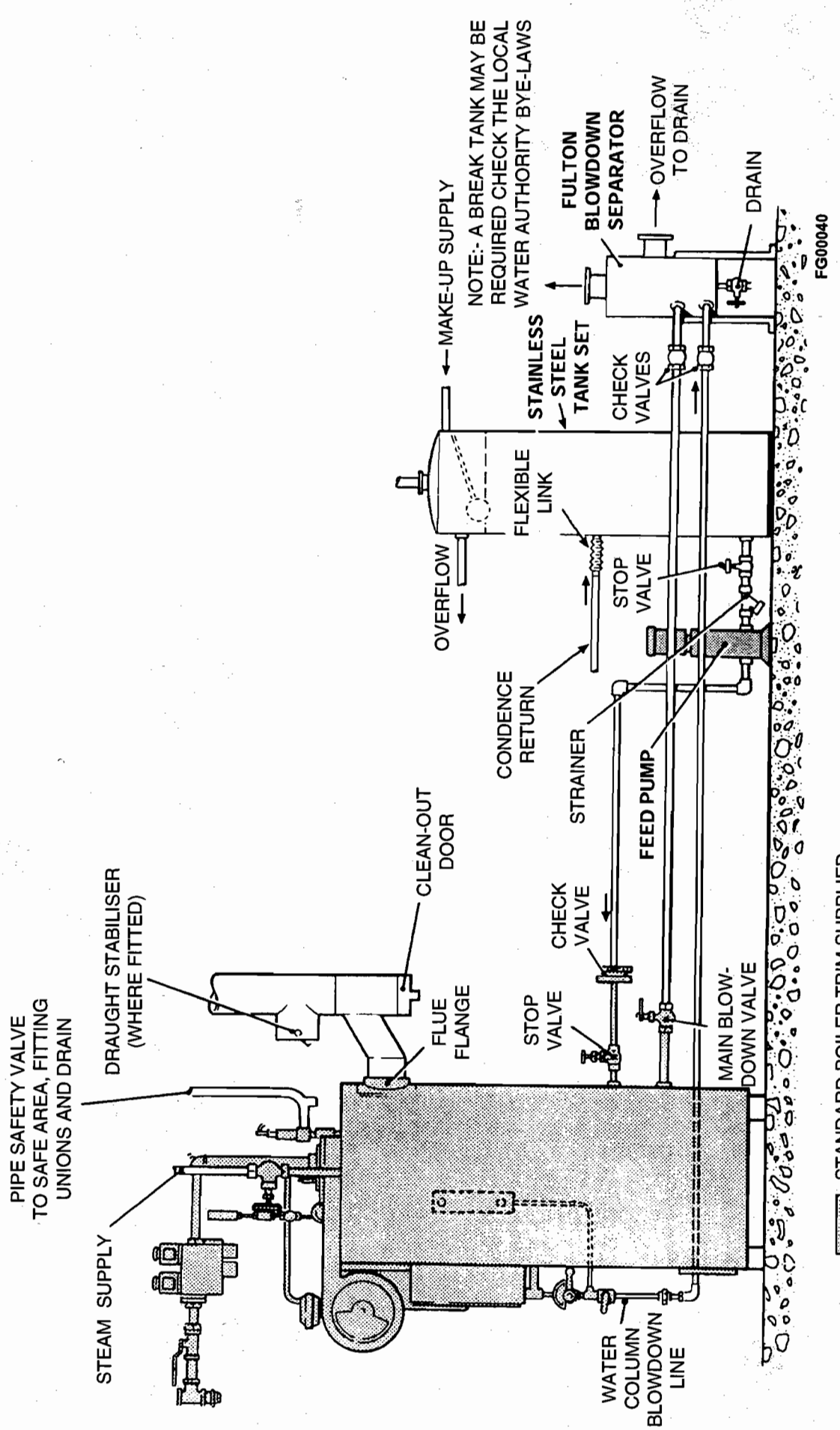


FIG.3 TYPICAL INSTALLATION

2.4 FLUE OUTLET

The height and type of flue will generally be subject to local planning regulations and approvals. The following information is intended to provide assistance where the installation of a simple flue is required. Where multi-boiler flues or difficulties are experienced, specialist advice should be obtained.

The flue diameter must be the same or larger than the flue flange provided with the boiler and the outlet should be at least 2ft (610 mm) higher than the nearest ridge to avoid down draughts. Where a chimney cowl is fitted, care should be taken to ensure that the cross sectional area of the outlet is equal to at least 1.5 times the cross sectional area of the flue, and that it is of the terminal cone type.

Note:

(a) *If the flue layout is such that it may produce an excessive up-draught, a draught stabiliser may be required.*

(b) *Avoid fitting 90deg. elbows whenever possible, if unavoidable compensate by increasing the flue diameter.*

(c) *Ensure all pipework from the boiler to the main flue has a rising pitch of not less than 15deg.*

2.5 WATER SUPPLY

The quality of the water used in the boiler will affect the life and performance of the boiler. It is strongly recommended that a reputable water treatment concern is consulted prior to commissioning the boiler. The following water conditions represent those which are considered essential in the boiler.

Total hardness of feedwater in terms of $CaCo_3$ (mg/L)	Max 2.
Caustic alkalinity of boiler water in terms of $CaCo_3$ (mg/L)	300 ppm max.
Total dissolved solids in boiler water (mg/L)	2000 ppm max.
PH value of boiler water	8 to 10.

Connect the feed water pump to the boiler with 1in. bore pipe and insert the stop valve and check valve supplied. It is essential to protect the feedwater pump from damage by foreign matter. A strainer should therefore be inserted in the pump suction pipework.

Note: 1 *The boiler feedwater pump may contain an inhibitor and this should be flushed from the pump prior to fitting the pump to the boiler. Failure to do so may result in water bounce or foaming due to the inhibitor forming a seal in the boiler.*

2 *If the boiler is to be operated with little or no condensate return, consideration should be given to pre-heating the feedwater. If in doubt consult Fulton Boiler Works.*

3 *The Feedwater inlet connection on some boilers is located on the left hand side of the boiler below the sight glass assembly.*

2.6 BLOWDOWN VALVES

There are three blowdown valves on the boiler (four if two water gauge sets are fitted), the main valve at the rear of the boiler, the water column blowdown valve and the water gauge blowdown valve. All of these valves must be connected to a blowdown receptacle of approved design. Regulations exist covering such items and care must be taken to ensure compliance with these regulations. If in doubt regarding blowdown arrangements, consult your Fulton agent.

2.7 MAIN STEAM VALVE

The main steam stop valve should be inserted in the steam line approximately 12in. (305 mm) from the top of the boiler.

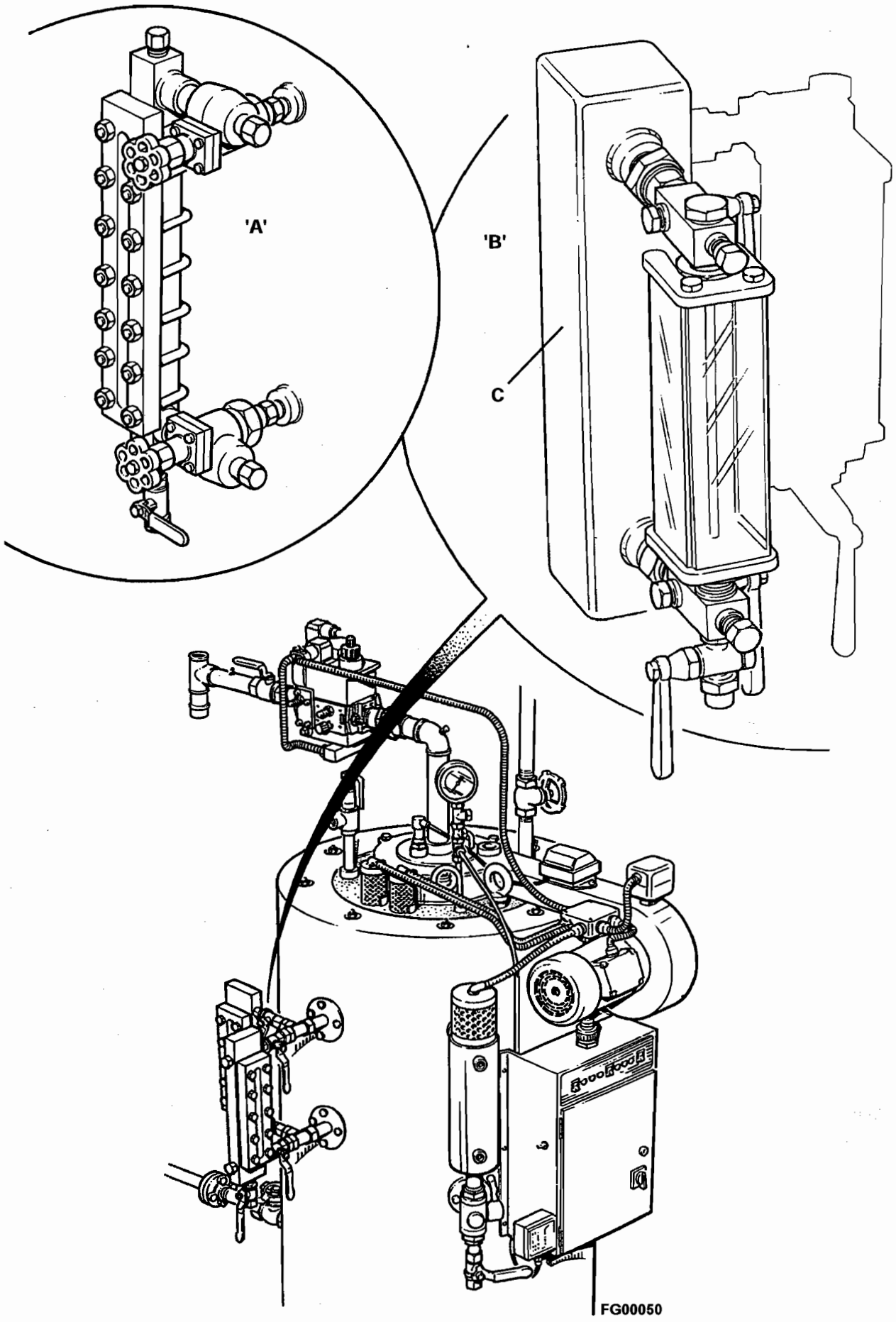


FIG 4 WATER GAUGE SET

2.8 STEAM SAFETY VALVES

Safety Valves are factory fitted and pre-set, they MUST NOT be adjusted. The discharge outlet should be piped to a safe discharge point and the piping so arranged that any condensate trapped in the pipework will drain away from the valve.

(a) The lift pressure is indicated on the safety valve. **(Do not adjust).**
(b) The safety valve fitted to the boiler is designed to prevent the boiler exceeding it's design pressure.
(c) Any system connected to the boiler not capable of accepting boiler pressure must be protected by a separate safety valve set to the required pressure.

⚠ WARNING

Factory fitted safety valves are pre-set to protect the boiler only and must not be used protect any other items !

2.9 WATER GAUGE SET (The design may vary from that illustrated)

Numbers may vary due to individual countries regulations.

Boiler models 6E - 8E are supplied with one complete water gauge set. This gauge should be fitted as illustrated in detail **'A' Fig. 4**. Boiler models 10E - 60E are supplied with two complete water gauge sets. These gauges should be fitted as shown in detail **'B'** and main view **Fig. 4**. The water gauge glass blowdown cock should be connected to the auxiliary blowdown line from the water column blowdown valve in soft copper tubing. The connection to the gauge cock is 1/8 in. BSP for conventional gauge glasses and 3/8 in. for reflex type gauges, (all connections female). Mounting manifolds **'C'** are only supplied for conventional tubular gauge glasses.

2.10 GAS SUPPLY

Verify that the burner is suitable for the type of gas being supplied. Ensure the piping from the meter is the correct size, and that a gas cock is inserted in the line between the boiler and the meter. To avoid pressure drops, eliminate all unnecessary bends and elbows in the pipework between the gas meter and the boiler. A scale trap is provided on the gas train and should be used.
Burners suitable for operation on natural and manufactured gas are supplied with gas trains or a modular gas head which are fitted with pressure regulating governors. No additional pressure regulating devices should be required. A minimum pressure of 7 in. (17.5 mb) water column is required at the gas train for natural gas installations and a minimum pressure of 5 in. (12.5 mb) water column is required at the gas train for manufactured gas installations.

Burners arranged for operation on L.P. gas are supplied with gas trains which include a pressure regulating governor. It is essential that the MAXIMUM pressure of the gas at the gas train does not exceed 32 in. (80 mb) water column and does not fall below 20 in. (50 mb) water column. To obtain these pressures a pressure regulating device or service governor must be fitted to the supply line from the storage tank to the boiler gas train.

2.11 ELECTRICAL REQUIREMENTS

An individual wiring diagram for the boiler is located on the inside cover of the control box. When referring to the electrical specification of the boiler, the reference number located on the rear inside wall of the control box and the wiring diagram number should be quoted.

The audible alarm bells supplied are mounted on the side of the control panel, if not audible they should be re-positioned where they can be heard by a person competent to take the appropriate action should the alarm be activated. Unless otherwise specified, the alarms supplied will be mains voltage models. Unless otherwise specified all models are supplied with burner motors and feed water pump motors arranged for operation on a three phase supply.
The power ratings and requirements are given in **Section 1.2 - Technical Data**.

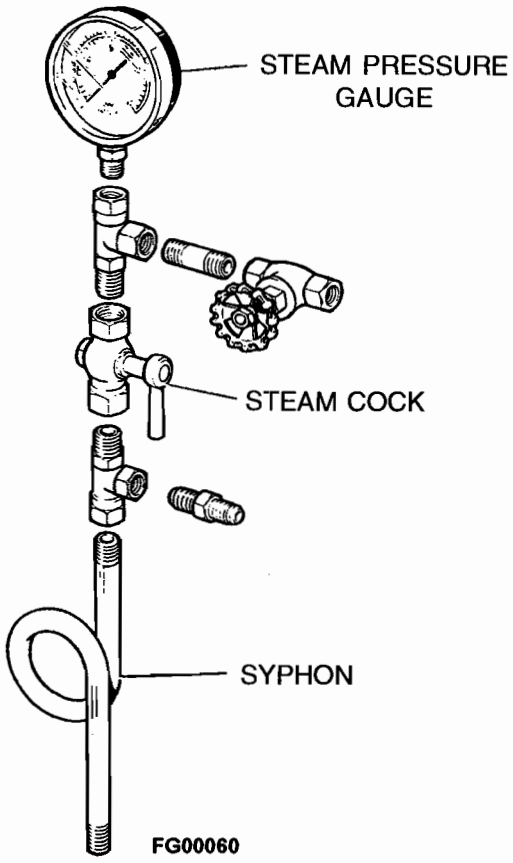


FIG. 5 STEAM PRESSURE GAUGE

2.12 STEAM PRESSURE GAUGE (Fig. 5)

The steam pressure gauge assembly should be assembled in accordance with **Fig. 5** using a suitable sealant on all joints.

Screw the assembly into the top of the boiler and connect the copper tube from the control panel box to the nipple provided on the assembly.

2.13 VENTILATION

(a) Ensure there is adequate ventilation in the boiler room. Inefficient ventilation will create a high temperature and cause control lock-out.

(b) Do not keep exhaust fans running with windows, doors and vents closed, this will interfere with the necessary boiler draught.

(c) Do not store volatile chemicals in the boiler house, the fumes may damage your health and affect the boiler and flue, causing the burner to lock out on flame failure.

2.14 BOILER FLUE

(a) Avoid fitting 90° elbows wherever possible, otherwise compensation by increasing the flue diameter may be necessary.

(b) Make sure that all flue pipes from the boiler to the main flue are at a rising pitch of 15° min.

(c) Make sure that the size of the flue is not less than the bore of the flange at the boiler.

2.15 PLUMBING

(a) Fit the check valve supplied, between the feedwater pump and the boiler.

(b) Ensure that the boiler is washed out after installation and before it is put into service.

(c) Conduct a feedwater analysis before operating the boiler.

2.16 COMMISSIONING THE BOILER (Fig. 7)

It is essential that the commissioning procedures listed below are carried out by a Fulton service engineer who will have the necessary experience and testing equipment to ensure that the installation is not only correct, but is operating at maximum efficiency.

INSPECTION

(a) Ensure the boiler has been washed out after installation.
Conduct a water analysis before operating the boiler.
Examine the probes in the water column and the boiler shell.
Replace any damaged probes.

(b) Remove the burner and check that the electrodes have not been damaged and that their setting corresponds to the appropriate drawing (refer to **Fig. 6**). If the burner is fitted with an ultra-violet scanner, remove the scanner and check for damage.

(c) Check that the burner is the correct type for use with the gas being supplied.

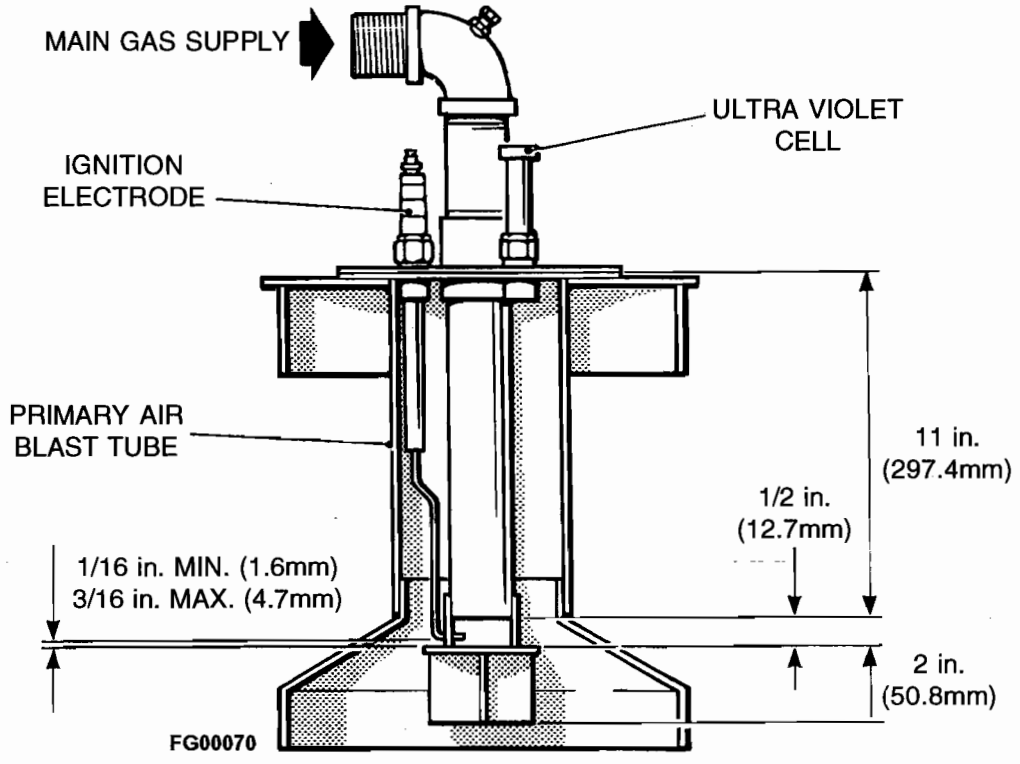


FIG. 6 BURNER ELECTRODE SETTINGS

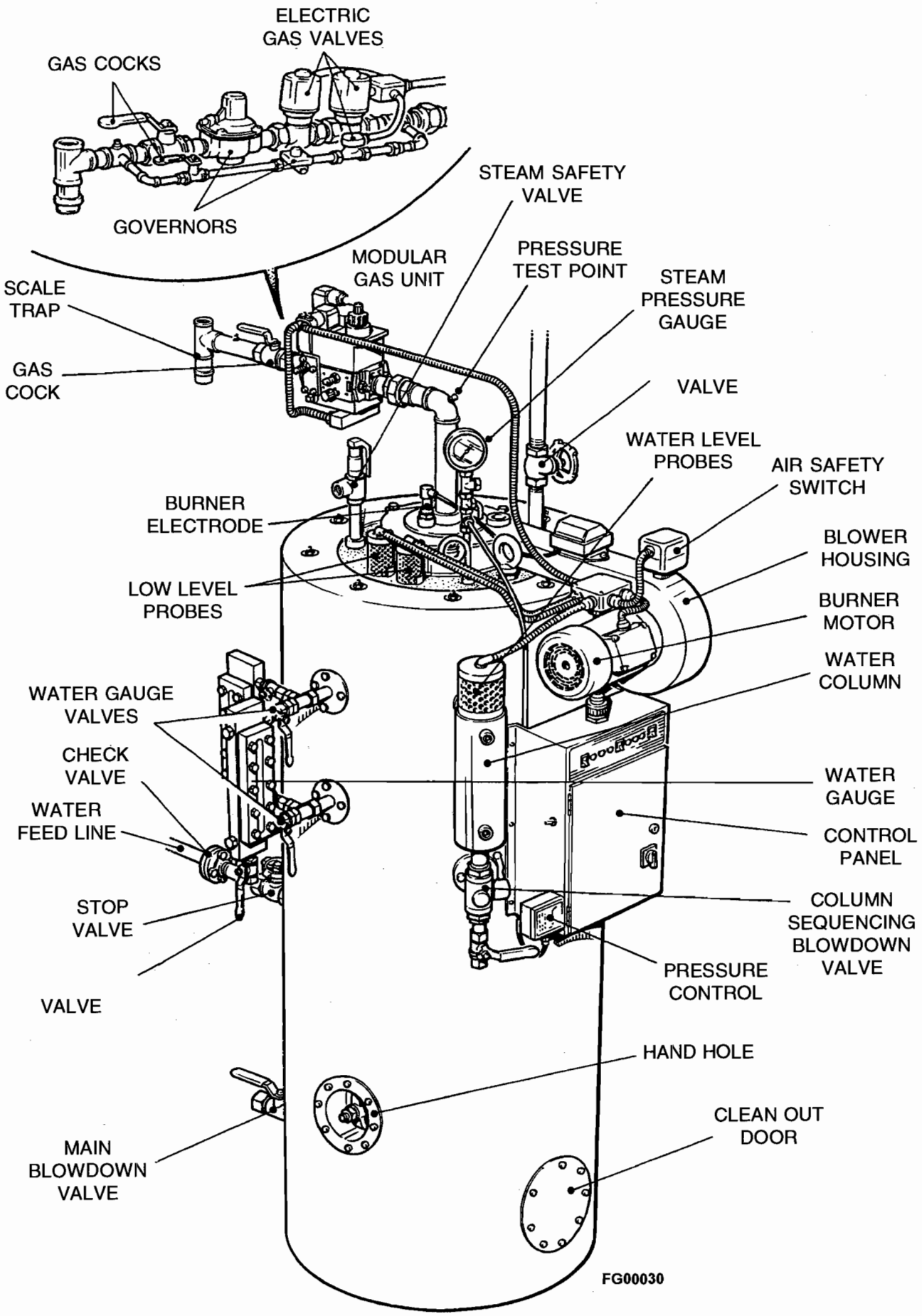


FIG. 7 COMMISSIONING THE BOILER

(d) Ensure that all wiring connections are correct and that all terminal screws are tight.

(e) Insert a micro-ammeter into the meter jack (if fitted) on the burner programmer. This task should be undertaken by a qualified service engineer.

(f) A barometric type draught stabiliser, if fitted in the flue, should be set for a draught of - 0.01 in. to 0.02 in. (0.025 mb to 0.05 mb) of water column pressure with the burner off.

(g) Open all the valves in the water feed line.
Switch on the feedwater pump motor and fill the boiler, see **Section 3 - Operation**.
The operation of the pump controls should be checked by using the boiler blowdown valve (located at the rear of the boiler). When the water sight level gauge is reading half full, the pump will stop. Open the boiler blowdown valve and slowly drain the boiler. When the water level falls below the PUMP ON probe, the pump should start. If the pump does not start check the probe connections. Close the boiler blowdown valve.

(h) After purging the gas lines of air, start the burner as detailed in **Section 3 - Operation**. Check the readings on the micro-ammeter for the pilot and main flames, adjusting the primary air control to obtain the maximum readings.

(j) Adjust the main air control gate to obtain a clean combustion.

(k) Observe the flame through the peephole between the electrodes and adjust the primary air control so that the flame cannot be seen 'backing up' the blast tube.

(l) Check the operation of the low water safety controls as detailed in **Section 3 - Operation**.

(m) Adjust the steam pressure control to suit the boiler application. It should be borne in mind that boilers are designed to operate most efficiently at their maximum operating pressure. When boilers are to be operated below a pressure of 80 psi (5.5 bar) consideration should be given to the fitting of a pressure reducing set. **See 2.8 Safety Valve setting**.

If the pressure control is fitted with a differential scale:

(i) Set the main scale to the maximum pressure required.

(ii) Set the differential scale to give the required pressure differential between the boiler cutting out and restarting. If the pressure control has a fixed differential, i.e. no adjustable differential scale, set the main scale to the maximum pressure required.

SETTING THE BURNER FOR LOW FIRE / HIGH FIRE, MODELS 50E AND 60E

The correct settings for low fire/high fire operation are obtained by making adjustments to the two stage solenoid valve (**Fig. 8**) and the low fire steam pressure switch.

(a) Set the gas input to the boiler for correct input on high fire. This should be done where possible by using the gas meter. Adjust the main air gate and top damper adjustment to obtain optimum combustion conditions.

(b) Adjust the low fire steam pressure switch to cut out at approximately 5 psi below the setting of the main steam pressure control (See **Section 2.16** (m)).

(c) Adjust the two-stage solenoid valve to obtain a low fire gas input of approximately 80% of high fire. Leave the air gate adjustments as for high fire.

(d) Refer to the adjusting procedure below on the two-stage solenoid valve.

TWO-STAGE SOLENOID VALVE ADJUSTING PROCEDURE (Fig. 8)

Low Fire

(a) Slacken the cheese-headed screw one turn.

(b) Rotate the hydraulic brake to set the required gas flow rate. Volumetric flow rate can be adjusted up to 40%. Clockwise rotation reduces the gas flow rate. Counter-clockwise rotation increases the gas flow rate.

(c) Retighten the cheese-headed screw.

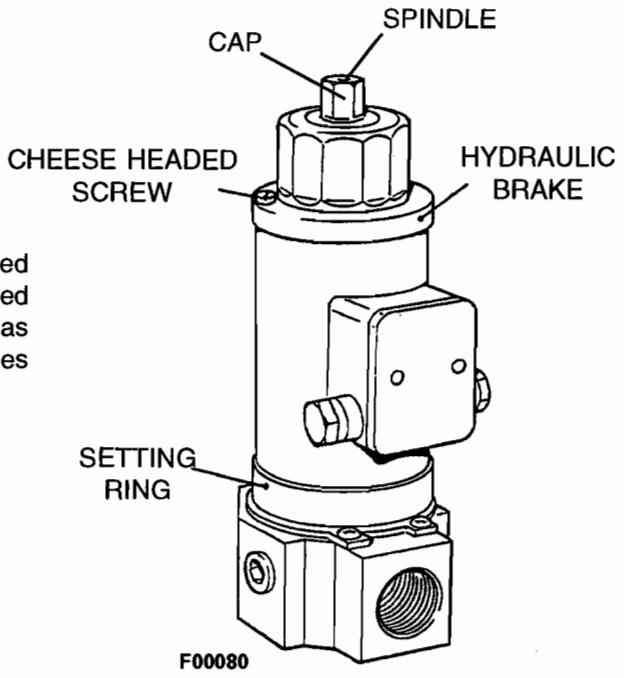


FIG. 8 TWO STAGE SOLENOID VALVE

High Fire

(a) Slacken the cheese-headed screw one turn.

(b) Rotate the setting ring, using a tommy bar in the holes, to set the gas flow rate. Clockwise rotation reduces the gas flow rate. Counter-clockwise rotation increases the gas flow rate.

(c) Retighten the cheese-headed screw.

Rapid Stroke

(a) Remove the cap.

(b) Using the cap in reverse, rotate the setting spindle. Clockwise rotation reduces the rapid stroke. Counter-clockwise rotation increases the rapid stroke.

(c) Replace the cap.

Compact Modular Gas Valve (fitted upto December 1996 - See TI 13)

Some models of the Gas Fired Boiler are fitted with a Compact Modular Gas Train comprising two valves activated by electrical solenoids.
The Start Gas valve is fitted with two solenoids identified **VS** for Start Gas and **V1** for Normal Running. The second valve has one solenoid identified **V1** and is fitted with a Gas Regulator.

Adjustments in gas flow are provided for Start Gas by an adjuster located under the cap on solenoid **VS** and for Normal Running by an external adjuster located on the Gas Regulator. System pressure can be tested by means of a test point provided in the Start Gas valve.

MONOBLOC GAS VALVES (FIG. 9)

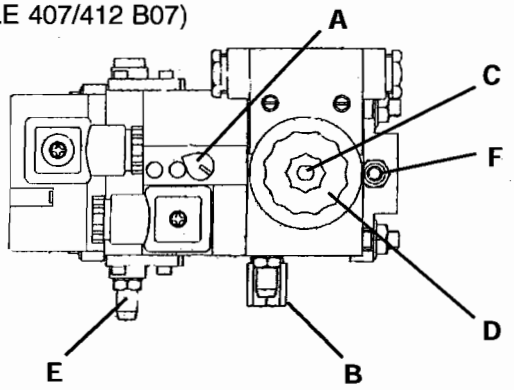
The Monoblock gas valve operates in two stages through two main shut-off valves:-

Stage 1. The first valve opens fully and the second valve opens slowly such that the maximum gas flow rate during the start gas proving period does not exceed 30% of the full firing rate.

Stage 2. The second valve is fully open.

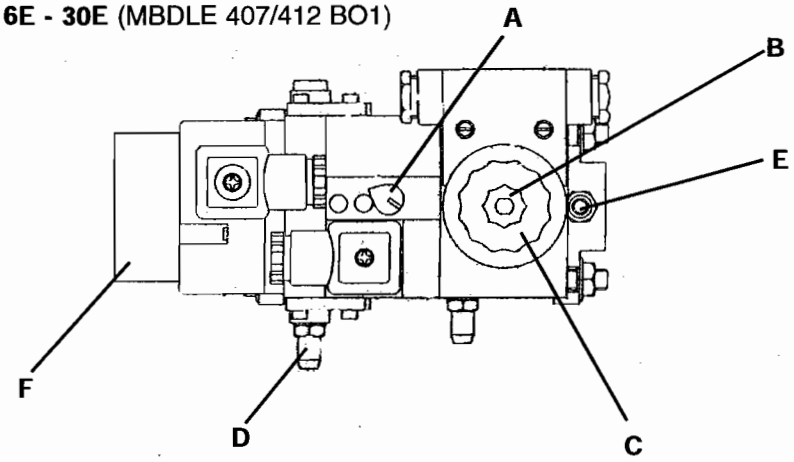
NOTE: *The time taken to open fully is set by the adjustment of the first and second stage initial lift adjuster.*

ADJUSTMENTS 6E - 30E (MBDLE 407/412 B07)



ADJUSTMENTS		ACTION
A	Main and Pilot Gas Governor.	Turn clockwise to increase gas pressure. Range 4 - 20 mbar.
B	Pilot gas range.	Turn anticlockwise to increase and clockwise to decrease rate.
C	First and second stage - initial lift adjuster, main gas valve.	
D	Main gas throughput	Slacken locking screw, turn fluted knob anticlockwise to increase, clockwise to decrease.
E	Gas supply test point	
F	Boiler side test point	

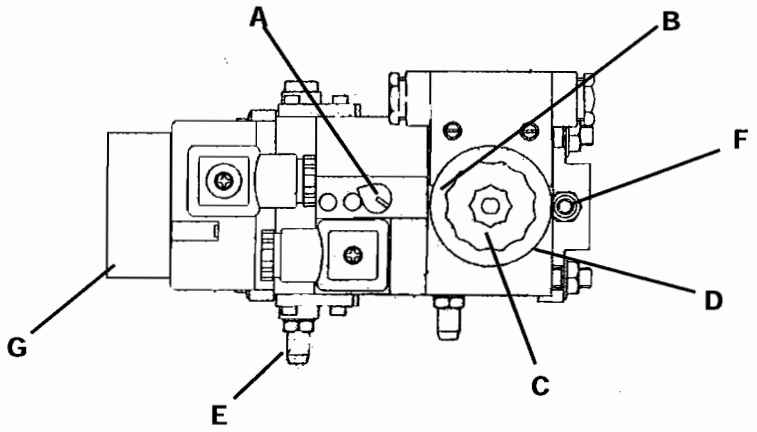
ADJUSTMENTS 6E - 30E (MBDLE 407/412 BO1)



ADJUSTMENTS		
A	Main and Pilot Gas Governor.	Turn clockwise to increase gas pressure. Range 4 - 20 mbar.
B	First and second stage - initial lift adjuster, main gas valve.	
C	Main gas throughput	Slacken locking screw, turn fluted knob anticlockwise to increase, clockwise to decrease.
D	Gas supply test point	
E	Boiler side test point	
F	Low gas pressure switch	

MONOBLOC GAS VALVES (FIG. 9) continued.

ADJUSTMENTS 40E - 60E (MBZRDLE 415/420 BO1)



ADJUSTMENTS		ACTION
A	Main Gas Governor.	Turn clockwise to increase gas pressure. Range 4 - 20 mbar.
B	First and second stage - initial lift adjuster, main gas valve.	
C	High flame throughput	Slacken locking screw, turn fluted knob anticlockwise to increase, clockwise to decrease.
D	Low flame throughput.	Turn fluted knob anticlockwise to increase, clockwise to decrease.
E	Gas supply test point	
F	Boiler side test point	
G	Low gas pressure switch	

2.17 CLEANING STEAM LINES AND PRESSURE VESSEL

During the first week of boiler operation, clean all oil and dirt from the boiler, steam line and condensate return pipe. To do this, carry out the following procedure:

(a) disconnect the condensate return pipe adjacent to the condensate return tank.

(b) Direct the returns to a floor drain or other safe discharge point and make safe.

(c) Leave in this position for one week to allow all impurities to flush through.

(d) Each day drain the boiler completely.

(e) After the week is completed, drain and flush the condensate return tank, removing all installation sediment. Reconnect the condensate return pipe to the condensate return tank.

L.P. GAS

2.18 GAS SUPPLY - PROPANE / BUTANE

WARNING

Do not change the boiler fuel without consulting the boiler manufacturer.

An L.P. gas boiler is similar in design to a natural gas boiler, the main differences are important and must be taken into account when installing the boiler and ordering spare parts.
When installing an L.P. gas boiler, the feed from the bulk tank supply must be fitted with a supply governor which is set to reduce the supply feed pressure to the boiler governor to 30 in. (80 mbar) Water Column or less.

For PROPANE:-The boiler governor must be adjusted to give a firing pressure of 10 in. (25 mb) water column at the test point provided at the elbow on the gas train.
For BUTANE:-The boiler governor must be adjusted to give a firing pressure of 8 in. (20 mb) water column at the test point provided at the elbow on the gas train.

Gas Pressure Alarm Indicator Light
For L.P.G. applications the inlet pressure switch is used to protect the system from over pressure and should be set at 100 mbar.

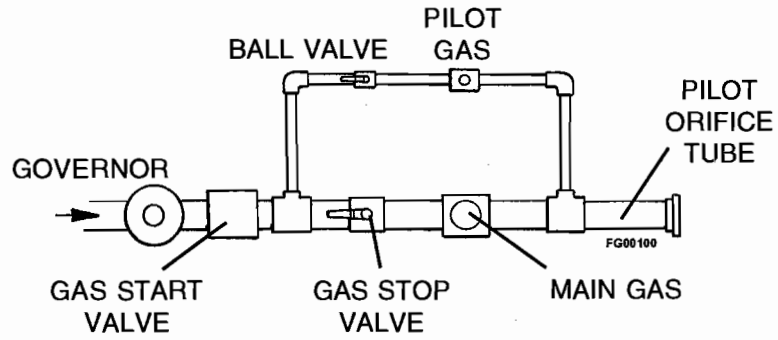
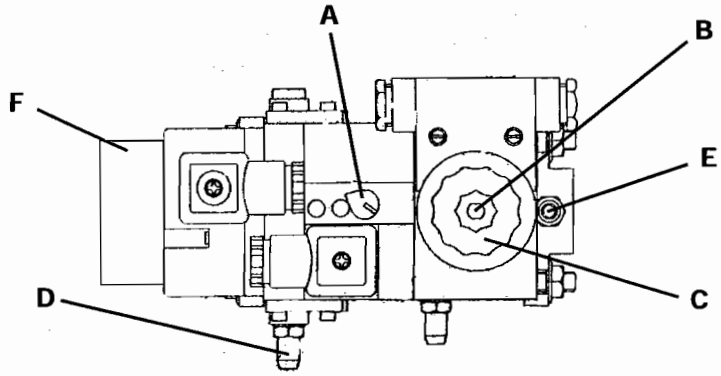


FIG. 10 L.P. GAS TRAIN

MONOBLOC ADJUSTMENTS LPG Boilers (MBZRDLE 405/412 BO1)



ADJUSTMENTS		ACTION
A	Main Gas Governor.	Turn clockwise to increase gas pressure. Range 4 - 50 mbar.
B	First and second stage - initial lift adjuster, main gas valve.	
C	Main gas throughput	Slacken locking screw, turn fluted knob anticlockwise to increase, clockwise to decrease.
D	Gas supply test point	
E	Boiler side test point	
F	High gas pressure switch	

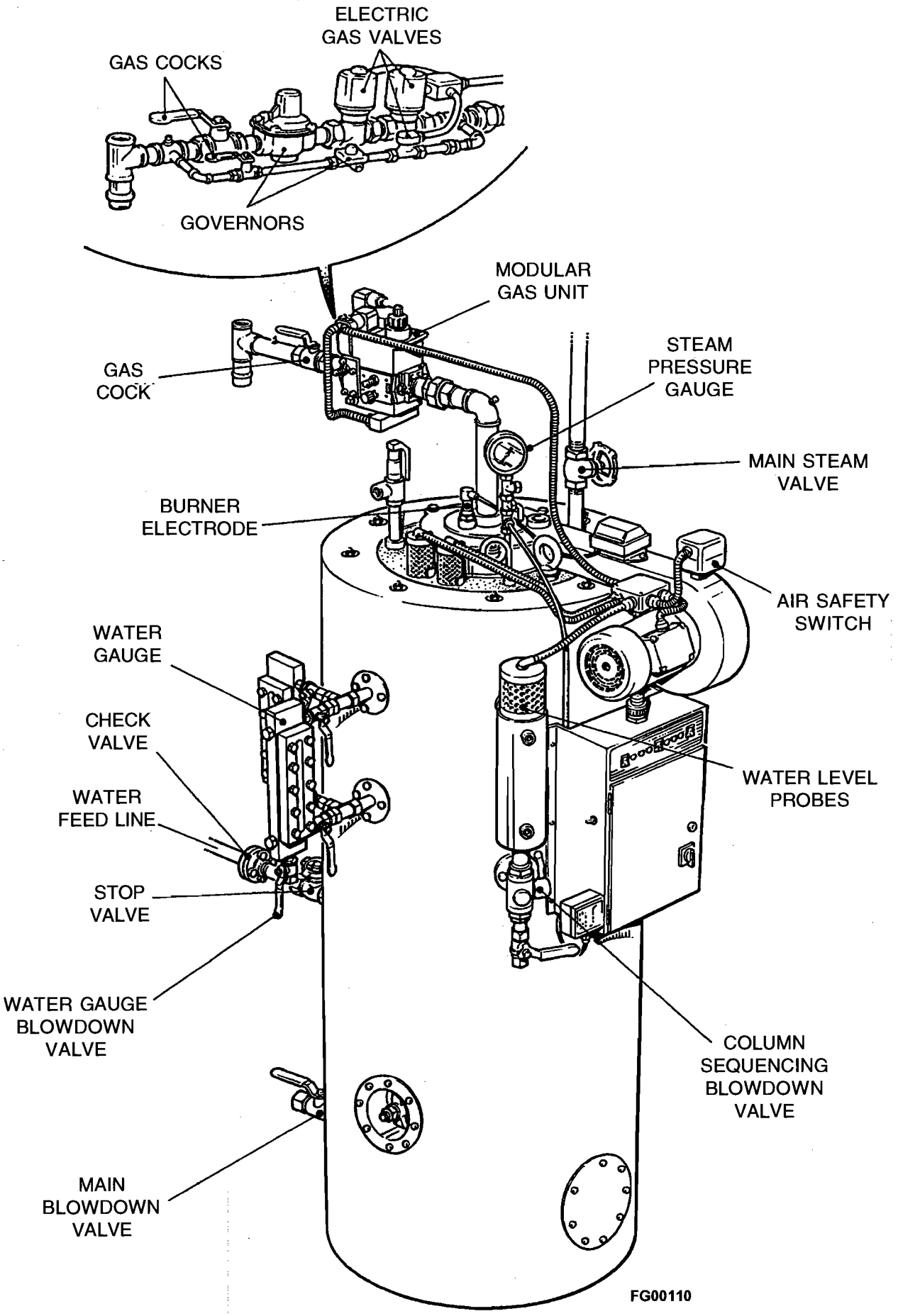


FIG. 11 BOILER OPERATION

OPERATION

SECTION 3

3.1 GENERAL

The following instructions are given for the guidance of the operator in the use of the Series 'E' gas fired boiler and to provide adequate information to ensure that when the boiler is put into use it will be done safely and without risk to health.
Where original equipment Service Manuals are supplied, they must be read and understood in conjunction with this manual. All Warnings and Cautions must be observed.

3.2 BOILER CONTROLS

The following brief description of the controls used on the Series E gas fired boiler is intended to provide the operator with a basic understanding of the operating principles, which is essential for the continued efficient operation of the boiler.

Note: *All the controls are of the 'fail-safe' type and are wired in series; failure of any one will automatically shut down the boiler.*

Low Water Safety Relays and Feedwater Pump Relays. These relays operate in conjunction with probes suspended in the boiler and water column to automatically maintain the level of the water in the boiler and to cut-off the burner should the water fall to an unsafe level.

Steam Pressure Control(s). Located on the control panel box and connected to the steam pressure gauge assembly by copper tube, the pressure regulator controls the on/off cycle of the burner, shutting the burner off when maximum pressure is reached and switching it on when the steam pressure falls.

Burner Programmer. This is the main control in the panel box. The programmer in conjunction with a sensing device 'supervises' the ignition sequence, proves the flame is satisfactory and finally 'monitors' the established flame. Should any fault occur, either during the ignition sequence or during normal running, the programmer will immediately go to 'lock-out' and both main and pilot gas valves will be closed.

Air Pressure Switch. Mounted on the burner scroll, this switch is operated by the pressure of air entering the burner through the throat of the scroll. Lack of air, or insufficient pressure, will prevent the switch completing the circuit thus preventing the burner from operating.

Gas Head Assembly. Consists of pilot and main gas supply lines, each line having a manual gas cock, a governor and electrically powered gas valves. The governors maintain a constant pressure of gas entering the burner and are adjustable. The electrically powered gas valves are controlled by the burner programmer.

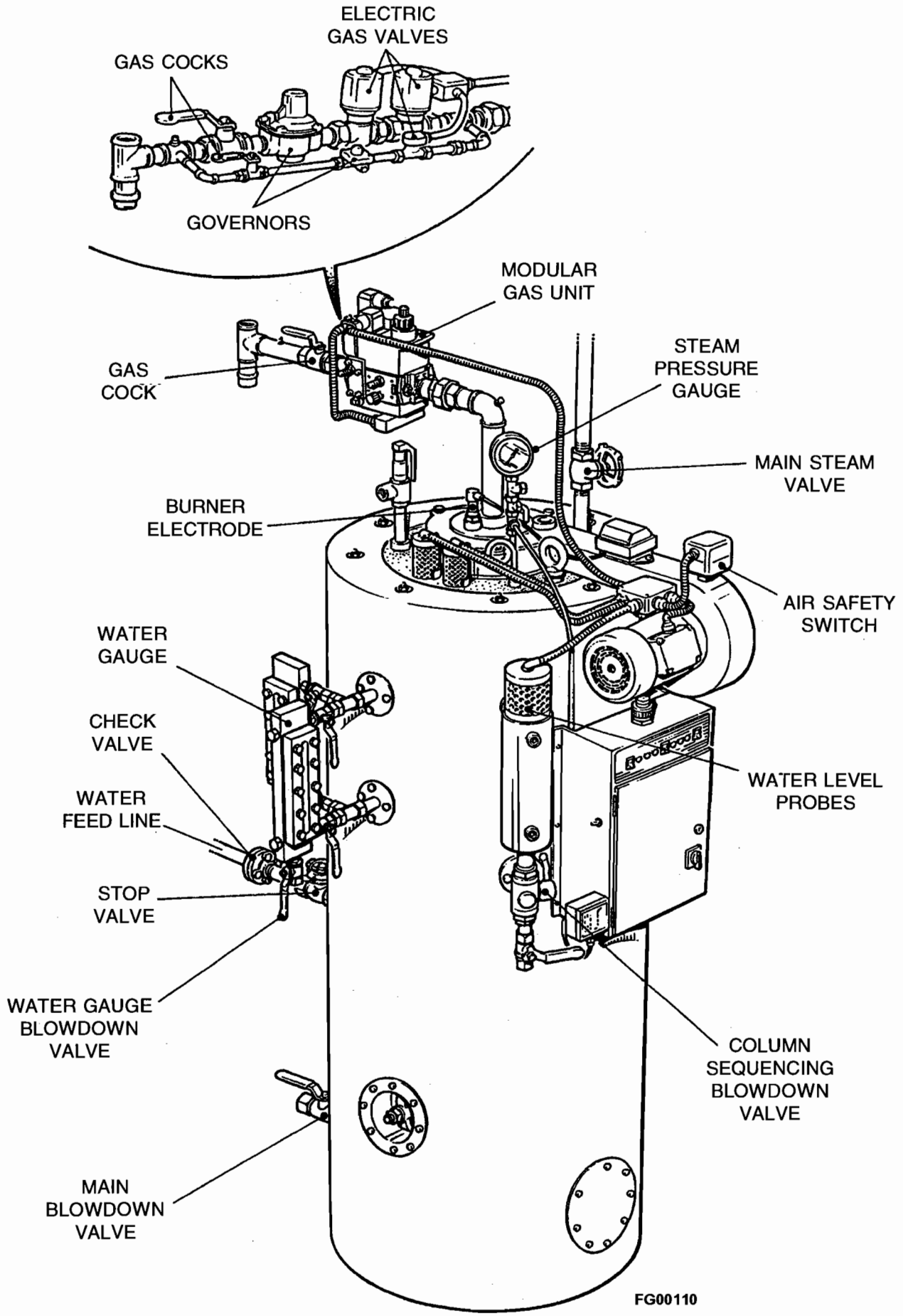


FIG.11 BOILER OPERATION

3.3 INDICATOR LIGHTS

Indicator lights are fitted to the control panel as an additional aid to the operator.
The meaning and operating sequence of these lights is as follows:

Start/Low Water Reset. This switch will be illuminated and the audible alarm will sound when the boiler is switched on following shutdown. The switch must be pressed to start the boiler. Should the switch be illuminated at any other time this, together with the audible alarm, indicates that the boiler has gone to a lock out due to a low water condition. The controls can be reset by pressing this switch once the water in the boiler has been restored to the safe operating level.

Circuit On. (Circuit Energised 40E - 60E) Indicates that power is being supplied to the control panel box.

Low Water Alarm. This light will be energised immediately the boiler is switched on. The low water reset switch must be pressed to cancel this. Should the light be energised at any other time it indicates that there is a low water condition in the boiler.

Ignition. Indicates that the ignition transformer has been energised. This light will only be illuminated for approximately 5 - 10 seconds during the ignition sequence.

Gas Pressure Alarm. This light will illuminate whenever the gas is off, or below minimum inlet pressure required by the European Standard for gas burners EN676.
This switch should normally be set to 10 - 0 mbar.

Main Gas. This light illuminates when the Monoblock gas valve is energised.

Flame Failure / Reset. This switch will be illuminated when the burner has gone to a lock out condition due to flame failure. The burner controller can be reset by pressing this switch.

Pump Overide Switch. Fitted on the left side of the control panel, used for switching off the pump during evaporation tests.

Combustion Air. This light indicates that the burner motor contactor is energised.

ADDITIONAL INDICATOR LIGHTS ON MODELS 40E AND 60E

Low Flame. This light indicates that the burner is operating in the low flame mode.

High Flame. This light indicates that the burner is operating in the full firing mode.

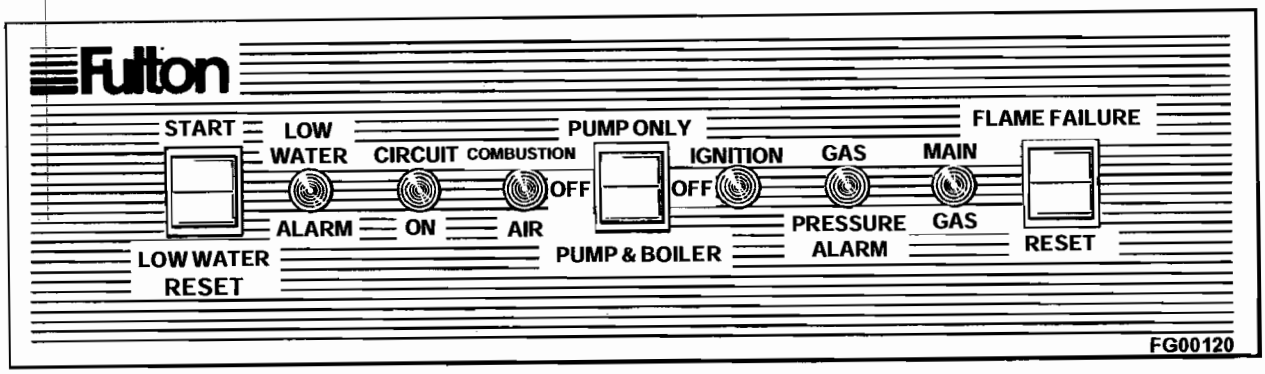


FIG . 12 CONTROL PANEL 6E / 30E

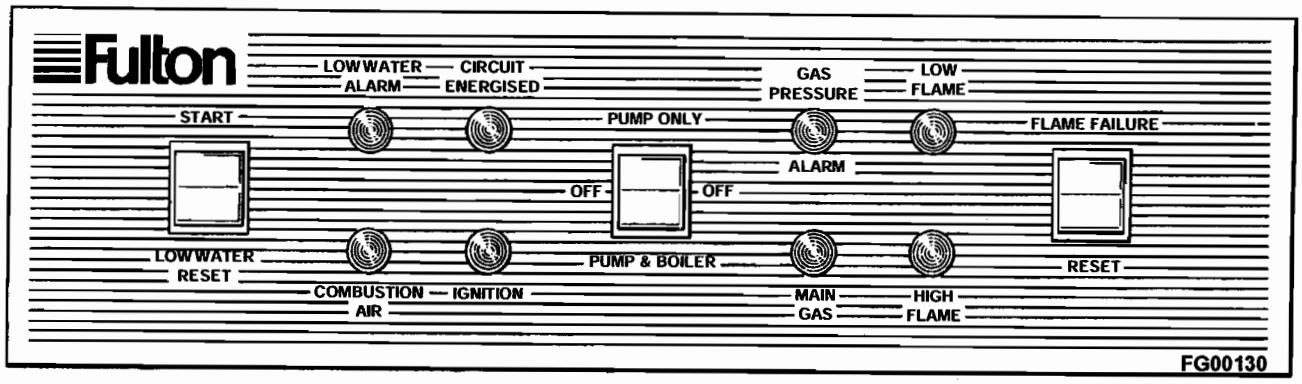


FIG. 13 CONTROL PANEL 40E / 60E

3.4 FILLING THE BOILER - ALL MODELS

Carry out the following procedure on the initial start up of the boiler and on every subsequent occasion when restarting the boiler after a shut down:

(a) Ensure the main steam stop valve is OPEN.

(b) Ensure the steam pressure gauge isolating valve is OPEN.

(c) Ensure all the valves in the main gas supply to the boiler are OPEN, including the manual gas cock(s) on the burner gas line.

(d) Ensure all the valves in the water feed line are OPEN.

(e) Ensure the main blowdown valve is CLOSED.

(f) Ensure water gauge isolating valve(s) is OPEN.

(g) Ensure water gauge blowdown valve(s) is CLOSED.

(h) Ensure column sequence valve lever is in the WORKING position.

(i) Ensure column blowdown valve is CLOSED.

(j) Ensure boiler electrical control switch is switched OFF.

(k) Ensure all appropriate electrical isolators are switched ON.

CAUTION

The feed pump seals are water cooled.
The pump must never be allowed to run whilst dry, irreparable damage may result.
Ensure the pump is fully primed before energising the motor.

(l) Depress the control switch to the PUMP ONLY position.

Note: *If the boiler water level is below its correct level, the water pump will operate. When the water reaches the correct level (half way up the water level gauge sight glass), the pump will stop. If the water level is above the top of the water level gauge sight glass, drain off until the level is in the middle of the water level gauge sight glass.*

3.5 STARTING THE BURNER

(a) CLOSE the steam stop valve.
(b) Depress the control switch to 'PUMP AND BOILER' position, the low water alarm bells will sound, the low water reset and low water alarm lights will illuminate.
(c) Depress the low water reset switch for two seconds maximum.
The alarms will stop, and the alarm lights extinguish.
The burner start sequence will commence.
(d) After a maximum of two minutes the burner should be firing, and the main gas light be ON.

3.6 DAILY OPERATING TESTS (3.6 - 3.7)

With the burner firing and the steam pressure gauge reading 5-10psi carry out the following checks.

Note: *Ensure that the water level is maintained during the pressure build up. If any part of the equipment is not operating correctly, the fault should be investigated before the boiler is used. Ensure that all blowdown pipework is safe and discharged to a blowdown receptacle.*

3.6.1. PUMP CHECK

With the burner firing and the pump not running lower the water level in the boiler by opening the main boiler blowdown valve.
As the water level falls, visable in the sight glass, and before the low water lock out position is reached the water pump should start to run. When this happens close the main boiler blowdown valve. The water pump should continue to run and re-fill the boiler to the correct level and stop.

3.6.2. 1st. LOW WATER LEVEL- 6E & 8E only

(a) Ensure the burner is firing, the water level is correct in the boiler and the water pump is not running.

(b) Move the column sequence valve lever to the blowdown column position.

(c) OPEN the column blowdown valve to drain the column.
After a few seconds the 1st low water alarm should illuminate, the alarm bell should sound and the burner stop firing.

(d) CLOSE the column blowdown valve and move the column sequence valve to the working position.

After a few seconds the low water alarm will stop sounding, the low water alarm light will go out and the burner start sequence will re-start automatically.
After a delay of approximately 1 minute the burner should be firing.

Note:
It is normal for the pump contactor to operate or chatter during this operation.

3.6.3. Overriding Low Water Check - 6E & 8E.

Before carrying out this check ensure that the burner is firing, the water level is correct in the boiler and the water pump is not running.

(a) Move the column sequencing valve to the blowdown leg position.

(b) OPEN the column blowdown valve

(c) As the water level nearsthe bottom of the gauge glass, the alarm will sound, the low water alarm and low water reset lights will illuminate and the burner stop firing. When this happens CLOSE the column blowdown valve and move the column sequencing valve lever to the working position.

(d) The water pump should now start to refill the boiler to its correct level and then stop.

(e) The alarm bells should continue to sound, the alarm lights should stay on and the burner should NOT restart automatically.

(f) When the water level is correct and the water pump stopped the boiler can be restarted by depressing the low water reset switch for a maximum of 2 seconds.

3.6.4. 1st. Low Water Check - 10E - 60E

(a) Ensure the burner is firing, the water level is correct in the boiler and the water pump is not running.

(b) Move the column sequencing lever to the blowdown leg position.

(c) OPEN the column blowdown valve.

(d) When the water level nears the bottom of the gauge glass the low water alarm will sound, the alarm light will illuminate and the burner will stop firing. When this happens CLOSE the column blowdown valve immediately.

(e) Move the column sequencing valve to the working position.
The pump should run and refill the boiler, when the water level in the boiler is above the 1st. low water level, the low level water light will go out, the alarm will stop sounding and the burner start sequence will commence automatically.
The pump will run until the boiler water level is correct, and stop.

3.6.5. Overriding Low Water Check - 10E - 60E.

Before carrying out this check ensure that the burner is firing, the water level is correct in the boiler and the water pump is not running.

(a) Move the column sequencing valve lever to the blowdown leg position.

(b) OPEN the column blowdown valve.

(c) When the water level nears the bottom of the gauge glass the low water alarm light will illuminate, the alarm will sound and the burner stop firing.

(d) When this happens continue to blowdown and as the water level falls nearer the bottom of the gauge glass the low water reset light will illuminate and the 2nd. low water alarm bell will sound.

(e) CLOSE the column blowdown valve and move the column sequence valve lever back to the working position.

The water pump should now start to run and refill the boiler to the correct level and stop, the alarm will continue to sound, the alarm light should stay on and the burner should NOT restart.

When the level of water in the boiler is correct the burner can be restarted by depressing the low water reset switch for a maximum of 2 seconds.

3.7 BLOWDOWN PROCEDURES (DAILY TEST)

(See note).
Keep the boiler, water gauge, water column and interconnecting pipework free from sludge and scale build-up by blowing down in the following manner:

(a) Start the boiler and generate not more than 10psi of steam.
(b) Shut off both the burner and the pump.

Boiler Blowdown

(a) Fully OPEN the boiler main blowdown valve for not more than 10 seconds.
(b) CLOSE the valve.

Water Column Blowdown (FIG 14)

(a) Move the lever on the column sequencing valve to the blowdown column position **A.**
(b) OPEN the ball valve **B** in the water column, close after 5 seconds.
(c) Move the lever a further 90° to the blowdown leg position **C.**
(d) OPEN the ball valve **B**, close after 5 seconds.
(e) Return the lever to its working position **D** by moving it 180° to the right.

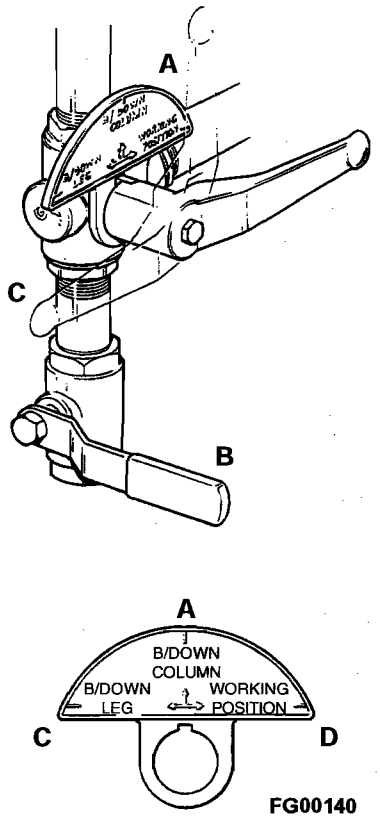


FIG. 14 BLOWDOWN SEQUENCE

Water Gauge Blowdown (FIGS 14A, 14B)

Lever Type

(a) Blowdown the water gauge set by opening the gauge glass blowdown valve **A** and closing the top and bottom gauge valves **B** and **C** in sequence.

(b) Where a Boiler is operating continuously at steam pressure or using water treatment additives, advice should be taken from a Fulton agent as to the appropriate blowdown procedure.

On completion of the blowdown procedure ensure that all isolation valves are OPEN and all blowdown valves CLOSED.

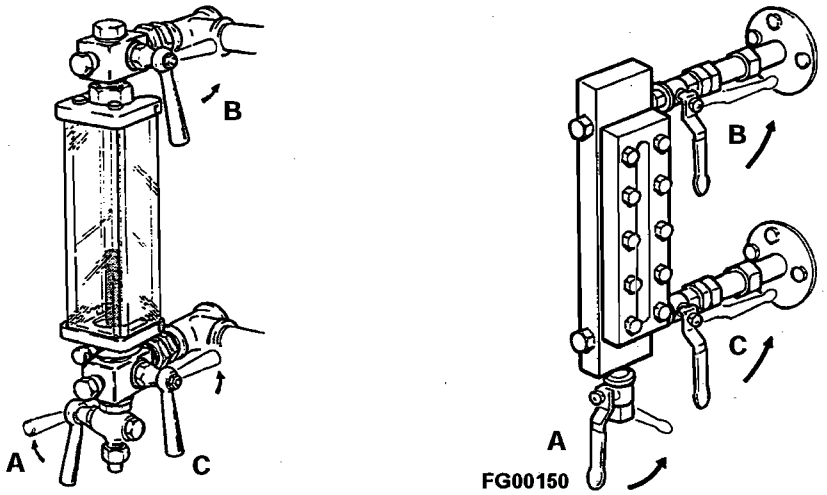


FIG. 14A LEVER TYPE - WATER GAUGE

Heavy Duty - Handwheel Type

Incorporated within the valve is a flow limiting safety shut-off device which is actuated by a sudden increase in flow rate, a pressure drop or excessive flow rate. The purpose of the device, which is fitted in both steam and water connections is to isolate the gauge from the boiler in the event of a glass fracture.
Care must be taken during the blowdown operating sequence since opening the blowdown valve too quickly or by having the blowdown valve open and then opening either of the isolating valves too quickly or to far will result in the shut-off devices in the isolating valves operating, isolating the boiler.

(a) Close both isolating valves **A** and **B**.

(b) Open valve **A** half way (approximately one revolution anticlockwise).

(c) Fully open valve **C**. to blowdown the steam connection.

(d) Close valve **A** and valve **C**.

(e) Open valve **B** half way.

(f) Fully open valve **C** to blowdown the water connection.

(g) Close valve **C**.

(h) Fully open valves **A** and **B**.

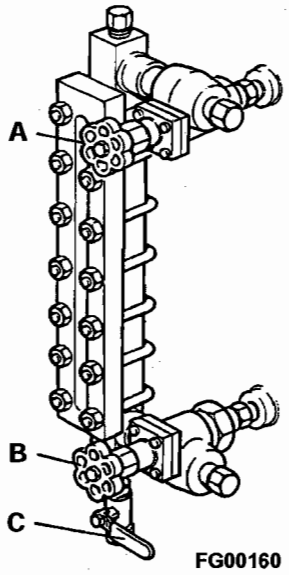


FIG. 14B HANDWHEEL TYPE - WATER GAUGE

Note: *The required amount of blowdown will vary with the feed water analysis, type of steam load and percentage of condensate return. Consult your water treatment specialist for detailed advice.*

3.8 EVAPORATION CHECKS

With the boiler running under normal load conditions and the pump off, having just completed a refill cycle.

(a) Ensure the boiler water level is correct.

(b) Switch OFF the pump at the pump override switch.

(c) Move the column sequencing valve to the blowdown leg position. (Ensure the column blowdown valve remains closed throughout this check).

The water level in the boiler will lower through natural evaporation, and when it nears the bottom of the gauge glass the 1st. low water alarm will sound, the low water alarm light will illuminate and the burner will shut down.
On models 10E to 60E if it is required to check 2nd. low water alarm, wait a further period for the low water reset switch to illuminate.
When the check is complete the water column sequence valve lever can be put back to the working position, switch the pump ON at the pump override switch and reset the low water switch, the pump will start to refill the boiler.
If at any time during this check the pump started to run the check would have to be abandoned and restarted from the beginning.

	Burner will not start	Flame Failure	Low Water Alarm	Poor Combustion	Boiler will not Maintain Pressure
Power Supply	■	■			
Gas Supply	■	■		■	■
Refractories				■	
Ignition Electrode	■	■			
Pri Air Adjustment		■		■	
Sec Air Adjustment		■		■	
Transformer	■				
Low Water Probes	■		■		
U/V Cell		■			
Low Water Safety Relay	■		■		
Water Level Relay	■		■		
Pressure Control	■		■		■
Draught				■	
Steam Overload					■
Feedwater Pump	■		■		
Burner Programmer	■	■			
Burner Motor	■	■		■	
Contam. Feedwater			■		
Feedwater Too Hot			■		
Dirty Flues					
Air Switch	■	■		■	■

FIG 15. FAULT FINDING CHECK LIST

MAINTENANCE

SECTION 4

4.1 GENERAL

To ensure the efficiency of the boiler, carry out the regular maintenance instructions detailed below.

If any fault is found during these operations contact your Fulton representative.

***Note**: It is essential that regular checks are made to ensure that scale build-up is not taking place within the boiler. Such checks will ensure that water treatment being applied to the boiler feed water is effective.*

The lower hand hole doors should be removed after one month of operation and the interior of the boiler thoroughly examined. If scale or sludge build up is observed the water treatment supplier should be advised. New gaskets must be fitted every time a handhole door is removed.

Subsequent interior examinations should be carried out on a regular basis until satisfactory conditions are observed. Thereafter, inspections should be carried out at three monthly intervals.

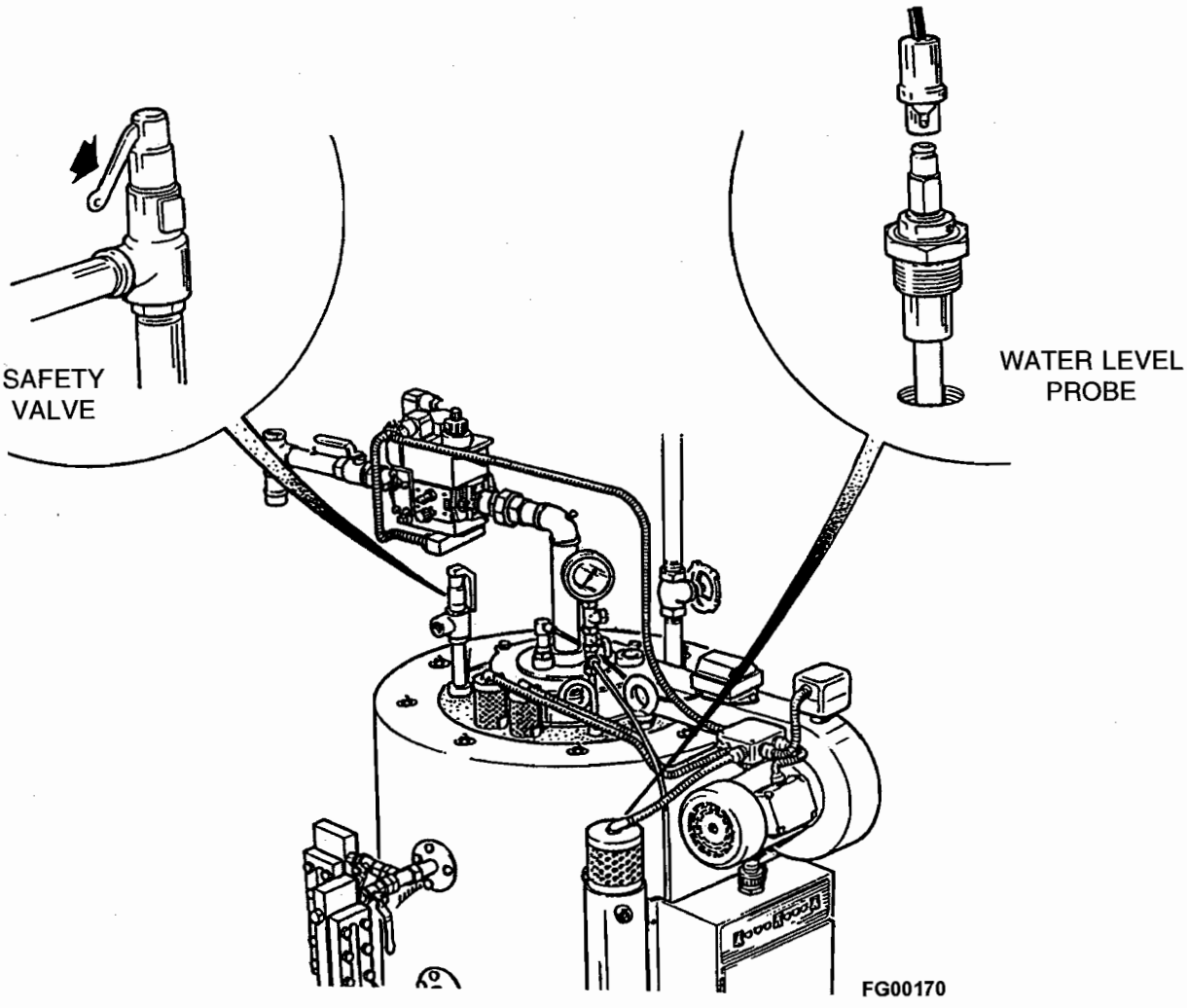


FIG. 16 BOILER MAINTENANCE

4.2 WEEKLY

WARNING

Ensure the fittings around the steam safety valve(s) are secure.
The safety valve will be very hot, do not operate the safety valve without protection.

(a) Make sure that the pipes from the safety valve outlet is not damaged and that it continues to a safe blowdown point.

(b) In addition to carrying out the daily operating tests described in Section 3 - Operation, the water level and safety cut-off controls should be tested under operating conditions by interrupting the water feed supply.

To carry out this test, depress the feed pump interrupt switch to isolate the feedwater pump and lower the water level in the boiler by evaporation. As the level of water falls, the burner should shut down and the alarm sound.

On completion of this test, switch off the pump interrupt switch and check that the water level is restored to normal.

4.3 MONTHLY (Weekly tests plus)

(a) Blow down the boiler and water column completely.

(b) Inspect the hand holes in the boiler. If any leakage is evident proceed as follows:
Use only Fulton genuine replacement parts.

(i) Using the special tee handle wrench, remove the handhole assembly.

(ii) Remove the old gasket and thoroughly clean the mating faces of the plate and boiler.

(iii) Fit the handhole assembly as follows:

1 Place the new gasket on the handhole plate and ensure that it is seating correctly. Do not use any grease, lubricant or adhesive.

2 Position the plate in the boiler, set the crab and tighten the securing nut only sufficiently to provide a snug fit. Verify the position of the plate in the boiler to ensure that there is uniform space between the periphery of the door and the boiler inspection opening. Tighten the nut hand tight only. Using the special wrench, tighten the nut a further quarter of a turn. DO NOT OVERTIGHTEN.

(iv) If the gasket leaks as the pressure is building up, tighten the securing nut only sufficient to stop the leakage.

(c) Clean the sight glass. If any leakage is evident, renew the gasket.

Note: *Isolate the gas supply.*

(d) Referring to **Fig. 18** disconnect the gas head from the burner by unscrewing the union. Remove the burner plate screws, withdraw the burner assembly. Clean the ignition electrodes and reset. If an ultra -violet cell is fitted, check that the lens is clean.

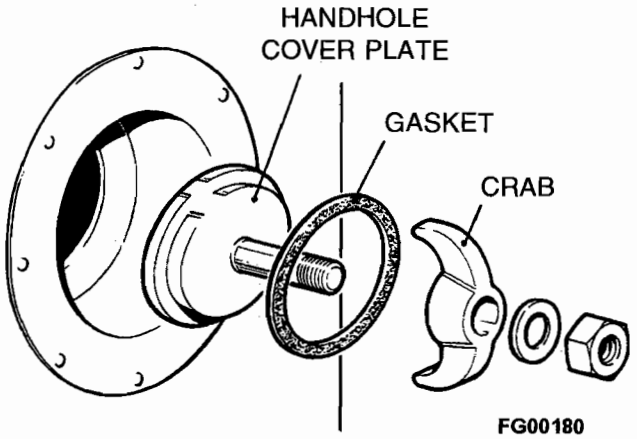


FIG. 17 HANDHOLE

4.4 THREE MONTHLY (Monthly tests plus)

(a) Drain and isolate the boiler.

(b) Remove the lower handhole assemblies and inspect the interior of the pressure vessel for scale and sludge build up.

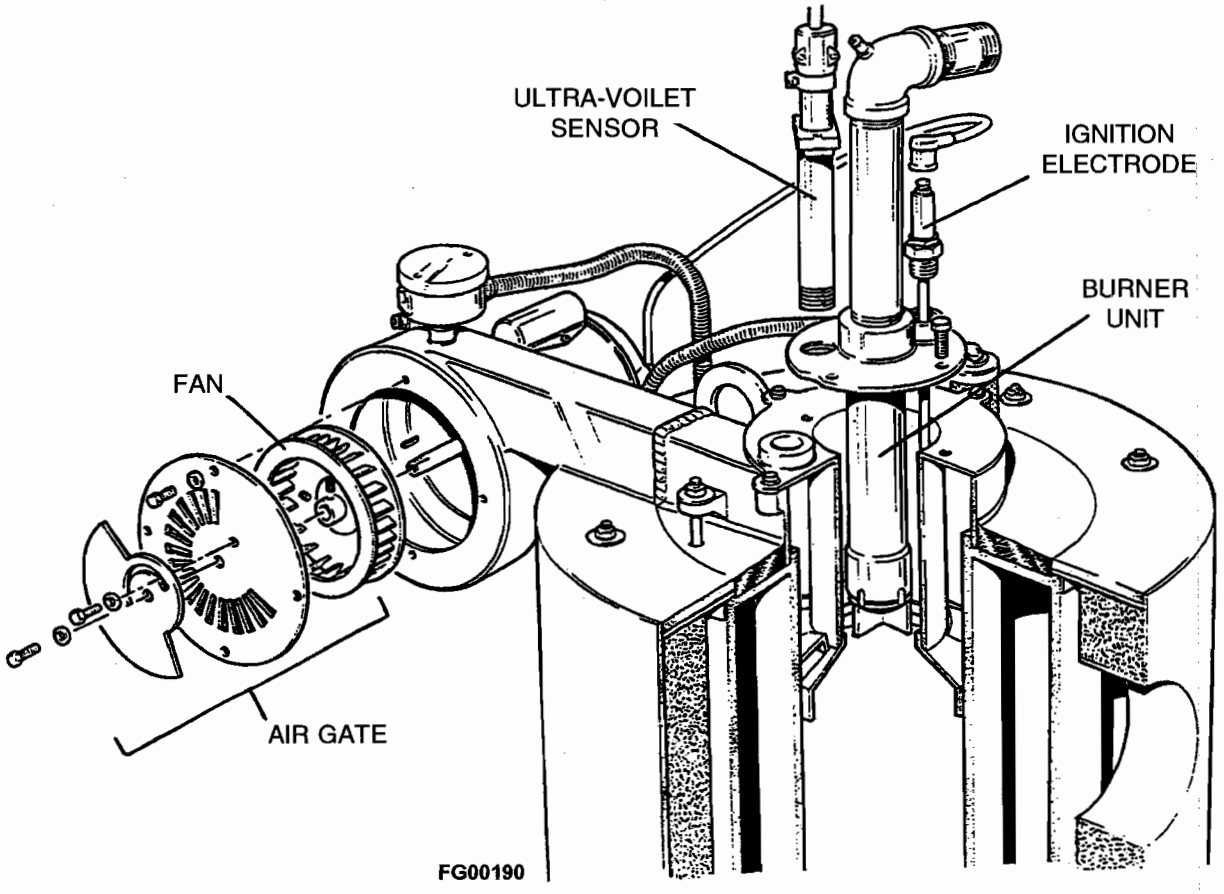


FIG 18 BURNER ASSEMBLY

4.5 SIX MONTHLY (Three monthly tests plus)

It should be noted that after a Fulton boiler has been in operation for several months, pieces of burned metal will be found in the space at the bottom of the boiler. These pieces of metal are the remains of a light gauge metal form which was used during manufacture for forming the boiler insulation. This is normal and does not affect the efficiency or the life of the boiler in any way.

(a) Remove the cover plates and clean-out door. Clean out the flue passes. When replacing the cover plates and clean-out door, use furnace cement to ensure a tight seal, thus preventing the escape of hot gases.

(b) Apply a small quantity of oil to the bearings of the burner motor and the feed water pump motor.

(c) Drain and flush the feed water tank. Clean any filters in the tank, in the feed water line or in the feed water pump.

(d) Remove and clean the water probes, take care not to crack the porcelain. After replacement of the probes, check the operation of the low water cut-off relay and of the feed water pump.

(e) Remove the air gate and clean the fan.

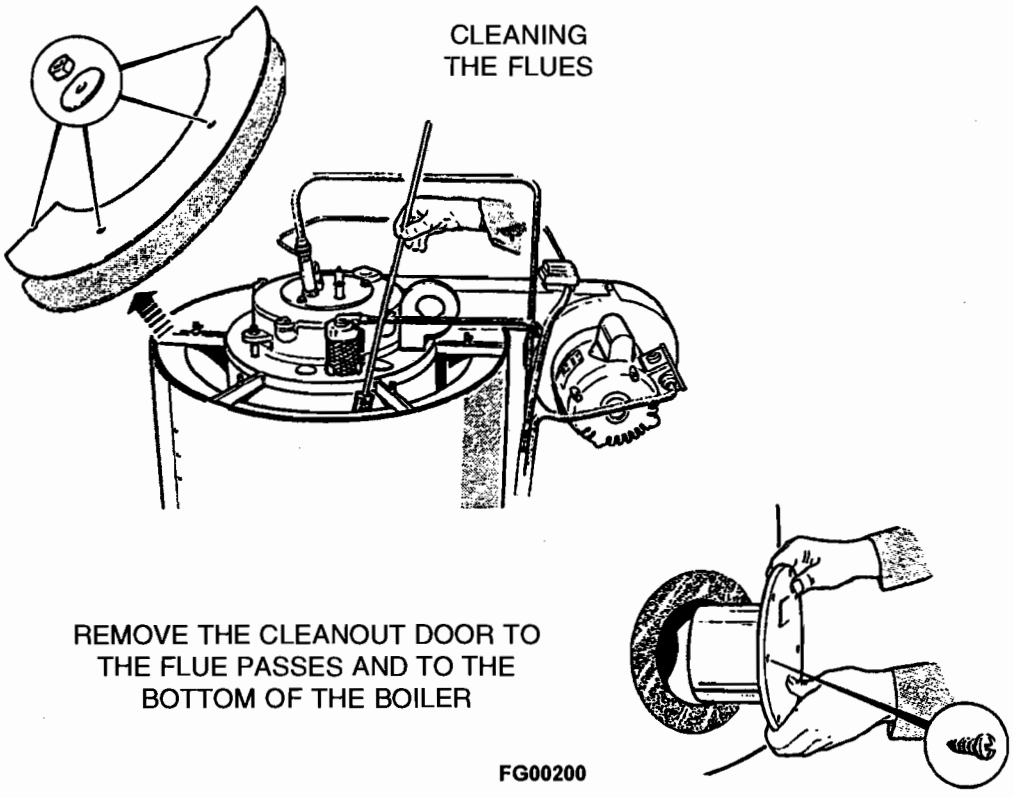
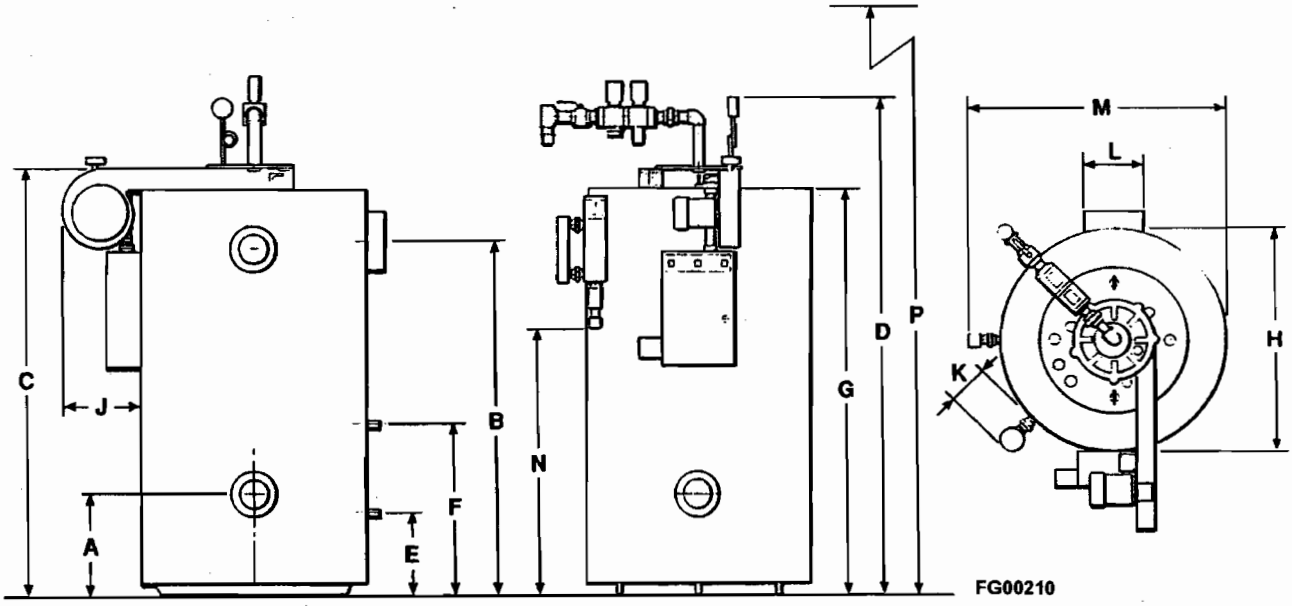


FIG. 19 FLUE CLEANING

GENERAL DATA

SECTION 5



	A	B	C	D	E	F	G	H	J	K	L	M	N	P
6E	480	1295	1535	1960	380	840	1460	665	345	300	150	825	725	2000
8E	480	1395	1635	2060	380	840	1560	665	345	300	150	825	825	2100
10E	480	1445	1685	2110	380	840	1610	715	310	240	150	975	875	2150
15E	480	1570	1835	2260	380	840	1760	765	290	260	205	1025	1025	2300
20E	510	1625	1955	2430	405	870	1840	985	415	250	255	1235	1105	2500
30E	510	1850	2205	2690	405	870	2090	1175	420	250	305	1435	1355	2750
40E	510	1930	2290	2900	400	1095	2170	1390	470	250	305	1730	1435	2950
50E	510	1930	2290	2900	400	1095	2170	1390	470	250	305	1730	1435	2950
60E	510	2080	2440	3050	400	1095	2320	1390	470	250	305	1730	1585	3100

FIG. 20 BOILER DIMENSIONS

Note:-

Standard Working Pressure 6E - 30E, 8.6bar. 40E - 60E, 10.34bar.

15mm Water Sample point located on Water Column if fitted.

Gas Train can rotate through 360°.

STANDARD TRIM ITEMS

Additions and Optional items should be requested when ordering the boiler

⚠ WARNING

It is the responsibility of the installer to ensure all parts supplied with the boiler are fitted to the boiler in a correct and safe manor.

Standard boiler trim.	Quantity
Main Steam Valve	1
Steam Safety Valve	1
Steam Pressure Gauge Assembly	1
Boiler Blowdown Valve	1
Water Level Gauge Set with Sight Glass	1 or 2*
Water Level Gauge Protector	1 or 2*
Feedwater Check Valve	1
Feedwater Stop Valve	1
Flue Flange and Gasket	1
Alarm Bell	1 or 2*
Flue Brush	1
Tee Handle Wrench	1

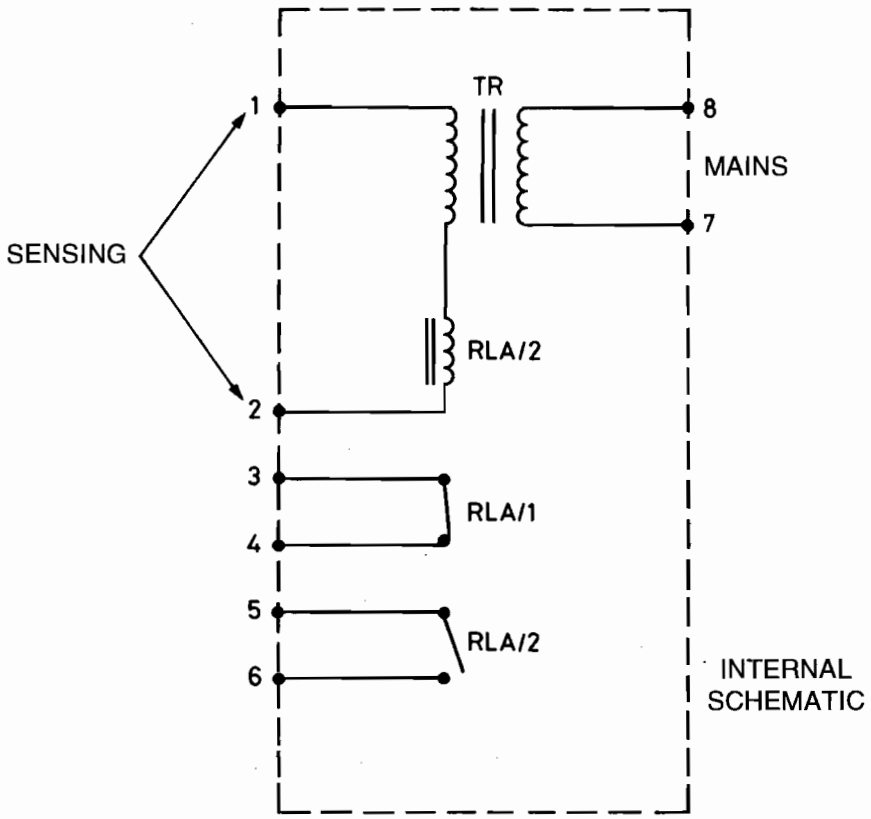
Items marked * vary according to boiler specification.

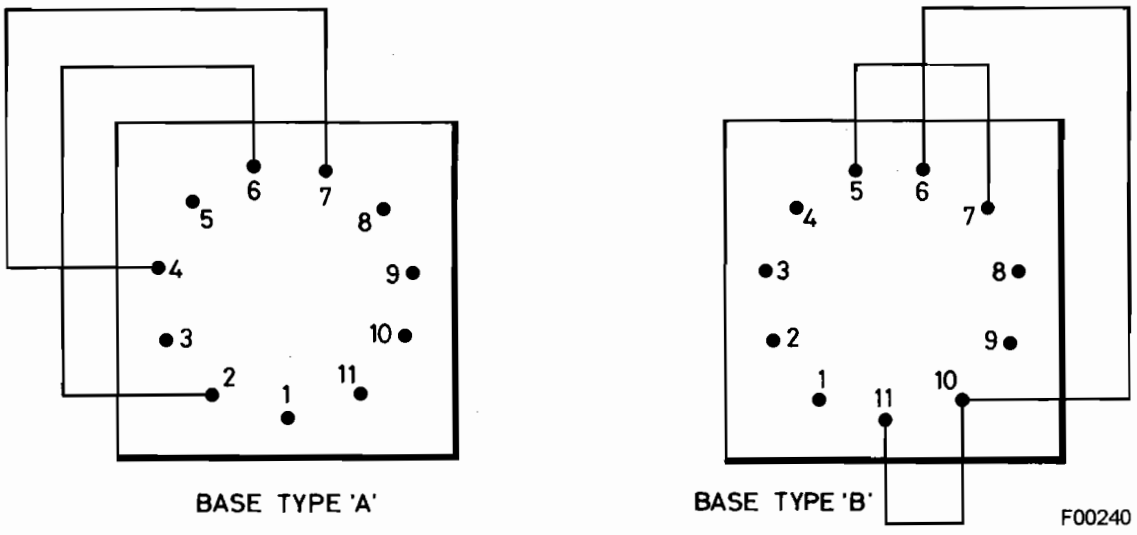
Note:

Sizes 40E - 60E supplied with water level gauge sight glasses which do not require a separate protector.

BOILER TRIM		6E	8E	10E	15E	20E	30E	40E	50E	60E
Steam Safety Valve (Discharge side)	in.	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
	(mm)	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)
Steam Outlet Valve	in.	0.75	0.75	1.00	1.25	1.25	1.50	2.00	2.00	2.00
	(mm)	(20)	(20)	(25)	(32)	(32)	(40)	(50)	(50)	(50)
Feed Water Stop Valves	in.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(mm)	(25)	(25)	(25)	(25)	(25)	(25)	(25)	(25)	(25)
Feed Water Check Valve	in.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(mm)	(25)	(25)	(25)	(25)	(25)	(25)	(25)	(25)	(25)
Boiler Blowdown Valves	in.	0.75	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.00
	(mm)	(20)	(20)	(20)	(20)	(25)	(25)	(25)	(25)	(25)
Water Column Blowdown Valves	in.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	(mm)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)
Sight Glass Blowdown Valve	**Conventional unit**	0.125 in. (3.0 mm)								
	Reflex unit	0.25 in. (6.0 mm)								

Dimensions in. (mm)





INTERNAL BASE WIRING

Note: *A common base is supplied for type A & B controller bases. Links must be fitted as per* ***Fig. 21****.*

FIG. 21 TYPE LC1 LEVEL CONTROLLER

Material & Workmanship Warranty

5 Year Warranty

On the Fulton Boiler Pressure Vessel

Fulton Boiler Works (Great Britain) Ltd. will repair or replace FoB factory any Fulton pressure vessel which within five (5) years of the date of delivery is found to be defective in workmanship, or material, provided this equipment is operated and maintained by the buyer for the purpose for which it was designed and in accordance with the Manufacturer's Handbook. This Warranty does not cover damage or failures that can be attributed to corrosion, scale or dirt accumulation or to low water conditions. This Warranty is good only in the United Kingdom of Great Britain and Northern Ireland. This Warranty does not include labour or delivery charges of any kind.

Fulton®

Fulton Boiler Works, (Great Britain) Ltd.

General Warranty

The Fulton general Guarantee is given in lieu of and in exclusion of any warranty expressed or implied, statutory or otherwise, as to the state, condition, performance, quality or fitness of the goods. Save thereunder we shall be under no obligation or liability of any kind to you in regard to the goods. In the case of new goods manufactured and supplied by us we will make good any defect developing therein under proper use within 12 months of delivery, provided that after investigation in our sole discretion we are satisfied that the defect arose from faulty design, materials or workmanship and from no other cause whatsoever.

Defective goods or parts must be returned to us as soon as possible after discovery of the defect, Costs of carriage and of detaching and incorporating parts will be borne by you. In all cases at the termination of such 12 months all liability on our part will cease.

No liability whatsoever is to be incurred by us in respect of gauge or sight-glasses, packing glands or electric motors orany goods or accessories not of our manufacture. But so far as we are able, we shall let you have the benefit of any guarantee or warranty given to us in respect thereof.

SPARE PARTS

SECTION 6

In order to ensure spare parts are correct, please complete the details below and have them at hand when ordering parts or making enquires regarding the boiler.

1. **Boiler number** _____
2. **Boiler type** _____
3. **Type of fuel used** _____
5. **Wiring Diagram No.** _____
6. **Commissioning Date** _____

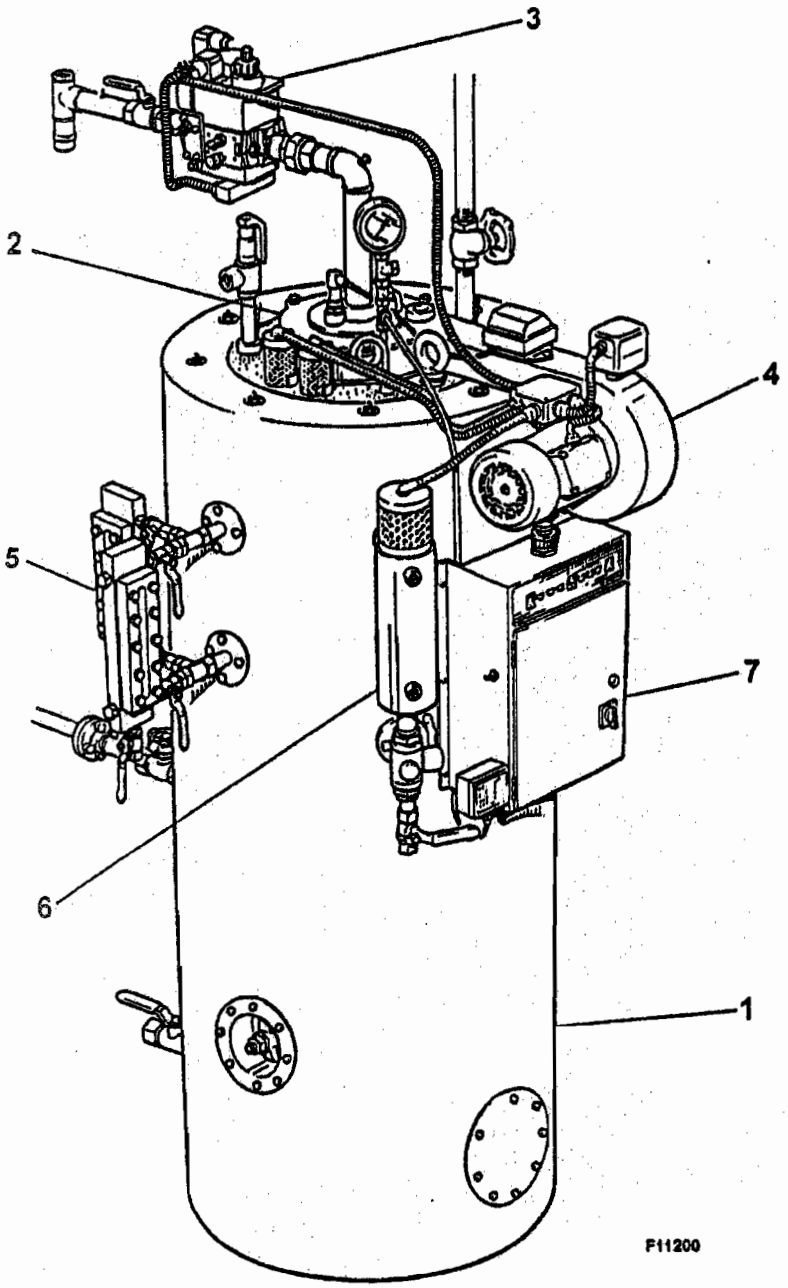
WARNING

The type, size and lift pressure of the safety valve fitted to a boiler is specific to that boiler. When ordering new safety valves it is important that, as well as the information requested above, the following additional information is given:

Boiler design pressure (located on the boiler data plate).

Make and type (eg fig no.) of safety valve fitted.

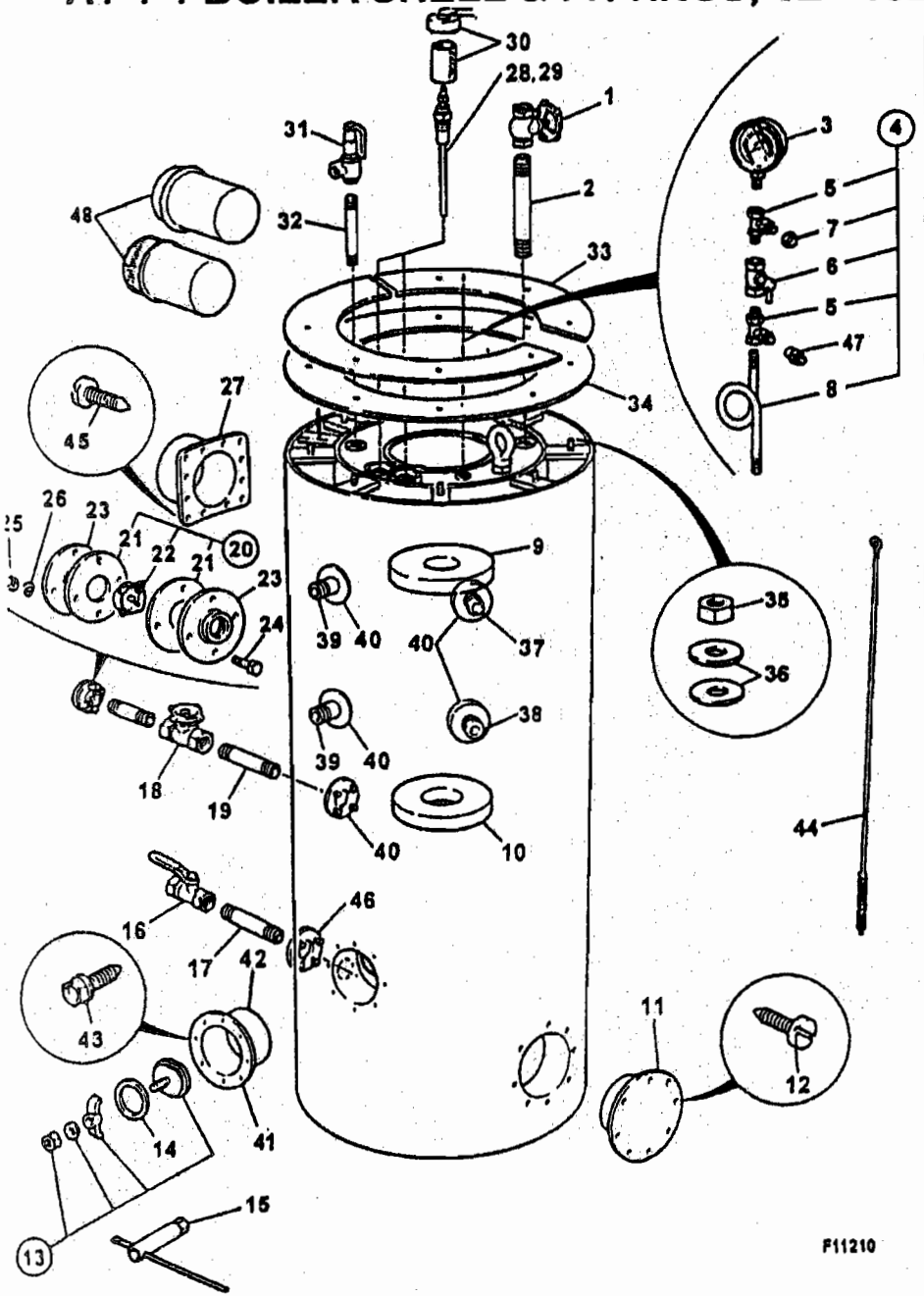
A0-1-1 BOILER, GAS



Item	Part no.	Qty.	Description	Remarks	Boiler size
1		1	Boiler Shell & Fittings	See A1-1-1	4E - 15E
		1	Boiler Shell & Fittings	See A1-2-1	20E - 60E
2		1	Burner assembly	See B1-1-1	6E - 15E
		1	Burner assembly	See B1-2-1	20E - 30E
		1	Burner assembly	See B1-3-1	40E - 60E
3		1	Gas Train assembly	See C1-1-1	4E - 15E
		1	Gas Train assembly	See C1-2-1	20E - 30E
		1	Gas Train assembly	See C1-3-1	40E - 60E
		1	Gas Train assembly, Moduline	See C1-6-1	4E - 15E
		1	Gas Train assembly, Moduline	See C1-7-1	20E - 30E
		1	Gas Train assembly, Propane	See C1-4-1	4E - 15E
		1	Gas Train assembly, Propane	See C1-5-1	20E - 60E
		1	Gas Train assembly, Monobloc	See C1-8-1	6E - 15E
		1	Gas Train assembly, Monobloc	See C1-9-1	20E - 30E
4		1	Burner Scroll assembly, Gas	See D1-1-1	6E - 15E
		1	Burner Scroll assembly, Gas	See D1-2-1	20E - 30E
		1	Burner Scroll assembly, Gas	See D1-3-1	40E - 60E
5		1or2	Gauge, water level	See F1-1-1	6E - 60E
		1or2	Gauge, water level	See F1-1-2	6E - 60E
		1or2	Gauge, water level	See F1-2-1	6E - 60E
		1or2	Gauge, water level	See F1-3-1	6E - 60E
6		1	Column, water assembly	See E1-1-1	6E - 60E
		1	Column, water assembly	See E1-2-1	6E - 60E
7		1	Box, control, assembly	See G1-1-1	6E - 15E
		1	Box, control, assembly	See G1-2-1	20E - 30E
		1	Box, control, assembly	See G1-3-1	40E - 60E

A0-1-1 BOILER, GAS

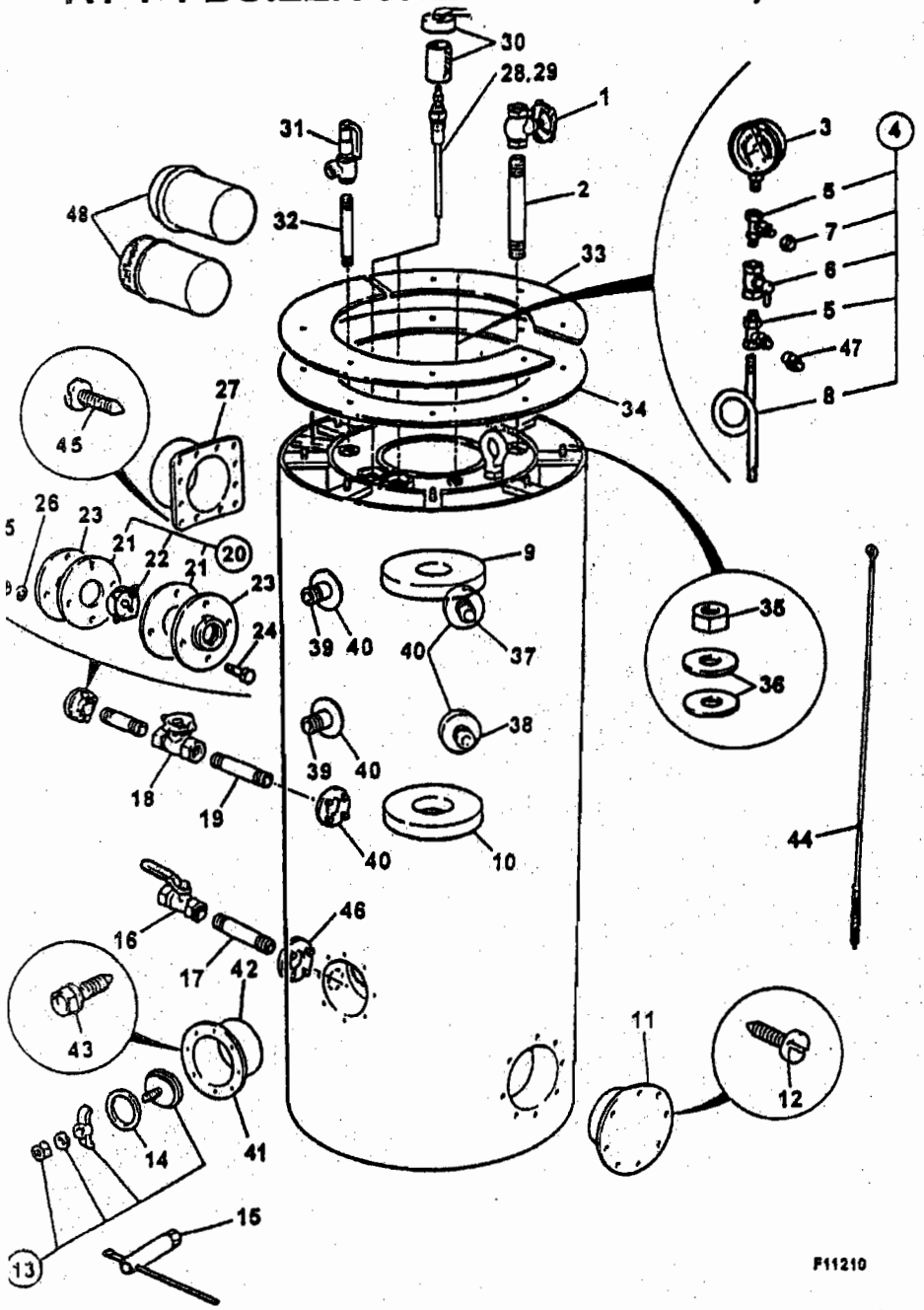
A1-1-1 BOILER SHELL & FITTINGS, 4E - 15E



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	10535	1	Valve, steam stop	3/4in.	4E - 8E
	10536	1	Valve, steam stop	1in.	10E
	10537	1	Valve, steam stop	1 1/4in.	15E
2	10596	1	Pipe, nipple	3/4in.	4E - 8E
	10600	1	Pipe, nipple	1in.	10E
	11072	1	Pipe, nipple	1 1/4in.	15E
3	10566	1	Gauge, pressure	4in. x 250psi	4E - 15E
4	SA0001	1	Gauge, pressure, assembly	Fittings	4E - 15E
5	10565	2	Tee		4E - 15E
6	10548	1	Valve		4E - 15E
7	10655	1	Plug		4E - 15E
8	10564	1	Syphon, pigtail		4E - 15E
9	10001	1	Refractory, furnace	Top	6E - 10E
	11016	1	Refractory, furnace	Top	4E
	12037	1	Refractory, furnace	Top	15E
10	12040	1	Refractory, furnace	Bottom	6E - 15E
	12042	1	Refractory, furnace	Bottom	4E
11	10006	1	Door, cleanout		4E - 15E
12	10817	7	Screw		4E - 15E
13	10009	3	Handhole assembly		4E - 8E
	10010	3	Handhole assembly		10E
	10011	3	Handhole assembly		15E
14	10017	3	Gasket, handhole		4E - 15E
15	10023	1	Wrench, tee	Handhole	4E - 15E
16	11524	1	Valve, blowdown		4E - 15E
17	11537	1	Pipe, nipple		4E - 15E
18	10536	1	Valve, feedwater stop		4E - 15E
19	10602	1	Pipe, nipple		4E - 15E
20	SA0002	1	Valve, check, assembly		4E - 15E
21	11522	2	Gasket		4E - 15E
22	11608	1	Valve, check		4E - 15E

A1-1-1 BOILER SHELL & FITTINGS, 4E - 15E

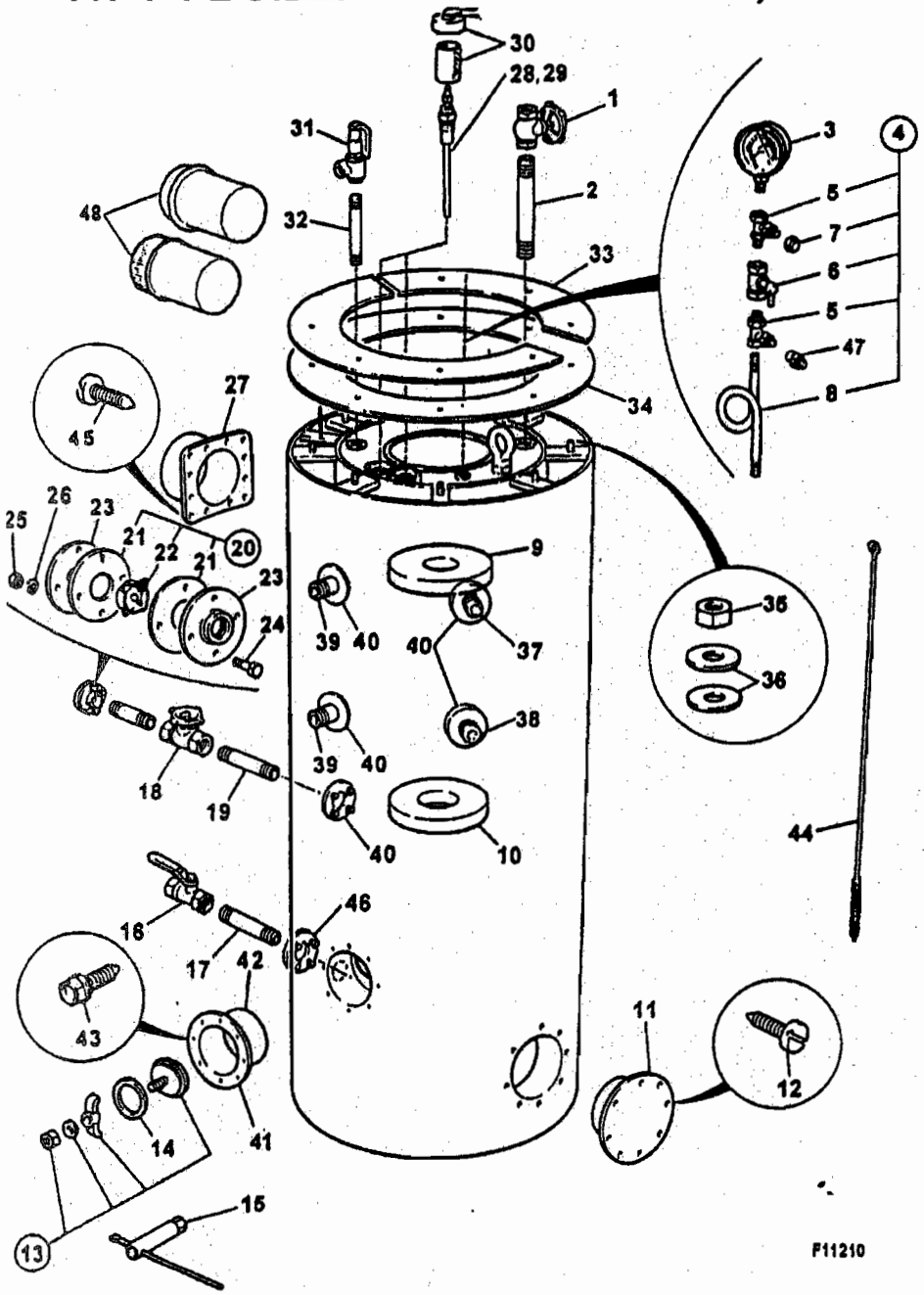
A1-1-1 BOILER SHELL & FITTINGS, 4E - 15E



Item	Part no.	Qty.	Description	Remarks	Boiler size
23	11523	2	Flange		4E - 15E
24	11625	4	Bolt		4E - 15E
25	11568	4	Nut		4E - 15E
26	11567	4	Washer, spring		4E - 15E
27	10119	1	Flue, flange		4E - 10E
	10120	1	Flue, flange		15E
28	10417	1	Probe, water level		4E - 15E
29	11882	1	Probe, water level		4E - 8E
	11774	1	Probe, water level		10E - 15E
30	099E9360	2	Basket, probe		4E - 15E
31	10558	2	Valve, steam safety. 3/4in. Birk	130psi. See note	4E - 15E
	11504	1	Valve, steam safety. 3/4in. N.V	130psi. See note	4E - 15E
	11609	2	Valve, steam safety. 3/4in. Birk	125psi. See note	4E - 15E
	11952	1	Valve, steam safety. 3/4in. Birk	140psi. See note	4E - 15E
	11953	1	Valve, steam safety. 3/4in. Birk	165psi. See note	4E - 15E
32	10596	1	Pipe, nipple		4E - 15E
33	10073	1	Plate, flue cover		4E - 8E
	10075	1	Plate, flue cover		10E
	10077	1	Plate, flue cover		15E
34	10135	A/R	Gasket, flue cover		4E - 15E
35	10800	7	Nut		4E - 15E
36	10848	14	Washer		4E - 15E
37	10601	1	Pipe, nipple		10E - 15E
	10604	1	Pipe, nipple		4E - 8E
38	10602	1	Pipe, nipple		10E - 15E
	10605	1	Pipe, nipple		4E - 8E
39	10601	2	Pipe, nipple		10E - 15E
	10602	2	Pipe, nipple		4E - 8E
40	10103	5	Pipe, stamping		4E - 15E
41	10107	3	Handhole, stamping		4E - 15E
42	10096	3	Liner, handhole		4E - 15E

A1-1-1 BOILER SHELL & FITTINGS, 4E - 15E

A1-1-1 BOILER SHELL & FITTINGS, 4E - 15E

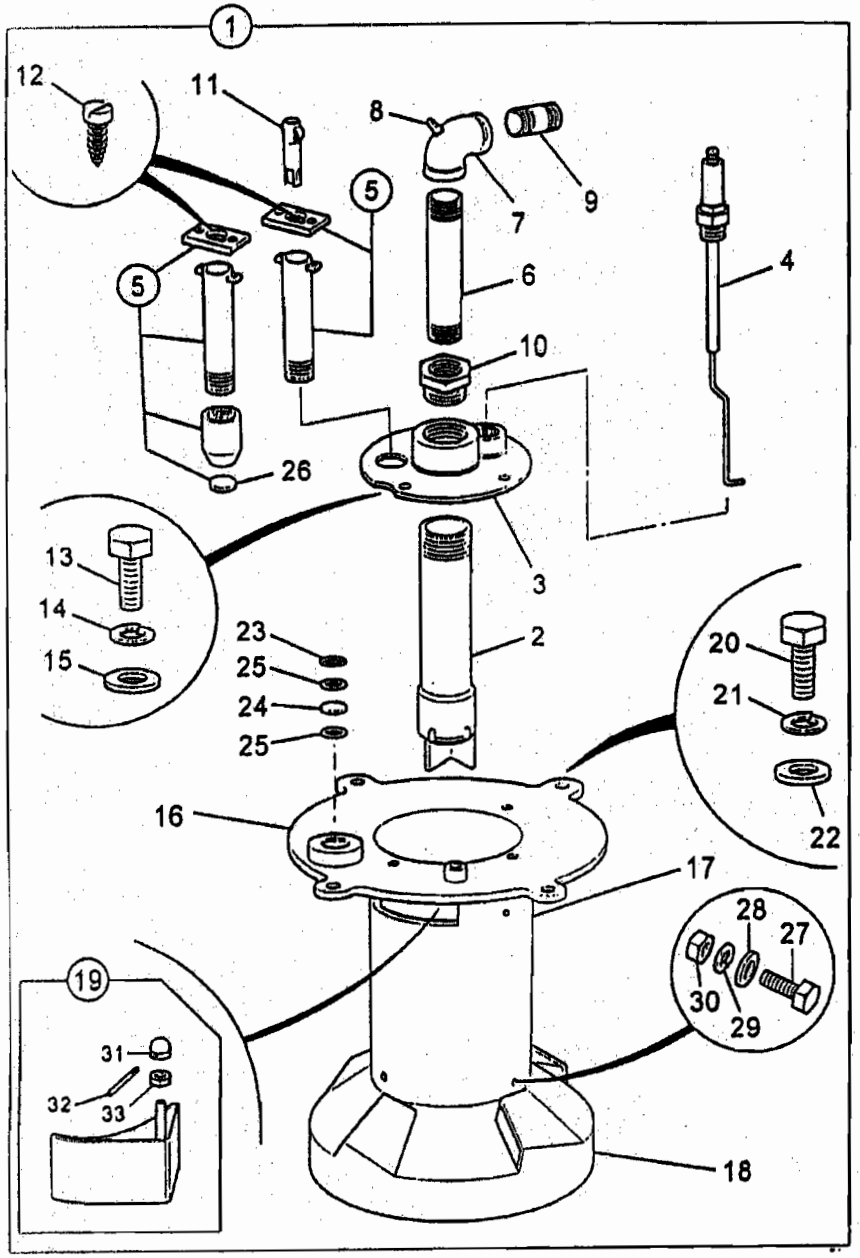


Item	Part no.	Qty.	Description	Remarks	Boiler size
43	10825	48	Screw, drive		4E - 15E
44	10022	1	Brush, flue		4E - 15E
45	10817	12	Screw		4E - 15E
46	10102	1	Pipe, stamping		4E - 15E
47	10714	1	Coupling, male	1/4in. x 1/4in.	4E - 15E
48	13508	1	Flue connector, male	6in.	4E - 10E
	13510	1	Flue connector, male	8in.	15E
	13509	1	Flue connector, female	6in.	4E - 10E
	13511	1	Flue connector, female	8in.	15E

NOTE: To comply fully with safety regulations it is essential that the correct safety valves are used.
If in any doubt please contact Fulton Boiler Works (Great Britain) Ltd. Sales and Service Department for assistance.

A1-1-1 BOILER SHELL & FITTINGS, 4E - 15E

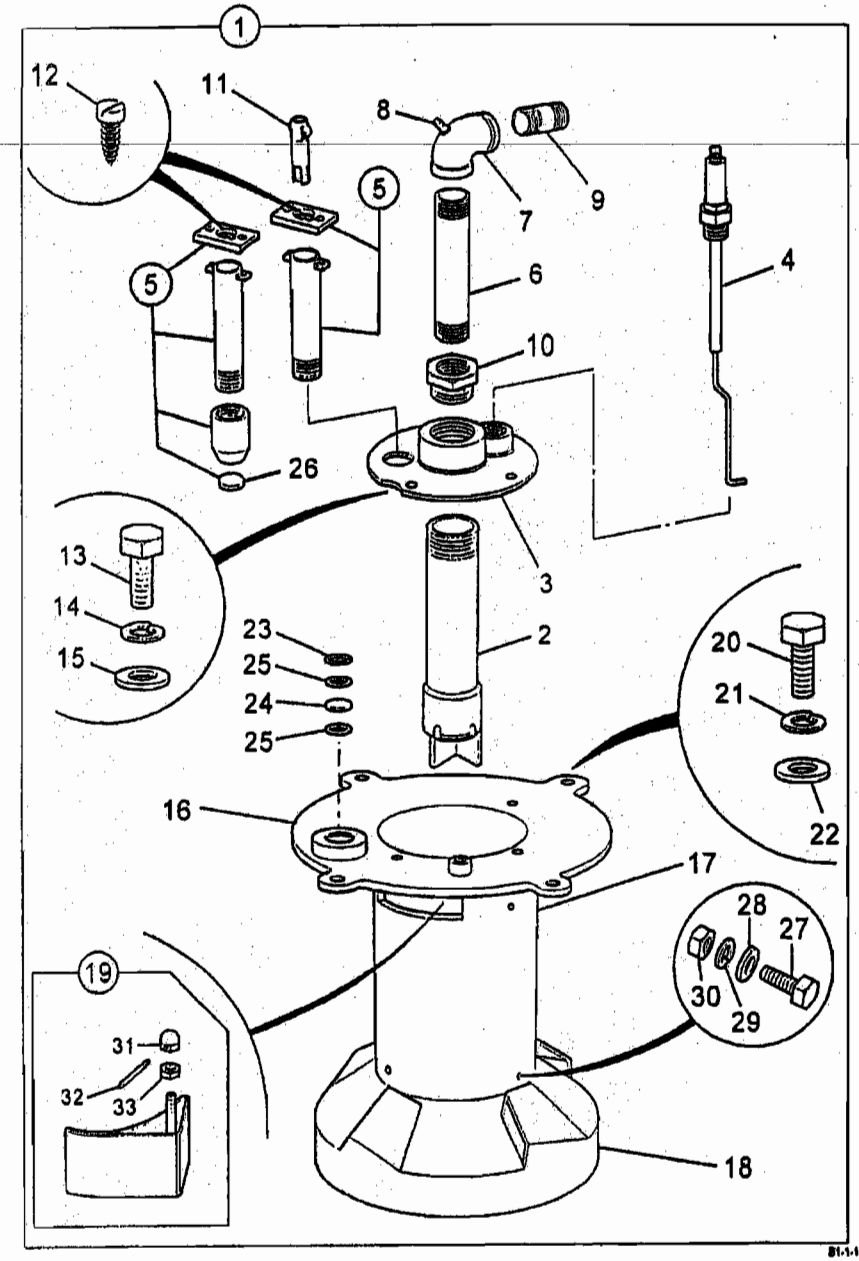
B1-1-1 BURNER ASSEMBLY, GAS. 6E - 15E



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	006EG330	1	Burner, assembly, Nat. Gas	see note	6E
	006EP330	1	Burner, assembly, L.P. Gas	see note	6E
	008EG330	1	Burner, assembly, Nat. Gas	see note	8E
	008EP330	1	Burner, assembly, L.P. Gas	see note	8E
	010EG330	1	Burner, assembly, Nat Gas	see note	10E
	010EP330	1	Burner, assembly, L.P. Gas	see note	10E
	015EG330	1	Burner, assembly, Nat. Gas	see note	15E
	015EP330	1	Burner, assembly, L.P. Gas	see note	15E
2	10330	1	Orifice, tube	Natural gas	6E
	10332	1	Orifice, tube	Natural gas	8E
	10334	1	Orifice, tube	Natural gas	10E
	10340	1	Orifice, tube	Natural gas	15E
	10333	1	Orifice, tube	L.P.G.	6E
	10335	1	Orifice, tube	L.P.G.	8E
	10336	1	Orifice, tube	L.P.G.	10E
	10341	1	Orifice, tube	L.P.G.	15E
3	010EG430	1	Burner, plate		6E - 10E
	015EG430	1	Burner, plate		15E
4	10251	1	Electrode, Ignition		6E - 15E
5	SA0004	1	Adaptor, sensor	Satronic	6E - 15E
	SA0031	1	Adaptor, sensor	Landis	6E - 15E
6	10603	1	Nipple, pipe	Superseded 1997	6E - 10E
	11537	1	Nipple, pipe		6E - 8E

NOTE:- When ordering complete assembly, you must order Items 5 and 11 separately specifying the sensor model.

B1-1-1 BURNER ASSEMBLY, GAS. 6E - 15E

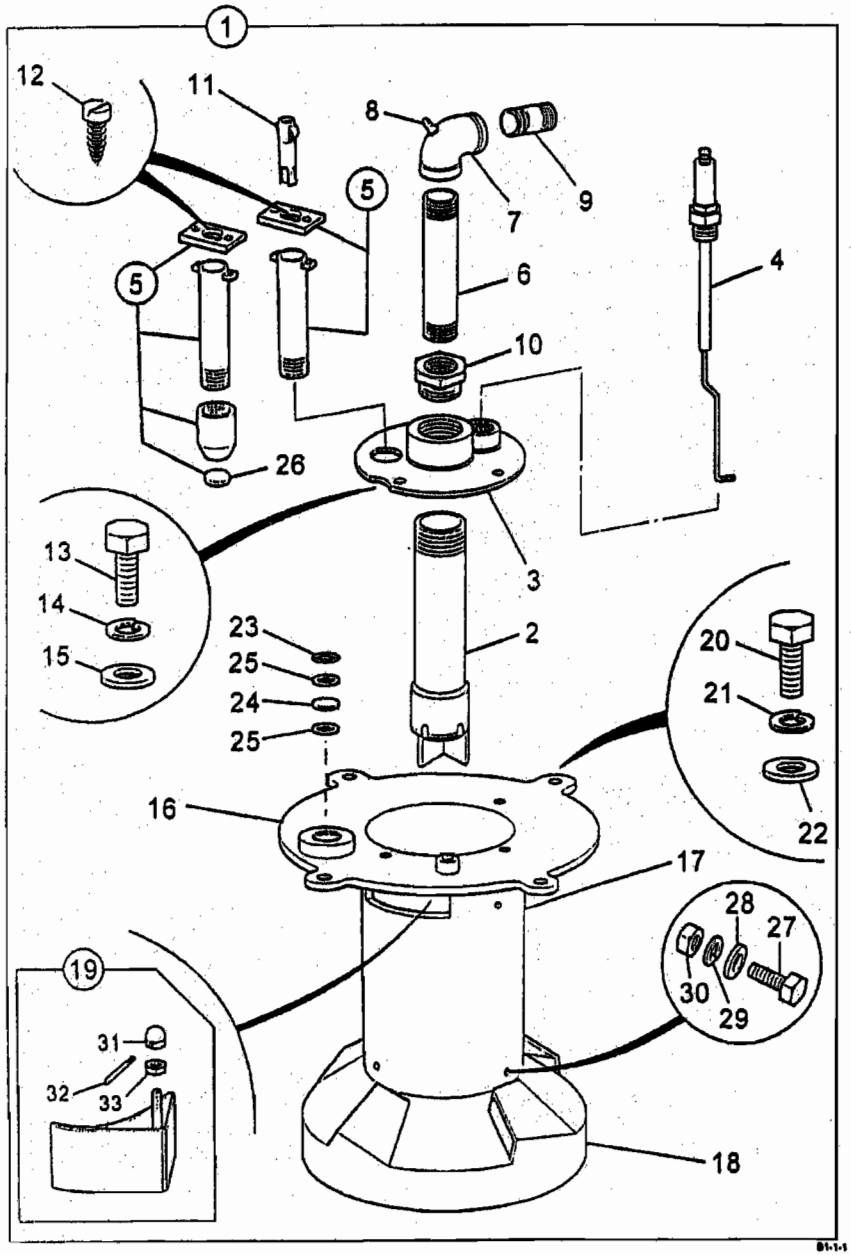


Item	Part no.	Qty.	Description	Remarks	Boiler size
6	10597	1	Nipple, pipe	Nat. Gas	10E
	10597	1	Nipple, pipe	L.P.G.	10E - 15E
	11072	1	Nipple, pipe	Nat Gas	15E
7	10644	1	Elbow	Superseded 1997	6E - 10E
	10643	1	Elbow		6E - 10E
	10643	1	Elbow	L.P.G.	15E
	11072	1	Elbow	Nat. Gas	15E
8	10350	1	Nipple, pressure test		6E - 15E
9	10598	1	Nipple, pipe	Superseded 1997	6E - 10E
	10592	1	Nipple, pipe		6E - 10E
	10592	1	Nipple, pipe	L.P.G.	15E
	10607	1	Nipple, pipe	Nat. Gas	15E
10	10627	1	Bush, reducing		6E - 10E
	10627	1	Bush, reducing	L.P.G.	15E
11	10292	1	Sensor, UV	Satronic	6E - 15E
	11507	1	Sensor, UV	Landis	6E - 15E
12	10820	2	Screw		6E - 15E
13	10793	3	Bolt		6E - 15E
14	10850	3	Washer, spring		6E - 15E
15	10842	3	Washer		6E - 15E
16	10385	1	Casting, top plate		6E - 15E
17	SA0025	1	Tube, blast		6E - 15E
18	11547	1	Plate, deflector		6E - 15E

NOTE:- When ordering complete assembly, you must order items 5 and 11 separately specifying the sensor model.

B1-1-1 BURNER ASSEMBLY, GAS. 6E - 15E

B1-1-1 BURNER ASSEMBLY, GAS. 6E - 15E

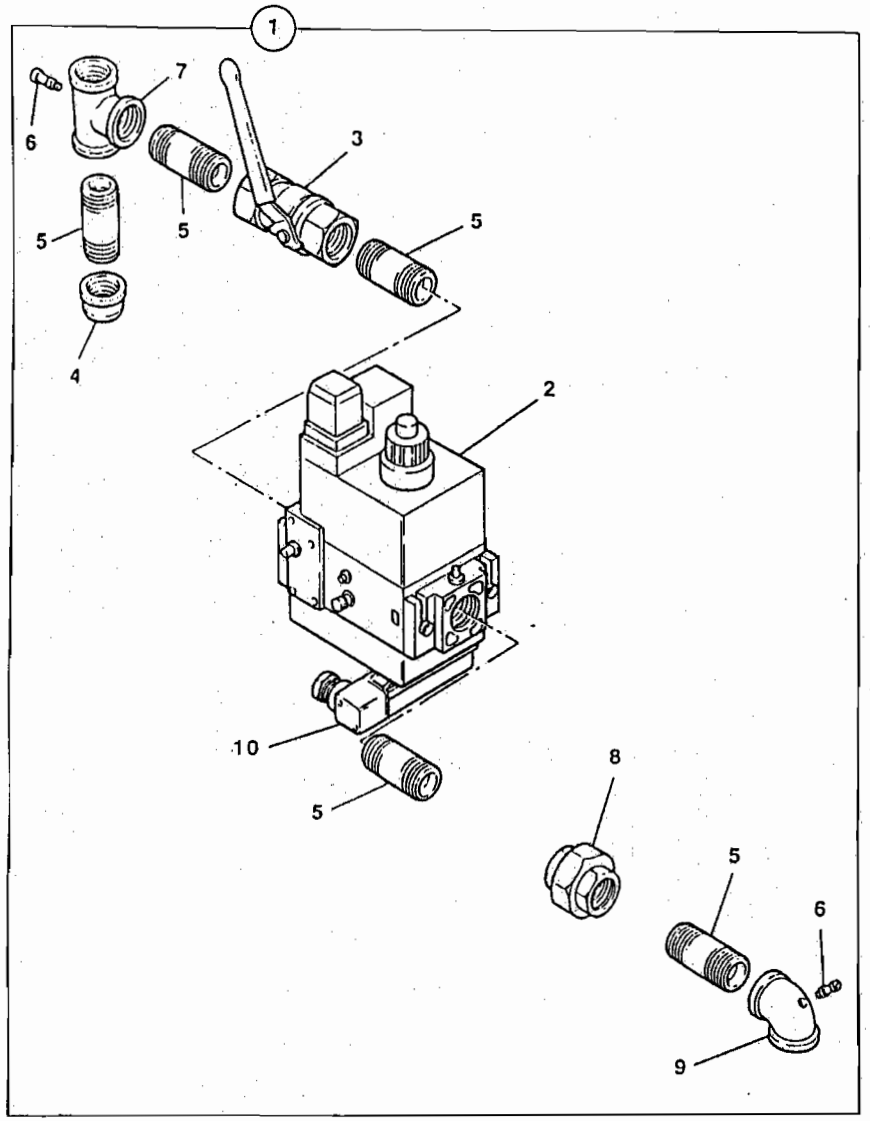


Item	Part no.	Qty.	Description	Remarks	Boiler size
19	SA0005	1	Gate assembly, pimary air		6E - 15E
20	10794	4	Bolt		6E - 15E
21	10850	4	Washer, spring		6E - 15E
22	10842	4	Washer		6E - 15E
23	10318	1	Spring, retaining		6E - 15E
24	10319	1	Eye, glass		6E - 15E
25	10977	2	Washer		6E - 15E
26	11633	1	Lens		6E - 15E
27	10785	6	Bolt		6E - 15E
28	11033	6	Washer, flat		6E - 15E
29	11139	6	Washer, spring		6E - 15E
30	10832	6	Nut		6E - 15E
31	10838	1	Nut, dome		6E - 15E
32	10839	1	Rod, actuating		6E - 15E
33	10843	1	Locknut		6E - 15E

NOTE:- When ordering complete assembly, you must order Items 5 and 11 separately specifying the sensor model.

B1-1-1 BURNER ASSEMBLY, GAS. 6E - 15E

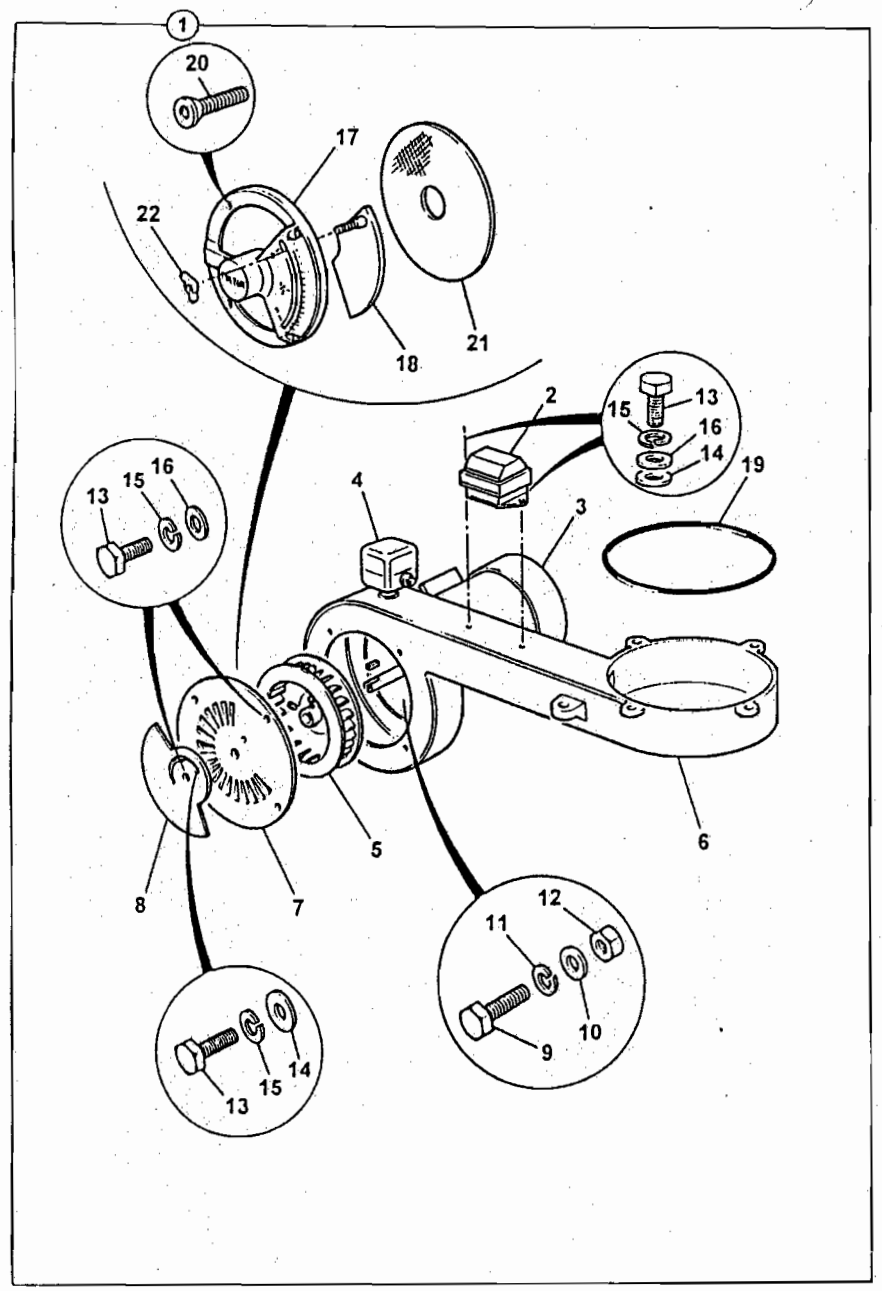
C1-8-1 GAS TRAIN, MONOBLOCK, 6E - 15E



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	006EG350AU	1	Gas train assembly	Australian	6E - 10E
	006EG350UK	1	Gas train assembly		6E - 10E
	015EG350AU	1	Gas train assembly	Australian	15E
	015EG350UK	1	Gas train assembly		15E
2	11536	1	: Valve assembly		15E
	12022	1	: Valve assembly		6E - 10E
3	10550	1	: Valve	U.K.	6E - 10E
	10552	1	: Valve	U.K.	15E
	11712	1	: Valve	Australian	15E
	12024	1	: Valve	Australian	6E - 10E
4	10635	1	: Cap		6E - 10E
	10637	1	: Cap		15E
5	10592	5	: Pipe, nipple		6E - 10E
	10607	5	: Pipe, nipple		15E
6	10350	2	: Nipple, pressure test		6E - 15E
7	10697	1	: Tee		15E
	11415	1	: Tee		6E - 10E
8	10665	1	: Union		15E
	11416	1	: Union		6E - 10E
9	10592	1	: Elbow		6E - 10E
	10645	1	: Elbow		15E
10	12136	1	: Indicator, closed position	Australian	6E - 15E

C1-8-1 GAS TRAIN, MONOBLOCK, 6E - 15E

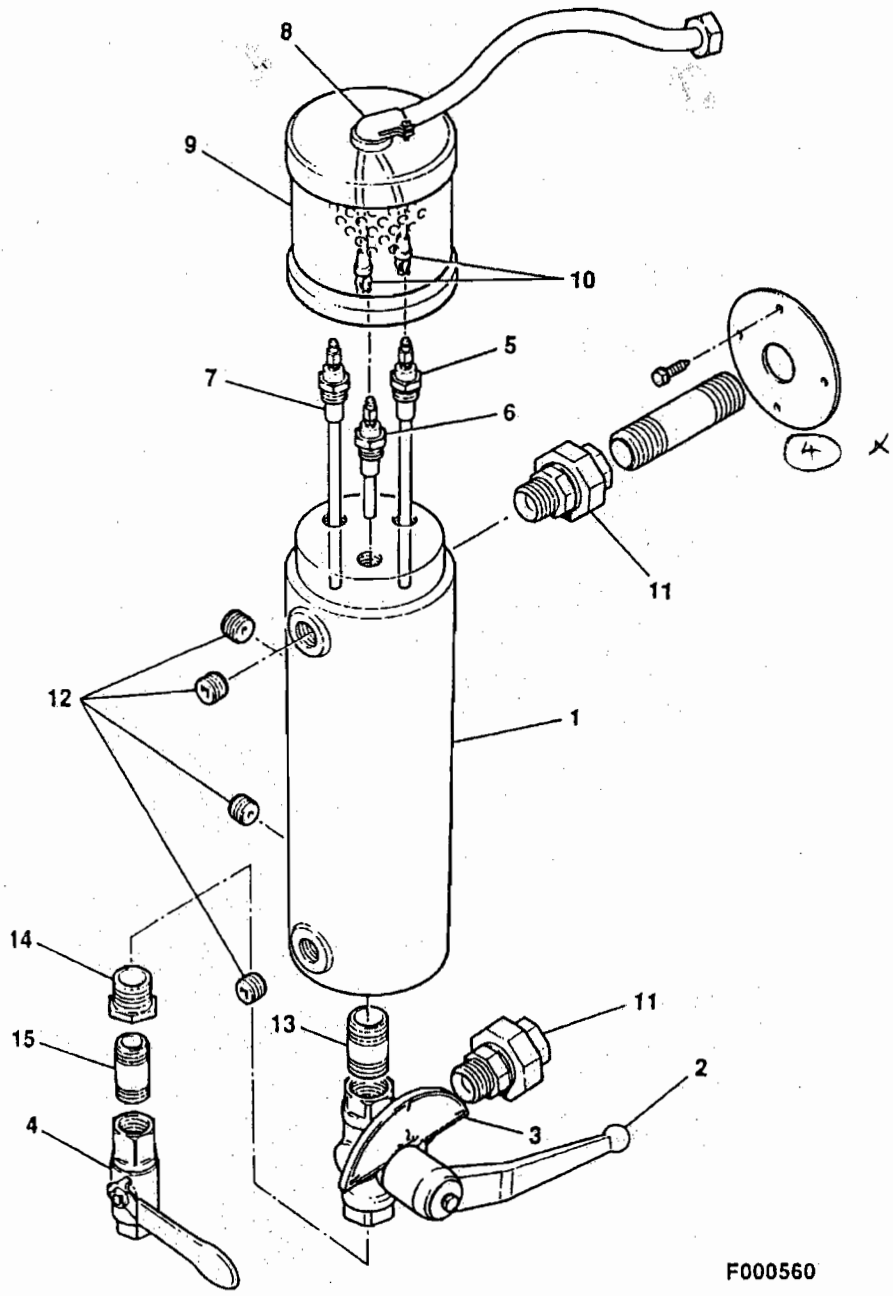
D1-1-1 BURNER SCROLL ASSEMBLY, GAS, 6E - 15E



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	006EG340	1	Scroll assembly		6E - 8E
	010EG340	1	Scroll assembly		10E
	015EG340	1	Scroll assembly		15E
2	10237	1	: Transformer, ignition		6E - 15E
3	10241	1	: Motor, burner	1ph	6E - 15E
	10247	1	: Motor, burner	3ph	6E - 15E
4	10270	1	: Switch, air		6E - 15E
5	10271	1	: Fan, burner		6E - 8E
	10272	1	: Fan, burner		10E
	10274	1	: Fan, burner		15E
6	10366	1	: Casting, scroll		6E - 15E
7	10376	1	: Gate, air		6E - 15E
8	10379	1	: Damper, air		6E - 15E
9	10796	4	: Bolt		6E - 15E
10	10842	4	: Washer		6E - 15E
11	10850	4	: Washer, spring		6E - 15E
12	10833	4	: Nut		6E - 15E
13	10786	8	: Bolt		6E - 15E
14	10831	3	: Washer		6E - 15E
15	10849	8	: Washer, spring		6E - 15E
16	10841	7	: Washer		6E - 15E
17	11770	1	: Casting, air gate		6E - 15E
18	11771	1	: Casting, air gate		6E - 15E
19	10146	A/R	: Gasket		6E - 15E
20	11835	4	: Screw		6E - 15E
21	SA0009	1	: Screen, mesh		6E - 15E
22	11147	1	: Wingnut		6E - 15E

D1-1-1 BURNER SCROLL ASSEMBLY, GAS, 6E - 15E

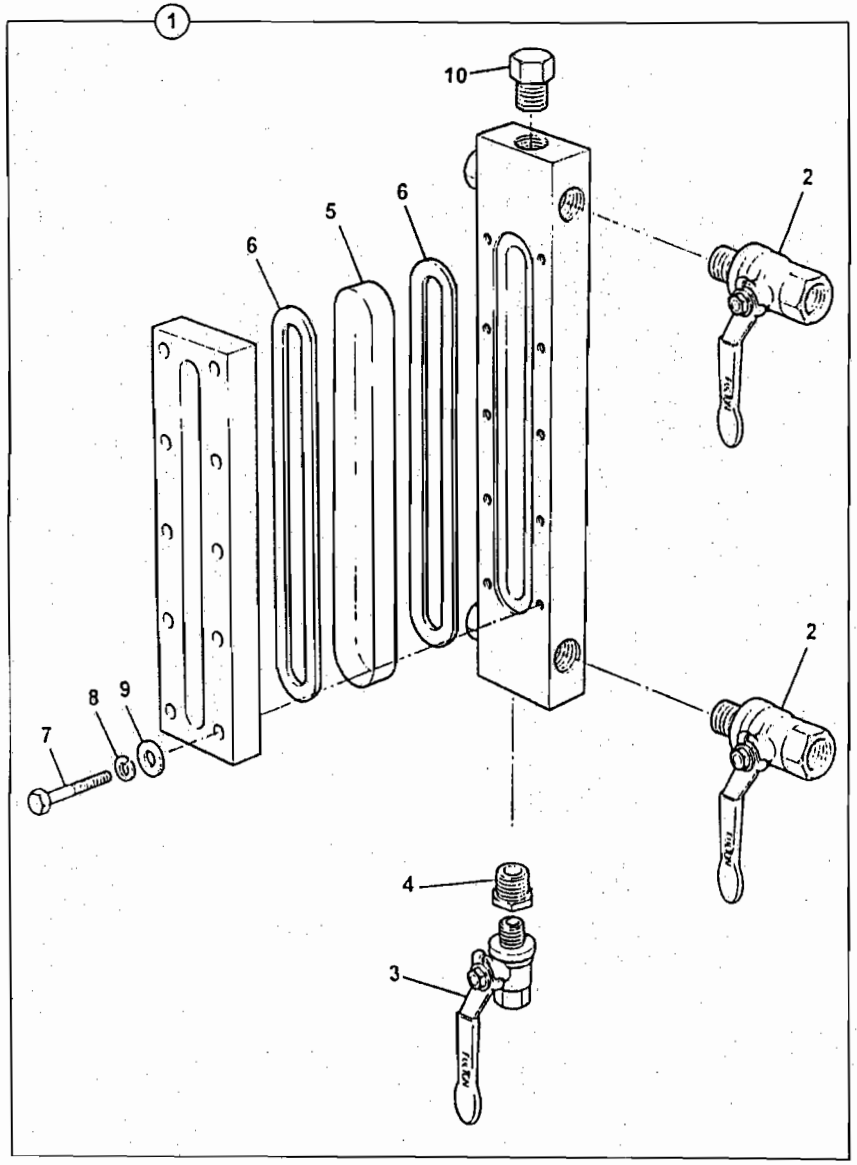
E1-2-1 WATER COLUMN, 3 WAY VALVE



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	10403	1	Casting, water column		6E - 60E
2	SA0017	1	Valve	With handle	6E - 60E
3	11517	1	Plate, indicator		6E - 60E
4	11640	1	Valve		6E - 60E
5	11541	1	Probe	Pump on	6E - 60E
6	10418	1	Probe	Pump off	6E - 60E
7	10420	1	Probe	Low water, if fitted	6E - 60E
8	10729	1	Connector, conduit		6E - 60E
9	99E9370	1	Basket		6E - 60E
10	10250	A/R	Terminal	Rajah	6E - 60E
11	10670	2	Union		6E - 60E
12	10661	4	Plug		6E - 60E
13	11404	1	Pipe, nipple		6E - 60E
14	10627	1	Bush		6E - 60E
15	10592	1	Pipe, nipple		6E - 60E

E1-2-1 WATER COLUMN, 3 WAY VALVE

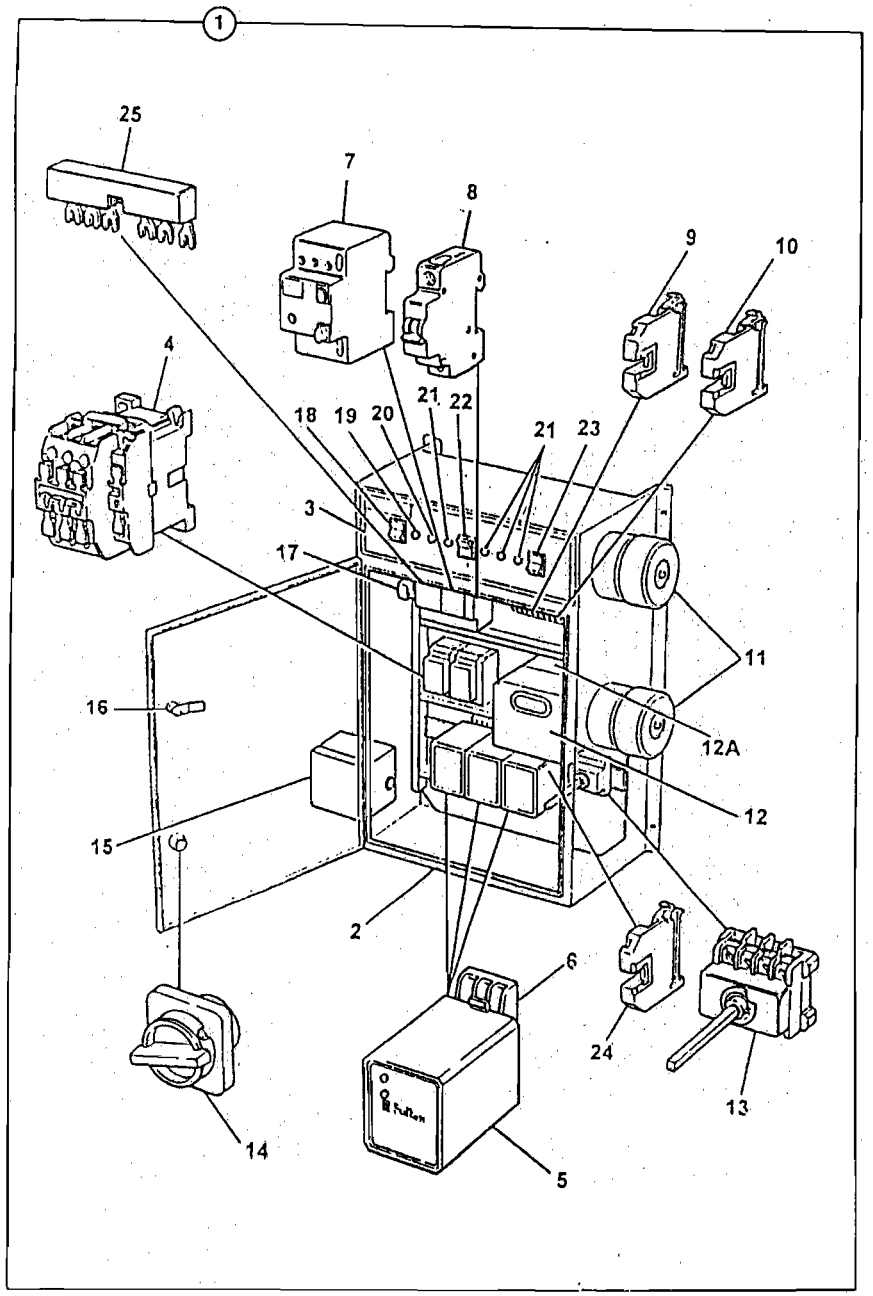
F1-3-1 WATER LEVEL GAUGE ASSEMBLY, CLIFTON



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	12207	1	Gauge Assembly	1995 onward	6E - 60E
	12292	1	Gauge Assembly	Pre. 1995	6E - 60E
2	12199	2	: Valve		6E - 60E
3	12210	1	: Valve		6E - 60E
4	10626	1	: Bush, reducing		6E - 60E
5	12200	2	: Glass, reflex		6E - 60E
6	12201	2	: Gasket		6E - 60E
7	12208	10	: Bolt		6E - 60E
8	10850	10	: Washer, spring		6E - 60E
9	10842	10	: Washer		6E - 60E
10	12227	3	: Plug		6E - 60E

F1-3-1 WATER LEVEL GAUGE ASSEMBLY, CLIFTON

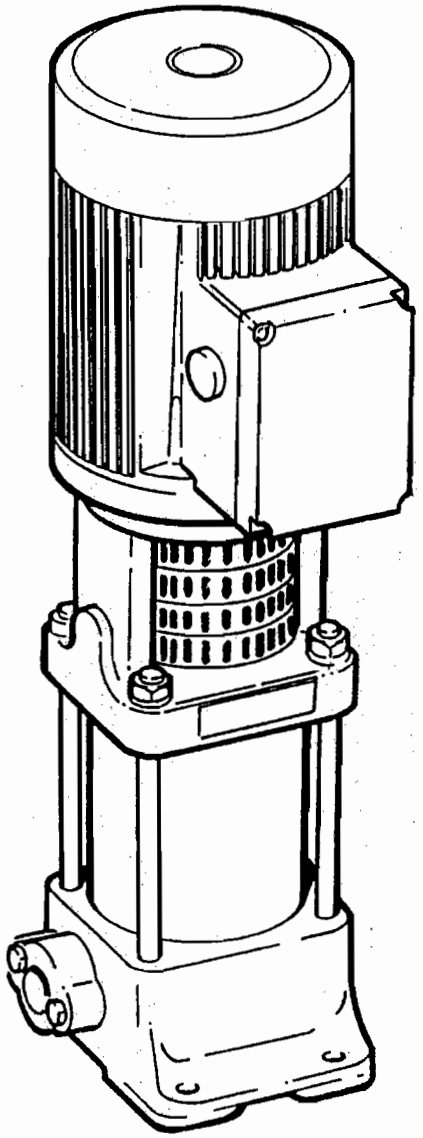
G1-1-1 CONTROL BOX ASSEMBLY, GAS, 6E - 15E



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	006EG322UK	1	Control Box assembly	240V/1/50	6E - 15E
	006EG323UK	1	Control Box assembly	380V/3/50	6E - 15E
	006EG324UK	1	Control Box assembly	415V/3/50	6E - 15E
2	10434	1	: Enclosure		6E - 15E
3	11688	1	: Label, facia		6E - 15E
4	10488	2	: Contactor		6E - 15E
5	11869	3	: Relay, water level		6E - 15E
6	11904	3	: Base, water level relay		6E - 15E
7	11941	1	: Trip, thermal	1 - 1.6Amp.	6E - 15E
	11943	1	: Trip, thermal	2.5 - 4Amp.	6E - 15E
8	11154	1	: M.C.B.	6Amp.	6E - 15E
9	11509	19	: Block, terminal		6E - 15E
10	11430	3	: Earth, terminal block		6E - 15E
11	10575	2	: Alarm, audible		6E - 15E
12	10486	1	: Control, burner	Satronic	6E - 15E
	11506	1	: Control, burner	Landis	6E - 15E
12A	11344	1	: Base, burner control	Satronic	6E - 15E
	11511	1	: Base, burner control	Landis	6E - 15E
13	10448	1	: Switch, isolator		6E - 15E
14	12016	1	: Isolator, switch handle		6E - 15E
15	10508	1	: Control, pressure	Fixed differential	6E - 15E
	10509	1	: Control, pressure		6E - 15E
16	12545	1	: Key, lock		6E - 15E
17	11327	1	: Switch, pump override		6E - 15E
18	11526	1	: Switch, rocker	Amber	6E - 15E
19	10455	1	: Lamp, indicator	Red	6E - 15E
20	10457	1	: Lamp, indicator	Green	6E - 15E
21	10459	4	: Lamp, indicator	Amber	6E - 15E
22	11587	1	: Switch, rocker	White	6E - 15E
23	11527	1	: Switch, rocker	Red	6E - 15E
24	12004	1	: Earth, terminal block		6E - 15E
25	11940	1	: Busbar		6E - 15E

G1-1-1 CONTROL BOX ASSEMBLY, GAS, 6E - 15E

H1-1-1 PUMP, FEEDWATER



Item	Part no.	Qty.	Description	Remarks	Boiler size
1	11962	1	Pump, feedwater, VL211F 415/3	130psi, 9bar	6E - 30E
	12010	1	Pump, feedwater. VL213F 415/3	150psi, 10.3bar	6E - 50E
	12011	1	Pump, feedwater, VL215F 415/	150psi, 10.3bar	60E
	12012	1	Pump, feedwater, VL211F 240/	130psi, 9bar	6E - 30E
	12013	1	Pump, feedwater, VL213F 240/	150psi, 10.3bar	6E - 50E
	12026	1	Pump, feedwater, VL209F 415/3	105psi, 7bar	6E - 30E

H1-1-1 PUMP, FEEDWATER

Fulton

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