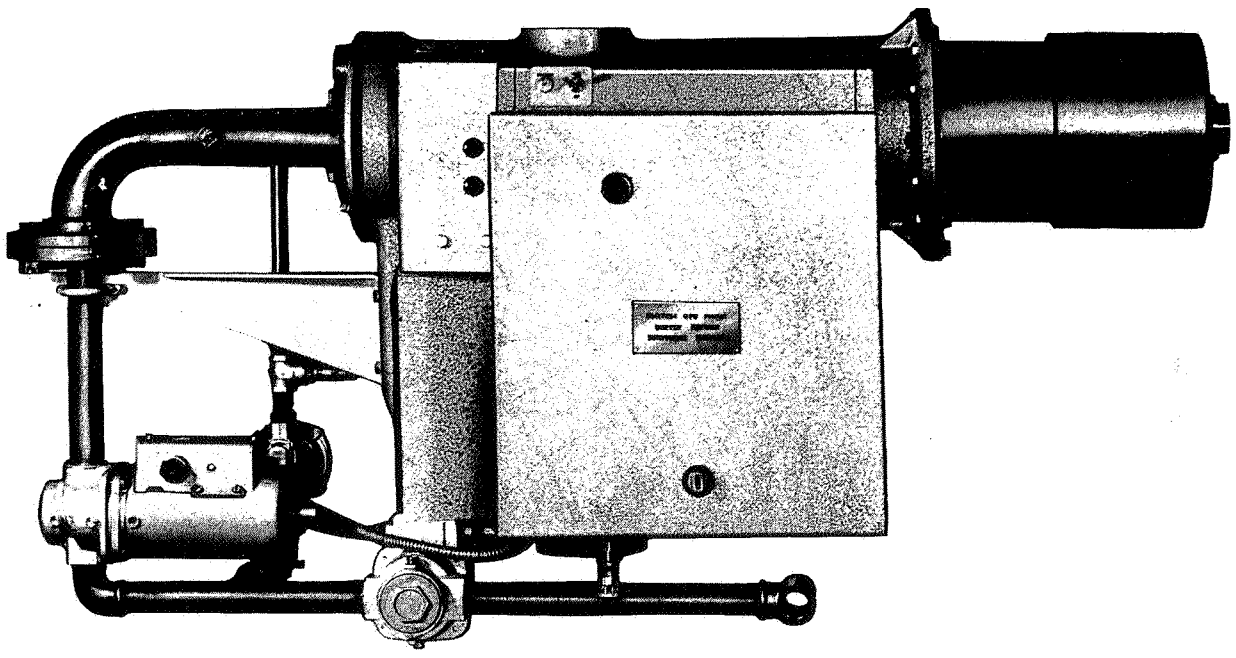
NU·WAY

BY APPOINTMENT TO HER MAJESTY THE QUEEN MANUFACTURERS OF COMBUSTION EQUIPMENT NU-WAY HEATING PLANTS LTD DROITWICH

Handbook

automatic gas burners

MODEL
AG Mk3



NU·WAY

IMPORTANT

READ THESE INSTRUCTIONS RIGHT THROUGH BEFORE STARTING TO INSTALL THE BURNER.

WHEN THE BURNER BEING INSTALLED IS A COMPONENT OF A PROPRIETARY OIL-FIRED BOILER OR AIR HEATER, THE INSTRUCTIONS SUPPLIED WITH THE MAIN HEATING UNIT ARE TO BE STRICTLY FOLLOWED. ANY SUCH INSTRUCTIONS HAVE BEEN EVOLVED AFTER LABORATORY AND FIELD TRIALS OF THIS PARTICULAR COMBINATION OF BURNER AND HEATING UNIT AND THEY THEREFORE TAKE PRECEDENCE OVER THE GENERAL INSTRUCTIONS CONTAINED IN THIS BULLETIN.

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NU-WAY SERIES 'AG' FULLY AUTOMATIC GAS BURNERS

INSTALLATION AND SERVICE MANUAL

INTRODUCTION

A.G. Models are available which cover a range of Gas inputs from 25 to 80 therms per hour. Each model is suitable for operation with all common gases, i.e. Town Gas, Liquid Petroleum Gases (L.P.G.) or Natural Gas.

Each burner can be supplied completely packaged, ready for connection to a suitably boosted gas supply and to the mains electricity supply. The burner system is in line with the control and safety recommendations of the British Gas Council for this Class of burner, and is designed for firing packaged boilers and appliances originally designed for oil or solid fuel firing. Models are available for the firing of high resistance appliances without the need for an induced draught fan. The burners are of the nozzle mixing type, and both main and pilot gas throughputs can be adjusted by altering the outlet pressures from the governors.

SITE SURVEY

When the burner is not part of a packaged boiler or air heater it is most important to carry out a site survey before a burner is ordered, in order to check that the boiler or air heater, etc. (hereinafter called the "appliance") is suitable for firing with this burner, that it is in good condition, and that the site conditions are satisfactory.

If the appliance is not new, its current condition is very important. It must be sound in construction, clean and well-sealed against the infiltration of air. Appliance sealing is even more important with forced draught gas burners than with oil burners, because there will be a lower proportion of heat transfer to the appliance by radiation and maximum overall efficiency with rated output will be much more dependant upon using a very small amount of excess air. (Air in excess of that theoretically required to complete combustion). "In-leakage air" is excess air which may never take part in the combustion process and merely carries away heat up the chimney.

The change in the method of firing involved will impose different stress patterns in the appliance structure, and these may show up unsuspected weaknesses.

Stack System

The flue and stack system may be similar to that used for an oil burner. If the appliance is not sealed, and is to be operated under natural draught, the calculations in the Nu-Way publication "Flues and Chimneys" apply. The draught required at the appliance combustion chamber should be within the range 0.02" to 0.05" w.g. (Negative Pressure). It must be stressed that the calculations used in "Flues and Chimneys" are only valid if the flue and chimney are unrestricted and free from leaks. Air "in-leakage" through the clean-out inspection openings, through poor joints between flue pipe sections, where the flue pipe enters the stack, and through the brickwork joints themselves, will reduce the draught available at the appliance. The effect is twofold; a reduction of gas temperature and thus of gas buoyancy, and an increase in gas volume and thus velocity and resistance. When two brick flues run together with a brick mid-feather separating them, leakage is extremely difficult to avoid, as the joints cannot be re-pointed. This method of construction is therefore not recommended. Leakage will not occur when both flues are working, but when one is idle, cold air will be drawn from the top of the idle flue though the leakage points.

No solid or liquid-fired appliance may use the same flue or stack as a gas-fired appliance.

BOILER HOUSE VENTILATION

The permanent ventilation of the boilerhouse (not including doors and windows which may be closed) is essential.

Boiler house ventilation serves two essential purposes. One is to permit combustion air to flow freely to the burners from outside the building. The second is to maintain a clean atmosphere within the boiler house at a reasonable temperature level.

The minimum area of entry into the boiler house for combustion air purposes only is proportional to the size of the appliance or appliances within. It should be calculated on the basis of 1/6th square foot per 100,000 BTU/hr appliance output. To maintain a satisfactory atmosphere in the boiler house, this area must be substantially increased.

The extra area must be disposed in two parts, one at low and the other at high level in such a way convection across the boilers will create the necessary air changes. It is important that the high level opening is not so close to the low level opening that short circuiting of air, without ventilation across the boilers, can occur. The frequency of air changes necessary will depend to a very large extent upon the effectiveness of the appliance lagging and the amount of exposed metal flue pipe within the boiler house. Although Fully Automatic Gas Burners and their associated controls will operate at temperatures up to 110°F, their ultimate reliability will be impaired by such temperatures and it is thus strongly recommended that the temperature should be held below 80°F when ever possible, by effective lagging of both appliance and flue and by good boiler house ventilation.

It is suggested that for ground level and higher situated boiler houses that the area for ventilation be one third square foot per therm/hour at low level and half that resultant area at high level.

For boiler houses below ground level, arrangements should be made to induce fresh air if necessary, i.e. if the air access is restricted and of a type which forms a "chimney" from the boilerhouse windows to ground level.

SOURCE OF GAS (Natural and Town Gas)

The gas mains and meter must be checked by the local gas authority to ensure that both are capable of handling the quantities of gas required for the burner and any other existing load.

When a booster is used, the gas pressure at the booster inlet must not fall below 1" W.G. under all conditions. The supply authorities should be asked to recommend the size of the pipe work between the meter and burner to guarantee this pressure.

The pressure of the gas supplied to the burner itself should not, in general, exceed 40" w.g. otherwise there is risk of damage to the diaphragms of the burner gas governors.

It is particularly important to protect the burner line components against excessive pressure when the gas supply mains are being pressure tested and purged before commissioning. It is strongly recommended that the burner be disconnected from the supply mains at this time.

A. G. Burner Models

Burner type	Gas input Therm/h	Burner fan static pressure "wg	Max. Boiler resistance "wg
AG25–3	25	3	1
–5		5	2
–10		10	4
–14		14	7
AG40–5	40	5	2
–10		10	4
–14		14	7
AG60–5	60	5	2
–10		10	4
–14		14	7
AG80–5	80	5	2
–10		10	4
–14		14	7
AG80B–14	100	14	5

APPLIANCE PREPARATION

Generally this is a matter for consultation with the Appliance Manufacturer, and the following principles should be followed depending on their relevance to the particular application. All uncooled surfaces inside the appliance should be covered with refractory brickwork. A minimum of 2" refractory and 2" insulating brickwork should be applied to the floor of the combustion chamber if it is uncooled. If the floor is "tanked" the insulation thickness must be increased or provision made for ventilating the base.

A back target wall is not essential to ensure flame stability, and may only need fitting if the appliance manufacturer anticipates local overheating due to flame impingement.

The burner should generally be mounted on the boiler so that the end of the flame tube is flush with and protected by surrounding brickwork as shown on sketch E.10166 attached.

A $\frac{5}{16}$'' dia. hole should be drilled through the frontplate, in a position where it will not be covered by the internal brickwork, in order to communicate with the Combustion Chamber. During commissioning, a probe will be inserted through this hole to take combustion chamber draught readings. The hole may finally be plugged. Alternatively it may be used as a connection for an air pressure switch if the appliance is working under a negative pressure.

A further $\frac{5}{16}$'' dia. hole should be drilled in the appliance flue gas outlet before any draught stabiliser or damper.

This hole should be placed so that a sampling tube can be inserted for analysis purposes. The sampling process through the open end of this tube must not be affected by air ingress, at either the draught stabiliser, or damper spindle. The burner can be mounted on the appliance after the combustion head has been examined to make certain that the ignition electrode and flame probe (if fitted) are correctly set. (See E10164 and E10104(1).

MAIN GAS SUPPLY

Governors are used to maintain a controlled gas supply to the burner. When the gas supply pressure is insufficient to give the required gas throughput against the running resistance of the appliance, it is customary to fit a gas booster into the gas supply line. The main and pilot governors are then positioned in the supply line after the booster.

There are regulations and recommendations to be adhered to when a booster is used. A low pressure gas cut-off switch must be placed at the inlet side of the booster. This ensures that unless there is a positive pressure gas supply at the inlet to the booster the booster motor will be switched off. It is desirable to prevent the burner working normally on full flame if the booster is not working otherwise there could be long periods of operation with full air and reduced gas which could be harmful to the plant. This is prevented by a gas pressure switch, which is used to prove that the booster delivery pressure is higher than the booster inlet pressure. This switch is connected into the burner control circuit to prevent high flame operation unless the switch is made.

The low pressure gas cut-off switch must be wired into the booster motor contactor circuit, whilst the gas booster proving switch is wired in the burner control circuit.

PILOT GAS SUPPLY

There are two alternative arrangements used for the pilot gas supply connection in relation to the main gas line, shown on sketch E.10167.

Arr. 1.—Shows the pilot line independent of the main line with the pilot connection taken from upstream of the main line governor.

In many cases is is desirable to connect the pilot line from downstream of the main line governor in order to make the pipework more compact.

Arr. 2.—Shows the more compact arrangement which is generally used.

PIPEWORK

The gas supply lines, sized in accordance with the local authority's recommendations, must be made up in accordance with B.S. 1737 for Towns Gas, and fully supported throughout their length. It is important that no strain from the pipework should be transmitted to either the booster or the burner. After the piping has been connected to these units, the piping adjacent to them must be supported in such a manner that no strain is imposed on these items. In particular provision should be made for expansion of the appliance/burner unit relative to the gas supply piping and a special expansion joint may be required in the pipework to prevent strain from this expansion.

A union or flange should be incorporated in the supply pipe adjacent to the burner, to permit removal for appliance, or burner maintenance. It is recommended that the installer should provide a manual shut off valve for isolaton of the burner from the incoming gas supply.

ELECTRICITY SUPPLY

A.G. Gas burner incorporate relatively sophisticated controls which, while they are designed to operate from a voltage supply of 220 to 240 volts, and will function correctly at the statutory 6% above and below these figures, will not accept voltages outside these ranges. It is therefore advisable to check that the voltages at peak periods, remain within the statutory limits.

Burner wiring may now be carried out to the wiring diagrams specified for the appliance/ burner unit in accordance with the relevant British Standards and I.E.E. Regulations. Final electrical connections to the burner and to the thermostats should be in flexible conduits, these being arranged in such a way that they do not require disconnecting during burner maintenance periods.

PRE-COMMISSIONING

Before commissioning, the installation should be checked over to see that it is complete, that there is water in the boiler, that any flue dampers are locked in the fully open position, that all inspection plates are in position and that the gas and electricity connections have been fully tested. The burner should also be inspected to make sure it has suffered no damage during transit, storage or installation. It is important that the correct gas fuel is supplied to the burner, as indicated on the burner nameplate.

The gas throughput rating in therms per hour for the burner is stamped on the burner nameplate together with the nominal governed gas pressure required to give this rating. This governed pressure figure is given as a guide to assist early commissioning until the actual gas consumption can be measured by means of the site gas meter. The final setting for the main governor must be determined from meter readings of gas consumption.

The nominal governed pressure figure is given in terms of the pressure required in excess of the appliance resistance, if the latter is appreciable. For example, the figure given is 6'' w.g. and the combustion chamber pressure on high flame is 2'' w.g. then the gas pressure after the main governor should be set initially at 8'' w.g. by adjustment of the main governor spring.

It is desirable before the burner is commissioned, to ensure that there is gas present at the burner inlet. The test point after the governor can be used to assist bleeding of air from the supply main until gas is found to issue from the test point. A draught gauge should be connected to a test point on the appliance frontplate to record combustion chamber pressure where possible. A monometer should be connected to the gas test point immediately downstream of the main governor.

Switch the ''Low Flame Hold'' switch on the burner control panel to the low flame position for initial commissioning.

For initial commissioning it is also desirable to prevent the main gas supply from reaching the burner head until the operation sequence has been checked and the pilot flame established securely. On early AG models there is a manual shut-off valve in the main gas line which can be used for this purpose. On current models the main gas valve can be kept in the de-energised (closed) position by removing the red plug in the terminal block within the terminal box mounted on the burner casing. The main gas safety shut-off valve (S.S.O.V. or main gas valve) will remain de-energised at all times until the red plug is replaced for normal oeration.

Check that the air damper is fully open, and set the low flame adjusting screw, so that the damper will be half open on low flame. (See sketch E.10165). Check that all instruments in the control circuits are ''calling for heat''. The contacts of all instruments such as hot water boiler, or air heater, control and limit thermostats, steam boiler control and limit pressure switches, high and low water level switches, room thermostats and time switches should all be closed.

Switch on the electricity to the burner control trol panel. and if necessary press the red reset button, also the motor overload reset button. Note the rotational direction of the fan or motor shaft. Switch off. If the fan (or motor shaft) is rotating the wrong way change over any two of the three phases feeding the motor and re-check rotation. It is vitally important that the fan is rotating correctly before any firing tests are carried out.

ROTATION MUST BE IN AN ANTI CLOCKWISE DIRECTION, VIEWED FROM THE MOTOR SIDE OF THE CASING.

Incorrect rotation will lead to incomplete combustion, formation of Carbon Monoxide (CO), and a possibly potentially dangerous situation inside the appliance. Under controlled conditions, the air pressure switch will prevent any attempt at ignition, but this rotation test is never-the-less an important added safeguard.

The full starting and running sequence is as described below, but on "Pilot Hold" the main Gas valve will remain de-energised and on "Low Flame Hold" neither the air damper nor the main gas valve will move to the high fire position.

Remove the red plug from the burner terminal block and switch the Low Flame Hold switch to "Low". Switch on the mains electricity and note the sequence of the burner.

BURNER OPERATION SEQUENCE

	*Approx. Timings**
Damper to high flame position	At start
Burner fan on	Several seconds later
Pre firing purge duration	30 or 60 secs approx.
Damper to low flame position and ignition on	At end of pre-purge
Pilot gas on (Pilot Flame)	Generally 3 secs after ignition on
Ignition off	Within 5 secs of pilot on
Main gas on (Low Flame)	After 5 secs (Min) of ignition off
Damper to high flame then main gas to high flame**	After suitable interval (optional)

Operation

Note 1* See control box leaflet (attached) for actual timing for each particular control box.

Note 2** After high flame is established the subsequent operation from high flame to low flame, and then either returning to high flame or shutting down, would be under the control of the appliance control thermostats or pressure switches.

At this stage in commissioning, the burner should operate on Pilot flame only with the air damper still in the low flame position. If there is difficulty in establishing Pilot flame refer to the paragraphs on Fault Finding. It is important at this time to check that the gas supply to the pilot has been established (supply main bled and pilot gas valve opening). It is particularly important to take the opportunity at this time to adust the position of the U.V. cell in the casing to give a good signal on the Pilot flame, as described in the control box leaflets attached and in the paragraphs on Fault Finding.

If the flame monitoring is by probe and not by U.V. cell, it is important that the probe is positioned correctly in relation to the gas nozzle, as shown on sketch E.10104/1 attached, in order that the probe metal is immersed in the flame at all times whether on pilot, low flame or high flame.

It is assumed in the above description that the pilot gas valve is connected to the control box for 'PERMANENT PILOT' as is correct for normal operation of the AG burner. If the pilot gas valve is connected for 'Intermittent Pilot' then the pilot valve would be energised for a few seconds only and there is therefore only this limited time per starting cycle to check the pilot signal.

The next objective after establishing the pilot flame is to proceed to high flame for the purpose of setting the correct gas rate and then the correct air rate to suit. The procedure therefore is first to re-connect for low flame and briefly to set the main governor pressure at the nominal value; then to proceed to high flame for final high flame settings; and lastly to return to low flame for final low flame settings. In more detail the steps are as follows :

1. Re-connect for energising main gas valve (replace red plug in burner terminal box). Set main governor pressure to the nominal value. The burner should now be operating on low flame.
2. Switch from 'LOW FLAME HOLD' to 'NORMAL'. Observe that the air damper opens fully, the damper micro switch is made and the main gas valve moves to high flame.
3. Measure the high flame gas rate by means of the gas meter and adjust the main governed gas pressure as necessary.

4. Measure for sufficient excess of combustion air by means of a Firite Oxygen indicator sampling from the flue gas. Adjust the high flame stop of the burner air damper to reduce the damper opening so that 5/6% O_2 is obtained. It is essential to avoid forming appreciable amounts of carbon monoxide in the flue gases due to incomplete combustion and it is therefore necessary at this time to sample the flue gases for CO concentration using a proprietary sampling instrument to give indication of CO concentration. The maximum CO concentration should be 0.2% by volume of the flue gases. If necessary increase the burner damper opening to clear this CO level. The proprietary sampling instruments give the CO reading directly in terms of percentage by volume of flue gases.

5. Lock the high flame stop when the damper position has been established. Note that adustments of the damper may affect the gas rate slightly. It is therefore necessary to re-check the gas rate before finalising the settings of the governor and the damper.

6. Switch to Low Flame Hold. Set the low flame gas rate as desired by adjustment of the travel limit switch of the main gas valve (by Allen Key or screwdriver, depending on the model) using meter readings to measure the gas rate.

7. Set the air damper for low flame by the same method as previously used for high flame, i.e. with sufficient excess air to avoid appreciable CO formation but, if possible, with not more than 6% O_2 in the flue gases.

8. Lock the low flame stop when the damper position has been established.

9. The air pressure switch needs to be set at this time on low flame running. The diaphragm loading screw should be screwed down until the burner cuts out and then screwed back three full turns.

10. This air pressure switch is mounted vertically on the side of the burner air inlet and access to the setting screw is by removal of the outside cover plate, held on by two screws.

NOTES

(a) The 5/6% O_2 setting should ensure that the flame is not starved of combustion air. However there could be air ingress at the back of the appliance so that the flame is starved even though 5/6% O_2 is indicated. It is for this reason that it is important to measure that appreciable CO is not being formed.

(b) If is it desired to operate on low flame for an extended period before proceeding to set high flame correctly it would be necessary to make a preliminary setting of the low flame damper position to ensure adequate combustion air on low flame, i.e. 5/6% O_2 in flue gas, without appreciate CO (CO test required).

(c) If the gas fuel being used is L.P.G., i.e. propane or butane, a gas meter would generally not be available as part of the gas supply installation. Advice should be sought from the supplier of the L.P.G. regarding the method to use for measuring the gas consumption rate. One method sometimes adopted is to measure gas rate by means of the pressure differential obtained across a calibrated restriction in the gas supply to the burner.

If a method of measurement of L.P.G. gas rate is not available at the time of commissioning care should be taken not to over-fire the appliance by excessive gas throughput.

The result of this would be an excessively high flue gas temperature at the appliance outlet. The gas rate must therefore be adjusted until the flue gas temperature is brought down to a reasonable level for the type of appliance being fired.

(d) If the main gas valve is of the hydramoter type HOV1A or J the pressure differential across this valve can be used as a guide to the gas consumption. The Hydramotor leaflet attached tabulates the gas rate in BTU per hour for various sized valves when the pressure drop across the valve is 1'' w.g. The rate depends on the square root of this pressure drop, e.g. it is double the tabulated figure for 4'' w.g. pressure drop. The tabulated BTU per hour figures are for town gas.

Control & Safety Features

All AG Gas Burners are available with High/Low/Off operation and establish their main flame through a pilot flame sequence.

Burner control is effected through a cyclic control system and the burner flame can be monitored by ultra-violet cell or flame rectification.

The burner operation sequence is carefully regulated, and the adjacent schedule indicates the stages and timing for the operational cycle.

Ignition on each model is provided by a single spark electrode, through a 10,000 volt 50 M.A. transformer.

Gas is passed to the burner nozzle through a series of regulating controls consisting of gas governors, main and pilot safety shut-off valves (wired to the burner control system) and manual shut-off valves. The layout of the AG gas control system which is in line with the control and safety recommendations of the British Gas Council for this class of burner, is shown on the back page of this Data Sheet.

Gas Boosters will in general be required for use with every AG burner using Town gas and these we can supply if required. A suitably sized gas booster can be common to a number of burners.

Where a gas other than Town gas is to be used, a resistance will be provided for the flow of gas to the burner combustion head. The purpose of this, is to correct the flow of gas for changes in calorific value and specific gravity.

On a boosted system where for any reason the booster was not operational, the burner would be supplied with gas at a greatly reduced pressure.

Since it would be wasteful to run for long periods with a reduced gas supply i.e. with a large excess of combustion air, all boosters supplied by us are fitted with a pressure switch device to prevent normal burner operation if the booster delivery pressure is unusually low.

In order to ensure that sufficient combustion air is always available, all models are fitted with an air pressure switch. Should the burner combustion air supply be restricted the air pressure switch will not allow burner light-up sequence to begin until the air supply has been restored.

Electrical Data

Model	Fan motor hp	Fan motor kW	Start current A/phase	Run current A/phase	Recommended mains cable size mm^2	Recommended fuse rating A
AG25–3	1·0	0·75	11·0	2·1	1·0	10
–5	1·5	1·1	15·0	2·5	1·0	10
–10	3·0	2·2	25·0	4·6	1·5	15
–14	4·0	3·0	35·0	6·1	1·5	20
AG40–5	3·0	2·2	25·0	4·6	1·5	15
–10	3·0	2·2	25·0	4·6	1·5	15
–14	4·0	3·0	35·0	6·1	1·5	20
AG60–5	3·0	2·2	25·0	4·6	1·5	15
–10	4·0	3·0	35·0	6·1	1·5	20
–14	5·5	4·1	45·0	8·0	2·5	25
AG80–5	4·0	3·0	35·0	6·1	2·5	20
–10	5·5	4·1	45·0	8·0	2·5	25
–14	5·5	4·1	45·0	8·0	2·5	25
AG80B–14	7·5	5·6	40·0*	11·5	2·5	20

All current ratings relate to 415V supply.
* Star-delta start.

Panel to A.O.T.C. requirements

Type AG burners intended for firing steam boilers may, if required, be fitted with control panels built to AOTC requirements (Associated Offices Technical Committee of the boiler insurance companies). This panel includes a boiler feed pump starter for direct-on-line start, and fuse protection for both burner and feed pump motors. Gas pressure booster motor control equipment can also be incorporated in the main control panel.

Booster Model	Motor H.P.	Start Current (Amps/Phase)	Run Current (Amps/Phase)	Recommended Main Cable Sizes
534	·75	5·0	1·4	3/029
535/2	2·0	10·0	3·0	3/029
539	3·0	15·0	4·5	3/029
540/3	5·5	21·0	8·0	3/029

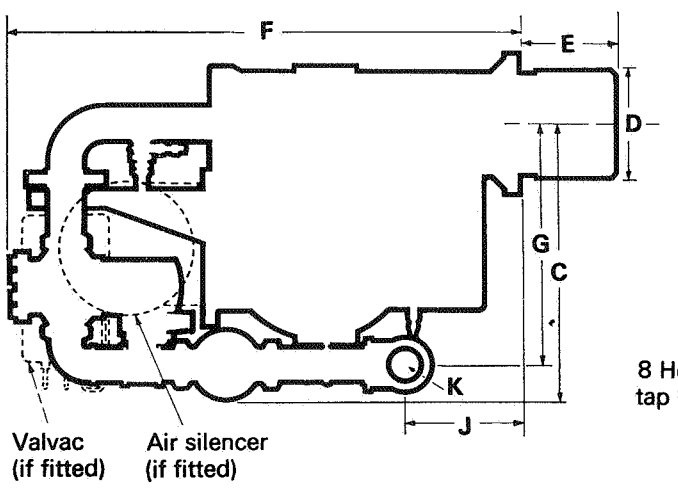
Leading Dimensions

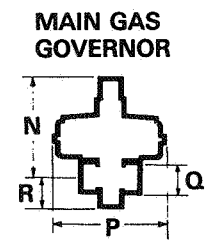
FAN DOWN, STANDARD VALVE TRAIN

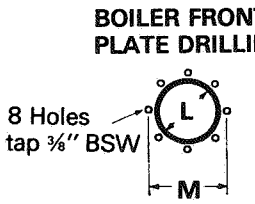
Model	A	B	C	D	F	G	J	K " BSP	L	M	N	P	Q " BSP	R	S	Weight lb	Weight kg
AG25–3	13¼ 337	14½ 368	22⅜ 568		39¾ 1010	19¾ 502				10 254					23¾ 603		
–5	13¼ 337	14½ 368	22⅜ 568		39¾ 1010	19¾ 502				10 254					23¾ 603		
–10	14½ 362	14½ 368	26 661	8⅜ 213	41½ 1055	23⅜ 594	6 153	2	9 229	10 254	7¼ 184	—	2	2 51	23¾ 603	318	145
–14	18 457	16¼ 413	28⅞ 734		42⅜ 1076	26¼ 667				12 305					32¾ 832		
AG40–5	13¼ 337	14½ 368	24 610		40¾ 1036	20½ 521									23¾ 603		
–10	14¼ 362	14½ 368	27⅝ 702	9 229	42½ 1080	24⅛ 613	6 153	3	10 254	12 305	15⅝ 397	16¾ 426	3	4⅜ 111	23¾ 603	375	170
–14	18 457	16¼ 413	30½ 775		43⅜ 1101	27 686									32¾ 832		
AG60–5	16 407		28⅝ 727		42½ 1080	25⅛ 638											
–10	16 407	16¼ 413	28⅝ 727	10 5/16 262	42½ 1080	25⅛ 638	6 153	4	11 280	12 305	20¾ 527	19 484	4	4⅜ 111	32¾ 832	414	190
–14	18 457		30½ 775		43⅜ 1101	27 686											
AG80–5	16 407		28⅝ 727		42½ 1080	25⅛ 638											
–10	16 407	16¼ 413	28⅝ 727	10 5/16 262	42½ 1080	25⅛ 638	6 153	4	11 280	12 305	20¾ 527	19 484	4	4⅜ 111	32¾ 832	432	197
–14	18 457		30½ 775		43⅜ 1101	27 686											
AG80B–14	Dimensions on application																

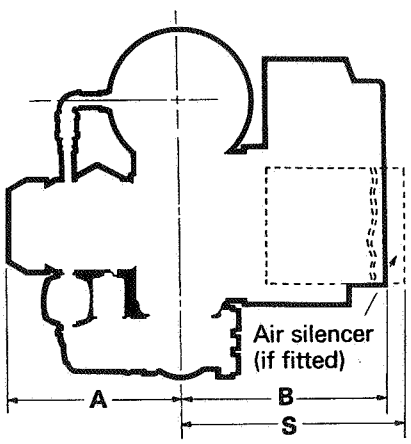
NOTES

1. Dimensions shown in black inch, green mm.
2. Dimension E is dependant on individual customers' requirements.
3. Gas connections K and Q are screwed up to and including 3" BSP size, flanged for 4" BSP and above.









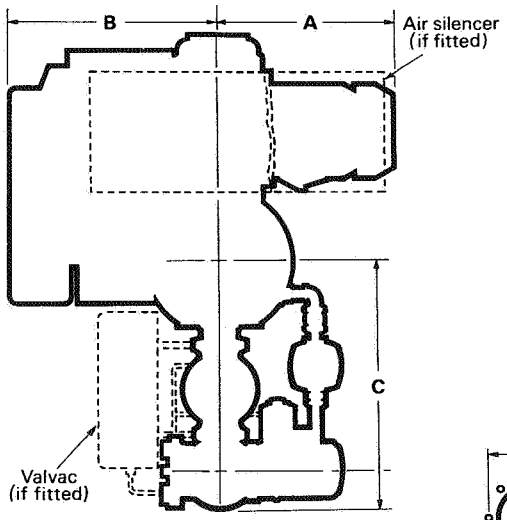
Leading Dimensions

FAN UP, STANDARD VALVE TRAIN

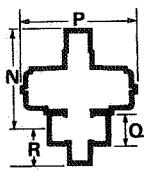
Model	A	B	C	D	F	G	J	K "BSP	L	M	N	P	Q "BSP	R	Weight lb	Weight kg
AG25–3	13¼	16¼	18⅞		33⅛	16¼				10						
	337	413	480		842	413				254						
–5	13¼	16¼	18⅞		33⅛	16¼				10						
	337	413	480		842	413				254						
–10	14¼	16¼	18⅞	8⅜	34⅞	16¼	6	2	9	10	7¼	—	2	2	318	145
	362	413	480	213	886	413	153		229	254	184			51		
–14	18	18	20⅝		35¾	18				12						
	457	457	524		908	457				305						
AG40–5	13¼	16¼	24½		33⅞	21										
	337	413	622		860	534										
–10	14¼	16¼	24½	9	35⅝	21	6	3	10	12	15⅝	16¾	3	4⅜	375	170
	362	413	622	229	905	534	153		254	305	397	426		111		
–14	18	18	26¼		36½	22¾										
	457	457	667		927	578										
AG60–5	16	17¾			35⅝											
	407	451			905											
–10	16	17¾	26¼	10 5/16	35⅝	22¾	6	4	11	12	20¾	19	4	4⅜	414	190
	407	451	667	262	905	578	153		280	305	527	484		111		
–14	18	18			36½											
	457	457			927											
AG80–5	16	17¾			35⅝											
	407	451			905											
–10	16	17¾	26¼	10 5/16	35⅝	22¾	6	4	11	12	20¾	19	4	4⅜	432	197
	407	451	667	262	905	578	153		280	305	527	484		111		
–14	18	18			36½											
	457	457			927											
AG80B–14	Dimensions on application															

DIMENSIONS AND WEIGHTS

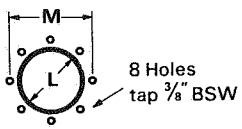
The drawings, dimensions and weights relate to burners fuelled with town's gas. Dimensions and weights of burners for operation on natural or liquified petroleum gases are available on request.

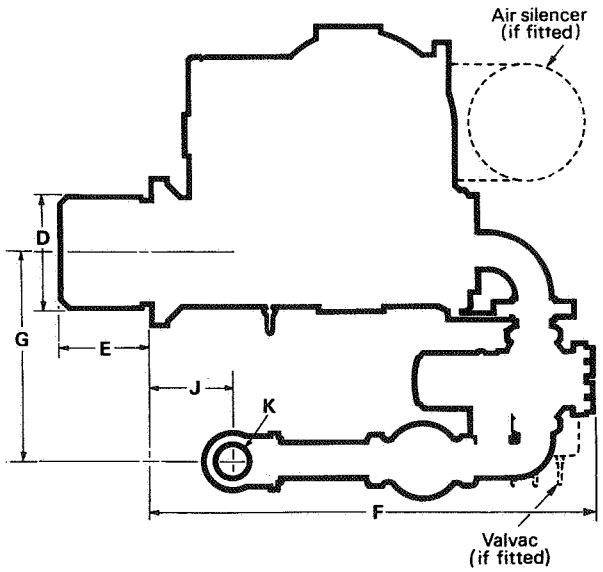


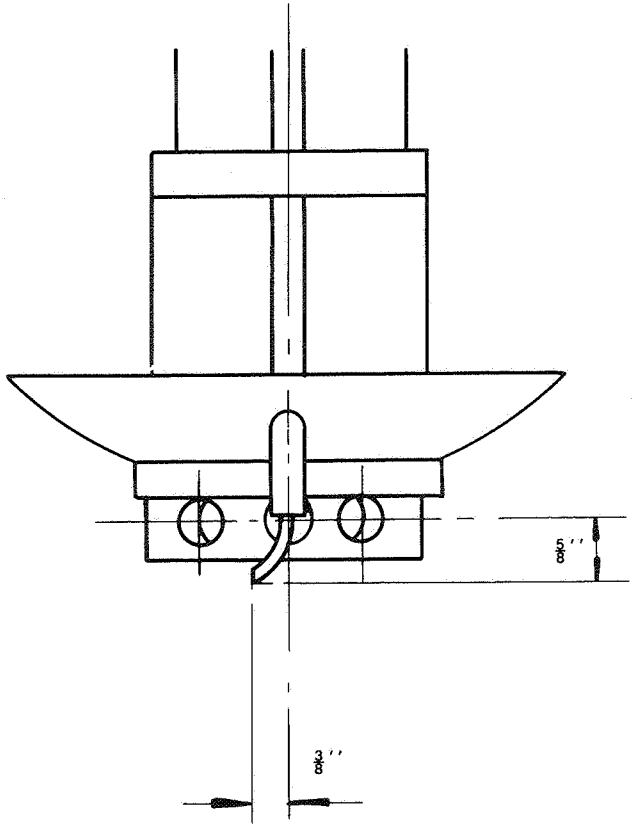
MAIN GAS GOVERNOR

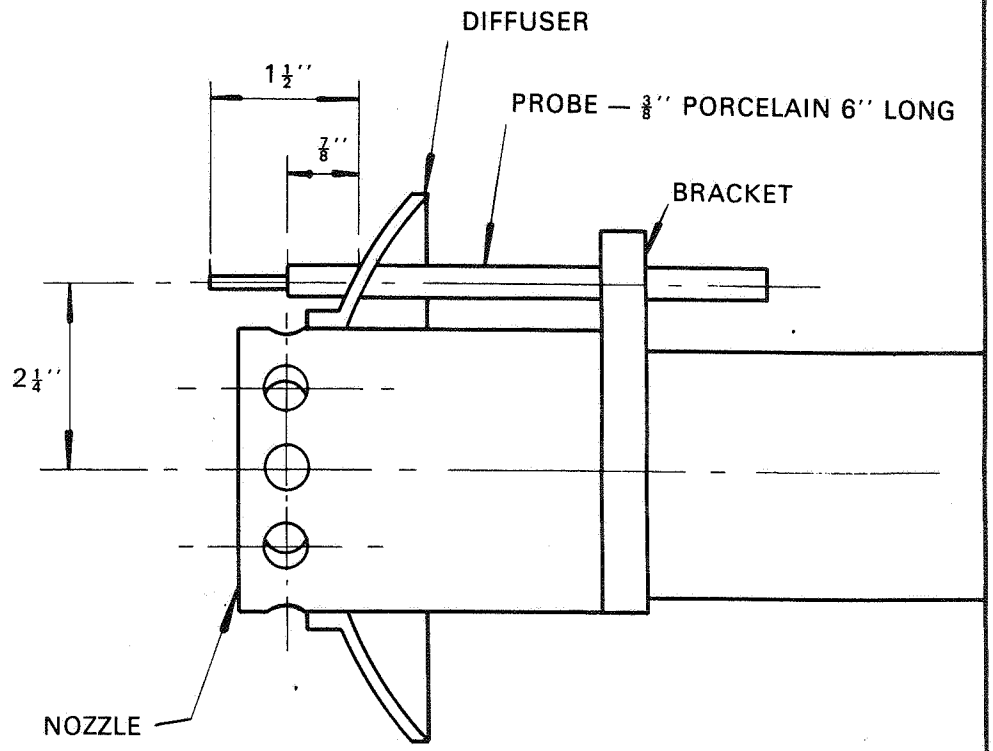


BOILER FRONT PLATE DRILLING





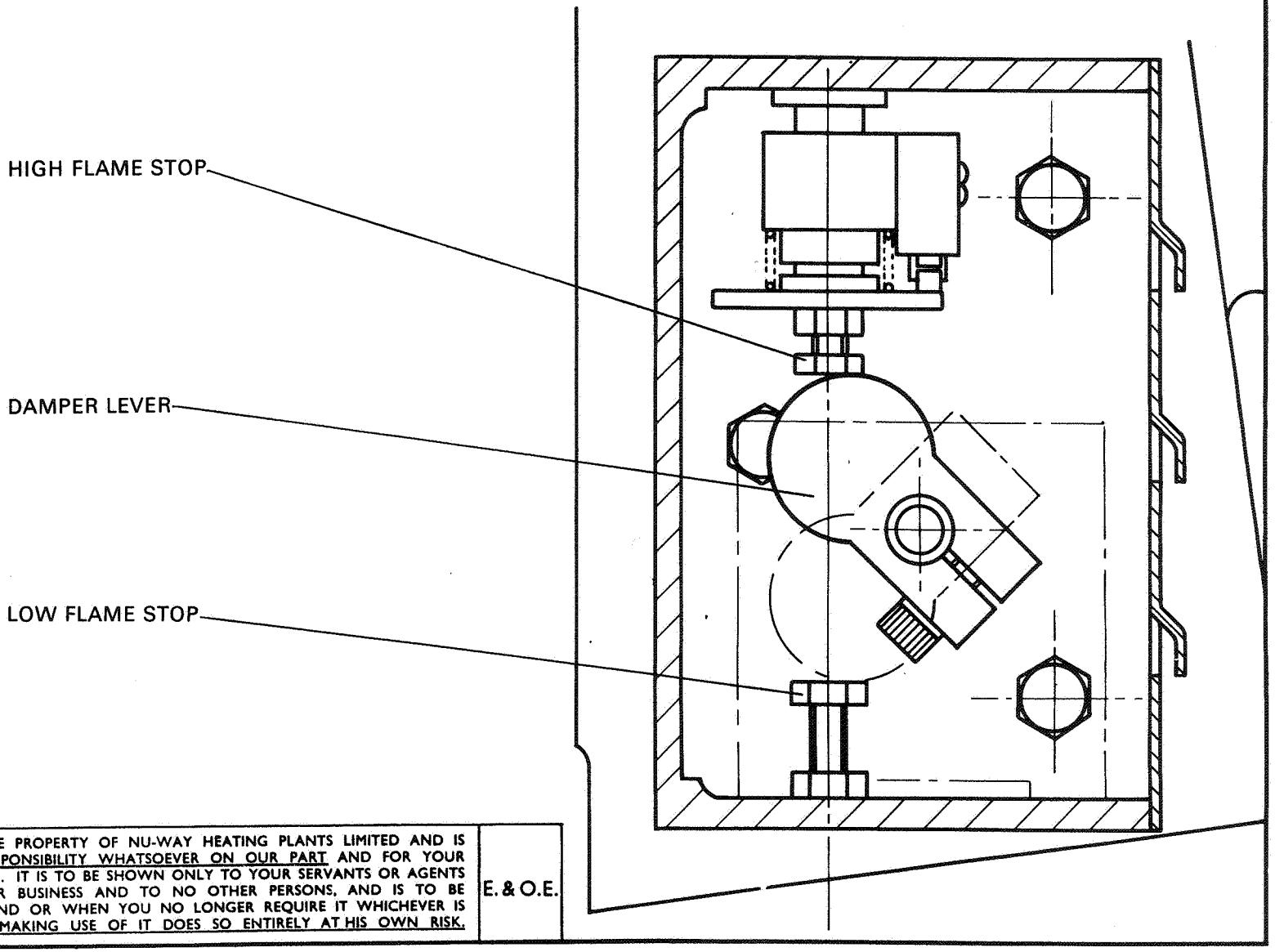




PROBE SETTING FOR PG & AG BURNERS — 2 1/2'' NOZZLE

SKETCH No. E.10104/1

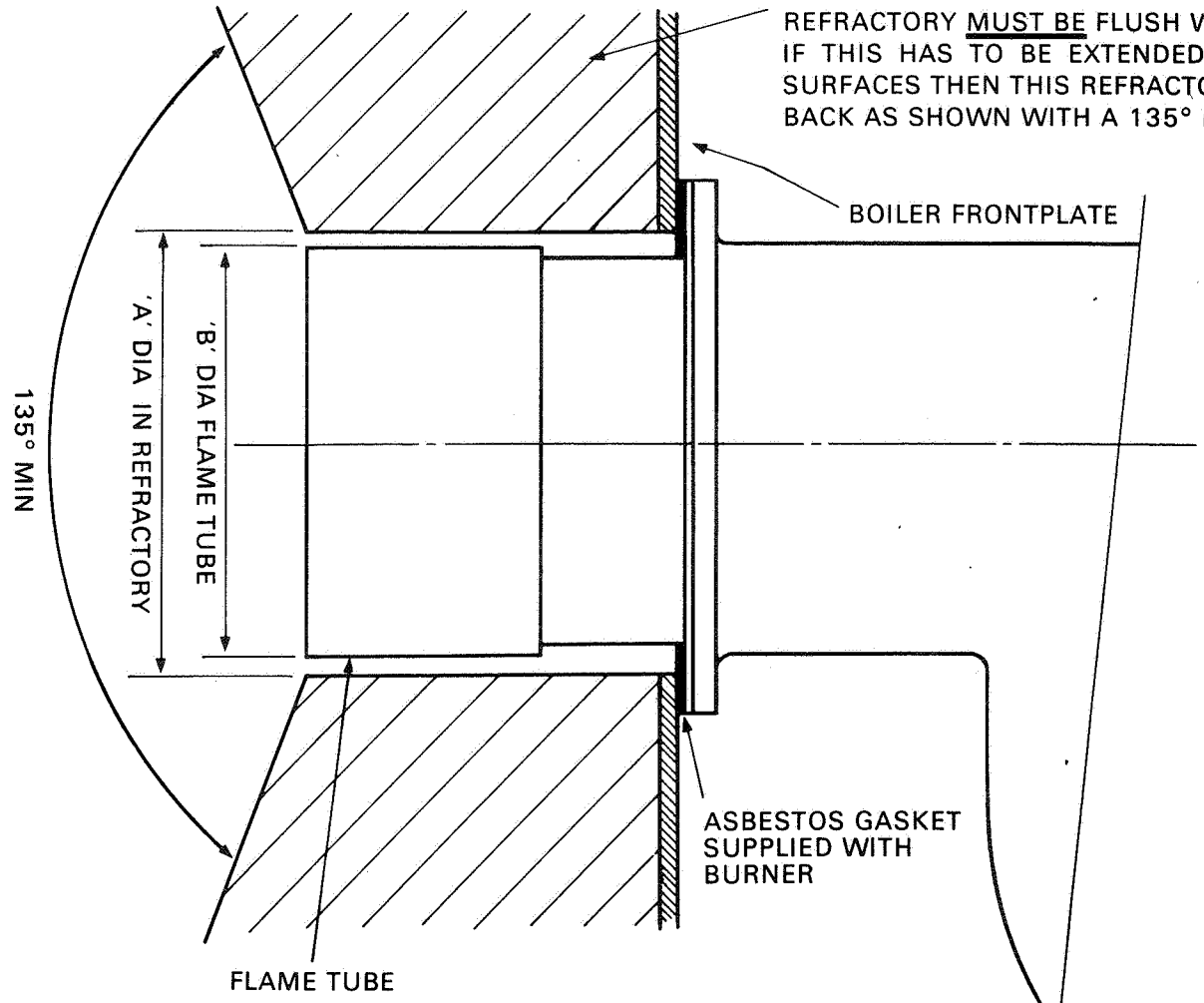
NU-WAY HEATING PLANTS LTD. DROITWICH



AIR DAMPER CONTROL ARRGT. AG BURNERS

SKETCH No. E.10165

NU-WAY HEATING PLANTS LTD. DROITWICH



BURNER	'A'	'B'
AG 25	9''	7¾''
AG 40	9½''	9''
AG 60 & 80	11''	10⅜''

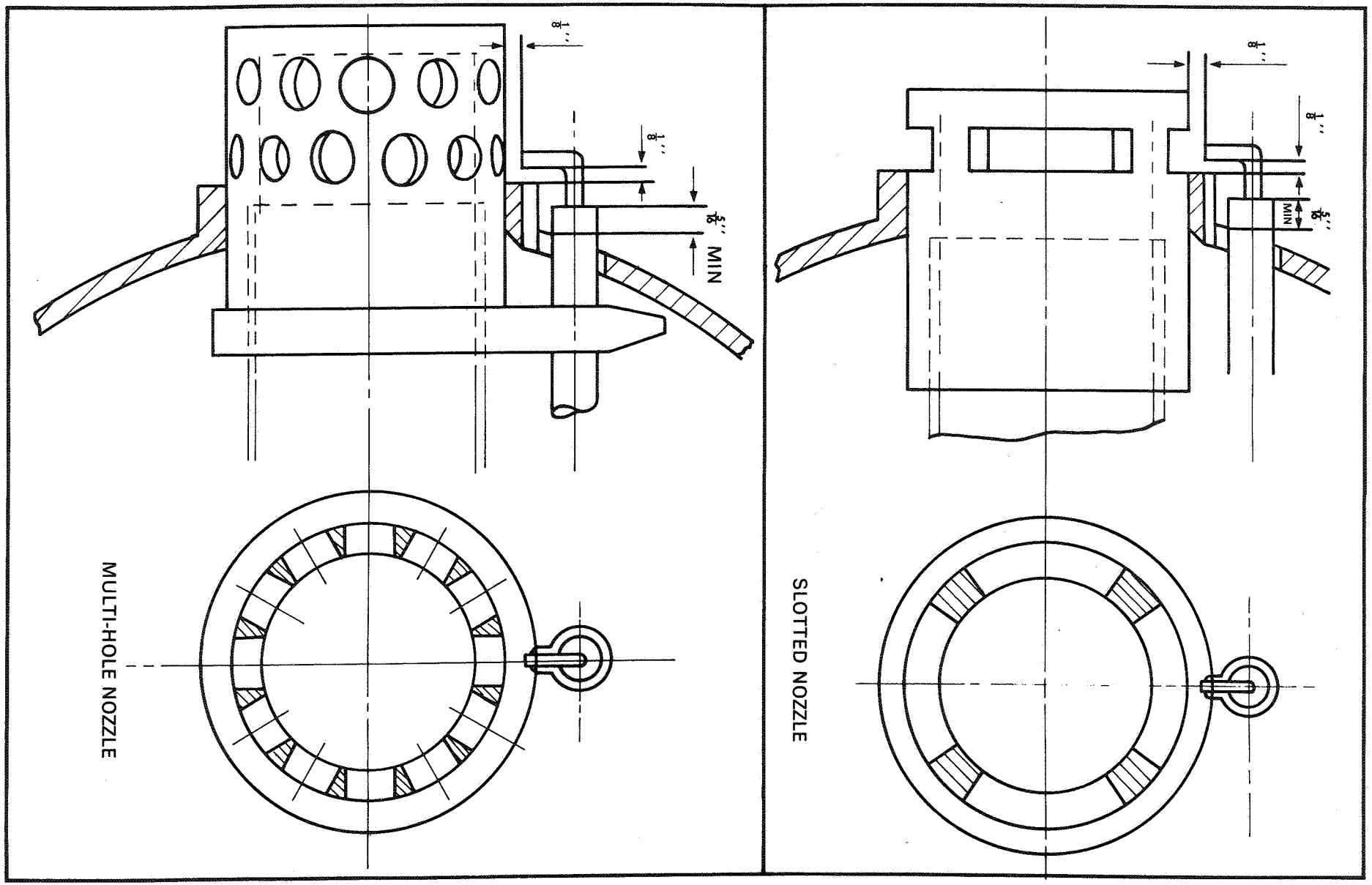
E. & O.E.

FRONTPLATE DETAILS FOR AG BURNERS

SKETCH No. E.10166

NU-WAY HEATING PLANTS LTD.

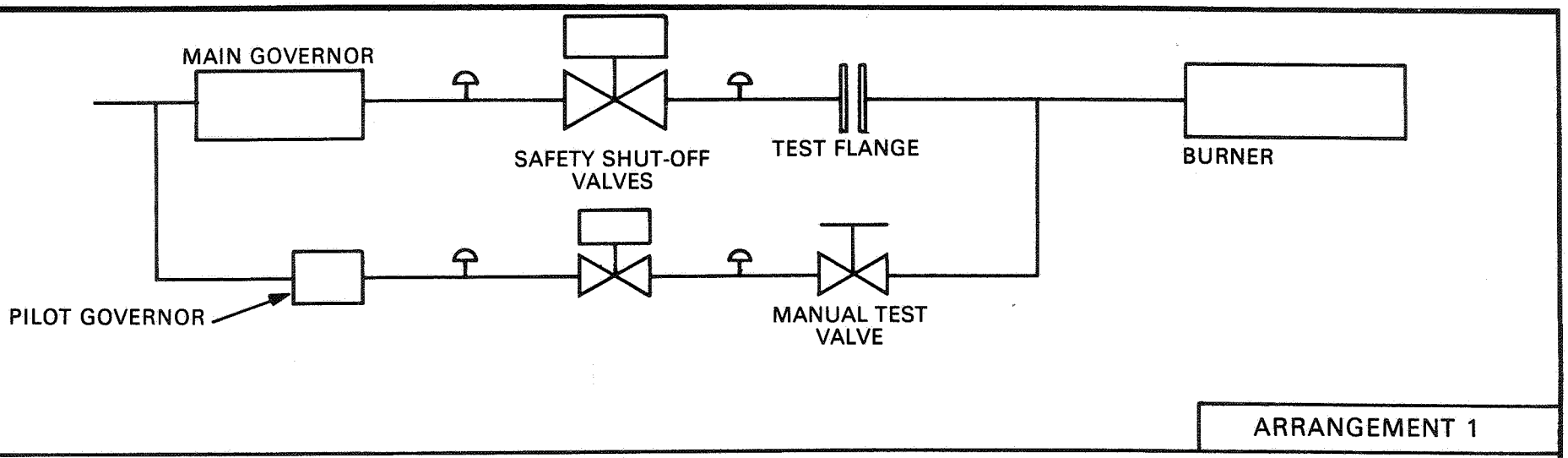
DROITWICH



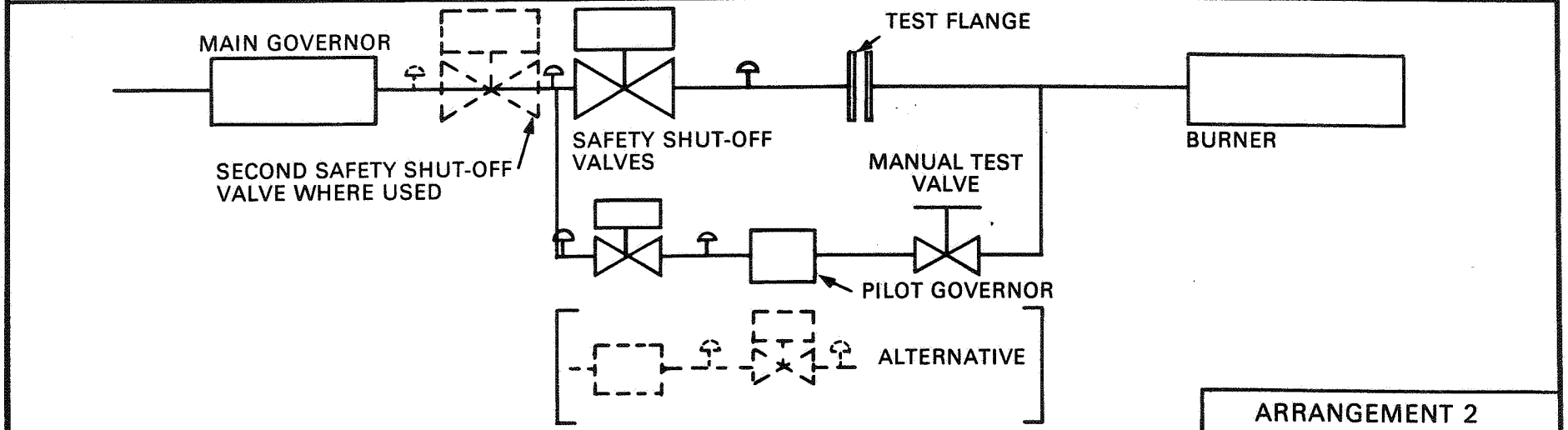
ELECTRODE SETTING FOR AG BURNERS

SKETCH No. E.10164

NU-WAY HEATING PLANTS LTD. DROITWICH



ARRANGEMENT 1



ARRANGEMENT 2

E. & O.E.

DENOTES PRESSURE TEST POINT

LINE DIAGRAM OF GAS LINE FOR AG BURNERS

SKETCH No. E.10167

Burner Gas Inputs

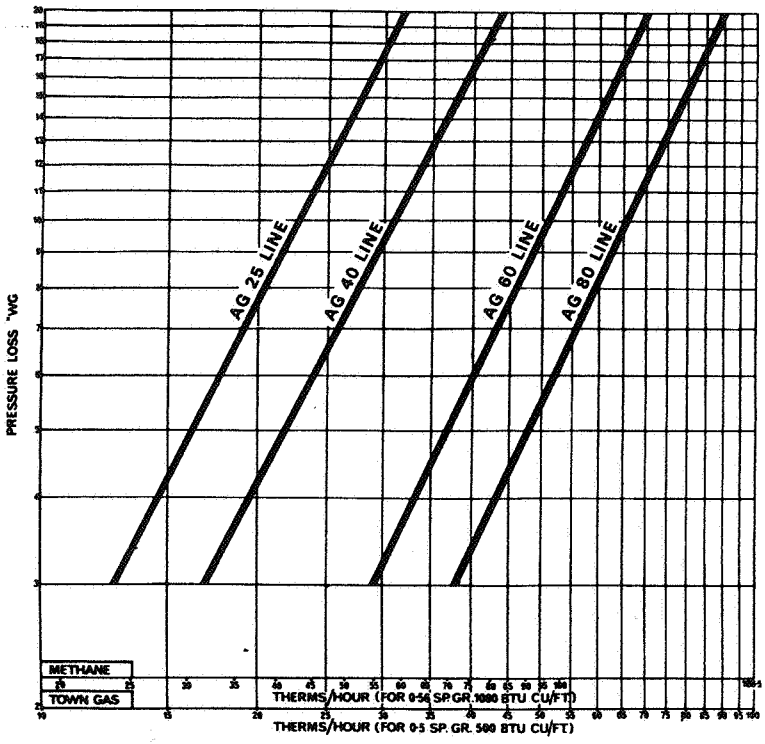
TOTAL PRESSURE LOSS IN AG GAS LINES —INCLUDING GAS GOVERNOR

This graph is for standard type Town gas burners: the throughput would be greater on methane as indicated on the bottom of the graph.
When burners are ordered specifically for working on natural gas or methane, smaller lines would be used and the graph would not apply.

The graph also gives the total gas pressure loss for the burner line and governor, but excluding the burner gas nozzle. The usual pressure drop allowed for the nozzle is 3 inches W.G.
The resistance of the boiler, nozzle and of any additional gas supply piping must be added to arrive at the total gas supply pressure required. In general this supply pressure will be met by boosting the main gas supply.

The pressure setting required after the governor is not shown on these graphs, but is indicated on the burner nameplate in terms of the governed pressure required in excess of boiler resistance.

Maximum burner governor inlet pressure:– 30 inches W.G.



GAS BOOSTER

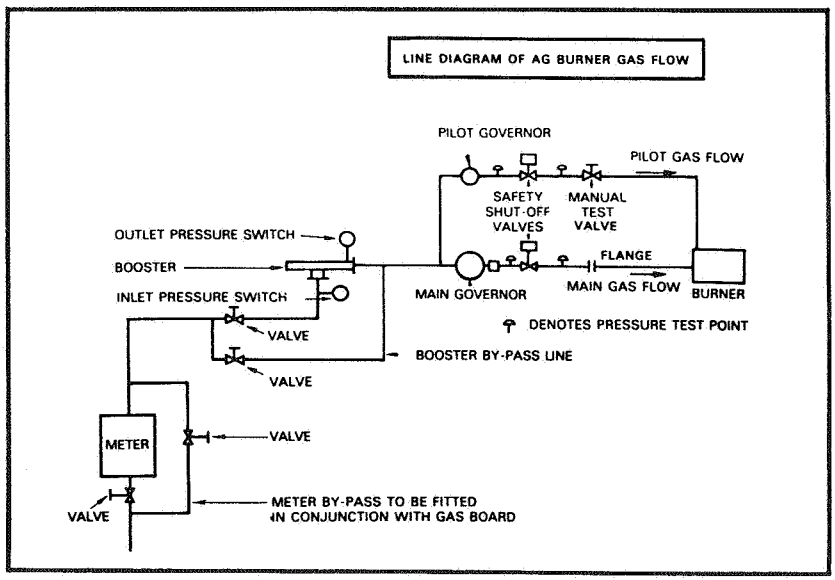
Gas boosters will in general be required for use with every AG burner using Town gas, and these we can supply if required. A suitably sized gas booster can be common to a number of burners.

When a booster is used, its inlet gas pressure must never fall below one inch W.G. under all conditions.

The booster must be wired to cut out automatically if its inlet pressure falls below one inch W.G.

BOOSTER DATA

Booster Type	Max. Capacity Th/hr (Town Gas)	Amount of Boost Inches W.G.
534	25	8·5
535/2	60	18
539	75	18
540/3	160	18



LANDIS & GYR

GAS BURNER CONTROLS

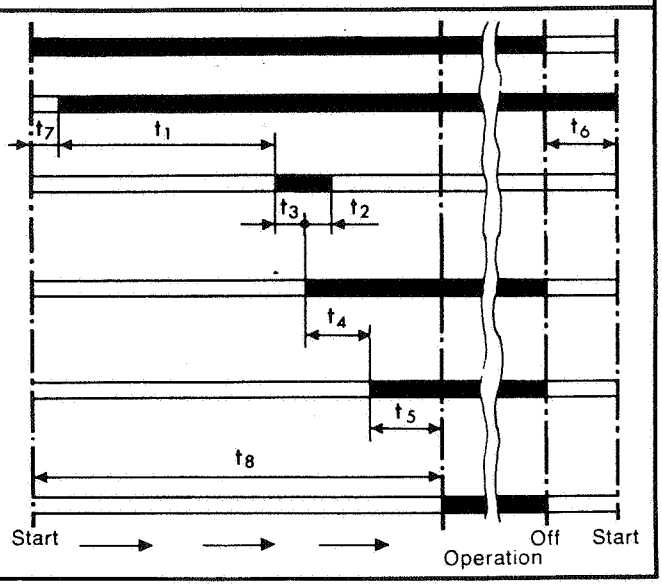
LFA1...

LFB1...

TYPES LFA 1·33 - IONISATION
LFB 1·33 - U.V. DETECTION

Switching programme for the burner elements

Burner element, function	Symbol	Connection terminal and switching programme
Burner motor	G	9 = 16 =
Ignition transformer	ZT	6 =
Pilot gas valve	ZGV	5 =
Main gas valve	HGV	7 =
Burner output control (if fitted) (e. g. controller operating a solenoid valve)	LR RV	11 =



Programme times:

t1	Pre-purge time	30 secs.	t6	Post-purge time	10.5 secs.
t2	Safety time for pilot flame	3 secs.	t7	Delay time	6 secs.
t3	Pre-ignition time	3 secs.	t8	Start-up time	79.5 secs.
t4	Interval between the release of the pilot gas and main gas	12 secs.			
t5	Interval between main gas 1 and main gas 2	28,5 secs.	T	Running time of the switching mechanism	90 secs.

Technical data

Supply voltage	(220 V—15% ... (240 V+10%)
Frequency	50 cycles – 6%
Consumption	
Start	about 5 VA
Running	about 3 VA
Test voltage	2000 V
Surge voltage test	up to 3 kV 1/5
Max Fuse Rating	5 amp
Construction standard	P30
Permissible ambient temperature	
Control	—10 ... +60°C
UV-detectors QRA2 and QRA10 (air cooling possible with QRA10)	0 ... 50°c
Reaction time (Flame present)	less than 1 sec.
Reaction time (Flame lost)	less than 1 sec.
Programme times	see Time diagram
Switching capacities (max. permissible current strength)	
Terminals 3, 16	4 A (Peak 20 A)
Terminal 6	2 A
Terminals 5, 7, 11	1 A
Terminal 12	1 A
Weight of the control	1,25 kg
Ionisation field (LFA1.335)	
Voltage between flame rod and earth	approx. 300 V~
Current by short circuit	less than 0,5 mA
Minimum required ionisation current	7µA
UV-detector (LFB1.335)	
Test voltage	approx. 260 V~
Working voltage	approx. 230 V~
Minimum required UV-detector current	100 µA

LANDIS & GYR LTD.
ELGEE WORKS, VICTORIA ROAD,
NORTH ACTON, LONDON, W.3.

TELEPHONE: 01-992 5311
TELEX: 21486
TELEGRAMS: ELGEEMETER LONDON

Meters
Supervisory control
Thermal control
Ripple control
Nucleonics

FAULT FINDING

The burner is a precision instrument which has been carefully assembled by Nu-Way Heating Plants Limited and, under normal circumstances, it should not be dismantled except by a qualified engineer.

BURNER FAILS TO START

Check that the main isolating switch of the burner is ON. Check also that the isolator feeding the booster, where fitted, is ON.

Check that power is available at the control panel and at the booster, where fitted.

Check that the boiler door micro-switch, where fitted, is closed.

Check that switches such as the time switch, low water, fusible fire link, etc, are all closed.

Check that the safety thermostat or pressure switch has not tripped.

NOTE: If the safety thermostat has tripped it must be reset manually. If it trips repeatedly it is either faulty or set too close to the control thermostat. It should be set at least 20^{o} ($11^{o}C$) higher than the control thermostat.

The safety thermostat may operate if the circulating pumps and the burner are shut off simultaneously. This can cause the water temperature to temporarily overshoot the settings of the thermostats. Hence, it is not good practice to shut off pumps and burner together.

Check that the air pressure switch contacts are closed in the "burner start" position. The air pressure switch MUST be in this position before the firing cycle can start. If the air pressure switch is stuck in the "satisfied" or an intermediate position, the burner cannot start.

If a pressure booster is installed, check that both gas pressure switches function correctly.

Check the overload protective devices of the burner fan motor and, where fitted, of the gas pressure booster.

BURNER MOTOR STARTS: NO IGNITION SPARK

Switch burner OFF.

Check spark gap.

Check HT lead and connections.

Check that ignition electrode and insulator is clean and dry and that the insulator has not developed a conductive track to earth.

BURNER LOCKS OUT BEFORE PILOT VALVE OPERATES

Lockout at this stage of the burner operating sequence can be caused by failure of the ignition system, pilot gas supply interruption or failure of the flame sensing device (ultra violet or ionisation probe).

DURING LIGHT-UP

Air failure will cause the burner control to re-cycle.

DURING RUN

Air failure will shut the burner down and cause it to re-cycle.

Flame failure or failure of the flame sensing device drive the burner to lockout.

In the case of ionisation probe flame sensors flame "lift-off" causes the burner to lock out.

BURNER PILOT LIGHTS: BURNER LOCKS OUT AFTER 3–4 SECONDS

Flame sensor, or wiring to it, is faulty.

The UV cell is not receiving sufficient signal from the flame. Rotate cell in its holder and or clean its envelope (see commissioning instructions).

Check the position of the ionisation probe, if fitted.

SMELL OF GAS LOCAL TO THE APPLIANCE

Check all pipe line joints with a soap solution.

Check the gas tightness of the pilot and main gas valves.

COMBUSTION TROUBLES

If combustion trouble is suspected, eg excessive combustion noise or a flame which appears more yellow than normal contact your installer or service engineer.

Any alterations of the burner settings MUST be accompanied by flue gas analysis to ensure that no carbon monoxide (CO) is being generated. Even an extremely small concentration of carbon monoxide can lead to potentially dangerous situations.