

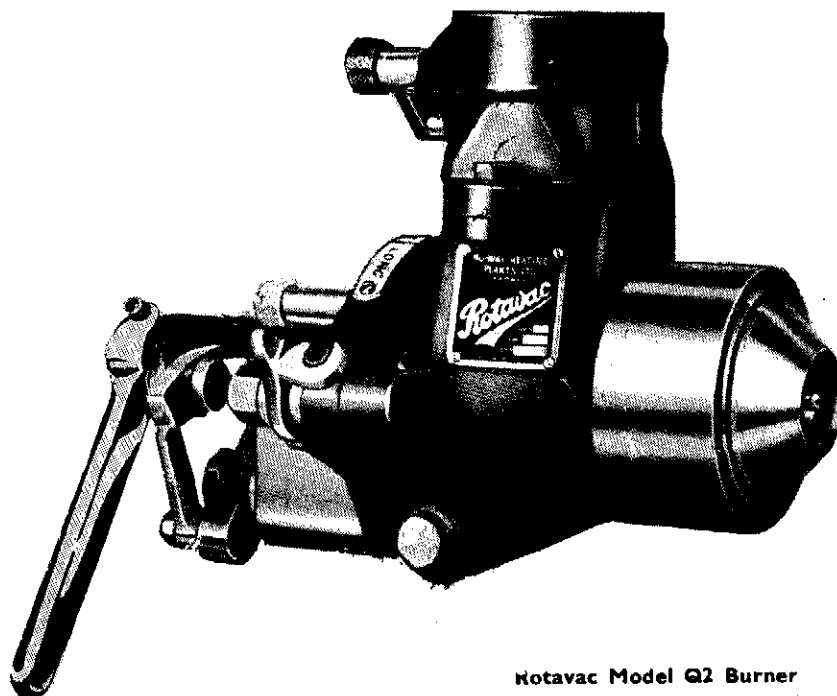


proportioning oil burners

MODEL

Q

QH



Rotavac Model Q2 Burner

MODEL Q & QH FEATURES

- 1 **SINGLE LEVER** controls both oil and air, keeping the ratio constant from maximum to minimum firing rate. Easily and efficiently operated by unskilled labour.
- 2 **RADIAL MOVEMENT** allows burners to be easily controlled in groups on one furnace instantly and accurately by shaft or cable. Lever adjustable through 360°.
- 3 **REMOVABLE INNER ASSEMBLY** makes nozzle cleaning a simple task. Patent withdrawal latch overcomes sticky fuel oils.
- 4 **ANY FURNACE ATMOSPHERE** selected at will and maintained throughout firing range with uniformly high CO₂. Often gives reduced fuel consumption (10-20%) when replacing ordinary burners in particular applications.
- 5 **VARIABLE AIR/OIL VALVE COUPLING** allows selection of the correct air/oil ratio while the burner is running. Any ratio, once selected remains constant from high to low flame.
- 6 **INTERCHANGEABLE NOZZLES** provide for adjustment of the burner flame characteristics and firing range to match furnace requirements.
- 7 **REGULATING SLEEVE AND ISOLATOR VALVE** with established settings provide reduced supply of highly turbulent air for quicker simpler lighting. Also shuts off air supply when servicing burner.
- 8 **QUICK-RELEASE OIL VALVE LINKAGE** allows oil valve to be closed during shut-downs, while permitting continuous circulation of hot oil through the burner body.

ROTAVAC TYPE Q

low-air pressure burners are accurately and robustly constructed to burn any grade of liquid fuel with constant high efficiency.

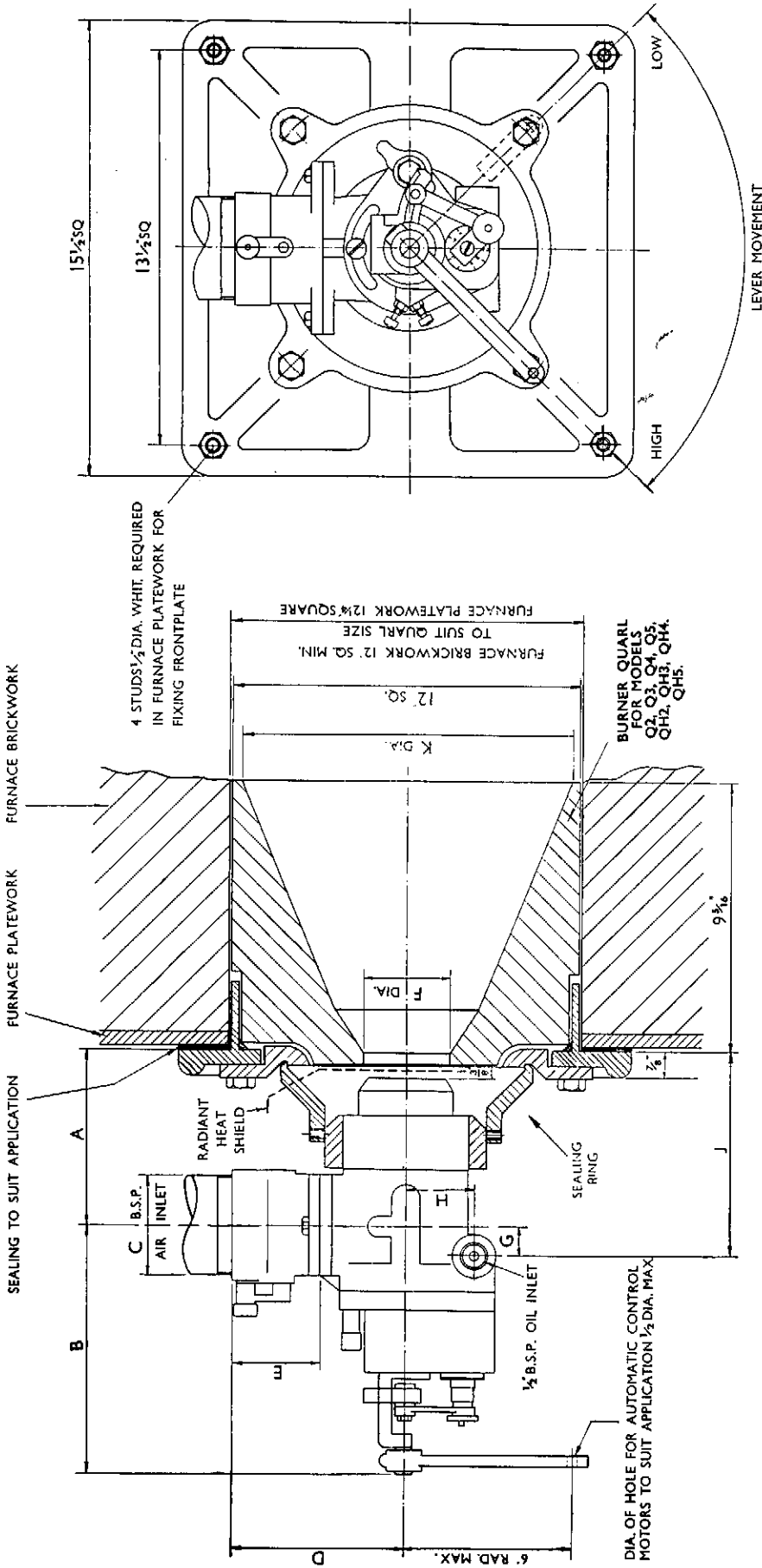
Use of the "Q" burner on any heat process equipment overcomes many difficulties with complicated mechanisms requiring the frequent manipulation of several valves and controls. It also eliminates variations in operating conditions which lower combustion efficiency.

ROTAVAC TYPE QH

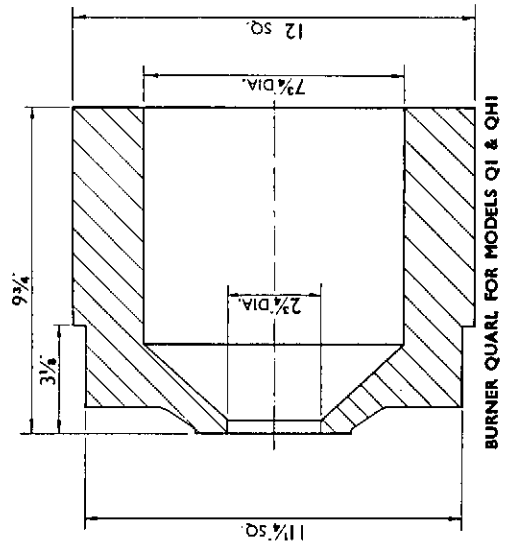
is a special version of the "Q" burner capable of operating with 100% pre-heated air at up to 500°C.

With its unique patterning of fuel spray and selective mixing of oil and hot air, the "QH" burner remains leakproof and air-tight with free movement of the control mechanism under the hottest conditions.

NU-WAY



Burner	A	B	C	D	E	F	G	H	J	K
Q1	4 11/16"	10"	2"	4 5/8"	2 1/4"	2 3/8"	2 1/16"	2 3/8"	6 7/8"	7 1/4"
QH1	5"	"	"	"	"	"	"	"	7 1/16"	"
Q2	6 1/4"	8 1/2"	3"	6"	3"	3"	1"	2 3/8"	7 5/8"	11 3/8"
QH2	5 11/16"	"	"	"	"	"	"	"	6 11/16"	"
Q3	6 3/4"	10"	4"	7 1/4"	5"	3"	2 1/8"	2 1/8"	9 3/8"	11 3/8"
QH3	7 1/16"	"	"	"	"	"	"	"	9 3/8"	"
Q4	7 13/16"	9 5/8"	4"	8 3/4"	5"	4 1/4"	2"	3 1/4"	9 13/16"	11 3/8"
QH4	8 3/16"	"	"	"	"	"	"	"	10 1/16"	"
Q5	9 8/8"	10 5/8"	5"	10"	6"	4 1/4"	2 3/4"	4"	12 1/8"	11 3/8"
QH5	9 3/4"	"	"	"	"	"	"	"	12 1/4"	"



FUELS AND FLEXIBILITY

Rotavac low-air-pressure burners type "Q" are capable of burning any grade of liquid fuel with uniformly high efficiency. Turndown ratio of the Rotavac "Q" burner is approximately—
4 or 5 : 1 (depending on the application)

OIL SUPPLY

to Rotavac Type "Q" and "QH" burners may be by gravity or by pump fed ring-main. Care must be taken to ensure that the supply pressure at the burner inlet is not less than 6 to 7 lb. per sq. in. when using distillate oil or 7 to 10 lb. per sq. in., when using residual oil.

For those applications where true proportioning control is required throughout the burner turndown range, a pressure-regulated ring-main supply must be provided.

Our Technical Department will be pleased to advise on the design of ring-main systems for particular applications and will freely provide estimates for the supply of suitable oil pumping and heating units, filtration and pressure regulation equipment, etc.

PRE-HEATED AIR

For pre-heated air temperatures up to 250°C., burning residual oils, the standard Type "Q" burner can be used. For burning these fuels with higher air temperatures up to 500°C. the Type "QH" burner is offered.

Type "QH" burners can also be used to burn light distillate oils with pre-heated air at temperature up to 250°C

CAPACITY DATA

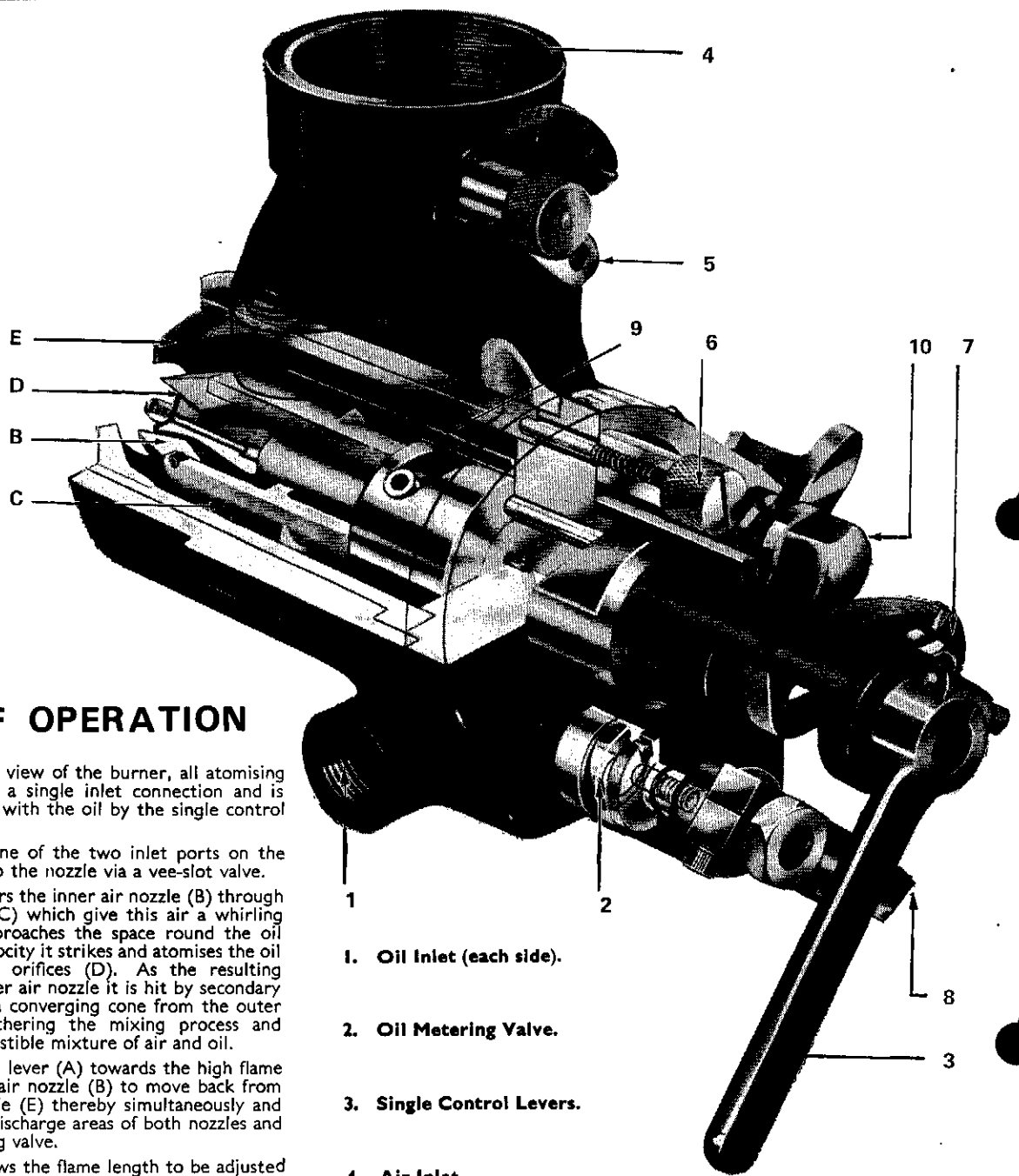
Model	Nozzle Size	Max. Oil Capacity (at 25" w.g. air pressure) Imperial gallons per hour
Q1	S	2.5
QH1	L	4.5
Q2 QH2	S	4.5
	L	8.0
Q3 QH3	S	8.0
	M	11.0
Q4 QH4	L	15.0
	S	15.0
	M	18.0
Q5 QH5	L	24.0
	L	40.0

Note.—When Ordering, state size of nozzle required.

CONTROL SYSTEMS, IGNITION

One or more "Q" or "QH" burners are readily connected to any form of control actuator Front-plates can be provided to accommodate a control motor (either "High/Low" or Modulating), photo-electric flameguard and gas-electric ignitor as required.

NU-WAY



TYPE Q METHOD OF OPERATION

As shown in the cut-away view of the burner, all atomising air enters the burner at a single inlet connection and is controlled simultaneously with the oil by the single control lever.

The oil enters through one of the two inlet ports on the burner body and passes to the nozzle via a vee-slot valve.

Primary atomising air enters the inner air nozzle (B) through tangential inlet opening (C) which give this air a whirling rotary motion. As it approaches the space round the oil nozzle, with maximum velocity it strikes and atomises the oil issuing from eight radial orifices (D). As the resulting air/oil mist leaves the inner air nozzle it is hit by secondary atomising air blowing in a converging cone from the outer air nozzle (E), thus furthering the mixing process and producing a readily combustible mixture of air and oil.

Moving the air/oil control lever (A) towards the high flame position causes the inner air nozzle (B) to move back from the stationary outer nozzle (E) thereby simultaneously and uniformly increasing the discharge areas of both nozzles and of the vee-slot oil metering valve.

The regulating sleeve allows the flame length to be adjusted while the burner is in operation. This is accomplished by applying a varying degree of swirl to the air entering the burner. The flame shape can be changed at will from short, with a wide angle of divergence, to long, with a narrow angle.

For starting, a rich mixture is produced by moving the main air isolator to its half-closed position (START).

The air/oil valve linkage allows adjustment of the air/oil ratio while the burner is in operation, to suit the particular furnace application.

* Type "QH" has different internal construction. Method of operation is identical with Model "Q."

1. Oil Inlet (each side).
2. Oil Metering Valve.
3. Single Control Levers.
4. Air Inlet.
5. Air Isolator Valve.
6. Regulating Sleeve Control.
7. Air/Oil Valve Linkage (variable).
8. Quick-Release Oil Valve Connection.
9. Extra-Low Flame Shield (optional).
10. Inner Assembly Withdrawal Nut.

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Nu-way policy is one of continuous improvement. The right to change prices and specifications without notice is reserved.



ROTAVAC TYPE 'Q' BURNERS

INSTALLATION INSTRUCTIONS PART I

See Data Sheet QD 1273 contained in this booklet. Every care must be taken to ensure that the burner is properly aligned with the quarl. The design of the quarl and frontplate will preclude the possibility of a major error in alignment but if furnace conditions make for critical burner settings—particularly at low rates of firing, then care taken in installation will be repaid. (N.B. If a non standard frontplate and quarl arrangement are involved—possibly to permit the use of a photo-electric cell flame failure device or for other reasons, it will need extra care to ensure that the burner nose is exactly central to the quarl and the burner correctly aligned from the frontplate. The following instructions in this case will still be generally applicable).

To Install the burner proceed as follows:—

1. Mount the frontplate on the furnace plate. The equipment will be more easily handled if the inner burner assembly is removed. To do this unscrew the bronze withdrawal nut(s) (there are two such nuts on the models Q.4 and Q.5) using a $\frac{1}{2}$ " spanner. (If the burner is motorised for automatic control disconnect the linkage at the burner control lever). When the withdrawal nut(s) is/are loosened the associated latch(es) can be lifted clear and the inner assembly withdrawn. Put the inner assembly in a place where it cannot be damaged. Replace withdrawal nut on its stud for safe keeping.

The 4— $\frac{1}{2}$ " screwed studs in the furnace plate should project $1\frac{3}{4}$ " and have a screwed portion of not less than 1 inch. Brass nuts are recommended. Use soft fireclay or similar sealing material between the frontplate and furnace plate and tighten nuts evenly.
2. Insert the quarl in furnace wall (from inside the furnace) using suitable refractory jointing compound to centralise it with the frontplate. The nozzle hole face of the quarl should be slightly less than flush with the centre portion of the frontplate. See Data Sheet QD 1273. Between quarl and except that the solenoid valve must be fitted in a horizontal pipe as close to the burner as possible and in between the frontplate use

soft fireclay or similar material to effect an air tight seal.

3. Replace the burner inner assembly.
4. Make final oil connection—normally to the left hand side of the burner. For distillate oils (See below under OPERATING INSTRUCTIONS) the oil connection at the opposite side of the burner may be simply plugged. For residual oils which require preheating a small fullway gate valve must be fitted to the alternative oil connection, followed by a bend downwards to permit easy drainage of oil prior to lighting up. (In certain circumstances it may be desirable to have oil permanently circulating through the burner body whilst the plant is in operation. Such an arrangement is the subject of special advice on our part. Arrangements for ensuring constant oil pressure at the burner are also the subject of special advice which should be sought in the design stage of the installation). In all cases an isolating stop valve must be fitted before the burner inlet connection—preferably within 18" of the burner itself. Flexible pipe is not to be preferred for the final connection due to its tendency to harden and leak under very hot conditions. Be careful to ensure that the connecting pipe does not tend to distort the burner from its correct position. To guard against this a union fitting in the oil line near the burner is advisable.
5. Make final air pipe connection. There is no need to have an isolating air valve before the burner—a butterfly valve is built into the burner itself. Neither is it necessary to have a flexible air pipe but every care must be taken to ensure that the final connection is exactly in line with the burner air inlet so that distortion of the burner position is avoided. For this reason a flanged joint should be arranged close to the burner and preference given to flanged prefabricated ducting throughout rather than screwed standard pipework.

The foregoing instructions are unaffected by the use of photo-electric cell and solenoid oil valve flame failure equipment burner oil line isolating valve and the burner.

OPERATING INSTRUCTIONS PART II

Fuel Temperatures and Pressures at the Burner

Grade of Fuel (Nominal)	Fuel Temperature	Fuel Pressure (range recommended— higher pressure can be used—see note below).	
Distillate—Maximum 70 seconds viscosity Redwood No. 1 @ 100°F.	Unheated	3—10 p s.i.	0.2 —0.69 Bars
Residual—200 seconds Redwood No. 1 @ 100°F	165°F 73.9°C	10—20 p s.i.	0.69—1.37 Bars
Residual—1,000 seconds Redwood No. 1 @ 100°F	195°F 90.6°C	10—20 p s.i.	0.69—1.37 Bars
Residual—3,500 seconds Redwood No. 1 @ 100°F	225°F 107.2°C	10—20 p s.i.	0.69—1.37 Bars

Oil and air pressures at the burner must be constant if true proportioning control is to obtain. The higher the oil pressure the more sensitive will be the burner metering valve to adjustment. However a relatively high oil pressure is to be preferred with residual oils to assist initial oil flow when lighting up.

All burners are rated at air pressure of 25 inches water gauge with all air through the burner against a neutral pressure condition. Maximum rate of firing and turn down range will be reduced at lower air pressures. Atomisation will be reduced to an impracticable level with air pressures below about 12 inches water gauge on distillate oils and about 16 inches water gauge on residual oils.

To light and set the burner

(N.B. The description of burner parts given below are taken from the illustration at the back of, or drawing inside of Data Sheet QD 1273 e.g. "single control lever", "sealing ring", etc.)

1. Ensure that oil at the correct temperature and pressure is available.
2. With the exception of the burner isolating valve make sure that all other valves in the oil supply line are open. Also open the burner drain valve—opposite the burner oil inlet if residual fuel is being used.
3. Start Primary Air Fan. Ensure that all burners receiving air have their Air Valve lever in the 'OFF' position.
4. Slacken off burner quick release oil valve knob and set metering valve closed. The valve is marked off "0—10". The valve is closed when set at "0". Crack open the burner isolating valve and allow cold oil to be purged from burner drain port.
5. As soon as a good supply of hot oil is available close the burner isolating valve and then close the burner drain valve.
6. Move the flame length regulating sleeve knob to the position marked 'LIGHT' for distillate oil and 'SHORT' for residual oils. Move the single control lever to the half open position i.e. clockwise to its fullest extent (closed) and then choose a midway position for burners size 1 and 2. For burners size 3, 4 and 5 a position about a third open will be found to be better.
7. Open air valve to 'START' position. Draw back the sealing ring and apply a gas torch so that the gas flame is licking around and immediately in front of the burner nozzle. Open the burner isolating valve until the burner lights. A faulty light up will lead to heavy smoke emission from the furnace. Shut stop valve, let air clear

the smoke and try again. Adjust on metering valve to achieve a rich but not heavily smoking flame. Gradually open the air valve towards the 'RUN' position adjusting if necessary on the oil metering valve to sustain a good flame condition. Opening the air valve too quickly may cause the flame to go out. If so shut down and try again. Proceed until a good flame with air at 'RUN' is achieved.

8. Allow the quarl to warm up. When hot move the flame length regulating sleeve knob clockwise from the lighting up position until the flame is just clear of the quarl. If this is done too quickly flame will become unstable or go out altogether. However, too long a period of firing in the light up position will result in carbon forming within the quarl.

(At this stage the burner is at a midway firing rate with the single lever only controlling the air. If for any reason a slow warming up of the furnace is desirable a smaller flame can be obtained by gradually moving the single lever control anti-clockwise and by following each movement of the single lever with a corresponding adjustment (towards "0") on the oil metering valve until a suitable flame is obtained. The longer the burner fires the hotter will become the quarl and smaller will become the possible flame size without loss of flame stability).

9. As soon as conditions are suitable for full range adjustment put the burner into a high flame position. If it has been set lower as described above, reverse the slowing down procedure i.e. gradually open oil metering valve followed up corresponding movement (clockwise) of the single control lever.

Without moving the control lever slacken off the nut which clamps the variable oil/air linkage to the associated slotted quadrant. Move the pointer which is attached to a position about No. 8 on the quadrant and retighten finger tight only. Without moving the oil metering valve slacken off the cap head screw which clamps the metering valve lever to the valve spindle and move the lever into a position which enables the quick release connection to be reconnected. Make the connection and tighten cap head screw.

The burner is now under control for both oil and air by the single control lever.

10. High Flame Adjustment

Move the single control lever clockwise to its fullest extent—this is the high flame position. Adjust for approximately correct oil/air ratio by slackening off the oil metering valve lever cap head screw so that oil can be adjusted without moving burner lever from high flame position. Also adjust for desired flame length so that ultimately a flame which verges on making smoke without actually doing so is achieved. Tighten cap head screw and flame length regulating knob when conditions are satisfactory.

11. Low Flame Adjustment

For low flame adjustment move the single control lever anti-clockwise gradually. If the flame tends to become oxydising (very bright—possibly with sparks) slacken off quadrant nut and move the connection progressively from the No. 8 position to a lower number. This will permit more oil to pass to the nozzle. If reducing (smoky) move the connection out towards No. 10 position until the flame is clear of smoke. Proceed in this way until single lever is in the furthest anti-clockwise position with a clean flame.

12. When the furnace is really hot close the frontplate with sealing ring and reset for high and low flame to achieve best possible conditions. When this is done secure all fastenings firmly and note the position of all settings; i.e. flame length regulating sleeve knob; variable oil/air adjusting link on quadrant; high flame setting on oil metering valve and oil pressure.

For subsequent light ups, proceed as for 1, 2 and 3. Then bleed off cold oil as in the latter part of 4 and proceed as for 5.

Then move single operating lever into a halfway position, open air valve to 'START', draw back frontplate closing collar and apply gas torch. Open burner isolating oil valve gradually but fairly quickly. If burner fails to light easily move the flame length regulating sleeve knob back towards the 'LIGHT' position. Once burner is alight gradually bring air valve to 'RUN' position and return flame length regulating sleeve to best position. When flame is well established close the frontplate and work burner as required.

Shutting Down

First close the burner isolating oil valve. (If the burner is fed by a ring main circulating oil loop

undo oil metering valve quick release nut and put valve into off position). Then shut off air valve. Withdraw sealing ring and drop radiant heat shield into position. If burner is to be off for any great length of time it is worth considering removing the inner assembly, swilling the nozzle portion only in paraffin and replacing in burner body immediately. (This applies only where preheated oils are used). Do not immerse the whole inner assembly in paraffin. The use of the anti-radiation shield will preserve nozzle life indefinitely.

Use of High and Low Flame Stops

It may be desirable to limit the movement of the single control lever below maximum. If so the high and low flame stops as indicated in Data Sheet QD 1273 can be used. (This would apply on hand controlled jobs only—on motorised burners the lever movement can be controlled by adjustment of the linkage between control motor and burner lever). Each stop screw is fitted with a locknut. Slacken this off and screw stop into burner back plate assembly to achieve desired limits of movement.

Use of Extra Low Flame Shield (If fitted—See Item (9) Data Sheet QD 1273.

At times the furnace conditions and required high flame length will combine to prevent a stable low flame which is as low as the process demands. Removal of the flame length regulating sleeve will expose the extra low flame shield. By moving this shield clockwise (with the burner nozzle towards you) extra swirl of air on low flame can be achieved. This will stabilise the flame. Secure and mark the best position. The best position can only be found by trial and error and some patience may be needed before it is found.

Maintenance of Burner

It will normally only be necessary to keep the burner clean to ensure consistent, trouble free operation.

To Clean the Burner

Turn off the oil supply to the burner. (It is not sufficient to have the oil metering valve in the closed position). Put the air valve to 'OFF'—or switch off the fan if convenient. Unscrew the bronze withdrawal nut(s) on the burner backplate assembly—using a $\frac{1}{2}$ " spanner. When the nut(s) has/have been loosened the associated latch(es) may be lifted clear, the nuts removed, and the inner assembly withdrawn. The nut(s) should be replaced immediately on the stud(s) for safe keeping.

Handle the inner assembly with care. Do not drop it or bring it into sharp contact with other

hard objects. If possible take it to a bench or other place where parts can be put into a clean place pending cleaning and reassembly.

Remove the flame length regulating sleeve knob and detach regulator sleeve. By moving the control lever into the high flame position the oil jet nose will be sufficiently exposed to permit cleaning of radial oil ports with soft copper or brass wire. Removal of the oil jet end plug will permit cleaning of the centre bore in a similar way. Clean burner, hot from use on the furnace or with preheated oil, the nozzle portion only can simply be agitated in a bucket of paraffin and wiped clean. If any dirt has accumulated on the body of the assembly wipe this off with clean rags.

General Maintenance.

The foregoing attentions are all that are necessary for routine maintenance. If further attention or inspection is warranted the burner may be stripped down completely by a competent engineer. Care should be taken to note the disposition and means of fastening all parts so that correct reassembly is easily achieved.

Removal of the oil metering valve spindle will expose 'O' type sealing rings and special care must be taken not to lose or damage these items.

If the jet assembly has to be removed clamp the burner back plate in a soft jawed vice and use a spanner on the 'flats' provided. On reassembly the joint between the jet assembly and backplate must be made up with oil-pipe jointing compound and secured most tightly. Some burners are fitted with an 'O' ring where jet assembly enters backplate in which case jointing compound is unnecessary.

Spares

All parts for Rotavac Industrial Burners may be obtained from Nu-Way Heating Plants Ltd., P.O. Box 1, Droitwich WR9 8NA, England.

'O' rings and a spare inner assembly are recommended as spares to be carried where a number of burners are involved. All inner assemblies (for burners of the same size) are interchangeable and a spare assembly which can be inspected and cleaned at comparative leisure may be found valuable at times. Although inner assemblies are basically interchangeable slight variations in settings will probably apply where conditions are critical. Notation of settings should therefore be applied to inner assemblies rather than burners as a whole.